

SEC Petition Evaluation Report Petition SEC-00161

Report Rev #: 1

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Site Expert(s):	N/A

Petitioner Administrative Summary			
Petition Under Evaluation			
Petition #	Petition Type	Petition A Receipt Date	DOE/AWE Facility Name
SEC-00161	83.14	December 28, 2009	General Electric Co. (Ohio)

NIOSH-Proposed Class Definition
All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at General Electric Co. in Evendale, Ohio, from January 1, 1961 through June 30, 1970, 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.

Related Petition Summary Information			
SEC Petition Tracking #(s)	Petition Type	DOE/AWE Facility Name	Petition Status
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Related Evaluation Report Information	
Report Title	DOE/AWE Facility Name
N/A	N/A

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Evaluation Report Summary: SEC-00161, General Electric Co. (Ohio)

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) per 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

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at General Electric Co. in Evendale, Ohio, from January 1, 1961 through June 30, 1970, 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.

Feasibility of Dose Reconstruction Findings

NIOSH lacks sufficient information, which includes biological monitoring data, sufficient air monitoring information, and sufficient process and radiological source information, to allow it to estimate with sufficient accuracy the potential internal exposures to uranium, thorium, and fission product radionuclides to which the proposed class may have been subjected.

NIOSH finds that it is likely feasible to reconstruct occupational medical dose for General Electric Co. (Ohio) workers with sufficient accuracy.

- Principal sources of internal and external radiation for members of the proposed class included exposures to uranium, thorium, and fission product radionuclides during operations, such as high-temperature testing of refractory metals and alloys, reactor components, and fuel element materials, as well as the treatment of thorium-oxide in high-temperature furnaces.
- NIOSH has obtained uranium urinalysis results for 1965, 1966, 1967, and 1970; and has obtained thorium urinalysis results for 1965, 1966, and 1967. NIOSH has determined that the bioassay data are insufficient for development of co-worker dose distributions for the years with no data. NIOSH has found no fission product bioassay monitoring data for the period from January 1, 1961 through June 30, 1970.
- NIOSH has obtained individual external monitoring data for each year during the period 1961 through 1970. These data include over 3500 film badge readings. Because NIOSH-identified deficiencies in internal monitoring data span the entire GE-Ohio covered period, NIOSH has not evaluated the external film data on an individual worker basis, and has not determined whether sufficient data exist to generate adequate external co-worker dose distributions for the assignment of unmonitored dose during partial dose reconstruction.

- NIOSH has obtained gross alpha and gross beta-gamma workplace monitoring data collected in 1969, late in the DOE operations period. NIOSH has obtained source term information for some specific projects or experiments, but lacks the specific information from which to identify the operations with the highest exposure potential. Such information is required to enable NIOSH to bound potential exposures in the absence of personnel monitoring data.
- Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures) for an individual claim. Therefore, dose reconstructions for individuals employed at General Electric Co. (Ohio) during the period from January 1, 1961 through June 30, 1970, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

Health Endangerment Determination

The NIOSH evaluation did not identify any evidence supplied by the petitioners or from other resources 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 uranium, thorium, and fission products, and from direct exposure to these radioactive materials. Therefore, 42 C.F.R. § 83.13(c)(3)(ii) requires NIOSH to specify 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-00161

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 (ORAU) Team Lead Technical Evaluator: Michael Kubiak, MJW Technical Services, Inc. The rationales for all conclusions in this document are explained in the associated text.

1.0 Purpose and Scope

This report evaluates the feasibility of reconstructing doses for employees who worked at the General Electric Co. facility in Evendale, Ohio, from January 1, 1961 through June 30, 1970. 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 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 that 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 add one or more classes of employees to the SEC. Once NIOSH has received and considered the

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>.

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 employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at General Electric Co. in Evendale, Ohio, from January 1, 1961 through June 30, 1970, 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. During this period, employees at this facility were involved with high-temperature testing of refractory metals and alloys, reactor components, and fuel element materials, as well as the treatment of thorium-oxide in high-temperature furnaces.

The evaluation responds to Petition SEC-00161, 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. 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 General Electric Co. facility in Evendale, Ohio (GE-Ohio) from January 1, 1961 through June 30, 1970 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

General Electric's Aircraft Nuclear Propulsion (ANP) Project began in 1951 at the facility in Evendale, Ohio. The ANP work was performed in a facility known as Air Force Plant 36, a 68-acre portion of the larger General Electric Aircraft Engine Plant (EPA, 2008). The ANP Project was terminated in 1961; however, the use of radioactive materials continued under other Atomic Energy Commission (AEC) contracts (Murphy, 1988, p. 9). In 1961, GE-Ohio continued as a prime contractor to the AEC for development of high-temperature fuel elements and reactor materials (Review, 1979, pdf p. 4). From 1961 through June 30, 1970, the AEC contract work occupied

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>.

buildings C and D and certain other smaller auxiliary structures, under a use permit from the Air Force. Custody of the facilities was returned to the Air Force on June 30, 1970 (General Electric, 1974a).

Information available to NIOSH regarding the size of the radiological workforce at GE-Ohio is limited. In 1959, during the ANP Project, approximately 3000 people were employed on the ANP project, approximately 600 of which were scientific and engineering personnel (General Electric, 1974b, pdf pp. 11-13). Indications of radiological workforce size during the covered 1961-1970 period include the following:

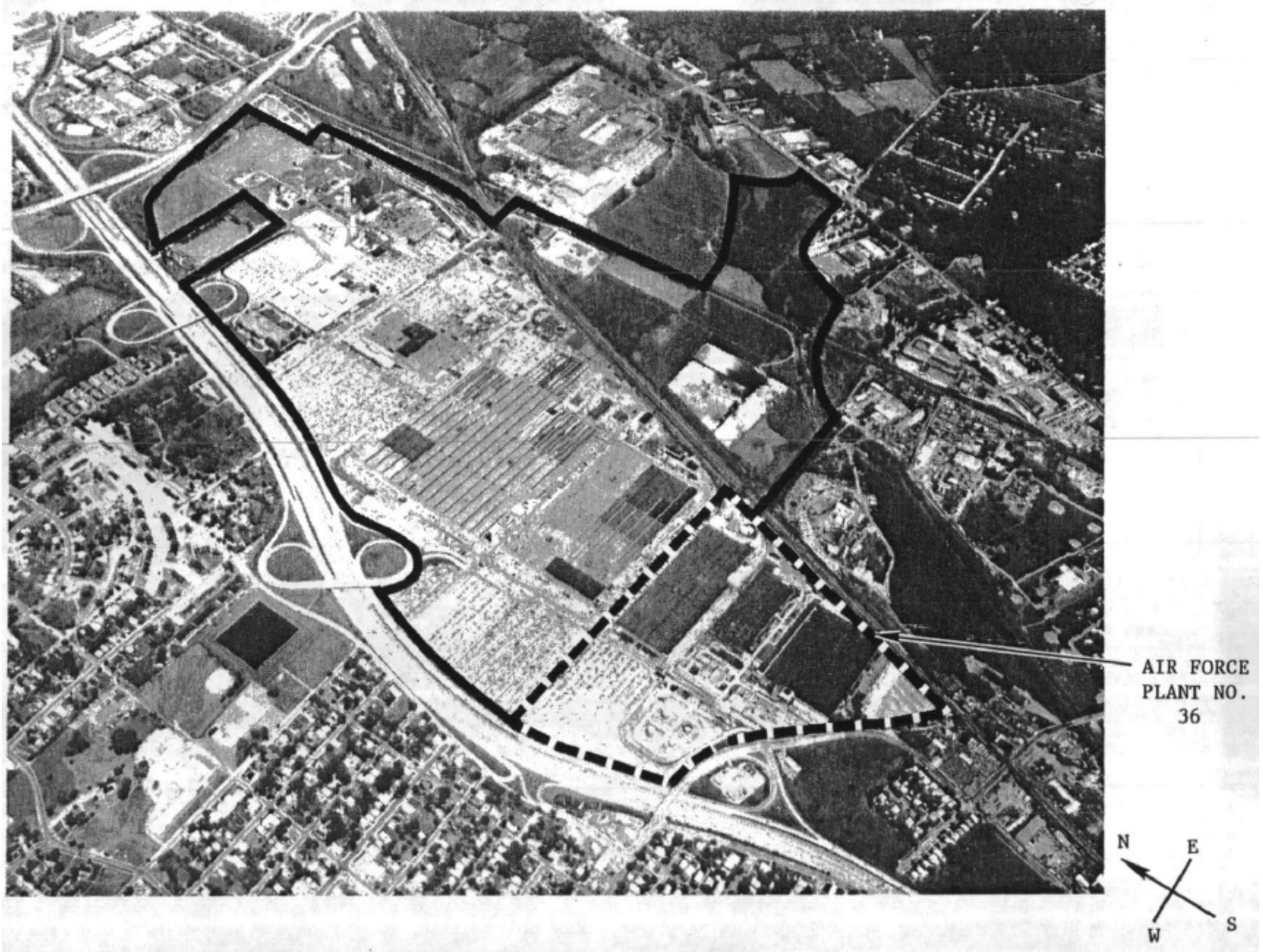
- An April 1961 newspaper article states: *In practical terms [the cancellation of the ANP project] means that Evendale's work force will be reduced from 2300 to 375* (POPSEE Sketches, 1991, pdf p. 7)
- A July 2010 discussion with former GE-Ohio employees indicates that there were between 300 and 350 workers during the 1961 to 1970 timeframe. (Outreach Meeting Minutes, 2010)

AEC operations at GE-Ohio during the Department of Energy (DOE) operations period from January 1, 1961 through June 30, 1970 included:

- testing fuel element materials and high-temperature reactor materials (Rice, 1966, pdf p. 110);
- testing the effects of radiation on refractory metals and alloys (Rice, 1966, pdf p. 110);
- examining radiation effects in beryllium oxide (Rice, 1966, pdf p. 110);
- examining fission product transport processes in reactor fuels (Rice, 1966, pdf p. 110);
- testing the effects on clad uranium-oxide fuels in meltdown environments (Rice, 1966, pdf p. 110);
- developing a process for densification of thorium (Herries, 1966, pdf p. 5); and
- calcination of thorium-oxide in high-temperature furnaces (Rennich, 1965, pdf p. 53).

NIOSH has been unable to collect detailed data describing the processes or equipment associated with the operations listed above. Much of the operations and monitoring data obtained by NIOSH are relevant only to the ANP Project years at GE-Ohio, prior to the covered period under evaluation in this report. NIOSH data capture efforts also failed to produce detailed source term information related to DOE/AEC operations at GE-Ohio during the 1961-through-1970 period. Review of the available data indicates the onsite existence of thorium and fission product residues (Karl, 1969). The potential for uranium and thorium exposures is also evidenced by the inclusion of elemental uranium, enriched uranium, and thorium in the GE-Ohio bioassay program through the 1960s (Boback, 1965; General Electric, 1964; General Electric, 1967).

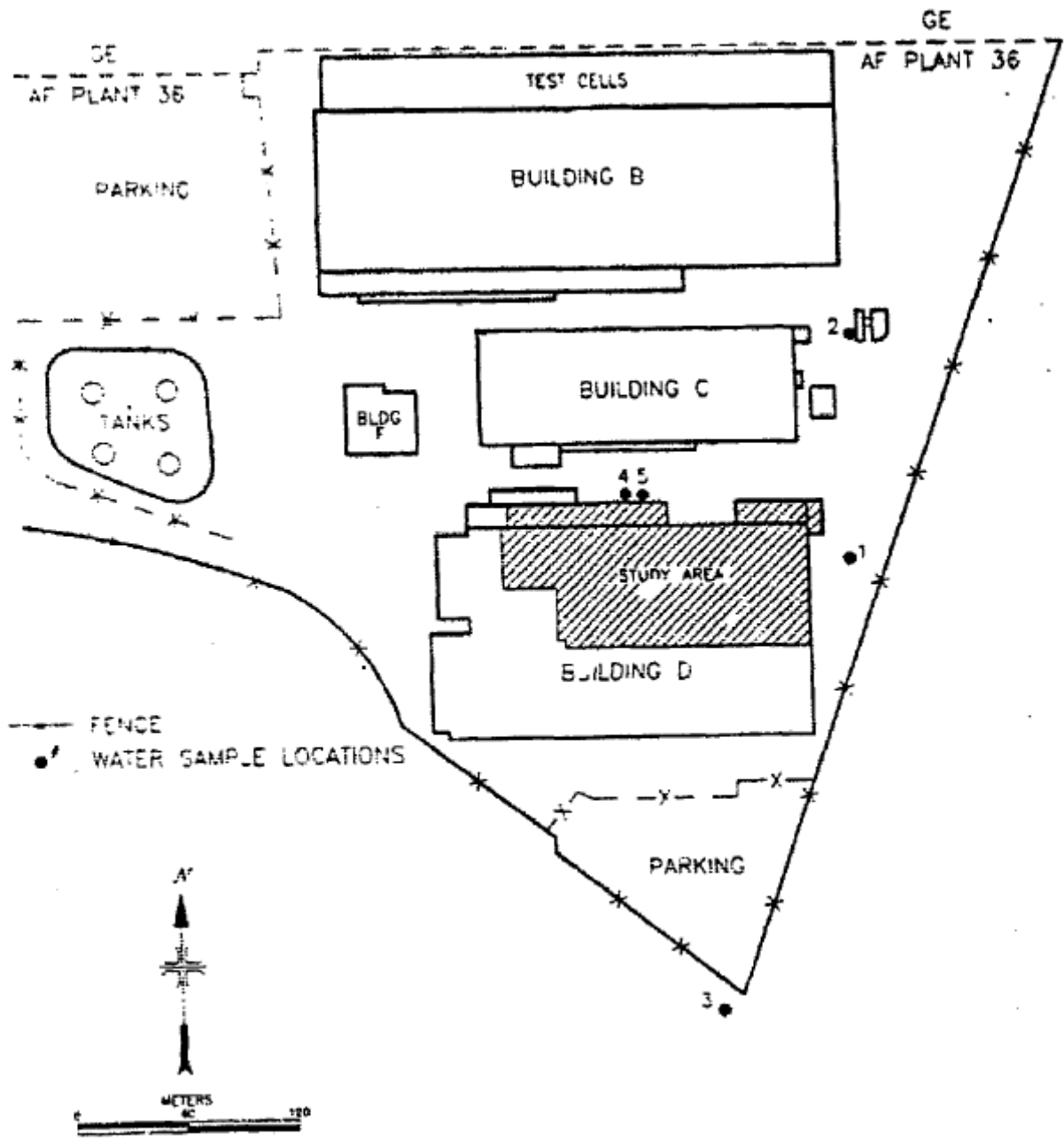
Figure 4-1 provides an aerial photo of the General Electric Co. site in Evendale, Ohio, with the Air Force Plant No. 36 boundary delineated by the dashed line.



Source: General Electric, 1984, pdf p. 10

Figure 4-1: Aerial View of the General Electric Co. Site in Evendale, Ohio

Figure 4-2 shows a more close-up drawing of the Air Force Plant No. 36 footprint.



Source: Murphy, 1988, pdf p. 40

Figure 4-2: Map of Air Force Plant No. 36, General Electric Co., Evendale, Ohio

Building C

Building C, measuring approximately 660 x 280 feet, was built circa 1941. In 1956, additional space was needed to support the ANP operations in Building D; 42% of Building C was allocated and henceforth called "C-West" (General Electric, 1984, pdf p. 9). Between 1961 and 1968, Building C-West was used for fuel element production in conjunction with AEC reactor development programs (General Electric, 1984, pdf p. 15). Beginning in 1967, Room 120 of Building C-West was used to calcine high-purity thoria (ThO₂) for the thermal breeder reactor program. By June 1984, Building C-West was decontaminated to levels below the contemporaneous NRC guideline levels for unrestricted use (General Electric, 1984, pdf p. 66).

Building D

Building D, measuring approximately 680 x 450 feet, was built in 1943 as an aluminum foundry (Review, 1979, pdf p. 11). In 1951, Building D was chosen as the operational laboratory building for the ANP operation (Review, 1979). The main Laboratory area is divided into six blocks of alternating rows of laboratories or rooms. Other support facilities were located west of the Laboratory area. A high bay area was located along the entire length of the north side of Building D. The east portion of the high bay in the Laboratory area housed the Radioactive Materials Laboratory (three hot cells), additional laboratories, central air conditioning and exhaust facilities, and the Nuclear Experimental Area (Thorium Inventory, 1973-1996, pdf p. 8). Sources of laboratory alpha contamination were natural uranium, depleted uranium, 93% enriched uranium, and natural thorium (Thorium Inventory, 1973-1996). Sources of beta-gamma contamination included fission products from irradiated uranium fuel elements in laboratory areas, such as the Radioactive Materials Laboratory; L4-8 (Metallurgical Warm Cell); and L1-6/L1-8 (Radiochemistry Warm Cell) (Thorium Inventory, 1973-1996). Decontamination of Building D was completed in 1987 (Thorium Inventory, 1973-1996, pdf p. 17; Hoffer, 1987; Murphy, 1988).

Radioactive Waste Storage Area

The Radioactive Waste Storage facilities were built in 1957 to upgrade the centralized storage and control of radioactive waste prior to shipment to an approved burial site (General Electric, 1986a, pdf p. 10). These facilities were located on the north end of Building D, and consisted of a fenced concrete storage pad on the west adjacent to a decontamination building in the middle, and a clean drum storage area east of the building (Murphy, 1988, pdf p. 17; General Electric, 1986a). The heated building was primarily used for storage of liquid wastes. The west pad was an open area for storage of 55-gallon drums filled with contaminated wastes. On a few occasions (dates unknown to NIOSH), the concrete floor inside the building was contaminated by thorium liquid leakage from the drums (General Electric, 1986a). Decontamination of the Radioactive Waste Storage Area was completed in 1986 (General Electric, 1986a).

4.2 Radiation Exposure Potential from Operations

The potential for internal and external radiation dose existed in Buildings C and D and surrounding support areas, including a fenced and locked outdoor Radioactive Waste Storage Area north of Building D. Based on the site operations outlined in Section 4.1, sources of exposure included:

- natural, depleted, and highly-enriched uranium (Thorium Inventory, 1973-1996)
- mixed fission and activation products from work with irradiated reactor fuel elements (Thorium Inventory, 1973-1996; Rice, 1966)
- thorium from the calcination operations with thorium-oxide (Herries, 1966, pdf p. 5; Rennich, 1965, pdf p. 53; Personal Communication, 2008, pdf p. 3)

4.3 Time Period Associated with Radiological Operations

Per the DOE Office of Health, Safety and Security, the time period associated with DOE operations at GE-Ohio is from 1961 through 1970. NIOSH has found no data to identify a specific start date in 1961, and therefore assumes January 1, 1961 for the start of DOE operations. NIOSH has found evidence that DOE/AEC operations ceased on June 30, 1970 when the facilities were returned to the Air Force (General Electric, 1974a). Therefore, NIOSH assumes that the DOE operations period at GE-Ohio ended on June 30, 1970.

4.4 Site Locations Associated with Radiological Operations

Although Buildings C and D are specifically noted for the use of AEC-related radiological materials, documentation available to NIOSH does not indicate any definite boundaries between radiological and non-radiological areas for the period being evaluated. In an effort to better understand the association between radiological and non-radiological areas of the GE-Ohio plant from 1961 through 1970, NIOSH conducted two Worker Outreach meetings in 2010:

- May 10, 2010: Worker Outreach Meeting with United Auto Workers (UAW) Local 647, held in Evendale, Ohio (Outreach, 2010a)
- July 13, 2010: Worker Outreach Meeting with International Association of Machinists and Aerospace Workers (IAM) Local 912, held in Evendale, Ohio (Outreach, 2010b)

A major objective of the Worker Outreach efforts was to ascertain directly from workers the level of access control that may have been in place for Buildings C and D and any associated radiological areas. While some input from workers applied to years before and after the period under evaluation (January 1, 1961 through June 30, 1970), the general indications given to NIOSH were that there was no fence or permanent access control separating Buildings C and D (or the general Air Force Plant 36 areas) from the rest of the larger GE facility. Many interviewees spoke of security guards doing tours, and of certain parts of the radiological facilities being locked, but no information came to light that would allow NIOSH to determine which workers did, or did not, have the potential to enter the radiological areas associated with Buildings C or D. (Outreach Meeting Minutes, 2010)

In a separate attempt to better identify the group of GE-Ohio workers with the potential for radiation exposures, NIOSH obtained a list of former GE-Ohio workers who supported the site's various nuclear research and development operations (POPSEE List, 1987). While this list does identify almost 500 workers with a presumed increased potential for radiation exposure, NIOSH has determined that such a list does not enable NIOSH to define the potential exposure scenarios for other site workers.

Given the lack of information to completely describe access controls and operations processes associated with radiological operations in Buildings C and D and the larger Air Force Plant 36 areas, NIOSH is unable to determine which GE-Ohio workers did, or did not, have the potential for radiation exposure during the period from January 1, 1961 through June 30, 1970. NIOSH is therefore unable to define individual worker exposure scenarios based on specific work locations within the GE-Ohio facility.

4.5 Job Descriptions Affected by Radiological Operations

Given the general lack of process knowledge, workplace surveys, or detailed source term information, it is not possible to determine that any specific work group was not potentially exposed to radioactive material during the covered DOE operations at the GE-Ohio facility. NIOSH has found no documentation associating job titles and/or job assignments with specific radiological operations or conditions and is, therefore, unable to define potential radiation exposure conditions based on worker job descriptions.

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, exposure rate surveys, process knowledge, and source term modeling can sometimes be used to reconstruct the 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>.

5.1 Data Capture Efforts and Sources Reviewed

In addition to examining its Site Research Database (SRDB) to locate documents supporting the evaluation of the proposed class, NIOSH identified and reviewed numerous data sources to locate information relevant to determining the feasibility of dose reconstruction for the class of employees proposed for this petition. This included determining the availability of information on personnel monitoring, workplace monitoring, and radiological source term data.

NIOSH data capture efforts for GE-Ohio focused on the General Electric Co., the Ohio Department of Health, DOE (including DOE Legacy Management, OpenNet repository; and Office of Scientific and Technical Information [OSTI]), and the National Archives record centers. Attachment One contains a summary of over 550 GE-Ohio documents captured by NIOSH as of April 5, 2011, including:

- 162 documents from GE;
- approximately 160 documents from DOE;
- approximately 150 documents from non-DOE Federal sources;
- approximately 30 documents from state sources; and
- approximately 20 documents from OSTI.

The summary in Attachment One identifies specific data capture details for each document retrieved, including database searches.

During a search of both the Internet and the SRDB, NIOSH was unable to locate GE-Ohio Material Control and Accountability (MC&A) records for the period under evaluation. NIOSH did determine that GE did have two accountability station codes for the ANP Project prior to the AEC-covered period. GE-Ohio also submitted thorium accountability reports to National Lead of Ohio after 1970 (i.e., after the period under evaluation).

5.2 Worker Interviews and Meetings

To obtain additional information, NIOSH conducted worker outreach meetings and interviewed former GE-Ohio employees. As presented in Section 4.4, NIOSH conducted worker outreach meetings in Evendale, Ohio with GE-Ohio members of the United Auto Workers (May 10, 2010) and the International Association of Machinists and Aerospace Workers (July 13, 2010). The May 2010 meeting with UAW members was attended by 37 signed attendees, four of whom volunteered for personal interviews, as listed below. The July 2010 meeting with the IAM was attended by six union attendees.

- Personal Communication, 2008, *Personal Communication with Retired GE Evendale Health & Safety Manager*; Telephone Interview by ORAU Team; April 1, 2008; SRDB Ref ID: 43509
- Personal Communication, 2009, *Personal Communication with Retired GE Evendale Health & Safety Manager*; Telephone Interview by ORAU Team; August 18, 2009; SRDB Ref ID: 73138
- Personal Communication, 2010a, *Title*; Worker Outreach Interview with United Auto Workers Local 647 member (formerly at GE-Evendale); May 10, 2010; SRDB Ref ID: 94106

- Personal Communication, 2010b, *Title*; Worker Outreach Interview with United Auto Workers Local 647 member (formerly at GE-Evendale); May 10, 2010; SRDB Ref ID: 94107
- Personal Communication, 2010c, *Title*; Worker Outreach Interview with United Auto Workers Local 647 member (formerly at GE-Evendale); May 10, 2010; SRDB Ref ID: 94108
- Personal Communication, 2010d, *Title*; Worker Outreach Interview with United Auto Workers Local 647 member (formerly at GE-Evendale); May 10, 2010; SRDB Ref ID: 94109
- Outreach Meeting Minutes, 2010, Meeting Minutes for the NIOSH SEC Worker Outreach Meeting for General Electric-Evendale; July 13, 2010; SRDB Ref ID: 94110

5.3 Previous Dose Reconstructions

NIOSH reviewed its NIOSH DCAS Claims Tracking System (referred to as NOCTS) to locate EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation. Table X-1 summarizes the results of this review. (NOCTS data available as of April 11, 2011)

Table 5-1: No. of General Electric Co. (Ohio) Claims Submitted Under the Dose Reconstruction Rule	
Description	Totals
Total number of claims submitted for dose reconstruction having employment in the covered period 1961-1970.	172
Total number of claims submitted for energy employees having: <ul style="list-style-type: none"> • an SEC specified cancer; and • • • %• • -days of employment in the period January 1, 1961 through June 30, 1970. 	105
Number of dose reconstructions completed for energy employees who worked during the period under evaluation (i.e., the number of such claims completed by NIOSH and currently submitted to the Department of Labor for final approval).	11
Number of claims for which internal dosimetry records were obtained for the identified years in the evaluated class definition.	0
Number of claims for which external dosimetry records were obtained for the identified years in the evaluated class definition.	20

5.4 Internal Personnel Monitoring Data

By means of continued data capture efforts through late 2010, NIOSH has obtained *in vitro* and *in vivo* bioassay results for GE-Ohio workers for the period under evaluation (Boback, 1965a; Boback, 1965b; Boback, 1965c; Boback, 1965d; Boback, 1965e; Boback, 1966a; Boback, 1966b; Boback, 1967a; Boback, 1967b; Boback, 1968; Dose Summaries, various dates). NIOSH reviewed the available internal monitoring data to identify possible work location information that might be useful in differentiating between exposed and non-exposed worker populations or job descriptions. Only one

of the 499 internal monitoring results reviewed had a work or sample location noted. NIOSH has obtained the following data for the period January 1, 1961 through June 30, 1970:

- 1961 through 1964: No internal monitoring results
- 1965: 43 thorium urine results, 183 uranium urine results, 1 *in vivo* count
- 1966: 11 thorium urine and 57 uranium urine results
- 1967: 17 thorium urine and 185 uranium urine results
- 1968 and 1969: No internal monitoring results
- 1970: 2 uranium urine results

NIOSH has found no fission product bioassay monitoring data for GE-Ohio for the period under evaluation. As indicated in Table 5-1, NIOSH has been unable to associate any of the available internal monitoring data listed above with any of the 172 claims currently referred to NIOSH for dose reconstruction.

5.5 External Personnel Monitoring Data

By means of continued data capture efforts through late 2010, NIOSH has obtained film badge, pocket ion chamber (PIC), and extremity monitoring results for GE-Ohio workers for the period under evaluation (Thorton, 1964 pdf p. 68; Clark, 1961; Visitor Exposures, 1961; Exposure Cards, various dates; Dose Record Cards, various dates; Engel, 1971; Engel, 1972; Engel, various dates). NIOSH reviewed the available external monitoring data to identify possible work location information that might be useful in differentiating between exposed and non-exposed worker populations or job descriptions. Less than 5% of the 4451 external results reviewed had a work location noted. NIOSH has obtained the following data for the period January 1, 1961 through June 30, 1970:

- 1961: 1252 film, 124 PIC, and 47 finger/hand results
- 1962: 262 film and 18 finger/hand results
- 1963: 207 film and 38 finger/hand results
- 1964: 418 film and 42 finger/hand results
- 1965: 274 film and 28 finger/hand results
- 1966: 309 film and 250 finger/hand results
- 1967: 298 film and 252 finger/hand results
- 1968: 254 film and 49 finger/hand results
- 1969: 214 film and 3 finger/hand results
- 1970: 107 film and 5 PIC results

As indicated in Table 5-1, NIOSH has associated the external monitoring data listed above with only twenty of the 172 claims currently referred to NIOSH for dose reconstruction. Although over 95% of these external monitoring data cannot be associated with specific work locations or processes, NIOSH has determined that substantial data exist for the entire covered period. However, because NIOSH-identified deficiencies in internal monitoring data span the entire GE-Ohio covered period (see Section 5.4), NIOSH has not fully evaluated the available external monitoring data to determine the number of individuals represented in the 1961-1970 data.

5.6 Workplace Monitoring Data

By means of continued data capture efforts through late 2010, NIOSH has obtained a contamination survey of facilities and equipment performed by GE-Ohio staff in September 1969 (Hoffer, 1969). The survey was performed at AEC request in preparation for the AEC relinquishing use of the Evendale facility and returning it to the Air Force. The survey included a room-by-room assessment of the Building C-West and Building D “Restricted Areas” where equipment and facilities were used for nuclear work at the Evendale facility (Hoffer, 1969). The 1969 survey classified the surveyed areas into four categories: (1) completely contaminated; (2) partially contaminated; (3) potentially contaminated; and (4) free of contamination.

A NIOSH review of the survey results indicates that the levels in the most contaminated areas (termed as “Completely Contaminated Areas” in the report) can be represented by the following examples:

- External surfaces of L-6 exhaust duct: 150 mR/hour at 1 cm. The report notes that “Radiation levels inside ducts will be higher because of beta radiation.”
- Facilities Contamination:
 - 6660 d/m/100cm² removable alpha contamination in the Ceramic Research Laboratory
 - 125,000 d/m/100cm² removable beta-gamma contamination in the Ceramic Research Laboratory
- Equipment Contamination:
 - 51,000 d/m/100 cm² removable alpha contamination in the Chemical Research Laboratory
 - 114,000 d/m/100 cm² removable beta-gamma contamination in the Chemical Research Laboratory

Regarding non-radiological areas, the report indicates that non-restricted areas of the Evendale facility were also monitored during the summer of 1969, and states: “No detectable contamination above background levels was found in these [non-restricted] areas of Buildings D, C, GDF-II and the Transfer Dock. Outside roadways, walkways, and soils are free of detectable surface contamination as measured by portable radiation instruments and smear tests” (Hoffer, 1969, pdf p. 9).

NIOSH has also obtained U.S. Nuclear Regulatory Commission Decontamination Reports for the release of Buildings C and D in 1984 and 1986, respectively (General Electric, 1984; General Electric, 1986b; Murphy, 1988).

5.7 Radiological Source Term Data

A majority of source term data obtained by NIOSH pertains to periods outside the 1961-1970 AEC operations period being evaluated. NIOSH has obtained source term information for some specific projects or experiments during the period from January 1, 1961 through June 30, 1970, but lacks the specific information from which to identify the operations with the highest exposure potential. As

presented in the preceding sections, the principal sources of internal and external radiation during the period under evaluation included exposures to natural, depleted, and enriched uranium, thorium, and fission product radionuclides during operations, such as high-temperature testing of refractory metals and alloys, reactor components, and fuel element materials, as well as the treatment of thorium-oxide in high-temperature furnaces.

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 co-workers at the facility for whom NIOSH believes that dose reconstruction is similarly infeasible, but for whom additional research and analysis is 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). 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

NIOSH has evaluated the available personnel and workplace monitoring data and source term information and has determined that there are insufficient data for estimating internal exposures, as described below.

NIOSH has identified insufficient personnel and workplace monitoring data from which to draw conclusions regarding the potential magnitude of any internal doses from exposure to uranium, thorium, or fission products at GE-Ohio for the entire DOE operations period. The uranium and thorium bioassay data available to NIOSH do not represent potential exposures during the entire period under evaluation and are therefore insufficient to support development of an internal dose co-worker distribution for the years without data.

NIOSH has identified workplace survey data for the GE-Ohio radiological areas. Although the 1969 area survey (Hoffer, 1969) is comprehensive in the areas surveyed, the results are strictly in units of gross alpha or gross beta-gamma, with no isotopic results available to NIOSH. NIOSH has determined that without information about exposure scenarios and the isotopic source term, the available workplace monitoring data are insufficient to allow sufficiently accurate dose reconstruction in the absence of personnel internal or external monitoring data. Decontamination-era reports from the mid 1980s (General Electric, 1984; General Electric, 1986b; Murphy, 1988) are insufficient to bound potential exposures in the diverse fuel production and laboratory environments encountered by workers during the 1961-1970 AEC period of operations.

A majority of source term data obtained by NIOSH pertains to periods outside the 1961-1970 AEC operations period under evaluation. NIOSH has obtained source term information for some specific projects or experiments during the period from January 1, 1961 through June 30, 1970, but lacks the specific information by which to identify the operations with the highest exposure potential. Such information is required to enable NIOSH to bound potential exposures using source term data in the absence of personnel monitoring data. NIOSH has not identified sufficient documentation to define and quantify the total source term for GE-Ohio during the DOE operations period. Available documentation indicates that GE-Ohio worked with uranium, thorium, and fission product radionuclides throughout the entire DOE operations period. Without additional documentation, NIOSH can make no assumptions about the relative amounts of these materials that would have been encountered at the site during the period from January 1, 1961 through June 30, 1970. Therefore, there is insufficient source term information available to NIOSH to bound internal exposures to uranium, thorium, and fission products for the period from January 1, 1961 through June 30, 1970.

NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential internal exposures to uranium, thorium, or fission product radionuclides during the period of DOE operations at GE-Ohio from January 1, 1961, through June 30, 1970. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures and resulting doses for the class of employees covered by this evaluation.

Although it is not possible to completely reconstruct internal radiation doses for the period from January 1, 1961 through June 30, 1970, NIOSH intends to use any internal monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals who do not qualify for inclusion in the SEC may be performed using these data as appropriate.

6.2 Feasibility of Estimating External Exposures

This evaluation responds to a petition based on NIOSH determining that internal radiation exposures to uranium, thorium, and fission product radionuclides could not be reconstructed for a dose reconstruction referred to NIOSH by the Department of Labor (DOL). 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 exposures for the class of workers covered by this report.

NIOSH has obtained external monitoring results for all years from 1961 through June 1970 (over 3500 film badge results, as discussed in Section 5.5). However, due to NIOSH's identified inability to adequately reconstruct all internal radiation doses with sufficient accuracy during the 1961-1970 period (as presented in Section 6.1 above), NIOSH has not evaluated the external film data on an individual worker basis, and has not determined whether sufficient data exist to generate adequate external co-worker dose distributions for the assignment of unmonitored dose during partial dose reconstruction.

Adequate reconstruction of medical dose for GE-Ohio workers is likely to be feasible by using claimant-favorable assumptions in the complex-wide Technical Information Bulletin, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006) and *Guidance on Assigning Occupational X-ray Dose Under EEOICPA for X-rays Administered Off Site* (ORAUT-OTIB-0079).

Although it may not be possible to completely reconstruct external radiation doses for the period from January 1, 1961 through June 30, 1970, NIOSH intends to use any external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals who do not qualify for inclusion in the SEC may be performed using these data, as appropriate.

6.3 Class Parameters Associated with Infeasibility

As presented in Section 4.3, NIOSH has found no data to identify a specific start date in 1961, and therefore assumes January 1, 1961 for the start of DOE operations. NIOSH has found evidence that DOE/AEC operations ceased on June 30, 1970, when the facilities were returned to the Air Force (General Electric, 1974a). NIOSH therefore recommends that the class be defined within the period from January 1, 1961 through June 30, 1970.

As presented in Section 4.4, NIOSH put considerable effort into trying to identify building- and area-specific information, or workgroup-specific information, that would allow NIOSH to define the recommended class according to specific work locations within the context of the broader GE Evendale plant footprint. NIOSH has determined that the Air Force Plant 36 areas were not physically separated from the general Evendale Plant, and that there is insufficient access control documentation available to allow NIOSH to define individual worker exposure scenarios based on specific work locations within the GE-Ohio facility. NIOSH therefore continues to recommend that the class definition include all areas of the GE-Ohio facility during the specified time period.

As presented in Section 4.5, NIOSH has found insufficient documentation associating job titles and/or job assignments with specific radiological operations or conditions. Without such information, NIOSH is unable to define the proposed SEC class based on worker job descriptions. NIOSH therefore recommends that the proposed class definition include all employees of DOE, its predecessor agencies, and their contractors and subcontractors who worked at GE-Ohio during the specified time period.

7.0 Summary of Feasibility Findings for Petition SEC-00161

This report evaluates the feasibility for completing dose reconstructions for employees at GE-Ohio from January 1, 1961 through June 30, 1970. NIOSH determined that members of this class may have received radiation exposures from uranium, thorium, and fission product radionuclides. NIOSH lacks sufficient information, which includes biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source information that would allow it to estimate the unmonitored potential internal exposures to which the proposed class may have been exposed. Reconstruction of external dose for individuals for whom personal external monitoring records are available is considered feasible. NIOSH considers the adequate reconstruction of medical dose for GE-Ohio workers to be feasible.

NIOSH has documented herein that it cannot complete the dose reconstruction related to this petition. 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.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any available internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at GE-Ohio during the period from January 1, 1961 through June 30, 1970, but who do not qualify for inclusion in the SEC, may be performed using these data, as appropriate.

8.0 Evaluation of Health Endangerment for Petition SEC-00161

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(b) 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 uranium, thorium, and fission product radionuclides, as well as 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-00161

The evaluation defines a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. This class includes all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at General Electric Co. in Evendale, Ohio, from January 1, 1961 through June 30, 1970, 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.

10.0 Evaluation of Second Similar Class

In accordance with § 83.14(a), NIOSH may establish a second class of co-workers 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 are required. Such a class would be addressed in a separate SEC evaluation rather than delay consideration of the current claim. At this time, NIOSH has not identified a second similar class of employees at GE-Ohio for whom dose reconstruction may not be feasible.

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Attachment 1: Data Capture Synopsis

Table A1-1: Data Capture Synopsis for General Electric Co. (Ohio)			
Data Capture Information	General Description of Captured Data	Date Completed	Uploaded To SRDB
<p><u>Primary Site/Company Name:</u> General Electric-Evendale BE 1951-1970; AWE/DOE 1961-1970; Residual Radiation 1971-1994. Company contacts are [Name redacted], IH, and [Name redacted], Environmental Counsel</p> <p><u>Other Site Names:</u> GE Evendale GE Cincinnati GE Lockland Air Force Plant 36</p> <p><u>Physical size of the site:</u> Air Force Plant 36 occupied 66.4 acres at the southern end of the GE Evendale facility. The primary Air Force Plant 36 buildings were B, C, D (now demolished), and the South Fuel Farm. Covered activities took place in Building C-West, approximately 58,000 square feet, and Building D, approximately 306,000 square feet.</p> <p><u>Size of the workforce during the SEC related periods:</u> The site population estimate during the Covered Period is approximately 8,000.</p>	<p>Radiation and contamination surveys, decontamination reports, air sample results, instrument calibration and performance records, source calibration records, zone number coding for AEBG facilities, Environmental Hygiene Org. chart from 1959, 1958 job descriptions for Health Physicist, Specialist, Radiation Education and Program Measurements, Supervisor Radiological Health Services, Radiological Measurement Specialist, Dosimetry Records Clerk with criteria for dose records maintenance, and for Standards Analyst, affidavit on contracts, radioactive materials, and waste disposal, whole body and lung count results for a decon worker, brief 1987 status reviews for Buildings D and C-West, the "POPSEE" roster of former ANPO, NMPO, SPPS, NSP, ESP, and AEP workers, biographical sketches of POPSEE workers, the 1959-1960 Health and Hygiene Instruction Manual, employee access to exposure records, dose record cards, radiological surveys during asbestos removal, AEC byproduct material license amendments, AEC source material license, thorium safe handling instructions, description of radiography program, x-ray machine surveys, and decontamination technical specifications.</p>	12/03/2010	162
State Contacted: Ohio Department of Health	State registrations and license, description of ANP work, reactor safety determination, and a site survey.	11/20/2007	26
Department of Energy (DOE)	AEC documents regarding the application of the AEC indemnity provision to the ANP Program.	06/19/2008	25
Department of Labor/Paragon	Uranium scrap evaluations, nuclear safety inspections, industrial hygiene inspections, process descriptions, and FUSRAP documentation and review.	12/30/2008	10
DOE EM FUSRAP Files	FUSRAP elimination recommendation, license applications, and a database report.	07/22/2003	2
DOE Hanford	History of the FEMP's thorium process including GE's thorium oxalate processing and a 1961 Hanford visit to GE.	01/17/2008	2

Table A1-1: Data Capture Synopsis for General Electric Co. (Ohio)			
Data Capture Information	General Description of Captured Data	Date Completed	Uploaded To SRDB
DOE Headquarters, Germantown, MD	Thorium research and development, beryllium data, and safety recommendations.	07/22/2003	2
DOE - Idaho National Engineering Laboratory Library	Report of heat transfer reactor experiment No. 3.	10/30/2006	1
DOE Legacy Management - Grand Junction Office	Contract data for GE contracts administered by the New York Operations Office and the Savannah River Office, AEC meeting on the Aircraft Nuclear Propulsion Program, authorization to ship W-25 tubing to GE, status and plans for Air Force Plant 36, and a brief overview of Air Force Plant 36.	03/11/2011	11
DOE Legacy Management - Morgantown	A 1971 FMPC report mentioning the shipping of thorium oxalate to GE for the production of thorium oxide and FMPC reports documenting services performed for GE including sectioning ThO ₂ spheres in 1974.	06/30/2010	5
DOE Legacy Management - MoundView (Fernald Holdings, includes Fernald Legal Database)	Health & Safety Division annual report, thorium process information, contamination survey of thorium handling equipment, laundering contaminated clothing, calcining thorium oxalate to thorium oxide for the FMPC Bettis Project, FUSRAP report, request for spectrographic analysis of thorium oxide, thoria powder progress reports, procurement documents, removal of equipment from GE, contracts for and results from uranium and thorium urinalyses conducted by FMPC, a newsletter account of an AEC contract extension for reactor system studies, and accountability documents.	01/17/2011	102
DOE Office of Scientific and Technical Information (OSTI)	Summary hazards reports, tensile strength of irradiated material, parameters of beryllium moderated critical assemblies, and proceedings of a nuclear propulsion conference.	03/02/2010	9
Federal Records Center, Chicago, IL	Plant air sampling records, film badge reports, exposure reports, urinalysis results, contamination surveys, nuclear safety records, and stack sampling results.	10/02/2008	67
Federal Records Center, Lee's Summit, MO	Film badge reports.	11/04/2008	1
Federal Records Center, San Bruno, CA	Summaries of high temperature reactor research programs.	01/31/2006	1
Internet - Comprehensive Epidemiologic Data Resource (CEDR)	No relevant data identified.	04/10/2008	0
Internet - DOE Hanford Declassified Document Retrieval System (DDRS)	Hanford monthly reports identifying visits to and visitors from GE Evendale and a report of a GE Evendale mock fuel rod experiment conducted at Hanford. NOTE: 4 documents were added by Site Association Review.	10/15/2008	4
Internet - DOE Legacy Management Considered Sites	Tonawanda area progress report. NOTE: This document was added by Site Association Review.	10/25/2007	1

Table A1-1: Data Capture Synopsis for General Electric Co. (Ohio)			
Data Capture Information	General Description of Captured Data	Date Completed	Uploaded To SRDB
Internet - DOE OpenNet	Human radiation studies oral history, AEC semi-annual reports, and NYOO monthly status reports. NOTE: 7 documents were added by Site Association Review.	04/04/2008	7
Internet - DOE OSTI Energy Citations	No relevant documents identified.	04/12/2008	0
Internet - DOE OSTI Information Bridge	Fuels, materials, and reactor component reports and a radioactive waste evaluation.	04/12/2008	8
Internet - Google	Physics Division progress report, ORNL ceramics information meeting, Department of Defense report on Air Force Plant 36, news report of toxic leak, health hazard evaluation reports, and reactor component research reports. NOTE: 4 documents were added by Site Association Review.	05/27/2008	19
Internet - Health Physics Journal	No relevant data identified.	04/01/2011	0
Internet - Journal of Occupational and Environmental Hygiene	No relevant data identified.	04/01/2011	0
Internet - National Academies Press (NAP)	No relevant data identified.	04/13/2008	0
Internet - National Nuclear Security Administration (NNSA) - Nevada Site Office	No relevant data identified.	04/10/2008	0
Internet - NRC Agencywide Document Access and Management (ADAMS)	The 2001 FUSRAP sites review. NOTE: This document was added by Site Association Review.	04/13/2008	1
Internet - Washington State University (U.S. Transuranium and Uranium Registries)	No relevant data identified.	04/13/2008	0
National Archives and Records Administration (NARA) - Atlanta	Annual health protection status report, neutron source transfer records, material transfer records, material transfers to ORNL, and ANP fuel and core experiment reports.	05/21/2008	22
National Archives and Records Administration (NARA) - College Park	Report of a 1954 Department of Defense visit to GE.	08/17/2010	2
National Archives and Records Administration (NARA) - Kansas City	Site decontamination history.	03/03/2005	1
New York State Department of Environmental Conservation	Report on carbon reduction of uranium oxide.	01/07/2011	1
NIOSH	Shielding studies with beryllium oxide, salt slabs, gadolinium, and water for Aircraft Nuclear Propulsion Project.	03/02/2010	4
NOCTS	Organizational chart, job descriptions, process information, U-235 process information, shielding information, Building 700 ventilation grievance, and radium chip exposure grievance.	07/10/2008	20

Table A1-1: Data Capture Synopsis for General Electric Co. (Ohio)			
Data Capture Information	General Description of Captured Data	Date Completed	Uploaded To SRDB
ORAU Team	Project spreadsheets, process knowledge expert documented communications, and a documented communication with GE's Environmental Counsel which confirmed the completion of the records search conducted by GE Aviation's Compliance Leader.	04/01/2008	10
Petitioner Provided	1977 Evendale site telephone book.	10/07/2010	1
SAIC	Annual whole body exposure summaries.	09/02/2004	4
Savannah River Site	Dosimetry visitor cards and thoria program reports.	08/26/2008	6
Southern Illinois University, Edwardsville, IL	GE waste disposed in the St. Louis area and an ERDA report citing need for obtaining GE dosimetric data.	10/18/2008	2
Unknown	Fernald area and Lockland trip reports, technical reports on the GE ANP Program, including activities at Idaho National Laboratory, exposure information, beryllium reports, NYOO air dust survey, a 1953 report concerning liquid waste disposition, thorium shipment to GE, and material transfers from Fernald.	08/04/2003	13
TOTAL			552

Databases Searched for General Electric Co. (Ohio)			
Database/Source	Keywords / Phrases	Hits	Uploaded To SRDB
NOTE: Database search terms employed for each of the databases listed below are available in the Excel file called "GE-Evendale Rev 01., (83.14) 04-05-11.xls"			
CEDR http://cedr.lbl.gov/ COMPLETED 04/10/2008	See Note above	0	0
DOE Energy Citations http://www.osti.gov/energycitations/ COMPLETED 04/12/2008	See Note above	3,508	0
DOE Hanford DDRS http://www2.hanford.gov/declass/ COMPLETED 10/15/2008	See Note above	0	0

Databases Searched for General Electric Co. (Ohio)			
Database/Source	Keywords / Phrases	Hits	Uploaded To SRDB
DOE Legacy Management Considered Sites Database http://csd.lm.doe.gov/ COMPLETED 10/25/2007	N/A	0	0
DOE OpenNet http://www.osti.gov/opennet/advancedsearch.jsp COMPLETED 04/04/2008	See Note above	0	0
DOE OSTI Information Bridge http://www.osti.gov/bridge/advancedsearch.jsp COMPLETED 04/12/2008	See Note above	7,007	8
Google http://www.google.com COMPLETED 05/07/2008	See Note above	11,922	15
HP Journal http://journals.lww.com/health-physics/pages/default.aspx COMPLETED 04/01/2011	See Note above	0	0
Journal of Occupational and Environmental Health http://www.ijoe.com/index.php/ijoe COMPLETED 04/01/2011	See Note above	6	0
National Academies Press http://www.nap.edu/ COMPLETED 04/13/2008	See Note above	0	0
NNSA - Nevada Site Office www.nv.doe.gov/main/search.htm COMPLETED 04/10/2008	See Note above	15	0
NRC ADAMS Reading Room http://www.nrc.gov/reading-rm/adams/web-based.html COMPLETED 04/13/2008	See Note above	5,000	0
U.S. Transuranium & Uranium Registries http://www.ustur.wsu.edu/ COMPLETED 04/13/2008	See Note above	12	0

Table A1-3: OSTI Documents Requested for General Electric Co. (Ohio)			
Document Number	Document Title	Requested Date	Received Date
AD-A-285563/3/XAB OSTI ID: 7098399 SRDB: 44372	Multi-group Analysis of Nuclear Reactors in Three Space Dimensions dated 4/20/1960	10/19/2007	05/07/2008