Los Alamos National Laboratory

Special Exposure Cohort (SEC) Evaluation Summary

LaVon Rutherford, CHP
Special Exposure Cohort (SEC) Team Lead
NIOSH Division of Compensation Analysis and Support

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Background

- Petition received on April 3, 2008
- Qualified for evaluation May 29, 2008
- Class Evaluated: *All Service Support Workers January 1, 1976 through December 31,2005*
- Evaluation report approved:
- Rev. 0, 1/22/2009
- Rev. 1, 8/15/2012
- Addendum, 4/24/2017

Worker class added to SEC

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico from January 1, 1976, through December 31, 1995, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort

Background

- The identified infeasibility included the inability to bound unmonitored intakes of exotic alpha emitters, fission products, activation products, tritium (STCs), Sr/Y-90, Th-230 and Th-232
- NIOSH committed to continue to evaluate these issues for the post-1995 period.
- The end date of December 31, 1995 for the class is based on the presumption that LANL would have been in full compliance with 10 CFR 835, *Occupational Radiation Protection,* by then.

Background

- 10 CFR 835 requires internal dosimetry programs (including routine bioassay programs) for Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent (CEDE) of 0.1 rem (0.001 Sv) or more from all occupational radionuclide intakes in a year
- Given this requirement, in the absence of individual internal dosimetry data, intakes would be unlikely to have resulted in greater than 0.1 rem CEDE and the infeasibility to reconstruct dose would not exist.

Background

- Since the issuance of Rev. 1 of the SEC-00109 Evaluation Report, NIOSH has sought and received additional information, documents, and procedures relating to post-1995 use of exotic radionuclides
- Work with these radionuclides, especially after 1995, has been sporadic and there are correspondingly few bioassay data

November 2015 LANL Trip

- Trip included personnel from DCAS, SC&A, and ORAUT
- Meetings were held with LANL Health Physics, including Managers, Dosimetrists, and field personnel to better understand how compliance with 10 CFR 835 was achieved
- New documents were captured including RWPs, respirator use, air sampling, radiation surveys, HP checklists, routine monitoring instructions, and external exposure data

November 2015 LANL Trip

- LANL provided: radiological policy and procedures documents; background information on 10 CFR 835 implementation; Organization charts; non-routine radionuclides handled by waste management; summary of radiological dosimetry monitoring program
- LANL also provided information and documents specific to Special Tritium Compounds

Assessment of sites during the 10 CFR 835 era

- If sites assess an operation and determine that workers are unlikely to receive 100 mrem per year (CEDE), dosimetry would not required
- Therefore, in many cases we have reduced personnel monitoring data

SEC Evaluations 10 CFR 835 ERA

- During 10 CFR 835 era, if a site has a Radiation Protection Program (RPP) approved by DOE, NIOSH will assume compliance unless documentation supports otherwise
- NIOSH will focus their evaluations during this period on internal and external assessments and incident reports associated with 10 CFR 835

SEC Evaluations 10 CFR 835 ERA

- NIOSH focus when Reviewing Findings
- (SEC Perspective) Do the findings identify unmonitored exposures that may prevent reconstructing exposures to a defined class of workers?
- (DR Perspective) Do the findings identify a programmatic flaw that would suggest the unmonitored workers could have received exposures in excess of 100 mrem (CEDE) per year?

Addendum

- Therefore, NIOSH's evaluation for this addendum looked at
  - Assessments – focusing on findings, response, and corrective action
  - Nonconformance Tracking System (NTS) for 10 CFR 835 violations, site response, and corrective action
  - Occurrence Reporting System (ORPS)

Assessments

- May 1995 LANL Internal Assessment of the Radiation Protection Program
  - One Finding associated with administrative controls for sealed sources
  - Five observations – of those one was relevant to internal dosimetry
  - Observation 4 – stated that the RPP office has not coordinated with support organizations to implement site-specific document control and records management programs. Problems were identified with document control and distribution of updated procedures

Assessments

- DOE NNSA conducted an independent review of the internal dosimetry program at LANL in July 2004
  - The stated performance requirements for the assessment included evaluation of compliance with 835.702(a)
  - No findings or observations associated with 835.702(a), but there were three non-compliances noted in the assessment
- None of the findings in the assessment would likely affect NIOSH's ability to perform individual dose reconstructions

Nonconformance Tracking System (NTS)

NIOSH reviewed the NTS system for LANL 10 CFR 835 violations, site responses, and corrective actions

- 384 reports were captured
- 91 were considered potentially relevant
- Of the 91 two were considered pertinent to compliance with 10 CFR 835.702(a)
  - NC ID:652 – Records: Non-Laboratory exposure data was not included in all employee records for current year or lifetime dose. In some cases, when an employees previous employer provided dose information, it was not included in the employee's current year or lifetime dose
  - NC ID:1377 – The Cumulative Total Effective Dose Equivalent (CTEDE) received by each individual as recorded and reported by LANL does not include doses received at other locations as required by 10 CFR 835

Nonconformance Tracking System (NTS)

- The findings for the two NTS reports would not likely affect NIOSH's ability to perform individual dose reconstructions. NIOSH considers all relevant data from all sites for a claimant when performing dose reconstructions
- SC&A identified an NTS report that NIOSH overlooked in reviewing the reports. The report NC ID: 484 and an additional report NC ID: 1219 were reviewed using the same criteria identified previously

Nonconformance Tracking System (NTS)

- NC ID: 484 identified a number of deficiencies which could affect LANL's ability to ensure personnel with the potential of receiving a dose greater then 100 mrem per year CEDE were monitored appropriately
- The site implemented a number of programs to ensure this would not happen in the future (10/2000)
- NIOSH has requested additional information from LANL as to what the site concluded concerning the potential exposures to personnel who were not monitored

Nonconformance Tracking System (NTS)

- NC ID: 1219 identified a deficiency where some workers at TA-55 were not on the appropriate bioassay programs
- Some personnel were on a less conservative bioassay program than required (23 of 93)
- Caused by a computer software problem

Nonconformance Tracking System (NTS)

- Corrective Actions for NC ID: 1219 included
  - Computer problems were corrected and tested
  - Workers were placed on the appropriate bioassay program
  - Line Managers were reminded of the requirements to review dosimetry assignments for their employees
- NIOSH concludes although the non-compliance occurred the corrective actions insured no personnel with the potential to receive 100 mrem CEDE were not monitored

Occurrence Reporting System (ORPS)

- NIOSH reviewed the DOE ORPS for LANL 10 CFR 835 violations.
- NIOSH identified a total of 159 reports in our initial search
- Of the 159 reports 64 were deemed potentially relevant
- NIOSH reviewed the 64 in detail and found no findings pertinent to 10 CFR 835

Occurrence Reporting System (ORPS)

- NIOSH found after the initial search that other search parameters (e.g., Area, Contractor name) would yield different numbers of reports.
- Therefore, after issuing the Addendum NIOSH continued to search ORPS
- After further investigation NIOSH concluded that a 10 CFR 835 violation would have an NTS report

Dose Reconstruction for Unmonitored Workers

- Based on NIOSH's review of –
  - LANL's approved Radiation Protection Program;
  - Internal and External assessments that followed;
  - NTS report findings; and
  - ORPS reports
- NIOSH concludes that intakes for unmonitored workers with access to controlled areas were unlikely to have resulted in CEDE of 100 mrem per year

Dose Reconstruction Methodology

- Bounding intake quantities corresponding to 100 mrem CEDE may be defined as 2% of the Stochastic Annual Limit on Intake (ALI)
- An unmonitored worker can be assumed exposed to 2% SALI per year from potential radionuclides
- For purposes of dose reconstruction, the radionuclide and lung clearance class selected for each years intake would be the one resulting in the highest dose to the organ of interest

Dose Reconstruction Methodology cont.

- Again the specific 2% SALI nuclide mixture resulting in the highest dose to the organ of interest at the time of cancer diagnosis would be the selected intake
  - Example DR
  - White Non-Hispanic Male born in 1965
  - Starts employment at LANL on 1/1/1996
  - Ends employment 12/31/2016
  - Diagnosed with cancer 12/31/2016

Dose Reconstruction Methodology

Cancer Location	1996 - 2009	2010 - 2016	Total Organ Internal Dose	POC	POC Comments
	Bounding Nuclide / Type		rem		
Bone Surface	U-234 M	Th-228 M U-234 M	20.012	22.02%	
Kidney	U-234 F	U-234 F	9.878	11.73%	
Lung	U-234 M	Pu-239 SS Th-228 S U-234 M	14.542	31.22%	never smoked
				18.45%	former smoker
				15.14%	>40 cig/day currently
Prostate	U-234 F	U-234 F	0.555	0.17%	

Special Tritium Compounds (STCs)

- Potential dosimetric issues associated with STCs, including stable metal tritides and organically bound tritium were not formally recognized or addressed by LANL or DOE until the late 1990s
- In 1998 LANL issued LANL Dose Assessment – Tritium Internal Dosimetry and Bioassay Programs which specifically addressed bioassay for STCs
- The potential for significant exposure to STCs was small and dose assessments were rarely deemed necessary.

Special Tritium Compounds (STCs) cont.

- Bioassay data specific to STCs are rare for the entire period of the evaluation
- NIOSH can bound unmonitored intakes of STCs in the same manner as intakes of other rare nuclides for which internal dosimetry data is lacking by
  - Assuming intakes to unmonitored workers did not exceed 2% of the SALI
  - Equivalent to 2% of SALI for Tritiated Water Vapor
  - Dose Reconstruction for intakes of STCs may be performed using the methodologies outlined in ORAUT-OTIB-0066

Petitioner Concern

Preliminary Notice of Violation (PNOV)

- On February 16, 2007 DOE issued a PNOV to LANL
- The PNOV included radiological protection violations for monitoring
- The PNOV noted that the Office of Independent Oversight 2005 inspection found that LANL failed to adequately establish personnel and area monitoring for TA-55 hazards of neptunium and radionuclides other than uranium, plutonium, americium and tritium

Petitioner Concern

- Preliminary Notice of Violation (PNOV) cont.
- NIOSH reviewed
  - LANL responses and corrective actions
  - NTS reports related to LANL
- NIOSH also asked LANL for information on the potential neptunium exposure
  - LANL indicated the 100 gram quantities fell below their monitoring threshold as documented in the LANL Internal Dosimetry Technical Basis Document

Petitioner Concern

- Preliminary Notice of Violation (PNOV)
- After reviewing all available information. NIOSH finds that unmonitored workers involved in these operations were unlikely to have received intakes that would have resulted in 100 mrem CEDE
- Therefore, the methodology described earlier for bounding intakes for unmonitored workers is appropriate for workers involved with the Neptunium operations identified in the PNOV

For the period of January 1, 1996 through December 31, 2005, NIOSH finds that it has access to sufficient information to:

- Estimate the maximum radiation dose for every type of cancer for which radiation doses are reconstructed, and could have been incurred in plausible circumstances by any member of the class; or
- Estimate radiation doses for members of the class more precisely than an estimate of maximum dose.

Feasibility Findings for SEC-00109, Addendum (January 1, 1996 – December 31, 2005)

Source of Exposure	Dose Reconstruction *is* Feasible	Dose Reconstruction *not* Feasible
Internal		
- all radionuclides	X	
External		
-Beta-Gamma	X	
- Neutron	X	
- Occupational Medical X-ray	X	

Questions?