EXHIBIT 13

John T. Conway, Chairman
A.J. Eggenberger, Vice Chairman
Joseph J. DiNunno
Herbert John Cecil Kouts
John E. Mansfield

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004-2901
(202) 208-6400

March 19, 1999

The Honorable Bill Richardson
Secretary of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Richardson:

The topic of protection of collocated workers at the Department of Energy's defense nuclear sites has been the subject of numerous discussions over the years between the Defense Nuclear Facilities Safety Board (Board) and its staff on one side, and staff members of the Department of Energy on the other. At times the matter has been discussed as a generic one, and at other times it has been addressed as an important component of safety in particular instances.

The question of methodology ensuring adequate protection of these workers has now been reviewed systematically by the Board, and the results are incorporated in a report designated DNFSB/TECH-20 and entitled, "Protection of Collocated Workers at the Department of Energy's Defense Nuclear Facilities and Sites."

Knowing of your interest in this matter, the Board forwards herewith a copy of the report just referred to.

Sincerely,

John T. Conway
Chairman

Enclosure

c: Mr. Mark B. Whitaker, Jr.

DNFSB/TECH-20

Protection of Collocated Workers at the Department of Energy's Defense Nuclear Facilities and Sites

Defense Nuclear Facilities Safety Board

Technical Report

February 1999

EXHIBIT 13

DNFSB/TECH-20

Protection of Collocated Workers at the Department of Energy's Defense Nuclear Facilities and Sites

Herbert J. C. Kouts
Member, Defense Nuclear Facilities Safety Board

EXHIBIT 13

PREFACE

This report was prepared in reaction to recently expressed interest in requirements for protection of collocated workers at the Department of Energy's current and former defense nuclear facilities and sites from potentially hazardous effects of radioactive material worked on at those sites. It is hoped that the report will help resolve the issues that have been raised.

The author would like to thank his colleague and fellow Board Member, Joseph DiNunno, for many helpful discussions, and especially for his patience in reading and commenting on successive versions of this report.

EXHIBIT 13

TABLE OF CONTENTS

1. REASONS FOR THE REPORT

Considerable discussion and debate have recently addressed protection of collocated workers at defense nuclear facilities of the Department of Energy (DOE) from possible harmful effects of nuclear radiation. That topic has often been considered at length in discussions between the Defense Nuclear Facilities Safety Board (Board) and its staff on the one hand and staff members of DOE on the other hand. At times these discussions have dealt with protection of collocated workers as a policy question, and at other times they have addressed specific questions. Typical examples of the latter have been protection of workers who are collocated relative to tritium facilities at the Savannah River Site (SRS), and protection of workers outside facilities being decommissioned at the Rocky Flats Environmental Technology Site (Rocky Flats).

The topic has also become a matter of particular interest in other contexts at the Hanford Site and the Oak Ridge Site. Future operations of privatized facilities at those sites are expected to be conducted in the midst of other work that is conducted by DOE contractors. Employees involved in DOE activities will be collocated relative to the privatized activities, and vice versa.

The lack of clear resolution of this issue has led to the review presented in this report. However, it is recognized that the system that has been in effect up to now has been successful. There is no pattern of personal injury from nuclear radiation among collocated workers at DOE's defense nuclear facilities and sites, nor is there such a pattern among other groups of individuals at or near these sites. For better understanding of the reason for the apparent success, it has been necessary to develop a better definition of the basis for the present practices that ensure the protection of collocated workers. It has been found, surprisingly, that the logic begins not with protection of the surrounding public, though that is the predominant goal emphasized in the Atomic Energy Act. Rather, understanding of protection of collocated workers requires that it be viewed in the context of protection of all individuals who may conceivably be affected by hazardous operations at defense nuclear facilities and sites. The steps necessary to protect the public generally, and all workers as well, begin with actions to protect workers most at risk.

The protection of collocated workers is found to depend strongly on three elements. The first is recognition of fundamental aspects of the way radiation protection of workers and the public is actually structured. The protection of individuals in each category rests heavily on measures taken to protect the others. This point is often obscured by documentation practices that appear to treat protection of the public and workers separately. For instance, process hazard analysis is cast in the form of protection of workers, whereas formal safety analysis is oriented primarily to protection of the surrounding public. Such bifurcated treatment has developed almost as an accidental consequence of the way in which the field of nuclear safety has evolved historically, as has been pointed out in DNFSB/TECH-16, *Integrated Safety Management*. However, the actual process by which protective measures are developed unites the systems for safety of workers and the public more closely and in a natural way, as will be seen subsequently in this report. Recognition that there is a common objective in protection of individuals in different categories thus leads directly to a logical basis for the means to protect collocated workers specifically, as a by-product of the overall effort.

The second element is recognition of the fact that the primary objective of nuclear safety management is assurance that appropriate steps have been taken to avoid any potentially harmful releases of radioactive material, and to avoid harmful doses of nuclear radiation in the course of normal work or through such accident situations as inadvertent criticality. An important secondary objective is that, in case of failure of the protective systems and procedures, the radiation dose will be limited to less than that stated in some criterion.

The third and perhaps the most important element is adoption of and operation according to the principle of integrated safety management advocated in the Board's Recommendation 95-2. That concept has been developed in detail in several of the Board's technical reports:

- DNFSB/TECH-5, *Fundamentals for Understanding Standards-Based Safety Management of Department of Energy Defense Nuclear Facilities* (May 31, 1995);
- DNFSB/TECH-6, *Safety Management and Conduct of Operations at the Department of Energy's Defense Nuclear Facilities* (October 6, 1995);
- DNFSB/TECH-16, *Integrated Safety Management* (June 1997); and
- DNFSB/TECH-19, *Authorization Agreements for Defense Nuclear Facilities and Activities* (April 1998).

The concept of integrated safety management is also covered by the Department of Energy Acquisition Regulations (DEAR)—in DEAR 970.1001, DEAR 970.5204-2, and DEAR 970.5204-78—and in such DOE publications as:

! DOE P 450.4, *Safety Management System Policy*;

! DOE G 450.4-1,2, *Integrated Safety Management System Guide; and*

! DOE G 450.3-3, *Tailoring for Integrated Safety Management Applications.*

Indeed, the first two elements necessary for understanding the collocated worker issue are actually covered by details of the system of integrated safety management.

2. ORIGINS OF DOE'S PROTECTIVE SYSTEM

The logic of the system used by DOE to protect workers and the public is better understood when introduced through its historical development.

The protection of individuals from radiation hazards under regulation by the Atomic Energy Commission (AEC) grew in an evolutionary manner. The existence of radiation hazards was recognized from the beginning because of the research on radioactivity that had taken place over the years. At the start of the Manhattan Project and in the early days of the AEC, however, understanding the nature and extent of the hazards was not well advanced. As a result, the workers approached each activity in their tasks with care, and made protective measures an integral part of what they did. The work practices were structured so as to include what was believed to be appropriate protection. The work and the protection were informal and expert-based. Mistakes that led to accidents, injury, and spread of radioactive material were sometimes made. Lessons were derived from these mishaps, and over time work practices incorporated improved protection of both workers and others.

Primary attention was given at first to protection of those workers most at risk. Practices were developed to provide ample shielding against both routine radiation exposure and the possible receipt of a radioactive dosage from an accident. Containment and confinement of hazardous activities were instituted. Ventilation practices were put in place. Health physics developed as a means of maintaining uncontaminated workplaces and measuring the radiation exposure of workers and their uptake of radioactive material should that occur. These are only examples of the major elements of radiation protection that were developed. These protective measures were incorporated into formal requirements to varying degrees at different AEC sites.

The safety of workers not intimately involved in hazardous activities at a site or facility was treated by guidelines comparable to those for workers at any hazardous industrial site, such as a chemical plant, with the assumption that they had accepted the existence of some degree of hazard when they took the job. Their work kept them either largely or entirely away from hazardous locations. They were taught the fundamentals of radiation hazards, and were instructed in emergency plans to be activated in case of an accident. Their safety was afforded principally by measures taken to protect those of their colleagues who were more at risk.

In addition to the care taken to avoid accidents and the confinement of hazardous activities within protected areas, protection of the public was ensured by locating hazardous activities remotely and on large sites. Wide separation of the hazardous facilities from the public was thereby achieved.

These were the concepts in place prior to the beginning of commercial nuclear power. The advent of licensing of nuclear plants introduced new and more complex practices into the AEC's policies concerning the safety of commercial nuclear reactors. Formal, arms-length, and even adversarial methods were instituted for interacting with would-be licensees. No need was seen, however, to introduce such severe formality into operations at the sites and facilities where the AEC's own operations took place, because these were under the AEC's immediate control. Rather, control of pertinent activities was incorporated into documents applicable to work by operators of AEC activities, chapters of the AEC Manual, and other directives. For the AEC's successor agency, DOE, these documents generally became DOE Orders.

Along the way, as time passed, some of the structure got lost. Because of the wide diversity of operations at DOE sites, only a subset of the Orders was pertinent to the work being done for any given site, facility, or activity. Uncertainty arose as to what portions of DOE's Orders were applicable to the actions of which contractors. As stated in DNFSB/TECH-16, requirements on DOE's operators became the set of specific items spelled out in the contract covering the work. That situation intensified as DOE promulgated several nuclear safety rules enforceable by civil and criminal penalties under the Price-Anderson Act Amendments of 1988.

A second problem also arose. The early habits of integrating safety into operations weakened as the scientists and technicians who had been steeped in the practice began to retire. Section 3.1.1 of DNFSB/TECH-16 ("How Engineering Analysis and Environmental Analysis Became Separate Activities") explains how the essential unity of safety and operations broke down. Recognition of the responsibility of operating line management for the safety of its operations was weakened.

In its Recommendation 95-2, the Board sought to restore the integration of responsibility for safety and operations. The process of restoration is now well under way, and in the following discussion it is assumed to be in place.

3. THE INTEGRATED SYSTEM

As discussed in the documents referenced in Section 2, integrated safety management unites the protective measures instituted for activities, facilities in which activities take place, and sites on which the facilities are located. The protective measures at the site level are those that affect uniformly all facilities and operations at the site. Measures at the facility level are designed to add protection in an enveloping way against hazards of all activities that are envisioned to take place in the facility. Further measures at the activity level are directed to hazards specifically identified for the particular activities.

Integrated safety management at the facility level is conducted in conformance with an authorization basis and an authorization agreement, whose nature is set forth in the documents referenced in Section 2. It is not the function of this report to repeat the material contained in these documents. Here we content ourselves with a statement of the principal features of the safety management system assumed to be in place, as these contribute to the discussion of protection of individuals generally and of collocated workers in particular against possible harmful effects of nuclear radiation. The authorization agreement will lead to the following:

- Site-wide protective measures are in place and are effective. They include policies, practices, and organization for radiation protection, fire protection, and general safety; a safety training organization; and a site emergency plan.

- Each defense nuclear facility has been the subject of an approved Safety Analysis Report (SAR) or the equivalent (e.g., Basis for Interim Operations). The SAR defines the design basis accidents for the facility and presents analysis showing that the consequences of each to the surrounding public would fall below guideline values. The SAR also identifies safety-class structures, systems, and components (SSCs) required to ensure that the guidelines will be met. It identifies safety-significant SSCs needed to protect workers from fatal or disabling effects of accidents, as well as those needed for defense in depth. The SAR is graded according to the degree of hazard of the facility.

- Each nuclear activity of a hazardous nature has been the subject of a process hazard analysis (PHA) or an equivalent review. This analysis identifies the hazards as well as the measures adopted to avert those hazards and perhaps to mitigate them if, in spite of preventive measures, an accident were still to occur. The protective and mitigative measures make up a framework of defense in depth. The analysis is graded according to the degree of hazard of the activity. The PHAs may in principle lead to the identification of additional safety-class or safety-significant SSCs.

- Technical Safety Requirements (TSRs) have been written that encompass all safety-class SSCs and all safety-significant SSCs for all defense nuclear facilities on the site and all defense nuclear activities under way.

- Measures for defense in depth have been defined in the SARs and the PHAs, and they are identified in manuals of practice[1] applicable to all defense nuclear facilities and activities on the site. These measures are directed toward preventing any uncontrolled release of radioactive material and any accidental criticality, and controlling occupational radiation levels to be as low as reasonably achievable (ALARA). Preventive measures are supplemented as appropriate by mitigative measures.

- A system of approved operating procedures, graded according to the complexity and hazard of the situation, is in effect for all defense nuclear activities. Workers who must use the procedures have been trained in them.

- All workers on site have been instructed in the hazards of nuclear radiation and the nature of hazardous activities on the site, to a degree commensurate with their need to be informed.

- Emergency plans are in effect for protection of personnel in the event of an accident.

- The requirement for conformance with the Unreviewed Safety Question (USQ) process of DOE Order 5480.21 is in effect.

[1]See DNFSB/TECH-16, Section 2-1, "DOE's Basis for Establishing Requirements."

4. CLASSIFICATION OF POPULATIONS IN AND AROUND HAZARDOUS NUCLEAR FACILITIES

The following discussion of protection of workers and the public is confined to defense nuclear facilities where hazardous nuclear work is performed, so that protection of individuals at and near the facilities requires special measures. The discussion is also confined to radiation hazards, though with no assumption that nuclear hazards are any more egregious than other kinds. To the contrary, all hazards receive attention in safety programs. The present discussion is simply more limited. The intent is to expound the overall concept of the means by which individuals at and near defense nuclear facilities and sites are protected from radiation hazards at those sites. It will be seen that, properly implemented, the system is complete in coverage, and it works.

The individuals in or near a facility and whose safety must be considered can be grouped in the following categories:

- **Immediate workers**—workers of DOE, DOE's contractors, or subcontractors with mission-related functions, who spend a substantial part of their working day inside the facility in the conduct of their duties. Among these are immediately engaged workers, whose functions require their presence in specially hazardous rooms or areas of the facility.

- **Collocated workers**—individuals who are employees of DOE or of one of DOE's operating contractors or mission-related subcontractors at the nuclear site where the facility in question is located, but who spend little, if any, of their time in the facility.

- **Other on-site worker personnel**—persons at work in support of operations at the site as employees of incidental contractors, such as for construction activities, or employees of privatized facilities on the site, or of leasers of DOE-owned space. These are workers for organizations not contributing directly to the missions of the site. There may be workers whose duties involve them intimately in activities with nuclear hazards at privatized or leased facilities. Protection of these workers from the radiation hazards of their activities could (presumably) be subject to control by licensing authorities, not DOE.

- **Transient on-site personnel**—people engaged in activities such as delivery of equipment and supplies and collection of material to be transported off site. They spend only a small fraction of their time on site in any year.

- **Off-site personnel**—individuals who live or work at locations beyond the boundary of the site, or are temporarily in such places, and are seldom, if ever, on site.

Protection of individuals in each of these categories is detailed in the following sections.

4.1 PROTECTION OF IMMEDIATE WORKERS

The jobs of these individuals require their presence in the facility. The safety measures in effect in the facility are designed primarily to protect the immediately engaged workers, as being those most at risk. As the first step in the PHA of the integrated safety management for an activity, analysis is done to identify the hazards of the operations performed by immediately engaged workers, and to evaluate the severity of those hazards.

The PHA thus begins with a review of possible actions and events that could lead to overexposure of immediately engaged workers to nuclear radiation, or that could cause excessive committed effective dose equivalent (CEDE) through such pathways as breathing, ingestion, or absorption through breaks in the skin. The next step in the PHA is the specification of safety measures required to protect immediately engaged workers from the identified hazards. This is accomplished through a system of defense in depth. The component measures of the defense in depth designed into the facility to protect immediately engaged workers from nuclear hazards fall in the following categories:

- Prevention through use of engineered safety features;
- Prevention through operating procedures;
- Provision for mitigation through engineered safety features;
- Specification of means to arrest an accident sequence should one begin; and
- Design and testing of a plan for emergency evacuation of immediate workers, as part of a larger plan for the entire site.

Semiquantitative estimates of risk may be helpful in devising the measures for appropriate protection. However, eventual determination of adequacy is based on informed engineering judgment. The end product is a set of engineered features and procedures that under normal conditions will maintain the operations within safe limits of operating parameters. These features and procedures are backed up by additional defenses, such as safety systems that can be depended on to function if an abnormality in operations should develop; mitigative measures that tend to restore parameters to within safe limits if they should be exceeded; signals to warn of the development of abnormal conditions; mitigative measures that warn of and limit the release of radioactive material; systems for the confinement of such releases; and emergency plans, including those for evacuation if necessary.

The process of putting the safety controls into effect includes initial establishment of the safety configuration through issuance of the safety management practices and the operating procedures, and verification of the presence and effectiveness of engineered safety features and the system to be used to ensure their continued effectiveness in the future. Putting safety controls into effect also requires training and qualification of immediately engaged personnel in the procedures they are to use and in the purpose and use of protective features and measures. In addition, the process includes radiation training of other immediate workers in the facility, and their indoctrination in such matters as the nature of the hazards present in the facility and emergency measures. Further direction on this matter is given in 10 CFR 835.90(a) of the radiation protection rule.

In order to maintain the effectiveness of the engineered safety features, a program of maintenance and configuration control will normally be required, graded in rigor according to the importance of the feature, in order to prevent poorly planned future maintenance activities from unintentionally degrading the performance of the original design. In some cases, the engineered safety features may be decades old, so that configuration control has been lost. (An example is the ventilation systems in some older DOE plants.) In these cases, operating procedures are carefully designed and maintained to compensate for possible degradation of the safety features resulting from changes made during maintenance or upgrade.

Once the appropriate controls have been identified, approved by the defined process and put into effect, immediately engaged workers can generally be regarded as appropriately protected. Since other immediate workers are at lesser risk, they are also appropriately protected. This conclusion is verified through review of the accident scenarios, and if further measures are necessary in this regard, they are added. The PHA also considers the activity in light of any need for confinement for protection of collocated workers and the public.

4.2 PROTECTION OF COLLOCATED WORKERS

Protection of collocated workers from hazards of nuclear radiation resulting from possible accidents at defense nuclear facilities is generally consistent with common industrial practice for collocated workers at other kinds of hazardous industrial facilities. Indoctrination makes collocated workers aware that certain kinds of hazardous operations are conducted at particular locations on the site, and orientation informs them of the safety measures that protect them and the steps to be taken if further protection is required.

However, the protective measure of greatest importance for protection of collocated workers is confinement of the hazardous materials involved in operations within facilities or within sequestered areas. Effectiveness of the confinement at most hazardous facilities is attained through use of a treatment system for ventilation and discharge of air, designed to capture and retain radioactive material so that it is not dispersed outside. The ventilation systems are fundamentally important for the protection of collocated workers and the public around hazardous defense nuclear facilities. Additional protection is provided by arrangements for evacuation via a designated path to a designated location if the need should arise.

Confinement of operations within buildings with the capability to neutralize fires, localize the effects of criticality, isolate the spread of contamination, and confine the release of radioactive contaminants limits almost all possibility of radioactive exposure and biological uptake of radioactive material to within the structure. These kinds of scenarios would be the most likely of those conceivable to generate hazards. They would threaten primarily immediate workers in the hazardous facilities, and especially immediately engaged workers. For accidents in which consequences are confined in this manner, it can be concluded that appropriate protection of immediate workers also serves even more so as appropriate protection of collocated workers. Protection of collocated workers depends largely as well on the ability of management at the site to control on-site personnel and to move or remove them in response to an emergency should one occur.

In some exceptional circumstances, there could exist unusual scenarios that would particularly affect collocated workers. Some examples that have been encountered were noted earlier; they include possible fires involving combustible plutonium-bearing waste on a loading dock at the Rocky Flats plant, and some accident scenarios leading to stack releases of tritium from a facility at SRS. Protection of collocated workers by means beyond warning signals and evacuation may be necessary in such cases. In this event the system used to protect collocated workers follows the same lines as that for protection of immediate workers; that is, it depends on a system of defense in depth constructed in accordance with good engineering judgment.

To summarize, safety of collocated workers at the more hazardous defense nuclear facilities requires assured confinement of radioactivity within the hazardous facility. Further, and in accordance with good industrial practice, collocated workers are considered adequately protected if, in addition:

- Immediate workers and especially immediately engaged workers are appropriately protected;
- Collocated workers have been indoctrinated in the nature of hazardous nuclear radiation and the existence of hazardous operations;
- Collocated workers know their roles in evacuation plans and other protective steps they may need to take; and
- Appropriate measures have been taken to protect collocated workers from any accidents that might have principal hazardous effects outside the hazardous facilities.

4.3 PROTECTION OF CASUAL ON-SITE PERSONNEL

Typical personnel in this category are members of the crew of a construction subcontractor, engaged in building or modifying an on-site structure other than the one under discussion. Appropriate protection of these individuals is achieved by, in effect, treating them as if they are collocated workers. The protective measures in place for collocated workers are therefore extended to protect regular on-site support personnel as well. Further, the indoctrination provided collocated workers is also given to casual support personnel.

4.4 PROTECTION OF TRANSIENT ON-SITE PERSONNEL

By definition, transient on-site personnel are present only very occasionally and for a small fraction of the time. Any risk assumed by these individuals would be diminished by a factor equal to that fraction of time spent on site.

A level of physical protection appropriate for collocated workers will be even more effective for transient personnel because of their brief presence on site. Transient on-site personnel may be given a reasonable indoctrination in the existence of the hazards and any special emergency measures directed toward their safety.

4.5 PROTECTION OF OFF-SITE PERSONNEL

DOE Orders 420.1 and 5480.23, along with the guidance document DOE-ST-3009, require that a hazard analysis be developed as the basis for a conclusion that off-site personnel are sufficiently protected from accidents at a nuclear facility. That conclusion is to be reached through analysis showing that the estimated individual dose off site from any design basis accident or evaluation basis accident would be less than some guideline amount. No guideline value has been issued by DOE, but a value of 25 rem CEDE is frequently used by DOE's contractors in the absence of a specified value. If the safety analysis and the safety requirements for protection of the surrounding public were to end there, they would be woefully insufficient. In fact, this is not the case. The requirement for defense in depth leads to additional measures to ensure that the facility and the activities within it have also been made safe through avoidance of both uncontrolled release of radioactive material and accidental criticality. These measures of defense in depth are not stated primarily in the SAR, which addresses mainly limiting accidents, but are to be found in the manuals of practice that are described in DNFSB/TECH-16.

EXHIBIT 13

5. SOME FURTHER COMMENTS

For an understanding of the specific basis for protection of collocated workers at DOE's defense nuclear facilities and sites it has been necessary to develop a better understanding of protection of all individuals in and around such a site. The review to provide this understanding has been presented bearing in mind that the historical record is good. There is no pattern of personal injury from nuclear radiation among collocated workers at DOE's defense nuclear facilities and sites, nor is there such a pattern among other groups of individuals at or near these sites. The goal of this review has been to develop and foster understanding of what appears to be an effective system. In developing this understanding, however, it has been found that there are still aspects of the system that need shoring up.

First, there is uncertainty as to the basis for and structure of requirements established in accordance with defense in depth. DOE's guides for integrated safety management (DOE G 450.4-1,2, *Integrated Safety Management System Guide*, and DOE G 450.3-3, *Tailoring for Integrated Safety Management Applications*) help in this respect, making it evident that measures for defense in depth are to be developed through the hazard analysis that is a fundamental part of an integrated safety management program. But the guidance as to which features for defense in depth are to be included among the TSRs and which are to be incorporated in the manuals of practice is not very clear. The importance of this matter lies in the nature of commitments made according to the two kinds of documents. TSRs are commitments that can be changed only with the concurrence of the Principal Secretarial Officer, who is generally an Assistant Secretary of Energy. The manuals of practice can be changed according to the USQ process when it is determined in local review that no unresolved safety question has been generated. In the absence of better guidance, the tendency of contractors is to include as much as possible in the manuals of practice, which are easier to change. That may be a reasonable course, but clarification would be helpful.

Second, certain numerical guidance is still missing. Especially troublesome has been the absence of the evaluation guideline that is referred to in connection with TSRs and safety-class SSCs designed for protection of the public outside the sites. Several years ago, a draft Standard STD-3005 that contained proposed implementation guidelines was circulated and discussed, but in the face of strong technical objections the draft was withdrawn, and no replacement or substitute has since been issued. The references to the evaluation guideline in other Orders and Standards were not removed, however. Lacking anything better, contractors have tended to use a guideline value of 25 rem CEDE for the maximum calculated dose from a design basis accident or a design basis event. A draft Appendix A to DOE-STD-3009-94, *Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Safety Analysis Reports*, was recently put forward, which would codify that practice for designation of safety-class SSCs. Final issuance of that draft document would help considerably to remedy this problem.

This review has shown once more the importance of the confinement properties of ventilation systems at the more hazardous defense nuclear facilities and sites. Their performance capabilities are fundamental to the protection of collocated workers and the public. There is no good reason in such cases why such systems at the more hazardous facilities should be identified as other than safety class, with all the additional reliability and treatment that designation implies. This comment also applies to related systems required for the reliability of the ventilation systems, such as electrical power supplies and filter testing.

Finally, the topic of defense in depth requires more attention than it has received in the past. The concept is an old one; its importance was recognized at the start of the development of nuclear safety concepts. Adequacy of defense in depth underlies all protection of individuals from hazardous aspects of nuclear operations. The determination of its adequacy in any one case is fundamental to acceptance of the program of integrated safety management in that case. It is particularly important to capture the defense-in-depth concept as part of any practice that involves use of the guideline of 25 rem or equivalent.

APPENDIX - LIST OF ABBREVIATIONS AND ACRONYMS

DOE	Department of Energy
Board	Defense Nuclear Facilities Safety Board
SRS	Savannah River Site
Rocky Flats	Rocky Flats Environmental Technology Site
DEAR	Department of Energy Acquisition Regulations
AEC	Atomic Energy Commission
SAR	Safety Analysis Report
SCC	Structures, Systems and Components
PHA	Process Hazard Analysis
TSR	Technical Safety Requirements
ALARA	As Low As Reasonably Achievable
USQ	Unreviewed Safety Question
CEDE	Committed Effective Dose Equivalent