Review of One Advisory Board-Selected Case Reworked for the Evaluation of Aliquippa Forge Technical Basis Document Revisions (DCAS-PER-045, Subtask 4)

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February 15, 2022

Summary of Aliquippa Forge facility operational history

- Produced uranium rods from uranium billet
- **Operational period:** Rolling operation started in January 1947 and continued through the end of the Atomic Energy Commission (AEC) contract period on February 28, 1950
- **Residual period:** March 1, 1950, through December 31, 1987, and again from January 1, 1989, through December 31, 1992

DCAS-PER-045, "Aliquippa Forge TBD Revision"

- Issued April 2012 due to revisions to Aliquippa Forge site profile (ORAUT-TKBS-0021)
- Revision resulted from identification of new data and incorporating data from ORAUT-OTIB-0070, revision 01
  - Increased external dose during most of the residual period
  - Decreased internal dose for most years but increased for some

SC&A's Review of DCAS-PER-045 (findings 1–4)

- SC&A's August 2014 review identified eight findings and two observations
- Summary of findings 1–4:
  - **Finding 1:** Failure to account for a previous decontamination and decommissioning effort
  - **Finding 2:** Backward extrapolation by means of the NIOSH-derived source term depletion factor is inappropriate
  - **Finding 3:** SC&A was unable to match inhalation and ingestion rates given in table 3
  - **Finding 4:** Failure to acknowledge and use a reported air sample that at 180 dpm/m^3 was ~20-fold higher than the assumed value of 8.94 dpm/m^3

SC&A's Review of DCAS-PER-045 (findings 5–8)

- Summary of findings 5–8:
  - **Finding 5:** NIOSH's "conversion" of empirically measured air concentration 8.94 dpm/m^3 that was reduced more than 42-fold to a "modeled air concentration" represents a major error as the starting point for deriving inhalation and ingestion doses for years 1950 to 1995
  - **Finding 6:** Inappropriate use of the resuspension factor 1×10^{-6} m^{-1} for post-AEC work during active operations at the Aliquippa Forge facility
  - **Finding 7:** Use of 1992 survey measurement (350 dpm/100 cm^2) removable alpha contamination postdates the "interim decontamination efforts" conducted from October to December 1988
  - **Finding 8:** NIOSH's methodology for deriving inhalation and ingestion doses does not comply with the use of available data and the prioritization of recommended methods defined in ORAUT-OTIB-0070, revision 01

SC&A's Review of DCAS-PER-045 (observations 1 and 2)

- Summary of observations 1–2:
  - **Observation 1:** NIOSH should rephrase the role of ORAUT-OTIB-0070 in section 2.0 of DCAS-PER-045
  - **Observation 2:** Neither revision 00 nor revision 01 of the Aliquippa Forge TBD (ORAUT-TKBS-0021) was ever reviewed or audited by SC&A
- All findings and observations were discussed and closed at the Subcommittee for Procedure Reviews meeting on May 16, 2016

DCAS-PER-045 subtask 4 review of one reworked case

- ABRWH selected one reworked case for SC&A's review in April 2021, based on the following criteria:
  - assignment of external dose during the residual period
  - assignment of internal dose during the residual period
- SC&A reviewed the reworked case in December 2021 to determine if external and internal doses were correctly assessed in accordance with DCAS-PER-045

NIOSH's reworked DR

- NIOSH's rework of the case:
  - Used applicable dose reconstruction (DR) tools
  - Recalculated all annual doses
  - Re-ran IREP
- Revised DR report not sent to U.S. Department of Labor because the compensation decision did not change

Case background

- Energy employee (EE) worked at Aliquippa Forge for two brief timeframes during the residual period
- EE worked throughout the site
- EE was not monitored for radiation exposure
- Diagnosed with qualifying cancers nearly 25 years after employment termination

Comparison of NIOSH's reworked doses versus original doses

Dose categories	Reworked vs. original dose percentage
External	~ 207% increase
Occupational medical	No change
Internal	~ 80% decrease
Total	~ 39% decrease
POC	~ 53% decrease

Original external dose calculations

- Used external exposure values from table 13 of ORAUT-TKBS-0021, revision 00 PC-1
- Doses prorated for partial years of employment
- Dose conversion factors (DCFs):
  - DR report stated DCF values based on thyroid (1.440) as the surrogate organ
  - Doses actually calculated using the maximum thymus DCF values (1.692)
  - This resulted in a slight overestimate of dose
- Assigned dose to all cancer sites ~0.300 rem

Reworked external dose calculations

- Used external exposure values from table 5-1 of TBD revision 01
- No prorating for partial years of employment.
- Applied exposure DCF of 1.44 for the thyroid as the surrogate organ
- Assigned dose of ~1.100 rem to all cancer sites

SC&A's conclusions on external dose

- Appropriate dose values selected from table 5-1 of TBD revision 01
- Correct surrogate organ was selected, based on ORAUT-OTIB-0005, revision 05
- Appropriate DCF value was applied
- No partial-year prorating applied, as an efficiency and claimant-favorable measure
- Review confirmed doses were accurately entered into IREP
- As expected, reworked DR external dose increased from that calculated in the original DR
- SC&A had no findings about reworked external dose assignment

Original internal dose calculations

- Inhalation and ingestion intakes taken from table 13 of TBD revision 00 PC-1
- Used IMBA to compare doses from uranium absorption types M and S, with type S resulting in the higher dose
- Assigned dose of ~2.200 rem to all cancer sites

Reworked internal dose calculations

- Used inhalation and ingestion exposure values from table 5-1 of TBD revision 01
- Compared solubility types M and S, with type S resulting in higher dose
- Using CADW, calculated dose of ~0.400 rem to all cancer sites

SC&A's conclusions on internal dose

- Reviewed NIOSH's CADW files for the reworked DR and confirmed that correct intake values were used, based on data in table 5-1 of TBD revision 01
- SC&A verified:
  - Type S solubility resulted in the higher dose
  - Dose data appropriately entered in IREP table
  - Doses were assessed to the date of cancer diagnoses
- SC&A had no findings about the assessment of internal dose in the reworked case

Questions?