UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

JUN 26 2013

Mr. Bruce Ramme
Vice President, Environmental
We Energies
231 West Michigan Street
Milwaukee, WI 53203

Dear Mr. Ramme:

In your letter of April 19, 2012, you requested clarification from the U.S. Environmental Protection Agency (EPA) that We Energies, in accordance with 40 CFR 241.3(b)(4), produces a non-waste fuel through its patented process of recovering coal ash material[1] from its landfills and processing the material with virgin coal. To be designated as a non-waste fuel under that section, the non-hazardous secondary material (NHSM) must be processed in accordance 40 CFR 241.2. Also, after processing, the NHSM must meet the legitimacy criteria in 40 CFR 241.3(d)(1).

Based on the information provided in your letter, supplemental information submitted on August 16, 2012 and November 15, 2012, and follow-up phone conversations and emails[2], we believe the material recovered from your landfills, processed with virgin coal and used as a fuel in combustion units, constitutes a non-waste fuel under 40 CFR Part 241.[3] In making this determination, we conclude that, in this specific instance, the recovered coal ash material consists of both unburned coal which contains carbon utilized as a fuel for energy recovery and coal ash which is utilized in the production of concrete. The remainder of this letter provides the basis for our position. *If there is a discrepancy in the information provided to us, it could result in a different interpretation.*

Processing

Processing is defined in 40 CFR 241.2 as operations that transform discarded NHSM into a non-waste fuel or non-waste ingredient, including operations necessary to: remove or destroy contaminants; significantly improve the fuel characteristics (e.g., sizing or drying of the material,

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[1] The coal ash material includes a mixture of unburned coal, fly ash, bottom ash, slag, coal debris, mill rejects (including pyrites, stone and metals) and a small presence of other debris (such as aluminum cans),

[2] Emails from Liz Stueck-Mullane dated August 16, 2012, March 15, 2013, and April 1, 2013; letter from Bruce Ramme to Jim Berlow dated November 15, 2012, and phone conversation between Liz Stueck-Mullane and George Faison dated February 12 and April 1, 2013.

[3] A non-waste determination under 40 CFR Part 241 does not preempt a state's authority to regulate a non-hazardous secondary material as a solid waste. Non-hazardous secondary materials may be regulated simultaneously as a solid waste by the state, but as a non-waste fuel under 40 CFR Part 241 for the purposes of determining the applicable emissions standards under the Clean Air Act for the combustion unit in which it is used.

in combination with other operations); chemically improve the as-fired energy content; or improve the ingredient characteristics. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for the purposes of the definition.

The determination of whether a particular operation or set of operations constitutes sufficient processing to meet the definition in 40 CFR 241.2 is necessarily a case-specific and fact-specific determination. This determination applies the regulatory definition of processing to the specific discarded material(s) being processed, as described in correspondence and supporting materials, taking into account the nature and content of the material, as well as the types and extent of the operations performed on it. Thus, the same operations may or may not constitute sufficient processing under the regulation in a particular circumstance, depending on the material being processed and the specific facts of the processing. In some cases, certain operations will be sufficient to "transform discarded non-hazardous secondary material into a non-waste fuel[,]" and in other cases, the same operations may not be sufficient to do so.

In your letter, you state that the processing of the recovered coal ash material will ensure the efficient operation of the boilers and optimize power generation, while utilizing the fuel value for energy recovery and recovering the mineral content for beneficial use as a material used in concrete production. EPA considers these materials within the context of the entire processing operation from the recovery of the coal ash material from the landfill to its processing with fine graded coal fuel in determining whether this NHSM has been sufficiently processed. EPA's analysis takes into account the fact that, in this unique circumstance, the coal ash material is processed for two related purposes. First, the unburned coal in the processed coal ash is combusted for energy recovery in an on-site boiler in combination with virgin coal. Second, that combustion reduces the carbon content of the coal ash component of the material, and once that is achieved, the ash is used for production purposes in cement kilns. Processing occurs in several steps as outlined below.

Processing of Coal Ash Material Prior to Blending with Virgin Coal

Coal ash material recovery and processing by We Energies begins with excavation from one or more of its on-site legacy monofills.[4] The coal ash material is removed in bulk to a staging area where it is stacked in piles to drain excess water or to allow for air drying. The coal ash material is crushed and screened to render larger solids into granular material and remove debris. The large, hardened chunks are separated and the material is crushed into uniform size ranges suitable for mixing with coal.

The dewatered and crush/screened coal ash is then transported by covered truck to a dedicated receiving building where the material is stored under moisture control and protected from the

[4] You indicated in phone conversations that, as some monofills are decades old, removal of the coal ash helps eliminate potential future environmental liabilities and risk associated with leaching from old landfills and impoundments without liners or modern covers. You also indicated that where the landfills and impoundments will continue to be used for storage and disposal, state-of-the-art liners and landfill covers are installed after ash removal. While these facts are not relevant to our determination, EPA notes that these practices help avoid other types of environmental harm.

weather. The coal ash is loaded on the coal ash conveyer hopper and further screened to aid in uniform loading.

Processing After Coal Ash Material is Blended with Virgin Coal

Uniform coal ash material is then transferred to the coal conveyer for blending with virgin coal. The resultant fuel blend contains between 1 to 5 percent coal ash and the remaining portion is virgin coal. The coal ash material / virgin coal mixture is then conveyed to a crusher house containing pulverizer units to further blend and crush the material to uniform size. Pulverizer units have several critical moving components which rotate during processing. You indicate that the pulverizer has two main components, air flow operations and grinding process.

Air Flow Operations - - -Air provides the primary motive force for transporting materials within the grinding chamber of the pulverizer unit and acts in conjunction with centrifugal forces on solids which are produced by cyclonic air flow within the chamber. The use of heated air is an important feature of the system, providing a means to dry the coal ash blend to the optimum level for combustion of the coal and increasing the effective BTU content of the blend.

Heated air ranging from between 350^{o} and 450^{o} F is delivered into the pulverizer at high velocity. The temperature of the hot air inlet is controlled in an effort to maintain an ideal coal-air pulverizer outlet temperature ranging between 160^{o} and 170^{o} F. Heated air enters the pulverizer below the grinding table in the lower chamber where it is introduced to the upper pulverizer chamber through an annular space between the grinding table and chamber walls.

Cyclonic air flow is induced by vanes within the pulverizer chamber. The air flow induces a centrifugal force in heavier solids (pyrites, stone, and metals) causing them to impinge on the chamber wall and fall by gravity to the lower chamber where they accumulate in the rejects bin for removal. Heated air flow carries ground fines high into the chamber where they impinge on a rotating steel bar cage. Larger or heavier solids impact the cage at this location and are thrown outward re-entering the grinding area.

Grinding Process ---This process increases the combustion efficiency of the virgin coal and coal ash material, which may contain a mixture of unburned coal, hardened and non-hardened fly ash, bottom ash, pyrites and other non-combustible contaminants, such as metals and stone. The rotating grinding wheels track within a grooved turning grinding table where a continuous grinding process takes place as materials are introduced to the upper pulverizer chamber. Larger solids are rendered into increasingly smaller particle sizes, ultimately reaching powder gradation. Kinetic action and internal friction in the grinding zone causes solid particles to disassociate with bulk contaminants, in particular discrete metallic solids, such as iron and zinc. This process is continuous and occurs in a dynamic environment with a high degree of particle impact, friction, and abrasion with disassociation of heavier compounds from both the coal and coal ash and segregation of reject contaminants which have undesirable impacts on combustion efficiency and air quality.

Those materials which are not readily ground into powder and have heavier densities are cast out of the grinding zone in the pulverizer upper chamber by kinetic action and centrifugal force where they migrate to the outer wall of the chamber and drop by gravity to the lower pulverizer chamber and are contained in the rejects collection pan.

Within the lower collection pan, vanes sweep accumulated rejected contaminants to an exit port where they are deposited in a sealed storage rejects bin. The segregated, rejected contaminants are evacuated from the rejects storage bin periodically and are managed in a separate material handling system.

Overall, you indicate that these multiple processes operate within the pulverizer concurrently in a highly dynamic environment with considerable kinetic energy for the purpose of rendering the coal ash material / virgin coal blend into an optimum condition and removing undesirable non-combustible contaminants, such as metals and stone from the fuel stream. While conditioning and grinding operations are essential for complete combustion of the virgin coal and the unburned coal, these pulverizer operations also help ensure proper boiler operation and ash byproduct quality. These processing features of the pulverizer make use of cyclonic air flow, mechanical impact rejection, gravimetric dynamics and applied heat to achieve a continuous process which matches changing boiler conditions.[5]

Conclusions Regarding Processing

This processed fuel blend described above is then used on-site in We Energies solid fuel-fired boilers. Based on this description of your operations, we believe that the processing of the coal ash material with virgin coal (and in the same type of processing operations as virgin coal) meets the definition of processing in 40 CFR 241.2. Our conclusion is based in part on the fact that the processing serves two related purposes, which are inextricably linked since the material resulting after combustion of the unburned coal is intended and used for cement production. As you explain in the materials you provided to EPA, the U.S. Patent Office issued a patent to We Energies in October 2003 for recovering the byproducts of coal combustion in a utility boiler (specifically coal ash) and for passing the coal ash through a coal burning utility boiler to produce a marketable material as described in the process above.[6] In addition to the recovery of the remaining heat value in the unburned coal, an additional value of the recovery of coal ash is that the ash ultimately produced meets accepted end user specifications, including ASTM C618 and is recognized as a material with value in commerce.

The patent for coal ash recovery is unique and limited to We Energies, where you blend and prepare a relatively small percentage of coal ash material with virgin coal for fueling coal fired boilers with the intent of producing steam for energy recovery as well as marketable ash. You also noted that use of the recovered ash material as a product for use in concrete manufacturing

[5] We recognize that the coal ash recovered from landfills, which is a mixture that contains unburned coal, is processed the same as virgin coal. As stated in the March 21, 2011 final rule, "coal refuse that is recovered from legacy piles and used as fuel that is subjected to the types of operations that are used to process virgin coal, which serve to both increase energy value as well as reduce contaminants, would meet our definition of processing . . . . ." See 76 FR 15509. Because the unburned coal in the coal ash is similar to legacy coal piles, and is processed in the same operations as the virgin coal, similar to legacy piles, we believe the same conclusions regarding the definition of processing would apply.

[6] The description provided in this section is taken from your November 15, 2012 letter to Jim Berlow.

was based on studies showing that concrete performed better when made from a blend of virgin coal ash and recovered coal ash rather than virgin coal ash alone.[7]

Specifically, as described above, the combustion efficiency is increased as the material recovered from the monofill is stacked to remove excess water and then crushed and screened to render larger solids into granular material and remove debris. The pulverizer units, which include processing operations such as cyclonic air flow, mechanical impact rejection, gravimetric dynamics and applied heat, increase combustion efficiency through the use of heated air to dry the blend to the optimum level for combustion and effective BTU content. The pulverizer grinding process also increases combustion efficiency by rendering larger solids into increasingly smaller particle sizes, ultimately reaching powder gradation. Contaminants are removed during this phase as kinetic action and internal friction in the grinding zone causes solid particles to disassociate with bulk contaminants, such as iron and zinc. The materials with heavier densities are cast out of the grinding zone; accumulated rejected contaminants are swept to an exit port where they are deposited in a sealed storage rejects bin.

Legitimacy Criteria

Under 40 CFR 241.3(d)(1), the legitimacy criteria for fuels include: 1) management of the material as a valuable commodity based on the following factors—storage prior to use must not exceed reasonable time frames, and management of the material must be in a manner consistent with an analogous fuel, or where there is no analogous fuel, adequately contained to prevent releases to the environment; 2) the material must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy; and 3) the material must contain contaminants at levels comparable to or less than those in traditional fuels which the combustion unit is designed to burn.

Manage as a Valuable Commodity

Regarding the first criterion, the recovered coal ash is stored for 1 – 7 days prior to blending with the virgin coal. After blending, the processed coal ash/coal fuel blend is conveyed to the coal bunkers for use in the power plant. Transfer operations occur daily and mixing operations are continuous during coal transfers. The coal ash/virgin coal fuel blend is then continually used on-site in We Energies solid fuel-fired boilers.

Based on this information, the material is managed as a valuable commodity and storage does not exceed a "reasonable time frame" as discussed in the NHSM final rule (40 CFR 241.3(d)(1)(i)(A).[8] Management and storage of the coal ash by We Energies appears to be analogous to the management and storage of coal, which is continuously fed to the solid-fuel boilers for use as a fuel.

[7] Blending Fly Ash for a Better Concrete; The Concrete Producer, June 1998. Tables Showing Ash Fuel Influence – Email from Liz Stueck-Mullane to George Faison, April 1, 2013.

[8] As discussed in the NHSM final rule (76 FR 15520) ''reasonable time frame'' is not specifically defined as such time frames vary among the large number of non-hazardous secondary material and industry involved.

Meaningful Heating Value and Used as a Fuel to Recover Energy

Regarding the second legitimacy criterion, you indicate in your November 15, 2012 letter that the legacy coal ash material has an average heating value of 2500 Btu/lb.[9]

As the Agency stated in the preamble to the NHSM final rule, NHSMs with an energy value greater than 5,000 Btu/lb, as fired, are considered to have a meaningful heating value (see 76 FR 15541, March 21, 2011). However, the preamble indicates that a lower heating value could meet the meaningful heating value criteria if it can be demonstrated that the unit can cost effectively recover energy from the NHSM—such factors in making that determination include, but are not limited to: 1) cost savings from not purchasing traditional fuels that would otherwise be needed; 2) whether the NHSM is to be used as a fuel; 3) whether the NHSM can self-sustain combustion; and 4) whether the operation produces energy that is sold for a profit. See 76 FR 15523

Regarding factor 1, information submitted indicates that the recovered coal ash material has an average carbon content of 10% (which exceeds the break-even point for providing a net energy gain) when the carbon is burned at a rate of 5%. This results in a coal fuel mix that would contribute 275,000,000 Btu per day for electrical energy production at the Elm Road Generating Station. This amount of energy, contributed by burning the carbon in the coal ash, is equivalent to approximately 21,150 pounds of coal per day, which We Energies then avoids having to buy. In fact, you indicate in your April 2011 letter that since you have been processing coal ash at your facilities for use as a fuel, you have avoided the purchase of 320,778 tons of coal. EPA determines that this figure is a meaningful energy contribution. [10] You also indicate that the burning of the coal in the ash along with the virgin coal is combusted as a fuel for power generating plants that sell electricity to local communities, thus addressing factors 2 and 4.

We would note that, generally, the Agency would not consider Btu values at the lower end of the range meaningful. In this unique circumstance, however, the coal ash material includes two components used for different purposes. The first component, the unburned coal in the processed coal ash, is cost-effectively combusted for energy recovery in an on-site boiler in combination with virgin coal. This energy recovery component of the coal ash material has a heating value of 14,500 Btu/lb. The second component, the coal ash itself, is not a waste material, but is used for production purposes in cement kilns after the carbon content has been effectively reduced through the combustion process. Thus, as explained above, the presence of recovered coal ash material in the boiler is to enhance it for the production of concrete. EPA has determined that when taking into account all the factors described above, the coal ash material

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[9] Additional information submitted by We Energies on August 18, 2012 indicates that the dry loss on ignition value (i.e. the carbon content of the ash) ranged from 6.2% (551 Btu/pound) to 23.5% (2554 Btu/pound), but you also noted that the overall energy contribution for ash utilization, less enthalpy loss and less auxiliary load for ash utilization, estimates a break-even point of between 0.4% and 0.5% carbon content in the ash above which the operation contributes energy for power generation. That is, any carbon beyond the break-even point provides a net energy gain to help off-set additional coal that would otherwise be needed for electric power generation.

[10] We note that the ash utilization building ($3.7 million in capital cost) was specifically included in the overall design of the new plant at Oak Creek. Thus, as you note, utilization of the coal ash is integral to the actual design and operation of the plants, including the boiler and associated emission control equipment.

used in the boiler meets the legitimacy criterion for meaningful heating value and use of the material as a fuel to recover energy.

Comparable Contaminant Levels

Regarding the third criterion on contaminant levels, your letter requested confirmation that the coal ash material meets the contaminant legitimacy criterion when compared to coal, the traditional fuel used in combustion units for which We Energies coal ash is designed to burn. In Table 1, "Contaminant Concentrations in Coal and We Energies Coal Ash Fuel Sources," you compared contaminant data for the coal ash to contaminant data for coal as outlined in the materials characterization paper, "Traditional Fuels and Key Derivatives."

As indicated in your Table 1, the coal ash material meets the legitimacy criterion for contaminant levels when compared to a solid traditional fuel. This conclusion assumes that the coal ash was tested for any constituents expected to be present. Additional constituents for which the coal ash were not tested must, as is the case for those tested, be present at levels comparable to or less than those in coal, based on your knowledge of the material.

Conclusion

Overall, based on the information provided in your letter, we believe the facts indicate that the recovered coal ash material meets both the processing definition and the legitimacy criteria outlined above. Accordingly, we would consider this NHSM a non-waste fuel under the 40 CFR Part 241 regulations.

If you have any questions, please contact George Faison of my staff at 703-305-7652.

Sincerely,

Suzanne Rudzinski

Suzanne Rudzinski, Director
Office of Resource Conservation and Recovery

Enclosure

Table 1: Contaminant Concentrations in Coal and We Energies Coal Ash Fuel Sources

Contaminant	Units	OAQPS Databases Coal Data		We Energies Coal Ash Fuel Sources	
		Min	Max	Min	Max
Metals					
Antimony	ppm	ND	6.9	0.47	2.3
Arsenic	ppm	ND	174	3.4	42
Beryllium	ppm	ND	206	0.63	2.9
Cadmium	ppm	ND	19	0.35	1.5
Chromium	ppm	ND	168	6.8	21
Cobalt	ppm	ND	25.2	1.6	17
Lead	ppm	ND	148	2.5	42
Manganese	ppm	ND	512	40	170
Mercury	ppm	ND	3.1	0.03	0.25
Nickel	ppm	ND	730	11	39.8
Selenium	ppm	ND	74.3	4	11
Non-metals					
Chlorine	ppm	ND	9080	200	300
Fluorine	ppm	ND	178	4.1	82
Nitrogen	ppm	13600	54000	2600	4400
Sulfur	ppm	740	61300	100	900
HAPs Compounds					
Benzene	ppm	ND	38	<0.025	0.061
Ethyl benzene	ppm	0.7	5.4	<0.025	0.047
Styrene	ppm	1	26	<0.025	0.043
Toluene	ppm	8.6	56	<0.025	0.169
Xylenes	ppm	4	28	<0.077	0.179
16-PAH	ppm	6	253	0.096	5.2

Source for Coal Data: **Contaminant Concentrations in Traditional Fuels: Tables for Comparison**

http://www.epa.gov/epawaste/nonhaz/define/pdfs/nhsm-concept.pdf

http://www.epa.gov/epawaste/nonhaz/define/pdfs/nhsm_cont_tf.pdf