

Independent Assessment of Safety Training at Oak Ridge National Laboratory

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Acronyms

CBT	Computer-based Training
CFR	Code of Federal Regulations
CNMS	Center for Nanophase Materials Sciences
COVID-19	Coronavirus Disease 2019
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
DTO	Directorate Training Officer
EA	Office of Enterprise Assessments
ESH&Q	Environment, Safety, Health, and Quality
ESTD	Energy Science and Technology Directorate
F&O	Facilities and Operations
HOP	Human and Organizational Performance
IOP	Internal Operating Procedure
LSM	Laboratory Space Manager
OFI	Opportunity for Improvement
OJT	On-the-Job Training
ORNL	Oak Ridge National Laboratory
OTT	Office of Technical Training
PI	Principal Investigator
PPE	Personal Protective Equipment
PSD	Physical Sciences Directorate
QEW	Qualified Electrical Worker
RSS	Research Safety Summary
SBMS	Standards-based Management System
SME	Subject Matter Expert
TPP	Training Program Plan
TQMS	Training and Qualification Management System
UT-Battelle	UT-Battelle, LLC

INDEPENDENT ASSESSMENT OF SAFETY TRAINING AT OAK RIDGE NATIONAL LABORATORY

Executive Summary

The U.S. Department of Energy Office of Enterprise Assessments (EA) conducted an independent assessment of UT-Battelle, LLC (UT-Battelle) safety training at the Oak Ridge National Laboratory (ORNL) from May to July 2025. The assessment evaluated the extent to which UT-Battelle's safety training practices have adapted to workplace changes since the COVID-19 pandemic, such as the loss of experienced staff who historically have provided coaching or mentoring to new hires; a surge in the hiring of new staff; and an increased reliance on remote work/telework. The assessment reviewed 4 of the 28 ORNL directorates: the Office of Technical Training (OTT), within the Environment, Safety, Health, and Quality (ESH&Q) Directorate; the Energy Science and Technology Directorate (ESTD); the Facilities and Operations (F&O) Directorate; and the Physical Sciences Directorate.

EA identified the following strengths, including one best practice:

- UT-Battelle's practice of including training requirements in a table at the end of work procedure documents establishes a clear, standardized way to link these requirements directly to work procedures, ensuring that personnel are properly trained before they perform specific tasks and enabling the straightforward verification of training compliance. (Best Practice)
- The ESH&Q Directorate has initiated a notable effort, referred to as Human and Organizational Performance, to focus ORNL personnel on the importance of improving human performance behaviors to help proactively reduce the frequency of worker errors.
- UT-Battelle has established an effective training system that relies on foundational courses provided by OTT that are supplemented by specialized training in the individual directorates. This system supports the needs of both resident and visiting or temporary staff.

EA also identified several opportunities for improvement, as summarized below:

- OTT does not have a formalized instructor observation or an initial instructor qualification process.
- OTT does not have a dedicated facility where students have the opportunity to perform hands-on practical demonstrations.
- Emergency response training for ESTD does not incorporate the audible alarm sounds or drill scenarios where workers are engaged in complex activities, such as those that could trigger the alarms.
- The current Standards-based Management System *General Safety Rules for Ladders* and computer -based training module do not include all aspects of safe ladder use, and there is no practical hands-on skills evaluation for workers or supervisors.
- The ability of F&O staff to conduct safe controlled burns at the Hawks Nest woody debris accumulation area is limited by the availability of training opportunities.
- ORNL does not offer credit for prior education, training, or experience outside of certain limited radiation worker training topics.
- The training assigned by managers is not always aligned with the level of knowledge required (awareness, operator, or technician) to perform specific tasks or activities.
- Support material, training content, and point-of-contact information are not readily available for trainees to refer to after completing training.

- UT-Battelle has not established a campus-wide standard for the minimum elements required for on--the-job training and the sign-off processes for laboratory equipment and tools by tool owners.

In summary, UT-Battelle has responded to the safety training challenges that the organization faced since the COVID-19 pandemic. While no significant concerns were identified, several opportunities for improvement are offered, including establishing a dedicated training facility, formalizing an instructor qualification and observation program, and evaluating new employees' previous training and qualifications for possible reciprocity credit before assigning onboarding training. Addressing concerns identified in this report will further support continuous improvement and enhance the effective delivery of vital safety training across ORNL's directorates.

INDEPENDENT ASSESSMENT OF SAFETY TRAINING AT OAK RIDGE NATIONAL LABORATORY

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Worker Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of UT-Battelle, LLC (UT-Battelle) safety training at Oak Ridge National Laboratory (ORNL). ORNL is managed and operated by UT-Battelle for the DOE Office of Science and is overseen by the ORNL Site Office. This assessment was conducted as part of a series of assessments of safety training programs across the DOE complex. Assessment activities were conducted from May to July 2025.

In accordance with the *Plan for the Independent Assessment of Safety Training at the Oak Ridge National Laboratory, June 2025*, the assessment evaluated UT-Battelle's training practices to determine the extent to which UT-Battelle's safety training practices have adapted to workplace changes since the COVID-19 pandemic, such as the loss of experienced staff who historically have provided coaching or mentoring to new hires; a surge in the hiring of new staff; and an increased reliance on remote work/telework. The assessment reviewed 4 of the 28 ORNL directorates: the Office of Technical Training (OTT), within the Environment, Safety, Health, and Quality (ESH&Q) Directorate; the Energy Science and Technology Directorate (ESTD); the Facilities and Operations (F&O) Directorate; and the Physical Sciences Directorate (PSD).

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms "best practices, deficiencies, findings, and opportunities for improvement (OFIs)" as defined in the order.

As identified in the assessment plan, this assessment considered requirements within 10 CFR 851.25, *Training and information*. Additionally, EA used selected criteria, objectives, and lines of inquiry from EA CRAD 30-12, Revision 0, *Safety Training Assessments*.

EA examined key program documents, procedures, manuals, policies, and training and qualification records. EA also interviewed key personnel responsible for developing and executing the associated programs and observed 60 work activities conducted by ESTD, PSD, and F&O Directorate employees, focusing on the safe performance of work within prescribed safety and health requirements.

Prior to the onsite visit, EA distributed a questionnaire to approximately 10% of UT-Battelle staff to gather preliminary feedback related to the effectiveness of UT-Battelle's training programs. The questionnaire data was used to identify on-site focus group interviews. A total of 20 focus group interviews with an average of 9 participants each were conducted to gain additional insights from staff as to how well UT-Battelle has adapted its training to workplace changes, and how well the training prepares them for safe work execution. Data gathered from the focus group interviews is documented in Section 3.3 of this report.

The members of the assessment team, the Quality Review Board, and the management responsible for this assessment are listed in appendix A.

There were no previous EA findings to follow up on during this assessment.

3.0 RESULTS

3.1 Safety Training Institutional Programs

This portion of the assessment evaluated UT-Battelle's training program alignment with the DOE training program handbook (DOE-HDBK-1078-94, *A Systematic Approach to Training*), training delivery, and training program assessments.

Training Procedures

OTT effectively provides procedures and guidance for training program implementation. OTT has established adequate procedures for designing, developing, implementing, and evaluating training through the administration of the Training and Qualification Management System (TQMS), a subset of the web-based Standards-Based Management System (SBMS). The procedure entitled *Instructional System Design*, a TQMS subject area, adequately incorporates guidance provided in DOE-HDBK-1078-94.

The SBMS Requirements, Documents, and Records management system includes a procedure entitled *Document Management* that effectively establishes requirements for procedure development. Notably, this procedure states that any training requirements for work performance should be included in a table entitled *Training* at the end of work procedure documents. Use of this method is considered a **Best Practice** because it establishes a clear, standardized way to link training requirements directly to work procedures, ensuring that personnel are properly trained before they perform specific tasks and enabling the straightforward verification of training compliance.

OTT has effectively used job and task analysis to identify new training needs. Reviewed documentation showed that OTT recently used the job and task analysis process for an enhancement to the laboratory space manager (LSM) position and for the development of the new subcontractor field representative position.

Individual ORNL directorates have appropriately assigned division training officers (DTOs) who support the implementation of training requirements for their organizations and manage training programs in conjunction with OTT. Interviewees explained that, when appropriate, OTT will conduct training classes at or close to the students' work location to minimize work time impacts. Each directorate appropriately identifies the core training needed to accomplish their mission and collaborates with OTT to effectively implement the training.

Training Delivery

OTT's implementation of safety training appropriately follows TQMS procedures and is generally effective. The TQMS procedure entitled *Instructor Qualification* identifies a generally effective process for the qualification of instructors and assigns the respective Directorate Director as approver upon completion of ORNL Form 603, *Instructor/Instructional Technologist Qualification*. During seven classroom and practical factor observations, instructors demonstrated thorough knowledge of their subject matter. For many subjects, OTT appropriately conducts training and requires hands-on demonstration of understanding/competence at locations that have the necessary equipment and space; however, focus group interviews, discussed in section 3.3 below, revealed that some computer-based training (CBT) lessons lack sufficient hands-on demonstrations.

The ESH&Q Directorate has initiated a notable effort to focus ORNL personnel on the importance of improving human performance behaviors to help proactively reduce the frequency of worker errors. The initiative, referred to as Human and Organizational Performance (HOP), has been systematically incorporated into training materials. Effective implementation of this initiative was verified through training observations, interviews, and review of training documents.

While most training delivery was adequate, the following opportunities for improvement were identified:

- The *Instructor Qualification* procedure does not require any formal instructor training and ORNL Form 603 does not provide criteria or minimum expectations for establishing instructor qualification. This results in inconsistent and less rigorous standards and methods of qualification across directorates. Additionally, the *Evaluate Training Effectiveness* section of the *Instructional System Design* procedure suggests, but does not require, a periodic instructor observation/evaluation program; no documentation of periodic instructor observations was provided for review. (See **OFI-UT-Battelle-1**.) Seven classroom and practical factor observations included: an instructor coaching during proficiency demonstrations, exam questions and answers reviewed prior to administering an exam, and recertification exercises lacking sufficient depth and breadth to validate competence in the activity being recertified. These observations indicate a compromise in the integrity and reliability of the training and certification process, as they suggest individuals could be deemed competent or certified without truly possessing the required knowledge or skills.
- Training facilities are decentralized and are not controlled by OTT or dedicated solely to training, which represents a challenge for OTT in establishing effective schedules and conducting training. (See **OFI-UT-Battelle-2**.) A walkdown of the training facilities associated with eight different hands-on training activities revealed how training is adversely impacted by such variables as the weather, approvals, conflicting activities, travel distances from classrooms, and unavailability of shared training equipment.

Training Program Assessments

The conduct of training program assessments is appropriately governed by the *Instructional System Design* procedure. The section of this procedure entitled *Evaluate Training Effectiveness* appropriately establishes assessment requirements for student feedback, trainee evaluation, trainee performance, and overall training program effectiveness. Thirteen reviewed assessments performed in the last 24 months demonstrate that assessments have a clear purpose and methodology, are critical, and effectively implement the intent of the procedure.

The last comprehensive independent assessment of OTT, completed in October 2023, was thorough and appropriately critical of the training program. The effectiveness of the assessment was enhanced by the inclusion of training professionals from the Los Alamos, Brookhaven, and Pacific Northwest National Laboratories. Additionally, the assessment provided valuable insights through benchmarking these laboratories.

Interviews and reviewed records demonstrate that OTT performs an annual health assessment of the TQMS that effectively evaluates training programs and processes and their implementation. The health assessment effectively uses a color grading method to communicate the status of OTT's ability to meet its goals.

Safety Training Institutional Programs Conclusions

Procedures provide adequate instructions for designing, developing, implementing, and evaluating training. The proactive method of including a table at the end of work procedures that specifies necessary

training is considered a best practice. OTT appropriately conducts training, providing the knowledge and skills necessary for ORNL to achieve its mission. The conduct of training program assessments is adequate. However, opportunities for improvement were identified associated with instructor qualification and observations and the availability of training facilities and equipment.

3.2 Safety Training Implementation

This portion of the assessment evaluated directorate and division level implementation of safety training, including on-the-job training (OJT), through reviews of research safety summaries (RSSs) (a required work planning and control document for research work that identifies the scope of work, hazards, and controls), observations of associated research work, and observations of work performed by F&O craft workers using work orders.

Training

The two reviewed research directorates (PSD and ESTD) and the F&O Directorate adequately implement training. Overall, PSD demonstrated a more structured framework, incorporating several practices that enhance program consistency and effectiveness. For example, PSD proactively developed directorate-specific requirements and policy documents that effectively complement OTT's institutional training requirements, enabling the directorate to address its unique operational needs. PSD proactively developed a comprehensive, directorate-wide training program plan (TPP), *PSD Training Program Plan*, (PSD Plan002). The TPP defines PSD-specific onboarding and offboarding processes, outlines training requirements, describes the overall training process, introduces division-level training procedures, and assigns roles and responsibilities for PSD staff.

PSD's onboarding and offboarding processes are adequate. The onboarding process is intended to ensure adequate planning and coordination of training and other requirements through the required use of Form-5, *PSD Onboarding Form*. Similarly, the offboarding process, which requires the completion of Form-11, *PSD Offboarding Form*, by both the departing employee and their supervisor, helps retain pertinent knowledge about research and work activities and supports records retention in accordance with SBMS. Each PSD division has established a training procedure that describes how the TPP is implemented within the division; these training procedures clearly define division-level training roles and responsibilities, describe the division's training process, and lists relevant forms and division-level training requirements.

Further, PSD appropriately developed directorate-level policy document PSD POL 001, *Expectations for the Safe Conduct of Work in PSD Laboratories*, which defines PSD management expectations and promotes consistency. The policy document clearly defines 17 specific management expectations, covering various topics such as RSS usage, training and mentoring requirements, attire, personal protective equipment (PPE) and laboratory conduct, and related safety and conduct topics.

ESTD's training program appropriately requires, at a minimum, an annual review by line management of a training and qualification report prepared by the DTO. In addition, the DTO meets with RSS-responsible principal investigators (PIs) to review and update their RSS training curricula matrix, which defines the specific training required for participants, on an ad hoc basis. Since 2020, the DTO has conducted three such reviews, with the most recent completed in May 2025 demonstrating a commitment to maintaining relevant training requirements and incorporating operational changes.

PSD and ESTD appropriately include required site-specific training in their curricula matrices for unescorted access to certain buildings, facilities, laboratories, and/or floor areas. Reviewed documents confirmed that staff had completed the required online training for three observed site-specific training activities: a PSD Center for Nanophase Materials Sciences (CNMS) cleanroom walkdown training

conducted by a supervisory staff member for two new researchers; an ESTD laboratory space training for an intern at the Energy Efficiency Demonstration Laboratory; and an ESTD low/high bay access training at the Hardin Valley Campus Manufacturing Demonstration Facility. These walkdown orientation/site-specific training courses are appropriately required for staff to become authorized workers on specific RSSs. The walkdowns/trainings were comprehensive and included area familiarization, workstation and tool usage orientation, and associated safety topics. ESTD assigned unique procedure numbers to these training activities and documented the required content, which appropriately included emergency egress routes and fire extinguisher locations. Successful completion of site-specific training is appropriately documented in the learning management system.

In PSD and ESTD, DTOs appropriately contact PIs directly whenever new hires/participants need to be authorized on an RSS to ensure the proper identification and assignment of training requirements in accordance with their RSS training curricula matrices. Interviewed LSMs and facility operations managers confirmed their responsibility for verifying training completion before granting unescorted facility access, as badge access systems (key cards) are used to gain entry to most facilities. In general, facility access is revoked when routine training delinquency reports show that an authorized RSS user has lapsed on any of their access required training.

F&O Directorate workers receive training in their respective craft, which supervisors supplement with an appropriate standard set of OTT-offered training. The F&O Directorate process appropriately requires each work group supervisor to actively monitor the training status of their staff members in conjunction with the DTO and ensures timely retraining as expiration dates approach. When F&O supervisors require additional trained personnel, they use an online overtime training request tool, which also serves as a very useful mechanism to verify individual training status. While most F&O workers have many years of experience, workers with less than two years of experience at ORNL are assigned a probationary period that is managed and evaluated using a Human Resources process. Using this process, the first line supervisor appropriately evaluates the worker's performance periodically for criteria related to quality and quantity of work, attendance, acceptance of assignments, safety, and overall performance.

Across the three directorates, all interviewed PIs and supervisors described a common, structured training sequence to authorizing a new employee to perform work: identifying training requirements based on RSS curricula matrices (PSD, ESTD) or work group assignments (F&O Directorate); completing general (core) ORNL and directorate/division site-specific training; reviewing relevant equipment standard operating procedures; shadowing/OJT under an authorized equipment user; and performing tasks while being shadowed by an equipment owner. The duration of this authorization process appropriately varies based on work complexity, equipment requirements, experienced staff availability, and the employee's prior knowledge.

Observed workers, including researchers, technical professionals, craft personnel, and supervisors at the directorate and division levels were highly trained and knowledgeable, with experience ranging from 6 months to over 20 years in their respective positions. Interviewed managers and supervisors/group leaders conveyed concerns about the changing dynamics in the workforce, namely the influx of new workers and loss of experienced workers, with over 60% of the ORNL workforce having less than five years of experience at the laboratory.

On-the-Job Training

OJT was adequately implemented across all three directorates (PSD, ESTD, and F&O) and effectively provided specific training in facility/laboratory familiarization, equipment operation, and task completion. Observed OJT was adequately conducted by qualified personnel for several new staff members and those newly added to specific tasks. Observations in PSD and ESTD included hands-on training at CNMS for

cleanroom tool and workstation use and a compressed air demonstration unit in the Energy Efficiency Demonstration Laboratory.

Each observed training session was interactive, appropriate, and designed to ensure that trainees achieve proficiency in both the safe operation and task-specific safety requirements associated with each workstation or tool. Upon successful completion of the hands-on training, trainers signed off accordingly, adding the names of each trainee to qualified-user listings. PSD uses electronic forms for completing sign-offs, which effectively updates qualified user lists in real time.

An observed Breaker/Disconnect/Starter Operator Practical Training class was adequately delivered by an ESTD directorate electrical safety officer (DESO) at the Hardin Valley Campus. The DESO actively engaged participants by asking targeted questions about the purpose of the training and the types of breakers/motor starters they would operate. Following the *OJT Practical Evaluation-Record of Completion* form, the DESO guided participants through each required demonstration step while facilitating knowledge checks and discussions of each step. Students were engaged, and the DESO asked questions throughout to test their knowledge. The DESO reviewed work control, reinforcing that successful training completion did not authorize participants to operate disconnects, as that final step rests with their supervisors.

While observed OJT delivery was adequate and well-supervised, the methodologies used to conduct OJT are informal across directorates, divisions, and groups. For example, while the CNMS trainer demonstrated proper equipment setup and operation of various tools, and the PI in the Energy Efficiency Demonstration Laboratory conducted a thorough hazard review covering zero energy states and noise and hearing protection, the topics discussed were not formally documented and relied on instructor expertise. Interviewed F&O Directorate first line supervisors stated that new workers receive OJT, though no training sessions were observed during the assessment. F&O Directorate work crews typically pair less experienced workers (under five years) with more senior craft members. While supervisors described this as an expectation, no formal mechanism is in place to ensure that this pairing occurs (see the OFI-UT-Battelle-8 discussion in section 3.3).

Conduct of Research

RSSs are used across all research directorates, effectively functioning as the primary work control document, and the accompanying curricula matrices include the training requirements needed to perform the defined scope of work. Reviewed RSS documents associated with walkthroughs and observed work contained detailed and relevant content to convey the scopes of work, work locations, and associated hazard controls. ESTD also uses internal operating procedures (IOPs) as a mechanism to standardize directorate-wide procedures and processes for activities. The observed work associated with 22 RSSs and 3 ESTD IOPs was adequate.

Reviewed RSS training curricula matrices were effectively implemented, ensuring that RSS users were appropriately assigned and had completed required ORNL, directorate, division, and group training before being allowed to work under the RSS. The following examples illustrate well-structured and hazard-appropriate training requirements associated with the observed work:

- ESTD-RSS 16236.8, *Metal Additive Power Bed Fusion*, listed the training for a technical professional and specified the use of a powered air purifying respirator, including medical clearance and fit testing. Facility operations managers verified current respirator status before issuing the equipment. In addition, ESTD developed task-specific training for a unique manual electric self-propelled crane, including it in the curricula matrix to ensure that only trained personnel operate the equipment.

- ESTD-RSS 6046.16, *Wireless Power Transfer for Electric Vehicles*, and RSS 752.23, *Power Electronics and Electric Machinery (PEEM) Labs*, included Cooperative Research and Development Agreement (CRADA) partners in the curricula matrix, requiring them to complete the same course curriculum as ORNL staff. Further, ESTD appropriately restricted key card access to the laboratory space, ensuring that these partners only operate under ORNL staff supervision.
- CNMS-RSS 4380.21, *CNMS Nanofabrication Research Laboratory RSS for Cleanroom Operations*, maintained a comprehensive curricula matrix covering both ORNL and CNMS training. The matrix identified 13 ORNL training modules and an additional 7 CNMS training modules addressing cleanroom hazards, including electrical safety, compressed gases, cryogenic safety, fall protection (including ladder safety and scaffolding), environmental management awareness, and specialized CNMS training for chemical hygiene, hydrofluoric acid safety, PPE, and Resource Conservation and Recovery Act (RCRA) awareness.

The observed performance of ESTD IOPs appropriately included procedures for *Lab Space Surveillance Walkdowns* for conducting and documenting triannual laboratory space surveillance walkdowns, and other procedures addressing *Vendor Pre Job Brief (PJB)* and *ESTD Contractor/Vendor Work Control and Site Access*. In each case, the IOPs were conducted and documented in accordance with the established procedure, with all participants being adequately trained and demonstrating a clear understanding of their roles and responsibilities. However, during the walkdown of B4500S Laboratories A151 and A147, there was a gap in the execution of IOP section 1.3, which required that “[t]he walkdowns include inspection of life safety, worker safety and health and emergency response functions which support research operations.” Although staff received basic emergency response training, including generic evacuation instructions, they had not conducted drills involving the actual sounding of hydrogen detector or oxygen deficiency alarms. As a result, employees lacked familiarity with actual alarm sounds and had not practiced appropriate responses in realistic scenarios (e.g., responding while installing a hydrogen cylinder when an alarm activates). (See **OFI-UT-Battelle-3**.)

RSS training updates appropriately address new hazards introduced by changes in scope of work, such as new equipment or work location; the development of new training courses; and directorate-specific initiatives. A notable example is ESTD’s initiative to reduce the number of staff required to complete qualified electrical worker (QEW), forklift, and crane operator training. Initially, several RSS training curricula matrices included these courses because they provided staff with general awareness, even though many staff did not routinely perform this type of work. By refining training assignments and aligning requirements for authorized staff, ESTD improved training programs and reduced the unnecessary burden on some staff while building a more qualified pool of skilled operators.

Performance of Work (Work Orders)

Work execution in the F&O Directorate is appropriately structured through the formal use of work orders issued to each respective work group, with first line supervisors overseeing implementation. Observed pre-job briefings contained an appropriate level of information for the conduct of skill-of-the-craft assigned tasks. Examples included the installation of overhead cord reels onto existing metal beams using Unistrut fixtures, predictive maintenance testing by electricians, tree felling by the roads and grounds crew, and breaker maintenance. Even though formal pre-job briefings are not required for grade 4 work (skill of the craft), workers appropriately reviewed assigned work orders and applied the five HOP questions to verify readiness.

F&O Directorate workers and their supervisors were observed to be highly trained and knowledgeable within their craft. With one exception discussed below, all observed work was appropriately conducted and met training expectations and applicable requirements. Observed tasks included: operations plan-of-

the-day meetings; machining activities by the Fabrication Group; equipment handling by the Hoisting and Rigging Group; conduit installation by the Utilities Group; instrument calibrations at the steam plant and calibration shop; excavation backfilling by Site Utilities; repairs at the sewage treatment plant; servicing of overhead doors and cord reels installation by millwrights; tree felling and debris removal by the roads and grounds crew; and breaker maintenance and scanning of energized electrical panels.

While most observed F&O Directorate work was performed using adequate safety precautions, one work evolution using a ladder was not conducted in accordance with safe work practices and training. Two workers (an F&O Directorate craft worker and a subcontractor technician) were observed using ladders unsafely during a hoisting and rigging task. Unsafe behaviors included facing outward while climbing, not maintaining three points of contact while ascending and descending, and bracing one foot on the ladder and the other foot on equipment mounted on mobile casters. These practices are not in accordance with the SBMS (Exhibit: General Safety Rules for Ladders) which, includes the following requirement: “Do not overextend sideways. Use the belt buckle rule: keep your belt buckle positioned between the side rails.” Reviewed training records for the F&O Directorate craft worker confirmed completion of the ladder safety refresher training in 2023, which was within the required three-year retraining periodicity. Neither co-workers nor supervisors in the area intervened during these unsafe practices. EA brought the unsafe act to the attention of ORNL staff and briefed the supervisor and worker.

The ladder safety CBT module adequately addresses ladder selection, inspection, setup, care, and basic safe use. However, the SBMS ladder safety subject area and associated CBT module does not address prohibiting split contact (e.g., one foot on the ladder and the other foot on equipment). (See **OFI-UT-Battelle-4.**)

Routine operations by the F&O Directorate roads and grounds crew include assisting in controlled burns at woody debris accumulation areas (e.g., the ORNL Hawks Nest location). A recent request for assistance to conduct a controlled burn could not be supported by the roads and grounds crew and was subsequently cancelled and then rescheduled. F&O Directorate management explained that the cancellation was because there were not enough trained craft workers to support this request, given the heat stress potential and limited number of workers needed to fill the required work-rest regimen. Training for this work, delivered by the Oak Ridge Reservation Forester, has not occurred since 2022 and the program currently depends on a single qualified instructor, resulting in only two F&O Directorate craft personnel currently trained. (See **OFI-UT-Battelle-5.**)

Safety Training Implementation Conclusions

Overall, PSD, ESTD, and the F&O Directorate adequately implement training. Researchers, craft workers, and supervisors were observed to be well trained and knowledgeable. Observed OJT was adequately implemented across all three directorates. For research directorates, RSSs and their associated curricula matrices effectively identify the scope of work, hazards and controls, and training requirements. Work execution in the F&O Directorate is appropriately structured through the formal use of work orders. However, opportunities for improvement were identified associated with training for alarm sound recognition and ladder safety, and the availability of required craft training to support controlled burns of woody debris.

3.3 Interview and Focus Group Feedback

This portion of the assessment gathered interview and focus group feedback from staff in PSD, ESTD, and the F&O Directorate to evaluate the effectiveness of UT-Battelle’s training programs. The purpose of the focus groups was to understand employee perceptions on how well UT-Battelle adapts its training to

workplace changes and how well the training prepares them for safe work execution. The focus groups also provided feedback on resource acquisition, development, and deployment; employee perceptions of their competency; role-relevant training; training context; and stop/pause work practices. While the focus group interviews were conducted simultaneously with the onsite evaluation of the program processes and implementation, some concerns shared during these interviews were validated through management discussions and system demonstrations. As such, OFIs have been documented.

Changing Workplace Dynamics

UT-Battelle is responding to changing workplace dynamics, such as an increase in remote work/telework, a nomadic and overall less-experienced workforce, and a lack of experienced workers who historically were relied upon to coach or mentor less-experienced staff by continuously improving its training programs. OTT has consolidated a variety of training programs and is transitioning to hybrid training models that combine CBT with subsequent hands-on learning. Examples include moving the new employee orientation from an online format to a face-to-face format and converting the three-day manager training into a module-based format, allowing managers to complete training while accommodating work priorities and operational demands. UT-Battelle also demonstrated responsiveness by swiftly reintroducing important integrated safety management training that had been deprioritized during the COVID-19 pandemic, rolling out the initiative within a year of recognition. Currently, UT-Battelle is integrating HOP principles into manager and staff training, aiming to reduce human error and enhance hazard identification capabilities.

As the workforce continues to change, UT-Battelle has responded by creating an equivalency process for training radiation workers. The process outlines prior training that is accepted at ORNL. Participants also reported that supplemental training was created to address any gaps between the equivalent courses and site-specific radiation hazards. Participants explained and leadership staff verified that this practice is not used for other job/task equivalencies across the three reviewed directorates (e.g., causal analysis, fire protection services). (See **OFI-UT-Battelle-6**.)

Resource Acquisition, Development, and Deployment

Multiple focus groups and interviewees reported that OTT's staffing and facilities supporting training have not grown proportionately to the post-COVID-19 growth at ORNL. Focus group participants stated that there is a small number of staff doing a large volume of work in instructional design, and the number of trainers is insufficient to support the scope and volume of training demands. Focus group participants discussed the challenges in recruiting trainers, including concerns about compensation and career development. Participants reported that multiple trainers operate without cross-trained backups to support training if an instructor is unavailable.

The issue of training supply and demand was also discussed. Multiple interviewees and focus groups reported long waiting periods for enrollment in high-demand courses. The wait for training can be several months for high-demand training classes. Some participants reported signing up for training classes that they did not need as a placeholder for expected new hires; this practice allows employees to remove themselves from the training roster and place new employees in their place. An interviewee reported the need for analysis and improvement in forecasting to align training frequency and availability of courses. The analysis would include evaluating the number of courses, timing of course offerings, and prioritizing students to support mission needs. Interviewees and focus group participants also discussed challenges with accessing adequate training for employees who are on shift work. Some employees working a 28-day schedule (including weekends) often have limited availability during the day shift, when training classes are offered.

Interviewees and focus group participants reported a lack of adequate space to conduct training (see the OFI-UT-Battelle-2 discussion in section 3.1). Participants noted a shortage of available classrooms and experiential training rooms, larger training facilities, and designated areas for material storage and preparation. Currently, the ability to conduct training is dependent on finding an appropriate space.

Trained versus Competent

When discussing the type and focus of training, focus group participants raised concerns about the content, delivery, and effectiveness of the core training provided by OTT. The participants described the training as compliance-based (i.e., developed to meet minimal requirements), generic (i.e., not addressing site-specific hazards and controls), and, at times, at a level inconsistent with assigned duties (i.e., at a level that is too high or too low for what the trainee needs). The volume of training required and condensed timeframes in which training had to be completed were also of concern. Participants reported that trainees often struggle to retain important information from the core training because they are expected to absorb too much material too quickly. Exacerbating the issue for them was that personnel were considered as being “trained” once core training was completed, which is predominantly provided as CBT without any practical exercise or hands-on demonstration to prove their competency. To ensure that someone who had been trained was able to recall and apply knowledge, participants recommended more hands-on demonstrations, standardized use of formal and documented OJT, and use of qualification standards, as needed. To improve knowledge retention, participants recommended making CBT training materials readily accessible without having to relaunch a training topic in their learning history. They stated that relaunching and not completing training results in classes with a pending status in their profile. (See **OFI--UT-Battelle-7.**) Due to delays in the time between when training is delivered and when it is applied, participants believed that having access to handouts, checklists, and key information summaries would be helpful to recall and apply training.

In addressing their concerns about core training, participants noted that when topics lacked direct relevance to their work or site, the use of HOP training would be more helpful than training on unrelated or ancillary topics. Participants viewed HOP as a safety net that could fill gaps in their understanding of ancillary safety topics, as it teaches how to identify hazards and take appropriate action to reduce risk. Additionally, participants desired the development and use of a training equivalency system, like that used for radiation workers, particularly for skilled craft personnel (e.g., journeyman or master tradesperson) and personnel with national laboratory experience (see the OFI-UT-Battelle-6 discussion above). As many highly trained and skilled personnel are hired, participants thought it would benefit the organization and personnel to develop a system to recognize and give credit for prior experience.

Participants recognized the need for and use of division or site lead learner-centered training that accompanies core, compliance-based training, to provide job- and site-specific information to personnel who find hands-on application vital to their understanding. The systems used to provide the job- and site-specific training varied, and participants noted that the quality, quantity, and level of information provided were not standardized (e.g., within or throughout the directorates) and depended on the trainer, mentor, or supervisor providing the instruction. To address these concerns, participants recommended establishing clearer standards within work groups for how such job- and site-specific training is delivered, documented, and assessed (including OJT). (See **OFI-UT-Battelle-8.**) Refresher training, in their opinion, was needed but should be focused on changes or updates to past training, and suggested it be conducted, when feasible, as team-based discussions highlighting actual experiences and lessons learned. Participants further advocated for incorporating drills or hands-on exercises to verify competency and supported the use of similar evaluations to “test-out” of training or demonstrate that past training meets established equivalency standards (see the OFI-UT-Battelle-6 discussion above).

Critical Evaluation of Role-relevant Training

Focus group participants consistently emphasized that training does not build competence without experience, which is why mentoring programs and supervisory oversight are so important until competence is achieved. Most areas of research at ORNL have some mentoring requirements for new hires, interns, and graduate students. While this process was generally consistent across research laboratories, it is informal and up to individual LSMs or PIs to determine the scope and length of mentoring. Participants believed that more hands-on learning and dynamic learning activities could help build competence.

Interviewees expressed concern, and management confirmed that new hires, despite having industry recognized certifications (e.g., National Certification of Crane Operators, journeyman cards), qualifications from previous jobs and years of experience are often treated as apprentices, instead of getting credit for experience and certifications (see the OFI-UT-Battelle-6 discussion above). This lack of recognition for prior experience adds to unnecessary or redundant training and lengthy wait periods.

ORNL benefits from a larger group of subject matter experts (SMEs), which are a significant resource of knowledge, but many SMEs reported not being consulted during training updates, fact findings, or incident critiques. Focus groups viewed this as a missed opportunity to leverage institutional knowledge.

Building Training Context

Employees emphasized the importance of understanding the relevance of training and the context in which the information will be applied. There were many examples where participants believed that training did not meet the needs of the people being trained. Most focus groups perceived that QEW training was geared towards electricians and linemen but was not applicable for a researcher that may need to operate a breaker, for example. Most participants recommended a QEW class tailored to research environments. Laser safety training was also discussed as misaligned with user needs. The training focuses on the history and mechanics of lasers, but lacks emphasis on critical topics like hazards, controls and PPE.

Focus group participants requested training content modifications to meet the needs of the learner, for example, designating training topics to the audience in the course catalogue, for example awareness-, operator-, and technical-level training, so managers and/or DTOs can properly select courses for their staff. (See **OFI-UT-Battelle-9**.) Post focus group inquiries of OTT staff indicated that, for managers to determine what training each individual needs, managers must read through course descriptions to determine if it is awareness-, operator-, or technical-level training. It was not clear if there were any other indicators to determine the content and/or the targeted audience (i.e., skill level) that the training is intended for. Additionally, some participants perceived a post-COVID-19 decline in training and rigor; for example, the 3-day basic rigger training was reduced to 1.5 days post-COVID-19 and is now 1 day.

Stop/Pause Work

SBMS outlines a formal stop/pause work process, and HOP training reinforces the use of pause work. Focus group participants reported that pause work based on HOP training is well supported by management, and employees reported actively engaging the pause work process. Many participants expressed that they have paused work when procedural or safety questions arose during their work activities. Participants also reported being part of a formal stop work process, which is implemented by leadership and used when needed.

Other Insights

Focus group participants expressed a variety of other training-related insights. Specifically:

- Some focus group participants expressed concern about the effectiveness and consistency of OJT; individuals stated that they did not feel competent after completing OJT. This concern was raised for both formal OJT and informal equipment sign-off processes, where an owner of a piece of equipment is selected to train other personnel.
- Some focus group participants expressed skepticism about the overtime and selection process, noting that individuals can be high on the overtime list for certain tasks despite lacking demonstrated proficiency in the activity. Normally, these individuals would not be selected by supervisors, but due to their overtime list placement, they may be assigned to the job; otherwise, the job would need to wait until a non-overtime period.
- Some focus group participants cited examples of inconsistent training accountability, such as trainees arriving late or taking phone calls during training sessions yet still receiving credit for the class.
- UT-Battelle had not clearly communicated, at the time of the assessment, how the upcoming radiation worker requalification requirement, which includes a practical dress-out, would be evaluated or how it would affect training logistics. Currently, only four students can dress-out per session due to instructor limitations, creating a long wait time for the initial radiation worker II qualification. Other nuclear facilities give credit to workers who dress-out regularly.

Interview and Focus Group Feedback Conclusions

Based on feedback gathered from interviews and focus groups, UT-Battelle has made notable progress in improving its training programs, including integrating CBT and OJT models, enhancing responsiveness to workplace changes, and reintroducing integrated safety management training. However, participants emphasized that training remains overly compliance-based, often lacking relevance to specific job functions or site hazards, and that condensed training timelines impair retention. The current volume of required training, limited capacity, and insufficient staffing further strain the system with delays in course availability and a lack of adequate training spaces. Further, inconsistently applying hands-on learning and mentoring and not using SMEs across directorates undermine training effectiveness. Many participants called for more standardized delivery of job- and site-specific training, improvements in training relevance, and better recognition of prior experience and certifications.

Although the data gathered from these interviews was not considered in *Safety Training Institutional Programs Conclusions* in section 3.1, it offers important information that management can consider to improve the safety training program and ensure competence commensurate with responsibility.

4.0 BEST PRACTICES

Best practices are safety-related practices, techniques, processes, or program attributes observed during an assessment that may merit consideration by other DOE and contractor organizations for implementation. The following best practice was identified as part of this assessment:

- UT-Battelle's practice of including training requirements for work performance in a table at the end of work procedure documents establishes a clear, standardized way to link training requirements directly to work procedures, ensuring that personnel are properly trained before they perform specific tasks and enabling the straightforward verification of training compliance.

5.0 FINDINGS

No findings were identified during this assessment.

6.0 DEFICIENCIES

No deficiencies were identified during this assessment.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFIs shown below to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

OFI-UT-Battelle-1: Consider revising the *Instructor Qualification* procedure, ORNL Form 603, and/or the *Evaluate Training Effectiveness* procedure to add more specific guidance on documenting instructor qualification, to increase the rigor for qualifying instructors (including initial instructor training), and to require periodic observations of instructor performance.

OFI-UT-Battelle-2: Consider providing a dedicated facility where the performance of practical demonstrations can be performed.

OFI-UT-Battelle-3: Consider revising ESTD emergency response training to incorporate alarm sounding and drill scenarios where RSS participants are engaged in complex activities, such as those that could trigger the alarms.

OFI-UT-Battelle-4: Consider revising the SBMS ladder safety subject area (*General Safety Rules for Ladders*) and qualification training/retraining CBT module to address prohibiting split contact. Additionally, consider implementing a practical OJT skills evaluation for both workers and supervisors to reinforce safe ladder practices in the field.

OFI-UT-Battelle-5: Consider using trained subcontractor personnel to perform work associated with controlled burns of woody debris. Also, consider adopting a vendor-supplied training program or requesting additional resources from the Oak Ridge Reservation Forestry staff to increase the number of F&O Directorate craft personnel trained to perform such work.

OFI-UT-Battelle-6: Consider implementing an equivalency or “test-out” process, similar to the radiation worker training equivalency process, for other job and task training.

OFI-UT-Battelle-7: Consider making support material, training content, and point-of-contact information available to trainees after they complete online, in-person, and hybrid training for reference.

OFI-UT-Battelle-8: Consider establishing a clear, standardized process for OJT and sign-off processes for training on laboratory equipment and tools by the equipment/tool owners.

OFI-UT-Battelle-9: Consider tailoring training to the level of knowledge required (awareness, operator, or technician) to perform the task or activity, including hazards, controls, and PPE.

Appendix A Supplemental Information

Dates of Assessment

May 13 to July 7, 2025

Office of Enterprise Assessments (EA) Management

John E. Dupuy, Director, Office of Enterprise Assessments
William F. West, Deputy Director, Office of Enterprise Assessments
Kevin G. Kilp, Director, Office of Environment, Safety and Health Assessments
David A. Young, Deputy Director, Office of Environment, Safety and Health Assessments
Brent L. Jones, Acting Director, Office of Nuclear Safety and Environmental Assessments
David Olah, Acting Director, Office of Worker Safety and Health Assessments
Jack E. Winston, Director, Office of Emergency Management Assessments
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