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DOE/IG-0386

**U.S. Department of Energy**  
Office of Inspector General

MARCH 1996



Report on

**Summary Results of the  
Inspection of Issues Regarding  
the Scope of the Accident  
Investigation of the Tristan  
Fire at the Brookhaven  
National Laboratory**



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# memorandum

DATE: March 15, 1996

REPLY TO

ATTN OF: IG-1

SUBJECT: INFORMATION: Report on "Summary Results of the Inspection of Issues Regarding the Scope of the Accident Investigation of the TRISTAN Fire at the Brookhaven National Laboratory"

TO: The Secretary

## BACKGROUND:

The subject final report is provided to inform you of our findings and recommendations concerning our review of issues regarding the scope of the accident investigation of a March 31, 1994, fire at the Terrific Reactor Isotope Separator To Analyze Nuclides (TRISTAN) experiment at the Department of Energy (DOE) Brookhaven National Laboratory (BNL), Upton, New York. The Chicago Operations Office (CH) Manager appointed a Type B Accident Investigation Board (Board) to investigate the fire. In a June 16, 1994, letter to the Inspector General, DOE, the CH Manager requested the Inspector General to look into an allegation by a former Board member that senior Chicago management consciously violated the requirements of DOE Order 5484.1, "ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS," in attempting to control the investigation. The former Board member alleged that there was not a clear verbal agreement among the Board members regarding the focus of the scope of the investigation. He said that the Board Chairman wanted to focus on the physical causes of the fire, while he (the former Board member) believed that the Board should focus on the apparent management deficiencies that allowed TRISTAN to operate without a proper safety analysis and in violation of DOE orders for so many years.

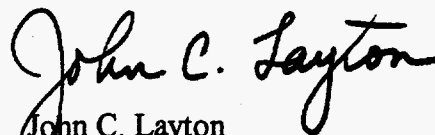
## DISCUSSION:

We concluded that the written scopes for the accident investigation were generally consistent with DOE Order 5484.1 and the example scope in the DOE Accident/Incident Investigation Manual. We did not find evidence that senior managers gave explicit direction that improperly limited the scope of the investigation regarding management systems. However, we did find that the Board conducted an investigation and prepared a report that did not adequately address specific management systems and organizations as a root cause. Without a thorough root cause analysis of specific management systems, deficiencies in the exercise of oversight responsibilities by "upstream" management organizations may not be identified and corrected.

Based on the evidence we have reviewed, we did not conclude that a lack of management integrity played any role in the deficiencies in the accident investigation regarding root cause analysis. That is, we did not conclude that senior managers, as alleged, consciously, i.e., knowingly and willfully, violated the provisions of DOE Order 5484.1. We believe that the Board Chairman's and the Board members' limited experience and training in accident investigation, and thus root cause analysis, may have contributed to the Board conducting an accident investigation that did not adequately address specific management systems and organizations. Further, the Board Chairman and the Board did not believe that they should be critical of management in their investigation report. We found evidence that we believe indicates that this Board's reluctance to adequately investigate management systems as a root cause may not be an isolated case, but may be a more general problem with DOE accident investigations and, in particular, those conducted by field components.

Our conclusions support that the former Board member had a valid concern that the Board was not going to adequately investigate and report on specific management systems and organizations as a root cause. However, we found no evidence that DOE recognized the validity of this concern until an Office of Environment, Safety and Health (EH) memorandum was forwarded to CH in March 1995. The former Board member's valid concerns may have had more timely recognition under the processes envisioned in the Secretary's new initiative to ensure appropriate review of employee concerns.

Of the seventeen recommendations included in our report, nine were made to EH, three to the Office of Economic Impact and Diversity (ED), two to the Office of Nuclear Energy, Science and Technology (NE), and three to CH. We recommended, among other things, that EH modify pertinent oversight and training procedures and regulations, that ED review and expedite DOE's program on employee concerns, that NE identify and review management systems and procedures, and that CH conduct a root cause analysis of the TRISTAN accident and ensure that future investigation boards understand their responsibilities in investigating and reporting management systems as a root cause. Management generally agreed with our recommendations.

  
John C. Layton  
Inspector General

Attachment

cc: Deputy Secretary  
Under Secretary  
Associate Deputy Secretary for Field Management  
Assistant Secretary for Environment, Safety and Health  
Director, Office of Economic Impact and Diversity  
Director, Office of Nuclear Energy, Science and Technology  
Manager, Chicago Operations Office


U.S. DEPARTMENT OF ENERGY  
OFFICE OF INSPECTOR GENERAL

REPORT ON  
SUMMARY RESULTS OF THE INSPECTION OF ISSUES REGARDING  
THE SCOPE OF THE ACCIDENT INVESTIGATION OF THE TRISTAN  
FIRE AT THE DOE BROOKHAVEN NATIONAL LABORATORY

**MASTER**

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Report No. DOE/IG-0386  
Date Issued: March 15, 1996

  
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Washington, D.C. 20585

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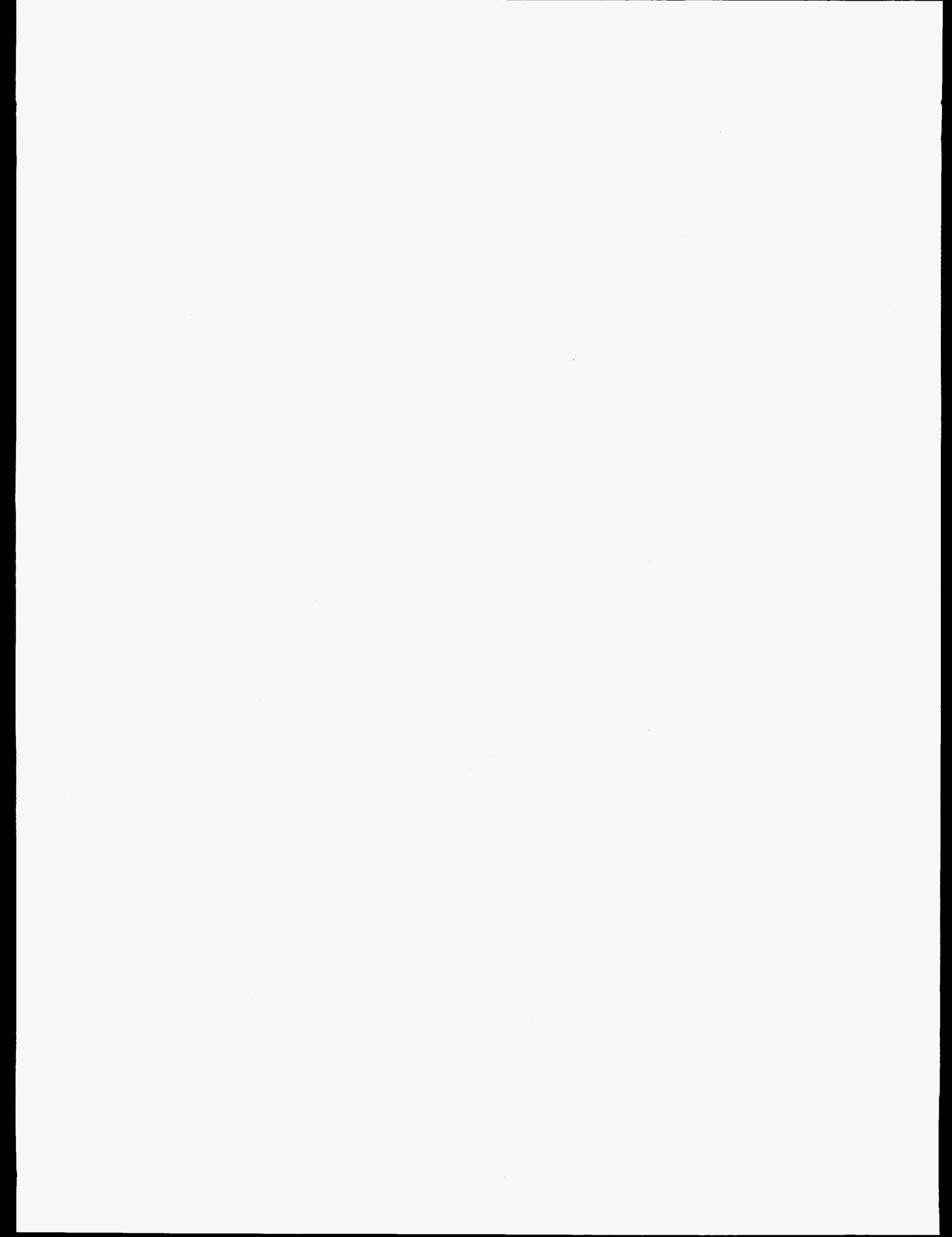
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CHAIRMAN'S SCOPE STATEMENTS





U.S. DEPARTMENT OF ENERGY  
OFFICE OF INSPECTOR GENERAL  
OFFICE OF INSPECTIONS  
WASHINGTON, DC 20585

REPORT ON  
SUMMARY RESULTS OF THE INSPECTION OF ISSUES REGARDING  
THE SCOPE OF THE ACCIDENT INVESTIGATION OF THE TRISTAN  
FIRE AT THE DOE BROOKHAVEN NATIONAL LABORATORY

This is an Office of Inspector General (OIG) report regarding our review of concerns with the scope of the Department of Energy's (DOE's) investigation of the March 31, 1994, fire at the Terrific Reactor Isotope Separator To Analyze Nuclides (TRISTAN) experiment at the DOE Brookhaven National Laboratory (BNL), Upton, New York. Following the fire, a Type B investigation of the fire was initiated by the Chicago Operations Office (CH) Manager and she appointed the TRISTAN Type B Accident Investigation Board (Board) to conduct the investigation.

This report presents a summary of findings, conclusions, and recommendations, as well as management comments on the report. A more comprehensive report, from which this summary has been taken, includes additional evidence to support our findings and conclusions. That report uses names of individuals interviewed and is, therefore, not a publicly available document.

This inspection was conducted in accordance with the Quality Standards for Inspections issued by the President's Council on Integrity and Efficiency.

PREDICATION

In a June 16, 1994, letter to the Inspector General, DOE, the CH Manager expressed concern about issues raised in a June 13, 1994, letter by a former Board member to an Office of Environment, Safety and Health (EH) official regarding the Type B accident investigation of the March 31, 1994, TRISTAN fire. In her letter, the CH Manager requested the Inspector General look into the former Board member's allegation that senior Chicago management consciously violated the requirements of DOE Order 5484.1, "ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS," in attempting to control the investigation. In the attachment to his June 13, 1994, letter to an EH official, the former Board member had stated, among other things, that he had personally raised concerns about the scope of the investigation to the CH Manager and the Board Chairman of the TRISTAN Type B Accident Investigation Board. In a signed sworn statement dated July 15, 1994, the former Board member stated that there was not a

clear verbal agreement among the Board members regarding the focus of the scope of the investigation. He said that the Board Chairman wanted to focus on the physical causes of the fire, while he (the former Board member) believed that the Board should focus on the apparent management deficiencies that allowed TRISTAN to operate without a proper safety analysis and in violation of DOE orders for so many years.

We identified the following issue as the focus of our review:

Did senior managers improperly limit the scope of the accident investigation of the TRISTAN fire at the Brookhaven National Laboratory regarding the identification of specific management systems and organizations as a root cause?

In conducting our inspection, we interviewed DOE Headquarters and Operations Office officials and contractor officials involved in appointing the Type B accident investigation Board members, conducting the accident investigation, preparing the accident investigation report, and reviewing the report. We also reviewed applicable DOE regulations and supporting guidelines, the report of the TRISTAN accident investigation, written reviews and related documents regarding the TRISTAN accident investigation report, and selected documents related to the accident investigation.

## BACKGROUND

According to the Final Occurrence Report prepared by BNL contractor personnel, dated May 4, 1995, a fire occurred on March 31, 1994, within a shielded cave of the TRISTAN experiment and consumed all the available combustible material. Several individuals received contamination either on their skin or clothing. All of the individuals were decontaminated or subsequently found to be clean. Although there was a release from the building stack, the effect of the release of radioactive material to the environment was negligible. The BNL Site Emergency Plan was activated, which resulted in the fire being categorized as an emergency. The BNL Local Emergency Coordinator notified DOE Headquarters, New York State, and Suffolk County officials that a fire had occurred.

The TRISTAN Type B Accident Investigation Board consisted of the Chairman, five Board members, and four advisors. The Board convened for the first time at BNL on April 6, 1994. An appointment letter was signed by the CH Manager on April 11, 1994. The former Board member participated in the investigation for ten days and requested dismissal from the Board on April 15, 1994. He stated that he left the Board because of personal reasons and differences with the Board Chairman regarding the scope of the accident investigation. The former Board member described these concerns in a June 13, 1994, letter to an EH official, which we briefly discussed in the PREDICATION section.

By memorandum dated May 20, 1994, the CH Manager provided the Assistant Secretary for Environment, Safety and Health a copy of the TRISTAN accident investigation report, titled "TYPE B INVESTIGATION OF THE MARCH 31, 1994 FIRE AND CONTAMINATION AT THE TRISTAN EXPERIMENT, HIGH FLUX BEAM REACTOR BROOKHAVEN NATIONAL LABORATORY UPTON, NY."

The issue we identified above as the focus of our review uses the term "root cause." Determining the root cause of the accident is the primary purpose of an accident investigation. We found that our understanding of the need for determining the root cause was facilitated by "ROOT CAUSE ANALYSIS GUIDANCE DOCUMENT (DOE-NE-STD-1004-92)." Based on our reading of this document, we developed an analogy of an airplane accident that we found helpful in our understanding of the concept of root cause analysis. If, for example, an investigation of an airplane crash concluded that a failed bolt was the cause of the crash, this would be inadequate as a root cause and would not answer the root cause question of why the bolt had failed. The bolt could have failed, for example, because of inadequate maintenance procedures or regulations, inadequate maintenance management, inadequate quality control inspection of new/replacement bolts for substandard or counterfeit parts, or inadequate specification of procurement requirements. Unless the root cause is identified and corrected, other airplanes may crash for the same reason. Also, the fact that the crashed airplane will not be operated anymore, or even the fact that that model of airplane will not be operated anymore, would not eliminate the need to identify the root cause of the accident. The root cause may be a fundamental problem that could impact other airplanes or other airplane models.

## RESULTS OF INSPECTION

Did senior managers improperly limit the scope of the accident investigation of the TRISTAN fire at the Brookhaven National Laboratory regarding the identification of specific management systems and organizations as a root cause?

We divided this overall issue into three sub-issues. We reviewed (1) whether the specified written scope for the investigation was improperly limited regarding the identification of specific management systems and organizations as a root cause, (2) whether the scope direction provided by senior managers during the investigation improperly limited the identification of specific management systems and organizations as a root cause, and (3) whether the scope of the investigation that was conducted by the Board resulted in an adequate investigation and report regarding specific management systems and organizations as a root cause.

### Written Scope

Due to a delay in the completion of the appointment letter, which described the scope of the investigation, the Board Chairman created a written scope. The appointment letter, signed by the appointing official (the CH Manager) on April 11, 1994, arrived at BNL on April 12, 1994, six days after the Board convened on April 6, 1994. We concluded that the written scopes for the investigation were generally consistent with DOE Order 5484.1 and the example scope in the DOE Accident/Incident Investigation Manual (A/I Manual). The former Board member told us that he had no problem with the scope in the appointing official's letter and that the Board Chairman's scope was sufficiently broad to conduct the investigation. Also, each of the Board members told us that they believed that the Board Chairman's scope statement was adequate to perform the investigation. Appendix A presents selected criteria for evaluating the adequacy of the scope of the investigation in regard to management systems and Appendix B contains excerpts from the written scopes.

### Scope Direction During the Investigation

Regarding the scope direction provided by management officials during the investigation, we did not find evidence that senior managers gave explicit direction that improperly limited the scope of the investigation regarding management systems. More specifically, we did not find evidence that the CH Manager gave explicit direction to the former Board member that improperly limited the scope of the investigation. However, the CH Manager said that the former Board member had told her that there would be aspects that he believed that the Office of Environment, Safety and Health (EH) would want covered that were beyond what the investigation was going to cover. Although these aspects included management systems, the former Board member told us that he did not discuss specific issues with the CH Manager. The CH Manager told us that she told the former Board member to submit questions or concerns that were

outside the scope of the investigation to Brookhaven Area Office (BHO, now the Brookhaven Group Office) officials for review.

Regarding the Board Chairman, the former Board member had identified four actions by the Board Chairman that he believed were inappropriate limitations of the scope. These actions included: taking a week long break during the middle of the investigation, establishing a very tight schedule for writing the report, screening the former Board member's written questions to ensure they were within the scope of the investigation, and, during at least one interview, stopping the former Board member from asking questions because the Board Chairman considered the questions to be outside the scope of the investigation. We did not find evidence that the one week break or the schedule resulted in the Board members not being able to complete work on issues they wanted to pursue. We found that the former Board member had not submitted any questions to the Board Chairman. Further, when interviewed, none of the other Board members stated any concern regarding screening of questions. We did, however, find one occasion when the former Board member was interrupted during an interview, stopping his questions. We were told, however, that this was after he had been asking his questions for a period of time.

We did not find evidence that the Board Chairman gave explicit direction to the former Board member that improperly limited the scope of the investigation. However, we did conclude that the Board Chairman's view of the objectives of the accident investigation did not encourage the identification and analysis by the Board of specific management systems and organizations as a root cause of the accident. The Board Chairman believed the accident investigation report should not identify or name specific management organizations because this would be inappropriately laying blame or finding fault.

#### Scope of the Investigation Conducted

Although we did not find evidence that senior managers gave explicit direction that improperly limited the scope of the investigation regarding management systems, we did find evidence that there was a lack of direction to the Board by senior managers as well as a reluctance by Board members to identify and report specific management systems and organizations as a root cause. We believe that this resulted in the Board conducting an investigation and preparing a report that did not adequately address specific management systems and organizations as a root cause. The Board reported the root cause of the accident as "the lack of a comprehensive safety review of TRISTAN, commensurate with the level of hazards." However, this reported root cause did not answer the root cause "why question" of why TRISTAN did not have a comprehensive safety review.

Without a thorough root cause analysis of specific management systems, deficiencies in the exercise of oversight responsibilities by "upstream" management organizations may not be identified and corrected. The following statement from the review by

Pacific Northwest Laboratories (PNL) of the TRISTAN Accident Investigation Report, which was requested by the Office of Environment, Safety and Health, clearly highlights this point:

“The report does not adequately discuss the role of oversight in the accident. The oversight responsibilities of Brookhaven National Laboratory (BNL), Brookhaven Area Office (BHO), DOE Headquarter’s [sic] Office of Energy Research (ER) and Office of Nuclear Energy (NE) are presented briefly in the facts section. The analysis section, however, fails to explore the management systems that held responsibility for the program. The judgment of needs does not reference the organizations that should implement related corrective actions. As a consequence, any deficiencies that may exist in the assignment or exercise of oversight responsibilities may not be recognized and corrected. [Emphasis added.]”

Further, a separate report of the accident was prepared by BNL personnel in accordance with DOE Order 5000.3B, “OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION.” This report identified different, more “upstream” management systems as a root cause than did the CH accident investigation Board report. This Occurrence Report stated:

“Root Cause (Management; Policy Not Adequately Defined/Disseminated/Enforced)

“Management failed to adequately disseminate and enforce the responsibility and authority interface between the TRISTAN Experiment Group and the Reactor Division.”

Additionally, we interviewed a senior Office of Nuclear Energy (NE, now the Office of Nuclear Energy, Science and Technology) official who told us that he is the DOE official in charge of Energy Research reactors, including the BNL High Flux Beam Reactor (HFBR). He said that he accepted responsibility for the accident. He also said that the actual root cause of the TRISTAN fire was the lack of control by BNL Reactor Division management. We believe that the root cause identified by this official was not inconsistent with the root cause identified in the BNL Occurrence Report discussed above.

#### Applicable Regulations and Procedures and the TRISTAN Hazard Category

In order to identify the assignment of oversight responsibility, the identification of the existing regulations and procedures that were applicable to the accident is an important part of root cause analysis. The AI Manual and the draft DOE Accident Investigation Report Writing document provide guidance on the need to identify existing regulations and procedures applicable to the accident and the need to report

whether the applicable procedures were followed. Also, the CH Manager told us that she expected the investigation to determine whether the requirements of all applicable DOE orders had been met.

The Board Chairman, however, said he did not identify specific procedures that would have required a comprehensive safety review commensurate with the hazards for TRISTAN. Also, the CH Manager, in a September 13, 1995, memorandum to the Headquarters Employee Concerns Officer regarding the former Board member's concerns, stated that ". . . reviews of DOE Orders, Brookhaven Safety Procedures, and the HFBR Technical Specification in question have identified no violations of these requirements." The lack of a requirement for such a comprehensive safety review, if true, would have been a significant need that, in our view, should have been recognized by the Board and addressed in their report.

It is not clear to us, however, that there wasn't an order or regulation that would have required a comprehensive safety review. The former Board member, consistent with the area assigned to him as a member of the Board, sought to identify orders that were relevant to the accident. He suggested on more than one occasion the possibility that the TRISTAN experiment itself was a "class 3" [Category 3 Hazard] nuclear facility under DOE Order 5480.23, "NUCLEAR SAFETY ANALYSIS REPORTS," and thus should have been subject to a Category 3 Hazard safety analysis and other requirements. Although identifying applicable regulations and procedures and the applicable hazard category designation was very relevant, focusing only on whether TRISTAN should have been classified as a Category 3 Hazard nuclear facility may not, in our view, have been appropriate. We were told that there had not been a segmentation study, as currently described in DOE STD 1027-92, "HAZARD CATEGORIZATION AND ACCIDENT ANALYSIS TECHNIQUES FOR COMPLIANCE WITH DOE ORDER 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS," to separate TRISTAN from the Category 1 Hazard safety analysis requirements of the HFBR to which TRISTAN was attached. TRISTAN, therefore, was subject, as part of the HFBR, to the safety analysis requirements of a Category 1 Hazard nuclear facility found in DOE Order 5480.23, dated April 10, 1992. We were told that the requirements for a Category 1 Hazard nuclear facility safety analysis under that Order are at least as rigorous as the requirements for a Category 3 Hazard nuclear facility. Further, the applicability of safety analysis requirements over the life of TRISTAN could have been researched. For example, at the time the 1991 update to the HFBR Safety Analysis Report (SAR) was developed, it appears that the requirements for a safety analysis found in the then DOE Order 5480.5, "SAFETY OF NUCLEAR FACILITIES," would have applied.

Even if these nuclear safety orders did not apply, we have been told that DOE Order 5481.1B, "SAFETY ANALYSIS AND REVIEW SYSTEM," dated September 23, 1986, would have applied to the TRISTAN experiment. This Order requires a safety analysis for DOE operations that "involve hazards that are not routinely encountered and accepted in the course of everyday living by the vast majority of the general public."

Safety analyses under this Order shall "Demonstrate that there is a reasonable assurance that the DOE operation can be conducted in a manner that will limit risks to the health and safety of the public and employees, and adequately protect the environment."

#### Possible Causes of the Inadequate Investigation of Management Systems

We identified several possible causes for the lack of direction to the Board and a reluctance by Board members to identify specific management systems and organizations as a root cause in the accident investigation report. We believe that the Board Chairman's and the Board members' limited experience and training in accident investigation, and thus root cause analysis, may have contributed to the Board conducting an accident investigation that did not adequately address specific management systems and organizations. Further, we found the Board members did not believe they should be critical of management in their investigation. The Board Chairman and several Board members, including the one member experienced in accident investigations, believed that the accident investigation report should not identify or name specific management organizations because this would be inappropriately laying blame or finding fault.

We also found evidence that we believe indicates that this Board's reluctance to adequately investigate management systems as a root cause may not be an isolated case. This may be a more general problem with DOE accident investigations and, in particular, those conducted by field components. For example, we interviewed EH Headquarters and PNL officials that were involved in the review of investigation reports in accordance with DOE Order 5484.1. According to these officials, past investigation reports did not go far enough in the examination of management systems. Additionally, we looked at reviews requested or conducted by EH of two previous accident investigation reports. These reviews included observations that the reports failed to adequately review management systems. Also, DOE's draft guide for preparation of accident reports stated that evaluation of past accident investigation reports identified concerns regarding the failure to properly assess root causes and the failure to evaluate management systems that allowed the accident to occur.

Based on the evidence we have reviewed, we did not conclude that a lack of management integrity played any role in the deficiencies in the accident investigation regarding root cause analysis. That is, we did not conclude that senior managers, as alleged, consciously, i.e., knowingly and willfully, violated the provisions of DOE Order 5484.1. The discussion above has addressed what we believe are the possible causes of the deficiencies in the accident investigation regarding root cause analysis of management systems.



## Need for Analysis of Management Systems

As of October 1995, during our field work, we did not find evidence that a thorough root cause analysis of the role of management systems in the TRISTAN accident had been conducted.

Pursuant to the requirement of DOE Order 5484.1 that EH review the TRISTAN accident investigation report for thoroughness, objectivity, and independence, the Assistant Secretary for Environment, Safety and Health provided comments on the investigation report to the CH Manager in a March 24, 1995, memorandum. The EH Assistant Secretary commented that the report "could be enhanced" by several actions, including an evaluation of the effectiveness of the roles and responsibilities of line management organizations such as CH, NE, and the Office of Energy Research. She posed the question: "What, if any, actions should they have taken or should they now take to preclude a recurrence of the accident. [Emphasis added.]" In an attachment to her May 22, 1995, response to the Assistant Secretary, the CH Manager stated the following:

"We note your comment and agree that the investigation should have included a written evaluation of the roles and responsibilities of the Department of Energy's (DOE's) line management in addition to the contractor's. We will assure all future accident investigations conducted by the Chicago Operations Office (CH) include a written evaluation of the effectiveness of DOE and involved contractors. [Emphasis added.]"

CH, therefore, did not state, in response to the March 24, 1995, EH memorandum, that they planned to enhance the TRISTAN investigation report by reviewing the roles and responsibilities of line management and determining what actions the line organizations should have taken. A CH official who drafted the response initially told us that he believed that the actions that they reported in the response to EH addressed the issue of what actions line management organizations should have taken. However, he acknowledged in response to our questions, and upon reflection, that this issue regarding what actions line management organizations should have taken had not been addressed by CH.

Had CH, in response to the March 24, 1995, EH memorandum, analyzed the roles and responsibilities of line organizations in the TRISTAN accident, to include what management systems should have or could have prevented the accident, we believe that that analysis would have identified additional possible oversight issues. Even our limited search, for example, for requirements and responsibilities that should have resulted in a comprehensive safety review of TRISTAN identified what we believe are possible management oversight issues.

In our limited review of safety analysis requirements for TRISTAN, we tried to determine what the status was of the HFBR Safety Analysis Report (SAR) upgrade at

the time of the TRISTAN fire. We did this because it appeared to us that a comprehensive safety analysis of TRISTAN should have been required as part of the HFBR SAR. As a result of these inquiries, we found deficiencies in the more recent coordination among oversight organizations regarding the processing of the proposed BNL plan to develop an upgraded HFBR SAR, which is required by DOE Order 5480.23.

DOE Order 5480.23, dated April 10, 1992, requires the HFBR to have either an upgraded SAR in accordance with the new provisions of the Order or to have submitted for approval a SAR plan and schedule (SAR upgrade plan) to develop an upgraded SAR. In a memorandum responding to the initial draft of this report, the CH Manager stated that the HFBR has operated under a DOE approved SAR since 1965. According to a senior NE official, the most recent approved HFBR SAR update was dated March 5, 1991. However, as of September 1995, at the time of our inquiry, the HFBR did not have an upgraded SAR and the BNL Reactor Division (RD) Manager did not believe BNL had an approved SAR upgrade plan.

BNL had submitted a proposed SAR upgrade plan in 1992 that closely followed the content guidelines of DOE Order 5480.23, but it was not approved by DOE due to the projected cost. BNL submitted a modified proposed SAR upgrade plan in September 1994. This modified proposed SAR upgrade plan included a provision, in response to guidance from NE and BHO, to develop a comparison matrix as a first step toward an upgraded SAR. This comparison matrix, which would take eighteen months for BNL to develop, would determine what new safety analysis requirements established in the 1992 DOE Order 5480.23 are not addressed in the HFBR's most recent SAR update approved in 1991 and other related BNL documentation. For example, we were told by a senior NE official that it is not certain that all the provisions of DOE Order 5480.23 (he noted decontamination and decommissioning) were covered by the 1991 HFBR SAR update and other BNL safety documentation. The September 1994 proposed SAR upgrade plan stated that work on the comparison matrix would begin when the plan was approved.

When we sought to determine the status of the proposed SAR upgrade plan for the HFBR, we found deficiencies in coordination among oversight organizations and staff regarding the processing of the proposed SAR upgrade plan. For example, we found that a senior NE official believed that he had put the proposed SAR upgrade plan "on hold" because he believed that developing a comparison matrix would be too expensive and time consuming. This senior NE official's staff had given guidance to BNL to submit the 1994 proposed SAR upgrade plan, to include the comparison matrix. An NE official with the action responsibility for the NE review of the proposed SAR upgrade plan believed that the plan was "pending NE approval," but did not know why it had not been approved. BNL officials, however, had received verbal approval from BHO to proceed with developing the comparison matrix and BNL had drafted and submitted over one half of the draft chapters in the comparison matrix to BHO. BHO

had not forwarded the draft chapters to CH or NE because the proposed SAR upgrade plan had not been approved by NE.

It was not the purpose of our inspection to review how the HFBR safety analysis upgrade was being processed. We have, by this discussion, tried to give an example of one possible management oversight issue that might have been identified by a root cause analysis of management systems in the TRISTAN accident.

In comments on a draft of this report, NE informed us that the proposed SAR upgrade plan was approved on November 3, 1995.

#### Failure to Recognize Valid Concerns

Our conclusions support that the former Board member had a valid concern that the Board was not going to adequately investigate and report on specific management systems and organizations as a root cause. Until the EH memorandum to CH in March 1995, however, we found no evidence that DOE recognized the validity of this concern. This failure to recognize the validity of the former Board member's concern may still have been an issue in September 1995. In a September 13, 1995, memorandum to the Headquarters Employee Concerns Officer regarding the former Board member's concerns, CH stated the following:

“... reviews were conducted by Brookhaven National Laboratory (BNL), CH, the Office of Environment, Safety and Health (EH), and the Office of Nuclear Energy (NE). These organizations agree with the Investigation Board's root cause determination.”

As we briefly discussed earlier, we do not believe that EH agreed that the investigation's stated root cause was adequate. Also, as briefly discussed earlier, BNL and NE had identified different, more “upstream” root causes than the Board had identified.

The former Board member's valid concerns may have had more timely recognition under the processes envisioned in the Secretary's new initiative to ensure appropriate review of employee concerns. Accordingly, we believe that it is important that the Secretary's initiative for an enhanced DOE employee concerns management program announced in August 1995 be implemented as quickly as possible. We understand that responsibility for this program has been assigned to the Office of Economic Impact and Diversity and that the appointment of a manager is in process.

## RECOMMENDATIONS

DOE Order 225.1, "ACCIDENT INVESTIGATIONS," was published on September 29, 1995. This directive replaced the provisions of DOE Order 5484.1 regarding the responsibilities of DOE Federal employees in the conduct of accident investigations. Therefore, our recommendations are directed to DOE Order 225.1.

We recommend that the Assistant Secretary for Environment, Safety and Health:

1. Require that a briefing or other communication is provided to all Type A and B accident investigation boards at the beginning of each accident investigation. The briefing or communication should emphasize that the board is empowered to examine management systems and organizations as a root cause and that the board is expected to do so and to fully report its findings. This briefing or communication should also instruct Type A and B accident investigation boards that they have the authority to investigate up to and beyond the level of the appointing official when looking at specific management systems and organizations.
2. Consider changes to DOE Order 225.1, "ACCIDENT INVESTIGATIONS," dated September 29, 1995, regarding the training and experience of board chairpersons and members. Possible changes could be requiring training for the chairperson, requiring that more than one member have training, or provide guidance on the specific roles and responsibilities of the trained accident investigators during an accident investigation.
3. Revise DOE Order 225.1, "ACCIDENT INVESTIGATIONS," dated September 29, 1995, to more specifically define specific management systems and more clearly state the requirement to review and report on specific management systems and organizations as a root cause.
4. Modify the "GUIDE TO DOE ACCIDENT INVESTIGATION REPORT WRITING" to clarify that the statement concerning the intention of the report not to lay blame does not mean that a root cause including specific management systems and organizations should not be identified.
5. Modify the "GUIDE TO DOE ACCIDENT INVESTIGATION REPORT WRITING" to include a management systems subsection in the Analysis Section of the report outline.
6. Modify the Accident/Incident Investigation Manual to provide a consolidated discussion of the responsibilities of the board to identify specific management systems, to include management organizations, as a root cause.

7. Review how EH can provide accident investigation boards with policy analysis support in identifying what line organizations should have done to prevent the accident. In particular, consider how a board can be supported in identifying DOE orders that assign oversight responsibilities, relevant to the accident, to line organizations. Based on the results of this review, establish a mechanism to provide appropriate support.
8. Review the assignment and exercise of oversight responsibilities regarding the actions of NE, EH, CH, and BHO in processing the HFBR proposed SAR upgrade plan. Identify and disseminate any lessons learned to other appropriate Program Secretarial Officers. Take appropriate corrective actions regarding identified management deficiencies.
9. For the Annual Department of Energy Environment, Safety and Health Conference, include a session for managers on the conduct and objectives of accident investigations, including the requirement for an analysis of management systems and organizations as a root cause of the accident.

We recommend that the Director, Office of Economic Impact and Diversity:

10. Review how the former Board member's concerns were handled by DOE organizations and officials and determine if lessons can be learned on how to better identify and respond to concerns of employees.
11. Based on the results of this review, consider developing additional guidelines and procedures to reinforce the Secretary's policy on openness to receiving and reviewing employee concerns.
12. Expedite the appointment of a manager for the Employee Concerns Oversight Office and ensure the program is implemented as soon as possible.

We recommend that the Director, Office of Nuclear Energy, Science and Technology:

13. Based on the statement by a senior NE official that NE had a causal role in the TRISTAN accident, identify the Headquarters management procedures that allowed the accident to occur and identify corrective actions necessary to ensure that similar problems do not recur at DOE nuclear reactors under NE management.
14. Review the processing of the HFBR proposed SAR upgrade plan to identify management deficiencies and take necessary actions to correct management systems that allowed these deficiencies to occur.

We recommend that the Manager, Chicago Operations Office:

15. Ensure that accident investigation boards for future accident investigations understand their responsibility in investigating and reporting management systems as a root cause.
16. Conduct a root cause analysis and report on the roles of specific management systems and organizations in the TRISTAN accident and what actions management should have taken that might have prevented the accident.
17. Review the assignment and exercise of oversight responsibility by CH and BHO regarding the HFBR proposed SAR upgrade plan.

## MANAGEMENT COMMENTS

By memorandum dated March 5, 1996, the Office of Environment, Safety and Health (EH) provided comments signed by the Deputy Assistant Secretary, Office of Oversight, on our official draft report. He said that a reevaluation of the Accident Investigation Program by the Office of Oversight concluded that there was a need for a significant change. He said that, as a result, the program was transferred from the EH Residents to the Office of Security Evaluations on December 26, 1995. He said that EH is currently reviewing all aspects of the program and focusing on developing better and more cost-effective approaches for accomplishing program goals. He said that, in particular, EH sees a need for improvements in training, follow-up activities, and guidance to the field. He said that EH agrees with the basic premise behind the nine recommendations for EH; however, in some cases EH has developed alternatives to the prescriptive solutions suggested.

Regarding Recommendation 1, the Deputy Assistant Secretary said that EH agrees with the recommendation and proposed to take the following actions to assure that each Type A and B accident investigation board fully understands their roles and responsibilities, authorities, and obligations to examine all levels of both DOE and contractor organizations and management systems as they relate to the accident.

(1) By April 30, 1996, DOE Order 225.1 will be revised and reissued. The revision will incorporate the issues identified in the recommendations and summarized above. Specifically, the Order will be revised to clarify and further define the responsibility of each Type A or B accident investigation board in gathering facts, performing root cause analysis, developing findings, probable causes and judgments of needs with respect to organizations and management systems that could have or should have prevented the accident being investigated.

(2) By April 30, 1996, EH will issue a bulletin to the Heads of all Field Elements that will reconfirm all field accident investigation points of contact (POCs). Additionally, the bulletin will require that all type A and B accident investigation boards be provided a briefing within 3 days of their appointment. Briefing material that outlines the issues identified in the recommendations above will be included with the bulletin. The bulletin will serve as an interim measure to quickly provide needed guidance while the program is being refocused and permanent program documents are being revised.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 2, the Deputy Assistant Secretary said that EH agrees with the intent of this recommendation and proposed taking the following actions to assure that future accident investigation board chairpersons and members fully understand the DOE accident investigation process.

(1) The Office of Security Evaluations (SE), which now has responsibility within the Office of Oversight for the Accident Investigation Program, has already taken some interim measures and plans additional measures to address this issue. For example, the two most recent Type A investigation boards were led by formally trained EH chairpersons and were comprised of carefully selected EH and field staff. The newly appointed Program Manager is taking an active role by not only identifying and implementing needed program revisions, but also, more immediately, by personally providing guidance and assistance to current investigation boards. The bulletin described in the reply to Recommendation 1 above will address such issues as roles and responsibilities of board members and investigators. EH is currently scoping and identifying or developing new training for board members and chairpersons that will likely include provision of written materials, availability of information over the Internet, periodic workshops, and formal courses, and may also result in qualification standards for board members. Formal training is planned in September and October 1996 for a core group of Chairpersons from EH and for field-appointed POCs and potential Chairpersons and board members.

(2) DOE Order 225.1, which applies to all DOE elements, will be revised and reissued by April 30, 1996, as explained in the response to Recommendation 1 above.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 3, the Deputy Assistant Secretary said that EH agrees with this recommendation and proposed taking the following actions to more specifically define management systems and more clearly state the requirement to review and report on specific management systems and organizations as probable causes of accidents.

(1) The revision of DOE Order 225.1 will include appropriate definitions, including specific definitions of management systems, as well as the requirement to review those systems as appropriate. The Office of Oversight has developed a template for safety management based on the DOE's Five Guiding Principles for Safety Management. The template, as well as the guiding principles, will be referenced in the order as appropriate.

(2) By July 28, 1996, the Draft Implementation Guide (DOE G-225.1) for DOE Order 225.1 will be revised to reflect the concerns stated above and will be distributed throughout the Department.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 4, the Deputy Assistant Secretary said EH agrees with the concept of Recommendation 4 and proposed taking the following action to assure that accident investigation board chairpersons and members understand that they can



identify organizational and management system deficiencies and probable causes of an accident without assigning blame to a particular individual.

(1) By July 28, 1996, the Draft Implementation Guide (DOE G-225.1) will be revised to include the concerns stated above and will be distributed throughout the Department. Expanding the scope of the Implementation Guide by incorporating report writing guidance is in line with EH's ongoing efforts at paperwork reduction and EH's plans to streamline and consolidate program guidance.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 5, the Deputy Assistant Secretary said that EH agrees with the concept of Recommendation 5 and proposed taking the following actions to assure that future Type A and B accident investigation reports contain management sub sections in the report outline.

(1) By July 28, 1996, the Draft Implementation Guide (DOE G-225.1) will be revised to include information on a standardized format and process for writing accident investigation reports. The format will include management system subsections in the Facts, Analysis, Findings, Probable Cause, and Judgment sections of the report. Again, including report writing guidance in the Implementation Guide supports EH's ongoing efforts at paperwork reduction and EH's plans to streamline and consolidate program guidance.

(2) The bulletin described in the response to Recommendation 1 above will provide similar information as an interim measure.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 6, the Deputy Assistant Secretary said that EH agrees with this recommendation and proposed taking the following actions to assure that future accident investigation board chairpersons and members fully understand their responsibilities with respect to identifying and analyzing specific management systems and organizations to determine their possible contributions to the accident being investigated.

(1) By July 28, 1996, the Accident/Incident Investigation Manual will be revised to reflect the issues discussed above.

(2) The bulletin described in the response to Recommendation 1 above will also address this issue as an interim measure.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 7, the Deputy Assistant Secretary said EH agrees with the intent of this recommendation and proposed the following actions to assure that necessary subject matter experts are either members of the accident investigation board or advisors to the board.

(1) By April 30, 1996, the planned revision to DOE Order 225.1 will attack this problem more generally by providing a better definition of the skills required by board members. This includes knowledge of applicable DOE requirements and DOE policies. Subsequent to the written comments, an official of the Office of Oversight clarified EH's response. This official told us that EH policy subject matter experts will be made available to accident investigation boards to assist in any policy clarification requirements.

We believe that EH's reply is responsive to our recommendation.

Regarding Recommendation 8, the Deputy Assistant Secretary said that EH agrees with this recommendation and action has already been taken to address this issue. EH-22 is conducting a follow-up review of the TRISTAN accident to determine the effectiveness of BNL, CH, and NE's corrective actions. The on-site review was completed February 29, 1996, and a DOE Headquarters review and analysis is currently under way. Upon completion of the review and analysis, a report will be published and lessons learned communicated across the Department. Subsequent to the written comments, an official of the Office of Oversight clarified EH's response. This official told us that the TRISTAN accident followup review report will be completed by April 15, 1996.

We believe that EH's planned actions are responsive to our recommendation.

Regarding Recommendation 9, the Deputy Assistant Secretary said that EH agrees with this recommendation and proposed the following actions to assure that clarifications and revisions being made to the DOE accident investigation process are effectively communicated across the Department.

(1) Establish an agenda item on the revised accident investigation process at the Annual Department of Energy Environment, Safety and Health Conference.

(2) Assure that the presentation at the conference adequately reflects the requirement for analysis of management systems and organizations as a probable or root cause of the accident being investigated.

We believe that EH's planned actions are responsive to our recommendation.

By memorandum dated December 29, 1995, the Director, Office of Economic Impact and Diversity (ED), provided comments regarding our initial draft report. She said that the concerns raised by the former Board member could fall within the purview of the

Employee Concerns program. She said that the responsibility for the program was recently transferred to the Office of Economic Impact and Diversity.

Regarding Recommendation 10, the Director said that ED is currently in the process of establishing a formal Employee Concerns program. She said that she has appointed two ED staff members to head a task force of individuals who will undertake this effort. She said that these members will consult with the previous Headquarters Employee Concerns Manager, as well as field managers and other subject matter experts, in order to create a process which is responsive, effective and efficient. She said that in formulating a program, the task force will study the handling of the former Board member's case to ensure that appropriate safeguards and procedures are built into the process to address the concerns which that case raises. Subsequent to the written comments, an ED official told us that they will implement this recommendation within 60 calendar days from the date of issuance of this report.

We believe that ED's planned actions are responsive to our recommendation.

Regarding Recommendation 11, the Director said that in its report to her, the task force will recommend guidelines and procedures for reinforcing the Secretary's policy on openness to employee concerns. Subsequent to the written comments, an ED official told us that they will implement this recommendation within 90 calendar days following their implementation of Recommendation 10.

We believe that ED's reply is responsive to our recommendation.

Regarding Recommendation 12, the Director said that following receipt of the task force report, she anticipates appointing an Employee Concerns Manager to oversee the program. She also said that she regrets that progress in this effort will be hampered by the lack of FTEs (Full Time Equivalents) and funding associated with the Employee Concerns program. She said that when funding does come available, she will move swiftly to ensure that the program is fully implemented and operational. She said that she will keep the Office of Inspector General apprised of the status of her efforts. She said that, in the interim, her Office will accept all matters relating to employee concerns which are brought to its attention and will process them in the most appropriate manner .

By memorandum dated February 27, 1996, the ED Director provided additional comments regarding our official draft report concerning Recommendation 12. She said "Please be assured that our previous comments were not intended to indicate that the Employee Concerns function would be 'sidelined' pending reassignment of funding and/or FTE's." She said that significant actions have already been taken with respect to the program. She said that members of the Director's staff have begun to review the current program, and to consult with stakeholders regarding potential restructuring. She said that, in addition, a notice is currently being drafted to inform DOE employees that the Employee Concerns function now resides within ED. Subsequent to the

written comments, the Acting Deputy Director for Civil Rights and Diversity told us that he has been designated as the Acting Employee Concerns Manager.

We believe that ED's planned actions are responsive to our recommendation.

By memorandum dated March 7, 1996, the Deputy Director, Office of Nuclear Energy, Science and Technology (NE), provided comments on our official draft report.

Regarding Recommendation 13, the Deputy Director said that after the TRISTAN event, NE examined existing controls at its reactors for experiment safety review. He said that, as part of NE's review, the technical safety requirements for each reactor facility were reviewed to confirm that they include adequate requirements to institutionalize the experiment review process. He said that the HFBR and the High Flux Isotope Reactor (HFIR) have both incore experiments and beam tube experiments external to the core. He said that the beam tube experiment safety review process at the HFIR was reviewed and determined to be acceptable. He said that as part of the corrective action plan for the TRISTAN event, an extensive safety review of all beam tube experiments at HFBR was conducted by a multi-discipline team that included reactor operation personnel. He said that, additionally, the HFBR technical safety requirements were revised to require that a documented multi-discipline review of beam tube experiments be performed on new experiments and on all experiments on a biennial frequency. He said that to ensure lessons from the TRISTAN event were shared with NE facilities and the DOE complex, a lessons learned workshop was conducted at BNL on September 22, 1994. He said that NE will conduct followup reviews of BNL and the Oak Ridge National Laboratory (ORNL) beam tube experiment safety review processes. He said that, additionally, review of the contractor experimental review process will be made a mandatory part of the facility representative assessment program. The Deputy Director provided the following milestone and completion dates:

<u>Milestone Description</u>	<u>Completion: Actual (A)/Scheduled (S)</u>
Identify the management procedures that allowed the TRISTAN accident to occur.	05/24/94 (A)
Conduct a lessons learned workshop on the TRISTAN event for other NE facilities and the DOE complex.	09/22/94 (A)
Examine existing controls for experiment safety review.	09/30/94 (A)
Conduct an extensive safety review of all beam tube experiments at HFBR.	12/30/94 (A)

Revise BNL procedures for performing beam tube safety reviews.

11/21/95 (A)

Include the review of the contractor experimental review process as a mandatory part of the facility representative assessment program at NE facilities.

04/26/96 (S)

Conduct followup reviews of BNL and ORNL beam tube experiment safety review processes.

05/17/96 (S)

We believe that NE's planned actions are responsive to our recommendation.

Regarding Recommendation 14, the Deputy Director said that the proposed SAR upgrade plan was deliberately deferred. He said that an interim response to CH would have clarified this position; however, no such response was issued. He said that the plan was not approved until November 3, 1995, due to the Deputy Director's concerns with ensuring a cost-effective approach to meeting the requirements of the SAR Order 5480.23, particularly in light of other initiatives that were being considered in that timeframe. He said that these included the Necessary and Sufficient Review Process and the SAI -15 review of cost-efficient operation and degree of oversight requirements for DOE test and research reactors. He said that in the future, under similar circumstances, an interim response will be issued.

We believe that NE's reply is responsive to our recommendation.

In a letter dated December 9, 1995, the Manager, Chicago Operations Office, provided comments regarding our initial draft report. She said that she believed that our investigation was conducted in an extremely professional, thorough, and competent fashion. She said that she believed that our report reflects the evenhanded methods used to present the results of the investigation. She said that the recommendations made in our report are appropriate and that she accepts the recommendations made for the Chicago Operations Office.

Regarding Recommendation 15, the Manager said that the CH procedures for carrying out accident investigations will be reviewed to assure that appropriate guidance is included to assure that future boards investigate and report upon the management systems as part of the root cause analysis. A CH official subsequently told us that these actions would be completed by April 15, 1996.

We believe that CH's planned actions are responsive to our recommendation.

Regarding Recommendation 16, the Manager said that a Root Cause Analysis Team will be established. She said that this team will use the information found in the

accident investigation report and files as a baseline from which to start this analysis. She said that the team will complete the root cause analysis to determine what actions management should have taken to prevent the accident. A CH official subsequently told us that these actions would be completed by March 15, 1996.

We believe that CH's planned actions are responsive to our recommendation.

Regarding Recommendation 17, the Manager said that CH will review the assignment and exercise of oversight responsibility regarding the HFBR proposed SAR upgrade plan. She said that this review will be focused on all members of the team to assure that all responsibilities are thoroughly understood. She said that in areas where shortfalls are found, appropriate corrective actions will be recommended. She said that the corrective actions will be tracked in the CH management action tracking system. A CH official subsequently told us that these actions would be completed by May 1, 1996.

We believe that CH's planned actions are responsive to our recommendation.

SELECTED CRITERIA REGARDING SCOPE

DOE orders and supporting documents established criteria for developing the scope statement for accident investigations. They also provided guidance on conduct of accident investigations with respect to the role of management systems in failure to prevent the accident.

DOE Order 5484.1, "ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS," dated February 24, 1981, with changes one through seven, was applicable to all Departmental contractor operations where the Department has established control over environmental protection, safety, and health program content. Chapter II, paragraph 2.b.(2) of this Order provided criteria for the development of a scope statement for Type A and B investigations and stated:

- "(c) Scope of Investigation. This statement shall set forth the issues or objectives to be investigated and any special limitations or instructions to the board."

This Order also provided criteria for the completion of the investigation report with respect to management systems. Chapter II, paragraph 2.b.(1) of this Order stated:

- "(b) The investigation report shall fully cover and explain the technical elements of the causal sequences of the occurrence and shall also describe the management systems which should have, or could have, prevented the occurrence, e.g., the hazard review system and the quality assurance program for safety, including the monitoring of actual operations."

DOE Order 5484.1 also referenced the "Accident/Incident Investigation Manual, DOE ISSDC 76-45/27" (A/I Manual). Page 31, Figure 15 of this manual, "TYPICAL LETTER OF APPOINTMENT-TYPE A OR B ACCIDENT INVESTIGATION" included the following example of a scope statement:

- "Your investigation is to be conducted in accordance with DOE Order 5484.1, and the report is to be submitted to me by (Date). The report should fully explain the technical elements of the causal sequence and describe the management systems which should have, or could have prevented the occurrence. Appropriate recommendations for the improvement of the management systems will be required. The DOE Accident/Investigation Manual is to be used for guidance in conducting the investigation and preparing the report."

The AI Manual provided additional guidance on the development of an investigation scope. Page 25, Chapter III of this manual stated:

- “3. . . . Generally, the scope should be defined broadly enough to include the upstream processes which produced the accident situation and the management system which should have controlled it. It should also be limited enough to be manageable by the appointed board.”

Chapter IV, page 47 of this manual stated:

- “6. Were there pertinent codes, standards, and regulations applicable to this work? Was a safety procedure required? Were job instructions prepared? Were they followed? If not, why not?”

The AI Manual also provided guidance on the completion of an accident investigation with respect to management systems in Chapter IV, page 99, and stated:

“Deficiencies can exist anywhere in the organization and are as common at the management levels as at the first line operating or worker level. In fact, deficiencies at lower organizational levels almost always mirror similar defective performances at higher levels. So, when accidents, incidents, and losses occur, the investigator should use MORT [Management Oversight and Risk Tree] analysis to look beyond the errors and failures which immediately precipitated them. The investigator must identify system deficiencies at both the worker and management levels to determine the underlying oversights, omissions, performance errors, and accepted risks which are the root causes.”

The MORT Tree depicts the unacceptable losses, and the oversights and omissions and the assumed or accepted risks which lead to them. It also shows the dual nature of accidental loss development: (a) the less than adequate (LTA) specific control factors which identify what happened, and (b) the ever-present management systems factors which identify why it happened. Factors which are listed as part of management systems, as stated in the MORT Tree chart, include:

“Line Responsibility LTA  
Staff Responsibility LTA  
Management Services LTA  
Accountability LTA  
Vigor and Example LTA”

DOE Guideline DOE-NE-STD-1004-92, “ROOT CAUSE ANALYSIS GUIDANCE DOCUMENT,” dated February 1992, stated in Chapter 2, page 3, that:



"Root Cause. The cause that, if corrected, would prevent recurrence of this and similar occurrences. The root cause does not apply to this occurrence only, but has generic implications to a broad group of possible occurrences, and it is the most fundamental aspect of the cause that can logically be identified and corrected. There may be a series of causes that can be identified, one leading to another. This series should be pursued until the fundamental, correctable cause has been identified."

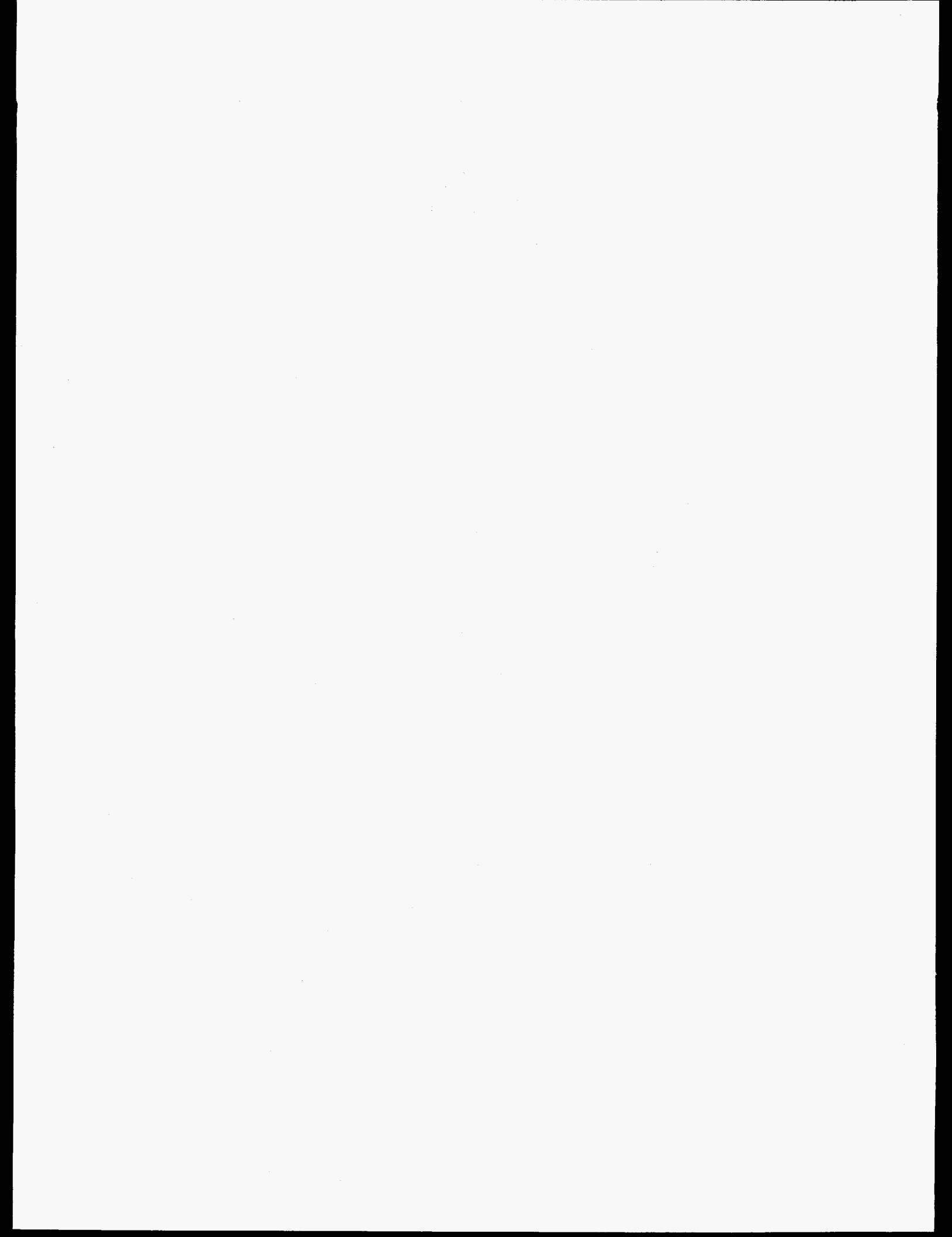
The draft DOE Accident Investigation Report Writing document, dated February 1993, stated on page 7:

"10. . . . Discuss inadequacies in the management system that allowed performance discrepancies by those doing the work. 'Management System' in this context is broad and included inadequacies in contractor, DOE Field Office, and DOE Headquarters management systems."

Page 21 of this draft stated:

"o Do pursue root causes to an adequate level, contractor management, DOE Field Office, or DOE Headquarters, as appropriate."

Based on the information presented above and other interviews we conducted, a review of management systems in root cause analysis should, in our view, include examining "upstream" management systems and organizations which could have or should have prevented the accident. This review should identify specific management systems and organizations as a root cause and the findings of this review should be reported in the accident investigation report.



EXCERPTS FROM THE APPOINTING OFFICIAL'S AND  
BOARD CHAIRMAN'S SCOPE STATEMENTS

The appointment letter for the TRISTAN Type B Investigation, Subject: "INVESTIGATION OF OCCURRENCE AT THE HIGH FLUX BEAM REACTOR (HFBR) BROOKHAVEN NATIONAL LABORATORY," was signed by the CH Manager, on April 11, 1994. The April 11, 1994, letter stated that:

"The investigation and reporting are to be conducted in accordance with Department of Energy (DOE) Order 5484.1 insofar as circumstances associated could have, prevented the occurrence; e.g., the safety or hazard review system, the quality assurance program for safety (including the monitoring of actual operations). Appropriate recommendations for the improvement of the management systems will be required."

The scope statement created by the Board Chairman for the TRISTAN Type B Accident Investigation stated:

". . . the TRISTAN Category B accident investigation will be conducted in accordance with the requirements of DOE Order 5484.1 Environmental Protection, Safety, and Health Protection Information Reporting Requirements."

\* \* \* \* \*

- "1) review the facts surrounding this occurrence
- "2) analyze these facts
- "3) reach conclusions as to the root cause(s) of this occurrence
- "4) identify recommendations for corrective actions to prevent a similar occurrence in the future"

Additionally, the Board Chairman's scope statement required the Board to examine:

- "1) any specific activities or events that contributed to the occurrence, or contributed to the severity of the event.

"2) any specific systems or lack of systems (including technical and management) that contributed to the cause or severity of the event."

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