



North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

June 29, 2015

Mr. Charles Price
President
Charah Inc.
12601 Plantside Drive
Louisville, KY 40299

SUBJECT: Applicability Determination No. 2647 – Secondary Material Determination
Charah Inc.

Dear Mr. Price:

The North Carolina Division of Air Quality (DAQ) received your letter dated May 21, 2015, requesting the DAQ's concurrence with its determination of regulatory status of specific coal combustion products (CCP) such as fly ash when used in its Carbon Burn-Out (CBO) unit primarily as an ingredient but also as a fuel in accordance with 40 CFR 241 "Solid Wastes Used As Fuels or Ingredients in Combustion Units" ("Solid Waste Definition Rule" or "Rule" hereinafter). CCP is similarly defined in the Rule as coal combustion residuals (CCRs) that are formed during coal-burning processes in power plants and industrial boilers and are produced in various forms that are categorized by the process in which they are generated.

Specifically, Charah, Inc. (CHARAH), a coal combustion product management company, requests the confirmation that coal combustion products (CCP) obtained from the following specific sources meets the requirements in §241: fly ash received directly from coal-fired power plant's particulate collection infrastructure (e.g. electrostatic precipitator), and processed fly ash received from landfills and ash ponds.

Unless exempt, combustion of non-hazardous secondary material (NHSM), as defined in §241.2 would subject the emissions unit (such as the CBO) to requirements in 40 CFR 60 Subpart CCCC "Standards of Performance for Commercial and Industrial Solid Waste Incineration Units" or, Subpart DDDD "Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units." These regulations are commonly known as CISWI ("Commercial and Industrial Solid Waste Incineration").

The DAQ has determined that the coal combustion products (CCP) received directly from the coal-fired power plant's particulate collection infrastructure (e.g. electrostatic precipitator) are an NHSM that can be used as a fuel or an "ingredient" as defined in §241.2. DAQ has further determined that this CCP meets the legitimacy criteria included in §241.3(d)(2) and thus concludes that it is not a solid waste. Therefore, the CBO is not subject to the requirements in CISWI.

Moreover, the processed fly ash received from landfills or ash ponds is an NHSM that can be used as a fuel or an "ingredient." The DAQ has determined that this fly ash also meets the legitimacy criteria included in §241.3(d)(2), and thus, concludes that it is not a solid waste. Therefore, the CBO is not subject to the requirements in CISWI.

The following includes discussion on the CBO, and technical and regulatory analysis supporting these conclusions for each of the above types of CCP:

Carbon Burn-Out unit (CBO)

The CBO is a patented technology developed by PMI Ash Technologies, LLC and licensed to CHARAH for the thermal beneficiation/processing of fly ash, hereinafter "feedstock," along with other ingredient materials such as calcium reagents or limestone (continuously metered) in a fluidized bed combustor that will produce high-quality, low-carbon, pozzolanic material that will be marketed and sold as a partial Portland cement replacement in concrete manufacture.

The primary component of the CBO is the fluidized bed combustor (FBC) in which the majority of the process reactions take place. These reactions can include a range of both chemical and physical reactions that are endothermic. Thermal energy required for these reactions is provided by oxidation of carbon in the feedstock and, as necessary, from combustion of auxiliary fuel such as natural gas or fuel oil. An induced draft fan is required to keep the FBC freeboard pressure slightly sub-atmospheric. All of the solids and gases exit together at the end of the reactor for cooling where the pozzolan product is separated from the flue gas by a cyclone and bag house and is pneumatically conveyed to the storage and load out area. A portion of the cooled product may be recirculated back the FBC to facilitate temperature control.

Technical and Regulatory Analysis

Fly Ash Received Directly from A Coal-fired Power Plant's Particulate Collection Infrastructure (e.g., Electrostatic Precipitator)

As described above, the CBO is capable of utilizing fly ash, received directly from a coal-fired power plant's particulate emissions controls, as its primary ingredient along with other select ingredients in order to produce a pozzolan intermediate for concrete manufacture products.

§241.2 of the rule defines NHSM as "a secondary material that, when discarded, would not be identified as a hazardous waste under Part 261 of this chapter". Further the same section defines secondary material as "any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap."

The fly ash generated from combustion of coal is not a "primary product of a manufacturing" facility (such as electric generating facility), and this product can be deemed as "post-industrial material." Moreover, coal fly ash is not regulated as a hazardous waste as per Part 261 of 40 CFR "Identification and Listing of Hazardous Waste."

In fact, EPA has promulgated a rule on April 17, 2015 (80 FR 21302) to regulate the disposal of coal combustion residues [CCRs] (fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers) as solid waste under Subtitle D "State or Regional Solid Waste Plans" of the Resource Conservation Act (RCRA) [administrative regulations included in 40 CFR 257] and not under the Subtitle C of the RCRA "Hazardous Waste Management" [administrative regulations included in 40 CFR 261]. In addition, the beneficial uses (e.g., use of fly ash in concrete manufacturing replacing traditional product cement) of CCR is exempt from this regulation.

Based on the above discussion, DAQ concludes that the fly ash generated from the coal combustion and received directly from coal-fired power plant's particulate emissions control devices is an NHSM.

§241.3(b)(3) of the Solid Waste Definition Rule provides that NHSMs are not solid waste when "used as an ingredient in a combustion unit that meets the legitimacy criteria specified in paragraph (d)(2) of this section." §241.2 of the Solid Waste Definition Rule defines "ingredient" as "a non-hazardous secondary material that is a component in a compound, process or product." The feedstock is merely one component among a number of variables which are introduced to the CBO to produce the pozzalanic material as a replacement for Portland cement. Therefore, feedstock processed in the CBO is an ingredient under the Solid Waste Definition Rule.

Legitimacy Criteria

For a non-hazardous secondary material used as an ingredient to be excluded from the definition of solid waste under §241.3 of the Solid Waste Definition Rule, the material must satisfy the following legitimacy criteria under Subsection (d)(2):

- (i) The non-hazardous secondary material must be managed as a valuable commodity;
- (ii) The non-hazardous secondary material must provide a useful contribution to the production or manufacturing process.
- (iii) The non-hazardous secondary material must be used to produce a valuable product or intermediate.
- (iv) The non-hazardous secondary material must result in products that contain contaminants at levels that are comparable in concentration to or lower than those found in traditional products that are manufactured without the non-hazardous secondary material.

Managed as a Valuable Commodity - §241.3(d)(2)(i)

Charah stores its feedstock in silos prior to using it as an ingredient in the CBO and conveys the material to the process equipment pneumatically. As per §241.3(d)(2)(i), the Solid Waste Definition Rule identifies the following three factors to be considered in determining whether a material is managed as a valuable commodity:

- (A) The storage of the non-hazardous secondary material prior to use must not exceed reasonable time frames;
- (B) Where there is an analogous ingredient, the non-hazardous secondary material must be managed in a manner consistent with the analogous ingredient or otherwise be adequately contained to prevent releases to the environment;
- (C) If there is no analogous ingredient, the non-hazardous secondary material must be adequately contained to prevent releases to the environment;

The storage capacity of the silos and partially enclosed storage bins for incoming feedstock ranges from 200-3000 tons and could accommodate approximately three to ten days of production under normal operating conditions. As such, under normal operations, the incoming feedstock is typically stored no more than three days prior to introduction into the CBO process. However, during shutdown of the CBO or periods of CBO maintenance or when high production from the coal fired power plant occurs, the feedstock may be stored for longer periods of time, but usually no more than 60 days. The shutdown of the CBO will not generally exceed 20 days. CHARAH will be blending feedstock (high loss on ignition) fly ash or low loss on ignition fly ash) with other feedstock at ratios which ensure that processing in the CBO produces an end product which meets CHARAH's quality control standards. The blending process may require storage of some off-specification feedstock for as long as 60 days depending upon the quantity involved. Accordingly, even outside of the normal three-day processing scheduling for incoming feedstock, CHARAH's storage of incoming feedstock does not exceed a reasonable time frame.

Additionally, CHARAH manages the incoming feedstock as a valuable commodity and takes measures to prevent loss of material during off-loading and storage. In the preamble to the rule, EPA explains that "if on the other hand, a company does not manage the non-hazardous secondary material as it would traditional ingredients, that behavior may indicate that the non-hazardous secondary material is being discarded." Refer to 76 FR 15543. The material must be "stored in a manner that both adequately prevents releases of other hazards to human health and the environment, considering the nature and toxicity of the non-hazardous secondary material." *Id.* In most cases, this requirement is satisfied if the material is in some manner "contained." *Id.* As noted, CHARAH stores its feedstock in enclosed silos, and therefore meets this criterion.

Additionally, at all times prior to processing, CHARAH handles the material in a manner consistent with this criterion. Feedstock is transferred from its suppliers (typically, coal-fired power plants) to CHARAH either directly by pneumatic conveyor into the silos or by truck. All bin vents within the pneumatic conveyer system are equipped with fabric filter recovery devices to minimize loss of this valuable material. Thus, CHARAH believes that it unquestionably manages its feedstock as a valuable commodity.

Useful Contribution to the Production or Manufacturing Process - §241.3(d)(2)(ii)

CHARAH believes that the feedstock processed in the CBO provides a useful contribution to its production of the pozzolan intermediate marketed by CHARAH for use in concrete manufacturing. In the preamble to the Solid Waste Definition Rule, at 76 FR 15543, EPA explains the rationale behind this criterion for legitimacy:

A non-hazardous secondary material used as an ingredient in combustion systems provides a useful contribution if it contributes valuable ingredients to the production/manufacturing process or to the product or intermediate of the production/manufacturing process. This criterion is an essential component in the determination of legitimacy because legitimate use is not occurring if the non-hazardous secondary material doesn't add anything to the process, such that the non-hazardous secondary material is basically being disposed of or discarded. This criterion is intended to prevent the practice of "sham" recycling by adding non-hazardous secondary materials to a manufacturing operation simply as a means of disposing of them.

CHARAH states that the feedstock processed in the CBO is clearly not added to dispose of that material, and the processing of the feedstock in the CBO can in no manner be characterized as "sham" recycling. CHARAH states that without the feedstock there would be no valuable product from the CBO.

Produces a Valuable Product or Intermediate - §241.3(d)(2)(iii)

As per CHARAH, it is undisputed that feedstock material is used in the CBO to make a valuable product. "The product or intermediate is valuable if it is (i) sold to a third party or (ii) used as an effective substitute for a commercial product or as an ingredient or intermediate in an industrial process." Refer to 76 FR 15544. Also, as discussed above, the CBO has the capability to process its fly ash and other feedstock to produce a pozzolan intermediate for the concrete production. All of the products currently produced in the CBO will be sold to third parties (e.g. ready-mix concrete facilities). Additionally, the pozzolan intermediate produced in the CBO has application as both substitute for a commercial product and as an ingredient in an industrial process. Accordingly, in all respects, CHARAH's feedstock processed in the CBO satisfies this criterion for legitimacy as an ingredient.

Comparable Contaminants Concentration of End Product - § 241.3(d)(2)(iv)

CHARAH states since the CBO has the capability to process its feedstock to produce beneficiated fly ash that can reduce the amount of Portland cement required in concrete manufacturing, comparison of the contaminants concentration between these two products is not meaningful because the products serve different functions in the manufacture of concrete. Fly ash is a supplemental cementitious material that is used in conjunction with Portland cement in the manufacture of concrete.

Beneficiation of the fly ash allows fly ash to be used in place of cement¹. Therefore, the most appropriate comparison of end product contaminant concentrations comparison is unprocessed fly ash that has pozzolanic properties comparable to those of the beneficiated ash.

Fly ash that is used as an ASTM C-618 pozzolan must have a low percentage of unburned carbon, referred to as "Loss On Ignition", typically below 3.0%. The North Carolina Department of Transportation (DOT) as well as other state DOTs restrict the LOI to less than 4.0%. Therefore concrete manufacturers in the regional market will only utilize pozzolan with an LOI below 4% and preferably below 3%. Unburned carbon, when found in pozzolan, impacts the quality of the concrete, and therefore is specified by the engineering specifications for concrete for essentially all design projects. The primary purpose of the CBO will be to reduce the pozzolan LOI to levels that meet the NC DOT specified limits.

Total concentrations of the constituent trace metals remain the same in the fly ash mineral during the CBO process since the temperatures of combustion do not reach a level sufficient to release the trace constituents from the mineral component. Since the fly ash feedstock was produced in a utility boiler at much higher combustion temperatures, the fly ash mineral remains stable during the CBO process. The primary change in the fly ash feedstock between entry into the CBO and exit is a reduction in the carbon content. Further, EPA has documented that concentrations of organic constituents, such as polyaromatic hydrocarbons and dioxins, are near or below analytical detection limits in coal combustion residuals. As a result, EPA concluded that organic constituents are not constituents of potential concern associated with CCPs.² Destruction of organic compounds in the CBO would result in even lower levels in beneficiated fly ash. These data show that contaminant concentrations in beneficiated fly ash are comparable or lower than unprocessed fly ash, thus satisfying this legitimacy criterion.

The preamble to the Solid Waste Definition Rule includes the following:

The assessment of whether the products produced from the use of nonhazardous secondary materials that have contaminants that are comparable to (or lower) in concentration can be made by a comparison of contaminant levels in the ingredients themselves to the traditional ingredients they are replacing, or by comparing the contaminant levels in the product itself with and without the use of the nonhazardous secondary material.

Refer to 76 FR 15544.

The preamble also explains the rationale for and purpose of the comparison of contaminants in the legitimacy criteria for use of a non-hazardous secondary material as an ingredient:

¹ Notably, this legitimacy criterion would also be satisfied if concrete were identified as the "end product" for which a comparison was performed. As U.S. EPA recently determined, "environmental releases of constituents of potential concern (COPCs) from CCR fly ash concrete ... during use by the consumer are comparable to or lower than those from analogous non-CCR products, or are at or below relevant regulatory and health-based benchmarks for human and ecological receptors." "Coal Combustion Residual Beneficial Use Evaluation: Fly Ash Concrete and FGD Gypsum Wallboard," U.S. Environmental Protection Agency, Office of Solid Waste & Emergency Response, Office of Resource Conservation & Recovery, Feb. 2014, p.i.

² "Coal Combustion Residual Beneficial Use Evaluation: Fly Ash Concrete and FGD Gypsum Wallboard," U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Office of Resource Conservation and Recovery, February 2014, p. 1-2

The Agency recognizes that there may be instances where the contaminant levels in the products manufactured from non-hazardous secondary material ingredients may be somewhat higher than found in the traditional products that are manufactured without the non-hazardous secondary material, but the resulting concentrations would not be an indication of discard and would not pose a risk to human health and the environment.

Refer to 75 FR 31844, 31885 (Jun. 4, 2010).

In addition, EPA has recognized that contaminant levels in the products made from NHSM can have contaminant levels within a "small acceptable range" at 76 FR 15523 (March 21, 2011).

The above discussion clearly provides that it may be allowable under §241.3(d)(2)(iv) for certain contaminants in the end product made with non-hazardous secondary materials ingredients to be "somewhat higher" or within a "small acceptable range" than those in traditional products. Thus, CHARAH's fly ash feedstock satisfies the legitimacy criterion in §241.3(d)(2)(iv) since the contaminant levels in the CHARAH product are comparable to the contaminants levels or within a "small acceptable range" for beneficiated fly ash typically used as a substitute for Portland Cement (traditional product).

Fly ash Received from Landfill or Ash Pond

§241.3(b)(4) of the rule provides that NHSMs are not solid wastes when combusted: "fuel or ingredient products that are used in a combustion unit, and that are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section, with respect to fuels, and paragraph (d)(2) of this section, with respect to ingredients."

As discussed above, the coal fly ash disposed of in a landfill or an ash pond can be deemed an NHSM. Prior to being used as an acceptable ingredient (feedstock) in the CBO, any fly ash received from landfills or ash ponds must be "processed," as that term is defined in the rule. As discussed below, any commercial agreement between a supplier and CHARAH will specify the acceptable criteria (e.g., specifications) for a feedstock that can be used in the CBO as a condition for supplying processed fly ash.

Pursuant to §241.2, "processing" means any operations that transform discarded non-hazardous secondary material into a non-waste fuel or non-waste ingredient product. Processing includes, but is not limited to, operations necessary to: remove or destroy contaminants; significantly improve fuel characteristics of the material, e.g. sizing or drying the material in combination with other operations; or chemically improve the as-fired energy content. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for purposes of this definition. Under the same section of the Rule, "secondary material" is defined as any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap.

While it is recognized that coal fly ash which was initially placed into a landfill may be considered to have been “previously discarded” by custom and practice, coal-fired utilities also collect this coal ash in permitted wastewater treatment ponds. This coal ash has not historically been considered “discarded” as it was merely solids settling within a permitted wastewater unit. CHARAH believes that the processing of these materials as required to satisfy CHARAH’s specifications for its feedstock would meet the requirements for processing of “previously discarded” materials under the Solid Waste Definition Rule as applied to CISWI. As such, the requisite processing of materials to be used as feedstock in the CBO would be sufficient to transform them to an ingredient.

The Solid Waste Definition Rule provides that a previously discarded material may be processed to transform the waste to a non-waste ingredient. Specifically, §241.3(b)(4) of the Solid Waste Definition Rule provides as follows:

Fuel or ingredient products that are used in a combustion unit, and are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section, with respect to fuels, and paragraph (d)(2) of this section, with respect to ingredients. The legitimacy criteria apply after the non-hazardous secondary material is processed to produce a fuel or ingredient product. Until the discarded nonhazardous secondary material is processed to produce a non-waste fuel or ingredient, the discarded non-hazardous secondary material is considered a solid waste and would be subject to all appropriate federal, state, and local requirements.

As per CHARAH, any processing of materials from landfills or from ash ponds to meet CHARAH’s feedstock specifications will be undertaken under the control of the supplier prior to being received by CHARAH for use as an ingredient in its CBO. Accordingly, this feedstock when received by CHARAH or used in the CBO would meet the legitimacy criteria for direct use as an ingredient and therefore would not be a solid waste under the Solid Waste Definition Rule. All feedstock sent to CHARAH for use as an ingredient in the CBO will first be required to undergo processing:

- A. Free of all, but minimal contaminants (e.g., organic debris, slag);
- B. Finely-divided and free-flowing,
- C. Have consistent moisture content of $\leq 25\%$; and
- D. Have a consistent chemical composition, including organic content as measured by loss on ignition.

The above are CHARAH specifications for acceptance of any coal fly ash (discarded in landfills or ash ponds).

As per CHARAH, the specific processing steps that may be needed to meet the CHARAH specifications (as described above) and produce a suitable feedstock for the CBO will vary depend upon the specific characteristics of each source of coal fly ash. Generally speaking, one or more of the following four processing steps will be necessary to produce a suitable feedstock for the CBO:

- 1) Dewatering,
- 2) Screening/Separation,
- 3) Milling, and
- 4) Blending.

For use as a feedstock in the CBO, coal ash from an ash pond having higher moisture content will likely need to be processed using most, if not all, of these steps. Coal ash from a landfill may not require every step. For example, it may be unnecessary to dewater coal ash from landfills if the material has consistent and acceptable moisture content.

Depending on the source of the ash, the general steps described above can require sub processes. For example, it may be necessary to remove larger particles or other materials found with the ash for the feedstock that would be appropriate for the CBO,. In addition, to meet CHARAH's specifications, some coal ash may require further processing through a separate loop that includes equipment (e.g., roll crusher) needed to produce a more finely-divided, free-flowing feedstock. For others, it may be necessary to utilize a magnetic separator to remove metal constituents. Also, materials such as coal, pyrites, or other more coarse materials may need to be screened. The Screening/Separation step will occur routinely to produce a free-flowing, finely-divided feedstock suitable for the CBO. Depending on the source of coal ash, milling may not be necessary to achieve a finely-divided and free-flowing material.

As emphasized by CHARAH, the specific processing steps and the specific processing equipment cited above are typical examples for how these materials might be processed to produce a suitable feedstock. Those performing the actual work (i.e., suppliers) will elect to use different techniques and/or equipment. CHARAH states that as long as the processed coal ash conforms to CHARAH's general specifications outlined above, the coal fly ash received from landfills or ash ponds will have been sufficiently "processed" and will be a suitable feedstock as an ingredient in the CBO.

It needs to be noted here that the EPA has recognized similar processing steps (similar to CHARAH suggested processing steps as above to meet North Carolina Department of Transportation (NC DOT) specifications) are "likely to meet our definition of processing, as it appears that these processes in fact remove contaminants and improve the ingredient characteristics of these recovered CCRs (**e.g., ash from ponds and landfills**)". Refer to 76 FR 15518, March 21, 2011 (emphasis added).

With respect to the requirement for meeting the legitimacy criteria in §241.3(d)(2) and pursuant to §241.3(b)(4), for fly ash received from landfills or ashponds, CHARAH emphasizes that after completion of "processing," it will become similar to the fly ash received directly from a coal-fired plant's particulate collection infrastructure (e.g., electrostatic precipitator), and thus will meet all legitimacy criteria as discussed above.

Finally, with respect to the particular criterion for comparable contaminants concentration of end product (traditional products) in §241.3(d)(2)(iv), CHARAH compared the CBO processed constituents in dry source fly ash, pond ash and landfill ash feedstock to the typical coal fly ash and found the feedstock to be comparable with carbon actually being reduced. Therefore, CHARAH concludes that there will be no increase in emissions as a result of the use of pond ash and landfill ash as a feedstock for the CBO.

Conclusions

In summary, the DAQ has determined that the fly ash received directly from the coal-fired power plant's particulate collection infrastructure (e.g., electrostatic precipitator) is an NHSM and an "ingredient," as defined in §241.2. DAQ has further determined that this fly ash meets the legitimacy criteria included in §241.3(d)(2). Thus, it concludes that it is not a solid waste and therefore, the CBO is not subject to the requirements in CISWI.

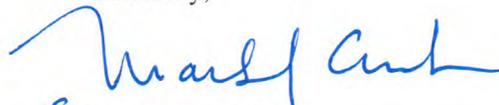
Mr. Charles Price
June 29, 2015
Page 10

Moreover, the processed fly ash received from ash landfills or ash ponds meets the definition of "processing" in §241.2, and is also an NHSM that can be used as a fuel or an ingredient. NC DAQ has further determined that this fly ash also meets the legitimacy criteria included in §241.3(d)(2). Thus, it concludes that it is not a solid waste, and therefore, the CBO is not subject to the requirements in CISWI.

It needs to be emphasized here that this letter includes only the "non-waste" determination, which is specific to the materials discussed herein. Furthermore, the determination does not give any permission to CHARAH to burn or process fly ash in the CBO. CHARAH will need to evaluate and submit a permit application for an air permit, as needed, for burning/processing CCP, as discussed herein, in the CBO at Duke Energy's Marshall Steam Station or any other location in NC.

If you have any questions regarding this determination, please contact me at (919) 707-8726 or Jeff Twisdale of my staff at (919) 707-8472.

Sincerely,



for William D. Willets, P.E., Chief, Permitting Section
Division of Air Quality, NCDENR

c: Mooresville Regional Office
Asheville Regional Office
Fayetteville Regional Office
Washington Regional Office
Wilmington Regional Office
Winston-Salem Regional Office
Raleigh Regional Office
Central Files