

Review of Parameters Associated with Defining Sufficient Accuracy

January 2013

L. Rutherford, NIOSH/DCAS

One of the recommendations from the ten year review was to develop criteria or provide further guidance to determine if the information available for a site allows for the completion of sufficiently accurate dose reconstructions. After discussion with the Advisory Board's SEC Issues work group, DCAS decided that an effective way to accomplish this was to review the criteria in the HHS Secretary's decision letter to determine if a pattern could be identified.

It was decided to initially look at the past year of determinations/designations, as these more recent decisions were likely to be more indicative of any common principles or practices that have emerged over time. DCAS reviewed these Secretarial designations and determinations to determine what factors led to the decision to either recommend or deny an SEC class. From this review a matrix (attached) was developed that identified the class evaluated and summarized the specific reasons for recommending adding or denying a class. Once the findings were summarized for each determination/designation, they were grouped based on their similarities..

As DCAS reviewed the matrix and summary of each determination/designation, it became clear it was not possible to identify specific circumstances or exposure types (e.g., thorium exposure) that would automatically lead to an infeasibility determination. Further, defining the amount of data necessary to determine feasibility was not possible. This is due to the fact that there are many interrelated factors that affect the feasibility determination. However, using the hierarchy of data for dose reconstruction as a guideline, it is possible to identify the typical data shortcomings that lead to an infeasibility determination and a general idea for what is necessary to determine feasibility. For example:

Personal Monitoring Data

- 1) To be representative, it must be possible to demonstrate that the highest exposed workers were monitored. This can be done by showing that most of the exposed work force was monitored (e.g., uranium at Weldon Spring) or that a large portion of a smaller potentially exposed group was monitored (Mound research quantity isotopes) and that the monitored group included the workers expected to receive the highest exposure.
- 2) The monitoring method must allow for either directly or indirectly measuring the exposure potential (i.e. uranium bioassay for uranium exposures). For analyses not directly connected to the nuclide (such as gross alpha), additional analyses must also provide a method of sorting out different exposures without the method resulting in "implausibly high" intake values for some isotopes. For example, gross alpha measurements in urine that were primarily caused by uranium intakes could not be assumed to be the result of thorium exposure if the resulting calculations produced unrealistically high thorium estimates.

Area Air Monitoring Data

- 1) Area air monitoring information has a number of obstacles to overcome to demonstrate that it is representative of workplace exposures. Not only do they have to represent the breathing zone during operations, but it also is necessary to understand which workers were exposed and for how long. This is often done in a bounding fashion by assuming all workers were in the highest area 100% of the time.

Review of Parameters Associated with Defining Sufficient Accuracy

That can, however, lead to unrealistically high intake estimates. An example would be the decision made at Linde Ceramics that office workers' exposures could not be reconstructed by assuming continuous exposure to the high level air sample levels associated with decommissioning and decontamination activities.

Source Term Data

- 1) Source term data can take many forms depending on its use. It can be used to justify the use of surrogate data or to create a model.

Model

- a. - Like area monitoring data, models must overcome the problem of producing unrealistically high estimates. The reason that models often provide unrealistic estimates is the tendency to conservatively estimate every parameter. By including conservatively high estimates of parameters such as building ventilation rate or respirable particle fractions models can easily produce implausibly high exposure estimates.
- b. - Besides the source term data necessary for a model, a number of assumptions are usually necessary and each of them have to have an adequate basis to be scientifically defensible.

Surrogate Data

- c. - In order to justify the use of surrogate data the source term data is necessary. Also, the operations, engineering and administrative controls, material quantities must be similar. Again bounding data may be applied at times but this can cause unrealistically high values.

With the above criteria in mind, the SEC decisions in the attached table can be categorized as follows:

Dose Reconstruction Feasible

Adequate Personnel Monitoring Data

1. - Mound SEC 0090 (Denial) – highest exposed workers monitored, employees with potential for exposure to research quantities were monitored for those isotopes.
2. - United Nuclear SEC 0116 (uranium) – bioassay adequate even with 2 year gap {see area monitoring for thorium}

Inadequate Personnel data but adequate area data

1. - United Nuclear SEC 0116 (thorium) – area monitoring shown to cover entire area and time frame. Possible because of limited area and limited time frame
2. - Titanium Alloys Manufacturing SEC 0190 – Work defined to a limited time and area well enough that small amount of area monitoring deemed adequate

Inadequate personnel or area data but adequate source term data for modeling

1. - Hangar 481 SEC 0139 – enough source term data to show no internal exposure potential

Review of Parameters Associated with Defining Sufficient Accuracy

Inadequate personnel or area data but adequate source term data for surrogate data use

1. - Hooker (not in the attachment matrix) – enough source term data about the material to show surrogate data was representative while employees were working with it. Enough source term data (process description) to bound exposure times without being unrealistically high.

Dose Reconstruction Not Feasible

Inadequate personnel or areas monitoring data and inadequate source term data and process information

Mound SEC 0207

ORANL SEC 0189

Nuclear Metals SEC 0195

Mound SEC 0090 (early years)

Ventron SEC 0198

Winchester SEC 0199

Clarksville SEC0202

Medina SEC 0203

Hanford SEC 0201

Sandia National Lab SEC 0188

Brookhaven SEC 0196

Clinton Engineering Works SEC 0178

Electromet SEC 0136

Review of Parameters Associated with Defining Sufficient Accuracy

SEC Petition Feasibility Determination/Designation

HHS Designation/Determination	Central Issue for Infeasibility
<p><u>SEC 0207 Mound (83.14)</u> All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Mound Plant in Miamisburg, Ohio, from September 1, 1972, through December 31, 1972, or from January 1, 1975, through December 31, 1976, 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 Special Exposure Cohort.</p>	<p>NIOSH determined that members of this class may have received radiation exposures from radon isotopes and progeny originating from residual radioactive material associated with the Ra-Ac-Th process conducted in the SW Building. The technologically-enhanced radon emanated into Room SW-19 and was potentially distributed throughout the R and SW buildings.</p> <p>NIOSH found no workplace monitoring records after February 1955 relevant to the radon exposures in the R and SW buildings until air measurements were made in 1979 and 1980. NIOSH also lacks activity data for the residual Ra-Ac-Th source term affecting Room SW-19 and its subsequent distribution throughout the SW building and the corridor of the R building, which was contiguous with the SW building. Therefore, NIOSH has concluded that it lacks sufficient monitoring data and source term information to perform adequate individual dose reconstructions for workers during the periods under evaluation.</p> <p>From September 1, 1972, through December 31, 1972, and from January 1, 1975, through December 31, 1976, NIOSH cannot determine which employees at the Mound facility were exposed to radon in the R and SW buildings. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures to radon and resulting doses for the class of employees covered by this evaluation.</p>
<p>Summary: <u>Internal dose</u> There is no personal monitoring data and no area monitoring data for the source of Radon produced from remaining radioactive material associated with the Ra-Ac-Th process. In addition, there is little information concerning the source strength and potential distribution of the source in the SW building. Therefore, the central issue for the infeasibility is an unmonitored source term with a lack of knowledge of the source strength and the distribution of the source.</p>	
<p><u>SEC 0189 ORNL</u> All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at the Oak Ridge National Laboratory (X-10) in Oak Ridge, Tennessee, from June 17, 1943, through July 31, 1955, for a number of work days</p>	<p>Based on NIOSH's evaluation of available data, NIOSH concluded that it is <u>not</u> feasible for NIOSH to reconstruct with sufficient accuracy the internal doses at the Oak Ridge National Laboratory (X-10) from: uranium exposures during the period June 17, 1943, through December 31, 1948; thorium exposures during the period from January 1, 1948, through July 31, 1955; and mixed fission product exposures during the period from November 4, 1943, through December 31, 1949. Combining these periods of infeasibility yields a collective time period for dose reconstruction infeasibilities of June 17, 1943, through July 31, 1955.</p>

Review of Parameters Associated with Defining Sufficient Accuracy -

<p>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 Special Exposure Cohort.</p>	<p>NIOSH determined that it lacks sufficient information, which includes specific biological monitoring data, air monitoring information, process and radiological source information, and surrogate data from similar operations at other sites that would allow it to estimate the total internal dose from exposures to all the principal sources of internal radiation for all workers who worked at the Oak Ridge National Laboratory (X-10) during the period from June 17, 1943, through July 31, 1955. Based on the available information, NIOSH believes external dose reconstruction is feasible for the evaluated time period.</p>
<p>Summary: <u>Internal dose</u> There is a lack of personal monitoring data, area monitoring data, and a lack of process and source term knowledge to develop a model. In addition, because of the lack of source term and process knowledge and the early years of operation surrogate data could not be used.</p>	
<p><u>SEC 0195 Nuclear Metal Inc.</u> All Atomic Weapons Employees who worked at the facility owned by Nuclear Metals, Inc. (or a subsequent owner) in West Concord, Massachusetts, during the period from October 29, 1958, through December 31, 1979, 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 included in the Special Exposure Cohort.</p>	<p>Internal exposure monitoring data available to NIOSH include: urine bioassay results for most years in the evaluation period except 1968, 1972, and 1975 (with the number of urinalysis results increasing dramatically from 1978 through 1983); approximately 500 lung counting results beginning in 1982; summary air data for the pre-1975 period giving only maximum, minimum, and average air concentrations; and 28,000 breathing zone and work area air sample results during the period 1980, through 1983.</p> <p>Based on NIOSH's evaluation of available data, NIOSH concluded that it is not feasible to reconstruct doses for internal exposure because: (1) the early bioassay program (pre-1980) results are often sparse and NIOSH cannot verify that available data represents the worse-case exposures; (2) early air sample data are limited and not equivalent to breathing zone sampling; (3) NIOSH did not locate any urine bioassay or air sample data for thorium operations; and (4) NIOSH did not locate thoron monitoring data or indications of a thoron monitoring program for the thorium sources.</p> <p>Therefore, NIOSH concludes that it is not feasible for NIOSH to reconstruct with sufficient accuracy the internal exposures to enriched uranium, thorium, uranium progeny, and thorium progeny, for Nuclear Metals, Inc. workers during the period from October 29, 1958, through December 31, 1979. NIOSH found that it may be feasible to reconstruct internal doses from natural and depleted uranium for employees during the recommended SEC period from October 29, 1958, through December 31, 1979, using available claimant and site monitoring data, and information in established procedures.</p>

Review of Parameters Associated with Defining Sufficient Accuracy -

Summary:

Internal dose

Inadequate personal and area monitoring data for uranium prior to 1983. In addition, a lack of process knowledge and source term to allow the use of surrogate data. There is an unmonitored source term for thorium and a lack of process knowledge and source term to allow the use of surrogate data.

SEC 0090 Mound (Denial)

All employees of the Department of Energy, Department of Energy contractors, or subcontractors who worked in any area at the Mound Plant in Miamisburg, Ohio, during the period from March 1, 1959, through December 31, 2007, except for workers who fall within the Special Exposure Cohort (SEC) classes established by SEC petitions 00171 and 00207.

The principal source of internal and external radiation doses for members of the evaluated class associated with the operations performed at the Mound Plant included exposures to polonium, plutonium, and tritium. These exposures were considered primary because they were existed in larger quantities and were use more widespread across the site. Secondary radionuclides of concern at Mound included uranium and thorium and their progeny, americium, curium, actinium, various radium and radon isotopes, and protactinium.

NIOSH determined that internal exposures during the operational period, for radionuclides other than those associated with existing Mound Plant SEC classes, can be bounded using available data for the site. In its *SEC-00090 Evaluation Report*, NIOSH demonstrated that employees with the greatest potential for internal intake were monitored, and determined that the available bioassay data can be used to reconstruct potential internal radiation doses for those employees

For radionuclides for which exposures were routinely monitored, NIOSH has established coworker models that will be used to reconstruct internal doses for those workers who were potentially exposed, but not monitored. For reconstruction of internal exposures to research quantities of radionuclides that were infrequently monitored, NIOSH will rely on the available bioassay data in combination with available air concentration measurements and process information.

Summary:

There's adequate monitoring data for routinely used radionuclides. The monitoring data includes personal and area monitoring data. The personal monitoring data is gross alpha which is used for all radionuclides.

SEC 0116 United Nuclear (Denial)

All site employees who worked in any area of the United Nuclear Corporation – Hematite, Missouri, site from January 1, 1958, through December 31, 1973, and the residual period January 1, 1974, through July 31, 2006.

Bioassay and air sampling data are available in sufficient quantity and quality to adequately represent the potential internal exposures for the UNC-Hematite class under evaluation over the entire operational period. These data can also be used to support the evaluation of the UNC-Hematite internal dose over the site's residual radioactivity period. Technical Basis Document for the United Nuclear Corporation Hematite, Missouri, (DCAS-TKBS-0008). NIOSH can bound the internal uranium dose associated with the weapons-related residual radioactivity that remained on site after the end

Review of Parameters Associated with Defining Sufficient Accuracy -

	<p>AEC-related operations.</p> <p>The available air sample data, including breathing zone and general air data, are available and can be used to supplement the bioassay data, or as the primary source of internal monitoring data for the period from 1961-1962. In addition, NIOSH has access to other radiological monitoring data and investigation reports that support bounding internal dose for UNC-Hematite from January 1, 1958, through December 31, 1973, and the residual period January 1, 1974, through July 31, 2006.</p>
<p>Summary: There's adequate personal monitoring data and area monitoring data for uranium. There is a two year gap in bioassay data, but the bioassay data before and after the gap with validation from air sampling during the gap supported the conclusion that the co-worker model provided bounding estimates during the gap period. The thorium operations were done over a short period (6-8 months) and there was good area monitoring data and a good description of the source term and process.</p>	
<p><u>0198 Ventron</u> All Atomic Weapons Employees who worked for the Ventron Corporation at its facility in Beverly, Massachusetts, from November 1, 1942, through December 31, 1948, 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 included in the Special Exposure Cohort.</p>	<p>NIOSH has not located documentation indicating the existence of a routine internal personnel exposure monitoring program for the period under evaluation. The very limited internal monitoring and air sample data available to NIOSH are sparse and there is no evidence to indicate that these data are representative of the most highly-exposed workers at the Ventron facility, or that the available sample results are representative of all workers. Without additional personnel radiation monitoring data representing the period from 1942 through 1948, NIOSH does not have sufficient information to appropriately characterize intakes of radioactive material intakes during operations at the Ventron Corporation facility.</p> <p>NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate internal and external exposures for Ventron workers during the periods of refining and smelting operations from November 1, 1942, through December 31, 1948.</p>
<p>Summary: <u>Internal and External</u> There is inadequate personal and area monitoring data. In addition, the years of operation were before HASL existed and therefore before an established air monitoring program existed in the AEC complex. There is inadequate source term and process information to develop an internal or external exposure model. Also, the early years of operation with the lack of source term and process information prevent using surrogate data.</p>	

Review of Parameters Associated with Defining Sufficient Accuracy -

0199 Winchester (83.14)

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Winchester Engineering and Analytical Center in Winchester, Massachusetts, from January 1, 1952, through December 31, 1961, 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 Special Exposure Cohort.

NIOSH determined that the principal sources of internal and external radiation exposures for members of the proposed class included exposures to uranium and thorium, including the progeny of these radionuclides, as found in various grades of ores, raffinates, and process effluent samples sent to the facility for analysis.

NIOSH identified limited personnel internal monitoring data for select individuals for the years 1953, 1954, and 1955. The data are not comprehensive and there is no evidence to indicate these data are representative of the most highly-exposed workers at the Winchester facility, or to indicate that the available sample results are representative of all workers. Without additional personnel radiation monitoring data representing the period from 1952 through 1961, NIOSH has insufficient information to appropriately characterize radioactive material intakes during DOE operations at the Winchester Engineering and Analytical Center.

NIOSH located little documentation as to the quantities of radiological materials shipped to the site for processing or testing. It is clear from reports and worker communication that the site worked with uranium and thorium. NIOSH also inferred from research reports that various forms of uranium-bearing materials were used in the sites' research. However, without additional documentation, NIOSH is unable to ascertain the quantity or forms of the source materials that may have been used or stored on site at any time during the period under evaluation.

In the absence of adequate internal dose monitoring criteria and personnel monitoring data, NIOSH has not found sufficient general area air sampling, breathing zone air sampling, site survey, or source term information to allow it to bound potential exposures, or to demonstrate that workers were adequately monitored for potential exposure to radioactive material at the site during the operational period. Consequently, NIOSH finds that it is not feasible to estimate with sufficient accuracy the total internal dose for workers at Winchester Engineering and Analytical Center during the time period from January 1, 1952, through December 31, 1961.

Summary:

Internal dose

The site had uranium ore and by-product materials with sporadic personal and area monitoring. When dealing with ore material more data and information are required to bound the dose to the uranium and thorium progeny. In addition, the dis-equilibrium in radionuclides in the by-product materials created from processing the ore makes it difficult to create sufficiently accurate bounding doses for the progeny without isotopic specific data. Also for this site, there is inadequate source term and process information to develop an exposure model or to allow the use of surrogate data.

Review of Parameters Associated with Defining Sufficient Accuracy -

SEC 0202 Clarksville

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Clarksville Modification Center, Ft. Campbell, in Clarksville, Tennessee, from August 1, 1949, through December 31, 1967, 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 included in the Special Exposure Cohort.

The principal sources of internal radiation exposures for members of the Clarksville Modification Center, Ft. Campbell proposed class included exposures to tritium as a gas, weapons-grade plutonium, highly-enriched uranium, depleted uranium, polonium-210 in a Po-Be neutron generator and small activities of cesium-137 during the assembly, inspection, and disassembly of weapons components.

NIOSH has found that air monitoring for tritium was called for in the plant operating procedures. However, NIOSH has been unable to locate recorded results of this monitoring. NIOSH has also identified a lack of information indicating urinalysis or other forms of internal monitoring were conducted to monitor for intakes of uranium, plutonium, or tritium.

NIOSH has located very little documentation as to quantities of radiological materials shipped to the Clarksville Modification Center, Ft. Campbell, for processing or testing. It is clear from reports and worker communication that the Clarksville employees worked with uranium, tritium, and plutonium. However, without additional documentation, NIOSH is unable to ascertain the quantities or forms of the source materials that may have been used or stored on site at any time during the period under evaluation.

In the absence of adequate internal dose monitoring criteria and adequate personnel monitoring data, NIOSH has not found sufficient general area air sampling, breathing zone air sampling, site survey, or source term information to allow it to bound potential internal exposures, or to demonstrate that workers were adequately monitored for potential exposures. Therefore, NIOSH finds that it is not feasible to estimate with sufficient accuracy the total internal dose for workers at the Clarksville Modification Center, Ft. Campbell, in Clarksville, Tennessee, during the period from August 1, 1949, through December 31, 1967.

Summary:

Internal dose

There is a lack of personal monitoring data, area monitoring data, and a lack of source term information to develop a model for the routinely used radionuclides or use surrogate data.

Review of Parameters Associated with Defining Sufficient Accuracy -

SEC 203 Medina

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Medina Modification Center in San Antonio, Texas, from January 1, 1958, through December 31, 1966, 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 Special Exposure Cohort.

The principal sources of internal radiation exposures for members of the Clarksville Modification Center, Ft. Campbell proposed class included exposures to tritium as a gas, weapons-grade plutonium, highly-enriched uranium, depleted uranium, polonium-210 in a Po-Be neutron generator, and small activities of cesium-137 during the assembly, inspection, and disassembly of weapons components.

NIOSH has found that air monitoring for tritium was called for in the plant operating procedures. However, NIOSH has been unable to locate recorded results of this monitoring. NIOSH has also identified a lack of information indicating urinalysis or other forms of internal monitoring were conducted to monitor for intakes of uranium, plutonium, or tritium.

NIOSH has located very little documentation as to quantities of radiological materials shipped to the Clarksville Modification Center, Ft. Campbell, for processing or testing. It is clear from reports and worker communication that the Clarksville employees worked with uranium, tritium, and plutonium. However, without additional documentation, NIOSH is unable to ascertain the quantities or forms of the source materials that may have been used or stored on site at any time during the period under evaluation.

In the absence of adequate internal dose monitoring criteria and adequate personnel monitoring data, NIOSH has not found sufficient general area air sampling, breathing zone air sampling, site survey, or source term information to allow it to bound potential internal exposures, or to demonstrate that workers were adequately monitored for potential exposures. Therefore, NIOSH finds that it is not feasible to estimate with sufficient accuracy the total internal dose for workers at the Clarksville Modification Center, Ft. Campbell, in Clarksville, Tennessee, during the period from August 1, 1949, through December 31, 1967.

Summary:

Internal dose

There is a lack of personal monitoring data, area monitoring data, and a lack of source term information to develop a model for the routinely used radionuclides or use surrogate data.

Review of Parameters Associated with Defining Sufficient Accuracy -

<p><u>SEC 0190 Titanium Alloys Manufacturing (Denial)</u> All employees who worked in any area or building at Titanium Alloys Manufacturing from January 1, 1955, through December 31, 1956.</p>	<p>The principal source of internal radiation doses for members of the evaluated class was inhalation and ingestion of uranium and uranium progeny contained in dusts and fumes associated with the furnace operations, and the principal source of external radiation doses was from exposure to beta and gamma radiation emanating from uranium-bearing materials.</p> <p>NIOSH has determined that uranium internal exposures during the operational period can be bounded using air concentration data measured during TAM's operational period from January 1, 1955, through December 31, 1956. NIOSH may choose to employ a more refined approach when reconstructing individual doses based on information associated with individual claims. NIOSH will use appropriate dose reconstruction methods, including best-estimate approaches that employ new details of site operations, if discovered, to complete individual dose reconstructions.</p> <p>NIOSH determined that although no external monitoring data are available for the TAM site, Table 6-1 of Battelle-TBD-6000, can be used to bound the photon dose during the operational period from January 1, 1955, through December 31, 1956.</p>
<p>Summary: Although there is no personal monitoring data, there is enough area monitoring data, process information, and source term data to bound the dose. Another factor in this determination was this was a uranium operation with no other isotopes of concern.</p>	
<p><u>SEC 0201 Hanford (83.14)</u> All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Hanford Engineer Works in Richland, Washington, from July 1, 1972, through December 31, 1983, 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 included in the Special Exposure Cohort.</p>	<p>NIOSH determined that the principal sources of internal radiation exposures for members of the current proposed class at Hanford included exposures to HEU, U-233, thorium, and neptunium in the 200 and 300 Areas.</p> <p>Consistent with the NIOSH, DOE, and DOL determinations associated with the evaluation of SEC-00152 in 2009, NIOSH has determined that the Hanford site-specific and claimant-specific data available for the time period under evaluation continue to be insufficient to allow NIOSH to characterize worker movements between the 200 and 300 Areas and other areas of Hanford during the period under evaluation. Furthermore, NIOSH has no indication that Hanford implemented routine or special bioassay programs sufficient to detect intakes of purified HEU, U-233, thorium, or neptunium until the end of the period under evaluation.</p> <p>NIOSH is unable to assess whether an energy employee, or class of employees, did or did not potentially enter specific areas of the Hanford site having the potential exposures to HEU, U-233, neptunium, and thorium during the period from July 1, 1972, through December 31, 1983. Therefore, NIOSH cannot define individual worker exposure scenarios based on the areas or specific work location</p>

Review of Parameters Associated with Defining Sufficient Accuracy -

	<p>during the evaluated period.</p> <p>NIOSH determined that it does not have sufficient source term information for the various site operations. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures to HEU, U-233, thorium, or neptunium and resulting doses for the proposed class of employees during the period from July 1, 1972, through December 31, 1983.</p>
<p>Summary: There is a lack of personal and area monitoring data for enriched uranium, U-233, thorium, or neptunium for the period evaluated. In addition, there is a lack of source term and process information to develop an exposure model or allow the use of surrogate data.</p>	
<p>SEC 0139 Hangar 481 (Denial) All employees who worked at Hangar 481, Kirtland Air Force Base (AFB), from March 1, 1989 through February 29, 1996.</p>	<p>NIOSH determined that no unsealed radioactive materials were handled nor were radioactive materials stored at the Hangar 481 facility. Radioactive materials handled by workers at Hangar 481 were in sealed DOT-compliant containers and monitored in accordance with DOT regulations to verify radiation and contamination levels on package exteriors.</p> <p>Based on the available information on the radiological program and potential for internal exposure sources, NIOSH concluded that internal radiological exposures to Ross Aviation employees resulting from services rendered for the DOE at Hangar 481 are unlikely to have occurred.</p> <p>Sandia National Laboratories, being an adjacent facility, was used to provide a bounding estimate of the dose from ambient environmental internal dose during the covered period.</p> <p>External dose records exist for many Ross Aviation personnel and the Radiation Exposure Information and Reporting System (REIRS) reported data have been verified using Eberline dosimetry data from 1990-1994. The individual results of these records or use of the highest dose received by monitored personnel, adequately bounds external dose for unmonitored workers.</p>
<p>Summary: There is little potential for internal exposure for this site and operation. In addition, the personal monitoring data available allows for the external dose to be reconstructed.</p>	

Review of Parameters Associated with Defining Sufficient Accuracy -

<p><u>SEC 0188 Sandia National Lab</u> All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at Sandia National Laboratories in Albuquerque, New Mexico, from January 1, 1963 through December 31, 1994, 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 included in the Special Exposure Cohort.</p>	<p>NIOSH determined that principal sources of internal radiation for members of the proposed class included exposures to plutonium, tritium, uranium, americium, and fission and activation products. Potential exposure pathways could have involved the handling of these radionuclides during waste-burial operations and related research and support missions or exposure to surface or air contamination associated with reactors and/or accelerators work.</p> <p>NIOSH found that source terms and associated exposures varied over the evaluated period. Considering the potential exposure scenarios, NIOSH finds it is unable to estimate these internal exposures with sufficient accuracy for the period from January 1, 1963 through December 31, 1994. Additionally, a contribution factor to the extension of the SEC class time period thru 1994 was that the internal dosimetry data from 1992 thru 1994 was found not suitable for dose reconstruction.</p> <p>Based on the findings, NIOSH concluded that it is not feasible to estimate internal exposures with sufficient accuracy for all workers at the Sandia National Laboratories-Albuquerque site from January 1, 1963 through December 31, 1994. The basis of this finding 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 for that period.</p>
<p>Summary: <u>Internal dose</u> A number of factors supported the infeasibility for this site. The site had difficulty retrieving personal and area monitoring records prior to 1992 in support of the EEOICPA program. In addition, the site did not do a lot of personal and area monitoring during the period of the recommended class. There was more than one radionuclide of concern (e.g., plutonium, tritium, uranium, americium, and fission and activation products) and the source terms varied over time. In addition, processes varied over time. Subsequently, the site's incident based personal monitoring program and limited area monitoring data did not support developing a co-worker model that could have been used to bound unmonitored workers.</p>	
<p><u>SEC 0196 Brookhaven National Lab (83.14)</u> All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Brookhaven National Laboratory in Upton, New York, from January 1, 1980 through December 31, 1993, for a number of work days aggregating at least 250 work days, occurring either solely under this</p>	<p>NIOSH determined that principal sources of internal and external radiation for members of the proposed class included exposures to plutonium, uranium, tritium, fission and activation products, transuranic radionuclides, nuclear reactors, linear accelerators, radiography equipment, and a wide variety of other radioactive materials, which could have occurred during the performance of reactor or accelerator operations, or the performance of research and development activities at the site.</p> <p>NIOSH has determined that, due to undocumented worker movements across the site and limited claimant-specific information pertaining to work locations, it is unable to eliminate any specific worker</p>

Review of Parameters Associated with Defining Sufficient Accuracy -

employment, or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

from potential exposure scenarios based on assigned work location.

NIOSH lacks sufficient information, which includes in-vivo and in-vitro monitoring data that would allow it to estimate the potential internal exposures to which the proposed class may have been exposed. NIOSH evaluated the available personnel and workplace monitoring data and source term information and determined that there are insufficient data for estimating internal exposures for workers at Brookhaven National Laboratory during the time period from January 1, 1980 through December 31, 1993.

Consistent with its findings associated with SEC-113, NIOSH finds that it lacks sufficient information, which includes in-vivo and in-vitro monitoring data, to allow it to estimate with sufficient accuracy the potential internal exposures to various radionuclides to which the proposed class may have been subjected.

NIOSH has documented that it cannot complete the dose reconstructions related to this petition with sufficient accuracy for the employees who worked at the Brookhaven National Laboratory from January 1, 1980 through December 31, 1993. The basis of this finding 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 for that period.

NIOSH determined that it did not have access to sufficient source or source term information associated with Brookhaven National Laboratory operations to bound potential internal exposures from these radionuclides for the covered period.

Summary:

Internal dose

A number of factors supported the infeasibility for this site. The site had difficulty retrieving personal and area monitoring records in support of the EEOICPA program. In addition, the site did not do a lot of personal and area monitoring during the period of the recommended class. There was more than one radionuclide of concern (e.g., plutonium, tritium, uranium, americium, and fission and activation products) and the source terms varied over time. In addition, processes varied over time. Subsequently, the site's incident based personal monitoring program and limited area monitoring data did not support developing a co-worker model that could have been used to bound unmonitored workers.

Review of Parameters Associated with Defining Sufficient Accuracy -

<p><u>SEC 0178 Clinton Engineering Works</u> All employees of the Tennessee Eastman Corporation (1943-1947) and the Carbide and Carbon Chemicals Corporation (1947-1949) who were employed at the Clinton Engineer Works in Oak Ridge, Tennessee, from January 1, 1943 through December 31, 1949 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 classes of employees included in the Special Exposure Cohort.</p>	<p>NIOSH has determined that the principal sources of internal radiation for members of the proposed class included exposures to uranium residues as well as African and domestic uranium ores through inhalation and ingestion of airborne uranium dust, and exposure from thorium, radium, radon and radon progeny.</p> <p>NIOSH has determined that based on the lack of thorium, radium, radon and uranium monitoring data for Clinton Engineer Works Elza Gate warehouse workers during the storage and/or repackaging operations conducted during the period from January 1, 1943 through December 31, 1949, internal dose reconstruction from all potential sources of exposure is not feasible.</p>
<p>Summary: <u>Internal dose</u> The site had a lack of personal and area monitoring data to support bounding internal and external dose from uranium ores and residues. In addition, there is a lack of source term and process information to develop an exposure model or allow the use of surrogate data.</p>	
<p><u>SEC 0136 Electro Metallurgical</u> All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Electro Metallurgical site in Niagara Falls, New York, from August 13, 1942 through December 31, 1947, 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 included in the Special Exposure Cohort.</p>	<p>NIOSH has determined that the principal sources of internal radiation for members of the proposed class included exposures to uranium and its short-lived progeny present in uranium metal fabrication and scrap recovery operations. The modes of exposure were inhalation and ingestion of dust generated during the various processes.</p> <p>NIOSH finds it is not feasible to estimate internal exposures with sufficient accuracy for all workers at the site from August 13, 1942 through December 31, 1947. Internal monitoring data, work area radiological monitoring data, and source term data are not sufficient to provide a sufficiently accurate estimate of the bounding internal dose during this early period at the Electro Metallurgical site.</p> <p>NIOSH has determined that neither the bioassay nor the early limited air sampling data are sufficient to bound the dose at Electro Metallurgical for the August 13, 1942 through December 31, 1947 portion of the period under evaluation. Based on health improvements described as occurring in late 1947, the internal dose related data collected after 1947 cannot be extrapolated to exposures occurring prior to 1948 at Electro Metallurgical.</p>

Review of Parameters Associated with Defining Sufficient Accuracy -

Summary:

Internal dose -

There is inadequate personal and area monitoring data. In addition, the years of operation were before HASL existed and therefore before an established - air monitoring program existed in the AEC complex. There is inadequate source term and process information to develop an internal exposure model. - Also, the early years of operation with the lack of source term and process information prevent using surrogate data. -