

SEC Petition Evaluation Report Petition SEC-00108

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Petition Administrative Summary

Petition Under Evaluation

Petition #	Petition Type	Petition A Receipt Date	DOE/AWE Facility Name
SEC-00108	83.14	3/12/2008	Nuclear Materials and Equipment Corporation (NUMEC) Parks Township

Proposed Class Definition

All Atomic Weapons Employer employees who worked at the Nuclear Materials and Equipment Corporation plant in Parks Township, Pennsylvania, from June 1, 1960 through December 31, 1980, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

Related Petition Summary Information

SEC Petition Tracking #(s)	Petition Type	DOE/AWE Facility Name	Petition Status
None			

Related Evaluation Report Information

Report Title	DOE/AWE Facility Name
None	

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Evaluation Report Summary: SEC-00108, NUMEC Parks Township

This evaluation report by the National Institute for Occupational Safety and Health (NIOSH) addresses a class of employees proposed for addition to the Special Exposure Cohort (SEC) as defined by the *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, 42 U.S.C. § 7384 *et seq.* (EEOICPA) and 42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act of 2000*.

NIOSH-Proposed Class Definition

The NIOSH-proposed class includes all Atomic Weapons Employer (AWE) employees who worked at the Nuclear Materials and Equipment Corp. plant in Parks Township, Pennsylvania from June 1, 1960 through December 31, 1980 for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

Feasibility of Dose Reconstruction

Per EEOICPA and 42 C.F.R. § 83.14(b), NIOSH has established that it does not have sufficient information to complete dose reconstructions for individual members of the class with sufficient accuracy. NIOSH lacks adequate and reliable personal monitoring data, workplace monitoring data, and source term descriptions, making reconstruction of internal doses infeasible.

Health Endangerment Determination

The NIOSH evaluation did not identify evidence supplied by the petitioners or from other sources that would establish that the class was exposed to radiation during a discrete incident likely to have involved exceptionally high-level exposures, such as nuclear criticality incidents or other events involving similarly high levels of exposures. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of radionuclides and direct exposure to radioactive materials. Consequently, in accordance with 42 C.F.R. § 83.13(c)(3)(ii), NIOSH has determined that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class, or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

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SEC Petition Evaluation Report for SEC-00108

1.0 Purpose and Scope

ATTRIBUTION AND ANNOTATION: This is a single-author document. All conclusions drawn from the data presented in this evaluation were made by the Oak Ridge Associated Universities Team Lead Technical Evaluator: Joseph S. Guido, MJW Corporation, Inc. These conclusions were peer-reviewed by the individuals listed on the cover page. The rationales for all conclusions in this document are explained in the associated text.

This report evaluates the feasibility of reconstructing doses for all employees who worked at a specific facility during a specified time. It provides information and analysis germane to considering a petition for adding a class of employees to the Congressionally-created Special Exposure Cohort (SEC).

This report does not make any determinations concerning the feasibility of dose reconstruction that necessarily apply to any individual energy employee who might require a dose reconstruction from NIOSH, with the exception of the employee whose dose reconstruction could not be completed, and whose claim consequently led to this petition evaluation. The finding in this report is not the final determination as to whether or not the proposed class will be added to the SEC. This report will be considered by the Advisory Board on Radiation and Worker Health (the Board) and by the Secretary of Health and Human Services (HHS). The Secretary of HHS will make final decisions concerning whether or not to add one or more classes to the SEC in response to the petition addressed by this report.

This evaluation, in which NIOSH provides its findings on both on the feasibility of estimating radiation doses of members of this class with sufficient accuracy and on health endangerment, was conducted in accordance with the requirements of EEOICPA and 42 C.F.R. § 83.14.

2.0 Introduction

Both EEOICPA and 42 C.F.R. pt. 83 require NIOSH to evaluate qualified petitions requesting the Department of Health and Human Services add a class of employees to the SEC. The evaluation is intended to provide a fair, science-based determination of whether it is feasible to estimate, with sufficient accuracy, the radiation doses of the proposed class of employees through NIOSH dose reconstructions.¹

NIOSH is required to document its evaluation in a report, and to do so, relies upon both its own dose reconstruction expertise as well as technical support from its contractor, Oak Ridge Associated Universities (ORAU). Once completed, NIOSH provides the report to both the petitioners and the Advisory Board on Radiation and Worker Health. The Board will consider the NIOSH evaluation report, together with the petition, comments of the petitioner(s) and such other information as the Board considers appropriate, to make recommendations to the Secretary of HHS on whether or not to

¹ NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 C.F.R. pt. 82 and the detailed implementation guidelines available at <http://www.cdc.gov/niosh/ocas>.

add one or more classes of employees to the SEC. Once NIOSH has received and considered the advice of the Board, the Director of NIOSH will propose a decision on behalf of HHS. The Secretary of HHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Board, and the proposed decision issued by NIOSH. As part of this final decision process, the petitioner(s) may seek a review of certain types of final decisions issued by the Secretary of HHS.²

3.0 NIOSH-Proposed Class Definition and Petition Basis

The NIOSH-proposed class includes all AWE employees who worked at the Nuclear Materials and Equipment Corp. (NUMEC) plant in Parks Township, Pennsylvania from June 1, 1960 through December 31, 1980 for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the SEC. During this period, employees at this facility were involved in nuclear research and production of nuclear materials involving isotopes of uranium, plutonium, thorium, polonium, radium, iridium, cobalt, mixed fission products and activation products.

The evaluation responds to the Petition designated SEC-00108 which was submitted by an EEOICPA claimant whose dose reconstruction could not be completed by NIOSH due to a lack of sufficient dosimetry-related information. This claimant was employed from 1973 – 1977. NIOSH's determination that it is unable to complete a dose reconstruction for an EEOICPA claimant is a qualified basis for submitting an SEC petition pursuant to 42 C.F.R. § 83.9(b).

4.0 Radiological Operations Relevant to the Proposed Class

The following subsections summarize the radiological operations at the NUMEC Parks Township site from June 1, 1960 to December 31, 1980 and the information available to NIOSH to characterize particular processes and radioactive source materials. Using available sources, NIOSH has attempted to gather process and source descriptions, information regarding the identity and quantities of radionuclides of concern, and information describing processes through which the radiation exposures of concern may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is meant only to be a summary of the available information.

4.1 Operations Description

Construction on the NUMEC Parks Township site began on September 28, 1959 and was completed by May 1960. Receipt of radioactive materials (plutonium) began in June 1960; however, the Atomic Energy Commission (AEC) license for operation was not approved until March 1961. The following process descriptions are based on: *Description of Processes at Parks Township Facility* (BWXT/date unknown); *Brief History of NUMEC to Present B&W PANSO* (Former Production Manager, 2007). 2007); and *Large Scale Processing of Plutonium in an Industrial Plutonium Plant* (Caldwell, 1970).

² See 42 C.F.R. pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available at <http://www.cdc.gov/niosh/ocas>.

Building A: Plutonium Processing

Building A was constructed in five major phases from 1959 until 1970. The original portion of the building was designed as a plutonium laboratory to perform research and development (R&D) leading to plutonium-based products for emerging nuclear businesses. Initial operations in Building A were authorized by the AEC in 1960. Many experimental fuel forms and compositions were produced there in the 1960s, including oxides, carbides, and metal alloys. Work with nuclear materials in Building A was conducted in fabrication areas designated as Fab 1 through 7 and Fab 9, and in several small laboratories adjacent to the Fab areas. Indications are that all significant work on nuclear fuel materials was done within containment systems such as radiochemical hoods and glove boxes.

Plutonium scrap recovery was an integral part of Building A operations. Scrap recovery operations were conducted in Fab 5 until August 1, 1967. Recovery operations were moved in 1968 to a much larger, improved operation in Fab 6 that operated throughout the 1970s and into 1980. Conversion of plutonium nitrate to plutonium oxide was performed at the north end of Fab 1 inside HEPA-filtered glove boxes.

The chemical, physical, mechanical, and radiochemical properties of in-process fuel, finished fuel forms, and radiation sources were determined on small samples in several small laboratory rooms adjacent to the west side of Fabs 1, 2, 3, and 4. Separate laboratories existed for wet chemistry, metallography and mechanical properties, and radiochemistry. An analytical chemistry laboratory was also installed in Fab 5 after removal of the scrap recovery process equipment; however, this lab only operated for about six months during 1979-80.

Alpha, neutron, and thermal sources were also produced in Building A. The two most common neutron sources were double-encapsulated plutonium-beryllium metallic sources and compacted mixtures of americium oxide and beryllium metal powders. These neutron sources were made in the Fab 4 area. A standard alpha source was made that consisted of a plutonium oxide film deposited on one or both sides of a flat metal backing plate. Limited quantities of various other neutron, beta, and gamma sources were also made to specific customer specifications. Materials used in these specialty sources included polonium, plutonium, americium, iridium, cesium, cobalt, and beryllium. Source manufacturing always took place inside HEPA-filtered glove boxes, except for high-activity sources fabricated in the Building A Hot Cell.

Gamma sources of Ir-192 and Co-60, which required extensive shielding (i.e., a hot cell), and high-yield neutron sources of Po-210/beryllium were fabricated in the Building A Hot Cell, but the primary work performed in the Hot Cell was destructive post-irradiation examination of test capsules and fuel pins irradiated in research reactors.

All plutonium glove boxes and fume hoods were removed from Building A during a 1981-1983 deactivation program. Most of the effluent streams that existed during the years of plutonium fuel production were thus eliminated. The workload in Building A then shifted to repair and refurbishment of contaminated equipment used at reactor sites, building decontamination, and Low Level Radioactive Waste volume reduction services for commercial customers. As commercial work slowed in the mid-1990s, the pace of building decontamination increased.

Building B: Multiple-Purpose Facilities

Building B was constructed in three stages, beginning in 1961 when the Hafnium Facility was built. The second stage occurred in 1963 when the Metals Plant was built to the east of the Hafnium Facility. The third stage occurred in 1964, when the space between the Hafnium Facility and the Metals Plant was enclosed to create the Machine Shop. Later in its history, the combined facility became known as the Metals Building, and then Building B.

Depleted uranium was the primary radioactive material processed in Building B, although smaller quantities of natural uranium, thorium, and Pu-238 were also processed. The depleted uranium was primarily in the form of metal or metal alloy. Processing consisted mostly of forming, rolling, and machining operations that do not generate significant airborne emissions. The thorium work consisted of thorium fuel encapsulation and production of thorium containing experimental fuel.

Hafnium Facility

While most of the Hafnium Facility was used to produce bars of zirconium and hafnium, Pu-238 nitrate was converted into an oxide product in a room in the northwest corner of the Hafnium Facility known as the Plutonium Annex, under an AEC contract. The conversion process for the Pu-238 nitrate was very similar to the process used for converting Pu-239 nitrate into fuel products in Building A except that only oxalate precipitation was used. The conversion was performed in eight HEPA-filtered glove boxes.

Machine Shop

The Machine Shop, which connected the Hafnium Facility to the Metals Plant, was used to fabricate equipment and machine metals in support of the production lines at the NUMEC Apollo and NUMEC Parks Township sites. The equipment in the Machine Shop included drill presses, lathes, shears, grinders, polishers, welders, sandblasting, degreasing and other associated metal-working machinery.

Machining of depleted uranium was performed in the Machine Shop, as was repair/refurbishment of equipment from the Apollo and Parks facilities. Some of this equipment contained levels of radioactivity that exceeded the then-existing criteria for release for unrestricted use.

All machining operations took place on the ground floor. The second floor contained primarily offices and a training room, although a small environmental laboratory was in use at the south end of the second floor until 1991. After 1991, most of the second floor was used as office space until decontamination operations started in Building B in late 1996.

Metals Plant

Built in 1963, the original layout of the first floor of the Metals Plant included a variety of equipment used in the production of uranium metal alloys. Metals production from the Metals Plant appears to have been small-scale and intermittent. During a plant tour by the Atomic Energy Commission (AEC), Smith (1965) noted that the Metals Plant was engaged in the production of thorium containing experimental elements. Most of the processing equipment was removed for resale or disposal in

1973-74. During the mid-1970s, a portion of the high bay area was used to machine non-radioactive fan components.

The second floor of the Metals Plant initially contained only one office, but over the years other offices were added along with two physical and mechanical testing laboratories for quality control testing, and an Energy Conversion Lab (also called the R&D Lab) where R&D projects were performed, such as the development of Pu-238-fueled heart pacemakers, under an AEC sealed-source license.

Building C: High-Enriched Uranium Processing

Combined with the general expansion of Building A in the 1969-70 time period, a new building was erected to the east of Building A. The building sat unused until 1973 when the company received a contract to fabricate a high-enriched uranium product, as authorized by the AEC in Amendment No. 83 to SNM-414.

4.2 Radiation Exposure Potential from Operations

Based on the site operations outlined in Section 4.1 and NIOSH evaluations of available dosimetry data, NIOSH concluded that workers at NUMEC Parks Township had the potential for internal radiation exposures (from uranium, thorium, plutonium, polonium, iridium-192, cobalt-60, and mixed fission and activation products) and external exposures (from beta-gamma and neutron radiation) during the performance of their work.

4.3 Time Period Associated with Radiological Operations

Per the DOE Office of Health, Safety and Security, the time period associated with EEOICPA-covered AWE operations at the NUMEC Parks Township site is from 1957 through 1980 (DOE, 2008). As presented in Section 4.1, NIOSH has determined that receipt of radioactive materials (plutonium) at the NUMEC Parks Township site began in June 1960 (Caldwell, 1970). NIOSH has been unable to determine a more specific date for when AWE radiological operations began; therefore, this evaluation assumes that AWE radiological operations began on June 1, 1960. NIOSH has also been unable to establish a definitive date in 1980 when AWE radiological operations ceased; therefore, this evaluation assumes that the AWE radiological operations at the NUMEC Parks Township site ceased on December 31, 1980.

4.4 Site Locations Associated with Radiological Operations

NIOSH does not have not access to information that either details or restricts the use of AEC-related radionuclides to particular areas of the NUMEC Parks Township site. Without such information, NIOSH is unable to limit the SEC class based on work locations within the site. Consequently, the entire NUMEC Parks Township site is included in the proposed SEC class.

4.5 Job Descriptions Affected by Radiological Operations

According to the NUMEC Health and Safety Manual (NUMEC, 1974), all personnel who normally worked in the Restricted Areas at the Parks Township Site were required to wear dosimeters, thus indicating external monitoring may be adequate to define the class. However, during an AEC inspection in 1967 (USAEC, 1967), the inspectors noted that the radiation dose rate in an unrestricted area exceeded 2 mrem/hr, thus exceeding regulatory requirements for unrestricted areas. Surveys of unrestricted areas (NUMEC, 1968) were conducted between 1966 to 1968 also indicate periodic dose rates approximately 12 mR/hr in unrestricted areas outside the scrap recovery facility (FAB-5). Although most of the dose rates were relatively low (background levels to < 0.5 mR/hr) around the facility, these periodic higher dose rates in unrestricted areas indicate that at various times unmonitored workers could have been exposed to low to moderate doses of radiation. In addition, NIOSH has limited documentation that associates job titles and/or job assignments with specific radiological operations from which to develop a co-worker model for these unmonitored workers.

Due to the lack of information regarding worker job descriptions, and lack of knowledge concerning worker movements on the NUMEC Parks Township site during the AWE period and evidence of measurable radiation exposures in unrestricted areas, NIOSH is unable to use job descriptions to define or limit the proposed SEC class.

5.0 Summary of Available Monitoring Data for the Proposed Class

The primary data used for determining internal exposures are derived from personal monitoring data, such as urinalyses, fecal samples, and whole-body counting results. If these are unavailable, the air monitoring data from breathing zone and general area monitoring are used to estimate the potential internal exposure. If personal monitoring and breathing zone area monitoring are unavailable, internal exposures can sometimes be estimated using more general area monitoring, process information, and information characterizing and quantifying the source term.

This same hierarchy is used for determining the external exposures to the cancer site. Personal monitoring data from film badges or thermoluminescent dosimeters (TLDs) are the primary data used to determine such external exposures. If there are no personal monitoring data, then exposure rate surveys, process knowledge, and source term modeling can sometimes be used to reconstruct potential exposure.

A more detailed discussion of the information required for dose reconstruction can be found in OCAS-IG-001, *External Dose Reconstruction Implementation Guideline*, and OCAS-IG-002, *Internal Dose Reconstruction Implementation Guideline*. These documents are available at: <http://www.cdc.gov/niosh/ocas/ocasdose.html>.

NIOSH data capture efforts included making formal requests to the former site operator Babcock and Wilcox (BWXT) and the NRC. Personal monitoring data are available for monitored individuals who worked at NUMEC Parks Township from 1960 to the end of the decommissioning phase.

5.1 Internal Personnel Monitoring Data

Urine bioassay data for americium, plutonium, and uranium are available for workers at NUMEC Parks Township from 1961 through 1976. Fecal bioassay results for americium, plutonium and uranium are available from 1969-76. A very limited number of bioassay samples are available for thorium (six urine and five fecal samples, all collected in June 1971) and mixed fission products (four urine samples collected in September 1962; two urine samples collected in June 1971). The thorium bioassay samples also appear to have been for employees who worked predominately at the Apollo plant.

The contractor Controls for Environmental Pollution (CEP) was used by NUMEC to analyze urine and fecal bioassay samples from 1976-93. Available information indicates that CEP was the sole such contractor used during this period. In 1994, CEP came under suspicion of data falsification for analyses performed for Sandia National Laboratories (Sandia) from 1992-94. The allegations were serious enough that federal authorities executed a search warrant for CEP records, and the NRC and DOE issued press releases to their licensees that the accuracy of the data provided by CEP was questionable (NRC 1994). Although the NUMEC period almost completely predates these events, there is no indication for what time period the CEP data can be considered reliable. Because it is not clear to NIOSH what actions may have been taken by NUMEC in response to these allegations, NIOSH is unable to validate NUMEC monitoring data for the period containing CEP results. A 1994 press release by the NRC to its licensees states that the events related to CEP give reason to question the sample results received from the company (NRC, 1994).

NUMEC Parks Township personnel were also evaluated by whole-body counting from 1968-85. NUMEC initially used the services from the Helgeson mobile body counter and later had a contract with the University of Pittsburgh. Only employees who normally worked in the restricted area were monitored for U-235 and/or Pu-239/Am-241.

5.2 External Personnel Monitoring Data

External dosimetry data for NUMEC Parks Township employees who normally worked in the restricted areas are available from 1961-83.

5.3 Workplace Monitoring Data

Air sampling data sheets (for both uranium and plutonium) are available starting in 1961 in the form of general air samples and breathing zone samples. Available data range in frequency from numerous samples per year (greater than 100) to sporadic sample coverage. At this time NIOSH has not been able to determine whether the difference in sample frequency represents a variation in the degree of radiological risk, changes in monitoring programs, or lapses in captured data.

5.4 Radiological Source Term Data

Radioactive materials handled at the NUMEC Parks Township site included isotopes of plutonium, uranium, americium, thorium, polonium, iridium, and mixed fission and activation products. Without additional documentation, NIOSH cannot make assumptions about particular radionuclides, quantities, or forms of source materials that may have been used in specific areas of the site.

6.0 Feasibility of Dose Reconstruction for the Proposed Class

42 C.F.R. § 83.14(b) states that HHS will consider a NIOSH determination that there was insufficient information to complete a dose reconstruction, as indicated in this present case, to be sufficient, without further consideration, to conclude that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy.

In the case of a petition submitted to NIOSH under 42 C.F.R. § 83.9(b), NIOSH has already determined that a dose reconstruction cannot be completed for an employee at the DOE or AWE facility. This determination by NIOSH provides the basis for the petition by the affected claimant. Per § 83.14(a), the NIOSH-proposed class defines those employees who, based on completed research, are similarly affected and for whom, as a class, dose reconstruction is similarly not feasible.

In accordance with § 83.14(a), NIOSH may establish a second class of coworkers at the facility for whom NIOSH believes that dose reconstruction is similarly infeasible, but for whom additional research and analysis are required. If so identified, NIOSH would address this second class in a separate SEC evaluation rather than delay consideration of the claim currently under evaluation (see Section 10.0). This would allow NIOSH, the Board, and HHS to complete, without delay, their consideration of the class that includes a claimant for whom NIOSH has already determined a dose reconstruction cannot be completed, and whose only possible remedy under EEOICPA is the addition of a class of employees to the SEC.

This section of the report summarizes research findings by which NIOSH determined that it lacked sufficient information to complete the relevant dose reconstruction and on which basis it has defined the class of employees for which dose reconstruction is not feasible. NIOSH's determination relies on the same statutory and regulatory criteria that govern consideration of all SEC petitions.

6.1 Feasibility of Estimating Internal Exposures

Based on its review of available data, NIOSH has concluded that information pertaining to internal dosimetry is inadequate to ensure sufficiently accurate reconstruction of internal exposures for the NUMEC Parks Township operations. Specific inadequacies include:

- Inadequate Description and Monitoring of Thorium Operations: A very small number of thorium bioassay measurements is available for 1971 (see Section 5), and these appear to be for the Apollo plant. During the data capture phase, NIOSH identified a limited amount of air sampling data for thorium. However, it appears all of the air samples are from the NUMEC Apollo plant in 1970 and 1971. The full scope of thorium operations at the Parks Township site is not known. Documents related to NUMEC operations indicate that thorium operations at Parks Township included fuel encapsulation in 1963 (Former Production Manager, 1963) and production of thorium containing experimental elements in 1965 (Smith, 1965). In addition documentation from the Bureau of Mines (Parker, 1969; Woodmansee, 1970) lists the Parks Township site as a "thorium fabrication facility." Similarly, a 1970 Fernald report (Woodmansee, 1971) lists the Parks Township site as a thorium "nuclear fuel producer."

To date, NIOSH has been unable to find detailed process descriptions or information concerning the overall scope of the thorium work, such as when actual operations stopped, whether the

operations areas were decontaminated and decommissioned, and whether all thorium was removed from the site. NIOSH has determined that due to the limited information on the operational period, the small amount of personnel monitoring data, and the lack of detailed information describing the work processes, NIOSH is unable to establish sufficiently accurate bounding conditions for potential exposures associated with thorium work at the NUMEC Parks Township site.

- Questionable Bioassay Data from CEP: Controls for Environmental Pollution (CEP) came under suspicion of data falsification in 1994 after bioassay data provided to Sandia were found to be questionable. In November 1994, both DOE and the NRC advised contractors and/or licensees to seriously question the accuracy of any analytical results provided by CEP (NRC, 1994).

The seriousness of the Sandia events calls into question the reliability of CEP's analytical services for other nuclear facilities, including those it provided to NUMEC Parks Township from 1976-93. NIOSH is not aware of any documentation that would limit the time period during which CEP's analytical processes were considered to be flawed, or that shows why only the early 1990s data provided to Sandia should be considered suspect. Based on available documentation, NIOSH concluded that it must consider all CEP data provided to NUMEC Parks Township to be suspect, and therefore, cannot use these data to support dose reconstructions, SEC evaluations, or the development of co-worker models. Since CEP was the major bioassay contractor for NUMEC from 1976-93, this creates a gap in the usable monitoring data available for dose reconstruction.

As mentioned in section 5.3 air sampling for plutonium and uranium started in 1961 and whole body counts are available for workers starting in 1968. The air sampling data and whole body count results could be used to develop a co-worker model. However, it does not appear everyone with the potential for exposure received a whole body count nor is it clear the protocol used for whole body counting. Based on the infeasibility to reconstruct doses associated with thorium and radionuclides associated with source production (e.g., polonium and iridium) NIOSH did not pursue a detailed analysis to determine if there are a sufficient number of data points to support a co-worker model.

- Lack of Information on Fabrication of Radiation Sources and Work with Irradiated Fuel: Historical documentation indicates that NUMEC fabricated neutron sources (e.g., Po-Be and Pu-Be), Co-60 and Ir-192 sources. In addition, irradiated fuel was handled in the Hot Cell facility. Exposures from these activities are evident from incident reports (Puechl, 1965, 1967) and whole-body counting records that indicate uptakes of these radionuclides (Caldwell, 1968). However, to date NIOSH has not been able to locate any detailed process descriptions for these operations, any source term data, any personnel or area monitoring data specifically associated with these processes, nor any records establishing the exact time period these operations took place. Therefore, NIOSH concluded that it has insufficient data to establish sufficiently accurate bounding conditions for doses resulting from these operations.

Workers at NUMEC Parks Township had the potential for radiological internal exposures from radioactive materials, including uranium, thorium, plutonium, americium, polonium, Ir-192, Co-60, and mixed fission and activation products. Given the limited personal monitoring data, workplace monitoring data, and source term descriptions for the various radiological operations at NUMEC Parks Township, it is not feasible for NIOSH to reconstruct with sufficient accuracy the internal doses

that may have been received from potential exposure to radionuclides during the AWE radiological operations at the NUMEC Parks Township site from June 1, 1960 through December 31, 1980.

Although NIOSH concluded that there are inadequate data to permit sufficiently accurate reconstruction of internal doses at NUMEC Parks Township, NIOSH does intend to use any available non-CEP internal monitoring data that may reside in an individual's file (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures) to support partial internal dose reconstructions for claimants not qualifying for inclusion in the SEC.

6.2 Feasibility of Estimating External Exposures

This evaluation responds to a petition based on NIOSH determining that internal radiation exposure could not be reconstructed for a dose reconstruction referred to NIOSH by the Department of Labor. As noted above, HHS will consider this determination to be sufficient without further consideration to determine that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy. Consequently, it is not necessary for NIOSH to fully evaluate the feasibility of reconstructing external radiation exposure in this case.

As mentioned in section 5.2, NIOSH has external monitoring data starting in 1961. NIOSH intends to use any available external monitoring data that may reside in an individual's file (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures) to support partial external dose reconstructions for claimants not qualifying for inclusion in the SEC.

NIOSH considers adequate reconstruction of medical dose for NUMEC Parks Township workers likely to be feasible by using claimant-favorable assumptions as well as the applicable protocols in the complex-wide Technical Information Bulletin, *Dose Reconstructions from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006).

7.0 Summary of Feasibility Findings for Petition SEC-00108

This report evaluated the feasibility for estimating the dose, with sufficient accuracy, for all AWE employees at the NUMEC Parks Township site from June 1, 1960 through December 31, 1980. NIOSH determined that it lacks sufficient bioassay monitoring data, workplace monitoring data, and source term or processing information to reconstruct the internal exposures at the facility during this time period. Consequently, NIOSH finds that it is not feasible to estimate with sufficient accuracy the radiation doses resulting from internal exposures received by members of this class of employees.

NIOSH has documented herein that it cannot complete the dose reconstruction related to this petition. The basis of this finding is specified in this report, which demonstrates that NIOSH does not have access to sufficient information to estimate either the maximum radiation dose incurred by any member of the class or to estimate such radiation doses more precisely than a maximum dose estimate.

Members of this class at the NUMEC Parks Township site may have received internal and external exposures from various radionuclides at the plant. NIOSH lacks sufficient information, which includes personnel and workplace monitoring data and radiological source term information, to allow it to estimate the total internal exposure to which the proposed class may have been exposed.

8.0 Evaluation of Health Endangerment for Petition SEC-00108

The health endangerment determination for the class of employees covered by this evaluation report is governed by EEOICPA and 42 C.F.R. §§ 83.14(c) and 83.13(c)(3). Pursuant to these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. The regulations require NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has not been established, then NIOSH is required to specify that health was endangered for those workers who were employed for a number of work days aggregating at least 250 work days within the parameters established for the class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

NIOSH has determined that members of the class were not exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of radionuclides and from direct exposure to radioactive materials. Consequently, NIOSH is specifying that health was endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

9.0 NIOSH-Proposed Class for Petition SEC-00108

The evaluation defines a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. This class includes all AWE employees who worked at the Nuclear Materials and Equipment Corp. plant in Parks Township, Pennsylvania from June 1, 1960 through December 31, 1980 for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

10.0 Evaluation of Second Similar Class

In accordance with § 83.14(a), NIOSH may establish a second class of coworkers at the facility, similar to the class defined in Section 9.0, for whom NIOSH believes that dose reconstruction may not be feasible, and for whom additional research and analyses is required. If a second class is identified, it would require additional research and analyses. Such a class would be addressed in a separate SEC evaluation, so as not to delay consideration of the current claim. At this time, NIOSH has not identified a second similar class of employees at the NUMEC plant in Parks Township, Pennsylvania for whom dose reconstruction may not be feasible.

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11.0 References

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42 C.F.R. pt. 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 2, 2002; SRDB Ref ID: 19392

42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 28, 2004; SRDB Ref ID: 22001

42 U.S.C. §§ 7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*; as amended; OCAS website

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