



Review of Program Evaluation Report DCAS-PER-079

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Subcommittee for Procedure Reviews

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DCAS-PER-079 purpose and review summary

- ◆ **Purpose:** Assess the impacts of rev. 02 of the Pinellas Plant occupational external dose technical basis document (TBD) (12/11/2017) on previously completed dose reconstructions (DRs)
- ◆ **October 27, 2020:** The National Institute for Occupational Safety and Health (NIOSH) issued DCAS-PER-079 (“PER-079”)
- ◆ **March 14, 2024:** Subcommittee for Procedure Reviews (SPR) tasked SC&A to review the program evaluation report (PER)
- ◆ **September 26, 2024:** SC&A issued its [PER subtask 1-3 review](#) report

Pinellas Plant background

- ◆ Constructed by General Electric in 1956 on a 100-acre site near Clearwater, Florida
- ◆ Operations:
 - Manufactured neutron generators (NGs), containing tritium
 - After 10 years, expanded to include other electronic components, including thermoelectric generators (RTGs), containing plutonium
- ◆ Site consisted of:
 - One large building, Building 100, which contained many different areas
 - 17 smaller, surrounding buildings, which themselves also contained different areas and rooms
- ◆ At its peak, the plant employed about 2,000 people
- ◆ Covered periods:
 - Operational period: 1957–1994
 - Decontamination and decommissioning activities: 1995–1997
 - Remediation period 1999, 2008–2009

Radiation sources at Pinellas

Radioactive material

- ◆ **Tritium** targets in NGs
- ◆ **Plutonium (Pu)**-oxide heat sources in RTGs
- ◆ Borosilicate glass structures that contain **uranium** and may store **tritium** as well
- ◆ Leak-detection systems contain **krypton-85**
- ◆ Instrumentation calibration, check sources, and assorted small quantities of other radioisotopes
- ◆ **Carbon-14** as a radioactive label in some lab solvents

Radiation-generating devices

- ◆ NGs, which are small linear accelerators, generate fusion **neutrons** when operating
- ◆ Ion accelerators for ion implantation, target assessment, materials analysis, etc.
- ◆ X-ray diffraction and electron-beam equipment
- ◆ Medical x-ray exam equipment

Potential external exposure hazards

- ◆ **Tritium** (low-energy beta emitter)
 - Occurred as tritiated water, tritium gas, organically bound tritium, metal tritides
 - Low external radiation hazard
- ◆ **Krypton-85** (beta-emitting noble gas)
 - Beta energy is high enough to cause a skin dose if exposed to leaking gas
 - No evidence of such an exposure has been found
- ◆ **Plutonium** (Pu-238)
 - Pu decay also produces neutrons and gammas from spontaneous fission
 - daughter products also emit radiation
- ◆ **Uranium** (natural or depleted)
 - Emit alpha particles and x-rays
 - Some decay chain progeny also emit different types of radiation
- ◆ **Carbon-14** (beta emitter)
 - Used in small amounts as a radioactive label in some solvents
 - Considered negligible hazard
- ◆ **Nickel-63** (beta emitter)
 - Used in krytrons (high-speed switch used in nuclear weapons)
 - Low energy and negligible amount

External worker exposures

◆ Electrons

- TBD concludes no external electron hazard since tritium, the principal source of electrons, produces only low-energy betas that cannot penetrate the skin

◆ Photons

- Neutron generation production area exposures were from testing of neutron tubes and neutron generators
- RTG production area radiation exposures were from the plutonium oxide ($^{238}\text{PuO}_2$) heat sources

◆ Neutrons

- Neutron generators, which accelerated deuterium ions into deuterium- or tritium-containing targets, produce neutrons from fusion reactions
- Sealed $^{238}\text{PuO}_2$ heat sources used for the RTGs

External monitoring techniques

TBD (rev. 02) provides information in Section 6 on external radiation dosimetry through the years in tables 6-3 through 6-7

Table	Contents
6-3	Historical dosimetry events from 1957 through October 1994, when the primary mission changed from defense to cleanup
6-4	Whole body beta-gamma dosimeters, 1957–1997
6-5	Whole body neutron and beta-gamma neutron dosimeters, 1957–1991
6-6	Wrist beta-gamma dosimeters, 1974–1997
6-7	Ring beta-gamma dosimeters, 1957–1997

Subtask 1: changes necessitating PER

- ◆ NIOSH produced the current version (rev. 02) of the occupational external dose TBD in response to several SC&A and SPR reviews and discussions that were conducted since the previous version (rev. 01) of the TBD
- ◆ PER-079 lists two revisions to the TBD that resulted in increased (“claimant favorable”) assigned doses:
 - Eliminated the assignment of online ambient external dose and replaced it with the more favorable unmonitored dose (“co-exposure dose”)
 - Monitored and unmonitored tritium doses increased for all years
- ◆ SC&A assessed NIOSH’s evaluation and characterization of the issues addressed in PER-079 and its potential impacts on dose reconstruction, and SC&A concurs with NIOSH’s determination

Subtask 2: Assess corrective action methods

- ◆ PER Section 2.0 implies that “Eliminating the assignment of onsite ambient external dose and replacing it with the more favorable unmonitored dose” is a factor that increases the assigned external dose in a DR
- ◆ SC&A notes that this is following the guidance of section 6.5.1 and attachment B of the external dose TBD (rev. 02)
 - The TBD assumes that workers with potential for external exposures were monitored and those with little potential were not; hence, whatever doses the unmonitored workers might have received were less than those of the monitored workers
 - The TBD assigns a claimant-favorable annual unmonitored external dose (100% 30–250 kiloelectron volt photons) of 100 millirem as justified in attachment B

Subtask 2: SC&A conclusion

- ◆ SC&A reviewed rev. 02 and previous versions of the occupational external dose TBD and determined, with the concurrence of the Pinellas Work Group, that all issues were resolved
- ◆ SC&A believes that **it is acceptable to use its assumptions, methodologies, and data in performing dose reconstruction reviews**
- ◆ SC&A has no findings associated with subtask 2

Subtask 3: PER selection criteria

- ◆ 529 previously completed DRs identified
- ◆ 16 claims removed by the U.S. Department of Labor for various reasons
- ◆ 7 claims “active at NIOSH” after being returned for rework and a new DR
- ◆ 76 claims eliminated because the original DR had probability of causation (POC) >50%
- ◆ 4 claims compensated under a non-Pinellas Special Exposure Cohort
- ◆ 39 claims had no Pinellas employment or visit
- ◆ 3 claims eliminated because they were completed after the TBD was revised
- ◆ 4 claims returned to NIOSH prior to this evaluation and will be revised based on the revised TBD
- ◆ 149 claims were removed in total, leaving **380 claims to reconsider**

Subtask 3: SC&A conclusion

- ◆ Although SC&A did not have access to the NIOSH Claims Tracking System at the time of the review to evaluate the data used to identify and quantify those cases that qualify for reevaluation, SC&A agrees that the selection criteria should include all affected noncompensated claims
- ◆ SC&A has **no findings** associated with subtask 3

Subtask 4: Audit of reevaluated DRs

- ◆ SC&A recommends that the Advisory Board on Radiation and Worker Health select two cases for production workers covering the operational periods with POCs still <50% after NIOSH reworked the DRs



Questions?