ILLINOIS POLLUTION CONTROL BOARD
November 16, 2006

IN THE MATTER OF:	)	
	)	
PETITION OF BIG RIVER ZINC	)	AS 06-4
CORPORATION FOR AN ADJUSTED	)	(Adjusted Standard - Land)
STANDARD UNDER 35 ILL. ADM. CODE	)	
720.131(c)	)	

OPINION AND ORDER OF THE BOARD (by N.J. Melas):

Big River Zinc Corporation (BRZ) has operated an electrolytic refinery in Sauget, St. Clair County, producing zinc products for a variety of industrial and agricultural uses. BRZ now seeks a Board determination in the form of an adjusted standard. Specifically, BRZ wants the Board to determine that electric arc furnace dust (EAFD), proposed as feedstock for a new zinc recycling process, is not a solid waste. BRZ maintains that this determination is essential to BRZ resuming operations at the currently-idled facility.

EAFD, the dust emitted from electric arc furnaces used to produce steel, would ordinarily be considered a "solid waste" and a "hazardous waste" under the federal Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 *et seq*., and corresponding Illinois hazardous waste laws and regulations. EAFD is a "listed" hazardous waste with the assigned hazardous waste number of "K061." BRZ would like to receive and use EAFD without becoming subject to Illinois' hazardous waste requirements.

To that end, BRZ has filed a petition for an adjusted standard under 35 Ill. Adm. Code 720.131(c). Section 720.131(c) allows the Board to determine, on a case-by-case basis, that certain materials are not solid wastes, and therefore not hazardous wastes, if they meet certain criteria. BRZ asserts that EAFD, as BRZ proposes to use it, meets these criteria. The Illinois Environmental Protection Agency (IEPA) recommends that the Board grant the adjusted standard.

For the reasons below, the Board finds that BRZ has established that EAFD placed into its proposed Leach, Solvent Extraction, Electrowinning (LSXEW) refining process to produce zinc products is not a solid waste. The Board therefore grants BRZ's petition for an adjusted standard, subject to the conditions set forth in the order that follows this opinion.

In this opinion, the Board first provides a brief background on BRZ's facility. Second, the Board sets forth the legal framework in which the Board considers adjusted standard requests for solid waste determinations. Next, the Board gives the procedural history of this case. The Board then makes its findings of fact, after which the Board discusses the issues and renders its legal conclusions.

BACKGROUND ON BRZ FACILITY

The primary raw material feedstock for BRZ's Sauget refinery has been "zinc concentrates from largely exhausted mineral ore deposits in Missouri and Tennessee." Pet. at 2. The facility has also used "secondary zinc oxide materials reclaimed from EAFD via processing through a High Temperature Metal Recovery ('HTMR') unit" pursuant to an adjusted standard issued by the Board as a solid waste determination in *In re* Petition of Big River Zinc Corporation for an Adjusted Standard Under 35 Ill. Adm. Code 720.131(c), AS 99-3 (May 6, 1999). *Id*.

BRZ ceased operations at the Sauget facility in February 2006, because of BRZ's "inability to source sufficient feed at competitive prices to support ongoing refining activities." Pet. at 2-3. BRZ proposes to "retrofit" the facility with a new technology called the Leach, Solvent Extraction, Electrowinning (LSXEW) process. *Id*. at 3. According to BRZ, the LSXEW process would allow BRZ to use EAFD itself directly (*i.e.*, without HTMR processing) as a feedstock in place of some or all of the raw materials BRZ has used in the past. *Id*. at 3. In BRZ's view, the LSXEW represents "the next step in the evolution of EAFD reclamation technology," beyond the sort of reclamation involved in AS 99-3, because now the "reclamation that has occurred at the scrap steel EAF [electric arc furnace] is now sufficient" to produce an economic feedstock without further processing. *Id*. at 37. Both BRZ and IEPA note that the LSXEW process was not considered when EAFD's K061 hazardous waste listing was developed. Pet. at 41; IEPA Rec. at 2.

BRZ expects this change would allow it to "restart the refinery and return its Sauget Facility operations to profitability," "preserving numerous jobs and contributing to the prosperity of an economically challenged region of the State of Illinois." Pet. at 3, 37. BRZ states that its requested solid waste determination for EAFD is "crucial to the ability of the Facility to operate economically." Mot. to Exp. at 1.

LEGAL FRAMEWORK

The status of materials as "solid wastes" is significant because under the laws and regulations that Congress and the United States Environmental Protection Agency (USEPA) have established, only those materials that are "solid wastes" can be regulated as "hazardous wastes" under RCRA and corresponding Illinois hazardous waste requirements. Accordingly, materials that are not solid wastes are not subject to Illinois' hazardous waste regulations, which impose various obligations on persons who generate, treat, store, dispose, recycle, or transport hazardous waste. *See* 35 Ill. Adm. Code 722-726, 728. USEPA has authorized Illinois to administer the hazardous waste program in this State. *See* 40 C.F.R. 272.700, 272.701.

Generally, a solid waste is any discarded material. *See* 35 Ill. Adm. Code 721.102. A solid waste is a hazardous waste if it exhibits a "characteristic" of hazardous waste (*i.e.*, it is toxic, corrosive, ignitable, or reactive) or if it is "listed" as hazardous waste (*e.g.*, it comes from a specific type of process, such as electroplating). *See* 35 Ill. Adm. Code 721.103, 721, Subparts C and D.

BRZ would like to use EAFD as a raw material feedstock for zinc production without becoming subject to Illinois' hazardous waste regulations. BRZ asks the Board to determine that EAFD recovered from scrap steel with an electric arc furnace and to be used in BRZ's LSXEW process is not a solid waste.

Section 28.1(a) of the Environmental Protection Act (Act) (415 ILCS 5/28.1(a) (2004)) provides that "[a]fter adopting a regulation of general applicability, the Board may grant, in a subsequent adjudicatory determination, an adjusted standard . . . ." Further, Section 28.1(b) of the Act (415 ILCS 5/28.1(b) (2004)) states that "in adopting a rule of general applicability, the Board may specify the level of justification required of a petitioner for an adjusted standard . . . ."

In the case of the Board's hazardous waste regulations of general applicability (35 Ill. Adm. Code 720 *et seq*.), the Board specified the level of justification required of an adjusted standard petitioner seeking to have material be deemed not a solid waste. Specifically, the Board adopted provisions identical in substance to the USEPA solid waste determination regulations (40 C.F.R. 260.30(c), 260.31(c)). Accordingly, Section 720.130 of the Board's hazardous waste regulations provides in part:

> In accordance with the standards and criteria in Section 720.131 and the procedures in Section 720.133, the Board will determine on a case-by-case basis that the following recycled materials are not solid wastes:
>
> ***
>
> c) Materials that have been reclaimed but must be reclaimed further before the materials are completely recovered. 35 Ill. Adm. Code 720.130.

BRZ claims that EAFD has been reclaimed but would be further reclaimed through LSXEW for complete recovery. According to BRZ, such EAFD meets the requirements of Section 720.131(c) of the Board's hazardous waste regulations (35 Ill. Adm. Code 720.131(c)) and therefore is entitled to a Board determination that it is not a solid waste in this case. Section 720.131(c) reads as follows:

> The Board will determine that those materials that have been reclaimed but must be reclaimed further before recovery is completed are not solid wastes if, after initial reclamation, the resulting material is commodity-like (even though it is not yet a commercial product, and has to be reclaimed further). This determination will be based on the following criteria:
>
> 1) The degree of processing the material has undergone and the degree of further processing that is required;
>
> 2) The value of the material after it has been reclaimed;
>
> 3) The degree to which the reclaimed material is like an analogous raw material;

4) The extent to which an end market for the reclaimed material is guaranteed;

5) The extent to which the reclaimed material is handled to minimize loss; and

6) Other relevant factors. 35 Ill. Adm. Code 720.131(c).

Section 720.133 of the Board's hazardous waste regulations (35 Ill. Adm. Code 720.133) requires that the Board's adjusted standard procedures be used for solid waste determinations under Section 720.131(c). The Board's adjusted standard procedural rules are set forth at 35 Ill. Adm. Code 104.Subpart D.

PROCEDURAL HISTORY

BRZ filed its petition for an adjusted standard on June 30, 2006. The petition includes 26 exhibits (A-Z). Four of the exhibits (L, P, U, V) were claimed as trade secrets by BRZ and, accordingly, the Board has limited access to the articles pursuant to 35 Ill. Adm. Code 130. Along with the petition, BRZ filed a motion for expedited review. On July 20, 2006, IEPA filed a recommendation in support of the Board granting the petition.[1]

On August 4, 2006, the Board issued an order finding that BRZ had satisfied the requirement of newspaper notice for adjusted standard petitions, a prerequisite to the Board having jurisdiction over this proceeding. Section 28.1(d)(1) of the Act (415 ILCS 5/28.1 (2004)) and Section 104.408(a) of the Board's procedural rules (35 Ill. Adm. Code 104.408(a)) require petitioner to publish notice of the petition by advertisement in a newspaper of general circulation in the area likely to be affected by the proposed adjusted standard. BRZ filed a certificate of publication on July 19, 2006, documenting that the required notice of the petition was provided in the *News-Democrat*, published in Belleville, St. Clair County, on July 11, 2006. Additionally, in its August 4, 2006 order, the Board granted BRZ's motion for expedited review. In the same order, the Board also noted that BRZ had waived hearing.

Within 21 days after newspaper publication of an adjusted standard petition, any person may file a request that a public hearing be held in an adjusted standard proceeding. *See* 35 Ill. Adm. Code 104.420(a); *see also* 415 ILCS 5/28.1(d)(1). The Board received no requests for a hearing on BRZ's proposed adjusted standard.

In an August 17, 2006 order, the Board identified several informational deficiencies in BRZ's petition and directed BRZ to file an amended petition by September 15, 2006, to cure the deficiencies. Further, the Board directed IEPA to file any amended recommendation within 21 days after IEPA received BRZ's amended petition.

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[1] The Board cites BRZ's June 30, 2006 petition as "Pet. at _"; the petition's exhibits as "Exh. _ at _"; BRZ's motion for expedited review as "Mot. to Exp. at _"; and IEPA's July 20, 2006 recommendation as "IEPA Rec. at _."

On September 8, 2006, BRZ filed an amended petition. On September 18, 2006, IEPA filed a response to BRZ's amended petition, recommending that the Board grant the amended petition. As permitted by the Board's procedural rules (35 Ill. Adm. Code 104.418(d)), these respective filings did not repeat the entire unchanged portions of BRZ's original petition or IEPA's original recommendation.[2] In a September 21, 2006 order, the Board found that the amended petition addressed the identified informational deficiencies and that with the filing, BRZ had provided all of the information required for the requested solid waste determination. *See* 35 Ill. Adm. Code 104.406, 720.131(c).

FACTS

BRZ Facility

BRZ has operated an electrolytic refinery for over 65 years in Sauget to produce zinc products for various industrial and agricultural applications. Pet. at 2, 11-12. The facility is located in St Clair County at 2401 Mississippi Avenue, near the Mississippi River. Am. Pet. at 7; Exh. L at 5. Historically, the primary feedstock for the refinery has been zinc concentrates mined from deposits in Missouri and Tennessee. Pet. at 2. Also used as a feedstock has been secondary zinc oxide materials recovered from EAFD through HTMR processing. *Id*. The latter feedstock for BRZ was deemed not a solid waste by the Board pursuant to a previous adjusted standard granted in Big River Zinc, AS 99-3 (May 6, 1999). *Id*. Presently, BRZ has stopped operations at the Sauget facility because it has been unable to find sufficient amounts of feedstock at competitive prices to support ongoing refining. *Id*. at 2-3.

Zinc Uses and Markets

Zinc is an essential raw material used in galvanizing, chemicals, rubber tires, and alkaline batteries, and for brass and die cast alloys, and plant, human, and animal health applications. Pet. at 4. Galvanizing is zinc's most common use, accounting for approximately 47% of the metal's global use. *Id*; Exh. A. Galvanizing, which retards corrosion, involves coating steel with a thin layer of zinc that bonds to the steel's surface. Pet. at 4; Am. Pet. at 3.

The price of zinc is based on supply and demand and is set by the London Metal Exchange (LME), "the industry's major trade and accreditation organization." Pet. at 4. The LME price of zinc was $0.87/lb or $1912/ton as of January 3, 2006, with the lowest price listed for the last decade at $0.35. *Id*.; Exh. B. In 2002, the United States consumed 1,157,000 tons of zinc, but produced only 237,000 tons. This domestic zinc demand has generally been satisfied by imports from countries including Canada, Mexico, Peru, China, and Australia. Pet. at 4; Exh. B.

[2] The Board cites BRZ's amended petition as "Am. Pet. at _"; and IEPA's amended recommendation as "IEPA Am. Rec. at _."

Zinc Production

Generally, zinc is produced by (1) mining ores from primary zinc deposits and (2) recycling steel scrap. Pet. at 4.

Primary Zinc Production and LSXEW

Zinc deposits occur naturally as small pods of mineralization, typically found with sulfur as the simple sulfide mineral sphalerite. When a sufficient number of pods contain viable quantities of ore, the pods are mined. Mined zinc ore deposits have an average grade of about 5-6% zinc. Initially, the mined zinc ore is physically processed at the mine to separate the sphalerite from the other ore constituents, creating a concentrate generally ranging from 52-59% zinc. Pet. at 5; Exh. A; Exh. C; Exh. D at 4.2; Exh. E.

The zinc concentrate is shipped to electrolytic refineries to produce zinc metal. Pet. at 5. In a conventional refinery, the zinc concentrate is first roasted to transform the zinc sulfite into a crude zinc oxide. From the crude zinc oxide, zinc can be recovered by dissolution in dilute sulfuric acid. *Id*. Precipitated impurities must be removed from the zinc-bearing solution, which is accomplished by filtration. If the concentrate has less than approximately 40% zinc, removing greater amounts of impurities may be uneconomical. *Id*. After purifying, electrowinning is the last step, which involves "passing the solution through electrolytic cells where zinc is plated from solution." *Id*.

Some naturally-occurring zinc deposits contain not zinc sulfides but rather zinc oxides. Zinc in these deposits generally "cannot be efficiently concentrated using known economic beneficiation technologies and can also contain impurities that preclude conventional treatment." Pet at 5-6. Historically, these deposits have therefore been considered low-quality zinc feeds and "typically uneconomic to extract." *Id*. at 6. In 1999, however, a British mining and mineral exploration company, Reunion Mining, PLC (Reunion Mining), "pioneered the use of a new proprietary approach, LSXEW, for the recovery of zinc from non-sulfide deposits." *Id*.

LSXEW, which can directly process a relatively impure feedstock without initial concentration, involves:

> the direct dissolution ("L" = Leaching) of ore in dilute sulfuric acid, without prior concentration, and the subsequent purification of solutions by solvent extraction ("SX") before conventional metal recovery by electrowinning ("EW"). Pet. at 6.

The leaching and electrowinning steps in the LSXEW process are conventional technologies. Solvent extraction technology, however, while well known for other metals (*e.g.*, copper), has not been used much for zinc. Pet. at 6-8. Using a specially formulated organic solution, the LSXEW solvent extraction method separates the zinc from the impure aqueous solution to form a "high strength pure solution suitable for zinc recovery by electrowinning." *Id*. at 6-7.

Reunion Mining formed ZincOx Resources PLC (ZincOx) in 1999 to develop other opportunities for applying the LSXEW technology, including its proposed use in recovering zinc from EAFD. Pet. at 8. ZincOx developed and adapted the LSXEW process for zinc. For example, Namibia's Skorpion zinc deposit was believed to be uneconomic and so remained undeveloped for 20 years. *Id*. However, with the use of the LSXEW process:

> [T]he deposit became one of the lowest cost zinc operations and today operates as the 10th largest zinc mine in the world. The zinc oxide ore from the mine has a grade of only 10% and without further concentration is able to produce 145,000 tons of Special High Grade zinc metal per year. *Id.*; Exh. F.

Scrap Steel Recycling

In 2005, the steel industry in the United States recycled approximately 75 million tons of ferrous scrap, over 80% of which was consumed in electric arc furnaces (EAFs). Pet. at 8; Exh. G.

EAFs and EAFD. EAF recycling of scrap steel begins by loading scrap metal and other ingredients (*e.g.*, limestone, burnt lime, iron ore, and ferro-alloy additives) into a charge bucket, which is conveyed to a furnace. A crane dumps the bucket contents into the EAF, after which the furnace roof is lowered and then the electrodes are lowered to "strike an arc between the electrodes and through the scrap," commencing the melting stage. Pet. at 8-9.

Scrap is remelted in EAFs at approximately 1,400ºC. Pet. at 9. Most scrap is metallic iron, which is recycled into steel. There are, however, other materials that are removed during scrap recycling:

> More volatile elements are essentially boiled off and carried into the flues together with fine particles of iron oxide. Air mixes with the off-gasses and the volatile impurities form simple oxides that have high melting points and precipitate as a fine dust. The precipitated dust is generated during: (1) charging of scrap, (2) tapping of furnaces, (3) pneumatic injection of additives, (4) oxygen blowing, and (5) meltdown/refining periods. The dust together with the iron oxide particles are filtered and recovered as dry EAFD or scrubbed with water and collected as a filter cake. *Id.*

Zinc is present in scrap iron. During charging, the scrap "hits the molten iron" and the zinc immediately boils off, with the resulting vapor recombining with oxygen to form zinc oxide, which is collected as a major EAFD constituent in the baghouse. Pet. at 9-10. Unlike HTMR, EAF charging is a "violent, almost explosive, activity" as scrap touches molten metal at 1,400ºC. The violent reaction causes iron oxide particles on the scrap metal surface to be "blown off" and recovered in the baghouse. *Id*. at 10.

EAF melting of scrap steel concentrates zinc in EAFD. Pet. at 10. Scrap steel contains approximately 0.28% zinc; that zinc content is concentrated about 70 times during remelting (fuming) in the EAF. *Id.*; Exh. H. The zinc in EAFD comes from the zinc of galvanized scrap.

Am. Pet. at 3. Zinc concentrations in EAFD typically range from 15% to 24% but may go up to 35%, which is comparable to mined ore. Pet. at 10; Exh. I; Exh. J, Table 1; Am. Pet. at 4. The grade of zinc in EAFD varies from one mill to another because the scrap feed blend used at the mills differs depending on what final products the individual steel mill produces and because the scrap recycling process and equipment vary throughout the industry. Am. Pet. at 3-4.

Managing EAFD. EAFD is not an attractive direct feed for conventional zinc smelters, especially because of its halide (chloride and fluoride) content, which would cause serious problems during electrowinning. Pet. at 10-11. These halides cannot be removed in conventional zinc refineries. *Id*. at 11. Due to impurities in EAFD, HTMR units like the Waelz Kiln have been used to upgrade EAFD so that EAFD may be accepted by electrolytic refineries. *Id*. In the HTMR process, EAFD is:

> mixed with coal and fed into a horizontal rotary kiln . . . . The coal ignites, raising the temperature to about 1,100ºC. The coal . . . convert[s] zinc into metal, which, at 1,100ºC, immediately boils. The zinc vapor escapes from the solid material and reacts with the oxygen in the air to re-form zinc oxide. The zinc oxide condenses as a solid that is collected in bag filters as the final product. Other volatile impurities act in a similar fashion to zinc, but the iron is left behind so that the resultant "fume" is enriched in zinc, as well as impurities including chlorides and fluorides. *Id*.

BRZ Operations Historically

BRZ is owned by Korea Zinc Co., Ltd. (Korea Zinc), but is in the process of being acquired by ZincOx. Pet. at 15. For more than 65 years, BRZ's Sauget facility has been producing zinc using electrowinning refining. *Id*. at 11-12. Originally, the facility was designed to process exceptionally pure zinc ore concentrates found in regional mines. *Id*. at 12; Exh. K, Affid. of BRZ President George Obeldobel at ¶ 3. BRZ has also used HTMR-processed EAFD concentrates. Pet. at 12. BRZ has ultimately recovered zinc metal by electrolysis from zinc sulfate solution using conventional technology: roasting; leaching; partial neutralization; filtration; purification; and electrowinning. *Id*. at 12-13. The resulting zinc sheets, or cathodes, which are 99.995% zinc quality, are melted, alloyed, and cast as ingots in sizes required by customers. *Id*. at 13-14.

To upgrade the Sauget facility's processing capabilities, BRZ has invested over $80 million in capital improvements over the last eight years. Pet. at 14. During full production, the facility had approximately 300 employees. BRZ has produced zinc ingots of 99.995% purity, equaling the highest quality recognized by the LME (Special High Grade or SHG). *Id*.; Exh. K, Obeldobel Affid. at ¶¶ 4, 5. Along with ingots, the facility has produced alloys, zinc powder for batteries, zinc sulfate monohydrate to use as a micronutrient in animal feed and fertilizer, and other zinc compounds. Pet. at 14. There is a strong demand for such zinc products around the St. Louis, Missouri area. The United States is a major net importer of zinc metal. *Id*.

Regional zinc mines in the United States that have historically provided BRZ with feedstock "are now largely exhausted and have almost all closed." Pet. at 15; Exh. A. Sufficient

quantities of available concentrates are too far from the Sauget facility to be economical. Due to an "exceptional" worldwide shortage of zinc sulfide concentrates, it has been difficult for Korea Zinc to source sufficient concentrate for the Sauget operation. Pet. at 15. Quantities of available HTMR-processed zinc concentrate are also "finite and limited." *Id*.

BRZ needs to operate at "near full capacity" to run the Sauget facility economically. There is, however, only enough domestic feed for approximately 40% of the required capacity. Pet. at 15. The Sauget facility has consequently ceased operating and all but 20 employees have been laid off or terminated. *Id*.; Exh. K, Obeldobel Affid. at ¶¶ 6, 7.

Proposed LSXEW Operation

Under ZincOx's ownership, BRZ plans on spending over $40 million to restart zinc operations at the Sauget facility using the ZincOx LSXEW process. Pet. at 15. LSXEW can process a wider range of feedstock, including oxide ores, oxide concentrates, and EAFD. *Id*. Numerous steel mills operating within the region generate EAFD. EAFD is plentiful and available to be sourced from within the United States and is "high grade (when compared to many primary zinc oxide ores)." *Id*. at 16. BRZ predicts that using EAFD as feed in production operations "as a supplement to the zinc sulfide concentrate and HTMR concentrate will resolve the Facility's raw material deficiencies, allowing the Facility to operate profitably." *Id*.

LSXEW is designed to process these materials directly, without prior concentration. Impurity levels present in feedstocks like EAFD are not expected to negatively impact production economics because the solvent extraction system, as detailed below, is more efficient at purifying zinc sulfate solutions than are conventional processes used at electro-refineries. Pet. at 16.

As part of the proposed new LSXEW operation at the Sauget facility, BRZ plans to install new receiving, leaching (L), and solvent extraction (SX) equipment, but use the existing electrowinning (EW) plant. Pet. at 16. Both the existing circuit and the proposed LSXEW process involve leaching, *i.e.*, zinc oxide dissolution in dilute sulfuric acid. *Id*. The zinc feed into the leaching process for LSXEW, however, is expected to primarily be EAFD, while the conventional operation's feed has been zinc oxide calcine or HTMR concentrate. For both the new and old circuits, leaching would be followed by partial neutralization to "precipitate iron ahead of filtration to produce a clarified liquor suitable for chemical purification." *Id*. at 16-17.

The purification step is the primary difference between the proposed LSXEW process and the existing conventional process of zinc refining. Pet. at 17-18. With LSXEW, purification would be performed by solvent extraction, rather than the multi-stage filtration step of the existing system:

> In conventional purification, impure zinc sulfate solutions are treated so as to remove sequentially those impurities that would interfere with or contaminate the product of zinc electrolysis. The LSXEW process, however, extracts the zinc from the impure solution leaving behind all the other elements (whether deleterious or benign). *Id*.

In that sense, solvent extraction purifies more efficiently and comprehensively than conventional purification. For example, halides, which are problematic for the conventional process, are left behind in the solvent extraction process when the zinc is extracted into the electrolyte. Pet. at 18. With both the LSXEW and conventional processes, the respective purification steps would be followed by the refinery's zinc electrowinning circuit, which, in turn, is followed by the melting and casting of zinc. *Id*. at 17-18.

BRZ plans to continue operating the traditional extraction method for available zinc concentrates produced from sulfide ore and EAFD from HTMR processing. Pet. at 18. BRZ estimates that these sources will provide approximately 30,000 tons per year of feedstock, equivalent to one-third of the feed used for the operation before it was suspended. For LSXEW, BRZ intends to build a separate leaching and purification system parallel to the conventional process. However, the zinc-bearing solutions from both the LSXEW process and the traditional extraction process would be fed into the same electrowinning circuit. That electrowinning circuit, which currently exists at the plant, is where the zinc would be electrodeposited on cathodes before being periodically removed, melted, and cast. *Id*.; Exh. L.

With the LSXEW technology and a return to full operation, BRZ anticipates that 30,000 tons of high purity zinc metal (99.995% zinc) will be produced from EAFD annually and that the Sauget facility will employ approximately 300 people. Pet. at 19.

As proposed, the LSXEW process would generate two waste streams. First, wastewater would be generated, which BRZ expects will be pretreated in a new on-site plant, with the resulting effluent discharged to the local publicly owned treatment works (POTW), American Bottoms Regional Wastewater Treatment Facility. BRZ has a permit addressing discharge of the wastewater effluent to the POTW. Pet. at 20-21; Am. Pet. at 4-5. This on-site wastewater pretreatment would also generate wastewater residue, which BRZ proposes to send to an area landfill, though testing is underway to see if the residue may be used to produce a gypsum product for use in the cement industry. Am. Pet. at 4-5.

Second, the LSXEW process, specifically the leaching phase, would create a filter cake residue, which BRZ plans to "manage[] as a newly generated waste in compliance with all RCRA regulations." Pet. at 21-22; Am. Pet. at 6. Specifically, BRZ intends that:

> The [filter cake] residue will be managed as nonhazardous waste or characteristically hazardous waste, as appropriate after characterization. If the residue is hazardous, on-site de-characterization [*i.e.*, treatment in accumulation tanks or containers] may be performed [to render the material non-hazardous]. The residue will be transported off-site to a properly permitted landfill in units such as rail cars, roll-off boxes, dump trailers, and/or dump trucks, also in accordance with applicable laws and regulations. Pet. at 21; Am. Pet. at 6-7.

Under BRZ's plan, air pollution controls would be used for the LSXEW process itself. Am. Pet. at 5. The leaching tanks, which may produce acid mist, would be covered and vented to an alkaline venture scrubber to remove the fumes. *Id*. In place of traditional "open tank"

solvent extraction systems, the proposed solvent extraction system uses "new technology that totally encloses the process." *Id*. at 6. BRZ expects therefore that the only organic material emission from the SX system would be "from smaller pump tanks and storage tanks, which are closed vessels that vent to a thermal oxidizer emission control device." *Id*.

BRZ proposes that a covered conveyor system would be used to transfer LSXEW filter cake and wastewater treatment residue to a loading area for off-site shipment, which area would have baghouses. Am. Pet. at 6.

EAFD Sources and Management

BRZ has allied itself with Envirosafe Services of Ohio, Inc. (ESOI) to access the EAFD market. Pet. at 19. ESOI is one of the largest companies in the United States for managing, treating, and disposing of EAFD. ESOI has contracts with steel mills for EAFD management. *Id*.; Exh. M.

BRZ plans to accept at the facility only that EAFD containing a sufficient quantity of recoverable zinc, as determined by a pre-acceptance evaluation. The minimum zinc concentration in EAFD that could be economically recycled at any given time will be affected by the market price for zinc. Pet. at 19.

BRZ has established a two-step process "to ensure that EAFD received at the BRZ Facility is suitable for processing in the LSXEW zinc recovery system." Am. Pet. at 1, 4. First, BRZ plans to solicit EAFD only from sources that demonstrate that their EAFD contains zinc concentrations of acceptable grade. For this first step, BRZ intends to review existing historical data from ESOI's customer base. For potential suppliers lacking existing data, BRZ plans to have "samples . . . collected over a sufficient period of time prior to any EAFD being shipped to BRZ." *Id*. at 1-2.

The second step in BRZ's planned verification process is to sample incoming EAFD "to confirm ongoing suitability of a supplier's EAFD material for recycling at the BRZ Facility." Am. Pet. at 2. BRZ intends to regularly collect and analyze samples during the unloading of EAFD. BRZ plans to use X-ray fluorescence or a similar method on the collected samples "to obtain an elemental fingerprinting and determine the corresponding zinc concentrations of the EAFD upon receipt." *Id*. BRZ proposes to regularly review the sample results and to discontinue the use of an EAFD source if that source's "grade becomes non-economically recoverable." *Id*. Under BRZ's plan:

> Any EAFD shipped from a nonconforming source for any reason would be rejected through the hazardous waste manifest process either to an alternate facility or back to the generator. Given ESOI's role in the supply of the EAFD, it is anticipated that many of the rejected loads would be redirected to the ESOI facility in Oregon, Ohio. *Id*.

BRZ proposes to institute recordkeeping procedures to document its pre-acceptance verification and sampling program and provide IEPA with requested access to those records. *Id*. at 3.

BRZ intends to have EAFD delivered to its facility by highway or rail and "managed as a regulated RCRA hazardous waste until it arrives at the Facility." Pet. at 19. According to BRZ's plans, the trucks and rail cars containing the EAFD would be "kept closed at all times except for sampling and unloading." *Id*. Further, BRZ intends to develop a contingency plan, training plan, inspection plan, and a partially reclaimed product analysis plan in accordance with RCRA Subtitle C guidance. *Id*. at 19-20.

BRZ plans to redesign and renovate or rebuild the facility's existing raw material unloading structure "to provide an enclosure that will prevent releases during unloading." Pet. at 20; *see also* Exh. N. As proposed, the facility would have two segregated unloading areas, one for trucks and the other for rail cars. Pet. at 20. BRZ intends that:

> The unloading areas will operate with the doors closed where feasible and with no visible emissions from the building. Both areas will be operated under negative air pressure with air flow being managed through a baghouse cleaning system so as to avoid dust emissions. *** The air pollution control system for the off-loading system will be permitted and the collected dust will be recycled back into the slurry tank. *Id*.; Am. Pet. at 5.

As proposed, the EAFD unloading, blending, and slurrying would take place in a building maintained under negative pressure and vented through a baghouse. Am. Pet. at 5. BRZ plans to design and operate the Sauget facility to avoid storing any EAFD. Pet. at 20. Once the truck or rail car transporting the EAFD is inside the unloading structure, BRZ intends to have the EAFD emptied directly from the rail car or truck onto a screw conveyor leading to an adjacent slurry tank. The EAFD would be slurried in the tank with a dilute acid solution, beginning the leaching phase described above. *Id*.

Market Demand for BRZ Products

The LSXEW process, as proposed, would have four outputs: the two waste streams identified above (*i.e.*, wastewater and filter cake residue), which have a "negative value"; plus, two products, namely, zinc metal and cadmium/copper "cement." Pet. at 21. Approximately 500 tons of the cement, which results from EAFD treatment, is expected to be produced annually. BRZ has regularly sold products similar to the cement to companies that recover valuable copper and cadmium. *Id*. at 21-22.

Under BRZ's plan, zinc metal would be produced mainly as ingots of varying sizes and shapes depending upon customer needs. Pet. at 21. The LSXEW process produces zinc ingots of 99.995% purity, the highest quality recognized by the LME. *Id*. Along with ingots, BRZ intends to continue producing alloys, zinc powder for batteries, zinc sulfate monohydrate as a micronutrient for animal feed and fertilizer, and other zinc compounds. The LSXEW process would not change the zinc products produced by BRZ. *Id*.

As noted, the United States is a significant net importer of zinc and demand is high in the St. Louis area. Pet. at 22. BRZ is confident that all zinc it produces from EAFD can be sold to

BRZ's two largest customers, Steel Dynamics and U.S. Steel. *Id.*; Exh. K, Obeldobel Affid. at ¶ 8. Further, the LME is obligated to purchase available zinc from any supplier at prevailing market rates. Pet. at 22.

DISCUSSION

In this portion of the Board's opinion, the Board first gives an overview of BRZ's requested solid waste determination and IEPA's recommendation. Second, the Board discusses whether EAFD is a solid waste. Following that is a discussion of whether the provision of the Board's regulations under which BRZ seeks this determination is available in this case. Next, the Board evaluates each of the factors upon which this determination is based. Lastly, the Board discusses the conditions that apply to this determination.

Overview of BRZ Request and IEPA Recommendation

BRZ states that it filed an adjusted standard petition for a solid waste determination in order to further its efforts to restart production at the Sauget refinery. Pet. at 3. The material at issue in BRZ's first adjusted standard, AS 99-3, was secondary zinc oxide, which is created by processing EAFD through an HTMR unit before introducing the material into the electrolytic refining process as a feedstock. In contrast, with the present adjusted standard request, BRZ wishes to use EAFD *directly* as feed material, without any secondary concentration by HTMR. *Id*.

BRZ proposes to retrofit the Sauget facility with the new LSXEW technology so as to allow the refinery:

> to utilize non-sulfide feed materials, including EAFD reclaimed at steel mills, as a substitute raw material feedstock in place of some or all of the Facility's traditional raw material supplies of zinc concentrates from mined ore and HTMR. By replacing approximately one-third of the Facility's production capacity with zinc from EAFD using the critical LSXEW technology, BRZ is confident that it can restart the refinery and return its Sauget Facility operations to profitability. Pet. at 3.

BRZ seeks the new adjusted standard to be able to so use EAFD without becoming subject to various hazardous waste regulations. Pet. at 3. Specifically, BRZ is requesting "relief from the applicability of the hazardous waste regulations at 35 Ill. Adm. Code Part 720 *et seq*. to the EAFD that BRZ will receive at the Facility and use as feedstock in the LSXEW zinc recycling process." *Id*. at 38.

According to BRZ, if it had to comply with the generally applicable rules, the residues generated at the facility by the LSXEW process would have to be disposed of as K061-listed hazardous waste (at approximately $135 per ton on average) as opposed to a nonhazardous waste

(at approximately $35 per ton on average).[3] Pet. at 38, 40; Exh. Y; Exh. Z. BRZ maintains that such additional disposal expenses could "imperil[] the viability of the project and the overall operations of the refinery itself." Pet. at 39, 40. In addition to these expenses, continues BRZ, if it does not receive the requested adjusted standard:

> EAFD received for recycling in the LSXEW process would continue to be classified as a hazardous waste. Accordingly, despite the fact that BRZ is a production facility, RCRA hazardous waste obligations would apply to BRZ's management of its raw material feedstock, EAFD. *Id*.

BRZ asserts that because of the physical and chemical similarities between non-sulfide zinc ore and EAFD and the LSXEW's ability to use EAFD as feed to produce zinc products, BRZ is entitled to a determination that EAFD received at the Sauget facility is not a solid waste. BRZ insists that such EAFD is instead a recycled material that has been reclaimed but must be reclaimed further before the material is fully recovered. Pet. at 22, citing 35 Ill. Adm. Code 720.130(c).

BRZ maintains that the relief it seeks through its adjusted standard petition for a solid waste determination is narrow. Pet. at 3. According to BRZ, if the Board grants the adjusted standard, the "requested relief would apply to EAFD only upon receipt at the BRZ facility, and solely for BRZ's use as a raw material feedstock for the new LSXEW process." *Id*. BRZ states that its requested solid waste determination "would not affect the applicability of RCRA hazardous waste management requirements to the EAFD prior to delivery at BRZ." *Id*. Specifically, BRZ proposes that the requested solid waste determination would "take effect once any shipment of EAFD enters the gate and is physically present on the BRZ property." Am. Pet. at 3. Further, BRZ would still be responsible, BRZ continues, for waste management requirements that apply to wastes generated at the Sauget facility. Pet. at 3.

IEPA recommends that the Board grant BRZ's requested adjusted standard "because the Petition limits the determination that [EAFD] is not a solid waste to those instances where it is introduced into the [LSXEW] process as a raw material." IEPA Rec. at 1; *see also* IEPA Am. Rec. at 2. In its recommendation, IEPA emphasizes that LSXEW:

> is used to process zinc ores and will be used at a manufacturing facility that was developed and operated specifically for the refining of zinc and zinc compounds. The resulting product is indistinguishable from products made with virgin ores. IEPA Rec. at 1-2.

Regulatory Status of EAFD

Section 720.131(c) allows the Board to determine that certain materials that would otherwise be solid wastes are not considered solid wastes under particular circumstances.

[3] This statement by BRZ assumes that if the adjusted standard is granted, the LSXEW residue disposed of by BRZ would not be characteristically hazardous waste. Pet. at 39, 40.

Therefore, the Board first must determine that EAFD is a solid waste; if it is not, BRZ has no need for an adjusted standard.

A "solid waste" is any discarded material not otherwise excluded in the regulations. *See* 35 Ill. Adm. Code 721.102(a)(1). One of the several ways that a material may be considered "discarded" is by being "recycled" in a manner specified in Section 721.102(c) of the regulations. *See* 35 Ill. Adm. Code 721.102(a)(2). Section 721.102(c)(3) specifies, in part, that if a "sludge" listed in Section 721.132 is recycled by being "reclaimed," it is a solid waste. *See* 35 Ill. Adm. Code 721.102(c)(3), 721.Appendix Z.

The Board finds that EAFD fits within this category, *i.e.*, a listed sludge being reclaimed. A "sludge" includes a "solid . . . waste generated from [an] . . . air pollution control facility . . . ." 35 Ill. Adm. Code 721.101(c)(2); 35 Ill. Adm. Code 720.110. EAFD is generated from an air pollution control facility (*i.e.*, the emission control device of the EAF) and is therefore a sludge. In addition, EAFD is "listed" in Section 721.132 under "iron and steel production wastes" and assigned USEPA hazardous waste number K061: "Emission control dust/sludge from the primary production of steel in electric furnaces." 35 Ill. Adm. Code 721.132 (K061 has Hazard Code "T" for toxic waste, 35 Ill. Adm. Code 721.130(b)).[4]

A material is "reclaimed" if it is:

> processed to recover a usable product, or if it is regenerated. Examples are recovery of lead values from spent batteries and regeneration of spent solvents. 35 Ill. Adm. Code 721.101(c)(4).

When USEPA promulgated the federal regulation upon which Section 720.131(c) is based, it explained that materials are reclaimed if "material values . . . are recovered as an end-product of a process (as in metal recovery from secondary materials)" or if they are "processed to remove contaminants in a way that restores them to their usable original condition." 50 Fed. Reg. 614, 633 (Jan. 4, 1985). In the context of BRZ's petition, the Board finds that EAFD is being recycled by reclamation.

Because EAFD is a listed sludge that is recycled by being reclaimed, it is a solid waste. Because EAFD is a solid waste that is also a hazardous waste, the generation, transportation, treatment, and other handling of EAFD is subject to the hazardous waste regulations for those activities. *See* 35 Ill. Adm. Code 721.103(a)(2)(B), 721.130(a), 722-726, 728.

Availability of Section 720.131(c)

Generally, a waste being reclaimed remains a waste until reclamation is completed. *See* 50 Fed. Reg. 614, 620, 633-634, 655 (Jan. 4, 1985). Section 720.131(c) provides an exception to

[4] BRZ notes that USEPA's proposed hazardous waste recycling rule (68 Fed. Reg. 61558 (Oct. 28, 2003)) would exclude EAFD from the definition of solid waste where the EAFD is recycled by being reclaimed within the same industry. Pet. at 34, n.1.

this principle for material that is initially reclaimed, but that requires further reclaiming before recovery is completed.

In discussing the federal counterpart to Section 720.131(c), USEPA explains that the provision is designed to address those situations in which "the initial reclamation step is so substantial that the resulting material is more commodity-like than waste-like even though no end-product has been recovered." 50 Fed. Reg. 614, 655 (Jan. 4, 1985).

The Board finds that EAFD destined for the LSXEW process at BRZ's Sauget facility has been initially but not fully reclaimed. EAF processing increases the eventual recovery of zinc values from scrap metal. However, EAFD requires further processing to recover end products. In this case, that further processing is LSXEW, which, as proposed, would directly accept EAFD as feed. The LSXEW refining process recovers a special high-grade quality zinc. The Board finds that Section 720.131(c) is available here because once zinc-containing scrap has been processed in an EAF to create EAFD for the LSXEW unit, there has been initial but not complete reclamation.

Section 720.131(c) Factors

The Board must determine whether EAFD, as proposed to be used by BRZ at the Sauget refinery, is commodity-like based on the Section 720.131(c) factors. BRZ maintains that such EAFD is "commodity-like when received by BRZ for recycling." Pet. at 22. The USEPA preamble to the federal rule analogous to Section 720.131(c) provides that the Board "may weigh these factors as [it] sees fit, and may rely on any or all of them to reach a decision." 50 Fed. Reg. 614, 655 (Jan. 4., 1985). Considering the factors, the Board finds that EAFD is commodity-like under the specific circumstances of this case. The Board now addresses the factors in turn.

The Degree of Processing the Material has Undergone and the Degree of Further Processing That is Required

In explaining the federal counterpart to Section 720.131(c)(1), USEPA states that "the more substantial the initial processing, the more likely the resulting material is to be commodity-like." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). BRZ asserts that, given the LSXEW innovation, the EAFD that BRZ would receive "has undergone sufficient reclamation such that it constitutes a partially reclaimed material that can be used directly as an economic feedstock in the LSXEW refining process." Pet. at 23.

A primary feedstock for EAFs in the production of new steel is scrap steel, which contains zinc because over 90% of steel contains a protective zinc coating, *i.e.*, is galvanized. Pet. at 23. In an EAF, zinc is separated from scrap steel and concentrated, generating concentrated zinc oxide in the form of EAFD. The high temperature EAF processing at steel mills "results in dramatically increased zinc concentrations from scrap steel to the EAFD." *Id.*; Exh. H. BRZ states that it would accept EAFD only from mills that use zinc-containing feeds such as scrap steel. Pet. at 23.

The process of zinc reclamation by EAF is fundamentally the same as that used by HTMR, the initial reclamation step involved in AS 99-3. Both processes involve heating, zinc volatilization, zinc oxidation, and baghouse collection. EAF processing actually "increases zinc concentrations by a factor of 70 times as opposed to the modest factor of 3 times for HTMR." Pet. at 23-24. For example, if the grade of zinc in EAF feedstock is 0.30%, the resulting EAFD would have a zinc grade of approximately 20% (*i.e.*, a concentration factor of 67), which EAFD would in turn serve as feedstock for an HTMR. HTMR (Waelz Kiln) processing of that EAFD would produce a material with a zinc grade of about 58% (*i.e.*, a concentration factor of 3). *Id*. at 24.

Because of past limitations of EAFD reclamation technologies, industry has historically viewed EAFD as necessarily requiring either off-site disposal or extensive processing to remove impurities before it could be considered commodity-like. Pet. at 24-25. Applying the LSXEW process to zinc refining "fundamentally alters this analysis" by allowing EAFD to be introduced directly into a zinc refining operation "as a raw material supplement or replacement for the non-sulfide zinc ores." *Id*. at 25.

The Board finds that when considered in light of the LSXEW processing that EAFD would undergo, EAF processing is substantial. The Board therefore finds that this factor supports BRZ's claim that EAFD in this context is commodity-like.

The Value of the Material After It Has Been Initially Reclaimed

USEPA states that "the more valuable a material is after initial processing, the more likely it is to be commodity-like." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). In addressing Section 720.131(c)(2), BRZ concedes that "[v]aluation is an elusive issue when dealing with EAFD which, absent reclamation, must be disposed of as hazardous waste." Pet. at 25. BRZ maintains, however, that EAFD's value to BRZ is "clearly significant" because:

> the availability and use of this [EAFD] feedstock in the LSXEW transforms the BRZ operation from a shuttered plant to a viable enterprise, directly employing 300 people. *Id*.

EAFD has a grade of approximately 20%, which represents a contained-zinc value of $460 per ton of EAFD based on the current zinc price of $2,300 per ton. Pet. at 25. In comparison, Skorpion mine ore has a grade of 10% zinc and a corresponding contained-zinc value of $230 per ton of ore, *i.e.*, roughly half that of EAFD. *Id*. BRZ asserts that the Skorpion mine ore "is of sufficient grade (value) to provide a very attractive investment return on the $450 million capital development cost for that project." *Id*.

According to BRZ, there is "strong competition for [EAFD] among the recycling companies." Pet. at 25. Currently, EAFD is valued for its zinc content through recycling by HTMR, an established reclamation technology that uses about 60% of all EAFD generated in the United States. *Id*. Now, however, BRZ states, EAFD is valuable without additional HTMR processing:

> Because of the revolutionary LSXEW process, EAFD, for the first time, is a valuable material in its initially reclaimed form when delivered to BRZ as a substitute for natural ores and concentrates. The consequence of this technology is the creation of a new market for a material that would otherwise need to be disposed or further processed before being transformed from an inherently waste-like material into a usable feedstock. *Id*. at 26.

Further, having EAFD as a feedstock, according to BRZ, would "dramatically reduce[] the costs of the raw materials utilized at the BRZ Facility," as well as "resolve[] concerns regarding the availability of sufficient raw material supplies." *Id*.

BRZ acknowledges that, as with ore deposits, "not all zinc bearing material will be economical to treat." Pet. at 26. The viability of EAFD as a feedstock for LSXEW will depend on several factors, including the zinc price, operating costs, and the EAFD's zinc grade. *Id*. Accordingly, the minimum zinc grade of EAFD that BRZ can economically process might vary over time. *Id*. The feasibility study for the Skorpion mine concluded that a minimum grade of 3.81 to 3.91% zinc in ore was needed over the life of the open pit. *Id*. at 26-27; Exh. D at 7.2.2. BRZ contemplates having a minimum acceptable grade for EAFD addressed in the EAFD supply agreement with ESOI. Pet. at 27; Exh. L; Exh. P. Further, BRZ plans to review EAFD source data before delivery, as well as sample incoming loads, to help ensure that EAFD received by BRZ is suitable for LSXEW processing. Am. Pet. at 2.

IEPA maintains that before being introduced into the LSXEW process, the EAFD "has no market value and may still be sent for disposal." IEPA Rec. at 2. However, IEPA states, EAFD is a "raw material when introduced into the LSXEW process." *Id*.

The Board finds that EAFD, used as a feedstock for BRZ's LSXEW process, has significant value.

The Degree to Which the Initially-Reclaimed Material is Like an Analogous Raw Material

In discussing the federal factor corresponding to Section 720.131(c)(3), USEPA states that "[i]f the initially-reclaimed material can substitute for a virgin material, for instance as a feedstock to a primary process, it is more likely to be commoditylike." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). In BRZ's view, this factor calls for a two-part analysis:

> [F]irst, similar constituents must be present to those found in the raw material, and second, the material must not contain significant amounts of hazardous constituents not found in the raw material. Pet. at 27.

BRZ proposes using EAFD as a feedstock "to replace mined sources of zinc." *Id*.

BRZ states that "no two zinc oxide ores are the same" because their formation in nature involves "complex interactions between other matter occurring in the deposit and ore minerals, air, water, and host rock chemistry." Pet. at 27. Ultimately, continues BRZ, EAFD constituents

and composition are "within the range generally found in naturally occurring zinc deposits" and EAFD therefore serves as an "analogous feed substitute for zinc oxide ores." *Id.*

Below is a comparison of raw zinc sulfide ore, zinc sulfide concentrates, zinc oxide ore, and EAFD:

Element	Zinc Sulfide Ore (% by weight)	Zinc Sulfide Concentrate (% by weight)	Zinc Oxide Ore (% by weight)	EAFD Oxides (% by weight)
Zinc	2.5-10	47-60	7.5-25	15-24
Lead	0.5-5	0.75-15	0.5-6	2.6-5
Cadmium	0.005-0.1	0.1-1	0.05-0.50	0.03-0.07
Iron	25-50	1-10	1.5-15	19-32
Copper	0.1-1.5	0.1-2.5	0.01-0.15	0.2-0.4
Sulfur	20-50	30-35	0.2-3.5	1.8-2.2
Arsenic	0.001-0.25	0.01-0.15	0.05-1.0	<0.001-0.10
Calcium	0.1-5	0.01-1	1-20	4-30
Silica	0.5-5	0.1-5	2.5-15	1.4-2.1
Magnesium	0.5-5	0.01-1	0.1-7.5	1.5-2.6
Aluminum	0.5-5	0.05-0.20	1-5	0.2-0.5
Sodium	0.1-0.5	0.01-0.06	0.01-0.20	0.3-1.4
Chloride	N/A	0.01-0.05	0.05-0.75	0.6-1.5
Fluoride	N/A	0.01-0.02	0.02-0.10	0.2-0.4

Pet. at 27-28; Exh. K; Exh.Q; Exh. R; Exh. S.

The following compares zinc concentrations in EAFD with zinc oxide ores from around the world:

Source	Location	Zinc Concentration
Skorpion	Namibia	10%
Mae Sot	Thailand	22%
Jabali	Yemen	10%
New Jersey	United States	20%
Shaimerden	Kazakhstan	24%
Remac	Canada	10%
Sierra Mojada	Mexico	12%
EAFD	United States	20%

Pet. at 19; Exh. J; Exh. T.

According to BRZ, LSXEW allows zinc in EAFD to be reclaimed for high-quality zinc production "using ultimately the same electroplating technology as is used for the production of zinc derived from sulfide concentrate." Pet. at 29. BRZ further states that EAFD is the "only locally abundant source of zinc feedstock to the LSXEW process," which new technology allows EAFD to be used like an analogous raw material. *Id.* The Board finds that EAFD, for purposes

of the proposed LSXEW process, is very similar to and can be substituted for mined sources of zinc.

The Extent to Which an End Market for the Initially-Reclaimed Material is Guaranteed

In discussing the federal version of the Section 720.131(c)(4) factor, USEPA states:

> If the [petitioner] can show that there is an existing and guaranteed end market for the initially-reclaimed material (for instance, value, traditional usage or contractual arrangements), the material is more likely to be commodity-like. 50 Fed. Reg. 614, 655 (Jan. 4, 1985).

As BRZ notes:

> This factor focuses in large part on ensuring that the material will not be stored for significant periods of time and on avoiding the potential risk that such stockpiling could impose. Pet. at 30 (citing 67 Fed. Reg. 52617, 52622 (Aug. 13, 2002)).

BRZ states that its facility will be designed "only to accept quantities of EAFD that can be immediately processed." Pet. at 30. BRZ assures that "[n]o storage of EAFD prior to entering the production process will be conducted at the Facility." *Id*. BRZ adds that there is a strong market for the zinc ingots to be produced, noting that the United States is "a net importer of zinc because domestic production is inadequate to meet demand." *Id*. Moreover, BRZ continues, the most common domestic application of zinc is in the galvinzation of steel:

> Since there are a large number of steel mills located within a reasonable distance of BRZ, the partially reclaimed zinc in EAFD can be obtained from those mills, fully reclaimed at BRZ, and sold back to the very industry from which it was obtained. *Id*.

According to BRZ, other routine uses for zinc, including battery powder, reducing agents, die cast and brass mill applications, and zinc oxide for rubber tires, ceramics, and additives in paint, and plant, human, and animal health products, "provide a long term guarantee for the continued market demand." *Id*.

BRZ states that during its long operating history, it has always been able to find markets for its products, and maintains that its "customer base remains strong and viable." Pet. at 30; Exh. K. The problem for the Sauget facility, BRZ asserts, has instead been ensuring that its processing operations be conducted cost-effectively so that facility operations remain profitable. Pet. at 31. Traditionally, according to BRZ, the largest cost it has faced has been for raw materials, typically costing 50 to 70% of the value of BRZ's products: "With the introduction of the LSXEW process and the expanded use of EAFD as raw material feed, the BRZ operation becomes financially viable." *Id*.

Additionally, zinc, like other internationally traded metals, is bought and sold through the LME. Pet. at 31. As BRZ explains, the LME guarantees to buy zinc at its daily quoted price, helping to smoothe out "uncharacteristic short term supply/demand variability" and create price stability. *Id*. BRZ accordingly concludes that there will "always be a buyer for BRZ's production because of the purity of the end product produced by the LSXEW/electrowinning process (99.995% Zn)." *Id*.

Considering BRZ's planned in-take and use of EAFD in the LSXEW process, as well as the demand for zinc in the United States, BRZ's customer base, and the availability of the LME, the Board finds that this end-market factor weighs in favor of finding that such EAFD is commodity-like.

The Extent to Which the Initially-Reclaimed Material is Handled to Minimize Loss

USEPA states that the "more carefully a material is handled, the more it is commoditylike." 50 Fed. Reg. 614, 655 (Jan. 4, 1985). In addressing the Section 720.131(c)(5) factor, BRZ asserts that because EAFD is similar to ore materials that are often too expensive as feedstock, "BRZ has an economic incentive to properly manage the EAFD throughout the system." Pet. at 31. According to BRZ, because zinc in EAFD is "by far the greatest source of revenue (greater than 90%) from the new facilities to be installed" at the Sauget site, "its value is critical and loss reduction is paramount in exactly the same way as it would be for any conventional mining or refining operation." *Id*. at 33. Simply put, it is in BRZ's financial interest not to lose the material: if BRZ loses EAFD, it has less feedstock for the LSXEW.

BRZ also emphasizes that its cooperative arrangement with ESOI "will ensure proper handling of EAFD and management of process residues." Pet. at 31-32. ESOI, along with its affiliated company Conversion Systems, Inc., has over 12 years of experience in shipping, treating, and disposing of EAFD, including operating on-site EAFD treatment facilities at customers' steel mills. *Id*. at 32. According to BRZ, ESOI, which owns and operates a RCRA Part B permitted treatment, storage, and disposal facility, has safely managed over 2.5 million tons of EAFD. ESOI provides transportation services for steel mills, including rail car tracking and management, and has direct rail service of EAFD into its containment building. BRZ has allied with ESOI "to ensure a viable market for and safe delivery of EAFD, and to provide expertise and assistance in the permitting, construction, and operation of the BRZ Facility." *Id*.; Exh. M.

As proposed by BRZ, EAFD would be transported in tightly sealed vehicles by highway or rail and unloaded through "enclosed systems equipped with controls to prevent releases of material." Pet. at 33. The off-loading facility would be enclosed with a floor, walls, and a roof. BRZ proposes to use a baghouse or an equivalent device on all air pollution control systems managing the off-loading building ventilation and hoods. Further, BRZ would:

> take measures to control fugitive dust emissions such that any openings (doors, windows, cracks, etc.) exhibit no visible emissions through the use of negative pressure inside the building and the use of a slurry system to minimize dusting when unloading. In addition, all associated particulate collection devices (*e.g.*,

fabric filter, electrostatic precipitator) will be operated and maintained with sound air pollution control practices and the recovered dust will be reintroduced into the process via the slurry tank. *Id*.

BRZ also states that the EAFD itself would be "unloaded directly into the closed loop LSXEW process." Pet. at 33. In short, concludes BRZ, the "unloading and processing" of EAFD at the Sauget facility would be "enclosed, minimizing losses of its valuable EAFD feedstock." *Id*. Moreover, according to BRZ, "[a]ny EAFD shipped from a nonconforming source for any reason would be rejected through the hazardous waste manifest process either to an alternate facility or back to the generator." Am. Pet. at 2.

The Board finds that for the LSXEW process at the Sauget facility, BRZ has established that EAFD will be handled to minimize loss.

Other Relevant Factors

Under Section 720.131(c)(6), the Board may consider any other factors "only to the extent that they are relevant to whether [EAFD] is commodity-like." *See* *In re* Petition of Big River Zinc Corporation for an Adjusted Standard Under 35 Ill. Adm. Code 720.131(c), AS 99-3, slip op. at 14 (Apr. 15, 1999); *see also* *In re* Petition of Horsehead Resource and Development Co., Inc. for an Adjusted Standard Under 35 Ill. Adm. Code 720.131(c), AS 00-2, slip op. at 14-15 (Feb. 17, 2000).

BRZ states that using the LSXEW process at the Sauget facility will increase the overall EAFD recycling rate in the United States by 30%. Pet. at 34. The Board finds that increased recycling of EAFD, in and of itself, is not relevant to determining EAFD's commodity-like status. It is the logical expectation with adjusted standards of this sort that increased recycling will necessarily result. *See* Big River Zinc, AS 99-3, slip op. at 14 (Apr. 15, 1999) (petitioner "has not established that an increase in EAF dust recycling is relevant to the question"). The Board finds, however, that such a dramatic enlargement of the national EAFD market (*i.e.*, 30%), as well as the resultant "transform[ation of] a shuttered business into a viable industrial enterprise," does enhance the commodity-like nature of the EAFD at issue. *Id*. at 36-37.

BRZ also expects numerous environmental benefits to flow from issuance of the adjusted standard. For example, in contrast to the traditional refining process used at the Sauget facility, the LSXEW process does not require roasting before leaching. Pet. at 17, 21. At the suspended production levels for the facility, BRZ roasted 100% of the zinc concentrate received. With the addition of LSXEW, BRZ expects to do about one-third less roasting and to therefore reduce air emissions by over 30%. *Id*. at 21, 35. BRZ also emphasizes that the adjusted standard would lead to less landfilling of EAFD (with the corresponding preservation of hazardous waste disposal capacity) and less resource depletion from zinc mining. *Id.* at 34-36, 40.

The Board finds that while these anticipated improvements for the environment are laudable, they do not bear upon whether EAFD is commodity-like and accordingly are not relevant to this determination. *See* Big River Zinc, AS 99-3, slip op. at 14 (Apr. 15, 1999) (noting that the Board encourages recycling, but holding that increased recycling alone is

irrelevant to the solid waste determination); Horsehead Resource and Development, AS 00-2, slip op. at 15 ("Although the Board encourages increased recycling, it cannot be classified as a 'relevant factor' because it is not relevant to the determination that [the material at issue] is commodity-like.").

Board Determination

The Board finds that BRZ has established that EAFD, as proposed to be used in the LSXEW process at BRZ's Sauget facility, is commodity-like under the Section 720.131(c) factors and therefore not a solid waste. The Board accordingly holds that an adjusted standard is warranted.

Conditions on the Adjusted Standard

Through its petition and amended petition, BRZ proposed the following language for the adjusted standard:

> The Board hereby determines that all electric arc furnace dust received by Big River Zinc Corporation at its facility in Sauget, St. Clair County, Illinois, and placed directly in the LSXEW zinc recycling process for use as feedstock is, upon receipt by Big River Zinc, not a solid waste. Pet. at 39.
>
> BRZ shall maintain records that document the sources of all EAFD material that BRZ accepts under this adjusted standard.
>
> BRZ shall maintain records that document the completion of pre-acceptance evaluations and document the results of testing to determine zinc concentrations in EAFD shipped to the BRZ Facility from individual sources.
>
> Representative samples shall be collected and tested in accordance with generally accepted practices, such as X-ray fluorescence and those specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication No. SW-846 (Third Edition).
>
> BRZ shall maintain the records required under this Order for a period of three years and shall make such records available for inspection and copying at any reasonable time during normal business hours upon the Illinois Environmental Protection Agency's request. Am. Pet. at 3.

IEPA asserts that it is "appropriate to limit the determination . . . to only those instances where it has been introduced into the LSXEW process" and states that BRZ's petition and amended petition accomplish that objective. IEPA Rec. at 1-2; IEPA Am. Rec. at 2.

Section 28.1(a) of the Act provides in part that "[i]n granting [] adjusted standards, the Board may impose such conditions as may be necessary to accomplish the purposes of this Act." 415 ILCS 5/28.1(a) (2004)). The Board finds BRZ's proposed adjusted standard language

appropriate and will adopt it in the order below with several minor clarifications. The Board has imposed similar conditions on prior solid waste determinations. *See* Big River Zinc, AS 99-3, slip op. at 6 (May 6, 1999); Horsehead Resource and Development, AS 00-2, slip op. at 17.

Additionally, in its August 17, 2006 order, the Board directed BRZ to clarify (1) precisely when BRZ proposed having the solid waste determination attach to the EAFD and (2) how any rejected loads of EAFD would be handled. *See* Big River Zinc, AS 06-4, slip op. at 2 (Aug. 17, 2006). First, BRZ replied by proposing that the solid waste determination "take effect once any shipment of EAFD enters the gate and is physically present on the BRZ property." Am. Pet. at 3. Second, BRZ responded by stating that any EAFD shipped to BRZ from a source whose EAFD does not conform to BRZ's minimum acceptable grade "would be rejected through the hazardous waste manifest process either to an alternate facility or back to the generator." *Id*. at 2. The Board will add BRZ's explanatory language to the adjusted standard to clarify the scope and conditions of the relief granted.

CONCLUSION

The Board finds that BRZ has established that EAFD delivered to its Sauget zinc refinery as a feedstock for the LSXEW process is commodity-like. Accordingly, the Board finds that EAFD, under these circumstances, is not a solid waste and grants BRZ's petition under Section 720.131(c) for an adjusted standard, subject to the conditions set forth in this order.

The Board emphasizes that this determination applies only to EAFD to be processed through LSXEW at BRZ's electrolytic zinc refinery in Sauget, St. Clair County. Further, this determination applies only to EAFD shipments once they enter the gate of the BRZ facility and are physically present at the facility.

This opinion constitutes the Board's findings of fact and conclusions of law.

ORDER

1. The Board finds that all electric arc furnace dust from the primary production of steel (K061 under 35 Ill. Adm. Code 721.132) (EAFD) received by Big River Zinc Corporation (BRZ) at its zinc refinery (2401 Mississippi Avenue, Sauget, St. Clair County, Illinois) (BRZ Facility) and placed directly into the BRZ Facility's Leaching, Solvent Extraction, Electrowinning (LSXEW) zinc recycling process as feedstock is, upon receipt by BRZ at the BRZ Facility, not a solid waste. The Board accordingly grants BRZ an adjusted standard under 35 Ill. Adm. Code 720.131(c).

2. This adjusted standard is subject to the following conditions:

    a. The determination described in paragraph one of this order applies only to an EAFD shipment once it enters the gate of the BRZ Facility and is physically present at the BRZ Facility.

b. Any EAFD shipped to the BRZ Facility from a source whose EAFD does not conform to BRZ's minimum acceptable grade for zinc concentrations must be rejected by BRZ through the hazardous waste manifest process and redirected either to an alternate facility or back to the generator.

c. BRZ must maintain records that document the sources of all EAFD that BRZ accepts under this adjusted standard.

d. BRZ must maintain records that document the completion of pre-acceptance evaluations and document the results of testing to determine zinc concentrations in EAFD shipped to the BRZ Facility from individual sources.

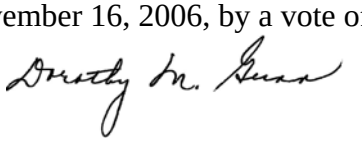
e. BRZ must collect and test representative, supplier-specific samples of EAFD delivered to the BRZ Facility. Each sample must be collected and tested in accordance with generally accepted practices, such as X-ray fluorescence and those specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," USEPA Publication number SW-846 (Third Edition, Final Update IIIA, April 1998), as amended by Updates I, IIA, III, and IIIA (Document No. 955-001-00000-1).

f. BRZ must maintain the records required under paragraphs 2(c), 2(d), and 2(e) of this order for a period of three years and must make such records available for inspection and copying at any reasonable time during normal business hours upon the Illinois Environmental Protection Agency's request.

IT IS SO ORDERED.

Section 41(a) of the Environmental Protection Act provides that final Board orders may be appealed directly to the Illinois Appellate Court within 35 days after the Board serves the order. 415 ILCS 5/41(a) (2004); *see also* 35 Ill. Adm. Code 101.300(d)(2), 101.906, 102.706. Illinois Supreme Court Rule 335 establishes filing requirements that apply when the Illinois Appellate Court, by statute, directly reviews administrative orders. 172 Ill. 2d R. 335. The Board's procedural rules provide that motions for the Board to reconsider or modify its final orders may be filed with the Board within 35 days after the order is received. 35 Ill. Adm. Code 101.520; *see also* 35 Ill. Adm. Code 101.902, 102.700, 102.702.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on November 16, 2006, by a vote of 4-0.



Dorothy M. Gunn, Clerk
Illinois Pollution Control Board