Illinois Environmental Protection Agency
Bureau of Air, Permit Section
Springfield, Illinois

Revised Project Summary for a Construction Permit Application from Archer Daniels Midland Company for Changes to the Lysine Manufacturing Department at Its Manufacturing Complex in Decatur

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I. INTRODUCTION

Archer Daniels Midland Company (ADM) has requested a construction permit for various changes to the Lysine Manufacturing Department at its Decatur complex. ADM makes lysine from dextrose for use as a supplement in animal feed. The changes would increase ADM's lysine manufacturing capacity.

The Illinois EPA has reviewed the application for this project. In February 2012, the Illinois EPA made a preliminary determination that the application met applicable requirements. Accordingly, the Illinois EPA prepared a draft of the air pollution control construction permit that it would propose to issue. The Illinois EPA held a public comment period to receive comments on the proposed issuance of the permit and the terms and conditions of the draft permit.

The Illinois EPA has now conducted a further review of the application considering the comments that were received on the draft permit, new guidance being developed by USEPA, and certain additional material submitted by ADM or prepared by the Illinois EPA. The Illinois EPA has again made a preliminary determination that the application for this project meets applicable requirements. The Illinois EPA has now prepared a revised draft of the construction permit that it would propose to issue.

Before issuing this construction permit, the Illinois EPA is holding an additional public comment period. This will provide the public with the opportunity to comment on the additional evaluations of air quality impacts that have been conducted for this project and on certain enhancements that would be made to the construction permit.[1] In particular, various evaluations have been conducted to confirm that the increases in emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) with this project would not have significant impacts on ambient air quality for fine particulate ($PM_{2.5}$), as discussed in new Section VII.3 of this Revised Project Summary. A new evaluation also has been conducted to confirm that this project would not threaten air quality for ozone, as discussed in revised Section VII.4 of this Revised Project Summary. The revised draft construction permit would set a limit on the hourly steam usage of the expanded Lysine Department to assure that this project would not be accompanied by significant impacts on ambient air quality for SO_2 or nitrogen dioxide (NO_2), as discussed in new Section VIII.2 of this Revised Project Summary. (See Draft Condition 2.1.7(c) and related monitoring and recordkeeping requirements in Draft Conditions 7.1.10(b) and 7.1.11(f).)

II. PROJECT DESCRIPTION

Lysine is an essential amino acid produced by ADM as a nutritional supplement for animal feeds. ADM manufactures lysine via fermentation of dextrose. ADM's Lysine Department uses fermentation to convert dextrose which is produced in ADM's corn plant to lysine. Fermentation is a biological process in which a selected microorganism is used under managed process conditions to convert an appropriate feedstock to a

[1] The Illinois EPA is taking this action to reopen the public comment period on this project pursuant to 40 CFR 124.14(b)(1) in USEPA's "Procedures for Decisionmaking," 40 CFR Part 124. This provides that a permitting authority may prepare a new draft permit and reopen a public comment period if any data or information or arguments submitted during the original comment period raise substantial new questions concerning a permit.

desired product.[2] The conversion of dextrose to lysine takes places in a number of fermentation tanks, which are operated on a batch basis. After each batch is completed, the broth from the fermentation tanks is then refined by various process equipment to reduce its water content and make a concentrated liquid lysine product. A portion of the concentrated liquid lysine is processed in steam-heated spray dryers and packaged for sale as a dry lysine product.

The fermentation of dextrose to produce lysine generates an off-gas stream that is rich in carbon dioxide (CO_2). This off-gas stream also contains low concentrations of volatile organic compounds (VOC), for example, ethanol.[3] Small amounts of VOC are also emitted from the downstream drying and dry material handling operations. The drying and handling of dry lysine emits particulate matter (PM).[4] These PM emissions are controlled by various filters or baghouses.

The proposed project would include changes to the Lysine Department to increase its capacity to approximately 450,000 tons of lysine per year. The service of certain existing emission units would be changed for lysine production. Certain existing units in the Lysine Department would be modified and certain new equipment would also be constructed.

The project would also involve increases in the operation of the boilers in ADM's existing Cogeneration Plant to supply the additional steam needed by the Lysine Department. The Cogeneration Plant has nine coal-fired fluidized bed boilers, Boilers 1 through 9. Emissions of the boilers are controlled with good combustion practices (carbon monoxide (CO) and VOC) and the fluidized beds (SO_2) and by selective noncatalytic reduction (NOx) and baghouses (PM). These boilers would not actually be modified as part of this project. In this regard, this permit would not authorize physical changes to these boilers or provide for a change in their method of operation, with increases in emissions over permitted levels as set by the construction permits for these boilers, Permits 85060030, 94020006 and 97050097.

III. PROJECT EMISSIONS

The project would increase emissions of VOC, PM and CO_2 resulting from the Lysine Department. The project would be accompanied by increases in emissions of VOC, PM, NOx, SO_2, and CO_2 and certain other greenhouse gases (GHG) from the existing Cogeneration Plant.

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[2] The most common example of fermentation is production of alcohol, in which a brewer's yeast is used to convert sugar or carbohydrate to alcohol.

[3] The vent system for fermentation tanks in ADM's BioProducts facility serves fermentation tanks for a number of products other than lysine. Due to the volume of air flow from the tanks, which conduct aerobic fermentation, and the potential for foam to form on the surface of the liquid, the off-gas streams go to a common header that serves a number of process water scrubbers before being released to the atmosphere. The design of these scrubbers is such that they have minimal impact on VOC emissions from the various fermentation processes. Accordingly, the emissions from lysine fermentation are determined based upon "uncontrolled" emissions, as present in the exhaust from the fermentation tanks. In addition, these water scrubbers are not considered emission control equipment as they are neither designed to nor relied upon to reduce emissions.

[4] For purposes of this project summary, the term particulate matter (PM) is used with its common meaning and also includes particulate matter$_{10}$ (PM_{10}) and particulate matter$_{2.5}$ ($PM_{2.5}$).

The maximum increases in emissions of different pollutants that are expected to result from this project, as would be provided for by the revised draft permit, are summarized below. The actual increases in emissions will be less than the permitted emissions to the extent that the Lysine Department would operate at less than its maximum capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limits.

Permitted Annual Emissions Increase from the Project (Tons/Year)

Pollutant	PM[a]	PM_{10}[b]	$PM_{2.5}$[c]	NO_x[d]	SO_2[d]	CO[d]	VOC	GHG
Lysine Department	17.4	9.1	5.4	-	-	-	82.4	156,068
Cogeneration Plant	7.2	5.7	3.8	41.17	153.0	17.3	0.4	108,450
Total	24.6	14.8	9.2	41.17	153.0	17.3	82.8	264,518
PSD Significant Emission Rates	25.0	15.0	10.0	40.0	40.0	100.0	40.0	75,000

Notes:

a. Particulate matter including condensable particulate as measured by USEPA Method 202.
b. PM_{10} including condensable particulate as measured by USEPA Method 202.
c. $PM_{2.5}$ including condensable particulate as measured by USEPA Method 202.
d. Increase in emissions associated with increase coal usage at existing coal fired boilers.

IV. APPLICABLE EMISSION STANDARDS

The application shows that the proposed project will readily comply with applicable state and federal emission standards, including the emission standards of the State of Illinois (35 Illinois Administrative Code: Subtitle B) and applicable federal emission standards adopted by the United States EPA (40 CFR Part 60 and 40 CFR Part 63).

The Lysine Department is not a major source for emissions of hazardous air pollutants (HAPs). HAPs will make up at most a fraction of the VOC emissions. Accordingly, the potential emissions from the Lysine Department are and will be less than 10 tons of an individual HAP (e.g., acetaldehyde), and will be less than 25 tons in aggregate for total HAPs. Therefore, the Lysine Department is not subject to National Emission Standards for Hazardous Air Pollutants, adopted by USEPA under 40 CFR 63. This project is also not subject to review under Section 112(g) of the federal Clean Air Act as a major modification for emissions of HAPs.

V. APPLICABILITY OF PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

Since ADM's existing Decatur complex is already a major source of emissions, the criterion for whether the proposed project is considered a major modification under the federal rules for Prevention of Significant Deterioration (PSD), 40 CFR 52.21, is whether the increases in emissions from the project for one or more pollutants regulated by PSD would qualify as significant, as defined by the PSD rules. The project meets this criterion for VOC, NOx, SO_2 and GHG with increases in annual emissions that are each greater than the PSD significant emission rate. The project is therefore potentially subject to the substantive requirements of the PSD rules for these pollutants. The increases in emissions of PM and CO from the project are not significant so that PSD does not apply for these pollutants.

The substantive requirement of the PSD rules that potentially apply to a major project for a pollutant are: 1) A case-by-case determination of Best Available Control Technology (BACT); 2) An ambient air quality impact analysis to confirm that the project would not cause or contribute to a violation of the National Ambient Air Quality Standard(s) (NAAQS) or applicable PSD increment(s); and 3) An assessment of the impacts on soils, vegetation and visibility.

Although the CO_2 emissions from the Lysine Department would increase with this project, with a projected increase of about 160,000 tons of CO_2 per year, the substantive requirements of PSD are not applicable to these emissions. This is because USEPA has deferred applicability of PSD to biogenic CO_2 emissions (i.e., CO_2 emissions from bioenergy and other biogenic stationary sources) until July 21, 2014. The CO_2 emitted from the lysine fermentation process is considered biogenic because the feedstock, dextrose, is made from corn.[5]

Although the project would increase emissions of NOx, SO_2 and GHG (CO_2, CH_4 and N_2O) from ADM's Cogeneration Plant, the boilers at this plant would not be subject to a case-by-case determination of BACT for these pollutants under the PSD rules. This is because the boilers would not undergo any physical changes. This permit also does not provide for increases in operation over permitted levels as set by the applicable PSD permits for these boilers, so that these boilers would not undergo "changes in the method of operation" as defined by the PSD rules.[6] Accordingly, the boilers are only subject to the substantive requirements of PSD other than the BACT requirement.

VI. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

1. Introduction

To address the BACT requirements of the PSD rules for the new and modified units in the Lysine Department, ADM submitted a "top-down" BACT demonstration in its application reflecting its judgment as to the emission control technologies and associated emission limits that should be considered BACT under the PSD rules. This demonstration addressed the VOC emissions from new and modified units, since VOC is the only pollutant which they emit that is subject to PSD.

The Illinois EPA has reviewed the material submitted by ADM and made its independent determination of BACT. In addition to the material submitted by ADM, the Illinois EPA's determination of BACT relies upon its general knowledge of the types of operations at the proposed plant. As explained below, the Illinois EPA concurred with ADM's assessment.

2. BACT for the Fermentation Process

The control technologies that are commonly used to control VOC emissions from fermentation tanks are wet scrubbing and oxidation. As

[5] In its application, ADM included an analysis of Best Available Control Technology (BACT) for the CO_2 emissions from the lysine fermentation process, as would have been required if its CO_2 emissions were subject to PSD. However, this analysis is no longer relevant because USEPA has amended the PSD rules, deferring applicability of PSD to biogenic CO_2 for three years.

[6] Under the PSD rules, 40 CFR 52.21(j)(3), the BACT requirement of the PSD rules does not apply to existing units that would not undergo a physical change or a "change in the method of operation."

such, both wet scrubbing and oxidation are technically feasible control options for reducing VOC emissions from the lysine fermentation tanks.

In wet scrubbing, VOC is absorbed from a gas stream by contact with water, generally in a packed tower. Relatively large volumes of water are necessary to achieve high control efficiencies on dilute streams such as a lysine fermentation vent. For this reason, a practical upper limit on wet scrubbing efficiency for a dilute VOC stream such as a lysine fermenter vent is 80%. Wet scrubbing for VOC control is generally most effective on high-concentration ethanol fermentation vent streams where the ethanol can be collected and recovered or reused in the process.

In oxidation or afterburner technology, combustion is used to control VOC emissions. There are several types of oxidation systems but all employ heat to destroy VOC, reducing it to CO_2 and water. For streams with low VOC concentrations such as a lysine fermentation vent, natural gas or other supplemental fuel must be combusted to raise the gas stream's temperature to the range in which the VOC will be oxidized. Although the types of systems can vary, oxidation systems can all readily achieve at least 90 percent control, with control efficiencies of up to 99 percent achievable under ideal applications. For non-catalytic or thermal oxidation, these technologies function by raising the temperature of the gas stream being treated to between 1,400 and 1,600 °F for about 1 to 2 seconds. Given sufficient mixing, this time-temperature condition usually results in high destruction efficiency of most VOC. Secondary pollutants can be produced by thermal oxidation, including NOx, CO, and CO_2. For catalytic oxidation, similar control efficiencies are achieved at lower temperatures with combustion facilitated by a catalyst bed. However, the gas stream must still be heated using supplemental fuel to the operating temperature range of the catalyst. In ADM's experience, because thermal oxidation would involve use of a regenerative thermal oxidizer or other means of efficient heat recovery, the costs of thermal and catalytic oxidation would be similar. Therefore, catalytic oxidation was effectively covered by ADM's review of thermal oxidation technology.

Both oxidation and wet scrubbing are technically feasible control options for VOC emissions from the lysine fermentation tanks, with oxidation being the top performing technology. To demonstrate that neither of these technologies should be required as BACT, ADM evaluated the economic (cost), energy, and environmental impacts of controlling lysine fermentation with thermal oxidization and wet scrubbing.

Thermal oxidation with regenerative heat recovery would have a very high cost impact, approximately $56,000 per ton of VOC controlled. This high cost occurs because VOC is present in low concentrations in the off-gas stream. Even with very effective recovery of heat, substantial qualities of supplemental fuel, i.e., natural gas would be required for effective oxidation. Based on this assessment, the Illinois EPA concludes that the high cost of thermal oxidation does not justify the VOC reductions that could be attained by using this technology. Thermal oxidation would only become cost-effective if the concentration of VOC in the off-gas were much higher. This is not practical because of the intrinsic nature of lysine fermentation, which is an aerobic process in which VOC is only present as an incidental byproduct of the biological fermentation process. The circumstances would be similar for catalytic oxidation. This is because similar quantities of fuel would

be needed since heat recovery would not be effective at the lower operational temperature of a catalytic oxidizer.

Use of wet scrubbing for lysine fermentation would have an even higher cost impact, over $75,000 per ton of VOC controlled. In addition, this wet scrubbing would consume significant water resources needing nearly two billion gallons of water per year to achieve 80% VOC control. Based on this assessment, Illinois EPA also concludes that wet scrubbing has excessive impacts and should not be considered as the basis for BACT.

The USEPA's ***RACT, BACT and LAER Clearinghouse*** database does not include any determinations specifically for VOC emissions from lysine fermentation. Nearly all of the determinations for fermentation in the database are for ethanol fermentation operations. These operations differ significantly from lysine fermentation. The VOC concentration, as carbon, in the off-gas from ethanol fermentation is on the order of 20,000 or 30,000 ppmv and add-on control has been required as BACT. By contrast, the concentration of VOC, as carbon, in the exhaust from ADM's lysine fermentation tanks will be orders of magnitude lower, no more than 50 ppmv. As discussed above, with this low concentration in the exhaust stream, the cost impacts for use of add-on control for VOC emissions would be excessive.

This determination is consistent with a 2006 BACT determination in the database for the fermentation operation at ADM's Polymers Plant in Clinton, Iowa. This is the only determination in the database for a fermentation process with comparable levels of VOC in the exhaust from the fermentation tanks. The VOC BACT determination for this operation did not require use of add-on control and the VOC BACT limit was set at 40 ppmv, as carbon, 30-day average.

Based on these considerations, the VOC BACT limit for the modified fermentation operation at the Lysine Department is proposed to be set at 50 ppmv, as carbon, dry basis, averaged over the batch cycle, determined in the exhaust ductwork from the fermentation tanks, at the inlet to the header serving the process water scrubbers. This limit would be consistent with the demonstrated level of VOC in the exhaust from fermentation to produce lysine, which is a different process than "polymer fermentation." In addition, this limit is proposed to generally apply as a batch average, rather than a 30-day average. For purpose of emission testing to confirm compliance with this limit, when quantitative measurements of emissions would be made, VOC emissions would be determined as an average over at least three fermentation batch cycles.[7]

3. BACT for Drying and Other Downstream Operations

The control technologies that were considered for fermentation are also relevant for VOC emissions from drying of lysine and from other downstream operations. Because the concentrations of VOC in the exhausts from these operations are lower than those of the fermentation tanks, the addition of control is considered cost prohibitive. This is the case even if the exhausts from these operations and the fermentation tanks were combined. BACT is set at "trivial" levels of

[7] If one set of measurements was not completed or was determined to be flawed, compliance could be determined from the average of two batch cycles, as generally provided by 40 CFR 60.11(f).

emissions, consistent with ADM's projections, at which add-on control is not appropriate.

Based on these considerations, the BACT limit for VOC emissions from each dryer is proposed to be set at 1.0 lb/hr, on a 3-hour average.

The VOC emissions from each affected material handling unit will be negligible. Based on these considerations, the BACT limit for VOC emissions from each new dry material handling unit is proposed to be set at 0.1 lb/hr or 10 ppmvd, whichever is greater, on a 3-hour average.

VII. AIR QUALITY ANALYSIS

1. Introduction

Various evaluations were conducted to assess the impact of the increases in emissions from the proposed project on ambient air quality. Under the PSD rules, these evaluations must determine whether the proposed project will cause or contribute to a violation of applicable National Ambient Air Quality Standards (NAAQS) and applicable PSD Increments. In this regard, USEPA has adopted NAAQS and PSD Increments for NO_2 and SO_2. In addition, VOC and NOx are precursors to the formation of ozone in the atmosphere and USEPA has adopted a NAAQS for ozone. NO_x and SO_2 are precursors to the formation of $PM_{2.5}$ in the atmosphere and USEPA has adopted NAAQS for $PM_{2.5}$.[8] An environmental consulting firm, RTP Environmental Associates of Raleigh, North Carolina, performed the air quality modeling and evaluations on behalf of ADM. Based on these analyses and accompanying review by the Illinois EPA, the Illinois EPA finds that the analyses for the proposed project are acceptable.

2. Air Quality Analysis for NO_2 and SO_2

For the NO_2 and SO_2, the starting point for determining the extent of the modeling necessary for the proposed project was evaluating whether the project would have a "significant impact" for NO_2 or SO_2. USEPA relies on Significant Ambient Impact Levels or SILs to determine the scope of air quality modeling that is needed for a project under the PSD rules. More detailed modeling is needed if the initial modeling for a project shows that the predicted concentration or impact of the project for a pollutant and averaging time is significant, i.e., exceeds the applicable SIL.

The increase in NOx and SO_2 emissions from this project are due to the increase in output from ADM's Cogeneration Plant. Initial air quality modeling of the increase in emissions due to this project was conducted by the consultant for NO_2 and SO_2. This modeling was performed to demonstrate that the SIL for each averaging period for NO_2 and SO_2 would not be exceeded as shown below.

Operation at reduced loads of 75 and 50 percent, as well as full load operation, were modeled for the boiler stack with the poorest

[8] USEPA has not adopted air quality standards for GHG. In addition, GHG emissions pose concerns for air quality on a global level, through global warming and climate change. Accordingly, USEPA has not developed modeling tools to address GHG emissions in PSD permitting.

characteristics for dispersion. The following table summarizes the maximum impacts predicted by the model.

Significant Impact Modeling for NO_2 and SO_2 (µg/m^3)

Pollutant	Averaging Period	Maximum Concentration	SIL	NAAQS
NO_2	1 Hour	2.11[9]	7.52[10]	188
NO_2	Annual	0.023	1.0	100
SO_2	1 Hour	7.84[9]	7.85[10]	196
SO_2	3 Hour	6.78[9]	25.0	1,300
SO_2	24 Hour	2.46[9]	5.0	-
SO_2	Annual	0.084	1.0	-

3. Impact of SO_2 and NO_x Emissions on Ambient Air Quality for $PM_{2.5}$

This project would have significant increases in emissions of SO_2 and NO_x, which are each regulated as a precursor to $PM_{2.5}$. This revised project summary addresses the secondary $PM_{2.5}$ formed in the atmosphere from emissions of SO_2 and NO_x from this project. The impacts from these emissions, as they lead to the formation of secondary $PM_{2.5}$ in the atmosphere, will not threaten the NAAQS for $PM_{2.5}$.[11]

The impact of precursor SO_2 and NO_x emissions on $PM_{2.5}$ was evaluated using a hybrid of qualitative and quantitative assessments utilizing existing technical work, consistent with draft guidance recently released by USEPA for public comment.[12] This guidance, if finalized by USEPA, would require some type of evaluation for secondary $PM_{2.5}$ when the SO_2 or NO_x emissions of a project are significant.[13] This evaluation could, as appropriate for the particular project and its circumstances, either be 1) Qualitative; 2) Hybrid qualitative/quantitative; or 3) Full quantitative photochemical grid modeling. Under this draft guidance, the evaluations that have now been conducted for this project would qualify as hybrid evaluations. The approach to the evaluation of the impact of SO_2 and NO_x emissions of this project on $PM_{2.5}$, which does not involve dispersion modeling, is necessary because USEPA has not developed modeling techniques that can be applied to this evaluation. In this regard, USEPA addressed the requirements for air quality

[9] In conjunction with the development of a limit on the operation of the expanded Lysine Department to assure that this proposed project would not be accompanied by significant impacts on ambient air quality for SO_2 or NO_2, as discussed in new Section VIII.2 of this revised Project Summary, ADM reassessed the maximum short-term increases in emissions of SO_2 and NO_x of the Cogeneration Plant. This increased the maximum short-term concentrations by a factor of 1.4. In particular, the maximum modeled concentration for SO_2 air quality on a 1-hour average, 7.84 µg/m^3, is now only slightly less than the SIL of 7.85 µg/m^3, instead of being 5.067 µg/m^3.

[10] The 1-hour SILs for NO_2 and SO_2 were both established by USEPA at 4 percent of the 1-hour NAAQS. Both 1-hour SILs are converted from ppb to µg/m3 to facilitate comparison with the results of modeling.

[11] The proposed project has not triggered PSD for direct $PM_{2.5}$ emissions because the project's direct $PM_{2.5}$ emissions are below 10 tpy, the applicable significant emission threshold for direct $PM_{2.5}$ emissions.

[12] USEPA, "Draft Guidance for PM2.5 Permit Modeling," Public Review Draft, 03/04/2013.

[13] The cover letter that accompanies this recent draft of revised guidance, USEPA observes "The draft guidance does not impose binding, enforceable requirements. This document does not substitute for statutory provisions or regulations, nor is it a regulation itself. Thus, this draft guidance document does not represent final agency action and cannot be relied upon to create any rights or obligations enforceable by any party."

analyses for $PM_{2.5}$ in its Final Rule adopting increments for $PM_{2.5}$.[14, 15] In the preamble to that rule, USEPA stated the following:

> The impacts of $PM_{2.5}$ precursors on ambient concentrations of $PM_{2.5}$ cannot be determined from the dispersion models that [U.S.] EPA has currently approved for modeling individual PSD sources. Such models are not designed to consider chemical transformations that occur in the atmosphere after the precursor emissions have been released from the source. Consideration of these transformations is necessary to be able to add precursor impacts into the total modeled ambient $PM_{2.5}$ concentrations for comparison to the SILs for $PM_{2.5}$. (75 FR 64,886)

With respect to the proposed project, it can first be concluded from the modeling analyses that were conducted for SO_2 and NO_2 air quality, as discussed above, that the emissions of SO_2 and NO_x will not threaten the NAAQS for $PM_{2.5}$. As these analyses show that the air quality impacts of the project for SO_2 and NO_2 will not be significant, they also show that the project's emissions of SO_2 and NO_x, as they are precursors to formation of secondary $PM_{2.5}$, will not have significant impacts on $PM_{2.5}$ air quality. In this regard, the effect of the SO_2 and NO_x emissions of this project on $PM_{2.5}$ air quality can be assessed using equivalence ratios published by USEPA for the eastern United States.[16] Using these ratios, the significant air quality impact levels set by USEPA for SO_2 and NO_x on an annual basis are equivalent to annual significant impacts levels for $PM_{2.5}$ of 0.025 and 0.01 $\mu g/m^3$, respectively. The equivalent significant impact levels for $PM_{2.5}$ on a 24-hour basis, using the 1-hour significant impact levels for SO_2 and NO_x are 0.196 and 0.072 $\mu g/m^3$, respectively.[17, 18] For the proposed project, this shows that the

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[14] See generally "Prevention of Significant Deterioration (PSD) for Particulate Matter Less Than 2.5 Micrometers ($PM_{2.5}$) - Increments, Significant Impact Levels (SILs) and Significant Monitoring Concentration (SMC)," 75 FR 64,864 (Oct. 20, 2010).

[15] The approach that has been taken for this project is consistent with current guidance from USEPA. However, USEPA's prior guidance indicated that no formal evaluation was needed if the direct $PM_{2.5}$ emissions of a project were not significant. For example, refer to USEPA's "Draft $PM_{2.5}$ Permit Modeling Guidance" that was presented by the USEPA at the Tenth Conference on Air Quality Modeling (March 13-15, 2012). (See "Draft $PM_{2.5}$ Permit Modeling Guidance," Presentation by George M. Bridgers, OAQPS-AQAD-Air Quality Modeling Group, March 14, 2012, at p. 28.) This guidance discusses the approaches that applicants for PSD permits should follow for air quality analyses for $PM_{2.5}$. For the scenario that is relevant to the proposed project, this guidance indicated that air quality modeling was not required for direct $PM_{2.5}$ emissions and no analysis of precursor emissions was required when the direct $PM_{2.5}$ emissions are less than 10 tpy and NO_x and/or SO_2 emissions are greater than 40 tpy. The previous guidance, i.e., that $PM_{2.5}$ air quality modeling would only be required when direct $PM_{2.5}$ emissions are significant, is fully supported by USEPA in preceding rulemaking discussions. In its proposed rule for implementation of NSR for $PM_{2.5}$, USEPA supports the use of the 10 tpy significant increase threshold for direct $PM_{2.5}$ based on analysis showing that emissions below this threshold would have an insignificant impact on ambient $PM_{2.5}$ concentrations. ***See***, the preamble to that rulemaking 70 FR 65,984, 66,038 (Nov. 1, 2005).

[16] USEPA published equivalence ratios between precursor emissions and emissions of $PM_{2.5}$ of 40 to 1 and 200 to 1 for SO_2 and NO_x, respectively. ***See,*** USEPA ***Final Rule, Implementation of New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers*** (PM2.5), 73 FR 28321, 28339 (May 16, 2008).

[17] The equivalent significant impact level for $PM_{2.5}$ is calculated by dividing the SIL for SO_2 or NO_x by the applicable equivalence ratio. For example, the SILs for SO_2 of 1.0 and 7.85 $\mu g/m^3$ for annual and 1-hour impacts, respectively, are divided by 40, i.e., 1.0 $\mu g/m^3 \div 40 = 0.025$ $\mu g/m^3$ and 7.85 $\mu g/m^3 \div 40 = 0.196$ $\mu g/m^3$.

[18] Because USEPA has not set a significant impact level for NO_2 on a 24-hour average, the significant impact level for NO_2 on a 1-hour average was conservatively used to

significant impact levels set by USEPA for SO_2 and NO_x also serve to address the impacts of precursor SO_2 and NO_x emissions on $PM_{2.5}$ air quality due to secondary $PM_{2.5}$.[19] Specifically considering $PM_{2.5}$ air quality in the Central Illinois area, as measured in Decatur and other monitoring stations in the area, the impacts of this project due to secondary $PM_{2.5}$ can readily be accommodated.[20, 21] Accordingly, the SO_2 and NO_x emissions of the proposed project do not pose a threat to continued attainment of the $PM_{2.5}$ NAAQS.

For the proposed project, continued attainment of the $PM_{2.5}$ NAAQS is also readily confirmed empirically by a review of the current levels of SO_2 and NO_x emissions from ADM's Decatur complex and other stationary sources in the Central Illinois area, which presently contribute to formation of secondary $PM_{2.5}$. The Central Illinois area has many stationary sources of SO_2 and NOx emissions, including three coal-fired electric power plants and additional coal-fired industrial and institutional steam plants. This project would potentially increase SO_2 and NO_x emissions in the area by 0.22 and 0.1 percent, respectively.[22] However, based on data from 2009 through 2011, $PM_{2.5}$ air quality is 3.3 and 25.3 percent below the NAAQS, on an annual and 24-hour basis, respectively.[23] Even if one assumes, unrealistically,[24] that all ambient

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address the impact on 24-hour $PM_{2.5}$ air quality. For consistency, the same approach was used for SO_2.

[19] For annual air quality, the potential impact of SO_2 emissions on $PM_{2.5}$ air quality would only be 0.21 percent of the NAAQS (0.025 $\mu g/m^3 \div 12.0\ \mu g/m^3 = 0.00208$). The potential impact of NO_x emissions would be less than 0.1 percent of the NAAQS (0.01 $\mu g/m^3 \div 12.0\ \mu g/m^3 = 0.00083$).

[20] The ambient air quality in Decatur, as measured by the Illinois EPA's monitoring station at 2200 N. 22nd Street in Decatur, provides direct confirmation that the proposed project will not threaten ambient air quality for $PM_{2.5}$. For 2011, the 24-hour maximum $PM_{2.5}$ concentration and design value were 25.7 and 23.1 $\mu g/m^3$, respectively, compared to the NAAQS of 35 $\mu g/m^3$. For 2011, the annual $PM_{2.5}$ concentration and design value were both 11.6 $\mu g/m^3$. Increases in secondary $PM_{2.5}$ from the proposed project will have no discernible effects on ambient $PM_{2.5}$ air quality in the area.

Incidentally, based on the ambient monitoring data collected 2012, $PM_{2.5}$ air quality in Decatur continues to improve, with design values of 21.9 and 11.2 $\mu g/m^3$, on a 24-hour and annual basis, respectively.

[21] The ambient monitoring station in Peoria, Illinois measured the highest maximum 24-hour $PM_{2.5}$ concentrations in the Central Illinois area. It had design values for the period 2009 through 2011 of 11.3 and 25.9 $\mu g/m^3$, annual and 24-hour basis, respectively.

[22] For the three year period 2009 through 2011, the estimated average actual annual SO_2 and NO_x emissions from stationary point sources in the Central Illinois area that includes Decatur were 70,214 and 41,531 tpy, respectively, as reported in the Annual Air Quality Reports prepared by the Illinois EPA. (*See*, data for Champaign, DeWitt, Logan, McLean, Macon, Peoria, Piatt, Sangamon and Tazewell Counties.)

Thus, this project would represent an increase of 0.22 percent in SO_2 emissions ($153 \div 70{,}214 = 0.0022$, ≈ 0.22 percent). It would represent an increase of 0.1 percent for NO_x ($41.3 \div 41{,}531 = 0.0010$, ≈ 0.10 percent).

[23] Current air quality on an annual basis is assessed using the monitored data for Decatur, i.e., 11.6 $\mu g/m^3$ $(12.0 - 11.6) \div 12.0 = 0.033$, ≈ 3.3 percent).

Current air quality on a 24-hour basis is assessed using the higher data for Peoria, i.e., 25.9 $\mu g/m^3$ $(35.0 - 25.9) \div 35.0 = 0.253$, ≈ 25.3 percent).

[24] It is inappropriate to assume that all ambient $PM_{2.5}$ is secondary $PM_{2.5}$, much less secondary $PM_{2.5}$ that is the result of SO_2 and NO_x emissions from local sources in the Central Illinois area. First, direct PM emissions also contribute to ambient $PM_{2.5}$. Second, $PM_{2.5}$ is a regional pollutant for which $PM_{2.5}$ transported from downwind areas has a significant role in ambient concentrations. For example, the $PM_{2.5}$ design values for the period 2009 through 2011 for the monitoring station at Knight Prairie in Hamilton County, Illinois, are 10.7 and 22.7 $\mu g/m^3$, annual and 24-hour basis, respectively. However, in 2011, estimated stationary point source emissions in Hamilton County were only 0.1, 5.6 and 39.8 tpy for SO_2, NO_x and PM_{10}, respectively.

$PM_{2.5}$ in the area is secondary $PM_{2.5}$ attributable to local SO_2 and NO_x emissions, the area can readily accommodate the additional emissions for SO_2 and NO_x from this project.[25]

Lastly, to assure that its application for this project satisfies USEPA's recent draft guidance on this subject, ADM submitted its own hybrid evaluation of the impacts of this project on secondary $PM_{2.5}$. This evaluation was more refined than the above evaluations as it relied upon the results of photochemical grid modeling that USEPA conducted as part of its development of the Cross State Air Pollution Control Rule. ADM's evaluation showed impacts of only 0.000348 and 0.00123 $\mu g/m^3$ on an annual and 24-hour basis, respectively. This confirmed that this project would not have measureable effects on ambient levels of secondary $PM_{2.5}$, showing essentially no effect on these levels.

4. Revised Air Quality Analysis for Ozone

For the NAAQS for ozone, the evaluation addressed emissions of VOC and NOx as they are precursors to the formation of ozone in the atmosphere. ADM conducted a new evaluation to address the impact of the proposed project on ozone air quality. This analysis was also conducted using the "Scheffe Method," a screening method developed by USEPA for PSD permitting. As a screening method, it provides a very conservative estimate of the impact of a proposed project on ozone air quality. While this method was originally developed to address the impact of proposed projects on the historic one-hour ozone standard, it can also be adapted to address the current 8-hour ozone standard. Accordingly, ADM's new evaluation for ozone air quality conformed to the current guidance and requirements of the USEPA and the Illinois EPA. The evaluation confirmed that this project will not cause a violation of the ozone NAAQS.

Information on current air quality for ozone in the region is available from an ambient monitoring station operated by the Illinois EPA in Decatur. These data show that air quality in the region currently complies with the ozone NAAQS. ADM's new evaluation of the project's impact for ozone was conducted using the ozone design value for the Decatur monitoring station, 0.07 ppm, 8-hour average.[26] The evaluation considered the incremental impact of the project on the NO_x and VOC emissions rates of ADM's Decatur complex. For 2011, the complex's annual NO_x and VOM emissions were 2,324 and 3,635 tons, respectively, for a VOM-to-NO_x ratio of 1.6. The proposed project will not change

[25] Even if one makes the extreme assumption that all ambient $PM_{2.5}$ monitored in Decatur is due to the SO_2 and NO_x emissions in Macon County, in which ADM's Decatur complex is located, the potential increases in SO_2 and NO_x emissions from this project would not threaten air quality for $PM_{2.5}$. The project would represent at most a 1.75 percent increase in actual emissions. In particular, in 2011, for the three year period 2009 through 2011, the estimated average actual annual SO_2 and NO_x emissions from stationary point sources in Macon County were 12,869 and 5,003 tpy, respectively. The potential increase in SO_2 and NO_x emissions with this project is only about 1.1 percent ((153.0 + 41.1) ÷ (12,869 + 5,003) = 0.0108, ≈ 1.1 percent).

[26] The initial evaluation for ozone air quality addressed the proposed project by itself, rather than the effect of the incremental change in emissions of VOM and NO_x with the project. In this analysis, with a VOC to NOx ratio of 2:1 and an increase of 83 tons/year of VOC, the predicted maximum 1-hour impact from this project is 0.013 ppm, as per USEPA's VOC/NO_x Point Source Screening Tables (USEPA, 1988). When combined with a 1-hour ozone design value of 0.082 ppm from the Decatur ambient monitoring station for the 2007-09 period, the maximum predicted 1-hour ozone value was 0.095 ppm, which is well under the former 1-hour standard of 0.12 ppm.

this ratio. Using Scheffe Table 1, accounting for all of the emissions of the complex, the increase in VOM emissions from 3,635 tpy (i.e., the pre-project baseline VOM emissions) to a post-project value of 3,718 tpy (i.e., the baseline complex emissions plus the project increase) would increase maximum 1-hour ozone by 0.00024 ppm.[27] Combined with an 8-hour background of 0.070 ppm, the predicted ambient concentration with the project is 0.07024 ppm.[28] With a predicted increase of only about 0.35 percent, this evaluation shows that the proposed project will not have a measurable impact on ozone air quality.[29]

5. Impacts on Soil, Vegetation and Visibility

The application addresses the potential impact of the proposed project on soils, vegetation, and visibility. The assessment concludes that the project would not adversely impact soils, vegetation or visibility. This is because the maximum air quality impact predicted for the project is de minimis, so that existing air quality should not be affected measurably by this project.

In regard to soils, even assuming that the annual average concentration maximum of NO_2 and SO_2 were entirely deposited onto the soil, a very trivial amount of acidification would occur. In regard to vegetation, threshold values for harm to vegetation, including crops and trees, are far above the peak concentrations that would result from this project. The impact from VOC upon vegetation was assessed by taking the screening method maximum impact for ozone (referenced above) and comparing it to USEPA vegetation screening levels. The predicted maximum ozone impact is well below the screening values for sensitive plant species. For visibility, the relevant modeling guidelines indicates that any source where the emissions of NO_2 and SO_2 (in tons per year) divided by the distance (in kilometers) to the nearest Class I area (referred to as Q/D) is less than 10 will not cause or contribute to degradation of visibility at that Class I area. The distance from ADM to the nearest Class I area (Mingo National Wildlife Refuge) is about 330 kilometers, and the sum of NO_2 and SO_2 emissions from the project is 194.1 tons per year. The Q/D value is 0.59, much

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[27] ADM extrapolated the impact of the proposed project from Scheffe Table 1 by fitting a curve to the relevant ozone impact values in the table and then determining the incremental impact of the project relative to the baseline actual VOC emissions from ADM's Decatur complex. The equation of this curve was: $y = -1.3047\ 10^{-15}\ x^4 + 3.7894\ 10^{-11}\ x^3 - 4.0278\ 10^{-07}\ x^2 + 1.9750\ 10^{-03}\ x + 1.0814$, where y is the ozone concentration in pphm (parts per hundred million) and x is the VOC emission rate in tpy. This curve has an r-squared value of 0.999 for the relevant values in the table for VOC-to-NOx mass ratios of less than 5.2.

[28] This evaluation conservatively assumed that the full 1-hour impact would continue for the entire 8-hour averaging period. The calculated 1-hour impact of the project was not adjusted by some factor when combined with the 8-hour background concentration. If such an adjustment were made, the ozone concentration with the project would be slightly less. In particular, in Decatur, the maximum monitored ozone concentration on an 8-hour average is about 85 percent of the maximum 1-hour ozone concentration. If an adjustment factor of 85 percent were applied to the results of ADM's evaluation, the resulting concentration would be about 0.0702 ppm, instead of 0.07024 ppm, essentially unchanged.

[29] This is what one would intuitively expect. The project would involve relatively small increases in emissions of VOM and NOx compared to current emissions of ADM and other sources in the Decatur area and "regional background," (i.e., precursor emissions in the air mass entering the area due to transport).

less than the threshold of 10. This leads to the conclusion that this expansion will not cause or contribute to a degradation of visibility.

VIII. PERMIT CONDITIONS

1. General

The conditions of the revised draft permit, like the original draft 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 VOC from the modified Lysine Department.

The permit would also establish enforceable limits on the future VOC emissions of the Lysine Department. In addition to annual limits on emissions, the permit includes monthly emission limits and operational limits, as needed to provide practical enforceability of the annual emission limits. As previously noted, actual VOC emissions associated with the project would be less than the permitted emissions to the extent that emission units operate at less than capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limits.

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

2. Additions in the Revised Draft Permit

The revised draft construction permit would also limit the steam usage of the expanded Lysine Department to 681,000 pounds per hour (See Draft Condition 2.1.7(c).) This limit would serve to assure that the increases in SO_2 and NO_x emissions at the Cogeneration Plant due to this project would not be accompanied by significant impacts on ambient air quality for SO_2 or NO_2. ADM supplied additional information, in response to a request from the Illinois EPA, to enable this limit to be established. This limit represents the sum of the pre-project or baseline steam usage of the Lysine Department and the increase in steam usage that, based on the modeling that was conducted for SO_2 and NO_2 air quality, as discussed in Section VII.2 of this Revised Project Summary, would not have hourly impacts on SO_2 or NO_2 air quality that would be significant.[30, 31]

The revised draft permit would require ADM to conduct continuous operational monitoring and recordkeeping to verify compliance with this limit. (See Draft Conditions 7.1.10(b) and 7.1.11(f).) The monitoring requirement would generally expand upon the instrumentation that ADM

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[30] The baseline steam usage of the Lysine Department is 592,000 pounds per hour. The draft permit would allow an increase in hourly steam usage of 89,000 pounds per hour.
[31] The SO_2 air quality analysis governs the level at which this limit would be set. This is because the NO_x emissions of the Cogeneration Plant are less than a quarter of its SO_2 emissions. Accordingly, a limit on steam usage that serves to address the impact on SO_2 air quality amply serves to address NO_2 air quality.

currently operates. The overall steam usage of ADM's Bioproducts Facility, which includes both the Lysine Department and equipment for certain other processes that use steam, is directly monitored. Most of the steam used by the BioProducts Department is used by the Lysine Department. The hourly steam use by the Lysine Department would be required to be verified by direct hourly monitoring of the steam usage of the BioProducts Facility accompanied by appropriate deductions to this data to account for the hourly steam usage that is not related to lysine production. For this purpose, the steam usage of "other" operations that are large and variable, such as the three alcohol recovery stills, which are not continuous production processes, must also be continuously monitored. The steam usage of other operations may be determined using operational records. This will require ADM to provide accurate determinations of the hourly steam usage of the Lysine Department to verify compliance with the applicable limit.

IX. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed project meets applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a construction permit for the project.

The Illinois EPA is taking this action to reopen the public comment period on this project pursuant to 40 CFR 124.14(b)(1) in USEPA's "Procedures for Decisionmaking," 40 CFR Part 124. This provides that a permitting authority may prepare a new draft permit and reopen a public comment period if any data or information or arguments submitted during the original public comment period raise substantial new questions concerning a permit.

Comments are requested on this proposed action by the Illinois EPA and the conditions of the draft permit.[32]

[32] While the Illinois EPA is generally reopening the comment period for this project, it should also be recognized that the additional evaluation relied upon by the Illinois EPA to show that this project would not threaten air quality for ozone and the new provisions in the draft permit that would limit the hourly steam usage of the expanded Lysine Department are developments that resulted from the Illinois EPA's review and consideration of comments received during the initial comment period. In this regard, comments were submitted that challenged the evaluation of the impacts of the project on ozone air quality. Comments also were submitted concerning the approach that was proposed to be taken to the impacts of the project on air quality for SO_2 and NO_2, which indicated that the permit must be based on modeling of the Cogeneration Plant at its maximum theoretical hourly emission rates or the permit must set hourly limits on plant's SO_2 and NO_x emissions. Based on these comments and further review of the proposed project, the Illinois EPA determined that a revised evaluation of the impact of the project for ozone was appropriate and the permit should include a limit on the hourly steam usage of the Lysine Department. As such, these items are a "logical outgrowth" of the permitting process and would not warrant a further comment period. *See, In re Old Dominion Electric Power Cooperative Clover*, 3 E.A.D. 779, 797-798 (EAB 1992). However, the Illinois EPA has determined that it is appropriate under the federal procedures for PSD permitting to open the comment period to provide the public with an opportunity to comment on the additional evaluations of air quality impacts that have been conducted for this project and on certain enhancements that have been made to the construction permit.