July 22, 2009

VIA OVERNIGHT MAIL

Dean Studer
Office of Community Relations, Mail Code 5
Re: Vulcan Construction Materials, LP
Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, Illinois 62794-9276

Dean.studer@illinois.gov

**Re: Comments on Draft Prevention of Significant Deterioration Construction Permit for Vulcan Construction Materials**

Dear Mr. Studer:

These comments are submitted on behalf of the Sierra Club and its 800,000 members, including 26,000 members in Illinois regarding the draft air permit for Vulcan Construction Materials's ("VCM") coal-fired lime plant.

For the reasons set forth below, IEPA must deny the draft permit, as it fails to meet the requirements of the Clean Air Act. If IEPA does not deny the permit, VCM must submit an amended application including the required information and analyses and IEPA must redraft substantially the permit terms and conditions, renotice the revised draft permit, and provide the public with a meaningful opportunity to comment on the revised draft permit.

## INTRODUCTION

The Illinois Environmental Protection Agency ("IEPA") proposes to issue a permit to Vulcan Construction Materials ("VCM") for a new (restarted) lime kiln in Mateno, Illinois. The kiln, as proposed, would principally burn a mix of coal and coke.

Congress intended to ensure that major sources of air pollution do not degrade air quality for people who live and work in the areas where the sources are located. Congress recognized that generic national ambient air quality standards ("NAAQS") do not adequately protect people. NAAQS "do not adequately protect against genetic mutations,

Exhibit 2

birth defects, cancer, or diseases caused by long-term chronic exposures or periodic short-term peak concentrations, and hazards due to derivative pollutants and to cumulative or synergistic impacts of various pollutants; and they do not adequately protect against crop damage and acid rain." *Hawaiian Elec. Co. v. U.S. Envt'l Protection Agency*, 723 F.2d 1440, 1447 (9th Cir. 1984). NAAQS also do not prevent the deterioration of otherwise cleaner air regions from deteriorating to the NAAQS "floor." For these reasons, Congress enacted the prevention of Significant Deterioration ("PSD") provisions of the Clean Air Act. 42 U.S.C. §§ 7470, *et seq*. EPA, IEPA, and the applicant rely upon the EPA's New Source Review Workshop Manual ("NSR Manual") in implementing the PSD program.

## I. THE DRAFT PERMIT FAILS TO IMPOSE BACT FOR GREENHOUSE GASES.

Significant emissions of CO2 will be exhausted to the atmosphere from VCM's proposed lime kiln. Neither VCM nor IEPA have quantified these emissions. A detailed inventory of CO2 and other greenhouse gas (i.e., N2O, CH4, etc.) should be included in the analysis. In the absence of such an analysis, it can only be assumed that a large quantity of the carbon in the fuel source will be converted to CO2 and that the processing/heating of limestone will release even more. This will result in hundreds of thousands to millions of tons of CO2 emissions each year. Additionally, as with most combustion processes, it is assumed that the kiln process releases N2O emissions. In short, it is undeniable that the proposed plant will emit huge quantities of the pollutants causing a climate crisis.

The draft permit fails to satisfy the minimum requirements of the Clean Air Act because it does not contain a "best available control technology" ("BACT") analysis (or any other limit) for carbon dioxide (CO2). In light of the United States EPA's recent draft greenhouse gas endangerment finding, its approval of CO2 limits in California auto emission standards (and all states adopting California's standards) and the Environmental Appeal Board's recent decisions related to CO2 and other greenhouse gases, the IEPA must either reissue a draft permit that contains a BACT limit for CO2 (and if emitted, N2O, methane, and other greenhouse gases) for VCM and begin a new public comment process, or suspend permit proceedings on the draft permit until after U.S. EPA completes its reconsideration and rulemaking discussed below.

It is beyond dispute that greenhouse gas ("GHG") pollution is a major contributor to climate change, which is likely to have numerous and severe adverse public health, environmental, and economic impacts. As the Director of the Kansas Department of Health and the Environment recently stated in denying a permit application for the proposed 1,400 MW Holcomb coal plant, "it would be irresponsible to ignore emerging information about the contribution of carbon dioxide and other greenhouse gases to climate change and the potential harm to our environment and health."[1] It would also be contrary to law because the Clean Air Act requires that binding BACT limits be placed on any major new or modified source of GHG emissions because GHGs are "subject to regulation under the Act." 42 U.S.C. §§ 7475(a)(4), 7479(3); 40 C.F.R. § 51.166(b)(49).

[1] Kansas Dept. of Health and the Environment, Press Release: KDHE Electric Denies Sunflower Electric Air Quality Permit (Oct. 18, 2007) (attached as Exhibit 1).

A PSD permit for a source that emits significant quantities of a pollutant "subject to regulation" under the Clean Air Act must include an emissions limit based on the best available control technology ("BACT") for that pollutant. 42 U.S.C. § 7475(a)(4); *see also* 40 C.F.R. § 52.21(b)(50) (2007). As discussed below, CO2 is currently regulated under the Act because various statutory and regulatory provisions in effect under the Act require monitoring, reporting, and control of CO2 emissions. Greenhouse gases are also "subject to regulation" under the Act. The Supreme Court has determined that carbon dioxide and other GHGs are "pollutants" under the Act, *Massachusetts v. EPA*, 127 S. Ct. 1438 (2007), and the EPA recently issued a draft greenhouse gas endangerment finding that will trigger regulation of greenhouse gases from motor vehicles under the Clean Air Act. Moreover, EPA just granted the "California Waiver," approving of California and thirteen other states and the District of Columbia's vehicle emission standards, limiting emissions of CO2 and other greenhouse gases under the Clean Air Act.[2] There is no question now that CO2 is regulated under the Clean Air Act and that the proposed PSD permit for VCM must therefore include a BACT emission limit for CO2.

### A. Climate Change Background: VCM Would Contribute To The Climate Change Crisis

Global warming is a threat to public health, welfare, and the environment. As the United States Environmental Protection Agency ("EPA") recently found in a proposed rule on greenhouse gas endangerment:

> The evidence points ineluctably to the conclusion that climate change is upon us as a result of greenhouse gas emissions, that climatic changes are already occurring that harm our health and welfare, and that the effects will only worsen over time in the absence of regulatory action. The effects of climate change on public health include sickness and death…The effects on welfare embrace every category of effect described in the Clean Air Act's definition of "welfare" and, more broadly, virtually every facet of the living world around us. . . . In both magnitude and probability, climate change is an enormous problem.[3]

The effects of climate change include "heat waves, more wildfires, degraded air quality, more heavy downpours and flooding, increased drought, greater sea level rise, more intense storms harm to water resources, harm to agriculture, and harm to wildlife and ecosystems." *Id*. at 1.

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[2] 74 Fed. Reg. 32744 (July 8, 2009); http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/5e448236de5fb369852575e500568e1b%21OpenDocument; http://www.arb.ca.gov/cc/ccms/ccms.htm; http://www.ens-newswire.com/ens/jun2009/2009-06-30-01.asp

[3] EPA Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Proposed Rule, 74 Fed. Reg. 18886, 18904 (April 24, 2009).

EPA's recent pronouncement is based on well-established facts that the international scientific and regulatory community has known for over a decade. The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and the United Nations Environment Programme in 1988 to comprehensively and objectively assess the scientific, technical, and socio-economic information relevant to human-induced climate change, its potential impacts, and options for adaptation and mitigation.[4]

The IPCC reports[5] include the following significant findings, many of which will have significant impacts in Illinois:

- In North America, major challenges are projected for crops that are near the warm end of their suitable range or depend on highly utilized water resources;

- Approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperatures exceed 1.5-2.5 Degrees Celsius;

- Even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades, which make adaptation essential, particularly in addressing near term impacts. Unmitigated climate would, in the long term, be likely to exceed the capacity of natural, managed and human systems to adapt.

- Fuel switching from coal to gas, renewable heat and power (hydropower, solar, wind, geothermal and bioenergy), and early applications of carbon capture and storage (*e.g.*, storage of removed carbon dioxide from natural gas) are key mitigation technologies and practices currently commercially available.

Illinois agriculture is particularly sensitive to warming because of the existing threats of heat waves, flooding and drought. The drought emergency declared in the state in 2005 illustrates one of the problems global warming poses in the coming decades. The Union of Concerned Scientists estimate that by 2100, average summer temperatures in the state could increase between 9-17 degrees. Rain would occur less often, but would come in more severe downpours, resulting in major flooding. Unless releases of global warming pollution are curbed and then significantly decreased, global warming pollution will continue to pose significant threats to the health, welfare, and economy of Illinois.[6]

Global warming also exacerbates the problem of ground-level ozone ("smog"), intensifying the public health dangers associated with air quality violations. Breathing

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[4] More information about the IPCC is available at http://www.ipcc.ch/about/index.htm.

[5] The IPCC reports are available at available at http://www.ipcc.ch/ipccreports/assessments-reports.htm.

[6] *See* National Wildlife Federation, Global Warming and Illinois, *available at* http://www.nwf.org/GlobalWarming/pdfs/Illinois.pdf.

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. In addition, global warming will result in increased surface water evaporation, which in turn could lead to more wildfires and increased dust from dry soil, both of which generate particulate matter emissions. Particulate matter triggers a host of health problems, including aggravated asthma, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, and premature death in people with heart or lung disease.

The IPCC reports authoritatively document the adverse environmental and socio-economic impacts of global warming at local, regional, national, and global scales, and the primary role of the burning of fossil fuels, including coal, in causing global warming. The evidence in the IPCC reports conclusively shows that greenhouse gases, including CO2 and N2O and methane, endanger public health, welfare, and the environment. The United States government recently officially adopted this conclusion.

New evidence suggests that even the alarming estimates of the dire threat of the pending global climate meltdown by the IPCC are too conservative and that the threat of global warming may be even more imminent than originally anticipated. A recent study found that from 2000 to 2006, the average growth in GHG emissions was 3.3% per year, compared to 1.3% per year during the 1990s.[7] The study estimates that the climate meltdown is happening faster than previously feared, and attributes this to recent growth in carbon intensity, and decreasing efficiency in carbon sinks on land and in oceans.

While global warming will have a significant impact on the human environment, IEPA did not consider these effects. Consideration of the direct and collateral effects from construction of the proposed plant must be analyzed before any permit decision is made. Moreover, limits on the global warming pollution from the proposed plant must be included in the permit.

### B. There are Numerous Options Available to Avoid or Minimize the Project's Greenhouse Gases.

Options exist to reduce the emission of GHGs from the VCM kiln that could be included in a BACT analysis. These include:

- Increased Efficiency;
- Controls options and work practice standards;
- Co-firing the combustion sources proposed for the plant with lower carbon fuels, including biomass or natural gas, instead of coal-based fuels.

[7] *See* http://www.ucar.edu/news/releases/2008/climate-threat.jsp.

### 2. IEPA Must Review Technically Feasible Control Options for Carbon Dioxide.

The IEPA and VCM must include in the PSD application and permit application review an analysis of technically feasible control options for minimizing CO2 (and all greenhouse gas emissions) during startup of the facility and during any other time during which the sale of CO2 is not feasible. In other words, a CO2 BACT analysis for all normal operating periods, including startup, shutdown, and malfunction, should be prepared.

### 3. Clean Fuels Must Be Evaluated.

Consistent with the statutory definition of BACT, long-standing practice, and the recent Environmental Appeal Board ("EAB") ruling in the *Northern Michigan* case, a top-down BACT determination must include consideration of "clean fuels." *See* 42 U.S.C. § 7479(3); *In re Northern Michigan University Ripley Heating Plant*, Slip. Op., PSD Appeal No. 08-02 (E.A.B. 2009). "Congressional direction to permitting applicants and public officials is emphatic. In making determinations, they are to give prominent consideration to fuels." *Id*. at 17-18. For a lime kiln this may include the use of natural gas, biomass, fuel oil, or landfill gas as readily available methods to reduce carbon dioxide emissions. We note that biomass fuel is readily available in the Midwest and both processed biomass fuel and fuel crops are available. The issues involving acquisition and transport of biomass, if any, involve costs. Biomass cannot be rejected as technologically infeasible. For example, the Department of Energy's website notes that in 2002 there were about 9,733 megawatts of installed biomass capacity in the United States, the largest source of non-hydro renewable electricity.[8] Xcel Energy proposed to build a biomass gasification plant at the site of its existing Bayfront Generating Station in Ashland, Wisconsin.[9] The Xcel gasifier will gasify 200,000 to 250,000 tons of biomass annually.[10] The most recent publicly-available cost information shows that using biomass is cost-effective. The Xcel Bay Front facility is currently paying between $25.00 and $29.00 per ton of wood waste, which provides between 5,500 and 6,500 Btu/pound ($3.85 to $5.27/MMBtu).[11] Therefore, biomass is a transferable pollution control option.

Moreover, as noted below for criteria pollutants, natural gas is available at VCM and is used by other lime kilns in the United States to reduce air pollution emissions. Moreover, natural gas produces a better, low sulfur lime product and, for this reason too, many kilns fire natural gas during certain periods even when they are capable of firing coal.

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[8] *See* http://www1.eere.energy.gov/biomass/index.html.

[9] *See* Application of Northern States Power Company, a Wisconsin Corporation, for a Certificate of Authority and Any Other Authorizations Needed to Construct and Place Into Operation a Biomass Gasifier at Its Bay Front Generating Facility, Docket No. 4220-CE-169, PSC Ref # 108437 (attached as Exhibit 2).

[10] *Id*. at 8.

[11] *See* Assessment of Biomass Resources for Energy Generation at Xcel Energy's Bay Front Generating Station at Ashland, Wisconsin, Energy Center of Wisconsin, 2007 (attached as Exhibit 3).

### C. IEPA is Required by the Clean Air Act's BACT Provisions to Impose Stringent Limits on Greenhouse Gas Emissions From VCM

Given the threat posed by global warming, it is now more important than ever to implement the federal Clean Air Act's requirement to impose stringent BACT limits on GHG emissions from coal-fired facilities. The PSD program requires that each "new major stationary source shall apply best available control technology for *each regulated new source review pollutant* that it would have the potential to emit in significant amounts." 40 C.F.R. §§ 52.21(j), 51.166(j)(2) (emphasis added). A "regulated new source review pollutant" includes any pollutant for which there is a national ambient air quality standard ("NAAQS"), a standard promulgated under Section 111 of the Act, and "any pollutant that otherwise is subject to regulation under the Act." 40 C.F.R. §§ 52.21(b)(50), 51.166(b)(49). The Clean Air Act itself also makes clear that the BACT requirements extend to "each pollutant subject to regulation under the Act." 42 U.S.C. §§ 7475(a)(4), 7479(3). This includes carbon dioxide, which is already regulated under the Delaware SIP (which is adopted into federal law under the Clean Air Act), the municipal solid waste landfill New Source Performance Standard, 40 C.F.R. §§ 60.33c, 60.751; 63 Fed. Reg. 2154-01 (Jan. 14, 1998), through the California vehicle emission standards, and through CAA section 821 and its various implementing regulations (explained in detail in section 2 below).

As IEPA is aware, the Environmental Appeals Board ("EAB") has repeatedly rejected refusals by EPA and delegated states to apply BACT requirements to GHG emissions under the Clean Air Act as unsupported by any existing law or policy. *In re Deseret Power Electric Coop.*, PSD Appeal No. 07-03, slip op. at 25 (Nov. 13, 2008); *In re Northern Michigan University Ripley Heating Plant*, Slip. Op., PSD Appeal No. 08-02 (E.A.B. 2009). The only legally defensible conclusion on remand is that CO2 is subject to regulation and, therefore, that BACT limits are required for CO2. IEPA cannot ignore these clear directives from the EAB.

Additionally, the U.S. EPA has recently announced that it is continuing to reassess whether greenhouse gases are regulated under the Clean Air Act. *See* Letter from Lisa Jackson to David Bookbinder (February 16, 2009) (attached as Exhibit 4). Most recently, the U.S. EPA granted a petition for reconsideration of former Administrator Stephen Johnson's memorandum of December 18, 2008 (the "Johnson memo"), which purported to establish that greenhouse gases are not subject to the Act. *Id*. In agreeing to revisit the issue, the current Administrator warned "PSD permitting authorities," such as IEPA, that they "should not assume that the memorandum is the final word on the appropriate interpretation of Clean Air Act requirements." *Id*. Instead, U.S. EPA intends to begin notice-and-comment rule-making in order to establish U.S. EPA's official interpretation in the "near future." *Id*. The result of U.S. EPA's rulemaking will have a direct impact on the Power Holdings permit. However, that final rulemaking is unnecessary for determining that CO2, N2O and CH4 are already subject to regulation under the Clean Air Act, as shown below.

We also note that even before Administrator Jackson's February 16, 2009, letter, the EPA Region 9 withdrew a PSD permit previously proposed for the Desert Rock plant in

New Mexico based on the EAB's decision in *Deseret.* *See* Notice of Partial Withdrawal of Permit, *In re Desert Rock Energy Company LLC*, PSD Appeal Nos. 08-03, 08-04, 08-05 and 08-06, Docket Entry No. 60 (Jan. 8, 2009) (attached as Exhibit 5).

In light of these actions, other project proponents have begun to submit CO2 BACT analyses.[12] And other EPA-delegated permit authorities have issued draft permits with CO2 BACT limits.[13] While these CO2 analyses suffer their own flaws, they do demonstrate that the regulated community and regulatory agencies have now concluded that CO2 BACT limits are a requirement of the Clean Air Act.

### 1. Greenhouse Gases Are Air Pollutants under the Clean Air Act.

The Clean Air Act defines "air pollutant" expansively to include "any physical, chemical, biological, radioactive . . . substance or matter which is emitted into or otherwise enters into the ambient air." 42 U.S.C. § 7602(g)(emphasis added). The U.S. Supreme Court recently confirmed in *Massachusetts v. EPA*, 127 S.Ct. 1438 (2007), that greenhouse gases fit within this expansive definition. The Court held that it is "unambiguous" that the "sweeping definition" of air pollutant found in the Act "embraces all airborne compounds of any stripe," including CO2 and other greenhouse gases." *Id*. at 1459-60.

Following up on that decision, on April 17, 2009, EPA issued a draft endangerment finding for carbon dioxide and other greenhouse gases.[14] EPA has now officially declared that carbon dioxide and other greenhouse gases are air pollutants that "may be reasonably anticipated to endanger public health and welfare," as defined under the Clean Air Act. Although CO2 is already regulated under other parts of the Clean Air Act, as explained in detail below, with a final endangerment finding, EPA is obliged to begin the process of regulating global warming pollution from motor vehicles. Clean Air Act Section 202 specifically states that EPA "shall" (*i.e.*, must, not may) regulate pollutants once they are found to endanger public health or welfare.

### 2. CO2 is Currently Regulated Under the Clean Air Act.

In addition to being an "air pollutant," CO2 also qualifies as subject to regulation under the Clean Air Act because it is actually regulated under the Act. In particular, Section 821 of the Clean Air Act Amendments of 1990 required EPA to promulgate regulations to

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[12] *See* Addendum #2, CO2 BACT Analysis for Cash Creek Generating Station, dated December 2008 (attached as Exhibit 6); Hyperion Energy Center, Best Available Control Technology (BACT) Analysis for Emissions of Carbon Dioxide, March 2009 (attached as Exhibit 7).

[13] *See* Draft Statement of Basis, Russell City Energy Center (June 23, 2009), available at http://www.baaqmd.gov/Divisions/Engineering/Public-Notices-on-Permits/2009/062309-15487/Russell-City-Energy-Center/Draft-Statement-of-Basis/15487-Draft-Statement-of-Basis.aspx

[14] EPA, Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, ("Endangerment finding"), 74 Fed. Reg. 18886 (April 24, 2009) (also available at http://epa.gov/climatechange/endangerment/downloads/GHGEndangermentProposal.pdf).

require certain sources, including coal-fired electric generating stations, to monitor CO2 emissions and report monitoring data to EPA. 42 U.S.C. § 7651k note.

Section 821, and the EPA regulations promulgated jointly pursuant to that section and other CAA sections, plainly make CO2 "subject to regulation" under the Clean Air Act. The U.S. Supreme Court has found recordkeeping and reporting requirements to constitute regulation in other contexts. *Buckley v. Am. Constitutional Law Found., Inc.*, 525 U.S. 182, 204 (1999) (holding that compelled reporting of ballot initiative petition circulators' names was impermissible regulation of speech and association rights); *Riley v. Nat'l Fed'n of the Blind, Inc.,* 487 U.S. 781, 798-99 (1988) (compelled reporting of professional fundraiser status is impermissible regulation of speech); *Buckley v. Valeo*, 424 U.S.1, 66-68 (1976) (evaluating recordkeeping, reporting, and disclosure requirements as regulation of political speech). Therefore, by requiring "regulation" of CO2 in Section 821, Congress clearly made CO2 "subject to regulation" for purposes of the Act's Section 165 BACT provisions. Enforcement of Section 821 is accomplished through the enforcement mechanism in the Act, 42 U.S.C. §§ 7413(a)(4), (b)(2), 7604(a)(1), and a violator is subject to the penalty provisions of the Act. 42 U.S.C. § 7651k(e).

### 3. CO2 Is Regulated Under The Act Through Part 75.

In 1993, EPA made CO2 further subject to regulation under the CAA by promulgating regulations at 40 C.F.R. Part 75. Those regulations generally require monitoring of carbon dioxide emissions through installation, certification, operation, and maintenance of a continuous emission monitoring system or an alternative method, 40 C.F.R. §§ 75.1(b), 75.10(a)(3); preparation and maintenance of a monitoring plan, 40 C.F.R. § 75.33; maintenance of certain records, 40 C.F.R. § 75.57; and reporting of certain information to EPA, including electronic quarterly reports of carbon dioxide emissions data, 40 C.F.R. §§ 75.60 – 64. Additionally, 40 C.F.R. § 75.5 prohibits operation of an affected source in the absence of compliance with the substantive requirements of Part 75, and provides that a violation of any requirement of Part 75 is a violation of the Clean Air Act. These regulations are located in Title 40, Chapter I, Subchapter C, which makes them "regulation[s] under the Act," according to EPA's only official interpretation. *See* 43 Fed. Reg. 26,388, 26,397 (June 19, 1978); Deseret, Slip Op. at 41 (holding that the fact that $CO_2$ is regulated by rules contained in 40 C.F.R. Subchapter C "augers in favor" of a conclusion that $CO_2$ is "subject to regulation under the Act," based on EPA's official interpretation in its 1978 rulemaking).

Furthermore, EPA has identified the CO2 monitoring and reporting requirements in Part 75 as applicable Clean Air Act requirements that must be incorporated into Title V operating permits. 40 C.F.R. § 71.2. Numerous states, including Illinois, Wisconsin, Indiana, and Michigan have included CO2 monitoring, record keeping, and reporting requirements in Title V permits. EPA has also enforced these CO2 monitoring regulations under the Clean Air Act on a number of occasions.[15] It is, therefore, undeniable that CO2 is subject to regulation under the Clean Air Act.

[15] *See, e.g., In re City of Detroit, Dept. of Public Lighting, Mistersky Power Station,* Docket No. CAA_05-

### 4. Greenhouse Gases Are Regulated Under The Act Through The NSPS Standard for Landfill Gases.

In addition to section 821 of the Act, and its implementing regulatory requirements, greenhouse gases such as CO2 and methane are also regulated as a component of landfill gases. EPA also promulgated emission standards for municipal solid waste (MSW) landfill emissions in Subchapter C. 40 C.F.R. §§ 60.33c, 60.752. "MSW landfill emissions" are defined as "gas generated by the decomposition of organic waste deposited in an MSW landfill or derived from the evolution of organic compounds in the waste." 40 C.F.R. § 60.751. EPA has specifically identified $CO_2$ as one of the components of the regulated "MSW landfill emissions." *See* Air Emissions from Municipal Solid Waste Landfills – Background Information for Final Standards and Guidelines, U.S. EPA, EPA-453/R-94-021 (Dec. 1995) (explaining "MSW landfill emissions, or [landfill gas], is composed of methane, $CO_2$, and NMOC.").[16] Thus, $CO_2$ is regulated through the landfill emission regulations at 40 C.F.R. Part 60 Subparts Cc, WWW. *See also* 56 Fed. Reg. 24468 (May 30, 1991) ("Today's notice designates air emissions from MSW landfills, hereafter referred to as 'MSW landfill emissions,' as the air pollutant to be controlled").

Greenhouse gas emissions-- including $CO_2$—were central to the landfill NSPS. The NSPS Rule was designed, in part, to control emissions of the trace amounts of non-methane organic compounds in the gas. When EPA issued its final rule requiring control of landfill gas emissions—consisting almost entirely of two greenhouse gases, including $CO_2$, and only traces of other compound—it was doing so based on the agency's determination that the emissions "contribute[] to global climate change." In fact, based on quantities of gas, the rule can best be described as a limit on $CO_2$ and methane and secondarily a limit on other constituents of landfill gas. Landfill gas emissions contain approximately 50% methane, 50% carbon dioxide, and less than 1% non-methane organic compounds. In a background technical document for that regulatory process, EPA, as early as March 1991, acknowledged that air emissions of greenhouse gases, including carbon dioxide and methane "contribut[ed] to the phenomenon of global warming," and that the "global warming effects" of those emissions posed "potential adverse health and welfare effects." *See* Exhibit 10 at 2-15. EPA noted that while, at the time, there was uncertainty as to the timing and ultimate magnitude of global warming, there was already a "strong scientific agreement" that the increasing emissions of greenhouse gases "will lead to temperature increases" and that efforts were underway to develop control options. One of the specific justifications that EPA articulated for adopting the Rule (particularly at the level of stringency chosen) was to limit emissions of methane to avoid global warming impacts. *See* 56 Fed. Reg. 24468, 24481 (March 12, 1996) ("[i]n considering which alternative to propose as BDT, EPA decided to consider both NMOC's and methane reductions"); 61 Fed. Reg. 9905, 9906 ("Briefly, specific health and welfare effects from [landfill gas] emissions

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2004-0027, Consent Agreement and Final Order ¶ 7 (May 10, 2004) (attached as Exhibit 8); *In re Indiana Mun. Power Agency*, Docket No.CAA-05-2000-0016, Compl. ¶¶ 5, 14-15, 34-37 (attached as Exhibit 9).

[16] *Available at* http://www.epa.gov/ttn/atw/landfill/landflpg.html.

are as follows . . . methane emissions . . . contribute to global climate change as a major greenhouse gas"); *id*. at 9914 (anticipated "methane reductions . . . are also an important part of the total carbon reductions identified under the Administration's 1993 Climate Change Action Plan"). EPA further noted in the preamble to the final rule that "[c]arbon dioxide is also an important greenhouse gas contributing to climate change," and quantified the benefits of the rule based on "equivalent reduction in $CO_2$." 56 Fed. Reg. at 24472 (stating that "1.1 to 2.0 billion trees would need to be planted . . .to achieve an equivalent reduction in $CO_2$ as achieved by today's proposal"). Clearly, then, global warming impacts of landfill gas emissions were central to the NSPS standards. The NSPS standard for landfill gases includes numerous steps and requirements to reduce emissions of methane and CO2. As such, under any reasonable interpretation of "regulated," these pollutants are regulated under the Clean Air Act and a BACT limit is required.

### 5. CO2 is regulated under the Act Through Approval of Delaware's SIP Limits on CO2 Emissions Into Part 52 Under the Act.

Further still, even if IEPA were to give an incredibly restrictive interpretation to the Clean Air Act, CO2 is still subject to regulation under the Act through EPA's recent approval of amendments adding various CO2 regulations to the SIP for the state of Delaware. 73 Fed. Reg. 23,101 (April 29, 2008); 40 C.F.R. § 52.420(c). EPA determined that the submission satisfied the requirements under CAA § 110(a), and published notice of its approval of the SIP revision in the Federal Register on March 5, 2008. 73 Fed. Reg. 11845. EPA allowed for public comment and, on April 29, 2008, EPA published notice of its Final Rule approving the SIP revision, effective May 29, 2008, in the Federal Register. 73 Fed. Reg. 23101 (April 29, 2008). Both the proposed and final rule notices state that EPA's approval of Delaware's Regulation 1144 was "under" and "in accordance with the Clean Air Act." 73 Fed. Reg. at 11845; 73 Fed. Reg. at 23101.

The Delaware SIP amendments establish CO2 emission limits and operating requirements, record keeping and reporting requirements, and CO2 emissions certification, compliance, and enforcement obligations for new and existing stationary electric generators. Del. Admin. Code 7 1000 1144. The approved Delaware SIP limits emissions of CO2 from certain electric generators to the following rates:

| | |
|---|---|
| **Existing Distributed Generators** | 1,900 lbs/MWh |
| **New Distributed Generators** | 1,900 lbs/MWh (if installed between effective date and 1/1/2012)<br>1,650 lbs/MWh (if installed on or after 1/1/2012) |
| **New Distributed Generators that use Waste, landfill or digester gases** | 1,900 lbs/MWh |

Delaware Department of Natural Resources and Environmental Control, Division of Air and Waste Management, Air Quality Management Section, Regulation No. 1144 § 3.2.1 – 3.2.2.

In adopting Delaware Regulation 1144 into Subchapter C, EPA was clear that it was adopting limits on $CO_2$ emissions under the Clean Air Act:

> Regulation No. 1144 contains provisions to control the emissions of nitrogen oxides (NOx), nonmethane hydrocarbons (NMHC), particulate matter (PM), sulfur dioxide (SO2), carbon monoxide (CO), *and carbon dioxide (CO2)* from stationary generators in the State of Delaware.
>
> Regulation No. 1144 establishes emission standards in pounds per megawatt-hour (lbs/MWh) of electricity output under full load design conditions or at the total load conditions specified by the applicable testing methods.
>
> …
>
> **CONCLUSIONS AND RECOMMENDED AGENCY ACTION:**
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> Regulation No. 1144 adopted by the State of Delaware will result in the control of NOx, NMHC, PM, SO2, CO*, and CO2 emissions from stationary generators* and will help the State in attaining compliance with the 8-hour ozone NAAQS. EPA approval of the SIP revision is recommended.

Memorandum from Rose Quinto, Environmental Engineer Air Quality Planning Branch, U.S. EPA Region 3, Re: Technical Support Document - Delaware; Regulation No. 1144 – Control of Stationary Generator Emissions (January 25, 2008) (emphasis added), attached as Exhibit 11

EPA's approval was made "in accordance with the Clean Air Act," 73 Fed. Reg. 23,101, and by approving inclusion of these provisions into Delaware's SIP, the agency confirmed that CO2 is "subject to regulation" under the Act, as SIPs are developed pursuant to Sections 110 and 113 of the Act, 42 U.S.C. §§ 7410, 7413, and become federally enforceable parts of federal law upon approval. *El Comite Para El Bienestar de Earlimart v. Warmerdam*, 539 F.3d 1062, 1066 (9th Cir. 2008); *Espinosa v. Roswell Tower, Inc.*, 32 F.3d 491, 492 (10th Cir. 1994); *Her Majesty the Queen in Right of the Province of Ontario v. City of Detroit*, 874 F.2d 332, 335 (6th Cir. 1989). As such, the Delaware SIP approval also demonstrates that CO2 is subject to regulation under the Clean Air Act for purposes of triggering the BACT requirements.[17]

[17] U.S. EPA letter to Clerk of the Board regarding In re Deseret and Delaware SIP approval, September 9, 2008 (attached as Exhibit 12).

### 6. IEPA cannot rely on the Johnson Memo.

As noted above, the U.S. EPA recently granted a petition for reconsideration of former Administrator Stephen Johnson's memorandum of December 18, 2008, (the "Johnson memo") which purported to establish that greenhouse gases are not subject to regulation under the Act for purposes of the PSD program. *See* Letter from Lisa Jackson to David Bookbinder (February 16, 2009) (attached as exhibit 13). In that grant, Administrator Jackson warned "PSD permitting authorities" like IEPA that they "should not assume that the [Johnson] memorandum is the final word on the appropriate interpretation of Clean Air Act requirements." *Id*. Further still, the Johnson Memo is also being challenged in a federal court appeal. The Johnson Memo will almost certainly be reversed by the courts or withdrawn by the Obama Administration, and the IEPA should not and cannot rely on it.

### 7. Congress' 2008 Appropriations Legislation Further Demonstrates that CO2 is Currently Regulated under the Clean Air Act.

In the Fiscal Year 2008 Consolidated Appropriations Act, Congress specifically required EPA to undertake rulemaking to establish monitoring and reporting requirements for all greenhouse gases (including CO2), economy wide. H.R. 2764; Public Law 110–161, at 285 (enacted Dec. 26, 2007). Congress made clear that the agency is "to use its existing authority under the Clean Air Act" including "existing reporting requirements for electric generating units under section 821 of the Clean Air Act" in adopting these regulations.[18] This action by Congress not only confirms that section 821 is part of the Clean Air Act, but also establishes a separate and distinct statutory obligation to regulate CO2 through mandatory emission monitoring requirements under the Act. In fact, the EPA's regulatory obligations under the Appropriations Act are much broader than the agency's duties under section 821 as the Appropriations Act requires *economy wide* reporting. Such requirements are further evidence that CO2 is actually regulated under the Clean Air Act.

### 8. CO2 Is Regulated Under The Act Through EPA's Approval of California's Greenhouse Gas Emission Standards for Vehicles Pursuant to Section 209 of the Act.

On July 8, 2009, EPA published final notice of its approval of numerous states and air districts' (in total 13 states and the District of Columbia) regulation of greenhouse gases through section 209(b)[19] of the Act. 74 Fed. Reg. 32,744. The California standards

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[18] Conference Report for the Consolidated Appropriations Act, at 1254, at http://www.epa.gov/climatechange/emissions/ghgrulemaking.html.

[19] Section 209(b), 42 U.S.C. § 7543(b), provides:

> **(b) Waiver**
>
> **(1)** The Administrator shall, after notice and opportunity for public hearing, waive application of this section to any State which has adopted standards (other than crankcase

approved by EPA include emission limits for four greenhouse gases: CO2, methane (CH4), nitrous oxide (N2O), and hydrofluorocarbons (HFCs). Id. at 32,746. While EPA elected not to address whether its decision resulted in CO2 and other greenhouse gases being "subject to regulation" under the Act for purposes of PSD, and left that decision to another forum, id. at 32,783, this is that other forum. There is no other interpretation of EPA's decision but that it resulted in the four greenhouse gases at issue (CO2, CH4, N2O and HFCs) being regulated under the Act and subject to PSD permitting. Therefore, emissions of these pollutants, in any amounts, from the VCM facility requires a BACT limit for each.

### 9. Greenhouse Gases are also "Subject to Regulation Under the Act."

Carbon dioxide is already regulated under the Clean Air Act for the many reasons explained above. Additionally, it is clear that all greenhouse gases are subject to regulation under the Clean Air Act. "Subject to regulation" means "capable of being regulated" and is not limited to pollutants that are "currently regulated." Federal regulations define "regulated NSR pollutants" to include not only air pollutants for which there are NAAQS under Section 109 of the Act, standards of performance for new sources under Section 111 of the Act, or standards under or established by Title VI of the Act (relating to acid deposition control), but also "[a]ny pollutant that is otherwise subject to regulation under the Act." 40 C.F.R. §§ 52.21(b)(50) & 51.166(b)(49).

The EPA's recent endangerment finding irrefutably shows that greenhouse gases are subject to regulation under the Act. The EPA specifically states that it is developing standards for greenhouse gas emissions from motor vehicles and the standard will be issued for public comment in a few months. Endangerment finding p. 23-24. The endangerment finding concludes that greenhouse gases in the atmosphere threaten the

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emission standards) for the control of emissions from new motor vehicles or new motor vehicle engines prior to March 30, 1966, if the State determines that the State standards will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards. No such waiver shall be granted if the Administrator finds that—

**(A)** the determination of the State is arbitrary and capricious,

**(B)** such State does not need such State standards to meet compelling and extraordinary conditions, or

**(C)** such State standards and accompanying enforcement procedures are not consistent with section 7521 (a) of this title.

**(2)** If each State standard is at least as stringent as the comparable applicable Federal standard, such State standard shall be deemed to be at least as protective of health and welfare as such Federal standards for purposes of paragraph (1).

**(3)** In the case of any new motor vehicle or new motor vehicle engine to which State standards apply pursuant to a waiver granted under paragraph (1), compliance with such State standards shall be treated as compliance with applicable Federal standards for purposes of this subchapter.

public health and welfare of current and future generations and that greenhouse gas emissions from motor vehicles contribute to the atmospheric concentrations of these key greenhouse gases and hence to the threat of climate change. Once these findings are finalized, the EPA has a mandatory legal duty to regulate greenhouse gas emissions from motor vehicles. *Mass. v.* EPA, 549 U.S. at 533. Section 202 of the Clean Air Act requires that the EPA Administrator "shall" proscribe regulations for pollutants that may endanger health or welfare. Thus, not only are greenhouse gases clearly subject to regulation, the regulatory process is in motion for further regulations of greenhouse gases under the Act.

Because BACT requirements extend to pollutants that are "subject to regulation under the Act" rather than to only those that are actually regulated, Illinois need not and, in fact, cannot wait until the U.S. EPA actually promulgates further regulations. Instead, the IEPA must include GHG BACT limits for the Proposed Coal Plant. Given the well known actual and potential adverse impacts of GHG emissions, and the widely acknowledged need to reduce and control such emissions, it would be nonsensical to allow a major new source of GHGs to slip in under the wire and avoid regulation.

### 10. CO2 Is Regulated Under 35 Ill. Admin. Code § 201.141, Which Is Incorporated Into the Illinois SIP.

CO2 is currently subject to regulation under the Clean Air Act because 35 Ill. Admin. Code § 201.141 prohibits emissions of CO2 that cause "air pollution." "Air pollution" is "the presence in the atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, to health." 35 Ill. Admin. Code § 201.102. The definition of air pollution is self implementing and does not require pollutant-specific standards or regulations to be adopted first. *See e.g., Fleishmann Malting Co. v. Ill. Pollution Control Bd*., 329 N.E.2d 282, 285 (Ct. App. 5th Dist. 1975) (and collected cases).

Based on EPA's endangerment finding, the work of the IPCC, and numerous respected scientific bodies, there is no question that CO2 emissions are causing global warming and will continue to do so until abated, and that global warming is injurious to human, plant and animal life. *See* discussion, infra. Therefore, uncontrolled CO2 emissions cause air pollution and are prohibited, to the extent they contribute to deleterious air pollution through global warming, by 35 Ill. Admin. Code § 201.141. That section is included in the Illinois SIP, which is part of 40 C.F.R. Chapter I, Subchapter C. In short, CO2 is subject to regulation under the Clean Air Act and a BACT limit is required of VCM before a PSD permit can issue.

### 11. Illinois Has the Authority Under Section 165 of the Clean Air Act and State Air Pollution Laws to Impose BACT or Stricter Limits on Greenhouse Gas Emissions From the Proposed Coal Plant.

In addition to being *required* by the Clean Air Act to impose BACT limits on greenhouse gas emissions from the proposed Power Holdings facility, the IEPA is

authorized to take steps to avoid or minimize such GHG emissions, including the authority to require a BACT analysis and BACT-level emission limits and/or GHG offsets. One source of such authority is Section 165(a)(2) of the Clean Air Act. Section 165(a)(2) grants a permitting authority broad discretion to impose permit conditions beyond the baseline requirements of BACT in order to protect air quality. *In re Prairie State Generating Co.*, PSD Appeal No. 05-05, slip op. at 40 (E.A.B. 2006), *quoting NSR Manual* at B.13. Thus, the IEPA could and should elect to approve a PSD permit only where the permit requires construction of a plant that fully incorporates all available measures for reducing GHGs, adopts appropriate GHG-related emission limits, and/or imposes GHG offset requirements. Under Section 165(a)(2), IEPA should consider such additional permit conditions on its own. *Id*.

In addition, the BACT provisions themselves, 42 U.S.C. § 7479(3), authorize a state permitting agency to take steps to protect air quality that go beyond the bare minimum requirements of BACT.

EPA has also recognized that "a PSD permitting authority still has an obligation under section 165(a)(2) to consider and respond to relevant public comments on alternatives to the source," and that a "PSD permitting authority has discretion under the Clean Air Act to modify the PSD permit based on comments raising alternatives or other appropriate considerations." Brief of the EPA Office of Air and Radiation and Region V, *In re Prairie State*, PSD Appeal 05-05, 12 E.A.D. 176 (EAB, Aug. 24, 2006). Here, these comments expressly require IEPA to fulfill this duty. Moreover, the EAB has made clear that a permitting authority has discretion to modify a permit based on consideration of "alternatives," whether or not the commenters raise the issues:

> Indeed, the permit issuer is not required to wait until an "alternative" is suggested in the public comments before the permit issuer may exercise the discretion to consider the alternative. Instead, the permit issuer may identify an alternative on its own. This interpretation of the authority conferred by CAA section 165(a)(2)'s reference to "alternatives" is consistent with the Agency's longstanding policy that, . . . "this is an aspect of the PSD permitting process in which states have the discretion to engage in a broader analysis if they so desire."

*See In re Prairie State*, PSD Appeal 05-05 (Aug. 24, 2006) (quoting the NSR Workshop Manual at B.13).

In fact, under this authority, a permitting authority can engage in a wide-ranging exploration of options. Under this authority the IEPA clearly has the discretion to require specific evaluation and control of carbon dioxide emissions, and/or to require other action to mitigate potential global warming impacts. Failure to do so in this case is a material breach of the agency's obligations to the people of Illinois and the United States.

To date, there has been no specific assessment of available measures or options to reduce the expected greenhouse gas emissions from the proposed VCM facility. The IEPA must consider and could require any number of possible actions to address the carbon dioxide footprint of the proposed plant. Options include requiring construction of a more efficient facility, use of biomass fuel stock, use of a less polluting fuel to run plant processes, and requiring the purchase of carbon dioxide offsets, or some combination of these approaches or others. Offsets can be an essential component of reducing carbon dioxide emissions because they can be implemented quickly for a relatively low cost, such as programs to increase the energy efficiency in buildings, factories, or transportation, generating electricity from renewable energy sources like wind or solar, shutting down older and less efficient power plants, and capturing carbon dioxide in forests and agricultural soils. An advantage of offsets is that they often result in other environmental, social, and economic co-benefits such as reductions in other dangerous pollutants, restoration of degraded lands, improvement in watersheds and water quality, creation of jobs and lower prices for electricity and gasoline.

Additionally, under § 165(a)(2) of the Act, IEPA must consider the "no-build" option, whereby IEPA would deny the PSD permit based on policy considerations related to carbon dioxide and other harmful emissions.

Accordingly, even assuming that IEPA could lawfully issue a PSD permit for the VCM facility without establishing BACT limits for GHGs, the agency has the duty and authority under Section 165 of the Clean Air Act to require GHG emission limits, application of all measures and technologies available to reduce GHG emissions, impose GHG offset measures, and any other appropriate alternatives and options in order to avoid or minimize the GHG emissions from the plants.

### D. IEPA May Not Increase Emissions of Global Warming Under Illinois's Ambient Air Standard for CO2.

IEPA is prohibited from granting this permit without mitigating the global warming impacts because it would allow the project proponent to emit carbon dioxide and other greenhouse gases such as nitrous oxide in such quantities that would cause or tend to cause air pollution. The State Implementation Plan states: "[N]o person shall cause or threaten or allow the discharge or emission of any contaminant into the environment in any State so as, either alone or in combination with other sources, to cause or tend to cause air pollution in Illinois." 35 Ill. Admin. Code § 201.141.

The term "air pollution" is further defined to mean "the presence in the atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, to health." 35 Ill. Admin. Code § 201.102.

Greenhouse gases plainly fit within this definition of air pollution and adding more global warming pollution will accelerate global warming and cause further harm human,

plant and animal life. The earth is already beyond safe levels of greenhouse gases in the atmosphere, and adverse impacts are beginning and will continue as a result.

### 1. GHG Emissions Threaten Human Health and the Environment.

The Intergovernmental Panel on Climate Change[20] ("IPCC") found that total GHG emissions have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.[21] Of primary concern is Carbon Dioxide ("CO2"), which is emitted in much larger quantities than any of the other greenhouse gases and is responsible for close to 85% of the total U.S. GHG inventory.[22] CO2 emissions have grown between 1970 and 2004 by about 80% (28% between 1990 and 2004).[23] In 2006, U.S. fossil fuel combustion produced 5,637.9 metric tons of carbon dioxide, and emissions from coal alone used in electricity generation accounted for over 2,000 million metric tons of CO2 in 2006. [24] Indeed, coal is the largest contributor to anthropogenic CO2 increases into the atmosphere.[25]

Atmospheric CO2 concentrations are reaching dangerous and unprecedented levels.[26] The global atmospheric concentration of CO2 has increased from a pre-industrial value of about 280 parts per million (ppm) to 379 ppm, in 2005. The Atmospheric concentration of CO2 in 2005 exceeds by far the natural range over the last 650,000 years (180-300 ppm) as determined from ice cores.[27] In fact, CO2 levels are far outside their range of the past 800,000 years for which ice core records of atmospheric composition are

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[20] The IPCC is perhaps the leading source of research and data regarding climate change, its causes, and its impacts. The IPCC is charged with comprehensively and objectively assessing the scientific, technical and socio-economic information relevant to human-induced climate change, its potential impacts, and options for adaptation and mitigation. The IPCC has released four assessments – in 1990, 1995, 2001, and 2007 – so far, each one stating with greater confidence than the one before that the climate change situation has become increasingly dire.

[21] Exhibit 14, IPCC Working Group III, Climate Change 2007: Mitigation, Summary for Policy Makers ("IPCC Working Group III Report") at ES-3.

[22] Exhibit 15, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006, EPA #430-R-08-005, April 2008, ("EPA Inventory 1990-2006") at ES-4, Figure ES-4.

[23] Exhibit 14, IPCC Working Group III Report at ES-3.

[24] Exhibit 15, EPA Inventory 1990-2006 at ES-5, 7; Exhibit 19.2, EPA Inventory 1990-2006, at A-3. This report expresses these figures as teragrams of CO2 equivalent (TgCO2). One teragram is equal to one million metric tons.

[25] Exhibit 16, "Dr. James E. Hansen Direct Testimony," In re Interstate Power and Light Company, before the Iowa Utilities Board, Docket No. GCU-07-01 ("Hansen Testimony"), at 3. Dr. Hansen is Director of the Goddard Institute for Space Studies. A trained physicist and astronomer, Mr. Hansen has focused on climate and global change for about twenty-five years.

[26] Exhibit 16, Hansen Testimony at 3.

[27] Exhibit 17, IPCC Working Group I, Climate Change 2007: The Physical Science Basis, Summary for Policymakers ("IPCC Working Group I Report") at ES-2.

available.[28] As further reference, fossil fuels burned now by humans in one year contain the amount of carbon buried in organic sediments in approximately 100,000 years.[29]

Evidence shows emissions rates continue to rise. A recent study found that from 2000 to 2006, the average emissions growth rate was 3.3% per year, compared to 1.3% per year during the 1990s.[30] The U.S. E.P.A. found that total U.S. emissions have risen by 14.7 percent from 1990-2006.[31] According to one expert, "The world is already at or above the worst case scenarios…. In terms of emissions, we are moving past the most pessimistic estimates of the I.P.C.C. and by some estimates we are above that red line."[32] Looking forward, the International Energy Agency ("IEA") estimates a 57% jump in CO2 emissions between 2005 and 2030, with the U.S., China, Russia and India contributing two-thirds to this increase.[33]

The sheer volume of CO2 in the air diminishes our planet's ability to process the amount of CO2 that humans unleash into the atmosphere. The earth is able to ingest atmospheric CO2, but only to a certain point. Commonly referred to as "carbon sinks," oceans and forests absorb CO2 from the atmosphere. Human sources of CO2, such as power plant emissions, have disrupted this carbon cycle: the ocean's uptake of CO2 slows as its CO2 concentrations increase, and in some cases oceans are reaching their saturation points.[34] Once the saturation point is reached, a carbon sink is no longer able to absorb carbon emissions and it may actually begin releasing excess carbon into the atmosphere. For example, one study, published in May 2007, shows that the Southern Ocean—which accounts for 15% of Earth's carbon sinks—has gradually slowed in its ability to absorb carbon dioxide from the atmosphere since 1990.[35] Another study suggests that a similar reduction in oceanic absorption of carbon dioxide has occurred in the northern Atlantic

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[28] Exhibit 16, Hansen Testimony at 21.

[29] Id. at 25.

[30] Exhibit 23, Canadell, J.G., C.L. Quere, M.R. Raupach, C.B. Field, E.T. Buitehuis, P. Ciais, T.J. Conway, N.P. Gillett, R.A. Houghton, and G. Marland, "Contributions to accelerating atmospheric CO2 growth from economic activity, carbon intensity, and efficiency of natural sinks," Proc. Natl. Acad. Sci. USA, doi 10.1073, 2007.

[31] Exhibit 15, EPA Inventory 1990-2006 at ES-3.

[32] Elizabeth Rosenthal, "U.N. Report Describes Risks of Inaction on Climate Changes," The New York Times, November 17, 2007, online at: http://www.nytimes.com/2007/11/17/science/earth/17climate.html?pagewanted=1&ei=5070&en=89a5dc9c06ef997d&ex=1195966800.

[33] International Energy Agency, World Energy Outlook 2007, China and India Insights, ("IEA World Energy Outlook 2007") at Executive Summary 11.

[34] Exhibit 16, Hansen Testimony at 49; Exhibit 26, Le Quere, C., C. Rodenbeck, E.T. Buitenhuis, T.J. Conway, R. Langenfelds, A. Gomez, C. Labuschagne, M. Ramonet, T. Nakazawa, N. Metzl, N. Gillett, and M. Heimann, "Saturation of the Southern Ocean CO2 sink due to recent climate change," *Science*, 316 (5832), 1735-1738, 2007.

[35] Le Quere, C., et.al., "Saturation of the Southern Ocean CO2 sink due to recent climate change," *Science*, 316 (5832), 1735-1738, 2007.

Ocean.[36] The inevitable result of such carbon cycle disruption is the dominance of CO2 in the atmosphere, which is creating and will continue to wreak catastrophic consequences for humans and other species.[37]

Rising atmospheric CO2 concentrations is a leading cause of global warming.[38] In fact, the IPCC reports CO2 as the most influential factor contributing to global warming.[39] Based on more than 29,000 observational data series, from 75 studies, the IPCC has concluded that "Warming of the climate system is unequivocal."[40] The IPCC reports the temperature increase since the 1950s is very likely due to the increase in human caused GHG pollution, and cannot be due to natural causes alone. [41] Put another way, as NASA scientist explained, when discussing warming in Antarctica, "It's extremely difficult to think of any physical way" the increase in greenhouse gases could *not* lead to global warming.[42]

The IPCC measured direct indicators of climate change, including global average air and ocean temperatures, ice and snow melt patterns, rising sea levels, changes in arctic temperatures, ocean salinity, and wind patterns, and incidence of extreme weather events. The following are among the reports' more alarming conclusions:

- Eleven of the last twelve years (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850).[43]

- Total temperature increase from 1850-1899 to 2001-2005 is .76 degrees C.

- The average atmospheric water vapor content has increased since at least the 1980s over land and ocean as well as in the upper troposphere. The increase is broadly consistent with the extra water vapor that warmer air can hold.

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[36] Schuster, U., and A.J. Watson, "A variable and decreasing sink for atmospheric CO2 in the North Atlantic," *J. Geophysical Res.*, 112, C11006, doi:10.1029/2006JC003941, 2007

[37] Exhibit 16, Hansen Testimony at 31.

[38] IPCC Working Group I Report at ES-3-4, Figure SPM.2; Exhibit 25, IEA World Energy Outlook, 2007, at Executive Summary 11; *See also* Exhibit 16, Hansen Testimony at 3.

[39] IPCC Working Group I Report at ES-2-4, Figure SPM.2. A factor's radiative forcing is the influence the factor has on tending to warm or cool the planet.

[40] Id, at ES-5.

[41] Id. at ES-10

[42] Kenneth Chang, "Study Finds New Evidence of Warming in Antarctica," The New York Times, January 22, 2009, online at http://www.nytimes.com/2009/01/22/science/earth/22climate.html?sq=antarctic%20is%20warming&st=cse&scp=1&pagewanted=print

[43] *See also,* National Oceanic and Atmospheric Administration, National Climatic Data Center 2006 Annual Report at ii ("Multiple paleoclimatic studies indicate that recent years, the 1990s, and the 20th century are all the warmest, on a global basis, of at least the last 1000 years.").

- Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1300 years.

- Glacial lakes are growing in number and size, permafrost regions are experiencing ground instability and hydrological systems suffer from increased runoff and earlier spring peak discharge, effecting the thermal structure and water quality of glacier-fed lakes and rivers.

- Global average sea level rose at an average rate of 1.8 mm per year between 1961 and 2003. The rate was faster over 1993-2003, about 3.1 mm per year.

- Average arctic temperatures increased at almost twice the global average rate in the past 100 years.

- Satellite data since 1978 show that annual average arctic sea ice extent has shrunk by 2.7% per decade.

- Temperatures at the top of the permafrost layer have generally increased since the 1980s in the Arctic by up to 3 degrees C. The maximum area covered by seasonally frozen ground has decreased by about 7% in the Northern Hemisphere since 1900.

- Increased precipitation and increased drying has been observed in different global regions.

- Changes in precipitation and evaporation over the oceans have increased ocean salinity in low-latitude waters and decreased salinity in high-latitude waters.

- The uptake of anthropogenic carbon since 1750 has led to the ocean becoming more acidic with an average decrease in pH of .1 units.

- Mid-latitude westerly winds have strengthened in both hemispheres since the 1960s.

- More intense and longer droughts have been observed over wider areas since the 1970s.

- In the past 50 years, cold days, cold nights and frost have become less frequent, while hot days, hot nights and heat waves have become more frequent.

- There is observational evidence for an increase in intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures.

In light of these findings, climate scientists urge immediate action to curtail CO2 and other GHG emissions. Rajendra Pachauri, and IPCC scientist and economist asserts, "If there is no action before 2012, that's too late…. What we do in the next two to three years will determine our future. This is the defining moment."[44] Dr. Hansen opines that the single most important action needed to decrease the present planetary imbalance driving climate change is curtailment of CO2 emissions from coal burning.[45]

It is important to note that increasing emissions of $CO_2$ and other greenhouse gases may also be compounding the dangers of climate change by creating self-triggering feedback loops.[46] For example, the melting of Arctic ice, which occurs as the atmosphere warms, can trigger additional warming because ice is more reflective of the Sun's heat than is the land and ocean that replaces the melting ice. In other words, as the planet's surface albedo (or reflectivity) lowers, the planet absorbs more sunlight, leading to further warming. As such, it is possible that increased $CO_2$ emissions will lead to a tipping point beyond which climate change will rapidly accelerate beyond what the scientific models currently predict.

There is no doubt, then, that greenhouse gases (including CO2, N2O and methane) threaten human health and the environment. Indeed, the IEA has warned, "Urgent action is needed if greenhouse-gas concentrations are to be stabilised at a level that would prevent dangerous interference with the climate system." Specifically, the Agency focused on the dangers posed by the increased construction of coal-fired power plants. According to the IEA, "government action must focus on curbing the rapid growth in $CO_2$ emissions from coal-fired power stations – the primary cause of the surge in global emissions in the last few years."[47] Numerous additional scientific studies directly link climate change with significant public health, environmental, economic, and ecological impacts.[48] Such impacts include direct heat-related effects, extreme weather events, climate-sensitive disease impacts, air quality effects, agricultural effects (and related impacts on nutrition), wildlife and habitat impacts, biodiversity impacts, impacts on marine life, property damage, and social disruption (such as population displacement).[49]

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[44] Elisabeth Rosenthal, "U.N. Chief Seeks More Climate Change Leadership," The New York Times, Nov. 18, 2007, online at http://www.nytimes.com/2007/11/18/science/earth/18climatenew.html?ex=1195966800&en=da2bc03ef46b3ee3&ei=5070&emc=eta1

[45] Exhibit 16, Hansen Testimony at 6.

[46] Exhibit 17, IPCC, Climate Change 2007: Synthesis Report: Summary for Policymakers, at 7-8.

[47] IEA World Energy Outlook 2007 at Executive Summary 12.

[48] *See, e.g.,* IPCC Working Group II Report, Climate Change 2007: Impacts, Adaptation, and Vulnerability ("IPCC Working Group II Report"); *see also* Matthias Ruth, *et al*., The US Economic Impacts of Climate Change and the Costs of Inaction, Center for Integrative Environmental Research (Oct. 2007).

[49] EPA, Climate Change, Health and Environmental Effects, available at http://www.epa.gov/climatechange/effects/health.html

The IPCC reports and other studies provide compelling evidence of dramatic changes in Earth's climatic systems. 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.[50]

The IPCC, other agencies and scientists report numerous long-term changes occurring across many different climate sectors. These observed changes applied to scientific modeling and compared against paleoclimatic data yield startling results, first and foremost being that temperature changes of a few degrees can cause large impacts.[51] Most troubling, however, are the secondary consequences arising from seemingly insignificant temperature increases, upon sea level, the Earth's hydrological and biological systems, plant and animal habitats, weather patterns and public health.

Rising temperatures melt large Arctic and Antarctic ice sheets, filling the oceans and raising the sea level. Nasa physicist James Hansen predicts "business-as-usual" growth of GHGs will result in a sea level rise of 1 meter during this century. The IPCC calculated a sea level rise of only 21-51 centimeters by 2095, but that report omitted any calculation due to ice sheet disintegration, because the IPCC was unable to reach a consensus on the magnitude of likely ice sheet disintegration.[52] "The last time the Earth was 2-3 degrees warmer than today, about 3 million years ago, sea level was about 25 meters higher. More than a billion people live within 25 meters above sea level. The last time the planet was 5 degrees warmer, just prior to the glaciation of Antarctica, about 35 million years ago, there were no large ice sheets on the planet. If ice sheets melt entirely, sea level will rise about 70 meters."[53] Sea level is rising about 35 cm per century, which is double the rate of 20 years ago. This data contrasts with historical data, which shows sea level had been relatively stable for the past several millennia.[54] The IPCC estimates that if the Greenland Ice Sheet, which is expected to continue melting, disappears completely, the result would be a 7 meter rise in sea level.[55]

Paleoclimate data has shown a correlation between increased warming and release of methane gas. Methane gases, trapped in ocean sediments and frozen ground, can be

[50] IPCC Working Group I Report at ES-9.

[51] Exhibit 16, Hansen Testimony at 10.

[52] Id. at 16.

[53] Id. at 15.

[54] Id. at 43.

[55] IPCC Working Group I Report at ES-17.

released during periods of melt. [56] Though methane is less prevalent in the atmosphere than is CO2, it is far more effective than CO2 in trapping heat in the atmosphere.[57]

Warmer temperatures are effecting water systems and terrestrial habitats. Increased runoff from melting snow and earlier spring peak discharge not only threatens flooding, but alter the temperature and quality of glacier-fed lakes and rivers.[58] These changes in hydrology, in turn, have consequences upon aquatic plants and animals.[59] Global warming is also triggering spring-time events to occur earlier than normal. Earlier spring and warmer temperatures are forcing some animal species to migrate northward in attempt to stay within their natural climate.[60] Animal species living in polar climates are not so lucky, as their habitats are shrinking with no possibility of moving northward. For example, the U.S. Fish and Wildlife Service has proposed to list the polar bear as a threatened species under the Endangered Species Act because global warming its destroying its critical habitat, Arctic sea ice.[61] Projected changes in future sea ice conditions, if realized, will result in loss of approximately 2/3 of the world's current polar bear population by the mid 21st century. Because the observed trajectory of Arctic sea ice decline appears to be underestimated by currently available models, this assessment of future polar bear status may be conservative.[62] In general, approximately 20-30% of plant and animal species are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5 degrees C to 2.5 degrees C.[63]

In addition to the evolving changes in hydrology and terrestrial climates, our planet has recently experienced and will continue to experience an increase in number and severity of extreme weather events. As global warming increases, the risks associated with catastrophic natural disasters, such as hurricanes, tornados, and tsunamis, also increase.[64]

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[56] Exhibit 16, Hansen Testimony at 37.

[57] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005, EPA #430-R-07-002, April 2007, ("EPA Inventory 1990-2005") at ES-8.

[58] IPCC Working Group II Report at ES-8.

[59] Id.

[60] Id.; Exhibit16, Hansen Testimony at 7.

[61] U.S. Dept of Interior, Fish & Wildlife Service, "12-Month Petition Finding and Proposed Rule To List the Polar Bear (Ursus maritimus) as Threatened Throughout Its Range," 72 Fed. Reg. 1064 (Jan. 9, 2007).

[62] United States Geological Survey, "Science to Inform U.S. Fish & Wildlife Service Decision Making on Polar Bears: Executive Summary," online at http://www.usgs.gov/newsroom/special/polar_bears/docs/executive_summary.pdf.

[63] IPCC Working Group II at ES-11.

[64] See, e.g., Exhibit 18, Emanuel, K., Increasing destructiveness of tropical cyclones over the past 30 years, *Nature*, online publication; published online 31 July 2005 | doi: 10.1038/nature03906 (2005); Exhibit 19, Knutson, T. K., and R. E. Tuleya, 2004: Impact of CO2-induced warming on simulated hurricane intensity and precipitation: Sensitivity to the choice of climate model and convective parameterization. *Journal of Climate*, 17(18), 3477-3495.

One study predicts an 8% to 16% average increase in intensity of hurricanes.[65] Another study predicts similar results for tornadoes and thunderstorms, with the most severe storms occurring more often.[66]

Numerous additional environmental impacts are likely to occur as a result of climate change.[67] These impacts include:

- 10-30% decreases in annual average river runoff and water availability in some dry regions at mid-latitudes and in the dry tropics;
- Declines in water supplies stored in glaciers and snow cover, which approximately one-sixth of the world relies at least in part on for water;
- Decreased snowpack, more winter flooding, and reduced summer river flows in western North America, exacerbating competition for over-allocated water resources;
- Increased drought, coupled with increased heavy precipitation events that augment flood risks;
- Impacts to North American forests from increased pests, droughts, and fires;
- Agricultural disruption from increased droughts and heat, and declining water availability in some areas;
- Widespread coral mortality and negative impacts on their dependent species from increased temperature and acidification of the oceans;
- Loss of coastal wetlands and habitats from rising sea levels.

Public health is closely linked to climate and, therefore, it is not surprising that global climate change is expected to have numerous significant impacts on human health. The U.S. EPA warns:

> Throughout the world, the prevalence of some diseases and other threats to human health depend largely on local climate. Extreme temperatures can lead directly to loss of life, while climate-related disturbances in ecological systems, such as changes in the range of infective parasites, can indirectly

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[65] Exhibit 19, Knutson, T. K., and R. E. Tuleya, 2004: Impact of CO2-induced warming on simulated hurricane intensity and precipitation: Sensitivity to the choice of climate model and convective parameterization. *Journal of Climate*, 17(18), 3477-3495

[66] Exhibit 20, Del Genio, Yao, and Jonas, Geophysical Research Letters, v.34, L16703, doi:10.1029/2007GL030525, 2007.

[67] IPCC Working Group II Report.

impact the incidence of serious infectious diseases. In addition, warm temperatures can increase air and water pollution, which in turn harm human health.[68]

Specificly, human and public health threats from ambient air concentrations of greenhouse gases include:

- Increased heat-related mortalities stemming from dramatic increases in summer heat index values in the Northeast, Southeast, and Midwest;[69]

- Worsening of air quality problems that already impact human health, including increased concentrations of ground-level ozone and particulate matter, exacerbated cardiovascular and pulmonary illnesses, asthma and chronic obstructive pulmonary disorders;[70]

- Increased risk of infectious diseases, including the expansion of the range of malaria and dengue fever, and more favorable conditions for outbreaks of West Nile Virus in the Northeastern U.S.[71]

- Greater casualties from extreme weather events, such as hurricanes, droughts, floods, wildfires and severe storms.[72]

The only reasonable way to address these threats to human health is to address the underlying problem, global warming, as the U.S. public health community is not prepared for multiple, global warming induced, large scale disasters.[73]

Climate change is not limited to arctic regions or people living on the coasts. While global warming is a worldwide phenomenon, the major climate changes associated with

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[68] EPA, Climate Change, Health and Environmental Effects, available at http://www.epa.gov/climatechange/effects/health.html

[69] U.S. Department of State, U.S. Climate Action Report (2002) at 106; *See also,* Patz, "Impact of Regional Climate Change on Human Health," *Nature*, 438, 310-317, *available at* http://www.nature.com/nature/journal/v438/n7066/full/nature04188.html (The World Health Organization estimates climate change causes more than 150,000 deaths annually world-wide, killing a disproportionate amount of children in poor countries.)

[70] Exhibit 21, U.S. Department of State, U.S. Climate Action Report (2002) at 107; U.S. Climate Change Science Program, *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems,* Third Review Draft, at ES-9.

[71] Exhibit 22, EPA, Climate Change, Health and Environmental Effects; Peter C. Frumhoff, *et al*., Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions (July 2007).

[72] U.S. Climate Change Science Program, *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems,* Third Review Draft, at ES-4.

[73] Exhibit 23, "Dr. Kristen Welker-Hood Direct Testimony," In re Interstate Power and Light Company, before the Iowa Utilities Board, Docket No. GCU-07-01, at 5,

global warming – increases in average temperature, and increased incidences of extreme heat, droughts, and heavy rain events – will be experienced throughout Illinois. For example, just a few of the likely impacts of climate change in the Midwest include:[74]

- A 6 to 10 degree increase in average winter temperatures and a 7 to 13 degree increase in average summer temperatures by the end of the century;
- A changing of the climate in to resemble that of northern Arkansas in the summer and southern Ohio in the winter;
- Increased heavy rainstorms and precipitation, yet a drier climate due to increased evaporation from the heat;
- A double or tripling of days in which the temperature exceeds 90 degrees in the Detroit area, and a five to ten fold increase in the number of days in which the temperature exceeds 97 degrees;
- A 1.5 to 8 foot decline in water levels in the Great Lakes and declines in the levels of inland lakes;
- Substantial disruption to agriculture from increased heavy rainstorms, a drier climate, increased heat, and the spread of agricultural pests;
- Disruption of the shipping industry, including the need for costly dredging, as a result of declining Great Lakes water levels; and
- Significant drain on public sector budgets, as infrastructure such as sewers and waste-water treatment plants will have to be upgraded to handle heavy precipitation events, and other areas will have to take steps to deal with droughts.

Additionally, U.S. EPA's endangerment finding agrees with and adds to many of these findings. EPA found, among other things:

> Concentrations of greenhouse gases are at unprecedented levels compared to the recent and distant past. These high atmospheric levels are the unambiguous result of human emissions, and are very likely the cause of the observed increase in average temperatures and other climatic changes. The effects of climate change observed to date and projected to occur in the future—including but not limited to the increased likelihood of more frequent and intense heat waves, more wildfires, degraded air quality, more heavy

[74] National Conference of State Legislatures (Oct. 2008); U.S. Global Climate Change Research Program, *Climate Change Impacts on the United States*, ch. 6 (2001).

downpours and flooding, increased drought, greater sea level rise, more intense storms, harm to water resources, harm to agriculture, and harm to wildlife and ecosystems—are effects on public health and welfare within the meaning of the Clean Air Act.

…

Warming of the climate system is now unequivocal, as is evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.

Global mean surface temperatures have risen by 0.74 □C (1.3 □F) over the last 100 years. Eight of the ten warmest years on record have occurred since 2001. Global mean surface temperature was higher during the last few decades of the 20th century than during any comparable period during the preceding four centuries.

Most 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.

…

Based on the total weight of evidence… it is the Administrator's judgment that current and projected levels of the mix of the six greenhouse gases endanger the public health and welfare of current and future generations.

…

Drought is expected to increase in the western U.S., where water availability to meet demands for agricultural and municipal water needs is already limited. Another projected impact in the western U.S. is decreased water availability due to a range of interconnected factors.

…

Rising sea levels could lead to salt water intrusion of coastal ground aquifers, which would further reduce freshwater availability for municipal and agricultural use among coastal communities that depend on these aquifers.

…

The U.S is projected to see an overall average increase in the intensity of precipitation events, which is likely to increase the risk of flood events, though projections for specific regions are very uncertain.

…

Increases in regional ozone pollution in the U.S. relative to ozone levels without climate change are expected due to higher temperatures and a modification of meteorological factors.

…

The IPCC reports with very high confidence that climate change impacts on human health in U.S. cities will be compounded by population growth and an aging population. The CCSP reports that

climate change has the potential to accentuate the disparities already evident in the American health care systems as many of the expected health effects are likely to fall disproportionately on the poor, the elderly, the disabled, and the uninsured.

Within settlements experiencing climate change stressors, certain parts of the population may be especially vulnerable based on their circumstances. These include the poor, the elderly, the very young, those already in poor health, the disabled, those living alone, those with limited rights and power (such as recent immigrants with limited English skills), and/or indigenous populations dependent on one or a few resources.

…

As heavy rainfall events are expected to become more intense, there is an increased risk of flooding, greater runoff and erosion, and thus the potential for adverse water quality effects. Climate change will likely further constrain already over-allocated water resources in some sections of the U.S., increasing competition among agricultural, municipal, industrial, and ecological uses.

…

In the Great Lakes and major river systems, lower levels are likely to exacerbate challenges relating to water quality, navigation, recreation, hydropower generation, water transfers, and binational relationships. Higher water temperatures, increased precipitation intensity, and longer periods of low flows can exacerbate many forms of water pollution. Decreased water supply and lower water levels are likely to exacerbate challenges relating to navigation in the U.S.

…

Ocean acidification is projected to continue, resulting in the reduced biological production of marine calcifiers, including corals.

…

The Administrator concludes that, in the circumstances presented here, the case for finding that greenhouse gases in the atmosphere endanger public health and welfare is compelling and, indeed, overwhelming. The scientific evidence described here is the product of decades of research by thousands of scientists from the U.S. and around the world. The evidence points ineluctably to the conclusion that climate change is upon us as a result of greenhouse gas emissions, that climatic changes are already occurring that harm our health and welfare, and that the effects will only worsen over time in the absence of regulatory action. The effects of climate change on public health include sickness and death. It is hard to imagine any understanding of public health that would exclude these consequences. The effects on welfare embrace every category of effect described in the Clean Air Act's definition of ''welfare'' and,

> more broadly, virtually every facet of the living world around us. And, according to the scientific evidence relied upon in making this finding, the probability of the consequences is shown to range from likely to virtually certain to occur. This is not a close case in which the magnitude of the harm is small and the probability great, or the magnitude large and the probability small. In both magnitude and probability, climate change is an enormous problem. The greenhouse gases that are responsible for it endanger public health and welfare within the meaning of the Clean Air Act.

74 Fed. Reg. 18886, 18895-96, 18898-904 (April 24, 2009).

Therefore, increases greenhouse gas emissions from the proposed facility here "alone or in combination with other sources" will result in "the presence in the atmosphere of . . . air contaminants in sufficient quantities and of such characteristics and duration as to be injurious . . ." IEPA may not issue a permit that will cause additional injury to human health and the health of animal and plant life. Pursuant to 42 U.S.C. § 7475(a)(3)(A), (C), IEPA cannot issue a PSD permit for the facility unless and until the applicant demonstrates that emissions from the facility will not cause or contribute to air pollution in violation of this SIP-approved standard.

## II. THE DRAFT PERMIT FAILS TO INCLUDE BACT AND SATISFY AIR QUALITY PROTECTIONS FOR PM2.5.

Before IEPA can issue a permit for the VCM facility, it must ensure that: (1) The plant is subject to BACT for each regulated NSR pollutant, 40 C.F.R. § 52.21(j); and (2) The plant will not cause or contribute to any violation of a national ambient air quality standard (NAAQS) or increment, 40 C.F.R. § 52.21(k). *See also* 42 U.S.C. § 7475(a)(3), (4).

The Draft Permit does not include PM2.5 BACT limits, nor does the record contain a top-down BACT analysis specific to PM2.5. Controlling law requires a BACT limit "for each pollutant subject to regulation under the Act that it would have the potential to emit in significant amounts." 40 C.F.R. § 52.21(j)(2). PM2.5 is "a pollutant subject to regulation under the Act" because EPA established a NAAQS for PM2.5 in 1997. 62 Fed. Reg. 38711; 40 C.F.R. § 50.7. Moreover, PM2.5 will be emitted from the new and modified emission sources at the PH plant in a "significant" amount because it will be emitted at 10 tons per year or more, 73 Fed. Reg. at 28,332, and because the plant will have a significant increase in PM2.5 precursors SO2 and NOx. *Id*. at 28,333.

There is no legal or factual basis for IEPA's failure to include a PM2.5 BACT limit for each emission point at the facility. There are no longer any technical reasons prohibiting such limits. Proposed Rule, 72 Fed. Reg. 54,112 (Sept 12, 2007); *see also* 70 Fed. Reg. at 66,043 (recognizing that the "practical difficulties" identified in the Seitz memo "have been resolved in most respects"). EPA withdrew all guidance suggesting that PM10 could be used as a surrogate. 73 Fed. Reg. 28,321 (May 16, 2008). EPA has also stayed the

effectiveness of 40 C.F.R. § 52.21(i)(1)(xi), which purported to allow the limited time use of PM10 as a surrogate for PM2.5. *See* Letter from Administrator Jackson to Paul Cort, Earthjustice (April 24, 2009).

Moreover, there is no legal or factual basis to assume that a PM (or PM10) limit is equivalent to a PM2.5 limit. The EPA's promulgation of PM2.5 NAAQS is premised upon the finding that PM10 and PM2.5 are not equivalent and a PM2.5 standard—rather than merely a PM10 standard—was necessary to protect health and welfare. That finding cannot be effectively undone, by substituting PM10 through a guidance document, based upon administrative expediency. PM2.5 is comprised of a larger faction of condensable particulates than is PM or PM10, and controls for PM and PM10 are not necessarily controls for PM2.5. *See* 73 Fed. Reg. at 28,334; *In re So. Montana Elec. Generation and Transmission Coop., Highwood Gen. Station*, Slip. Op. at 9, 25-30 (Mont.Bd.Envt.Rev. May 30, 2008).

Furthermore, from the SOB it appears that IEPA has not modeled the PM2.5 emissions from the facility to demonstrate that they comply with either the PM2.5 NAAQS or PM2.5 increment (to the extent this is set prior to the final permit), despite U.S. EPA's instructions to do so. 73 Fed. Reg. at 28,336 ("sources will be required to perform [air quality impact] analysis for the PM2.5 NAAQS and, when finalized, PM2.5 increments.").[75] We do note that there was discussion about IEPA about this, and it appears that at one point IEPA was intending to require a full PM2.5 NAAQS analysis. See Exs. 29, 30. Moreover, IEPA has not required, and VCM has not done preconstruction monitoring of ambient PM2.5 concentrations as required before a PSD permit can be issued. 42 U.S.C. § 7475(a)(7), (e); 40 C.F.R. § 52.21(m). This must include condensable PM2.5.

Moreover, regardless of the federal PM2.5 standards, IEPA is prohibited from granting this permit without first determining that the facility will not "cause or threaten or allow the discharge or emission of" PM2.5 "into the environment… so as, either alone or in combination with other sources, to cause or tend to cause air pollution in Illinois." 35 Ill. Admin. Code § 201.141. The term "air pollution" mean "the presence in the atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, to health …." 35 Ill. Admin. Code § 201.102. Notably, there has been no analysis of PM2.5 impacts from the proposed plant. More importantly, it is clear that PM2.5 concentrations below the federal NAAQS, which

[75] *See, e.g.*, Iowa Department of Natural Resources, Dispersion Modeling of PM2.5 Emissions For New Source Review DRAFT Frequently Asked Questions (FAQ) (May 21, 2008), available at www.iowadnr.gov/air/prof/progdev/files/PM25_Modeling_FAQ-draft%20052108.pdf: "when EPA revised the 24-hour PM2.5 NAAQS from 65 to 35 ug/m3 in 2006 it became clear from monitoring data in much of the state that control of PM-10 emissions in the permitting process and modeled or monitored attainment of the PM-10 NAAQS did not always equate to attainment of the PM2.5 NAAQS. It is therefore necessary for the Department to begin reviewing and permitting emissions of direct PM2.5, in addition to PM-10, on a case-by-case basis.") Note that Sierra Club does not allege that the duties to directly control PM2.5 arose upon revision of the NAAQS, but that the differential attainment listings give further support for direct PM2.5 control.

have been remanded to the EPA as insufficient to protect health and the environment[76]), are insufficient to prevent "sufficient quantities… and duration as to be injurious to human, plant, or animal life." In short, merely complying with the remanded federal PM2.5 NAAQS is insufficient to satisfy the Illinois ambient air standard set forth in 35 Ill. Admin. Code § 201.141. Before issuing a PSD permit, IEPA must, first, identify the PM2.5 concentration that will satisfy § 201.141, then determine that emissions from the PH facility "either alone or in combination with other sources" will not exceed that standard. *See* 42 U.S.C. § 7475(a)(3)(A), (C). That has not been done for the proposed PH facility.

Scientific consensus exists that the current PM2.5 NAAQS are not sufficiently protective of public health, especially in areas with populations of older residents and young children. According to the U.S. EPA, the PM2.5 fraction of particulate matter is distinguishable from the coarse fraction, as the smaller particles pose the "largest health risks."[77] In fact, in a 1996 report on the need to revise the PM ambient air quality standards, EPA staff found that the epidemiological data more strongly support fine particles as the surrogate for the fraction of PM most clearly associated with health effects at levels below the standards in place at that time.[78] Disturbingly, PM2.5 has been linked to premature death, in addition to aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions for asthma, emergency room visits, absences from school or work, and restricted activity days), changes in lung function and increased respiratory symptoms, and more subtle indicators of cardiovascular health.[79] U.S EPA also has identified lung cancer deaths, infant mortality and development problems (such as low birth weight in children) as possibly linked to PM2.5.[80]

Children are especially susceptible to the harms from PM2.5. According to the American Academy of Pediatrics, children and infants are among the most susceptible to many air pollutants, including PM2.5. Exposure to high levels of fine particulates impacts the ability of children's lungs to grow.[81] This damage is irreversible, and subjects children to greater risk of respiratory problems as adults. Children also have increased exposure

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[76] *American Farm Bureau Federation v. EPA*, Case No. No. 06-1410, Slip Op. (D.C. Cir. Feb. 24, 2009).

[77] *See* US EPA, "PM2.5 NAAQS Implementation," *available at* http://www.epa.gov/ttnnaaqs/pm/pm25_index.html; see also U.S. EPA Office of Air Quality Planning and Standards, "Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information." Staff Paper (July 1996) ("PM2.5 Staff Paper"), available at http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_1997_sp.html, at V-58 to V-77 (discussing health studies of fine versus coarse particles)

[78] PM2.5 Staff Paper at V-77.

[79] Clean Air Fine Particle Implementation Rule, 72 Fed. Reg. 20586, 20586-20587 (Apr. 25, 2007) (to be codified at 40 C.F.R. Part 51)

[80] *See* National Ambient Air Quality Standards for Particulate Matter, Proposed Rule, 71 Fed. Reg. 2620, 2627 (Jan 17, 2006).

[81] *See* Statement of Katherine M. Shea, MD, MPH, FAAP, On Behalf of the American Academy of Pediatrics, Before the Clean Air Scientific Advisory Committee to the U.S. Environmental Protection Agency, Regarding National Ambient Air Quality Standards for Particulate Matter, available at http://www.cleanairstandards.org/article/2005/04/390

compared with adults because of higher minute ventilation and higher levels of physical activity, and thus face serious health problems from PM2.5 pollution. This susceptibility is evidenced by a recent study of PM2.5 and asthmatic children in Detroit, which emphasizes "the continued need for enforcement of existing standards."[82]

Older adults also are particularly susceptible to PM2.5 because of their weaker lungs and hearts. For example, studies have suggested that serious health effects, such as premature mortality, are greater among older groups of individuals.[83] Older adults also are more likely than younger ones to have preexisting respiratory and/or cardiovascular conditions that become aggravated with exposure to PM2.5.[84]

Fine particle pollution from coal combustion facilities spreads over a wide area, with the majority occurring within a 500-mile radius of a plant[85] and the greatest concentrations seen nearby and within a moderate distance of a coal plant.[86] Numerous studies have linked fine particle pollution from coal plants in particular with the negative health effects described above.[87] For example, one study found PM2.5 pollution from the J.H. Campbell plant (located in West Olive, Michigan, and owned by Consumers Energy) in 2001 alone to be associated with 91-105 premature deaths (from all causes, with 12 due to cancer and 66 due to cardiopulmonary effects), 63 cases of chronic bronchitis, 33 hospital admissions, 24 asthma-related emergency room visits, 17,415 lost days of work, and 2,054 asthma attacks.[88]

Moreover, the costs of PM2.5 are staggering. The serious health impacts and accompanying costs from PM2.5 pollution will burden not only individuals, but also the state through expenditure of public and employer health care dollars, lost productivity, and strains on the education system from missed school days. Luckily, the benefits from control of PM2.5 are significant. For example, a cost-benefit study completed by the U.S. EPA for the agency's recent revision of 24-hour PM2.5 standard showed from $9 billion to $76 billion in health and visibility benefits, compared to a cost of $5.4 billion for achieving the

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[82] *See, e.g*., T. Lewis, et al., Pollution-Associated Changes in Lung Function among Asthmatic Children in Detroit, Environ Health Perspect 113:1068–1075 (2005)

[83] *See*, e.g., 71 Fed. Reg. at 2637.

[84] *Id*.

[85] L Deck (Abt Associates), "Particulate-Related Health Impacts of Emissions in 2001 From 41 Major US Power Plants," Nov. 2002, available at http://www.environmentalintegrity.org/pub80.cfm

[86] See Levy et al, "The Importance of Population Susceptibility for Air Pollution Risk Assessment: A Case Study of Power Plants Near Washington, DC," Environ Health Perspect 110:1253–1260 at 1257 (2002) (Figure 2 showing combined concentration reductions from emissions controls at power plants, in terms of primary PM2.5, secondary PM.25, and total PM2.5.

[87] *See, e.g., id;* J; J Levy et al, Using CALPUFF to Evaluate the impacts of power plant emissions in Illinois: model sensitivity and implications, Atmospheric Environment 36 (2002) 1063–1075; J Levy and J Spengler, Modeling the Benefits of Power Plant Emissions Controls, J. Air & Waste Manage. Assoc. 52:5-18 (2002).

[88] Deck, *infra*, at Table C.

standard.[89] In all, Illinois will benefit greatly from protecting its citizens through stringent control of fine particles from coal plants and major new sources of air pollution.

We note that the U.S. EPA staff and the CASAC have suggested an annual PM2.5 ambient air standard lower than 15 ug/m3. *See* OFFICE OF AIR QUALITY PLANNING AND STANDARDS, U.S. ENVTL. PROT. AGENCY, REVIEW OF THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER: POLICY ASSESSMENT OF SCIENTIFIC AND TECHNICAL INFORMATION (STAFF PAPER) § 5.3.1.1, at 5-7 (2005); Letter from Dr. Rogene Henderson, CASAC, to Administrator Stephen L. Johnson, EPA 3–4 (Mar. 21, 2006) ("Studies described in the PM Staff Paper indicate that short term effects of PM2.5 persist in cities with annual PM2.5 concentrations below [15 µg/m3]"). EPA staff has also recommended a daily PM2.5 standard at the "middle to lower end" of a 25-35 ug/m3 range (i.e., 25-30 ug/m3). STAFF PAPER § 5.3.7, at 5-46; *see also id.* § 5.3.5.1, at 5-32 ("[S]taff continues to believe that an annual standard cannot be expected to offer an adequate margin of safety against the effects of all short-term exposures"). Because some areas have "relatively high annual PM concentrations" but would "rarely" exceed ambient concentrations of 35 µg/m3, it is necessary to limit annual air concentrations below 15 µg/m3 to provide sufficient protection of human health on short term bases. Letter from Dr. Rogene Henderson, CASAC, to Administrator Stephen L. Johnson, EPA at 7 (June 6, 2005). Moreover, there are association between irreversible lung damage in children and long-term exposure to PM2.5 at levels below 15 µg/m3. W. James Gauderman et al., *Association Between Air Pollution and Lung Function Growth in Southern California Children*, 162 AM. J. RESPIRATORY & CRITICAL CARE MED. 1383 (2000). EPA staff has noted that this study indicates a need to limit annual PM2.5 concentrations below 13 µg/m3. *See* STAFF PAPER § 5.3.4.1, at 5-22–23. Moreover, the EPA has noted that short-term studies are relevant to determining the annual air concentrations protective of health and that "the strongest evidence for short-term PM2.5 effects occurs at concentrations near the long-term (e.g., annual) average." *See* Final Rule: National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38,652, 38,676/1 (1997).

Therefore, IEPA must ensure that emissions from the proposed facility will comply with both the NAAQS and increment for PM2.5 (when set), but also with more stringent standards that are necessary to protect human health and welfare to ensure that the plant complies with 35 Ill. Admin. Code § 201.141.

## III. TECHNICAL COMMENTS

### A. IEPA's BACT Analysis is Flawed

#### 1. The BACT Analysis Does Not Correctly Account for Clean Fuels

We note first that there is very little, if any, top-down BACT analysis in the IEPA's Statement of Basis (Project Summary) for this permit. In fact, it consists of nothing more

[89] *See* National Ambient Air Quality Standards for Particulate Matter; Proposed Rule, 71 Fed. Reg. 2620, 2627 (Jan. 17, 2006)

than IEPA's conclusory statements about what BACT controls are. *See* Project Summary at § VII. This does not satisfy IEPA's obligations to provide a sufficient Statement of Basis for public comment.

The entire BACT analysis also omits the necessary consideration of clean fuels. IEPA's SOB does not even mention the use of natural gas, nor even cleaner fuels such as waste biomass, which would provide significant greenhouse gas benefits as compared to the applicant's proposed coal and coke mix. Moreover, natural gas or biomass would results in significant emission reductions of criteria pollutants (including PM and SO2) compared to the applicant's proposed fuels.

VCM has identified natural gas as a technologically feasible control option for SO2.[90] According to its application: "Natural gas can also be used to fire kilns." 2002 Application at 4-12. Therefore, VCM notes that natural gas is technologically feasible and must be considered in step 4 of the top-down BACT analysis. See 2002 Application at p. 4-15. In fact, VCM ranks natural gas as the highest ranked control option, achieving 99.99% reduction in SO2 emissions. Id., see also id. at Table 4-15. This represents only 0.68 tons of SO2/year. Id.[91] Inexplicably, VCM's July 2006 update indicates that natural gas only results in a reduction of 78%. *See* July 2006 Supplemental BACT at 10. There is no basis for this. The 2002 numbers were not updated in the 2006 "Supplement." The 2002 numbers use the uncontrolled sulfur content of natural gas to show a 99.99% reduction, which appears to be correct.

We note that in its Responsiveness Summary for the MGP Ingredients of Illinois permit (attached as Exhibit 24), IEPA attempted to estimate the cost effectiveness of natural gas as a clean fuel. IEPA should do the same analysis for this permit, but must correct the mistakes IEPA made in the MGP Ingredients analysis. Specifically, IEPA must:

- Calculate the average cost effectiveness and not merely the incremental cost effectiveness of using natural gas;
- Calculate average cost effectiveness from a baseline of no control;[92]
- Compare the cost effectiveness of using gas at VCM (in dollars per ton of pollutant reduced) to the cost effectiveness of using gas at other sources in the same category and using natural gas;[93]

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[90] See July 2006 Supplemental BACT at 9. Additionally, Continental Lime Inc., Cricket Mountain Plant in Utah uses natural gas as the basis for BACT for two lime kilns. See Exhibits 25, 26. Arkansas Lime Company uses natural gas as the basis for BACT for its Rotary Lime Kiln No. 2. See Ex. 27.

[91] This is based on VCM's estimate of 0.6 pounds of SO2 per MMscf of gas. 2002 Appl. At p. 4-12. We note that is is high, and that natural gas typically has a sulfur dioxide content of slightly less. However, any different is nominal compared to the huge amounts of SO2 emitted with coal and coke.

[92] VCM's 2002 Application contains two possible emission rates for this "baseline": 7,902 tons SO2/year based on fuel sulfur content, and 3,434 tons SO2/year based on "controlled potential emissions based on inherent design of the kiln and current baghouse." See VCM 2002 Application at p. 2-9.

[93] We note that VCM's own application explains this. In its 2002 application, at page 4-2, VCM states:

- Spread the cost of the control (natural gas) across all pollutants that will be reduced with the same control option;[94]
- Only consider incremental cost effectiveness in combination with average cost-effectiveness and, then, only according to the NSR Manual's proscriptions; and
- Consider the realistic prices of natural gas.[95]

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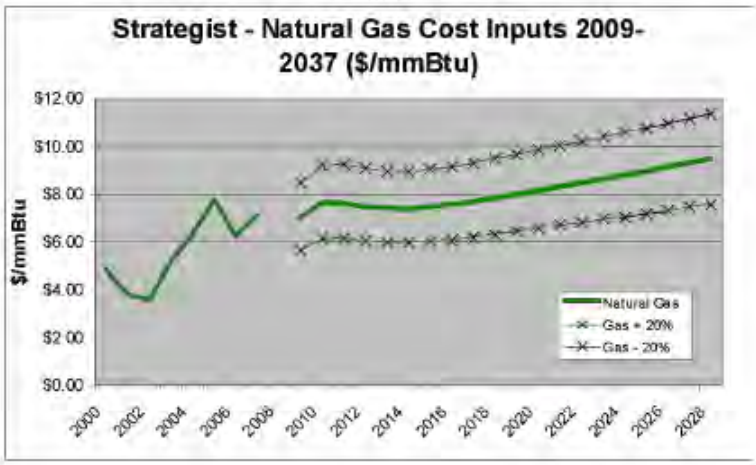
> Where control alternatives have been used in the same source category, the average and incremental cost effectiveness is [the] primary tool in determining if a control is viable. An applicant needs to document significant cost differences between the use of that control on other sources in the same category to their source.

*Citing New Source Review Workshop Manual* at B.31 (Draft Oct. 1990); see also July 2006 BACT update at 3.

[94] According to EPA's AP-42 Emission Factors for rotary lime kilns, natural gas results in significant emission reductions for particulate matter (including PM10 and condensable PM/PM10), sulfur dioxide and SO3 (and therefore sulfuric acid mist). See http://www.epa.gov/ttn/chief/ap42/ch11/final/c11s17.pdf Moreover, as Sierra Club notes above, BACT limits for CO2 are required. Natural gas will reduce CO2 emissions by half, or more, and will further significantly reduce the cost-per-ton of natural gas as a clean fuel pollution control. Additionally, natural gas has lower fuel nitrogen content as compared to coal and to the extent that fuel nitrogen is a contributor to NOx formation in the kiln, that component would be expected to be lower. However, because NOx formation is based on certain technical aspects of the kiln, including its temperature profile and oxygen and nitrogen concentrations, a specific determination of the degree to which NOx emissions are reduced by burning natural gas requires more detailed engineering that either the applicant or IEPA has done according to the record.

[95] In its Responsiveness Summary for MGP Ingredients recently, IEPA assumed a cost of natural gas of $8.12/MMBtu. Experts in the field, however, are estimating lower long term prices for natural gas. Xcel Energy projects the cost of natural gas at the Chicago Hub to not exceed $8/MMBtu on long term contracts until sometime after 2020. The following projection is from that company:

TABLE 4




Application of Northern States Power Company, a Wisconsin Corporation, for a Certificate of Authority and Any Other Authorizations Needed to Construct and Place Into Operation a Biomass Gasifier at Its Bay Front Generating Facility Docket No. 4220-CE-169 at p. 18, available at http://psc.wi.gov/apps/erf_share/view/viewdoc.aspx?docid=108437

The application and SOB are so incomplete that it is impossible to know what costs (if any) IEPA and the applicant assume for natural gas vs. the coal/coke blend proposed by the applicant. However, using the available information and IEPA's own figures from the MGP Responsiveness Summary, and using only SO2, we calculate the average cost effectiveness of using natural gas to be low:

- VCM estimates that it uses 7.0 MMBtu per ton of lime produced, and that it produces 600 tons of lime per day. Therefore, it requires 4,200 MMBtu/day and 1,533,000 MMBtu/year.

- IEPA estimated in the MGP Responsiveness Summary that natural gas costs $8.12/MMBtu. This results in an annual fuel cost for natural gas (and therefore the annualized cost of control for this option) of $12,447,960.

- Using a baseline of 7,709 tons of SO2/year, natural gas achieves a reduction of 7708 tons/year. Therefore, the cost-effectiveness of natural gas is ($12,447,960/7708) = **$1,614/ton SO2.**

- Using a baseline of 3434 tons SO2/year, natural gas achieves a reduction of 3433 tons/year. Therefore, the cost-effectiveness of natural gas is ($12,447,960/3433) = **$3,625.97**[96]

We note that this vastly overstates the cost of control. The actual cost per ton will be much lower because IEPA must spread the cost of gas among all pollutants and because this estimate does not credit the gas option for the reduction in capital and operating costs that can be avoided by not burning coal.

A cost effectiveness analysis must compare this cost to other facilities using natural gas, which neither IEPA or VCM has done. We doubt, however, that there can be any significant difference since gas is a commodity and most purchasers will be in a similar situation as far as costs. Moreover, because gas is a clean fuel and does not necessitate additional down-stream SO2 pollution controls, the cost of the control is essentially the cost of the fuel.

### 2. Omission of Basis In the Permit Record

The permit record is either missing significant parts or IEPA's review was incomplete. It does not appear that the permit record contains detailed engineering

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[96] While we believe that it is inappropriate to merely use a default cost-per-ton threshold for average cost effectiveness regardless of what cost other similar facilities are incurring to use the same control option, we note that this cost is less than half of the $10,000/ton default average cost effectiveness threshold IEPA used in the MGP Responsiveness Summary. Therefore, even under IEPA's less stringent cost-effectiveness analysis, it must require natural gas as the basis for BACT.

documentation of the kiln. Control of emissions is affected by fuel inputs, the manner in which the kiln is operated (i.e., conditions such as temperatures, air flow rates, the extent of preheating, etc.) and the design of the kiln. In particular, the design affects the design of any downstream feasible control technologies that should and could be considered and in assessing their costs. Without detailed design data, it is not feasible to conduct an appropriate and adequate engineering BACT evaluation. It appears that the Illinois EPA has relied mostly on statements by Vulcan in order to conduct its BACT evaluation. This is not correct. The IEPA should have conducted a thorough and independent BACT review, consistent with the controlling statutory requirements and regulations.

Vulcan has proposed and the IEPA has apparently accepted that the SO2 controls would be a combination of the kiln's natural ability to absorb SO2 followed by a dry scrubber. While the addition of the dry scrubber is better than no control, it is not clear why the more effective SO2 control, such as a wet scrubber, was not used to establish the BACT limits. We note that IEPA previously issued a permit for this kiln that would have required a wet scrubber. While the past permit's limit was not as stringent as the limit proposed in the pending permit, the 2002 permit did not reflect the pollution control achievable with a wet scrubber (it presumed a control reduction of only 50-60% with the wet scrubber). It is commonly known that wet scrubbers achieve 98%, or greater, SO2 control. This, in addition to the control achieved in the kiln itself (through reaction with the limestone) achieves a greater reduction than the dry scrubber proposed in the draft permit. Therefore, as a higher ranked option, a wet scrubber is presumptively preferred unless VCM demonstrates sufficient reason to reject it in step 4 of the top-down process.

Moreover, the BACT limit even based on a dry scrubber appears to be much less than the maximum achievable degree of control. Compared to the tested emissions of 5.5-7.0 lb/ton of stone feed, before the dry scrubbing system was contemplated, as discussed in the IEPA Project Summary, the proposed limit of 2.2 lb/ton of stone feed only implies a SO2 reduction by dry scrubbing of between 60-68%.[97] This is far lower than dry-scrubbing efficiencies that are possible. For example, in coal-fired boiler applications, dry-scrubbing is expected to yield reductions of 90-95%. It is not clear why such levels of dry scrubbing reductions, i.e., far smaller SO2 limits (for example, with 5.5 lb/ton stone and 95% reduction, the limit would be 0.275 lb/ton stone for SO2) were not considered in the BACT analysis. We note that nine years ago, IEPA considered BACT for this kiln and noted the following:

[97] While the IEPA notes that the SO2 limit may be reduced to 1.8 lb/ton stone feed at some future point in time "…based on evaluation of the actual operation…", this is an ephemeral expectation, and not consistent with BACT.

**This BACT determination is totally inadequate since there are a number of stack tests given in the Emission Factor Documentation for AP-42, Section 11.15 Lime Manufacturing[1] that have shown lower emissions. At least two of these plants (Dravo Lime, Saginaw Al and Martin-Marietta, Calera AL), if not more, are producing dolomitic lime.[2] The following tables give a comparison of Vulcan's proposed BACT and what has actually been achieved at other plants:**

| Ref | lb/ton | |
|---|---|---|
| 26 | 0.013 | Dravo Lime, Saginaw AL 1991 |
| 22 | 0.15 | J.E. Baker Millersville OH 1975 |
| 28 | 0.37 | Bethleham Mines, Annville PA 1974 |
| 22 | 0.45 | J.E. Baker Millersville OH 1975 |
| 10 | 0.79 | J.E. Baker Millersville OH 1974 |
| 6 | 3.1 | Virginia Lime, Ripplehead VA 1975 |
| 15 | 4.6 | Martin-Marietta, Calera AL 1975 |
| 15 | 4.6 | Martin-Marietta, Calera AL 1976 |
| 15 | 11 | Martin-Marietta, Calera AL 1977 |
| 22 | 12 | J.E. Baker Millersville OH 1975 |
| 22 | 12 | J.E. Baker Millersville OH 1975 |

See Ex. 31. At least five of these lime plants are achieving a lower emission rate than proposed for VCM in the draft permit. At least one of those—Dravo Lime, Saginaw AL, produces dolomitic lime, and has an emission rate more than a factor lower than the limit proposed.

### 3. NOx BACT

In the SOB, IEPA asserts that Selective Catalytic Reduction (SCR) "is not feasible for lime production given the operating temperatures at the locations at which reagent could be injected," because "outlet temperature of the fabric filter would be lower than the minimum operating temperature of an SCR system." This analysis is deficient for a number of reasons.

(1) There is no analysis of a high dust SCR.[98]

[98] It is not clear from IEPA's assertion in the SOB that SCR is "not feasible" whether IEPA refers to technical infeasibility or cost-infeasibility. Clearly, it cannot be the former. There is nothing technically infeasible about the application of SCR for the kiln – whether after the baghouse (where the dust loading and temperatures are lower) or before (where the temperature is in the proper range but the dust loading is higher). The BACT analysis and IEPA's independent review should contain a thorough discussion of the design and operating aspects of SCR in each of these locations/configurations, supported by vendor (i.e., SCR and catalyst manufacturers and suppliers) discussions. For example, SCR's are now routinely used in "high-dust" configurations in coal-fired boilers, before the particulate control device, even in conjunction with coals that have significant ash and calcium contents. Similarly, in the "low-dust" application, where the temperatures are too low for proper SCR application, there are several engineering approaches to increasing the gas temperature, such as via heat exchange or direct heating, that should be thoroughly evaluated before

(2) There is no analysis of a tail gas SCR following reheat of the flue gas to temperatures necessary for the SCR. Tail gas reheat is commonly considered in other applications, including top-down BACT analyses for CFB boilers. Reheat could occur with natural gas, a gas-to-gas heat exchanger, or a combination of those (and potentially other options).

(3) There is no analysis of other pollution control options. These options should include injecting a catalyst into the gas stream (sometimes referred to generally as Selective Catalytic Reduction or SNCR), low NOx burners[99], and flue gas recirculation.[100]

(4) The proposed NOx BACT limit of 4.5 lb/ton feed is inappropriate, even based on the controls IEPA assumed. Although the IEPA notes that this limit "…may be subject to a downward adjustment (as low as 3.5 lb NOx/ton of stone feed)..", it fails to point out that current BACT, even without SCR, as seen from EPA's RBLC database appears to be 3.5 or lower currently and has been for the last several years. First, IEPA should also express the NOx emission limit in terms of ton of lime produced for ease of comparison. For example, the AP-42 Table 11.17-6 shows that the NOx emission factor for coal-fired rotary kiln is 3.1 lb/ton lime produced. A search of the EPA's BACT database, under Code 90.019 dealing with lime kilns, shows determination WI-0233 for Cutler-Magner Company in August 2006 of a NOx value of 98.8 lb/hr and a throughput of 650 tons/day. This translates to a NOx value of 3.648 lb/ton throughput. Similarly, determination AR-0082 dated August 2005, shows a NOx limit of 3.50 lb/ton.

Moreover, from a 2000 IEPA memo, IEPA identified a number of facilities achieving a lower NOx emission rate than 4.5 lb/ton:

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rejection. The use of low-temperature catalysts should also be documented. To the extent IEPA means economically infeasible, it fails to make any record to support such conclusion.

[99] To the extent that VCM asserts that low NOx burners should not be considered because the kiln is already constructed, there is no basis for such assertion. VCM constructed a kiln that could not operate within its permit limits and was forced to shut down for an indefinite period. See Exs. 32-34. It is now restarting and must be considered a new construction. Allowing VCM to avoid a full top-down BACT analysis would ignore EPA's policy on treating a restarted facility as a new facility, rather than a modification, and would reward VCM for its past failure to build a plant that can comply with BACT. Moreover, there is no technical reason why low NOx burners cannot be retro-fit to an existing lime kiln. In fact, almost ten years ago IEPA rejected this argument by VCM, asserting: "USPEA lists low NOx burners for NOx control which was given a minimum discussion but was dismissed because '… the technology had not been validated by source testing after the kiln was built…' *Hardly a convincing argument that it cannot be applied*." Ex. 31 (emphasis added).

[100] IEPA notes in the SOB that the NOx emissions from the kiln are "…minimized by the design of the burner and combustion system of the kiln…" However, the specifics of this different design of burner and combustion system are not discussed. What aspects of design of the burner and combustion system serve to reduce NOx, and do so in a predictable and reliable manner are not spelled out. Thus, it is difficult to properly evaluate the proposed NOx benefits.

| Ref | lb/ton | |
|---|---|---|
| 8 | 1.1 | Standard Lime, Woodville OH |
| 26 | 2.1 | Dravo Lime, Saginaw AL 1991 |
| 6 | 3.2 | Virginia Lime, Ripplehead VA 1975 |
| 28 | 3.6 | Bethleham Mines, Annville PA 1974 |
| 15 | 5.3 | Martin-Marietta, Calera AL 1975 |

Ex. 31.

**4. CO BACT**

There is no top-down analysis and very little to support the proposed CO BACT limit of 11.48 lbs/ton. We note that IEPA has not even considered the lower emission rates documented in its own permit file:

| Ref | lb/ton | |
|---|---|---|
| 28 | 0.12 | Bethleham Mines, Annville PA 1974 |
| 15 | 0.76 | Martin-Marietta, Calera AL 1975 |
| 22 | 0.9 | J.E. Baker Millersville OH 1975 |
| 22 | 2.7 | J.E. Baker Millersville OH 1975 |
| 6 | 52 | Virginia Lime, Ripplehead VA 1975 |

Ex. 31.

**B. IEPA and VCM Failed To Conduct Sufficient Preconstruction Monitoring.**

Under the PSD program, a permit may not issue to a project that threatens air quality standards, including National Ambient Air Quality Standards and PSD "increments." See 42 U.S.C. § 7475(a)(3). Protection of air quality is the purpose of the PSD provision-- to "ensure that the air quality in attainment areas or areas that are already 'clean' will not degrade." *Alaska Dep't* at 470. To accomplish this, an applicant must conduct a preapplication analysis of air quality, as well as a modeling demonstration showing protection of ambient air quality standards after construction of the proposed source. Post-construction monitoring may be required as well to ensure that no violations occur.

The Clean Air Act requires an applicant to "conduct such monitoring as may be necessary to determine the effect which emissions from any such facility may have, or is having, on air quality in any area which may be affected by emissions from such source." 42 U.S.C. § 7475(a)(7). More specifically, at a minimum, the full PSD review must "be preceded by an analysis… by the State… or by the major emitting facility applying for such permit, of the ambient air quality at the proposed site and in areas which may be affected…" 42 U.S.C. § 7475(e)(1). This "preconstruction" analysis "*shall include* continuous air quality monitoring data *gathered for purposes of determining* whether emissions from such facility will exceed the [NAAQS or PSD increment]." 42 U.S.C. § 7475(e)(2) (emphasis added). The

Act specifies that this data "shall be gathered over a period of one calendar year preceding the date of application for a permit under this part unless the State… determines that a complete and adequate analysis for such purposes may be accomplished in a shorter period." *Id.* Federal and state regulations similarly require the applicant to submit a pre-application analysis of ambient air quality in affected areas that includes at least one year of representative continuous air quality monitoring data.

During the application phase, the applicant must demonstrate that

> allowable emission increases from the proposed major source or major modification, in conjunction with all other applicable emissions increases or reduction, including secondary emissions, shall not cause or contribute to air pollution in violation of either of the following:
>
> (a) Any national ambient air quality standard in any air quality control region.
> (b) Any applicable maximum allowable increase over the baseline concentration
> in any area.

Compliance with the NAAQS "is based upon the total estimated air quality, which is the sum of the ambient estimates resulting from existing sources of air pollution (modeled source impacts plus measured background concentrations) and the modeled ambient impact caused by the applicant's proposed emissions increase… and associated growth." *NSR Manual* at C.3. Under the "PSD increment" analysis, project emissions, plus all other applicable emissions, cannot exceed the amount of each pollutant that may be allowed in an attainment area. The regulations also explicitly list sources of emissions that are exempted from the PSD increment, i.e., that are in the baseline and do not consume increment.

The Act makes clear that preconstruction monitoring: (i) is required; (ii) must precede the analysis under §7475(a); (iii) must be conducted at the proposed site and affected areas specifically for the purpose of PSD permitting; and (iv) must occur for at least 12 months unless, pursuant to the applicable regulations, a shorter period is allowed. *See* 42 U.S.C. § 7475(e)(2); s*ee also U.S. v. Louisiana-Pacific Corp*., 682 F.Supp. 1141, 1146 (D. Colo. 1988). The plain language does not allow monitoring data gathered for a different purpose (such as state air quality planning) to be substituted.

It is undisputed that no pre-construction monitoring was done for purposes of assessing NAAQS or PSD increment impacts from the proposed VCM kiln and associated equipment. Rather, IEPA apparently relied on an existing series of air quality monitors that were installed for purposes other than permitting the VCM kiln. Background concentrations from Braidwood (for NOx and CO), Midlothian (PM10) and Joliet (SO2) were used. See Project Summary § VIII. This reliance on regional monitoring is erroneous and unlawful.

Without conceding that the plain language of the Act requires preconstruction monitoring[101], we note that the regional monitors used by IEPA failed to meet U.S. EPA's requirements for a waiver of preconstruction monitoring. To receive approval to use data from a regional site, an applicant typically files a waiver request. A waiver request may only be granted if the applicant shows that valid, sufficient, and representative ambient air quality data already exist from regional monitoring stations. *NSR Manual* at C.18-19. This is a difficult showing to make, requiring specific demonstrations on specific factors; it would only be possible in very limited circumstances. *Id*.

Under EPA guidance, existing monitoring data from regional sites is only sufficient to supplant the need for site-specific monitoring when specific determinations are made as to the data's adequacy. These determinations include:

> (1) monitor location;
> (2) quality of the data; and
> (3) "currentness" of the data.

*NSR Manual* at C.19 (citing the "PSD Monitoring Guideline"); *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)*, EPA-450/4-87-007 (May 1987) (hereinafter "*Guidelines for PSD*")[102]; *see also In re Northern Michigan University Ripley Heating Plant,* 14 E.A.D. __, Slip Op. at 62-63 (EAB Feb. 18, 2009) (remanding due to agency's failure to explain how monitoring data from existing regional monitors satisfy the Act or EPA monitoring guidance); *Hibbing Taconite*, Slip Op. at 20 ("EPA allows substitution of existing representative data in lieu of having the source generate its own preconstruction monitoring data, *provided* these data meet the criteria in the 'Ambient Monitoring Guidelines for the Prevention of Significant Deterioration' (July, 1980)" (emphasis added)). If existing data are not "representative" based on the criteria in EPA's published guideliens, "the applicant *must* proceed to establish a site-specific monitoring network." *NSR Manual* at C.19 (emphasis added); *see also Louisiana Pacific*, 682 F.Supp. at 1153 (EPA refused to waive pre-construction monitoring required by 40 C.F.R. § 52.21(m)).

The monitoring data IEPA used for background concentrations fulfill none of the requirements of U.S. EPA's guidance. Pursuant to the applicable minimum standards for using monitoring data from existing ambient air quality monitors to determine baseline air quality for PSD permitting, the data must be representative of three specific areas:

> (1) the location(s) of maximum concentration increase from the proposed source or modification,

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[101] We do not concede that EPA has authority to waive site-specific monitoring, in light of the plain language of the Clean Air Act and applicable regulations, which require monitoring. However, even assuming that EPA can waive monitoring in specific, limited, instances, it only does so to the extent that existing monitoring meets EPA's express minimum criteria.

[102] The Guidelines are incorporated into 40 C.F.R. Pt. 51 Appx W, which in turn is incorporated into part 52.

(2) the location(s) of the maximum air pollutant concentration from existing sources, and
(3) the location(s) of the maximum impact area, i.e., where the maximum pollutant concentration would hypothetically occur based on the combined effect of exiting sources and the proposed new source or modification.

*Guidelines for PSD* at § 2.4.1; *see also Hibbing Taconite*, 2 E.A.D. at 850. Monitors at Braidwood, Midlothian, and Joliet fail to meet these "location" criteria.[103] Braidwood is 20-25 miles from Manteno and Midlothian and Joliet are both more than 25 miles from Manteno. These locations are nowhere near the location of the maximum increase in ambient PM, NOx, SO2, or CO concentrations from the proposed kiln, the maximum impact from existing sources nearby to the proposed facility, or the location of the maximum impact from existing and proposed sources, much less the location of *all three* as required to substitute existing monitoring data. In fact, none of the modeling in the record even only modeled an area extending out to the locations where the existing Braidwood, Midlothian and Joliet monitors are located. Instead, maximum impacts were expected to occur much closer. In short, the preconstruction monitoring does not meet the location criteria and the permit cannot be issued.

Second, even if existing air quality monitors could be used to determine ambient air quality for permitting the VCM plant under limited circumstances, the data must meet the same quality standards that on-site monitoring must meet. At a minimum, this includes:

1) continuous instrumentation monitoring
2) documented quality control, including calibration, zero and span checks, and control checks;
3) calibration and span gases should be working standards certified by comparison to Nation Bureau of Standards gaseous Standards Reference Material;
4) minimum 80% data recovery.

It is not clear that these data quality requirements were met and there is no documented quality control, calibration or minimum data recovery.

Third, it is not clear whether "current" data, within the meaning of the applicable minimum standards, were used. To be current, the data must have been collected within the most recent three years. The application for VCM has dragged on for almost a decade, and ore recent revisions have referred back to past versions. It is unclear what data, from

[103] Additionally, when the new or modified source will be located in an area that has multiple air pollution sources *and flat terrain*, the applicant can only use existing, representative monitoring data that is from (1) a nearby monitoring site, *within 10 km* of the points of emissions; or (2) from a monitor that is no more than *1 km* away from either the maximum air pollutant concentration from existing sources or from the area(s) of combined maximum impact from existing and proposed sources. *Guidelines for PSD* § 2.4.1. This criteria also was not met.

what time period, was used. Unless current data was used, and IEPA can document that fact in the record, the preconstruction monitoring is deficient.

## IV. THE MODELING FOR THIS PERMIT SUFFERS NUMEROUS ERRORS.

### A. IEPA's Air Quality Analysis Relies on Arbitrary and Unsupportable Methods – Violations of the $SO_2$ NAAQS Have not been Mitigated

IEPA's Project Summary for Vulcan Lime (Statement of Basis) includes PSD and NAAQS compliance analyses. For the PSD analysis, the $PM_{10}$ emissions are underestimated. When corrected there are clear $PM_{10}$ increment violations from the Vulcan Lime project alone (see comment below). For the NAAQS analyses, IEPA's Statement of Basis initially shows that there are violations of the 3-hour and 24-hour $SO_2$ NAAQS from the proposed project and other nearby sources. The Statement of Basis also shows annual $NO_2$ and 24-hr $PM_{10}$ impacts at 98% and 99.2% of the NAAQS, respectively.[104]

IEPA downplays the modeled NAAQS violations, basing the results on deficiencies in emission inventories and other modeling inputs:

> The Illinois EPA conducted a detailed review of URS's and ACT's results, which confirmed that the lime plant does not cause or contribute to any exceedances. The modeled exceedances also appear to result from deficiencies in the emission inventories for existing sources, such as lack of unit-specific stack parameters, which require assumptions that overstate impacts of existing sources. It was not feasible to attempt to correct these deficiencies for this analysis, given the number and location of the existing units. In particular, the emission inventory for modeling the lime plant extended out for a number of miles around the plant. These deficiencies in the inventory data are more effectively corrected as part of routine processing of the permits for the existing sources or future air quality analysis for projects at those sources.[105]

However, meeting air quality standards through correct modeling is a prerequisite to issuing a permit. Having deficient data is not a reasonable or lawful basis to revise the modeling assumptions until a facility passes modeling and to therefore issue the permit. IEPA must either obtain the necessary data or deny the permit. However, instead, IEPA prepared an alternative evaluation that doubled the monitored background air concentrations, yet removed all non-Vulcan Lime sources from the modeling analyses:

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104 *See* IEPA Project Summary (Statement of Basis), Table 3A.

105 Id., Section VIII, Air Quality Analysis.

> A more realistic evaluation of the impact of Vulcan's Manteno lime plant on air quality in the vicinity of Manteno is provided in Table 3B. This alternative evaluation uses the maximum modeled impacts of the lime plant and other new sources in the area. However, these analyses assumes (sic) that other existing sources contribute to ambient air quality in an amount equal to the monitored background concentration.[106]

This arbitrarily doubling[107] of background air concentrations and removing emission sources that already show modeled NAAQS violations, is completely outside any recognized modeling guidelines or practice. There is no basis for this assumption, other than IEPA's belief that it will be realistic—a belief that has no basis in the record (or elsewhere). Certainly, no support for this unique methodology can be found in the U.S. EPA's Guideline on Air Quality Modeling or any other similar guidance documents. It appears, instead, that IEPA developed this method specifically for Vulcan Lime, solely to be able to model air concentrations less than the NAAQS and issue the permit to VCM. In other words, IEPA's "more realistic evaluation," is simply thin air. It cannot be used as a basis for supporting VCM's revised construction permit and PSD approval.

### B. Significant Impact Levels, as used by Vulcan's Consultant, Cannot be Used to Justify NAAQS Violations

Vulcan's consultant (Air Control Techniques or ACT) uses an unlawful method (other than IEPA's doubling concept above) to escape the conclusion that model impacts are above the NAAQS:

> The NAAQS analysis indicated some exceedances of the 3-hour and 24-hour sulfur dioxide standards; however, the contribution of the Manteno plant was below the significance threshold at the time and location of each of the predicted violations.[108]

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[106] Id.

[107] In addition to arbitrarily deciding to double the "background," the background concentrations have no basis either. IEPA apparently assumes that the peak $SO_2$ and $PM_{10}$ impacts from non-VCM sources are equal to the background air concentrations at the monitoring locations. However, as noted further in these comments, the background concentrations come from Joliet ($SO_2$) and Midlothian ($PM_{10}$) monitors, both of which are more than 20 miles from the project site. IEPA made no effort to determine whether the background air concentrations at these sites are in any way correlated to the peak modeled impacts from non-Vulcan lime sources that impact the areas of highest impact from VCM. In fact, due to their location, there is almost no conceivable way that they are so correlated. For example, there are five PM10 sources within 3 km of VCM. See Ex. 28.

[108] *See* Sulfur Dioxide, Nitrogen Dioxide, and Carbon Monoxide Air Quality Net Impact Analyses – Vulcan Manteno Lime Kiln Facility, November 2008, p. 8.

Since IEPA remains silent on Air Control Techniques' method of circumventing a modeling NAAQS violation, it is reasonable to assume that IEPA does not agree with this approach. To complete the record, however, we feel it is necessary to explain why Air Control Techniques' Significant Impact Level (SIL) method of getting around NAAQS violations is flawed and inappropriate. The concept of NAAQS SILs, as set forth in regulation, can be found at 40 CFR 51.165(b)(2):

> A major source or major modification will be considered to cause or contribute to a violation of a national ambient air quality standard when such source or modification would, at a minimum, exceed the following significance levels at any locality that does not or would not meet the applicable national standard…

Section 40 CFR 51.165(b)(2) also includes a table setting forth the NAAQS SILs. For example, the significance level is 5 $\mu g/m^3$ for the 24-hour average $SO_2$ NAAQS and 25 $\mu g/m^3$ for the 3-hour average $SO_2$ NAAQS.

The NAAQS SILs regulation does not allow for the exemption of modeled violations when the permittee-project's *contribution* is below the significance threshold *at the time and location* of each of the predicted violations. The regulations say nothing about matching time to a location as an exemption. Furthermore, the regulations specify locality, not location. In all air dispersion models, location refers to a receptor – a specific x and y coordinate used to determine the relationship to the emission sources. The keyword "locality," however, clearly applies to a broader region, such as the zone of impact or even the air quality control region, not a specific modeled receptor. This is an important distinction because modeling receptors are spaced on a grid and do not necessarily capture each point in space—meaning the highest impacts and all areas of violations are not necessarily found by the model.[109] Additionally, requiring that a permittee's emissions contribute above the SIL at a model receptor point at the specific time when that receptor point shows a violation implies a false level of precision. For example, the Guideline on Air Quality Model discusses the poor performance of models at a specific time and site:

> Models are more reliable for estimating longer time-averaged concentrations than for estimating short-term concentrations at specific locations; and (2) the models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of ± 10 to 40 percent are found to be typical, *i.e.,* certainly well within the often quoted factor-of-two accuracy that has long been recognized for these models. However, estimates of

[109] It is also important to note that the applicant's consultant modeled certain, limited, receptor locations on a grid surrounding the VCM site. In the effort to determine whether the project contribution is below the significance threshold at the time and location of each of the predicted violations, the applicant's consultant would have to model infinitely more receptors to identify all possible source to receptor combinations. This was not done, nor is it feasible to do.

concentrations that occur at a specific time and site, are poorly correlated with actually observed concentrations and are much less reliable.[110]

The exemption of modeled violations, when the project contribution is below the significance threshold at the time and location of each of the predicted violations, is relying on a situation where model performance is particularly poor. In essence, the model performance is generally reliable in a given locality, but is much less reliable at a *specific paired time and location*. Therefore, the SILs guidance speaks in terms of locality, but not a specific paired time and location.

Moreover, the idea that exemptions to modeled NAAQS violations can be justified by having project impacts below the SIL at a specific time and receptor location are simply not supported by regulation. [111]

Applied to the permit at issue here – the attempt to use SILs to avoid NAAQS violations ignores the real possibility that VCM, in conjunction with surrounding emission sources, are creating NAAQS violations. This undermines key aspects of the Clean Air Act, which requires specific mitigation strategies for identified nonattainment areas.

### C. Fugitive $PM_{10}$ Emissions, and Resulting Air Impacts, are Underestimated

VCM submitted $PM_{10}$ emissions impact analyses for its lime plant and limestone quarry, located south of Manteno, Illinois. There have been several revisions to this modeling analysis, and several subsequent auditing analyses performed by IEPA. The latest version of this report appears to be dated January 21, 2009.

The Vulcan $PM_{10}$ emissions impact analyses include numerous emission calculation and modeling errors, which will underestimate project impacts and resulting air impacts. These inadequacies are discussed below.

#### 1. Fugitive $PM_{10}$ Emissions from Unpaved Roads are Underestimated

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110 U.S. EPA, Guideline on Air Quality Models, November 9, 2005, Section 9.1.2.a.(1).

111 To the extent IEPA relies on the NSR Manual to determine that use of SILs to circumvent NAAQS is acceptable (see NSR Manual at C.52), IEPA should be aware that the NSR Manual is incorrect on this point. While the Manual is valuable and has become the authoritative documents on PSD permitting by practice it does not, cannot, and is not intended to supersede regulatory statutes and requirements. As the preface to the Manual notes:

> This document was developed for use in conjunction with new source review workshops and training, and to guide permitting officials in the implementation of the new source review (NSR) program…. ***Should there be any apparent inconsistency between this manual and the regulations (including any policy decisions made pursuant to those regulations), such regulations and policy shall govern***.

(Emphasis added), available at http://www.epa.gov/region7/programs/artd/air/nsr/nsrmemos/1990wman.pdf).

The applicant purports to have modeled fugitive $PM_{10}$ emissions from vehicle travel on onsite unpaved roads. The emissions from unpaved roads were calculated by Air Control Techniques, Vulcan's air modeling consultant, and they assumed 90% dust control efficiency from watering.[112]

The 90% assumed dust control efficiency is almost certainly unachievable, even if the applicant *continuously* applies water, which itself is neither required nor envisioned by the permit. The practice of continuous watering is impractical or impossible (especially during winter when watering is prevented by ice formation). Air Control Techniques claims to have performed sources testing for other clients showing 90% control by watering; however, these source tests were not included with the record, and they most certainly do not represent continuous worst-case conditions. In any event, continuous watering is not required by the permit or enforceable as a practical matter and, therefore, the claimed 90% control cannot represent the worst-case conditions that must be assumed for modeling.

Dust emissions from unpaved roads, as well as possible control approaches, have been widely studied. Using watering as a control technique will typically yield short-term unpaved road dust control efficiencies on the order of 50%. These studies are documented as follows:

- The Midwest Research Institute reports short-term 50% control for a water application intensity of about 0.2 gallon/$yd^2$/hour.[113]
- The 50% figure is presented in Fugitive Emissions and Controls, which also lists 60 to 80% controls for non-water wetting agents, and 85-90% control efficiencies for paving and sweeping.[114]
- The South Coast Air Quality Management District suggests control efficiencies of 34 to 68% for watering of unpaved roads.[115]
- The WRAP Fugitive Dust Handbook lists control efficiencies of 10% to 74% for watering of unpaved roads.[116]

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[112] *See* $PM_{10}$ Particulate Matter Emissions Impact Analysis (January 21, 2009), Section 3.2.1.

[113] C. Cowherd, G. E. Muleski, and J. S. Kinney, Final Report: Control of Open Fugitive Dust Sources, Midwest Research Institute, September 1988, p.5-10.

[114] Howard Hesketh and Frank Cross, Fugitive Emissions and Controls, Ann Arbor Science, 1983, p. 42.

[115] South Coast Air Quality Management District, CEQA Air Quality Handbook, April 1993, pp. 11-15.

[116] Western Governor's Association, WRAP Fugitive Dust handbook, November 15, 2004, p. 3.

Note, again, that these are short term efficiencies and frequency and time between applications of the control (watering, chemical suppressants, and/or sweeping) are critical. We recalculated onsite unpaved road dust fugitive $PM_{10}$ emissions assuming 75% control, which is overly charitable to VCM and, itself, not feasible on a long term basis. Using this 75% control figure, we remodeled the air impacts using the exact same methodology used by Air Control Techniques in their January 21, 2009 $PM_{10}$ Particulate Matter Emissions Impact Analysis. In other words, the only change involved recalculating the unpaved road dust fugitive $PM_{10}$ emissions assuming 75% control.

The correction from 90% assumed control efficiency to a more realistic 75% control increases the unpaved road dust fugitive $PM_{10}$ emissions by a factor of 2.5. The corrected emissions are shown in the table below.

| Unpaved Road (Modeled as Volume Sources) | Applicant $PM_{10}$ Emissions per Segment (g/s) | Corrected $PM_{10}$ Emissions per Segment (g/s) |
|---|---|---|
| Customer Truck Traffic, Unpaved Roads (10 segments) | 1.90E-03 | 4.75E-03 |
| Coal and Coke Delivery Traffic, Unpaved Roads (10 segments) | 5.00E-04 | 1.25E-03 |
| Transporting Limestone Back to the Quarry on Unpaved Roads (14 segments) | 7.00E-04 | 1.75E-03 |
| Transporting Flue Dust Back to the Quarry on Unpaved Roads (10 segments) | 3.00E-04 | 7.50E-04 |

### 2. Fugitive $PM_{10}$ Emissions from the Flue Dust Storage Pile are Underestimated

The applicant calculated, and modeled, wind erosion $PM_{10}$ emissions from the flue dust storage pile. The basis for their emission calculations is that wind erosion of fugitive dust only occurs with winds speeds greater than 12 miles per hour.[117] The applicant's emission calculations, however, are fraught with inconsistencies and errors.

The flue dust storage pile receives particulate matter from the project calciner. The particulate matter includes lime particles entrained at the kiln feed end, and calcined lime that is collected in the pulse jet fabric filter.[118] The flue dust storage pile is located east of the calciner main stack, and outside the pit area.

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117 *See* $PM_{10}$ Particulate Matter Emissions Impact Analysis (January 21, 2009), p. 8.

118 Id., p. 4.

The applicant's emission inventory for the project does not include any other emissions from the flue dust storage pile – only wind erosion emissions. Any loading to, and unloading from, the pile are absent (there are flue dust conveyor emissions even in the pit, too). To assume that the only fugitive $PM_{10}$ emissions from the flue dust storage pile are from wind erosion is a gross underestimate of actual conditions. In reality, emissions from loading to (including dropping) and from the storage pile must be included.

Furthermore, the modeled dimensions of the flue dust storage pile are inconsistent and not credible. Air Control Techniques reported the flue dust storage pile as a rectangular pile 150 feet by 500 feet in size.[119] The area of this pile is 1.72 acres. In their modeling, however, Air Control Techniques assigned an initial horizontal dispersion parameter of 35.44 meters to this source, which is representative of a 5.74 acre area.[120] It appears that Air Control Techniques over-estimated the initial horizontal dispersion from the flue dust storage pile, thus underestimating modeled impacts.

Assuming for the moment that the 500 by 150 foot dimension for the pile is correct, it is important to note that Air Control Techniques modeled the pile as being 150 feet tall.[121] This means that the sides of the pile are at a 2:1 slope (63.4 degree angle), which, considering the silty nature of the material in the pile, is virtually impossible to maintain. Such a slope would also makes any fugitive dust controls very difficult (or impossible) to apply.

Air Control Techniques did not provide their emission calculations for the flue dust storage pile, but they did report a modeled emission rate of 0.128 pound/hour (0.0161 gram/second).[122] We were able to recreate their calculated emission rate, using inputs of 0.22 acre exposed pile size, 95% silt, and 90% control efficiencies for the dust pile.

- First, Air Control Techniques does not provide any justification for assuming that only 0.22 acres of the pile are exposed and subject to wind erosion. And since calculated emissions are proportional to exposed surface area, assuming that only 0.22 out of a 1.72 acre storage pile is exposed is an almost eight-fold reduction in emissions. Without detailed explanation and very stringent permit requirements, using only 0.22 acres of exposure is unreasonable and unlawful.

- Second, the 95% silt fraction assumed by Air Control Techniques is inconsistent with their calculated emissions. Since the emissions are already calculated as $PM_{10}$,

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[119] Id., pp. 15-16.

[120] For single volume sources, the initial horizontal dispersion parameter is equal to the side length of a square volume source multiplied by 4.3. Multiplying 35.44 meters by 4.3, represents a square volume source of 5.74 acres (23,223 square meters or about 250,000 square feet).

[121] *See* $PM_{10}$ Particulate Matter Emissions Impact Analysis (January 21, 2009), p. 15.

[122] Id., p. 20.

the silt fraction is 100% (silt is defined as particles less than or equal to 75 micrometers in size).[123] In other words, all $PM_{10}$ emissions are silt.

- Third, the 90% control efficiency that Air Control Techniques applied to calculating flue dust storage pile emissions is completely undocumented in the application, IEPA's SOB, or, for that matter, in any literature that we are aware of.[124] Since there are no documented and supported control efficiencies for this source, zero percent control the only a realistic assumption. Also, IEPA includes no permit requirements for controlling fugitive $PM_{10}$ emissions from the flue dust storage pile, so it must assume zero control as a worst case emission rate.

We recalculated the wind erosion emissions from the flue dust storage pile using a corrected 100% silt fraction, and an appropriate control efficiency of 0%. This is justified as (1) there is no supporting information and (2) there are no permit requirement to apply any controls to this source— much less controls achieving worst-case control of 90%. Our recalculated flue dust storage pile wind erosion emissions are 0.1697 gram/second, about 10.5 times the value calculated by Air Control Techniques. Had we assumed that the entire pile (1.72 acres) is subject to wind erosion emissions, which is required without enforceable permit limits on the maximum amount of exposed area, on our emissions would have been 7.81 (1.72/0.22) times higher than that calculated by Air Control Techniques. Correcting both of these errors would be cumulative, resulting in even higher emission rates.

### 3. Fugitive $PM_{10}$ Emissions within the Project Pit are Underestimated

Many of Vulcan's fugitive $PM_{10}$ emissions are located in the pit area. Air Control Techniques modeled the pit as a 220 by 335 meter area, which is about 18.2 acres. The pit is located in the quarry, and is about 50 feet below grade level.

There are unpaved road segments located in the pit area, which were modeled by Air Control Techniques assuming 90% control efficiency for fugitive $PM_{10}$ emissions. As discussed in Section A. above, 75% controls for watering of unpaved roads is an overly generous, but more reasonable, assumption. We recalculated the unpaved road segments within the pit with 75% control efficiency for fugitive $PM_{10}$ emissions.

In addition, Air Control Techniques applied 90% control efficiencies to storage piles within the pit. As for the flue dust storage pile, Air Control Techniques did not provide emission calculations, but we were able to recreate their reported emission factors only when applying 90% control efficiency. And as for the flue dust storage pile, Air Control

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[123] USEPA, Office of Air Quality Planning and Standards, Emission Factor Documentation for AP-42, Section 13.2.2, Unpaved Roads, Final Report, September 1998.

[124] In fact, due to the nature of the material, so much water would have to be applied to achieve even half of the applicant's assumed 90% control efficiency that the material would either wash away or congeal to a cement-like substance.

Techniques did not provide any justification or support for assuming 90% controls on these pit sources. We note that Air Control Techniques applied zero percent controls to wind erosion from storage piles within the pit, although this too is undocumented. Lastly, IEPA includes no permit requirements for controlling fugitive $PM_{10}$ emissions from the pit storage piles. Absent permit requirements sufficient to achieve a minimum, worst-case control efficiency, IEPA is required to model with uncontrolled emission rates. (Modeling must be done with worst-case emissions.)

We recalculated the pit stockpile fugitive $PM_{10}$ emissions using zero percent controls. This is justified as there is no supporting information or permit requirement to apply any emission controls to these sources. The pit sources corrected for control efficiency (emissions increase by a factor of 10) include:

- Limestone Stockpile, Load-in
- Limestone Oversize and Undersize Load-out
- Coal and Coke Unloading to Storage Pile

Lastly, Air Control Techniques incorrectly calculated fugitive $PM_{10}$ emissions from material handling within the pit area. Air Control Techniques assumes, without any supporting documentation, that wind speeds within the pit average only 5 miles per hour. This assumption significantly underestimates emissions from the following sources:

- Limestone Stockpile, Load-in
- Limestone Oversize and Undersize Load-out
- Coal and Coke Unloading to Storage Pile
- Coal and Coke Conveyor Transfer Points

Air Control Techniques also used AP-42 Section 13.2.4, Aggregate Handling and Storage Piles, to estimate fugitive $PM_{10}$ emissions generated during the loading of the limestone, coal, and coke.[125] The emission calculation equation requires mean wind speed, in miles per hour, in calculating fugitive $PM_{10}$ emissions. We calculated a mean wind speed equaling 10.11 miles per hour for the five years of meteorological data used in Air Control Techniques' modeling.[126]

[125] *See* $PM_{10}$ Particulate Matter Emissions Impact Analysis (January 21, 2009), p. 7.

[126] Note, however, that mean wind speed means the mean within the averaging period modeled. Therefore annual mean wind speed can only be used to model annual impacts. Twenty-four hour impacts must be modeled with the highest 24-hour mean wind speed in the data set. We use a value that is favorable to VCM to show that, even with this assumption, the impacts far exceed the standards. Correcting for highest 24-hour mean would cause the model results to increase even further.

Air Control Techniques, however, arbitrarily assumed that the mean wind speed in the pit is 5 miles per hour. There are no data to support this assumption, even though it has a marked effect on calculated emissions and modeled concentrations. Furthermore, the pit is over 18 acres in area, while being only 50 feet or so below grade. The size to depth ratio for the pit is simply too large to affect wind speeds, particularly as the downwind end of the pit. It is important to recognize that the pit size, 220 meters by 335 meters, is 722 feet by 1099 feet. Also, the sources are not on the pit floor, but are elevated. The stockpiles, for example, are likely to approach or exceed the pit grade.

In short, there is no basis to choose a 5 mph default wind speed for modeling pit sources. No meteorological monitoring was done within the pit for the duration of the modeling period. Nor are there any recognized methods for deducing that value. Accordingly, we recalculated the fugitive $PM_{10}$ emissions from material handling emission sources within the pit using a mean wind speed of 10.11 miles per hour. Using 10.11 miles per hour, instead of 5 miles per hour, increases fugitive $PM_{10}$ emissions from these sources by a factor of 2.5.[127]

Air Control Techniques modeled pit emissions as one OPENPIT source in AERMOD, with an area source emission rate of 2.361E-06 gram/(second-square meter). To this base emission rate, we added the corrected emission rates for unpaved roads, storage piles, and material handling within the pit. The sources we corrected, and the resulting corrected emission rates, are presented in the following table:

[127] Material handling fugitive emissions are proportional to $(ws/5)^{1.3}$, where ws is the wind speed in miles per hour. $(10.11/5)^{1.3} = 2.50$; $(5/5)^{1.3} = 1.00$ (AP-42 Section 13.2.4, Aggregate Handling and Storage Piles).

| Pit Emission Source | Material Handling Wind Speed Correction | Control Efficiency Correction | Additional Modeled $PM_{10}$ Emissions ($g/s\text{-}m^2$) |
|---|---|---|---|
| Customer Truck Traffic, Unpaved Roads (3 segments) | 1.00 | 2.50 | 1.160E-07 |
| Coal and Coke Delivery Traffic, Unpaved Roads (6 segments) | 1.00 | 2.50 | 6.106E-08 |
| Transporting Limestone Back to the Quarry on Unpaved Roads (3 segments) | 1.00 | 2.50 | 4.274E-08 |
| Transporting Flue Dust Back to the Quarry on Unpaved Roads (3 segments) | 1.00 | 2.50 | 1.832E-08 |
| Product Loadout, 4 Silos | 1.00 | 1.00 | 0.000E+00 |
| Limestone Stockpile, Load-in | 2.50 | 10.0 | 4.637E-06 |
| Limestone Oversize and Undersize Load-out | 2.50 | 10.0 | 1.477E-06 |
| Coal and Coke Unloading to Storage Pile | 2.50 | 10.0 | 4.103E-08 |
| Wind Erosion, Storage Piles | 1.00 | 1.00 | 0.000E+00 |
| Wind Erosion, Coal and Coke Storage Piles | 1.00 | 1.00 | 0.000E+00 |
| Conveyor Transfer Points | 1.00 | 1.00 | 0.000E+00 |
| Coal and Coke Conveyor Transfer Points | 2.50 | 1.00 | 6.155E-09 |
| Fuel Silo, T-191 Fabric Filter | 1.00 | 1.00 | 0.000E+00 |
| Fabric Filter Dust Conveyors | 1.00 | 1.00 | 0.000E+00 |
| Flue Dust Loading Chute U-189 Fabric Filter 188 | 1.00 | 1.00 | 0.000E+00 |
| Flue Dust Loading Chute U-189 Fabric Filter 189 | 1.00 | 1.00 | 0.000E+00 |
| Product Cooler, Feeders, Bucket Elevator | 1.00 | 1.00 | 0.000E+00 |
| Product Handling, Feeder, Conveyor, Bucket Elevator | 1.00 | 1.00 | 0.000E+00 |
| Product Handling, Feeder, Conveyor, Bucket Elevator | 1.00 | 1.00 | 0.000E+00 |
| Lime Slurry Make-Up Tank T-182 | 1.00 | 1.00 | 0.000E+00 |
| Limestone Screening Operation | 1.00 | 1.00 | 0.000E+00 |
| Lime Screening Operation | 1.00 | 1.00 | 0.000E+00 |
| Roll Crushers | 1.00 | 1.00 | 0.000E+00 |
| | | | |
| Applicant-modeled Pit total: | | | 2.361E-06 |
| Corrected Pit total: | | | 8.760E-06 |

### 4. Revised Modeling Results, Using Corrected $PM_{10}$ Emission Rates, Exceed PSD Increments

Our modeling results for corrected 24-hour average $PM_{10}$ emissions are presented in the following table. The corrected $PM_{10}$ impacts include revisions to unpaved roads, the flue dust storage pile, and emissions assigned to the Vulcan Lime quarry pit. We used AERMOD, v. 07026, and the same five years of data and other inputs modeled by Air Control Techniques.

| Year of Meteorological Data | Highest-Second-High 24-hr $PM_{10}$ Concentration ($\mu g/m^3$) | Easting Coordinate (meters) | Northing Coordinate (meters) |
|---|---|---|---|
| 2003 | 68.90 | 429068.31 | 4563342.00 |
| 2004 | 58.74 | 429068.31 | 4563342.00 |
| 2005 | 52.14 | 429061.00 | 4563293.50 |
| 2006 | 57.43 | 429075.59 | 4563390.50 |
| 2007 | 62.24 | 429061.00 | 4563293.50 |

The corrected Vulcan highest-second-high 24-hour average $PM_{10}$ concentrations vastly exceed the Class II PSD increment of 30 $\mu g/m^3$. The basis for which IEPA is issuing this permit is therefore flawed and issuing the permit is unlawful. It is important to note that we used the Rockford 2003 through 2007 meteorological data used in the permit application. These meteorological data are distant and low quality and underestimate project impacts, as discussed below. Correcting this error by IEPA and VCM would further increase the modeled results.

## D. Rockford, Illinois Airport Meteorological Data are Unreliable for Class II PSD Compliance Air Dispersion Modeling

Vulcan Lime is proposing to assess compliance with the Class II PSD increments using five years of meteorological data (2003 through 2007) from the Rockford, Illinois Airport. The proposed Rockford Airport data are flawed and unacceptable for a number of reasons, including:

- The proposed data are not site-specific;
- The airport data have not been shown to be representative of the project site;
- The proposed data do not meet EPA's Meteorological Monitoring Guidance for Regulatory Modeling Applications;
- The airport data excludes all low wind speed conditions, which are critical for verifying compliance with the NAAQS and Class II PSD increments;

- Using the airport measurements results in an AERMOD profile data set with only surface level winds. This is unacceptable for a facility with a 42.67 meter tall stack.

Because of these critical defects, any Vulcan Lime AERMOD modeling using these data will be unacceptable for NAAQS and PSD increment consumption analyses. Using the Rockford Airport data will lead to unreliable and underestimated modeling results. Our detailed comments follow.

**1. The Rockford Airport Data are not Site-Specific for Vulcan Lime**

The Rockford Airport data, collected at a location over 100 miles (161 km) from Vulcan Lime's proposed Manteno facility, is neither site-specific, nor is the quality of the data acceptable for air dispersion modeling. The Vulcan Lime permit application submitted to IEPA, which proposes using these data for air modeling, will therefore be flawed.

The Rockford Airport data are not appropriate for the Vulcan Lime Manteno facility. The distance between the Rockford Airport and the Vulcan Lime Manteno facility (over 100 miles) makes the airport data clearly not site-specific, with numerous land use classifications existing between Vulcan Lime and the airport. Equally important, however, are the difference in land uses at Vulcan Lime and the airport, respectively. The Rockford Airport is comprised of concrete runways, parking lots, passenger terminals, and other structures associated with air travel activities. These surface and building characteristics in turn affect the boundary layer meteorology present at the airport.[128] In addition, landings, takeoffs, and idling of airplanes affect the site-specific conditions at the airport such that the meteorological conditions are not representative of the area surrounding the Vulcan Lime facility.

**2. The Applicant Fails to Show that the Rockford Airport Data are Representative of the Manteno Site**

Vulcan Lime performed supplemental AERMOD air dispersion modeling to assess $PM_{10}$ impacts from a revised project description. As part of this modeling analysis, either Air Control Techniques or IEPA (the record is unclear), prepared AERMOD input meteorological data using surface characteristics surrounding the airport site.[129] Air Control Techniques, however, only examined the surface characteristics at the airport, and ignored the conditions at the project site. Clearly, the applicant has failed to verify whether the surface characteristics of the Rockford Airport are representative of the proposed Manteno site.

From the AERMOD Implementation Guide:

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[128] Oke T.R., Boundary Layer Climates, Halsted Press, 1978, pp. 240-241. (see attached file oke.pdf)

[129] *See* $PM_{10}$ Particulate Matter Net Impact Analysis, January 21, 2009, pp. 11-12)

### 3.1.1 Meteorological data representativeness considerations (01/09/08)

When using National Weather Service (NWS) data for AERMOD, data representativeness can be thought of in terms of constructing realistic planetary boundary layer (PBL) similarity profiles and adequately characterizing the dispersive capacity of the atmosphere. As such, the determination of representativeness should include a comparison of the surface characteristics (i.e., $z_0$, *Bo* and *r*) between the NWS measurement site and the source location, coupled with a determination of the importance of those differences relative to predicted concentrations. Site specific meteorological data are assumed by definition to be representative of the application site; however, the determination of representativeness of site-specific data for AERMOD applications should also include an assessment of surface characteristics of the measurement and source locations and cannot be based solely on proximity. The recommendations presented in this section for determining surface characteristics for AERMET apply to both site-specific and non-site-specific (e.g. NWS) meteorological data.

The degree to which predicted pollutant concentrations are influenced by surface parameter differences between the application site and the meteorological measurement site depends on the nature of the application (i.e., release height, plume buoyancy, terrain influences, downwash considerations, design metric, etc.). For example, a difference in $z_0$ for one application may translate into an unacceptable difference in the design concentration, while for another application the same difference in $z_0$ may lead to an insignificant difference in design concentration. If the reviewing agency is uncertain as to the representativeness of a meteorological measurement site, a site-specific sensitivity analysis may be needed in order to quantify, in terms of expected changes in the design concentration, the significance of the differences in each of the surface characteristics.

If the proposed meteorological measurement site's surface characteristics are determined to NOT be representative of the application site, it may be possible that another nearby meteorological measurement site may be representative of both meteorological parameters and surface characteristics. Failing that, it is likely that site-specific meteorological data will be required.[130]

Surface roughness, shown in shorthand as $z_0$, is an essential parameter in estimating turbulence and diffusion. Technically, it's the height above the ground that the log wind law extrapolates to zero; $z_0$ can also be thought of as a measure of how much the surface characteristics interfere with the wind flow. Very smooth surfaces, like short grass or calm

[130] USEPA, AERMOD Implementation Guide, Last Revised: March 19, 2008, pp. 3-4.

ponds, have very low values of $z_0$ -- on the order of 0.01 meter or less. Tall and irregular surfaces, which are a greater obstacle to wind flow, have higher values of $z_0$ – up to 1.0 meter or more for forests.

When using NWS data, such as from the Rockford Airport, the applicant must determine whether the surface characteristics are representative of the project location they are modeling with AERMOD. And just as important, they need to determine just how sensitive the modeled impacts are to differences in the chosen surface parameters, for example $z_0$.

Furthermore, USEPA's guidance is saying that if the data comes from a site with surface characteristics that are not representative of the application site, then it is likely that a better data set will be required. In practice, that usually means collecting site-specific pre-construction meteorological data prior to modeling project impacts.

VCM did not prepare any analyses to determine whether the Rockford surface characteristics are representative of their Manteno site. This is particularly important since the applicant used seasonal weather conditions and segment-averaged surface characteristics representative of the Rockford, Illinois Airport. It is very unlikely that the same set of weather and sector-specific surface conditions found at the Rockford, Illinois Airport exist at the Manteno site. And since modeled impacts are highly dependent on surface characteristics, the applicant failed to determine how the modeled project impacts are affected by the Rockford Airport surface parameters. It should be obvious that a quarry and lime calcining plant will have very different surface roughness, Bowen Ratio, and albedo conditions than at the Rockford Airport. Moreover, simply comparing satellite photos of the two locations through Google Maps shows very different surrounding areas.

By relying solely on Rockford Airport data and surface characteristics, without any consideration of the conditions at the Manteno site, Vulcan Lime failed to show that the Rockford Airport data are representative of the Manteno site.

### 3. The proposed Data do not Meet EPA's Meteorological Monitoring Guidance for Regulatory Modeling Applications

For air dispersion modeling purposes, airport data are among the least desirable. Problems with location and the general quality of data are the primary concerns. The USEPA, in their Meteorological Monitoring Guidance for Regulatory Modeling Applications, summarizes these concerns about using airport data:

> For practical purposes, because airport data were readily available, most regulatory modeling was initially performed using these data; however, one should be aware that airport data, in general, do not meet this guidance.[131]

[131] USEPA, Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-05, February 2000, p. 1-1.

The use of antiquated airport data was initially used for simpler Gaussian dispersion models such as ISCST, ISCST2, and even ISCST3. It was also used for older, less-refined models such as MPTER, CRSTER, and COMPLEX-I/II. The key word is *initially*. Any regulatory agency, IEPA included, should be aware that continuing this outdated practice will lead to flawed air impact analyses.

This concern is particularly true here, as the VCM site modeling uses the newer AERMOD dispersion model. AERMOD requires specific parameters to characterize boundary layer and upper air dispersion in a meaningful fashion. The data collected at the Rockford Airport are simply inadequate to provide AERMOD with the required parameters needed for realistic dispersion calculations. Just because one can run AERMOD with airport data does not imply that one should do so.

The major issue is the quality of the meteorological data collected at the Rockford Airport. It is important to remember that the airport data are not collected with the thought of air dispersion modeling in mind. For example, Rockford Airport meteorological parameters are reported once per hour, based on a single visual observation (usually) taken in the last ten minutes of each hour. The USEPA recommends that sampling rates of 60 to 360 times per hour, at a minimum, be used to calculate hourly-averaged meteorological data.[132] Air dispersion modeling requires hourly-averaged data, which represents the entire hour being modeled, and not the once-per-hour snapshot represented by airport data.

In addition, data collected at the Rockford Airport are not subject to the system accuracies required for meteorological data collected for air dispersion modeling. The USEPA recommends that meteorological monitoring for dispersion modeling use equipment that are sensitive enough to measure all conditions necessary for verifying compliance with the NAAQS and PSD increments. For example, low wind speeds (less than or equal to 1.0 meter per second) are usually associated with peak air quality impacts – this is because modeled impacts are *inversely* proportional to wind speed. Following USEPA guidance, wind speed measuring devices (anemometers) should have a starting threshold of 0.5 meter per second or less.[133] And the wind speed measurements should be accurate to within plus or minus 0.2 meter per second, with a measurement resolution of 0.1 meter per second.[134]

The Rockford Airport data used in the modeling here, rather than being measured in 0.1 meter per second increments, are based on wind speed observations reported in whole knots. This is evidenced by examining the meteorological data files for the Rockford Airport. Every modeled hourly wind speed in these data sets is an increment of whole

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132 Id., p. 4-2.

133 Id., p. 5-2.

134 Id., p. 5-1.

knots. The once-per-hour observations at the Rockford Airport (in whole knots, no fractions or decimals) are simply converted to meters per second and can therefore be back-converted to the whole knot measurements originally reported by the airport.

### 4. The Airport Data Excludes all Low Wind Speed Conditions, which are Critical for Verifying Compliance with the NAAQS and Class II PSD Increments

To further exemplify the problem of using airport data, the meteorological data files from the Rockford Airport include an unacceptably large percentage of calm hours. Out of a possible 43,824 hours in the Rockford five-year modeling data set (2003 through 2007), there are 4,409 calm hours. This represents 10.06% of the total data set. Typically, when properly measured with modern anemometers, there are only a few calm hours in a meteorological data base per year.[135]

In AERMOD, calms are identified when the reported wind speed is 0.0 meter per second. At airports, any wind speed less than three knots (1.54 meters per second) are automatically regarded as calm, even if the wind is not entirely still. The purpose of this reporting procedure is simple: winds less than three knots do not pose a concern for pilots, so airports identify all low wind speed conditions as calm. The problem with using these data for air permitting, however, is that the best wind conditions for landing and take offs (low wind speeds) are the worst-case conditions for air modeling impacts. Using airport data that show no periods with wind speeds less than three knots results in a bias of under-predicted highest modeled air impacts. This is particularly true for low-level fugitive $PM_{10}$ emissions, which are widely present at the Vulcan Lime site.[136]

Without a doubt, the conditions most crucial for verifying compliance with the NAAQS and PSD increments (low wind speeds) are excluded from the VCM modeling analysis because of the use of Rockford Airport data. This is particularly disconcerting here, given that AERMOD is designed to handle wind speeds less than one meter per second, but the model has not been put to this full use. Excluding the calm hours from modeled concentrations favors the project proponent and is in appropriate given the improved capabilities of AERMOD.

Sensitive and accurate measurements of wind speeds are necessary for measuring winds down to 0.5 meter per second (about one knot), which can then be used as valid hours in the air dispersion modeling analyses. There would be no need to label such low wind speed hours as calm, which will greatly increase the number of hours included in the modeling analyses. As discussed in Comment C. above, it is these low wind speed hours

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[135] For example, the 10-meter pre-construction monitoring data set for the Newmont Nevada proposed coal-fired power plant has five calm hours in the one-year period from 9/1/2003 through 8/31/2004. (see attached file BoulderValleyWinds.pdf)

[136] Scire, Joseph S., Comments on the 9th Conference on Air Quality Modeling, Research Triangle Park, North Carolina, October 9-10, 2008, Attachment 2.

that must be included in the modeling data set for realistically verifying compliance with the NAAQS and PSD increments.

In addition to excluding the 4,409 worst-case air quality conditions (calm hours), the Rockford data set has 1,484 missing hours. Together, the calm and missing hours make up over 13.4% of the total Rockford data set. In other words, IEPA is processing a permit application based on fewer than 87% of the possible data. To make matters worse, the data that are used for the analyses were sanitized of the very wind conditions that cause the highest modeled impacts.

Using low-quality airport meteorological data for modeling major sources of air pollutants, such as Vulcan Lime's proposed Manteno plant, must not be allowed. IEPA should require Vulcan Lime to collect at least one-year of site-specific meteorological data consistent with USEPA Meteorological Monitoring Guidance for Regulatory Modeling Applications.

### 5. IEPA and VCM Improperly Used the Rockford Airport Measurements To Produce an AERMOD Profile Data Set with only Surface Level Winds

The meteorological data problems here are broader still. The meteorological data proposed for Vulcan Lime's NAAQS and PSD modeling must include both surface and upper air data, the latter being stored in the AERMOD vertical profile data file. From the AERMET User's Guide:

> The second file contains one or more levels (a profile) of winds, temperature and the standard deviation of the fluctuating components of the wind. Generally, this latter file contains the data from an (sic) site-specific measurement program. In the absence of such data, a single level using NWS hourly surface observations may be used for this profile.[137]

Using NWS hourly surface observations for the vertical wind and turbulence profile may be acceptable for specific low-level releases (less than or roughly equal to the anemometer height), but certainly not for elevated effective stack heights such as those proposed for the Vulcan Lime project.

If IEPA does not require Vulcan Lime to collect site-specific meteorological data, it will be allowing the applicant to use surface winds from many miles away instead of representative vertical profile conditions. While this is expedient for both IEPA and VCM, it is unreasonable in light of AERMOD's required inputs and unlawful in light of the requirement to use site specific and representative data. The consequence is that there are no meaningful wind data for transporting and dispersing pollutants from the proposed main stack, which has an effective stack height much higher than the available wind

[137] USEPA, User's Guide for the AERMOD Meteorological Preprocessor (AERMET), EPA-454/B-03-002, November 2004, p. 1-5.

measurements. Instead, the data used will completely lack both the vertical profile of winds and any measurements of the fluctuating components of the wind. This is a serious mistake, which completely ignores the AERMOD input requirements necessary for meaningful transport and dispersion from elevated emission sources.

Examining the applicant's AERMOD profile data, it is clear that the "upper air" observations that VCM used are not upper air at all, but are instead the surface winds measured at 10 meters: there is no other possibility given the data set VCM is using. VCM's AERMOD profile data will contain only one "upper air" profile, and it will use the exact same values as the surface data collected at the Rockford Airport. In other words, the modeling used Rockford Airport surface data instead of upper air profile data. This failure to use upper air data completely invalidates the upper air transport and dispersion needed to assess the air impacts from VCM's 42.67 meter-tall calciner stack. There is no vertical profile (which implies data at more than one level) whatsoever in VCM's profile data.

Furthermore, VCM's profile data contains no measurements of fluctuating components of the wind. These are measured as standard deviations of either wind speed or wind direction, in both the vertical and horizontal planes. These data (along with other parameters such as wind speed, direction, and temperature) are necessary to characterize plume dispersion, and must be measured at various vertical levels to give any meaningful depiction of the facility's elevated emission plumes. Instead, VCM's vertical profile data contains only measurements of wind speed, direction, and temperature measured at 10 meters above the ground at an airport over 100 miles away – and nothing else. This invalidates any analyses performed using these data simply because the data are unreliable for use in a sophisticated boundary layer characterization model, such as AERMOD.

Again, to remedy this unacceptable situation, VCM must collect at least one year of pre-construction meteorological data consistent with USEPA Meteorological Monitoring Guidance for Regulatory Modeling Applications. The pre-construction meteorological data should include both surface and profile measurements up to the effective stack height of the tallest point source.

Absent representative data, IEPA's permit review is flawed, unreasonable, and unlawful.

## CONCLUSION

For all of the above reasons, we respectfully request that the Illinois Environmental Protection Agency fulfill its duty to protect the health and environment of Illinois' residents by denying this permit.

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