

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

February 25, 2000

TO: G. W. Cunningham, Technical Director

FROM: M. Sautman, Hanford Site Representative

SUBJ: Activity Report for the Week Ending February 25, 2000

Plutonium Finishing Plant (PFP): PFP personnel gave a presentation to DOE managers and the Site Rep about their concerns with plutonium metal storage and their proposed corrective actions. Most of the PFP plutonium metal inventory consists of fuels grade (i.e., high decay heat), British “barter” ingots that were packaged nearly 30 years ago. The shape and size of some ingots are such that there is very little room in some cans for volume expansion in the radial direction. In 1969 and 1970, metal oxidation resulting from leaking cans caused two cans of this material to fail at PFP and grossly contaminate the vault. Nearly all plutonium metal container failures in the United States (US) and England have involved high decay heat plutonium and very small leaks in containers that were intended to be well sealed.

In 1996, 69 items were weighed and radiographed. Three items showed abnormal weight gains of 28, 11, and 8 grams, one of which was later repacked. In the past, PFP routinely repacked any can exhibiting more than 5 grams weight gain, but this has not been performed for several years. Two-thirds of the inventory has not been weighed in the last 10 years to check for weight gains. Determining cumulative weight gains is complicated because incremental weight gains of less than 5 grams are listed as zero and the original weights were rebaselined in 1980. Radiography indicates that about 10 percent of the cans are buckling inwards. Radiography also shows metal items that are corroding, spalling, and crumbling. Some images show that the void space in the radial direction has been filled with oxide. Radial pressure resulting from metal oxidation has caused 8 cans in the US and England to rupture, even when there was significant void space on top of the item. The can with the 28 gram weight increase has been repacked twice already due to excessive weight gains and buckling. Its middle can is noticeably buckled inwards. It has gained another 11 grams of weight since 1996 and monthly measurements indicate that the rate of weight gain is increasing. Radiography indicates that there is available space in the radial direction, but this image is over 3 years old and does not reflect the recent 11 grams of weight gain. Oxidation rates can quickly change. One item in England gained only 3 grams over 5 years, but then totally oxidized within the next 2 years, eventually rupturing both cans. Radiography also indicates that there are 3 metal items in direct contact with plastic. Based on similar identification numbers, 4 additional items are strongly suspected to also be in contact with plastic.

PFP personnel do not believe they can predict when a rupture may occur and have not identified any trends that could predict which items might be gaining weight. Furthermore, they have concluded that the vault safety inventory system (VSIS) may not even detect a can failure if it ruptured from radial pressure. VSIS only detects if the lids are bulging, not the sides. Some

containers are also stored on inoperable VSIS pedestals and are inspected monthly. PFP managers believe they need to weigh all metal items and a subset of their plutonium alloy items. This would begin on March 6 and finish by April 28. Radiography of all items exhibiting greater than 5 grams cumulative weight gain would start on March 31. The 4 items potentially in contact with plastic would be radiographed by April 14. Disposition recommendations of the plastic and weight gain items would be made by April 28.

There are two things that are disturbing about this situation. First, this is not new information. This information was known in 1996 and PFP was taking actions to resolve these issues in 1997. However, after the explosion and other building shutdowns, the issue appears to have been forgotten by PFP management. Second, PFP no longer has the infrastructure in place to allow them to brush, repack, and/or thermally stabilize plutonium metal items. Right now, all they are allowed to do is transfer the cans into a glovebox. There are operating restrictions on their metal repacking glovebox due to ventilation control problems (i.e., sharp differential pressure swings). There has also been a months long dispute over whether seismic straps are needed for a filter. The metal repacking procedure was deactivated in 1997 after the sparking incident occurred and never reinstated. Metal is also not currently an approved feed stream for thermal stabilization. In an emergency, PFP could place a bulging can in a glovebox, but they would need several special approvals to be able to eliminate the hazard. The Site Rep expressed the belief that PFP needs to take near-term action to make the administrative fixes necessary to handle an emergency. There does not appear to be any physical reason why PFP cannot today safely repack items with excessive weight gain or that are in contact with plastic.

The staff believes that addressing known problems should be the highest priority and that the emphasis should be on eliminating hazards rather than continued monitoring. The Site Rep questioned why PFP had to wait until May to start repacking items known to be in contact with plastic or exhibiting significant weight gains. Considering that there are only 7 plastic items and 2 weight gain items, it seems like PFP should be able to repack these quicker. The Site Rep was especially concerned when PFP personnel indicated that they might continue to monitor the item exhibiting the worst weight gain until the gain reached 50 grams. This did not seem prudent considering the basis for the available volume was based on a 1996 radiograph and the weight gain rate appeared to be increasing. Pete Knollmeyer also expressed concern about waiting until May to address confirmed problems as well as how PFP got into the current situation. PFP managers were responsive to these concerns and committed to seeing how much they could accelerate their response on the worst containers. The next morning, the item with the worst weight gain was transferred into a glovebox.

cc: Board members