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## *OZONE – THE GOOD, THE BAD AND THE UGLY*

The regulatory machinery of this Administration is slowly cranking up. Last week, the Environmental Protection Agency (EPA) took a major step towards reversal of a Bush Administration decision on ground-level ozone standards. The net effect is to make the standards more stringent. As you may recall, the 2008 standards were controversial because of accusations that upper level management ignored recommendations from staff.

Before I go into the details, I know what you are thinking. "Does this have anything to do with climate change and greenhouse gases?" And "I thought ozone was good, that we are trying to stop it from disappearing. How can it be bad too?"

Ozone (O3) is a gas composed of three oxygen atoms. Ozone has the same chemical structure whether it occurs miles above the earth or at ground-level and is referred to as "good" or "bad," depending on its location in the atmosphere.

In the earth's lower atmosphere, ground-level ozone is considered "bad." It is not usually emitted directly into the air, but at ground-level is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of sunlight. Ground-level ozone is the primary constituent of smog. Sunlight and hot weather cause ground-level ozone to form in harmful concentrations in the air. When we talk about "bad ozone," we are talking about the creation of it by that chemical reaction.

"Good" ozone occurs naturally in the stratosphere approximately 10 to 30 miles above the earth's surface and forms a layer that protects life on earth from the sun's harmful rays. When we talk about greenhouse gases and their impact on the climate or global warming, we are talking about the gases, including chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, methyl bromide, carbon tetrachloride, and methyl chloroform, that "erode" the good ozone.

On January 6, 2010, the EPA proposed to strengthen the national ambient air quality standards (NAAQS) for ground-level ozone. The EPA is proposing to strengthen the 8-hour "primary" ozone standard, designed to protect public health, to a level within the range of 0.060-0.070 parts per million (ppm). The EPA is also proposing to establish a distinct cumulative, seasonal "secondary" standard, designed to protect sensitive vegetation and ecosystems, including forests, parks, wildlife refuges and wilderness areas. The EPA is proposing to set the level of the secondary standard within the range of 7-15 ppm-hours.

The EPA will take public comment for 60 days following publication of the proposal in the Federal Register. The agency also will hold public hearings on the proposal. The EPA has said it will issue final standards by August 31, 2010.

The Clean Air Act of 1970 authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources. Under the Clean Air Act, the EPA sets limits on certain air pollutants, including setting limits on how much can be in the air anywhere in the United States. The Clean Air Act also gives the EPA the authority to limit emissions of air pollutants coming from sources like chemical plants, utilities, and steel mills. The EPA must approve state, tribal, and local agency plans for reducing air pollution. If a plan does not meet the necessary requirements (non-attainment), the EPA can issue sanctions against the state and, if necessary, take over enforcing the Clean Air Act in that area. States have to develop State Implementation Plans (SIPs) that outline how each state will control air pollution under the Clean Air Act

Major changes were made to the Clean Air Act in 1990. While it gave the states more time to meet the air quality standard - it also requires states to make constant progress in reducing emissions. For ozone, the 1990 changes established nonattainment area classifications ranked according to the severity of the area's air pollution problem. These classifications are marginal, moderate, serious, severe and extreme. EPA assigns each nonattainment area one of these categories, thus triggering varying requirements the area must comply with in order to meet the ozone standard.

Nonattainment areas have to implement different control measures, depending upon their classification. Marginal areas, for example, are the closest to meeting the standard. They are required to conduct an inventory of their ozone - causing emissions and institute a permit program. Nonattainment areas with more serious air quality problems must implement various control measures. The worse the air quality, the more controls areas have to be implemented.

The Clean Air Act of 1990 established tighter pollution standards for emissions

from automobiles and trucks. These standards have been reducing tailpipe emissions of hydrocarbons, carbon monoxide, and nitrogen oxides on a phased-in basis beginning in model year 1994. Scheduled reductions in gasoline volatility and sulfur content of diesel fuel were also required by the 1990 amendments.

In 1971, the EPA established a 1-hour NAAQS ozone standard of 0.08 ppm. In 1979, the EPA revised the 1-hour standard to 0.12 ppm. The EPA revised the air quality standards for ozone replacing the 1979 standard with an 8-hour standard set at 0.08 ppm. The EPA issued revised ozone standards on March 12, 2008, and set both standards at a level of 0.075 parts per million (ppm). In May 2008, states, environmental groups and industry groups filed petitions with the D.C. Circuit Court of Appeals for review of the 2008 ozone standards. In March 2009, the court granted the EPA's request to stay the litigation so the new administration could review the standards and determine whether they should be reconsidered.

The EPA has decided to revise the 2008 standards, because "the ozone standards set in 2008 were not as protective as recommended by the EPA's panel of science advisors, the Clean Air Scientific Advisory Committee (CASAC). The new proposed standards are consistent with CASAC's recommendations."

While the establishment of standard is a big deal, we will not know what businesses are directly affected until States seek attainment. For the most part the States get to decide how to reach the target for their area. So the big question is what are the emission sources that the States will try to curb? To answer that, one has to start with a brief chemistry lesson.

Ground-level ozone is the result a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. These are called precusors. So if you want to follow the bouncing ball, the next question is where do the two precursors come from? Nitrogen Dioxide ($NO_2$) is the largest category of nitrogen oxides. $NO_2$ forms from emissions from cars, trucks and buses, power plants, and off-road equipment. The following chart is based on 2005 data, which is the most current data available. The amounts are expressed in tons.

| | |
|---|---|
| Electricity Generation | 3,783,659 |
| Fertilizer & Livestock | 2,098 |
| Fires | 94,372 |
| Fossil Fuel Combustion | 2,384,297 |
| Industrial Processes | 1,163,635 |
| Miscellaneous | 3,644 |
| Non Road Equipment | 4,162,872 |
| On Road Vehicles | 6,491,821 |
| Residential Wood Combustion | 38,324 |
| Solvent Use | 6,400 |
| Waste Disposal | 155,415 |

The other precursor is volatile organic compounds that have a high vapor pressure and low water solubility. Many VOCs are human-made chemicals that are used and produced in the manufacture of paints, pharmaceuticals, and refrigerants. VOCs are also industrial solvents, such as trichloroethylene; fuel oxygenates, such as methyl tert-butyl ether (MTBE); or by-products produced by chlorination in water treatment, such as chloroform. VOCs are often components of petroleum fuels, hydraulic fluids, paint thinners, and dry cleaning agents.

The following chart is based on 2005 data, which is the most current data available. The amounts are expressed in tons.

| | |
|---|---|
| Electricity Generation | 47,985 |
| Fertilizer & Livestock | 42,191 |
| Fires | 681,309 |
| Fossil Fuel Combustion | 136,785 |
| Industrial Processes | 1,645,584 |
| Miscellaneous | 1,202,517 |
| Non Road Equipment | 2,843,213 |
| On Road Vehicles | 4,112,147 |
| Residential Wood Combustion | 543,469 |
| Road Dust | 1 |
| Solvent Use | 4,245,897 |
| Waste Disposal | 465,003 |

The EPA estimates the value of health benefits of reducing ozone to 0.070 ppm would range from about $13 billion to $37 billion per year in 2020. For a standard of 0.060 ppm, the value of benefits would range from about $35 billion to $100 billion per year in 2020. The costs of reducing ozone to 0.070 ppm would range from an estimated $19 billion to $25 billion per year in 2020. For a standard of 0.060 ppm, the costs would range from $52 billion to $90 billion.

In 2007, the EPA conducted a Regulatory Impact Analysis (RIA) that looked at a limited range of attainment strategies. As the RIA stated, "It is also important to recognize that the cost estimates are limited in their scope. Because we are not certain of the specific actions that states will take to design State Implementation Plans to meet the revised standards, we do not present estimated costs that government agencies may incur for managing the requirement and implementation of these control strategies or for offering incentives that may be necessary to encourage or motivate the implementation of the technologies, especially for technologies that are not necessarily market driven. This analysis does not assume specific control measures that would be required in order to implement these technologies on a regional or local level."

Now, the EPA has announced it will release a supplement to that RIA. Said the EPA, 'The supplement to the RIA assumes that the proposed standards can be achieved throughout the U.S. using a mixture of known air pollution control technologies and unknown, future technologies. The annual control technology costs of implementing known controls as part of a strategy to attain a standard in the proposed range of 0.060 ppm or 0.070 ppm in 2020 would be approximately $3.3 billion to $4.5 billion. EPA used several statistical methods to provide a range of likely compliance costs for other, currently unknown technologies that would be needed to attain the proposed primary standards."

There is almost no doubt the standard will become final. If the rule moves forward as planned, by December 2013 State Implementation Plans, outlining how states will reduce pollution to meet the standards, are due to EPA. From 2014 to 2031, States are required to meet the primary standard, with deadlines depending on the severity of the problem.