S. HRG. 113–810

OVERSIGHT HEARING: EPA'S PROPOSED NATIONAL AMBIENT AIR QUALITY STANDARDS FOR OZONE

HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

DECEMBER 17, 2014

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C O N T E N T S

OVERSIGHT HEARING: EPA'S PROPOSED NATIONAL AMBIENT AIRQUALITY STANDARDS FOR OZONE

THURDSAY, DECEMBER 17, 2014

U.S. SENATE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
Washington, DC.

The committees met, pursuant to notice, at 2:30 p.m. in room 406, Dirksen Senate Building, Hon. Sheldon Whitehouse (chair of the subcommittee) presiding.

Present: Senators Whitehouse, Gillibrand.

OPENING STATEMENT OF HON. SHELDON WHITEHOUSE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator WHITEHOUSE. Good afternoon, everyone. I think I will call this hearing to order at the exact moment that at least my little BlackBerry says it is 2:30.

Welcome, everyone, to what is virtually assuredly the last congressional hearing of this Congress. I think most of the building is empty but for us, and we are relatively empty here as well. But I am very pleased that we are here, and I thank the witnesses for coming today.

The Clean Air Act requires EPA to review National Ambient Air Quality Standards, which if you initialize that, it turns to NAAQS, which in turn gets pronounced as "nacks." So that is why everybody talks about NAAQS in this area. It requires EPA to review NAAQS standards for ozone and for five other pollutants every 5 years to ensure that they protect public health.

The current 75 parts per billion ozone standard has been too high since the day it was finalized by the Bush administration back in 2008. That decision by the Bush administration was so out of line that the scientific advisory committee actually pushed back after the fact and wrote a very unusual letter to Administrator Johnson, telling him that he had made a mistake and that the number could not be justified. But given the priorities of that Administration, the scientific advice was not reckoned with.

So therefore, the standard was set. Since then we have had false comfort that the air we breathe every day is safe. The revised standard is a significant improvement. It is based on extensive scientific research, including over 1,000 studies that have been published since the 2008 standard. This is a particularly big deal in my home State of Rhode Island. The congressional Research Serv-

ice has looked at the history of these air quality standards and it has in its report a map from the EPA Green Book that shows the non-attainment areas and the State of Rhode Island and a good deal of the northeast coast is just whack in the middle of the area.

There is a significant reason for that that I will get to in a minute. But Providence and Kent Counties in Rhode Island, as a result, get F grades for high ozone days in the American Lung Association's 2014 State of the Air Report. Regrettably, there is not a whole lot that we can do about it in Rhode Island, because the causes tend to be out of State. And specifically, they include out of State power plants that for years dodged providing adequate pollution controls. At the same time, they used particularly tall smokestacks to launch the ozone-forming pollutants that they produced up into prevailing winds that move northeast from the Midwest, from the Ohio Valley, from that heavy coal-burning area. And they come landing on us. It is actually a pretty deliberate path to ozone formation that pollutes the air and the lungs of people in downwind States like mine.

Now, the industry claims that an ozone standard that protects public health will devaState businesses and the economy. But when you look at history, over and over again, those claims have been shown to be exaggerated and usually the contrary is true. In this case, I believe Ms. McCabe will testify that in terms of cost and benefit, the benefits of this rule in health and in other areas are three times the cost.

EPA's analysis shows that health benefits of a 65 to 70 part per billion ozone standard translate into economic benefits that, excluding California, which I guess already complies with this, would be $4 billion to $23 billion higher than the costs in 2025. These EPA regulations have already lowered the number and severity of bad air days in the United States. These bad air days are days where ozone levels are so high that it is unhealthy for sensitive individuals like the elderly or infants or people with breathing difficulties to be outdoors.

We get those in Rhode Island. We get those in Rhode Island in the summer. It is a perfectly nice day, you are driving into work, you are listening to the radio and the voice on the radio suddenly says, today is a bad air day in Rhode Island, and advises the elderly and infants and people with breathing issues to stay indoors. Basically, the day of those people has just been taken from them by out of State polluters who have been reckless about complying with the laws.

As climate change warms things up, it actually makes the conditions for ozone formation more common and therefore, more bad air days more likely. CASAC, the Science Advisory Committee, is again recommending that EPA set a standard within the 60 to 70 parts per billion range, noting that 60 parts per billion would offer more public health protection than a standard between 65 and 70 parts per billion. I hope that EPA will set a standard of 60 parts per billion that prioritizes public health protection.

I thank Ms. McCabe for being here, and invite her to proceed.

STATEMENT OF JANET McCABE, ACTING ASSISTANT ADMINISTRATOR FOR THE OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Ms. MCCABE. Thank you, Chairman Whitehouse. Thank you for the opportunity to testify today on EPA's recently proposed updates to the ozone National Ambient Air Quality Standards, or NAAQS, as you described them.

Because the air we breathe is so important to our overall health and well-being, the Clean Air Act requires EPA to review the NAAQS every 5 years to make sure that they continue to protect public health with an adequate margin of safety. For at-risk groups, including millions of adults and children who have asthma, this is critical.

Establishing and implementing a NAAQS is a two-step process for improving air quality. Setting the standards is step one. It is about defining what is clean air to protect public health. Implementing the standards is step two, and involves the Federal Government, States and tribes, if they wish to, putting measures and programs in place to reduce harmful pollution.

For this review, EPA examined thousands of scientific studies and, based on the law, based on a full review of the science, based on the recommendations of the agency's independent scientific advisors, and based on the assessment of EPA scientists and technical experts, the Administrator has proposed to strengthen the standards to within a range of 65 to 70 parts per billion to better protect Americans' health and welfare. This is a proposal, and taking public comment on a range is exactly how the process is supposed to work. The agency welcomes comments on all aspects of the proposal, including on setting the level as low as 60 parts per billion. We will accept comment on retaining the existing standard, as well.

We are also proposing to update the Air Quality Index for ozone. The AQI is the tool that you just referred to, Senator, that gives Americans real-time information to help them make the best choices to protect themselves and their families. And we are proposing to make updates to monitoring and permitting requirements, to smooth the transition and to assure that the public has full information about air quality. All of these updates are designed to ensure that Americans are alerted when ozone approaches levels that may be unhealthy, especially for sensitive people.

To protect the environment from damaging levels of ground level ozone, as required by the Clean Air Act, the EPA has also proposed to revise the secondary standard to within the same range to protect against harm to trees, plants, and ecosystems. The science clearly tells us that ozone poses a real threat to our health, especially to growing children, older Americans, those of us with heart or lung conditions, and those who are active or work outside. The proposal to strengthen the standards is designed to better protect children and families from these health effects of ozone pollution.

For example, we estimate that meeting a level of 70 parts per billion would prevent hundreds of thousands of missed school days and asthma attacks and hundreds of premature deaths per year. This would yield annual health benefits of $6.4 billion to $13 billion. These estimated benefits include the value of avoiding asthma

attacks, heart attacks, missed school days and premature deaths, among other health effects.

States will ultimately determine what measures beyond the Federal ones are appropriate for their clean air plans. EPA has estimated illustrative annual costs at $3.9 billion for a standard of 70 parts per billion. The estimated benefits outweigh the estimated costs by as much as a ratio of three to one. And meeting a standard of 65 parts per billion is projected to provide additional benefits.

Implementing a NAAQS has always been and will continue to be a Federal, State and tribal partnership. Local communities, States, tribes and EPA have already shown that we can reduce ground level ozone while our economy continues to thrive. Nationally, since 1980, average ozone levels have fallen by a third. And 90 percent of the areas originally identified as not meeting the ozone standard set in 1997 now meet those standards. We have reduced air pollution and our economy has grown. We fully expect that this progress will continue.

Existing and proposed Federal measures like vehicle standards and power plant rules are leading to substantial reductions in ozone nationwide, which will help improve air quality and help many areas meet any revised standard.

Exposures to ground level ozone, a key component of smog, can have very serious consequences for our families' health and the environment. We are looking forward to hearing what the public thinks about the proposal. There will be a 90-day public comment period, which I believe starts today. I am told that the rule published today. We will be holding three public hearings, as well, as we work toward completing the final standards by October 1st, 2015.

Senator, I look forward to your questions. Thank you very much.

[The prepared statement of Ms. McCabe follows:]

Opening Statement of Janet McCabe Acting Assistant Administrator
U.S. Environmental Protection Agency
Hearing on EPA's Proposed Ozone National Ambient Air Quality Standards
Environment and Public Works
Clean Air and Nuclear Safety Subcommittee
U.S. Senate
December 17, 2014

Chairman Whitehouse, Ranking Member Sessions, members of the subcommittee: Thank you for the opportunity to testify today on EPA's recently proposed updates to the Ozone National Ambient Air Quality Standards.

Because the air we breathe is so important to our overall health and well-being, the Clean Air Act requires EPA to review the National Ambient Air Quality Standards (NAAQS) every five years to make sure that they continue "to protect public health with an adequate margin of safety." For at-risk groups, including the estimated 25.9 million people who have asthma in the United States (almost 7.1 million of whom are children), this is critical. Establishing and implementing a NAAQS is a two-step process for improving air quality. Setting the standards is step one – it is about defining what is clean air to protect public health. Implementing the standards is step two, and involves the federal government, states, and tribes if they wish to, putting measures

and programs in place to reduce harmful pollution. We will continue to work together with state, tribal and local partners to build on the progress we have already made and meet any revised standard over time in a flexible and cost-effective way. The Federal government also promulgates regulations designed to reduce emissions, helping states meet the NAAQS.

For this review, EPA examined thousands of scientific studies, including more than 1,000 new studies published since EPA last revised the standards in 2008. And based on the law, based on a thorough review of the science, based on the recommendations of the agency's independent scientific advisors, and based on the assessment of EPA scientists and technical experts, the Administrator's judgment was to propose to strengthen the standards to within a range of 65 to 70 parts per billion to better protect Americans' health and welfare. This is a proposal, and taking public comment on a range is exactly how the process is supposed to work. The agency welcomes comments on all aspects of the proposal, including on setting the level as low as 60 parts per billion, and will accept comment on retaining the existing standard.

We are also proposing to update the Air Quality Index for ozone to reflect a revised standard if one is finalized. The AQI is the tool that gives Americans real time information to help them make the best choices to protect themselves and their families. And we're proposing to make updates to monitoring and permitting requirements, to smooth the transition to any revised standards and assure that the public has full information about air quality. EPA is proposing to lengthen the ozone monitoring season for 33 states to match the season when ozone levels can be elevated. All of these updates are designed to ensure that Americans are alerted when ozone approaches levels that may be unhealthy, especially for sensitive people.

To protect the environment from damaging levels of ground-level ozone as required by the Clean Air Act, the EPA has also proposed to revise the secondary standard. Based upon new studies that add to the evidence that repeated exposure to ozone can stunt the growth of some trees and damage some plants, the Administrator judges that proposing a secondary standard within the range of 65 to 70 parts per billion would protect the public welfare, particularly against harm to trees, plants and ecosystems.

The science clearly tells us that exposure to sufficiently elevated ozone levels poses a real threat to our health, especially to growing children, older Americans, those of us with heart or lung conditions, and those who are active or work outside. The Administrator's proposal to strengthen the standards is designed to better protect children and families from the health effects of ozone pollution.

For example, we estimate that meeting a level of 70 parts per billion would prevent an estimated 330,000 missed school days, 320,000 asthma attacks, and 710 to 1,400 or more premature deaths per year. Meeting a standard of 65 parts per billion is projected to provide additional benefits.

In addition to giving families across the country an improved quality of life, the benefits of avoiding these health effects are significant. EPA estimates that meeting the standards will yield health benefits valued at $6.4 to $13 billion annually in 2025 for a standard of 70 ppb, and $19 to $38 billion annually in 2025 for a standard of 65 ppb, nationwide, excluding California. These estimated benefits include the value of avoiding asthma attacks, heart attacks, missed school days and premature deaths, among other health effects. EPA analyzed the estimated benefits and

costs for California separately, because a number of areas in California would have longer to meet the proposed standards under the Act, due to the unique challenges facing the state. Benefits of meeting the proposed standards in California add to the nationwide benefits after 2025, with values estimated at $1.1 to $2 billion annually after 2025 for a standard of 70 ppb, and $2.2 to $4.1 billion for a standard of 65 ppb.

States will ultimately determine what measures – beyond federal ones – are appropriate for their clean air plans, but EPA has estimated illustrative costs at $3.9 billion in 2025 for a standard of 70 ppb, and $15 billion for a standard at 65 ppb, nationwide except for California. Estimated costs in California post-2025 are $800 million for a standard of 70 ppb and $1.6 billion for a standard of 65 ppb. The estimated benefits outweigh the estimated costs by as much as a ratio of 3 to 1.

Implementing a NAAQS has always been and will continue to be a federal, state, and tribal partnership. EPA stands ready to do our part to assist states and tribes with pollution control programs and to streamline implementation. Local communities, states, tribes and EPA have already shown that we can reduce ground-level ozone while our economy continues to thrive. Nationally,

since 1980, average ozone levels have fallen by a third. And 90 percent of the areas originally identified as not meeting the ozone standards set in 1997 now meet those standards. We have reduced air pollution and our economy has grown. We fully expect that this progress will continue. Existing and proposed federal measures like vehicle standards and power plant rules are leading to substantial reductions in ozone nationwide, which will help improve air quality and help many areas meet any revised standard.

Conclusion

Exposures to ground-level ozone, a key component of smog, can have very serious consequences for our families' health and for the environment.

We are looking forward to hearing what the public thinks about the proposal. Once it's published in the Federal Register, there will be a 90-day comment period, and we'll be holding three public hearings as well, as we work toward completing the final standards by October 1, 2015.

I look forward to discussing the proposal over the next several months, and I look forward to your questions. Thank you.

Senator WHITEHOUSE. Thank you very much, Ms. McCabe. Let me welcome Senator Gillibrand. Being a fellow Northeasterner, it is no surprise to me that she has taken the trouble to come to this hearing. Our States are on the receiving end of the ozone that other States and the power plants in those States emit.

Can you describe what you think the methodology is likely to be for compliance with this standard in other States? Is it cleaning up at the smokestack? Is it policy changes at the State level? What are you expecting by way of a compliance method?

Ms. MCCABE. It will really depend on a couple of things. The States are ultimately responsible for designing plants to meet the standard. They can take into account any Federal measures that have been put in place. EPA, for example, recently finalized the Tier 3 engine and fuel standards, which will provide substantial benefits, way out into the future, in the timeframe needed for these areas. So I would expect that many States would rely on programs like that, and other Federal programs that are going forward.

Senator WHITEHOUSE. So some things, some compliance regimes that will help States achieve the standard are already in place. Measuring their effect will be a part of the compliance.

Ms. MCCABE. That is correct.

Senator WHITEHOUSE. Do you expect that there are new requirements that, for instance, power plants will have to apply?

Ms. MCCABE. When it comes to power plants, we have, of course, the mercury rule. We have the cross-State air pollution rule. We have the Clean Power Plan, which is moving forward as a proposal at this time. There are other tools that either we or States would look at. The cross-State air pollution comes from our good neighbor provisions in the Clean Air Act. States are obliged to address pollution that they are contributing to downwind areas. We will be working with the States to assess whether there are those kinds of contributions, in light of the other programs that are in place. And as appropriate, then we and the States would work together to put in place requirements that might affect large sources like power plants.

Senator WHITEHOUSE. So a power plant owner looking at this proposed rule could expect that the improvements in emissions that they would be obliged to make as a result, for instance, of the good neighbor policy, would count toward the new ozone standard and would likely help reduce their emissions of ozone precursors as well, correct?

Ms. MCCABE. That is correct. It all depends on what the monitors show, and any program that is helping those monitors show compliant air quality is helping.

Senator WHITEHOUSE. EPA's analysis that the benefits are between $6 billion and $13 billion and the costs around $4 billion, that analysis is not a first effort by EPA. You have looked at the question of cost benefit analysis of clean air regulations for many years, have you not?

Ms. MCCABE. We do, yes.

Senator WHITEHOUSE. What is the track record of your estimates?

Ms. MCCABE. We generally are conservative in estimating the costs of the measures that would be put in place. I think there is

a fairly steady track record of technologies coming in at lower costs than we expected.

Senator WHITEHOUSE. So you are pretty confident in the track record of your previous estimates, and that gives you some confidence that these estimates have merit?

Ms. MCCABE. Yes, and I should note also that these costs are illustrative, because as I said, it will be up to the States ultimately to determine what makes the most sense for them, and they will look for the most cost-effective approaches. We do our best to do an illustrative case.

Senator WHITEHOUSE. And would costs that would be required to meet this standard also be costs that would be pertinent to meeting the good neighbor rule?

Ms. MCCABE. Well, we don't double-count things, so if costs have already been assumed in other rules, then we don't count them again here. So we try to make very clear that the costs for each rule are associated with that rule.

Senator WHITEHOUSE. Senator Gillibrand.

OPENING STATEMENT OF HON. KIRSTEN GILLIBRAND, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator GILLIBRAND. Thank you so much, Senator Whitehouse, for chairing this hearing today. I am very eager that we have a chance to address the EPA's proposed National Ambient Air Quality Standards for ozone.

I also want to thank Assistant Administrator Janet McCabe for joining us today. I am very grateful.

At a time when pictures of smog-filled foreign capitals are making front pages around the world, the United States should be taking the lead on the issue of air quality. I believe it is an urgent public health challenge and we have to take it very seriously. We are long overdue in this Country for updated air quality standards from the EPA.

This past April, the American Lung Association released its annual State of the Air Report. They found that nearly half of all Americans, more than 147 million people, live in counties where ozone or particle pollution levels make the air unhealthy to breathe. Although some air quality indicators improved, levels of ozone and smog are much worse than they were last year. The report also found the 22 out of 25 most smog-polluted cities, including New York City in my home State, had more high smog days on average than last year.

In the richest and most innovative Country on earth, it is stunning that our air quality is moving back in this direction in the year 2014, and we have to reverse the trend. Because as global temperatures continue to rise, and it is clear that they are doing so, the risks for smog in our communities will continue to grow.

I have heard from many New Yorkers whose children have asthma about the challenges they face in addressing air quality in their own communities. So this is something that we all have to be concerned about, not just for kids, but for our seniors and anyone with any type of lung or heart disease. I find it especially disturbing that more than 35.6 million children under 18 right here in the United States live in counties that have poor air quality. I am very

concerned particularly about the levels of bronchitis and lung infections that we have in our communities. And we are failing them if we can't enact more stringent air quality controls.

The Southern California Children's Health Study looked at children who grew up in more polluted areas, and it came to the stunning conclusion that lung function for those kids dropped by 20 percent from what was expected for their age. It is as if these children grew up in a home with parents who smoke, except the side effects just came from playing outside.

Senator GILLIBRAND. So I have a couple of questions to ask you that I can submit for the record if we don't have enough time.

Senator WHITEHOUSE. We are good, it is just us.

Senator GILLIBRAND. Just us, OK.

Ozone values for New York City, Staten Island and Long Island have been dropping since 1990. But values are still at or above the current 75 parts per billion standard, especially during summer months. What are some of the standards that could be put in place to help New York and other States meet the proposed lower standard?

Ms. MCCABE. Sure. I mentioned the Tier 3 engine and fuel standards that the agency finalized at the beginning of this year. Those will go into effect starting in 2017 and will significantly reduce the NOx emissions from motor vehicles. In a populated place like New York, Rhode Island, the east coast, that will have a tremendous and very quick impact.

Reductions by power plants of NO_x will also have an impact and that has been mentioned already. Ozone is a regional pollutant, so emissions reductions that happen many miles away can help reduce impact in local areas.

There are also a number of local measures that areas can take to reduce local emissions. Many areas have put a lot of those in place already, New York City, Rhode Island, those areas certainly have done that. But we know that there continue to be reductions that can be achieved out there, both locally and regionally.

Senator GILLIBRAND. Thank you.

Throughout the history of the Clean Air Act, we have continually heard claims by polluters and other opponents of strong clean air standards that they can't afford to clean up emissions, that it just costs too much. This implication is that somehow we can't have both a clean environment and a healthy economy. This is something I strongly disagree with and we have not seen the doomsday scenarios that they have predicted time and time again.

Now, we are hearing the same industry chorus again saying that it is too costly to implement the new proposed ozone standards. Can you address some of these claims head-on, and how do you see the ability of industry to adapt and innovate to meet strong ozone standards? Can you describe the benefits that we will see as a society and the cost savings for families that will come from taking more pollutants out of the air?

Ms. MCCABE. The first thing to really emphasize in response to your question, Senator, is that the decision that the Administrator proposed just recently and that is out for public notice today is all about what is the right level that means safe air quality. It is not about implementation, it is not about the costs associated with im-

plementation. There are processes laid out in the Clean Air Act to address that. This is about making sure that Americans can know what is a safe level for them to have in their air. So that is what we are all about here.

However, I will go on to say that over the last 40 years, 40-plus years now that the Clean Air Act has been in effect, air pollution in this Country has declined by 70-plus percent. The economy has tripled. The record jus doesn't bear out that a clean economy and clean air don't go together. I share your view on that.

We have found time and time again that American industry, American engineers have innovated, have developed technologies that we didn't know existed at the time that standards were established or existed but were not in widespread use or were costly. And those costs came down, and those technologies have become the norm now. Things like selective catalytic reduction, catalytic converters for cars, low or zero VOC coatings. All these things are technologies that have developed and have helped to bring clean air and to grow business and industry in this Country.

Senator GILLIBRAND. Thank you. Thank you, Mr. Chairman.

Senator WHITEHOUSE. One last question with respect to the NO_x emissions from the power plants. How are those reduced?

Ms. MCCABE. Typically, technology like selective catalytic reduction or non-selective catalytic reduction are the two main technologies that are used. There are low-NO_x burners, other technologies like that.

Senator WHITEHOUSE. Equipment that is manufactured in order to clean up the emissions?

Ms. MCCABE. That is correct.

Senator WHITEHOUSE. Great, thank you. Thank you very much for your testimony. Good luck with the rule. I know that you have a lot of input ahead of you before you finalize it. And thank you for your efforts.

Ms. MCCABE. Thank you.

Senator WHITEHOUSE. I will now call the next panel. What I would like to do is introduce the witnesses who are here and then invite them to speak sequentially. Our first witness is Greg Wellenius, who is an Associate Professor of Epidemiology and Associate Director of the Center for Environmental Health and Technology at Brown University School of Public Health. His work is primarily focused on studying the effects of ambient air pollution on the risk of cardiovascular events and its effects on cardiovascular physiology. He received his Bachelor of Science and Master of Science in Physiology from McGill University and his doctorate in epidemiology and environmental health from Harvard University. He has been doing ground-breaking work in Rhode Island studying heat-related deaths and hospitalizations. So I am particularly proud that Dr. Wellenius is with us today.

He will be followed by Vicki Patton, who is Environmental Defense Fund's General Counsel, and manages the organization's national and regional clean air programs. Prior to joining EDF, Patton worked at the U.S. Environmental Protection Agency's Office of General Counsel here in Washington, where she provided legal counsel on a variety of national air quality initiatives. She serves as a member of EPA's National Clean Air Act Advisory Committee.

She received her B.S. in hydrology from the University of Arizona and her J.D. from NYU School of Law.

Dr. Thomas Ferkol is the Alexis Hartmann Professor of Pediatrics and a professor of cell biology and physiology and director of the multi-disciplinary division of Pediatric Allergy, Immunology and Pulmonary Medicine at the Washington University School of Medicine. In addition to his work at Washington University School of Medicine, Dr. Ferkol is the President of the American Thoracic Society, an international organization with over 15,000 members. He also serves as a member of the American Board of Pediatrics sub-board of Pediatric Pulmonology. Dr. Ferkol is a graduate of Case Western Reserve and the Ohio State University College of Medicine.

The remaining two witnesses on our panel, Mr. Ross Eisenberg and Dr. Bryan Shaw are no-shows. They were invited, they accepted the invitations and they confirmed their attendance. We informed them that the hearing would proceed as clearly as allowed under Senate rules. So it is unfortunate they have chosen not to attend this official Senate hearing. But we will go ahead with the witnesses who did choose to attend.

If you would proceed, Dr. Wellenius, thank you very much for coming down from Rhode Island for this hearing.

STATEMENT OF GREGORY A. WELLENIUS, SC.D., ASSOCIATE PROFESSOR OF EPIDEMIOLOGY; ASSOCIATE DIRECTOR, CENTER FOR ENVIRONMENTAL HEALTH AND TECHNOLOGY, BROWN UNIVERSITY SCHOOL OF PUBLIC HEALTH

Mr. WELLENIUS. Thank you, Mr. Chairman. It is a pleasure to be here. Thank you for the opportunity to testify today.

My name is Dr. Greg Wellenius, and I am an associate professor of epidemiology at the Brown University School of Public Health and associate director of the Brown University Center for Environmental Health and Technology. I earned my doctorate in environmental health and epidemiology from the Harvard School of Public Health, and previously served on the faculty at Harvard Medical School. I have been conducting research on the health effects of air pollution for more than 15 years and it is my pleasure to provide testimony in this area today.

There is broad scientific and medical consensus that the current standard of 75 parts per billion is outdated, and that a protective standard should fall within the range of 60 to 70 parts per billion. Reducing ozone pollution will save lives and improve air quality for everyone, especially vulnerable populations like children and those with asthma.

For the reasons I will detail in a moment, I encourage the EPA to give full consideration to setting a 60 parts per billion standard and to finalize a standard that will protect the public's health.

As I mentioned, there is a broad consensus in the scientific and medical communities that ambient ozone is harmful to human health. In 2011, 14 leading medical and public health organizations, including the American Academy of Pediatrics, the American Heart Association, the American Lung Association and the American Thoracic Society, co-signed a letter to the Obama administration saying that "To safeguard the health of the American people,

help to save lives and reduce health care spending, we support the most protective standard under consideration, 60 parts per billion, averaged over 8 hours."

EPA staff and the Clean Air Scientific Advisory Committee, a panel of external, independent scientists, have also concluded that there is a causal relationship between short-term ozone exposure and respiratory health effects. This conclusion is based on the findings of more than a thousand studies carried out over decades and overall demonstrating that ozone exposure leads to increased risk of respiratory deaths, hospital admissions and emergency department visits, increased respiratory symptoms and medication use, reduced life function and increased airway reactivity.

As one example out of very many, a 2010 study by the scientists at Emory and Georgia Institute of Technology found that in the Atlanta metropolitan area, ozone was linked to higher rates of pediatric emergency department visits for asthma, even at levels well below the current standard. Many other studies also indicate measurable adverse health effects at levels below the current standard. For example, meaningful and statistically significant reductions in lung function have been observed in exercising young, healthy adults exposed to ozone levels as low as 60 parts per billion. Other studies have found increased respiratory symptoms during controlled exposures to ozone at levels of 70 parts per billion. Of note, these controlled exposure studies have been conducted in healthy adults. It is expected that people with asthma, including asthmatic children, would be even more sensitive to these effects.

The scientific evidence clearly shows that the current standard for ozone is inadequate to protect the public's health. The Clean Air Scientific Advisory Committee concluded that there is "clear scientific support for the need to revise the standard" and that "there is adequate scientific evidence to recommend a range of levels for a revised primary ozone standard from 70 parts per billion to 60 parts per billion."

Lowering the primary ozone standard would have significant public health benefits, including fewer deaths, fewer hospital admissions and emergency room visits for respiratory diseases, fewer respiratory symptoms and improved lung function, especially amongst the most vulnerable members of the population. In Rhode Island, the State that you represent and where I work, at Brown University, asthma rates in adults and children are above the national average. Ensuring ozone pollution is at safe levels will save lives and improve the quality of life for the people of Rhode Island and for people across the Country.

Rising temperatures from climate change could further exacerbate the health effects of ozone. Research has shown that formation of ground level ozone is affected by weather and climate and that there is a strong link between higher temperatures and increased ozone levels. Ozone itself is also a major greenhouse gas and an important contributor to global climate change. Thus, reducing ozone pollution today would not only provide immediate and long-lasting public health benefits, it would also help slow the pace of future climate change. At the same time, addressing climate change could help reduce ozone pollution.

In conclusion, EPA's proposal to revise the ozone standard is based on scientific and medical consensus and supported by extensive scientific evidence. I encourage the EPA to give full consideration to setting the primary ozone standard at the health-protective level of 60 parts per billion.

Thank you for your attention, and I would be happy to answer any questions.

[The prepared statement of Mr. Wellenius follows:]

Testimony of Gregory Wellenius, ScD

Associate Professor of Epidemiology, Brown University School of Public Health
Associate Director, Brown University Center for Environmental Health and Technology

Hearing on

"Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone"

Subcommittee on Clean Air and Nuclear Safety
Committee on Environment and Public Works
U.S. Senate

December 17, 2014

Mr. Chairman, Members of the Committee, thank you for the opportunity to testify today. I am Dr. Gregory Wellenius, Associate Professor of Epidemiology at the Brown University School of Public Health and Associate Director of the Brown University Center for Environmental Health and Technology. I earned my doctorate in Environmental Health and Epidemiology from the Harvard School of Public Health and previously served on the faculty at Harvard Medical School. I have been conducting research on the health effects of air pollution for more than 15 years, have authored or coauthored more than three dozen original studies in this area, and contributed as an author for the EPA's 2009 Integrated Science Assessment for Particulate Matter. My research has focused on the human health effects of ambient air pollutants and it is my pleasure to provide testimony in this area.

As we've heard, the EPA is proposing to revise the primary standard for ozone from the current level of 75 ppb to a level in the range on 65-70 ppb, and is accepting comments

on revising the standard to as low as 60 ppb. There is scientific and medical consensus that the current standard of 75 ppb is outdated and that a protective standard should fall within the range of 60-70 ppb. Reducing ozone pollution will save lives and improve air quality for everyone, especially vulnerable populations like children with asthma and others with respiratory diseases. For the reasons I explain in my testimony, I encourage the EPA to give full consideration to setting a 60 ppb standard and to finalize a standard that will protect public health.

There is broad consensus in the scientific and medical communities that ambient ozone is harmful to human health. For example, the American Lung Association states that "ozone air pollution threatens the health of infants, children, seniors, and people with asthma and other lung diseases." They further urge EPA to "set the final standard where it provides the greatest safeguards to the most people."[1] This sentiment has been echoed by a number of medical and professional societies including the American Academy of Pediatrics, the American Heart Association, the American Public Health Association, and the American Thoracic Society, among others. On August 3, 2011, fourteen leading medical and public health organizations cosigned a letter to the White House stating the following:

> "The ozone health standard must protect those who are most vulnerable from the dangerous health impacts of ozone, including infants, children, older adults, and those with chronic diseases. To safeguard the health of the American people, help to save lives, and reduce health care spending, we support the most protective standard under consideration: 60 parts per billion (ppb) averaged over eight hours."[2]

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[1] http://www.lung.org/associations/states/colorado/clean-air/ozone.html.

[2] The organizations signing this letter were the American Academy of Pediatrics, American Association of Cardiovascular and Pulmonary Rehabilitation, American College of Preventive Medicine, American Heart Association, American Lung Association, American Public Health Association, American Thoracic Society, Asthma and Allergy Foundation of America, National Association for Medical Direction of Respiratory Care, National Association of County and City Health Officials, National Environmental Health Association, National Home Oxygen Patients Association, Physicians for Social Responsibility, and Trust for America's Health. http://c.ymcdn.com/sites/www.acpm.org/resource/resmgr/policy-files/2011_ltr_presidentozone.pdf.

The external panel of independent scientists that make up the Clean Air Scientific Advisory Committee (CASAC) and EPA scientists have also concluded that there is a "causal relationship between short-term O_3 [ozone] exposure and respiratory health effects."[3] This conclusion is based on the findings from more than a thousand epidemiologic, clinical, and toxicologic studies carried out over decades and consistently demonstrating adverse effects of ozone exposure on respiratory morbidity and mortality, including increased risk of respiratory deaths, hospital admissions, and emergency department visits, increased respiratory symptoms and medication use, decrements in lung function, increased airway reactivity, and evidence of increased pulmonary inflammation and injury. As one example, a 2010 study by scientists at Emory and the Georgia Institute of Technology found that in the Atlanta metropolitan area a 30 ppb increase in 8-hour maximum ozone levels was associated with approximately a 6% higher rate of pediatric emergency department visits for asthma.[4] In this study, the investigators found that the dose-response curve was approximately linear with adverse health effects evident at ozone levels well below the current ozone standard of 75 ppb.

The physiologic mechanisms underlying these effects include: (1) activation of neural reflexes, (2) initiation of inflammation, (3) alteration of epithelial barrier function, (4) sensitization of bronchial smooth muscle, (5) changes in immunity, and (6) airway remodeling. These downstream consequences of exposure to ozone lead not only to the respiratory and pulmonary effects described above, but also to adverse effects on other organs beyond the lungs.

Recent evidence also suggests that short-term exposure to ozone likely increases both total mortality and cardiovascular mortality, with supporting evidence provided by several large studies conducted in the US, Canada, and Western Europe. Further

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[3] U.S. Environmental Protection Agency. (2013). Integrated Science Assessment for Ozone and Related Photochemical Oxidants (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-10/076F.

[4] Strickland MJ, Darrow LA, Klein M, Flanders WD, Sarnat JA, Waller LA, Sarnat SE, Mulholland JA, Tolbert PE. Short-term associations between ambient air pollutants and pediatric asthma emergency department visits. Am J Respir Crit Care Med. 2010;182:307-316.

support for these findings is provided by a growing number of epidemiologic, clinical and animal toxicologic studies that have found a connection between ozone exposure and subclinical changes in cardiovascular physiology.

Many of the available studies indicate measureable adverse health effects at levels below the current standard of 75 ppb. For example, meaningful and statistically significant reductions in lung function have been observed in young, healthy adults exposed to ozone levels as low as 60 ppb.[5, 6] Other studies have found increased respiratory symptoms during controlled exposure to ozone at levels of 70 ppb.[7] Of note, these controlled exposure studies have been conducted in healthy adults. It is expected that people with asthma, including asthmatic children, are even more sensitive to these effects. Epidemiologic studies also support the presence of adverse respiratory health effects at ozone levels well below the current standard. For example, the study of pediatric emergency department visits for asthma that I mentioned earlier provided evidence of effects at ambient ozone levels as low as 30 ppb.[8]

Results from these studies indicate that the current standard for ozone is inadequate to protect the public's health. Based on the existing evidence, CASAC's review of the EPA's second draft policy assessment for the review of the ozone standard concluded that "there is clear scientific support for the need to revise the standard" and that "there is adequate scientific evidence to recommend a range of levels for a revised primary ozone standard from 70 ppb to 60 ppb."[9]

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[5] Brown JS, Bateson TF, McDonnell WF. Effects of exposure to 0.06 ppm ozone on FEV1 in humans: a secondary analysis of existing data. Environ Health Perspect. 2008;116:1023-1026.
[6] Kim CS, Alexis NE, Rappold AG, Kehrl H, Hazucha MJ, Lay JC, Schmitt MT, Case M, Devlin RB, Peden DB, Diaz-Sanchez D. Lung function and inflammatory responses in healthy young adults exposed to 0.06 ppm ozone for 6.6 hours. Am J Respir Crit Care Med. 2011;183:1215-1221.
[7] Schelegle ES, Morales CA, Walby WF, Marion S, Allen RP. 6.6-hour inhalation of ozone concentrations from 60 to 87 parts per billion in healthy humans. Am J Respir Crit Care Med. 2009;180:265-272.
[8] Strickland MJ, Darrow LA, Klein M, Flanders WD, Sarnat JA, Waller LA, Sarnat SE, Mulholland JA, Tolbert PE. Short-term associations between ambient air pollutants and pediatric asthma emergency department visits. Am J Respir Crit Care Med. 2010;182:307-316.
[9] http://yosemite.epa.gov/sab/sabproduct.nsf/264cb1227d55e02c85257402007446a4/5EFA320CCAD326E885257D030071531C/$File/EPA-CASAC-14-004+unsigned.pdf.

Scientific evidence supports a causal link between short-term exposures to ozone and increased respiratory morbidity and mortality at levels below the current standard. Lowering the primary ozone standard would have significant public health benefits including fewer deaths, fewer hospital admissions and emergency room visits for respiratory diseases, fewer respiratory symptoms, and improved lung function, especially among the most vulnerable members of the population.

In Rhode Island, the state Senator Whitehouse represents and where I work at Brown University, asthma rates in adults and children are above the national average. Ensuring ozone pollution is at safe levels will save lives and improve the quality of life for people in Rhode Island and across the country.

Rising temperatures from climate change could further exacerbate the health effects of ozone. Research has shown that the formation of ground-level ozone is affected by weather and climate, and that there is a strong link between higher temperatures and increased ozone levels. Ozone itself is also a major greenhouse gas and an important contributor to global climate change. According to the Intergovernmental Panel on Climate Change (IPCC), ozone in the troposphere is the third most important greenhouse gas contributing to climate change (after carbon dioxide and methane). Models estimate that average global ozone levels in the troposphere have increased by 30-70% since the pre-industrial era, but levels have increased by 4 or 5 fold in some regions. Thus, reductions in ozone pollution are expected to slow the pace of future climate change, in addition to the immediate public health benefits of reducing ozone pollution. At the same time, addressing climate change could help reduce ozone pollution.

EPA's proposal is based on scientific and medical consensus and supported by extensive scientific evidence. I encourage the EPA to give full consideration to setting the primary ozone standard at the health-protective level of 60 ppb. Thank you for your attention. I would be happy to answer any questions you might have.

BROWN
School of Public Health

Gregory A. Wellenius, ScD
Associate Professor of Epidemiology
Associate Director, Center for Environmental Health and Technology

December 31, 2014

Dear Senator Boxer and members of the Senate Committee on Environment and Public Works,

It was a pleasure to appear before the Subcommittee on Clean Air and Nuclear Safety on December 17, 2014 and provide invited testimony on the hearing titled "Oversight Hearing: EPA's Proposed National Ambient Air Quality Standard for Ozone."

Thank you for your additional questions and the opportunity to provide further information on this important topic. Each question is answered below.

Question: Written testimony submitted to the Subcommittee from the Commissioner of the Texas Commission on Environmental Quality stated: "Over the last ten years, the incidence of asthma has increased, whereas the ambient concentrations of ozone have decreased. If asthma incidence was associated with ozone concentrations, then the incidence should be going down, not up. Altogether, there is very little evidence that people with asthma are more sensitive to ozone." Overwhelming scientific evidence indicates that this assertion is inaccurate. Can you please summarize how breathing ground-level ozone triggers asthma and impacts the incident rates of asthma?

Wellenius Response: In his written testimony, Dr. Shaw claims that asthma hospitalizations cannot be associated with ozone because (1) asthma hospitalizations are highest in winter when ozone levels are lowest and (2) that asthma hospitalizations have been increasing in the US while ozone levels have been decreasing in that same time period. Contrary to Dr. Shaw's testimony, neither of these observations provides evidence that ozone is safe for people because they fail to account for other causes of asthma and asthma hospitalizations that also change over time. For example, there are more asthma hospitalizations in the winter than in the summer because many respiratory infections and even the common cold can trigger an asthma attack in sensitive people, and these infections or colds occur more often in winter than in summer. Similarly, there are many risk factors for developing new asthma that have also changed over time. The science clearly shows that rates of asthma and asthma hospitalizations would likely be lower if ozone levels were lower.

Question: People most at risk from breathing air containing dangerous levels of ozone include children, people with asthma and other respiratory diseases, and older adults. Can you please explain why this is the case and at what level peer-reviewed science tells us would be the most protective ozone NAAQS being consider by EPA for these sensitive populations?

Wellenius Response: Individuals with respiratory disease are of primary concern in evaluating the health risks of ozone because a given change in lung function is likely to have a greater impact on a person with pre-existing disease compared to a healthy adult. The current evidence shows that people with asthma are more vulnerable to the health risks from ozone. The science also shows that people with chronic obstructive pulmonary disease (a disease of the lungs that affects more than 5% of adults across the US and up to 25% of adults in some areas) are also more sensitive to the adverse effects of ozone.

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Children are also at greater risk of the adverse health effects of ozone because: (1) compared to adults children spend more time outside where ozone levels are higher, (2) children's developing lungs are exposed to more ozone, particularly when they exercise, and (3) children's developing lungs are more sensitive to the adverse effects of ozone.

Many of the available scientific studies indicate measureable adverse health effects at levels below the current ozone standard of 75 parts per billion (ppb). Results from these studies indicate that the current standard for ozone is inadequate to protect the public's health. Based on the available evidence, The EPA's Clean Air Scientific Advisory Committee (CASAC, an external panel of independent scientific experts) concluded that "there is clear scientific support for the need to revise the standard" and that "there is adequate scientific evidence to recommend a range of levels for a revised primary ozone standard from 70 ppb to 60 ppb."[1] Indeed, scientific evidence indicates that ozone levels as low as 30 ppb are linked to adverse health.

Question: The 20 I 4 National Climate Assessment found: "Factors that affect ozone formation include heat, concentrations of precursor chemicals, and methane emissions, while particulate matter concentrations are affected by wildfire emissions and air stagnation episodes, among other factors. By increasing these different factors, climate change is projected to lead to increased concentration of ozone and particulate matter in some regions." Do you agree with this peer reviewed, scientific finding?

Wellenius Response: There is a complex relationship between ozone and projected climate change. Rising temperatures from climate change could further exacerbate the health effects of ozone. Research has shown that the formation of ground-level ozone is affected by weather and climate, and that there is a strong link between higher temperatures and increased ozone levels. Ozone itself is also a major greenhouse gas and an important contributor to global climate change. According to the Intergovernmental Panel on Climate Change (IPCC), ozone in the troposphere is the third most important greenhouse gas contributing to climate change (after carbon dioxide and methane). Thus, reductions in ozone pollution are expected to slow the pace of future climate change, in addition to the immediate public health benefits of reducing ozone pollution. At the same time, addressing future climate change and limiting further increases in average temperatures could help reduce ozone pollution.

Once again, thank you for the opportunity to provide additional information on this important topic. Please do not hesitate to contact me if I may be of further assistance.

Sincerely,

Gregory A. Wellenius, ScD
Associate Professor of Epidemiology
Associate Director, Center for Environmental Health and Technology
Brown University

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[1] http://yosemite.epa.gov/sab/sabproduct.nsf/264cb1227d55e02c85257402007446a4/5EFA320CCAD326E885257D030071531C/$File/EPA-CASAC-14-004+unsigned.pdf.

Senator WHITEHOUSE. Thank you, Dr. Wellenius. I very much appreciate that you have come down to give not only your scientific perspective, but your Rhode Island perspective.

Ms. Patton, thank you.

STATEMENT OF VICKI PATTON, GENERAL COUNSEL, ENVIRONMENTAL DEFENSE FUND

Ms. PATTON. Chairman Whitehouse, thank you very much for your leadership on behalf of clean, safe air for our communities and families. We sure appreciate it.

The United States' commitment to clean air is a broadly shared American value, whether you live in a red State, a blue State or a purple State, or in the case of my own home State, in the heart of the Rockies in Colorado, which is all of the above. Americans want clean, healthy air for our communities and for our families.

The establishment of the health-based air quality standards for ozone is really the bedrock foundation of our Nation's clean air laws. It is why Congress has instructed the Administrator of the Environmental Protection Agency to establish those standards on the basis of human health. The question for the Administrator is whether the air in our communities is safe to breathe.

This determination on the basis of human health was affirmed in a landmark Supreme Court decision, penned by Justice Antonin Scalia, who broadly affirmed that it is EPA's solemn responsibility to establish health-based standards for ozone on the basis of whether the air in our communities is in fact safe to breathe. And we know, as others have already commented, that it is not safe to breathe on the basis of the current health-based standard. The Clean Air Scientific Advisory Committee, which was established by Congress under the Nation's clean air laws, to give EPA rigorous, independent advice on the scientific foundations of the national health-based air quality standards, has in fact concluded that the current health-based standards is not adequate to protect our children's health, our Nation's health, and that we do in fact need to strengthen that standard in a range between 60 and 70 parts per billion. And indeed, they further recommended that a standard in the lower end of the ranges would be appropriate, and questioned whether a standard in the higher levels of those ranges, up toward 70 parts per billion, would in fact carry out the Administrator's responsibility to protect human health with an adequate margin of safety.

We know that the effects of ozone are profound. There is difficulty breathing on high ozone days, there are asthma attacks, emergency room visits, hospital admissions and premature deaths. Indeed, one of the most significant findings since the Bush administration reviewed and revised the ozone standard in 2008 is the strong basis of science linking ozone concentrations to premature death.

The populations at risk include our children, it includes individuals with asthma, elderly, those who are outside working, exercising and living. The Clean Air Scientific Advisory Committee looked at a whole host of information in concluding that these effects are significant and the populations at risk are imperiled, in-

cluding clinical studies, epidemiological studies, animal toxicological studies, exposure and risk assessments.

We have heard the numbers. We have heard the numbers of health impacts at stake. But if you are a mother or a father of a child with asthma and that child suffers an asthma attack on a high ozone day, the impacts are profound on your family. It changes your family's fabric in so many fundamental ways.

This is why Congress has long instructed the Environmental Protection Agency to establish the health-based standards, on the basis of science, on the basis of public health. We have already talked about how we are well on our way to achieving those standards. Senator Gillibrand talked about sort of the fact that our Nation can achieve both vital human health protections and grow our economy. Indeed, in her own home State of New York, there are manufacturers that are going to be making the clean air technologies that will help deliver fundamentally cleaner vehicles under the Tier 3 tailpipe emission standards that others have talked about, and that will reduce ozone-forming pollution by 80 percent beginning with model year 2017 vehicles.

There has been lots of skepticism throughout the history of the Nation's clean air laws that we can't meet these challenges, that we can't deliver cleaner, healthier air for our communities and families and grow our economy. When the Nation confronted this challenge in 1997, there was one Senator, Senator Whitehouse, who commented at the time that if we moved forward with strong ozone health standards, that our hair salons would be imperiled. In fact, we have achieved cleaner, healthier air, and those businesses are up and running and strong.

Senator WHITEHOUSE. Hair salons are not extinct. Glad to hear it.

[Laughter.]

Ms. PATTON. And Senator, you indicated at the outset that not all the Senators are here today. I want you to know who is here today. Moms Clean Air Force is here today, they are here in the audience listening to this hearing. And Moms Clean Air Force represents over 400,000 moms across our Nation, moms who are faith-based moms, moms who live in purple States and red States and moms who are united by their abiding commitment to clean air for our children. Those moms know that when we tuck our children into bed at night, we are overwhelmed by our love for them and we are overwhelmed by our commitment to ensure a clean and safe and healthy environment for our children.

Your leadership in ensuring that we have strong, health-based ozone standards is really one of the single most important gifts you can give to our communities, to our families and to all children who are threatened by unhealthy air. So thank you.

[The prepared statement of Ms. Patton follows:]

Before the United States Senate
Subcommittee on Clean Air and Nuclear Safety

Oversight Hearing:
EPA's Proposed National Ambient Air Quality Standards for Ozone

Testimony of Vickie Patton
General Counsel
Environmental Defense Fund

December 17, 2014

Chairman Whitehouse, Ranking Member Sessions and Members of the Subcommittee, thank you for the opportunity to testify about the U.S. Environmental Protection Agency's proposed revisions to the nation's health-based ambient air quality standard for ground-level ozone.

My name is Vickie Patton. I serve as the General Counsel at Environmental Defense Fund, a national non-partisan science-based environmental organization, where I manage the national and regional air quality programs. EDF is a national environmental organization with over one million members that links science, economics, law and private-sector partnerships to solve our most serious environmental challenges. EDF and its members are deeply concerned about harmful air pollution, including ground-level ozone, and I greatly appreciate the opportunity to testify about the urgent need for strengthened ozone standards to protect human health and the environment. I previously served as an attorney-advisor in the U.S. Environmental Protection Agency's Office of General Counsel under the George H.W. Bush and William Clinton Administrations, where I worked on a variety of Clean Air Act matters.

I. The Clean Air Act: A Bi-partisan Triumph for Public Health, the Environment, and Economy

The Clean Air Act is a bedrock public health statute that has provided for extraordinary, bipartisan progress in protecting Americans' health and the environment for over 40 years. Senator John Sherman Cooper, a Republican from Kentucky, captured the spirit of bipartisan cooperation that led to the United States Senate's historic and unanimous adoption of the modern Clean Air Act in 1970:

> We worked together. We disagreed. We worried about many provisions of the bill. At last, however, we joined unanimously in recommending and sponsoring this bill, believing that our approach was one that could make progress toward solution of the problem of air pollution.[1]

[1] 116 CONG. REC. S32,917 (daily ed. Sept. 21, 1970) (statement of Sen. Cooper).

The unanimous vision forged into law by the United States Senate has secured healthier air for millions of Americans. The net benefits of the Clean Air Act from 1970 to 1990 are valued at over $21 trillion.[2] By 2020, the Environmental Protection Agency ("EPA") estimates the 1990 Clean Air Act Amendments will prevent a projected 230,000 deaths; 2.4 million asthma attacks; 200,000 heart attacks; and 5.4 million lost school days,[3] as set out in the Table immediately below. EPA also found that these vital health protections would provide $2 trillion in monetized benefits.[4] Additionally, EPA projects a net overall improvement in economic growth due to the benefits of cleaner air.[5]

The 1990 Clean Air Act Amendments prevent:

	Year 2010 (cases)	Year 2020 (cases)
Adult Mortality - particles	160,000	230,000
Infant Mortality - particles	230	280
Mortality - ozone	4,300	7,100
Chronic Bronchitis	54,000	75,000
Acute Myocardial Infarction	130,000	200,000
Asthma Exacerbation	1,700,000	2,400,000
Emergency Room Visits	86,000	120,000
School Loss Days	3,200,000	5,400,000
Lost Work Days	13,000,000	17,000,000

This chart shows the health benefits of the Clean Air Act programs that reduce levels of fine particles and Ozone.

Source: EPA[6]

II. The Clean Air Act's Two-Step Process: Establishing and Implementing National Health-Based Ambient Air Quality Standards

In 1970, Congress established an effective process in the fight against air pollution. Congress commanded that the national ambient air quality standards ("NAAQS") be based on public

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[2] U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act, 1970 to 1990*, at 53 (Oct. 1997), *available at* http://www.epa.gov/cleanairactbenefits/copy.html. Estimates of benefits, in 1990 dollars, range from $5.6 to $49.4 trillion, with a central estimate of $22.2 trillion. *Id.*

[3] U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act from 1990 to 2020*, at 5-25, tbl. 5-6 (Apr. 2011), *available at* http://www.epa.gov/cleanairactbenefits/feb11/fullreport_rev_a.pdf.

[4] *Id.* at 7-3.

[5] U.S. Environmental Protection Agency, Summary Report, *The Benefits and Costs of the Clean Air Act from 1990 to 2020*, at 3, *available at* http://www.epa.gov/cleanairactbenefits/feb11/summaryreport.pdf.

[6] U.S. Environmental Protection Agency, *Benefits and Costs of the Clean Air Act Amendments of 1990*, Fact Sheet, *available at* http://www.epa.gov/cleanairactbenefits/feb11/factsheet.pdf.

health considerations alone. Then, economics are thoroughly considered in developing the air pollution control strategies to achieve the health standards. So, the law is sharply focused on ensuring the nation's health-standards are established solely on the basis of public health, and this same law is broadly encompassing in considering economics when federal, state and local officials determine how to cost-effectively achieve the health standards.

Protecting Public Health

Some have long protested this carefully calibrated dual system. Some have argued that this two-step inquiry should be conflated rather than distinct, that the nation's health standards should be based on economics and then economics should likewise infuse the policies to achieve the standards. This argument has been thoroughly presented and resoundingly rejected over the past 40-plus years.

This question was answered by a unanimous Senate in 1970. The language crafted by Congress in 1970 is straight forward; its meaning is plain. The Administrator is instructed to establish standards that "are requisite to protect the public health" with "an adequate margin of safety."[7] The statute thus provides for the health-based standards to be based exclusively on public health and to be precautionary in safeguarding against adverse health effects.

This question has also been consistently answered by the decisions of prior EPA Administrators and numerous judicial decisions of the federal court of appeals in Washington, D.C.[8]

Ultimately, this question was emphatically answered by a unanimous Supreme Court. Justice Antonin Scalia, writing for the high Court, explained that the text of the Clean Air Act is clear, notwithstanding the copious arguments of many lawyers:

> Were it not for the hundreds of pages of briefing respondents have submitted on the issue, one would have thought it fairly clear that this text does not permit the EPA to consider costs in setting the standards.[9]

Justice Scalia then set forth the inquiry the Administrator must make in establishing the nation's health-based air quality standards that is thoroughly anchored in protecting public health:

> The EPA, "based on" the information about health effects contained in the technical "criteria" documents compiled under § 108(a)(2), 42 U.S.C. § 7408(a)(2), is to identify the maximum airborne concentration of a pollutant that the public health can tolerate, decrease the concentration to provide an "adequate"

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[7] Clean Air Act § 109(b)(1), 42 U.S.C. § 7409(b)(1).

[8] *See, e.g., Am. Lung Ass'n v. EPA*, 134 F.3d 388 (D.C. Cir. 1998); *Natural Res. Def. Council v. Adm'r, EPA*, 902 F.2d 962 (D.C. Cir. 1990), vacated in part on other grounds, 921 F.2d 326 (D.C. Cir. 1991); *Am. Petroleum Inst. v. Costle*, 665 F.2d 1176 (D.C. Cir. 1981); *Lead Indus. Ass'n, Inc. v. EPA*, 647 F.2d 1130 (D.C. Cir. 1980).

[9] *Whitman v. Am. Trucking Ass'ns, Inc.*, 531 U.S. 457, 465 (2001).

> margin of safety, and set the standard at that level. Nowhere are the costs of achieving such a standard made part of that initial calculation.[10]

Accordingly, in setting the health-based air quality standard for ozone, Administrator McCarthy must base her decision exclusively on what is requisite to protect the public health with an adequate margin of safety. That is her solemn responsibility under the law in protecting the health of the American people.

Considering Costs and Deploying Cost-Effective Solutions

After the health-based standards are established, the Clean Air Act provides a prominent role for consideration of costs in national, state and local decisions about the pollution control strategies deployed to achieve the health standards. The statute provides for the consideration of costs in setting emission limits for cars, SUVs, trucks, buses, construction equipment, aircraft, fuels, power plants, and industrial facilities.[11]

States and local governments, in turn, are distinctly responsible for designing the air quality management plans for their communities and entrusted with determining how the clean up burden is allocated to restore healthy air. Justice Scalia succinctly explained that "[i]t is to the States that the Act assigns initial and primary responsibility for deciding what emissions reductions will be required from which sources."[12]

III. Strengthening the Ozone Standard is Long Overdue, and Urgently Needed to Protect Americans' Health

There has been enormous progress in the past few decades to clean the air, but our nation has more bipartisan work to do to adequately protect public health from ozone pollution. Scientific evidence overwhelmingly demonstrates that the current 75 part per billion ("ppb") standard for ground-level ozone is not requisite to protect human health with an adequate margin of safety, as required by the Clean Air Act.[13]

The Clean Air Scientific Advisory Committee Recommends Stronger Ozone Standards

The recommendations of the statutorily established and independent scientific advisory committee—the Clean Air Scientific Advisory Committee ("CASAC")—underscore the need, as determined by the latest scientific evidence, to strengthen the ground-level ozone standard.

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[10] *Id.*

[11] 42 U.S.C. §§ 7521(a), 7547(a), 7545, 7541, and 7411(a).

[12] *Whitman*, 531 U.S. at 470.

[13] Letter from Christopher Frey PhD to Administrator McCarthy, *CASAC Review of the EPA's Second Draft Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards*, at ii (June 26, 2014), *available at* http://yosemite.epa.gov/sab/sabproduct.nsf/5EFA320CCAD326E885257D030071531C/$File/EPA-CASAC-14-004+unsigned.pdf (hereinafter "CASAC Letter").

In the 1977 Clean Air Act Amendments, Congress established the CASAC to review the scientific and technical basis for the NAAQS and to provide the Administrator with independent advice concerning the establishment, review, and revisions of those standards. Section 109(d) of the Clean Air Act underscores CASAC's independent scientific charge and broad-based scientific and technical expertise: "[t]he Administrator shall appoint an independent scientific review committee composed of seven members including at least one member of the National Academy of Sciences, one physician, and one person representing State air pollution control agencies."[14] Among other things, the statute requires that CASAC "recommend to the Administrator any new national ambient air quality standards and revisions of existing criteria and standards as may be appropriate under section 108 [42 U.S.C. § 7408] of this title and subsection (b) of this section."[15] Consistent with these statutory requirements, the CASAC ozone review panel is currently comprised of scientific experts from numerous universities as well as other independent experts, including a representative from the Electric Power Research Institute.[16]

CASAC has reviewed and provided analysis and feedback on EPA's scientific and policy assessments related to the agency's proposed revisions of the 2008 ozone standards. In its most recent letter responding to EPA's *Second Draft Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards*—which reflects the recommendations of EPA staff — CASAC emphasized that the latest scientific evidence underscores the inadequacy of the current standard.[17] Specifically, CASAC found "scientific justification that current evidence and the results of the exposure and risk assessment call into question the adequacy of the current standard" and that there is "clear scientific support for the need to revise the standard."[18]

Accordingly, CASAC recommended strengthening the health-based standard for ozone to effectuate the statute's command to protect public health with an adequate margin of safety: "[t]he CASAC further concludes that there is adequate scientific evidence to recommend a range of levels for a revised primary ozone standard from 70 ppb to 60 ppb."[19] In recommending this range, however, CASAC emphasized that "[a]t 70 ppb, there is substantial scientific evidence of adverse effects as detailed in the charge question responses, including decrease in lung function, increase in respiratory symptoms, and increase in airway inflammation."[20] While CASAC noted a level of 70 ppb would provide greater protections than the 2008 standard of 75 ppb, it concluded that a standard of "60 ppb would certainly offer more public health protection than levels of 70 ppb or 65 ppb" and so recommended that the Administrator "set the level of the standard lower than 70 ppb within a range down to 60 ppb, taking into account your judgment

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[14] 42 U.S.C. § 7409(d)(2)(A).

[15] *Id.* § 7409(d)(2)(B).

[16] *See* EPA Clean Air Scientific Advisory Committee (CASAC), *Ozone Review Panel*, http://yosemite.epa.gov/sab/sabpeople.nsf/WebCommitteesSubcommittees/Ozone%20Review%20Panel (last visited Dec. 15, 2014).

[17] CASAC Letter, supra note 13, at ii.

[18] *Id.* at ii.

[19] *Id.*

[20] *Id.*

regarding the desired margin of safety to protect public health, and taking into account that lower levels will provide incrementally greater margins of safety."[21]

In reaching this conclusion, CASAC evaluated extensive scientific evidence, including clinical studies, epidemiological studies, and animal toxicology studies—summarized in EPA's Integrated Scientific Assessment— along with findings from exposure and risk assessments included in EPA's Health and Risk Exposure Assessment. As with any scientific assessment, CASAC identified certain areas where additional research would help facilitate and further enhance future evaluations of the ozone standard, but in doing so, emphasized "that there is sufficient scientific evidence, and sufficient confidence in the available research results, to support the advice we have given above for this review cycle of the primary and secondary standards."[22]

A More Protective Health Standard for Ozone is Requisite to Protect Public Health in Light of the CASAC Findings and the Extensive Scientific Evidence Before EPA

The Environmental Protection Agency's analysis is consistent with this CASAC recommendation, and is based on an extensive and compelling body of scientific evidence. Since the last proposal, there have been more than 1,000 new studies that demonstrate the health and environmental harms of ozone.[23] In particular, EPA has concluded:

> Exposure to ozone can cause respiratory system effects such as difficulty breathing and airway inflammation. For people with lung diseases such as asthma and COPD (chronic obstructive pulmonary disease), these effects can lead to emergency room visits and hospital admissions.
>
> . . . .
>
> Studies have also found that ozone exposure is likely to cause premature death from lung or heart diseases. In addition, evidence indicates that long-term exposure to ozone is likely to result in harmful respiratory effects, including respiratory symptoms and the development of asthma.[24]

With respect to ozone's impact on premature mortality, EPA applied risk estimates based on two short-term epidemiological studies and one long-term study. The Table below summarizes the studies' findings and the strong link between ground-level ozone and premature mortality.

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[21] *Id.* at ii-iii.

[22] *Id.* at iv.

[23] U.S. Environmental Protection Agency, Fact Sheet, *Overview of EPA's Proposal to Update the Air Quality Standards for Ground-Level Ozone*, *available at* http://www.epa.gov/airquality/ozonepollution/pdfs/20141125fs-overview.pdf (hereinafter "Ozone Standard Fact Sheet"); *see also* U.S. Environmental Protection Agency, Integrated Science Assessment for Ozone and Related Photochemical Oxidants, Final Report (Feb. 2013), *available at* http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492#Download.

[24] Ozone Standard Fact Sheet, supra note 23.

Table 8-1 Estimated annual O_3-related premature mortality in 2007 associated with 2006-2008 average O_3 concentrations (95th percentile confidence interval)

Source of risk estimate and modeling period	Exposure duration	Age	City-specific effect estimates[1]	National average effect estimate[2]
Smith et al. (2009), May-September	Short-term	>0	15,000	16,000
95% confidence interval			(1,400-28,000)	(7,200-22,000)
% occurring within the 98 cities			43%	
Zanobetti and Schwartz (2008), June-August	Short-term	>0	16,000	15,000
95% confidence interval			(6,000-25,000)	(8,300-22,000)
% occurring within the 48 cities			30%	
Jerrett et al. (2009), April-September	Long-term	≥30 years	-	45,000
95% confidence interval				(17,000-70,000)

[1] City-specific effect estimates are applied to the gridcells lying within the cities defined in the epidemiological studies. Average effect estimates across all cities included in the epidemiological studies (national average) are applied to all other gridcells. For the application of Smith et al. (2009) effect estimates, city-specific effect estimates were applied to 2,227 gridcells and the national average to 44,064 gridcells. For the application of Zanobetti and Schwartz (2008) effect estimates, city-specific effect estimates were applied to 925 gridcells and the national average to 45,366 gridcells.

[2] National average effect estimates are based on the average of all cities included in the epidemiological studies applied to all 12km gridcells nationally.

Source: EPA[25]

Scientific and technical analyses—reflected in EPA's proposal—underscore that the risk of these harmful health effects is even more pronounced for people with asthma and other respiratory diseases, children, older adults, people who work or are active outdoors. Nearly 26 million people have asthma in the U.S., including almost 7.1 million children.[26] Asthma disproportionately impacts communities of color and lower-income communities.[27] Strong ozone health standards will help improve air quality in these and all communities across the country.

Children, in particular, are considered the most at risk group because they breathe more air per unit of body weight, are more active outdoors, are more likely to have asthma than adults, and are still developing their lungs and other organs. In fact, EPA's Children's Health Protection Advisory Committee—a body of external experts that provide the Administrator with recommendations concerning children's health—recommends a revised ambient air quality standard of 60 ppb to protect the health of children. CHPAC finds that "[c]hildren suffer a disproportionate burden of ozone-related health impacts due to critical developmental periods of lung growth in childhood and adolescence that can result in permanent disability."[28]

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[25] U.S. Environmental Protection Agency, Health Risk and Exposure Assessment for Ozone, Final Report, at 8-7, tbl. 8-1 (Aug. 2014), *available at* http://www.epa.gov/ttn/naaqs/standards/ozone/data/20140829healthrea.pdf.

[26] Ozone Standard Fact Sheet, supra note 23.

[27] *Id.*

[28] Letter from Sheela Sathyanarayana MD MPH, Chair, Children's Health Protection Advisory Committee to Christopher Frey PhD, *CASAC Review of the Health Risk and Exposure Assessment for Ozone and Policy Assessment for the Review of the Ozone NAAQS: Second External Review Drafts*, (May 19, 2014), *available at* http://yosemite.epa.gov/sab/sabproduct.nsf/7F79D27B503CB28385257CDE00546CB3/$File/CHPAC+May+2014+Letter+&+Attached+2007+Letters.pdf.

Strengthening the Nation's Health Standard to Protect Americans' from Ground-Level Ozone Will Help to Secure Substantial Public Health Benefits.

EPA's analysis demonstrates the clear, profound health benefits of strengthening the ozone standard to 60 ppb. Under a standard of 60 ppb, for example, EPA projects as many as 7,900 fewer deaths, 1.8 million fewer asthma attacks in children, and 9.2 million fewer minor restricted activity days or lost school days. Indeed, EPA estimates at this level of protection the monetized benefits in 2025 will be $37–75 billion.[29]

IV. Strengthened Ozone Standards are Achievable and Cost-Effective

Strengthened ozone standards are urgently needed to protect public health and many highly cost-effective, commonsense clean air measures are available to help secure these needed health protections. The 40-year history of the Clean Air Act shows that the nation's public health standards are achievable, through available technologies and innovation by states and businesses. Our nation has often worked to achieve greater reductions than required, sooner, and at lower costs than estimated. Indeed, there are many clean air measures well underway that will help states, communities and families realize vital protections from ozone pollution.

Misplaced "Sky is Falling" Claims Provoke Polarization Over Clean Air Protections for America's Communities and Families

Some claim that strengthening the ground-level ozone standard to protect public health, as the science and law demands, would amount to "the most expensive regulation ever."[30] Unfortunately, these "sky is falling" prognostications are not new. In 1997, during another debate over strengthened national public health standards, Senator Spencer Abraham (R-MI) was among those who claimed that the new standards would have serious economic impacts: "Dry cleaning establishments, hair salons, and other small businesses will not be able to absorb the increased costs imposed by these regulations," the Senator said.[31]

In fact, our nation made enormous strides in protecting public health from air pollution through commonsense cost-effective solutions. This is consistent with the time tested history of the Clean Air Act. Between 1990 and 2020, a recent EPA report projects that the benefits of the Clean Air Act will outweigh costs by 30 to 1.[32]

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[29] U.S. Environmental Protection Agency, Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Ground-Level Ozone (Nov. 2014), *available at* http://www.epa.gov/glo/pdfs /20141125ria.pdf.

[30] Nat'l Assoc. of Manuf., *Ozone Regulations: Potentially the Costliest Regulation in History Threatens Manufacturing Comeback*, http://www.nam.org/Issues/Ozone-Regulations/ (last visited Dec. 15, 2014).

[31] 143 CONG. REC. S10813 (daily ed. Oct. 9, 1997) (statement of Sen. Abraham).

[32] U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act from 1990 to 2020*, supra note 3.

In recent years, similar "sky is falling" claims have been made about clean air standards to control acid rain, cut mercury and other air toxics, reduce soot, and lower tailpipe emissions.

These "sky is falling" claims were recently prominent in the debate over EPA's landmark mercury and air toxics standards for power plants. EPA Administrator Lisa Jackson signed the final Mercury and Air Toxics Standards in December 2011 at Children's Hospital in Washington, D.C. Within months, major power companies that had been making "sky is falling" claims about the compliance costs during EPA's development of these standards were touting to investors that compliance costs were plummeting:

- On July 20, **American Electric Power CEO Nicholas Akins** confirmed that the company's projected costs have come down nearly 25% from what AEP originally projected. He added, "[W]e expect it to continue to be refined as we go forward." In other words, costs will come down even further.[33]

- On May 15, **Southern Company CFO and Executive Vice President Arthur P. Beatty** stated that the amount the company projects for compliance costs "could be $0.5 billion to $1 billion less, because of the new flexibility that [the company has] found in the final rules of the MATS regulation."[34]

- On August 8, **First Energy CEO Anthony Alexander** stated, "[W]e have significantly reduced our projected capital investment related to MATS compliance."[35]

Based on recent earnings calls, American Electric Power Company's range of cost estimates has fallen by a third to half, Southern Company's cost estimates have declined by a third, and FirstEnergy's costs have fallen approximately 77-85 percent.[36]

This is consistent with the history of the Clean Air Act. Since 1970, our nation has reduced the six pollutants regulated under the national ambient air quality standards program by 68 percent while GDP has grown 234 percent as illustrated in the graph below.

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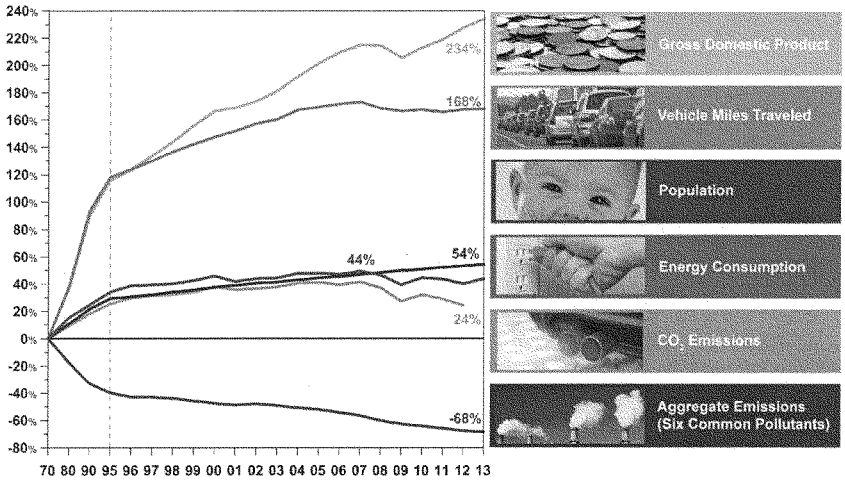
[33] Nicholas Akins, American Electric Power Co., Inc. Q2 2012 Earnings Call Transcript (July 20, 2012), *available at* http://seekingalpha.com/article/736561-american-electric-power-management-discusses-q2-2012-results-earnings-call-transcript?all=true&find=american%2Belectric%2Bpower%2BAEP%2B%2Bjuly%2B12%2C%2B2012.

[34] Art Beattie, CFO of Southern Company, Deutsche Bank Clean Tech, Utilities and Power Conference Call Recording (May 15, 2012), *available at* http://earningscast.com/SO/20120515.

[35] Anthony Alexander, CEO, FirstEnergy, Q2 2012 Results, Earnings Call Transcript (Aug. 8, 2012), *available at* http://seekingalpha.com/article/790061-firstenergys-ceo-discusses-q2-2012-results-earnings-call-transcript.

[36] *See* Envtl. Def. Fund, Blog, *Power Companies' Declining Estimates of Compliance Costs of the Mercury & Air Toxics Standards (MATS)*, http://blogs.edf.org/climate411/files/2014/05/Declining-costs-of-MATS-compliance.pdf?_ga=1.102810441.834084056.1418406109.



Source: EPA[37]

Actions Already Underway Will Help Communities Meet Strengthened Ozone Standards

Currently, 90 percent of areas designated nonattainment for the 1997 ozone health standards now meet those standards.[38] The U.S. has already taken steps over the past few years that help to cost-effectively reduce ozone smog pollution and help restore healthy air. Those protections include the Tier 3 tailpipe standards, supported by the U.S. auto industry, which will slash smog-forming pollution from new cars beginning in model year 2017 and the lower sulfur gasoline requirements will reduce pollution from every car on the road, and EPA's proposed Clean Power Plan which will substantially reduce smog-forming pollutants from power plant smokestacks nationwide.

These are just a few of the existing and pending national emission standards that will secure substantial reductions and that EPA anticipates will help to achieve broad-based compliance with strengthened ozone air quality standards. Analysis of various clean air measures adopted or soon to be put in place indicates that our nation will reduce the precursors to smog by millions of tons, securing over two million tons of volatile organic compound reductions and over five million tons of nitrogen oxides reductions.[39] These emissions standards will help to secure the vast majority of reductions needed to meet a strong health-based standard for ozone.

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[37] U.S. Environmental Protection Agency, Air Quality Trends, http://epa.gov/airtrends/images/y70_13.png (last visited Dec. 15, 2014).

[38] U.S. Environmental Protection Agency, *The National Ambient Air Quality Standards, EPA's Proposal to Update the Air Quality Standards for Ground-level Ozone*, Fact Sheet, *available at* http://www.epa.gov/airquality/ozonepollution/pdfs/20141125fs-numbers.pdf.

[39] U.S. Environmental Protection Agency, Regulatory Impact Analysis, supra note 29, at tbl. 3-1.

V. There is Broad Support to Strengthen the Health-Based National Ambient Air Quality Standards for Ground-Level Ozone

Leading health and medical associations have strongly recommended that our nation strengthen the health-based standard for ground-level ozone to protect public health. The American Lung Association, American Public Health Association, American Thoracic Society, Trust for America's Health, Asthma and Allergy Foundation of America, Health Care Without Harm, and National Association of County and City Health Officials recommended a health protective range for the 8-hour ozone standard that "extends no higher than 60 ppb."[40]

Here are a few examples of the broad support for stronger health-protective ozone standards:

> "Today's proposal by the Obama Administration to strengthen the National Ambient Air Quality Standards for ozone would provide greater protection to millions of Americans from the nation's most pervasive air pollutant—a step that is long overdue."
>
> "We are concerned that EPA did not include 60 ppb in the range, though it was the clear recommendation of independent scientists as well as health and medical societies, including the American Lung Association. The scientific record clearly shows that a standard of 60 ppb would provide the most public health protection. We will continue to push the Agency to adopt standards based on the scientific evidence."
>
> "Thousands of peer-reviewed medical studies show that breathing ozone pollution is dangerous to human health and the EPA review shows harm is occurring at levels far below what is currently considered 'safe.' "
>
> "This means too many Americans have been informed that the air in their community is safe to breathe based on the outdated standard. The science shows that information was wrong. Every parent in America has a right to know the truth about the air their children breathe."
>
> "The EPA's proposal to strengthen the standard is a step forward in the fight to protect all Americans from the dangers of breathing ozone pollution, especially to protect our children, our older adults and those living with lung or heart disease. To that end, we will focus on ensuring that the final ozone standard provides the most protection possible to the American people, especially the most vulnerable."
>
> "For far too long, millions of Americans have been living with a weak and outdated standard. We call on President Barack Obama and EPA Administrator Gina McCarthy to adopt a more protective standard to protect the American

[40] Letter from Janice Nolen, et al., to Christopher Frey PhD (May 19, 2014), *available at* http://blogs.edf.org/climate411/files/2014/11/health_and_medical_org_letter_to_casac_on_o3_naaqs.pdf.

people from real dangers of ozone pollution no later than October 1, 2015. Further delay is not acceptable."

- **Harold P. Wimmer, National President and CEO of the American Lung Association**[41]

"The Academy welcomes the new proposed standard, which is between 65 and 70 parts per billion, but urges EPA to go further. Scientific evidence strongly supports a level of 60 parts per billion, and pediatricians will focus on ensuring that the final ozone standard provides the most possible protection to especially vulnerable citizens like children and those who suffer from asthma."

"Ozone pollution in the air disproportionately impacts children, who are not just little adults and whose unique health and developmental needs make them more susceptible to pollutants. High levels of ozone in the air can lead to decreased lung function, coughing, burning and shortness of breath, as well as inflammation and swelling of the airways. For children with asthma, the health consequences of ozone pollution are even more pronounced, often requiring trips to the emergency room or intensive care unit for treatment. On high ozone days, many of these children are forced to stay home or to see their pediatrician, missing school or other recreational activities. Today's new ozone standard is a welcome and needed step forward to protect children's health by ensuring the air they breathe is safe and clean."

"As pediatricians, we can prescribe inhalers and treat asthma attacks, but unfortunately we cannot reduce the risk that ozone pollution poses to our young patients. The EPA's proposed new lower standard is a step in the right direction to help limit the amount of ozone our children are exposed to on a daily basis, whether during their walk to the bus stop or their outdoor sports activity. Every child deserves the opportunity to play outside without the risk of breathing in harmful air, and pediatricians will continue advocating for clean air until we achieve that goal."

- **American Academy of Pediatrics**[42]

"While the ATS is pleased EPA is proposing a stricter standard, the society is concerned EPA is not considering a standard of 60 ppb. "The body of scientific evidence supporting the health benefits of a lower ozone standard has grown substantially in the last few years," said John R. Balmes, MD, a pulmonary critical care physician and chair of the ATS Environmental Health Policy Committee. "Ozone pollution has been linked to low birth weight, decreased lung function and other respiratory problems in infants and children, worse asthma

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[41] American Lung Association, Press Release, *Lung Association Welcomes Obama Administration's Long Overdue Ozone Pollution Proposal, Calls for Greater Protection*, (Nov. 26, 2014), *available at* http://www.lung.org/press-room/press-releases/healthy-air/statement-on-2014-ozone-regs.html.

[42] American Academy of Pediatrics, *AAP Statement on New EPA Ozone Standards Proposal* (Nov. 26, 2014), *available at* http://www.aap.org/en-us/about-the-aap/aap-press-room/Pages/EPAOzoneStandard.aspx.

control in both children and adults, and with cardiovascular disease and increased mortality in adults."

"While some evidence shows that ozone exposure below 0.060 ppm also has adverse health effects, the strongest data support the connection between exposure at levels above 0.060 ppm and serious adverse health effects in people of all ages."

"The recent evidence linking ozone pollution and adverse health effects includes studies showing dose-response relationships between ozone exposure and hospital admissions for asthma in children and hospital admissions for asthma and COPD in adults, lung function deficits in healthy adults exposed to ozone at levels between 0.060 and 0.070 ppm, and an increased mortality risk associated with ozone exposure, primarily affecting the elderly and patients with chronic diseases."

- **American Thoracic Society**[43]

"Today's announcement by EPA is welcome news for our country and for the millions of who live in areas that frequently suffer high levels of ozone. A more protective standard on ozone will limit the pollution that we all breathe and will especially benefit the most vulnerable among us: those with respiratory problems like asthma, children and the elderly."

"Ozone, the main component of smog, is a dangerous air pollutant formed when emissions from vehicle tailpipes, power plants and factories pollutants including volatile organic compounds such as cancer-causing benzene and nitrogen oxides, combine with strong sunlight. Even at low levels, smog can aggravate asthma, cause and worsen respiratory illnesses, and cause lung damage for those who breathe it repeatedly. Ozone exposure results in excessive hospitalizations and emergency room visits and millions of lost school and work days. For the millions of Latinos who work outdoors in construction, landscaping and other fields, continued exposure can lead to serious health problems."

"If we missed the window to protect our families before, this re-energized proposal is right on time. We couldn't agree more with Administrator McCarthy that 'bringing ozone pollution standards in line with the latest science is more than just a legal requirement; it empowers the American people."

"Voces urges EPA to set the standard at 60 ppb. We look forward to engaging our allies, friends and leaders to voice their support for this proposal in the months ahead."

- **Adrianna Quintero, Director of Voces Verdes**

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[43] American Thoracic Society, ATSNews, *EPA Proposes Stricter Ozone Standard* (Dec. 5, 2014), *available at* http://news.thoracic.org/?p=5515.

VI. Conclusion

A rigorous and extensive body of science demonstrates that EPA's current national ambient air quality standard for ground-level ozone must be strengthened to protect public health. The Clean Air Act, forged on a bedrock foundation of bipartisan collaboration for our nation, instructs the EPA Administrator to take decisive and protective action against these health harms and to establish standards that are requisite to protect public health with an adequate margin of safety.

At the same time, our nation has commonsense and cost-effective solutions already moving forward that will help to achieve a more protective ozone standard and restore healthy air. These solutions include clean air measures, supported by the U.S. auto industry, that will dramatically reduce the smog-forming emissions from new cars beginning in model year 2017 and the landmark Clean Power Plan that will reduce a suite of health-harming emissions from power plants. Indeed, EPA, states and communities alike carefully consider costs in developing the solutions to restore healthy air, and the time tested history of the Clean Air Act is that our nation has in fact secured cleaner, healthier air at a fraction of the predicted costs.

The science and law, along with these innovative solutions, create a strong foundation for carrying out the Clean Air Act's founding bipartisan vision to establish national air quality standards that are protective of the health of our children and communities, and then to work together to find cost-effective, common sense solutions to meet the level of protection that science tells us is necessary to safeguard the health of our nation. This vibrant, bipartisan made in America law has stood the test of time—delivering a stronger, healthier and more prosperous nation. If we continue to work together building from this legacy of bipartisan collaboration forged in law we will continue to chart a commonsense path forward in protecting the health of our children and communities, securing a stronger and more prosperous nation, and finding that the sky is clearing not falling.

December 31, 2014

The Honorable Barbara Boxer
Chairman
United States Senate
Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, DC 20510

Re: Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone

Dear Chairman Boxer,

I have enclosed responses to the questions presented on December 24, 2014, following the above-referenced hearing.

Thank you for the opportunity to testify.

Sincerely yours,

Vickie Patton

Vickie Patton
General Counsel
Environmental Defense Fund

Oversight Hearing:
EPA's Proposed National Ambient Air Quality Standards for Ozone
Responses to Follow Up Questions

Question 1. Since 1970 aggregate emissions of common air pollutants have dropped 72 percent, while the U.S. gross domestic product grown 219 percent. Total private sector jobs increased by 101 percent during the same period. Does the past experience in implementing updates to the NAAQS suggest that the nation will continue to see similar benefits to the nation's health and economy from updating the ozone NAAQS to within the range of 60 to 70 ppb?

The time tested history of implementing health protective national ambient air quality standards under the Clean Air Act is that our nation has achieved vital public health safeguards while our economy has grown. We will secure these health and economic gains in the future for the same reasons we have achieved past progress, due to the extensive human health and welfare benefits of cleaner air, advances in clean air solutions that drive down costs, innovative public and private collaboration, and the vibrant federal and state partnership in carrying out air quality protections that is a bedrock foundation of our nation's clean air laws. See, e.g., U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act, 1970 to 1990* (Oct. 1997), *available at* http://www.epa.gov/cleanairactbenefits/copy.html; U.S. Environmental Protection Agency, *The Benefits and Costs of the Clean Air Act from 1990 to 2020*, (Apr. 2011), *available at* http://www.epa.gov/cleanairactbenefits/feb11/fullreport_rev_a.pdf; and ICF Consulting, *Clean Air Act Amendments: Spurring Innovation and Growth While Cleaning the Air* (EPA, Oct. 2005).

Question 2. Written hearing testimony submitted by the National Association of Manufacturers refers to a recent study conducted by NERA Economic Consulting estimating the possible costs associated with the updating the ozone NAAQS to 60 ppb. Numerous experts, including the Congressional Research Service, have criticized the report's methodology including using outdated data, not accounting for other existing EPA pollution standards, and failing to account for the public health benefits of adopting a more stringent standard.

Do you believe the methodology and conclusions of the study are inaccurate? Please provide any reasons why you have concluded that the study is inaccurate.

The NERA Economic Consulting study submitted by and commissioned by the National Association of Manufacturers is flawed and as a result produces unrealistically high estimates of the potential costs associated with updating the ozone NAAQS to 60 ppb. The NERA analysis has many serious shortcomings including failing to account for the extensive public health benefits of a more protective ozone air quality standard, utilizing high cost estimates that are a product of relying on overinflated and fundamentally unrealistic cost curves beyond those otherwise expected, and creating a flawed "job-equivalent" loss calculation. The Congressional Research Service found that the study relied on "simplifying assumptions" including failing to account for recent EPA rules that will cost-effectively reduce ozone-forming emissions, failing

to account for cost-effective reductions in volatile organic compounds, and relying on information from outdated EPA analyses. See Congressional Research Service, *Ozone Air Quality Standards: EPA's 2015 Revision* at p. 15 (Oct. 3, 2014), available at: http://fas.org/sgp/crs/misc/R43092.pdf. There is an important body of analysis showing that the actual compliance costs associated with environmental protections tend to be much less than predicted by industry representatives or government policymakers due to technological advances, compliance innovations and other factors that contribute to overstated cost predictions. See, e.g., World Resources Institute Fact Sheet, *For EPA Regulations, Cost Predictions are Overstated* (Nov. 2010), available at: http://pdf.wri.org/factsheets/factsheet_for_epa_regulations_cost_predictions_are_overstated.pdf

Question 3. The 2014 National Climate Assessment found: "Factors that affect ozone formation include heat, concentrations of precursor chemicals, and methane emissions, while particulate matter concentrations are affected by wildfire emissions and air stagnation episodes, among other factors. By increasing these different factors, climate change is projected to lead to increased concentration of ozone and particulate matter in some regions." Does the Environmental Defense Fund agree with this peer reviewed, scientific finding?

In addition to agreeing with this peer reviewed, scientific finding from the 2014 National Climate Assessment, Environmental Defense Fund recommends that the Committee consider the serious public health implications of the linkages between climate change and concentrations of ozone and particulate matter. The 2014 National Climate Assessment also estimated that "assuming no change in regulatory controls or population characteristics," there will be "from 1,000 to 4,300 additional premature deaths nationally per year by 2050 from combined ozone and particle health effects." See Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment* 222. U.S. Global Change Research Program, doi:10.7930/J0Z31WJ2. The projected regional increases in ozone concentrations associated with climate change and the serious toll on human health from ozone pollution further underscore the imperative for our nation to ensure that the ozone standard is set at a safe level as demonstrated by the scientific evidence and to implement protective measures to address both climate and ozone-forming pollution.

Senator WHITEHOUSE. Thank you, Ms. Patton. And welcome to Moms Clean Air Force. As a dad, I will be the first one to admit that when a young child is in an emergency room with an asthma attack, it is likely to be the mom who had to take off work and go and sit there with them. When a child has had to miss a day of school, it is likely to be a mom who is called home and has to organize coverage for the child who is not in school. So even if it is not affecting the lungs of the moms, it sure is affecting their lives.

Dr. Ferkol.

STATEMENT OF THOMAS WILLIAM FERKOL, JR., M.D., ALEXIS HARTMANN PROFESSOR OF PEDIATRICS; PROFESSOR OF CELL BIOLOGY AND PHYSIOLOGY, DIVISION OF ALLERGY, IMMUNOLOGY AND PULMONARY MEDICINE, WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

Dr. FERKOL. Thank you, Mr. Chairman, for the opportunity to speak today.

I am Tom Ferkol, I am a division director of Pediatric Allergy, Immunology and Pulmonary Medicine at Washington University in St. Louis, Missouri. To put it simply, I care for children with lung disease, some with severe, even life-threatening disease. You have my written testimony before you. Dr. Wellenius has already provided scientific background on why reducing ozone pollution is important for public health.

I just have a few brief points that I would like to make that I think adds to the discussion. First, with each breath, the lungs and airways are exposed to the outside environment. Breathing is not an option. Airborne pollutants, if present, are unavoidable. And children are far more vulnerable than adults to the effects of air pollution.

The lung is not completely formed at birth. It is still growing, it is still developing. The developing lung is particularly susceptible to the harmful effects of air pollutants. Air pollution is associated with impaired lung growth that may be permanent. So what is happening during childhood does not end in childhood, but continues on well into adulthood.

Ozone exposure increases the risk of developing asthma in childhood, including children that seemingly were previously healthy. Ozone pollution is particularly harmful to children who do have lung disease. That is not surprising, and it has been said before, but it is worth repeating. For children with asthma, the most common chronic disease of childhood that affects nearly 7 million children and adolescents in the United States alone, ozone levels below the current EPA standards are associated with increasing respiratory symptoms and the need for rescue medications. In some cases it requires greater medications, higher doses, to control their asthma systems. That may sound OK, except that often these medications or these increases in doses lead to unintended side effects.

School absences, emergency room visits, hospital admissions, are all clearly associated with ambient air pollution. This is common knowledge. Every pediatrician who cares for a child, especially a child with asthma, understands this relationship. Sometimes it

means children with asthma die, which is tragic and I like to think avoidable.

Third, ozone exposure as a child can lead to deficits that persist well into adulthood. I mentioned that before, but I felt the need to repeat it. The data is emerging, and there are several lines of evidence that are clearly showing that early exposures to air pollution, including ozone pollution, have long-term effects. It is not surprising that the cumulative exposures during childhood would impact lung health later in life. Indeed, very few people begin their lives as adults.

Fourth, when we in the medical community talk about the ozone impact on public health, it sounds like public health is a high-level concept. It really is not. Public health is just the accumulation of all the personal stories that make up America. Public health includes the mother of the child with asthma who is in the emergency room, worried whether their son will recover from a severe asthma attack. She is also thinking that she cannot afford to miss another day of work to stay home with her son.

Air pollution not only leads to direct costs for medical care of the ill child, but also increases indirect costs from lost productivity due to missed work and school.

Last, as has been stated by the previous speakers, the science is strong and compelling. Since 2006, when the Bush administration reviewed the ozone standard, the American Thoracic Society recommended a more protective level of 60 parts per billion. We were confident of a recommendation then, we are even more confident of that recommendation today. The research evidence is growing. The medical community has no doubts about air pollution's adverse effects on pediatric health.

The EPA is not basing their proposed protective ozone standard on one study or 10 studies. The proposed rule is based on literally hundreds of studies that demonstrate that the current standard is not protective. These studies deployed multiple scientific methods and models, as mentioned by the previous speaker.

But the data are clear. The current ozone standard is not protective of public health, and the EPA must issue a more protective standard. Thank you.

[The prepared statement of Dr. Ferkol follows:]

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Testimony
of Thomas W. Ferkol, MD
On Behalf of the American Thoracic Society

Before the Senate Environment and Public Works Committee
Subcommittee on Clean Air and Nuclear Safety

Hearing on
"Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone"

December 17, 2014

Mr. Chairman, Ranking Member, and members of the Subcommittee, my name is Dr. Tom Ferkol. I am a pediatric pulmonologist at the Washington University in St. Louis School of Medicine, and also the current President of the American Thoracic Society. On behalf of the American Thoracic Society, I want to thank the Committee for the opportunity to testify regarding the Ozone National Ambient Air Quality Standard proposed by the Environmental Protection Agency (EPA). The American Thoracic Society is a medical professional organization with over 15,000 professionals and patients who are dedicated to the prevention, detection, treatment and cure of respiratory disease, critical care illnesses and sleep-disordered breathing. We pursue our mission through research, clinical care, education and advocacy.

Ozone (O_3) is a potent oxidant that damages the airways and lungs. The American Thoracic Society strongly supports EPA's proposal to strengthen the National Ambient Air Quality Standards for ozone. If anything, we are disappointed EPA did not go further by recommending a stronger standard of 60 parts per billion (ppb).

For several years, the American Thoracic Society has encouraged the EPA to issue a health protective ozone standard. When the standard was reviewed in 2007 under the Bush Administration, we recommended a standard of 60 ppb based on the available evidence at that time. When the Obama Administration first reconsidered this standard in 2010, we again urged 60 ppb. While the recommended standard endorsed by the physician community has not changed during this time, the scientific evidence supporting this recommendation has significantly strengthened. Over the last seven years, we have gained an even greater scientific understanding of the health effects of ozone exposure, including greater links between respiratory disease in infants and children, reduced lung function, and increased mortality in adults. Indeed, the scientific record provides clear, consistent, and conclusive evidence that we believe should compel EPA to establish an ozone standard no higher than 60 ppb [**1,2**].

This is the second time that the Obama Administration has considered updating the current ozone standard of 75 ppb. In 2007, the Bush administration established the current standard outside of the range recommended by the independent Clean Air Scientific Advisory Committee (CASAC) of 60 ppb to 70 ppb [**3**]. In 2010, CASAC reaffirmed its initial recommendation as part of the Obama Administration's first reassessment of the ozone standard, an effort that was ultimately abandoned in 2011 [**4**]. The 2010 review did not include a new assessment of the science, but EPA's current review of the ozone standard does include a comprehensive review of significant new scientific evidence on ozone's adverse effects that has been developed since 2006.

Numerous scientific studies show that ozone exposures in the range of 60 ppb to 70 ppb have adverse physiologic effects across the entire age spectrum—from newborn infants to the elderly. While there is also some evidence of health effects of ozone exposure below 60 ppb, the strongest evidence supports the conclusion that serious adverse health effects occur across all ages at ozone levels above 60 ppb.

Several new lines of evidence have demonstrated the connection between ozone exposure in the 60 ppb to 80 ppb range and childhood asthma hospital admissions and emergency room visits [**6-9**]. A new study of emergency department visits by preschool age children in Atlanta further found that each 30 ppb increase in the three-day average of ozone was associated with an 8% higher risk of pneumonia [**5**].

Suffice it to say, ozone pollution – at levels permissible under the current standard – makes children sick. EPA has the authority and obligation to set a standard that protects children from the adverse health effects of ozone exposure. But it's not just children – adults are also harmed by ozone exposure.

Research shows that for each incremental rise in ozone exposure, severe exacerbations, emergency room visits, and hospitalizations for asthma increase for adults [**9-11**]. Similar associations have been found between increased ozone levels and adult admissions for chronic obstructive pulmonary disease [**12,13**] and pneumonia [**13**]. A population-based cohort study of generally healthy adults found that FEV_1 was lower after days when ambient ozone ranged from 59 ppb to 75 ppb compared to days with levels under 59 ppb [**14**]. Healthy individuals have normal lung function. Not surprising, poorer lung function is associated with greater morbidity in patients who have chronic respiratory diseases and lowers the threshold for exacerbations. Controlled human exposure studies have re-affirmed lung function decrements in healthy adults after exposure to 60 ppb to 70 ppb of ozone [**15,16**]. Perhaps of greatest concern, there is now stronger evidence of increased mortality in association with higher ozone levels [**17-19**], particularly among the elderly and those with chronic disease [**20,21**]. Large, multi-city studies have found strong and consistent associations between increased risk of premature death and increased ozone levels, particularly in warmer months when ozone levels are higher.

In sum, there is accumulating evidence that ozone pollution – at levels permitted by the current standard of 75 ppb – is damaging to the human lungs and contributes to disease. Based on this evidence, the American Thoracic Society strongly encourages EPA and the Administration to move forward with a strong, scientifically-supported standard of 60 ppb to protect the nation's children, elderly, other vulnerable populations, and the American public at large, from the known hazards of ozone pollution on human health.

While the evidence that ozone harms the lungs is particularly comprehensive and compelling, recent studies have also shown significant adverse health effects from ozone beyond the lungs. EPA's Integrated Science Assessment has concluded that, "...the evidence is stronger for most every health endpoint, with causal findings strengthened from 'suggestive' to 'likely causal' for cardiovascular effects and total mortality from short-term exposures." In addition, the

Assessment found that ozone affects the central nervous system and brain, and that a number of recent toxicological studies reveal adverse effects on neurologic function, cells, and tissue from long-term exposure to ozone, including changes similar to those observed in neurodegenerative disorders, such as Parkinson's disease and Alzheimer's disease. EPA's Assessment concluded that, "...the toxicological evidence for the impact of O_3 on the brain and behavior is strong, and suggestive of a causal relationship between O_3 exposure and effects on the central nervous system."[22]

In summary, the latest scientific research reaffirms and deepens our understanding of the adverse health effects of ozone exposure. Without question, the current EPA ozone standard fails to protect America's public health, and in particular fails to protect the most vulnerable among us. The Environmental Protection Agency and the Administration both have the authority and the obligation to establish a more protective ozone standard. On behalf of the American Thoracic Society, I strongly urge EPA and the Administration to finalize a more protective ozone standard of 60 ppb.

I would be happy to answer any questions.

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December 29, 2014

Mr. Drew Kramer
Majority Press Assistant and Staff Assistant
Senate Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, DC 20510

Dear Mr. Kramer,

Thank you for the inquiries regarding testimony given at the Senate Committee on Environment and Public Works oversight hearing, titled "EPA's Proposed National Ambient Air Quality Standards," which was held on December 17, 2014.

I've listed the questions submitted by Senator Boxer, highlighted in bold, and our responses below:

1. Written testimony submitted to the Committee the Commissioner of the Texas Commission on Environmental Quality stated: "Over the last ten years, the incidence of asthma has increased, whereas the ambient concentrations of ozone have decreased. If asthma incidence was associated with ozone concentrations, then the incidence should be going down, not up. Altogether, there is very little evidence that people with asthma are more sensitive to ozone." Is this assertion scientifically accurate? If not, please provide the reasons the statement is inaccurate.

Response: The above statement in the Texas Commission on Environmental Quality shows a surprising lack of understanding about the scientific basis of the relationship between asthma and air pollution. Asthma is a chronic airway disease that is greatly influenced by an individual's genetic background, lung development, and pre- and post-natal environmental and infectious exposures. The Texas Commission on Environmental Quality mistakenly presumes that ozone air pollution is the sole cause of asthma, and supposes that if ozone exposure is reduced (which has occurred in many U.S. communities), then the number of people with asthma should similarly fall. This is an erroneous assumption. Ozone is merely one of the many environmental precipitants of asthma exacerbations. Reducing air pollutants, like ozone, should reduce exposure to triggers but does not cure people of asthma, since asthma pathology does not resolve between exacerbations.

The statement, "there is very little evidence that people with asthma are more sensitive to ozone," shows a disturbing lack of knowledge of existing literature in peer-reviewed scientific journals. To be clear, ozone is a noxious, powerful oxidant that affects everyone when present in inhaled air. For individuals with asthma, chronic obstructive pulmonary disease (COPD), and other airway diseases, exposure to ozone can precipitate life-threatening short-term exacerbations and lead to long-term damage to airways. In addition, there are several lines of evidence that indicate a role for pollutants in the development asthma in childhood. In cystic fibrosis, another airway disease, elevated levels of airborne ozone are associated with an increased risk of exacerbations and decline in lung function. Air pollution has also been linked

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to sudden infant death syndrome (SIDS) and mortality due to respiratory disease in normal birth weight infants.

2. People most at risk from breathing air containing dangerous levels of ozone include children, people with asthma and other respiratory diseases, and older adults. Can you please explain why this is the case and at what level peer-reviewed science tells us would be the most protective ozone NAAQS being consider by EPA for these sensitive populations?

Response: The Clean Air Act directs the Environmental Protection Agency to set a National Ambient Air Quality Standard for criterial pollutants – including ozone – at a level that protects the public health, including vulnerable populations. The standard is to be set without regard to costs. The United States Supreme Court has affirmed this legislative mandate.

Where the Clean Air Act mentions "vulnerable populations," it is referring to people who have a heighten susceptibility to environmental insults. For ozone, vulnerable populations include all people with respiratory illnesses, such as asthma and chronic obstructive lung disease, the young, elderly, and millions of Americans with chronic non-pulmonary conditions, like heart disease and diabetes. The lung is in direct contact with air, so with each breath individuals who have underlying respiratory diseases are immediately susceptible to the damage caused by exposure to ozone pollution.

Children are more vulnerable than adults to the effects of air pollution. Exposure to air pollution is greater in children, due to higher minute ventilation and increased time spent outdoors. The lung is not completely formed at birth, with more than 80% of alveolarization occurring throughout childhood and adolescence. Alveolar cells that line the airspace actively proliferate and differentiate through adolescence, and are more susceptible to the harmful effects of chemicals and particulates that comprise air pollution, even in otherwise healthy children. Indeed, air pollution is associated with impaired lung growth and clinically significant deficits in lung function during childhood, with these defects persisting into adulthood. Thus, not only can ozone exposure precipitate short-term exacerbations, cumulative damage to the lungs can reduce the lung capacity of children into adulthood.

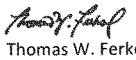
The American Thoracic Society, joined by the American Academy of Pediatrics, American Medical Association, American College of Preventive Medicine, American College of Occupational and Environmental Medicine and other medical organizations endorse a standard of 60 ppb per 8-hour standard. Numerous peer-reviewed studies, employing several different scientific methods and models, have shown adverse health effects from exposure to ozone at levels above this concentration. Chamber studies using healthy adults have shown that people exposed to ozone levels at 60 ppb for less than 8 hours have measurable lung inflammation and reduction in lung function. Epidemiological studies have revealed adverse health effects and even death in susceptible populations at these levels. In children, school absences, emergency room visits, and hospital admissions for respiratory diseases are all clearly associated with ambient air pollution. These studies are not limited to the United States, and investigators worldwide all confirm adverse human health effects at levels above a 60 ppb per 8-hour standard.

3. The 2014 National Climate Assessment found: "Factors that affect ozone formation include heat, concentrations of precursor chemicals, and methane emissions, while particulate matter concentrations are affected by wildfire emissions and air stagnation episodes, among other factors. By increasing these different factors, climate change is projected to lead to increased concentration of ozone and particulate matter in some regions." Does the American Thoracic Society agree with this peer-reviewed, scientific finding?

Response: The American Thoracic Society agrees that there is comprehensive and compelling evidence indicating that climate change will likely impede efforts to improve air quality. Physicians are concerned about what the future holds. The Society recently completed a survey of a random sample of our members who practice in the United States, and found a convincing majority of respondents felt that climate change is real, caused primarily by man-made emissions, and is already affecting the health of our patients today. The American Thoracic Society will freely share details of this study once they have been published after the New Year.

Thank you again for the invitation to speak. Please let me know if you have other questions.

Sincerely,



Thomas W. Ferkol, Jr., M.D.
Alexis Hartmann Professor of Pediatrics
Professor of Cell Biology and Physiology
Washington University in St. Louis
President, American Thoracic Society

Senator WHITEHOUSE. Thank you very much, Doctor.

Let me ask a few questions, and let me start with Dr. Wellenius. You have done some impressive work in Rhode Island, studying heat-related deaths and hospitalizations. Is ozone formation exacerbated by climate change, in your view? What is the linkage between added heat and added ozone?

Mr. WELLENIUS. Thank you, Senator, for that question.

Senator WHITEHOUSE. It is a local question, in Rhode Island.

Mr. WELLENIUS. Yes. In Rhode Island, what we have looked at is the relationship between warm temperatures and extreme heat and the number of emergency department visits and deaths in the State of Rhode Island. We found a strong association. That means that more people are hospitalized and die for heat-related illnesses on those hot days.

What we are trying to explore right now in Rhode Island is whether that is made worse on high ozone days. We think from other studies in other parts of the Country and across the world that days that are both hot and high ozone are generally worse for people than days that are either hot or high ozone, but not both together. So we are looking at that currently in Rhode Island. I don't have the results to share with you today, but I would be happy to provide those in the near future.

Senator WHITEHOUSE. Dr. Shaw did not choose to attend the hearing, but he did file pre-filed testimony with us, in which he told us that asthmatics are not in fact at greater risk of adverse health effects from ozone. Do you have any reaction to that statement?

Mr. WELLENIUS. I think it is just not true, to be frank. There is substantial evidence that asthmatics are at least at as great a risk as non-asthmatics to the health effects of ozone. There are, as with any body of science, body of evidence, not every study shows that, but the overwhelming consensus in the field is that people with asthma are at greater risk.

Senator WHITEHOUSE. Ms. Patton, the existing standard, the previous standard, the 75 parts per billion standard, was criticized at the time that it was adopted by the Clean Air Scientific Advisory Committee, saying, they actually took the step of writing to Administrator Johnson to say that they do not endorse the new primary ozone standard as being sufficiently protective of the public health. And that that decision "failed to satisfy the explicit stipulations of the Clean Air Act" that you ensure an adequate margin of safety for all individuals, including sensitive populations.

You were at EPA for a while, and you are familiar with the Scientific Advisory Panel, the CASAC. Was that an unusual step for them to take?

Ms. PATTON. It was an unusual step, Senator Whitehouse. It also highlights why the Clean Air Scientific Advisory Committee, in its recommendations to the Administrator in June, was so clear about its findings. It wanted to leave really very little room for ambiguity about the foundational science that supports two really central conclusions. One is that the current standard is not adequate to protect public health. That is what that body found in June in its recommendations to the Administrator, and also that there is clear evidence warranting a stronger standard.

The 2008 standard was criticized sharply at the time, not only by the Clean Air Scientific Advisory Committee that had advised EPA to establish a stronger standard, but a number of other leaders in the medical and health community.

Senator WHITEHOUSE. Somebody obviously didn't find the Clean Air Scientific Advisory Committee to be very credible, in ignoring their recommendations back in 2008. What can you tell the committee for the record of this hearing about the credibility and the credential of the Clean Air Scientific Advisory Committee? Should we pay attention to what they say?

Ms. PATTON. The Clean Air Scientific Advisory Committee is established under the law to provide the Administrator with independent scientific and medical advice on these really important public health questions. So this particularly advisory committee that most recently communicated to the Administrator in June is comprised of leading scientific experts at institutions across our Country from leading academic institutions in North Carolina to the research arm of the U.S. power industry, the Electric Power Research Institute. A wide variety of experts, a wide variety of perspectives, wide and deep expertise in epidemiology, toxicology, the leading scientific foundations. They have communicated clearly to the Administrator, it is her solemn responsibility to strengthen the health-based standard for ozone.

Senator WHITEHOUSE. So a private citizen listening to this hearing can take comfort that the Clean Air Scientific Advisory Committee is a reputable and reliable body?

Ms. PATTON. That body is a reputable, highly regarded body of leading scientific experts. Its recommendations are also confirmed by the leading medical and health associations, the American Lung Association, the American Public Health Association, the American Thoracic Society. So there is an extensive body of just leading public health and medical associations and experts that further confirm the findings and recommendations of the Clean Air Scientific Advisory Committee.

Senator WHITEHOUSE. You have made a perfect segue to Dr. Ferkol. For the record, tell us a little bit about the American Thoracic Society, and presume that I have challenged the credibility of the American Thoracic Society. Presume that I come at you with the point of view that this is an irresponsible, liberal organization and explain what the American Thoracic Society actually is.

Dr. FERKOL. I would say we are anything but that. We are somewhat egalitarian when it comes to our political leanings.

The American Thoracic Society is an organization, professional organization of over 15,000 members. It includes scientists, physicians, nurses, respiratory therapists, patients, families, all of whom are interested in improving the pulmonary health of patients, dealing with patients who are critically ill, as well as focusing to some extent on sleep disorders. It is a very proud organization. There are a lot of different people with a lot of different views, with a lot of different political leanings. I would say that we are neither left nor right in that respect.

Senator WHITEHOUSE. And so the American Thoracic Society, in your view, is also reputable and reliable when it makes a recommendation like this on a matter with its expertise?

Dr. FERKOL. I would hope so. Otherwise, I don't think I would want to be the president.

Senator WHITEHOUSE. Thank you.

So let's say you are a mother in Rhode Island, or a father. It is a summer day and you wake up in the morning and you are preparing breakfast, and you are listening to the radio and your kids are home, and they are small. And the radio announces that today is a bad air day in Rhode Island and that infants should be kept indoors. You are not really sure what that means. You take your child out to get some sunshine, to run around a little bit. Is there harm that could be happening to that child that wouldn't be to a parent, to the dad or mom?

Dr. FERKOL. The scenario that you give is a very common one, and it is a dilemma that families have, especially when you hear about particularly bad air days. We have them in St. Louis as well.

Yes, there is in fact harm, and it is invisible. You don't smell ozone, you don't see ozone, but you are being exposed to ozone. The effects of this noxious agent in the air is cumulative. It is not just, you go out, you get exposed to ozone and you suddenly have an asthma attack. This is something that certainly can precipitate asthma, we think that is very clear. That is one of the causative factors. But it also can lead to cumulative damage the airways, to the lungs, that makes your lung function, as was mentioned previously, that makes your lung function worse and may lower the threshold for the next time that you have an asthma exacerbation.

Senator WHITEHOUSE. So the risk is not that the child or the vulnerable person is going to suddenly begin coughing or having shortness of breath or have an asthma attack, it is that lasting, permanent insidious damage that is being done to the lung that is not apparent that day.

Dr. FERKOL. That is exactly right. I mean, certainly, I am sure that it is contributing to the inflammation of the airway that leads to an asthma exacerbation. But I think the cumulative effect, that is, you used the exact right word, insidious, it sort of sneaks up on you, sneaks up on the patient, sneaks up on the family. And how much of that influences the progression of lung disease, how much of this contributes to lung disease in adults is something that is a very interesting question. But we, needless to say, have more than a few concerns that this is happening.

Senator WHITEHOUSE. So a vulnerable person who goes out on a bad air day and experiences no apparent, immediate ill effects, doesn't feel shortness of breath, doesn't cough, doesn't in any way have a present sense during the bad air day that they have been affected, nevertheless could suffer, could be suffering harm as a result.

Dr. FERKOL. It doesn't mean that there hasn't been some incremental injury to the airways that then predisposes the child or, when the child grows up, the adult to later problems with their lungs.

Senator WHITEHOUSE. And does the harm tend to be cumulative?

Dr. FERKOL. That is a very good question. I would probably defer to Dr. Wellenius to answer.

Senator WHITEHOUSE. Dr. Wellenius, could you answer that question? The type of harm that we have been discussing, that is

not manifest in a particular discomfort or coughing or shortness of breath or anything else during the day, nevertheless is happening, and could potentially manifest months or years later, correct?

Mr. WELLENIUS. Yes, absolutely. The strongest evidence is for the short-term effects, for those effects on the same day. You could be outside 100 high-ozone days and not suffer an obvious effect and then on the 101st, you could suffer an asthma attack that lands you in the emergency department, or have really bad respiratory symptoms.

But then there are also these cumulative effects that we have been talking about. Those are not just respiratory effects, but there is increasing evidence that those could also be cardiovascular effects. So we are very concerned, not just about the short-term effects of ozone, but about the longer, life-long effects of ozone.

Senator WHITEHOUSE. And you did say that they were cumulative. Could you explain that?

Mr. WELLENIUS. Yes. Again, the science still needs to be refined in the area of over what timeframe they can be cumulative. But for instance, some of the cardiovascular effects can be seen even in young adults with having enhanced cardiovascular damage from their lifetime exposure to ozone. There are some studies demonstrating that.

Senator WHITEHOUSE. All right. Let me ask you to stand by one moment.

I think at this point I will conclude the hearing. I do want to, with unanimous consent of all present, put into the record a combination press release and letter issued by the ranking member of the committee, actually inviting the Republican witnesses not to attend. So their failure was not just a failure to appear of their own. They were invited not to appear by the ranking member.

[The referenced information follows:]

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After Congress Adjourns, EPW Republicans Won't Attend Last-Stand Ozone Press Conference

December 17, 2014

U.S. Sen. David Vitter, top Republican on the Senate Environment and Public Works (EPW) Committee, and other Committee Republicans will not attend the scheduled Subcommittee on Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone, because Congress adjourned. Vitter also informed Republican witnesses their attendance was no longer necessary.

"Congress adjourned last night. Sen. Vitter told the Republican witnesses there was zero reason to show up to Ranking Member Boxer's last-stand press conference," said EPW Committee spokesman Luke Bolar.

Text of Vitter's letter to the Republican witnesses is below.

December 17, 2014

Dear Mr. Eisenberg and Dr. Shaw:

I would like to personally thank you for your willingness to testify before the Senate Environment and Public Works Committee at the hearing titled "Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone," scheduled for 2:30 p.m. December 17, 2014. Despite your commitment, I must inform you that it is no longer necessary for you to attend the hearing.

The 113th Congress adjourned sine die late last night. The American people voted for a change, and elections have consequences. Ranking Member Boxer is still moving forward with having one final hurrah to push an agenda that voters have clearly rejected. There will be no Republican members at this hearing, and accordingly, your presence is no longer requested by the office that invited you. Although having such a hearing earlier in the year would have been prudent, I can assure you that Republicans plan to seriously focus on this critical issue with legitimate hearings in which all members can be present in the new year.

Given last night's official adjournment, any efforts to move forward with such a hearing will be nothing more than political theater bordering on a press conference for the majority. Accordingly, I respectfully thank you for your help, ask that we continue the open dialogue and working relationship in the new year, and ask that you enjoy the holidays without further engagement with the EPW Committee until 2015.

Thank you,

David Vitter
Ranking Member

-30-

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Senator WHITEHOUSE. And I would also like to State for the record that the question about proceeding with this hearing after the adjournment of the Senate last night was one that we have taken up with Senate legal counsel. We have been advised that we can proceed, that this is a legitimate hearing. So we have gone forward with that advice.

So we are going to continue to treat this as a legitimate hearing, I believe that it is. That means that the record of the hearing remains open for an additional week after the conclusion of the hearing.

Let me also add to the record a statement for the record by Senator Inhofe, "Chairman Whitehouse, thank you for holding this hearing," and so forth. Senator Inhofe's hearing statement will be also admitted to the record, alongside Senator Vitter's press release denying that this is a hearing.

[The referenced information follows:]

INHOFE STATEMENT FOR EPW HEARING ON PROPOSED OZONE STANDARDS

Wednesday, December 17, 2014

WASHINGTON, D.C. — U.S. Sen. Jim Inhofe (R-Okla.), senior member of the Senate Environment and Public Works (EPW) Committee, submitted the following statement for the record today for the EPW Subcommittee on Clean Air and Nuclear Safety hearing entitled: "Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone." Witnesses included Janet McCabe, Administrator for the Office of Air and Radiation at the U.S. Environmental Protection Agency; Dr. Thomas William Ferkol Jr, Alexis Hartmann Professor of Pediatrics and Professor of Cell Biology and Physiology, Division of Allergy, Immunology, and Pulmonary Medicine at the Washington University School of Medicine; Vickie Patton, General Council for the Environmental Defense Fund; Dr. Gregory A. Wellenius, Associate Professor of Epidemiology and Associate Director at the Center for Environmental Health and Technology for Brown University's School of Medicine; Ross Eisenburg, Vice President of Energy and Resources Policy for the National Association of Manufacturers; and Dr. Bryan W. Shaw, Chairman of the Texas Commission on Environmental Quality.

As submitted for the record:

Chairman Whitehouse, thank you for holding this hearing.

As I've watched the President's actions since November, it has become clear to me that he is intent on making the environment the bedrock of his legacy.

We're seeing this with his eagerness to strike an international global warming agreement, however hollow, as we saw recently in China.

But we see it most clearly with EPA's own agenda, which is, quite simply intent to pursue regulations without concern for their impact on jobs or the economy.

EPA is pursuing methane and hydraulic fracturing regulations in an effort to stall the booming oil and gas sector, which employs over 9 million people.

To further tighten the screws on coal, which supplies nearly 40% of our electricity at very affordable prices, the EPA is finalizing a rule this week that will establish federal regulations for coal ash, which is something states have done well for decades. And this is added to the Clean Power Plan which will enable EPA to completely takeover the nation's electric grid.

Then there's the Waters of the United States rule, which will allow EPA bureaucrats to regulate every drop of water we have. The list goes on and on.

This regulatory agenda is all about the President establishing a permanent system enacting his philosophy and guiding mentality that government knows best.

The ozone rule may be the clearest evidence of this, as you can see in the map behind.

The EPA's rule proposes lowering the Ozone standard from 75 parts per billion to 65 parts per billion and leaves the door open to go as low as 60 parts per billion.

Why that low? Because it is what the environmentalists want. With a standard that low, 2,829 counties will be out of attainment across the country, covering 95% of the total population. Keep in mind that 40% of the population continues to live in areas that are out of attainment with the current standard of 75 parts per billion.

In Oklahoma, all 77 counties would be put out of attainment if the standard is lowered to 60, and compliance could cost as much as $846 million and cause 13,000 job losses.

Across the country, the cost could exceed $300 billion annually and destroy 2.9 million jobs.

I've long talked about the cost of cap-and-trade, but now many are arguing that the Ozone rule could be the most expensive regulation ever.

By lowering the standard this far, EPA will be giving itself the authority to give a thumbs up or thumbs down to nearly every road and manufacturing project proposal across the country.

Importantly, EPA has no path forward on how the nation would ever attain the proposed standard, as the technology we have today is not sufficient to reduce emissions to the low levels the President wants.

Add to that naturally occurring ozone, which according to the proposed rule can exceed 75 in some areas, and it's fair to question whether EPA's motive is health based or more about seizing for itself more power as it is doing with its other rules like the Clean Power Plan.

And this is something Steven Beshear understands. He is the Democrat Governor of Kentucky and has pledged to reduce carbon emissions by 80% by 2050, yet last month he wrote President Obama and asked him to keep the standard where it is because of the detrimental impact it would have on Kentucky job creators and manufacturers. I'd like to submit that letter for the record.

Additionally, it is worth noting that this is the same regulation that President Obama cancelled because of its extreme cost. He wrote in September 2011 that the rule was not appropriate, "particularly as our

economy continues to recover."

I am not sure what is different about our economy today compared to then – there are still a lot of people suffering, looking for jobs, and many families are still far from catching up to where they were before the recession.

The ozone rule is something I look forward to conducting more rigorous oversight of in the next Congress.

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Senator WHITEHOUSE. It is getting interesting around here already.

Anyway, for a week, the record of the hearing will remain open. Let me thank you again, all of our witnesses, for coming down. This is, in my view, a long overdue change in a rule that had no validity from the very beginning. And thank you very much for not only your support for the EPA action, but for your support for EPA pushing toward the lower 60 part per billion standard, which I believe is the unanimous recommendation of the assembled panel.

Without further ado, we will adjourn the hearing. Again, thank you all very much for your participation.

[Whereupon, at 3:28 p.m., the hearing was adjourned.]

[Additional material submitted for the record follows.]

NATIONAL ASSOCIATION OF
Manufacturers

Leading Innovation, Creating Opportunity, Pursuing Progress.

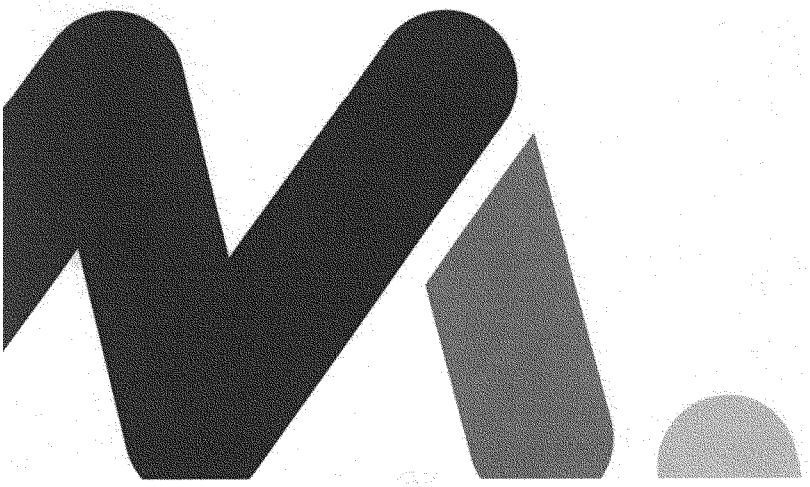
Testimony

of Ross Eisenberg
Vice President
Energy and Resources Policy
National Association of Manufacturers

before the Senate Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety

on "Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone"

December 17, 2014



TESTIMONY OF ROSS EISENBERG

BEFORE THE SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

Hearing on:
"Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone"

DECEMBER 17, 2014

Good morning, Chairman Whitehouse, Ranking Member Sessions and members of the Subcommittee on Clean Air and Nuclear Safety. My name is Ross Eisenberg, and I am vice president of energy and resources policy at the National Association of Manufacturers (NAM). The NAM is the nation's largest industrial trade association, representing nearly 14,000 small, medium and large manufacturers in every industrial sector and in all 50 states. I am pleased to represent the NAM and its members at today's hearing on the Environmental Protection Agency's (EPA) proposed National Ambient Air Quality Standards (NAAQS) for ground-level ozone.

Manufacturers have demonstrated a commitment to protecting the environment through greater sustainability, increased energy efficiency and reducing emissions. We are building cleaner and more efficient automobiles. Since 1990, highway vehicle emissions of the primary precursors of ozone, nitrogen oxides (NO_x) and volatile organic compounds (VOC), are down are down 48 and 30 percent respectively,[1] while an additional 60 million vehicles

[1] EPA, National Emissions Inventory (NEI) Air Pollutant Emissions Trends Data, February 2014.

have been added to U.S. roadways over the same time period.[2] We are operating cleaner and more efficient factories: since 1990, manufacturers' NO_x emissions are down 52 percent and VOC emissions have been reduced by 70 percent,[3] while our value added to the economy has more than doubled.[4] As a country, ozone levels are down nearly 25 percent since 1990[5] and our economy has grown by 43 percent.[6] With the right policies and a balance between environmental ambition and technological feasibility, we can have both a clean environment and a prosperous economy. However, when policymakers push beyond the limits of what is technologically feasible, the critical balance between environmental improvement and economic growth is lost and manufacturers and the economy will suffer.

Increasingly, we are losing that balance. More and more, the EPA is proposing regulations that are beyond the bounds of innovation putting manufacturers and other industries in a position where the only available compliance strategy, unless policies are modified, is closing up shop. When EPA first issued its Boiler MACT regulation,[7] the standards were so unrealistic that that no single boiler could meet all of the rule's requirements.[8] In 2012[9] and then

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[2] U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology, Bureau of Transportation Statistics, National Transportation Statistics, Table 1-11: Number of U.S. Aircraft, Vehicles, Vessels, and Other Conveyances.
[3] EPA, National Emissions Inventory (NEI) Air Pollutant Emissions Trends Data, February 2014.
[4] U.S. Department of Commerce, Bureau of Economic Analysis, Value Added by Industry.
[5] EPA, Air Quality Trends. http://www.epa.gov/airtrends/aqtrends.html#comparison
[6] U.S. Department of Commerce, Bureau of Economic Analysis, Gross Domestic Product by Year.
[7] EPA, Nation Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, 75 Federal Register 32006 (June 4, 2010) (EPA Docket Number OAR–2002–0058)
[8] See comments filed by the National Association of Manufacturers on August 23, 2010.
[9] EPA, Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, Docket ID No. EPA –HQ–OAR–2011–0660; FRL–9654–7, 77 Fed. Reg. 22,392 (April 13, 2012)

again in 2014,[10] the EPA proposed New Source Performance Standards (NSPS) for new coal-fired utilities at levels that were neither being achieved in practice nor which could be achieved by any commercially available technology.[11] Now, the EPA has proposed new ozone standards for which it can only identify 60 percent of the necessary technologies to achieve a 65 parts per billion (ppb) standard, while relying on so called "unknown controls" for 40 percent of its path to compliance. [12] This is not a balanced policy. This is not an achievable rule.

The NAM opposes the EPA's proposed revisions to the NAAQS for ozone. This proposal is likely to be the most expensive regulation ever, regardless of the point in the proposed range of 65 to 70 parts per billion (ppb) the Administrator ultimately lands. A substantial portion of the compliance with a new standard will come from controls that are unknown even to the EPA, and if these controls are not invented in time, manufacturers will be forced to consider scrapping existing plants and equipment. Manufacturers operating in newly-designated nonattainment areas could be effectively closed off to any new growth, and even manufacturers in areas in compliance with the new standards will struggle to model attainment and obtain their new permits. No sector will be spared, and the nation's manufacturing comeback—driven largely by an advantage on energy—could be placed in jeopardy.

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[10] EPA, Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Utility Generating Units, Docket ID No. EPA –HQ–OAR–2013–0495; FRL–9839–4, 79 Fed. Reg. 1,430 (January 8, 2014)

[11] See NAM Comments filed May 9, 2014.

[12] EPA, Regulatory Impact Analysis of the Proposed Revision to the National Ambient Air Quality Standards for Ground-Level Ozone, pp. ES-8, ES-9 (November 2014).

The current standard of 75 ppb and dozens of other recent regulations on power plants, manufacturers, vehicles and fuels are already causing manufacturers to make dramatic reductions in ozone over the next several years, reductions that will protect public health. They will also impose significant new costs. Manufacturers support reasonable regulation, but at some point the costs of manufacturing in the United States will make it impossible for manufacturers to stay in business. A strict new ozone NAAQS may be that tipping point.

The Clean Air Act has been successful in improving air quality across the United States over the past four decades. However, incremental improvements in ozone are now coming at exponential cost. A NAAQS process that does not allow the Administrator to consider cost or technical feasibility is no longer productive. As the sun sets on the 113th Congress and the members of this Subcommittee focus on priorities for the 114th Congress, the NAM urges you to consider ways to improve the ozone NAAQS process so that we can protect public health while also protecting the economy and our nation's manufacturing base.

Manufacturers Are Already Making Major Emissions Reductions

Ground-level ozone is formed through a chemical reaction when NO_x and VOCs interact with sunlight. Emissions from power plants, industrial facilities, automobiles, gasoline vapors and solvents are all sources of NO_x and VOCs. Natural sources, such as plant life and fires, also contribute to the formation of ozone; today, given how much ozone levels in the United States have already

been reduced, a significant portion of a given area's ozone concentration is made up of natural background ozone and ozone that has traveled from other states and, increasingly, from overseas.

Under the Clean Air Act, the EPA is instructed to select a primary NAAQS for ground-level ozone that protects the nation's public health within an "adequate margin of safety." In March 2008, the EPA lowered the primary NAAQS for ground-level ozone from 84 ppb to 75 ppb.

EPA groups the sources of man-made ground-level ozone into four main categories: (1) onroad and nonroad mobile sources; (2) industrial processes (including solvents); (3) consumer and commercial products; and (4) the electric power industry. These sectors have taken or will take major steps to reduce NO_x and VOCs over the past few decades by complying with the following regulations:

Mobile Sources

- New emissions standards under title II of the Clean Air Act, 42 U.S.C. 7521–7574, for numerous classes of automobile, truck, bus, motorcycle, earth mover, aircraft, and locomotive engines, and for the fuels used to power these engines;
- New EPA standards for locomotive and for marine diesel engines;
- New standards for Category 3 (C3) engines installed on U.S. ocean-going vessels and to marine diesel fuels produced and distributed in the U.S.;
- New greenhouse gas and fuel efficiency standards from EPA and the National Highway Transportation Safety Administration for new 2014-2018 model year medium and heavy-duty engines and vehicles; and
- New EPA Tier 3 standards for tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles.

Industrial Processes

- Maximum achievable control technology (MACT), reasonably available control technology (RACT), and best available control technology (BACT) standards for a wide range of industrial categories, including combustion sources, coating categories, and chemical manufacturing;
- New EPA emission standards and fuel requirements for new stationary engines;
- New EPA regulations for commercial, industrial and solid waste incinerators, which set standards for NOx and several air toxics for all commercial incinerators, as required under Section 129 of the Act;
- New air toxics rules for industrial boilers, which will yield co-benefit NOx reductions as a result of tune-ups and energy efficiency measures, especially from boilers that burn coal; and
- Several new source performance standards and air toxics standards, including upcoming review and revisions for gas turbines and municipal waste combustors and proposed requirements for the petroleum refining industry.

Consumer and Commercial Products

- New national VOC emission standards for aerosol coatings;
- Review and revision of existing rules for household and institutional consumer products, architectural and industrial maintenance coatings, and automobile refinish coatings;
- Control techniques recommendations issued in 2008 for four additional categories of consumer and commercial products, such as surface coatings and adhesives used in industrial manufacturing operations; and
- Energy Star, a joint program of the EPA and the U.S. Department of Energy, which encourages energy efficient products and practices.

Electric Power Sector

- The EPA's Clean Air Interstate Rule (CAIR) and its successor, the Cross-State Air Pollution Rule (CSAPR);

- New Source Performance Standards (NSPS) for electric generating units;
- Prevention of Significant Deterioration (PSD) or Nonattainment New Source Review (NNSR) requirements;
- The Mercury and Air Toxics Standard (MATS) rule; and
- Regional Haze best available retrofit technology (BART) determinations.

Manufacturers' responses to these regulations, combined with market-driven innovation and other dynamics, have reduced and will continue to reduce NO_x and VOC emissions substantially. In 1990, 25.2 million tons of NO_x were emitted in the U.S.; by 2013, this total was cut by almost half, down to 12.9 million tons. Factoring in the current ozone standard of 75 ppb, total U.S. NO_x emissions will be driven down to 9.7 million tons by 2018.

Even in the absence of new ozone regulations, NO_x emissions will be roughly 25 percent lower in 2018 than they are today, and over 60 percent lower than they were in 1990. Manufacturers are making the air cleaner and will continue to do so, and we are doing it *without* having to revise the ozone standard any further.

Tighter Ozone Standard Could Be the Most Expensive Regulation Ever

When the EPA sought to tighten the ozone standard to a range between 60 and 70 ppb in 2011, its own estimate of the cost of the rule ranged from $19-25 billion (at 70 ppb) to $32-44 billion (at 65 ppb) to $90 billion (at 60 ppb) per year.[13] At these estimates, any of these would have been the most expensive regulation of all time, and would have presented major cost and attainment

[13] http://www.epa.gov/glo/pdfs/201107_OMBdraft-OzoneRIA.pdf.

challenges for manufacturers. Moreover, the EPA's analysis was incomplete: it left out costs for California, the nation's largest economy, and it provided little justification for what appeared to be an unrealistically low cost estimate for "unknown controls" needed to comply with the rule. With a 2014 review looming and with environmental and health groups pressing for a range of 55 to 60 ppb, our members asked us to hire experts to determine whether any of these limits were feasible and what the cost would be.

After an exhaustive search, the NAM retained David Harrison, Jr., Ph.D, and Anne E. Smith, Ph.D, of NERA Economic Consulting to model the impacts of a new ozone regulation set at 60 ppb. We asked Dr. Harrison and Dr. Smith to perform two study objectives: (1) estimate the costs and economic impacts of a 60 ppb ozone standard using the best available information from the EPA and other sources; and (2) identify any gaps in existing EPA literature and analysis that would prevent the Agency from accurately assessing the economic impacts of the regulation.

NERA's results were startling. A standard of 60 ppb would be absolutely devastating to manufacturers and to the economy as a whole. Specifically, NERA found that a 60 ppb standard would:

- Reduce gross domestic product (GDP) by about $3.4 trillion on a present value basis (as of 2014) and by $270 billion per year on an annualized basis (spread evenly from 2017 to 2040);
- Reduce average annual household consumption—money that would normally be spent on food, clothes or other consumer goods—by about $1,570 per household per year;
- Result in 2.9 million less job-equivalents per year;

- Cause the retirement of 101 gigawatts (GW) of additional coal-fired capacity, about one-third of the coal fleet; and
- Increase industrial electricity prices by 5.5 percent and industrial natural gas prices by 12 percent.

In addition, oil and natural gas producers in areas that become in nonattainment under a tighter ozone standard might face new requirements, such as the need to obtain air permits as well as emissions reduction credits, or offsets, for NO_x and/or VOCs, in order to develop new wells. If such barriers to new well development do emerge, the projected economic impacts of a 60 ppb ozone standard could be even higher:

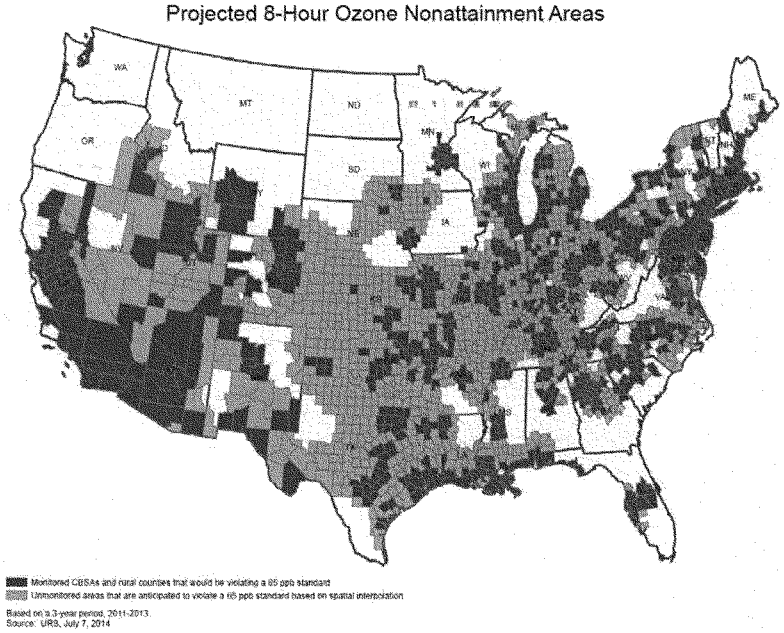
- GDP reduced by nearly $4.5 trillion across the 2017-2040 study period;
- Average annual household consumption is reduced by $2,040 per year;
- Industrial electricity prices could increase by 23 percent; and
- Industrial natural gas prices could increase by 52 percent.

For manufacturers, particularly those in energy-intensive sectors, such as iron and steel, cement, aluminum, pulp and paper and chemicals, energy cost increases at these levels would be devastating in their ability to compete internationally.

Nonattainment Means No Growth

A new ozone standard means that, as soon as 2017, many new areas across the United States will be thrust into "nonattainment."

Projected 8-Hour Ozone Nonattainment Areas



The map above, which assesses attainment of a 65 ppb standard, looks substantially different than the one the EPA produced when it rolled out the rule in November. The differences are that EPA's map is what the Agency projects attainment to look like in 2025—ten years after the rule is finalized, and eight years after initial attainment designations are made; and only accounts for counties with monitored data. The map above was compiled using current monitored data as well as modeling projections of air quality, and is a more accurate reflection of how the map would look in 2017 when counties are designated nonattainment.

Why does this matter? Because nonattainment is a significant barrier to growth. Nonattainment is a significant deterrent to manufacturers to build or expand in an area, because the permits are so difficult to obtain versus an attainment area. Companies building or expanding facilities in nonattainment areas are required to install specific technologies regardless of cost, and projects cannot move forward unless ozone is reduced from other sources. These "offsets" are neither cheap nor easy to obtain. Currently, offset prices in the Houston-Galveston-Brazoria Non-Attainment area are close to $175,000 per ton of NO_x and $275,000 per ton of VOC. Offset prices in southern California nonattainment areas are approaching $125,000 per ton of NO_x. Rural areas, which could become new nonattainment areas under a tighter standard, may lack offsets altogether, making the offset requirement a total barrier to new projects.

Even manufacturers not looking to expand will be subject to restrictive new regulations in nonattainment areas. For instance, in the Houston non-attainment area, existing facilities are subject to additional controls under the Highly Reactive VOC (HRVOC) rule, and combustion units, such as boilers and ethylene crackers, must install SCRs and low-NOx burners. In the most severe cases, states with nonattainment areas could lose federal highway and transit funding.

Why Would New Ozone Regulations Be So Expensive?

Thankfully, the EPA did not propose a standard of 60 ppb. Instead, the Administrator has proposed a narrower range, between 65 and 70 ppb.

Nevertheless, the NAM/NERA report is instructive not only because of the top-line economic numbers but also because of NERA's careful investigation into why this regulation is so expensive.

Attaining a tighter ozone standard will require large reductions in NO_x and VOC emissions from power plants, manufacturing facilities and mobile sources, such as cars, trucks and off-road vehicles. These reductions come at a high cost per ton because significant investments have already been made to reduce emissions, leaving few low-cost control options as the ozone standard tightens.

EPA has identified a suite of "known controls" for power plants, manufacturers, commercial and residential consumers, and onroad and off-road vehicles. These technologies are all expensive. However, application of all existing known controls will still fall short of attainment of an ozone standard set at 60, 65 or even 70 ppb. The remaining reductions will have to be met with what EPA calls "unknown controls." These are exactly as they appear: EPA cannot identify what the controls are.

In 2011, the EPA identified only one-third of the controls needed to reduce the 3.9 million tons of NOx to achieve a 60 ppb ozone standard. When EPA modeled the cost of these unknown controls, it drew a cost curve with little evidence behind it, but still wound up at a cost per ton 19 times higher for unknown controls than for known controls. NERA's model assumed the same costs per ton as EPA for known controls, but differed sharply on the cost of unknown controls. NERA concluded that removal of the 2.6 million tons of NOx covered by "unknown controls" would necessarily require some power plants,

manufacturing facilities and vehicles, along with other industrial, commercial, agricultural and even residential equipment, to have to be shut down or scrapped. The reductions needed to attain 60 ppb were so aggressive that few industries or sectors were spared.

NERA performed an evidence-based approach to draw its cost curve for unknown controls. NERA used information on the cost per ton to reduce NO_x from existing literature—specifically, studies done on the retirement of coal-fired power plants and an analysis done by Dr. Christopher Knittel of Massachusetts Institute of Technology on the "cash for clunkers" automobile program[14]—and developed a more informed curve of the potential costs of unknown controls.

Unfortunately, the EPA's latest proposed ozone rule suffers from many of the same cost and feasibility challenges identified by NERA in the 2011 proposal. Manufacturers will again need to rely on unknown controls—as much as 40 percent of the NO_x reductions under a standard of 65 ppb—yet EPA has somehow assumed that these unknown controls will be *less* expensive per ton than some of the known controls. In addition, the EPA modeled only attainment in 2025, but nonattainment designations will be made as early as 2017, meaning EPA's cost projections do not take into account any of the costs for areas that go from nonattainment to attainment between 2017 and 2025. The EPA only projected costs for areas with emissions monitors, which excludes roughly 76 percent of U.S. counties. EPA assumes costs will be lower due to NO_x reductions

[14] Knittel, Christopher. 2009. "The Implied Cost of Carbon Dioxide under the Cash for Clunkers Program." Center for the Study of Energy Markets, UC Berkeley. *Article available at* http://www.ucei.berkeley.edu/PDF/csemwp189.pdf; *spreadsheet available at* http://web.mit.edu/knittel/www/papers/CfC.xls.

from the Clean Power Plan, a rule that has not gone final and may not in its current form. And, as in 2011, the EPA excluded California from its base economic analysis.

When NERA identified and corrected these modeling deficiencies in its study of a 60 ppb standard, the annual cost of the rule more than doubled, from an estimated present value of $900 billion from 2017-2014 (EPA) to $2.2 trillion over the same time period (NERA). Given that many of these modeling deficiencies are present in the current proposal, it is reasonable to assume that the EPA has underestimated the regulation's cost.

Implementation of the Current Standard Has Barely Begun

Even though the current standard was finalized in 2008, the EPA stopped implementing it from 2010-2012 while it pondered an out-of-cycle rulemaking to make it more stringent. EPA did not restart implementation until early 2012, six months after the White House rejected EPA's more stringent ozone standard.

EPA's delay put state implementation of the 2008 ozone standard well behind the normal schedule. States did not find out which of their counties would be designated nonattainment under the 2008 standard until April 2012. The implementing regulations from the 2008 standard are still logged at the Office of Management and Budget, and have not been released to states so that they can submit their State Implementation Plans (SIPs).

States are committing time and money to meet the 2008 ozone standard. Yet EPA now wants to move the goal posts in the middle of the game, straining

the limited state resources for implementation and not giving states a chance to meet the current NAAQS.

EPA's Proposed Standard is Approaching Background Ozone Levels

The chemistry and formation of ozone is complex. Ozone is formed at ground-level due to chemical interactions involving solar radiation and VOCs, NO_x, methane (CH_4) and carbon monoxide (CO). Precursor emissions leading to ozone formation result from man-made sources like power plants, factories and cars, but also natural sources like forest fires and plant life. Additionally, ozone from the stratosphere that protects us from ultraviolet rays can migrate to ground-level.[15] Ozone can be transported hundreds or even thousands of miles by wind across both state and national borders. As EPA notes in its proposed rule, "some locations in the U.S. can be substantially influenced by sources that may not be suited to domestic control measures. In particular, certain high-elevation sites in the western U.S. are impacted by a combination of non-local sources like international transport, stratospheric O_3, and O_3 originating from wildfire emissions."[16] EPA also notes that analysis suggests that in some parts of the country and at certain times, background concentrations of ozone approach or even exceed the current 75 ppb standard.[17] EPA's proposal is so stringent that the Grand Canyon would fail the proposed 70 ppb standard, and Yellowstone National Park would fail the proposed 65 ppb standard. The National Oceanic and Atmospheric Administration (NOAA) released a study showing that Las

[15] EPA Proposed Rule, National Ambient Air Quality Standards for Ozone, Pre-Publication, p. 32 (2014).
[16] EPA Proposed Rule, p. 33 (2014).
[17] EPA Proposed Rule, p. 33 (2014).

Vegas would exceed EPA's proposed range of ozone NAAQS almost entirely due to background ozone.

Further, the relationship between precursor emissions, which ultimately are the target of regulation from NAAQS policies, and ozone formation are nonlinear. As EPA notes in the proposed rule, "In some areas, such as urban centers where NO_x emissions typically are high, NO_x leads to the net destruction of O_3, making O_3 levels lower in the immediate vicinity."[18] The inverse has also been demonstrated, as NO_X emissions are reduced in some areas, ozone levels actually increase.

Conclusion

Manufacturers have established a strong record of environmental protection, and strive to reduce the environmental footprint of our operations and to become more sustainable. A high standard of living depends upon a healthy environment, robust economic growth and an adequate and secure supply of energy at globally competitive prices. There must be a balance.

The EPA's proposed new ozone NAAQS fails to achieve this balance. This proposal is likely to be the most expensive regulation ever, and comes at a time when manufacturers are busy complying with dozens of other new regulations that will drive major reductions in ozone. At some point the constant threat of billions of dollars of capital expenditures driven by new regulations will shut down our nation's job creators. Manufacturers are on the verge of a major comeback—they just need some balance from Washington.

[18] EPA Proposed Rule, p. 33 (2014)

NATIONAL ASSOCIATION OF Manufacturers

Ross E. Eisenberg
Vice President
Energy & Resources Policy

December 31, 2014

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

The Honorable David Vitter
Ranking Member
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Vitter:

Thank you for your follow-up questions for the record from the Committee's recent oversight hearing on the Environmental Protection Agency's (EPA) proposed regulations on ground-level ozone. Enclosed are my responses. The National Association of Manufacturers looks forward to working with the Committee in 2015.

Sincerely,

Ross Eisenberg
Vice President
Energy and Resources Policy

RESPONSES TO QUESTIONS FOR THE RECORD

ROSS EISENBERG, NATIONAL ASSOCIATION OF MANUFACTURERS

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
OVERSIGHT HEARING: EPA'S PROPOSED NATIONAL AMBIENT AIR QUALITY STANDARDS FOR OZONE

DECEMBER 17, 2014

Senator Barbara Boxer

Q: On December 11, 2014, you were formally invited by the Chairman of Senate Committee on Environment and Public Works and Chairman of the Subcommittee on Clean Air and Nuclear Safety to appear as a witness at the December 17, 2014, hearing entitled "Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone." You accepted the invitation and submitted written testimony in accordance with the procedures put forth in this invitation.

On December 17, 2014, a NAM representative contacted the Committee by phone and was informed that the hearing would be held in accordance with applicable Senate rules. A mere assertion by the Ranking Member of the Committee that you do not need to attend the hearing because the Senate had adjourned does not excuse your absence.

Senate Rule XXVI authorizes all committees to sit and hold hearings during sessions, recesses, and adjourned periods of the Senate. This includes after sine die adjournment. This legal determination was communicated several times to the offices of the Ranking Member of the Committee prior to the hearing and your absence was not excused by the Chair of the Committee.

The hearing was held on December 17, 2014, in full accordance with Senate rules. The Chairman of the Committee and the Chairman of the Subcommittee were never informed that you would not appear at the hearing. In fact, your representative contacted the Majority offices of the Committee and the requirement to appear at the hearing was confirmed. Failing to appear to testify before a duly constituted Senate Committee hearing after accepting an official invitation is a serious matter. Can you please explain why you did not appear as a witness at the December 17th hearing?

A: Thank you for this question. As you note, the NAM accepted an invitation from Ranking Member Vitter to appear as a witness for the minority at a December 17, 2014 hearing on ground-level ozone. This is a very important issue to manufacturers, and I submitted a comprehensive written statement in preparation for the hearing and planned to appear. However, when the Senate adjourned *sine die* prior to the hearing, I received the enclosed letter from Ranking Member Vitter advising me that I was no longer requested to appear by the office that had invited me. I followed the instructions I was given.

I regret that the NAM is caught in the middle of a disagreement between the Chairman and Ranking Member over Senate procedure. I understand that a copy of the letter addressed to me from Ranking Member Vitter was entered into the record at the hearing on December 17. I am resubmitting a copy along with today's response. I also resubmit my 17-page written statement, which provides a detailed examination of the EPA's proposed ozone regulation and the challenges it poses for manufacturers.

I look forward to working with the members of this Committee in the 114th Congress, and hope the Committee will continue its oversight of the EPA's work on a new ozone standard. To the extent the NAM can be helpful in these efforts, please do not hesitate to contact me.

Enclosures:

1. Letter from Senator David Vitter to Ross Eisenberg, December 17, 2014
2. Written Testimony of Ross Eisenberg, December 17, 2014

United States Senate

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
WASHINGTON, DC 20510-6175

December 17, 2014

Ross Eisenberg
Vice President, Energy and Resources Policy
National Association of Manufacturers
733 10th Street NW Suite 700
Washington, DC 20001

Dear Mr. Eisenberg:

I would like to personally thank you for your willingness to testify before the Senate Environment and Public Works Committee at the hearing titled "Oversight Hearing: EPA's Proposed National Ambient Air Quality Standards for Ozone," scheduled for 2:30 p.m. December 17, 2014. Despite your commitment, I must inform you that it is no longer necessary for you to attend the hearing.

The 113th Congress adjourned *sine die* late last night. The American people voted for a change and elections have consequences. Ranking Member Boxer is still moving forwards with having one final hurrah and pushing an agenda that the voters clearly rejected, but there will be no Republican members at this hearing and, accordingly, your presence is no longer requested by the office that invited you. Although having such a hearing earlier in the year would have been prudent, I can assure you that Republicans plan on seriously focusing on this critical issue with legitimate hearings in which all members can be present in the new year.

Given last night's official adjournment, any efforts to move forward with such a hearing will be nothing more than political theater bordering on a press conference for the majority. Accordingly, I respectfully thank you for your help, ask that we continue the open dialogue and working relationship in the new year, and ask that you enjoy the holidays without further engagement with the EPW Committee until 2015.

Thank you.

David Vitter
Ranking Member

Bryan Shaw, Ph.D.
Commissioner
Texas Commission on Environmental Quality

EPA is currently considering lowering the existing national eight-hour ozone standard from its current level of 75 parts per billion (ppb) to a much lower range, between 70 and 60 ppb. However, after an in-depth review of the EPA's analysis, as well as a thorough study of the relevant scientific literature, the TCEQ has concluded that there will be little to no public health benefit from lowering the current standard. Surprisingly, the EPA's own modeling in twelve cities across the country indicates the net result will be *increased* mortality in some areas, including Houston and Los Angeles. The EPA did not do the analysis for other cities in Texas.

There is no doubt that, at some higher level, ground level ozone is harmful to human health. The question is, has the EPA adequately demonstrated that lowering the ozone standard to 70 to 60 ppb would actually have health benefits. We think that EPA's process of setting ozone standards has not scientifically proven this, and that further lowering of the ozone standard will fail to provide any measurable increase in human health protection.

The EPA's own modeling in their Health Risk and Exposure Assessment (HREA) indicates that lowering ozone concentrations would actually result in more deaths in Houston (Appendix 7, page 7B-2 of the HREA). Either this indicates that lowering ozone standards defeats its stated purpose of protecting human health, or it indicates that something is wrong with the EPA's methodology. Either way, it's not a good argument for lowering ozone standards. Further, EPA is not very forthcoming about the increased deaths. It's not mentioned in the executive summary of their policy analysis, but it's found on page 115 of Chapter 3, more than one third of the way through the 597 page document.

The EPA's proposed lower ozone standard derives much of its claimed benefits from associating ozone with worsening asthma. The problem with this association is that asthma diagnoses are increasing in the U.S., yet nationwide, air quality is improving. If asthma were actually tied to ozone, you would expect to see the instances of asthma decreasing, not increasing. In fact, data from Texas hospitals show that asthma admissions are actually highest in the winter, when ozone levels are the lowest.

Below are a few simplified facts and explanations of the TCEQ's conclusion that a lower ozone standard is not justified.

Sensitivity of asthmatics to ozone:

- Exposure of human volunteers to ozone showed similar lung effects in asthmatics as in non-asthmatic subjects.

Mortality caused by long-term exposure to ozone:

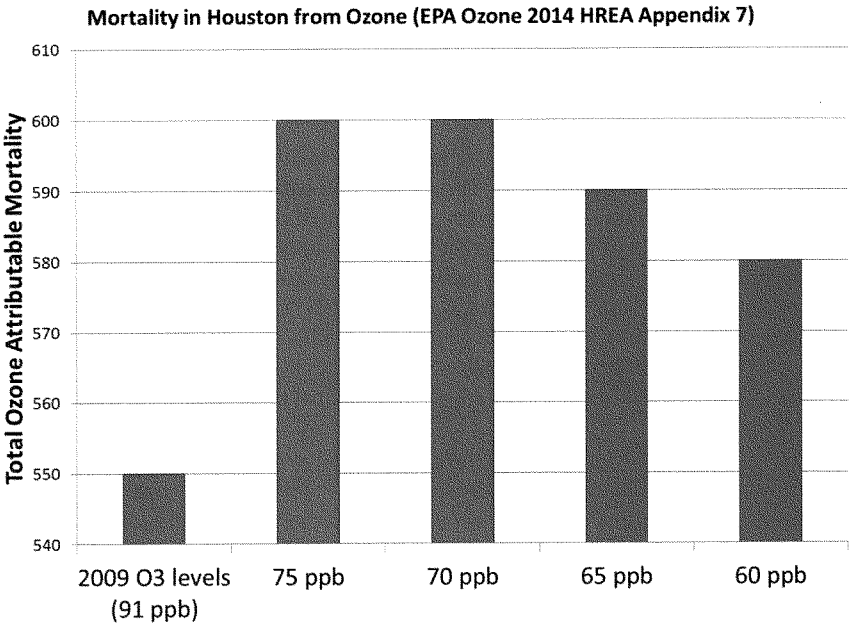
- Only 1 out of 12 studies showed an association between long-term exposure to ozone and early death (after considering other pollutants). This single study is used by the EPA as evidence that long-term exposure to ozone causes mortality. Interestingly, this study did not show higher mortality in Southern California, where some of the highest ozone levels in the country are measured.
- Laboratory animals have been used for decades to assess the health effects of pharmaceuticals, cosmetics, household chemicals, and environmental contaminants. Despite many years of exposing laboratory animals to high doses of ozone for long periods of time, none die from ozone exposure. Therefore, does ozone actually kill people?

Ambient ozone concentrations don't represent real-world conditions:

- Ozone is an outdoor air pollutant, because systems such as air conditioning remove it from indoor air. Since most people spend more than 90% of their time indoors, we (and the people in the epidemiology studies used to justify lowering the standard) are rarely exposed to significant levels of ozone.
- Ozone concentrations under shade trees are lower than concentrations in direct sunlight, where ozone monitors are located.
- For ozone to cause a slight change in lung function in clinical studies, people need to be exposed to outdoor levels of ozone for hours while vigorously exercising (e.g. 6 hours of bicycling). These changes in lung function are often so small that they are within a person's *normal* daily variation.
- Epidemiology studies show an association between a person's likelihood of dying, and the outdoor concentrations of ozone in the days before (or the day of) a person's death. However, we spend most of our time indoors (particularly people who are near death), so we are exposed to levels of ozone that are far below those that cause any clinical effect.

Problems with implementing a new ozone standard:

- Some places in the US have background levels of ozone that account for up to 80% of total ozone. Background ozone occurs naturally, or is transported from other countries. The EPA does not take this into account when making the rule.
- Ozone is not produced directly, but instead is made when other chemicals (particularly nitric oxides) react with sunlight. However, ozone chemistry is complicated, and the same nitric oxides that produce ozone can also react with ozone to remove it from the air. So places that have high nitric oxide production (such as near roads), often have lower ozone levels.
- Because ozone chemistry is complex, lowering ozone-producing chemicals in the cities would decrease ozone in the suburbs, but could increase ozone in the inner-cities (because there will be a decrease in the nitric oxides that can remove ozone). This means that, according to EPA predictions, those living in the inner cities could bear more health burdens, while people on the outskirts enjoy the predicted benefits.


Mortality in Houston from Ozone (EPA Ozone 2014 HREA Appendix 7)
Total Ozone Attributable Mortality
610
600
590
580
570
560
550
540
2009 O3 levels (91 ppb)
75 ppb
70 ppb
65 ppb
60 ppb

Interesting Facts About Ozone

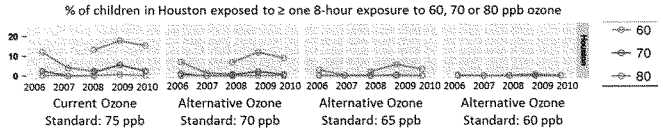
The EPA is considering lowering the national ozone standard. This is based primarily on two health effects: a decrease in lung function, and premature mortality (dying sooner than you should). The EPA sets standards that are protective of public health, including presumed sensitive subpopulations, such as people (particularly children) with asthma. The following interesting facts address the relationship between ozone and these health effects. For general information about ozone and ozone monitoring go to https://www.tceq.texas.gov/airquality/monops/ozonefacts.html.

FEV1 and Lung Function:

- The EPA is considering lowering the ozone standard to 60 ppb averaged over an 8 hour period[1]. This is based in part on data from studies that exposed human volunteers to 60 ppb ozone, while they were exercising at high intensity for 50 minutes of every hour for 6.6 hours. In one study (Adams 2006) these volunteers had an average 2.8% decrease in forced expiratory volume for 1 second (FEV_1) with ozone exposure, and in another study, the volunteers had a 1.75% decrease in FEV_1 (Kim, 2011). However, the American Thoracic Society and the European Respiratory Society (ATS/ERS) together published that the daily variation in FEV_1 for a healthy person is 5% (Pellegrino et al 2005). Therefore, the effects of ozone at 60 ppb were *within normal variation* and cannot be characterized as adverse.

- In addition, the ATS/ERS states that changes in FEV_1 correlate "poorly with symptoms and may not, by itself, accurately predict clinical severity or prognosis for individual patients." This group requires that reversible loss of lung function *in conjunction with* symptoms (such as coughing and pain with deep inhalation) should be considered adverse. The EPA should consider both FEV_1 and symptoms when judging effects on lung function, but in recent reviews has only used FEV_1.

- Based on computer-generated models, the EPA estimates that < 20% of children in urban areas will be exposed at least once per year to 60 ppb ozone for 8 hours, and few if any will be exposed to at least one 8 hr period of 70 or 80 ppb ozone (EPA ozone Health Risk and Exposure Assessment). This is true even if the current 75 ppb ozone standard is maintained:



EPA Ozone HREA 2nd Draft, pg 5-30

Figure 1. *Percent of children in Houston who will be exposed at least once per year to 60 (red line), 70 (green line) or 80 (blue line) ppb ozone for 8 hours while exercising. This was modeled using the data from 2006 – 2010, assuming that the city met the current ozone standard (75 ppb) or one of the alternate standards (70, 65 or 60 ppb).*

[1] The standard will take the form of the annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.

- Therefore, even if the ozone standard is not changed, few if any children will be exposed to 80 ppb ozone for 8 hours (a dose that shows some adverse clinical effect). A few children will be exposed to 70 ppb ozone for 8 hours (there is debatable evidence for clinically adverse effects at this dose), and some children could be exposed to 60 ppb for 8 hours, but (as stated above) there is no concrete evidence that this dose causes any adverse effects on lung function.

Asthma:

- A one hour exposure to 120 ppb ozone does not cause any significant respiratory effects in healthy or asthmatic adolescents (Koenig et al 1985). Other studies have found similar results (Holz et al 1999, Chen et al 2004). **This means that asthmatics are not necessarily more sensitive to ozone than non-asthmatics.**

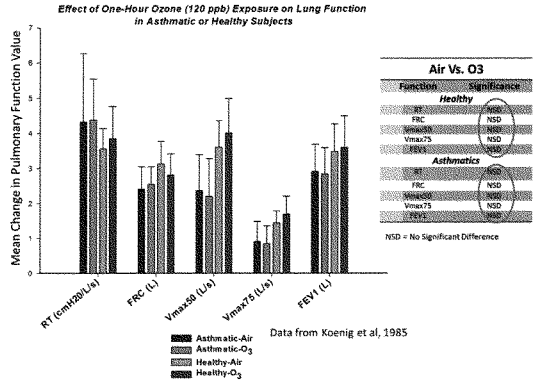


***Figure 2**. Changes in different pulmonary values after healthy or asthmatic subjects were exposed to 120 ppb ozone for one hour. The figure to the right shows that there is no statistically significant difference between people exposed to filtered air or to ozone, or between healthy and asthmatic subjects.*

- There is mixed evidence that high ozone days increase the number of hospitalizations for asthma, and several multi-city studies show no relationship: Schildcrout et al 2006 and O'Connor et al 2008. And in fact, analysis in Texas shows that there is an increase in asthma hospitalizations (blue line) in the winter, when ambient ozone concentrations (red line) are low:

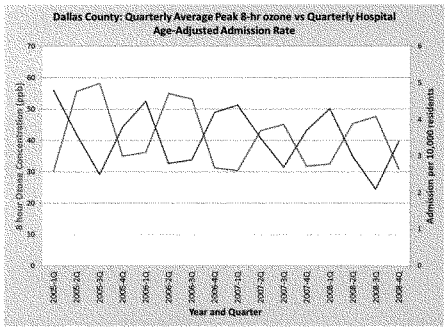


***Figure 3**. Plot of time in yearly quarters from 2005 – 2008, against 8 hour ozone (left y-axis, red line) and hospital admissions per 10,000 residents (right y-axis, blue line). It shows that in quarters where mortality is high (during the winter), ozone is low.*

- Over the last ten years, the incidence of asthma has increased, whereas the ambient concentrations of ozone have decreased. If asthma incidence was associated with ozone concentrations, then the incidence should be going down, not up.
- Altogether, there is very little evidence that people with asthma are more sensitive to ozone. However, there are many other known triggers for asthma, including cold dry air, allergens, tobacco smoke, dust mites and mold. The Centers for Disease Control have information about these triggers: http://www.cdc.gov/asthma/triggers.html.

Personal Exposure:

- Personal exposure to ozone (the amount of ozone that a person actually breathes) is much lower than the ozone concentrations measured at monitors, because people spend most of their time indoors, and indoor ozone concentrations are very low. This has been shown by a number of studies, including Lee et al 2012, who measured the levels of outdoor, indoor and personal ozone concentrations for a group of children in Tennessee:

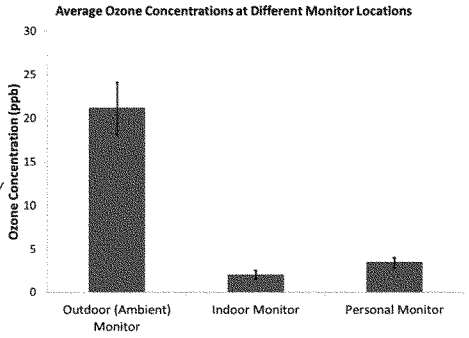


Figure 4. *Concentrations of ozone in Tennessee measured at an outdoor ambient monitor, measured using an indoor monitor, or measured using a personal monitor being worn by the study subjects.*

- Several national studies have shown that actual personal exposure is much lower than the concentrations of ozone that the EPA is considering for a new, lower standard (Meng et al 2012). This is also true for outdoor workers. For example, a study by O'Neill et al 2003 reported that outdoor workers in Mexico City experienced average personal ozone exposures that were 60% lower than ambient monitor levels. In addition, there is a protective ozone standard already in place for outdoor workers in the United States.

- Epidemiological studies that connect ozone and mortality assume that people are exposed to outdoor levels of ozone all the time. If personal exposure were used instead, all of the mortality would occur at levels of ozone that are well below background. Therefore, the mortality seen in these studies is likely attributable to another cause, or to natural random variation in daily mortality rates.

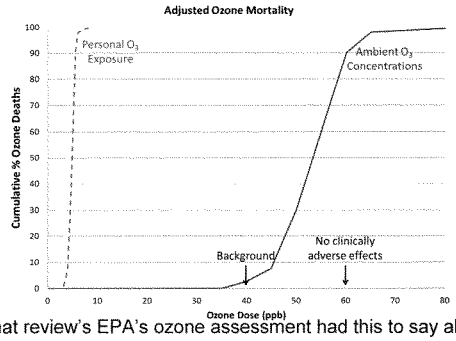


***Figure 5**. Concentration-Response curve for short-term mortality of ozone based on ambient monitoring data (blue line), or personal exposure data (red line). Exposure to 60 ppb ozone does not cause adverse respiratory effects and 40 ppb ozone is considered to be background.*

- The scientific advisory committee that review's EPA's ozone assessment had this to say about mortality and personal exposure:

  "The Ozone Staff Paper should consider the problem of exposure measurement error in ozone mortality time-series studies. It is known that personal exposure to ozone is not reflected adequately, and sometimes not at all, by ozone concentrations measured at central monitoring sites....Therefore, it seems unlikely that the observed associations between short-term ozone concentrations and daily mortality are due solely to ozone itself." CASAC ozone review panel – June 5, 2006

Mortality:

- The relationship between long-term ozone exposure and mortality has been investigated in at least 12 epidemiology studies. When considering other potential causes of mortality, such as other air pollutants, ***only one*** of those studies showed a statistically significant (but very small) effect of ozone on mortality.

Table 1: Studies examining the relationship between long-term ozone exposure and mortality, while considering other air pollutants

Statistically Significant Effect	NO Statistically Significant Effect
Jerrett et al 2009	Dockery et al 1993
	Abbey et al 1999
	Lipfert et al 2000
	Pope et al 2000
	Chen et al 2005
	Jerrett et al 2005
	Lipfert et al 2006a
	Lipfert et al 2006b
	Krewski et al 2009
	Smith et al 2009
	Wang et al 2009

- Different cities have different associations between short-term exposure to ozone and mortality, and very few of those associations are positive. This has been shown by many studies (Smith et al 2009, Bell et al 2004, Bell et al 2005, Zanobetti & Schwartz 2008). Of those cities that do show an association with mortality, there is no correlation between a positive association of ozone with mortality, and the ambient concentrations of ozone in that city:

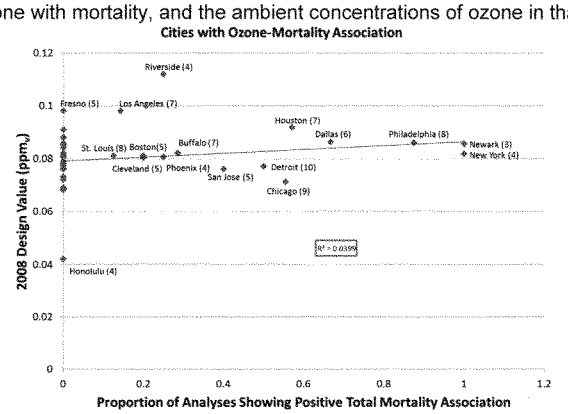


Figure 6. *Graph comparing the proportion of studies that have shown a positive association between ozone and mortality for a particular city (number of studies shown in parentheses next to the city name), compared to the 2008 ambient concentrations of ozone in those cities.*

- Even when a positive association is observed between short-term mortality and ozone concentration, that association is very small when considering other factors that affect mortality, such as socioeconomic status, temperature, time of year, and even napping:

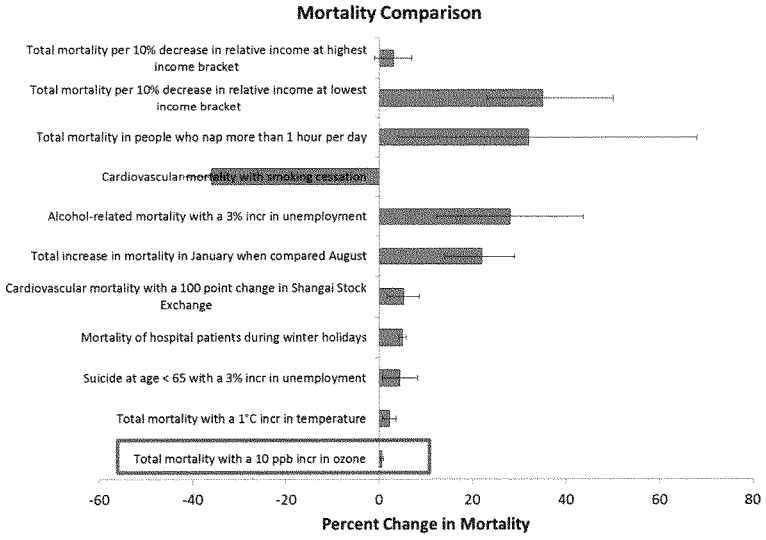
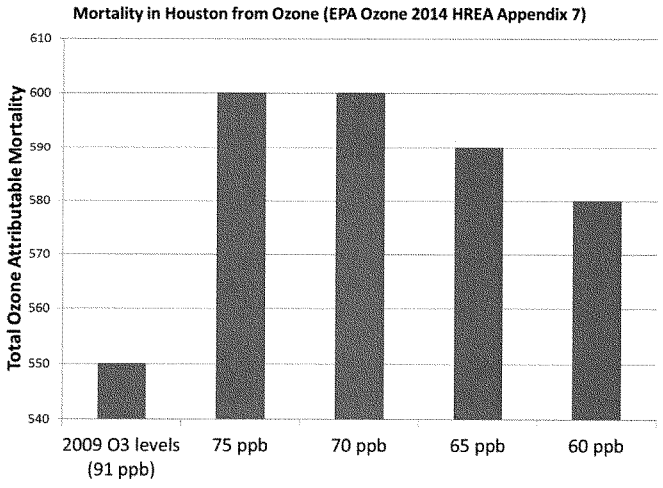


Figure 7: *Graph comparing the percent change in mortality caused by different stimuli. The reference table for this figure is at the end of this document.*

- Based on the EPA's analysis, lowering the ozone standard would ***increase*** overall mortality in certain U.S. cities, including Houston. These numbers were not presented in the main text, but could be found in Appendix 7 of the EPA Ozone HREA (see Final HREA, Appendices 7-9). This result is not discussed in the executive summary for the EPA Ozone Policy Assessment, although it was briefly mentioned on page 3-115 of that document, as well as on pages 7-69 – 7-70 of the HREA. The idea that mortality increases with decreasing ozone doesn't make logical sense, and shows that the EPA models and assumptions are flawed.

Table 2: Number of Premature Mortalities Predicted by EPA to Occur in Houston (2009 simulation year, mortality per 100,000 people)		
	Presented by EPA in Chapter 7	Based on Full Analysis found in Appendix 7 going from 2009 ozone levels to standard level
Meeting Current Standard (75 ppb) from Present Day Ozone Levels	*Not presented*	47 more deaths
Going from 75 ppb to 70 ppb	1 more death	48 more deaths
Going from 75 ppb to 65 ppb	3 fewer deaths	44 more deaths
Going from 75 ppb to 60 ppb	12 fewer deaths	35 more deaths

- Here is a graphical representation of the above table:



- Because mortality has little connection to ozone concentration (and doesn't take into account personal exposure), it should not be the basis of a new, lower national standard for ozone.

Difficulties with Implementing the Ozone Standard:

- Background ozone is ozone produced naturally, or transported from other countries. These background ozone levels can be greater than 40 ppb, and can contribute >80% of the measured ozone in an area (from the EPA Ozone Policy Assessment).

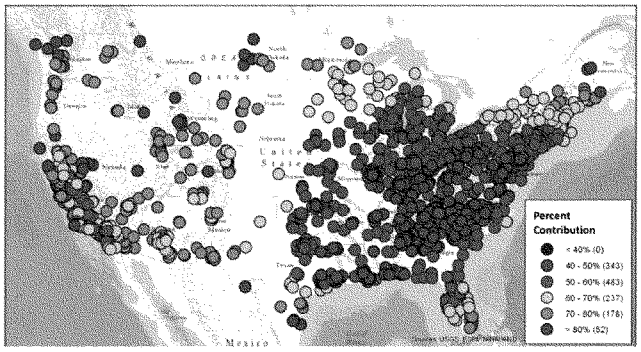


Figure 2-12. Map of apportionment-based U.S. background percent contribution to seasonal mean O_3 based on 2007 CAMx source apportionment modeling.

Figure 8. *Map of the contribution of background ozone to total ozone across the United States (based on 2007 data and modeling).*

- When making judgments about the risks of ozone and the benefits of reducing ozone, the EPA used calculations that unrealistically assume that ozone could be reduced to 0 ppb. Instead, they should use background ozone levels as their baseline, because it is not possible to control or regulate background ozone levels.

- There is a large variation in background ozone levels in different areas of the U.S. (Figure 8 above, from the EPA ozone policy assessment). Therefore, it makes more sense to set an ozone standard that is different for different regions, and not a single national standard that doesn't consider background ozone levels.

- The chemistry of ozone is complex. Ozone is not produced directly, but instead is made when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react with sunlight. However, NO_x can also chemically remove ozone, and so ozone levels actually decrease the closer you get to a road (vehicles are a major producer of NO_x).

- Because ozone chemistry is so complicated, decreasing NO_x can actually increase the amount of ozone in areas that are close to where the NO_x is being produced (such as in the inner cities). Conversely, areas that are far from major NO_x sources (such as the suburbs) will experience a decrease in ozone when NO_x decreases. This means that a lower ozone standard can lead to disproportionate benefits for those who live outside the cities, compared to those in the inner cities (Figure 9).

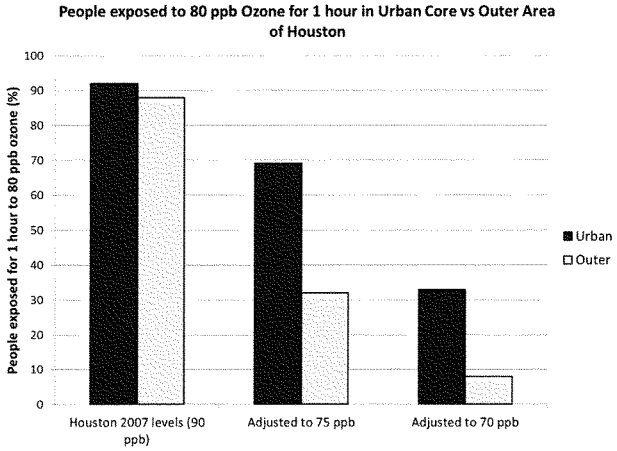


Figure 9. *Ozone levels are proportionally higher in urban compared to outlying areas, and this increases with a decreasing ozone standard. Based on Ozone HREA (Appendix 9).*

- It will be very difficult to implement a new lower ozone standard, particularly if it is set at 60 ppb. The EPA itself can only predict 1/3 of the emissions decreases, meaning that 2/3 of the pollutant decreases will have to be attained by as-yet-unknown technology. Because of this, achieving this decrease in ozone could be very expensive, and in fact is anticipated to cost $270 billion of gross-domestic product nationally, *per year*. There would also be increases in electricity costs, and an effective loss of >$1000 in household income per year in Texas.

References for Mortality Comparison Graph

Statistic	Reference (s)	Pubmed ID
Total mortality per 10% decrease in relative income at highest income bracket	Elstad et al 2006. Eur J Public Health. Associations between relative income and mortality in Norway: a register-based study	16476681
Total mortality per 10% decrease in relative income at lowest income bracket	Elstad et al. 2006	16476681
Total mortality in people who nap more than 1 hour per day	Leng et al 2014. Am J Epidemiol. Daytime napping and the risk of all-cause and cause-specific mortality: a 13-year follow-up of a British population	24685532
Cardiovascular mortality with smoking cessation	Critchley & Capewell 2003. JAMA. Mortality risk reduction associating with smoking cessation in patients with coronary heart disease: a systematic review	12837716
Alcohol-related mortality with a 3% incr in unemployment	Stuckler et al 2009. Lancet. The public health effect of economic crises and alternative policy response in Europe: an empirical analysis	19589588
Total increase in mortality in January when compared August	Van Rossum et al 2001 Int J Epidemiol. Seasonal variation in cause-specific mortality: are there high-risk groups? 25-year follow-up of civil servants from the first whitehall study	11689530
Cardiovascular mortality with a 100 point change in Shangai Stock Exchange	Ma et al. 2011 Eur Heart J. Stock volatility as a risk factor for coronary heart disease	21196446
Mortality of hospital patients during winter holidays	Phillips et al 2004. Circulation. Cardiac mortality is higher around Christmas and New Year's than at any other time: the holidays as a risk factor for death	15596560
Suicide at age < 65 with a 3% incr in unemployment	Stuckler et al 2009	19589588
Total mortality with a 1°C incr in temperature	Martiello & Giacchi 2010. Scand J Public Health. High temperatures and health outcomes: a review of the literature	20688791
Total mortality with a 10 ppb incr in ozone	All year studies referenced in Table 6-27 (page 6-222) from the EPA Ozone 2013 Integrated Science Assessment	http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492

How dose response curves derived from clinical ozone exposures can inform public policy

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[1]Toxicology Division, Texas Commission on Environmental Quality, Austin, TX; [2]Gradient, Cambridge, MA; [3]Toxicology Excellence for Risk Assessment, Cincinnati, OH

TCEQ

Abstract

Ozone is one of the 6 criteria air pollutants whose levels are set by the US EPA through the National Ambient Air Quality Standards. Data from animal, human clinical and epidemiology studies are used to decide at which level to set the standard. The purpose of our work is to use data from human clinical studies to inform policy decisions about a protective ambient ozone level. Many studies have been conducted and can be applied to generate ozone dose-response curves, using ozone total inhaled dose (which is calculated from ozone concentration, duration of exposure and ventilation rate) and forced expiratory volume (FEV_1) decrements. Outside of modeling done by the EPA, these dose response curves have not been utilized as tools to inform the choice of a protective ambient ozone concentration. In this work we plotted mean FEV_1 response versus total inhaled ozone dose from clinical studies of varying durations (1 – 8 hours). Mode of action (MOA) information was incorporated as appropriate. The initial plot used data from healthy young adults, and additional analyses incorporated data from children and asthmatics to determine whether they differed from the healthy adult curve. The trend line from this data was employed to make tables demonstrating the ozone concentrations required to produce a given FEV_1 decrement at different exposure times and ventilation rates (i.e. exercise levels). We also plotted ozone doses at which other relevant clinical effects occur (e.g. inflammation) although the variability in technique and lack of consistent quantification makes these difficult to model in a similar way as FEV_1. We think that this type of analysis is crucial for deciding on a protective ambient ozone concentration, because differing levels have significant societal and economic implications. Clinical data provides quantifiable and confident endpoints that can be justifiably used for well-reasoned and scientifically credible rule making.

Introduction

- Ozone (O_3) is one of 6 air pollutants regulated by the National Ambient Air Quality Standards (NAAQS).
- The level of the O_3 NAAQS is currently 75 ppb, and the EPA is proposing to lower it into the range of 65 – 70 ppb.
- In clinical studies volunteers were exposed to O_3 at different concentrations and ventilation rates (ie. exercise levels), for different times. These studies measure respiratory endpoints.
- Other groups have used this data to make ozone dose-response curves, using ozone total inhaled dose and decrements in forced expiratory volume in 1 second (FEV_1)[19]
- Outside of the EPA, dose response curves have not been used as a tool to inform the choice of a protective ambient ozone concentration.
- This is important because choosing a protective ambient ozone concentration has societal and economic implications, and clinical data can provide quantifiable endpoints that can be used for rule making.

Ozone Mode of Action

- O_3 is an oxidant which can be scavenged by antioxidants (such as uric acid, glutathione and ascorbic acid) in the extracellular lining fluid of the respiratory tract.
- O_3 in the nasal cavity activates bronchial C-fibers, which initiates a neural reaction, leading to spirometric responses (e.g. FEV_1 decrements).
- O_3 initiates inflammation in all areas of the respiratory tract, measured by influx of neutrophils; this is considered more detrimental than spirometric responses.
- O_3 can impair epithelial barrier function of the respiratory epithelia.
- O_3 increases airway hyper-responsiveness to bronchoconstrictive stimuli, and this may be worse in those with compromised airways.
- None of these effects are correlated with spirometric responses – that is, people with heightened spirometric responses do not necessarily show increased inflammation, loss of epithelial barrier function or airway hyper-responsiveness.
- The ozone mode of action is thoroughly reviewed in the most recent EPA ozone Integrated Science Assessment (2013)[22]

Methods

- Ozone concentration (in ppm), time of exposure (in min) and ventilation rates (in L/min) were extracted from 11 publications[1-6,8,10,13,14,19,20]. These were multiplied to produce **total inhaled dose** (in ppm*L). The associated **mean change in FEV_1** (in % change from baseline) for the group of study subjects was also used.
- The main curve was made using data derived from healthy young adults. We also plotted data from 3 additional studies using mild asthmatics as volunteers[9,11,12], one study using children aged 8-11 as volunteers[17], and one study that exposed elite athletes at very high exercise levels in a hot environment[7].
- Non-linear dose-response curves were fit to the short exposure (≤ 3 hours) and long exposure (> 6 hour) data, using the following sigmoid response model:

$$\%\Delta FEV_1 = \delta + \frac{\alpha - \delta}{1 + \exp(\beta \ln(\text{Total dose} / \lambda_{50}))}$$

Where $\%\Delta FEV_1$ is the percent change in FEV_1 after the ozone exposure compared to the pre ozone exposure. "Total dose" is the total ozone dose defined as ventilation (L/min) × time (min) × ozone (ppm), δ is the top plateau of FEV_1 decrements at minimal dose, α is the bottom plateau of FEV_1 decrements at high dose, β is the slope parameter that defines the steepness of the curve, λ_{50} is the dose at which the response is halved, and δ, α, β and λ_{50} are parameters of the model and can be estimated from observed data.

- Ozone concentration matrix:
  - Exposures ≤ 4 hours: Using the short exposure time curve, the doses at which the mean curve crossed -10% FEV_1 were taken, and then the ozone concentrations were calculated based on the different exposure times and ventilation rates.
  - Exposures > 4 hours: Using the longer exposure time curve, the doses at which the mean curve crossed -10% FEV_1 were taken, and then the ozone concentrations were calculated based on the different exposure times and ventilation rates.

Results

Dose Response Curve from O_3 Clinical Data

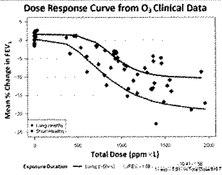


Figure 1: Plot of total inhaled dose (in ppm*L) versus percent change in mean FEV_1; data is derived from mean FEV_1 change of healthy young adults exposed for ≤3 hours (short) or > 6 hours (long) to ozone while exercising. Below the plot are the equations associated with each curve.

Dose Response Curve Characteristics

- Sigmoid-shaped curve:
  - FEV_1 barely changes at low doses (<500 ppm*L)
  - FEV_1 decreases as ozone dose increases and the decreasing rate increases (500-1000 ppm*L) and then decreases (1000-1500 ppm*L) at medium doses
  - the FEV_1 decrements reach a plateau at high total doses (>1500 ppm*L)
- Using regression analysis, there is a significant difference in response rate between long exposure experiments and short exposure experiments.

Dose Response Curve with Sensitive Populations

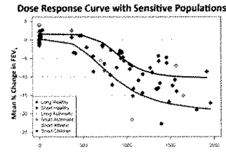


Figure 2: Plot of total inhaled dose (in ppm*L) versus percent change in mean FEV_1 as in Figure 1; also plotted are data from mild asthmatics exposed for < 3 hours (short asthmatic) or > 6 hours (long asthmatic); data from children exposed for < 3 hours (short children); and for elite athletes exposed for 1 hour (short athletic)

Inverse of the dose-response curve for identifying benchmark doses

$$\text{Total dose} = \lambda_{50} \times \exp\left[\ln\left(\frac{\alpha - \%\Delta FEV_1}{\%\Delta FEV_1 - \delta}\right) / \beta\right]$$

Table 1: Doses associated with mean changes in FEV_1, derived from long & short dose response curves

Mean % Change in FEV_1	Short exposure dose (ppm*L)	Long exposure dose (ppm*L)
0	228.2	868.5
-5	606.7	950.7
-10	848.4	1018.4
-15	1173.1	N/A

Table 3: Concentrations of O_3 at which a population would be expected to experience an FEV_1 decrement of 10%, given different exposure times and ventilation rates (V_E - ie. exercise levels)

FEV₁ Decrement =10% — Ozone Concentration (ppb), Time (hrs)

Source	Population & Exercise	V_E (L/min)	1	2	3	4	5	6	7	8	12	24
EPA[22]	Sedentary Child	5	2917	1458	972	729	1124	937	803	703	468	234
EPA	Sedentary Adult	5	2642	1321	881	660	1018	849	727	636	424	212
EPA	Light Int Child	11	1273	636	424	318	491	409	350	307	204	102
EPA	Light Int Adult	12	1167	583	389	292	450	375	321	281	187	94
TCEQ[21]	General Pop (24 hr)	14	1000	500	333	250	385	321	275	241	161	80
Samet[18]	Child Outdoor Play	16	875	438	292	219	337	281	241	211	141	70
EPA	Med Int Child	22	636	318	212	159	245	204	175	153	102	51
TCEQ	Adult Worker (8 hr)	22	636	318	212	159	245	204	175	153	102	51
Zuurbier[23]	Adult Bicycle Commute	24	596	298	199	149	230	191	164	144	96	48
EPA	Med Int Adult	26	538	269	179	135	208	173	148	130	86	43
Samet	Child Bicycling	27	519	259	173	130	200	167	143	125	83	42
EPA	High Int Child	42	333	167	111	83	128	107	92	80	54	27
EPA	High Int Adult	50	280	140	93	70	108	93	77	67	45	22
Samet	Adult Male Bicycling	65	215	108	72	54	83	69	59	32	36	17

Note: The highlighted 8 hour time point is the averaging time of the O_3 NAAQS, grey numbers indicate times and ventilation rate combinations that are unlikely to occur.

Threshold Doses of Ozone

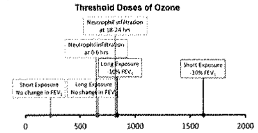


Figure 3: Threshold ozone doses after which one would expect to see various respiratory effects

Uncertainties in Ozone Dose-Response Data

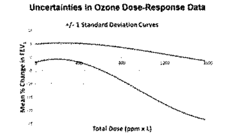


Figure 4: Sigmoidal curves fitted to the total ozone dose plotted against one standard deviation higher than the mean FEV_1 response and one standard deviation lower than the mean FEV_1 response.

Exercise Ventilation Rates

Table 2: Ventilation rates in L/min and m³/day for different exercise levels

Source	Population	Exercise	Ventilation (L/min)	Ventilation (m³/day)
EPA O_3 ISA 2013[22]	Children (6-11)	Sedentary	4.8	6.9
		Light Intensity	11	15.8
		Moderate Intensity	22	31.7
		High Intensity	42	60.5
	Young adult (21-31)	Sedentary	5.3	7.6
		Light Intensity	12	17.3
		Moderate Intensity	26	37.4
		High Intensity	50	72
Zuurbier 2003[23]	Adult	Commuting by bicycle	23.5	33.8
Samet 1993[18]	Child	Outdoor play	16	23
	Child	Bicycling	27	38.9
	Adult male	Bicycling	65	93.6
TCEQ Guidance 2012[21]	Adult worker	Occupational (8 hour day)	22	10
	General Population	Non-Occupational (24 hour day)	14	20

Summary & Conclusions

- O_3 clinical exposure data can be used to derive dose-response curves.
- O_3 dose-response is dependent on the rapidity of exposure, consistent with a mechanism of antioxidant protection against ozone in the respiratory tract.
- Sensitive populations such as asthmatics and children show similar responses to O_3 as healthy young adults.
- These dose-response relationships can be used to create a tool to provide guidance as to how long populations can be exposed, at what exercise level and O_3 concentration, before experiencing a given FEV_1 decrement.
- This tool can be used by policy makers to help make an informed decision about setting the level of the O_3 standard, based on time activity data that will inform choices about exposure times and ventilation rates.

References

[illegible]

Proposed 2015 Eight-Hour Ozone Standard

OVERVIEW

On November 25, 2014, the United States Environmental Protection Agency (EPA) proposed a more stringent National Ambient Air Quality Standard (NAAQS) for ground-level ozone. The EPA is proposing to revise both the primary ozone standard to protect public health, and the secondary standard to protect public welfare (e.g., crops and vegetation).

- Both standards are proposed to be eight-hour standards set within a range of 0.065 to 0.070 parts per million (ppm), which is often expressed as 65 to 70 parts per billion (ppb). The form of the standard will remain as the annual fourth highest daily maximum eight- hour average concentration, averaged over three years.
- The current standards were set in 2008 at a level of 0.075 ppm measured over eight-hours.
- The EPA is taking comment on a primary standard as low as 0.060 ppm as well as retaining the current standard.
- The EPA is taking comment on a secondary standard based on the weighted (W126) metric within a range of 13 to 17 ppm-hours averaged over three years and on defining a target protection level in terms of a W126 index value as low as 7 ppm-hours.
- In addition to the proposed revisions to the NAAQS, the EPA is proposing revisions to requirements for ambient air monitoring and permitting for ozone.
- The EPA estimates a cost of $3.9 billion for 70 ppb and $15 billion for 65 ppb by 2025. California is expected to have an attainment date and costs incurred after 2025 and an additional cost of $0.8 – $1.6 billion for 70 or 65 ppb, respectively.
- The EPA estimates benefits of $7.5-$15 billion for a 70 ppb standard and $21 - $42 billion for a 65 ppb standard (includes California benefits after 2025).

NOTE: After an in-depth review of the EPA's analysis, as well as a thorough study of the relevant scientific literature, the TCEQ has concluded that there will be little to no public health benefit from lowering the current standard. The EPA's own modeling in 12 cities across the country indicates the net result will be increased mortality in some areas, including Houston and Los Angeles.

The EPA's proposed lower ozone standard derives much of its claimed benefits from associating ozone with worsening asthma. However, asthma diagnoses are increasing in the U.S., yet nationwide, air quality is improving. Data from Texas hospitals show that asthma admissions are actually highest in the winter, when ozone levels are the lowest.

TIMELINE

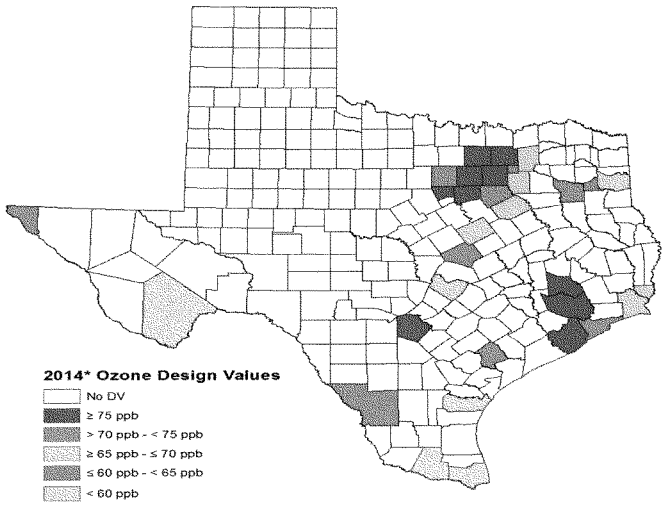
- **October 1, 2015** - The EPA is under consent decree to finalize the standard by this date.
- **October 1, 2016** – Upon finalization, states will have one year to submit designation recommendations to the EPA regarding the attainment status of all areas within the state. The state's recommendation will likely be based on air monitoring data from 2013, 2014, and 2015.
    - Nonattainment – the area does not meet or contributes to an area that does not meet the standard
    - Attainment – the area meets the standard

- Unclassifiable – there is not enough information to determine whether an area meets the standard

- **October 1, 2017** – The EPA has two years after the standard is promulgated to finalize designations based on recommendations made by the states. The EPA's final designations will likely consider air monitoring data from 2014, 2015, and 2016.
  - The Federal Clean Air Act (FCAA) requires the EPA to notify states 120 days prior to making final designations if the Administrator intends to finalize designations that differ from the state's recommendation.
- **2020** – States would be required to submit revisions to the State Implementation Plan (SIP) to demonstrate how the state will meet the revised standard to the EPA.
- **2020 to 2037** – Nonattainment area deadlines fall within this range depending on the area's classification.

IMPACTS TO TEXAS

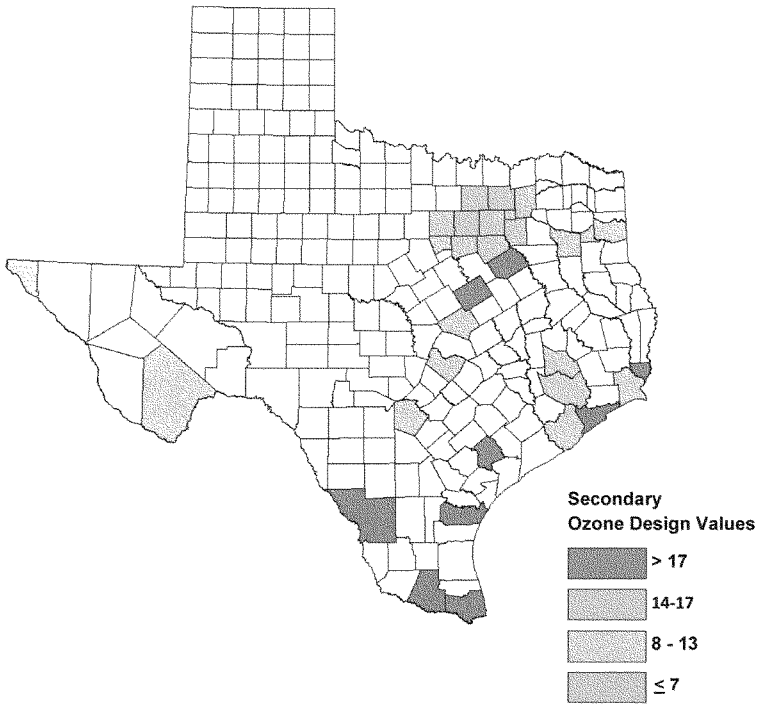
Under the current ozone standard, two areas are designated nonattainment: Dallas-Fort Worth and Houston-Galveston-Brazoria. If the EPA finalizes a standard below 0.075 ppm, several additional areas could be designated nonattainment. The map below shows where counties with ozone monitors stand with regard to the range of potential primary standards the EPA has proposed based on the most recent monitoring data (2012, 2013, and 2014 as of December 4).



*2014 data as of December 1, 2014 and subject to change. Counties in white indicate that the county does not have enough data for a 2014 design value or that there is no monitor located within that county. Only regulatory data shown.

Because the EPA's most recent guidance begins with a presumed nonattainment area based on Core Based Statistical Areas (CBSAs) or Combined Statistical Areas (CSAs), several additional counties would likely be designated nonattainment.

2014* Secondary Ozone
W126 Design Values by County

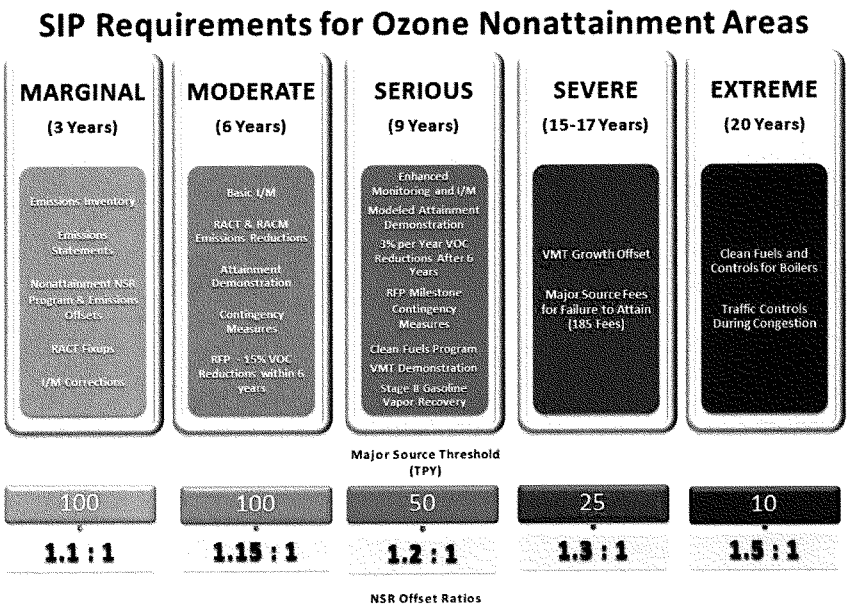


*2014 W126 Design Values are preliminary and are subject to change.

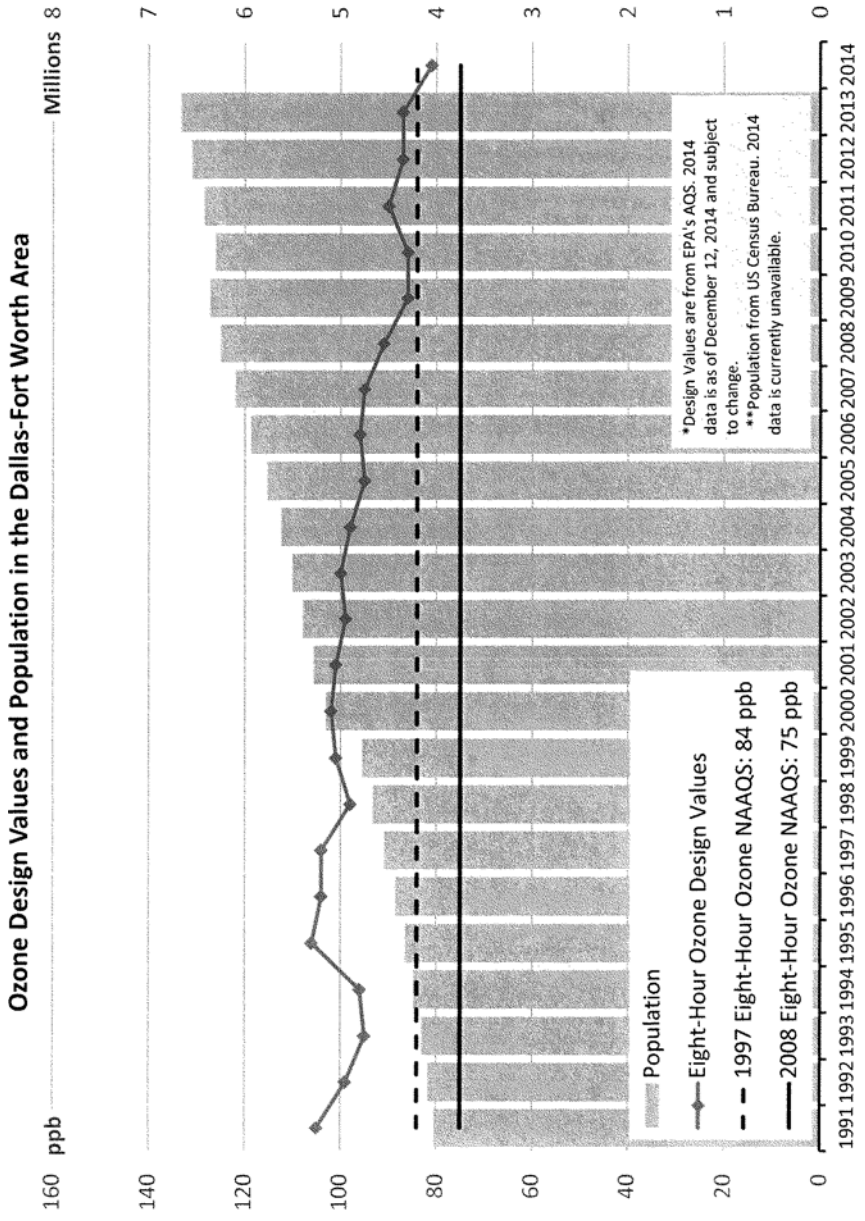
NONATTAINMENT AREA REQUIREMENTS

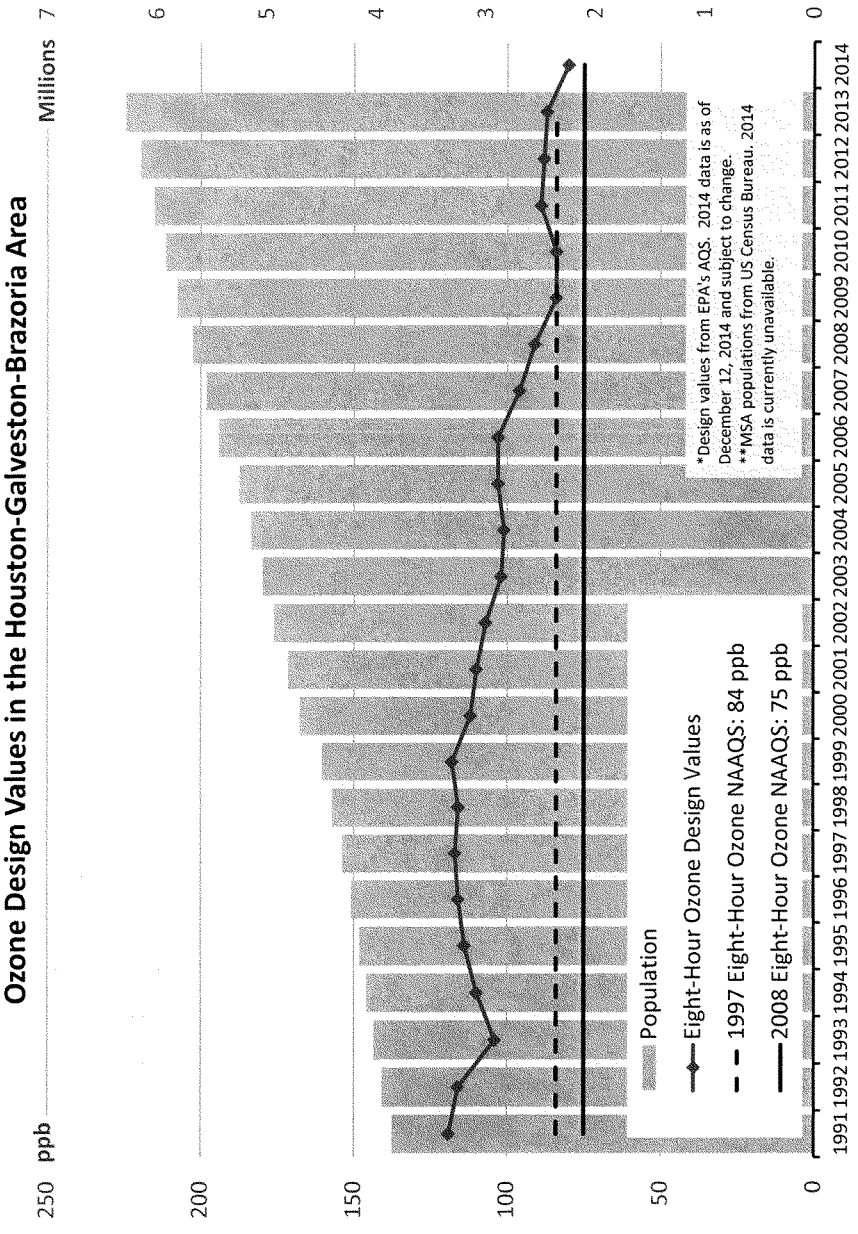
The EPA classifies areas designated nonattainment based on the area's design value at the time of designations. In order of severity, the classifications are: marginal, moderate, serious, severe, and extreme. Requirements for nonattainment areas become more stringent as the classification increases, and requirements are cumulative as the classification increases.

States with areas that are classified as moderate and above are required to submit a SIP revision that demonstrates to the EPA that the area will meet its attainment deadline and how, including all applicable FCAA requirements for its classification. The figure below includes FCAA nonattainment area requirements by classification.



Nonattainment requirements compound as classification increases.


Ozone Design Values and Population in the Dallas-Fort Worth Area
ppb
Millions
160
140
120
100
80
60
40
20
0
8
7
6
5
4
3
2
1
0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Population
Eight-Hour Ozone Design Values
1997 Eight-Hour Ozone NAAQS: 84 ppb
2008 Eight-Hour Ozone NAAQS: 75 ppb
*Design Values are from EPA's AQS. 2014 data is as of December 12, 2014 and subject to change.
**Population from US Census Bureau. 2014 data is currently unavailable.


Ozone Design Values in the Houston-Galveston-Brazoria Area
ppb
Millions
250
200
150
100
50
0
7
6
5
4
3
2
1
0
Population
Eight-Hour Ozone Design Values
1997 Eight-Hour Ozone NAAQS: 84 ppb
2008 Eight-Hour Ozone NAAQS: 75 ppb
*Design values from EPA's AQS. 2014 data is as of December 12, 2014 and subject to change.
**MSA populations from US Census Bureau. 2014 data is currently unavailable.
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

COMMONWEALTH OF KENTUCKY
OFFICE OF THE GOVERNOR

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GOVERNOR

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(502) 564-2611
FAX: (502) 564-2517

November 21, 2014

The Honorable Barack H. Obama
President of the United States
The White House
1600 Pennsylvania Avenue, NW
Washington, D. C. 20502-0001

Dear Mr. President:

I am writing concerning the anticipated Environmental Protection Agency's (EPA) proposed rule related to the ground-level ozone standard. I appreciate the great challenge that EPA faces in setting health-based standards. As you are aware, protecting the health of Kentuckians is of critical importance to me. However, I must share with you the concern I have that the new ozone standard could create a hardship for many of our communities.

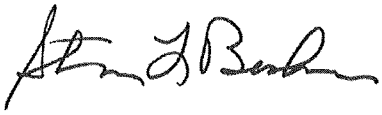
I understand the Clean Air Science Advisory Committee has recommended that the EPA adopt a standard within the range of 60-70 parts per billion (ppb). Any point within that range would be below the existing standard of 75 ppb, and any such reduction would have a significant impact.

The impact of the new standard will vary depending whether or not the standard is reduced from the current 75 ppb and how extreme the reduction is. For example, if 60 ppb is promulgated as the new standard, all 29 of the air monitors that Kentucky operates will exceed the standard. If the highest end of the range is selected, nonattainment will be limited to major metropolitan areas. Currently at 75 ppb only one metropolitan area exceeds the standard. This is of critical importance because if a lower standard is selected, counties in Kentucky that have never before experienced the ramifications of a nonattainment designation may be forced into that position.

I must remind you that other EPA rules either finalized or proposed have been touted for their direct or indirect impact of reducing ozone precursors. The Corporate Average Fuel Economy and Tier 3 standards will affect ozone-forming pollutants from the mobile sector. The Clean Power Plan, which was proposed on June 2 of this year, is expected to reduce 407,000-428,000 tons of nitrogen dioxide in 2030 as reported by the EPA. Thus, there are already extant or proposed ancillary standards that will significantly lower ozone-producing criteria pollutants. Therefore, my advisors recommend the ozone standard should remain unchanged for the time being.

There are many environmental rules driving up costs in Kentucky that will negatively impact the economy. A new ozone standard does not have to contribute to these costs. Kentucky is a manufacturing state. For example, Kentuckians produce many of the vehicles and much of the aluminum and steel manufactured in the U.S., and our manufacturers rely on low-cost electricity to produce these products. I, therefore, ask you to retain the current ozone standard which will continue to protect the health of our citizens without burdening our communities with costly nonattainment compliance programs. The growth of our economy is dependent on it.

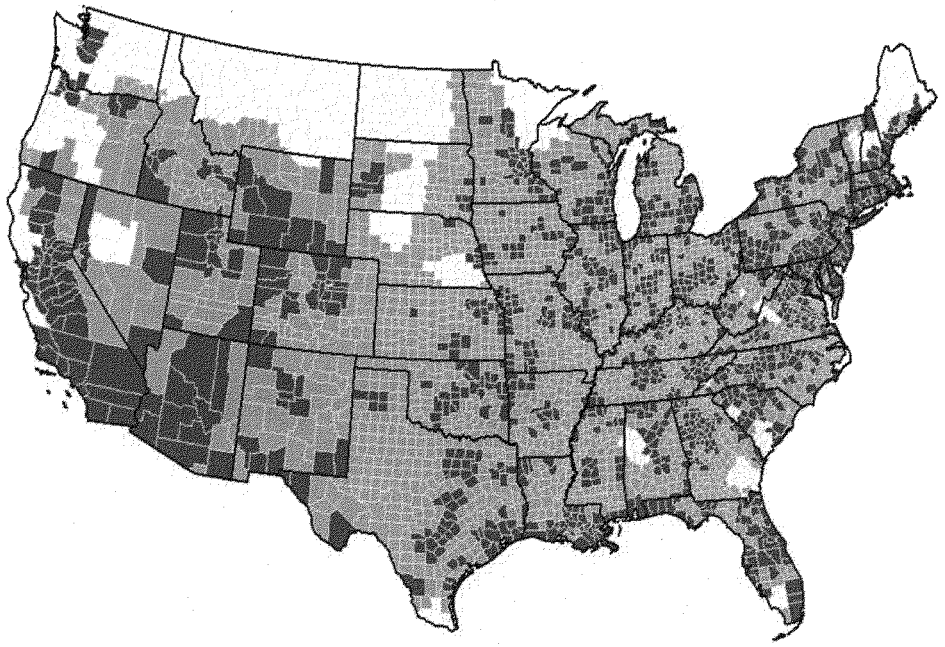
Sincerely,



Steven L. Beshear

cc: Gina McCarthy, Administrator
United States Environmental Protection Agency

Attainment Status: Ozone at 60 parts per billion



Data Source: Environmental Protection Agency

SENATE RESOLUTION 253, 113TH CONGRESS

Authorizing expenditures by the committees of the Senate for the periods October 1, 2013, through September 30, 2014, and October 1, 2014, through February 28, 2015.

Resolved,

SECTION 1. AGGREGATE AUTHORIZATION.

(a) IN GENERAL.—For purposes of carrying out the powers, duties, and functions under the Standing Rules of the Senate, and under the appropriate authorizing resolutions of the Senate there is authorized for the period October 1, 2013 through September 30, 2014, in the aggregate of $98,087,800, and for the period October 1, 2014 through February 28, 2015, in the aggregate of $40,869,917, in accordance with the provisions of this resolution, for standing committees of the Senate, the Special Committee on Aging, the Select Committee on Intelligence, and the Committee on Indian Affairs.

(b) AGENCY CONTRIBUTIONS.—There are authorized such sums as may be necessary for agency contributions related to the compensation of employees of the committees for the period October 1, 2013 through September 30, 2014 and for the period October 1, 2014 through February 28, 2015 to be paid from the appropriations account for "Expenses of Inquiries and Investigations" of the Senate.

SEC. 2. COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY.

(a) GENERAL AUTHORITY.—In carrying out its powers, duties, and functions under the Standing Rules of the Senate, in accordance with its jurisdiction under rule XXV of such rules, including holding hearings, reporting such hearings, and making investigations as authorized by paragraphs 1 and 8 of rule XXVI of the Standing Rules of the Senate, the Committee on Agriculture, Nutrition, and Forestry is authorized from October 1, 2013, through February 28, 2015, in its discretion—

(1) to make expenditures from the contingent fund of the Senate;

(2) to employ personnel; and

(3) with the prior consent of the Government department or agency concerned and the Committee on Rules and Administration, to use on a reimbursable, or nonreimbursable, basis the services of personnel of any such department or agency.

(b) EXPENSES FOR FISCAL YEAR 2014 PERIOD.—The expenses of the committee for the period October 1, 2013 through September

30, 2014 under this section shall not exceed $6,583,591, of which amount—

(1) not to exceed $50,000 may be expended for the procurement of the services of individual consultants, or organizations thereof (as authorized by section 202(i) of the Legislative Reorganization Act of 1946 (2 U.S.C. 72a(i))); and

(2) not to exceed $50,000 may be expended for the training of the professional staff of such committee (under procedures specified by section 202(j) of that Act).

(c) EXPENSES FOR PERIOD ENDING FEBRUARY 28, 2015.—The expenses of the committee for the period October 1, 2014 through February 28, 2015 under this section shall not exceed $2,743,163, of which amount—

(1) not to exceed $50,000 may be expended for the procurement of the services of individual consultants, or organizations thereof (as authorized by section 202(i) of the Legislative Reorganization Act of 1946 (2 U.S.C. 72a(i))); and

(2) not to exceed $50,000 may be expended for the training of the professional staff of such committee (under procedures specified by section 202(j) of that Act).

SEC. 7. COMMITTEE ON ENERGY AND NATURAL RESOURCES.

(a) GENERAL AUTHORITY.—In carrying out its powers, duties, and functions under the Standing Rules of the Senate, in accordance with its jurisdiction under rule XXV of such rules, including holding hearings, reporting such hearings, and making investigations as authorized by paragraphs 1 and 8 of rule XXVI of the Standing Rules of the Senate, the Committee on Energy and Natural Resources is authorized from October 1, 2013 through February 28, 2015, in its discretion—

(1) to make expenditures from the contingent fund of the Senate;

(2) to employ personnel; and

(3) with the prior consent of the Government department or agency concerned and the Committee on Rules and Administration, to use on a reimbursable, or nonreimbursable, basis the services of personnel of any such department or agency.

(b) EXPENSES FOR FISCAL YEAR 2014 PERIOD.—The expenses of the committee for the period October 1, 2013 through September 30, 2014, under this section shall not exceed $5,463,481.

(c) EXPENSES FOR PERIOD ENDING FEBRUARY 28, 2015.—The expenses of the committee for the period October 1, 2014 through February 28, 2015 under this section shall not exceed $2,276,450.

SEC. 8. COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS.

(a) GENERAL AUTHORITY.—In carrying out its powers, duties, and functions under the Standing Rules of the Senate, in accordance with its jurisdiction under rule XXV of such rules, including holding hearings, reporting such hearings, and making investigations as authorized by paragraphs 1 and 8 of rule XXVI of the Standing Rules of the Senate, the Committee on Environment and Public

Works is authorized from October 1, 2013 through February 28, 2015, in its discretion—

(1) to make expenditures from the contingent fund of the Senate;

(2) to employ personnel; and

(3) with the prior consent of the Government department or agency concerned and the Committee on Rules and Administration, to use on a reimbursable, or nonreimbursable, basis the services of personnel of any such department or agency.

(b) EXPENSES FOR FISCAL YEAR 2014 PERIOD.—The expenses of the committee for the period October 1, 2013 through September 30, 2014, under this section shall not exceed $5,194,253, of which amount—

(1) not to exceed $8,000 may be expended for the procurement of the services of individual consultants, or organizations thereof (as authorized by section 202(i) of the Legislative Reorganization Act of 1946 (2 U.S.C. 72a(i))); and

(2) not to exceed $2,000 may be expended for the training of the professional staff of such committee (under procedures specified by section 202(j) of that Act).

(c) EXPENSES FOR PERIOD ENDING FEBRUARY 28, 2015.—The expenses of the committee for the period October 1, 2014 through February 28, 2015 under this section shall not exceed $2,164,272, of which amount—

(1) not to exceed $3,333.33 may be expended for the procurement of the services of individual consultants, or organizations thereof (as authorized by section 202(i) of the Legislative Reorganization Act of 1946 (2 U.S.C. 72a(i))); and

(2) not to exceed $833.33 may be expended for the training of the professional staff of such committee (under procedures specified by section 202(j) of that Act).

SEC. 9. COMMITTEE ON FINANCE.

(a) GENERAL AUTHORITY.—In carrying out its powers, duties, and functions under the Standing Rules of the Senate, in accordance with its jurisdiction under rule XXV of such rules, including holding hearings, reporting such hearings, and making investigations as authorized by paragraphs 1 and 8 of rule XXVI of the Standing Rules of the Senate, the Committee on Finance is authorized from October 1, 2013 through February 28, 2015, in its discretion—

(1) to make expenditures from the contingent fund of the Senate;

(2) to employ personnel; and

(3) with the prior consent of the Government department or agency concerned and the Committee on Rules and Administration, to use on a reimbursable, or nonreimbursable, basis the services of personnel of any such department or agency.

(b) EXPENSES FOR FISCAL YEAR 2014 PERIOD.—The expenses of the committee for the period October 1, 2013 through September 30, 2014 under this section shall not exceed $7,993,936 of which amount—

(1) not to exceed $30,000 may be expended for the procurement of the services of individual consultants, or organizations

Senate Committee Procedure

Senate Rule XXVI

1. Each standing committee, including any subcommittee of any such committee, is authorized to hold such hearings, to sit and act at such times and places during the sessions, recesses, and adjourned periods of the Senate, to require by subpena or otherwise the attendance of such witnesses and the production of such correspondence, books, papers, and documents, to take such testimony and to make such expenditures out of the contingent fund of the Senate as may be authorized by resolutions of the Senate. Each such committee may make investigations into any matter within its jurisdiction, may report such hearings as may be had by it, and may employ stenographic assistance at a cost not exceeding the amount prescribed by the Committee on Rules and Administration. The expenses of the committee shall be paid from the contingent fund of the Senate upon vouchers approved by the chairman.

Summary of Legal Basis for Holding Today's Subcommittee Hearing Provide by Senate Legal Counsel on December 17, 2014

First, the Standing Rules of the Senate are continuing in effect and do not expire at the end of a Congress. Rule 26 authorizes all committees to sit and hold hearings during sessions, recesses, and adjourned periods of the Senate. This includes after sine die adjournment. Committees continue to function after sine die adjournment.

Second, the Senate adjourned sine die because it does not intend to convene again this Congress. That doesn't means there is no Congress. If the Leaders reconvened the Senate before January 3 pursuant to the concurrent adjournment resolution, it would still be the 113th Congress.

Third, unlike the House, the Senate's rules and committees and chairs (those who are returning Senators) continue from Congress to Congress even after January 3, until the Senate organizes its committees for the new Congress.

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