SEC Petition 116 - United Nuclear

Uranium Refining Atomic Weapons Employers Work Group
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United Nuclear - Summary

- The Uranium Refining AWE Work Group recommends that Petition 116 be denied
- The Work Group review process underlying this recommendation will be described in the following slides
- The presentation examines both the United Nuclear Site Profile and the SEC Petition Evaluation Report, since they are closely intertwined

United Nuclear – Site Description

- Located in Hematite, Missouri
- Manufactured uranium metal and uranium compounds from natural and enriched uranium for use as nuclear fuel for U.S. Navy and commercial customers
- Manufactured Th-U oxide pellets in 1964
- Operations Period from 1958–1973
- Residual Period from 1974–2009

United Nuclear – Chronology

- March 2008 – NIOSH Issues Appendix D to TBD-6001 (Battelle 2008) – Site Profile for United Nuclear, Rev. 0
- June 2008 – NIOSH receives SEC Petition 116
- November 2008 – NIOSH qualifies Petition 116 for evaluation
- August 2009 – NIOSH issues SEC Petition Evaluation Report (NIOSH 2009)

United Nuclear - Chronology (con't)

- September 2009 – SC&A provides review of United Nuclear Site Profile only (SC&A 2009); Review makes 6 Findings.
- February 2010 – NIOSH issues revision to Petition Evaluation Report (NIOSH 2010b)
- April 2010 – NIOSH issues Rev. 1 to Appendix D (United Nuclear Site Profile) (NIOSH 2010a); Revised to include additional site-specific data
- June 2010 – SC&A delivers review of Rev. 1 to Appendix D (SC&A 2010a)

United Nuclear - Chronology (con't)

- September 2010 – SC&A delivers focused review NIOSH Petition Evaluation Report (SC&A 2010b) with 8 Findings
- March 2011 – NIOSH issues free-standing Site Profile replacing Appendix D of TBD-6001 (DCAS 2011)
- November 2011 – NIOSH issues white papers responding to SC&A review of PER (Davis 2011, Clark 2011, Hughes 2011)
- September 2012 – Work Group proposes to deny SEC Petition

United Nuclear – Uranium Refining AWE Work Group Activities

- July 7, 2010 (First meeting under TBD-6001 WG)
- November 4, 2010
- May 16, 2011
- August 16, 2011 (As Uranium Refining AWE WG)
- November 21, 2011
- February 14, 2012
- September 7, 2012

United Nuclear - Monitoring Data

- Extensive bioassay data available at UNC
- Bioassay coworker model developed for operators and supervisors/laborers for two periods: prior to June 1963 and after June 1963, when significant process improvements made at site
- Bioassay data gap exists during 1961–1962, but air sampling data are available to validate bioassay model
- Coworker model intakes are more claimant-favorable than intakes based on air sampling for 1961–1962 period (NIOSH 2011)
- NIOSH agreed to modify coworker model to use fixed 95th percentile for gap period (1961–1962) and full distribution for other years (9/7/2012 WG Meeting)

United Nuclear – Urinalysis Monitoring Data

Year	No. of Employees	No. of Samples
1958	19	7
1959	41	138
1960	37	106
1961	0	0
1962	74	196
1963	110	1730
1964	45	1537
1965	57	1238
1966	87	1351
1967	64	1320
1968	116 op. /74 non-op	1845
1969	131	1980
1970	45	158

Data for 1971–1973 available but not reliable.
Source: NIOSH PER for SEC-116.

United Nuclear – Resolution of Site Profile Findings

- SC&A made 6 Findings based on its review of Appendix D of TBD-6001 (Battelle 2008)
- Some of the Findings were inter-related with PER Findings
- All Site Profile Findings have been resolved in principle, but minor clean-up remains

United Nuclear – Resolution of Site Profile Finding #1

- SC&A Finding: Current guidance for assigning occupational medical dose is insufficiently prescriptive
- Resolution: On November 4, 2010, the Uranium Refining AWE Work Group closed Finding #1 on the basis that there were no occupational medical exposures at the UNC site

United Nuclear – Resolution of Site Profile Finding #2

- SC&A Finding: Default doses defined in Battelle-TBD-6001, Appendix D, Rev. 0 for external whole-body and skin doses are based exclusively on summary statements of a 1960 AEC inspection report and may be inappropriate
- Resolution: New dosimetry data covering the years 1958–1973 were subsequently incorporated in Battelle-TBD-6001, Appendix D, Rev. 1; the Work Group closed Finding #2 on 11/4/2010

United Nuclear – Resolution of Site Profile Finding #3

- SC&A Finding: Potential exposures to neutrons are not addressed in Battelle-TBD-6001, Appendix D, Rev. 0
- Resolution: In Section D.4.2 and Table D.4 of Battelle-TBD-6001, Appendix D, Rev. 1, NIOSH introduced modeled neutron doses for three job categories that employed claimant-favorable assumptions/model parameters that address Finding #3

United Nuclear – Resolution of Site Profile Finding #4

- SC&A Finding14: The geometric mean of coworker inhalation intakes of uranium, as recommended by NIOSH in Table D.1 of Battelle-TBD-6001, Appendix D, Rev. 0 for all workers, may not correlate with empirical UNC urinalysis data for select years.
- Resolution: (1) NIOSH has restricted the use of Table D.1 to UNC workers for whom bioassay data is inadequate; and (2) in the recent Work Group discussion (9/7/2012), NIOSH has agreed to use the 95th percentile values of the coworker intakes defined in Table D.1 for 1961–1962 when no bioassay data are available.

United Nuclear – Resolution of Site Profile Finding #5

- SC&A Finding: NIOSH provides insufficient information regarding the method used to derive inhalation intakes from residual contamination
- Resolution (Conditional): In a Work Group session dated 11/4/2010, NIOSH agreed that there was a mathematical error in their calculation; NIOSH further agreed that this error will be addressed when the independent Site Profile (DCAS-TKBS-0008) is issued. Note, however, Table 4 of DCAS-TKBS-0008 contains the same erroneous values identified in Finding #5. (If this error in DCAS-TKBS-0008 is corrected, Finding #5 will be considered resolved.)

United Nuclear – Resolution of Site Profile Finding #6

- SC&A Finding: Section D.6 of Appendix D provides insufficient information that would allow the validation of default external dose estimates from residual contamination.
- Resolution: In an attempt to validate NIOSH's default external dose estimates from residual contamination, SC&A failed to include the dose contributions of short-lived daughters associated with U-234 and U-235. When this error was accounted for, SC&A validated NIOSH's default external dose estimates and withdrew Finding #6.

United Nuclear – Resolution of PER Findings

- SC&A made 8 Findings based on its review of Rev. 1 of the Petition Evaluation Report
- Some of the Findings were inter-related with Site Profile Findings
- All PER Findings have been resolved

United Nuclear - PER Findings

- Finding A: There is a need for better documentation of the beta/gamma ratios used to reconstruct external doses
- Finding B: How were the beta/gamma ratios derived and how will they be used in a claimant-favorable way for reconstructing external doses for 1961 through 1965?
- Resolution: Additional data were included in the Site Profile (DCAS 2011) (see also Site Profile Finding #2)

United Nuclear – PER Findings (con't)

- Finding C: Model used to reconstruct the neutron doses likely overestimates the doses significantly and needs to be based on assumptions that can be related to the actual operations at UNC
- Resolution: Based on worker interviews, it was determined that the assumption of 2,000 hours per year was both bounding and plausible; the WG closed this issue at the 11/21/2011 meeting (ABRWH 2011, p. 156)

United Nuclear – PER Findings (con't)

- Finding D: If dose estimates are to be based in some cases on air sample data alone, it is necessary to consider the possibility of inhalation of Type F material to avoid underestimates of doses to systemic tissues
- Resolution: The coworker model is based on bioassay results – air sampling is not used in the model

United Nuclear – PER Findings (con't)

- Finding E: For workers that might have been exposed to Type F uranium, the frequency of air sampling, bioassay sampling, and/or chest counting does not appear sufficient to provide adequate data for dose reconstruction.
- Resolution: Issue discussed in detail at 11/4/2010 WG meeting. NIOSH position that chronic exposures currently calculated as Type M or Type S are bounding for reasonable scenarios was accepted. Frequency of air sampling is not relevant, since air sampling not used for dose reconstruction. Sufficient bioassay sampling available to calculate bounding doses.

United Nuclear – PER Findings (con't)

- Finding F: The use of air sampling data for dose reconstruction is not reliable
- Resolution: The coworker model is based on bioassay results – air sampling is not used in the model

United Nuclear – PER Findings (con't)

- Finding G: A discussion is needed describing why internal exposures can be reliably reconstructed, given the limited bioassay data available from 1961 through 1962 and what appears to be the unreliability of air sampling data as a means to reconstruct internal doses.
- Resolution: Air sampling results were used only to validate the assumption that exposures in 1961 and 1962 were similar to the years before and after the data gap period (Hughes 2011): NIOSH will use the 95th percentile of the bioassay coworker model for this period (09/07/2012 WG Meeting)

United Nuclear – PER Findings (con't)

- Finding H: Considerably more information is needed before an assessment of the feasibility of reconstructing doses to thorium workers, even upper bound doses, can be made
- NIOSH white paper (Davis 2011) provided evidence to WG that upper bound doses could be plausibly estimated. Issue closed at 11/21/2011 WG meeting (ABRWH 2011, p. 154).

United Nuclear – Naval Fuel Operations

- The WG initially had some concerns that classified activities at UNC might not have been adequately reflected in the NIOSH assessments
- Therefore NIOSH interviewed an Item Plant Worker on February 28, 2012 (Interview 2012)
- The worker also participated in the WG teleconference call on September 7, 2012
- Discussions with worker provided considerable new detail that confirmed NIOSH's documented understanding of UNC operations

United Nuclear – Uranium Refining AWE WG Recommendation

- Petition 116 covering "All site employees that worked in any area of the United Nuclear Corporation – Hematite, MO, site from January 1, 1958 through December 31, 1973 and the residual radiation period January 1, 1974 through July 31, 2006" should be denied
- Based on analysis of the available resources, there is no part of the class under evaluation for which radiation doses cannot be bounded under plausible circumstances

United Nuclear - References

- Battelle 2008. Battelle-TBD-6001, *Site Profiles for Atomic Weapons Employers the Refine Uranium and Thorium – Appendix D United Nuclear Corporation*, March 14, 2008.
- SC&A 2009. *Review Of The NIOSH Site Profile For The United Nuclear Corporation, Missouri, Battelle-TBD-6001, Appendix D.* September 2009.
- NIOSH 2009. *SEC Petition Evaluation Report for the United Nuclear Corporation, Petition SEC-00116.* Rev. 0. August 17, 2009.
- SC&A 2010a. *A Critical Review of Revision 1 of the NIOSH Site Profile for the United Nuclear Corporation, Missouri, Addendum to SCA-TR-SP2009-0040*. June 24, 2010.

United Nuclear – References (con't)

- SC&A 2010b. *A Review of the SEC Petition Report For United Nuclear Corporation, Petition SEC-00116*. September 2010.
- NIOSH 2010a. *Rev. 1 to Appendix D*. April 30, 2010.
- NIOSH 2010b. *SEC Petition Evaluation Report for the United Nuclear Corporation, Petition SEC-00116.* Rev. 1. January 28, 2010.
- DCAS 2011. *Technical Basis Document for the United Nuclear Corporation , Hematite, Missouri.* DCAS-TKBS-0008. Effective Date 03/21/2011. (Replaces Appendix D)
- Hughes 2011. *United Nuclear Corporation Air Concentration Data for 1961 and 1962*. Lara Hughes, NIOSH/DCAS. November 2011.

United Nuclear – References (con't)

- Davis 2011. *White Paper: Representativeness and Applicability of United Nuclear Corporation Air Sampling for Reconstructing Thorium Intakes.* NIOSH. November 14, 2011.
- Clark 2011. *White Paper: SEC-00116 United Nuclear Corporation Petitioner Issues.* Rev. 1. November 3, 2011.
- ABRWH 2011. Transcript of the Uranium Refining AWE Work Group Meeting of November 21, 2011. Advisory Board on Radiation and Worker Health. http://www.cdc.gov/niosh/ocas/pdfs/abrwh/2011/wgtr112111.pdf
- Interview 2012. Interview with UNC Employee (34333), February 28, 2012.