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Project Summary for an Application for Construction Permit/PSD Approval from Mississippi Lime Company for a Lime Manufacturing Plant in Prairie Du Rocher, Illinois

Site Identification No.: 157863AAC
Application No.: 08100063

Schedule
Public Comment Period Begins: October 4, 2010
Public Hearing: November 18, 2010
Public Comment Period Closes: December 18, 2010

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I. INTRODUCTION

Mississippi Lime Company (Mississippi Lime) has applied for an air pollution control construction permit for a lime manufacturing plant at its existing limestone mine located in Prairie Du Rocher. Mississippi Lime proposes to construct a plant that would include two pre-heater rotary kilns; limestone crushing, storage and handling; fuel storage and handling; lime hydrators; lime storage, handling, and loadout; and other ancillary operations.

The Illinois EPA has reviewed Mississippi Lime's application for a construction permit and made a preliminary determination that the application meets applicable requirements. Accordingly, the Illinois EPA has prepared a draft of the construction permit that it would propose to issue for the proposed construction of lime plant. However, before issuing the permit, the Illinois EPA is holding a public comment period and a public hearing to receive comments on the proposed issuance of a permit and the terms and conditions of the draft permit.

II. BACKGROUND

Lime is manufactured in kilns by high-temperature roasting or "calcination" of limestone or other material rich in calcium carbonate to convert calcium carbonate ($CaCO_3$) into lime or calcium oxide (CaO).

Lime is commonly manufactured in rotary kilns. A rotary kiln is a long, cylindrical, horizontal furnace, lined with refractory, through which the limestone and combustion gases pass in opposite directions, in counter-current flow. The kiln is slightly inclined, with stone feed going in at the higher end and lime product coming out at the lower end, where the burner is located. The heating of the limestone is facilitated by rotation of the kiln about its horizontal axis.

The kiln is the principal source of emissions at a lime manufacturing plant. The kiln emits dust or particulate matter (PM), which is generated from the limestone as it moves through the kiln and is calcined and from ash and particulate released by combustion of fuel. This particulate must be controlled by water scrubbing or filtration. Lime kilns also emits sulfur dioxide (SO_2) due to the sulfur contained in the fuel burned in the kiln and in the limestone feedstock. The SO_2 emissions are controlled by inherent adsorption on particulate emissions and the particulate control device. This control may be supplemented by equipment to specifically enhance control of SO_2. Lime kilns also emit nitrogen oxide (NO_x), which is formed in a kiln when nitrogen and oxygen in the combustion air combine during combustion of fuel. The NO_x emissions of lime kilns are minimized by the design of the burner and combustion system of the kilns. Finally, lime kilns emit carbon monoxide (CO) and volatile organic material (VOM), which are products of incomplete combustion of fuel and the organic matter present in the limestone. These are minimized by good combustion practices.

The other emission units at lime manufacturing plant beside the kilns involve (1) the handling of and preparation of the raw limestone to be fed to the kilns by crushing and sizing of the limestone (also known as "processed stone handling"), (2) the handling and processing of the lime product from the kilns, (3) the handling of solid fuel for the kilns, and (4) plant roadways, with vehicle traffic. These units emit particulate, which is controlled by measures to reduce the generation of emissions and measure to control emissions that are released.

III. PROJECT

Mississippi Lime has applied for a construction permit for a lime manufacturing plant with two rotary kilns that would burn coal and petroleum coke, i.e., solid fuel. The lime produced by the kilns would be cooled in a integral cooler that would recover heat to dry and preheat the fuel. Each kiln would have a preheater at the exhaust end of the kiln, before the add-on air pollution control. The preheater would heat the stone feed that will go into the kiln using the thermal energy contained in the hot flue gas from the kiln. The use of preheaters will lower the amount of fuel that is needed to make lime, in Btu per ton, increasing the energy or fuel efficiency of the kilns.

The emissions of the kilns would be controlled by a combination of design, work practices and add-on emission control equipment. Emissions of NO_x, CO and VOM would be controlled by the design of the kilns and low excess air and good combustion practices. PM emissions would be controlled by add-on baghouses or fabric filters. SO_2 emissions would be controlled by the natural ability of limestone and lime dust to absorb SO_2, with SO_2 then being removed from the flue gas in the dust collected by the fabric filters. As the plant would produce high-calcium lime, this would provide very effective control of SO_2 emissions.

The limestone processed at the proposed plant is expected to come by an enclosed transfer system from an associated underground mine facility, which is owned by Mississippi Lime, and crushed to final size at the plant. Alternatively, limestone may be received by truck from an off-site quarry. The associated mine facility at the plant site is currently operated by Martin Marietta Materials under a lease that is set to expire in October 2010 (Illinois EPA Source ID. No.: 157863AAB). Mississippi Lime plans to take over operation of this facility and operate it to supply limestone to local markets on an interim basis until the proposed lime plant is operational. For this purpose, Mississippi Lime has obtained a permit to install its own limestone crushing plant at the mine facility (Construction/Operating Permit No. 10050062). When the proposed plant begins operation, units at this limestone crushing plant that are addressed by this construction permit would continue in operation. Other units that are not addressed by this permit would cease operation.

At the proposed plant, the crushed limestone will be stored in stockpile. Limestone from the storage pile will be screened to remove material that is too small or large from the limestone that is fed to the kilns. Appropriately sized material will go to bins pending feed to the kilns. Unsuitable material will be stockpiled pending loadout for alternative use. Solid fuel for the kilns will also be handled at the plant. Solid fuel will also be stored in stockpiles. From the stockpiles, fuel be transferred to the fuel feed bins for the kilns. The particulate emissions from these operations will be minimized by the nature of the materials, including moisture content, enclosure and work practices.

The raw lime product from the kilns must be screened to size the product lime. Some of the lime from the kilns, which is quick lime (CaO), would be converted to hydrated lime ($Ca(OH_2)$) by adding water in a hydration system. Kiln dust, i.e., lime and limestone dust collected by the baghouses on the kilns, will also be handled pending final disposition. The particulate emissions from these operations equipment will be controlled by a combination of work practices and fabric filters (baghouses).

Fugitive dust or particulate emissions will also be generated by vehicle traffic and wind erosion on roadways, parking areas and access areas at the plant. These emissions are controlled by implementation of a dust control program to minimize the generation of emissions.

IV. EMISSIONS

A summary of the permitted or potential emissions of the lime plant as would be allowed by the draft permit on an annual basis are provided below. In practice, the actual emissions from the plant should be less than the permitted emissions as units operate at less than their maximum capacity and emission rates are normally lower than the applicable standards and limitations.

Summary of Permitted Annual Emissions of the Lime Plant (Tons/Year)

Pollutant	Permitted Emissions
NO_x	1,533
CO	1,095
SO_2	283
$PM/PM_{10}/PM_{2.5}$	107/107/52.3
VOM	22

V. APPLICABLE EMISSION STANDARDS

All emission units in Illinois are subject to state emission standards adopted by the Illinois Pollution Control Board. These standards specify the maximum rate or concentration of a pollutant that may be emitted from a unit or certain minimum control requirements must be achieved. The state standards represent the minimum requirement for emission units in Illinois. 35 IAC 212.321 addresses PM emissions from process emission units, including lime kilns and other operations at lime plants, setting limits on hourly emissions based on the amount of material processed by a unit. These standards are less stringent than applicable federal emission standards adopted by USEPA and the emission limitations that would be set by the permit for the plant.

USEPA has adopted emission standards called New Source Performance Standards (NSPS) for various categories of emission units. The proposed kilns are subject to the NSPS for lime manufacturing plants, 40 CFR 60, Subpart HH. This NSPS sets standards for the particulate emissions and opacity from lime kilns, i.e., 0.60 pounds of PM per ton of limestone feed and 15 percent opacity (40 CFR 60.342).

USEPA has also adopted emission standards called federal National Emission Standards for Hazardous Air Pollutants (NESHAP) for various categories of emission units. The lime kiln is subject to the NESHAP for lime manufacturing plants, 40 CFR 63, Subpart AAAAA. This NESHAP sets a standard for particulate emissions of lime kilns, i.e., 0.10 pound per ton of limestone feed (40 CFR 63.7090). It also sets standards for the handling of limestone or "processed stone handling operations" at a lime manufacturing plant, limiting stack emissions of particulate matter to no more than 0.032 gram per cubic meter, the opacity of uncaptured particulate emissions to 7 percent, and the opacity of fugitive emissions to no more than 12 percent

VI. APPLICABILITY OF REQUIREMENTS FOR MAJOR PROJECTS

Construction of a project that results in a significant increase in emissions at an existing major source or that would by itself is a major source is subject to additional requirements pursuant to the "New Source Review (NSR)." In an area that is attainment for a criteria air pollutant (i.e., meeting the ambient air quality standards), the federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21, apply. Prairie Du Rocher is in the portion of Randolph County, an area that is classified as attainment for all criteria pollutants.[1]

The PSD rules were established to preserve clean air. The PSD rules require: 1) an "emission limit" on new or modified equipment which represents Best Available Control Technology (BACT), 2) an air quality assessment of the impact of new emissions, and 3) an analysis of impacts on soils, vegetation, and visibility. The Illinois EPA has been delegated authority by USEPA to administer the PSD permit program in Illinois.

Mississippi Lime's proposed lime manufacturing plant is subject to PSD for emissions of SO_2, NO_x and CO because the potential emissions of the plant are more than 100 tons/year. The plant is also subject to PSD for particulate emission because its potential emissions of particulate, as particulate matter (PM), PM_{10} and $PM_{2.5}$ are more than the significant emission rates set for particulate emissions by the PSD rules.[2] As Mississippi Lime has applied for a permit with potential emission for the plant exceeding the major source threshold for certain pollutants, the application must be appropriately reviewed under the

1. Baldwin Township in Randolph County is designated nonattainment for $PM_{2.5}$ air quality.
2. Under the PSD rules, 40 CFR 52.21(b)(23), the particulate emissions of a proposed construction project are considered significant if the increase or net increase in annual emissions are equal to or greater than 10, 15 or 25 tons per year for particulate measured as $PM_{2.5}$, PM_{10} or filterable PM, respectively.

PSD rules for those pollutants. The potential emissions of the lime plant for other PSD pollutant would not be significant. In particular, the potential emissions this project for VOM and sulfuric acid mist (H_2SO_4) are less than 40 and 7 tons per year, respectively, so that this project is not subject to PSD for these pollutants.[3]

VII. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

The Clean Air Act defines BACT as: "... an emission limitation based on the maximum degree of reduction ... which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable ...."

Mississippi Lime submitted a BACT demonstration in its application reflecting its judgment as to the emission control technology and associated emission limits that should be considered BACT under the PSD rules for various units at the plant. The BACT demonstration evaluates various technologies that could be used to control emissions of different pollutants. It also includes a review of the emission limits set as BACT for other lime plant projects in the country that were subject to PSD permitting.

The Illinois EPA has reviewed the material submitted by Mississippi Lime and made its independent determination of BACT. In addition to the material submitted by Mississippi Lime, the Illinois EPA's determination of BACT relies upon its general knowledge of the types of operations at the plant. As explained below, the Illinois EPA concurred with Mississippi Lime's selection of control technologies as it reflected technologies that are commonly used at lime manufacturing plants and effectively control emissions. The Illinois EPA's determination of BACT for the proposed plant, as set forth in the draft permit, would establish stringent performance requirements for the use of this control technology at the proposed plant.

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3. Even though the emissions of greenhouse gases (GHGs), including carbon dioxide (CO_2), from the proposed plant would be significant, GHGs are not yet a regulated pollutant under the PSD rules. (Refer to the definition of "subject to regulation" at 40 CFR 52.21(B)(49).)

However, the proposed lime plant would be developed to minimize emissions of GHGs as it includes features to enhance fuel and energy efficiency of the kilns, notably the preheaters on each kiln. If PSD were applicable to the proposed plant for its emissions of GHGs, these preheaters would be the primary control technology specified as Best Available Control Technology (BACT) for the kiln's emissions of GHGs, which are primarily CO_2. (This is addressed in Supplemental BACT Information submitted by Mississippi Lime, "BACT for GHG Emissions from Lime Kilns.")

As it is, the preheater on the kilns would be a secondary control technology for emissions of pollutants that are subject to PSD as they reduce fuel consumption and accordingly act to reduce emissions of NO_x and CO, which are linked with combustion of fuel in the lime kilns. Because the preheaters serve to reduce emissions of NO_x and CO, the draft permit would set design standards for the energy efficiency of the kilns with preheaters, expressed indirectly in terms of emissions of GHGs and CO_2 per ton of lime product from the kilns, on an annual average basis.

Lime Kilns

General Design of Kilns and Selection of Principle Fuel – Mississippi Lime has proposed to use an established approach to the kilns, with features, notably preheaters, to minimize emissions. It has also proposed to use commercial solid fuels, for which it can rely upon long-term availability, consistent quality, and reasonably certain future prices. These decisions are consistent with the business purpose of the proposed plant, as it is intended to process an existing reserve of high-calcium limestone owned by Mississippi Lime or, alternatively, other local reserves of limestone to make various types of high-calcium lime products for regional markets. These considerations appropriately define the scope of the proposed plant, and, among matters, eliminate use of biomass fuel as a potential alternative fuel for the plant for purposes of BACT.[4, 5]

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4. The use of biomass as the fuel for the proposed plant can be readily eliminated as a BACT alternative for the proposed plant. The fact that biomass fuel is used at certain facilities to produce steam and electricity does not show that it should be required at the proposed plant. Biomass fuel is not consistent with the nature of the plant, which would produce lime, a physical product, for sale. To effectively convert limestone into lime, the kilns need fuel with consistent heat content and other physical properties. This objective is inconsistent with use of biomass fuel. As a general matter, the composition and properties of biomass fuels are significantly different than those of coal and petroleum coke. For example, biomass is not a friable material and cannot be pulverized like coal or petroleum coke so would burn at a different rate in the kiln. The lower heat content of biomass also results in it not being a suitable fuel for a calcination process designed for high-heat content fuels.

In addition, as the objective is to manufacture lime, this necessitates use of commercial fuels for which a reliable supply will be available during the life of the plant. Even if biomass fuels could be used in the kilns, biomass fuels cannot yet generally be considered a commercial fuel. Farming to produce low quality biomass fuels, of the type that would potentially be available for use at the proposed plant, is in its infancy. The future availability of such fuel and its cost cannot be determined or predicted in a way that would allow it to be considered an available fuel. In this regard, key factors are the nature of government programs that accelerate the development of commercial biomass fuels and the extent to which rules are adopted and programs implemented that increase competition for this fuel, such as federal rules supporting use of renewable fuels. This situation with the proposed plant is different from projects in which the sources propose to utilize or develop certain biomass resources. In those cases, the sources are voluntarily accepting the uncertainty in the future availability and cost of material from the selected resource. Likewise, the circumstances are different from those of sources that propose to utilize waste as fuel and voluntarily accept the uncertainty associated with use of such material and the additional accompanying regulatory burdens.

These considerations, which preclude use of biomass as the required fuel for the proposed plant, also preclude use of a blend of biomass and coal and coke as the fuel for the plant. In addition, use of a blended fuel, even if feasible and otherwise appropriate, would act to negatively affect the operation of the plant. The increase in the complexity of operation, which would be inherent in using a blend of coal, coke and biomass, would be contrary to consistent and reliable operation, such that an increase in process upsets and production of off-specification lime should be contemplated. Similarly, the use of fuels derived from biomass by the proposed lime kiln is also rejected. The conversion of biomass into a biomass-derived fuel adds significantly to the costs of such a fuel compared to conventional fuels. Thus biomass derived fuels are readily rejected for purposes of BACT as their emission characteristic would be no better than those of natural gas but they would be several times more expensive, with higher cost impacts than those of natural gas.

Nitrogen oxides (NO_x) - The Illinois EPA has determined that BACT for NO_x emissions for the kilns to be combustion management, which would reduce the peak flame zone temperature. Add-on NO_x control technology is not feasible for lime kilns given the operating temperatures at the locations at which reagent could be injected. In particular, the temperature of the exhaust after the fabric filter would be significantly lower than the bottom of the range of operating temperature of selective catalyst reduction (SCR) technology. SCR technology is not feasible before the fabric filter because the dust loading in the flue gas before filtration would interfere with efficient operation of the beds of catalyst in the SCR system.[6] The flue gas temperatures at the exit of kilns would also be significantly lower than the bottom of the range of operating temperature of nonselective catalyst reduction (NSCR) technology. As related to emissions of NO_x, for a lime kiln, solid fuel is a "clean fuel." Because solid fuel is introduced into the kilns in a powdered form, it burns more slowly than natural gas producing less NOx than firing of natural gas.[7] An appropriate BACT limit for NO_x is proposed at 3.5 lb NO_x/ton of lime produced, 24-hour average.

Sulfur dioxide (SO_2) - BACT for SO_2 emissions from the kilns is determined to be "natural scrubbing," as achieved with the limestone and lime dust produced by the lime kilns and captured by the fabric filters. The proposed plant would produce high-calcium lime from high-

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5. Given the nature of the kilns and use of fabric filters, it is unclear that the use of biomass fuel would be accompanied by significantly lower levels of emissions of regulated pollutants. For particulate, the performance of the filters reflects residual levels of dust in the flue gas, based on the capabilities of the filters, rather than removal of a percentage of dust in the flue gas. As such, performance is independent of the level of dust in the flue gas. Accordingly, "cleaner fuels," which contain less ash, do not translate into lower emissions of filterable particulate.

As addressed in more detail elsewhere, as the SO_2 emissions of the kilns would be controlled by "natural scrubbing," the reduction in SO_2 emissions with a lower sulfur fuel would only be a fraction of the reduction in the sulfur content of the fuel.

6. Reheat of the flue gas to the operating temperature for SCR technology would be experimental, as reheat has not been applied to kilns. It would also be accompanied by increased emissions as additional fuel would have to be burned in the stack to reheat the flue gas. Use of an indirect reheat system would not be feasible because the dust loading in the hot flue gas would interfere with effective operation of the hot-side of the heat exchanger.

7. Given the physical geometry of a lime kiln, with combustion occurring at one end of a refractory line tube, "low-NO_x burners," as used on boilers are not feasible for lime kilns. This is because management of secondary combustion air, as is a key aspect of low-NO_x burners, cannot be accomplished with separate ports and adjustments for secondary combustion air. Rather, combustion in a lime kiln is accomplished with use of burners that appropriately manage primary air for good combustion and generally control or manage the amount of secondary air that enters the kiln to minimize excess air and formation of NO_x and maintain the fuel and energy efficiency of the kiln.

These circumstances are different for those of a boiler. In a boiler, the mixing of fuel and combustion air can be manipulated and staged with low-NO_x burners to minimize the conditions favorable to formation of NO_x. This is particularly true for natural gas because it is burned as a gas, with combustion initially constrained by the availability of combustion air. This is different from combustion of solid fuel, which while constrained by availability of combustion air, must also address the time that it takes the individual particles of fuel to completely gasify and burn in the boiler.

calcium limestone. High-calcium limestone and lime are very reactive with an affinity for SO_2. Indeed, Mississippi Lime plans to market the lime product from the proposed plant to coal-fired power plants equipped with scrubbers for control of SO_2 emissions at those plants. This reaction is facilitated as SO_2 is removed from the flue gas by dust not only in the preheater and ductwork but also as flue gas must pass through the dust cake accumulated on and in the filtration material in the fabric filters. An appropriate SO_2 BACT emission limit with the scrubber is 0.645 lbs SO_2 per ton of lime produced, on a daily or 24-hour average basis. This represents a nominal control efficiency of over 97 percent based on the design fuel supply for the kilns, considering only the SO_2 emissions attributable to sulfur introduced with fuel and disregarding any sulfur retained in the lime product.[8] Given the level of SO_2 removal that would be required to be achieved by natural scrubbing, further add-on control equipment is not warranted for SO_2, both because of cost and because of the uncertainty of any significant further reduction in SO_2 emissions with such equipment. In addition, use of natural gas, which would be an essentially sulfur-free clean fuel for SO_2 emissions, is not warranted.[9] The associated cost for control of SO_2 emissions would clearly be excessive, as it would be in excess of $20,000 per ton of SO_2 controlled.[10] The proposed plant

8. Based on achievement of an actual fuel usage rate by the kilns of 10 tons per hour and a design sulfur content of 3.5 percent, fuel would introduce 700 pounds per hour of sulfur into a kiln, equivalent to 1400 pounds of SO_2 (10 x 0.035 x 2000 = 700, 700 x 2 = 1400). The controlled SO_2 emissions of the kiln based on a BACT limit of 0.645 pounds per ton of lime would be 32.25 pounds per hour (50 x 0.645 = 32.25). The nominal control efficiency for SO_2 achieved by natural scrubbing would be about 97.5 percent (1 – 32.25/1400)/100 = .977, ≈ 97 percent).

9. While certain lime kilns that produce food grade lime are fired with natural gas, this does not show that the use of natural gas is appropriate for a lime manufacturing plant like the proposed plant, which is being developed to produce various types of general purpose lime.

10. Based on a target firing rate for each kiln of 220 mmBtu/hour and a cost differential of $3 per mmBtu between solid fuel and natural gas, use of natural gas would cost $15,420,000 more dollars per year than natural gas (220 mmBtu/hour x 2 kilns x 8760 hours/year x $3/mmBtu = $11,560,000). Assuming that use of natural gas would reduce emissions of SO_2 to essentially zero, the accompanying reduction in SO_2 emissions would be 283 tons per year. This results in a cost-effectiveness from the use of natural gas that would be about $40,000 per ton of SO_2 controlled ($11,560,000/year ÷ 283 tons/year = $40,847/ton). The cost-effectiveness of use of diesel fuel as the principal fuel for the kilns would be over $200,000 per ton of SO_2 controlled, as the cost of diesel fuel per mmBtu is more than five times more than that of natural gas. The cost-effectiveness of the use of lower sulfur and more costly solid fuels is also excessive. The key factor in all these evaluations of the potential use of alternative fuels is that most of the SO_2 emissions theoretically present with solid fuel would be controlled by natural scrubbing and as they are already being controlled without any added cost, would not be affected by the use of an alternative fuel.

Consideration of the reduction in emissions of other regulated pollutants that might accompany use of natural gas would not meaningfully alter this conclusion. This is because it should not be expected that the particulate emissions of the kilns would change if fired on natural gas, given the level of control of required for particulate with most particulate attributable to limestone and lime dust. The only accompanying decrease in particulate emissions would be from elimination of fuel handling, involving emissions of at most a few tons per year.

This conclusion would not be altered if GHGs were a regulated NSR pollutant. This is because the upper bound on reasonable cost-effectiveness values for the control of GHGs is in the range of $10 to $20 per ton of GHG controlled, compared to $5,000 to would also almost certainly no longer be a viable project from a business perspective as it would not be able to compete in the marketplace with other existing lime manufacturing plants in the Midwest that produce general purpose lime as these existing plants use solid fuel rather than natural gas.[11]

Particulate matter - The BACT for particulate emissions from the kilns is determined to be fabric filtration or baghouses. Fabric filtration is generally considered the most effective control technology for direct particulate emissions in applications where filtration is feasible and practical, as is the case with lime kilns.[12] A limit of 0.14 lb/ton of lime produced is proposed for filterable particulate matter. This limit would be significantly more stringent than the standard for lime kilns set by the NESHAP for lime manufacturing plants, which is equivalent to about 0.20 lb/ton of lime produced.[13] Separate BACT limits are also proposed to be set for particulate as PM_{10} and $PM_{2.5}$ (total filterable and condensable) at 0.18 and 0.105 lb/ton of lime produced, 3-hour average. These limits would directly address emissions of particulate measured as PM_{10} and $PM_{2.5}$.

Carbon monoxide (CO) - BACT for CO emissions from the kilns is determined to be good combustion practice. While CO emissions could potentially be reduced by operation with additional excess air, this would be counter-productive. Use of additional excess air would directly act to increase NO_x emissions. It would also act to increase particulate emissions of the kilns as the volume of flue gas that would be handled by the filters would increase. It would also reduce thermal efficiency of the kilns, acting to increase emissions of GHGs. An appropriate BACT limit for CO is proposed at 2.50 lb per ton of lime produced, 24-hour average.

Limestone and Solid Fuel Handling

BACT for particulate emission for affected units involved in handling and processing of limestone and solid fuel is proposed to be opacity of fugitive emissions of no more than 10 percent, stack emissions of PM of 0.005 gr/dscf with no more than 7 percent opacity, and no visible emissions from the enclosed units. These limits would provide effective control of particulate emissions. These BACT requirements

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$10,000 per ton. For example, if one assumes that the use of natural gas would eliminate emissions of 300,000 tons of GHG annually, with a reasonable cost-effectiveness of $15 per ton, the value of this reduction would be $4,500,000 per year. The adjusted cost-effectiveness for the use of the alternative use of natural gas would then become $25,000 per ton of SO_2 controlled (($11,560,000 - $4,500,000) ÷ 283 tons = $24,947/ton, ≈ $25,000/ton).

11. As the proposed plant would have lower emissions and better fuel efficiency than these existing plants, it is preferable from an environmental perspective that the demand for general purpose lime be supplied by the proposed plant.

12. The contribution of the NOx and SO_2 emissions of the kilns to emissions of condensable particulate and to secondary particulate matter in the ambient air, which is formed in the atmosphere as NOx and SO_2 react to form particulate, would be directly addressed by the BACT limits set for emissions of NO_x and SO_2.

13. The NESHAP limit of 0.10 lb/ton of limestone feed to the kiln is equivalent to about 0.20 lb/ton of lime product, as the limestone input to a kiln is about twice its lime output.

are accompanied by requirements for inspections, recordkeeping, notifications and reporting.

Lime and Kiln Dust Handling Operations

BACT for particulate emissions from product conveying, processing and loadout is enclosure and filtration. BACT for fugitive particulate emissions from product loadout is partial enclosure and loadout practices to minimize loss of material. The proposed BACT determination would appropriately establish BACT for the different types of operations, with readily enforced performance standards as it is practical to do so, e.g., no visible emissions and use of appropriately designed filtration devices. These BACT requirements are accompanied by requirements for performance testing, operational instrumentation, inspections, recordkeeping, notifications and reporting.

Storage Piles and Roadways

BACT for particulate emissions from the coal and petroleum coke storage piles and the limestone storage pile is determined to be opacity of fugitive emissions to be less than 10 percent. BACT for fugitive dust or particulate matter emissions generated by vehicle traffic and wind erosion on roadways, parking areas and other access area at the plant to be an opacity less than 10 percent from these units, accompanied by a fugitive dust control program.

The proposed BACT determination for storage piles and roadways is intended to require that these emissions be effectively controlled while still providing appropriate operational flexibility in the manner with which this is accomplished in practice by the source. This general approach has been taken because of the Illinois EPA's experience with fugitive dust control programs. This experience indicates that dust control programs must be flexible to appropriately respond to changing operation and weather conditions (rain, hot, dry weather in the summer, and snow and ice in the winter). In addition, dust control programs change and evolve over time as new control techniques become available to control emissions. Accordingly, like material handling operations, roadways associated with the proposed plant are most appropriately addressed through establishment of broad BACT control requirements, rather than with detailed, prescriptive requirements for control of emissions.

VIII. AIR QUALITY ANALYSIS

Mississippi Lime has submitted an air quality analyses that assess the potential effect of the proposed plant on ambient air quality. The analyses were conducted by Shell Engineering & Associates, Inc. (Shell Engineering) and addressed emissions of particulate, NO_x, CO, and SO_2, i.e., the PSD pollutants that would be emitted in significant amounts by the proposed plant. The analyses used reference dispersion models and other approved methodology. The results of these analyses follow.

The first step in these analyses is to determine the maximum impacts of the proposed lime plant by itself (See Table 1). This evaluation shows that the plant would not have significant impacts on air quality for certain pollutants and averaging times. In particular, this analysis shows maximum impacts for carbon monoxide (CO) that are not considered significant and no further analysis is required for CO.[14] Because the predicted maximum impacts for certain other pollutants and averaging times are considered significant under the PSD rules, rather than de minims or insignificant, further analyses were performed that also addressed the emissions of other sources besides the proposed plant.

Table 1: Lime Plant Maximum Impacts (micrograms/cubic meter or ug/m^3)

Pollutant	Averaging Period	Maximum Predicted Impact	PSD Significant Impact Level
NO_2	1-hour	55.5	7.5
	Annual	2.25	1
PM_{10}	24-hour	7.96	5
	Annual	30.52	1
$PM_{2.5}$	24-hour	4.54	1.2
	Annual	1.14	0.3
SO_2	1-hour	11.40	7.9
	3-hour	10.36	25
	24-hour	4.54	5
	Annual	0.55	1
CO	1-hour	66.47	2,000
	8-hour	29.66	500

The further analyses that were performed compared predicted ambient impacts to the applicable PSD increments[15] and to the National Ambient Air Quality Standards (NAAQS). The analysis for consumption of PSD increment addressed the impact of the emissions NOx and PM_{10} from the proposed plant and other new and modified emission units since the baseline was set in Randolph County. The results of these analyses are shown in Table 2 and show compliance with the applicable PSD Increments.[16]

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14. This analysis also shows that the proposed plant would not have significant impacts for sulfur dioxide (SO_2) on a 3-hour, 24-hour, and annual basis.
15. The PSD rules set limits on the maximum increases in concentration of SO_2 (3-hour, 24-hour, and annual average), PM_{10} (24-hour and annual average) and NO_2 (annual average) in the ambient air that may occur in an area as a result of the construction of new and modified emission units. These limits are called "PSD increments". The proposed lime manufacturing plant would be in an area that is designated a Class II area, for which the applicable PSD increments accommodate moderate growth in emissions. The consumption of increment is evaluated from a "baseline date" set as the date that a complete PSD application is first submitted for an area for a pollutant, so as to reflect the existing air quality for the pollutant in the area prior to proposal of a major project that is subject to the PSD rules. The increase in ambient concentration of pollutants due to a major project is also limited by the National Ambient Air Quality Standards (NAAQS). In no case can a PSD permit be issued that would cause or significantly contribute to a violation of the NAAQS.
16. This analysis did not address SO_2 because the proposed plant was shown to not have significant impacts on SO_2 air quality for the averaging time for which SO_2 increments have been established by USEPA.

Table 2: Results of Analysis of PSD Increment Consumption (ug/m^3)

Pollutant	Averaging Period	Maximum Impact Concentration	PSD Increment
NO_2	Annual	12	25
PM_{10}	24-Hour	29	30
	Annual	8	17

The further air quality analyses to evaluate the impacts of the proposed lime plant on compliance with the NAAQS accounted for the emissions of both the proposed plant and existing sources. The contribution of existing sources is addressed by modeling of units at larger sources and by use of a monitored background concentration to account for units that are not individually modeled. The monitored concentrations were taken from ambient monitoring stations operated by the Illinois EPA that conservatively represent the existing air quality at the plant site, as these monitors are located in areas that are more developed, i.e., have more emission source. The maximum air quality impacts predicted by these analyses are shown in Table 3.

Table 3: Results of Analysis of Maximum Ambient Concentrations (ug/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background Concentration	Projected Overall Concentration	NAAQS
NO_2	1-hour	65.10	117.00	182.10	188
	Annual	12.96	30.19	43.15	100
PM_{10}	24-Hour	31.45	65.00	96.45	150
	Annual	9.34	24.00	33.34	50
$PM_{2.5}$	24-hour	6.12	26.70	32.22	35
	Annual	1.49	12.10	13.59	15
SO_2	1-hour	11.40	174.00	185.40	198

IX. IMPACTS ON SOIL, VEGETATION AND VISIBILITY

At the level of impacts predicted by the air quality analysis, the emissions of the proposed lime manufacturing plant should have no significant impact on soils, vegetation, and visibility in the surrounding areas. Mississippi Lime submitted further analyses in its application specifically addressing impacts on soils, vegetation, and visibility. They confirm that the impacts of the proposed plant will not be significant.

X. PERMIT CONDITIONS

The conditions of the permit would set forth the air pollution control requirements that the project must meet. These requirements include the applicable emission standards that apply to the project. They also include the measures that must be used and the emission limits that must be met as BACT for emissions of PM, CO, SO_2, and NO_x from the plant.

The permit would also establish enforceable limitations on the amount of emissions for which the project is permitted. Limitations are set both for PM, CO, SO_2, and NO_x, for which the project is major, and for pollutants for which the project is not major. In addition to annual limitations on emissions, the permit includes short-term limitations and operational limitation, as needed to provide practical enforceability of the annual emission limitations. As previously noted, actual emissions associated with the project would be less than the permitted emissions to the extent that the facility operates at less than capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limitation.

The permit would also establish appropriate compliance procedures for the ongoing operation of the plant, including requirements for emissions testing, required work practices, operational monitoring, recordkeeping, and reporting. These measures are imposed to assure that the operation and emissions of the facility are appropriately tracked to confirm compliance with the various limitations and requirements established for individual emission units.

XI. REQUEST FOR COMMENT

It is the Illinois EPA's preliminary determination that the application for a construction permit meets all applicable state and federal air pollution control requirements. The Illinois EPA is requesting public comments before taking action to issue a permit.

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