IEA Independent Activity Report - Rev. 0	**Report Number:** IAR-WTP-2014-03-31
Site: Hanford Site	**Subject:** Office of Environment, Safety and Health Assessments Activity Report for the Observation of the Waste Treatment and Immobilization Plant Low Activity Waste Facility Hazards Analysis Activities

Dates of Activity :	03/31/14 - 04/10/14	**Report Preparer:**	James O. Low

Activity Description/Purpose:
The Office of Independent Enterprise Assessments, Office of Environment, Safety and Health Assessments (Independent Oversight), reviewed hazard evaluation (HE) tables for hazard analyses (HAs) developed for the Waste Treatment and Immobilization Plant (WTP) Low Activity Waste (LAW) Facility Melter and Off-gas systems; observed a portion of the HA activities; and met with Bechtel National, Incorporated (BNI) personnel to discuss HE table comments. This Independent Oversight observation is part of a planned multi-phase review (Reference 1) focusing on the technical adequacy of select BNI-issued LAW HA Reports (HARs) and subsequent submittal of the LAW documented safety analysis (DSA) and technical safety requirements (TSR) for the U.S. Department of Energy (DOE) Office of River Protection's review and approval.

Result:
The HA process, executed by each BNI Safety Design Integration Team (SDIT), leads to identification of potential events (i.e., process upset conditions that lead to adverse consequences to facility workers, co-located workers, or the public) for analysis (see References 2 through 5). These events are organized in hazard and operability (HAZOP) matrix tables for the HA node (or subnode) being analyzed. The HAZOP matrix tables include physical parameters, such as pressure, temperature, and flow, and potential deviations in these parameters (e.g., high, low, or none) that, taken together, can lead to a possible hazard event.

Prior to these Independent Oversight field observations, BNI announced a significant reorganization of WTP Environmental and Nuclear Safety (E&NS) functions which led to replacement of URS Corporation managers with BNI employees. BNI's plan was to have the new organization Nuclear Safety Engineering (NSE) in place by April 18, 2014. In addition, the existing E&NS nuclear safety staff positions have been converted to BNI with URS incumbents transferring or loaned on a case-by-case basis. The new NSE management team indicated that development of LAW, Analytical Laboratory, and Balance of Facility HARs will be accelerated to deliver all HAR volumes by the end of fiscal year 2014. BNI will evaluate the existing E&NS processes for accident analysis and control selection for potential efficiencies. In conjunction with the establishment of the NSE organization, BNI is preparing a re-baseline plan to implement DOE direction for a LAW direct feed alternative, bypassing the Pre-Treatment Facility. This LAW re-baseline planning, which will incorporate direct feed options, would delay the submittal of the LAW DSA/TSR from November 2014 to September 2016.

During this Independent Oversight observation, the SDIT conducted HA analysis of events related to Off-gas system sub-nodes regarding hazards in the system components. The SDIT cross-checked earlier analysis against the HE tables to identify whether more hazard events should be added or modifications be made to specific HA events.

Independent Oversight reviewed the draft HE event tables for the LAW Melter and Off-gas systems (03/27/14 version). Review comments were provided to BNI for written response. After reviewing the BNI responses, Independent Oversight and responsible BNI personnel held a discussion session to establish a mutual understanding of the BNI responses and their subsequent revision (Reference 6). The review comments identified some opportunities to improve the level of detail and ensure technical defensibility of the HA event records. The BNI responses identified actions to modify the HE tables in order to resolve the comments.

Independent Oversight noted that, overall, Off-gas system HA processes have continued to improve, specifically:

- Event material at risk and consequences are conservatively estimated.
- No new potential events that would result in high consequences to the public or co-located workers were identified, building confidence that the SDITs will select an appropriate set of candidate design basis accidents.
- SDIT cross checks of analyzed events appeared to be contributing to completion of a comprehensive HA.
- Fewer examples of previously identified Potential Concerns (see Attachment 1) were found.

- HA event tables include accident types that are appropriate to the analyzed systems (e.g., fires, explosions, and loss of confinement).
- No new potential concerns of a systemic nature were identified.

Although improvements were noted in the HA process and resulting HE tables, the observation of the SDIT activities and review of the Melter and Off-gas systems HE tables indicated sporadic examples of previously identified Potential Concerns (References 3 through 5). For example:

- Some events have incomplete identification of unmitigated system effects.
- Some events do not address the potential for ammonia-fed fires resulting from explosions.
- A few additional examples of Potential Concerns 1, 3, and 4 were identified by the review.

BNI intends to implement corrective actions as indicated in Reference 6.

At the end of Independent Oversight's observation period, cross checks of events against existing references remained to be evaluated, and several action items on specific technical issues for various Off-gas system nodes remained open. Completion of these activities, as well as HAR development, review, and approval, will conclude the HA process for the LAW Melter and Off-gas systems.

HSS Participants	**References**
1. James O. Low (lead)	1. DOE/HQ HS-45, *Plan for the Independent Oversight Review of the Hanford Site Waste Treatment Plant Low Activity Waste Facility Documented Safety Analysis Development*, April 22, 2013.
2. David Odland	2. DOE/HQ HS-40 Letter, John S. Boulden III to SL Samuelson, *Independent Oversight Review of the Hanford Site Waste Treatment & Immobilization Plant Low Activity Waste Melter Process System Hazard Analysis Activity*, dated December 21, 2012.
3. Mary Miller	3. DOE/HQ HS-45 Report Number: HIAR-WTP-2013-05-13, *Activity Report for Waste Treatment and Immobilization Plant Low Activity Waste Melter Off-gas Process System Hazards Analysis Activity Observation.*
4. Dan Schwendenman	4. DOE/HQ HS-45 Report Number: HIAR-WTP-2013-10-21, *Activity Report for Observation of Waste Treatment and Immobilization Plant Low Activity Waste Melter and Melter Off-gas Process System Hazards Analysis Activities.*
	5. DOE/HQ HS-45 Report Number: HIAR-WTP-2014-01-27, *Activity Report for the Observation of Waste Treatment and Immobilization Plant Low Activity Waste Facility Off-gas Systems Hazards Analysis Activities.*
	6. E-mail: Hill, Andrew to James Low, "*Fwd: HS-45 HA Comments 4-4-14*" April 08, 2014 4:03 PM (PST).

Were there any items for HSS follow up? ☒Yes ☐No

HSS Follow Up Items

1. Continue to review BNI actions in response to the observations and potential concerns identified in previous Independent Oversight reports related to LAW Melter and Off-gas systems HAs.
2. Conduct an independent review of the final HAR volumes for the LAW Melter and Off-gas systems to determine the disposition of the potential concerns, as well as overall conformance to DOE-STD-3009 requirements. Issue Independent Review reports for these HAR volumes.
3. Perform focused observations of HA development for the LAW Integrated Control Network/Programmable Protection System and LAW facility (natural phenomena hazards and facility-based HA). These may lead to additional independent reviews of the final HAR volumes for these systems.
4. Perform focused observations of BNI's control selection team processes for the above specified systems.
5. Update Independent Oversight review plan to reflect WTP LAW DSA development re-baseline plan.

Attachment 1 – **Potential Concerns excerpt from Reference 4 (revised)**	**Report Number:** IAR-WTP-2014-03-31

HIAR-WTP-2013-05-13, Activity Report for Waste Treatment and Immobilization Plant Low Activity Waste Melter Off-gas Process System Hazards Analysis Activity Observation, included the following potential concerns about the interim results of the analysis. The items identified by Independent Oversight were labeled as potential concerns because the analysis process is incomplete until the HARs are completed, internally reviewed, approved by BNI, and thus ready for DOE review. Nonetheless, the following potential concerns, which involve event records with unmitigated high consequences to facility workers or co-located workers, could lead to weaknesses in the final HARs:

- Potential Concern 1: For several hazard events the described sequence of events did not link directly to the identified causes; for example, by assuming non-mechanistic or unstated equipment failures or implied operator errors. An unclear sequence description may adversely impact subsequent identification of candidate controls.

- Potential Concern 2: Multiple event sequences and release locations were combined in several hazard events. Different event sequences and different locations may require different candidate controls.

- Potential Concern 3: The development and documentation of the HAZOP matrix table for the subnode 1a (film cooler) was not performed in sufficient detail to lead to full analysis of all process parameter deviations that could potentially affect the Off-gas system performance.

- Potential Concern 4: Some hazard events did not identify all the related causes, and the hazard events did not always have a clear relationship between identified causes and subsequent candidate controls.

Note: Potential Concern 1 was revised (see Reference 5) to clarify that the event sequence description is not always defined sufficiently to allow the identification of appropriate candidate controls. In some cases, non-mechanistic failures were assumed such that the described sequence of events did not lead to an identified cause. In other cases, the event record contained unstated assumptions that could affect the identification of event causes and corresponding candidate controls.