DEPARTMENT OF ENERGY (DOE) EMERGENCY OPERATIONS FUNCTIONAL ANALYSIS FOR PERFORMANCE IMPROVEMENT

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ABSTRACT

The Department of Energy (DOE) facilities are responsible for producing, storing, and handling significant quantities of nuclear materials, weapons, classified information, and equipment, creating a need for extensive initial and ongoing training in the interest of national security. Emergency Operations (EO) staff throughout the entire DOE complex must have the knowledge, skills, and abilities (KSA) to respond to any site/facility/transportation emergency and to any radiological or nuclear crisis or emergency. Therefore, it is essential that EO staff training be designed complex-wide not only to maintain but to improve human performance in responding to a radiological or nuclear emergency. As one of the initial activities in designing a comprehensive staff training program, a first-ever, complex-wide, functional analysis was performed. Spanning several months and involving the Nonproliferation and National Security Institute (NNSI), the Emergency Operations Training Academy (EOTA), DOE, and TRW, this pioneering effort took an in-depth, national approach to data collection, resulting in comprehensive analysis of 15 EO staff performance functions, which were comprised of 613 performance tasks, and subtasks. Quantitative survey results relied on response ratings using 5-point Likert scale and applied within a Training Recommendations Decision Tree. Overall, the data reflected an overwhelmingly large number of *recurring* training task recommendations within all EO functional areas. Of the 613 total tasks addressed, only two (<1%) were recommended for *informal* (on-the-job) training. In addition to quantitative data, the survey asked respondents to provide comments regarding training needs for each functional area. Also, table-top interviews with EO staff regarding the functions were performed at various nuclear sites around the country. This allowed an opportunity for further participant input and perspective on the EO performance and training issues. The application of this phased, quantitative/qualitative, systems-based approach provided significant insight into EO training program needs for the future. This comprehensive, complex-wide training analysis supported the development of standard training requirements for effective EO course design and development at DOE sites across the U.S.

BIOGRAPHICAL SKETCHES

Laura Kratochvil is a Senior Instructional Designer with TRW. She holds an M.A. in Organizational Learning and Instructional Technology from the University of New Mexico. Her areas of interest include the design and development of instructional applications, human-computer interaction, and information design. Her experience includes work in the design, development, and implementation of various performance improvement and training programs. Her clients have included all military branches, DOE, and the Defense Threat Reduction Agency (DTRA).

Jerry Childs is Director, Training and Performance Engineering with TRW, where he provides human performance and training support to government and commercial contracts. He has 26 years experience in the training industry and holds a PhD in Engineering Psychology from Texas Tech University. He has served on I/ITSEC subcommittees and is a member of the Aviation Industry CBT Committee (AICC). His clients have included the FAA, all military branches, DOE, NASA, Ford, General Motors, Sprint, Caterpiller, and Hughes.

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INTRODUCTION

In the spring of 2000, the National Park Service ignited a prescribed burn at Bandelier National Monument in northern New Mexico, miscalculating the potential severity of the event and sparking the Cerro Grande fire, the worst wildfire in the state's history. Within days of its origin, the fire threatened one of the nation's premier nuclear weapons research facilities, Los Alamos National Laboratory (LANL). This was an especially critical moment in history to the U.S. Department of Energy's (DOE) Emergency Operations (EO) staff, the key personnel involved in site/facility emergencies. Although LANL did not incur major damage and no hazardous or radioactive materials were affected, the incident did prompt DOE to take a closer look at many EO areas, including staff training.

An important issue that arose was the need for EO training to have complex-wide, uniform standards, which are needed to maintain, improve, and measure DOE's emergency response capabilities for the 21st Century. In the fall of 2000, the Emergency Operations Training Academy (EOTA), through the Nonproliferation and National Security Institute (NNSI), commissioned TRW to perform a training analysis of 15 EO job functions across DOE sites. To address the need for analyzing EO staff functions uniformly, a completely new, complex-wide DOE approach to analysis was initiated to support training development in order to maintain and improve human performance in responding to radiological or nuclear emergencies. Past training analyses within DOE Emergency Operations were typically focused on a specific facility or on only a few functional areas of emergency operations with minor involvement from sites. This effort was the first complex-wide, functional training analysis aimed at EO functions.

Analysis Overview

NNSI, a key participant in the analysis process, provides safeguards and security training to support all DOE facilities and sites. Because the emergency functions that were to be reviewed are performed by a variety of staff positions across EO sites, facilities, and offices nationwide, a functional training analysis procedure was selected. This decision was based on prior NNSI efforts, which demonstrated this procedure to be effective when the functions examined are to be performed by different positions at different sites. The functional analysis is one of the initial activities performed within a comprehensive instructional systems development (ISD) approach set forth by DOE Handbook 1078-94 (U.S. Department of Energy, 1994). Data produced by this functional analysis are being used to determine complex-wide training requirements and to develop effective courses for EO activities at DOE nuclear facilities.

This analysis included identification of the associated tasks and subtasks within 15 EO functional areas (Figure 1). This identification process included a comprehensive review of related documents and materials gathered from DOE Emergency Management Order 151.1 and Regulations, Guides, facility emergency management guides, and training materials. Numerous DOE sites across the nation were contacted to submit for review relevant EO documentation, including training manuals, facility guides, and other relevant materials. As a result of the document review, a preliminary task inventory was developed. Table-top interviews with six EO site offices were then performed to verify and revise as necessary, the task inventory document. Interview data were important for gathering valuable site input and perspective on the EO functions and tasks. To complete the verification process, DOE headquarters reviewed the task inventory document, and revisions were made where needed.

Based on the task inventory, a comprehensive EO survey was then developed. In collaboration with several DOE offices, the survey was distributed to solicit critical information from EO personnel across DOE sites nationwide. To gather support for this new, comprehensive approach in training analysis efforts, the following DOE offices were designated

stakeholders and strong supporters in the analysis efforts:

- Office of Nuclear Energy Science and Technology
- Office of Fossil Energy
- Office of Energy Efficiency and Renewal Energy
- Office of Science, Environmental Management and Defense Programs

1. Hazards Survey and Hazards Assessment
2. Program Administration
3. Training and Drills
4. Exercises
5. Readiness Assurance
6. Emergency Response Organization
7. Emergency Facilities and Equipment
8. Categorization and Classification
9. Notifications and Communications
10. Consequence Assessment
11. Protective Actions and Reentry
12. Emergency Public Information
13. Termination and Recovery
14. Emergency Medical Support
15. Offsite Response Interfaces

Figure 1. Emergency Operations (EO) Functional Areas.

Information regarding performance, level of difficulty, consequence, and frequency was gathered on 613 EO tasks. These tasks were derived from the inventory document generated by extensive research of relevant DOE documents and group and individual interviews.

The extensive amount of data collected from the interviews and surveys was analyzed to determine preliminary training needs for various performance areas. Tasks with a high degree of difficulty or consequence that require formal training or recurring training will be used to further direct EOTA training development efforts. This analysis resulted in a culmination of 15 functional areas with a total of 613 EO tasks and subtasks rated for training needs. Based on research document information, survey, and interview data, subsequent training recommendations were determined. As a direct result, training requirements stemming from this functional analysis have been reviewed against proposed and existing training materials. This process will help identify initial training gaps that exist for the 15 EO functions.

Goals and Objectives

The goal of this project was to conduct a functional analysis of emergency operations within the DOE to support performance improvement, which was expected to include course and program design and development for the EOTA. The intent was to implement a ground-breaking, comprehensive approach towards developing EO training standards for maintaining and improving DOE complex-wide emergency staff response capabilities.

Specific technical research objectives for this analysis included:

- Review and summarize duties and tasks within the 15 EO functions.
- Develop a preliminary EO task inventory based on documentation review.
- Validate and finalize the EO task inventory through subject matter expert (SME) and expert performer interviews.
- Identify EO training recommendations through a comprehensive survey and analysis of the field performers.

METHODOLOGY

The scope of this project called for multiple team members to research, collect, analyze, and interpret data. The project team consisted of an analysis team leader, an ISD technical lead, two additional instructional designers, and NNSI and DOE project coordinators. Data resources included field SMEs and existing EO documentation. Our phased approach included procedures for preparing, gathering, organizing, and interpreting the data. Previous research on training evaluation strategies (Torres, Preskill, and Pointek, 1996) has shown that a phased, systems-based approach such as the one employed in this study can facilitate interpretation and application of results for future program development.

Document Review and Task Inventory

The first step in the analysis process was to research all the documentation relevant to the 15 EO functional areas (Figure 1). These functional elements were identified and described in detail throughout DOE Emergency Management Guides, Volumes I-VII, (Department of Energy, 1997) as the standard functional areas within emergency operations supporting the DOE Comprehensive Emergency Management System objectives within DOE Order 151.1 (1997). The principal sources of documentation used to directly develop the task inventory were:

- DOE Comprehensive Emergency Management System Order 151.1 (1996).
- DOE Emergency Management Guides Vol. I-VII (1997) and all support documents, including
- DOE Training Program HDBK 1078-94 (1994).

As part of the document research and review process, our study team contacted emergency operations staff across the DOE complex to introduce

the analysis project and to gather relevant information and documentation related to the EO tasks. This research provided cross-reference support materials on the standard, functional performance areas and tasks within emergency operations from facilities and sites across the nation. This step also played an important role in introducing and involving EO staff, primary stakeholders who will be affected by the analysis results through training determinations and implementations.

Task Inventory Validation

The document review was used to generate a preliminary task inventory. This product was then reviewed and validated by 12 EO SMEs at six different sites using the table-top interview process. The six validation sites were the following:

- Hanford Facility
- Sandia National Laboratories (SNL)
- Idaho National Engineering and Environmental Laboratory (INEEL)
- Nevada Operations (NVO)
- Pantex Plant
- Los Alamos National Laboratories (LANL).

The interviews resulted in identification and validation of the tasks and subtasks of the 15 EO functions outlined within the task inventory. The validation also included a review of the task inventory by DOE Headquarters Office of Emergency Operations. Revisions to the task inventory were then made as advised.

Emergency Operations Functional Survey

Once the task list was validated, an Emergency Operations functional survey was developed which included the 15 EO functions subdivided into 613 tasks and subtasks. The survey also contained two qualitative, open-ended response questions on each of the 15 functional areas. The first question asked respondents to list any training needs related to the particular functional performance area. The second question allowed respondents to write-in any other tasks that may not have been addressed within that function in the survey. Combining quantitative and qualitative data, the survey was designed to identify the training needs within the 15 EO functions and their associated tasks based on difficulty, consequence, and frequency of performance.

In cooperation with the Director, Office of Emergency Operations, the study team forwarded the survey to key DOE nuclear facilities nationwide. The survey was then distributed to SMEs in the field who rated difficulty, consequence, and frequency of the tasks. Cooperation request letters, accompanying each survey, were sent by the Director, Office of Emergency Operations, and signed by senior DOE officials.

Gathering the assistance from the DOE offices was an extremely significant effort for complex-wide support and success of the data gathering process. This was the first time an analysis of complex-wide magnitude had been attempted with DOE, and support and eventual buy–in from the facilities and their supporting offices was extremely important for a significant survey return rate and ultimate success of the study.

Survey Structure. The quantitative method for collecting data used a 5-point, structured Likert scale to provide ratings by SMEs in the field. In the survey, respondents were first asked whether they perform the task. For all "Yes" responses, they then rated the task on each of three dimensions: difficulty, consequence and frequency (Figures 2, 3, and 4).

What is the level of difficulty to perform? (This is a measure of mental ability and/or motor skills that are required to perform the task.)
5 = Very high level of difficulty
4 = High level of difficulty
3 = Moderate level of difficulty
2 = Low level of difficulty
1 = Very low level of difficulty

Figure 2. Difficulty of performance rating.

What is the level of consequence of improper performance? (This represents the potential for an adverse effect on operations/security, national security, personnel, equipment, or the environment if the task is not properly performed.)
5 = Very high: not successful if done improperly
4 = High: success would be difficult to achieve
3 = Moderate: would impact the success of the job
2 = Low: may have slight impact on the job
1 = Not important: would not affect the job at all

Figure 3. Consequence of performance rating.

How frequently do you perform this task? (This reflects how often the task is performed relative to your current position.)
5 = Weekly (1 or more times each week)
4 = Monthly (1 or more times each month)
3 = Quarterly (2 to 4 times a year)
2 = Annually (once a year)
1 = Less than once a year or not at all

Figure 4. Frequency of performance rating.

The qualitative method for data collection enabled the SMEs to write open-ended responses for

each of the 15 EO functions. These responses pertained to 1) additional tasks performed but not listed within the survey and 2) any training needs foreseen for each area.

Data Collection and Analysis

The surveys were sent to DOE field offices/sites for distribution to personnel performing the EO functions identified within the survey. Completed surveys were returned from 32 responding offices/sites. The study team distributed 23 surveys to individuals across 18 principal facilities/sites. In turn, these individuals distributed the surveys to all their EO personnel, including those at associated sites/facility offices. Thus, the number of surveys completed and returned (n=32) actually exceeded the number originally distributed (n=23). Only two of the 23 principal site surveys that were initially sent were not returned.

613 tasks within the 15 EO functional areas were analyzed from the 32 surveys received. This analysis included a DOE complex-wide review of results with an overview of training recommendations.

The study team reviewed data gathered from each site/facility reporting operationally to the DOE program offices, the offices originally supporting the distribution of the surveys. Based on the complex DOE organizational structure, many of the sites/facilities actually report to more than one DOE office on various issues. The four office categories provided a structural view of the sites and reporting offices even though the sites report operationally to various programmatic offices, resulting in complex affiliations among offices/sites and DOE programs. This complex DOE structure was designed for a diverse organization of facilities/sites all of which have responsibility for Emergency Operations. This complexity illustrates the challenge of gathering, collating, and analyzing data from a dynamic and diverse population.

Performance Indications, Task Characteristics, and Training Recommendations

Performance Indications. Site/facility respondents indicated which of the EO survey tasks they performed. Percentages were calculated of those respondents indicating "Yes" for performance of each task. These performance percentages were calculated for each of the four office categories.

Task Characteristics. Mean Likert scale ratings for task characteristics (difficulty, consequence, and frequency) were computed for each of the 613 tasks/subtasks. Summaries for task characteristic means were reported.

Training Recommendations. Each task had one of three possible training recommendations (Table 1) resulting from the application of the Training Recommendation Decision Tree (Figure 5). The Training Recommendation Decision Tree is a standard, proven analytical tool used within the NNSI and EOTA for training design and development (Nonproliferation and National Security Institute, 2000).

Recurring	Combines formal initial training with periodic refresher training for the task
Train	Formal training recommended; formal training is a structured form of training with objectives and lesson plans conducted in an environment, such as a classroom or formal on-the-job training (OJT) program.
Informal	NO formal training necessary; the task can be learned on the job.

Table 1. Training recommendations and definitions.

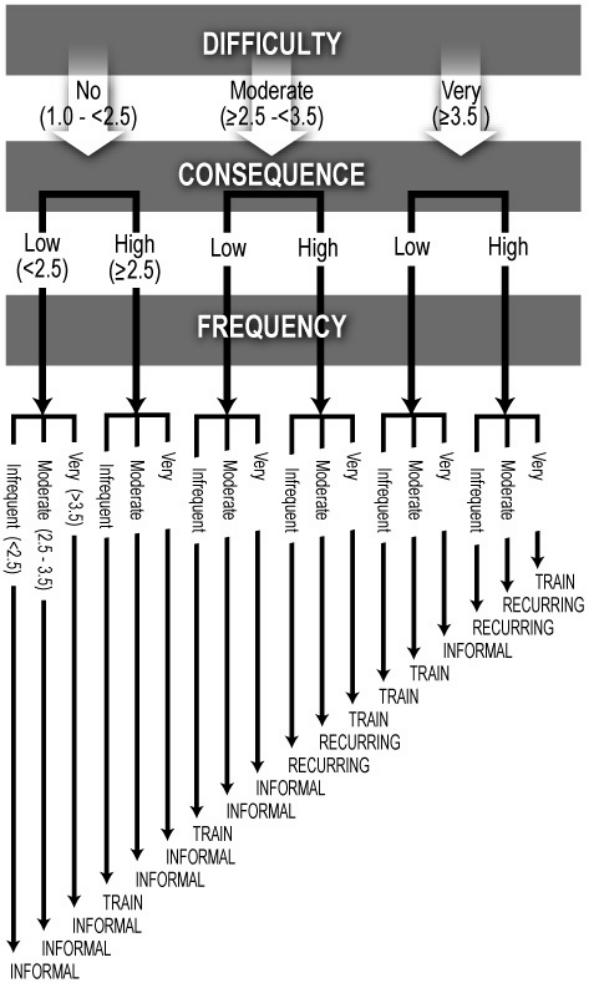

Figure 5. Training Recommendations Decision Tree.

In the decision tree, difficulty and consequences have greater impact on the training recommendation than does frequency. This is an important factor in the analysis. Although a task may not be performed routinely, it is important that the knowledge and skills be maintained to promote proficiency when task performance is required, however infrequently. For example, while EO tasks such as "Handling and disposing of contaminated remains" and "Providing decontamination advice" are performed infrequently, they are undoubtedly critical to EO response effectiveness when they are performed. The applicable tool for addressing DOE EO tasks was the Training Recommendation Decision Tree.

Respondent Comments: Additional Tasks and Training Needs

For each functional area section in the survey, respondents were given the opportunity to provide open-ended input based on their own experience and need. These inputs were aimed at identifying additional tasks performed by respondents within given EO areas and any training needs not being met.

Based on the nature of the EO survey data collected, one individual respondent may have completed an entire survey, while several others may have completed only particular sections based on their site-specific EO assignments. Thus, the study team used the number of individual surveys completed and returned, not the number of persons who completed the survey.

Due to this organizational variability, EO personnel in some sites/facilities may perform several EO functions, while at other facilities/sites personnel may perform only one EO function. Based on these circumstances, there was no need to collect individual names or job titles for this analysis. It was known, however, that staff members from a wide variety of positions, including EO management, were represented based on the distribution process.

In summary, the methodology for this analysis played an important role in developing and organizing the research approach including the analysis structure. The methodology consisted of a systems-based, phased data collection and analysis plan comprised of the following:

- Document Review
- Task Inventory
- Task Inventory Validation
- Emergency Operations Functional Survey Development
- Survey Implementation
- Data Collection in Collaboration with Key DOE Officials
- Data Analysis/Interpretation Using the Training Recommendation Decision Tree

RESULTS

Survey Return Rate

23 surveys were initially sent to 18 different sites/facilities. Four of those responding sites (Chicago Operations, Oak Ridge Operations, Oakland Operations, and Ohio Operations) distributed the surveys to a total of 18 of their associated sites/facilities. A total of 32 surveys were completed and returned for analysis.

Of the 23 original surveys sent to the 18 sites/facilities, two surveys were not returned, resulting in a return rate of 92%. However, a total of 32 surveys were received, due to facilities having distributed surveys to other associated sites/facilities.

Total Task Results

For the 15 EO functions and their 613 total associated tasks, 62% of the tasks were reported as being performed by the 32 responding sites/facilities (Figure 6).

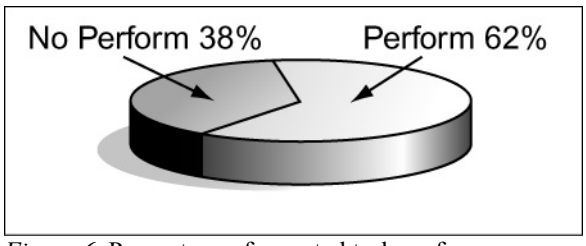

Figure 6. Percentage of reported task performance.

The mean rating of each of the 613 tasks was applied to the Training Recommendations Decision Tree. Each task was assigned one of three recommendations for training: *informal, train,* or *recurring*. From the reported performed tasks, 93% of the tasks received a *Recurring* training recommendation, while another 5% reported a *train* recommendation (Figure 7). This reflects that 98% (601) of the EO tasks that are being performed at sites/facilities across the DOE complex are recommended for training, the largest percentage requiring a combination of formal training and periodic retraining to ensure retention. We expected this large percentage of a recurring training need based on the type of work we were reviewing, emergency operations. Most EO work is performed intermittently, on an as-need basis, rather than day-to-day. Yet, proper performance in emergency operations at nuclear facilities is of the utmost importance to the nation's safety and security. Thus, recurring or periodic training

is often vital to performers to refresh their KSAs for those rare occasions they must perform in emergency situations. Initial training is also of utmost importance because it requires a primary, more fundamental structured form of training and is required before recurring training can take place.

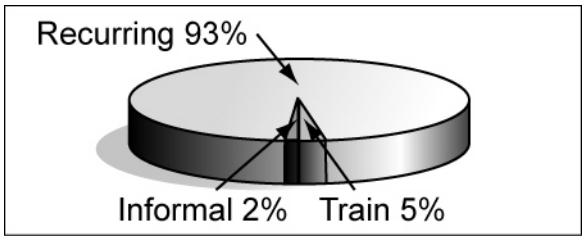

Figure 7. Percentages of training recommendations.

Functional Areas

Functional areas with *train* recommendations were the most significant since they required a more formal approach to training to develop a standard knowledge base. In this study, we wanted to uncover the EO performance areas that would require not only recurring training, but also initial training as well. This would allow EOTA to focus on those functional areas for training initially, which would better enable them to develop and implement a phased, complex-wide standard training approach.

For each of the 15 EO functional areas and their associated tasks, mean ratings of difficulty, consequence, and frequency were computed and applied to the Training Recommendation Tree. Tasks determined as *train* have, at minimum, the highest difficulty and consequence ratings. It was found that three of the 15 areas addressed, hazards survey and hazards assessment, program administration, and emergency response organization had not only a large number of tasks that needed recurring training, but also contained high percentages of tasks that resulted in the more formal *train* requirement.

Hazards Survey and Hazards Assessment

Within the EO functional area of hazards survey and hazards assessment, 57 tasks were identified. To comply with DOE Order 151.1, it is required that Hazards Surveys and facility-specific Hazards Assessments be prepared, maintained, and used by EO staff for emergency planning purposes. The Hazards Survey briefly describes the potential impacts of emergency events or conditions and summarizes the planning and preparedness requirements that apply. Performing a Hazards Survey includes identifying generic emergency conditions, which involve identifying hazardous material releases, environmental releases, or malevolent acts such as hostage-taking or sabotage. If a hazards survey identifies hazardous material at the facility/site in excess of predetermined thresholds, a facility/site specific Hazards Assessment is required. The Hazards Assessment includes characterization of hazardous materials specific to a facility/site, analyses of potential accidents/events, and an evaluation of potential consequences. This assessment also includes determination of the geographic area of the site, known as the Emergency Planning Zone (EPZ), within which special planning and preparedness activities are required to reduce the potential health and safety impacts (Department of Energy, 1997).

Means for these tasks were calculated and training recommendations were derived using the Training Recommendations Decision Tree. Of the 57 tasks, 16% (9 tasks) were determined as *train*, while 82% (47 tasks) were determined as *recurring*. Only 2% (1 task) was recommended for *informal* training (Figure 8). The hazards survey and hazards assessment tasks that rated the highest in difficulty, consequence, and frequency and thus resulted in a *train* recommendation included the following.

- Identify and describe each facility
- Provide a general characterization of the facility and operations
- Provide information about the normal occupancy
- Provide information about classified material
- Identify natural phenomena impacts
- Establish the facility's placement
- Provide general site information
- Provide information about the location of the facility
- Describe large quantities of fuels

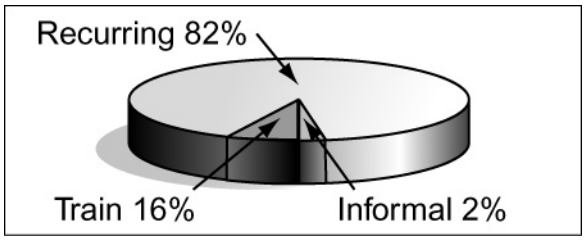

Figure 8. Hazards Survey & Hazards Assessment training recommendations.

Program Administration and Emergency Response Organization

In the program administration function, EO staff must establish and maintain effective organizational management and control of the emergency management program. Each DOE organizational tier (Cognizant Secretarial Officer (CSO), operations/field office, and site/facility) has one program administration position responsible for administering the emergency management program at their level.

Within this area, 56 of the 72 tasks (78%) were recommended as *recurring*. Particularly noteworthy was that another 21% (15 tasks) were recommended as *Train* (Figure 9), the more formal approach to training. Only 1% (1 task) was assessed as an *informal* training task. Based on these results, 99% of the program administration tasks were recommended for some form of training.

The program administration tasks that were rated the highest in difficulty, consequence, and frequency and resulted in *train* recommendations included:

- Perform emergency management duties [as outlined within DOE].
- Coordinate emergency resources.
- Maintain responsibility for emergency management.
- Maintain oversight for emergency management.
- Apply a site/facility/activity-specific comprehensive emergency management program that is based upon a graded approach, and commensurate with the hazards.
- Perform tasks at the facility level by the facility emergency management program administrator.
- Coordinate activities.
- Coordinate drills and exercises to prevent conflict with other activities and to ensure that resources are available.
- Perform tasks at the multiple-facility site level by the emergency program administrator.
- Conduct emergency response activities on a multiple-facility site.
- Perform tasks at the operations/field office level.
- Review the activities of the sites and any facilities reporting to the operations/field office.
- Develop and administer the field element emergency management system necessary for the operations/field office to carry out its responsibilities during an emergency.
- Program management for ensuring the operational readiness of the Emergency Operations Center (EOC) used by the operations field office during emergencies.
- Perform administrative procedures

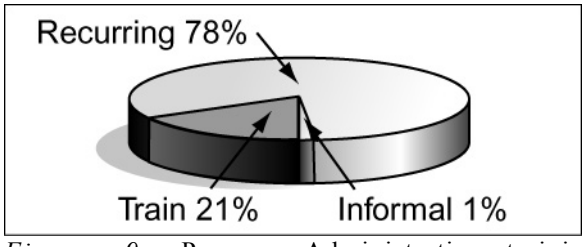

Figure 9. Program Administration training recommendations.

For the Emergency Response Organization functional area, 85% (17 tasks) were recommended for *Recurring* training; the remaining 15% (3 tasks) resulted in a *train* recommendation (Figure 10). In this functional area, tasks that rated the highest and resulted in a *train* recommendation included:

- Perform basic ERO tasks.
- Perform emergency management actions.
- Assemble and deploy fire/rescue personnel and equipment.

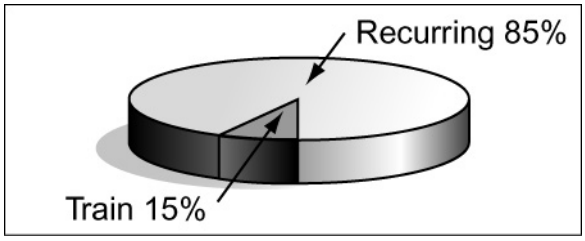

Figure 10. Emergency Response Organization training recommendations.

Remaining Functional Areas

Survey results revealed a recommendation of *Recurring* training for all tasks within the remaining functional areas:

- Training and Drills
- Exercises
- Readiness Assurance
- Categorization and Classification
- Notifications and Communications
- Consequence Assessment
- Protective Actions and Reentry
- Termination and Recovery
- Emergency Medical Support
- Offsite Response Interfaces

In a few of these areas there was a notable amount of tasks that rated high (≥3.9) in consequence, frequency, and/or difficulty. For instance, in consequence assessment, the process used to evaluate the impacts of a release of radioactive or other hazardous materials, 22 of the 44 tasks rated high (≥3.9) in consequence. The tasks performed in this process are vital to support the time-urgent, critical first decisions and the continuous process of refining those initial assessments as more information becomes available during an emergency. Recurring training in this area, particularly in the high consequence tasks is vital to performance. The tasks that rated high (≥3.9) in consequence included:

- Provide event detection, recognition, categorization, and classification.
- Track events and event systems.

- Analyze indicators to Emergency Action Levels (EAL).
- Apply EALs on consequence estimations and evaluations.
- Provide timely assessment.
- Estimate and summarize potential consequences.
- Assess results of potential consequences gathered together, tabulated, and indexed.
- Establish procedures for incorporating even-specific data into analyses.
- Identify input data/information in three categories: source term, meteorology, and receptor locations.
- Obtain assumptions/default inputs and key them to recognizable event conditions.
- Identify expected sources of real-time information.
- Assure provisions for incorporating real-time information into analysis.
- Establish consequence estimate calculations by identifying a range of initiating events and scenarios.
- Determine applicable classification and protective actions.
- Determine when and where impacts are likely to occur.
- Communicate results for public information.
- Provide continuous assessment.
- Identify and train technical personnel to present results.
- Establish degree of uncertainty prior to distribution of assessment results.
- Participate with Emergency Classification and Protective Actions.
- Coordinate with federal, state, tribal, and local organizations to estimate the impact of the release on the public and the environment.
- Provide a quality assurance system.

Another area with a notable amount of tasks that rated high in consequence was protective actions and reentry. This process is part of emergency planning and is one of the direct applications of the hazards assessment results. Protective actions are the measures taken for evacuation, sheltering, and reentry, to prevent or minimize health and safety impacts of workers, responders and the public. The tasks that rated high ($\geq$3.9) in protective actions and reentry included:

- Provide information in order to take protective actions, to implement protective actions, and to respond safely.
- Develop plans and procedures for protective actions.
- Determine protective actions.
- Recommend and implement protective actions to offsite organizations.
- Notify onsite responders and workers.
- Conduction continuous consequence assessment.
- Reevaluate protective actions.
- Control, monitor, and maintain records of personnel exposed to hazardous materials (radiological and non-radiological).
- Provide a primary and back-up means of communication.
- Assure/Provide medical treatment
- Ensure that reentry activities do not inadvertently increase the actual or potential release of hazardous material.
- Conduct decontamination in existing facilities, if possible.

Although protective actions and reentry and consequence assessment functional areas resulted in a recurring training recommendation, there were a number of tasks that rated high in consequence. Assuring proper recurring training for performance of these tasks should be reviewed.

Under the final functional areas, Emergency Facilities and Equipment, with 31 tasks, and Emergency Public Information, with 107 tasks, one task from each resulted in a *train* recommendation. For Emergency Facilities and Equipment, highest rated task that resulted in a *train* recommendation was to establish field monitoring equipment that is capable of measuring data on concentrations and/or exposures. In the Emergency Public Information task, performance as a media relations coordinator, was the highest rated task and resulted in a *train* recommendation.

Additional Comments

Respondents were given an opportunity to write-in additional tasks that were not listed within the survey. This provided a unique opportunity to gain insight into other tasks that may have been overlooked or not specifically documented. Except for Readiness Assurance, respondents provided one or more additional tasks for all EO functions. The greatest number of additional tasks (n=13) was recommended for the Hazards Survey and Assessment area. Seven additional tasks were listed for each of two other areas, Emergency Public Information and Consequence Assessment. Figure 11 depicts the number of additional tasks provided by respondents for each functional area.

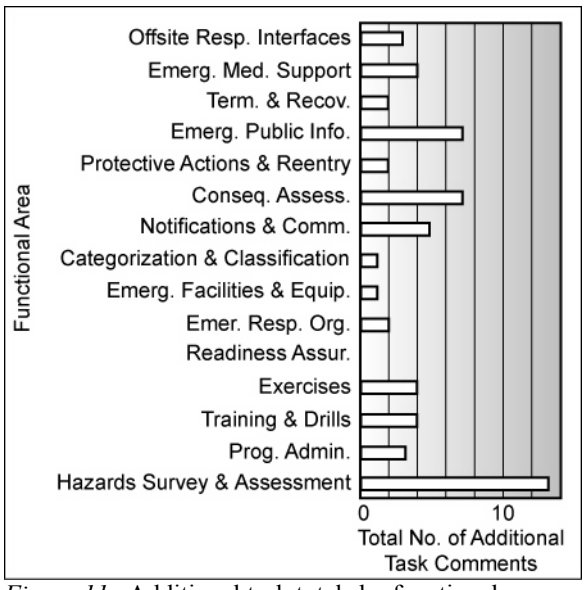

Figure 11. Additional task totals by functional area.

Respondents were also given the opportunity to list training needs within the survey. Hazards Survey and Hazards Assessment, one of the three areas with a significant number of *train* tasks, also yielded the most comments among the 15 functions. A total of 19 training needs comments were provided.

SUMMARY AND CONCLUSIONS

Recommendations were made to EOTA based on the quantitative and qualitative data collected. These recommendations also stem from discussions among study team members and senior DOE, NNSI/WSI, and EOTA representatives. The recommendations are:

- Develop a Task-to-Training Matrix (TTM), matching the data collected from the analysis to the objectives and lesson plans of existing EO training courses. This will serve as a gap analysis to determine the courseware that needs to be developed and/or modified to meet EO training requirements.
- Identify and focus on a standard, phased training process to meet those EO tasks designated as *Train*, as well as *Recurring*. To begin, this plan should focus on tasks within 3 functional areas: hazards survey and hazards assessment, program administration, and emergency response organization. The plan should include core EO training requirements for complex-wide base knowledge and skill development as well as those that are specific to designated sites/facilities.
- Develop and implement a standard, complex-wide EO training curriculum consisting of all hardware, software, courseware, personnel, and procedures to facilitate acquisition and maintenance of EO knowledge and skills.
- Plan and schedule SME focus groups and Table-top Job Analyses (TTJA) to develop and apply integrated, systems-based approaches to EO training; these approaches should encompass DOE complex-wide goals, models, tools, and processes.
- Identify appropriate methods of core EO training implementation, including research on cost-effective delivery methods, target audience needs, facility accessibility, course objectives, and site/facility goals.
- Develop and implement complex-wide training evaluation methods, including testing concepts, to ensure that those with EO responsibilities demonstrate mastery of EO learning content.

Although this analysis originally arose from the significant role the EO staff played at LANL during the Cerro Grande Fire in the spring of 2000, in light of the events of September 11, 2001, the immense importance of staff performance within our nation's nuclear facilities has never been greater. Since this study was completed and submitted to EOTA in August, 2001, the implementation process of designing and developing a standard, complex-wide approach to EO training has begun. The EOTA has completed a training gap analysis and review of existing training encompassing over half of the 613 tasks outlined in this study. Once complete, they will have outlined the existing training that meets the functional areas and associated tasks, possibly needing modifications as necessary, and what needs to be developed to meet the performance requirements for those areas and their associated tasks.

This complex-wide approach to training also helped drive a new Senior Energy Official (SEO) analysis that is being implemented by the EOTA. SEOs are a select few, high-ranking officials under the lead of the Secretary of Energy, who have lead oversight to facilities/sites nationwide. A formalized, standard training approach for this position has not been developed. The planned analysis begins this approach by examining DOE staff role and associated tasks.

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ACKNOWLEDGEMENT

This work was performed under subcontract to Wackenhut Services, Incorporated (WSI), the general support contractor to the Nonproliferation and National Security Institute (NNSI). Views expressed in this paper are solely those of the authors and do not necessarily represent those of NNSI or DOE. The authors wish to thank Dr. Stan Laktasic of WSI for project guidance, Mr. Manuel Leyva, Emergency Operations Training Academy (EOTA), and Ms. Rose Duffman, Department of Energy (DOE), for their support with data collection.