COMMENTS ON PROPOSED AMENDMENTS TO THE CURRENT STANDARDS OF PERFORMANCE FOR PETROLEUM REFINERIES
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Submitted by:
Environmental Integrity Project and the Sierra Club
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On behalf of the Environmental Integrity Project (EIP) and the Sierra Club (Commenters), Earthjustice submits the following comments on the U.S. Environmental Protection Agency's (EPA's) proposed New Source Performance Standards (NSPS) for Petroleum Refineries, as published in the Federal Register on May 14, 2007 (72 Fed. Reg. 27,178). Commenters have submitted separate comments pertaining to the proposed amendments to subpart J and new subpart Ja, and now include comments on one further issue relating to the proposed NSPS.

Our specific comments follow:

EPA Must Include Limits for Carbon Dioxide (CO_2) and Methane (CH_4) Emissions in the NSPS for Petroleum Refineries

I. Section 111 requires EPA to promulgate NSPS for each of the pollutants emitted by a source category that cause, or contribute significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare. Therefore, EPA must set NSPS for CO_2 and CH_4 because petroleum refineries' emissions of CO_2 and CH_4 cause and contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare.

Section 111 of the Clean Air Act establishes a series of mandatory duties relating to EPA's regulation of emissions from new and modified stationary sources. Section 111(b)(1)(A) provides

> The Administrator shall, within 90 days after December 31, 1970, publish (and from time to time thereafter shall revise) a list of categories of stationary sources. He shall include a category of sources in such list if in his judgment it causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare.

42 U.S.C. § 7411(b)(1)(A) (emphasis added). For each such category of sources, section 111 further provides that EPA "shall publish proposed regulations, establishing Federal standards of performance for new sources within such category." 42 U.S.C. § 7411(b)(1)(B) (emphasis

added). At least every eight years, EPA "shall" review, and if appropriate, revise these standards. Id.

In sum, if in EPA's judgment a category of sources "causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare," then the Act unquestionably requires EPA to (1) add the category to a list, (2) issue standards of performance applicable to the category, and (3) review those standards on a prescribed schedule. Moreover, the above-cited provisions necessarily mean that EPA's standards of performance for each source category must limit the emissions of all air pollutants that "cause, or contribute significantly to," air pollution.

The United States Court of Appeals for the District of Columbia Circuit has already reached this conclusion. In National Asphalt Pavement Association v. Train, 539 F.2d 775, 784-85 (D.C. Cir. 1976), the D.C. Circuit squarely rejected the asphalt industry's argument that asphalt plants do not significantly contribute to PM pollution. In explaining the operation of section 111, the Court reasoned that section 111(b)(1) "obviously contemplates an evaluation by the Administrator of the risk that certain types of air pollution will 'endanger' public health and welfare, and the risk that allowing construction of new stationary sources, even subject to existing state and local regulation, will contribute 'significantly' to that air pollution. Id. at 783 (emphasis added). Thus, the Court's explanation recognizes that Congress crafted the mandatory language of section 111 to force EPA to limit the emissions of each of these "certain types" of air pollutants.

It would be wholly inconsistent with the mandatory tenor of the statutory scheme if EPA could find that a category of sources significantly contributes to air pollution, but then refuse to issue standards of performance limiting the emissions of one or more of the pollutants that such sources emit in amounts sufficient to significantly contribute to air pollution. Rather, if a category of sources emit any air pollutant in such amounts that those emissions significantly contribute to "air pollution which may reasonably be anticipated to endanger public health or welfare," then EPA is legally required to issue standards of performance limiting the emissions of that air pollutant from the source category at issue.

This reading is supported by the language of section 111, which repeatedly refers to the regulation of "any" air pollutant emitted by sources subject to regulation under this section. For example, "stationary source" is defined as any building, etc., "which emits or may emit any air pollutant." 42 U.S.C. § 7411(a)(3). Further, existing sources that undergo modification become subject to the NSPS, and a "modification" is defined as a physical or operational change "which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted." 42 U.S.C. § 7411(a)(4).

Similarly, in reviewing the efficacy of existing NSPS for listed source categories, EPA is not free to ignore certain air pollutant emissions. Instead, EPA must develop standards of performance for any air pollutant that sources in the category emit, provided that EPA finds those emissions cause or significantly contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. Section 111's requirement that EPA "shall, at least every 8 years, review and, if appropriate, revise such standards following the procedure

required by this subsection for promulgation of such standards," confirms this in two ways. See 42 U.S.C. § 7411(b)(1)(B). First, the term "such standards" incorporates the inclusive "any air pollutant" language in the definition of a "standard of performance." Second, section 111 specifically commands that the agency use the exact same procedure in reviewing the efficacy of existing standards of performance that Congress mandated EPA use when first establishing such standards. Congress would not have mandated this procedural step had it not intended that the agency go back and review the impacts of all pollutants emitted by the source category.

Moreover, although CO_2 and CH_4 are not currently regulated under the Act as either criteria pollutants or air toxics, this fact is immaterial for purposes of the NSPS. Section 111 clearly envisions that EPA will develop NSPS for pollutants that fall beyond the scope of the NAAQS and NESHAPS programs. Thus, section 111(d)(1) provides that

> The Administrator shall prescribe regulations which shall establish a procedure similar to that provided by section 7410 of this title under which each State shall submit to the Administrator a plan which (A) establishes standards of performance for any existing source for any air pollutant (i) for which air quality criteria have not been issued or which is not included on a list published under section 7408(a) of this title or emitted from a source category which is regulated under section 7412 of this title but (ii) to which a standard of performance under this section would apply if such existing source were a new source, and (B) provides for the implementation and enforcement of such standards of performance.

42 U.S.C. § 7411(d)(1). This provision demonstrates Congressional recognition of section 111 as a valuable tool for reducing the emissions of air pollutants that either are not amenable to, or have not yet been sorted into, one of the Act's two primary pollutant categories. This is precisely the situation of CO_2 and CH_4.

Section 111(f), 42 U.S.C. § 7411(f), also supports the proposition that Congress required EPA to establish NSPS for all pollutants emitted by a category of sources. Section 111(f) responded to the EPA's past difficulties in promptly establishing NSPS for source categories listed under section 111(b). Congress placed EPA on a timetable to complete a specified number of delinquent NSPS by certain dates. In determining which source categories should be addressed first, Congress directed EPA to consider three factors:

> (A) the quantity of air pollutant emissions which <u>each such category</u> will emit, or will be designed to emit;
> (B) the extent to which <u>each such pollutant</u> may reasonably be anticipated to endanger public health or welfare; and
> (C) the mobility and competitive nature of each such category of sources and the consequent need for nationally applicable new source standards of performance.

42 U.S.C. § 7411(f)(2). Plainly, Congress understood that EPA's role in promulgating NSPS was to establish standards covering all pollutants emitted in damaging quantities by each source category.

The Clean Air Act provisions requiring EPA to establish NSPS are very similar to the provisions of the Act governing EPA's regulation of emissions from new motor vehicles and

new motor vehicle engines. Section 202(a)(1) of the Act, 42 U.S.C. § 7521(a)(1), provides that EPA "shall by regulation prescribe . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Massachusetts v. EPA, 549 U.S. ___, 127 S.Ct. 1438, 1446 (2007), held that this language confines EPA's discretion in adopting standards to the question of whether motor vehicle emissions cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare: "If EPA makes a finding of endangerment, the Clean Air Act requires the agency to regulate emissions of the deleterious pollutant from new motor vehicles." Id. at 1462. Although the Court did not examine section 111, its analysis applies equally well to that section. In each case the judgment triggering EPA's mandatory duty is essentially the same: If the Administrator determines that some particular kind of emissions from the source at issue contribute to "air pollution which may reasonably be anticipated to endanger public health or welfare," then the Administrator is required to regulate those emissions.

Although the language of the statute is dispositive, EPA's own practice further demonstrates that, in reviewing the efficacy of existing NSPS, the agency must consider the emissions of all air pollutants emitted by the source category under review, and limit the emissions of any of those pollutants that cause or contribute significantly to air pollution as provided in the statute. Thus, in its recent review of the NSPS for stationary combustion turbines, the agency considered promulgating new regulations that would, for the first time, establish limits for CO, VOC, and PM emissions from this source category. 70 Fed. Reg. 8314, 8320-21 (Feb. 18, 2005). However, EPA concluded that standards for these pollutants were not necessary, grounding its reasoning in the section 111 requirement to limit the emissions of all pollutants which contribute significantly to air pollution. See 70 Fed. Reg. 8320-21. Other evidence of EPA practice conforms to the interpretation of section 111 that EPA advanced during the combustion turbine rulemaking. See 41 Fed. Reg. 3827 (Jan. 26, 1976) (discussion of standards for CO and SO_2 emissions in NSPS for primary aluminum reduction plants); 42 Fed. Reg. 22,507 (May 3, 1977) (discussion of standards for NO_x and CO emissions in NSPS for lime manufacturing plants); 49 Fed. Reg. 25,106-07 (June 19, 1984) (discussion of standards for PM, CO, and hydrocarbon emissions in NSPS for fossil fuel-fired industrial steam generating units); Letter from Gregory A. Green, Deputy Director, Office of Air Quality Planning and Standards, EPA, to Vickie Patton, Environmental Defense (July 14, 2004) (emphasis added) (Attachment 1) (announcing the agency would evaluate "emissions of all air pollutants that may be appropriate for control under section 111(b) of the Clean Air Act, including but not necessarily limited to, oxides of nitrogen, particulate matter, hydrocarbons, sulfur dioxide, and carbon monoxide").

Finally, EPA's practice confirms two other important points about the scope of section 111. First, EPA's regulation of fluoride emissions from several source categories under this section confirms that the NSPS encompass pollutants for which NAAQS have not been issued. See, e.g., 40 C.F.R. § 60.192 (standards for fluoride emissions from aluminum reduction plants). Second, the very EPA proposal at issue here forecloses any assertion that EPA is only obligated to review and revise standards for pollutants from petroleum refineries that the agency has previously regulated. The existing NSPS for petroleum refineries does not include standards for the emission of NO_x, but the agency has now proposed NO_x standards for FCCUs. See 72 Fed.

Reg. 27,180 ("the NO_x emission limit is a new requirement"). Obviously, then, EPA does not believe it is bound by section 111 only to advance NSPS for pollutants for which NAAQS have been issued, or, in reviewing existing NSPS, to limit only those emissions which have been previously regulated.

II. Petroleum refineries' emissions of CO_2 and CH_4 cause, or contribute significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare.

A. Petroleum refinery CO_2 and CH_4 emissions significantly contribute to global climate change.

As the Supreme Court has recently recognized, there is a consensus in the scientific community that the increasing atmospheric concentration of greenhouse gases are a leading cause of global warming:

> A well-documented rise in global temperatures has coincided with a significant increase in the concentration of carbon dioxide in the atmosphere. Respected scientists believe the two trends are related. For when carbon dioxide is released into the atmosphere, it acts like the ceiling of a greenhouse, trapping solar energy and retarding the escape of reflected heat. It is therefore a species-the most important species-of a "greenhouse gas."

Massachusetts v. EPA, 127 S.Ct. at 1446. If anything, however, this modest statement by the Court understates the true extent of the scientific consensus on the causes of global warming.

The existence of global warming is now beyond dispute. In a report published earlier this year the Intergovernmental Panel on Climate Change (IPCC)[1] expressed in the strongest language possible its conviction that global warming is occurring: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." IPCC, Summary for Policymakers at 5, in Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007) [hereinafter Working Group I].

Moreover, it is also abundantly clear that anthropogenic emissions of greenhouse gases like CO_2 and CH_4 are driving the observed warming of the planet. Prior to the industrial revolution, over the last 650,000 years the global atmospheric concentration of CO_2 ranged from 180 to 300 parts per million (ppm), but in 2005, global CO_2 levels reached 379 ppm. Working Group I at 2. Similarly, atmospheric concentrations of CH_4 have increased from a range of 320 to 790 parts per billion (ppb) over the last 650,000 years to 1774 ppb in 2005. Id. at 3. Fossil fuel use has played a primary role in the growth of CO_2 and CH_4 concentrations. See id. at 2 (fossil fuel use is "[t]he primary source of the increased atmospheric concentration of carbon dioxide since the pre-industrial period"); Id. at 3 (stating with greater than 90% certainty that, "the observed increase in methane concentration is due to anthropogenic activities, predominantly agriculture and fossil fuel use"). The increasing concentrations of these radiative

[1] The IPCC was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme to provide an authoritative international statement of scientific understanding of climate change. Its various Working Group and Assessment Reports on climate change are available at: http://www.ipcc.ch/.

forcing gases has led the IPCC to conclude that, "[m]ost of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." Id. at 10 (emphasis in original). Thus, the world's leading scientific body on the subject has now concluded, with greater than 90 percent certainty, that emissions of CO_2, CH_4, and other greenhouse gases are responsible for climate change. See id. at 3, n.6 (explaining the use of the term "very likely" in Working Group I).

The Clean Air Act does not require a finding that a specific category of sources is the complete or sole cause of a given environmental harm, considered on its own. Rather, section 111 of the Act requires EPA to regulate emissions from such a category if the Administrator determines that those emissions "contribute significantly to," pollution that may reasonably be anticipated to cause that harm. Thus, it is not necessary to show that the emissions of CO_2 and CH_4 from petroleum refineries in the U.S. are independently responsible for the increases in atmospheric concentrations of these gases. Rather, it is sufficient that the contribution of these sources to such concentrations is not insignificant.

By any measure, petroleum refineries are a significant contributor to total U.S. greenhouse gas emissions. According to EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2005 [hereinafter Inventory],[2] fossil fuel combustion is responsible for the vast majority of U.S. CO_2 emissions – 5751.2 of the 6089.5 total Teragrams (Tg) of CO_2 emitted in the U.S. in 2005. EPA, Inventory (2007) at ES-4, Table ES-2. The industrial end-use sector accounted for 1575.2 Tg CO_2 in 2005, or about 27.4 percent of all CO_2 emissions from fossil fuel combustion. Id. at ES-7, Table ES-3. EPA's Inventory does not break out CO_2 emissions from the combustion of fossil fuels by industrial sector. However, other estimates of U.S. greenhouse gas emissions demonstrate that petroleum refineries play a key role in climate change. According to estimates prepared by the U.S. Department of Energy's Energy Information Administration (EIA) as part of its Annual Energy Outlook 2007, energy consumption at U.S. petroleum refineries resulted in the emission of 224.5 Tg of CO_2 in 2005. See EIA, Annual Energy Outlook 2007 (2007) [hereinafter AEO 2007][3] at Supplemental Data Table 24: Refining Industry Energy Consumption. If EIA's methodology and data are consistent with EPA's Inventory, then petroleum refineries are responsible for about 14.3 percent of industrial emissions and about 4 percent of U.S. emissions of CO_2 from fossil fuel combustion.

Moreover, if left unregulated, refinery CO_2 emissions are projected to increase rapidly. By 2030, AEO 2007 predicts that refineries will emit 378.0 Tg of CO_2. Id. at Supplemental Data Table 24: Refining Industry Energy Consumption. This amounts to an increase of 2.1% per year from 2005 to 2030, a much faster rate of expansion than AEO 2007 predicts for CO_2 emissions from fossil fuel combustion as a whole – 1.2% per year – during this period. See id. at 101.

Furthermore, the AEO 2007 estimates may be low. Another recent EIA study, based on data collected in the Administration's Manufacturing Energy Consumption Survey, measured the contribution of industrial sectors to greenhouse gas emissions in 2002. This study found that petroleum refineries emitted 277.6 Tg of CO_2 – more than any other industrial sector, and more than the combined emissions of the next three largest industries. Mark Schipper, EIA, Energy-

[2] Available at http://www.epa.gov/climatechange/emissions/usinventoryreport.html (last updated May 31, 2007).
[3] Available at http://www.eia.doe.gov/oiaf/aeo/index.html (last visited August 26, 2007).

Related Carbon Dioxide Emissions in U.S. Manufacturing [hereinafter Schipper] (2006) at 4, Table 1. This figure is also 43% higher than the corresponding AEO 2005 estimate for 2002 – 194.1 Tg CO_2. Compare Schipper at 4, Table 1, with EIA, AEO 2005 (2005)[4] at Supplemental Data Table 24: Refining Industry Energy Consumption.

Yet another study estimates a much greater contribution to greenhouse gas emissions from petroleum refineries. According to Greenhouse Gas Estimates for Selected Industry Sectors, petroleum refinery energy consumption accounted for 513.8 Tg of CO_2 equivalent (CO_2e) in 2000 – more than double the fuel combustion derived CO_2 emissions of any other industrial activity (save electric power generation). Environmental Roadmapping Initiative, National Center for Manufacturing Sciences, Greenhouse Gas Estimates for Selected Industry Sectors (2003) at Table 5.[5]

Whatever their exact contribution to total U.S. greenhouse gas emissions, it is clear that petroleum refineries are a significant source of fossil fuel derived CO_2 emissions, because they consume such large quantities of energy. Petroleum Refining is the most energy intensive industry in the United States. Ernst Worrell & Christina Galitsky, Environmental Energy Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory, Profile of the Petroleum Refining Industry in California (2004) at iii [hereinafter Worrell].[6] U.S. petroleum refineries consume over 3.2 quadrillion British thermal units (quads) of primary energy annually. Id. Total U.S. energy consumption is only about 100 quads. EIA, Annual Energy Review 2006 (2007) at Table 1.1 Energy Overview, Selected Years, 1949-2006.[7]

Finally, it is important to note that CO_2 is not the only greenhouse gas that refineries emit. According to the most recent EPA Inventory, petroleum refineries are also responsible for an additional 0.6 Tg of CO_2 equivalent via CH_4 emissions. EPA, Inventory at 3-47, Table 3-38. EPA's Inventory provides a detailed analysis of the sources of refinery CH_4 emissions:

> Within refineries, vented emissions account for about 87 percent of the emissions, while fugitive and combustion emissions account for approximately six and seven percent respectively. Refinery system blowdowns for maintenance and the process of asphalt blowing – with air, to harden the asphalt – are the primary venting contributors. Most of the fugitive CH_4 emissions from refineries are from leaks in the fuel gas system. Refinery combustion emissions include small amounts of unburned CH_4 in process heater stack emissions and unburned CH_4 in engine exhausts and flares.

EPA, Inventory at 3-47.

B. Global climate Change qualifies as air pollution under the Clean Air Act.

The Clean Air Act does not define the term "air pollution," however under the Act the related term "air pollutant" means "any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special

[4] Available at http://www.eia.doe.gov/oiaf/archive/aeo05/index.html (last visited August 26, 2007).
[5] Available at http://ecm.ncms.org/ERI/new/GHG.htm (last visited August 26, 2007).
[6] Available at http://ies.lbl.gov/iespubs/55450.pdf (last visited August 26, 2007).
[7] Available at http://www.eia.doe.gov/emeu/aer/overview.html (last visited August 26, 2007).

nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air." 42 U.S.C. § 7602(g). In the past, EPA has contended that greenhouse gases do not fall within the sweep of this definition. See, e.g., Massachusetts v. EPA, 127 S. Ct. at 1460 ("Because EPA believes that Congress did not intend it to regulate substances that contribute to climate change, the agency maintains that carbon dioxide is not an 'air pollutant' . . . .").

However, the Supreme Court has now held that text of the Act "forecloses" this reading. Id. In Massachusetts v. EPA, the Court determined that "greenhouse gases fit well within the Clean Air Act's capacious definition of 'air pollutant.'" Id. at 1462. The Court's analysis leaves no room to argue that greenhouse gases do not constitute air pollutants under the Act:

> The Clean Air Act's sweeping definition of "air pollutant" includes "any air pollution agent or combination of such agents, including any physical, chemical . . . substance or matter which is emitted into or otherwise enters the ambient air . . . ." § 7602(g) (emphasis added). On its face, the definition embraces all airborne compounds of whatever stripe, and underscores that intent through the repeated use of the word "any." Carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons are without a doubt "physical [and] chemical . . . substance[s] which [are] emitted into . . . the ambient air." The statute is unambiguous.

Id. at 1460.

Although CO_2 and CH_4 emissions from petroleum refineries do not become subject to regulation under section 111 unless those emissions contribute significantly to "air pollution which may reasonably be anticipated to endanger public health or welfare," 42 U.S.C. § 7411 (emphasis added), and although EPA has in the past determined that the term "air pollution," as used in the Act "cannot be interpreted to encompass climate change," 68 Fed. Reg. 52,928 (Sept. 8, 2003), these facts present no barrier to EPA's regulation of CO_2 and CH_4 under section 111. EPA's determination that climate change does not qualify as "air pollution" was based on its incorrect belief that CO_2 was not an "air pollutant" under the Act. 68 Fed. Reg. 52,928. Moreover, in rejecting EPA's overly narrow interpretation of "air pollutant" the Supreme Court also voided EPA's construction of the term "air pollution," noting that because greenhouse gases both enter the ambient air and warm the atmosphere, they are "unquestionably 'agents' of air pollution." Massachusetts v. EPA, 127 S. Ct. at 1460 n.26.

C. Global climate change may reasonably be anticipated to endanger public health or welfare.

As the "may be reasonably anticipated" language of section 111 affirms, the Clean Air Act is a precautionary statute under which proof of actual harm is not required. Congress directed that regulatory action taken pursuant to an endangerment finding would be designed to "precede, and, optimally, prevent, the perceived threat." Ethyl Corp. v. EPA, 541 F.2d 1, 13 (D.C. Cir. 1976). EPA is not required to document "proof of actual harm" as a prerequisite to regulation; rather, EPA is supposed to act where there is "a significant risk of harm." Id. at 12-13. In Ethyl Corp. v. EPA, noting the novelty of many human alterations of the environment, the Court of Appeals for the District of Columbia Circuit found:

> Sometimes, of course, relatively certain proof of danger or harm from such modifications can be readily found. But, more commonly, 'reasonable medical concerns' and theory long precede certainty. Yet the statutes and common sense demand regulatory action to prevent harm, even if the regulator is less than certain that harm is otherwise inevitable.

Id. at 25.[8]

The 1977 Clean Air Act Amendments confirmed and adopted the precautionary interpretation enunciated in Ethyl, enacting special provisions, Pub. L. No. 95-95, § 401, 91 Stat. 790-91 (August 7, 1977), designed to "apply this interpretation to all other sections of the act relating to public health protection." H.R. Rep. No. 294, 95th Cong., 1st Sess. 49 (1977); Accord, id. at 51 (amendments are designed inter alia to "emphasize the precautionary or preventive purpose of the act (and, therefore, the Administrator's duty to assess risks rather than wait for proof of actual harm)"). Congress rejected the argument that, "unless conclusive proof of actual harm can be found based on the past occurrence of adverse effects, then the standards should remain unchanged," finding that this approach "ignores the commonsense reality that 'an ounce of prevention is worth a pound of cure.'" Id. at 127.

However, while the precautionary nature of the Clean Air Act creates a low threshold for findings relating to the negative consequences of air pollution, here there is ample evidence that global climate change is endangering and will continue to endanger public health and welfare. Evidence of dramatic changes in Earth's climatic system abounds. Changes in climatically sensitive indicators support the inference that the average temperature in the Northern Hemisphere over the last half-century is likely higher than at any time in the previous 1,300 years, while ice core records indicate that the polar regions have not experienced an extended period of temperatures significantly warmer than today's in about 125,000 years. Working Group I at 9. Meanwhile, the IPCC reports "numerous long-term changes in climate" observed at "continental, regional and ocean basin scales," including "changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones." Id. at 7. As demonstrated below, such changes will have pronounced adverse impacts on public health and welfare.

1. Public Health Impacts

Global climate change is expected to have significant impacts on human health in numerous ways, including increased heat-related mortalities, the spread of infectious disease vectors, greater air and water pollution, an increase in malnutrition, and greater casualties from fires, storms, and floods. EPA has already recognized that climate plays a significant role in public health:

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[8] Accord, Industrial Union Dep't v. American Petroleum Institute, 448 U.S. 607, 656 (1980) (plurality) (agency need not support finding of significant risk "with anything approaching scientific certainty," but rather must have "some leeway where its findings must be made on the frontiers of scientific knowledge," and "is free to use conservative assumptions in interpreting the data," "risking error on the side of overprotection rather than underprotection").

> Throughout the world, the prevalence of some diseases and other threats to human health depend largely on local climate. Extreme temperatures can directly lead to loss of life, while climate-related disturbances in ecological systems, such as changes in the range of infective parasites, can indirectly impact the incidence of serious infectious diseases. In addition, warm temperatures can increase air and water pollution, which in turn harm human health.

EPA, Climate Change, Health and Environmental Effects [hereinafter EPA Report].[9] Given the ample evidence linking climate change to adverse public health impacts, there is no rational basis for EPA to conclude that climate change could not be reasonably anticipated to endanger public health.

Perhaps the most direct impact of climate change on human health will occur through increased heat-related mortalities. Heat waves already pose a serious threat to public health, and climate change is predicted to increase the magnitude, frequency, and duration of heat waves in the United States. See IPCC, Summary for Policymakers at 10-11, in Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007) [hereinafter Working Group II]. Thus, the U.S. Department of State's, U.S. Climate Action Report 2002, indicated that rising temperatures will likely produce dramatic increases in summer heat index values in the Northeast, Southeast, and Midwest. U.S. Department of State, U.S. Climate Action Report 2002 at 110. (2002) [hereinafter CAR 2002]. By the end of the century, cities such as Hartford and Philadelphia could average nearly 30 days with high temperatures above 100°F each year. Peter C. Frumhoff, et al., Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions at x (July 2007) [hereinafter Northeast Report].[10] Segments of the population that are particularly vulnerable, such as those with heart problems, asthma, the elderly and very young, and the homeless, are especially at risk to extreme heat. EPA Report.

Climate change is also expected to play a role in worsening air quality problems that already impact human health. For example, EPA has recognized that the higher temperatures that result from climate change may result in increased concentrations of ground-level ozone. EPA Report. Breathing ozone can trigger a variety of health problems, including chest pain, coughing, throat irritation, and congestion, and repeated exposure can lead to bronchitis, emphysema, asthma, and permanent scarring of lung tissue. EPA, Ground-Level Ozone: Health and Environment (2007).[11] Moreover, climate change may also indirectly affect the concentration of PM in the air by increasing sources such as wildfires and dust from dry soils. EPA Report. Exposure to such particles can affect both the lungs and heart and has been linked to a variety of problems, including increased respiratory symptoms such as irritation of the airways, coughing or difficulty breathing, decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, and premature death in people with heart or lung disease. EPA, Particulate Matter: Health and Environment (2007).[12] As with other forms of air pollution, certain vulnerable segments of the population, such as children with asthma and the elderly, are the most likely to be affected. Id.

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[9] Available at http://www.epa.gov/climatechange/effects/index.html (last updated Apr. 6, 2007).
[10] Available at http://www.climatechoices.org/ne/resources_ne/nereport.html (last visited Aug. 27, 2007).
[11] Available at http://www.epa.gov/air/ozonepollution/health.html (last visited Aug. 26, 2007).
[12] Available at http://www.epa.gov/air/particlepollution/health.html (last visited Aug. 26, 2007).

Climate change is also expected to increase the risk from certain infectious diseases, especially vector-born diseases spread by mosquitoes or other insects. EPA Report. Thus, vector-born diseases like malaria and dengue fever may expand their ranges in the United States. Id. Moreover, hotter, longer, and drier summers punctuated by heavy rainstorms may also create more favorable conditions for outbreaks of West Nile Virus in the Northeast. Northeast Report at xi.

Climate change's role in increasing the frequency and severity of extreme weather events, such as hurricanes, droughts, and floods, may also adversely impact public health. For example, in delta regions, coastal areas, and small islands, sea level rise is anticipated to threaten human populations by exacerbating flooding and increasing the size of storm surges. Working Group II at 8-11. The Atlantic coast of the Southeast is likely to see such effects and suffer the loss of important buffers against storm damage. CAR 2002 at 110. In Appalachia, the increase in intense rainfall events is likely to result in more dangerous flash floods. Id. Meanwhile, warming in the West is projected to decrease mountain snowpack and cause more winter flooding with reduced summer flows. Working Group II at 10. Finally, rising sea levels are expected to increase the salinity of surface and ground water through salt water intrusion, threatening drinking water supplies in places like New York City, Philadelphia, southern Florida, and California's Central Valley. EPA Report.

2. Public Welfare Impacts

The Clean Air Act provides a broad definition of "welfare," that encompasses a host of environmental ills:

> All language referring to effects on welfare includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants.

42 U.S.C. § 7602(h). Of particular importance here, "welfare" refers to "effects on . . . weather . . . and climate." Thus, the most basic effect of global climate change – that the Earth's average mean temperature will increase – is directly implicated as an effect on public welfare under the Act. As discussed above, global climate change is already resulting in well documented impacts on climate and weather, including air and ocean temperature increases, widespread melting of snow and ice, changes in precipitation amounts and wind patterns, and more frequent extreme weather events such as hurricanes, heat waves, floods, and droughts. Working Group I at 5-9. However, aside from direct impacts on weather and climate, there are numerous other ways in which global climate change may be reasonably anticipated to endanger public welfare.

In its recent assessment of the impacts of climate change, the IPCC concluded that "[o]bservational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases." Working Group II at 1. In the U.S., the impacts vary by region, but climate change will have significant consequences for ecosystems in many areas. For example, CAR 2002 reports that each of the

following are likely climate change outcomes: (1) water quantity and quality in the Great Lakes will decrease; (2) prairie potholes, an important migratory bird habitat in the Great Plains, will become drier; (3) river temperatures in the Northwest will increase, placing additional stress on migrating fish; and (4) melting of sea ice and permafrost in Alaska will harm ecosystems and infrastructure.[13] CAR 2002 at 110. Climate change is also likely to pose problems for many forested areas in the U.S. by extending and increasing the intensity of fire seasons and fostering insect outbreaks. EPA Report.

Some habitats that are already imperiled by other forces will be particularly susceptible to damage from climate change. For example, sea level rise driven by climate change will contribute to the loss of coastal wetlands. Working Group II at 3. In addition to their role in protecting against floods and storm surges, such wetlands provide habitat for many species, enable recreational opportunities, and play a key role in both nutrient uptake and the economy of the surrounding area. EPA Report. However, because they are generally located within a few feet of sea level, coastal marshes and swamps are particularly vulnerable to rising sea levels. Id. Thus, sea level rise could eliminate up to 22% of the world's coastal wetlands by the end of this century. Id. EPA has estimated that a two foot rise in sea level, a figure that is within range of the IPCC's modeling for sea level rise during the 21st Century, could eliminate between 17 and 43 percent of U.S. wetlands. See id.; Working Group I at 13, Table SPM.3.

Moreover, changes in the Earth's climate are already having an impact on marine and freshwater biological systems. For example, the ranges of algae, plankton, and fish have shifted in many water bodies in response to changes in water temperature, ice cover, oxygen content, salinity, and circulation. Working Group II at 2. However, corals are particularly vulnerable to thermal stress and have a limited ability to adapt to changes in their ecosystem. Id. at 6. Thus, the IPCC projects that an increase in sea surface temperature of approximately 1 to 3°C (1.8-5.4°F) will result in widespread coral mortality. Id.[14] Finally, the increasing absorption of CO_2 has already decreased ocean pH by 0.1 units on average, Id. at 2, and the IPCC predicts that further acidification will have negative impacts on corals and other shell forming organisms. Id. at 6.

The welfare impacts of climate change are not limited to impacts on natural systems. For example, climate change will also adversely affect agriculture. EPA has recognized that, "[a]griculture is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms," and that climate change can adversely affect crop yields in regions where summer heat already limits production, increase the likelihood of severe droughts, and increase the rate of evaporation of moisture from topsoil. EPA Report. Moreover, the increase in heavy precipitation events to which climate change contributes is projected to lead to increased soil erosion. Working Group II at 14.

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[13] This is especially true for species like the polar bear, which is evolutionarily adapted to life on the sea ice and spends only short periods on land. *See* 72 Fed Reg. 1064 (Jan. 9, 2007) (Proposed Rule To List the Polar Bear as Threatened Under the Endangered Species Act).

[14] The National Marine Fisheries Service has found that shallow reef habitats are especially vulnerable to increases in global air and sea temperatures due to coral bleaching. 71 Fed. Reg. 26,852, 26,858 (May 9, 2006) (Final Rule to List Elkhorn (*Acropora palmata*) and Staghorn (*A. cervicornis*) Corals as Threatened Under the Endangered Species Act).

III. Existing technologies can reduce the emissions of CO_2 and CH_4 from petroleum refineries.

Section 111 requires EPA to adopt standards of performance which reflect "the degree of emission limitation achievable through the application of the best system of emission reduction which . . . the Administrator determines has been adequately demonstrated." 42 U.S.C. § 7411(a)(1). The technologies that can be mandated in an NSPS include "design, equipment, work practice or operational standards." 42 U.S.C. § 7411(h)(1). As enumerated below, several options are available to reduce CO_2 and CH_4 emissions from petroleum refineries by increasing the efficiency of refinery operations, and therefore EPA should use its expertise to set NSPS limiting refinery emissions of CO_2 and CH_4 on a per unit of output basis.[15]

Significant improvements in the energy efficiency of petroleum refinery operations are possible. For example, in 2001 the U.S. Department of Energy conducted a plant-wide energy efficiency assessment at a California refinery and identified potential energy savings totaling 6,230,600 million British thermal units per year (MMBtu/year), a figure roughly equal to 12 percent of the plant's total annual energy consumption. Office of Industrial Technologies, Energy Efficiency, and Renewable Energy, U.S. Department of Energy, Petroleum: Best Practices Assessment Case Study (Nov. 2002) at 1.[16]

Similarly, the Department of Energy recently commissioned a study assessing the potential energy efficiency gains at petroleum refineries. See Energetics Inc., Energy Bandwidth for Petroleum Refining Processes (Oct. 2006).[17] This study examined the five refinery processes that account for roughly 70 percent of total petroleum refinery energy consumption: atmospheric and vacuum crude distillation, fluidized catalytic cracking (FCC), catalytic hydrotreating, catalytic reforming, and alkylation, and concluded that, as currently carried out at refineries, each process exhibited room for efficiency improvements. Id. at 18. For example, the study concluded that efficiency measures like improving the heat integration between the atmospheric and vacuum towers and fouling mitigation could reduce atmospheric and vacuum distillation energy consumption by 55 and 40 percent, respectively, with the vast majority of these savings coming through application of available technology. See id. at 23-24.

One important piece of refinery equipment for which recent technological advances can enable significant improvements in refinery efficiency is process heaters. Typical refinery process heaters operate at an efficiency level of only about 83 percent. TIAX LLC, High Efficiency, Ultra-Low Emission, Integrated Process Heater System: Final Technical Report at 1-1 (2006) [hereinafter TIAX].[18] However, significant efficiency improvements have recently become possible with the development of ultra-low emission process heaters that incorporate advanced fired heater design to maximize convective and radiative heat transfer. This advance

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[15] The discussion of innovations that follows is not intended to be exhaustive. The commenters encourage EPA to consider such additional measures as the agency's investigation of this issue uncovers.

[16] Available at http://www1.eere.energy.gov/industry/bestpractices/pdfs/bp_cs_martinez.pdf (last visited Aug. 26, 2007)

[17] Available at http://www1.eere.energy.gov/industry/petroleum_refining/pdfs/bandwidth.pdf (last visited Aug. 26, 2007).

[18] Available at http://www.osti.gov/bridge/servlets/purl/887315-AaVFP2/887315.PDF (last visited Aug. 24, 2007).

in process heater technology can push efficiencies to 95 percent, yielding annual CO_2 emissions reductions of approximately 13 percent below the emissions of a typical process heater. See TIAX at 1-3, Table 1-1 (estimating conventional process heater CO_2 emissions at 71,500 tons per year and advanced fired heater emissions at 62,300 tons per year).

Even for existing process heaters, improved energy efficiency is an attainable goal. Efficiency improvements of 0.5 to 5 percent can often be achieved in such heaters through aggressive combustion/burner tuning and process optimization programs. See URS Corporation, Opportunities for Further Greenhouse Gas Emission Reductions for the BAAQMD Stationary Sources: Final Report (2007) at 8-2 [hereinafter URS Corp.].[19] Moreover, process heaters that have not already been optimized to reduce NO_x emissions could realize even greater energy savings. Id.

Another potential source of greenhouse gas emissions reductions at petroleum refineries is through the limitation of flaring. The flaring of combustible fuels results in the release of CO_2 and CH_4 emissions that are divorced from any energy productive activity and should therefore be eliminated, except as a last resort in an emergency. Although EPA states that, "[f]lares are first and foremost a safety device used to reduce emissions from emergency pressure relief of gases from refinery process units," 72 Fed. Reg. 27,195, the agency also admits that "many refineries . . . routinely use flares as an emission control device under normal operating conditions." Id. Existing technologies are capable of collecting flare gas for productive use, and because the Clean Air Act compels EPA to limit CO_2 and CH_4 emissions from refineries, EPA must require the use of such technologies in lieu of flaring.[20]

Similarly, the Act's requirement to regulate CO_2 and CH_4 emissions and the corresponding duty this places on EPA to promulgate standards of performance maximizing the energy efficiency of refineries argue in favor of requiring electricity co-generation for those refineries that produce more fuel gas than they can use in their own processes. EPA has recognized that co-generation is an option for "fuel rich" refineries, but declined to impose co-generation requirements. 72 Fed. Reg. 27,195. However, the petroleum refining industry has great potential for increased application of co-generation. Worrell at 45. Moreover, co-generating refineries are significantly more efficient than standard power plants because they take advantage of what would otherwise be wasted heat energy. Id. In addition, the distributed nature of such co-generation facilities minimizes transmission losses. Id.

Finally, EPA should consider requiring carbon capture and sequestration in conjunction with steam methane reforming or gasification. For example, the blending of hydrogen produced with carbon capture and sequestration into refinery fuel gas can reduce refinery CO_2 emissions. URS Corp. at 8-1 – 8-2, 8-7. Gasification may also be a particularly attractive option for co-generation at refineries. See Worrell at 46 (discussing successful co-generation applications of gasification at refineries).

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[19] Available at http://www.baaqmd.gov/pln/BAAQMDMitigationStudyFinalReportMarch2007.pdf (last visited Aug. 24, 2007).

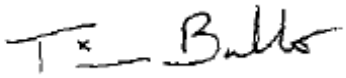
[20] See, e.g., Bay Area Air Quality Management District, Staff Report: Proposed Regulation: Regulation 12, Miscellaneous Standards of Performance: Rule 12, Flares at Petroleum Refineries (July 2005) at 7 (listing several strategies for reduction of flaring).

IV. EPA must also require each state to submit a plan to establish, implement, and enforce standards of performance limiting CO_2 and CH_4 emissions from existing petroleum refineries.

Section 111(d) of the Act provides that EPA shall require states to implement and enforce standards of performance for existing sources when the pollutant at issue is not regulated as a criteria pollutant or hazardous air pollutant. 42 U.S.C. § 7411(d)(1). Because CO_2 and CH_4 are not currently listed as either criteria pollutants or hazardous air pollutants, EPA's regulation of these pollutants under section 111 will trigger the section 111(d) requirement. Therefore, as part of its final rule revising the NSPS for petroleum refineries, EPA must require each state to submit a plan to establish, implement, and enforce standards of performance for CO_2 and CH_4 from petroleum refineries.

DATED: August 27, 2007

Respectfully Submitted,



Timothy Ballo
Associate Attorney
Earthjustice

Comments submitted on behalf of:

Environmental Integrity Project
and Sierra Club

Attachment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

JUL 14 2004

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Ms. Vickie Patton
Environmental Defense
2334 North Broadway
Boulder, CO 80304

Dear Ms. Patton:

This letter pertains to recent discussions between representatives of Environmental Defense and the Environmental Protection Agency's Office of Air Quality Planning and Standards and Office of General Counsel regarding development of the consent decree for New Source Performance Standards (NSPS) for stationary engines. Now that we have reached an agreement on a proposed consent decree establishing deadlines for issuing these standards, I would like to take this opportunity to restate what Penny Lassiter of my staff and I discussed with you recently on how we plan to go about developing these stationary engine standards.

In developing the NSPS, we plan to consider emission limits for all engine sizes, fuel combustion types, applications, and utilization, and we plan to consider limitations on the fuel content, including, but not limited to, the sulfur content. In addition, we plan to evaluate engine emissions of all air pollutants that may be appropriate for control under section 111(b) of the Clean Air Act, including but not necessarily limited to, oxides of nitrogen, particulate matter, hydrocarbons, sulfur dioxide, and carbon monoxide. We plan to evaluate standards for emissions of air pollutants that reflect the degree of emission limitations achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) we determine have been adequately demonstrated.

I appreciate the willingness to negotiate with us that you and the other Environmental Defense representatives demonstrated during the process of working through this settlement. We look forward to working with you and other stakeholders as we proceed with developing the standards, and we welcome any information and input you would like to share with us during that process.

Sincerely,

Gregory A. Green
Deputy Director

cc: Robert D. Brenner, OAR
Stephen D. Page, OAQPS