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POTENTIAL IMPACTS OF PENDING RESIDUAL RADIOACTIVITY RULES

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DISCLAIMER

DESCRIPTION OF PENDING REGULATIONS

The U.S. EPA Decommissioning Staff Draft

The scope includes setting standards for the remediation of soil, groundwater, surface water, and structures at Federal facilities. A staff draft is in review and comment resolution. Pathway analysis and modeling are in progress, the most mature of which are the soil regulations. The major element of this regulation is the establishment of a 15 millirem per year effective dose equivalent exposure to the reasonably maximumly exposed individual. If this level is met, the facility may be abandoned with no restrictions based on its future use.

The 15 millirem per year value includes a four millirem per year component dedicated to the groundwater associated with the facility. The basis for this regulation has been developed from the International Atomic Energy Agency, the International Council on Radiation Protection, and the National Council on Radiation Protection recommendations. The risk based levels are consistent with the CERCLA requirements for an excess cancer rate of 10^{-4} to 10^{-6}. In actuality, the 15 millirem per year dose equates to a 3×10^{-4}, which is considered to be within the range described by the U.S. EPA.

United States Nuclear Regulatory Commission Radiation Site Draft Cleanup Staff Draft

The scope includes specific radiological criteria for decommissioning of soils and structures at NRC license facilities. A final rule is anticipated in May 1995. The major element of this regulation is the establishment of a 15 millirem/year total effective dose equivalent, distinguishable from background and with ALARA considerations. The basis is the International Council on Radiation Protection and the National Council on Radiation Protection recommendations for individual dose.

Solid Radioactive Waste Regulations

The scope of regulations under being developed are, however, not fully determined. They may include source material, special nuclear material, byproducts, high-level waste, mixed waste, transuranic waste, and low-level waste. An issue paper and a preproposal draft have been developed. The proposed draft, Environmental Radiation Protection Standards for the Management, Storage and Disposal of Low Level Radioactive Waste (40 CFR 193), was issued in December 1994. The major elements will include requirements for treatment, storage and disposal of radioactive waste.

The most significant issue being discussed in the preliminary development of this regulation is the inadequacy of current waste classification systems. In essence, it may be appropriate for regulators to come up with a new classification system based on hazard rather than the generating process. In some cases, low-level waste are more hazardous than some forms of high-level waste, as well as some forms of NORM waste being more hazardous than mixed waste.

U.S. EPA Radioactive Material Recycling

The scope for recycling radioactive material rules has not been determined, but may include both restricted and unrestricted scenarios for regulation and implementation. The current status is that an issue paper is being developed to initiate the discussions and identify the need for any future regulations. Presumably, the regulation will rely on recommendations issued by the IAEA, OECD, ICRP and NCRP. The IAEA has issued a document on exemption criteria for radioactivity and the NCRP has authorized the formation of a committee to make recommendations on clearance levels.

Impact of Potential Pending Regulations

It is premature to address the impact of the pending regulations on the current waste management practices at the Fernald site. The desire is to have consistent and accepted rules governing the activities associated with radioactive waste management. At the Fernald site the question is extremely significant because the issuance of any of these rules will occur during the implementation of the Fernald cleanup. Therefore, adjustments will have to be made as the work is conducted. At the Fernald site it is not possible to wait for resolution of these issues and issuance of these regulations.

Recycling radioactive scrap metal will continue to play an important role in the remediation of the Fernald site.

Risk Based Regulations are welcome, and it is felt that they can be implemented at the site with little concern. The impact of any regulation will primarily be associated with the cost of dispositioning the material. In the absence of adequate regulation, or with regulations that result in clearance levels which are indistinguishable from the background radiation, Fernald may elect to provide timely land burial versus recycling or reuse.

SUMMARY

The Fernald site is an ongoing project. We are on the verge of implementing large scale activities which will result in a generation of large quantities of radioactive waste, including radioactive scrap metal. Under the current regulations, Fernald is able to recycle a portion of the radioactive scrap metal being generated at a cost which is comparable to other viable options such as land burial.

The pending regulations will be issued during the life of the Fernald project, and may have a severe impact to the ability of Fernald to continue beneficial reuse or recycling of its radioactive scrap metal, and may result in the burial of this material along with the contaminated soils and other radioactive waste residues. At this time, however, it is premature to speculate on these impacts given the lack of scope definition and lack of confidence in the ability to develop a widely accepted regulation concerning release of radioactive scrap metal.

Future RSM Management

At the completion of the initial scrap metal recycling project the management at Fernald reviewed the performance of the contract and the methodologies employed. A primary consideration was made to further segregate any future generated radioactive scrap metal. The segregation would occur primarily based on physical form, with the distinction being made on not only the radiological characteristics, but the presentation of the substrate.

METAL CLASSIFICATIONS

Metal waste at the FEMP is divided into two categories: refuse and recoverable. Recoverable metal (scrap metal) is further divided into two subcategories; recyclable and reusable. The distinctions are based on the physical and radiological characteristics of the metal form. Disposition of these materials can only be identified once the materials are appropriately categorized. Appropriate segregation into these categories will facilitate the most cost effective and timely final disposition of metal waste. The following are descriptions of the categories:

1. REFUSE - Refuse metal waste is metal which is radiologically contaminated or suspected of being radiologically contaminated. The physical form of the metal is such that is excessively oxidized or a bimaterial form where separation of the metal from the other materials is not cost effective. Evaluation of cost effectiveness requires a comparison of the cost of managing the material as refuse considering the regulatory status of the material as a waste (a specific material may be cost effective to recover if it would be regulated as mixed waste, whereas it may not be cost effective to recover if it would be regulated as low level radioactive waste).

2. RECOVERABLE - Recoverable metal is metal which is radiologically contaminated and can be processed for unrestricted release or controlled reuse. Generally, this category includes all metal which does not have the refuse characteristics.

   A. Unrestricted Release metal is metal which can be decontaminated and all potentially contaminated areas are accessible for direct contamination survey. Generally, unrestricted release scrap metal has a low surface area to mass ratio. Examples of reusable scrap metal are structural steel, tanks and decking. Metal forms may be considered for unrestricted release even if there are minor portions which cannot be cleaned or monitored if that portion can be effectively removed from the form.

   B. Restricted Release scrap metal is metal which cannot be decontaminated or surveyed to verify that the release limits have been met. Generally, restricted release metal is light gauge or has inaccessible areas where contamination may be present, such as ductwork, cabinets, machinery, and odd sized forms. Restricted release scrap metal may include unrestricted release metal when it is determined that the restricted end-use is more cost effective.

Fernald will be generating large quantities of radioactive scrap metal. It is anticipated that during the demolition of the former production area, more than 50,000 tons of radioactive scrap metal will be generated. Nearly one-third of this will fit into the category of Unrestricted Release Recoverable metal, while the remainder will be considered Restricted Release Material not conducive to free-release in accordance with existing surface radioactivity guidance.

Plant 7

As a result of the demolition of the building of Plant 7, 710 tons of structural steel and deck plate has been generated. All of this material has been containerized into reusable containers, and is awaiting shipment to an offsite facility for surface decontamination and free-release. The contamination level of the structural steel is a nominal 30,000 dpm per 100 centimeters squared or 4.51 becquerel per centimeter squared.

Only depleted uranium was processed at this facility, and measurements were taken to determine the thickness of lead base paint on the members. 8 mils of lead base paint were discovered to be on the surfaces. A contract has been let for the transportation, surface decontamination, survey, release, and secondary waste disposal of the 710 tons of scrap metal. The end product will be recycled scrap metal with no restrictions, and will be sold to a commercial vendor. It is believed that 95% by weight will be recycled.

The cost of the activity is approximately $1.4 million, as compared to a disposal cost of $2.6 million for this material. An important consideration in conducting cost comparisons between recycle and reuse options versus disposal is an understanding of the packaging efficiency for this type of material. Previous experience at Fernald has indicated that a density of 16 lbs/cubic foot can be obtained without exhaustive size reduction actions. Given that no automated or methodized size reduction capabilities exist at Fernald, it is appropriate to use this density in the disposal analysis.

Material Release Facility

Another project initiated at the Fernald site is the utilization of a previously unused facility as a Material Release Facility. The purpose of this facility is to provide the necessary quality assurance, survey and decontamination operations to release metal from the radiologically controlled area. The candidate material identified for processing through this facility is in general heavy gauge, lightly contaminated material that is suspected of not requiring exhorbant decontamination technologies. In fact, the only decontamination techniques which are employed are dry vacuuming, scrubbing, scraping and low pressure steam with detergent additives. It is anticipated in the future that additional decontamination technologies (i.e. grit blast, close circuit grit blast) will be employed but will not be complex from the perspective of either capital investment or technology.

Through the first five months of the project nearly 180 tons of metals have been released and sold to local scrap dealers for nominal scrap value. This facility operation will continue through the life of the remedial project. As long as activities are ongoing in the radiologically controlled area, there will exist a need for the controlled survey and release of items that may become potentially contaminated.

Fernald believes that it will process approximately 600 tons of material through this facility annually.

Waste Management Approach

The approach at Fernald is to develop a portfolio of disposition options for the waste generated as a result of the remedial action. At different times within the life of the project, various needs will become priority. Most notably, the needs will consist of economic evaluations and scheduler concerns. It is felt that with a portfolio of options for the management of the various types of radioactive waste the most responsible disposition will be able to be utilized.

Regulations

All of these management techniques have been developed to conform to the currently existing regulations. Changes are anticipated in the regulation of radioactive waste treatment storage and disposal. Most notably in the definition of radioactive material itself and also recycling radioactive scrap metal criteria.

At this point, the existing regulations only allow for the release of material which can be demonstrated to conform to surface radioactivity guidance. No regulatory foundation exists for the release of volumetric contamination or material that has inaccessible contamination for surveying.

As a summary to the pending regulations within the United States, Table II is offered to depict the activity. When cleaning a facility, it is easily visualized that there are four modes of releasing contaminants into the environment which could result in potential exposures. Of the four exposure pathways two are extremely well regulated. Air emissions resulting from the operation and decommission of a facility are well regulated under the Clean Air Act. Additionally, any water effluent associated with a facility are well regulated under the Clean Water Act and the Safe Drinking Water Act. The direct exposure associated with the facility, and the exposure associated with the solid waste generated at the facility are less well regulated.

Place Table II here

There are two pending regulations for the control of direct exposures as a result of a facility being remediated. One regulation, "Radiological Criteria for Decommissioning" issued by the United States Nuclear Regulatory Commission (NRC), is designed to regulate facilities which operate under an NRC license. A parallel regulation issued by United States Environmental Protection Agency entitled "Radiation Site Cleanup Standards" is being developed for implementation at facilities other than NRC license facilities, such as federal facilities.

By definition, if the air, water, and direct exposure routes are regulated to certain levels, this will dictate a certain amount of solid waste be generated to conform to these standards. The industry is in great need of regulations which will adequately address the issue of solid waste, of which recycling regulations would be a subset. The U.S. EPA is developing regulations for solid waste. The overall program originally titled "Radiation Waste Management" has been developed and will continue to be worked on for the next several years. As a subset of this, a specific regulation will be developed for the management of materials which may be recycled out of this solid waste.

POTENTIAL IMPACTS OF PENDING RESIDUAL RADIOACTIVITY RULES

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ABSTRACT

The purpose of this paper is to present an overview of pending rules governing residual radioactive release criteria and radioactive waste management, and the potential impact of these rules on the Fernald Scrap Metal program. More than 300,000 cubic meters of radioactively contaminated waste will be generated during the dismantlement of three complexes at the Fernald Site over the next year and a half. Under current regulations, as much as 70% (5,000 tons) of steel will be either recycled or re-used in controlled applications. Depending on regulatory developments, the ratios of recycling to burial will range from 100% burial to recycling more than 90% of the waste.

The absence of federal rules and regulations for classification of permissible levels of residual radioactivity is one of the most troublesome issues in the nuclear industry. The issue is growing in importance with the approaching end of useful life for many nuclear power generating stations and the planned remediation of the DOE nuclear weapons complex. Federal regulators have been involved in the "Enhanced rulemaking" process for over two years. The DOE Fernald site offers a good opportunity for understanding the potential impacts of the pending residual radioactivity regulations due to the maturity of the planned D&D activities, aggressive recycling program, and simple nature of contamination. The Fernald experience may offer a point of departure for many facilities engaged in D&D and waste management.

BACKGROUND

The Fernald Site is a former uranium metal production facility which was utilized for the conversion of UF6 to uranium metal and other applications within the Department of Energy. The production mission commenced in 1952, and proceeded through 1989. In 1989, the Department of Energy made a decision to end the production mission at the Fernald facility and began the remedial action dedicated to the cleanup of the former production facility.

As a result of production activities, uranium contamination was dispersed throughout the 80 acre production area. Two major areas being addressed within the complex include the former production facility and the waste pit area west of the production facility used for land placement of various process generated from the beginning of operations until 1985.

In 1985, land burial at the facility was ended and process waste were either stockpiled or packaged for transport and burial at the Nevada Test Site (NTS).

The mission was very straight forward with respect to the operations at the Fernald facility. The primary contaminants associated with all areas at Fernald are uranium, and thorium. No reprocessed fuel was used at the facility, therefore, fission products and activation products are not suspected at Fernald.

Various forms of Uranium were produced during the life of the project, which included a depleted uranium metal, normal distribution metal, and also low enriched uranium up to approximately 2% Uranium 235. The goal of the remedial action at the

Fernald site is to excavate and stabilize the waste that was previously placed in the ground, remove contamination from an aquifer which underlies the entire facility, and to take to grade or demolish all of the production facilities formerly used for uranium production.

As a result of the remedial actions, a large quantity of radioactive waste will be generated. Table I depicts the volumes of the major categories of waste. As can be seen, the total is nearly 3,000,000 cubic meters of waste, two-thirds of which will be soil and clay. The next major contributor to the volume of waste requiring remediation is 600,000 cubic meters of waste pit contents, and the remaining portion, nearly 300,000 cubic meters, will involve the management of the construction debris from the dismantlement.

Place Table I here

SCRAP METAL MANAGEMENT

Historical Practice

The historical practice for the management of radioactive scrap metal generated during the production mission was to stockpile the metal in the northeast section of the production area. By 1989, more than 6,000 short tons of radioactive scrap metal had been placed in the scrap metal storage area. An aggressive project was initiated in 1991 to clean up this area and plans were developed for the management of the radioactive scrap metal.

Nearly 4,000 tons of the radioactive scrap metal were packaged into large 8 foot x 8 foot x 20 foot containers and transhipped to the Nevada Test Site for burial. A project was initiated in 1991 to recycle or beneficially reuse the remaining metal stockpiled at the scrap metal storage facility.

The radioactive scrap metal destined for recycling or beneficial reuse consisted of both ferrous and non-ferrous metals (primarily ferrous metals) with a nominal contamination level of 50,000 dpm per 100 centimeters squared or 8.3 becquerel per centimeter squared with natural uranium.

A turnkey project was initiated to hire a subcontractor to provide characterization, size reduction, packaging, transportation, surface decontamination, metal melt, and secondary waste disposition. The end product for the action was the fabrication of shield blocks which would be transhipped to the Department of Energy for use as shielding in accelerator projects within the medium energy physics program. At the completion of the project, 90% of the material by weight had been beneficially reused or recycled.

A cost assessment was performed for the activity in which the recycle and reuse contracts was compared to the historical practice of disposal at the NTS. Disposal of the 2,210 tons of scrap metal would have cost approximately $4 million as compared to the expenditure of nearly $4.8 million to contract the services for beneficial reuse.

A net cost advantage was realized, given that the DOE avoided the expenditure of more than $1.7 million for the purchase of virgin metal shield block for the medium energy physics program. The benefit equated to nearly $1 million savings within the DOE.