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Integrated Safety, Environmental, & Emergency Management System (ISEEMS)

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The Risk Management and NEPA (National Environmental Policy Act) Department of Sandia National Laboratories/New Mexico (SNL/NM) recognized the need for hazard and environmental data analysis and management to support the line managers' need to know, understand, manage and document the hazards in their facilities and activities. The Integrated Safety, Environmental, & Emergency Management System (ISEEMS) was developed in response to this need.

SNL needed a process that would quickly and easily determine if a facility or project activity contained only standard industrial hazards and therefore require minimal safety documentation, or if non-standard industrial hazards existed which would require more extensive analysis and documentation. Many facilities and project activities at SNL would benefit from the quick screening process used in ISEEMS. In addition, a process was needed that would expedite the NEPA process. ISEEMS takes advantage of the fact that there is some information needed for the NEPA process that is also needed for the safety documentation process. The ISEEMS process (Figure 1) enables SNL line organizations to identify and manage hazards and environmental concerns at a level of effort commensurate with the hazards themselves by adopting a necessary and sufficient (graded) approach to compliance. All hazard-related information contained within ISEEMS is location based and can be displayed using on-line maps and building floor plans. This visual representation provides for quick assimilation and analysis.

The NEPA process requires collecting and organizing information as well as a system to track the status of NEPA documentation for a proposed facility or project activity. The Environmental Checklist/Action Description Memorandum (ECL/ADM) module within ISEEMS provides the capability to determine one of the following: prior NEPA coverage; categorical exclusion; or information to support development of an Environmental Assessment (EA) or Environmental Impact Statement (EIS). This module provides a friendly and intuitive user interface for completing the complex ECL/ADM document. The user has detailed "help" for each item along with samples that can be "cut-and-pasted" into the user's ECL/ADM.

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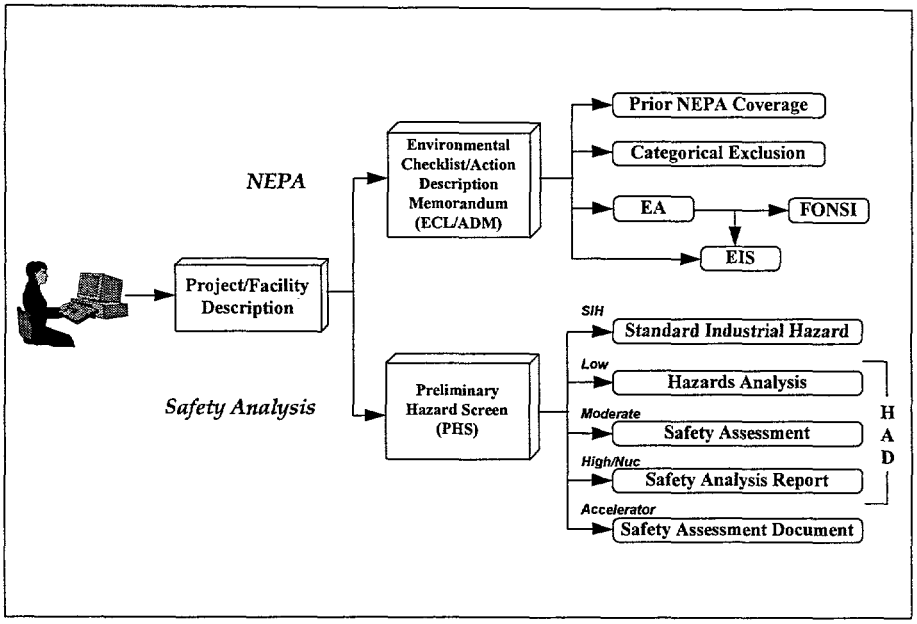

Figure 1 - ISEEMS Process

The Preliminary Hazard Screening (PHS) module of ISEEMS determines the facility or project activity hazard classification and facility designation (Figure 2). The facility designations used by ISEEMS are: Non-nuclear, Nuclear, and Accelerator. ISEEMS categorizes non-nuclear facility or project activities into one of the following hazard classifications: Office; Standard Industrial Hazard (SIH); and Low, Moderate, or High, non-standard industrial hazard. The level of rigor required for ES&H documentation is determined by the hazard classification and the facility designation. An Office or SIH hazard classification requires only a PHS; a Low hazard classification requires a Hazard Analysis (HA); a Moderate hazard classification requires a Safety Assessment (SA); a High or Nuclear hazard classification requires a Safety Analysis Report (SAR); and, an Accelerator hazard classification requires a Safety Assessment Document (SAD).

When users log into the ISEEMS they are presented with a master screen called the ISEEMS Navigator (Figure 3). The navigator screen provides the user with overview tabs for; Safety (Preliminary Hazard System), NEPA (Environmental tools such as the Environmental Checklist), and Utilities (for providing report generation and search capabilities). For instance, if a user chooses to work with the PHS system, a new PHS may be created or an existing one may be edited. In either case, the PHS

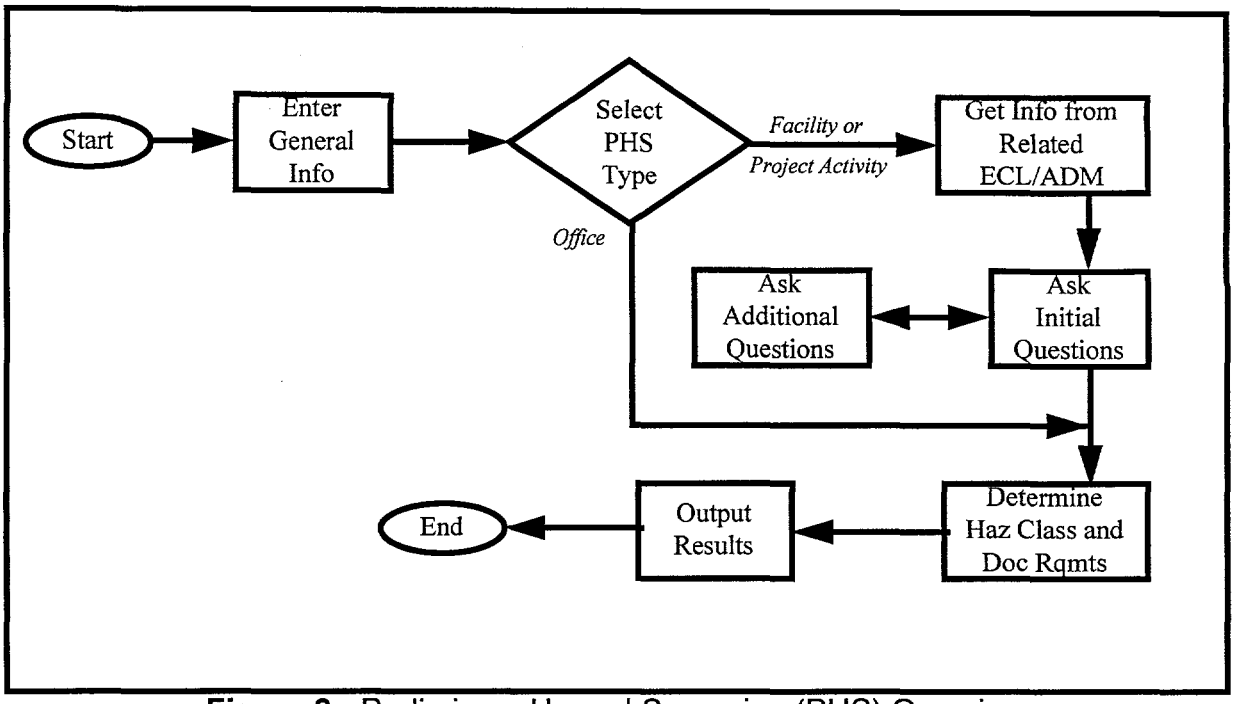

Figure 2 - Preliminary Hazard Screening (PHS) Overview

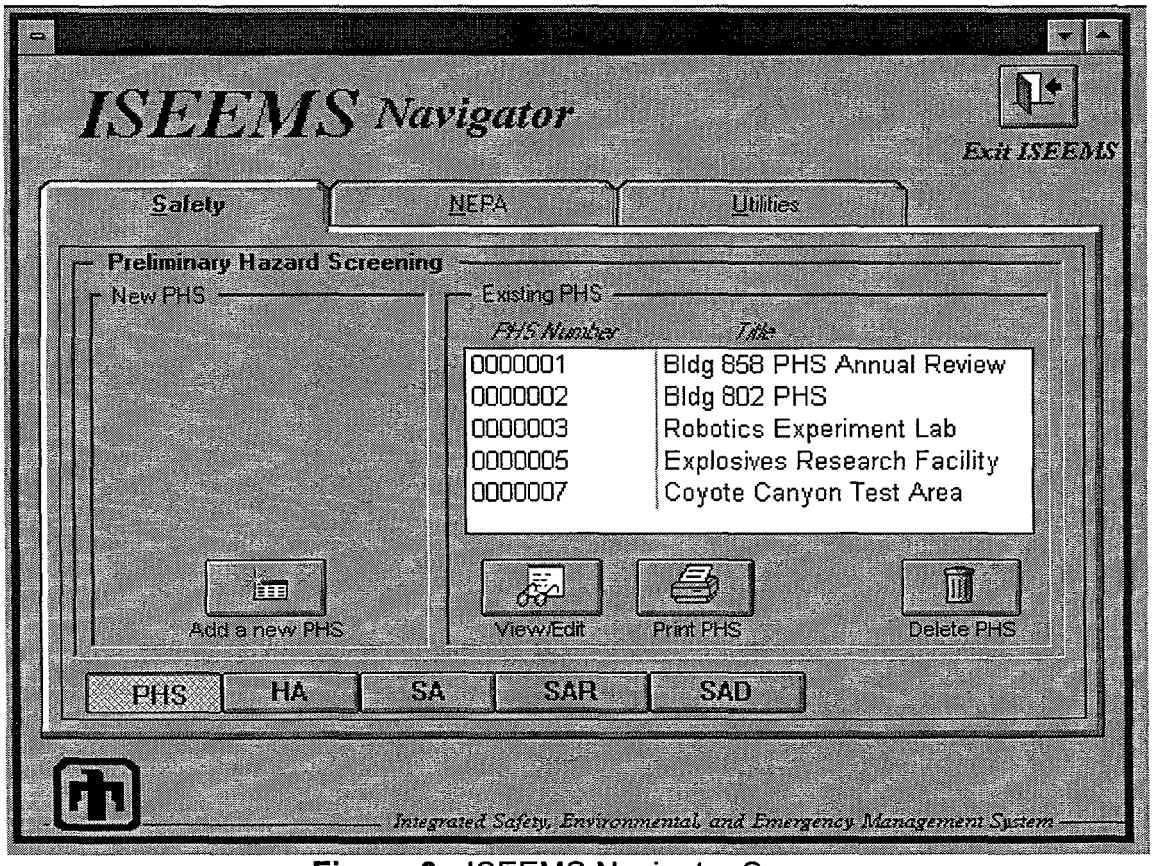

Figure 3 - ISEEMS Navigator Screen

General Information Screen (Figure 4) would be presented. This screen is used for recording general facility or project activity information such as facility characteristics, status, owning manager, etc. If the user specified that the PHS was for an office, it would then be screened out from further evaluation at this point.

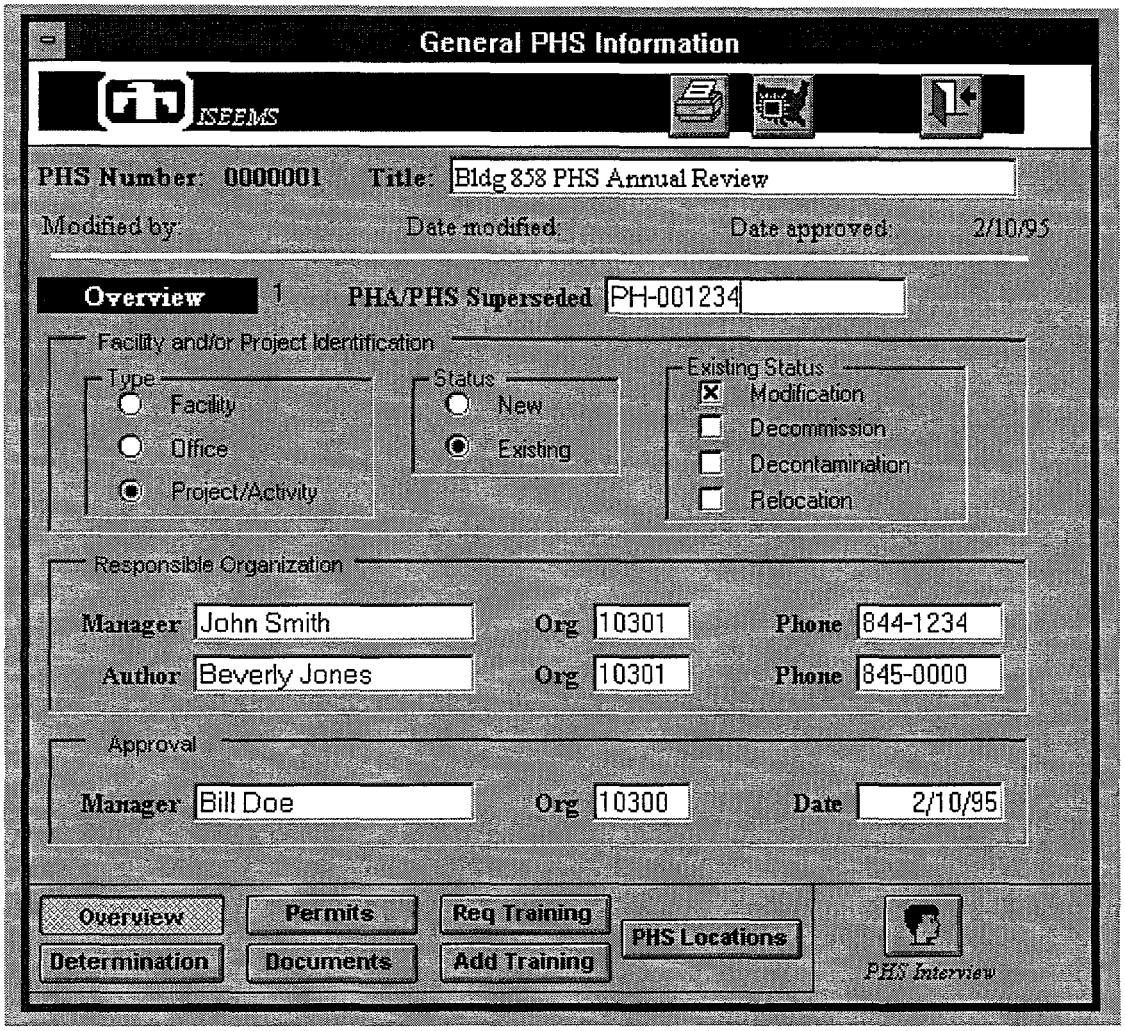

Figure 4 - General PHS Information Screen

Facility or project activities will require completion of the PHS Interview (Figure 5). The PHS Interview is a list of fifteen (15) high level screening questions designed to help the user identify hazards present in their workplace. Anytime a user answers "yes" to

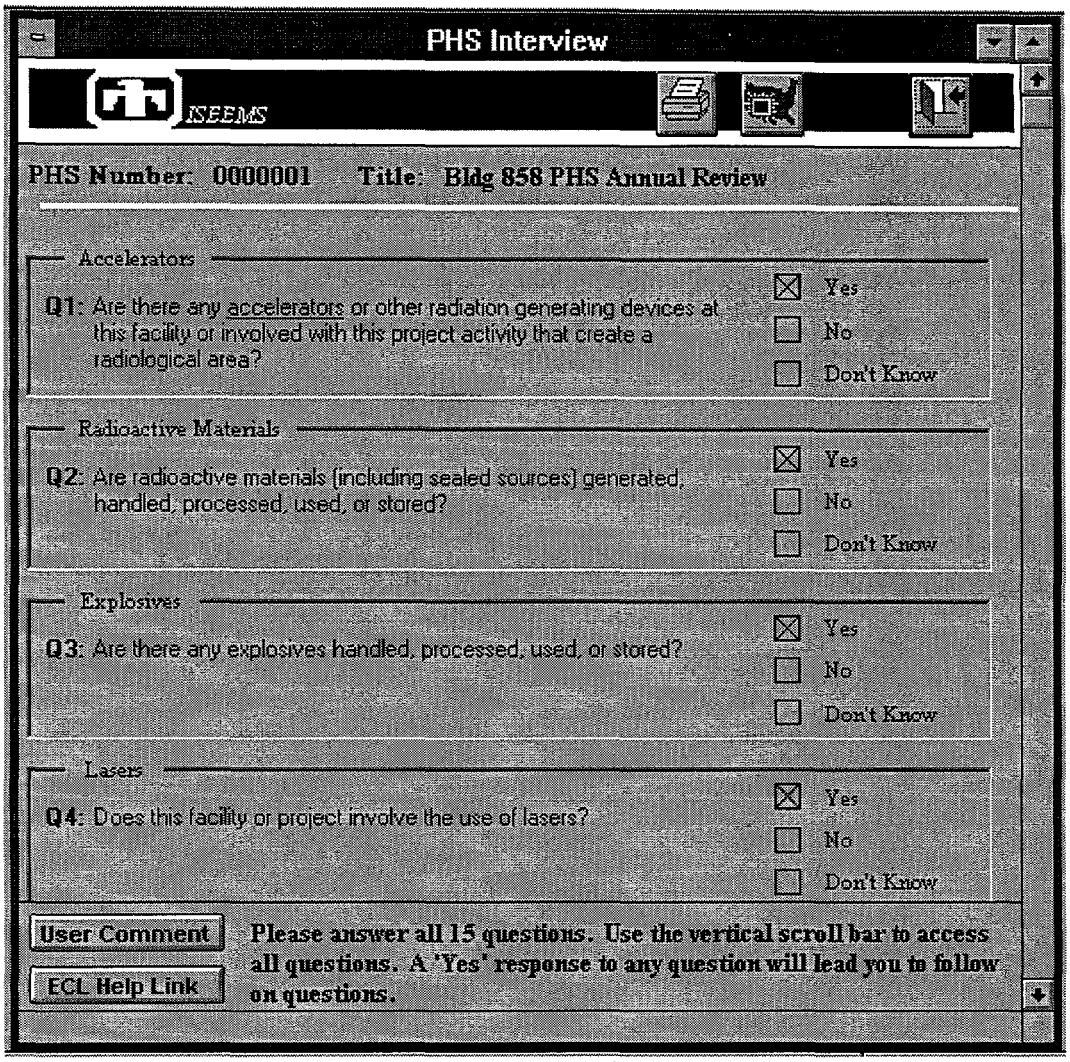

Figure 5 - PHS Interview Screen

an interview question the PHS system will automatically present additional questions (Figure 6) that will help determine the appropriate hazard classification, facility designation, required level of safety documentation, and training requirements specific to that hazard. If the answer is "Don't Know", the system will bring up hypertext to further explain the question.

ISEEMS combines a geographic information system (GIS), database management system (DBMS), and report generator into one application. ISEEMS integrates two commercially available products, Emergency Information System (EIS) from EIS International, and Microsoft Access from Microsoft, with Sandia customized coding. Through ISEEMS, users have the capability of analyzing data from disparate corporate data bases according to regulatory guidelines. The results of the analysis are then displayed in a graphic and narrative summary. The graphical output is unique hazard

icons displayed upon the facility map in the hazard's representative location. The power of ISEEMS lies in the geo-referenced icon. The icon is tied to relational database structures containing relevant data and allows immediate, visual integration of hazard information across geographic boundaries resulting in significant information compression. Additionally, a user can model a chemical release, using the Areal Location Of Hazardous Atmospheres (ALOHA), and plot the plume on the same map. This information is very useful in emergency response planning and in managing operational emergencies. A key objective of the U.S. Department of Energy's (DOE) Emergency Management Program is to ensure that all DOE facilities and operations develop and maintain emergency planning, preparedness and response capabilities, as well as effective public and interagency communications to minimize consequences to workers and the general public from events involving the release of hazardous materials. If planning and preparedness for emergencies is to be adequate and appropriate, then the hazards that are specific to each facility and operation must first be identified and understood. The Hazards Assessment process described in the next four paragraphs uses the computerized tool, ISEEMS, for the planning.

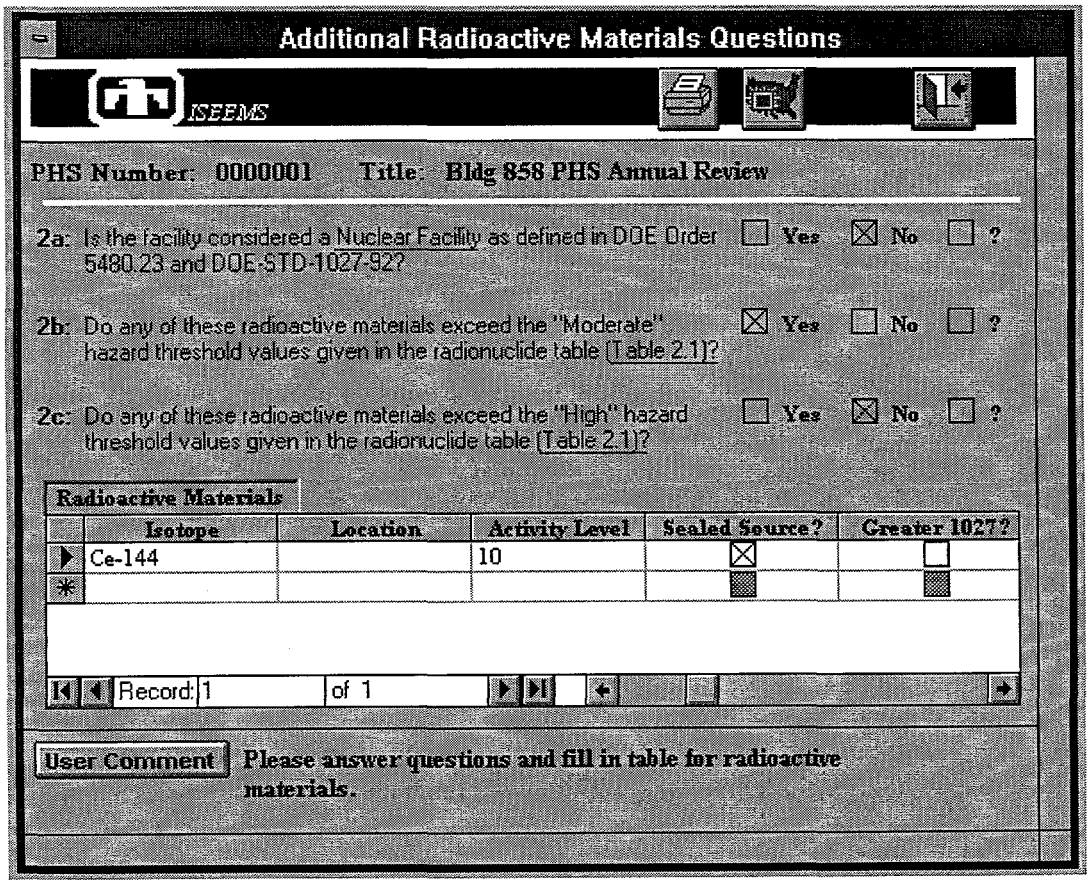

Figure 6 - PHS Additional Questions Screen

Hazards assessments are used to analyze the processes, chemicals, and radiological materials associated with facilities and/or activities, to determine the types and severities of accidents that could affect persons on-site and off-site of the facility. Hazards Assessment Documents (HADs) are used to formally establish and maintain emergency planning, preparedness, and response programs for all SNL facilities and project activities.

The first step in the SNL facility-specific hazard assessment process, is to identify the facility and site to be analyzed, and determine whether the hazards within the facility are significant enough to warrant a formal HAD. Sandia utilizes a "hazard screening process" whereby the chemical and/or radioactive material inventory for a given facility is compared against pre-determined screening criteria to ascertain whether the material(s) warrants further analysis.

The screening process utilizes the maximum chemical and/or radiological inventories available at any time in each facility. The process by which materials are either screened (identified as non-hazardous to the health and safety of personnel and the public) or kept (identified as potentially hazardous to the health and safety of personnel and the public) is detailed in the SNL Screening Criteria Document. The SNL Screening Criteria, which will be integrated into ISEEMS, is arranged in order of priority in an attempt to establish a programmatic and rational process with which to identify and/or screen hazards. The purpose of this process is to generate consistent screening of materials between the preparer of the hazard assessment as well as all of SNL. This enhances the credibility and defensibility of the screening stage and reduces subjectivity or bias that would be introduced by different individuals applying different criteria.

Computer models (e.g., ALOHA, ARCHIE & HOTSPOT) are utilized to analyze the consequences based on ERPG thresholds. The hazard assessment preparer employs release scenarios postulated in the previous section as the basis for consequence assessment. Two meteorological conditions "worst case," (defined by the Federal Emergency Management Agency (FEMA) of 1 meter per second wind speed with a Pasquill-Gifford stability class of F), and average (for the SNL/New Mexico site of 4 meters per second with a Pasquill-Gifford stability class of C), are used when performing these assessments.

The consequences that result from these events are based on calculated health effects on personnel and/or the public. The American Industrial Hygiene Association's (AIHA) ERPGs are employed in the modeling effort to identify distances to reversible, irreversible, and life threatening health effects due to a chemical or radiological release. Emergency classes (i.e., Alert, Site Area Emergency, and General Emergency) are assigned to each event that can adversely effect the public or non-involved workers. An Alert is defined as an ERPG-1 concentration (reversible health effect) for chemical releases and/or exposures equal to the Protective Action Guide (PAG) for radiological releases at 30 meters. A Site Area Emergency is defined as ERPG-2 concentrations (irrecoverable health effects) and/or exposures equal to the PAG at the site boundary. A General

Emergency is defined as ≥ERPG-3 concentrations (life threatening health effects) and/or exposures greater than the PAG at the site boundary.

At Sandia, ISEEMS runs on the Sandia Internal Restricted Network (IRN). This allows users from all over the site to execute ISEEMS in a network environment and to enter, edit, or obtain hazard or environmental information on a facility or project activity. The ISEEMS program runs in an MS-Windows environment on standard (desktop or laptop) PC hardware. The system can also be run in a stand-alone mode, which is ideal in an emergency response situation since the current databases can be downloaded to a laptop and used in an Emergency Mobile Command Post to assist in the emergency response decision making process.

The ISEEMS decision making logic is based on the following technical information and guidance sources:

- DOE Order 5481.1b Safety Analysis and Review System
- DOE Order 5480.23 Nuclear Safety Analysis Reports
- DOE Order 5480.25 Safety of Accelerator Facilities
- DOE Order 5480.19 Conduct of Operations Requirements for DOE Facilities
- DOE Order 5500.3a Planning and Preparedness for Operational Emergencies
- 29 CFR 1910 Occupational Safety and Health
- 40 CFR 1500-1508 Protection of Environment
- National Environmental Policy Act (NEPA)
- Current, Fire Hazard Analysis, Chemical, Radiological, and Sealed Source Inventories
- Equipment Inventories (e.g., Accelerators, X-ray generating devices).

The ISEEMS process and the ECL/ADM and PHS modules have been successfully integrated. A parallel project that uses the same files has been developed for the SNL/NM Emergency Operations Center (EOC) for their use. This modular development of ISEEMS provides the user with a useful initial tool without waiting for the complete process to be developed. Future development of ISEEMS will incorporate EA and EIS modules and HA, SA, and SAR modules. A qualitative risk analysis process developed at Sandia will also be added as an ISEEMS module.

The ISEEMS design paradigm incorporates the "Necessary and Sufficient" philosophy. "Necessary and Sufficient" is a concept developed for the Department of Energy which is a systematic and disciplined process for the identification of requirements appropriate to the work and it's hazards. This process is designed to more efficiently accomplish ES&H goals while assuring adequate protection for the public, workers and the environment. A team of knowledgeable and qualified staff developed the necessary and sufficient set of requirements and standards appropriate to the hazard and facility classifications. The necessary and sufficient set of requirements and standards were then independently reviewed and approved by SNL ES&H professionals. ISEEMS has been designed and implemented as a software application using the "approved necessary and sufficient set."

SNL is currently exploring the possibility of transporting ISEEMS to a "WEB-like" environment. SNL is fortunate to have a robust internal WEB that can be accessed by most of our users. WEB tools such as JAVA and Virtual Reality Markup Language (VRML) may make the conversion feasible. ISEEMS could then be run in a hardware-independent environment (i.e., PCs, Sun Workstations, or MACs) and still have all the functionality currently provided in an MS-Windows environment. Until then, other MS-Windows enhancements such as the use of ArcView will be used as the primary GIS interface to allow the user the option of using vector-based maps.

ISEEMS replaces the previous fractional methods of hazard data collection, and is a solution to the general unavailability of hazard-related data to ES&H professionals, other corporate entities, and DOE. ISEEMS provides a roll-up capability that shows the effects of accumulated hazards across several organizations or locations. ISEEMS answers the line managers' request for a software tool to Know, Understand, Manage, and Document their hazards.

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