

# **Rocky Flats Plant**

## **SEC-00192**

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RFP WG, Chairperson  
Advisory Board on Radiation and Worker  
Health**

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Naperville, Illinois**

# **Working Group: Rocky Flats Plant**

- **David Kotelchuck (Chairperson)**
- **Bill Field**
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# Petition Overview

- **August 23, 2011: NIOSH received an 83.13 petition for period of 4/1/1952 to 12/31/1989 covering tritium exposures.**
- **Feb. 9, 2012: Petition qualified for evaluation (SEC-00192) and petition period extended to 12/31/2005.**

# **Petition Overview -contd.**

- **October 17, 2013: Board extended existing SEC-0030 (up to 1966) to cover all employees with at least 250 workdays between April 1, 1952 and Dec. 31, 1983.**
- **Board then voted to extend investigations for SEC-00192 from 12/31/83 to 12/31/2005 in order to:**

# **Petition Overview -contd.**

- 1. Evaluate the use and exposure potential for Mg- Th alloy at Rocky Flats**
- 2. Continue to evaluate 1984-1988 period for Neptunium exposure potential**
- 3. Resolve open questions with SC&A and the work group concerning tritium**
- 4. Examine implications of Data Falsification issues**
- 5. Examine exposures at the Critical Mass Lab**

# 1. Mg-Th Alloy

- **Issue raised in 2007 under SEC-0030. Allegedly alloy shipped to RFP for use in plates to bullet-proof military trucks (2-4% Th typical).**
- **As part of SEC-00192 examination, NIOSH in 2013 carried out another review of the Site Research Database (SRDB) for an RFP/Mg-Th link, but found no corroborating evidence for such a link.**

## **Mg-Th Alloy**-contd.

- **However workers at Dow-Madison plant reported shipping Mg-Th plates to RFP. Dow-Madison worked with plates between 1962 and 1975.**
- **NIOSH asserted in its report that workers there were apparently not aware of other Dow facilities in Denver area, and may have delivered Mg-Th to these instead.**
- **Again no corroborating RFP links found.**

# **Mg-Th Alloy-contd.**

- **On 5/31/13 NIOSH was informed that an RFP worker (anonymous) reported that Mg-Th was used at the plant.**
- **NIOSH further reviewed RFP databases but still could not find corroborating documentation.**
- **NIOSH concluded that there was “no corroborating evidence” for the use of Mg-Th at the RFP site.**
- **Additionally NIOSH observed: If Mg-Th alloy was sent to the RFP, this took place between 1962 and 1975, during the covered SEC period.**

## **Mg-Th Alloy-contd.**

**However SC&A had a different perspective:**

- The workers interviewed both by NIOSH and SC&A provided a high level of “clarity and detail”. They specifically named 5 different Mg-Th alloy specifications, only two of which were searched for.**
- Rather than “confusion”, “it is just as ‘possible’ that the worker had it right all along.”**
- SC&A conclusion: “the receipt and use of Mg-Th alloy material at RFP remains inconclusive”.**

# **Mg-Th Alloy-contd.**

**Faced with this difference, the RFP Working Group needed to decide on the path forward on this issue. In this regard,**

- SC&A noted that 400 boxes of RFP records sit at LANL according to DOE and would have to be hand-searched. Estimated search time: 2 years.**
- Also in the SC&A report re lack of Mg-Th records, a DOE project mgr noted that 2%–4% thorium in Mg-Th alloy at RF may not have been considered to be a reportable quantity.**

# **Mg-Th Alloy-contd.**

**On 3/17/15 the WG decided not to ask NIOSH or SC&A to pursue this issue further and to close this issue. Our reasons:**

- 1. The failure of the intensive, years-long searches for documentation at the plant and agency levels.**
- 2. Consideration of current limitations on NIOSH resources of staff time and funding.**

**NOTE: The vast majority of cancers during yrs. of possible Mg-Th use are compensable under the existing SEC. (Only those with non-compensable cancers, not in SEC, might be negatively affected.)**

# **Mg-Th Alloy-contd.**

**On 2/6/17 co-petitioners released the transcript (via FOIA) of a 2013 interview with an RFP worker who reported use of plates btw 1984 and 1989 that he believed might have been Mg-Th (“It’s hard to say.”). Co-petitioners asked that the interview to be re-opened.**

**At its 2/9/17 meeting, WG with input from NIOSH and SC&A decided that the transcript had previously been evaluated in the context of all the information gathered and did not warrant further reconsideration or elaboration.**

**Thus this issue remains CLOSED.**

## **2. Neptunium-237**

- **A NIOSH search concluded that Np-237 was used at RFP after the 1983 SEC date, perhaps until 1988:**
- **“..evidence points to a series of discrete tasks performed from 1962 through 1983, involving a few gms. to a few hundred gms”, usually at request of other DOE facilities. Max: 300 gms in 1966.**

## **Neptunium-237-contd.**

- **The only processing operation in the post-1983 period involving Neptunium was the Plutonium-Neptunium Separation and Residue recovery operation from late 1985 to the end of 1987.**
- **This was a glove box operation involving 5 operators and one engineer.**

# **Neptunium-237-contd.**

- **With a Pu:Np mass ratio of 6.4 and the far greater specific activity of Pu, Np operations and later waste clean-up were monitored via Pu air sampling, contamination surveys and bioassays (urine & body counts), which were consistently implemented in the post-1983 period.**

# **Neptunium-237-contd.**

- **SC&A studies independently confirmed the results of the NIOSH White Paper.**
- **CONCLUSION: Only one processing operation in the post-1983 period involved neptunium, and the co-presence of neptunium with plutonium enabled radiological monitoring to account for any neptunium exposure component in a claimant-favorable manner.**  
**CLOSED.**

# 3. Tritium Exposure

- **Was the original basis for accepting SEC-00192.**
- **Internal doses are the main health concern from from tritium (H3).**
- **Prior to the 1970's the RFP radiological program did very little monitoring for tritium because they believed there was a limited tritium exposure potential. However a 1973 incident revealed that returned triggers (pits) containers could emit 500-2000 Ci of tritium.**

# **Tritium Exposure-contd.**

**As a result a series of changes were implemented, including:**

- Increased numbers of H3 bubblers and swipe samples**
- Air sampling upon opening incoming containers of used pits**
- Urine samples for 250 workers thought to be the most affected, followed two years later by sampling only among those in job-specific categories because the earlier results showed no excess exposure levels**
- 10% of urine samples for Pu were tested for tritium**

**RESULT: Greatly reduced levels of H3 exposure by the 1980's.**

# **Tritium Exposure-contd.**

- **Since virtually all RFP workers before 1983 are covered by SEC-0030, the crucial issue for NIOSH/ORAU, SC&A and the RFP WG was whether the post-1983 tritium exposure control program was adequate and individual H3 exposures appropriately assessed.**
- **After extensive group discussion about the placement of bubblers, their efficacy and H3 sampling procedures, the WG agreed that the exposure control program after 1983 was adequate to protect workers exposed to H3.**

# **Tritium Exposure-contd.**

- **Partial dose reconstructions for workers before 1973 will be assessed as chronic doses based on measurements just after the 1974 H3 incident (37.5 mr/yr), which are believed to be claimant-friendly over-estimates.**
- **Exposure measurements taken in 1975 and thereafter were consistently found to be less than 1 mr/yr, due to the control measures enacted after 1973 and the short lifetime of H3 (12.3 yrs).**

**The WG agreed that H3 exposure at RFP does not add materially to the radiation exposure burden of plant workers post-1983 and thus of itself does not constitute a basis for an SEC category beyond 1983.  
CLOSED.**

# 4. Data Falsification Issues

An FBI raid was conducted at RFP in 1989 concerning alleged data falsification, improper bioassay processing and document destruction. Also in 1989 a related DOE study was conducted. However the FBI did not release the redacted interview transcripts requested by NIOSH until 2015.

1. NIOSH and SC&A interviewed a number of RFP employees, including one who reported being ordered to destroy records. NIOSH reported no loss in “essential records” which would interfere with radiation dose reconstruction, nor did it find evidence of relevant data falsification. SC&A concurred.

# Data Falsification Issues-contd.

2. Another interviewee made statements about the inadequacy of fume hoods, stack samples and improper handling and/or preparation of environmental samples. “From a radiological perspective, NIOSH finds no scientific basis for concluding that the issues raised regarding environmental samples would compromise radiological count results” (emphasis added).

# Data Falsification Issues-contd.

3. Another interviewee raised the issue of dosimetry technicians writing down dose rate information in pencil, which might allow others later to direct changes in these data. This might impact results recorded for field survey instruments, but the primary sources of dose reconstruction data are personnel dosimeters and bioassays, assessed in labs.

# **Data Falsification Issues-contd.**

- 4. SC&A reviewed eight documents mentioned in the NIOSH White Paper. It concluded “the documents were concerned with other aspects of RFP operations or environmental issues, rather than data falsification, record destruction, or bioassay data, that would potentially impact the ability to perform adequate dose reconstructions.”**

# **Data Falsification Issues-contd.**

- **Based on its interviews, analyses and evaluation of the 2015 FBI report, NIOSH concluded that “there exists a sufficient quantity of individual external monitoring data to support the assessment of RFP personnel external doses.” SC&A agreed with this conclusion.**

# **Data Falsification Issues-contd.**

- **In addition to its basic support of the conclusions of the NIOSH White Paper, SC&A expressed concern that data used to generate radionuclide intakes might be impacted by the environmental sampling/data issues that surfaced after both the 1989 FBI raid and the 1989 DOE investigation.**
- **The RFP WG having read the associated White Papers and heard the presentations agreed with the NIOSH conclusions and referred the env./occ. linkage issue to the Subcommittee on Procedures Review.**

# **Data Falsification Issues-contd.**

- **Claimant representatives wrote a detailed response (9/18/15) to the NIOSH White Paper: “NIOSH combines all of the issues raised by the petitioners and their relationship to Building 123. Each of the issues raised are separate concerns. Some concerns may be related to Building 123 but not all of the issues are. Therefore, each of the issues needs to be addressed on an individual basis. It is the petitioners’ position that the problems associated with each individual concerns (sic) is sufficient for NIOSH to determine they cannot reconstruct dose with sufficient accuracy.”**
- **Their response itemized six different areas of concern. On 11/30/15 NIOSH responded to each of these. For example:**

# Data Falsification Issues-contd

## Records Destruction:

- **1. Petitioner concern: Relatively low nr of urine samples (10,468 in 1984) “equates to less than two samples per employee” that year.**
- **NIOSH: “incorrectly assumes that every worker employed at RFP in 1984 had a potential for internal exposure”. Petitioner metric “not appropriate”.**

# Data Falsification Issues-contd

- Records Destruction (cont'd):
- 2. Petitioner concern: “No fecal samples listed for years 1980 through 1988 – eight full years.” Nr of fecal samples for pre-1988 “very important”.
- NIOSH: Fecal samples “not necessary to bound inhalation intakes”. Urine analyses can also be used. However “more than 1000 fecal sample results” available for 1980-1988.

# **Data Falsification Issues-contd**

- **“Based on its review of the rebuttal document from the petitioners, NIOSH’s concludes that no new information has been presented that impacts its ability to bound, or reconstruct with sufficient accuracy, the dose for the class evaluated in the SEC-00192 RFP.” The RFP WG concurs with this conclusion. CLOSED.**

# **5. Critical Mass Lab**

**Operations in the Critical Mass Lab (CML) took various assemblies and radioactive materials to criticality levels. In addition to emissions from the criticality studies, the NIOSH White Paper issued 6/9/15 noted: “Radioactive materials at the CML included the nuclear fuels and sealed radioactive sources used in criticality experiments. Fission and activation products generated in the fuels, building materials and fixtures as a result of the nuclear criticality experiments conducted there are an additional source of radiological exposure.”**

# **Critical Mass Lab-contd.**

**This White Paper concluded: External radiation exposure to CML personnel from criticality expts. is accounted for by Rocky Flats' personnel dosimetry program, which assigned radiation dosimeters to all CML workers. This program also included periodic bioassays (urinalysis and body counts) that focused primarily on identifying uranium and plutonium intakes. Also NIOSH found "no significant personnel dose" to CML workers from mixed fission & activation products over the lifetime of the lab.**

**SC&A agreed and the WG accepted this Paper.**

# **Critical Mass Lab-contd.**

- **However on the 7/14/15 RF WG conference call, the last surviving of 3 senior scientists at CML (1964-1986) joined the discussion and expressed strong disagreement with the conclusions of the NIOSH White Paper. He requested a personal interview at a later time, which was agreed to and conducted on 10/13/15.**

# **Critical Mass Lab-contd.**

- **During the interview this CML scientist argued that no one could bound the neutron flux in the lab's near criticality experiments. He disputed NIOSH's ability to calculate upper bounds on the neutron flux via reactors' energy output during the criticality experiments.**
- **He also asserted that radiation levels at CML were not properly documented, and**
- **That the RFP personnel dosimetry program only performed lung counts, not full body counts on the lab's 30-35 employees, and conducted urinalyses irregularly.**

# **Critical Mass Lab-contd.**

- **In addition to exposures to its full-time employees, this CML scientist reported that during the 1980's typically 100-200 non-CML RF employees entered the lab annually to observe ongoing experiments.**
- **At the conclusion of this discussion, NIOSH staff agreed to review existing data, extend its search and issue an updated White Paper on CML. Included in this effort was a (time consuming) capture of CML data from Los Alamos National Lab (LANL).**

# **Critical Mass Lab-contd.**

**A Reassessment White Paper was issued on 11/28/16.**

- NIOSH found that CML staff had on five occasions satisfactorily assessed thermal power and neutron flux, and the power in all cases was less than the 10 mW estimated in its 7/14/15 NIOSH White Paper.**
- Routinely collected data was found for external exposures monitored via personnel badges and daily radiation surveys at control points. Potentially contaminated surfaces were checked regularly for alpha radiation via tissue smears .**

# **Critical Mass Lab-contd.**

- **Internal exposures resulting from inhalation and ingestion of airborne dusts and resuspension from contaminated surfaces were assessed via bioassays (with enough data to reasonably estimate internal exposures).**
- **Thus after reassessment NIOSH again concluded that “no significant personnel dose to Rocky Flats workers or contractors resulted from the generation of fission or activation products in the uranyl nitrate fuel or resuspended contamination from fuel spills as a result of criticality experiments conducted at CML over its lifetime.” CLOSED.**

# **Additional Issue: Cobalt-60 Exposure**

- In Spring 2015 claimants raised new concerns about radiation exposure from the 600 Ci Cobalt-60 source at RFP, and presented information from DOE (via FOIA) as well as employee testimony alleging lack of proper exposure protection during removal of this source from RFP.**
- A NIOSH White Paper on sealed sources was issued on 7/8/15. At the 10/28/15 RFP WG meeting, NIOSH reported that proper, standard radiation measurements were made during Co-60 use and removal, and only background levels of contamination were found. CLOSED.**

# Issues Resolution: RFP SEC-00192

- At its 10/17/13 meeting the Board charged the RF WG to investigate the following issues for a possible SEC beyond 12/31/83 to:
  1. Evaluate the use and exposure potential for Mg-Th alloy at Rocky Flats – CLOSED
  2. Continue to evaluate 1984-1988 period for Neptunium exposure potential – CLOSED
  3. Resolve open questions with SC&A and the work group concerning tritium – CLOSED
  4. Examine implications of Data Falsification issues – CLOSED, with referral to Proc. Review SC to examine any possible env. impact on dose reconstruction calculations
  5. Examine exposures at the Critical Mass Lab – CLOSED, and  
WG examined exposures during Co-60 use & removal - CLOSED

# **Recommendation RFP SEC-00192**

- **For the period January 1, 1984 – December 31, 2005, the RFP Working Group finds that radiation dose estimates can be adequately reconstructed for individual claimants, and recommends that this class not be added.**

**Questions?**