Attachment 1
Authorization and Exemption Support Material

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1. INTRODUCTION

The purpose of this letter is to request NRC approval of proposed procedures for disposal of the above referenced ^{137}Cs-contaminated K061 in accordance with the provisions of 10 CFR 20.2002. Approval of the proposed disposal procedures in accordance with 10 CFR 20.2002 would allow Nucor Steel – Jewett Texas (Nucor) to dispose of ^{137}Cs-contaminated K061 from the Nucor facility near Jewett, Texas, at the US Ecology facility located near Grand View, Idaho. A description of the material to be disposed in included in Section 3 of this document. The description includes physical and chemical properties of the material important to risk evaluation and the proposed conditions of waste disposal. In addition Nucor has performed a conservative radiological assessment of the material and determined that the potential dose to the workers involved in the transportation and placement of the material and to members of the general public after site closure will be no more than a few millirem per year total effective dose equivalent (TEDE). This dose will be a small fraction of the NRC decommissioning limits for exposure to members of the public of 25 millirem/yr TEDE.

Nucor has developed this request and related safety assessment in consultation with US Ecology, including health physics personnel responsible for the receiving disposal facility's radiological performance assessment.

2. DISPOSAL SITE CHARACTERISTICS

A recent description of the USEI site was submitted by Connecticut Yankee (CY-04-168, docket number 50-213). We refer you to that description which is still reflective of the Idaho facility. A copy of the description is included as ***Attachment 2 – Recent Description of USEI Site***.

The only significant departure from the above referenced information is that USEI has recently (May, 2005) modified to its permit to authorize the receipt of up to an average of 25 pCi/g of fission or activation products (including ^{137}Cs) in any conveyance or container. The RESRAD model was upgraded by USEI to include site-specific parameters. This improved performance assessment model was used to calculate potential doses based on the subject waste stream. Output from the model, which indicated adequate protection of public health and safety, is included as ***Attachment 3 – USEI 2005 Performance Assessment Model Output.***

3. DESCRIPTION OF THE WASTE

The material is primarily emission control dust for the primary production of steel in an electric arc furnace. The normal process that generates these materials involves the melting of scrap metals. In this process, most impurities in the scrap steel are removed and generally contained within process related slag or off-gas. Typically the off-gas carries dust that can contain iron and zinc, together with certain heavy metals, through an emission control system to a "baghouse", where the dust is captured in "bag-type" filters. The hazardous constituents within the dust are principally lead, cadmium, and chromium, and per the RCRA regulations, classified as EPA waste code K061.

The physical properties range brown to black in color and from a fine to small particle in size. A small percentage of this material may cling together in clumps as large as a "softball". The pH ranges from 6-8. The density ranges from 1.2 to 1.3 g/cm^3.

4. RADIOLOCICAL ASSESSMENTS

4.1. Transport Worker Dose Assessment

The transportation Scenario Maximally Exposed Individual (MEI) dose equivalent will not exceed a few (e.g., five (5)) millirem/yr. This standard of a "few millirem/yr" to a member of the public is defined in NRC Regulatory Issue Summary 2004-08. The transportation workers and worker at the US Ecology site are treated as members of the public as the US Ecology site is not licensed by the NRC. Evaluations of both internal and external dose hazards to the transportation worker are discussed below.

As the concentration of the cesium will be below 1 Bq/g (0.555 Bq/g), a volumetric concentration deemed by the International Atomic Energy Agency to deliver a trivial dose, i.e., an annual dose of 10 μSv/yr (1 millirem/yr), Nucor believes the material's concentration constitutes adequate evidence that the cesium contaminated K061 is not likely to cause a dose in excess of a " few millirem/yr' to the maximally exposed transportation worker. It is also clear that doses to the general public during transportation by rail can reasonably be expected to be below those projected for transportation workers.

4.2. USEI Worker Dose Assessment

<u>Dose to RTF Workers</u>

Workers at the USEI rail transfer facility (RTF) may receive dose while surveying incoming hopper cars and while removing the K061 from those cars. A pneumatic (vacuum type) system will be used to transfer the dust from the hopper to maintain potential exposures to as low as reasonably achievable levels (ALARA). Surveying procedures for the rail cars require the USEI employee to take multiple radiation readings along both sides and ends of each railcar. The time to perform these surveys is estimated to be no greater than 20 minutes. Based on experience, the employee is assumed to stand an average distance of one meter from the railcar during the procedure. Using the average concentration of 0.555 Bq (15 pCi/g), the MicroShield™ (***Attachment 3-1***) model calculates a dose rate of 1.42E-5 mSv/hr (1.42E-3 mrem/hr) at one meter from a hopper car. During the transfer of the K061 dust from the hopper car to a truck a USEI employee is required to stand on top of the hopper car on average up to 45 minutes in order to use an air lance to direct materials that may have clumped to the inner sides of the hopper car into the pneumatic system. Since it is possible that the same person who conducts the survey might also operate the air lance, the dose from both activities is conservatively assigned to one employee for the purpose of this assessment. The total hypothetical dose from both operations is (1.083 hr x 1.42 E-5 mSv/hr = 1.5E-5 mSv or 1.5E-3 mrem. The time taken to unload one hopper car is usually 5 hours. Two of these cars could be unloaded each day. Again, conservatively assuming that the same person surveyed and air-lanced the second car the MEI would receive a total dose of 3E-5 mSv or 3E-3 mrem.

The material from the hopper and gondola cars will be loaded into trucks for transfer to the disposal site. Generally, three trucks equipped with trailers will be required to unload one hopper or gondola car. The trucks require 5 minutes to survey. Surveys are conducted in the same manner as described for the rail cars. The total dose delivered during the survey of a gondola car is calculated to be 9.0E-6 mSv (9.0E-4 mrem). The dose calculated for surveying 3 trucks was calculated to be 7.0E-6mSv (7.0E-4 mrem).

An additional potential source of dose for the workers at the RTF is from cesium attached to airborne particulates. Handling K061 generates a visible dust. For the purpose of this assessment the dust loading in the air is conservatively assumed to be 50 mg/m^3. This concentration is considerably in excess of the threshold for nuisance dust, 15 mg/m^3. Based upon these conservative assumptions the airborne concentration of cesium would be expected to be 0.02775 Bq/m^3 or 0.75 pCi/m^3. Assuming the individual is in the airborne area for 8 of the 10 hours he works, his exposure without a respirator would be 2.78E-7 Bq/ml or 7.5E-13 μCi/ml (approximately one, one hundred-thousandth of the derived air concentration for ^{137}Cs). In practice all personnel who work in the RTF handling hazardous materials are required to wear a respirator during operations. Wearing the respirator adds a protection factor of 50 for USEI employees. Therefore, the airborne contribution to dose can be disregarded. Nucor does not anticipate sending more that 30 of these cars to USEI, hence, the TEDE to one individual should he survey and unload all of these cars would be less than 1 millirem for the year.

On any day there will be no fewer that 5 workers at the RTF. Assuming duties are shared equally, the dose to any one of them for the entire Nucor project would not exceed 1.3E-4 mSv (1.3E-2 mrem)

Truck drivers

USEI uses 15 trucks a day to haul material to the site. Dose rates calculated for the driver at 1.3 feet from the waste were calculated to be 4.39E-5 mSv/hr (4.39E-3 mrem/hr) Considering that a driver will make 4 round trips from the RTF to the disposal site each day, the dose calculated for each driver for the whole project is as follows: At 3 truck loads of material for each hopper or gondola of material received, the waste will require 60 trips to the disposal site. There are routinely 15 trucks assigned each day to transport waste. Therefore, each driver will make 4 four trips to deliver waste to the disposal site. A trip to the site takes 45 minutes. Each driver would receive a dose for the total project of 1.13E-4 mSv or 1.13E-2 mrem.

Stabilization Building Workers

Unloading of the material will take place in a building designed as a containment building in accordance with 40 CFR 264 subpart D. Another potential contributor to dose would be the metals stabilization treatment of the K061 at the main site to meet RCRA land disposal requirements. The stabilization process does not require an operator to be closer than 4.56 meters from the materials being treated. Each batch of material being treated will weigh about 72,000 kg. The material will be mixed by the operator wearing a respirator within an enclosed (cab) excavator. The material is mixed in a recessed, steel lined pit pit surrounded by plastic curtains. These measures partially shield the operator. Two of these loads are processed each day. Based on each batch requiring 30 minutes for mixing, and a dose rate about one quarter that for the RTF surveyor, a conservative estimate of dose for mixing both batches would be 1.42E-5 mSv or 1.42E-3 mrem. Over the coarse of the project (~a 20 day period) a single operator's estimated total dose for the year from this waste stream would be 2.84E-4 mSv or 2.84E-2 mrem. This is also conservative since multiple operators working during the facility's two shifts will likely share the mixing work.

Cell Workers

Again, using conservative assumptions, it is clear that the potential dose from inhalation of airborne radioactivity is negligible as demonstrated for the RTF worker. Stabilization of the material for the RCRA component will result in an increase in the volume and mass of the waste material, effectively reducing the concentration. For the purposes of this evaluation, we assume that the mass of the waste will be increased by a factor of 1.5. The resulting concentrations will be two-thirds of its original magnitude or 0.37 Bq/g (10 pCi/g). The mass to be disposed will be 108,000 kg.

Two employees at USEI operate heavy equipment in the landfill cell. These individuals would have occasion to receive an external dose from the K061 waste. Approximately 108,000 kg of this material will be buried in the cell at one time. Normal procedure requires the material be laid down in lifts of approximately 1 meter depth. Given a volume of approximately 72 m^3 at one meter depth this material would cover an area of 72 m^2 (***Attachment 3-2***). Conservatively assuming a single equipment operator (multiple are likely) worked on an area of this material 2 hours each day for a period of 20 days results in a calculated dose of 1.37E-3 mSv or 0.137 millirem during the disposal of the NUCOR material. As demonstrated at the RTF inhalation poses negligible dose potential.

5. POST-CLOSURE DOSE ASSESSMENT

As mentioned previously, the RESRAD model has been improved to more accurately portray hydro-geological conditions at the site, more accurately reflect available pathways for dose and building practices in the local area. New radionuclides were added to the source term in the contaminated zone including ^{137}Cs. The model assumes that the volume of the cell consists of the radionuclides at the given concentrations listed in the contaminated zone. The dose limit for the modeling time frame is 0.15 mSv/yr or15 millirem/yr. The period for which the model must demonstrate this limit is 1000 years. The maximum calculated dose rate of 0.1072 mSv/yr or10.72 millirem/yr is attained in year 287. This dose is caused by radionuclides other that ^{137}Cs. As can be seen in ***Attachment 3-3***, ^{137}Cs at 0.925 Bq/g (25 pCi/g) contributes only an insignificant dose during the time frame of the model. It may be concluded that the cesium contaminated K061 from the Nucor facility will have a vanishingly small impact on projected post-closure dose from the USEI facility (***Attachment 3-4***).

6. CONCLUSIONS

Nucor believes the evaluations above successfully demonstrate that the potential exposure to any individual member of the general public, including site workers, will be considerably less than one millirem (10 μSv) for the year as a result of the transfer, treatment and disposal of its cesium contaminated emissions control dust.