HSS

Office of Health, Safety and Security

2009 Current Beryllium-Associated Worker Registry Summary

Foreword

Why is Beryllium Found in Department of Energy Workplaces?

Beryllium and beryllium-containing materials have properties that have led to its use for both nuclear and nonnuclear applications within the U.S. Department of Energy (DOE). Its ability to slow and reflect neutrons without absorbing them led to its use in experimental reactors and nuclear weapons. Its transparency to x-rays led to its use in equipment that generate and measure x-rays. When bombarded with alpha particles, beryllium generates neutrons, which led to its use in high energy physics. Beryllium metal's lightweight, high strength, dimensional stability led to its use as structural components in aerospace applications. Beryllium strengthens copper in alloys that retain copper's ability to conduct electricity and heat and are as strong as stainless steel. In work that led to the Manhattan Project, beryllium oxide ceramics were used by Enrico Fermi as neutron moderators in the Chicago pile and by Frank Spedding in crucibles to produce high-purity uranium at Iowa State University. Beryllium has been used for over 60 years by DOE and its predecessors and continues to find applications in the development of new energy technologies. See appendix A for descriptions of activities at specific sites.

What is the Beryllium-Associated Worker Registry?

The DOE Beryllium-Associated Worker Registry is a collection of health and exposure information of individuals potentially at risk for chronic beryllium disease (CBD) due to their work at DOE-owned or leased facilities. The data are analyzed and summarized for use in managing CBD prevention programs. Title 10, Code of Federal Regulations, part 850 (10 C.F.R. 850), "Chronic Beryllium Disease Prevention Program," requires DOE sites to inventory and assess beryllium exposure hazards to determine whether employees are at risk for CBD. Sites that determine employees are at risk due to ongoing or past work must implement CBD prevention programs that include reporting health and exposure data to the DOE Beryllium-Associated Worker Registry. Health data are collected through the operation of medical surveillance programs for current workers at 21 DOE sites. Exposure data are collected through the operation of industrial hygiene programs at 16 sites that have continuing beryllium operations.

Who is included in the Registry?

The category "beryllium-associated worker" describes individuals who were screened for CBD or monitored for beryllium exposure while employed at a DOE site. The workers include both long-term employees who worked with beryllium years ago and workers exposed recently. Current workers who self-identify or are identified by supervisors as beryllium-associated workers are offered screening for CBD, but are not required to participate.

Individuals who have separated from employment at a DOE site are offered screening for CBD through programs operated by contract medical providers and cooperative agreement holders. The screening is performed at private clinics near the individual's current residence. These individuals are categorized as "former workers," and the results from these former worker

programs are summarized in separate reports. For more information, see **http://www.hss.energy.gov/HealthSafety/FWSP/formerworkermed/**.

Table 1. Sites and Organizations Submitting Data to the Registry

Argonne National Laboratory (ANL)	Brookhaven National Laboratory (BNL)
DOE Oak Ridge Office (DOE-ORO)	East Tennessee Technology Park (ETTP)
Fermi National Accelerator Laboratory (Fermi)	Hanford Site (HAN)
Idaho National Laboratory (INL)	Kansas City Plant (KCP)
Knolls Atomic Power Laboratory (KAPL)	Lawrence Berkeley National Laboratory (LBNL)
Lawrence Livermore National Laboratory (LLNL)	Los Alamos National Laboratory (LANL)
Nevada Test Site (NTS)	Oak Ridge National Laboratory (ORNL)
Pantex Plant (PTX)	Sandia National Laboratories (SNL)
Savannah River Site (SRS)	Southwestern Power Administration (SWPA)
Stanford Linear Accelerator Center (SLAC)	Wackenhut Security Services Inc., for ETTP, ORNL, and Y-12 (WSI)
Y-12 National Security Complex (Y-12)	

What kinds of health and exposure data are used in the Registry?

CBD is diagnosed when clinical evaluations indicate both sensitization and characteristic changes to lung tissue have occurred. Evidence of characteristic changes include finding abnormal tissue called granulomas in biopsy samples or, if biopsy is not possible, findings from x-ray studies or pulmonary function studies that are consistent with CBD. CBD usually develops over several years or even decades and can be in a mild or severe form. Beryllium-related granulomas (i.e., noncancerous tumors or growths due to inflammation) can make it difficult for the lungs to get oxygen to the bloodstream and body. Over time, scar tissue can develop causing permanent lung damage.

Workers potentially at risk for CBD are offered screening examinations. The beryllium lymphocyte proliferation test (BeLPT), symptoms questionnaires, and other tests recommended by the examining physician are used to screen for CBD. The BeLPT is a blood test that examines how lymphocytes (white blood cells in the immune system that fight disease) react to beryllium. A BeLPT is considered abnormal if a person's lymphocytes react strongly to beryllium. An abnormal BeLPT may indicate that a person is more likely than others with similar exposure to develop CBD in the future or may be an early sign of CBD. An individual must have two abnormal blood tests to be considered beryllium sensitized (BeS). It is recommended that individuals with abnormal findings obtain a diagnostic evaluation to determine if they have CBD and whether medical treatment is indicated. Results from screening and diagnostic evaluations are reported to the Registry.

The exposure levels of workers potentially exposed to beryllium are assessed periodically through personal breathing zone sampling. Workers may come into contact with beryllium in a number of jobs. Machinists, welders, and operators may be exposed through direct handling of beryllium and beryllium compounds. Performing quality assurance analyses on beryllium materials, coming into contact with contaminated equipment, or working near a beryllium operation may expose other workers. Personal breathing zone monitoring results representative of workers' occupational exposure to beryllium are reported to the Registry.

What time period is included in this report?

The report summarizes cumulative health data through the end of 2007. Much of the data for 2007 were reported to or corrected in the Registry in 2008. The 10 C.F.R. 850 rule required sites to begin reporting in January 2002. The Registry requested the health data for beryllium-associated workers include screening and diagnostic information from prior years. At some sites medical surveillance of current workers began in the early 1990s under research protocols, but was not widely adopted until the 10 C.F.R. 850 rule was issued in December 1999. Information reported by most sites includes results of medical evaluations before 2002, but the earliest dates vary from site to site.

The report summarizes exposure-monitoring results for years 2002 through 2007 with a focus on 2007. All 2007 data reported as of October 28, 2008, are included in this report. Sites are asked to report data in an electronic format in January and July. Computerized checking of data submissions identifies omissions, entry errors, and logical inconsistencies. These errors and omissions are returned to the site for resolution. Data included in this report have completed these error identification and resolution steps. Exposure-monitoring results from ETTP were excluded from some DOE-wide time trend analyses because of logical inconsistencies in 2004 and 2005 results that have yet to be resolved.

How are confidentiality and privacy protected?

The Privacy Act requires that DOE protect the confidentiality of medical and other personal information used in the Registry. This is achieved through the use of an encrypted identifier created and maintained at the site that reports data to the Registry. Names, social security numbers, and other identifying information are kept in confidential personnel medical records at the site. Information submitted to the Registry regarding a specific worker only includes his or her unique encrypted identification number.

Published reports using Registry information will generally contain only summary data. It is possible that descriptions of working conditions associated with a specific case will be published to share lessons with others. Such descriptions of specific cases will avoid containing enough unique information to allow readers to identify the individuals being described.

What happens to the information sent to the Registry?

Data are sent by each site to the Data Center maintained by the Oak Ridge Institute for Science and Education (ORISE). There the data are reviewed for completeness and accuracy. Registry staff members use a system of automated codes to determine missing data, data that are out of range (e.g., unusual or incorrect values), and other inconsistencies. The Data Center notifies each site data coordinator of errors or omissions so they can be corrected. Data processing and subsequent analyses are conducted by ORISE and the DOE Office of Health and Safety staff. Summary data and other results of analyses are published in periodic reports. Reports are reviewed internally by a Quality Review Board and approved reports are posted on the DOE Web site. Approved reports are not sent to line organizations or sites for validation prior to publication. Participating sites will be notified of the availability of these reports and asked for comments and suggested improvements for future reports. Data analyses will also be presented at meetings of DOE and DOE contractor personnel.

Where do I get more information?

Reports, operating procedures, and other information are posted on the Web at **http://www.hss.energy.gov/HealthSafety/IIPP/hservices/bery_wr.html**.

Questions about this program or related issues can be addressed to:

Office of Worker Safety and Health Policy
(301) 903-6061

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Executive Summary

A key aspect of all U.S. Department of Energy (DOE) missions is to protect the health, safety, and security of DOE employees, contractors, and subcontractors working at DOE-owned or leased sites. The Office of Health, Safety and Security (HSS) provides the corporate-level leadership and strategic vision necessary to better coordinate and integrate health, safety, environment, security, enforcement, and independent oversight programs. The HSS Office of Health and Safety supports this mission with programs that collect, analyze, and disseminate worker health information. The summaries and analyses in this report assist corporate decisionmaking and synthesize operational information to support continuous improvement across the DOE complex.

Beryllium's physical properties have led to its widespread and continuing use in high energy physics, experimental reactors, electronics, and nuclear weapons. By the mid-1990s, chronic beryllium disease (CBD) was recognized to be a leading cause of occupational disease in the DOE complex. In 2000, legislation created government-provided medical benefits for individuals with abnormal CBD screening test results and compensation to those diagnosed with CBD. In June 2008, the Department of Labor reported having accepted 489 claims for CBD from living current and former DOE workers who were diagnosed using modern criteria. The legacy of past beryllium use includes contaminated facilities and equipment that create the major health risk management challenge today. New cases of CBD continue to be diagnosed among current DOE workers.

This report summarizes health data from medical examinations reported for 13,583 current DOE workers who have had an association with beryllium work. These individuals received one or more DOE-provided screening examinations for CBD between 1991 and the end of 2007. Among the participants, 111 (0.8 percent) are known to have been diagnosed with CBD, and another 236 (1.7 percent) have been found to be sensitized to beryllium. The workforce contains a high proportion of long-term workers making it difficult to know whether new diagnoses are the result of past or ongoing exposures. New cases are being reported among more recently hired workers. Lower rates among the recently hired could be due to improved health protection or the time period between exposure and sensitization and CBD. Differences in exposure level are the only variable that can account for the differences in sensitization and CBD rates from site to site and among groups at the same site and demonstrate that beryllium exposure control has the potential to prevent sensitization and CBD. Differences in exposure between groups being screened could be due to better control of exposure, but also can be due to differences in participation. Targeting medical screening at high-exposed groups will increase rates, and rates will be lower if screening is broadened to include workers with lower exposure potential.

Exposure-monitoring data have the advantage of being a risk indicator for current working conditions. However, because beryllium exposure monitoring is labor intensive, only a small percentage of work shifts are monitored. Exposure assessments assume results from monitored shifts are representative of the work shifts that were not monitored. Beryllium exposure monitoring at DOE sites expanded after December 1999 when the CBD Prevention Program rule established an action level that was one-tenth the National permissible exposure limit. The rule required sites to begin reporting exposure-monitoring data to the Registry in January 2002.

The data suggest there were higher exposures in 2003 and 2004. These higher exposures were associated with projects to upgrade and remodel beryllium shops, implement new weapons

component-testing procedures, and repackage beryllium-containing mixed waste. Since 2004, data indicate that the Department, in general, controlled beryllium exposures to below the action level. Thirteen DOE sites reported exposure-monitoring data for 2007, indicating continuing beryllium-related activities at these sites. In 2007, exposures above the action level were predominantly associated with dust-disturbing tasks in contaminated facilities.

The Registry collects and analyzes existing information generated for other purposes. The quality and completeness of reporting of any particular data element varies depending on its accessibility to the site staff members who report the information. Difficulty in accessing personnel and medical records to obtain work history information limits the ability to identify differences in sensitization and CBD rates among groups. Plans to correct this through use of work history questionnaires or identification of more accessible records are being implemented. Exposure monitoring at several sites is limited to a small number of measurements, creating uncertainty as to whether exposures are being appropriately monitored and controlled.

After 6 years of operation, the completeness and accuracy of reporting has continued to improve and provide more reliable information on differences between sites, among groups of workers, and over time. These differences suggest opportunities for more indepth investigations and studies that can identify working conditions that are contributing to the risk of developing illness due to exposure to beryllium. With increasing depth of information over time, the Registry should become increasingly useful in identifying opportunities for prevention that would otherwise be missed.

The beryllium activities responsible for CBD cases at some sites have been identified and corrected. Cases occurring at other sites have yet to be explained and raise concern that some unidentified source of exposure is continuing. For example, cases occurring at the Kansas City Plant, Pantex Plant, Savannah River Site, and Hanford Site are inconsistent with the low exposure levels being reported and the perceived history of limited beryllium use. Overcoming the barriers to conducting the site-specific studies and investigations needed to understand the working conditions responsible for CBD is a continuing challenge to the improvement of DOE's CBD prevention programs.

Recommendations for DOE line management of beryllium facilities:

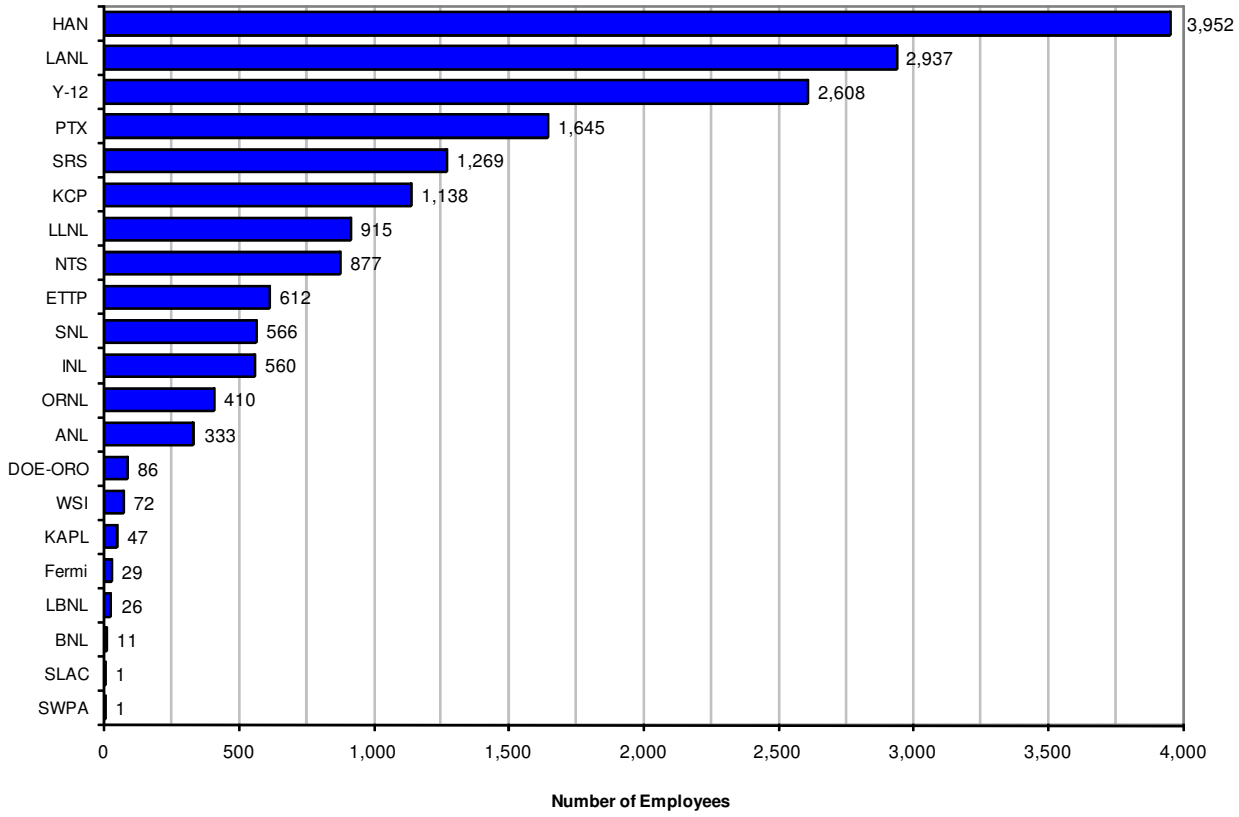
- Consider implementing exposure-monitoring strategies that include statistically planned surveys that make minimal assumptions about workers' exposure potentials. This statistically planned approach has the ability to determine whether work is disturbing unidentified beryllium contamination and resulting in potential exposure that is not being recognized during work planning. In addition, these data will provide greater information that can be used to identify the causes of sensitization and CBD cases.

- Consider implementing field epidemiology methods, such as disease outbreak investigation, to help understand the cause of CBD cases that remain unexplained. These methods involve collecting work histories, to describe common job characteristics, hypothesizing plausible common causes, and identifying opportunities to prevent new cases.

Analyses of Health Data

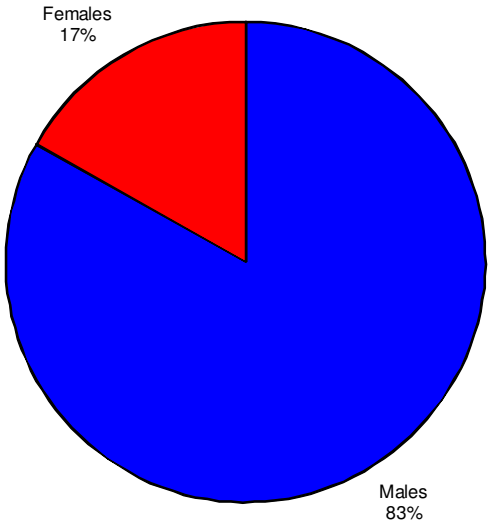
Figure 1 shows the cumulative number of beryllium-associated workers reported to the Registry since 2002. Included are individuals who were screened for CBD or monitored for beryllium exposure while employed at a DOE site. Most sites reported readily accessible records on individuals screened or monitored before 2002. Some of these individuals will have separated from employment since having been screened or monitored. There are a total of 18,095 individuals who have been included in rosters reported to the Registry. Rocky Flats Environmental Technology Site beryllium-associated workers included in previous reports have been dropped from this report because of closure of the site in 2005. The 3,998 Rocky Flats workers are now included in former worker medical screening programs.

Figure 1. Number of Employees Reported to the Be-Registry



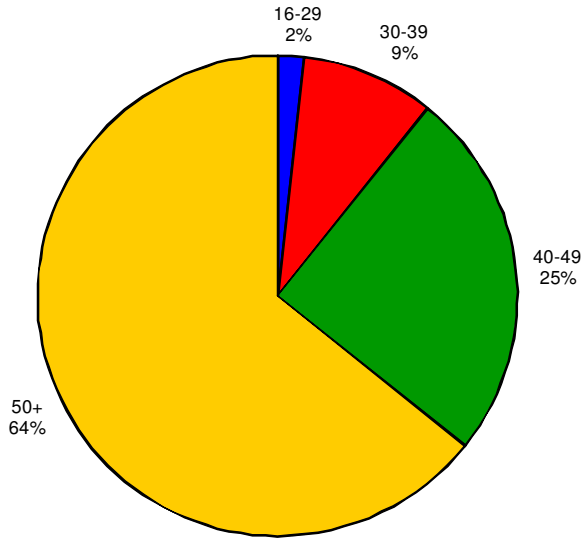
Beryllium-associated workers reported to the Registry are predominantly male. Reporting on gender was nearly complete with only 0.01 percent of the records failing to include information on gender.

Figure 2. Gender Breakdown of Employees Reported to the Be-Registry



The median age of beryllium-associated workers reported to the Registry exceeds 50 years. Reporting on age was nearly complete with only 0.03 percent of the records failing to include information on age.

Figure 3. Age Breakdown of Employees Reported to the Be-Registry



The age distribution of beryllium-associated workers is consistently skewed towards older workers at all sites.

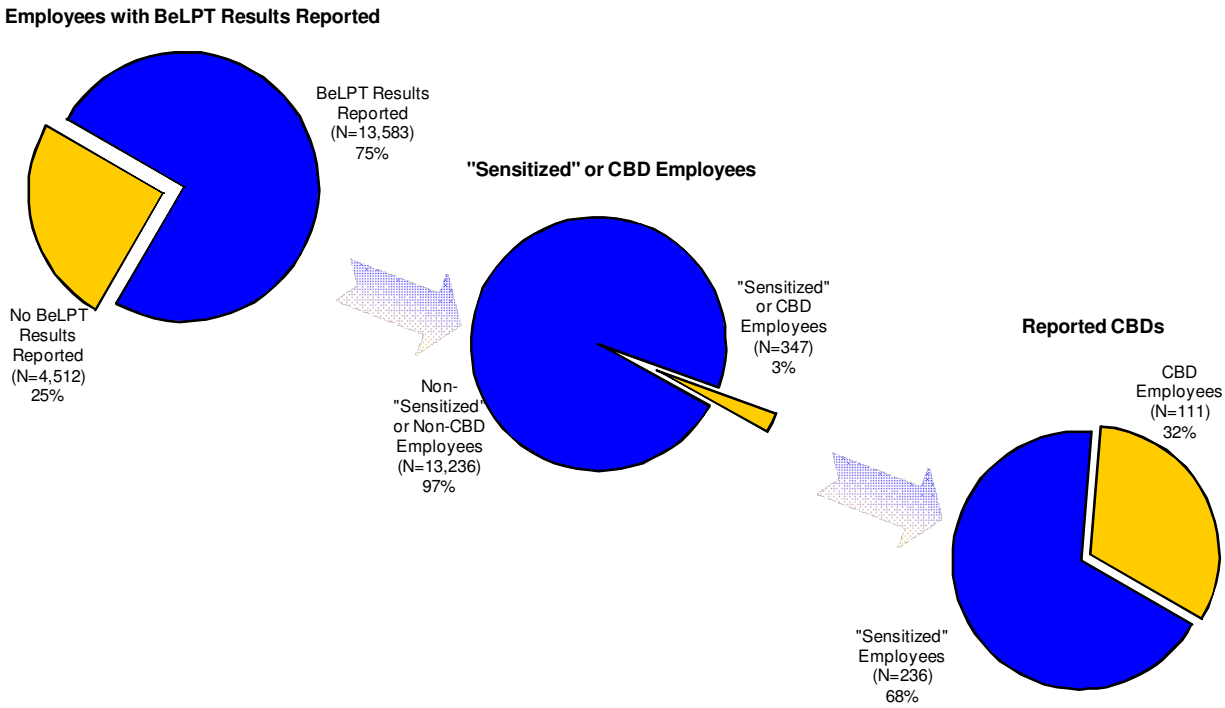
Table 2. Age Breakdown of 18,095 Employees Reported to the Be-Registry

Site*	16-29	30-39	40-49	50+	Not Reported
ANL	1	11	87	234	0
BNL	0	0	2	9	0
DOE-ORO	1	5	22	58	0
ETTP	27	75	111	399	0
Fermi	0	1	7	20	1
HAN	82	396	1123	2351	0
INL	43	92	198	227	0
KAPL	0	4	26	17	0
KCP	6	25	166	941	0
LANL	58	374	860	1645	0
LBNL	0	1	5	20	0
LLNL	12	78	244	580	1
NTS	22	99	175	581	0
ORNL	4	29	90	287	0
PTX	13	187	423	1022	0
SLAC	0	0	0	1	0
SNL	17	61	129	356	3
SRS	12	61	401	794	1
SWPA	0	0	0	1	0
WSI	0	4	16	52	0
Y-12	30	120	423	2035	0
Totals	**328**	**1,623**	**4,508**	**11,630**	**6**

*See list of site abbreviations on page 2, table 1.

Of the 18,095 individuals included in rosters of beryllium-associated workers, 13,583 have reported BeLPT results. Of those screened, 111 have been diagnosed as having CBD, and another 236 are sensitized for a total of 347 (2.6 percent of those tested). "Sensitized" indicates the number of individuals found to have an immunologic response to their beryllium exposures by two or more peripheral blood BeLPTs or from a bronchoalveolar lavage BeLPT. "CBD" are individuals who have undergone clinical evaluations and diagnosed with CBD based on sensitization and lung pathology consistent with CBD. The difference in numbers from the individuals reported in rosters to those with BeLPT results is due to a combination of individuals declining offers for medical screening and individuals for whom the BeLPT results are not accessible or not reported. Similarly, those reported as sensitized without CBD include those who underwent clinical evaluations and were found not to have any signs of lung pathology, those who declined the offer of a clinical evaluation, those whose clinical evaluation is pending, and those whose clinical evaluation results are not accessible or not reported.

Figure 4. Progression from BeLPT Testing to "Sensitized" to CBD



"Sensitized" indicates the number of individuals found sensitized from two or more peripheral blood BeLPTs or from a bronchoalveolar lavage BeLPT and does not include individuals who have been diagnosed as having CBD.

The number of BeLPT results is an indicator of the number of periodic medical screening examinations for CBD provided by DOE contractor-operated occupational medicine clinics. Individuals currently working with beryllium are offered screening examinations every year, and individuals who worked with beryllium in the past are offered screening examinations every 3 years. Individuals who have abnormal results are offered confirmatory testing that involves splitting blood samples, which are then tested in two laboratories. The total number of BeLPT results reported to the Registry is 35,398.

Figure 5. Number of BeLPT Results per Site

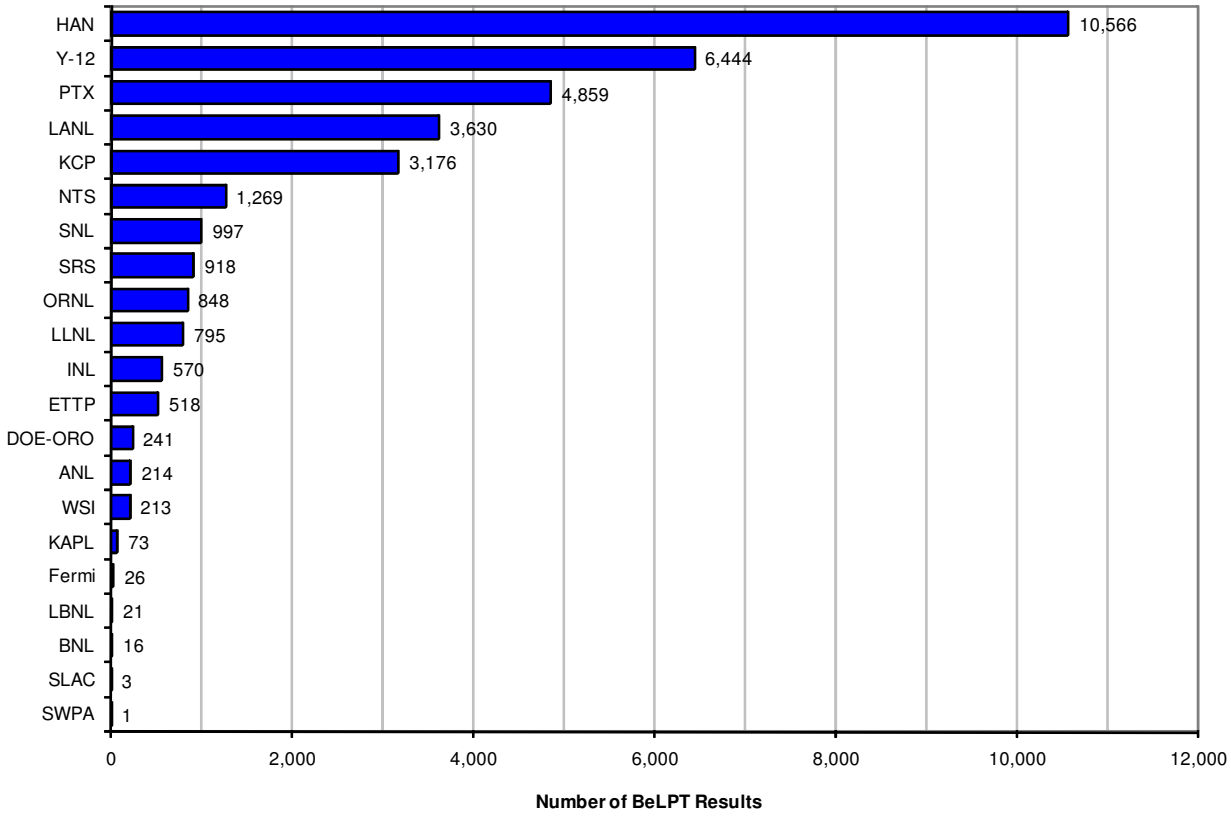


Table 3 shows the cumulative numbers of beryllium-associated workers reported to the Registry that have BeLPT test results are "sensitized" or have been diagnosed with CBD.

CBD cases are individuals who have undergone a clinical evaluation and been diagnosed as having CBD while employed at a DOE site. This does not include individuals who were diagnosed after separating from employment. The cases of CBD at Y-12 are consistent with the opportunities for exposure that have been extensively monitored and characterized. The cases at HAN, PTX, and KCP are not as well understood since exposure monitoring in the past was limited and more recent monitoring has not identified the causes of exposures likely to be responsible for the number of cases being observed.

Table 3. Number of Employees BeLPT Tested, "Sensitized," and CBD

Site*	Employees with BeLPT Results	"Sensitized" Employees	CBD Employees
HAN	3,785	58 (1.5%)	24 (0.6%)
Y-12	1,883	65 (3.5%)	45 (2.4%)
LANL	1,766	2 (0.1%)	3 (0.2%)
PTX	1,587	17 (1.1%)	15 (0.9%)
KCP	1,055	37 (3.5%)	12 (1.1%)
NTS	762	16 (2.1%)	3 (0.4%)
SNL	551	0	0
SRS	515	10 (1.9%)	4 (0.8%)
LLNL	413	11 (2.7%)	1 (0.2%)
ETTP	378	6 (1.6%)	4 (1.1%)
ORNL	300	5 (1.7%)	0
INL	264	2 (0.8%)	0
ANL	101	3 (3.0%)	0
DOE-ORO	85	1 (1.2%)	0
WSI	67	1 (1.5%)	0
KAPL	22	0	0
Fermi	19	0	0
LBNL	17	0	0
BNL	11	1 (9.1%)	0
SLAC	1	1 (100.0%)	0
SWPA	1	0	0
Totals	**13,583**	**236 (1.7%)**	**111 (0.8%)**

"Sensitized" indicates the number of individuals found sensitized from two or more peripheral blood BeLPTs or from a bronchoalveolar lavage BeLPT and does not include individuals who have been diagnosed as having CBD.

*See list of site abbreviations on page 2, table 1.

Site occupational medicine clinics have reported 236 “sensitized” (BeS) and 111 CBD cases to the Registry. Table 4 shows beryllium-associated workers are overwhelmingly long-term workers and, as a result, both BeS and CBD cases occur primarily among individuals who have worked for many years. However, 20 BeS cases and 1 CBD case have occurred among individuals hired since January 2001. New cases of BeS and CBD continue to be reported. Table 5 shows the distribution of initial positive screening results among cases who were eventually diagnosed as either BeS or CBD. Recent positive screening results among long-term workers could be due to false-negative results on initial tests, a latency period between exposure and the development of BeS, or as a result of recent exposure. The percentages shown in Tables 3 and 4 suggest a trend over time in the data. The trend could be due to improving working conditions. However, we may continue to see new cases of BeS or CBD due to the variable latency period between past exposure and the development of disease.

Table 4. Year of First Hire for Employees that Are "Sensitized" and CBD

Year of First Hire	Employees with BeLPT Results	"Sensitized" Employees	CBD Employees
<1961	63	0	1 (1.6%)
1961-1965	103	2 (1.9%)	0
1966-1970	602	21 (3.5%)	22 (3.7%)
1971-1975	679	9 (1.3%)	11 (1.6%)
1976-1980	1,886	53 (2.8%)	25 (1.3%)
1981-1985	1,425	29 (2.0%)	18 (1.3%)
1986-1990	1,155	12 (1.0%)	2 (0.2%)
1991-1995	1,108	18 (1.6%)	3 (0.3%)
1996-2000	961	13 (1.4%)	3 (0.3%)
2001-2005	1,495	16 (1.1%)	0
2006-2007	224	4 (1.8%)	1 (0.4%)
Not Reported	3,882	59 (1.5%)	25 (0.6%)
Totals	**13,583**	**236 (1.7%)**	**111 (0.8%)**

Table 5. Year of First Positive or Abnormal BeLPT for Employees that Are "Sensitized" and CBD

Year of BeLPT Result	Number of Employees Tested	"Sensitized" Employees	CBD Employees
<2000	697	32 (4.6%)	9 (1.3%)
2000	1,618	25 (1.5%)	16 (1.0%)
2001	3,219	35 (1.1%)	16 (0.5%)
2002	4,036	36 (0.9%)	14 (0.3%)
2003	4,022	11 (0.3%)	4 (0.1%)
2004	3,899	10 (0.3%)	3 (0.1%)
2005	5,209	24 (0.5%)	4 (0.1%)
2006	4,936	36 (0.7%)	2 (0.0%)
2007	4,618	21 (0.5%)	2 (0.0%)
Not Reported	0	1	38
Totals	**32,254**	**236 (0.7%)**	**111 (0.3%)**

The number of employees tested includes all testing with results of Normal, Negative, Borderline, Positive, Abnormal, and Unsatisfactory. Employees tested periodically are included in the number tested each year they were tested.

Table 6 reports the number of beryllium sensitization and CBD cases by groups sorted by work history activity. The work activities are a high level rollup of job functions. Individuals are placed in a group by site personnel based on the following descriptions:

- Management – Predominately office work at a desk; first level supervisor and above.
- Administrative Support – Predominately office work at a desk, however, can include tasks that involve visiting, production areas, shops, and laboratories. This category includes, but is not limited to, information technology, clerical, and secretarial staff.
- In-House Professionals – Predominately office work at a desk typically without supervisory responsibilities. Occasional tasks outside office create opportunities for exposure.
- Field Professionals – Frequently work outside of their offices in areas, such as, but not limited to, laboratories, testing areas, and construction areas.
- Technical Support – Workers who typically support the field professionals and have hands-on work situations.
- Service – Typically includes, but is not limited to, custodians, drivers, laundry workers, stationary engineers, and utility workers. These workers support and maintain the facility's infrastructure. Most work is not performed sitting at a desk.
- Security and Fire – Typically includes protective forces and firefighters.
- Crafts – Typically includes building trades, laborers, and other workers whose job titles are defined by the bargaining unit to which they belong.
- Line Operators – Typically workers who are directly involved in process, operation, or line activities at the facility.
- Guests – Employees on short-term assignments or internships. Typically includes guest scientists, postdoctoral fellows, co-op students, and interns. Potential for exposure dependent on job assignment.
- Unknown – Job title is missing.

Unlike results from published health studies of beryllium workers, the differences in rates among the groups are small. In addition, the differences are not consistent with our perceptions of the difference in opportunities for exposure among the groups (see Figure 9 below). Since work activity was not reported for 44 percent of the individuals, it is possible that improved reporting will lead to greater differences among the groups. Furthermore, workers in the Registry are predominantly older, long-term workers who may have had their most significant exposures in jobs that would have been grouped in another work activity.

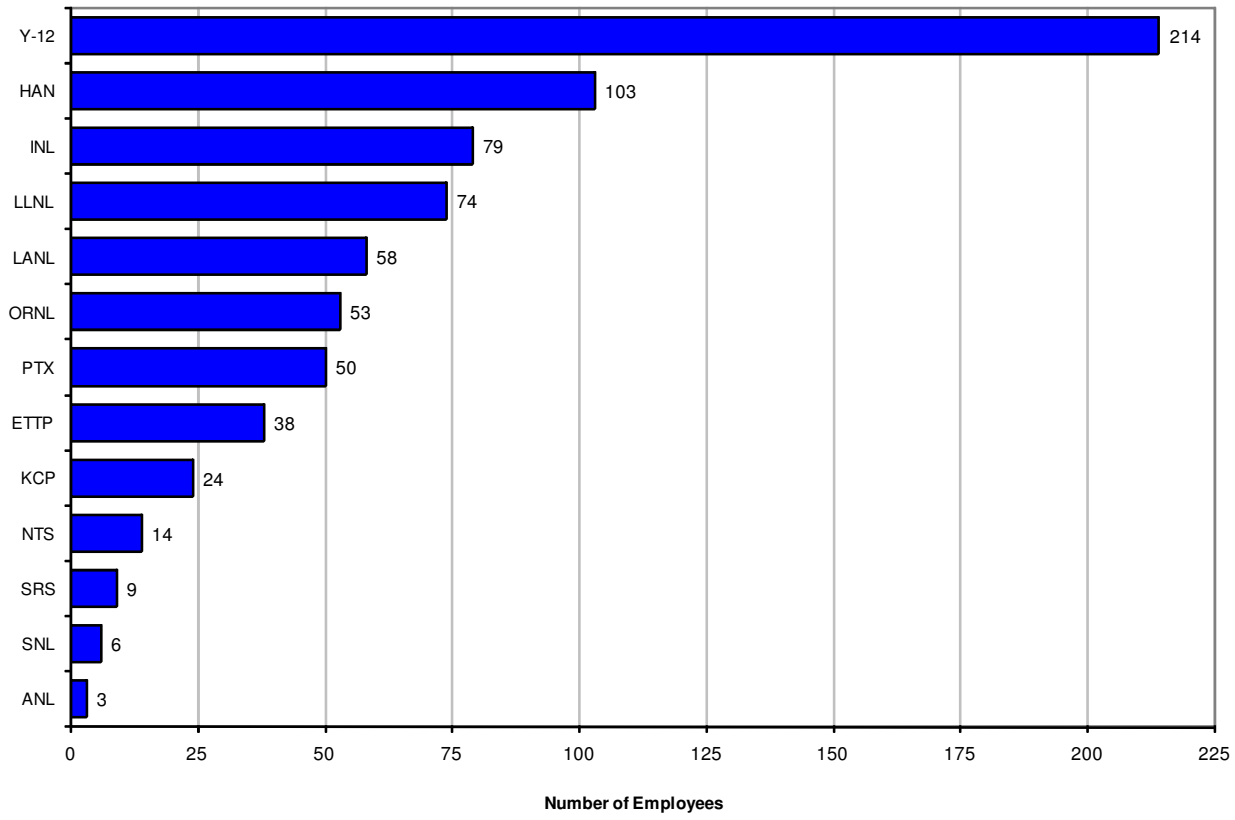
Table 6. Work History Activity for Employees that Are "Sensitized" and CBD

Work History Activity	Employees with BeLPT Results	"Sensitized" Employees	CBD Employees
Management (M)	659	9 (1.4%)	7 (1.1%)
Administrative Support (A)	593	21 (3.5%)	6 (1.0%)
In-House Professionals (I)	452	14 (3.1%)	6 (1.3%)
Field Professionals (F)	782	23 (2.9%)	5 (0.6%)
Technical Support (T)	1,025	21 (2.0%)	6 (0.6%)
Service (S)	572	14 (2.4%)	8 (1.4%)
Security and Fire (E)	523	9 (1.7%)	6 (1.1%)
Crafts (C)	1,718	43 (2.5%)	24 (1.4%)
Line Operators (O)	1,144	25 (2.2%)	16 (1.4%)
Guests (G)	8	0	0
Unknown (U)	107	7 (6.5%)	6 (5.6%)
Not Reported	6,000	50 (0.8%)	21 (0.4%)
Totals	**13,583**	**236 (1.7%)**	**111 (0.8%)**

Analyses of Exposure Data

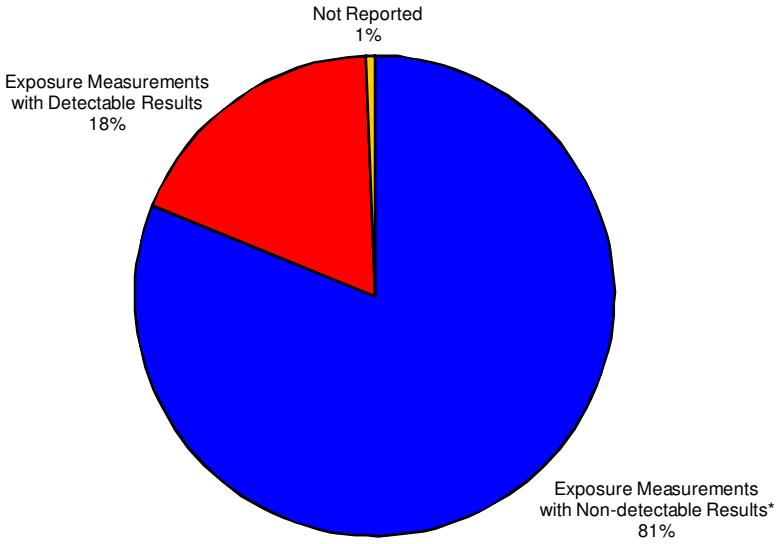
Figure 6 shows the number of individuals whose exposures were assessed by an industrial hygienist at least once in 2007. The number of individuals monitored is a function of the number of people working with beryllium or beryllium-contaminated facilities and equipment and the judgments and resources of the industrial hygiene programs responsible for monitoring their exposures. It is assumed that at least these numbers of individuals worked with beryllium at these sites in 2007 and is an indicator of the relative level of activity.

Figure 6. Number of Employees Monitored per Site in 2007



Participating sites have submitted 37,228 exposure-monitoring records to the Registry. The majority of these results were "nondetectable," which indicates that sample analysis results were less than the laboratory's reporting limit. Accredited laboratories report sample values at a specified level of accuracy (i.e., the reported value is within ± 10 percent of the true value). Results below this are reported as less than the reporting limit value and are commonly called "nondetects." The reporting limit can vary from sample to sample because of differing flow rates of the sampling equipment used and because of the presence of other materials on the sample that can interfere with the analysis. Reporting limits typically vary from 0.01 to 0.05 $\mu g/m^3$, which is one-twentieth to one-quarter of the action level of 0.2 $\mu g/m^3$.

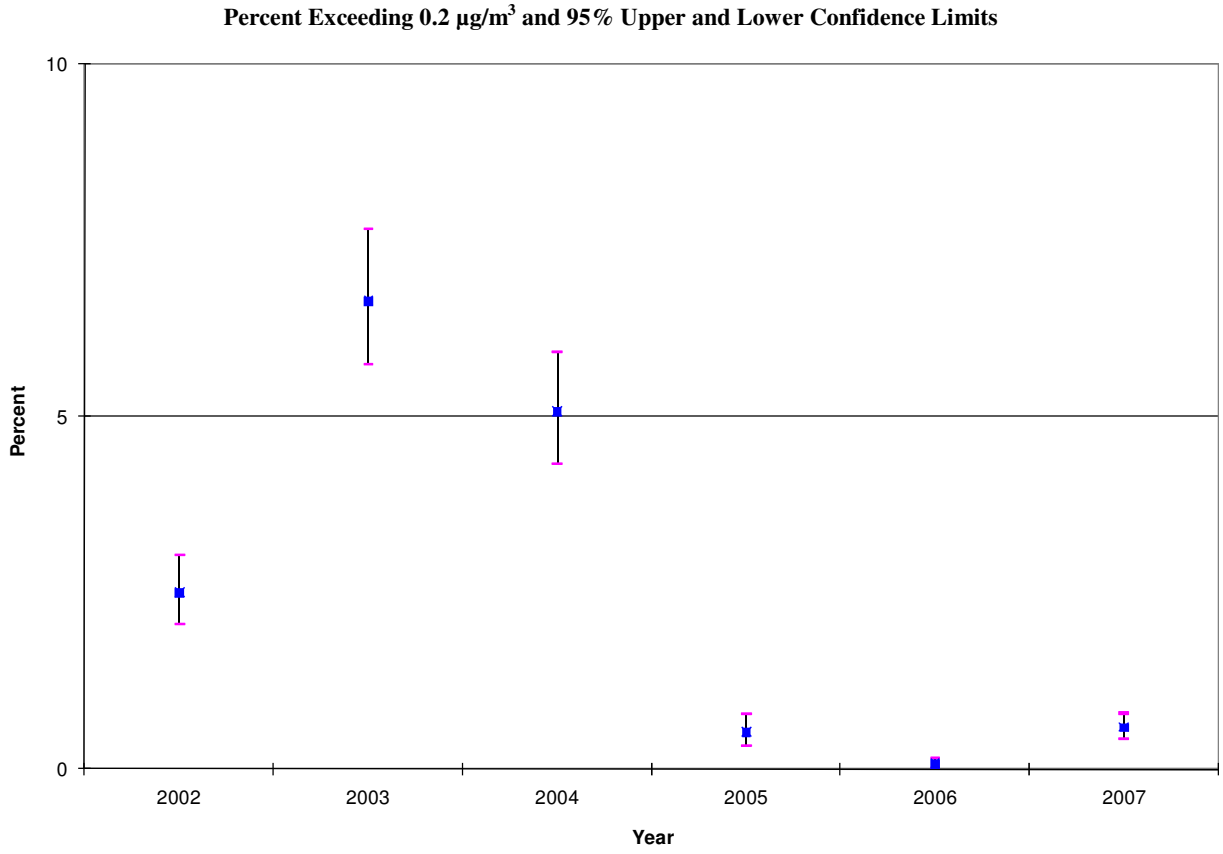
Figure 7. Reported Exposure Levels



*Nondetectable indicates that sample analysis results were reported as less than the laboratory's reporting limit.

Figure 8 shows estimates of the percentage of exposures exceeding the DOE action level of 0.2 µg/m^3 since the implementation date for 10 C.F.R. 850. Monitoring results with less than 5 percent of exposures exceeding the action level are considered evidence of compliance with the standard. The confidence intervals shown are a function of the number of measurements taken during the year. These data indicate that overall DOE has demonstrated an acceptable sampling program since 2005. However, Figures 9 and 10 demonstrate areas in which sampling programs could be improved.

Figure 8. Exposure Trend for 15 DOE Sites



ETTP exposure-monitoring results are not included in this analysis because of nondetected results with laboratory-reporting limits above 0.2 µg/m^3 in 2004 and 2005.

Note: For more information, see "A Strategy for Assessing and Managing Occupational Exposures," Ignacio, JS and Bullock, WH (editors): Third Edition. American Industrial Hygiene Association, Fairfax, VA (2006).

Figure 9 shows exposure date grouped by work activity. It includes measurements reported for the years 2002 through 2007. The work activities are the high level rollup of job functions used in Table 6 above. In this analysis, the unknown and not reported groups were combined. About 30 percent of measurements were from the unknown group. There are significant differences in the work activity groups; these differences reflect the opportunities for beryllium exposure. For the management, in-house professional, administrative, and security and fire groups there were no values above the action level. The large error bars demonstrate that some groups were not monitored frequently enough to be confident that their exposures are being controlled to levels below the action level.

Figure 9. Exposure by Work History Activity for Years 2002 through 2007

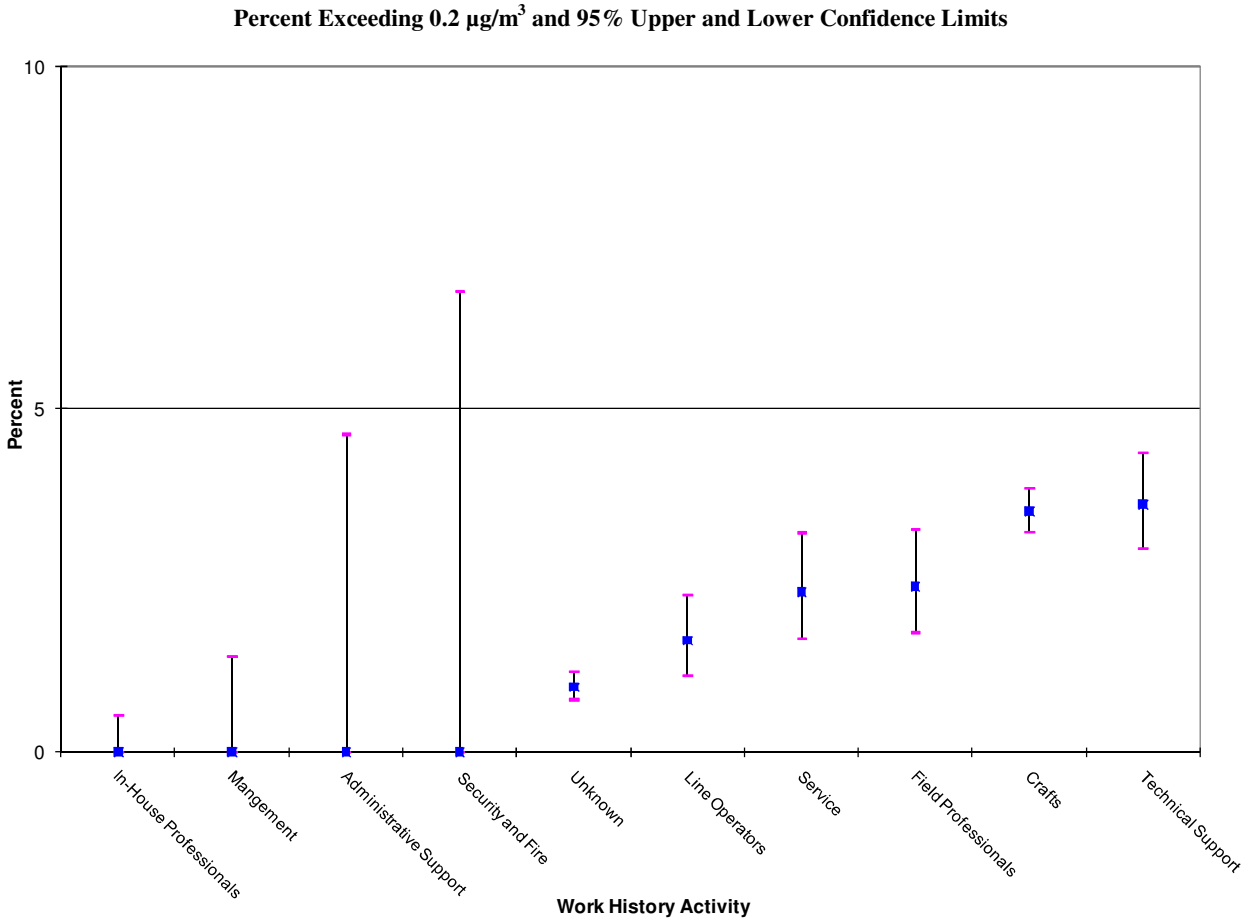
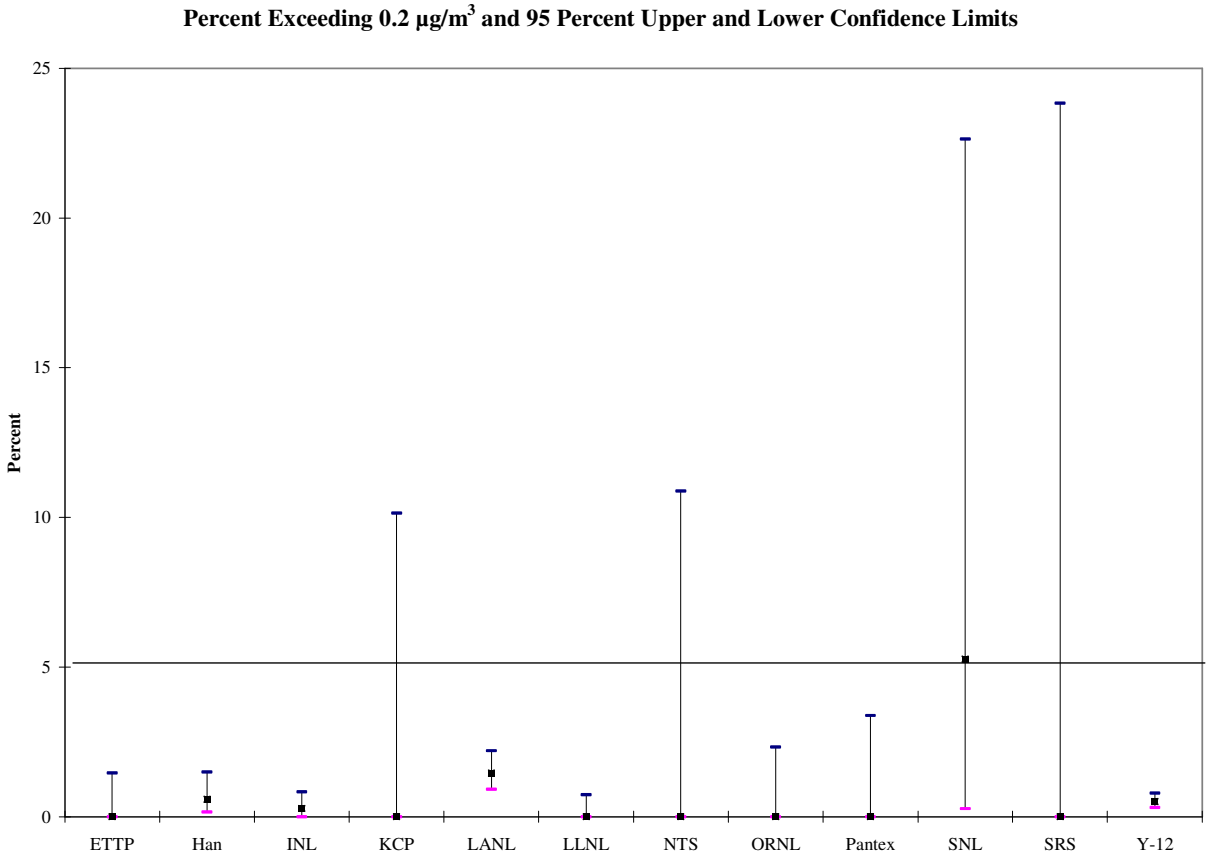


Figure 10 presents the same data grouped by sites. While the majority of sites have acceptable sampling programs, these data clearly show that some sites could revisit their sampling strategies and consider increasing the number of samples taken.

Figure 10. Percent of Exposure-Monitoring Results Exceeding the Action Level in 2007



Metrics for ANL are not shown. In 2007, ANL reported three 8-hour time-weighted, average-monitoring results, all below laboratory-reporting limits and the DOE action level.

The following table shows summary statistics estimated from exposure data submitted to the Registry. The majority of reported exposure-monitoring results were "nondetects." When there are no detected results, estimates of mean levels are not possible. For more information on the statistical methods used, see ORNL/TM-2005/52, "Statistical Methods and Software for the Analysis of Occupational Exposure Data with Non-Detectable Values" (June 2005), which is posted at **http://www.hss.energy.gov/HealthSafety/IIPP/sand/index.html**.

Table 7. Summary Exposure-Monitoring Statistics

Nonparametric Estimates	ETTP	HAN	INL	KCP	LANL	LLNL	NTS	ORNL	PTX	SNL	SRS	Y-12	Units
Arithmetic Mean (EX)		0.029	0.011		0.018	0.002				0.155		0.006	µg/m^3
Lower Confidence Limit (LCL) for EX		0.000	0.010		0.011	0.001				0.000		0.004	µg/m^3
Upper Confidence Limit (LCL) for EX		0.072	0.012		0.026	0.003				0.431		0.007	µg/m^3
Observed 95th Percentile of Data		0.011	0.014		0.031	0.013				0.175		0.010	µg/m^3
Upper Tolerance Limit		0.044	0.048		0.030	0.034						0.017	µg/m^3
Largest Value in the Data Set		12.513	0.109		2.350	0.095				2.800		1.999	µg/m^3
Percent of Values that are Nondetects	100	95	98.6	100	90.3	96	100	100	100	47.4	100	94.6	%
Observations in the Data Set	204	516	357	28	1098	404	26	127	87	19	11	2758	
The Number of Detected Values	0	26	5	0	106	16	0	0	0	10	0	149	
Number of Individuals Monitored	38	103	79	24	58	74	14	53	50	6	9	214	
Percent Exceeding 0.2 µg/m^3 (F)	0	0.58	0.28	0	1.46	0	0	0	0	5.26	0	0.51	%
LCL for F	0	0.16	0	0	0.92	0	0	0	0	0.27	0	0.31	%
UCL for F	1.46	1.50	0.84	10.15	2.20	0.74	10.88	2.33	3.38	22.64	23.84	0.79	%

Table 8 is a listing of 2007 personal exposure-monitoring results in which the 8-hour time-weighted average exceeded the 0.2 µg/m^3 action level. The activity descriptions associated with these results indicate exceedance was almost all due to dust-disturbing tasks from cleaning and other support work on contaminated facility and equipment. Only 2 of the 33 results were due to beryllium fabrication work. Work planning had identified these tasks as potentially hazardous, and individuals were wearing respiratory protective equipment with the assigned protection factors listed.

Table 8. List of Exposure-Monitoring Results Above the 0.2 µg/m^3 Action Level

Site	Activity Description	8-Hour Time Weighted Average µg/m^3	Respirator Assigned Protection Factor
Y-12	SUPPORT	0.21	100
LANL	DECON TECHNICIAN DECON	0.21	100
Y-12	SUPPORT	0.22	100
Y-12	SUPPORT	0.23	100
Y-12	MANUFACTURING	0.23	100
Y-12	SUPPORT	0.24	100
LANL	CHEM LAB TEC DECON	0.25	100
LANL	DECON TECHNICIAN DECON	0.27	100
Y-12	SUPPORT	0.29	100
LANL	CHEM LAB TEC DECON	0.31	100
LANL	DECON TECHNICIAN DECON	0.34	100
Y-12	PRODUCTION	0.36	100
Y-12	SUPPORT	0.38	100
Y-12	MANUFACTURING	0.45	100
Y-12	SUPPORT	0.49	100
HAN	RCT SUPPORT HAZ MAT REMOVAL	0.55	1000
LANL	CHEM LAB TEC DECON	0.61	100
Y-12	SUPPORT	0.75	10
LANL	CHEM LAB TEC DECON	0.82	100
Y-12	SUPPORT	0.90	100
LANL	CHEM LAB TEC DECON	0.95	100
LANL	DECON TECHNICIAN DECON	1.02	100
LANL	CHEM LAB TEC DECON	1.10	100
LANL	CHEM LAB TEC DECON	1.30	100
LANL	CHEM LAB TEC DECON	1.49	100
LANL	CHEM LAB TEC DECON	1.67	100
LANL	CHEM LAB TEC DECON	1.73	100
Y-12	SUPPORT	1.80	100
Y-12	SUPPORT	2.00	100
LANL	CHEM LAB TEC DECON	2.23	100
LANL	CHEM LAB TEC DECON	2.35	100
SNL	REMOVAL/DISASSEMBLY OF EQUIPMENT	2.80	50
HAN	HAZ MAT REMOVAL OF LIGHTS & BALLASTS	12.51	50

Discussion

In its audit report "Implementation of the Department of Energy's Beryllium-Associated Worker Registry," DOE/IG-0726, April 2006, the Inspector General described problems with the completeness and accuracy of data sent from DOE sites to the Registry. Reporting has steadily improved since 2002 as deficiencies and inefficiencies are identified and corrected. In 2008, there were differences in the number of BeS and CBD cases estimated from data reported to the Registry and known to site occupational medicine clinics at LLNL, NTS, and Y-12. These differences are due to lack of access to definitive diagnostic reports, information from before 2002 not required to be reported, and separation from employment not being reported to the Registry.

Data submitted by the sites to the central Data Center are run through computerized error-checking routines that identify missing fields, entry errors, duplicates, values outside of a logical range, and values that are logically inconsistent with others reported for the same individual or monitoring result. Errors may be minor and easily corrected or may point to systemic problems with corrective actions that require additional time and resources. Systemic problems can take several months to correct. As a result, the summary information in periodic reports is subject to change in subsequent reports as new and corrected information is added.

The goal of the Registry is to provide performance indicators that help the DOE manage its prevention efforts. Data in this report also suggest opportunities for further investigations that could more definitively characterize the working conditions associated with the development of CBD. At the Kansas City Plant, Pantex Plant, Savannah River Site, and Hanford Site, cases of CBD are occurring where personal monitoring has not detected significant exposure. These CBD cases could be due to exposures in the past; however, more extensive exposure monitoring is also indicated to rule out the chance that there are unrecognized sources of ongoing exposure.

Argonne National Laboratory

Site Description

The Argonne National Laboratory (ANL) covers 1,500 acres in DuPage County, Illinois. The site is 27 miles southwest of downtown Chicago. ANL was established in 1946 as a successor to the Manhattan Engineering District Chicago Metallurgical Laboratory, which developed the first nuclear reactor at the University of Chicago under the leadership of Enrico Fermi. It relocated to its current site in 1948 where most basic research is conducted and to an ANL-West site in Idaho where large-scale testing of experimental reactors and fuel processing is conducted. The ANL-West site is now part of Idaho National Laboratory (INL). Initially, ANL was known for its expertise in nuclear reactor research, development, and testing. The first prototypes of naval pressurized water reactors, Savannah River production reactors, electric power generating boiling-water reactors, low cost research reactors, and passively safe liquid metal reactors were designed, developed, built, and tested by ANL. The Zero Gradient Synchrotron, completed in 1963, was the first of several ANL high energy physics research facilities designed, built, and managed as unique, shared national resources. In 1960, the ANL mission expanded to include radiation biology and nuclear medicine research.

Current ANL-East activities include research and development in the basic physical, life, and environmental sciences; unique national facilities for materials science; advanced nuclear power technologies; efficient energy utilization in the transportation and industrial sectors; nuclear waste management; arms control and nonproliferation; reduced-enrichment fuel for research reactors; and enhanced science and mathematics education for students and teachers.

Beryllium Operations

Beryllium's ability to moderate and reflect neutrons led to its use in early experimental reactors designed, built, and tested at ANL. Similar to other laboratories, beryllium-containing components have been fabricated for use in instruments, tools, and other experimental apparatus. Beryllium-containing components, ranging in size from bench-top to very large reactor components, have been fabricated using machine tools, cutting, welding, and grinding equipment.

East Tennessee Technology Park

Site Description

The East Tennessee Technology Park (ETTP), formerly known as the K-25 Plant and the Oak Ridge Gaseous Diffusion Plant, is located on 4,689 acres in Roane County, Tennessee, 13 miles west of downtown Oak Ridge. The current site configuration is the product of past missions and programs, the most significant of which was the Oak Ridge Gaseous Diffusion Plant, which operated from the end of World War II until 1985. The primary mission of ETTP is decontamination and decommissioning (D&D) of facilities and equipment, and environmental restoration of the site. ETTP also operates a Toxic Substances Control Act (TSCA) incinerator,

which handles radioactive, hazardous, and uranium-contaminated polychlorinated biphenyl (PCB) wastes. The long-term goal for ETTP is to convert the site into a private industrial park. The reuse of key site facilities through title transfer is part of the closure plan for the site.

Beryllium Operations

In addition to operation of the gaseous diffusion plant, shop areas at ETTP supported a variety of defense and energy research and development missions. Work for Others projects included fabrication of beryllium components. As a result, contaminated equipment and facilities are undergoing D&D.

Hanford Site

Site Description

The Hanford Site (HAN) is located on 358,388 acres in southeastern Washington State, just north of Richland. It is bordered on the east by the Columbia River and on the south by the Yakima River and the city of Richland. The site was established in early 1943 to build the first, full-size reactors to produce plutonium for nuclear warheads. A plutonium production complex with 9 nuclear reactors and associated processing facilities, Hanford played a pivotal role in the nation's defense for more than 40 years. In 1987, the last remaining defense production reactor was shut down. Today, Hanford is engaged in the world's largest environmental cleanup project involving more than 1,700 waste sites and about 500 contaminated facilities. DOE has two Federal offices at Hanford, the Richland Operations Office (RL) and the Office of River Protection (ORP), each of which oversees separate contracts held by private companies. ORP is building and will operate a plant to treat the chemical and radioactive waste from past plutonium production. RL oversees cleanup of other Hanford Site facilities and wastes.

The Pacific Northwest National Laboratory (PNNL) operates laboratories on and adjacent to the Hanford Site. PNNL began in 1965 when Battelle was awarded a contract to perform research and development for the Hanford Site. The Laboratory's first projects included fabricating reactor fuel and designing reactors, including the Fast Flux Test Facility at Hanford. PNNL is a multiprogram laboratory that performs energy, environmental, and national security research.

Beryllium Operations

The cladding for reactor fuel included beryllium alloy components. Brazing operations in fuel fabrication areas used beryllium-containing base and filler materials. In addition, nuclear research and development activities led to fabrication of beryllium-containing components for experimental apparatus. Contaminated equipment and facilities are undergoing D&D through projects overseen by RL.

Idaho National Laboratory

Site Description

The Idaho National Laboratory (INL), located in eastern Idaho, consists of an 890-square-mile reservation on the Snake River Plain. Additional research facilities and office buildings are located 32 miles east in Idaho Falls, Idaho. INL was established in 1949 as the National Reactor Testing Station to provide an isolated location where various kinds of nuclear reactors and support facilities could be built and tested. From 1953 to 1992, the Idaho Chemical Processing Plant reprocessed spent naval reactor fuel to recover uranium-235. INL manages high-level and transuranic nuclear waste. In 2006, INL was named the DOE lead laboratory for nuclear reactor technology and is coordinating the Generation IV Nuclear Systems Initiative—an international effort to develop the next generation of nuclear power reactors. INL's Advanced Test Reactor produces isotopes for medical and aerospace applications. The new Space and Security Power Systems Facility at INL assembles radioisotope thermoelectric generators for the National Aeronautics and Space Administration's (NASA) space missions.

Beryllium Operations

Beryllium-containing components in experimental reactors have been assembled, disassembled, and maintained by INL workers. The radioactive waste managed at INL can also contain beryllium and other hazardous materials. Similar to other laboratories, beryllium-containing components have been fabricated for use in instruments, tools, and other experimental apparatus.

Kansas City Plant

Site Description

The Kansas City Plant (KCP) is situated on approximately 141 acres of the Bannister Federal Complex located 12 miles south of downtown Kansas City, Missouri. The facility was built by the Navy during World War II to assemble engines for U.S. Navy fighter planes. In 1949, the Atomic Energy Commission asked the Bendix Corporation to manage the facility and build nonnuclear electronic, electromechanical, mechanical, plastic, and metal components for nuclear weapons. Over the past 50 years, the products manufactured at KCP have become smaller and much more complex. The facility has evolved into a research production facility that specializes in science-based manufacturing. KCP operates 3 major factories involved in the development and production of nonnuclear weapons components, and produces more than 40 product lines for the Nation's defense system.

Beryllium Operations

Small quantities of copper beryllium alloys are used for fabrication of electronic components. Exposure monitoring of these operations indicated very low potential for exposures that might exceed exposure limits, and no routine exposure-monitoring programs were implemented. Subsequent to finding beryllium sensitization among KCP workers, the pattern of contamination detected by surface sampling indicated that beryllium oxide ceramic process equipment used in the production of engineered materials may have been a source of beryllium exposure.

Lawrence Livermore National Laboratory

Site Description

The Lawrence Livermore National Laboratory (LLNL) is one of three national laboratories that are part of the National Nuclear Security Administration (NNSA) within DOE. The Laboratory was established in 1952 and is located on a one-square-mile site in Livermore, California, on what was formerly the Livermore Naval Air Station. A 10-square-mile remote explosive testing site is situated 18 miles to the east. As an NNSA Laboratory, LLNL's ongoing responsibilities ensure that the Nation's nuclear weapons remain safe, secure, and reliable through the application of advances in science and technology. The Laboratory is also responsible for countering the proliferation of weapons of mass destruction and strengthening homeland security against the terrorist use of such weapons. With the Laboratory's broad-based capabilities in science and technology, it continues to make key advances in major research programs in energy and environment, bioscience and biotechnology, and basic science and applied technology. Facilities include an explosives test site, a tritium facility, the NOVA laser, Inertial Confinement Fusion facilities, the National Ignition Facility, and the High Explosive Application Facility.

Beryllium Operations

The primary beryllium operations at LLNL include testing beryllium-containing components to support the nuclear weapons stockpile stewardship mission. It is one of the metals studied in nonnuclear experiments using high explosives, which require cleanup and recovery activities. Beryllium components have also been fabricated to support a wide range of energy and physics research and development unrelated to nuclear weapons. A long history of materials and component research, development, and testing created a legacy of contaminated facilities and equipment that require management and remediation.

Los Alamos National Laboratory

Site Description

The Los Alamos National Laboratory (LANL) is one of three national laboratories that are part of NNSA within DOE. LANL covers approximately 28,000 acres in north central New Mexico. LANL was established in 1943 as a weapons research and development site for the Manhattan Project. When LANL was first established, scientists worked to achieve the Laboratory's original mission—developing atomic weapons. Following World War II, although scientists continued to focus on nuclear defense research and development, they also branched out into other nuclear energy and technology projects. Today, LANL's mission is divided into four focus areas: national security, energy resources, environmental quality, and fundamental science. Under the national security mission, LANL monitors the safety and reliability of nuclear weapons stockpiles, and tracks the international use and spread of nuclear weapons, materials, and technologies. The energy resources mission covers research and development of energy resources, including renewable, fossil, and nuclear fuels. The environmental quality mission focuses on the treatment, storage, and disposal of DOE wastes (both chemical and radiological), as well as research and development of remedial technologies. As part of the science mission, LANL conducts fundamental research in physics, materials science, chemistry, nuclear medicine, energy sciences, computational sciences, environmental sciences, and biological sciences.

Beryllium Operations

The primary beryllium operations at LANL support research and development, testing, and production activities. LANL fabricates beryllium metal nuclear weapon components to replace those consumed in the tests for stockpile stewardship. The processes include machining, welding, polishing, assembling, and testing of solid beryllium components. It is one of the metals studied in nonnuclear experiments using high explosives. Beryllium components have also been fabricated to support a wide range of energy and physics research and development unrelated to nuclear weapons.

Nevada Test Site

Site Description

The Nevada Test Site (NTS) is located on 864,000 acres with the southern entrance to the site approximately 65 miles north of Las Vegas. It is one of the largest secured areas in the United States. NTS was established in 1951 as a nuclear weapons testing site. Since the nuclear weapons testing moratorium in 1992, NTS has diversified into many program areas, such as subcritical experiments, hazardous chemical spill tests, emergency response training, conventional weapons testing, waste management, and environmental technology studies. NTS conducts both nondestructive and destructive tests of nuclear weapons components in support of the nuclear weapons stockpile stewardship program.

NTS is supported by laboratories and facilities in and near Las Vegas that develop specialized sensors and sensor systems, instrumentation and high-speed recording systems, and data analysis and data communication equipment. Employees in California, Maryland, Nevada, and New Mexico perform aerial radiation and environmental surveys of government sites, industrial nuclear power plants, and mining sites around the world to measure the levels of background and manmade radiation. They are part of the DOE nuclear emergency response program.

Beryllium Operations

NTS has a legacy of beryllium use associated with nuclear weapons tests and tests of experimental reactors. Beryllium-containing materials were used in instruments fabricated and assembled to support the nuclear weapons testing mission. Beryllium components in experimental reactors were disassembled, inspected, declassified, and disposed.

Oak Ridge National Laboratory

Site Description

The Oak Ridge National Laboratory's (ORNL) primary site is approximately 4,250 acres located about 10 miles southwest of Oak Ridge, Tennessee. Originally known as Clinton Laboratories, ORNL was established in 1943 to carry out the pilot-scale production and separation of plutonium for the World War II Manhattan Project. Approximately 531 buildings and other major facilities, totaling about 3.1 million square feet, are located throughout the primary ORNL site. ORNL facilities are also located outside the primary site boundary for a total of about 4 million square feet in facilities. ORNL is a multiprogram science and technology laboratory. Its mission today is to conduct basic and applied research and development to create scientific knowledge and technological solutions that strengthen the nation's leadership in key areas of science; to increase the availability of clean, abundant energy; to restore and protect the environment; and to contribute to national security. ORNL also performs other work for DOE, including isotope production, information management, and technical program management, and provides research and technical assistance to other organizations. The site continues to evolve to meet DOE's changing needs.

Beryllium Operations

Beryllium's ability to moderate and reflect neutrons led to its use in early experimental reactors designed, built, and tested at ORNL. Similar to other laboratories, beryllium-containing components have been fabricated for use in instruments, tools, and other experimental apparatus.

Pantex Plant

Site Description

The Pantex Plant (PTX), located on 16,000 acres in the Texas panhandle, 17 miles northeast of Amarillo, was constructed in 1942 to serve as a conventional bomb plant for the U.S. Army. PTX was deactivated when World War II ended and remained vacant until 1949 when Texas Technological University purchased the site for experimental cattle-feeding operations. The land was sold subject to recall under the National Security Clause, and the Atomic Energy Commission requested the Army to reclaim and reopen the site in 1951 to expand nuclear weapons assembly facilities. In 1975, PTX became the only nuclear weapons assembly and disassembly plant in the United States. Currently, the site has five primary operational missions: weapons assembly, weapons disassembly, evaluation of weapons, high explosive research and development, and interim plutonium pit storage.

Beryllium Operations

PTX workers have potential exposure from working with beryllium-contaminated tooling, equipment, containers, and legacy contamination in facilities. Assembly and disassembly involve handling beryllium components manufactured at other sites. Firing Site operations require energetic demilitarization (firing to disable) of components that contain small amounts of beryllium. Until recently, beryllium-containing components from weapons returned for dismantlement were demilitarized by crushing, shredding, or other means to make them unusable

for military purposes and to ensure declassification. Prior to the 1990s, PTX performed destructive testing involving explosives and beryllium weapons components.

Sandia National Laboratories

The Sandia National Laboratories–Albuquerque (SNL) is located at the foot of the Manzano Mountains adjacent to the city of Albuquerque, New Mexico, and is essentially surrounded by Kirtland Air Force Base. A second, smaller facility is located adjacent to LLNL in Livermore, California. Sandia has served as one of the major national defense research and development (R&D) laboratories since 1945. SNL scientists conduct large-scale tests at the Tonopah Test Range and other areas of the Nevada Test Site. The site's nuclear weapons mission included design, development, and testing the command, control, and packaging components needed to make nuclear explosives useful weapons. The mission expanded to include support of the space program and work on other advanced military technologies, energy programs, arms verification, and control technology and applied research. Today, through science and technology, people, infrastructure, and partnerships, SNL's mission is to meet national needs in four key areas: nuclear weapons, nonproliferation and materials control, energy and critical infrastructure, and emerging threats.

Beryllium Operations

Beryllium components have also been fabricated to support a wide range of materials energy and physics research and development related and unrelated to nuclear weapons. A long history of materials and component research, development, and testing created a legacy of contaminated facilities and equipment that require management and remediation.

Savannah River Site

Site Description

The Savannah River Site (SRS) complex covers 198,344 acres (310 square miles) located approximately 25 miles southeast of Augusta, Georgia, in the State of South Carolina. It borders 27 miles of the Savannah River. SRS was built in the early 1950s to produce tritium and plutonium-239 nuclear materials. The original site had five nuclear reactors, two chemical-separation facilities, a heavy water extraction plant, a nuclear fuel and target fabrication plant, and support and waste management facilities. All reactors were shut down in 1991 when environmental remediation activities began. Currently, SRS is involved in nuclear materials stabilization, vitrification of nuclear waste, and radioactive operations at the Tritium Replacement Facility. DOE’s Savannah River Operations Office is responsible for oversight of the EM operations at SRS. Two other DOE offices, the Savannah River Site Office and the Office of Site Engineering and Construction Management oversee the missions supporting DOE’s NNSA.

Beryllium Operations

Small quantities of copper beryllium alloys were used to fabricate electronic equipment and nonsparking tools to support SRS operations. Beryllium was also present in some materials irradiated in SRS production reactors.

Y-12 National Security Complex

Site Description

The Y-12 National Security Complex (Y-12) is located in Oak Ridge, Tennessee, on 811 acres within the Oak Ridge Reservation. The site was established in 1943 to produce highly enriched uranium as part of the Manhattan Project. Enriched uranium production started in November 1943. At its peak during World War II, the plant employed approximately 22,000 workers. After World War II, the plant's focus changed to manufacturing components for nuclear weapons. For more than 50 years, the complex has been one of the manufacturing facilities in the DOE weapons complex. Every weapon in the stockpile has some components manufactured at Y-12.

Beryllium Operations

The primary beryllium operation at Y-12 has been the production of weapons components from beryllium oxide ceramics. Beryllium oxide powder is received, mixed with other materials, pressed into a shape, and fired in a kiln. The blank work piece is machined using diamond grinding tools. The operations are supported by quality assurance testing of the materials when they are received and at various fabrication steps and by dimensional inspection of the finished products. Beryllium oxide ceramic components from retired weapons are returned to Y-12 for declassification and recycling of the materials. Y-12 also performs engineering research and development of new beryllium oxide ceramic manufacturing methods.

In the past, Y-12 operations produced beryllium metal components for nuclear weapons. The unique fabrication capabilities at Y-12 are used today to support energy and defense projects that include the use of beryllium metal, ceramics, and alloys. Remodeling, maintenance, and D&D projects on the site have required work on beryllium-contaminated facilities, utilities, and equipment.