

**DEFENSE NUCLEAR FACILITIES SAFETY BOARD**

September 9, 1993

**MEMORANDUM FOR:** Technical Director

**COPY TO:** Board Members

**FROM:** R. E. Kasdorf

**SUBJECT:** Rocky Flats Plant - Trip Report for the DNFSB Staff Review of Special Nuclear Material Issues

1. **Purpose:** This memorandum provides a summary report of the trip by the DNFSB staff (Stadnik, DeLaPaz, Bamdad, Tontodonato, Kasdorf and outside expert Leary) from July 19 - 22, 1993 to review special nuclear material issues at the Rocky Flats Plant (RFP).
2. **Summary:**
  - a. The RFP contractor, EG&G, has a good understanding of the types of items, quantities of plutonium and uranium and the general forms of special nuclear material (SNM) stored at Rocky Flats. However, the actual composition of much of the material, especially scrap and residues, is not known.
  - b. The staff believes that the safety controls for movement of SNM between material access areas at Rocky Flats are adequate for Category I and II material as defined by DOE Order 5633.3A, *Control and Accountability of Nuclear Materials*. Site procedures require a safety screening per the intent of DOE Order 5480.21, *Unreviewed Safety Questions*, by the Facility Safety Engineering (FSE) group which is intended to prevent movement of materials which would violate the safety basis of the receiving location. Similar controls for Category III and IV material did not exist; however, the staff was told a procedure was in draft and would include FSE group review.
  - c. The packaging and storage requirements for many different forms of SNM established by RFP are apparently based on past practices when the plant was in production. There appears to be little additional technical justification for the current storage requirements. SNM has not always been stored in a consistent configuration, nor are the requirements for the storage location such as atmospheric controls and engineered safety features consistent among the various storage locations. As such, the current storage requirements do not appear to address the health and safety concerns that arise from long-term storage of SNM that will likely occur with the new RFP mission.
  - d. RFP is planning a disciplined process to inspect and repackage about 1800 SNM items which have not been periodically inspected in accordance with RFP requirements. The

process includes an initial inspection of about 10% of the items to better understand the storage issues. However, inspection of many of the items will not be performed until the buildings in which they are stored are prepared to perform the repackaging evolution, which could be a year or two away.

- e. Apparently there are no requirements (e.g., periodic sampling, periodic containment integrity evaluation) for actinide solutions stored in tanks and bottles. Actinide solutions in tanks have not been sampled and raschig rings have not been inspected since curtailment of operations in 1989. Extended curtailment of operations at RFP has left potentially unstable actinide solutions in bottles, tanks and process systems in Buildings 771 and 371. Only limited tank surveillances (i.e., look for leaks) have been performed since curtailment. Bottles are being inspected and sampled as part of the Building 771 Phase I solution stabilization program. EG&G states that there are no imminent safety hazards with these solutions and is preparing a plan to address stabilization of these solutions. The Los Alamos Technology Office (LATO) has reviewed the conditions at RFP and in a draft report concluded that the most severe hazard would be an increased frequency of leaks from the tanks and piping.
- f. There are numerous plans and programs under preparation by RFP. These plans and programs did not appear to be well coordinated and disciplined. RFP is currently developing an integrated program with a risk-based ranking and prioritization of planned work. This integrated program will be used initially to prioritize about 1400 work items currently identified for FY 1994. The staff will be following this effort to ensure safety items are not inadvertently deferred.

### 3. Background:

- a. In May 1993, RFP reported that they were not in compliance with their site requirements for storage of SNM. Approximately 1800 items had not been inspected within the periodicity specified in site procedures (Health and Safety Practices Manual HSP 31.11, *Transfer and Storage of Pyrophoric Plutonium for Fire Safety*). In June 1993, the Board reviewed this non-compliance and other SNM issues at Rocky Flats. RFP did not adequately respond to Board questions concerning SNM stored at RFP such as:
  - 1. What is stored (form, quantity, condition, accuracy of the data),
  - 2. How is SNM movement controlled to ensure safety assumptions are met,
  - 3. What is the basis for the priority for processing the SNM,
  - 4. What is the basis for the final stored condition of the material, and
  - 5. Is there an integrated plan for transition including processing and elimination of SNM.
- b. The staff considered that additional action was necessary to better understand the SNM issues that exist at the RFP.

#### 4. Discussion:

- a. What is stored: RFP uses the Safeguards Accountability Network (SAN) system to provide an inventory of the items stored at RFP. SAN is a secret database which makes working with it difficult. SAN provides a detailed listing of each individual item stored which includes the Item Description Code (IDC), the mass of the item, the mass of plutonium, uranium or beryllium in the item, and the storage location (material balance area). Each IDC can be related to a general form of material. There are about 325 individual IDC's. For some items, such as pits, the data may also provide the actual chemical composition.

For finished components, parts and pure metal the data is expected to be complete and accurate. For other material, such as residues and scrap, the actual composition is generally not known. Only the quantity of certain materials (i.e., plutonium and uranium) are provided since they are required for safeguards purposes, which was the original purpose for maintaining the database. Where and how the residue or scrap was generated is generally known from the IDC. RFP assumes that the material is "typical" of that process. There are large quantities of actinide solutions (about 17,000 liters containing about 100 kg of plutonium) stored, most of which has not been sampled since the curtailment of operation in 1989.

The current packaging configuration for the items stored is not known with certainty for much of the material. Of particular concern is whether plastic was used in direct contact with plutonium metal or oxide, which is undesirable from the standpoint of radiolytic decay products from the plastic. When there is any doubt, RFP conservatively assumes that the material is in plastic. On this basis, as much as half of the non-compliant items may have been packaged in plastic.

RFP has provided the staff with a brief description of each of the IDC's. The staff is reviewing these descriptions to better understand the various types of materials being stored at RFP and their safety significance. The items that the staff believes may present a health and safety concern will be the subject of future reviews at RFP.

- b. Basis for the final condition: The storage practices for SNM are the same as historically used when RFP was in production. During the production era at RFP, SNM was not typically stored for extended periods. The DOE-RFO root cause analysis report concluded, in part, that there was a lack of a technical basis for making decisions on issues concerning SNM packaging and storage. The report also noted that a comprehensive technical analysis was not completed to provide a safety basis for SNM storage, packaging and inspection. The EG&G root cause analysis concluded a contributing cause of the non-compliance was the lack of DOE-wide standards for storage of plutonium. As such, the current RFP storage requirements may not address the health and safety concerns that arise from long-term storage of plutonium that is expected with the new RFP mission.

The primary DOE order for plutonium packaging and storage, DOE Order 5480.5, *Safety of Nuclear Facilities*, is, in general, not specific and leaves the individual sites to develop their own specific, detailed packaging and storage requirements.

There are other DOE orders which provide transportation, and safeguard and security requirements concerning SNM. The staff does not believe that these requirements adequately address health and safety concerns with long-term storage of SNM. The design requirements of DOE Order 6430.1A, *General Design Criteria*, in general, do not apply to existing facilities, and, furthermore, do not offer significant insight into the packaging and storage of SNM.

Material considered to be potentially pyrophoric, such as plutonium oxides, will be thermally stabilized in Building 707 at a temperature of about 550 °C. Prior to the public meeting concerning resumption of Building 707 operations, RFP provided the staff with information that indicated that this temperature had been selected based on ignition studies and processing experience which had proven to provide satisfactory stabilization of the material. The staff believes that most material thermally stabilized at RFP will be adequately stabilized for interim storage (5 to 10 years); however, there is little technical data concerning long-term storage of plutonium in the various forms existing at RFP.

For other SNM metal and oxides, the storage requirements for RFP are contained in their procedure HSP 31.11. As indicated above, this procedure is based on past production practices and there appears to be little technical basis for the requirements. EG&G is planning a disciplined process to repackage the 1800 items that RFP has identified as not being in compliance with the inspection periodicity in this procedure. The process will address the standards to be used, plutonium holdup in exhaust ducts for the gloveboxes to be used for inspection and repackaging, and fire protection requirements. Prior to repackaging the non-compliant items, a readiness evaluation will be conducted by DOE-RFO to address equipment, personnel, and management and administrative system readiness. While EG&G admits that there may be more important material in other buildings, the personnel, procedures, training, and equipment needed to conduct the repackaging in Buildings 779 and 707 are the closest to being ready. Materials stored in these buildings will be repackaged first. Other buildings are proceeding in parallel but some could be more than a year away from being ready.

EG&G categorized the 1800 items into 55 groups with similar properties or conditions and then ranked the groups with respect to hazard based on packaging, age, type of plutonium and material form. A statistical sample of about 200 of the higher hazard items were selected to be taken out of storage and inspected (including thermogravimetric analysis and infrared spectroscopy of oxides collected from the items) in an effort to better understand the severity of the storage issue and whether repackaging of the remaining items is warranted. These samples will be inspected when the building where the items are stored has had its readiness review by DOE-RFO. As noted above, Buildings 779 and 707 are the closest to being ready; other buildings could be a year away from being ready to perform this inspection.

At Rocky Flats several packaging configurations have been used in the past. RFP has proposed standard packaging configurations for future storage of SNM metal and oxides. The proposed configuration for plutonium metal is a can with a crimped seal, which is packaged while in an "inert" environment (less than 5% oxygen), and an outer can with a crimped seal. For stabilized plutonium oxides, Rocky Flats proposes an inner can with a taped lid, a plastic bag around this can, and an outer can with a locking lid that has been taped. Non-stabilized oxides would be placed in a can with a taped lid, and stored in an "inert" atmosphere or on a heat detector.

Apparently there are no requirements (e.g., periodic sampling, periodic tank integrity evaluation) for actinide solutions stored in tanks and bottles (i.e., RFP does not have requirements for liquids which are equivalent to HSP 31.11 requirements for metal and oxides). Extended curtailment of operations at RFP has left potentially unstable actinide solutions in bottles, tanks and process systems in Buildings 771 and 371. Actinide solutions in tanks have not been sampled and raschig rings have not been inspected as specified in ANSI/ANS-8.5 since the curtailment of operations in 1989. Only limited tank surveillances (i.e., look for leaks) have been performed since curtailment. Bottles with low concentration solutions (less than 1.5 g/l plutonium) are being inspected and sampled as part of the Building 771 Phase I solution stabilization program. EG&G states that there are no imminent safety hazards with the actinide solutions and is preparing a plan, the Actinide Solution Disposal Study, to address stabilization of these solutions. The Los Alamos Technology Office (LATO) has reviewed the conditions at RFP and in a draft report concluded that the most severe hazard would be an increased frequency of leaks from the tanks and piping.

The staff considers that the DOE needs to develop a standard to provide clear and consistent requirements for the storage of special nuclear materials. The staff will provide the Board an issue paper addressing the need for DOE to determine storage requirements that provide for adequate protection of the public and worker health and safety. A standard needs to be developed and issued which specifies:

1. Material forms and conditions that are acceptable for long term storage,
  2. Acceptable intermediate storage periods for other material forms and conditions,
  3. The type of environment to be established during packaging and the packaging configuration for storage,
  4. Requirements for the storage facilities such as atmospheric controls and engineered safety features, and
  5. Requirements for periodic inspection and surveillance of the stored material.
- c. How is SNM movement controlled to ensure that safety assumptions are met: RFP has developed a procedure for controlling transfer of certain types of SNM between material access areas (MAA). This procedure, 1-63200-NMT-001, *Transfer of Nuclear Material Between Material Access Areas*, is intended to prevent movement of Category I and II SNM (as defined by DOE Order 5633.3A) which would violate the safety basis of the receiving location. The procedure requires that Facility Safety Engineering (FSE)

perform a safety screen or unresolved safety question determination (USQD) prior to the material movement.

EG&G told the staff that a similar procedure for Category III and IV materials was being prepared and that the procedure would also include a FSE review prior to the material movement.

Material movement between material balance areas (e.g., a vault) within a MAA would be controlled by criticality safety operating limits (CSOL) or Nuclear Material Safety Limits (NMSL).

The staff believes that RFP will have adequate safety controls on SNM movement between MAA's once the procedure for Category III and IV is issued and implemented.

- d. What is the priority: The current efforts at RFP have focused on: thermal stabilization in Building 707; processing actinide solutions in Buildings 771 and 371; consolidation of SNM into Building 371; conducting inspections of SNM and bringing SNM storage back into compliance with local HSP requirements; and compliance with the numerous state and federal requirements.

The priority for work in FY 1994 and beyond is being evaluated and established using a risk-based assessment as part of an integrated planning program discussed below.

- e. Is there integrated site program planning: There are numerous plans being prepared and studies being conducted at RFP. There appears to be little coordination and discipline to these efforts. EG&G indicated that this was in part true, and that greater integration was needed. EG&G stated that current program plans and efforts are not prepared in a unified manner and that there is no risk-based ranking in the planning process. EG&G identified that they are trying to get all of their efforts pulled together into an integrated site-wide program plan. The process is called the Integrated Planning Process (IPP). This process is a pilot project which when fully implemented (plans are in three years) would provide a picture of all the activities going on at RFP from environmental monitoring to specific upgrades or clean-out projects needed to put the site in the condition desired for future uses. It is intended to provide a near-term and long-range planning tool to define and prioritize projects needed to achieve a final condition (not yet defined for RFP), and to provide input for future funding requirements. The IPP is currently focusing on organizing, unifying, and prioritizing the efforts identified for FY 1994 which represents about 1400 individual project plans.

EG&G has yet to complete the first round of integration, and complete their review of the risks and priorities before finalizing the activities that will be conducted during FY 1994 and beyond. Since these tools are still being prepared, the staff will be following up on this process in September 1993 as the first integrated program plan is completed to ensure that health and safety items are given a rational priority.

## **5. Future Actions:**

- a. The staff believes that DOE needs to develop a standard to provide clear and consistent requirements for the storage of special nuclear materials that ensure public and worker health and safety. The staff will provide the Board with an issue paper on this subject.
- b. The staff believes that DOE-RFO and EG&G need to evaluate the risk-benefit of inspecting SNM samples that have a relatively high risk ranking in buildings that are ready to conduct this inspection rather than waiting for the individual buildings to be prepared. EG&G has verbally agreed that inspecting the samples as soon as possible would be prudent. The staff will continue to follow RFP actions in this area.
- c. The staff believes that although the actinide solutions in tanks may not pose an imminent hazard to the public, the lack of a surveillance program which assesses the containment boundary for the solution process system (including tanks) may expose the workers to a risk of contamination due to leaks or possible rupture of the boundary. These solutions need to be disposed of to mitigate this concern. The staff has been informed that RFP intends to process these solutions for disposal starting in FY 1994. The staff will continue to follow RFP efforts on this project and will review EG&G's basis for considering safety issues other than leakage incredible.
- d. The staff will complete its evaluation of the list of descriptions of individual IDC's to identify the material forms that appear to have the greatest health and safety concern, and review the actions being taken by RFP to mitigate these concerns.
- e. The staff will follow-up on the EG&G efforts to integrate and prioritize the identified work at RFP to ensure that health and safety items are given a rational priority.