COMMONWEALTH OF PENNSYLVANIA **MEMO**
Department of Environmental Protection
Northwest Regional Office

TO Air Quality Permit File PA-37-00013G

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DATE May 4, 2022

RE Plan Approval Application PA-37-00013G
CEMEX Wampum Cement Plant
Wampum Borough, Lawrence County
APS #1019798 AUTH # 1320403 PF #246188

BACKGROUND

POWER Engineers, Inc. submitted to the Department of Environmental Protection (Department) a plan approval application on behalf of CEMEX Construction and Materials Atlantic, LLC (CEMEX) for the modernization of the Wampum cement plant in Wampum Borough, Lawrence County. The facility is located directly off Route 18 in Lawrence County (40° 52' 41.7139" -80° 19' 28.9139"). The application was received on January 16, 2020 and deemed administratively complete on January 30, 2020.

Currently, CEMEX operates the facility under the authorization of Title V Operating Permit TV 37- 00013 as a cement storage and truck loading operation. Title V permitted facilities have the potential to emit (PTE) pollutants in excess of the major source thresholds. This Title V permit has an expiration date of February 28, 2022.

In 2010, CEMEX submitted a deactivation and maintenance plan in accordance with 25 Pa. Code 127.11a to preserve the authorization to reactivate existing sources at the major Title V facility that had ceased operation in March 2010. The Department approved the maintenance plan on November 4, 2010 and the sources and related controls that were no longer in operation were removed from the Title V Operating permit: Sources identified were Source IDs 101 through 168; 170 - 180; 183 - 184; 186 - 208; 211; 213 - 215; and 218 - 250. The maintenance plan expired March 2020.

The proposed modernized plant will have a maximum production capacity of 3,120 short tons of clinker per day (stpd) and include installation of the following equipment and processes:

- One (1), 3,120 stpd, five (5) stage, preheater/calciner kiln system equipped with Low NOx burners, selective non-catalytic reduction (SNCR), and with NOx, SO_2, CO, O_2, NH_3, THC CEMS, and an opacity COMS.
- One (1), 3,120 stpd, clinker cooler
- One (1), 290 short tons per hour (stph), vertical, raw meal grinding system
- One (1), 20 short tons per hour (stph), ball mill, indirect coal grinding system
- One (1), cooling tower
- One (1), 15,200 gallon aqueous ammonia (<19%) tank
- One (1), 1000 KW emergency generator (1,475 bhp)
- One (1), fire system pump engine (183 bhp)
- One (1), main fabric filter dust collector
- Various other dust collectors
- Vehicle and truck traffic on paved roads.
- Other ancillary equipment including material handling and conveying

The project also proposes to refurbish and reactivate other existing equipment that includes the Finish Mills #1 & #2 and fuel tanks. The proposed new equipment replaces three (3) existing, coal fired long dry kiln, three (3) clinker coolers, two (2) raw meal grinding systems, two (2) stoker coal furnaces, three (3) coal grinding systems, multiple dust collectors, electrostatic precipitators, and a gravel bed filter. A list of deactivated sources has been identified in the plan approval application and are to be removed from the permit. These include Source ID #s: 112, 131, 132, 150, 155, 157,161 -165, 167- 171, 173, 174, 179, 195, 196, 198, 199, 201, 202, 205, 208, 220, 221, and 223 – 234. To document this action and the status of these sources, Section H of the plan approval will include the list of inactivated sources. These sources will be inactivated in the AIMS system at operating permit issuance.

CEMEX proposes to use coal as the primary fuel for the new pyroprocessing system but also plans to use natural gas, biomass, No. 2 fuel oil, spent activated carbon, petroleum coke, alternative non-hazardous fuels, non-hazardous engineered fuels, and Class A dried sewage sludge as alternate fuels to replace a portion of the coal fired in the new pyroprocessing system as economics dictate. In accordance with 40 CFR 63.1346(g)(1), at startup, kilns must use a one or a combination of clean fuels defined as: natural gas, synthetic natural gas, propane, distillate oil, synthesis gas (syngas), and ultra-low sulfur diesel (ULSD), until the temperature of 1200°F is reached in the kiln.

Primary air contaminants of concern from this facility will be NO_x (~859 tpy), CO (~786 tpy), PM (~160 tpy), PM_{10} (~148.5 tpy)/$PM_{2.5}$ (~116.2 tpy), SO_2 (~228 tpy), HCl (HAP)(~14 tpy), mercury (Hg) cmpds (HAP) (~0.012 tpy), D/F (~7.86E-8 tpy), THC (~130 tpy), VOC (~ 46 tpy), CO_2e (1.048 E6 tpy), NH_3 (~31 tpy), and H_2SO_4 (~63 tpy). The facility is a major stationary source and a major source of hazardous air pollutants (HAPs) as defined by the Clean Air Act (CAA).

According to the application, the net emission increases from the project would equal or exceed the 40 CFR §52.21(b)(23)(i) PSD significant emission thresholds for NO_x, CO, PM_{10}, $PM_{2.5}$, SO_2, H_2SO_4 and GHG.

PROCESS DESCRIPTION

The application identified eight (8) operations/processes at the facility:

1. Raw Material Receiving and Storage
2. Raw Material Drying and Grinding
3. Raw Meal Storage and Blending /Homogenizing
4. Coal Grinding, Drying and Pulverized Coal Storage Unloading and Storage
5. Pyroprocessing System
6. Clinker Storage
7. Finish Grinding
8. Cement Storage and Shipping

CEMEX provided concise process descriptions in their plan approval application, pages 2-5, for each operation. The following includes CEMEX's description along with the related Source ID and Control ID numbers proposed in the application, as follows:

1. Raw Material Receiving and Storage - Source IDs 180, 181, 252 & 253

Raw materials are delivered by truck. A portion of limestone and coal is directly unloaded onto open stockpiles maintained to a 2-day and 3-day supply, respectively. A portion of the raw materials, except for synthetic gypsum, is unloaded at the existing truck unloading station that has been refurbished and controlled by a wet suppression system. Materials are distributed via belt conveyors to existing raw material silos and a new coal bin. Material transfers are vented through new dust collectors. Limestone is also delivered to the Material Storage Building and controlled by fabric dust collectors.

A portion of the pea gravel, sand, and mill scale is unloaded into the Material Storage Shed and controlled by a wet suppression system. Synthetic gypsum is unloaded into the Material Storage Building and the Material Storage Shed.

2. Raw Material Drying and Grinding - Source ID 254 – 259 [C254A-F; C255A-B; C256A-D; 257A-B; C258A-B; C259A-B]

Limestone is reclaimed from the storage silos and transferred via belt conveyors to the stone hopper. Limestone, shale, mill scale, pea gravel/sand, and slag are reclaimed from the stone hopper and storage silos (multiple) and transferred via belt conveyors to the raw meal grinding system.

The raw grinding system is equipped with a vertical rolling mill. The waste heat from the preheater exhaust gases is utilized in the raw mill to dry and convey the ground materials through the raw mill. Preheater exhaust gases pass through a water spray conditioning tower for temperature control and gas conditioning when the raw mill is down. Two cyclone separators extract the ground raw meal from the raw mill exhaust. There are two gas streams from the cyclone operation. A portion of the exhaust is recycled back to the raw mill and the remaining exhaust is exhausted through the main pyroprocessing dust collector to the main stack. The dried and ground raw meal collected in the cyclones and the main dust collector is transported by screw conveyors, airslides, and a pneumatic system to number of raw meal storage silos. Material transfers are vented through fabric or bag dust collectors.

3. **Raw Meal Storage and Blending /Homogenizing - Source ID 260-261 [C260A-E; C261A-B]**
   Raw Meal is stored in blending silos. Raw meal is withdrawn from the blending silos storage and blending system, weighed and transported to the preheater tower via air slides and bucket elevators. Blending silos and raw meal transfers are controlled with dust collectors.

   A dust bin that stores a portion of the main dust collector dust sends collected dust to the blending silos when the raw mill is operating otherwise it is transferred to a small bin to blend with kiln feed or to the Finish Mill #2 dust hopper. The dust bin and dust hopper vent to dust collectors.

4. **Coal Grinding, Drying and Pulverized Coal Storage - Source ID 262 [C262A-D]**
   Delivered coal stored in the coal bin and is reclaimed via apron feeder conveyor to the coal mill. Preheater exhaust gases are used in the coal mill to dry and grind the coal. Pulverized coal is pneumatically conveyed to coal bins which feed the pyroprocessing system burners(kiln burner, and calciner). Coal mill exhaust gases can either be recirculated to the coal mill as make-up gas and/or vented through the coal mill dust collector to the coal mill stack. Coal bins vent through separate dust collectors.

5. **Pyroprocessing System - Source ID 263, 264, & 265 [C259B; C263A-K; C264A; C265A-C; & C266B]**
   The pyroprocessing system consists of a five (5) stage preheater, a calciner a rotary kiln, and a clinker cooler. The preheater design includes cyclone type preheater vessels arranged vertically in the gas stream exiting the rotary kiln. Hot gases from the rotary kiln pass upward, counter currently, through the downward-moving raw meal in the preheater vessels. Most of the preheater exhaust gases are input to the raw mill and a portion of the exhaust is input to the coal mill.

   The first fuel introduction point is within the calciner/kiln riser duct area. Calcination occurs at a gas temperature of 1,600 to 1,700 °F. At this stage, the fuel maintains the gas temperature to enable the calcination reaction prior to the raw material entering the rotary kiln. 90-98% of the calcination reaction occurs in the calciner/kiln riser duct area. The calciner/kiln riser duct/tertiary air inlets are designed to minimize NOx formation and reduce NOx generated in the kiln.

   The second fuel introduction point is within the discharge end of the kiln via a Low NOx burner. At this stage the fuel maintains the clinkering temperature of 2,600 to 2,700 °F. Kiln rotation assists in mixing the materials and transferring heat from upper to lower layers of the material bed.

   Hot clinker exits the kiln into the clinker cooler. The clinker cooler uses under-grate air fans to blow ambient air through the hot clinker bed to cool the clinker. The hottest portion of the heated cooling air is used in the kiln and calciner as preheated combustion air (secondary and tertiary air). The remaining heated cooling air is cooled by an air to air heat exchanger and vented through the main dust collector.

Clinker Storage & Reclaim- Source ID 266-269[C266A-H; C268A-B; C254F]]
Cooled clinker is conveyed by pan conveyors to either the clinker storage dome or a special clinker hopper. Clinker transfers, storage dome, and hopper are controlled by dust collectors. Stored clinker is reclaimed by belt conveyors and transported to the Clinker Silo #1 at the Finish Mill #1, the Clinker Silo #15 and the Raw Material Storage Building at the Finish Mill #2. Clinker Transfers, silos, and the material Storage Building are vented to dust collectors

6. **Finish Grinding - Source ID 270, 271, 272, 273 [C270A-B; C271A-B; C272A-B; & C273A-C]**
   The finish grinding system consists of two (2) finish mills, Finish Mill #1 and Finish Mill #2. Clinker, gypsum (synthetic or mineral), limestone, and cement kiln dust are reclaimed from storage by belt conveyors and bucket elevators and are transported to the finish grinding system. Bucket elevators and air slides transfer milled product between the mill and associated separator. Finish Mill #1, mill and separator vent through a dust collector. Finish Mill #2, mill and separator, vent through separate dust collectors.

7. **Cement Storage and Shipping - Source ID 178, 209, 210, 213, 214, 215, 216, 217, 218 [C178, C209; C210; C213; C214, C215, C216, C217& C218]**
   Finished cement is conveyed by a pneumatic transfer system to the cement storage silos. Designated as East Silos and West Silos. Cement silos are vented through dust collectors.

   Stored bulk cement is pneumatically transported from the cement storage silos to two truck loadout stations and one rail loadout station. Cement is loaded into enclosed trucks and railcars for shipment. A portion of the stored cement is pneumatically transported to the existing packhouse where it is packaged and loaded for truck shipment.

   The loadout bins at the bulk cement loading stations and the cement packing machines are vented through dust collectors.

The Source IDs, above, identify the major components of each process but do not include all components associated with the process or group. A complete listing of Source IDs and components comprising each process or Source ID are provided in the Plan Approval application forms and the plan approval Attachment 6 Emission Calculations. The Plan Approval application forms and Attachment 6 Emission Calculations should be referred to for any discrepancies or clarification for a specific source components, Source ID, or emissions contribution. Associated "*control devices*" are identified with a "C" before the unit number.

Please note that many particulate "*control devices*" or air cleaning devices identified here may act as process equipment for product and material recovery for collection and reintroduction into the process not for exhausting to atmosphere.

Other sources of emissions not included in the summaries above include: Source IDs CT (Cooling tower), 274 (Emergency Generator) and 275 (Fire Pump), Source ID 184 (Unpaved Roads) and Source ID 185 (Paved Roads). CT is a 352 gpm, Cooling Tower equipped with a drift eliminator. Source ID 274 is a 1,475 bhp Emergency Generator Engine meeting EPA certification for model year. Source 275 is a 183 bhp Fire Pump Engine meeting EPA certification for model year.

REGULATORY ANALYSIS

The regulatory analysis includes a summary of both state and federal requirements.

PENNSYLVANIA

General Provisions

25 Pa. Code §121.7 – Prohibition of air pollution will apply to this facility and has been included as a plan approval condition.

CEMEX will meet this requirement through the plan approval application process and through compliance with the final issued plan approval.

25 Pa. Code §122.3 – Adoption of standards, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources, promulgated in 40 CFR Part 60 (relating to standards of performance for new stationary sources) by the Administrator of the EPA under section 111 of the Clean Air Act (42 U.S.C.A. § 7411) are adopted in their entirety by the Department and incorporated herein by reference."

This Chapter gives the Department independent enforceability of U.S. EPA New Source Performance Standards ("NSPS"). Individual NSPS are applicable to this facility and are examined later within this regulatory analysis.

Standards for Air Contaminants

Fugitive Emissions

***25 Pa. Code §123.1 – Prohibition of certain fugitive emissions* and**
25 Pa. Code §123.2 – Fugitive particulate matter will apply to this facility and have been included as plan approval conditions.

CEMEX will meet these requirements through best management practices for stockpiling of materials, paving and watering of facility roadways, good housekeeping measures, vehicle speed controls, and facility-wide inspections.

Particulate Matter Emissions

***25 Pa. Code §123.13* – Processes** emission standards will apply to this facility but are superseded by more stringent emission limitations. These regulations place numerical limits on particulate matter emissions from the respective source categories and are summarized below:`

Table 1. 25 Pa. Code §123.13 Process Particulate Emission Standards Summary

Source	25 Pa. Code §	PM Emission Limit	Proposed BACT/Bat Average Case Emission Rate
Source ID 263 Clinker Production (Kiln)	123.13(b)(1) & (2)	0.02 gr/dscf,	0.02 lb/ton of clinker
Source 264 Clinker Cooling (Clinker Cooler)	123.13(b)(1) & (2)	0.02 gr/dscf,	0.02 lb/ton of clinker
Source ID CT Cooling Tower[e]	123.13(c)(1)(i)[b]	0.04 gr/dscf	BAT/BACT drift rate of 0.001%
Source ID 274 Emergency Generator Engine			EPA certified unit
Source ID 275 Fire Pump Engine			EPA certified unit
All other particulate matter emitting sources			Various BACT/BAT based on approved emission factors and manufacture's guarantee

[a] Formula $A=0.76E^{0.42}$ where F=150 lbs/ton and W=130 tons/hr for Portland cement production, and F-50 lbs/ton and W= 130 tons/hr for clinker cooling.W is based on 3,120 stpd assuming a 24 hr workday.
[b] Processes with effluent gas less than 150,000 dry standard cubic feet per minute.

CEMEX will meet these standards for their process sources by implementing approved BAT and BACT control strategies along with any applicable NSPS and NESHAP requirements and good operating practices. For engines, BAT will be demonstrated by purchasing EPA certified units to meet applicable Federal emission standards for the diesel-fired, fire pump and emergency generator engines.

The CPMS, visible observations, good operating practices, and pressure gauge monitoring are proposed by CEMEX for particulate monitoring. The Department understands that bag leak detection systems (BLDS) are more accurate at detecting slight deviations of grain loading than changes in baghouse pressure drop detected with pressure gauges. This enhanced monitoring method has been determined to be BAT for some baghouses proposed in the Commonwealth. The Department initiated discussions with CEMEX through their consultant Jennifer Seinfeld (Power Engineers) related to the use of bag leak detection systems (BLDS) as a more reliable baghouse performance monitoring method than the proposed daily visible emission observations and regular pressure drop readings for some baghouses throughout the facility. The Department explained that BLDS monitoring is more common and more economical and has been required for more recent baghouse installations with capacities rated at 12,000-15,000 acfm and above to meet BAT. CEMEX advised that they are meeting the Federal 40 CFR 60 Subpart F for particulate emissions through continuous monitoring via PM CPMS for the pyroprocessing system (kiln and clinker cooler) and the 40 CFR 63 Subpart LLL MACT requirements through visible emission monitoring for raw mill or finish mill operations. 40 CFR 63 Subpart LLL permits visible emission monitoring to demonstrate compliance with visible emission limits and provides for an optional use of BLDS. CEMEX advised that there are a significant number of smaller baghouses proposed in the plan approval. They contend that installing BLDS on all baghouses, including the numerous smaller units, would be overburdensome. CEMEX instead verbally proposed limited use of BLDS on select number of baghouses rated at 83,000 acfm and greater. As a result of that discussion, the Department compiled a list of the baghouses, by Source ID and rating, proposed in the plan approval application and compared those sized units to baghouses required to have BLDS in other regions for various processes.

The Department agrees with CEMEX that the majority of the 70+ baghouses are small capacity units. BLDS would not be required on these small units (<15,000 acfm) and compliance can be demonstrated through visible emission observations and pressure readings. The Department identified 15 baghouses rated at 15,000 acfm or greater that meet the recently approved threshold deemed feasible for installation of BLDS. Of the 15, three (3) are labeled as to be determined (TBD) so they may be eliminated from consideration if final size selected is below 15,000 acfm. These baghouses have been grouped and identified in Section E asGroup G07 BLDS Baghouses.

Sulfur Compound Emissions

25 Pa. Code §123.21 – General will apply to this facility but are superseded by more stringent emission limits derived from NSPS and BAT/BACT determinations, as applicable. These regulations place numerical limits on sulfur compound emissions from the respective source categories and are summarized in Table 2 below:

Table 2. 25 Pa. Code §123.21 Sulfur Compound Emission Standards Summary

Source	25 Pa. Code §	SO_2 Emission Limit	Proposed BACT/BAT Emission Rate
Source ID 263 Kiln/Precalciner	123.21(a)	500 ppmdv	0.4 lbs/ton of clinker, 30 day rolling avg.
Source ID 274 Emergency Generator[a]	123.21(a)	500 ppm (0.05 wt%)	15 ppm (0.0015 wt %) [40 CFR 60 Subpart IIII/ 40 CFR 80.510]
Source ID 275 Fire Pump Engine[a]	123.21(a) /	500 ppm (0.05 wt%)	15 ppm (0.0015 wt %) [40 CFR 60 Subpart IIII/ 40 CFR 80.510]

[a] Commercial fuel oil standard for ULSD. Maximum allowable fuel sulfur content by weight ensures compliance with the 15 ppm limitation.

CEMEX will meet these sulfur compound emission standards for the Source ID 274 (Emergency Generator) and the Source 275 (Fire Pump Engine) by purchasing and using No. 2 fuel oil and diesel compliant with more stringent Federal standards for sulfur content for the ULSD ultra low sulfur content diesel fuel 15 ppm (0.0015 wt %).

CEMEX will also combust of a low ash and low sulfur pipeline grade natural gas with a sulfur content < 0.2 gr/100 cf during start-up of the kiln. CEMEX will meet the proposed BACT/BAT emission rate from the kiln by inherent dry scrubbing design, along with dry absorbent addition of dry calcium oxide or calcium hydroxide as needed

SOx emissions from the kiln will demonstrate compliance with this standard by demonstrating compliance with other standards, implementation of BAT/BACT, and monitoring emissions via CEMs.

Odor Emissions

25 Pa. Code §123.31 – Limitations will apply to this facility and has been included as a plan approval condition. This regulation prohibits malodors that are detectable outside of the property boundary.

CEMEX will meet this requirement through the facility-wide inspections for potentially objectionable odors.

Visible Emissions

25 Pa. Code §123.41 – Limitations will apply to this facility but is superseded by more stringent visible emission limits. This regulation limits visible emissions to not exceed the following:

Table 3. 123.41 Visible Emission Standards

Source	25 Pa. Code §	25 Pa. Code Opacity Limit	BAT Opacity Limit
Source ID 263 Kiln **Source ID 264 Clinker Cooler**			Not to exceed 20% for 3 minutes in any 1 hour, or 60% at any time. [BAT]
All other Subpart Y, F and LLL affected sources except for the kiln and clinker cooler	123.41	Not to exceed 20% for 3 minutes in any 1 hour, or 60% at any time.	Superseded; May not discharge gases which exhibit 10% opacity or greater [NSPS, NESHAP (MACT), or BACT/BAT]
Source ID 259 Raw Mill or **Source ID 271 Finish Mill #1 and** **Source ID 273 Finish Mill #2**			Superseded; May not discharge gases which exhibit 10% opacity or greater [NSPS, NESHAP (MACT), or BACT/BAT]
Fire Pump Engine	123.41	Not to exceed 20% for 3 minutes in any 1 hour, or 60% at any time.	Not to exceed 10% for 3 minutes in any 1 hour, or 30% at any time; [BAT]
Emergency Generator			

Source ID 263, Kiln and Source ID 264,Clinker Cooler exhaust through the Main Stack (Stack ID 259B. Visible emissions from the Main Stack shall be monitored using a continuous opacity monitoring system (COMS) to demonstrate compliance with the 25 Pa. Code 123.41 opacity and the BAT limitation. Since the Source ID 259 Raw Mill exhaust is comingled with the kiln and clinker cooler exhaust out of the Main Stack (Stack ID 259B), the kiln and clinker cooler are subject to 10% opacity by default). Continuous opacity monitoring systems shall be installed on the main stack, Stack ID S259B, to monitor the Source IDs 259, 263, & 264. Visible emissions from other source shall be monitored through daily facility visible emission inspections.

Pursuant to 25 Pa Code §127.12b, according to best available technology (BAT) provisions in 25 Pa Code §127.1, the Prevention of Significant Deterioration provisions of 40 CFR §52.21 and 25 Pa Code §127.83, and other recent plan approvals for similar sources, conditions applicable to each source will be established in the plan approval.

The internal combustion engines BAT opacity limit determination is based on the General Permit BAQ-GPA/GP9 (rev. 6-2006) opacity standards for diesel-fired internal combustion engines. The emergency generator/fire pump engines are also subject to the 40 CFR Part 89.113 smoke emission standards. Compliance with the more stringent BAT opacity limitation of 25 Pa Code 127.12b ensures compliance with 40 CFR Part 89.113. CEMEX will meet this standard through the purchase of EPA certified engines, combustion of ultra-low sulfur content diesel fuel oil by the fire pump and emergency generator engines and facility-wide inspections for the presence of any visible emissions.

The 25 Pa. Code §123.42 Exceptions and 25 Pa. Code §123.43 Measuring techniques are applicable. CEMEX will be required to conduct observations for the presence of any visible stack emissions and keep records of these observations. All records will be required to be maintained for a minimum of five years.

<u>Hazardous Air Pollutants</u>

25 Pa. Code §124.3 – Adoption of standards, "National Emission Standards for Hazardous Air Pollutants ("NESHAP") promulgated in 40 CFR Part 61 (relating to National Emissions Standards for Hazardous Air Pollutants) by the Administrator of the United States Environmental Protection Agency under section 112(d) of the Federal Clean Air Act (42 U.S.C.A. § 7412(d)) are hereby adopted in their entirety by the Department and incorporated herein by reference." This Chapter gives the Department independent enforceability of U.S. EPA NESHAP, but only those promulgated under Part 61. Individual NESHAP under 40 CFR Part 61 will not be applicable to this facility.

<u>Construction, Modification, Reactivation and Operation of Sources</u>

25 Pa. Code §127.1, new sources shall control emissions to the maximum extent, consistent with the best available technology ("BAT") as determined by the Department as of the date of issuance of the plan approval for the new source.

The proposed new equipment meets the definition of a *new source* under 25 Pa. Code §121.1. *Existing sources* being refurbished and reactivated for this project are also "new sources" for the purposes of permitting since the reactivation plan was only valid until March 2020.

25 Pa. Code §127.3 implements the Clean Air Act sections relating to operational flexibility. Operational flexibility is authorized by §§ 127.448, 127.449, 127.14, 127.447, 127.462, 127.450 and Subchapter H, as applicable.

25 Pa. Code §127.11, approval by the Department is required to allow the construction of an *air contamination source* or installation of an *air cleaning device* on an air contamination source. The new equipment meets the definition of *air contamination source* as defined under 25 Pa. Code §121.1. *Air cleaning device* is defined as an article, chemical, machine, equipment, or other contrivance, the use of which may eliminate, reduce, or control the emission of air contaminants into the atmosphere.

40 CFR Part 64.1 of the Compliance Assurance Monitoring (CAM) rule defines *control device* as equipment, other than *inherent process equipment*, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere.

CEMEX contends that some of the proposed equipment that typically is used for emission control will be used in the proposed process for purposes of safety and material recovery not to meet an emission limitation or standard. Use of equipment in this manner meets the 40 CFR Part 64.1 definition of *inherent process equipment* that is discussed later in this document.

The proposed activated carbon, dry absorbent system (DAA), Selective Non-Catalytic Reduction (SNCR), dust collectors, and bin vents, meet the definition of *Air cleaning device* as defined under 25 Pa. Code §121.1.

25 Pa. Code §127.1(a) requires emissions from a *new source* to be the minimum attainable through the use of the *best available technology* (BAT). BAT is defined as equipment, devices, methods, or techniques as determined by the Department which will prevent, reduce, or control emissions of air contaminants to the maximum degree possible.

In addition to the demonstration of BAT for all pollutants, CEMEX is subject to PSD requirements and a determination of the Best Available Control Technology (BACT) for NO_2, CO, PM, PM_{10}, $PM_{2.5}$, SO_2 and GHG emissions and to Nonattainment New Source Review (NNSR) requirements and a determination of the lowest achievable emission rate (LAER) for NOx and VOC. In some cases, BACT or LAER satisfies the BAT requirements for NO_2, CO, PM, PM_{10}, $PM_{2.5}$, SO_2, GHG, and VOC emissions. Maximum achievable control technology (MACT) satisfies the BAT requirements for, THC, D/F, Hg, HCl, NH_3, and H_2SO_4. BACT/LAER/BAT is summarized in a later section of this document.

In response to the Department's technical deficiency letter dated February 10, 2021 and various emails, CEMEX provided additional technical information to justify and support their SO_2 and GHG BAT/BACT proposals. This information provided links to reference documents that specifically addressed the process chemistry, control strategies, and emissions and supported the economic infeasibility of restricting fuel options or requiring only low sulfur/low carbon fuel use instead. As a result, natural gas was added to the list of approved fuels in the plan approval and is required by Subpart LLL to be used at start-up but ultimately the fuel selection will be driven on availability and economics.

25 Pa. Code §127.14(d) CEMEX is expected to be capable of, meeting the plan approval exemption criteria of 25 Pa. Code §127.14(d) and listed as No. 6 in the Department's Plan Approval and Operating Permit Exemptions list[1] under 25 Pa. Code § 127.14(a)(8) for the diesel-fired fire pump engine to be located at this site. This exemption is based upon actual short and long-term NO_x emissions(less than 100 lbs/hr, 1000 lbs/day, 2.75 tons per ozone season and 6.6 tpy on a 12-month rolling basis for all exempt engines at the site). This engine has been accounted for in this plan approval application and evaluated for regulatory applicability. Applicable requirements will still be included as plan approval conditions for convenience and later incorporation into an operating permit.

25 Pa. Code §127.35 – Maximum achievable control technology standards for hazardous air pollutants("MACT"), "(b) The regulations establishing performance or emission standards promulgated under section 112 of the Clean Air Act (42 U.S.C.A. § 7412) at 40 CFR Part 63 (relating to National Emission Standards for Hazardous Air Pollutants for Source Categories) are incorporated by reference into the Department's plan approval program." This section requires the Department to include U.S. EPA NESHAP promulgated under Part 63 into a plan approval for each source or, if EPA has not promulgated a standard to control the emission of the HAPs for the category, requires the Department to establish a performance or emission standard on a case-by case basis.

Standards for Sources

25 Pa. Code §129.14 – Open burning operations will apply to this facility and has been included as a plan approval condition. This facility will be located in the *Upper Beaver Valley air basin* as defined in 25 Pa. Code §121.1. No open burning of material is permitted in an air basin.

25 Pa. Code §129.57 – Storage tanks less than or equal to 40,000 gallons capacity containing VOCs will not apply to the diesel fuel storage tanks at this facility. Per 25 Pa. Code Section 129.57,

[1] Air Quality Permit Exemptions, Document 275-2101-003, August 8, 2018

"The provisions of this section apply to above ground stationary storage tanks with a capacity equal to or greater than 2,000 gallons which contain volatile organic compounds with vapor pressure greater than 1.5 psia (10.5 kilopascals) under actual storage conditions."

Each diesel fuel and fuel oil storage tank will have a vapor pressure below 1.5 psia under actual storage conditions.

25 Pa. Code §129.91-§129.93 – Control of major sources of NO_x and VOCs will apply to this facility as a major source of NO_x and VOC. Presumptive Reasonably Available Control Technology ("RACT") requirements under 25 Pa. Code §129.93 would be applicable to NO_x and VOC sources at this facility. However, presumptive RACT will be satisfied through the application of Lowest Achievable Emission Rate (LAER) control requirements for sources of NO_x and VOC at this facility in accordance with 25 Pa. Code §129.93(c)(6).

The emergency generator and fire pump engines will also meet presumptive RACT through limited operational hours in accordance with 25 Pa. Code §129.93(c)(5).

25 Pa. Code §129.96 through §129.100– Additional RACT requirements for major sources of NO_x and VOCs will apply to this facility. Per 25 Pa. Code §129.96(d), "This section and §§129.97—129.100

CEMEX is a major NO_x emitting facility and formerly a major VOC emitting facility, as defined by 25 Pa. Code §129.96, and must evaluate this project for compliance with RACT. Since the facility is subject to NNSR and the more stringent requirements of LAER for NOx and VOC emissions from the kiln, compliance with the more stringent LAER emission limits will ensure compliance with the presumptive 25 Pa. Code §129.97(h)(3)(ii) RACT limitation for the pre-calciner cement kilns of 2.36 lb NOx /ton of clinker.

The 25 Pa. Code §129.7(c)(8) presumptive RACT requirements for the emergency and fire pump engines to install, maintain, and operate the engines in accordance with manufacturer's specifications and with good operating practices will be met by CEMEX.

Reporting of Sources

25 Pa. Code Chapter 135 will apply to this facility. Per 25 Pa. Code §135.1, "The purpose of this chapter is to provide a means of obtaining data required to evaluate the effectiveness of regulations, identify available or potential emission offsets and maintain an accurate inventory of air contaminant emissions for air quality assessment and planning activities."

CEMEX will be required to report annual emissions; and maintain records of production, fuel usage, maintenance of production or pollution control equipment, and any other information that may be necessary for identification and quantification of air emissions. These requirements have been included as plan approval conditions.

Sampling and Testing

25 Pa. Code Chapter 139 will apply to this facility. This chapter establishes requirements for source testing/sampling and monitoring. Source testing must be conducted in accordance with the most recent version of the Department's *Source Testing Manual* referenced under 25 Pa. Code §139.3. Source monitoring (CEMS) must be conducted in accordance with the most recent version of the Department's *Continuous Source Monitoring Manual* referenced under 25 Pa. Code §139.101. Per 25 Pa. Code §139.5(f), "A person proposing test methods, procedures, and guidance for reporting of emissions different from those contained in the *Source Testing Manual* or *Continuous Source Monitoring Manual* shall have the burden of proof to demonstrate that test methods, procedures, and guidance accurately characterize the emissions from the source.

CEMEX will be required to perform source testing and certify and operate CEMS in accordance with the requirements of this chapter.

Chapter 145-Interstate Pollution Transport Reduction will apply to this facility. Subchapter C - Emissions of NOx from Cement Manufacturing, which identifies standards for NOx emissions during ozone season (May 1 through September 30). 25 PA Code §145.143(b)(2)(iii) limits NOx emissions from preheater and pre-calciner cement kilns during the ozone season to 2.36 pounds of NOx per ton of clinker produced. 25 PA Code §145.143(d) requires that one NOx allowance be surrendered to PADEP for each ton of NOx where the actual emissions exceed the allowable emissions during the period from May 1 through September 30.

CEMEX will comply with the applicable limits this chapter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

New Source Performance Standards ("NSPS")

CEMEX was evaluated for the applicability of multiple NSPS including the following:

- 40 CFR 60 Subpart A-General Provisions
- 40 CFR 60 Subpart F—Standards of Performance for Portland Cement Plants
- 40 CFR 60 Subpart Y—Standards of Performance for Coal Preparation and Processing Plants
- 40 CFR Part 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984
- 40 CFR Part 60 Subpart OOO Standards of Performance for Nonmetallic Mineral Processing Plants
- 40 CFR Part 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition (CI) Internal Combustion Engines (ICE)

Applicable requirements include notifications (date of construction, initial startup, physical or operational changes, and commencement of continuous monitoring system performance); records (startup, shutdown, malfunction, and continuous monitor data); reports (continuous monitor excess emissions and performance); performance test standards; and continuous monitoring standards.

40 CFR Part 60 Subpart A – General Provisions will apply to this facility. Per 40 CFR §60.1(a), "Except as provided in subparts B and C, the provisions of this part apply to the owner or operator of any stationary source which contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility." Subpart A requirements include initial notification and recordkeeping, performance tests, monitoring and recordkeeping.

40 CFR 60 Subpart F—Standards of Performance for Portland Cement Plants will apply to the kilns, clinker coolers, raw mill systems, finish mill systems, raw mill dryers, and other affected process including raw material, clinker, and finished product storage, conveyor transfer points, bagging and bulk loading and unloading systems. The requirements include emission standards, monitoring, performance testing, recordkeeping, and reporting requirements. The kiln will be subject to NOx (1.5 lb/ton of clinker), SO_2 (0.4 lb/ton of clinker), and PM (0.02 lb/ton of clinker) emission requirements, the clinker cooler will be subject to PM (0.02 lb/ton of clinker) emission requirements, and other affected facilities/source are subject to opacity limits. [Applicable Standards-78 FR 10037, Feb. 12, 2013, as amended at 80 FR 44779, July 27, 2015; 83 FR 35132, July 25, 2018].

40 CFR 60 Subpart Y—Standards of Performance for Coal Preparation and Processing Plants [74 FR 51977, Oct. 8, 2009] will apply to the preparation and processing of coal preparation plants. Affected facilities may include the proposed new coal crushing/breaking, screening equipment, storage systems (coal bins) and conveying equipment (belt conveyors), coal transfer and loading systems, and open storage piles. Overall, an opacity limit of 10% or less applies to the affected facilities. For affected facilities equipped with a mechanical vent (baghouse) are subject to a PM emission limit of 0.010 gr/dscf. Open storage piles require preparation and submission of a fugitive coal dust emission control plan. This plan will be submitted prior to start up.

40 CFR Part 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 will not apply to the existing 10,000 gallon diesel and 12,000 gallon fuel oil storage tanks at this facility. Per 40 CFR §60.110b, "(a) Except as provided in paragraph (b) of this section, the affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters (m^3) (19,813 gallons) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984." Paragraph (b), as well as paragraph (d), under the same section identifies storage vessel subcategories for which this subpart does not apply.

40 CFR Part 60 Subpart OOO Standards of Performance for Nonmetallic Mineral Processing Plants [74 FR 19309, Apr. 28, 2009, unless otherwise noted] will not apply. The Subpart OOO affected sources identified as each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station for limestone, shale, sand, and gypsum will not apply because they are subject to 40 CFR Part 60 Subpart F provisions.

A Subpart OOO affected facility subject to 40 CFR Part 60, Subparts F or that follows in the plant process any facility subject to Subpart F is not subject to the provisions of Subpart OOO, per 40 CFR § 60.670(b). Subpart F affected facilities include the kiln, clinker cooler, raw mill system, finish mill system, raw mill dryer, raw material storage, clinker storage, finished product storage, conveyor transfer points, bagging and bulk loading and unloading systems. The raw mill systems and the finish mill systems are subject to Subpart F. Upon closer examination of the rule and the affected facility definitions, CEMEX found no combination of the equipment meets the criteria of the nonmetallic mineral processing plant, so no facility at the plant is subject to Subpart OOO. This differs from their initial analysis in the plan approval and was provided in response to the technical deficiency letter inquiry. The Department agrees with CEMEX's findings and notes that 40 CFR 60 Subpart OOO does not address the raw material unloading and conveyance preceding the raw material storage.

40 CFR Part 60 Subpart IIII- Standards of Performance for Stationary Compression Ignition (CI) Internal Combustion Engines (ICE) will apply to the diesel-fired fire pump engine and the diesel-fired emergency generator engine at this facility. Per 40 CFR §60.4200(a)(2), "The provisions of this subpart are applicable to… Owners and operators of stationary CI ICE that commence construction after July 11, 2005, where the stationary CI ICE are: Manufactured after April 1, 2006, and are not fire pump engines and…manufactured as a certified National Fire Protection Association (NFPA) fire pump engine after July 1, 2006."

Source ID 274 Emergency Generator Engine, rated at 1,474 bhp, and Source ID 275, Fire Pump Engine, rated at 183 bhp, are emergency CI ICE proposed to be installed as part of the project. The model year and manufacture date is to be determined but is expected to be after the applicability dates of July 7, 2006 and subject to this standard. Source ID 274 , Emergency Generator will be subject to emission standards under 40 CFR Part 60.4205 (a) or (b) either Table 1 to Subpart IIII or Part 89.112 and 89.113 of the nonroad compression ignition engine standards depending on the model year selected. Subpart IIII applicable limits are: NOx + NMHC (VOC) = 6.4 g/hp-hr; CO = 3.5 g/hp-hr; and PM10 = 0.2 g/hp-hr and HC = 0.03 g/hp-hr. Source ID 275 fire pump engine based on NOx emissions would be exempt from plan approval but is subject to the emission standards under Table 4 to Subpart IIII of Part 60 which are included in this plan approval. Both engines will be subject to fuel sulfur content limitations, work practice standards, monitoring and recordkeeping. A non-resettable hour meter will be required to be installed per the requirements of 40 CFR § 60.4209(a) on each engine. The engine's hours of operation are not limited during use in emergency situations, but shall otherwise be limited to 100 hours or less annually according to the qualifications under 40 CFR § 60.4211(f)(2). The smoke emission standards of 40 CFR Part 89.113 are less stringent than those imposed by the PADEP BAT determination for internal combustion engines.

CEMEX has described that the engines will meet the EPA certification based on model year, engine size and type, meet the 40 CFR 80.510(a) sulfur fuel limit of 15 ppm (0.0015%), be equipped with a non-resettable hour meter, and will be limited to 100 hours of non-emergency operation.

National Emission Standards for Hazardous Air Pollutants ("NESHAP")

CEMEX was evaluated for the applicability of multiple NESHAPs or Maximum Achievable Control Technology (MACT) standards including the following:

- 40 CFR 63 Subpart A- General Provisions
- 40 CFR Part 63 Subpart Q - National Emission Standards for Hazardous Air Pollutants from Industrial Process Cooling Towers
- 40 CFR 63 Subpart LLL - National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry
- 40 CFR 63 Subpart ZZZZ-National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

CEMEX will be subject to the requirements of NESHAP:

40 CFR Part 63 Subpart A – General Provisions <u>will apply</u> to this facility. Per 40 CFR §63.1(b)(1), "The provisions of this part apply to the owner or operator of any stationary source that-

(i) Emits or has the potential to emit any hazardous air pollutant listed in or pursuant to section 112(b) of the Act; and
(ii) Is subject to any standard, limitation, prohibition, or other federally enforceable requirement established pursuant to this part."

CEMEX <u>will be</u> required to comply with Subpart A requirements include initial notification and recordkeeping, performance tests, monitoring and recordkeeping, as applicable.

40 CFR Part 63 Subpart Q **National Emission Standards for Hazardous Air Pollutants from Industrial Process Cooling Towers** <u>will not apply</u> to this facility. Per 40 CFR §63.400(a), "The provisions of this subpart apply to all new and existing industrial process cooling towers that are operated with chromium-based water treatment chemicals…"

CEMEX <u>will not</u> be using chromium-based water treatment chemicals in the industrial process cooling towers. PM, PM10, and PM2.5 emission are included in the emission calculations.

40 CFR 63 Subpart LLL - National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry <u>will apply</u> to most of the proposed new and existing emission units at this major facility that includes:

- Raw material storage bins including the Material Storage Shed and Material Storage Building
- Kiln including inline raw mill inline coal mill , preheater and pre-calciner
- Clinker Cooler
- Clinker storage bins including the Material Storage Building
- Finish Mills and separators
- Cement storage bins and clinker dome
- Conveying system transfer points including conveyance from coal mill to kiln that includes feeders, belt conveyors, bucket elevators and pneumatic systems for conveying duel, raw materials, raw meal, clinker or cement and
- Cement bagging and bulk loading systems

The kiln is subject to PM (0.02 lb/ton clinker), dioxin/furan (D/F)(0.2 ng/dscm @ 7%O_2 or 0.4 ng/dscm @ 400 F or less), mercury (21 lb/MMtons clinker), THC (24 ppmvd @ 7%O_2/ or 12 ppmvd for total organic HAP), and hydrochloric acid (HCl)(3 ppmvd @ 7%O_2) requirements.
The clinker cooler is subject to PM (0.02 lb/ton clinker) requirements. Raw mill and finish mill subject to 10% opacity standards. All other affected facilities except the kiln and clinker cooler are subject to the 10 % opacity limitation.

40 CFR Part 63 Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engine *(RICE)* <u>will apply</u> to the new, the diesel-fired emergency generator engine rated at 1,474 bhp, identified as Source ID 274, and the diesel-fired fired fire pump engine rated at 183 bhp, identified as Source ID 275, at this facility.

Per 40 CFR §63.6585, "You are subject to this subpart if you own or operate a stationary RICE at a major or area source of HAP emissions, except if the stationary RICE is being tested at a stationary RICE test cell/stand." Based on the HAP emissions PTE (HCl emissions are 14 tpy), this facility will be a major source of HAP. The proposed diesel-fired, fire pump engine and emergency generator engine, therefore, will be subject to 40 CFR Part 63 Subpart ZZZZ.

According to 40 CFR §63.6590(a)(2)(i) and (ii), these engines meet the criteria of an affected source and will be classified as new, stationary RICE located at a major source. However, due to different requirements based on engine brake horsepower ratings, they will have slightly different compliance requirements. Pursuant to 40 CFR § 63.6590(b(1)(i), Source ID 274, the 1,474 bhp emergency generator engine does not have to meet the requirements of this subpart and of subpart A of this part except for the initial notification requirements of § 63.6645(f) provided the engine is not contractually obligated to be available for more than 15 hours as specified further in the rule. Pursuant to 40 CFR 63.6590(c) and (c)(7), new emergency stationary RICE with ratings of 500 bhp or less (Source ID 275) must meet the requirements of Subpart ZZZZ by meeting the requirements of 40 CFR Part 60 Subpart IIII. By doing so, no further requirements under Subpart ZZZZ apply to the 183 bhp fire pump engine.

Per 40 CFR §63.1(b)(3), "An owner or operator of a stationary source who is in the relevant source category and who determines that the source is not subject to a relevant standard or other requirement established under this part must keep a record as specified in §63.10(b)(3)."

CEMEX shall keep records pertaining to the applicability determinations, submit the initial notification as specified, and comply with Subpart IIII as applicable.

Additional Federal Requirements

40 CFR Part 64 – Compliance Assurance Monitoring will not apply to this facility. Per 40 CFR §64.2, "*General applicability.*
(a) Except for backup utility units that are exempt under paragraph (b)(2) of this section, the requirements of this part shall apply to a pollutant-specific emissions unit at a major source that is required to obtain a part 70 or 71 permit if the unit satisfies all of the following criteria:

1) The unit is subject to an emission limitation or standard for the applicable regulated air pollutant (or a surrogate thereof), other than an emission limitation or standard that is exempt under paragraph (b)(1) of this section;
2) The unit uses a control device to achieve compliance with any such emission limitation or standard; and
3) The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source. For purposes of this paragraph, "potential pre-control device emissions" shall have the same meaning as "potential to emit," as defined in §64.1, except that emission reductions achieved by the applicable control device shall not be taken into account."

This facility will be classified as a major source and will be required to obtain a part 70 (Title V) operating permit. In accordance with 40 CFR Part 64.2(b)(1)(i) and (b)(1)(vi), new and existing equipment are exempt from 40 CFR Part 64 if they are subject to emissions limitations and standards, proposed after November 15, 1990 pursuant to section 111 (40 CFR Part 60) or 112 (40 CFR Part 63) of the Act and/or subject to emission limitations or standards for which a part 70 (Title V) or 71 permit specifies a continuous compliance determination method as defined in §64.1.

The facility is exempt under 40 CFR Part 64.2(b)(1)(i) because the proposed equipment is subject to the following standards that were proposed after 1990 section 111 and 112 rules.

- 40 CFR 60 Subpart F—Standards of Performance for Portland Cement Plants applies to the entire plant. [75 FR 55034, Sept. 9, 2010, as amended at 78 FR 10032, Feb. 12, 2013; 80 FR 44777, July 27, 2015]
- 40 CFR 60 Subpart Y—Standards of Performance for Coal Preparation and Processing Plants [Final rule is effective on October 8, 2009].
- 40 CFR 63 Subpart LLL - National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry [64 FR 31925, June 14, 1999, unless otherwise noted.]

Secondly, 40 CFR Part 64.2(b)(1)(vi) exempts sources subject to Title V permit requirements requiring continuous emissions monitoring (CEM) for compliance. The NO_x, SOx, mercury emissions from the kiln are required to use control systems and to be monitored by CEMS.

Particulate matter at the facility will be controlled by dust collectors. The applicant describes the dust collectors, subject to Subpart LLL, as being an integral part of the material transfer and separation process and not *control devices* for the purposes of meeting an emissions limitation or standard. The collected material from the dust collectors is reintroduced into the process. For subpart applicability purposes, §64.1 defines *control device* and *inherent process equipment* as follows:

> *"Control device* means equipment, other than *inherent process equipment*, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere. The types of equipment that may commonly be used as control devices include, but are not limited to, fabric filters,… If an applicable requirement establishes that particular equipment which otherwise meets this definition of a *control device* does not constitute a *control device* as applied to a particular pollutant-specific emissions unit, then that definition shall be binding for purposes of this part.
>
> *Inherent process equipment* means equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations. Equipment that must be operated at an efficiency higher than that achieved during normal process operations in order to comply with the applicable emission limitation or standard is not *inherent process equipment*. For the purposes of this part, *inherent process equipment* is not considered a control device.

The bin vent filters at the facility are described as *inherent process equipment* because they are integrated into the bins and serve and operate passively to capture material in the displacement air and return materials to the storage bin. They are not proposed as *control devices*.

As such these dust collectors and bin vents are not subject to CAM because they do not meet the first or second criteria of §64.2(a).

Four (4) particulate emission units equipped with dust collectors, not subject to 40 CFR Part 63, Subpart LLL, related to raw material truck unloading have a pre-controlled PM emission rate of well below the major source threshold of 100 tpy. These units are not subject to CAM because the third criteria of § 64.2(a) is not met.

No other source proposed to be installed at this facility will be subject to CAM because each does not meet the criteria specified in 40 CFR §64.2(a)(1-3).

40 CFR Part 68 – Chemical Accident Prevention Provisions –The requirement for preparation and implementation of a RMP may apply to this facility, if required by Section 112(r) of the Clean Air Act, is included as Section B. Condition #012 in all Plan Approvals. A RMP must be submitted no later than the date on which the regulated substance is first present above the threshold quantity. For aqueous ammonia, a RMP is required for concentrations of 20% or greater and in quantities of 20,000 lbs or more at the facility as identified in 40 CFR §68.130, Table 1. CEMEX proposes storing <19% aqueous ammonia in one 15,200 gallon tank so an RMP is not anticipated.

40 CFR Part 98 - Mandatory Greenhouse Gas (GHG) Reporting: Subpart A – General Provision and Subpart H – Cement Production will not apply to this facility. Applicable sources in cement production include each kiln and each in-line kiln/raw mill at any Portland cement manufacturing facility including alkali bypasses, and includes kilns and in-line kiln/ raw mills that burn hazardous waste. No hazardous waste burning has been proposed by CEMEX. The Department has been advised by U.S. EPA that emissions reporting under the Mandatory Reporting Rule is not currently considered an "applicable requirement" under U.S. EPA regulations implementing Title V and therefore does not have to be included in permits for minor or major sources.

The Department has elected to require the reporting of GHG emissions for all sources under 25 Pa. Code §127.12b as GHG are now a regulated pollutant under the Clean Air Act.

Prevention of Significant Deterioration (PSD) Review

On May 31, 1980, the Department adopted PSD requirements promulgated by U.S. EPA under the Clean Air Act. These requirements have been adopted in their entirety and incorporated by reference in 25 Pa. Code Chapter 127 Subchapter D. Per 40 CFR 52.21(a)(2)(i), "The requirements of [40 CFR Part 52.21, *Prevention of Significant Deterioration of Air Quality*] apply to the construction of any new *major stationary source* or any project at an existing major stationary source in an area designated as attainment or unclassifiable under sections 107(d)(1)(A)(ii) or (iii) of the Act."

Attainment or unclassifiable designations (listed under 40 CFR §81.339 for Pennsylvania) are established in reference to the National Ambient Air Quality Standards ("NAAQS") established under 40 CFR Part 50. New sources must be evaluated to determine whether or not they meet the definition of a new major stationary source (defined in 40 CFR §52.21(b)(1)) which would subject the sources to PSD requirements.

The plant is located in an area that is in attainment for all criteria pollutants.. Per 40 CFR §81.339, Wampum Borough, Lawrence County located in the Upper Beaver Valley air basin was designated as an area of attainment for all NAAQS, CO, NOx, SO_2, PM_{10}, $PM_{2.5}$, Pb, and ozone. All of the Commonwealth of Pennsylvania is located in the Northeast Ozone Transport Region (OTR) and is therefore treated like a moderate ozone nonattainment area (127.201(c)). Attainment classification for this project is summarized in Table 4. NAAQS Attainment Status Summary, below. Recognized precursor pollutants for ozone are NOx and VOC. NOx is unique in that it is potentially subject to both PSD and nonattainment new source review (NNSR) by virtue of its standing as an attainment criteria pollutant (NO_2) and as a nonattainment ozone precursor. VOC is only potentially subject to NNSR review.

Table 4. NAAQS Attainment Status Summary

Pollutant	Attainment Status
Sulfur Dioxide (SO_2)	Unclassifiable
Carbon Monoxide (CO)	Unclassifiable/Attainment
Particulate Matter (PM_{10})	Unclassifiable
Particulate Matter ($PM_{2.5}$)	Unclassifiable/Attainment
Nitrogen Dioxide (NO_2)	Unclassifiable/Attainment
Ozone (8-hour)	OTR moderate nonattainment
Lead	Unclassifiable/Attainment

Major stationary source is defined as either: (a) a source in one of the 28 source categories identified in 40 CFR 52.21 that has a potential to emit 100 tons or more per year of any regulated NSR pollutant[2], or (b) any other stationary source that has the potential to emit 250 tons or more per year of a regulated NSR pollutant (separate GHG emission thresholds are described below).

As one of the 28 listed categories subject to PSD review (Portland cement plants) in the 40 CFR 52.21 definition of a *major stationary source, t*he installation of this new kiln is subject to the applicability threshold of 100 tons per year of a regulated pollutant (except GHG). The proposed PTE for NOx, CO, SOX, PM, PM_{10}, and $PM_{2.5}$ exceeds the *major stationary source* threshold. Since operations were curtailed over 10 years ago, the net emission increases are also significant.

Once PSD requirements are triggered for one air contaminant, a review must be conducted for the other regulated NSR pollutants to determine if they exceed the significant levels as defined in 40 CFR 52.21(b)(23). Significance levels have been exceeded by NOx, CO, PM, PM_{10}, $PM_{2.5}$, SOX, H_2SO_4, and CO_2e and are subject to PSD review. Table 5: PSD/NNSR Applicability Summary, below, summarizes the potential emissions, significance thresholds, and the PSD rule applicability.

[2] For purposed of PSD regulations, a regulated NSR pollutant is defined under 40 CFR §52.21(b)(50).

Table 5: PSD/NNSR Applicability Summary

Pollutant	NO_2[a]	CO	VOC	PM[b]	PM_{10}	$PM_{2.5}$	SO_2	H_2SO_4[c]	Pb	CO_2e
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Facility-Wide PTE	**861**	**787**	**46**	**159.6**	**148.5**	**116.2**	**228**	**63**	**0**	**1,048,133**
PSD Major Source/Significant Increase Threshold[c]	100/40	100/100	N/A[d]	100/25	100/15	100/10	100/40	100/7	100/0.6	75,000[e]
Subject to PSD?	Yes	Yes	No	Yes	Yes	Yes	Yes	No/ Yes	No	Yes
NNSR Major Source/ Significant Increase Threshold	100	N/A[f]	50/40	N/A[f]	N/A[f]	N/A[f]	N/A[f]	N/A[f]	N/A[f]	N/A[f]
Subject to NNSR?	Yes	No	Yes	No	No	No	No	No	No	No

[a] For purposes of this applicability analysis, all NO_x emissions are assumed to be NO_2.

[b] PM is defined as total filterable particulate matter for purposes of this applicability analysis because historically only the filterable fraction had been considered for NSR purposes as well as the first set of NSPS for PM and PM NAAQS in 1971. The applicant has not delineated filterable and condensable PM in this application. This is irrelevant because there is no filterable PM NAAQS, and PM10 and PM2.5 are inclusive of all filterable particulate matter for the combustion turbines with duct burners and BACT will be unaffected.

[c] Significant increase thresholds are included because once a facility is subject to PSD for any pollutant then it may be subject for any other regulated pollutant which exceeds the significant increase threshold. Regulated NSR pollutant is on NAAQS and includes PM2.5, PM10, VOC, NOx, Ozone, H_2SO_4, and SO_2. H_2SO_4 does not meet the PSD major source threshold. It only exceeds the significance threshold. BACT level controls for SO_2 provides BACT level of control for H_2SO_4 emissions in this case.

[d] For VOC, PSD is not applicable because the OTR area is treated as an area of nonattainment for this pollutant. It is subject to NNSR applicability.

[e] This threshold is no longer applicable as of June 23, 2014, when the Supreme Court of the United States concluded that EPA's rewriting of statutory thresholds was impermissible. It is expected that this facility will emit more than a *de minimis* amount of GHG. The *de minimis* threshold for GHG has been proposed by EPA as 75,000 tons at this time. A BACT analysis remains appropriate in this case.

[f] These pollutants are not applicable because this is either an area of attainment or there is no ambient air quality standard for these pollutants.

Greenhouse Gases (GHG)

The U.S. EPA determined on December 07, 2009, that GHGs are a threat to public health and welfare. This determination was made final effective on January 14, 2010.[3] GHG emissions are those emissions of carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, and other fluorinated greenhouse gases defined in 40 CFR Part 98 Subpart A. Each different GHG emission is considered to impact global warming at varying levels. Carbon dioxide equivalent (CO_2e) emissions are the combined impact of each GHG emission after it is normalized to the impact of CO_2 as a reference. On May 13, 2010, U.S. EPA issued a final Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule (GHG Tailoring Rule) which became effective on August 2, 2010.[4] This rule established an applicability timeline and GHG emission thresholds for requiring facilities to be permitted for GHG emissions. Implementation occurred in steps with the last "Step 3" being finalized on June 29, 2012. PSD major source thresholds were established at 100,000 tons of CO_2e PTE for new sources and 75,000 tons of CO_2e PTE for existing major facilities. Title V permitting requirements applied to facilities with a potential to emit of at least 100,000 tpy CO_2e.

On June 23, 2014, the Supreme Court of the United States ruled that "EPA exceeded its statutory authority when it interpreted the Clean Air Act to require PSD and Title V permitting for stationary sources based on their greenhouse-gas emissions. Specifically, the Agency may not treat greenhouse gases as a pollutant for purposes of defining a "major emitting facility" (or a "modification" thereof) in the PSD context or a "major source" in the Title V context. To the extent its regulations purport to do so, they are invalid. EPA may, however, continue to treat greenhouse gases as a "pollutant subject to regulation under this chapter" for purposes of requiring best available control technology ("BACT") for "anyway" sources."[5] "Anyway sources" are sources that were already required to obtain a PSD or Title V Permit. In effect, the GHG Tailoring Rule and included GHG major source thresholds have been rescinded.

However, this facility will be an "anyway" source because of its NO_2, SO_2, CO, PM, PM_{10}, $PM_{2.5}$, H_2SO_4 and ozone PTE. BACT requirements will apply to other pollutants with a PTE that exceeds the *Significant* thresholds under 40 CFR §52.21(b)(23). Pollutants with a PTE below these thresholds are considered *de minimis* for PSD purposes and will not be subject to BACT requirements. In response to the above decision, U.S. EPA has formally proposed to revise the PSD and Title V permitting regulations and establish a significant emission rate ("SER") of 75,000 tpy CO_2e below which GHG emissions would be considered *de minimis* for PSD purposes, meaning, no BACT required for "anyway sources" under the SER level of 75,000 tpy.[6] GHG is proposed to be subject to PSD and Title V permitting requirements only if the source is subject to these requirements for another regulated pollutant. The public comment period for this proposed rule closed on December 16, 2016 but it has not yet been finalized.

Per 40 CFR §52.21(j)(2), "A new major stationary source shall apply best available control technology ("BACT") for each regulated NSR pollutant that it would have the potential to emit in significant amounts." This is an existing Title V facility and the PTE from each individual source shall be considered to determine if the facility is a "new major stationary source".

CEMEX will exceed the PSD major source threshold for SOx (SO_2), NO_x (NO_2), CO, PM (TSP), PM_{10}, PM2.5 and the PSD significant threshold for and H_2SO_4 and CO_2e. There is currently no formally established significant threshold for GHG although CEMEX's CO_2e PTE will be greater than any *de minimis* threshold for GHG (when

[3] *Federal Register*, Vol. 74, No. 239, Tuesday, December 15, 2009, Rules and Regulations, p. 66496.
[4] *Federal Register*, Vol. 75, No. 106, Thursday, June 3, 2010, Rules and Regulations, p. 31514.
[5] *Utility Air Regulatory Group v. EPA*, Docket No. 12-1146, June 23, 2014, http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf, p.29.
[6] *Federal Register*, Vol. 81, No. 191, Monday, October 3, 2016, Proposed Rules, p. 68113.

established). CEMEX is therefore subject to BACT requirements for SOx (SO_2), NO_x (NO_2), CO, PM (TSP), PM_{10}, $PM_{2.5}$, H_2SO_4, and CO_2e.

<u>Nonattainment New Source Review ("NNSR")</u>

On May 19, 2007, the Department adopted revised New Source Review regulations in 25 Pa. Code Chapter 127 Subchapter E. Per 25 Pa. Code §127.201(a), "a person may not cause or permit the construction or modification of an air contamination facility in a nonattainment area… unless the Department… has determined that the requirements of this subchapter have been met." As stated above, this facility will be located in an area of attainment for all NAAQS except for ozone because it is located in the Ozone Transport Region (OTR). Per 25 Pa. Code §127.203(a), "This subchapter applies to the modification at an existing major facility located in a nonattainment area…" In accordance with the definition of *major facility* under 25 Pa. Code §121.1, this facility is major if the potential to emit exceeds 100 tons of NOx and 50 tons of VOC per year. A NNSR analysis is necessary for only these pollutants because NNSR evaluations are performed on a pollutant specific basis. NOx and VOC are precursors to Ozone. NOx, VOC, and Ozone have and EPA promulgated NAAQS.

Per §127.203 and §127.203a NNSR applicability determination.

CEMEX operates under a valid Title V Operating Permit as a major NOx and VOC emitting facility. A reactivation plan was valid until March 2020 to retain this status and permit reactivation. This facility is viewed as major for VOCs and in accordance with 25 Pa. Code § 127.206(k):

> *(k) A major facility which, due to reductions in the maximum allowable emissions rates, including reductions made to generate ERCs, no longer meets the criteria in § 127.203 (relating to facilities subject to special permit requirements) will continue to be treated as a major facility.*

The VOC source shutdowns as a result of the expiration of the reactivation plan occurred outside the contemporaneous window, so these decreases cannot be used as a decrease in Step 2 of the NSR applicability analysis. So as a major VOC facility, this project would be a *major modification* under NNSR with over a 40 tons significant emissions increase and over a 40 ton significant net emissions increase, and is subject to the PSD requirements for VOC.

Table 6. Summary of NNSR applicability analysis

Pollutant	Significance Level (tpy)	Project Emissions (tpy)	Subject to NNSR Review
VOC	40	46	**Yes**
NOx	40	861	**Yes**

CEMEX will exceed the NNSR major source threshold for NO_x and VOC and is therefore subject to LAER requirements for NO_x and VOC. [Per 25 Pa. Code §127.201(c)].

Per 25 Pa. Code §127.205(1), "A new or modified facility subject to this subchapter shall comply with LAER…"

Per 25 Pa. Code §127.205(5), "...an analysis shall be conducted of alternative sites, sizes, production processes and environmental control techniques for the proposed facility, which demonstrates that the benefits of the proposed facility significantly outweigh the environmental and social costs imposed within this Commonwealth as a result of its location, construction or modification."

CEMEX has conducted an analysis of alternative sites, sizes, production processes, and environmental control techniques as part of pre-application project development and the plan approval application.[7] The conclusion was that the proposed use of state-of-the-art kiln technology and operating practices are an improvement over the previous less efficient kilns at the existing facility. The new units and modifications will minimize air emissions at the facility and be in compliance with all applicable Federal and State air emission regulations. In addition the reactivation of the facility will bring economic prosperity to the community through jobs and taxes that far outweigh the potential environmental and social costs imposed as a result of the project's location, construction, or modification. This analysis and conclusions are acceptable to the Department and meet the requirements of 25 Pa. Code §127.205(5).

25 Pa. Code §127.205(3) and §127.210,

CEMEX will be required to secure ERCs at a ratio of 1.15:1 in order to offset potential flue and fugitive emissions of NO_x from the facility. Additionally, VOC flue emissions shall be offset 1.15:1 and fugitive emissions of VOC shall be offset 1.3:1 from the facility.

CEMEX will be required by plan approval condition and regulation under 25 Pa. Code §127.206 to secure the following amount of ERCs which have been certified by the Department prior to commencement of operation:

Table 7: Calculated Offsets, Expressed in Tons per Year

Pollutant/Area	**Flue PTE**	**Ratio**	**Total ERCs as Offsets**
NO_x/Transport Region	**859**	1.15:1	**988**
VOC/Transport Region	**46**	1.15:1	**53**

ERC are described in the application as available through Pennsylvania's ERC Registry System or those of Maryland and New York with which there is a reciprocity agreement with Pennsylvania. For the ERCs coming from Maryland or New York, a modeling analysis to show ambient impact and equivalence is required. HYSPLIT (back-trajectory model) may be used. ERC requirements will be a condition of the Plan Approval authorization and CEMEX will not be authorized to operate unit ERCs are secured and processed through the ERC Registry System and certified in accordance with 25 Pa. Code §127.206(d).

<u>BACT/LAER/BAT SUMMARY</u>

A Comprehensive Top Down Control Analysis for BACT/LAER for each applicable process source or source group and pollutants has been summarized and tabulated in Appendix A Top Down Control Analysis of this document for ease of review. Appendix A includes four (4) tables, TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER, TABLE 2. BACT DETERMINATION FOR THE PM POINT SOURCES, TABLE 3. BACT DETERMINATION FOR THE FUGITIVE PM SOURCES, and TABLE 4. BACT DETERMINATION FOR THE COOLING TOWER.

Table 8-BACT/BAT/LAER Emission Limit Summary and Tables 9A, 9B, 9C-BACT/BAT Summary, below, include summaries of the final LAER/BACT/BAT determinations for different types of processes identified as a result of the Appendix A analysis, emission limits, controls, and methods of compliance proposed for each evaluated Source ID.

[7] See Application pages 20 through 21

Table 8-BACT/BAT/LAER Emission Limit Summary						
Source ID 263 Kiln, Source ID 264 Clinker Cooler, & Source ID 259 Raw Mill						
Pollutant	**Regulatory Basis**	**Emission Limit (exceptions as noted)**	**Units**	**Averaging Time**	**Proposed Control**	**Compliance**
PM (filterable)	BACT, MACT-LLL, NSPS-F, BAT	0.02 (kiln) 0.02 (clinker cooler)	lb/ton clinker	30-operating day, rolling average	Fabric Filtration and WPS	**Initial Performance Test PM/PM10/PM2.5 and CPMS; Work Practice Standards (WPS); Testing and monitoring focused for MACT LLL requirements**
PM (cond)	BACT, BAT	0.16 (kiln)	lb/ton clinker	average of three (3) one-hour runs	Good Combustion Practices	**Initial Performance Test and WPS**
NOX	LAER, BACT, NSPS-F, BAT	1.5	lb/ton clinker	30-operating day, rolling average	Indirect Firing, low-NOx burners, SCC, proper combustion practices, and SCNR	**CEMS performance evaluation test and NOx CEMS**
SO_2 (SOx)	BACT, NSPS-F, BAT	0.4	lb/ton clinker	30-operating day, rolling average	Alkali absorption in preheater/precalciner system and raw mill; fabric filtration, add-on dry absorbent (hydrated lime) system, as necessary	**CEMS performance evaluation test and SO2 CEMS**
VOC	LAER, , BAT	0.08	lb/ton clinker	Annual Average	Good Combustion Practices	**Initial Performance Test for VOC; WPS**
		0.1	lb/ton clinker	Average of three (3) runs		

Table 8-BACT/BAT/LAER Emission Limit Summary						
Source ID 263 Kiln, Source ID 264 Clinker Cooler, & Source ID 259 Raw Mill						
Pollutant	**Regulatory Basis**	**Emission Limit (exceptions as noted)**	**Units**	**Averaging Time**	**Proposed Control**	**Compliance**
CO	BACT, BAT	1.38	lb/ton clinker	30-operating day, rolling average	Good Combustion Practices	**CEMS performance evaluation test and CO CEMS; WPS**
H_2SO_4	BACT, BAT	0.11	lb/ton clinker	Average of three (3) runs	Alkali absorption in preheater/precalciner system and raw mill; fabric filtration, add-on dry absorbent system, as necessary.	**Initial Performance Test for H_2SO_4; WPS**
NH_3	BAT	65	ppmvd	Hourly Average	Proper design and operation of SNCR	**Initial Performance Test after SNCR is optimized; WPS**
		11	ppmvd	Annual Average		
HCl	MACT-LLL, BAT	3	ppmvd at 7 percent O_2	30-operating day, rolling average	Alkali absorption and fabric filtration	**Initial HCl performance test and continuous parametric monitoring of SO_2 in the exhaust gases along with an emission monitoring plan (or other MACT LLL monitoring options); WPS**
Hg	MACT-LLL, BAT	21	lbs/MMton clinker	30-operating day, rolling average	Activated Carbon Injection (ACI), as necessary, and fabric filtration	**Initial compliance test; Hg CEMS or sorbent traps**

Table 8-BACT/BAT/LAER Emission Limit Summary						
Source ID 263 Kiln, Source ID 264 Clinker Cooler, & Source ID 259 Raw Mill						
Pollutant	**Regulatory Basis**	**Emission Limit (exceptions as noted)**	**Units**	**Averaging Time**	**Proposed Control**	**Compliance**
D/F	MACT-LLL, BAT	0.2	ng/dscm (TEQ) at 7 percent O_2	Rolling three (3)-hour average temperature readings	Good Combustion Practices	**Initial D/F performance test; Temperature CMS, a monitoring plan; WPS**
		0.4	ng/dscm (TEQ), if temp. to PM control ≤400°F			
THC[2]	MACT-LLL, BAT	24	ppmvd, at 7 % O_2 **OR**	30-operating day, rolling average	Good Combustion Practices	**Initial compliance test; THC CEMS; WPS**
		12	ppmvd, for total organic HAP	30-operating day, rolling average		
CO_2e[1]	BACT BAT	0.92	ton/ton clinker	Rolling 12-month average	Good Combustion Practices, Energy efficiency	**Initial Performance Test for CO_2; CO_2 CEMS; WPS**
Opacity	BAT	10%	opacity		Good Combustion and Controls Practices	**COMS on main stack**

[1]The GHG limit has been established as a 12-month rolling average consistent with the long-term average recommendation and with the fuel usage data already required by plan approval condition. U.S. Environmental Protection Agency, EPA-457 B-11-001, *PSD and Title V Permitting Guidance for Greenhouse Gases*, March 2011, Page 46.
[2]CEMEX clarified in June 2021, that activated carbon control is proposed only for Mercury not THC emissions as was indicated in the plan approval application;

Table 9A - BACT/BAT Summary					
Source IDs 209-210, 217-218, 260, 262, 263, 265, 271, &272 Process Sources (Emission factors based on grain loading)**					
Pollutant	**Regulatory Basis**	**Emission Factor* (exceptions as noted)**	**Units**	**Proposed Control**	**Compliance**
PM (filterable)	BACT BAT	0.0044	gr/dscf	Fabric Filtration(and cyclones on select sources) and WPS	**Manufacturer's guarantee and emission factors**
PM10	BACT BAT	0.0037 (84% of PM)	gr/dscf		
PM2.5	BACT BAT	0.00198 (45% of PM)	gr/dscf		
Opacity	NESHAPS LLL	10	%		**VE Observations**
Source IDs 254-258, 262-270, 272-273 Process Sources (Emission factors based on throughput)**					
Pollutant	**Regulatory Basis**	**Emission Factor* (exceptions as noted)**	**Units**	**Proposed Control**	**Compliance**
PM (filterable)	BACT BAT	0.00014	lb/ton material	Fabric Filtration and WPS	**Manufacturer's guarantee and emission factors**
PM10	BACT BAT	0.000046 (84% of PM)	lb/ton material		
PM2.5	BACT BAT	0.000013***	lb/ton material		
Opacity	NESHAPS LLL	10	%		**VE Observations**
Source IDs 178, 217, 270, 272-Clinker/Cement-Process Sources					
Pollutant	**Regulatory Basis**	**Emission Factor* (exceptions as noted)**	**Units**	**Proposed Control**	**Compliance**
PM (filterable)	BACT BAT	0.003	lb/ton material	Fabric Filtration and WPS	**Manufacturer's guarantee and emission factors**
PM10	BACT BAT	0.0011	lb/ton material		
PM2.5	BACT BAT	0.00017***	lb/ton material		
Opacity	NESHAPS LLL	10	%	per MACT LLL	**VE Observations**

* Emissions factors used for PTE and are not intended as emission limits. Assumed control efficiency based on manufacturer's guarantee.

** NSPS Subpart Y only applies to specific emissions points within Source ID 262

*** Based on ratio of 0.053/0.35 of PM2.5/PM10

Table 9B- BACT/BAT Summary					
Source ID 252, 253, 270, 272 Process Sources- Fugitive					
Pollutant	**Regulatory Basis**	**Emission Factor***	**Units**	**Proposed Control**	**Compliance**
PM	BACT BAT	0.00014	lb/ton material	Partial Enclosure/Dust collectors/Wet suppression (except for gypsum loading)	**Manufacturer's guarantee and emission factors; WPS**
Opacity	NESHAPS LLL	10	%	per MACT LLL	**VE Observations**
Source ID 262 Coal Processing and Storage**					
Pollutant	**Regulatory Basis**	**Emission Limit**	**Units**	**Proposed Control**	**Compliance**
PM	BACT NSPS Y BAT	0.00441	gr/dscf	Fabric Filtration	**Manufacturer's guarantee and emission factors; WPS**
Opacity		10	%	Fugitive Dust Control Plan and WPS	**VE Observations and fugitive dust control plan**
Source IDs 180 and 181 Material Transfer and Storage Piles-Limestone and Coal (Fugitives)					
Pollutant	**Regulatory Basis**	**Emission Limit**	**Units**	**Proposed Control**	**Compliance**
PM (filterable)	BACT BAT	10%	%	Water Sprays and partial enclosures for raw material unloading; raw material and product transfer points are fully enclosed	**VE Observations; WPS; BMP**
Source IDs 184 and 185 Roads (Fugitives)					
Pollutant	**Regulatory Basis**	**Emission Limits**	**Units**	**Proposed Control**	**Compliance**
PM (filterable)	BACT BAT	25 Pa. Code 123.1 and 123.2		Paving, Watering as needed,, vehicle speed controls	**Daily visible emission inspections and observations; WPS**

** Emissions factors used for PTE and are not intended as emission limits. Assumed control efficiency based on manufacturer's guarantee.*

*** NSPS Subpart Y only applies to specific emissions points within Source ID 262*

**** Based on ratio of 0.053/0.35 of PM2.5/PM10*

Table 9C- BACT/BAT/Summary

Source ID 274 Emergency Generator

Pollutant	Regulatory Basis	Emission Factor (exceptions as noted)	Units	Proposed Control	Compliance
NOx	BACT LAER BAT NSPS IIII NESHAP ZZZZ	5.97	g/bhp-hr	EPA Subpart IIII certified Engine; Manufacturer's guarantee TBD	**EPA Certification; Hours limitation; Recordkeeping and fuel sulfur content**
CO		0.24	g/bhp-hr		
VOC		0.03	g/bhp-hr		
PM		0.04	g/bhp-hr		
PM10		0.04	g/bhp-hr		
PM2.5		0.04	g/bhp-hr		

Source 275 Fire Pump

Pollutant	Regulatory Basis	Emission Factor (exceptions as noted)	Units	Proposed Control	Compliance
NOx	BACT LAER BAT NSPS IIII NESHAP ZZZZ	3	g/bhp-hr	EPA certified engine; Manufacturer's guarantee TBD	**EPA Certification; Hours limitation; Recordkeeping and fuel sulfur content**
CO		2.6	g/bhp-hr		
VOC		0.00247*	g/bhp-hr		
PM		0.15	g/bhp-hr		
PM10		0.15	g/bhp-hr		
PM2.5		0.15	g/bhp-hr		

Source ID CT Cooling Tower

Pollutant	Regulatory Basis	Emission Factor (exceptions as noted)	Units	Proposed Control	Compliance
PM	BACT BAT	0.001	% drift	Drift eliminator; Manufacturer's guarantee and emission factors	**WPS**
PM10					
PM2.5					

** Emissions factors used for PTE and are not intended as emission limits. Assumed control efficiency based on manufacturer's guarantee.*

*** NSPS Subpart Y only applies to specific emissions points within Source ID 262*

**** Based on ratio of 0.053/0.35 of PM2.5/PM10*

BACT (Best available control technology) *is defined under 40 CFR §52.21(b)(12*) as:

"…*an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.*

In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

CEMEX has conducted a BACT analysis for CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, Pb, and GHG following a five (5)-step "top-down" analysis which has been recommended by U.S. EPA for traditional attainment pollutants as well as the new GHG pollutants.[8] The steps of this analysis are summarized as follows:

1. Identify all available control technologies.
2. Eliminate technically infeasible options.
3. Rank remaining control technologies by effectiveness.
4. Evaluate the most effective controls and document results.
5. Select BACT.

PM, PM_{10}, and $PM_{2.5}$ BACT analyses will be equivalent for this facility. Fossil fuel-fired and diesel-fired combustion source particulate emissions are all expected to be $PM_{2.5}$ or smaller. Facility roadway vehicle traffic PM, PM_{10}, and $PM_{2.5}$ emissions are not equivalent; however, the control techniques and work practices selected are applicable to each pollutant. BACT controls proposed for SO_2 are also proposed as BACT/BAT for H_2SO_4 emissions.

LAER – Lowest Achievable Emission *Rate* is defined under 25 Pa. Code §121.1 as:

"(i) The rate of emissions based on the following, whichever is more stringent:

(A) *The most stringent emission limitation which is contained in the implementation plan of a state for the class or category of source unless the owner or operator of the proposed source demonstrates that the limitations are not achievable.*
(B) *The most stringent emission limitation which is achieved in practice by the class or category of source.*

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[8] U.S. Environmental Protection Agency, EPA-457/B-11-001, *PSD and Title V Permitting Guidance for Greenhouse Gases*, March 2011, p. 12.

(ii) The application of the term may not allow a new or proposed modified source to emit a pollutant in excess of the amount allowable under an applicable new source standard of performance."

CEMEX has conducted a LAER analysis for NO_x and VOC following the same five (5)-step "top-down" analysis as above, but has also reviewed existing and proposed permits and other information sources for U.S. EPA's RBLC database 90.028 Portland cement manufacturing plants. This analysis approach satisfies the definition of LAER. LAER for NO_x and VOC is considered to be at least as stringent as BACT for NO_2 for each of these proposed air contamination sources. The LAER selection for NOx and VOC are identified in the last column of Appendix A, Tables 1-4, as applicable.

***BAT (Best available technology)* is defined under 25 Pa. Code §121.1 as:**

"Equipment, devices, methods or techniques as determined by the Department which will prevent, reduce or control emissions of air contaminants to the maximum degree possible and which are available or may be made available."

The main source of *air toxics* emissions from a Portland cement plant is the kiln system. Emissions originate from the burning of fuels and heating of feed materials. Air toxics are also emitted from the grinding, cooling, and materials handling steps in the manufacturing process. Pollutants regulated under the 40 CFR part 63, subpart LLL, are particulate matter (PM) as a surrogate for non-mercury hazardous air pollutant (HAP) metals, total hydrocarbons (THC) as a surrogate for organic HAP other than dioxins and furans (D/F), organic HAP as an alternative to the limit for THC, mercury, hydrochloric acid (HCl) (from major sources only), and D/F expressed as toxic equivalents (TEQ). The kiln is regulated for all HAP and raw material dryers are regulated for THC or the alternative organic HAP. Clinker coolers are regulated for PM. Finish mills and raw mills are regulated for opacity as are other specified affected sources. Clinker storage piles are regulated by work practice standards. During periods of startup and shutdown, the kiln, clinker cooler, and raw material dryer are regulated by work practice standards.

The remaining pollutants subject to Subpart LLL MACT and/or 25 Pa. Code §127 BAT in this review are a result of the pyroprocessing system, the PM process sources and controls. They include total hydrocarbon (THC), dioxin/furan (D/F), mercury (Hg), hydrochloric acid (HCl), ammonia (NH_3), and sulfuric acid (H_2SO_4). The associated BAT emission limitations are identified and summarized in Table 8, above.

Below are the primary source of each pollutant, the BAT determinations, and work practices to demonstrate compliance:

Total hydrocarbon (THC) emissions are generated in the preheater/precalciner kiln system from the raw material heating and fuel combustion. Good combustion practices and continuous monitoring are BAT. Emissions will be monitored with a THC CEMS for compliance demonstration.

Dioxin/Furan (D/F) emissions are generated in the preheater/precalciner kiln system. These emissions result from the combustion of coal and other fuels. Emissions are monitored by an exhaust gas temperature continuous monitoring system (CMS) and the use of a monitoring plan to demonstrate ongoing compliance. Work practice standards are inspection, adjustment, and/or maintenance and repairs to ensure optimal combustion. Work practice standards, continuous monitoring. along with good combustion practices are BAT.

Mercury compounds (Hg) are generated in the preheater/precalciner kiln system. These emissions result from the combustion of coal. Mercury compound emissions are on the list of Section 112(b) List of Hazardous Air Pollutants. Activated Carbon Injection (ACI) with Fabric Filter (FF) is proposed. Activated carbon injection will occur upstream of the main fabric filter and a dust shuttling system and is BAT for control of mercury emissions. Hg CEMS or sorbent traps will be used to monitor for ongoing compliance demonstration.

Hydrochloric acid (HCl) emissions are generated in the preheater/precalciner kiln system from the raw material heating and fuel combustion. Dry Sorbent Injection (DSI) with fabric filtration (FF) is proposed for SO_2 and HCl control. The hydrated lime will be injected into the preheater exhaust stream to neutralize acid gases (alkali absorption) prior to exhausting to the fabric filter and provides MACT and BAT control for HCl. In accordance with 40 CFR 63.1350(l), as an alternate monitoring requirement for a dry scrubber, the continuous parametric monitoring of the HCl requirement may be satisfied by continuous parametric monitoring of SO_2 in the exhaust gases along with an emission monitoring plan to demonstrate compliance. DSI with FF along with continuous parametric monitoring of SO2 in the exhaust gases and an emission monitoring plan to demonstrate ongoing compliance is BAT.

Ammonia emissions (NH_3 slip) are generated by the operation of the add-on SNCR for NOx control. Proper design and operation of the SNCR system in accordance with manufacturer's specifications and guarantee and good air pollution practices is BAT. Emissions will be minimized through SNCR optimization for ongoing compliance demonstration.

Sulfuric acid (H_2SO_4) emissions are generated in the preheater/precalciner kiln system and raw mill from the raw material and fuel sulfur compounds. H_2SO_4 emissions are assumed to be absorbed back into the process in the preheater tower and raw mill due to the calcium rich environment. H_2SO_4 in the kiln exhaust gases will be controlled by alkali absorption inherent in the precalciner kiln, by the alkali filter cake in the main stack fabric filter control device and add-on dry absorbent system DSI as necessary to meet BAT/BACT. Testing will be performed for initial compliance demonstration.

SINGLE FACILITY ANALYSIS

Regulatory criteria have been examined to determine whether emissions from CEMEX and other air contamination sources should be aggregated as a single source for air quality permitting purposes. Each of the following three criteria must be met for emission sources to be considered a single facility under Title V and PSD regulations:

1. Are the sources under common control?
2. Do the sources belong to the same industrial grouping?
3. Are the sources located on contiguous or adjacent properties?

Similarly, per the definition of facility in 25 Pa. Code §121.1, each of the following two criteria must be met for emission sources to be considered a single facility under NNSR regulations:

1. Are the sources owned or operated by the same person under common control?
2. Are the sources located on one or more contiguous or adjacent properties?

Common Control.

The two properties may meet the "common control" and "same industrial grouping" criteria. CEMEX explained that both the CEMEX Cement Plant as well as the CEMEX Quarry are owned by CEMEX Construction Materials Atlantic, LLC. The emissions units from these operations are under common control.

Same Industrial Grouping

Under the North American Industry Classification System (NAICS), the CEMEX Cement Plant is classified under 327310 ("Cement Manufacturing"), while the CEMEX Quarry is classified 212312 ("Crushed and Broken Limestone Mining and Quarrying"). [Under the Standard Industrial Classification (SIC) system, the CEMEX Quarry is classified under SIC code 1422 and the CEMEX Cement Plant cement is classified under SIC code 3241, or major groups 14 and 32, respectively.] The facilities do not belong to the same industrial grouping but the CEMEX Quarry could be viewed as a support facility to the CEMEX Cement Plant.

Adjacency

The determining factor in this case is the adjacency criteria. CEMEX Cement Plant and the CEMEX Quarry are not contiguous. Based on the distance of the properties from one another (~1.5 miles) and the EPA Guidance (The Nov 2019 EPA Guidance)) on adjacency, these two facilities also are not "adjacent" to each other.

As all applicable criteria need to be met in order for emission sources to be aggregated, we have determined that CEMEX Cement Plant and CEMEX Quarry do not meet the single source criteria for both NSR and Title V purposes.

EMISSIONS & CONTROLS

In Tables 8 of this document, a listing of each Source ID is provided with a summary of emission limit and controls, as applicable. It was intended to include all identified sources, applicable limits, proposed controls and methods of compliance, however, for this sized project, this was a challenging task.. In Tables 9A, 9B, 9C of this document, a listing of each Source ID is provided with a summary of emission factors and proposed controls, as applicable. For many of these source, the emission factor is not proposed as an emission limit. Instead operation in accordance with manufacture's recommendations and/or good air pollution control practice is proposed. For fabric filtration it is generally assumed a control efficiency at 99% or above.

The proposed emission limits, emission factors, rates, totals, control efficiencies, and controls were extensively reviewed and summarized in Tables 8, 9A, 9B, 9C and the BACT/LAER/BAT sections of this review memo. This section will include facility-wide emission summaries for the facility, particulate matter sources, and combustion sources. All emission estimation methods and calculations were found acceptable and were summarized after the tables in this section. Short-term emission rates in lb/hr are provided for sources generating a significant amount of emissions and will become part of the emission limitation conditions in the permit. For smaller or less significant sources, emissions will be grouped and reported in tons/year. CEMEX provided a summary of facility-wide potential emissions in an amendment to their Plan Approval application on February 11, 2021. Those values along with the emission calculations provided in the application were used to develop the following Table 10, Facility-wide PTE:

Table 10. Facility-Wide PTE[b]

Air Contaminant	Emission Rate[a,b] (tpy)
NO_x	**859**
CO	**786**
PM (Total)	**159.6**
PM_{10}	**148.5**
$PM_{2.5}$	**116.2**
SO_x	**228**
VOC	**46**
H_2SO_4	**63**
HCl	**13.4**
Ammonia	**30.6**
THC	**129.6**
D/F	**0.0000000786**
Hg	**0.012**
CO_2e	**1,048,162**

[a] Values may be slightly inconsistent out to the final significant digit due to rounding.
[b] Plan Approval Application, was amended to include a facility-wide PTE by e-mails in response to TD letter February 2021 on June 2021. This update did not include all pollutants evaluated in this review so this table includes values from both the Plan Approval Application and those values provided in the update.

The facility is being designed to operate 365 days per year and 24 hours per day except for maintenance outages. Activities associated with start-up, shutdown, and/or any disruptions are not expected to have any impact on emissions. The plant will not operate unless control systems are functioning as designed. Nevertheless, the kiln is subject to the startup/shutdown provisions of 40 CFR 63.1346(g) and the Clinker Cooler is subject to 40 CFR 63.1348(b)(9).

Sulfur Hexafluoride ("SF_6") Circuit Breakers are not proposed**.**

The following, Table 11. Source Level Particulate Matter Emission Summary (tons/year),is a summary of emission totals provided in Attachment 6 of the Plan Approval Application for each Source ID. Many controlled particulate source emissions were very small and have not been individually noted or summed, however, the PTE totals in the PADEP generated tables and those provided by CEMEX agree.

The special conditions in the permit will include facility-wide emission limitations along with short term and long term emission limitations meeting BACT, LAER, and BAT for the pyroprocessing system, clinker cooler, controls, and CEMS. The following Tables 11 and 12 are included for informational and PTE estimation purposes and not intended to infer individual source limitations for each Source ID listed. Their contribution will be captured in the facility wide emission totals and compliance determined through emission factors, throughputs, and/or manufacturer's guarantees. BACT, LAER, and BAT emission limits, where applicable, will be identified in the plan approval under the Source ID or Group Level requirements.

Table 11. Source Level Particulate Matter Emission Summary (tons/year)

Source ID#	Source Description	PM (filterable)	PM (cond)	PM_{10} (filterable)	PM_{10} (cond)	$PM_{2.5}$ (filterable)	$PM_{2.5}$ (cond)
		(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
180	Limestone Storage Pile	0.16		0.08		0.01	
181	Coal Storage Pile	0.01		0.002		0.00	
184	Unpaved roads	0.72		0.21		0.02	
185	Paved roads	2.40		0.47		0.12	
209	East Cement Silo Storage	1.92		1.62		0.87	
210	West Cement Silo Storage	1.92		1.62		0.87	
213	South Packer Bagging	2.48		2.08		1.11	
214	North Packer Bagging	2.48		2.08		1.11	
215	Masonry Packer Bagging	2.48		2.08		1.11	
216	East/West Truck Loading	0.73		0.61		0.33	
217	New Truck Loading	0.32		0.27		0.14	
218	Railcar Loading	0.80		0.67		0.36	
252	Raw Material Unloading-Limestone, Coal & Slag and Storage	0.02		0.01		0.0017	
253	Raw Material Unloading and Storage-Additives	0.00		0.00115		0.000324	
254	Raw Material Silos Reclaim to Raw Mill Feed	0.00		0.001083		0.000306	
255	Material Transfer	0.00		0.000165		4.66E-05	
256	Material Transfer	0.00		0.000343		9.72E-05	

Gray shaded cells indicate no data or insignificant emissions

Table 11. Particulate Matter Emission Summary (Continued)

Source ID#	Source Description	PM (filterable)	PM (cond)	PM_{10} (filterable)	PM_{10} (cond)	$PM_{2.5}$ (filterable)	$PM_{2.5}$ (cond)
		(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
257	Material Transfer						
259	Raw Grinding	0.63		0.53		0.28	
260	Homogenizing Silos	6.07		5.1		2.73	
261	Raw Meal Storage and Blending	1.80		1.51		0.80	
262	Coal Grinding	7.15		6.00		3.22	
263	Pyroprocessing System-Act. Carbon and Lime hopper	0.84		0.71		0.39	
	Pyroprocessing System	11.39	91.10	9.57	91.10	5.12	91.10
264	Clinker Cooler	11.39		11.39		0.72	
265	Dust pump, dust hopper, and dust from baghouse	0.80		0.67		0.36	
266-269	Clinker transport to Main Clinker Storage (Clinker Dome)						
270	Main Clinker Storage Reclaim and Transport to Finish Mills						
271	Finish Mill #1	3.91		3.29		1.76	
272	Finish Mill #2 dust collector	0.24		0.20		0.11	
273	Finish Mill #2 baghouse	7.77		6.54		3.50	
CT	Cooling Tower	0.01		0.01		0.00	
274	Emergency Generator	0.03		0.03		0.03	
275	Fire Pump System	0.02		0.02		0.02	
	TOTALS	**68.49**	**91.10**	**57.37**	**91.10**	**25.09**	**91.10**

Gray shaded cells indicate no data or insignificant emissions

Table 12. Combustion Sources and Clinker Cooler Emissions Summary

Source Description & ID	Pyroprocessing System 263		Clinker Cooler 264		Emergency Generator[a] 274	Fire Pump System[b] 275
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(tpy)	(tpy)
PM (filterable)	2.6	11.39	2.60	11.39	0.03	0.01
PM (cond)	20.8	91.10				
PM_{10} (filterable)	2.18	9.57	2.60	11.39	0.03	0.01
PM_{10} (cond)	20.8	91.10				
$PM_{2.5}$ (filterable)	1.17	5.12	0.16	0.72	0.03	0.01
$PM_{2.5}$ (cond)	20.8	91.10				
NOX	195	854.1			4.81	0.30
SO_2 (SOx)	52	227.76			0.00	0.00
VOC	13	45.55			0.02	0.11
CO	179.4	785.77			0.2	0.26
H_2SO_4	14.3	62.63				
NH_3	41.31	30.62				
HCl	3.06	13.42				
Hg	0.0027	0.012				
D/F	1.79E-08	7.86E-08				
THC	29.58	129.58				
CH_4		1,381			0.01	0.00
CO_2		1,043,921			375	51
N_20		2,394			0.00	0.00
CO_2e		1,047,696			376	51

Shaded area indicates no data or insignificant emissions;

The totals at the bottom of the column comport with the facility-wide PTE provide by CEMEX.

Engine assumed emissions rates based on 40 CFR Part 60 Subpart IIII :
[a]1,340 HP Emergency manufacturer's data
NOx = 9.36 g/hp-hr
CO= 0.73 g/hp-hr
VOC=0.02 g/hp-hr
PM (Total)=0.038 g/hp-hr
[b] 183 hp fire pump engine 40 CFR Part 60 Subpart IIII :
NOx 3.0 g/hp-hr
CO= 2.6 g/hp-hr
VOC=0.00247 g/hp-hr
PM (Total)=0.038 g/hp-hr

Emission Estimation and Calculation Methodology

The following emission calculation methods and resources were identified in the emission calculation tables of Section 6 of the Plan Approval Application and amendments provided to the Department.

Source ID 263 Kiln
Emission calculations were carried out by the applicant for kiln based upon NSPS, LAER, BACT, MACT, and BAT emission limits, manufacturer's emission guarantees, mass balance, AP-42 Chapter 11.6, Table 11.6-5 emission factors, and 40 CFR Part 98 Subpart C, Tables C-1 and C-2 emission factors, 8,760 hours of operation, and 3,120 tons per day and 1,138,800 tpy clinker production. GHG emission limitation compliance will be demonstrated using a CO_2 CEMS and records of operational hours, fuel usage, actual fuel gas analyses, and Department-approved emission factors and test results. CEMEX will be required to report CO_2e emissions from this facility annually as part of an Annual Emission Inventory Report.

Source 264 Clinker Cooler
PM Emission calculations were carried out by the applicant for the clinker cooler based upon BACT, MACT , and BAT emission limits, manufacturer's emission guarantees, AP-42 Chapter 11.6, Table 11.6-6 emission factors, 8,760 hours of operation, and 3,120 tons per day and 1,138,800 tpy clinker production. PM10 is assumed equal to PM. PM2.5 is assumed to be 6.3% of PM10.

Various Source IDs- PM Process Sources- Grain loading methodology
Emission calculations were carried out by the applicant for various PM Process Sources based upon BACT. PM emission factors ranging from 0.002 and 0.0044 gr/scf. 99.9% percent control is assumed. The PM_{10} and $PM_{2.5}$ fractions are based on the particle size multipliers in AP-42, Table 11.6-5, Uncontrolled, Dry Process (44% and 18%, respectively). The PM_{10} and $PM_{2.5}$ fractions are based on the particle size multipliers in AP-42, Table 11.6-5, Controlled, Dry Process with FF (84% and 45%, respectively)

Various Source IDs- PM Process Sources- Emission factor methodology
PM Emission calculations were carried out by the applicant for various PM Process Sources based upon BACT. Control of 85- 99.9% is assumed. Emissions were based on AP-42, Table 11.19.2-2, Conveyor Transfer Point and Tertiary Crushing.$PM_{2.5}$ emissions based on the PM2.5/PM10 ratio of 0.053/0.35 from AP-42, 13.2.4, for clinker and cement handling. Wet (controlled) material emission factors used since incoming material has a moisture content of at least 1.5%, Uncontrolled material emission factors used for clinker and cement. Cement manufacturing is a continuous, steady-state process operating throughout the year; short-term emissions, however, conservatively were calculated to be 9% higher than long-term emissions.

Source ID 180 Limestone and Source ID 181 Coal Storage Piles and Material Transfer
PM emission calculations were carried out based on AP-42, Section 13.2.4 & Table 13.2.4-1 and Figure 13.2.1-2, the references Wind Erosion Emissions derived from "Control of Open Fugitive Dust Sources", EPA-450/3-88-008, p. 4-17, KYNG 1/1/13 to 12/1/17, and historical Wampum data used in EI. A 90% control was based on wet material and use of water spray and enclosure.

Source ID 184 Unpaved Roads
Emission calculations were carried out by the applicant for the Emission factors from AP-42 Section 13.2.2 (12/03), Equations (1a) & (2).Silt content based on stone quarrying and processing, and average of plant road and haul road (Table 13.2.2-1). A control efficiency of 95% was used to account for watering and/or chemical

dust suppression on unpaved roads and implementation of a fugitive dust plan (FDP). Assumed trucks deliver 5 days/week, 12 hr/day,

Source ID 186 Paved Roads
Emission calculations were carried out by the applicant for the *AP 42, 13.2.1, Paved Roads, Jan. 2011, Equation (2), Table 13.2.1-3, Concrete Plant Roads, and AP 42, Figure 13.2.1-2.* A control efficiency of 95% was used to account for watering and/or chemical dust suppression on unpaved roads and implementation of a FDP. Assumed trucks deliver 5 days/week, 12 hr/day

Source ID 274 Emergency Generator
The emergency generator engine rated 1,000KW (1,474 bhp) will be subject to NSPS Subpart IIII Table 1 and 40 CFR Part 89, Table 1 emission standards depending on the model year selected. Emissions were calculated based on the manufacturer's specifications, the maximum fuel sulfur content, max fuel consumption, and the GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Source ID 275 Fire Pump Engine
The fire pump engine will be sized at183 bhp and will be subject to NSPS Subpart IIII for model year 2009 or later 60.4202(D) and 60.4205(C) Table 4 and 40 CFR Part 89, Table 1 emission standards depending on the model year selected. Emissions were calculated based on EPA AP-42, Table 3.3-1, the maximum fuel sulfur content and max fuel consumption, and the GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting. As discussed earlier in this document, this unit is exempt from plan approval requirements based on meeting the Department's Plan Approval and Operating Permit Exemptions list under 25 Pa. Code § 127.14(a)(8) exemption criteria for this unit. This does not exempt the unit from applicable NSPS or NESHAP requirements and the inclusion into the Title V Operating Permit.

Emission calculations were carried out by the applicant for the diesel-fired fire pump engine and emergency generator engine based upon manufacturer's emissions test data and mass balance techniques.

These engines are not required to be equipped with a post-combustion control device to meet these emission standards, and are not otherwise required to be equipped with a control device because of its classification as emergency engines. Total sulfur content of diesel fuel may not exceed 15 ppm. Operation of this engine may not exceed 100 hours annually for any non-emergency situations to retain this classification as an *emergency engine* under 40 CFR Part 60 Subpart IIII. Potential emissions due to the readiness checks and maintenance testing program were estimated at 500 hours/year. PTE assumes 500 hours/year. Operation in emergency situations is not limited. However, those emissions will count against the facility-wide emissions limitations.

CT Cooling Tower
Fugitive emission calculations were carried out by the applicant and based on the equation: [PM (lb/hr) = Circulating Water Rate (gpm) *60 (min/hr)*Density of Water (lb/gal)*Drift Eliminator Efficiency %/100* TDS (ppm/10^6)]. Compliance with the particulate matter emission limitations from natural cooling towers include options to minimize dissolved solids in the cooling water, add-on controls such as advanced drift eliminators, and good operating practices.

PM calculation based on 352 gpm, 1,500 ppm TDS with a 0.001% drift; PM_{10} and $PM_{2.5}$ are based on EPRI data.

Compliance with emission limitations will be demonstrated through the use of CEMS, CPMS, source testing requirements where practicable, and implementation of work practice standards and monitoring, as necessary.

PSD Modeling

A determination of completeness for the air quality analysis for Prevention of Significant Deterioration ("PSD") was made on January 31, 2020 by Daniel Roble, of the Department's Air Quality Modeling Section. A memo of Administrative Completeness was provided to NWRO on January 31, 2020.

Refined air dispersion modeling was performed and submitted with the plan approval application in order to demonstrate that CEMEX does not cause or contribute to air pollution in violation of any NAAQS or PSD increments. This modeling was evaluated by the Department's Division of Air Resource Management, Air Quality Modeling Section. The Air Quality Modeling Section's "Summary of Air Quality Analyses for Prevention of Significant Deterioration" memo is included in Appendix B of this review memorandum.

In accordance with 40 CFR § 52.21(k), CEMEX's source impact analyses demonstrate that the net emissions increase due to the major modification of the Wampum Cement Plant would not cause or contribute to air pollution in violation of the NAAQS for CO, NO2, PM-10, PM-2.5, or SO2. Additionally, CEMEX's source impact analyses demonstrate that the net emissions increase due to the major modification of the Wampum Cement Plant would not cause or contribute to air pollution in violation of the Class II or Class I PSD increments for NO2, PM-10, PM-2.5, or SO2.

Federal Land Manager Notification

The Department emailed the CEMEX provided Request for Determination of Need for a Class I AQRV Modeling Analysis form to Federal Land Manager contacts including Melanie Pitrolo (mpitrolo@usda.gov), Holly Salazer (Holly_Salazer@nps.gov), Don Shepherd (Don_Shepherd@nps.gov) and Tim Allen (tim allen@fws.gov) on March 15, 2021. On March 16, 2021, Andrea Stacy (Andrea_Stacy@nps.gov) contacted the Department requesting the application report/write up prepared by the environmental consultant that discusses the facility, proposed changes/project, future PTE, applicable regulatory requirements, BACT analyses and modeling requirements/results. The plan approval proposal text was provided on the same day. Ralph Perron (ralph.perron@usda.gov), the USDA Forest Service contact for Pennsylvania advised that he would respond on behalf of the Forest Service Federal Land Manager. On April 19, 2021, he advised that a AQRV analyses will not be requested. Holly Salazar of the National Park Service responded on April 20, 2021, that no further Class I analysis is required.

ADDITIONAL ASSOCIATED GROWTH

The CEMEX Construction and Materials Atlantic, LLC (CEMEX) Plan Approval Application PA-37-013G, Attachment 8, Air Quality Analysis Report (January 2020), includes an Additional Impact Analysis as required by the 40 CFR §52.21(o) of the Prevention of Significant Deterioration (PSD) regulations. This Additional Impact Analysis (Section 10, page 17), includes CEMEX's Growth Analysis (10.1.1), Visibility Impairment Analysis (10.1.2), and Soils and Vegetation Analysis (10.1.3) for the modernization of the Wampum cement plant in Wampum Borough, Lawrence County.

Growth Analysis

The growth analysis considers the associated industrial, commercial, and residential source growth in the area and the air emissions generated as a result of this industrial, commercial, and residential source growth associated with the project.

Associated growth[1] is growth that comes about as the result of the construction or modification of a source, but is not a part of that source. It does not include the growth projections addressed by 40 CFR 51.166(n)(3)(ii) and 40 CFR 52.21(n)(2)(ii), which have been called non-associated growth. Emissions attributable to associated growth are classified as *secondary emissions*.[2]

CEMEX predicts that up to several hundred temporary jobs will be created and filled by local residents from nearby communities for the construction activities at the site. CEMEX anticipates drawing from a pool of over 2,000 Lawrence County residents identified in 2018 data from the Lawrence County Employment Profile provided by the PA Department of Labor and Industry, as working in the construction industry. Once the project is completed, CEMEX anticipates full time employment for 150 people at the plant. This increase in permanent jobs represents a relatively small portion of the local population. Assuming these 150 full-time employees would be new residents to the area, CEMEX predicts that the surrounding communities in Lawrence and Beaver County can provide adequate housing and commercial services to support the increase in the workforce at the plant. CEMEX predicts that the increase in industrial jobs may lead to a small number of local support jobs but this increase is not expected to cause significant commercial or industrial growth in the nearby communities.

One point of industrial growth not specifically identified in this report but directly related to the operation of this plant is the reactivation of the CEMEX Construction and Materials Atlantic, LLC (CEMEX) under Plan Approval Application PA-37-293A for the installation and operation of a 650 stph limestone crushing operation located in Shenango and Wayne Townships, Lawrence County. This plant serves as an offsite support facility solely operating to provide raw material (limestone) to the CEMEX Wampum cement plant operations. The CEMEX Cement Plant and the CEMEX Quarry are not contiguous or adjacent and are approximately 1.5 miles from one another.

As part of the growth analysis, emissions generated by industrial growth need to be quantified by CEMEX to satisfy the 40 CFR § 52.21 Prevention of Significant Deterioration (PSD) requirements and the definition stated in 40 CFR 52.21 (b)(18). *"Secondary emissions*[3] *means emissions which would occur as a result of the construction or operation of a major stationary source or major modification, but do not come from the major stationary source or major modification itself. Secondary emissions include emissions from any offsite support facility which would not be constructed or increase its emissions except as a result of the construction or operation of the major stationary source or major modification. Secondary emissions do not include any emissions which come directly from a mobile source, such as emissions from the tailpipe of a motor vehicle, from a train, or from a vessel.*

> *(i) Emissions from ships or trains coming to or from the new or modified stationary source; and*
> *(ii) Emissions from any offsite support facility which would not otherwise be constructed or increase its emissions as a result of the construction or operation of the major stationary source or major modification."*

In Plan Approval Application PA-37-293A, CEMEX identifies the potential emissions associated with this limestone crushing operation as PM = 2.62 tpy, PM10 = 0.99 tpy; and PM2.5 = 0.14. The Air Quality Analysis Report (January 2020), Appendix K (modeling report) includes off-property source information including the quarry's secondary emissions under Model ID FILE0889 – FILE0899. The Department understands that the potential emissions from the quarry were combined with the Portland cement plant potential emissions as an input in the ambient air quality modeling analysis for the full impact analysis of the Portland cement plant

[1] EPA New Source Review Workshop Manual (Draft, October 1990), Chapter D.II.A, Growth Analysis
[2] EPA New Source Review Workshop Manual (Draft, October 1990), ChapterA.II.B.4, Secondary Emissions.
[3] Defined by *40 CFR §52.21 (b)(18)*

project. According to the guidance workbook, it is generally understood that secondary emissions must "impact the same general area as the stationary source or modification undergoing review" and small emissions increases in most areas will not have adverse impacts on soils, vegetation, or visibility. According the modeling section, the significant impacts from the CEMEX plant for both PM10 and PM2.5 occur close to the facility and not over the location of the quarry. The significant impact area for 24-hour PM-10 NAAQS is 1.9 kilometers, 24-hour PM-2.5 NAAQS is 2.7 kilometers, and annual PM-2.5 NAAQS is 1.7 kilometers. It is understood that the distance from CEMEX facility to the Quarry, at their closest point, is 3 kilometers. Since the NAAQS analysis and AERMOD output concentrations include the quarry and are below the primary NAAQS (which is same as secondary NAAQS for 24-hour PM-10 and 24-hour PM-2.5 and more stringent than secondary NAAQS for annual PM-2.5), the Department has determined that CEMEX will not need to do anything further at this time for the vegetation and soils analysis regarding secondary emissions.

Visibility Impairment Analysis

CEMEX performed Level 1 and 2 screening visibility analyses to determine potential impacts on visibility that the proposed stack emissions could have at the closest State Park(Mc Connell's Mill State Park) located 12.2 km to the east-northeast of the proposed project site.

CEMEX followed the procedures and recommendations given in the EPA's *Workbook for Plume Visual Impact Screening and Analysis (Revised)* (EPA-454/R-92-023) and used the VISCREEN model. The Level-1 screening analysis is used to provide a very conservative estimate of potential plume visual impact. In this case the Level-1 screening analysis indicated there may be a possibility for visibility impairment. When this occurs, a Level-2 analysis is performed using more realistic, site-specific inputs into the VISCREEN model. The results of the Level-2 analysis indicated that there is no possibility of visibility impairment expected at McConnell's Mill State Park as a result of this project.

Soils and Vegetation Analysis

CEMEX conducted an analysis of ambient impacts to sensitive vegetation types with significant commercial or recreational value, as well as sensitive soil types.

CEMEX used the *U.S. Department of Agriculture Natural Resources Conservation Service's Web Soil Survey (WSS) tool, https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx (accessed October 18, 2019),* and determined that the predominant soil type in the region was a variety of silt and gravelly loams. CEMEX identified that the potential effect from the air pollutants emitted by the project is the modification of soil chemistry through acidic deposition. CEMEX also noted that the soil types identified by the WSS analysis have a moderate to high buffering capacity, which act to mitigate the effect of acidic deposition. Additionally, the SNCR and the hydrated lime injection systems proposed for the kiln and main stack will reduce the potential NOX and SOX emissions that can form acidic compounds in the atmosphere that could contribute to acidic deposition in the soil.

CEMEX performed an analysis of vegetation types by comparing the maximum model-predicted impacts from the project (identified in Section 9, Table 9-2 of the application) to the secondary NAAQS and the AQRV screening concentrations provided in the EPA's *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals. U.S. EPA, Research Triangle Park, NC. December 12, 1980. EPA 450/2-81-078.* The result of this comparison indicated that sensitive vegetation types in the region around the project location will not be adversely affected by the project emissions.

Associated Growth Conclusion and Recommendation

It is important that the analysis fully document all sources of information, underlying assumptions, and any agreements made as a part of the analysis.

The EPA New Source Review Workshop Manual (Draft, October 1990), Chapter D II.E provides guidance and a description of the generally accepted criteria for determining the completeness and adequacy of the Additional Impact Analyses as follows:

- whether the applicant has presented a clear and accurate portrait of the soils, vegetation, and visibility in the proposed impacted area;
- whether the applicant has provided adequate documentation of the potential emissions impacts on soils, vegetation, and visibility; and
- whether the data and conclusions are presented in a logical manner understandable by the affected community and interested public.

After carefully examining the data provided in the report on additional impacts, the Department has determined that CEMEX has met the above general criteria and that the analyses performed included sources of information, underlying assumptions, and conclusions. The Department finds the Additional Impact Analyses satisfactory.

RECOMMENDATIONS & CONCLUSIONS

The proposed pyroprocessing system including the kiln, clinker cooler, controls and other ancillary equipment will be a state-of-the-art, efficient, and well-controlled. As described in the control technology analysis, emissions will be controlled to the represented BACT/LAER/MACT/BAT levels, consistent with cement kilns that have recently or currently been constructed nationally. Baghouses will meet the grain loadings represented in the application. The vendors of control technologies will design and guarantee their equipment, and CEMEX will operate the equipment and control systems, to meet the BACT/LAER/MACT/BAT emissions levels represented in the application. CEMEX has chosen the most effective control technology or combination of technologies identified as technically feasible for each pollutant. CEMEX has shown that emissions will be minimized through the use of appropriate BAT, BACT, MACT and LAER in this application for this major modification and installation of new sources at this facility located in Wampum Borough, Lawrence County and source impact analyses demonstrate that the net emissions increase due to the major modification would not cause or contribute to air pollution in violation of the NAAQS for CO, NO_2, PM-10, PM-2.5, or SO_2 nor would not cause or contribute to air pollution in violation of the Class II or Class I PSD increments for NO_2, PM-10, PM-2.5, or SO_2. On this basis, I recommend issuance of this Plan Approval for 18 months.

I recommend issuance of a Plan Approval for a period of 2 years subject to the standard conditions in Section B and the site specific conditions in the other sections of the plan approval.
The company has been provided a 30 day review of the draft plan approval and a publication notice for the local newspaper with 30 day comment period.
I recommend publication in the Pennsylvania Bulletin to satisfy the public notification requirements and commence the 30 day public comment period.
Notice was provided to nearby states of OH and WV.
Notice was provided to the EPA for a 45 day comment period. Date provided to the EPA and comment period end.
Inspector given copy of draft- send to Operations

Appendix A

Top Down Control Analysis

Appendix B

Summary of Air Quality Analyses for Prevention of Significant Deterioration

ATTACHMENT A

LAER/BACT/BAT CONTROL EVALUATION SUMMARY

The CEMEX Wampum Plant is classified as a Title V major NOx and VOC emitting facility located in the Ozone Transport Region (OTR). As such, the facility is subject to the NNSR provisions and LAER for NOx and VOC emissions and the NSR PSD regulations and BACT for NO_2, SO_2, CO, PM, PM_{10}, $PM_{2.5}$, H_2SO_4 and GHG emissions. Additionally, CEMEX is subject to 25 Pa. Code 127.12(a)(5), BAT provisions for all pollutants.

RACT/BACT/LAER CLEARINGHOUSE (RBLC)

The EPA's Technology Transfer Network RBLC was searched to identify control strategies used in Portland Cement Manufacturing to assist in determining BACT/BAT/LAER. Under the Section 90.028 Portland Cement Manufacturing section, the database was searched for kilns; clinker coolers; raw and finished material handling, conveying and storage; haul roads; and emergency generators to get a listing of control strategies currently in use. Attachment 5 of the CEMEX Plan Approval Application provides backup data from their EPA's RBLC Clearinghouse search as a basis for the proposed BACT/BAT/LAER emission limits in this plan approval.

In accordance with Chapter B of the EPA's Draft NSR Workshop Manual and Pa. Code 129.92(b), a five (5) step, top down analysis is required for each source. CEMEX satisfied this requirement by providing a five (5) step top down analysis and a proposal for BACT and LAER controls, as applicable. The Department used excerpts from CEMEX's control analysis and technical discussion for each control along with other feasibility considerations and analyses for the BACT/LAER determinations. These are presented in the following pages along with the Department's determinations and findings. A streamlined summary of the five (5) step top down analysis, findings, and BACT/BAT/LAER determinations can be found in Tables 1-5, below.

TOP DOWN ANALYSIS AND EVALUATION OF TECHNICAL FEASIBILITY

Step 1: CEMEX identified all available air pollution control technologies or techniques with reasonable potential for application to the sources. To initiate their investigation, CEMEX performed a search of the EPA's RBLC to identify air pollution control technologies or techniques used by similar sources across the nation.

This evaluation also includes a BACT determination of GHG emissions also conducted using the five (5) step top down BACT process as recommended in EPA's PSD and Title V Permitting Guidance for Greenhouse Gases (EPA-457/B-11-001, March 2011, p.17).

Technologies required under LAER determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative.

Control options demonstrated to be technically infeasible or have unacceptable energy, economic, and environmental impacts on a case-by-case (or site-specific) basis have been eliminated from BACT consideration. Unlike BACT, the LAER requirement does not consider economic, energy, or other environmental factors.

Step 2: CEMEX evaluated the technical feasibility of the available control options identified in Step 1 and eliminated the technically infeasible options. Under the Step 2 column of the Tables 1-5, below, controls technically infeasible are listed. A demonstration of technical infeasibility is based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review has been documented.

Step 3: CEMEX ranked the remaining technically feasible control options in order of overall control effectiveness for emissions, as appropriate. Under the Step 3 column of the Tables 1-5, below, feasible controls are listed in order of effectiveness, as appropriate.

Based on EPA guidance, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review. Options may be eliminated from BACT consideration because they are demonstrated to be technically infeasible or have unacceptable energy, economic, and environmental impacts on a case-by-case (or site-specific) basis. At that point, the permitting authority in its informed judgment may agree, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not "achievable" in that case. For LAER determinations, costs are not a part of the analysis.

Step 4: CEMEX evaluated the control effectiveness of each feasible control option, as appropriate.

Step 5: CEMEX proposed LAER, BACT, or BAT, as applicable.

STEP 1 & STEP 2 IDENTIFY AVAILABLE AIR POLLUTION CONTROL TECHNOLOGIES & DETERMINE TECHNICAL FEASIBILITY

LAER/BACT/BAT NOx CONTROL TECHNOLOGY FOR PYROPROCESSING SYSTEM

Indirect Firing with Low NOx Calciner, Staged Combustion Calciner (SCC) or multistage Combustion (MSC)

In this application, thermal NOx creation dominates the kiln burning zone and fuel NOx dominates the precalciner. The kiln's NOx control technology involves indirect firing, low-NOx burners and staged combustion (SC) that incorporates staged air, fuel, and/or feed burning locations to create low NOx zones in the calciner. The indirect firing with low NOx burners creates two combustion zones. The primary high temperature (1150°C -1200°C) low oxygen zone operates in fuel rich environment that minimizes NOx formation. The secondary, low temperature zone operates in an oxygen rich environment at a lower temperature which oxidizes CO and minimizes NOx formation.

Feasibility Considerations:

- Staged Combustion Calciners (SCC) are indirectly fired and reduce thermal NOx formation
- SC technology applied to the area of the precalciner works to lower NOx emissions per unit of clinker produced
- Low NOx burners are determined to be BACT for many processes.

Findings:

The Department has determined that Low NOx burners and SCC is technically feasible for the kiln calciner system.

Flue Gas Recirculation (FGR)

FGR reduces peak flame temperature and lowers the percentage of oxygen in the combustion air, thereby reducing thermal NOx formation.

Feasibility Considerations

- FGR is a proven NOx control technique widely used in boilers and heaters that involves recirculating flue gases from the exhaust into the main combustion chamber.
- FGR's effectiveness relies on cooling the flame and generating an oxygen-deficient (reducing) atmosphere for combustion to reduce NOx formation.
- Cement manufacturing process is a chemical reaction that relies on certain conditions (including minimum temperatures) to initiate the chemical reactions necessary to produce clinker.

Findings:

The resulting lower flame temperatures associated with FGR are not compatible with operation of a cement kiln, which relies on a higher flame temperature to produce a quality clinker product. The Department has determined that this option is not technically feasible.

Oxy-Fuel Combustion

This technology minimizes emissions from fuel-bound NOx. Oxy-fuel combustion involves the use of pure oxygen instead of nitrogen rich air as the primary combustion oxidant. Less fuel is used since there is no energy needed to heat the nitrogen component of air. The formation of thermal NOx is reduced because of the absence of the nitrogen component of the combustion air in the combustion zone. The fuel bound NOx formation is also reduced.

Feasibility Considerations

- Has been tested in several demonstration projects in the power sector.
- Complicating factors within the cement industry are related to the carefully controlled conditions necessary for the chemical reactions to occur, and quality clinker to be produced.
- NOx emissions for one particular oxy-fuel combustion demonstration test on a cement kiln used fuel containing varying mixtures of oxygen and air (not 100% oxygen) indicated higher NOx emissions using oxy-fuel than with 100% air[1].
- Ongoing studies and collaborative joint ventures currently evaluating oxy-fuel combustion technologies.
  .

Findings:

Oxy-fuel combustion for a cement kiln has not been demonstrated and has never been required as BACT. The Department has determined that this is not technically feasible for this project.

Selective Non-Catalytic Reduction (SNCR)

SNCR is an add-on NOx control technology that selectively reduces NOx emissions at relatively high temperature and uses a reagent (NH_3) or urea injected into the gas stream to chemically reduce NOx to nitrogen (N_2) and water (H_2O) at a required combustion gas temperatures range of (1,600 °F to 2,200 °F).

Feasibility Considerations:

- Efficiencies generally range from 30-65%, depending on inlet NOx concentration.
- Capable of controlling NOx to an emission rate of 1.5 lb/ton of clinker, when combined with a SCC design, indirect firing, and low NOx burners.
- Kiln inlet and bottom cyclone of the preheater SNCR requires a high but very specific temperature range between 1600 °F and 2000 °F and a residence time at this temperature to be effective.
- For SNCR to be effective, the reactants have to be in the optimum temperature range for a sufficient period of time to allow the reduction reactions to occur.
- The feasibility and effectiveness of the NOx reduction depends on a number of other variables that include: mixing, residence time, uncontrolled NOx concentration, O_2 concentration, CO concentration, reagent injection rates and location, type and design

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1 https://reader.elsevier.com/reader/sd/pii/S0016236118315059?token=D172F4F4C0C4B36625BC1E2B815D23DE72D20701FEFC0793143D3351F8C3703274D2B4D24E29B2CBB06C821D02788ABF

of pyroprocessing system, operating conditions, types and composition of fuel and feed, and the type of cement product produced.

- Ammonia slip caused by improper distribution of the reagent in the exhaust gas stream and application rates along with the numerous variables can be difficult to manage and may result in a visible detached plume and a significant source of condensable PM emissions.
- Unreacted ammonia can react with SO_2 liberated from the sulfur containing fuels and raw feed to form ammonium bisulfate and ammonium sulfate. These corrosive compounds are sticky and can be deposited on cooler internal surfaces of the preheater. This can cause plugging and issues with kiln operation. Downstream fouling of the baghouse is also a concern.
- Increased CO emissions are possible
- Increased N_2O emission are possible (when using urea reagent)

Findings:

For the SNCR system for NOx control to be effective without increasing CO emission there must be sufficient gas residence time between the introduction of the secondary or tertiary air and the introduction of ammonia for CO oxidation to occur. CEMEX proposes the use of SNCR, and sufficient gas residence time to minimize CO emissions while reducing NOx emissions.

The Department has determined that the design and operation of the kiln system with SNCR is a technically feasible NOx emission control option.

Selective Catalytic Reduction (SCR)

SCR uses a gaseous reagent (diluted ammonia) that is injected into the flue gas. The flue gas is then passed over a catalyst bed where the NOx is adsorbed onto a catalyst where the NO_x is converted to N_2 and H_2O. This reaction occurs at ~ 570 °F to 840 °F. Within a kiln system, there are several catalyst placement location options for high dust, semi dust, and low dust applications.

Feasibility Considerations:

- Efficiency range is estimated at between 70 and 90 percent, depending on the inlet NOx concentrations.
- The optimal range is 570 °F to 840 °F.
- For preheater /precalciner kilns that use an inline raw mill for grinding and drying raw materials and a baghouse, the exhaust would be characterized as a low dust application. At that location, after the baghouse, the exhaust gas at 90°C -120°C (194°F-248°F) would require the reheating to achieve the optimum temperature for catalytic reactions.
- For SCR to be effective , the reactants have to be in the optimum temperature range SCR is temperature sensitive. Any exhaust gas temperature fluctuations reduce removal efficiency and upsets the NH_3/NOx molar ratio. SCR units have the ability to function effectively under fluctuating temperature conditions (50°F) although this fluctuation affects removal efficiency of the NOx.

- In addition to temperature requirements, the feasibility and effectiveness of the NOx reduction also depends on a number of other variables that include: mixing, residence time, uncontrolled NOx concentration, catalyst activity, pressure drop, dust loading and ash management, catalyst pitch, catalyst deactivation (poisoning, surface plugging, fouling, pore plugging and masking, alkali salts), erosion, and thermal sintering.
- The use of SCR has not been widely demonstrated in the United States due to pyritic sulfur in the available raw materials.
- Installation and operating costs are up to 10 times that of SNCR

Findings:

No cement kiln systems known to be equipped with SCR in the United States have adequately demonstrated technological or economic feasibility, except for a full-scale SCR test at the Lafarge Joppa Kiln No. 1 as a result of an EPA consent decree. Even with the SCR requirement, this kiln (which is an older long dry kiln) is only required to meet a limit of 3.21 lb NOx/ton clinker on a rolling 30-day average, significantly higher emission rate than will be required for Wampum. The Department has determined that SCR is not technically feasible for control of NOx emissions in the proposed cement kiln system.

Catalyst Activated Ceramic Dust Filters (CADF)

This technology controls multiple pollutants using a single system. Catalyst activated ceramic dust filtration systems are a relatively new technology, described by some vendors as an "all-in-one" solution to remove PM, SO_2, HCl, Mercury, NO_X, organic HAPs, and dioxins. Upstream of the ceramic filter these systems use sorbent injection for control of SO_2 and HCl emissions, activated carbon for Mercury emission control, and ammonia for NO_X emissions control. Then the ceramic catalysts remove the PM (including PM10 and PM2.5), as well as VOCs. The NOx component of the stream is reduced in the same manner as standard SCR. The VOC component of the stream is reduced in the same manner as a standard oxidation catalyst.

Feasibility Considerations:

- No plants in the RBLC search are reported to be using CADF technology
- CEMEX has direct experience with this technology using the CATAMAX system at its plant in Demopolis, Alabama. The system has had extensive downtime and requires constant maintenance. The ceramic candles are rigid but very brittle. The candles routinely break off at the top and fall into the hopper, plugging up the rotary feeder. Because of this, candles are replaced very frequently.
- Based on vendor guarantees and experience with the system, CEMEX contends that it would offer comparable results (during the time it isn't down for repairs) in terms of emissions control as the other proposed control technologies.
- BACT/LAER/MACT emission limits can be met using other technologies

Findings:

While CADF has been installed in cement manufacturing applications and offers comparable vendor guarantees for control as other more reliable technologies proposed in this application, the cost, reliability, and operational and maintenance difficulties experienced by CEMEX while using at another site deem CADF an unreliable control. The Department has determined that CADF is technically infeasible for this application.

EMx™/SCONOx Technology

EMx technology uses a platinum-based catalyst that oxidizes nitrogen oxide (NO) to nitrogen dioxide (NO_2) and carbon monoxide (CO) to carbon dioxide (CO_2). The catalyst is coated with potassium carbonate, which converts NO_2 to potassium nitrate or potassium nitrite. The nitrates/nitrites collect on the surface of the catalyst. Periodically, the catalyst must be regenerated using hydrogen. Control efficiencies of 78 % are reported.

Feasibility Considerations:

- The EMx catalyst is also very sensitive to fouling by sulfur.
- For application on a cement kiln (or combustion equipment burning a sulfur-containing fuel), an additional sulfur catalyst would have to be placed upstream of the NOx catalyst to convert sulfur dioxide (SO_2) to sulfur trioxide (SO_3).
- The sulfur catalyst would also have to be regenerated periodically. (Regeneration of the sulfur catalyst converts the SO_3 back to SO_2, so there is no SO_2 reduction).
- Catalyst regeneration must take place in an oxygen free environment which would require a series of dampers upstream and downstream of each catalyst section to seal it off.
- Due to the buildup of nitrites, nitrates, and sulfates, the catalysts must be re-coated every six months to one year, requiring shutting down the unit to be able to remove the catalyst modules from the system.
- EMx/SCONOX has only been successfully used on small gas-fired turbines, never with sulfur-containing fuels, and never on a cement kiln

Findings:

For these reasons described above including the catalyst sensitivity to sulfur and no documented use on a cement kiln, the Department has determined that EMx is not technically feasible for controlling NOx emissions from the proposed kiln.

The NOx emissions resulting from the Emergency Generator and Fire Pump engines and proposed control will be discussed separately.

LAER/BACT/BAT VOC CONTROL TECHNOLOGY FOR PYROPROCESSING SYSTEM

Good Combustion Practices/Equipment Design

VOC emissions from the cement kiln pyroprocessing systems occur from the decomposition of the organic material in the kiln feed raw materials and additives, the incomplete combustion of the fuel and operating conditions. 40 CFR Part 63, Subpart LLL limits Total Hydrocarbon (THC) emission to 24 ppmvd at 7% oxygen for cement kilns. The kiln design and burner selection for the kiln and calciner along with operating conditions result in complete burnout of the organic fuel constituents resulting in negligible VOC emissions from incomplete combustion of the fuel.

Feasibility Considerations:

- Good combustion practices include: sufficient O_2, adequate time, temperature, turbulence to oxidize the carbon compounds.
- Good combustion practices will extract the maximum thermal energy from fuels while generating a minimum amount of pollutants.
- The plant will be equipped with process control systems to monitor and control combustion variables during the cement manufacturing process.
- System operators will be fully trained in the use of process control systems to optimized combustion and other components of plant operation.
- THC CEMs will be installed for Subpart LLL compliance monitoring, which gives an indication of VOC emissions.

Findings:

The Department has determined that good combustion practices, proper operation, and VOC monitoring with a Total Hydrocarbon (THC) CEMs on the main stack is technically feasible and is LAER.

The VOC emissions resulting from the Emergency Generator and Fire Pump and proposed controls will be discussed separately.

MACT/BAT TOTAL HYDROCARBON CONTROL (THC) TECHNOLOGY

Total hydrocarbon (THC) emissions are generated in the preheater/precalciner kiln system from the raw material heating and fuel combustion.

Feasibility Considerations:

- Good combustion practices include: sufficient O_2, adequate time, temperature, turbulence to oxidize the carbon compounds.
- Good combustion practices will extract the maximum thermal energy from fuels while generating a minimum amount of pollutants.
- The plant will be equipped with process control systems to monitor and control combustion variables during the cement manufacturing process.
- System operators will be fully trained in the use of process control systems to optimized combustion and other components of plant operation.
- THC is continuously monitored with a CEMs to ensure compliance with the 40 CFR 63 Subpart LLL MACT limitation of 24 ppmvd at 7% oxygen for new cement kiln.

Findings:

The Department has determined that good combustion practices and continuous monitoring of THC emissions with a THC CEMs for MACT and LAER compliance on the main stack is technically feasible and is BAT.

LAER/BACT/BAT DETERMINATION FOR EMERGENCY ENGINES

Emergency Diesel-Fired Internal Combustion Engines[2]

LAER for control of NO_x and VOC; BACT for control of CO, PM, PM_{10}, $PM_{2.5}$, and GHG; and BAT for control of H_2SO_4, SO_x, and HAP has been determined to be good combustion practices and proper operation and maintenance including certification of each engine to applicable federal emission standards and fuel sulfur content limits.

Source ID# 274, a 1000 KW emergency generator engine (1,340 bhp), and Source ID# 275, a 137 KW fire pump engine (183 bhp), will be classified as emergency engines and subject to 40 CFR Part 60 Subpart IIII, 40 CFR 63 Subpart ZZZZ, and 40 CFR Part 89, as applicable. Add-on controls are not installed on fire pump engines or emergency generator engines and are not considered feasible considering the limited and unpredictable operating hours for such engines.

Operation of the 1,340 bhp diesel fired emergency generator and a 183 bhp fire pump engine will meet BACT/LAER/BAT for NOx, CO, PM10, VOC, and SO_2 emission levels by performing proper operation and maintenance and burning ultra-low sulfur diesel (USLD) fuel 15 ppm (0.00015% by wt.) Operation will be restricted to 100 hours/year of non-emergency operation in accordance with 40 CFR 60 Subpart IIII. Non resettable hour meters will be installed. EPA certified engines will be purchased to meet the tiered emission limits based on model year and horsepower ratings for CI non road engines.

BACT/BAT DETERMINATION FOR SO_X (SO_2), H_2SO_4, CO, PM, PM_{10}, $PM_{2.5}$, AND GHG

BACT/BAT SO_X CONTROL TECHNOLOGY FOR PYROPROCESSING SYSTEM

Sulfur oxide (SOx) emissions are generated from the sulfur compounds in the raw materials and the sulfur in the fuels used to fire the preheater/precalciner kiln system and varies over time. Primarily SO_2 is both liberated and absorbed through the pyroprocessing system. The predominant source of SO_2 is from the pyritic sulfur in the limestone used as raw material and process conditions.

Process Design- Inherent Dry Scrubbing

Fuel produced SO_2 is readily scrubbed in the calcining zone or combined with alkalis in the kiln and readily absorbed into the kiln feed material, product (clinker) matrix and kiln dust. The raw mill and preheater/precalciner use kiln exhaust gases to heat and partially calcine the raw feed before it enters the rotary kiln. The counter flow of raw material to exhaust gases in the raw mill and preheater tower, act as an inherent dry scrubber to control SO_2 and SO_3 emission creating calcium sulfite ($CaSO_3$) and calcium sulfate ($CaSO_4$) which pass directly with the raw materials to the burning zone or are collected by the proposed main baghouse and recirculated back into the raw material stream.

[2] See Application page 5-21, 5-22.

Calcination of the cement raw materials produces, calcium oxide (CaO), commonly known as quicklime or burnt lime. CaO reacts with SO_2 and SO_3 liberated in the raw feed to be incorporated into clinker in the final product (cement). The reactions[3] include:

$CaO + SO_2 \rightarrow CaSO_3$ $CaSO_3 + \frac{1}{2} O_2 \rightarrow CaSO_4$ $CaO + SO_3 \rightarrow CaSO_4$

Feasibility Considerations:

- Technically feasible and an integral part of the proposed design. As such, it is the baseline configuration and is not considered in the control technology feasibility analysis.
- SO_2 generated by fuel combustion is readily scrubbed by the abundance of CaO in the burning zone and the proper temperature for reactions
- Additional SOx controls may be required to meet the NSPS SOx emission limit of 0.4 lb/ton clinker on a 30 day rolling average.

Findings:
The Department has determined that inherent dry scrubbing is technically feasible and part of the proposed kiln design but without additional SOx controls may not meet the BACT emission limit.

Raw Material Sulfur Reduction
Replacing raw feed materials containing high sulfur contents with lower sulfur content materials could reduce potential SO_2 emissions. Limestone contains sulfates, and often contains sulfur-rich pyrite (FeS_2). Pyrite has been identified as the cause of high SO_2 emissions at cement plants throughout the USA.

Feasibility Considerations:

- High pyrite limestone could be replaced either by pyrite free limestone or other calcium-rich products.
- High volume of limestone is needed in cement production,
- High volume of limestone is available at nearby quarry
- Replacement of other raw materials containing sulfur would have little effect on the reduction of SO_2 emissions.

Findings:
The Department has determined importation of low sulfur content limestone from other locations when limestone is readily available at their nearby quarry would likely generate other fuel combustion emissions due to transportation from other locations. Raw material replacement as a SOx emission control is not feasible for this project.

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[3] American Journal of Environmental Engineering 2014, 4(6): 143-146 DOI: 10.5923/j.ajee.20140406.01 Proposal for Reducing Emissions of SOx in Cement Plants

Low-Sulfur Fuel

As described under Process Design Inherent Dry Scrubbing, the SO_2 produced from the fuel in the kiln system is readily scrubbed and absorbed into the kiln feed systems. CEMEX provided two references from the Portland Cement Association (PCA). One, *Formation and Techniques for Control of Sulfur Dioxide and Other Sulfur Compounds in Portland Cement Kiln Systems*[4] that provided a complete description of the formation and techniques for control of sulfur dioxide, and *Interactions Among Gaseous Pollutants from Cement Manufacture and Their Control Technologies*[5] that discussed the interactions among gaseous pollutants and controls used in cement manufacturing industry. These publications described that the zone where fuel SO_2 emissions are liberated is the same zone where the CaO is in such high concentration and the conditions are favorable for the SO_2 to be scrubbed from the stream and absorbed into the kiln feed material, clinker, and kiln dust. This supports CEMEX contention that most of the SO_2 emissions are a result of the sulfur in the raw material not the fuel. This was also acknowledged in the development of NSPS, Subpart F Standards of Performance for Portland Cement Kilns, where the EPA stated " *In a cement kiln, SO_2 comes from two sources, the first is sulfur in the coal fuel (fuel SO_2). Most fuel SO_2 mixes with the lime in the kiln and preheater and is not emitted into the atmosphere. The other potentially more important source of SO_2 is the raw materials.*[6]"

Although it is technically feasible to select a lower SOx fuel, this selection will not have a significant impact on reducing the SO_2 emissions from the process. Further, by specifying one fuel over another and/or limiting the use of certain fuels it could negatively impact the cost to manufacture the cement thus be economically infeasible. The economic impact in the competitive commodity market makes fuel flexibility crucial to plant sustainability. All fuels proposed, including high sulfur fuel, will meet the proposed BACT emission limitations based on recently permitted units for all pollutants.

Add-on Controls: Wet Scrubbing

Wet scrubbing the exhaust stream with aqueous alkaline solution can reduce high levels of SO_2 emissions along with PM, VOC, and acid gases. In a cement plant application, the scrubber is normally located after the primary PM control device.

In theory, wet scrubbing produces a $CaSO_4$ by product called *synthetic gypsum*.

Feasibility Considerations:

- Effectiveness: >50%
- Requires a particulate control device on exhaust stream to reduce dust load
- Increases water demand

[4] Miller, F.M.; Young, G.L.; von Seebach, M., *Formation and Techniques for Control of Sulfur Dioxide and Other Sulfur Compounds in Portland Cement Kiln Systems*; PCA F&D Serial No. 2460, Portland Cement Association: Skokie, Illinois, 2001.

[5] Greer, W.L., *Interactions Among Gaseous Pollutants from Cement Manufacture and Their Control Technologies*, PCA R&D Serial No, 2728, Portland Cement Association , 2003

[6] 40 CFR 60 Subpart F Standards of Performance for Portland Cement Kilns, FR June 16,2008, p 34080

- Increased potential for a steam /condensation plume from the stack.
- Aerosols from the scrubber could increase PM loading and build up on exhaust gas processing equipment
- Exhaust gas stream may need to be reheated for corrosion prevention resulting in NOx and CO emissions from the combustion source used to heat the gas stream.
- Operation of a scrubber and demister increases the energy use at the site
- Wastewater treatment and disposal or recycling
- Scrubber sludge treatment and disposal
- Synthetic gypsum can be used to supplement purchased gypsum in the production of cement and represents a potential beneficial reuse of byproduct materials.
- Process quality of synthetic gypsum is site specific and hard to predict prior to scrubber startup. Impacts to process are possible if synthetic gypsum is used
- Material cost savings
- In practice, not all cement plants using wet scrubbing have been successful in generating useable synthetic gypsum and in those cases the scrubber water (liquid blowdown) and sludge must be treated and recycled and/or disposed.

Findings:

This wet scrubbing option is technically feasible but may be problematic to produce a useful gypsum product. In addition, this option has the potential to increase water demand: energy demand: and waste streams. For these reasons, the Department has determined that other proposed add-on controls proposed with equivalent control efficiencies and no adverse environmental impacts may be a better option for SOx BACT than wet scrubbing. On this basis, this control will be eliminated from consideration.

Add-on Controls: Wet Absorbent Addition

Wet absorbent addition (WAA) is the injection of calcium oxide (CaO) or calcium hydroxide ($Ca(OH)_2$) slurry into the process gas stream. Solid particles of $CaSO_3$ or $CaSO_4$ are produced and removed with reagent from the gas stream by a PM control device.

Feasibility Considerations:

- Effectiveness: >50%
- WAA can reduce high levels of SO_2 emissions in dry cement kiln systems
- SO_2 removal efficiency varies depending on point of introduction, temperature, mixing, and retention time
- Limited to systems where the lime slurry droplet can evaporate to dryness before the PM control device
- Exhaust gases must be conditioned (cooled and humidified) prior to control device.
- Thermal efficiency impact based on location of WAA.
- Additional heating energy to compensate for process gas cooling as a result of the WAA resulting in increased combustion emissions of NOx and CO.
- In applications with high uncontrolled SO_2 emissions and high dose rates, the excess sulfate can affect kiln chemistry and product quality

Findings:

The Department has determined that this control technology is technically feasible for this project. However, based on the disadvantages , adverse economic, energy, and environmental effects described above, the Department has determined that other proposed add-on controls proposed with equivalent control efficiencies and no adverse environmental or economic impacts may be a better option for SOx BACT than WAA. On this basis, this control will be eliminated from consideration.

Add-on Controls: Dry Absorbent Addition

Dry Absorbent addition (DAA) is the injection of dry calcium oxide (CaO) or calcium hydroxide ($Ca(OH)_2$) into the process gas stream. Solid particles of $CaSO_3$ or $CaSO_4$ are produced and removed from the gas stream along with excess reagent by a PM control device. Hydrated lime is proposed to be injected into the preheater exhaust gas stream to control both sulfur emissions and acid gases (hydrochloric acid (HCl)).

Feasibility Considerations:

- Effectiveness: >50%
- SO_2 removal efficiency varies depending on point of introduction, temperature, mixing and retention time
- Provides acid gas (HCl) control
- Fine particle or high Ca/S ratio is needed for effectiveness
- Ca/S Molar ratio for adsorption is 3 to 15
- Residence time of 2 seconds
- Complete uniform mixing of hydrate in the gas stream is necessary .
- The preheater exhausts is best location for injection to allow adequate residence time for reaction
- No adverse energy or environmental impact
- No significant process impact
- In applications with high uncontrolled SO_2 emissions and high dose rates, the excess sulfate can affect kiln chemistry and product quality

Findings:

The Department has determined that DAA is technically feasible for controlling SO_2 and HCl in this application.

Add-on Controls: D-SOx System

The D-SOx cyclone system is designed to use some of the free lime (CaO) that is created in the calciner to reduce SO_2 emissions. A portion of the calciner exit gas (~5%) is taken off the calciner exit duct and goes to a collection cyclone at the top of the preheater tower which separates the entrained dust from the gas. The captured dust is fed to the cyclone exit duct where the pyritic sulfur is converted to SO_2. The free lime (CaO) absorbs some of the SO_2. The exit gas from the D-SOx cyclone is returned to the outlet of the second stage preheater cyclone.

Feasibility Considerations:

- Effectiveness: < 50%
- Control efficiency is very low in the range of 25 to 30 %

Findings:

The Department has determined that this control technology is technically feasible for this project. However, it has been eliminated from consideration based on having lowest control efficiencies when compared to other available controls.

BACT/BAT SULFURIC ACID EMISSIONS

Sulfuric acid (H_2SO_4) gas is generated from the sulfur compounds in the raw materials and from the sulfur in the fuels used to fire the preheater/precalciner kiln system. As with SO_2, a portion of the H_2SO_4 is believed to be absorbed back into the process in the calcium-rich environment of the preheater tower and raw mill. Control technologies for H_2SO_4 emissions are similar to those reviewed in the SOx BACT analysis and include inherent absorption and fabric filtration.

Feasibility Considerations:

Control technologies for H_2SO_4 emissions are similar to those reviewed in the SOx BACT analysis and include inherent absorption, DAA, and fabric filtration.

Findings:

The Department has determined that inherent adsorption, DAA, and fabric filtration are technically feasible and BACT/BAT for the control of H_2SO_4.

BACT/BAT CARBON MONOXIDE (CO) CONTROL TECHNOLOGY

Staged Combustion in the Calciner (SCC)

CO emission from the cement kiln pyroprocessing systems occur from the decomposition of the organic material in the kiln feed, the incomplete combustion of the fuel, operating conditions, and, according to some studies, the result of implemented NOx controls (SNCR). Staged Combustion in the Calciner (SCC) (or Multistage Combustion (MSC) or “Low-NOX Calciner)” uses a reducing atmosphere to enhance NOx reduction and as a result CO emissions increase. Sufficient residence time, the addition of tertiary combustion air, and increased mixing will promote CO “burnout”, complete oxidation from CO to CO_2, thus mitigating the CO emissions increase.

Feasibility Considerations:

The major cement plant vendors offer some type of Low-NOX calciner that incorporates staged air, fuel, and/or feed burning locations to create low NOX zones.

The purpose of SC is to burn fuel in two stages, i.e., primary and secondary.

Staged air combustion suppresses the formation of NOx by operating under fuel-rich, reducing conditions (less than stoichiometric oxygen) in the flame or primary zone where most of the

NOX is potentially formed. This zone is followed by oxygen-rich conditions in a downstream, secondary zone where CO is oxidized at a lower temperature with minimal NOx formation..

Findings:

CEMEX proposes the use of a SCC design. The Department has determined that SCC is technically feasible. .

Good Combustion Practices/Equipment Design

The design, operation, and maintenance of the proposed equipment shall be in accordance with manufacturer's recommendations and in accordance with good combustion practices.

Feasibility Considerations:

- Efficient fuel combustion requires sufficient oxygen and adequate time, temperature, and turbulence to oxidize the carbon compounds.
- Optimum uniform combustion in the pyroprocessing system minimizes fuel consumption and emissions
- Fuel cost is a substantial part of cement manufacturing cost

Findings:

The proposed kiln design, add on controls, and operator training coupled with sophisticated process control systems to monitor, control, and evaluate raw materials, fuels and the manufacturing process will promote and ensure good combustion practices. Lower energy consumption, by extracting the maximum thermal energy from fuels, will result in lower fuel usage, combustion emissions, and operation costs. The Department has determined that equipment design and good combustion practices are technically feasible and BACT.

Raw Material Considerations

Feasibility Considerations:

Raw material composition impacts the quantity of emissions generated (CO, VOC, SOx)

The close proximity of raw material quarry to the plant location (miles) minimizes adverse environmental and economic impacts that would be incurred if limestone had to be imported and transported from a distant location. Importation of limestone is not practical or economically feasible.

Findings:

Importation of limestone is not feasible. Good Combustion practices and a CO CEM monitor on main kiln stack is BACT.

The CO emissions resulting from the Emergency Generator and Fire Pump are discussed separately.

BACT/BAT PM/PM_{10}/$PM_{2.5}$ EMISSIONS CONTROL TECHNOLOGY

Particulate matter emissions include total particulate matter (PM), particulate matter < 10 microns (PM_{10}), and particulate matter less than 2.5 microns ($PM_{2.5}$). All are generated from the pyroprocessing system (kiln and clinker cooler), raw mill, roadways, solid fuel handling, storage, and grinding, raw material milling and blending, clinker and gypsum handling and storage, cement finish grinding, and cement handling and loadout.

PM from the pyroprocessing system (kiln and clinker cooler) and raw mill includes both filterable and condensable components. All condensables fall into $PM_{2.5}$ category . PM , PM_{10}, and $PM_{2.5}$ are emitted from the clinker cooler. The clinker cooler exhaust is routed through the same control equipment as the main kiln exhaust. The BACT analysis for clinker cooler emissions is the same as the main kiln stack.

PM (PM , PM_{10}, and $PM_{2.5}$) from the PM point sources (solid fuel handling, grinding and storage, raw material handling, milling, blending, and storage, clinker and gypsum handling and storage, cement finish grinding, and cement handling and loadout) are predominantly filterable.

Fugitive PM sources include emissions from roadways, material transfer, and storage piles and are exclusively filterable PM emissions. These PM emission are from the truck and loader traffic on paved and unpaved roads, material transfer points and wind erosion of storage piles.

The BACT determination focuses on the same control technologies that the EPA evaluated in promulgating the particulate matter NSPS and NESHAPs for Portland cement kilns as described below:

Fabric Filter Systems

Fabric filter systems or baghouses remove PM from the flue gas by drawing the dust laden air through a bank of fabric filter media. Depending on the application (main kiln or PM point sources) fabric filtration can be accomplished through bag filters, baghouses, bin vent filters, and filter cartridges.

Feasibility Considerations:

- Exhaust gas temperatures must be below 500°F
- Moisture content must be minimized
- Exhaust gas cooling
- Simplicity in operation and ease of maintenance
- High pressure drops needed necessitating high energy consumption
- Frequent bag replacement costs
- Not effective control for condensable PM emissions
- Not effective control of fugitive PM emissions
- Filterable PM removal efficiencies of 99% or greater are typical.

Findings:

The Department has determined that all fabric filtration methods are technically feasible for PM point sources and the pyroprocessing system (main kiln and clinker cooler), as described. The fabric filter dust collectors (baghouse) are most effective PM control technology for the cement plant process sources. A fabric filter with membrane bags and equipped with a continuous parametric monitoring system is BACT for PM emissions from the kiln and clinker cooler. Fabric filters are BACT for PM emissions from PM point sources.

The Department has determined that add-on controls like fabric filtration for the control of fugitive PM sources is not technically feasible due to the impracticality of capturing and ducting emission to a control device

Electrostatic Precipitator (ESP) Systems

ESP systems include both wet and dry types. Cleaning of exhaust gases involves three steps (1) passing the suspended particles through a direct current corona to charge them electrically, (2) collecting the charged particles on a grounded plate, and (3) removing the collected particulate from the plate by a mechanical process for dry types or by water flushing for wet types. ESPs are primarily for filterable PM control . Wet ESPs may have limited effectiveness in reducing condensable PM through condensation on to liquid-covered plate surfaces inside a wet ESP. The specific collection area (SCA) is the parameter used to ensure proper design control efficiency. SCA is a ratio of the total plate area to the gas flow rate. As the SCA increases the collection efficiency improves.

Feasibility Considerations:

- Exhaust gases may require conditioning prior to control due to high resistivity of particles from preheater/precalciner kilns application
- Dry ESP have high filterable PM collection efficiency low pressure drop , low operating costs and ability to effectively operate at high temperature and flow rates
- Wet ESP can reduce condensables
- Inline raw mill operating mode has large variations in exhaust conditions.
- Sensitivity to exhaust gas conditions
- Initial high capital cost
- Large space requirements
- Wet ESP collected dust cannot be easily recycled back into the kiln system as with dry systems
- Wet ESPs are not suited for use in highly variable processes
- Not effective control of fugitive PM emissions

Findings:

Dry ESP systems are technically feasible for filterable PM in preheater/precalciner kiln applications. Wet ESP systems have not been used on cement kilns and are not technically feasible. NSPS and NESHAP standards can be met with a fabric filter. Dry ESP systems may not consistently meet these standards. A fabric filter is a more reliable particulate removal efficiencies, and a technically feasible option. For this reason, a dry ESP will not be considered for the pyroprocessing system.

ESPs were not proposed for PM point sources due to the space requirements and the comparable effectiveness of fabric filtration. The Department has determined that due to space requirements of ESPs and the availability of the comparable control efficiencies of fabric filtration, ESPs are not technically feasible for this project.

ESPs are not feasible for fugitive PM Emission Sources due to the impracticality of capture and collection of emissions.

CADF

CADF systems can reduce PM, PM_{10}, and $PM_{2.5}$. The ceramic catalysts remove the PM (including PM_{10} and $PM_{2.5}$). However, catalyst activated ceramic dust filtration systems are a relatively new technology, described by some vendors as an "all-in-one" solution to remove PM and other pollutants but have proved to be troublesome in cement manufacturing applications.

Findings:

As discussed above for NOx emission control, the system has been tried by CEMEX at another location and has been found to be troublesome and unreliable. Other technically feasible control options achieve the same control effectiveness without downtime for maintenance and operation issues. The Department in its informed judgment agrees that CADF for this project is not achievable and therefore is not technically feasible for this application.

Dust Suppression Techniques for Fugitive PM

Filterable PM controls for a variety of material handling processes and fugitive dust sources include water sprays and enclosures for storage structures and transfer points, wind screens and enclosures for storage piles, watering and chemical suppressants or stabilizers for unpaved roads, and flushing and vacuum sweeping for paved roads. Control efficiencies range from 50 - 90%. Combining dust suppression measures can achieve higher overall control of fugitive PM emissions.

Feasibility Considerations:

- Water sprays, water flushing, enclosures, and other PM control systems described above are technically feasible control options for filterable PM emissions from fugitive dust sources.
- Primary roadways into and throughout the plant will be paved
- Travel routes in unpaved areas of the site routinely change making paving unpaved routes infeasible
- Best management practices will be employed to minimize fugitive dust emissions

Findings:

The Department has determined that the following work practices and fugitive dust control measures as specified for each operation are feasible:

Drop heights

Best management practices to minimize fugitive dust emissions from material handling and storage operations

Paved Roads

For new high traffic roads paving will be utilized. Vacuum sweeping and/or water flushing to minimize silt on paved surfaces and a 15 mph speed limit

Unpaved Roads

For unpaved roads watering in combination with natural surface material moisture or chemical suppressant application and a 15 mph speed limit to minimize fugitive emissions.

Material Transfers

- Water sprays and partial enclosures (3-sided) is proposed as BACT for raw material unloading at the Material Storage Shed and Truck Unloading Station.
- All transfer points for conveyance of raw materials and product will be fully enclosed.

Storage Piles

- All clinker storage will be fully enclosed
- Limestone and other quarried materials will have high moisture content naturally to control fugitives
- Lower moisture materials and solid fuels will be stored under roof in a partial enclosure or behind wind screens.

BACT/BAT DETERMINATION FOR COOLING TOWER

Cooling Tower PM Emissions

Emissions associated with the cooling tower will consist of PM, PM_{10}, and $PM_{2.5}$. Emissions of PM, PM_{10}, and $PM_{2.5}$ are emitted from wet cooling towers due to small amounts of impurities dissolved solids (e.g. calcium, magnesium, etc.) that crystallize and form airborne particles as the water drift leaves the cooling tower and evaporates. Potentially available control options considered for reducing particulate matter emissions include options to minimize dissolved solids in the cooling water, add-on controls such as advanced drift eliminators, and good operating practices.

Feasibility Considerations:

- The magnitude of drift loss is influenced by the number and size of droplets produced within the cooling tower, which in turn are determined by the fill design, the air and water patterns, and other interrelated factors.
- Tower maintenance and operation levels also can influence the formation of drift droplets. Excessive water flow, excessive airflow, and water bypassing the tower drift eliminators can promote and/or increase drift emissions.
- A recent BAT/BACT PM, PM_{10}, and $PM_{2.5}$ control technology determination for a larger cooling tower (185,000 gpm) proposed by a project in PA concluded that there are combinations of control options and work practice standards for PM, PM_{10}, and PM $_{2.5}$ available for cooling towers to ensure that emissions are minimized from this type of process and a drift rate of 0.0005% has been achieved.

- CEMEX consulted the vendor about the availability of an advance drift eliminator for this sized unit. The vendor advised that the cost would increase significantly for an insignificant PM reduction.
- CEMEX has proposed a smaller unit with an estimated circulating water rate of 352 gpm, equipped with drift eliminator with a maximum drift rate of 0.001% and resulting in PTE of 0.01 tpy of PM and PM10 and <0.01 tpy for PM2.5.
- Water treatment chemicals proposed will not be chromium based.

Findings:

After discussions with CEMEX regarding the feasibility of installing an advanced drift eliminator, it was determined that installing an advanced drift eliminator to meet a 0.0005% drift rate on a PTE of 0.01 tpy PM source would not yield a significant reduction to justify the significant cost increase. The Department acknowledges that the lower rate of 0.0005% was proposed for a significantly larger unit. The Department has determined that the BACT/BAT for this cooling tower is a maximum drift rate of 0.001% and the employment of work practice standards to minimize the PM emission potential and ensure good operation of the unit.

BACT/BAT GHG EMISSIONS CONTROL TECHNOLOGY

The electricity and heat demands of cement production are responsible for around 50% the carbon dioxide (CO_2) emissions. The other 50% comes from the process of "calcination" – a crucial step in cement manufacture in which limestone (calcium carbonate $CaCO_3$) is heated to transform it into quicklime calcium oxide (CaO) and CO_2 in the process. The calcination of limestone to produce calcium oxide releases large amounts of carbon contained in the rock. CO_2 emissions are an intrinsic part of the cement production process. CEMEX grouped their technical feasible measures as follows into one of these categories: Energy Efficiency Measures, Add-On Controls, Use of Lower Emitting Fuel, and Raw Material Substitution.

Energy Efficiency Measures

The Energy Efficiency Measures included the measures identified in the EPA's cement industry GHG White Paper, *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry,* (October 2010)[7]

This was a considerable list and evaluation. For brevity the list of measures are described below. The detailed evaluation of each can be reviewed in the Plan Approval Application.

[7] *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry* (October 2010), Prepared by Sector Policies and Programs Division Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency Research Triangle Park, North Carolina 27711

Feasibility Considerations:

Measures evaluated include:

Process control and management systems, replacement of kiln seals, kiln combustion system optimization, use of flux/mineralizers, kiln/preheater insulation, refractory material selection, grate cooler conversion, multistage preheater and use of suspension preheater low pressure drop cyclones, heat recovery from kiln and clinker cooler exhausts, conversion of long dry kiln to preheater/precalciner kiln, kiln drive efficiency, high efficiency fan design, O_2 enrichment, mid-kiln firing, air mix technology, preheater riser duct firing, use of lower GHG-emitting fuel, decarbonated feedstocks, calcareous oil shale, blended cement, and carbon capture and storage.

Findings:

The technically infeasible measures evaluated for this kiln were heat recovery from kiln and clinker cooler exhausts for power (cogeneration), O_2 enrichment, mid-kiln firing, air mixing technology (high press air injection), decarbonated feedstocks, calcareous oil shale, and carbon capture and storage. (This summary differs slightly from the plan approval application summary on page 53).

The technically feasible measures proposed and determined to be BACT are: Process control and management systems; replacement of kiln seals, kiln combustion system optimization, use of flux/mineralizers, kiln/preheater insulation, refractory material selection, grate cooler conversion, multistage preheater and use of suspension preheater low pressure drop cyclones, conversion of long dry kiln to preheater/precalciner kiln, kiln drive efficiency, high efficiency fan design, preheater riser duct firing, use of lower GHG-emitting fuel, and blended cement (coal combustion fly ash). These measures are incorporated into the design, operation, and/or maintenance of the kiln.

Use of Lower GHG-Emitting Fuel

The proposed kiln/preheater fuels include: natural gas, coal, petroleum coke, No.2 oil, biomass, spent activated carbon, non-hazardous engineered fuels, and Class A dried sewage sludge. Coal is proposed as the primary fuel. Fuel cost, availability, reliability, and kiln process variables dictate the selection of the fuel mix that will be used in the proposed kiln. Fuel flexibility to use one or a blend of fuels is critical for the viability of the plant.

Feasibility Considerations:

- Modern kiln systems are fuel efficient
- Cement production also is a key source of CO_2 emissions, due in part to the significant reliance on coal and petroleum coke to fuel the kilns for clinker production.
- Natural gas combustion produces less GHG than coal
- Fuel cost is a substantial part of cement manufacturing cost. The ability to match kiln operation to the most cost-effective fuel available is essential to the sustainable operation of a cement kiln
- Intrinsic fuel flexibility is a common element in cement plan operation.
- Cement is a commodity product in a market with other similarly operated kilns

- Switching from coal as the primary fuel to oil or gas will reduce the fuel combustion
- portion of overall CO2 emissions, but will have no effect on the CO2 emissions from the calcination reaction.
- The CO2 reduction potential of switching from coal to heavy oil is about 18 percent (210 lb CO2/gigajoule (GJ) versus 170 lb CO2/GJ).
- Switching to natural gas will reduce fuel combustion CO2 emissions by about 40 percent (210 lb CO2/GJ versus 124 lb CO2/GJ).
- However, any fuel switching scenario will have to consider whether other pollutants, such as NOx increase as a result of the switch. (ECRA, 2009) [USEPA Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Portland Cement Industry (October 2010)]
- CEMEX claims climate change as a priority to their company and has achieved a significant reduction of more than 22% in their net specific CO_2 emissions compared to their 1990 baseline. CEMEX 2019 goal was to reduce 30% of their CO_2 net emissions by 2030. With a more ambitions target of reducing our CO_2 net emission by 2030. With aspirations to deliver net-zero CO_2 concrete globally by 2050. [8]

Findings:

The plan approval proposes fuel flexibility to allow for use of the most cost effective fuel for sustainable operation of the cement kiln.. Eliminating the option to use a higher GHG emitting fuel like coal is technically feasible but may have an adverse economic and competitiveness effect. It is technically feasible to select a lower GHG emitting fuel but the economic impact in the competitive commodity market makes it important to allow for fuel mix flexibility and including coal as a fuel option to maintain plant sustainability. The inclusion of lower GHG emitting fuels such as natural gas as an alternate fuel option provides for a low carbon choice for the plant. BACT for GHG for this plant is installation and proper operation of a modern fuel efficient kiln system, good engineering and combustion practices, and the inclusion and use of low carbon fuels as economics allow. Natural gas is readily available to the plant and is used in start up mode.

Raw Material Substitution

The use of decarbonated feedstocks, calcareous oil shale, and blended cement

Feasibility Considerations:

- decarbonated feedstocks are not a locally sourced raw material
- transportation to the site would increase associated GHG emissions
- calcareous oil shale can form THC emissions in the kiln
- use of additives to create Blended Cement is widely used and are described as including fly ash from coal combustion

[8] https://www.cemex.com/documents/20143/160187/cemex-position-climate-change-2020.pdf/08eb9a5b-2747-e5fc-a640-d00c9cb46ee7

Findings:

Decarbonated feedstocks transportation GHG emissions would most likely eliminate any potential GHG emission reduction from the alternate raw material. This option is not technically feasible.

Calcareous oil shale is not a technically feasible substitute due to the potential to increase and exceed the THC limits of Subpart LLL.

This differs slightly from the plan approval application summary on page 53. The application summary identifies Blended Cement as not feasible but in the evaluation identifies fly ash from coal combustion as being proposed as a material substitution, depending on cost and availability. The Department has determined that Blended Cement (fly ash addition when appropriate) is technically feasible.

Add-On Controls- Carbon Capture and Storage (CCS) Technology

Carbon capture and sequestration ("CCS") for CO_2 control is a recognized control technology potentially available for facilities with high CO_2 emission rates. CCS may also be applied to any fossil fuel-fired EGU or industrial process generating large amounts of CO_2. CCS steps include capture, compression, transportation, and finally underground injection for long term storage. Captured CO_2 would then be separated from the absorption media and compressed to higher pressures suitable for transport. Transport would be accomplished by pipeline of which existing infrastructure is primarily limited to parts of the western U.S engaged in EOR. Pipeline infrastructure in Pennsylvania is dedicated primarily to the transport of natural gas, natural gas liquids, or gasoline. Final permanent sequestration of the CO_2 would be in geologic formations underground which may include oil and gas reservoirs, coal seams, and deep brine aquifers. Southwestern PA, and nearby states, feature such underground geologic formations. None are known to be commercially available for sequestration, but this does not rule out technical feasibility.

Feasibility Considerations:

- The emerging CCS technology can potentially capture up to 90% of the CO_2 emissions produced from the use of fossil fuels in some industrial processes.
- Only amine absorption post-combustion solvent capture and stripping is currently commercially.
- Pilot studies are being conducted by the cement industry but such systems are not currently commercially available..
- CO_2 storage involves injection of supercritical CO_2 into deep geologic formations and sealing to prevent escape.
- There are no known pipelines capable of accepting and transporting a large volume of high pressure CO_2.
- The availability of a suitable sequestration site for CO_2 Storage has not been fully demonstrated.
- Deemed technically feasible for recent utility projects but not economically feasible at this time.

Findings:

Pilot studies on CCS are being conducted by the cement industry but such systems are not commercially available. In theory CO_2 capture is technically feasible for the proposed kiln but the other steps involved in CCS that include compression, transportation, and underground injection have not been developed in this areas of Pennsylvania. U.S. EPA's most recent reviews of GHG BACT determinations for large combustion units have consistently stated that CCS is considered technically feasible, but in each case is also considered economically infeasible. Based the lack of the infrastructure, lack of commercial availability it in this area, and the economic feasibility analysis conducted for other industry sectors, the Department in its informed judgment agrees that CCS for this project is not achievable and therefore not feasible at this time.

Good Operating and maintenance practices

Feasibility Considerations:

- Efficient fuel combustion requires sufficient oxygen and adequate time, temperature, and turbulence to oxidize the carbon compounds.
- Optimum uniform combustion in the pyroprocessing system minimizes fuel consumption and emissions.

Findings:

The Department has determined BACT is achieved through good operating and maintenance practices for the emission sources. The pyroprocessing system will also comply with reporting requirements specified in 40 CFR 98. CO_2 from the pyroprocessing system will be measured by a CEMS.

The GHG emissions resulting from the Emergency Generator and Fire Pump and proposed control will be discussed separately.

STEP 3: RANKING OF THE TECHNICALLY FEASIBLE CONTROL OPTIONS

For each control option, the LAER and BACT feasibility consideration and findings described under STEPS 1 & 2, above, the technically feasible control options identified for each pollutant are listed and ranked by effectiveness under the STEP 3 column in the tables below:

TABLE 1. BACT DETERMINATION FOR THE MAIN KILN,
TABLE 2. BACT DETERMINATION FOR THE PM POINT SOURCES,
TABLE 3. BACT DETERMINATION FOR THE FUGITIVE PM SOURCES, and
TABLE 4. BACT DETERMINATION FOR THE COOLING TOWER

STEP 4 EVALUATION OF THE EFFECTIVENESS OF EACH CONTROL OPTION

For each source or group identified in Tables 1-4, the Step 4 Control Evaluations column only includes an explanation on unchosen feasible controls. CEMEX has chosen the most effective control technology or combination of technologies identified as technically feasible for each pollutant. Cost evaluations were not and deemed not necessary because CEMEX chose to use the most effective emission controls for nearly all pollutants regardless of cost to meet LAER and BACT level of controls.

STEP 5 LAER/BACT/BAT SELECTED

The Top Down Methodology, Step 5 column for TABLE 1. BACT DETERMINATION FOR THE MAIN KILN, TABLE 2. BACT DETERMINATION FOR THE PM POINT SOURCES, TABLE 3. BACT DETERMINATION FOR THE FUGITIVE PM SOURCES, and TABLE 4. BACT DETERMINATION FOR THE COOLING TOWER, respectively, indicate the BACT selection for each case-by-case source. The BACT Method of Compliance column in the above referenced tables, describe applicable LAER/BACT/BAT limitations, monitoring, testing, work practice standards, as applicable, and proposed to demonstrate compliance with LAER and BACT. It is assumed that the top ranked feasible control is LAER for NOx and VOC. Table formatting prevented labeling each column header precisely so the control level is identified at the top of the comments. It is assumed that BAT is satisfied through LAER and BACT levels of control.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
NOx	Indirect firing; Low NOx SCC FGR Oxy-fuel Combustion SNCR SCR CADF EMx Good Combustion Practices	FGR Oxy-fuel Combustion SCR CADF EMx	Combination of all feasible controls will be used and include: Indirect firing; Low NOx Burner SCC SNCR Good Combustion Practices	N/A	Indirect firing; Low NOx Burner SCC SNCR Good Combustion Practices	**Restriction: LAER/BACT/BAT** NOx: 1.5 lb NOx/ton clinker, 30-operating day rolling average. **Monitoring:** NOx CEMS on main kiln stack **Testing:** Initial CEMS performance stack testing for NOx in accordance with detailed testing requirements as specified in NSPS F. **Work Practice Standard:** Maintain and operate in accordance with good combustion and air pollution control practices.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
SOx (SO_2)	Inherent Dry Scrubbing; Raw Materials Sulfur reduction; Wet Scrubbing; WAA; DAA; D-SOx Low sulfur fuel	Raw Materials Sulfur reduction;	Wet Scrubbing (>50%); WAA (>50%); DAA (>50%); D-SOx (<50%); Inherent Dry Scrubbing (Base Design);	Wet Scrubbing and WAA were eliminated due to additional environmental impacts with wet stream; D-SOx was eliminated due to low control eff.; Low sulfur fuel is not cost effective. Fuel mix is dependent on a myriad of criteria and low sulfur fuel may not be economically feasible at all times	Inherent Dry Scrubbing (Alkali absorption); fabric filter; and DAA (lime addition), as necessary, were chosen	**Restriction: BACT/BAT** SOx: 0.4 lbs SO_2/ton of clinker, 30-operating day rolling average **Monitoring:** SO_2 CEMS on main kiln stack **Testing:** Initial CEMS performance evaluation testing for SO_2 in accordance with detailed testing requirements per NSPS. F **Work Practice Standard:** Maintain and operate efficiently with DAA, as necessary.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
CO	Good Combustion Practices and Equipment Design Raw Material Substitution	Raw Material Substitution	Good Combustion Practices and Equipment Design	N/A	Good Combustion Practices and Equipment Design	**Restriction**: **BACT/BAT** CO: 1.38 lb CO/ ton of clinker, 30-operating day rolling average **Monitoring:** CO CEMS on main kiln stack **Testing:** Initial RATA and CO CEMS in accordance with detailed testing requirements per current permit conditions. **Work Practice:** Process control systems training for supervisors and operators. Maintain and operate in accordance with good combustion practices.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
VOC	Good Combustion Practices and Equipment Design Raw Material Substitution	Raw Material Substitution	Good Combustion Practices and Equipment Design	N/A	Good Combustion Practices and Equipment Design	**Restriction: LAER/BACT/BAT** VOC: 0.1 lb/ton clinker based on an average of three (3) runs; and 0.08 lb/ton clinker on an annual average **Testing:** Initial performance testing for VOC in accordance with detailed testing requirements per current permit conditions. **Work Practice:** Good Combustion Practices and Equipment Design Maintain and operate , in accordance with good combustion practices.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
PM/ PM10/ PM2.5	Fabric Filter Systems Dry ESP Wet ESP	Wet ESP	Fabric Filter Systems (99%) Dry ESP (<99%)	Fabric Filter System more reliable control efficiency; Dry ESP eliminated	Fabric Filter Systems	**Restriction: BACT/BAT** PM (filterable)(kiln): 0.02 lb PM (filterable)/ton clinker, 30-operating day average. PM(filterable)(clinker cooler): 0.02 lb PM (filterable)/ton clinker, 30-operating day average. PM(condensable)(kiln): 0.16 lb /ton clinker, based on average of three (3) one-hour testing runs. **Monitoring:** PM continuous parametric monitoring system (CPMS). **Testing:** Initial performance test for PM (PM/PM10/PM2.5) in accordance with detailed testing requirements per current permit conditions and MACT LLL. **Work Practice Standard:** Maintain and operate in accordance with good air pollution control practices.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
GHG (CO_2e)	Energy Efficient Measures; Lower GHG Emitting Fuel; Raw Material Substitution; Add-On Controls: CCS: Post CombustionCO2 Capture and Compression; CO2 Transport; Or CO2 Storage	Energy Efficient Measures: Heat recovery from kiln and clinker cooler exhausts for power (cogeneration); O_2 enrichment; mid-kiln firing; and air mixing technology (high press air injection) Raw Material Substitution: Decarbonated Feedstocks Calcareous Oil Shale Add-On Controls: CCS	All technically feasible Energy Efficient Measures are proposed and listed in Step 5; low GHG emitting fuel use is dependent on a myriad of criteria and may not be economically feasible at all times	N/A	Efficient equipment design, operation, and maintenance that may, as appropriate, include: Process control and management systems; Replacement of kiln seals, kiln combustion system optimization, use of Flux/Mineralizers, kiln/preheater insulation, refractory material selection, grate cooler conversion, multi preheater and use of suspension preheater low pressure drop cyclones, , kiln drive efficiency, high efficiency fan design, and preheater riser duct firing, use of lower GHG-emitting fuel when feasible, and blended cement.	**Restriction: BACT/BAT** CO_2e: 0.92 ton/ton clinker, rolling 12-month average. **Monitoring:** CO_2 CEMS on main stack **Testing:** Initial performance testing for CO_2 limits in accordance with detailed testing requirements per current permit conditions **Work Practice Standard:** Good combustion practices and energy efficiency. Maintain and operate in accordance with good combustion and air pollution control practices.

TABLE 1. BACT DETERMINATION FOR THE SOURCE ID 263 KILN AND SOURCE ID 264 CLINKER COOLER						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT/BAT Selected**	**Method of Compliance & Permit Conditions**
$H_2 SO_4$	Inherent Dry Scrubbing; Raw Materials Sulfur reduction; Wet Scrubbing; WAA; DAA; D-SOx	Raw Materials Sulfur reduction;	Wet Scrubbing (>50%); WAA (>50%); DAA (>50%); D-SOx (<50%); Inherent Dry Scrubbing (Base Design);	Wet Scrubbing and WAA were eliminated due to additional environmental impacts with wet stream; ; D-SOx was eliminated due to low control eff.	Inherent Dry Scrubbing, fabric filter, and DAA (lime addition) were chosen	**Restriction: BACT/BAT** H_2SO: 0.11 lb H_2SO_4/ton of clinker, based on average of three (3) test runs. **Testing:** Initial performance testing for H_2SO_4 in accordance with detailed testing requirements per current permit conditions. **Work Practice Standard:** Maintain and operate efficiently, with DAA, as necessary.

TABLE 2. BACT DETERMINATION FOR PM POINT SOURCES

Pollutant	Top Down Methodology					
	Step 1	Step 2	Step 3	Step 4	Step 5	BACT/BAT
	Control Technologies Identified	Technically Infeasible Control Options	Remaining Control Options Ranked by Effectiveness	Control Evaluation	BACT Selected	Method of Compliance & Permit Conditions
PM/ PM10/ PM2.5	Fabric Filter Systems Bin Vent filters Bag filters and cartridges		Fabric Filter Systems Bin Vent filters Bag filters and cartridges (99%)	N/A	Fabric Filter Systems meeting 0.0044 gr/dscf	**Restriction: BACT/BAT** **Monitoring:** Visible Emission observation monitoring. **Recordkeeping;** Manufacturer's control efficiency guarantee Maintenance records **Work Practice Standard:** Maintain and operate each source and control device Efficiently with good air pollution control practices.

TABLE 3. BACT DETERMINATION FOR FUGITIVE PM SOURCES (Sources identified in bold font in Step 3 column)						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT Selected**	**Method of Compliance & Permit Conditions**
PM/ PM10/ PM2.5	Add-on controls; Water sprays; Watering; Water Flushing; Sweeping Natural Moisture	Add-on controls	**Paved Roads:** Water Flushing[9] & Vacuum Sweeping (96-0.263**V**= %); Water Flushing[10](69-0.231**V** = %); enclosures; Vacuum Sweeping[10] (~50%) Table 3-1	N/A	Vacuum sweeping and/or water flushing; natural moisture	**Restriction: BACT/BAT** Zero Visible emissions at property line per 25 Pa. Code §123.2. **Monitoring:** Visible Emission observation monitoring. **Work Practice Standards:** Vacuum sweeping and/or water flushing of paved roadways, as needed.

[9] Control efficiency formulas are from nepis.epa.gov (https://nepis.epa.gov): Fugitive Dust Background Document and Technical Information Document For Best Available Control Measures**, EPA-450/2-92-004, September 1992, Table 3-1 Measured Efficiency Values for Paved Road Controls**. Assumes water at 0.48 gal/yd^2; **V**= number of vehicle passes since application

TABLE 3. BACT DETERMINATION FOR FUGITIVE PM SOURCES (Sources identified in bold font in Step 3 column)						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT Selected**	**Method of Compliance & Permit Conditions**
PM/ PM10/ PM2.5	Add-on controls; Water sprays; Watering; Dust Suppressants; Water Flushing; Sweeping Natural Moisture	Add-on controls	**Unpaved Roads:** Chemical dust suppressant (62-90%) Watering & Natural Moisture (0-90%)	N/A	Application of water or chemical dust suppressant and the natural surface moisture content	**Restriction: BACT/BAT** Zero Visible emissions at property line per 25 Pa. Code §123.2. **Monitoring:** Visible Emission observation monitoring. **Work Practice Standard:** Application of water or chemical dust suppressant, as needed.
PM/ PM10/ PM2.5	Add-on controls; Water sprays; Enclosures; Natural Moisture content	Add-on controls; Wet suppression for gypsum	**Material Transfers:** Watering & Natural Moisture (50-90%) Enclosures (75%)	N/A	Best management practices; water sprays; and enclosures or material high moisture content	**Restriction: BACT/BAT** Zero Visible emissions at property line per 25 Pa. Code §123.2. **Monitoring:** Visible Emission observation monitoring. **Work Practice Standards:** Best management practices to minimize fugitive dust emissions from material handling and storage operations. Best Management practices include: limiting drop heights between loaders and truck beds; Water Sprays, as needed. Enclosures

TABLE 3. BACT DETERMINATION FOR FUGITIVE PM SOURCES (Sources identified in bold font in Step 3 column)						
Pollutant	**Top Down Methodology**					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**BACT/BAT**
	Control Technologies Identified	**Technically Infeasible Control Options**	**Remaining Control Options Ranked by Effectiveness**	**Control Evaluation**	**BACT Selected**	**Method of Compliance & Permit Conditions**
PM/ PM10/PM2.5	Add-on controls; Water sprays; Enclosures; Windscreens; Natural Moisture	Add-on controls	**Storage Piles:** Watering & Natural Moisture (90%) Windbarriers or Enclosures (88%)	N/A	Best management practices; water sprays; enclosures or material high moisture content	**Restriction: BACT/BAT** Zero Visible emissions at property line per 25 Pa. Code §123.2. **Monitoring:** Visible Emission observation monitoring. **Work Practice Standards:** Best management practices to minimize fugitive dust emissions from material handling and storage operations. Best Management practices include: limiting drop heights between loaders and truck beds;

TABLE 4. BACT DETERMINATION FOR THE COOLING TOWER

Pollutant	Top Down Methodology					
	Step 1	Step 2	Step 3	Step 4	Step 5	BACT/BAT
	Control Technologies Identified	Technically Infeasible Control Options	Remaining Control Options Ranked by Effectiveness	Control Evaluation	BACT Selected	Method of Compliance & Permit Conditions
PM/ PM10/ PM2.5	Drift Eliminators/Demisters Limiting Total Dissolved Solids in the Cooling Water Good Operating Practices Water Treatment Chemicals		Drift Eliminators/ Demisters Limiting Total Dissolved Solids in the Cooling Water Good Operating Practices Water Treatment Chemicals	Combination of all controls	Drift rate of 0.001% And a combination of control measures to minimize the PM emissions	**Restriction: BACT/BAT** Drift rate of 0.001% **Monitoring:** Visible Emission observation monitoring. **Recordkeeping;** Manufacturer's control efficiency guarantee **Work Practice Standard:** Maintain and operate each source and control device in accordance with good air pollution control practices.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MEMO

TO Sheri L. Guerrieri, P.E.
Air Quality Engineer
New Source Review Section
Air Quality Program
Northwest Regional Office

FROM Daniel J. Roble DJR
Air Quality Program Specialist
Air Quality Modeling Section
Division of Air Resource Management

THROUGH Andrew W. Fleck AWF
Environmental Group Manager
Air Quality Modeling Section
Division of Air Resource Management

DATE December 17, 2021

RE Summary of Air Quality Analyses for Prevention of Significant Deterioration
CEMEX Construction Materials Atlantic, LLC
Plan Approval Application 37-00013G
Proposed Modernization and Reactivation of Wampum Cement Plant
Wampum Borough, Lawrence County

Background

The Pennsylvania Department of Environmental Protection (DEP) received a plan approval application[1] on January 16, 2020, from CEMEX Construction Materials Atlantic, LLC (CEMEX) for a proposal to modernize and reactivate its Wampum Cement Plant in Wampum Borough, Lawrence County. The plan approval application was prepared by POWER Engineers, Inc., on behalf of CEMEX. On January 30, 2020, the DEP Northwest Regional Office's (NWRO) Air Quality Program notified CEMEX that its plan approval application was administratively complete.[2] Subsequently, the DEP received additional information associated with CEMEX's plan approval application during the course of its technical review.

[1] Pennsylvania Department of Environmental Protection Plan Approval Application. CEMEX Construction Materials Atlantic, LLC / Wampum. January 2020.
[2] Letter from Sheri L. Guerrieri, NWRO New Source Review to Mike Egan, CEMEX. January 30, 2020.

PSD Requirements

CEMEX's proposed project at the Wampum Cement Plant would be a major modification[3] to an existing major stationary source.[4] CEMEX's plan approval application is therefore subject to the Prevention of Significant Deterioration (PSD) regulations codified in 40 CFR § 52.21. These federal PSD regulations are adopted and incorporated by reference in their entirety in 25 *Pa. Code* § 127.83 and the Commonwealth's State Implementation Plan (SIP) codified in 40 CFR § 52.2020.

In calculating its net emissions increase for PSD applicability purposes, CEMEX's emissions from proposed new sources were based on potential to emit (PTE) and CEMEX's emissions from existing sources were conservatively based on PTE. CEMEX's major modification of the Wampum Cement Plant would have a net emissions increase that equals or exceeds the PSD significant emission rates (SER)[5] for carbon monoxide (CO), nitrogen oxides (NO_X), particulate matter (PM), particulate matter less than or equal to 10 micrometers in diameter (PM-10), particulate matter less than or equal to 2.5 micrometers in diameter (PM-2.5), sulfur dioxide (SO_2), and sulfuric acid mist (H_2SO_4). CEMEX's plan approval application includes the following air quality analyses:

- Relevant to 40 CFR § 52.21(k) through (n), air quality analyses of the net emissions increase of CO, NO_X, PM-10, PM-2.5, and SO_2 due to CEMEX's major modification of the Wampum Cement Plant;

- Relevant to 40 CFR § 52.21(o), additional impact analyses of the impairment to visibility, soils, and vegetation that would occur as a result of CEMEX's major modification of the Wampum Cement Plant and associated growth; and

- Relevant to 40 CFR § 52.21(p), initial screening calculations for analyses of the net emissions increase due to CEMEX's major modification of the Wampum Cement Plant on air quality related values (AQRV) and visibility in nearby federal Class I areas.

Model Selection and Options

CEMEX's air dispersion modeling utilized the American Meteorological Society (AMS) / U.S. Environmental Protection Agency (EPA) Regulatory Model (AERMOD) v19191. AERMOD is the EPA's required near-field air dispersion model for a wide range of regulatory applications in all types of terrain and for aerodynamic building downwash.[6] CEMEX utilized proprietary software, Providence/Oris BEEST Suite, to prepare and execute AERMOD.

AERMOD was executed with regulatory default options to calculate concentrations for each applicable pollutant and averaging time. By default, AERMOD was also executed with rural

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[3] *Code of Federal Regulations*. 40 CFR § 52.21(b)(2). Definition of "major modification."
[4] *Code of Federal Regulations*. 40 CFR § 52.21(b)(1). Definition of "major stationary source."
[5] *Code of Federal Regulations*. 40 CFR § 52.21(b)(23). Definition of "significant."
[6] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). Subsection 4.2.2.1(a).

dispersion. In the 1-hour nitrogen dioxide (NO_2) analyses, the Ambient Ratio Method 2 (ARM2) option was selected with default upper and lower limits on the ambient NO_2/NO_X ratio applied to the modeled NO_X concentration of 0.9 and 0.5, respectively.[7]

Source Data Input

The CEMEX Wampum Cement Plant emissions of CO, NO_X, PM-10, PM-2.5, and SO_2 would be emitted to the atmosphere via typical unobstructed vertical stacks and as fugitives. The CEMEX Wampum Cement Plant would consist of the following emission sources:

- 1 selective non-catalytic reduction control system;
- 1 hydrated lime control system;
- 1 activated carbon control system;
- 1 kiln exhaust baghouse
- 1 coal mill baghouse;
- 35 baghouses;
- 42 material transfer baghouses;
- 2 cooling towers;
- 1 emergency generator;
- 1 emergency fire water pump;
- 1 limestone storage pile;
- 1 coal storage pile; and
- paved and unpaved haul road fugitives.

All stacks were characterized in AERMOD as point sources. Fugitive emissions from material storage and handling sources were characterized in AERMOD as area sources. In accordance with the EPA's guidance,[8] roadway fugitive dust emissions due to truck traffic routes were characterized in AERMOD as volume sources, except where ambient air receptors fell within the volume source's exclusion zone. In those cases, roadway fugitive dust emissions were characterized in AERMOD as area sources.

The emission rates and associated parameters entered in AERMOD for each source are consistent with those provided in CEMEX's plan approval application and associated additional information.

In the PM-10 and PM-2.5 analyses, roadway fugitive dust emissions in AERMOD were limited to hour 6 through hour 21. CEMEX's plan approval should therefore contain a condition restricting truck access for delivering and receiving to between 5:00 am and 9:00 pm local standard time.

CEMEX's plan approval should contain conditions restricting the magnitude, duration, and/or frequency of the emergency generator and emergency fire water pump emissions during non-emergency operation based on information provided in CEMEX's plan approval application for the following reasons:

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[7] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). Subsection 4.2.3.4(d).
[8] Haul Road Workgroup Final Report Submission to EPA-OAQPS, EPA memorandum from Tyler Fox, Air Quality Modeling Group to Regional Office Modeling Contacts. March 2, 2012. Pages 4-5.

- In the 1-hour NO_2 and 1-hour SO_2 analyses, emission data associated non-emergency operation of the emergency generator and emergency fire water pump, considered to be intermittent emission sources, were not included in AERMOD since, according to the EPA's guidance, an intermittent emission source or intermittent emission scenario would likely not be continuous enough or frequent enough to affect 1-hour NO_2 and 1-hour SO_2 design concentrations;[9]

- In the 8-hour CO, 24-hour PM-10, 24-hour PM-2.5, 3-hour SO_2, and 24-hour SO_2 analyses, the emission rates for non-emergency operation of the emergency generator and emergency fire water pump were adjusted by an operating factor of 1 hour per averaging time; and

- In the annual NO_2, annual PM-10, annual PM-2.5, and annual SO_2 analyses, the emission rates for non-emergency operation of the emergency generator and emergency fire water pump were adjusted by an operating factor of 500 hours per year.

The stack height entered in AERMOD for each CEMEX Wampum Cement Plant point source does not exceed Good Engineering Practice (GEP) stack height.[10] Direction-specific downwash parameters, calculated by the EPA's Building Profile Input Program for Plume Rise Model Enhancements (BPIPPRM) v04274, were entered in AERMOD for each CEMEX Wampum Cement Plant point source.

In the 24-hour PM-2.5 and annual PM-2.5 analyses, the AERMOD results were appropriately adjusted upward to account for secondary PM-2.5 formation due to the CEMEX Wampum Cement Plant's emissions of PM-2.5 precursors, i.e., NO_X and SO_2, based on the EPA's guidance.[11]

In the 1-hour NO_2, annual NO_2, 24-hour PM-10, 24-hour PM-2.5, annual PM-2.5, and 1-hour SO_2 National Ambient Air Quality Standards (NAAQS) analyses, background concentrations consisted of a modeled and monitored component. The modeled components of the NO_2, PM-10, PM-2.5, and SO_2 background concentrations were calculated by the inclusion in AERMOD of source data that represent existing nearby sources. The monitored components of the NO_2, PM-10, PM-2.5, and SO_2 background concentrations were derived from conservatively representative data measured from January 1, 2016, through December 31, 2018, at existing ambient monitors listed later in the "Existing Ambient Air Quality" section of this memorandum. In the annual NO_2 and 24-hour PM-10 NAAQS analyses, the monitored components of the NO_2 and PM-10 background were represented by the maximum concentration for each pollutant and averaging time, based on 3 years of data. In the 1-hour NO_2, 24-hour PM-2.5, annual PM-2.5, and 1-hour SO_2 NAAQS analyses, the monitored components of the NO_2, PM-2.5, and SO_2

[9] Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard. EPA memorandum from Tyler Fox, Air Quality Modeling Group to Regional Air Division Directors. March 1, 2011. Pages 8-11.
[10] *Code of Federal Regulations*. 40 CFR § 51.100(ii). Definition of "good engineering practice stack height."
[11] Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program (EPA-454/R-19-003, April 2019).

background were represented by design values, based on 3 years of data, in accordance with the EPA's guidance.[12]

The PM-2.5 minor source baseline date[13] was established as September 27, 2012, by Hickory Run Energy LLC's application for Plan Approval 37-337A, which was the first administratively complete application for a proposed project in Lawrence County that was subject to the PSD regulations with significant emissions of PM-2.5 or PM-2.5 precursors after the PM-2.5 trigger date of October 20, 2011.[14] The PM-2.5 baseline area[15] consists of all of Lawrence County, except Taylor Township. CEMEX's plan approval application for its major modification of the Wampum Cement Plant does not establish a PM-2.5 minor source baseline date for additional PM-2.5 baseline areas.

No actual emissions[16] from any major stationary source on which construction commenced after the major source baseline date of October 20, 2010,[17] or any actual emissions increases and decreases at any stationary source occurring after the minor source baseline date of September 27, 2012, that would affect PM-2.5 Class II PSD increment in the area that would be affected by CEMEX's major modification of the Wampum Cement Plant were identified.

In the 24-hour PM-2.5 and annual PM-2.5 Class II PSD increment analyses, however, emission data identical to those used in the 24-hour PM-2.5 and annual PM-2.5 NAAQS analyses, respectively, for existing nearby sources were included in AERMOD to conservatively represent potential PM-2.5 increment-consuming emissions, with two exceptions. Emission data for existing sources at the Universal Refractories Inc. Wampum and INMETCO LLC Ellwood City facilities were appropriately omitted from the 24-hour PM-2.5 and annual PM-2.5 Class II PSD increment analyses. No permitting or reported emissions changes have occurred at these facilities since the major or minor source baseline dates that would affect PM-2.5 increment consumption.

In the annual NO_2 Class II PSD increment analysis, emission data identical to those used in the annual NO_2 NAAQS analysis for existing nearby sources, were included in AERMOD to conservatively represent potential NO_2 increment-consuming emissions. In the 24-hour PM-10 and annual PM-10 Class II PSD increment analyses, emission data identical to those used in the 24-hour PM-10 NAAQS analysis for existing nearby sources, were included in AERMOD to conservatively represent potential PM-10 increment-consuming emissions.

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[12] Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard. EPA memorandum from Tyler Fox, Air Quality Modeling Group to Regional Air Division Directors. March 1, 2011. Pages 17-21.
[13] *Code of Federal Regulations*. 40 CFR § 52.21(b)(14)(ii). Definition of "minor source baseline date."
[14] *Code of Federal Regulations*. 40 CFR § 52.21(b)(14)(ii)(c). Definition of "trigger date."
[15] *Code of Federal Regulations*. 40 CFR § 52.21(b)(15)(i). Definition of "baseline area."
[16] *Code of Federal Regulations*. 40 CFR § 52.21(b)(21). Definition of "actual emissions."
[17] *Code of Federal Regulations*. 40 CFR § 52.21(b)(14(i)(c). Definition of "major source baseline date."

Receptor Data Input

Receptors were entered in AERMOD at locations defined to be ambient air.[18,19] In the significant impact level (SIL) analyses for the NAAQS and Class II PSD increment, a 50-kilometer by 50-kilometer Cartesian receptor grid, with receptor density decreasing with distance, was centered on the CEMEX Wampum Cement Plant. Additionally, in the NAAQS and Class II PSD increment analyses, localized Cartesian receptor grids with a 50-meter receptor spacing were entered in AERMOD in the area of maximum impact for each pollutant and averaging time. In the SIL analyses for the Class I PSD increment, receptors within the nearby federal Class I areas, i.e., Dolly Sods Wilderness and Otter Creek Wilderness, both in West Virginia, and Shenandoah National Park in Virginia, as suggested by the Federal Land Managers (FLM), were entered in AERMOD.

Receptor elevations and hill height scales were calculated by the AERMOD terrain preprocessor (AERMAP) v11103 and v18081 using the U.S. Geological Survey's (USGS) 3D Elevation Program (3DEP) data with a one arc-second resolution.

The extent and density of CEMEX's receptor domain in AERMOD were adequate to determine the location and magnitude of the maximum concentrations in the SIL analyses and design concentrations in the NAAQS and PSD increment analyses.

Meteorological Data Input

AERMOD utilized a 3-year meteorological dataset consisting of hourly records from January 1, 2012, through December 31, 2014. This dataset was derived from prognostic data generated by the Weather Research and Forecasting (WRF) model, v3.6.1. The Mesoscale Model Interface (MMIF) program, v3.4.1, was used to extract meteorological data for the WRF model's 4-kilometer grid cell nearest to CEMEX's Wampum Cement Plant. As required for regulatory purposes, MMIF generated surface data, upper air data, and surface characteristics data, i.e., albedo, Bowen ratio, and surface roughness length, for input to the AERMOD meteorological preprocessor (AERMET).[20,21]

The meteorological data was then processed with AERMET v19191. In AERMET, the Bulk Richardson Number approach was utilized to calculate the surface friction velocity and temperature scale. The surface friction velocity adjustment (ADJ_U*) option was also used in regulatory mode, i.e., without turbulence parameters. The ADJ_U* option is intended to address concerns regarding AERMOD's performance, i.e., overprediction of concentrations during stable

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[18] *Code of Federal Regulations*. 40 CFR § 50(e)(1). Definition of "ambient air."
[19] Revised Policy on Exclusions from "Ambient Air." EPA memorandum from Andrew R. Wheeler, Administrator to Regional Administrators. December 2, 2019.
[20] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). Subsections 8.4.2(a) and 8.4.5.1(b).
[21] Guidance on the Use of the Mesoscale Model Interface Program (MMIF) for AERMOD Applications. April 2018. Publication No. EPA-454/B-18-005. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

low wind speed meteorological conditions, by adjusting the surface friction velocity based on Qian and Venkatram (2011).[22]

The fully processed dataset was appropriate for AERMOD to construct realistic boundary layer profiles to adequately represent plume transport and dispersion under both convective and stable conditions within the modeling domain.

Existing Ambient Air Quality

Existing ambient air quality was established for the area that CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant would affect by utilizing conservatively representative NO_2, PM-10, PM-2.5, and SO_2 data measured from January 1, 2016, through December 31, 2018, at the DEP-operated ambient monitors listed in the following table:

Monitors for Establishing Existing Ambient Air Quality

Pollutant	Monitor Name	Monitor ID
NO_2	Beaver Falls	42-007-0014
PM-10	Beaver Falls	42-007-0014
PM-2.5	Beaver Falls	42-007-0014
SO_2	New Castle	42-073-0015

The data from these monitors were used for two purposes. First, if the impact of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant was calculated by AERMOD to be less than a pollutant's NAAQS SIL, then these data were used to support the conclusion that the impact of the net emissions increase of that pollutant would not cause or contribute to a violation of the NAAQS without having to conduct a cumulative impact analysis. Second, if the impact of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant was calculated by AERMOD to be greater than a pollutant's NAAQS SIL, then these data were used to characterize the monitored portion of the background concentration in a cumulative impact analysis.

CEMEX should be exempted from the PSD pre-application ambient monitoring requirements[23] for CO since the impact of CEMEX's net emissions increase of CO due to the major modification of the Wampum Cement Plant was calculated by AERMOD to be less than the 8-hour CO significant monitoring concentration (SMC).[24] Furthermore, there are currently no ambient monitors statewide with measured CO concentrations in which the NAAQS are threatened, even in areas with emissions that are greater than the emissions in the area that would be affected by the major modification of the Wampum Cement Plant. This finding was used by the DEP to support the conclusion that the impact of CEMEX's net emissions increase of CO due to the major modification of the Wampum Cement Plant, which was calculated to be below

[22] Qian, W., and A. Venkatram, 2011. Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions. *Boundary Layer Meteorology*, 138, 475-491.
[23] *Code of Federal Regulations*. 40 CFR § 52.21(m).
[24] *Code of Federal Regulations*. 40 CFR § 52.21(i)(5).

the 1-hour CO and 8-hour CO SILs, would not cause or contribute to violations of the 1-hour CO and 8-hour CO NAAQS, without having to conduct cumulative impact analyses.

CEMEX should also be exempted from the PSD pre-application ambient monitoring requirements for PM and H_2SO_4 since the EPA has not established an SMC for these pollutants.

SIL Analyses Results

The impacts of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant were calculated by AERMOD to be less than the following:

- The EPA's 1-hour CO and 8-hour CO NAAQS SILs;[25]
- The EPA's 3-hour SO_2 NAAQS SIL;[26] and
- The EPA's 3-hour SO_2, 24-hour SO_2, and annual SO_2 Class II PSD increment SILs.[27]

A cumulative impact analysis was therefore not necessary for the 1-hour CO, 8-hour CO, and 3-hour SO_2 NAAQS, and the 3-hour SO_2, 24-hour SO_2, and annual SO_2 Class II PSD increments.

The impacts of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant were calculated by AERMOD to be greater than the following:

- The EPA's 1-hour NO_2 interim NAAQS SIL;[28,29]
- The EPA's annual NO_2 NAAQS SIL;[30]
- The EPA's 24-hour PM-10 NAAQS SIL;[31]
- The EPA's 24-hour PM-2.5 and annual PM-2.5 NAAQS SILs;[32]
- The EPA's 1-hour SO_2 interim NAAQS SIL;[33,34]

[25] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2).
[26] Ibid.
[27] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2). Based on long-standing EPA policy and guidance, these NAAQS SILs have also been applied to Class II PSD increments.
[28] Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program. EPA memorandum from Stephen D. Page, Office of Air Quality Planning and Standards (OAQPS) to Regional Air Division Directors. June 29, 2010. Pages 11-13.
[29] Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide. DEP memorandum from Andrew W. Fleck, BAQ Air Quality Modeling Section to Regional Air Program Managers. December 1, 2010.
[30] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2).
[31] Ibid.
[32] Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program. EPA memorandum from Peter Tsirigotis, OAQPS to Regional Air Division Directors. April 17, 2018. Pages 15-16.
[33] Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program. EPA memorandum from Stephen D. Page, OAQPS to Regional Air Division Directors. August 23, 2010. Pages 4-6 of attached memorandum from Anna Marie Wood, OAQPS to Regional Air Division Directors.
[34] Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide. DEP memorandum from Andrew W. Fleck, BAQ Air Quality Modeling Section to Regional Air Program Managers. December 1, 2010.

- The EPA's annual NO_2 Class II PSD increment SIL;[35]
- The EPA's 24-hour PM-10 and annual PM-10 Class II PSD increment SILs;[36] and
- The EPA's 24-hour PM-2.5 and annual PM-2.5 Class II PSD increment SILs.[37]

Cumulative impact analyses were therefore necessary for the 1-hour NO_2, annual NO_2, 24-hour PM-10, 24-hour PM-2.5, annual PM-2.5, and 1-hour SO_2 NAAQS, and the annual NO_2, 24-hour PM-10, annual PM-10, 24-hour PM-2.5 and annual PM-2.5 Class II PSD increments.

The impacts of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant were conservatively calculated by AERMOD to be less than the following:

- The EPA's annual NO_2, 24-hour PM-10, annual PM-10, 3-hour SO_2, 24-hour SO_2, and annual SO_2 proposed Class I PSD increment SILs;[38] and
- The EPA's 24-hour PM-2.5 and annual PM-2.5 Class I PSD increment SILs.[39]

Cumulative impact analyses were therefore not necessary for the annual NO_2, 24-hour PM-10, annual PM-10, 24-hour PM-2.5, annual PM-2.5, 3-hour SO_2, 24-hour SO_2, and annual SO_2 Class I PSD increments.

<u>NAAQS Analyses Results</u>

The impacts of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant, in conjunction with emissions that represent existing nearby sources and secondary emissions[40] associated with the proposed reactivation of CEMEX's Wampum Quarry, were calculated by AERMOD to be less than the 1-hour NO_2, annual NO_2, 24-hour PM-10, 24-hour PM-2.5, annual PM-2.5, and 1-hour SO_2 NAAQS.

<u>PSD Increment Analyses Results</u>

The impacts of CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant, in conjunction with emissions that conservatively represent potential increment-consuming sources and secondary emissions associated with the proposed reactivation of CEMEX's Wampum Quarry, were calculated by AERMOD to be less than the annual NO_2, 24-hour PM-10, annual PM-10, 24-hour PM-2.5, and annual PM-2.5 Class II PSD increments.

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[35] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2). Based on long-standing EPA policy and guidance, these NAAQS SILs have also been applied to Class II PSD increments.
[36] Ibid.
[37] Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program. EPA memorandum from Peter Tsirigotis, OAQPS to Regional Air Division Directors. April 17, 2018. Pages 16-17.
[38] *Federal Register*. 61 FR 38249. Prevention of Significant Deterioration and Nonattainment New Source Review; Proposed Rule. July 23, 1996.
[39] Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program. EPA memorandum from Peter Tsirigotis, OAQPS to Regional Air Division Directors. April 17, 2018. Pages 16-17.
[40] *Code of Federal Regulations*. 40 CFR § 52.21(b)(18). Definition of "secondary emissions."

In accordance with 25 *Pa. Code* § 127.45(b)(4), the DEP's notice of proposed plan approval issuance in the *Pennsylvania Bulletin* must include, for sources subject to the PSD regulations, "the degree of increment consumption expected to result from the operation of the source or facility." To this end, the degree of Class II and Class I PSD increment consumption expected to result from the operation of CEMEX's Wampum Cement Plant is provided in the following tables:

Degree of Class II PSD Increment Consumption from Operation of CEMEX's Wampum Cement Plant

Pollutant	Averaging Time	Degree of Class II PSD Increment Consumption		Class II PSD Increment
		micrograms per cubic meter	Percent of Class II PSD Increment	micrograms per cubic meter
NO_2	Annual	< 2.32610	< 9.31 %	25
PM-10	24-hour	< 18.33741	< 61.13 %	30
	Annual	< 3.16609	< 18.63 %	17
PM-2.5	24-hour	< 8.91400	< 99.05 %	9
	Annual	< 1.49533	< 37.39 %	4
SO_2	3-hour	< 5.09213	< 1.00 %	512
	24-hour	< 2.05792	< 2.27 %	91
	Annual	< 0.11361	< 0.57 %	20

Degree of Class I PSD Increment Consumption from Operation of CEMEX's Wampum Cement Plant

Pollutant	Averaging Time	Degree of Class I PSD Increment Consumption		Class I PSD Increment
		micrograms per cubic meter	Percent of Class I PSD Increment	micrograms per cubic meter
NO_2	Annual	< 0.00568	< 0.23 %	2.5
PM-10	24-hour	< 0.01376	< 0.18 %	8
	Annual	< 0.00094	< 0.03 %	4
PM-2.5	24-hour	< 0.12776	< 6.39 %	2
	Annual	< 0.00575	< 0.58 %	1
SO_2	3-hour	< 0.18060	< 0.73 %	25
	24-hour	< 0.02713	< 0.55 %	5
	Annual	< 0.00150	< 0.08 %	2

<u>Confirmation of Air Dispersion Modeling Results</u>

The DEP confirmed the overall results of CEMEX's air dispersion modeling by executing AERMOD upon reviewing the appropriateness of all model input, i.e., model options, emission data, downwash data, background concentration data, terrain data, and meteorological data. The DEP executed AERMOD v19191 with terrain data that were processed with AERMAP v18081 and meteorological data that were processed with AERMET v19191. Regarding the EPA's May 11, 2021, release of AERMOD v21112 and AERMET v21112, the DEP (1) conducted limited test runs by executing AERMOD v21112 with meteorological data that were processed with AERMET v21112 and (2) reviewed the model change bulletins associated with AERMOD v21112 and AERMET v21112. The DEP determined that the revisions to these programs would not affect the overall results of CEMEX's air dispersion modeling.

In the technical review of the 24-hour PM-10 and annual PM-10 Class II PSD increment analyses, the DEP included the increase in PM-10 emissions authorized by the May 13, 2020, issuance of Plan Approval 37-185D to Universal Refractories Inc. for a proposal to construct a new blending facility at its Wampum plant. The DEP received the application for Plan Approval 37-185D from Universal Refractories Inc. on September 20, 2019, prior to receiving CEMEX's application for the major modification of the Wampum Cement Plant. The DEP determined that the inclusion of Universal Refractories Inc.'s PM-10 emissions for the new blending facility would not affect the overall results of CEMEX's 24-hour PM-10 and annual PM-10 Class II PSD increment analyses.

Additional Impact Analyses

General commercial, residential, industrial, and other growth associated with CEMEX's major modification of the Wampum Cement Plant is expected to be negligible, except for the proposed reactivation of CEMEX's Wampum Quarry which would include the installation of a limestone crushing operation and result in secondary emissions.[41]

Impairment to visibility due to the CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant is expected to be negligible based on a plume visual impact screening analysis for McConnell's Mill State Park using VISCREEN v13190 in accordance with the EPA's guidance.[42] CEMEX conducted a Level-1 plume visual impact screening analysis which used some of the Level-2 screening techniques.

No adverse impacts to soils and vegetation are expected. The impacts due to CEMEX's net emissions increase of criteria pollutants due to the major modification of the Wampum Cement Plant are less than the EPA's ambient screening concentrations.[43] CEMEX's net emissions increase of non-criteria pollutants due to the major modification of the Wampum Cement Plant would be subject to the EPA's Maximum Achievable Control Technology (MACT) standards under the National Emissions Standards for Hazardous Air Pollutants (NESHAP) program and would therefore not cause adverse impacts to soils and vegetation.

The DEP notes that the secondary NAAQS were established to protect visibility and vegetation, among other things. CEMEX's NAAQS analyses, which include CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant, secondary emissions associated with the reactivation of CEMEX's Wampum Quarry, and emissions that represent

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[41] Plan Approval Application 37-293A.

[42] Workbook for Plume Visual Impact Screening and Analysis (Revised). October 1992. Publication No. EPA-454/R-92-023. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

[43] A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals. December 12, 1980. Publication No. EPA 450/2-81-078. Office of Air Quality Planning and Standards, Research Triangle Park, NC. Table 5-3.

existing nearby sources, demonstrate that the impacts of these emissions would be less than the secondary NAAQS for the criteria pollutants subject to PSD review.

Class I Area Analyses for AQRVs and Visibility

The DEP's NWRO Air Quality Program provided written notice of CEMEX's proposed major modification of the Wampum Cement Plant to the FLMs of the following nearby federal Class I areas: Dolly Sods Wilderness and Otter Creek Wilderness, both in West Virginia, and Shenandoah National Park in Virginia.[44,45,46] The notice included information relevant to the initial screening calculations necessary to demonstrate that CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant would not adversely impact AQRVs and visibility in these nearby federal Class I areas.[47] The FLM of each nearby federal Class I area stated that no analyses for AQRVs and visibility would be necessary.[48,49]

Conclusions

The DEP's technical review concludes that CEMEX's air quality analyses satisfy the requirements of the PSD regulations. Additionally, CEMEX provided adequate responses[50] to the DEP's comments[51] on the air quality analyses.

In accordance with 40 CFR § 52.21(k), CEMEX's source impact analyses demonstrate that the net emissions increase due to the major modification of the Wampum Cement Plant would not cause or contribute to air pollution in violation of the NAAQS for CO, NO_2, PM-10, PM-2.5, or SO_2. Additionally, CEMEX's source impact analyses demonstrate that the net emissions increase due to the major modification of the Wampum Cement Plant would not cause or contribute to air pollution in violation of the Class II or Class I PSD increments for NO_2, PM-10, PM-2.5, or SO_2.

In accordance with 40 CFR § 52.21(l), CEMEX's estimates of ambient concentrations are based on applicable air quality models, databases, and other requirements specified in the EPA's *Guideline on Air Quality Models*[52] as well as the EPA's relevant air quality modeling policy and guidance.

[44] E-mail with attachment from Sheri Guerrieri, NWRO New Source Review to Melanie Pitrolo, U.S. Forest Service. March 15, 2021.
[45] E-mail with attachment from Sheri Guerrieri, NWRO New Source Review to Holly Salazer, National Park Service. March 15, 2021.
[46] E-mail with attachment from Sheri Guerrieri, NWRO New Source Review to U.S. Forest Service and National Park Service staff. March 16, 2021.
[47] U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service, 2010. Federal Land Managers' Air Quality Related Values Work Group (FLAG): Phase I Report – Revised (2010). Natural Resource Report NPS/NRPC/NRR – 2010/232. National Park Service, Denver, CO. Subsection 3.2.
[48] E-mail from Ralph Perron, U.S. Forest Service to Sheri Guerrieri, NWRO New Source Review. April 19, 2021.
[49] E-mail from Holly Salazer, National Park Service to Sheri Guerrieri, NWRO New Source Review. April 20, 2021.
[50] E-mail with attachment from Priscilla Guerrero, POWER Engineers to Andrew Fleck, BAQ Air Quality Modeling. November 10, 2020.
[51] E-mail with attachment from Andrew Fleck, BAQ Air Quality Modeling to Priscilla Guerrero, POWER Engineers. June 19, 2020.
[52] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W.

In accordance with 40 CFR § 52.21(m), CEMEX provided an analysis of existing ambient air quality in the area that the net emissions increase due to the major modification of the Wampum Cement Plant would affect which included existing representative ambient monitoring data for NO_2, PM-10, PM-2.5, and SO_2. CEMEX should be exempted from the requirements of 40 CFR § 52.21(m) for CO, PM, and H_2SO_4.

In accordance with 40 CFR § 52.21(n), CEMEX provided all information necessary to perform the air quality analyses required by the PSD regulations, including all dispersion modeling data necessary to estimate the air quality impacts of the net emissions increase due to the major modification of the Wampum Cement Plant.

In accordance with 40 CFR § 52.21(o), CEMEX provided additional impact analyses of the impairment to visibility, soils, and vegetation that would occur as a result of the major modification of the Wampum Cement Plant and general commercial, residential, industrial, and other growth associated with the major modification of the Wampum Cement Plant.

In accordance with 40 CFR § 52.21(p), written notice of CEMEX's proposed major modification of the Wampum Cement Plant has been provided to the FLMs of nearby federal Class I areas. The notice included information relevant to the initial screening calculations necessary to demonstrate that CEMEX's net emissions increase due to the major modification of the Wampum Cement Plant would not adversely impact AQRVs and visibility in nearby federal Class I areas.

All input, output, and data files associated with CEMEX's air dispersion modeling for the PSD air quality analyses are available in electronic format upon request.

If you have any questions regarding CEMEX's air quality analyses for PSD, you may contact me by e-mail at droble@pa.gov or by telephone at 717.705.7689. You may also contact Andrew Fleck, manager of the Air Quality Modeling Section, by e-mail at afleck@pa.gov or by telephone at 717.783.9243.

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