DEFENSE NUCLEAR FACILITIES SAFETY BOARD

TO: Timothy Dwyer, Technical Director
FROM: Wayne Andrews and David Kupferer, Site Representatives
SUBJECT: Oak Ridge Activity Report for Week Ending January 6, 2012

Uranium Processing Facility (UPF). Last month, in response to comments provided by both YSO and the Board's staff (see the 10/21/11 and 11/4/11 reports), B&W submitted a revision of the Safety Design Strategy (SDS) to YSO for approval. The cover letter to B&W's submittal states the following: (a) this revision of the SDS represents a major restructuring of the document to improve clarity and addresses comments regarding the post seismic design strategy for UPF, (b) B&W will continue to evaluate the Hazard Evaluation Studies to ensure that hazards are adequately addressed and appropriate controls have been selected, and (c) B&W will continue to evaluate the design of UPF to ensure that it is adequate to prevent and mitigate the release of hazardous material following a seismic event. The SDS includes the following:

- The design strategy of UPF includes ensuring that hazardous material is confined within the building structure following a seismic event. The facility structure is being designed to Seismic Design Category (SDC)-3 criteria; however, the active confinement system—which penetrates the facility structure—is being designed to SDC-1 criteria.
- The design strategy of UPF includes preventing nuclear criticality events that could be caused due to seismic activity by requiring equipment necessary to prevent these events to be designed to SDC-2 criteria.
- Fires involving nuclear materials that do not actuate the fire suppressions system (i.e., small fires) must be further evaluated to ensure that adequate controls have been identified.
- The following key safety decisions were identified as posing risk to the success of the UPF project: (1) designing the active confinement system to SDC-1 criteria, (2) designing engineered features for preventing criticality accidents to SDC-2 criteria, and (3) using potentially non-bounding accident analysis parameters (e.g., deposition velocity and meteorological data) to calculate radiological consequences to the public.

Safety Analysis Research. In June, B&W obtained funding to resume its research on airborne release fraction (ARF) and respirable fraction (RF) values of uranium metal in a fire environment (see the 4/1/11 report). The subject Test Plan includes three testing phases: (1) equipment testing (proof of concept), (2) a scoping study that involves burning depleted uranium coupons to evaluate differences in how various types of uranium (e.g., pure uranium versus uranium alloys) react in a fire, and (3) a parametric evaluation to validate B&W's hypotheses on which factors (e.g., grain size and oxidation rate) most significantly influence ARF and RF values. Two weeks ago, B&W completed phase one (i.e., equipment testing). Phase one included three primary goals: (1) validate the air flow rate through the burn chamber, (2) validate the temperatures that can be achieved in both the burn chamber and sample chamber, and (3) validate the burn characteristics of the fuel proposed for the phase two scoping study (i.e., high density polyethelene (HDPE) or anthracite coal). B&W's Test Plan was revised to include the results of phase one testing; specifically, (1) the air flow was adequate, (2) the heating element was inadequate to achieve the desired temperatures in the burn and sample chambers (the heating element actually failed during testing), and (3) neither HDPE nor anthracite coal demonstrated the desired burn characteristics. B&W plans to upgrade the burn chamber and proceed with the phase two studies using standard charcoal. B&W plans to complete phase two by May.