



The Secretary of Energy
Washington, DC 20585

August 22, 2005

The Honorable A. J. Eggenberger
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

We are pleased to forward the enclosed Implementation Plan (Plan) for the Defense Nuclear Facilities Safety Board's (Board) Recommendation 2004-2, *Active Confinement Systems*. This Plan provides the Department's approach for reviewing and upgrading active confinement ventilation systems at hazard category 2 and 3 defense nuclear facilities.

We appreciate the support provided by the Board and your staff during the development of this Plan. We will keep you informed of our progress in its completion. I have assigned Mr. Richard Black, Director of the Office of Nuclear and Facility Safety Policy, Office of Environment, Safety and Health, as the responsible manager for ensuring the Plan's successful completion. Mr. Black can be reached on (301) 903-0104 to answer any questions that might arise regarding details of the Plan and its implementation.

Sincerely,

A handwritten signature in black ink that reads "Samuel W. Bodman".

Samuel W. Bodman

Enclosure

cc:

M. Whitaker, DR-1

J. Shaw, EH-1



U. S. Department of Energy

Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2004-2

Active Confinement Systems



Washington, D.C. 20585

August 2005

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EXECUTIVE SUMMARY

Board Recommendation

On December 7, 2004, the Defense Nuclear Facilities Safety Board (Board) issued Recommendation 2004-2, *Active Confinement Systems*. Recommendation 2004-2 noted concerns with the safety system (safety-class or safety-significant) designation strategy utilized in or planned for several facilities to confine radioactive materials during or following accidents. The Board's main issue is that for the purpose of confining radioactive materials through a facility-level ventilation system, safety system designation should be based on the active safety function (forced air through a HEPA filter system). The Board is concerned that a passive confinement safety function may not be as effective as the active safety function in a few postulated accident scenarios.

In terms of justification of safety system designation, the Board believes in some instances there is a reliance on calculations that may not appropriately account for large uncertainties that are inherent in analyzing accident conditions. It specifically noted the uncertainty of the assumptions related to building leak path factors that are used to calculate the amount of radioactive materials that might escape a building following an accident. In addition, the Board is concerned that in some instances DOE sites may be using the evaluation guideline of 25 rem exposure at the site boundary as a design acceptance criterion for the performance of confinement systems and an allowable dose to the public, contrary to DOE-STD-3009 *Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Safety Analysis Reports* that states that the 25 rem evaluation guideline "is not to be treated as a design criterion."

The Board recommended that DOE disallow designation of passive systems for the purpose of performing the confinement safety function for all new and existing hazard category 2 and 3 defense nuclear facilities. The Board stated that active ventilation systems are expected to be classified as safety-class or safety-significant for hazard category 2 defense nuclear facilities. Exceptions to these requirements are to be approved at a level in DOE that ensures a consistent, conservative approach throughout the complex.

The Board recommended that all applicable DOE directives pertaining to the operation of existing facilities, design and construction of new facilities, and major modification to existing facilities be revised in accordance with the previous paragraph.

It was also recommended by the Board that existing facilities, on-going major modifications, and new design/construction projects be assessed to ensure that safety system designation pertaining to active confinement ventilation functions described above is implemented. In addition, the review should ensure that the 25 rem evaluation guideline is used solely for classification of safety controls.

Secretary Acceptance Response

On March 18, 2005, the Secretary accepted Board Recommendation 2004-2. The Secretary stated that the Department agrees with the Board that DOE cannot rely solely on passive building confinement when such reliance cannot be justified. The Department agreed that active building ventilation confinement systems can provide added safety

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benefit and are normally the preferred alternative when a building confinement safety function is needed to provide adequate protection to the public or collocated workers. The Recommendation was accepted based upon the understanding that it can be implemented as follows: DOE will proceed to review all hazard category 2 and 3 defense nuclear facilities. The review criteria will be based in large part on the Department's existing regulatory infrastructure, requirements, and methodologies established in 10 CFR Part 830, DOE Order 420.1A, DOE-STD-3009, and related guidance documents. First, DOE will establish criteria to exclude certain facilities and operations from further review based on sound safety considerations. The Secretary's response stated that facilities not excluded by these criteria would be reviewed to ensure that the selected confinement strategy is properly justified and documented. Priority would be given to design and construction projects, including ongoing major modifications of existing facilities.

For facilities not excluded, this implementation plan directs that a system evaluation will be completed. The system evaluation is broken into two components -- one for those ventilation systems that are currently identified as safety related (safety class or safety significant), and one for those ventilation systems that are not safety related (note this may also include some facilities that do not have ventilation systems, see discussion below). The overall focus of these system evaluations will be to (a) verify that appropriate performance criteria are derived for ventilation systems, (b) verify that these systems can meet the performance criteria, if applicable, and (c) determine if any physical modifications are necessary to enhance safety performance. As necessary, the system evaluations will also include a determination of whether appropriate safety system designation has been made.

As part of the confinement system evaluation, DOE will develop a methodology to evaluate the cost-benefit considerations that are inherent in any DOE decision on potential system upgrades that may enhance performance. The intent of this effort is to provide DOE decision makers a way to focus on and prioritize those modifications to the active confinement ventilation system that are most likely to significantly improve their safety performance. Adequate protection of the public and workers will be evaluated in the first instance without regard to the cost of potential upgrades. Cost-benefit considerations will be applied only after the safety adequacy of existing confinement strategies has been assessed and approved by DOE.

Priority will be given to design and construction projects (new facilities), including ongoing major modifications of existing facilities. Sites will be instructed to perform their reviews on these facilities prior to existing facilities so as to minimize any potential impacts on the design and construction process. For existing facilities, the Department expects that completing this recommendation will demonstrate that a long history of requiring active confinement ventilation functions in defense nuclear facilities exists. It is the Department's general expectation that these continuously operating systems will function as intended for the large majority of off normal events or accident conditions. Notwithstanding this, the Department also recognizes the usefulness of ensuring that these confinement ventilation systems are reviewed to ensure their appropriate role from a safety system functional perspective, and to determine if any system modifications are necessary and justified.

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In the Secretary's response, it was stated that the Department understands the Board recommendation is based on a fundamental premise that a more prescriptive safety requirement is likely needed to institutionalize the application of these principles at defense nuclear facilities. DOE further committed to assessing the need to make changes to DOE directives after all facility-specific reviews are concluded and changes to the safety approach have been made where necessary.

1. Definitions

Confinement – A building, building space, room, cell, glovebox, or other enclosed volume in which air supply and exhaust are controlled, and typically filtered. [DOE-HDBK-1169-2003]

Confinement System – The barrier and its associated systems (including ventilation) between areas containing hazardous materials and the environment or other areas in the facility that are normally expected to have levels of hazardous materials lower than allowable concentration limits.

High-Efficiency Particulate Air Filter or HEPA Filter – A throwaway extended-pleated-medium dry-type filter with (1) a rigid casing enclosing the full depth of the pleats, (2) a minimum particle removal efficiency of 99.97 percent for particles with a diameter of 0.3 micrometers, and (3) a maximum pressure drop of 1.0 in.wg. or 1.3 in.wg. when clean and operated at its rated airflow capacity. [DOE-HDBK-1169-2003]

Ventilation System – The ventilation system includes the total facilities required to supply air to, circulate air within, and remove air from a building/facility space by natural or mechanical means. [DOE-HDBK-1169-2003]

Confinement systems, including associated ventilation systems, need to effectively perform their required safety functions for the design basis accidents they are required to withstand. The decision to use an active or passive confinement feature should be based on the type of activity or event that is being confined by such a system. For ventilation systems the intended safety functions are typically active functions, to protect the confinement integrity of selected confinement barriers by providing the motive force that applies a negative pressure differential between areas of lower contamination to areas of higher contamination (what is intended by the term “*active confinement ventilation system*”). In a like manner the terminology “*passive confinement system*” refers to the functional performance of selected barriers as related to passively (no motive force) confining (containing) hazardous materials. The focus for this implementation plan is on active confinement ventilation systems in a building that remove air via mechanical means.

2. Background

The Department is confident that defense nuclear facilities are being designed, built, and operated in a safe manner which provides a very conservative margin of safety for workers and the public. The performance of the Department in terms of nuclear safety over the years has been excellent. Over the past several years the complex has substantially improved the quality and technical adequacy of documented safety analyses (DSAs), and the identification and implementation of preventive and mitigative safety features for defense nuclear facilities. Notwithstanding improvements in recent years in analysis techniques and safety features, it is possible that this review effort will ultimately provide further insights and safety system designation strategies that will result in an

overall improvement in the manner in which the Department designs, constructs, modifies, and operates defense nuclear facilities. These insights, strategies and techniques will be captured in revisions and improvements to DOE O 420.1A, *Facility Safety*, implementing guides and standards, as warranted.

For the Department's existing facilities, the reliability and effectiveness of ventilation systems, most of which were designed and installed years ago, have been matters of special attention by the Board and DOE for many years. Ventilation systems in many defense nuclear facilities provide important safety functions. Strong reliance on these systems is an integral part of protection of the public and workers against radiological hazards. This generally holds true whether or not the Department explicitly takes credit for these systems as part of addressing specific accidents in the DSA. The Department's overall position is that confinement ventilation systems play a key role in confining hazardous materials at defense nuclear facilities. The need to pay increased attention to the design and operational reliability of the confinement ventilation systems at defense nuclear facilities continues to be a high priority.

DOE and its contractors have expended significant resources over the years in formalizing expectations, establishing standards, improving system reliability, and institutionalizing assessment programs for confirming the reliability of ventilation systems. A partial discussion is provided to illustrate the Board's interest in this area, as well as the efforts of DOE and its contractors.

In March 1995, the Board issued DNFSB/TECH-3, *Overview of Ventilation Systems at Selected DOE Plutonium Processing and Handling Facilities*, which addressed the design of confinement ventilation systems. In its June 15, 1995, letter forwarding that report, and in subsequent correspondence in July 1995, the Board requested that DOE evaluate the design, construction, operation, and maintenance of ventilation safety systems in terms of applicable DOE and industry standards.

In its letter dated October 30, 1997, the Board pointed out several additional key issues associated with wetting of HEPA filters during tests of fire sprinkler systems, and the need for complex-wide guidance for DOE concerning the relationship between maintaining filter integrity and fire fighting strategies. In June 1999, the Board issued a technical report addressing DOE's infrastructure supporting effectiveness of HEPA filters, DNFSB/TECH-23 *HEPA Filters Used in the Department of Energy's Hazardous Facilities*. Additional Board technical reports, such as DNFSB/TECH-26 *Improving Operation and Performance of Confinement Ventilation Systems at Hazardous Facilities*, have been provided to DOE.

On March 8, 2000, the Board issued Recommendation 2000-2, concerning the degrading conditions of vital safety systems and the capability to apply engineering expertise to maintain the configuration of these systems. Specifically, the Recommendation concluded that degradation of confinement ventilation system reliability and operability might be approaching unacceptable levels. In response, DOE developed an extensive implementation plan to baseline the operational readiness of safety systems (including ventilation systems),

strengthen safety system expertise, and enhance the capability to routinely assess the condition of safety systems. While the Department's review identified several improvements related to strengthening configuration management programs with specific attention to system degradation, systemic degradation of confinement ventilation system reliability and operability was not found.

Throughout this period the Department has worked hard at improving the equipment, personnel, procedures and overall reliability of the confinement ventilation systems. Extensive assessments, corrective action plans, and new directives have been implemented over the years with the goal of improving system operability throughout the complex, such as the Recommendation 2000-2 Implementation Plan and the Department's report and action plan addressing issues raised in DNFSB/TECH-23. DOE completed the update of DOE-HDBK-1169-2003, *Nuclear Air Cleaning Handbook*, which provides comprehensive guidance for the design, construction, maintenance, testing and operation of confinement ventilation systems. The Department established federal safety system oversight programs and contractor system engineering programs, with the specific intent of improving overall system reliability and operability. DOE is in the process of implementing these programs at the sites.

3. Baseline Assumptions

The DOE-STD-3009, *Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Safety Analysis Reports*, and DOE G 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for use with DOE O 420.1, Facility Safety*, process for determining controls and functionally classifying them is fundamentally sound. Similarly, other DOE directives and guides associated with implementing nuclear safety are also adequate; however, clarification and amplification in certain areas may be needed. Specifically, the application of the off-site evaluation guideline will be reviewed to determine if additional guidance is necessary to ensure appropriate use of this guideline. The review process described in this implementation plan will assist DOE in determining the nature and extent of any changes.

4. Underlying Causes

In some situations there may be a misapplication of the Department's guidance at some facilities regarding confinement requirements and the analysis of accident consequences. DOE reviewers may not have always verified leak path factors claimed in the passive confinement analyses. In addition, DOE lacks specific guidance on analyzing existing facility safety systems for functionality and safety upgrades. System Evaluation is a consideration in the review and approval of Documented Safety Analysis (see section 4.3.X.4 and 4.4.X.4 of DOE-STD-3009). As part of completing these system evaluations it is recognized that requiring explicit design reconstitution is not beneficial. However, it is not clear whether enough has been done to verify that the appropriate performance criteria were derived for confinement ventilation systems, with a subsequent verification that the performance criteria can be met. In meetings with the Board staff, the

Department was encouraged to develop an overall approach that includes some type of assessment that considers current ventilation system design codes and standards as part of this verification.

5. Discussion

Hazardous operations at DOE facilities are typically located inside a confinement, versus a containment that is used in U.S. commercial nuclear power plants. The overall confinement function usually consists of the entire building structure and associated ventilation system(s). The building is maintained at a negative pressure relative to atmosphere by the ventilation system, which is an assortment of several subsystems that cascades the building negative air pressure from areas of lesser contamination to areas of greater contamination, with some intermediate contaminant removal via filtration. Prior to being exhausted from the building, the air undergoes filtration, sometimes through multiple stages of filters, such as prefilters, demisters, adsorbers, HEPA filters, and final filters. Air is supplied to the building by various air supply systems. Typically, air is supplied at a rate slightly less than it is exhausted, such that a vacuum can be maintained throughout the facility. Air may also “leak” into the building through door seals or penetrations and account for the mismatch between supply and exhaust. Various dampers and valves are usually employed to direct the air to specific locations. Theoretically, with the building maintained at a negative pressure relative to atmosphere, all of the air that enters the building should exit only after it is filtered during normal operating conditions and potentially during certain accident conditions.

From a safety system and safety function perspective, the Department recognizes that the Board desires a more prescriptive approach for designating confinement ventilation systems (inclusive of their active safety function) as safety-class or safety-significant for all non-excluded hazard category 2 defense nuclear facilities. Determination of the best way to address this perspective within the DOE directives system will be addressed as part of identifying the changes that may be necessary in DOE Orders, Guides, or Standards. In the interim, the Department will review all new facilities and facilities undergoing major modification from the perspective that a more prescriptive designation of safety systems may be needed.

As stated in the Secretary’s acceptance of Recommendation 2004-2, the Department agrees with the Board that DOE cannot rely solely on passive building confinement, from a safety system designation and safety function perspective, when such reliance cannot be justified. Issues that can impact confinement performance and reliability include the following.

- Several factors may cause the facility to “breathe,” or “exhale.” “Breathing” can be caused by the diurnal sun cycle that leads to the heating and cooling of the building and consequent expansion and contraction of the building air. Since the building seeks to remain at atmospheric pressure, it will breathe, hopefully through a pre-established filtered pathway, to accommodate the expansion and contractions within the building. Changes in barometric pressure act in somewhat the same way.

- The building can “exhale” by several mechanisms. Fires can cause the air to exhale from the building, as can the release of compressed gases. Strong winds can create a vacuum on the leeward side of the building and pull air through various penetrations.
- Cracks and damaged confinement penetrations, particularly following an earthquake, can provide potential unfiltered leakage pathways. In addition, during a seismic event unsecured items (e.g., waste containers, tools, and equipment) could move and possibly endanger the confinement boundary. An important point here is the tradeoff between protecting the material at risk from damage during a seismic event, versus allowing certain release and providing for filtration. In some cases, upgrades to secure material are more safety beneficial and cost effective.
- Under normal conditions door seals will leak. If there is no impediment to in-flow during normal operations, there will be no impediment to out-flow during passive confinement conditions. Doors are also susceptible to permanent distortion resulting from seismic events, at the doorframe to building mounting as well as the door to the doorframe mounting. The amount of expected distortion and resultant leakage pathway should be taken into consideration in the safety basis. As discussed in the Board’s recommendation, emergency response personnel entering and exiting a facility can produce substantial leakage pathways, possibly resulting in unfiltered releases of contaminants.
- Inlet and exhaust duct penetrations are another potential leakage pathway. As with doorways, the attachment of the ductwork to the structure represents a potential failure point that should be analyzed. In addition to the penetration itself, the extension of the ductwork into the facility also offers a potential bypass leakage pathway, as the skin of the ductwork is actually an inward (or outward) extension of the confinement boundary. This boundary should end with a testable isolation valve or a seismically designed filtration system. Obviously, all penetrations through the ductwork up to the point of isolation represent potential bypass leakage pathways and should be limited and testable. Potential problem areas include fan shaft seals, boots on fans, valve and damper shafts, instrument penetrations, and electrical penetrations.
- Besides bypass leakage considerations, another potential challenge to relying on passive systems to confine radioactive materials involves post-accident sampling. Without sample flow, installed instrumentation will not work. In addition, all the leakage cannot be directed past the monitor. The use of post-accident field sampling lacks accuracy and timeliness. There is no assurance that the air being measured represents the total threat, and the time to gather and analyze a sample precludes a timely protective action response.

As the Secretary stated, DOE agrees that active confinement ventilation systems can provide added safety benefit and are normally the preferred alternative when a building confinement safety function is needed to provide adequate protection to the public or collocated workers. There are limitations of computational models and assumptions used for determining leak path factors when evaluating confinement performance. As a result,

the Department agreed to perform another check at how safety system designation is implemented and assess the need for institutionalizing more prescriptive safety system requirements.

6. Summary of Completed and Near-Term Actions

As a result of Board Recommendation 2004-2, the Department is initiating a system evaluation of the confinement ventilation systems throughout the complex in order to identify those facilities where improvements may be warranted. Upon completion, the Department will use the results of this assessment and associated technical insights and safety bases information to determine the need for more prescriptive requirements regarding ventilation systems used in hazard category 2 and 3 defense nuclear facilities. To reiterate the Department's expectation – the highest level of priority should be given to new facilities and facilities undergoing a major modification to ensure an appropriate active confinement ventilation safety function is being designed, built, and maintained in accordance with established DOE standards and guides. New facilities and facilities undergoing major modification may only be excluded from this expectation based upon their proposed mission (e.g., tritium-only hazards, outside storage facilities) where an active confinement ventilation system is not needed, impractical or not effective.

7. Methodology

The Department is committed to improving the overall reliability and operability of systems designed to confine hazardous materials during normal, off normal, and accident conditions. The ventilation system, an integral part of this confinement strategy, is of particular importance. The implementation plan methodology initially will screen out many of the Department's defense nuclear facilities to ensure resources are focused on those remaining facilities where potential opportunities for risk improvement may be realized.

Priority will be given to new facilities and facilities undergoing major modification. Therefore, the process for evaluating and reporting information, and the initiation of any corrective measures should be performed on these new/modified facilities prior to existing facilities. The methodology supports both new and existing defense nuclear facilities; however, for new facilities the safety system designation and associated ventilation systems will be reviewed more expeditiously in order not to significantly impact mission and schedule.

Reference should be made to Figure 1 showing the process described in this implementation plan.

DOE IMPLEMENTATION PLAN FOR DNFSB RECOMMENDATION 2004-2

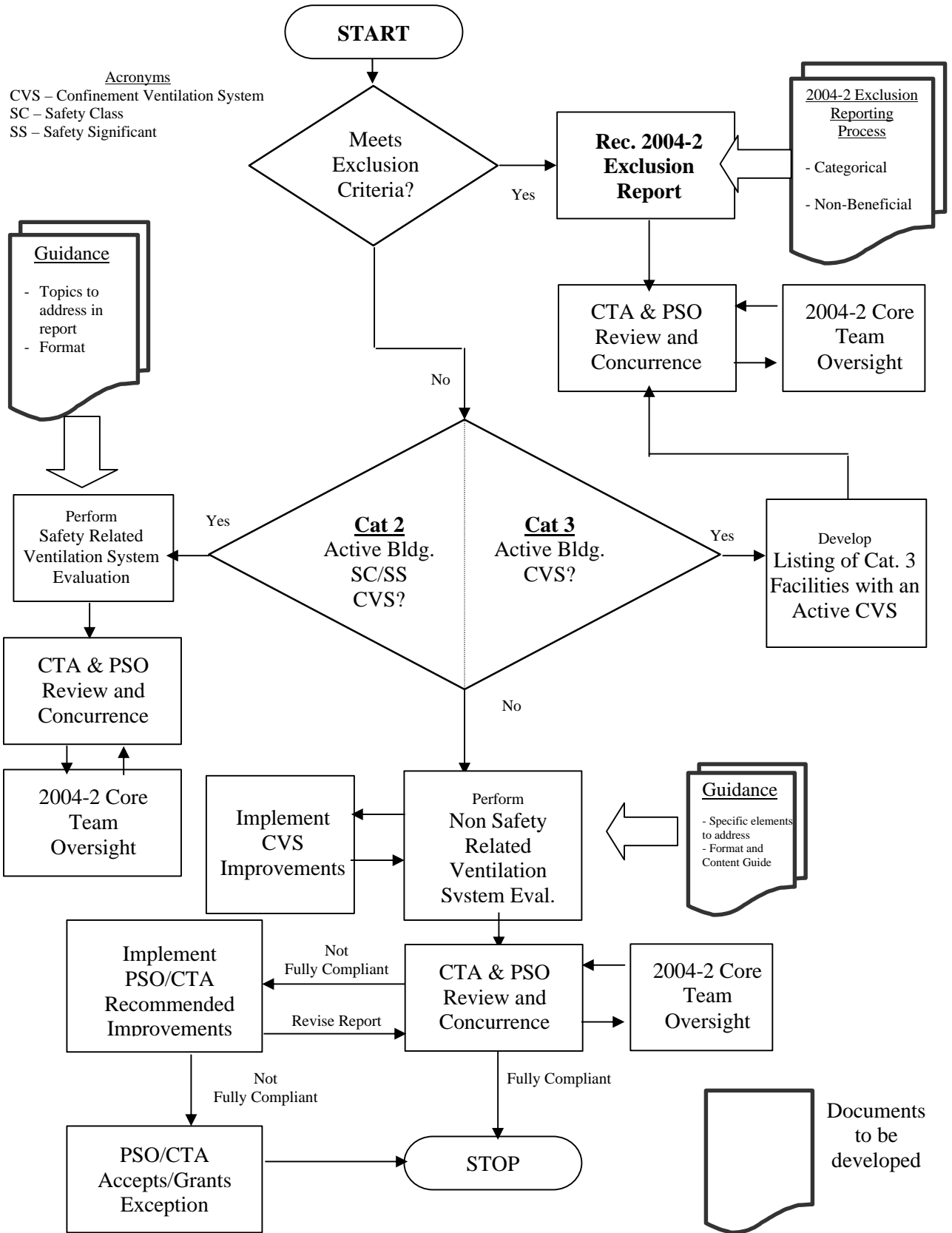


Figure 1 Recommendation 2004-2 Methodology

7.1 *Overview of Activities*

The overall methodology for satisfying the requirements of this implementation plan consists of specific actions and reports that may be required, based upon the mission, characteristics, hazard categorization, and existing confinement ventilation system currently in-place for a particular facility. Each of the deliverables will be discussed in detail. In support of these tasks, the 2004-2 Core Team (discussed below) will issue specific documents that provide guidance and the process for completion of the various reports, evaluations, and listings. The primary documents site or field offices will submit consist of:

- **Recommendation 2004-2 Exclusion Report** – This report is a listing of facilities that are excluded from further evaluation under this implementation plan based upon meeting Categorical Exclusion (CE) criteria or Non-Beneficial (NB) criteria. This report is addressed further in Section 7.4 *Recommendation 2004-2 Exclusion Report*.
- **Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System** – This facility listing will identify new and existing hazard category 3 facilities with an active confinement ventilation system that were not excluded in the site's *Recommendation 2004-2 Exclusion Report*. This listing is addressed further in Section 7.5 *Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System*.
- **Safety Related Ventilation System Evaluation** – This facility-level report will identify the safety related ventilation system safety functions, functional requirements, and performance criteria addressed in the DSA. A system evaluation will be completed to verify that appropriate performance criteria have been derived, and to verify that the identified system can meet these performance criteria. The system evaluation will also identify, as appropriate, those value added physical modifications that may be necessary. As outline below (see Section 7.6), the system evaluation will also include a consideration of the current ventilation system codes and standards as part of developing a workable list of performance and/or design expectations. This report is addressed further in Section 7.6 *Safety Related Ventilation System Evaluation*.
- **Non Safety Related Ventilation System Evaluation** This facility-level report will be submitted for each following facilities:
 - (1) Facilities that were not excluded in the site's *Recommendation 2004-2 Exclusion Report*,
 - (2) Hazard category 2 facilities that do not have a safety-class or safety-significant confinement ventilation system, and
 - (3) Hazard category 3 facilities that do not have confinement ventilation systems.

Because these facilities either lack physical ventilation systems, or lack designation of these systems as safety related, the initial focus of this evaluation will be to determine if safety system designation changes are needed. With respect to appropriate system evaluation, this will use the same overall approach developed to assess safety related ventilation systems. This report is addressed further in Section 7.7 *Non Safety Related Ventilation System Evaluation*.

7.2 *Recommendation 2004-2 Core Team*

A Recommendation 2004-2 Core Team Charter will be developed to formalize the composition and responsibilities of the team. The Core Team will work closely with the appropriate Central Technical Authority (CTA) (as established under Board Recommendation 2004-1) and Program Secretarial Offices (PSOs) to ensure concerns and issues are appropriately addressed. The 2004-2 Core Team will provide non-supervisory senior management oversight and technical expertise to coordinate the overall DOE response to this recommendation. The 2004-2 Core Team ensures consistent and timely completion of the various 2004-2 Implementation Plan deliverables listed below, and provides feedback to the Board in matters pertaining to successful completion of this plan. The CTA and PSO representation on the Core Team will facilitate review and concurrence of guidance and deliverables from their respective PSO organizations.

The composition of the Core Team and Core Team Charter will be based on input and concurrence from appropriate CTAs and PSOs. As Chairperson, the Director, Office of Nuclear and Facility Safety Policy and the PSOs will consider the following qualifications (knowledge or experience) when selecting and assigning core team members:

- Nuclear safety basis requirements, including 10 CFR Part 830, DOE-STD-3009, and DOE Order 420.1A
- Defense nuclear facility confinement ventilation systems
- Computer codes used for modeling conditions following certain accidents
- Leak path factors and associated computer codes for calculating
- Defense nuclear facility design requirements
- Defense nuclear facility operations and maintenance
- Back fit and cost-benefit analysis

7.3 *Listing of New Facilities and Facilities Undergoing Major Modification*

One of the first actions taken will be to accurately identify new category 2 and 3 defense nuclear facilities, including those undergoing major modification. This listing will ensure the facilities listed are given the highest priority in completing the activities addressed by this implementation plan. The facility listing will be prepared and submitted for site or field office review and approval. The appropriate CTA and PSO will review this listing and provide concurrence. The 2004-2 Core Team will provide non-supervisory oversight of this process. The *Listing of New Facilities and Facilities Undergoing Major Modification* is Commitment 8.1.

7.4 *Recommendation 2004-2 Exclusion Report*

Using a *Recommendation 2004-2 Exclusion Report*, defense nuclear facilities that can be categorically excluded by site or field offices from the analysis as a result of the nature of their operations will be eliminated from further consideration. The development of these exclusion criteria will be based on sound safety considerations, and will be provided to the sites in the *Recommendation 2004-2 Exclusion Reporting Process* (Commitment 8.2).

As acknowledged by the Board, certain hazard category 2 and 3 defense nuclear facilities would not benefit from a confinement ventilation system and can be excluded based upon Categorical Exclusion (CE) criteria. Examples include facilities that store radioactive material in protected, safety-class containers, tritium facilities, outside storage locations, and burial grounds. The CE criteria will be developed in the *Recommendation 2004-2 Exclusion Reporting Process*.

Some facilities with planned declining nuclear material inventories and which are scheduled for decommissioning in the near future or because of their life cycle stage considerations can be excluded based upon Non-Beneficial (NB) criteria. In addition, the existing facilities that utilize once-through process ventilation systems, such as many aspects of the Tank Farm facilities at Hanford and Savannah River sites, would be considered for exclusion under the NB criteria. These exclusions will be justified. New facilities and facilities undergoing major modification cannot be excluded from further review based on only NB criteria. The NB criteria will be developed in the *Recommendation 2004-2 Exclusion Reporting Process*.

The appropriate site or field office will review and approve the site's *Recommendation 2004-2 Exclusion Report* (Commitment 8.3) and forward it to the CTA and PSO for review and concurrence. The 2004-2 Core Team will oversee the adequacy of this process.

7.5 *Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System*

For hazard category 3 defense nuclear facilities with an active confinement ventilation system that are not excluded in the *Recommendation 2004-2 Exclusion Report*, a facility listing will be prepared and submitted for site or field office review and approval. The appropriate CTA and PSO will review this listing and provide concurrence. No further evaluation as part of this implementation plan is required for these facilities since these facilities have only localized consequences, and therefore the safety function of a ventilation system is primarily for in-facility workers, not as a confinement for protection of collocated workers. The 2004-2 Core Team will oversee the adequacy of this process.

The *Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System* is Commitment 8.4.

7.6 *Safety Related Ventilation System Evaluation*

For hazard category 2 defense nuclear facilities that have safety-class or safety-significant building confinement ventilation system that performs an active safety function, a *Safety Related Ventilation System Evaluation* will be required. This applies to both new and existing facilities. This facility-level review will verify that the performance criteria identified for the ventilation system in the related DSAs are appropriate, and can be met. This facility review will accomplish the Secretary's stated intent in his March 18, 2005 acceptance letter for Recommendation 2004-2 that facilities not excluded will be reviewed to ensure that the selected confinement strategy is properly justified and documented. As part of this assessment a determination will be made whether the installed system requires modification or upgrade. The basic approach for the system evaluation will be in accordance with the requirements in DOE-STD-3009, sections 4.3.X.4 and 4.4.X.4, but with an explicit consideration of current ventilation system codes and standards. An outline for this assessment is discussed below. This evaluation is intentionally not labeled a formal design adequacy evaluation for two reasons: (1) in order not to imply that any type of design reconstitution is necessary, and (2) as discussed below, formal line-by-line codes and standard comparison is not necessary.

The overall intent for completing these system evaluations is to (a) verify that ventilation system performance criteria are appropriately derived, (b) verify that the criteria are met, and (c) explicitly assess the need for value added improvements and upgrades to improve or ensure adequate performance of ventilation system safety functions. While this does not preclude identifying changes to procedures, equipment, and training, the focus will be on adequacy of the physical ventilation system. In addition, the system evaluation will also reaffirm the functional classification of the SSCs associated with the confinement ventilation safety functions. Safety significant and safety class SSCs will be reviewed to determine if their designation was appropriate.

The 2004-2 Core Team will issue a guidance document to the sites that will further amplify specific topics to be addressed in each facility *Safety Related Ventilation System Evaluation*. This guidance document will be provided to the CTAs and PSOs for review and concurrence and will be the basis for any changes to DOE directives as outlined in Section 7.8 below. The overall challenge is to integrate the use of current ventilation system design codes and standards into the overall approach for verifying that ventilation system performance criteria are properly defined and met. The Department will proceed along this path with the intent that such an exercise may reinforce performance expectations for ventilation systems. This may include physical upgrades and modification to these systems if they cannot achieve the appropriate performance expectations.

The Core Team will assemble a subject matter expert group to review the ventilation system design criteria, codes and standards contained in DOE G 420.1-1, the DOE Nuclear Air Cleaning Handbook, and associated appropriate DOE Standards. The subject matter expert group will review the ventilation system codes and standards to understand and identify differences between those that would be derived for a non-safety related design versus a safety related design. Based on this review, a reasonable, workable list of generic ventilation system performance and/or design attributes will be developed. These performance and/or design attributes would result in appropriate performance expectations for evaluating ventilation systems against safety functional requirements defined in facility-specific DSAs, including system requirements to perform during abnormal and accident conditions as established in the DSAs.

To ensure that this represents a workable approach, and to identify an adequate set of performance and/or design attributes, the Department will hold a workshop to review the material developed by the subject matter expert group. The overall objective for the workshop will be to develop the approach to be used to complete facility specific system evaluations. This workshop is necessary to ensure that the approach developed avoids unnecessary repetition of DSA work and/or safety system operability reviews, and will focus on appropriate physical aspects of confinement ventilation systems.

In addition to a set of performance and/or design attributes derived from current codes and standards, the workshop will also provide a forum to develop a methodology to evaluate the cost-benefit considerations that are inherent in any DOE decision on potential system upgrades that may enhance performance. The intent of this effort would be to provide focus on and prioritize those modifications to the active confinement ventilation system that are most likely to significantly improve their safety performance. Cost-benefit considerations will not be applied, however, to assess the safety adequacy of existing confinement strategies. Adequate protection of the public and workers will be evaluated in the first instance without regard to the cost of potential upgrades. All workshop deliverables, will be reviewed and approved by appropriate PSOs and CTAs prior to facility-specific use.

The facility specific system evaluation would first identify the safety functions, functional requirements, and performance criteria for safety related ventilation systems from the DSA. As necessary, assumptions regarding leak path factor will be identified at this stage. The evaluation will then explicitly consider all of the generic performance and/or design expectations, but with an initial screen that appropriately eliminates those expectations associated with specific accident conditions that are not significant from a release standpoint for the specific facility being assessed. For example, if the active ventilation system is not credited in a seismic accident condition there is no need to evaluate a seismic performance and/or design attribute for the ventilation system. Also, any seismic impact on the confinement ventilation system performance will be based on the current seismic analysis in the DSA.

For those generic ventilation system performance and/or design expectations that are not screened out, a system evaluation would be completed, judging the existing ventilation system against the intended generic performance and/or design expectations developed by the Core Team. As noted above, this evaluation will not require design reconstitution but rather, using available data, engineering judgments supported by sound technical justification and/or calculations will be made regarding the ability of the existing ventilation system to meet these expectations with sufficient confidence. The system evaluation will explicitly assess the need for any system upgrades, using the consistent cost-benefit method developed as a result of the workshop. The system evaluation may also result in recommended changes to procedures or other administrative actions.

The above outline will be applied to a few facilities (at least one each from NNSA and EM) as a pilot to gain additional confidence on consistent and efficient application. The *Safety Related Ventilation System Evaluation Guidance* document is Commitment 8.5. As part of meeting commitment 8.6, the Department may sequence facilities in series, so that appropriate adjustments could be made to the overall approach being considered. Such changes will be formally documented as part of the overall completion of Commitment 8.6.

The appropriate site or field office will review and approve each *Safety Related Ventilation System Evaluation* prepared and forward it to the appropriate CTA and PSO for review and concurrence. The 2004-2 Core Team will provide non-supervisory oversight of this process.

7.7 Non Safety Related Ventilation System Evaluation

The following facilities will be required to prepare a *Non Safety Related Ventilation System Evaluation* (note that this applies to both new and existing facilities) (Commitment 8.8):

- Hazard category 2 defense nuclear facilities that do not have safety-class or safety-significant confinement ventilation systems that perform an active safety function and that are not excluded in the *Recommendation 2004-2 Exclusion Report*.

- Hazard category 3 defense nuclear facilities that do not have active confinement ventilation systems and that are not excluded in the *Recommendation 2004-2 Exclusion Report*.

Each site or field office will initially prepare a report explaining their existing confinement approach, because these facilities either lack physical ventilation systems, or lack designation of these systems as safety related. Thus, the initial focus will be to determine if safety system designation changes are needed.

Similar to the *Safety Related Ventilation System Evaluation*, hazard category 2 facilities will complete a ventilation system evaluation to determine if physical upgrades are needed and justified. Given that these systems are not safety related, the use of defined functional requirements and performance criteria is not possible. Surrogate performance criteria will need to be defined for these systems so that the overall approach using the guidance developed as part of Commitment 8.4 can be used. For hazard category 2 facilities the decision not to designate ventilation system SSCs as safety-related will be closely reviewed and documented. Consistent with the reviews of safety related ventilation systems described in Section 7.6, these evaluations will uphold the Secretary's commitment that "DOE cannot rely solely on passive building confinement when such reliance cannot be justified."

The 2004-2 Core Team in the *Non Safety Related Ventilation System Evaluation Guidance* document (Commitment 8.7) will provide specific guidance regarding the issues to be reported and the format for this report. This guidance document will utilize the approach for completing a *Safety Related Ventilation System Evaluation* (Commitment 8.5 Guidance) and will include additional guidance on addressing the safety system designation issue. While this guidance is anticipated as a separate deliverable (Commitment 8.7), it may be combined with Commitment 8.5 as a single integrated guidance document. The CTAs and appropriate PSOs will review and concur with the guidance document.

Similar to the *Safety Related Ventilation System Evaluation*, this review may identify areas for improving the performance expectations of the ventilation system. These recommendations will be also documented in the *Non Safety Related Ventilation System Evaluation*. The appropriate site or field office will review and approve each *Non Safety Related Ventilation System Evaluation* and forward it to the appropriate CTA and PSO for review and concurrence. The CTA and PSO will evaluate the logic and completeness of this report and either fully accept the report or provide recommendations for improving the ventilation system performance expectations, as appropriate. Discussions among the CTA, PSO, and site personnel will result in a final revision of the report, encompassing the final agreed upon set of system modifications and upgrades, if any. The PSO having jurisdiction over the facility must grant an exception to the facility for any recommended improvements that will not be implemented. The 2004-2 Core Team will oversee the implementation of this process. The development of this *Non Safety Related Ventilation System Evaluation* may cause the facility management to implement changes in safety basis documents, hardware,

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compensatory measures, or other areas. These are to be addressed in the *Non Safety Related Ventilation System Evaluation*, along with anticipated completion dates.

7.8 *Directives Review and Lessons Learned*

Based upon the results of the workshop and the results of initial safety related ventilation system pilot evaluations identified in Section 7.6, the 2004-2 Core Team will evaluate the need for changes to DOE directives in two steps. In order to obtain wider field experience and input for evaluation guidance and standards, DOE will develop draft guidance documents as a result of the workshop and submit these documents for DOE-wide review and comment (Commitment 8.5.5) Based on DOE-wide input and comment and the lessons learned from the performance of work under this implementation plan that will be documented, plans will be further developed for implementing any needed directive changes (Commitments 8.8 and 8.9). This evaluation will consider changes to DOE G 420.1-1 regarding the application of the evaluation guideline for designation of safety systems for new facilities and major modifications to existing facilities. It is possible that more prescriptive safety directives and institutionalizing the application of these principles at defense nuclear facilities will be necessary. The Office of Nuclear and Facility Safety Policy (EH-22) will be responsible for developing any necessary revisions to DOE directives. Any proposed revisions will be vetted through the 2004-2 Core Team and the Board and technical staff before issuing for DOE-wide directive review and comment.

7.9 *Reporting*

Throughout this process, DOE will provide periodic briefings and reports to the Board on the status and results of the actions addressed in this implementation plan (Commitment 10.1).

8. Implementation

Two workshops were held in April-May 2005 with senior Department personnel and representatives from sites throughout the complex to develop the methodology and implementation strategy to meet the expectations of Board Recommendation 2004-2. As a result, the following actions were determined to be necessary to adequately address the Board's concerns and achieving improvement in the safety posture of the DOE complex.

For some commitments, there are two "Due Dates" shown, one for "New Facilities" and the other for "Existing Facilities." This reflects the priority being placed on new facilities and facilities undergoing major modification.

Commitment 8.1 – Listing of New Facilities and Facilities Undergoing Major Modification

The site or field office will develop a listing of new category 2 and 3 defense nuclear facilities, including those undergoing major modification. Priority will be given to these facilities when completing the activities addressed by this implementation plan. The facility listing will be reviewed and approved by the site or field office. The appropriate

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CTA and PSO will review this listing and provide concurrence. The 2004-2 Core Team will provide oversight of this process.

Lead Responsibility: DOE Heads of Field Organizations
Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.1: *Listing of New Facilities and Facilities Undergoing Major Modification*

Due Date: September 30, 2005

Commitment 8.2 – Recommendation 2004-2 Exclusion Reporting Process

The 2004-2 Core Team will develop the *Recommendation 2004-2 Exclusion Reporting Process* to be utilized for the initial screening of facilities subject to further review and analysis under this implementation plan. This process will be provided for review and comment from appropriate site, facility or technical experts, including the Board. The final process will be approved by the 2004-2 Core Team with the concurrence of the CTAs and PSOs as needed.

Lead Responsibility: Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.2: *Recommendation 2004-2 Exclusion Reporting Process*

Due Date: October 30, 2005

Commitment 8.3 – Recommendation 2004-2 Exclusion Report

Site or field offices complete the *Recommendation 2004-2 Exclusion Report* using the process developed in Commitment 8.2 and submit to the appropriate CTA and PSO for the hazard category 2 and 3 defense nuclear facilities that can be excluded from further review under the implementation plan. The CTA and PSO will review and concur with the facilities excluded from review under this implementation plan, with oversight provided by the 2004-2 Core Team. New facilities and facilities undergoing major modification cannot be excluded from further review based on only NB criteria.

Lead Responsibility: DOE Heads of Field Organizations
Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.3: Completed *Recommendation 2004-2 Exclusion Reports*

Due Date: December 30, 2005

Commitment 8.4 – Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System

DOE site or field offices, with contractor participation, complete the *Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System*. The appropriate CTA and PSO will review and concur with the facilities listed, with oversight provided by the 2004-2 Core Team.

Lead Responsibility: DOE Heads of Field Organizations
Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.4: *Listing of Hazard Category 3 Defense Nuclear Facilities with an Active Confinement Ventilation System*

Due Date: January 31, 2006

Commitment 8.5 – Safety Related Ventilation System Evaluation Guidance

The 2004-2 Core Team will develop guidance for the sites to utilize when performing the *Safety Related Ventilation System Evaluation*. This applies to hazard category 2 defense nuclear facilities with a safety-class or safety-significant active confinement ventilation system, which were not excluded in the *Recommendation 2004-2 Exclusion Report*. This guidance will be provided for review and comment from appropriate site, facility or technical experts, including the Board. The 2004-2 Core Team will approve final guidance with the concurrence of the CTAs and PSOs, as needed. Based on result of initial pilot evaluations and other ongoing reviews, the evaluation guidance will be used to develop any new or revisions to DOE directives or rule guidance documents to more formalize the guidance, including consideration of DOE policy on a “back-fit” process.

Lead Responsibility: NNSA Chief of Defense Nuclear Safety

Deliverable 8.5.1 PF-4 Safety Related Ventilation System Evaluation Report

Due Date: September 30, 2005

Lead Responsibility: Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.5.2: Assemble group of subject matter experts to develop appropriate performance and/or design expectations as input to guidance document.

Due Date: September 23, 2005

Deliverable 8.5.3: Hold DOE wide workshop to develop the final methodology and guidance to complete the safety related ventilation system evaluations.

Due Date: October 21, 2005

Deliverable 8.5.4: Develop initial *Safety Related Ventilation System Evaluation Guidance* document with input from CTAs, PSOs and Board.

Due Date: December 16, 2005

Deliverable 8.5.5: Develop new or revised draft guidance for DOE directives or rules and issue for DOE-wide review and comment.

Due Date: February 28, 2006

Commitment 8.6 – Safety Related Ventilation System Evaluation

Based on the initial workshop guidance and draft DOE directives or rule guidance, DOE site or field offices, with contractor participation, prepare the facility *Safety Related Ventilation System Evaluation* for hazard category 2 defense nuclear facilities with a safety-class or safety-significant confinement ventilation system, which were not excluded in the *Recommendation 2004-2 Exclusion Report*. The appropriate CTA and PSO will review and concur with the facility Confirmatory Report, with oversight provided by the 2004-2 Core Team.

Lead Responsibility: DOE Heads of Field Organizations
Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.6.1: Completed *Safety Related Ventilation System Evaluation* Reports

Due Date – New Facilities: April 14, 2006

Due Date – Existing Facilities: September 30, 2006

Deliverable 8.6.2: Recommendations for Improving the Confinement Ventilation System

Due Date – New Facilities: April 28, 2006

Due Date – Existing Facilities: November 30, 2006

Deliverable 8.6.3: PSO letter accepting recommendations or granting exception

Due Date – New Facilities: July 15, 2006

Due Date – Existing Facilities: February 28, 2007

Commitment 8.7 – Non Safety Related Ventilation System Evaluation Guidance

Non Safety Related Ventilation System Evaluation Guidance will be developed by the 2004-2 Core Team for the facilities to utilize when performing their *Non Safety Related Ventilation System Evaluation*. This applies to hazard category 2 facilities without a safety-class or safety-significant confinement ventilation system and hazard category 3 facilities without a confinement ventilation system, neither of which were excluded from review by the *Recommendation 2004-2 Exclusion Report*, submitted in accordance with Commitment 8.3. This guidance will be provided for review and comment from appropriate site, facility or technical experts, including the Board. The 2004-2 Core Team will approve final guidance with the concurrence of the appropriate CTAs and PSOs.

Lead Responsibility: Director, Office of Nuclear and Facility Safety Policy, EH
Chief of Defense Nuclear Safety, NNSA
Chief Operations Officer, Environmental Management

Deliverable 8.7: *Non Safety Related Ventilation System Evaluation Guidance*

Due Date: December 15, 2005

Commitment 8.8 – Non Safety Related Ventilation System Evaluation

Site and field offices, with contractor participation, complete the *Non Safety Related Ventilation System Evaluation* for the following facilities (except those excluded by the *Recommendation 2004-2 Exclusion Report*).

- Hazard category 2 defense nuclear facilities that do not have a safety-class or safety-significant confinement ventilation system that performs an active safety function.
- Hazard category 3 defense nuclear facilities that do not have an active confinement ventilation system.

The appropriate CTA and PSO will review and approve the facilities listed, with oversight provided by the 2004-2 Core Team. Priority will be given to facilities that are in the design and construction phase. For those reports not fully accepted, the CTA and PSO will provide recommendations to the facility for improving their confinement strategy. The PSO can approve or grant exceptions to the recommendations.

Lead Responsibility: DOE Heads of Field Organizations
Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.8.1: Completed *Non Safety Related Ventilation System Evaluation* Reports

Due Date – New Facilities: April 14, 2006

Due Date – Existing Facilities: November 30, 2006

Deliverable 8.8.2: Recommendations for Improving the Confinement Ventilation System

Due Date – New Facilities: July 15, 2006

Due Date – Existing Facilities: February 28, 2007

Deliverable 8.8.3: PSO letter accepting recommendations or granting exception

Due Date – New Facilities: August 15, 2006

Due Date – Existing Facilities: March 31, 2007

Commitment 8.9 – Evaluation of Directives

Upon completion of the workshop and comments received from draft guidance documents (See Deliverable 8.5.5), and facility specific reviews, the 2004-2 Core Team will evaluate the need for improving directives and the implementation of existing requirements. As stated in the Board’s recommendation, this assessment will consider the following, as a minimum:

- Providing more prescriptive safety directives for using a confinement ventilation system.

- Ensuring the 25 rem evaluation guideline is used solely for classification of safety controls.

Completion of this commitment will require a review of site office and contractor mechanisms or procedures for utilizing the 25 rem offsite dose evaluation guideline and application to approved safety bases. Actions will be taken by the site offices to correct any deficiencies identified during this review process. Other lessons learned will also be included in the report to address deficiencies and/or inconsistencies the 2004-2 Core Team believes needs improvement. The assessment report will be accompanied with an implementation plan for completing the recommendations.

Lead Responsibility: CTAs and PSOs

Deliverable 8.9.1: Results of reviewing site procedures and Safety Bases

Due Date: March 31, 2006

Lead Responsibility: Director, Office of Nuclear and Facility Safety Policy

Deliverable 8.9.2: Assessment Report – Lessons Learned for Improving Safety
As a Result of Board Recommendation 2004-2

Due Date: March 31, 2007

Deliverable 8.9.3 Plan for Revising DOE Directives

Due Date: July 1, 2007

Commitment 8.10 – Revised Directives

DOE will revise the DOE directives, rule guidance, and/or technical standards established in the Plan for Revising DOE Directives, as needed, and submit the revised directives into the DOE Directives or Technical Standards RevCom process for DOE-wide review and process after resolving Board issues.

Lead Responsibility: Director, Office of Nuclear and Facility Safety Policy, EH

Deliverable 8.10: Revised DOE directives/technical standards into RevCom

Due Date: November 30, 2007

9. Organizations and Management

The Office of Environment, Safety and Health (EH) is responsible for developing and proposing Departmental environment, safety and health policy, rules, and regulations and associated guidance, standards and technical interpretations in concert with programmatic and field element needs. The Assistant Secretary of EH is the Cognizant Secretarial Officer for this function and related actions under this Plan. Within EH, the Office of Nuclear and Facility Safety Policy is responsible for nuclear safety requirements, guidance, and standards associated with defense nuclear facility safety bases. The Responsible Manager for the execution of the Plan is the Director, Office of Nuclear and Facility Safety Policy. In this capacity, the Responsible Manager will ensure that

associated actions, deliverables, and commitments are accomplished. The Responsible Manager will work with the appropriate DOE line organizations in implementing the objectives of this Implementation Plan.

10. Reporting

To ensure the various Department implementing elements and the Board remain informed of the status of plan implementation, the Department's policy is to provide progress reports to the Board and/or Board staff. The Department will initially provide briefings to the Board and/or Board staff approximately every two months for the first 6 months and then quarterly thereafter.

Commitment 10.1: The Department will provide briefings to the Board and/or Board Staff. These briefings will include updates on the status of completing actions identified in the various reviews and assessments indicated in this implementation plan.

Lead Responsibility: Director, Office of Nuclear and Facility Safety Policy

Deliverable 10.1: Board and/or Board Staff Briefings

Deliverable 10.2 Recommendation 2004-2 Final Report

Due Date: Briefings will be provided initially every two months for the first 6 months and quarterly thereafter. The final report will be issued at the completion of all actions relating to this recommendation implementation plan. The final report will summarize physical modifications and upgrades resulting from the completed system evaluations, including plans for funding and schedules for completion.