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NUCLEAR REGULATORY COMMISSION  
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December 10, 1996

OFFICE OF THE  
INSPECTOR GENERAL

MEMORANDUM TO: Dr. Shirley Ann Jackson, Chairman  
U.S. Nuclear Regulatory Commission

FROM: Hubert T. Bell *Hubert T. Bell*  
Inspector General  
U.S. Nuclear Regulatory Commission

SUBJECT: OPPORTUNITIES TO IMPROVE NRC'S DRY  
CASK STORAGE PROGRAM

Attached is the Office of the Inspector General's special evaluation entitled,  
"Opportunities to Improve NRC's Dry Cask Storage Program." Since this report contains no  
recommendations, we did not provide a draft for agency comment.

Attachment:  
As stated

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ANNUAL EVALUATION  
REPORT

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OPPORTUNITIES TO IMPROVE NRC'S  
DRY CASK STORAGE PROGRAM

OIG/96A-20 December 10, 1996

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SPECIAL EVALUATION  
REPORT

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## REPORT SYNOPSIS

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On June 13, 1996, the Chairman, Nuclear Regulatory Commission (NRC) requested the Office of the Inspector General (OIG) to evaluate NRC staff actions in responding to a member of the public who raised concerns about an incident at the Point Beach nuclear power plant. The Chairman also requested OIG to review the dry cask storage program with particular emphasis on (1) loading and unloading techniques, (2) the NRC staff's scope and criteria for completing safety evaluations, (3) the vendor certification and review process, including vendor Quality Assurance (QA) programs, and (4) the interface between the Office of Nuclear Reactor Regulation (NRR) and the Office of Nuclear Material Safety and Safeguards (NMSS) regarding this program. On September 12, 1996, OIG staff briefed the Chairman's staff on this work and offered several observations to improve the program.

### EVALUATION OF NRC STAFF ACTIONS IN RESPONDING TO PUBLIC INQUIRIES

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NRC's categories of public inquiries include "principal" and "general". NRC's Records Management Handbook defines principal correspondence as executive correspondence that requires priority control, response, and management awareness, and requires that it receive "prompt attention." General correspondence includes letters from the public written to NRC staff, but the agency has not established firm milestones for responding to this correspondence. NRC staff told us that various factors affect their responsiveness to general correspondence. For example, they must balance general correspondence responses against other workload demands. They also noted that safety issues generally take priority, and responding to public letters is relatively low on their list of priorities.

### DRY CASK LOADING AND UNLOADING PROCEDURES

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NRC staff told us they do not formally approve or validate licensee loading and unloading procedures because the agency does not have sufficient staff or expertise to review each procedure. The staff recently formed a working group to review

spent fuel loading and unloading issues, and are developing a standard review plan (SRP) to guide the dry cask storage program. Some modifications to the inspection program have been incorporated into the draft SRP, and more may be added as staff gain a better understanding of the technical issues.

## **NRC STAFF'S SCOPE AND CRITERIA FOR COMPLETING THE DRY CASK SAFETY EVALUATION**

NRC staff conduct technical reviews to evaluate whether there is "reasonable assurance" that a vendor's design will perform its intended safety function. Based on the Point Beach incident, NRC staff is expanding its review criteria to include potential chemical reactions inside spent fuel casks.

## **THE VENDOR CERTIFICATION AND QA REVIEW PROCESS**

NRC regulations state that licensees are responsible for assuring fabricators and vendors establish and execute appropriate QA programs. NRC staff told us the agency does not have authority to issue a monetary fine to fabricators and vendors because they are not NRC licensees. When NRC identifies weaknesses in fabricator and vendor QA programs, the agency issues a Notice of Nonconformance which has no enforcement leverage. In July 1996, NRC proposed to expand enforcement authority to include parties who participate in safety-related functions, such as cask designers, fabricators, and vendors.

## **THE NRR/NMSS INTERFACE**

NRC staff have attempted to optimize the experience and efficiency of the program offices responsible for overseeing spent nuclear fuel storage. Industry representatives believe there has been effective interface among NRC staff regarding spent fuel issues. Some NRC staff suggested that due to the potential growth in the use of this technology throughout the industry, NRC needs to develop and conduct formal training for staff who play an instrumental role in the daily operations of the dry cask storage program.

## **MATTERS FOR CONSIDERATION**

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To improve its responsiveness to the public, NRC should consider providing staff with guidance in processing repetitive inquiries, and firm milestones for responding to these inquiries.

Also, based on the Point Beach precursors, and the potential growth of dry cask storage use at other nuclear power plants, we endorse several staff actions, either underway or planned, to improve this program including:

- \* Implement a mechanism to compel required improvements when problems are identified in fabricator and vendor QA programs;
- \* Develop and conduct formal training for NRC staff involved in dry cask storage.

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## INTRODUCTION

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On June 13, 1996, the Chairman, Nuclear Regulatory Commission (NRC) requested the Office of Inspector General (OIG) to evaluate NRC staff actions in responding to a member of the public who raised concerns about an incident at the Point Beach nuclear power plant. The Chairman also requested OIG to review the dry cask storage program with particular emphasis on (1) loading and unloading techniques, (2) the NRC staff's scope and criteria for completing safety evaluations, (3) the vendor certification and review process, including vendor Quality Assurance (QA) programs, and (4) the interface between the Offices of Nuclear Reactor Regulation (NRR) and Nuclear Material Safety and Safeguards (NMSS) regarding this program. On September 12, 1996, OIG staff briefed the Chairman's staff on this work and offered several observations to improve the program.

Subsequent to the briefing, OIG audit staff received additional correspondence from a member of the public who expressed concerns regarding the agency's responsiveness to programmatic issues they previously raised. This report summarizes the information we provided in the briefing, and developed in response to the additional correspondence. Appendix I contains additional information regarding our objectives, scope, and methodology.

## BACKGROUND

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On May 28, 1996, staff at the Point Beach nuclear plant were loading spent nuclear fuel into a VSC-24 spent fuel cask, the third to be loaded at the plant. The loading procedure includes welding a shield lid on the cask. During this phase of the operation, an unanticipated hydrogen gas ignition occurred inside the cask. The ignition displaced the lid upward about 3 inches, and cocked it at a slight angle. The shield lid is approximately 9 inches thick, 5 feet in diameter, and weighs about 6,400 pounds. There were no personnel injuries or evidence of damage to the spent fuel inside the cask.

During the event, radiation release pathways to the public were monitored with no indication of abnormal releases. NRC dispatched an Augmented Inspection Team (AIT) to the facility, and the team concluded there was no (1) resulting off-site radiological consequence, (2) measurable radioactivity release from the cask, or

(3) unanticipated radiation exposure to the staff. The AIT also found the licensee had several opportunities to identify gas generation inside the cask during previous loading operations, but did not document, thoroughly evaluate, or view these indications collectively.

The licensee also believes (1) the source of the hydrogen was an electrochemical reaction between zinc used in a coating to prevent corrosion inside the cask, and borated water from the spent fuel pool, and (2) opportunities to identify this reaction were missed during the cask's initial design and review.

## **EVALUATION RESULTS**

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In the past several years, NRC has received numerous public inquiries that raised a variety of concerns regarding the dry cask storage program. The Point Beach incident was a catalyst in the Chairman's request for the OIG to evaluate NRC staff actions in responding to public inquiries, and various aspects of the dry cask storage program. The following sections address the issues contained in the Chairman's letter.

### **EVALUATION OF NRC STAFF ACTIONS IN RESPONDING TO PUBLIC INQUIRIES**

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NRC's categories of public inquiries include "principal" and "general". NRC's responsiveness can be affected by which category the public inquiry falls under.

NRC's Records Management Handbook defines principal correspondence as executive correspondence that requires priority control, response, and management awareness. This includes letters from congressional sources, agency heads, or State and local governments addressed to the Chairman, the Commissioners, the Executive Director for Operations, (EDO) or other principal agency officials. The Handbook outlines staff office responsibilities for responding to principal correspondence, and requires that it receive "prompt attention."

General correspondence includes letters from the public written to NRC staff. NRC's Handbook states that staff should respond to general correspondence within 15 working days. It also states that NRC staff should provide an interim reply or acknowledgement when requested information is not readily available or a direct

reply cannot be made within this period. However, the agency has not established firm milestones for responding to general correspondence. NRR and NMSS developed a memorandum of understanding (MOU) that designates the NRR project manager for dry cask storage as the focal point for most public inquiries.

NRC staff told us various factors affect their responsiveness to general correspondence. For example, they must balance responding to general correspondence against other workload demands. They also noted that safety issues generally take priority, and responding to public letters is relatively low on their list of priorities. Their response time is further delayed if they receive numerous inquiries on a topic. In addition, the public inquiry response process is further complicated and delayed if the agency has received a petition under 10 CFR Section 2.206 on a related technical issue. When this occurs, NRC staff must ensure their response to public inquiries does not conflict with NRC's Section 2.206 proceedings.

NRC staff told us they have received approximately 70 letters from one member of the public within the past 2 years pertaining to the dry cask storage program at the Point Beach and Palisades nuclear power plants, and many of these letters are somewhat repetitive. The staff has responded to all but 5 backlogged letters in the "general" category, and are processing 5 letters in the "principal" category. During our audit, NRC staff received and are responding to 3 additional "general" letters from this person.

OIG also received correspondence from this person who suggested (1) they previously identified weaknesses in the dry cask review process which may have prevented the Point Beach incident, and (2) NRC staff has not been responsive to comments submitted in response to the Federal Register notice. NRC staff told us they do not believe the issues raised were predictive of the Point Beach incident because the comments focused on corrosion within the cask, not a chemical reaction and resultant hydrogen generation. The staff also said the agency did not consider the coating to be an issue during the initial cask certification process.

NRC staff also told us they do not respond to each person on each issue submitted to the Federal Register. Instead, they summarize public comments by subject matter, and state the agency position on each issue in the Federal Register. The staff also said they usually provide copies of the Federal Register notice that

outlines the agency's position to those who provided comments, and showed us copies of this information and other correspondence they provided to this individual.

## **DRY CASK LOADING AND UNLOADING PROCEDURES**

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We found that NRC has developed, and is continuing to modify its inspection procedures to verify that licensees have acceptable loading and unloading procedures.

NRC staff told us the agency has developed several inspection procedures to address various aspects of dry cask loading. The basic objective of NRC's inspection program is to verify that each licensee has developed procedures to ensure spent fuel loading and unloading is conducted safely. NRC staff then review a sample of the licensee's procedures to assess whether they appear reasonable. However, NRC staff told us they do not formally approve or validate licensee loading and unloading procedures because the agency does not have sufficient staff or expertise to review each procedure.

According to NRC staff, after the licensee who operates the Palisades nuclear power plant announced plans to unload a spent fuel cask, they inspected all loading and unloading procedures for licensees using this technology. NRC staff also told us they found licensee's loading procedures to be acceptable.

The staff also noted, however, that unloading procedures for spent nuclear fuel appear to be more complex. For example, questions have surfaced regarding re-flooding the cask with water, the possibility of thermal shock to the spent fuel, and steam generation. NRC staff told us they formed a working group to review spent fuel loading and unloading issues, and are developing an SRP to guide the dry cask storage program. Based on their review, some modifications to the inspection program have been incorporated into the draft SRP, and more may be added as they gain a better understanding of the technical issues. The staff expects to issue the final SRP in December 1996. NRC staff also told us the working group is drafting an Information Notice to licensees that discusses several concerns regarding dry cask loading and unloading procedures. They expect to issue the Information Notice in December 1996.

## **NRC STAFF'S SCOPE AND CRITERIA FOR COMPLETING THE DRY CASK SAFETY EVALUATION**

NRC staff conduct technical reviews to evaluate whether there is "reasonable assurance" that a vendor's design will perform its intended safety function. Based on the Point Beach incident, NRC staff is expanding its review criteria to include potential chemical reactions inside spent fuel casks.

NRC regulations, 10 CFR Part 72, establish requirements for licensing independent spent fuel storage facilities at nuclear power plants and approving the use of dry spent fuel storage casks. The agency has also published Regulatory Guides that describe acceptable methods of implementing NRC regulations, and is developing an SRP to guide NRC staff in reviewing licensee applications to utilize dry cask storage systems.

NRC requires vendors to prepare a Safety Analysis Report (SAR) that is of sufficient detail to permit agency staff to determine whether the design can be fabricated and used without endangering public health and safety. The SAR describes the component and its operating characteristics, and explains how it will meet NRC's safety requirements. Upon receiving an application to use the component, it is assigned to a project manager in the Spent Fuel Project Office (SFPO). The project manager is the lead staff member, and is responsible for compiling a technical review team to analyze the SAR and determine whether it contains sufficient information to meet NRC's regulations. If needed, the SFPO requests vendors to supply additional information. NRC staff told us this process continues until all required items are addressed.

NRC staff review the SAR, based in part on data provided by the vendor and other independent analyses, and document their evaluation in a Safety Evaluation Report (SER). If the staff concludes there is "reasonable assurance" that the vendor's design will perform its intended safety function, the agency issues a Certificate of Compliance (COC) which permits licensees to use the component.

In June 1996, NRC conducted an inspection at the Sierra Nuclear Corporation, manufacturer of the VSC-24 cask, to determine whether design activities had been conducted in accordance with NRC regulations. The inspection identified several nonconformances with the design process requirements, including a lack of (1) independent verification of design controls, and (2) analysis for environmental compatibility. NRC issued a Notice of Nonconformance, and requested the vendor to provide a written response to the issues identified. Sierra Nuclear Corporation replied to the Notice of Nonconformance in early August 1996, and NRC staff

told us they are currently evaluating the response.

NRC staff also noted the draft SRP previously focused on evaluating whether the cask design ensures the spent nuclear fuel is (1) confined, (2) isolated from the public and the environment, and (3) protects the fuel against degradation. They stated the SRP is currently being modified to include an evaluation of coatings that might cause a chemical reaction inside spent fuel casks.

## **THE VENDOR CERTIFICATION AND QA REVIEW PROCESS**

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NRC regulations state that licensees are responsible for assuring fabricators and vendors establish and execute appropriate QA programs. NRC staff told us the agency does not have authority to issue a monetary fine to fabricators and vendors because they are not NRC licensees. When NRC identifies weaknesses in fabricator and vendor QA programs, the agency issues a Notice of Nonconformance which has no enforcement leverage. NRC recently proposed to expand its enforcement authority.

NRC staff told us that in accordance with the draft SRP, their review of the applicant's or vendor's QA program is conducted independently of the SAR review, and is not included in the agency's SER. SFPO staff conduct on-site inspections at fabricator and vendor facilities to determine whether they have established, documented, and are using procedures that comply with regulatory requirements and commitments. Since 1991, NMSS staff conducted 14 on-site inspections of licensees, fabricators, and vendors to determine whether spent fuel storage systems are designed and constructed in accordance with applicable QA program requirements. The inspections identified 157 findings, such as weaknesses in vendor QA programs, and a lack of licensee oversight of the vendor's design and documentation process.

In addition, NRC regulations state that licensees are responsible for assuring fabricators and vendors establish and execute appropriate QA programs, and meet the specifications defined in the COC. NRC staff told us the agency does not have authority to issue a monetary fine to fabricators and vendors because they are not NRC licensees. When NRC identifies weaknesses in fabricator and vendor QA programs, the agency issues a Notice of Nonconformance which has no enforcement leverage. NRC staff suggested the agency could be more effective if it had explicit authority to take enforcement action against fabricators and

vendors. In July 1996, NRC proposed to expand enforcement authority to include parties who participate in safety-related functions, such as cask designers, fabricators, and vendors.

## **THE NRR/NMSS INTERFACE**

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We found NRC staff have attempted to optimize the experience and expertise of the program offices responsible for overseeing spent nuclear fuel storage. Industry representatives believe there has been effective interface among NRC staff regarding spent fuel issues.

In March 1995, NRR and NMSS agreed to an MOU that outlines the regulatory responsibilities of each Office. NRR provides technical guidance and advice to NMSS, conducts inspections at power plants, and addresses public concerns regarding dry cask storage issues. NMSS reviews and certifies cask systems and conducts inspections at fabricators and vendors. To further improve communication regarding dry cask storage issues, NRC has designated points of contact in NRR, NMSS, and regional offices. NRC staff also told us they regularly conduct conference calls to review program status and address new issues.

In addition, NRR and NMSS developed an Action Plan in July 1995 to identify and resolve major program issues. The staff revised their plan in January 1996, and expected to develop an update by July 1996. However, because they were working on safety issues associated with the Point Beach incident, the staff did not meet that date. NRC staff told us they expect the updated plan to be completed by January 1997; they also noted a decision has not been finalized whether to periodically update the plan to address emerging issues.

Some NRC staff told us the agency's dry cask storage training has been limited and non-specific. They also suggested that due to the potential growth in the use of this technology throughout the industry, NRC needs to develop and conduct formal training for staff, such as project managers and inspectors, who play an instrumental role in the daily operations of the dry cask storage program.

Representatives of the Nuclear Energy Institute, (NEI), the nuclear industry's Washington-based trade association, told us that because the industry has targeted dry cask storage as a high-priority issue, they created a task force to identify and resolve generic issues. They also stated there has been effective interface among NRC staff regarding spent fuel issues.

## **MATTERS FOR CONSIDERATION**

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To improve its responsiveness to the public, NRC should consider providing staff with guidance in processing repetitive inquiries, and firm milestones for responding to these inquiries.

Also, based on the Point Beach precursors, and the potential growth of dry cask storage use at other nuclear power plants, we endorse the following staff actions, either underway or planned, to improve this program:

- \* Promote a questioning attitude among agency staff and licensees, and resolve any inconsistencies found in dry cask storage operations;
- \* Implement a mechanism to compel required improvements when problems are identified in fabricator and vendor QA programs;
- \* Update dry cask storage guidance based on lessons learned from the Point Beach incident and licensee responses to NRC communications;
- \* Maintain an up-to-date action plan for outstanding programmatic issues; and,
- \* Develop and conduct formal training for NRC staff involved in dry cask storage.



## **OBJECTIVES, SCOPE, AND METHODOLOGY**

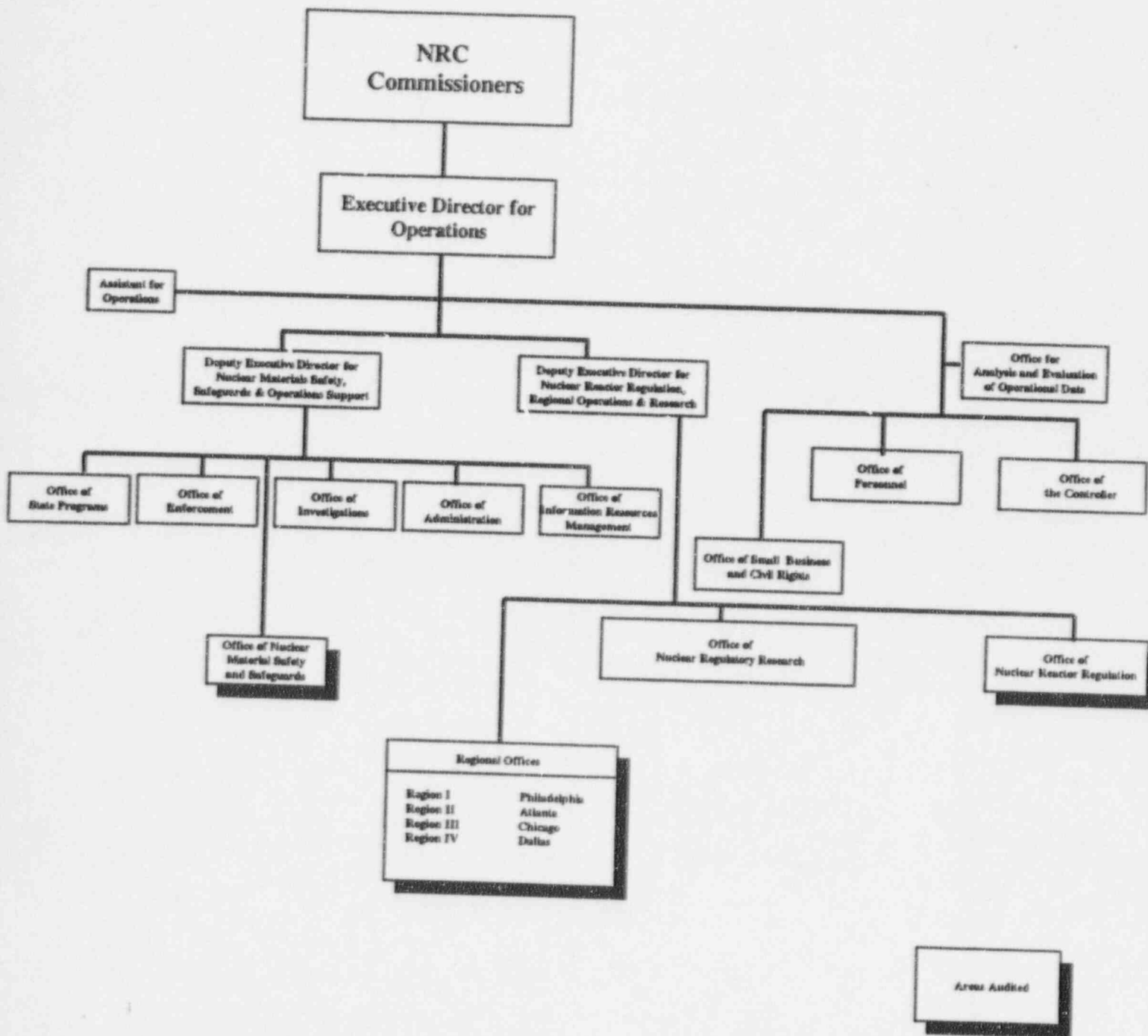
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The objective of our work was to evaluate NRC staff actions in responding to a member of the public who raised concerns about an incident at the Point Beach nuclear power plant, and review the dry cask storage program with particular emphasis on (1) loading and unloading techniques, (2) the NRC staff's scope and criteria for completing safety evaluations, (3) the vendor certification and review process, including vendor Quality Assurance (QA) programs, and (4) the interface between the Office of Nuclear Reactor Regulation (NRR) and the Office of Nuclear Material Safety and Safeguards (NMSS) regarding this program.

We interviewed managers in NRR, the Spent Fuel Project Office (SFPO) established within NMSS, and in Region III where the Point Beach nuclear power plant is located. We reviewed inspection reports, pertinent NRC guidance and directives, and other documents pertaining to dry cask design and certification. In addition, we spoke with representatives of the Nuclear Energy Institute, (NEI), the nuclear industry's Washington-based trade association, and attended NEI's Dry Cask Storage Task Force meeting held at Manitowoc, Wisconsin and the Point Beach facility in August 1996.

We conducted our work from June through October 1996.

**U.S. NRC FUNCTIONAL ORGANIZATION CHART**



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## GLOSSARY: OFFICE OF THE INSPECTOR GENERAL PRODUCTS

### INVESTIGATIVE

1. *INVESTIGATIVE REPORT - WHITE COVER*

An Investigative Report documents pertinent facts of a case and describes available evidence relevant to allegations against individuals, including aspects of an allegation not substantiated. Investigative reports do not recommend disciplinary action against individual employees. Investigative reports are sensitive documents and contain information subject to the Privacy Act restrictions. Reports are given to officials and managers who have a need to know in order to properly determine whether administrative action is warranted. The agency is expected to advise the OIG within 90 days of receiving the investigative report as to what disciplinary or other action has been taken in response to investigative report findings.

2. *EVENT INQUIRY - GREEN COVER*

The Event Inquiry is an investigative product that documents the examination of events or agency actions that do not focus specifically on individual misconduct. These reports identify institutional weaknesses that led to or allowed a problem to occur. The agency is requested to advise the OIG of managerial initiatives taken in response to issues identified in these reports but tracking its recommendations is not required.

3. *MANAGEMENT IMPLICATIONS REPORT (MIR) - MEMORANDUM*

MIRs provide a "ROOT CAUSE" analysis sufficient for managers to facilitate correction of problems and to avoid similar issues in the future. Agency tracking of recommendations is not required.

### AUDIT

4. *AUDIT REPORT - BLUE COVER*

An Audit Report is the documentation of the review, recommendations, and findings resulting from an objective assessment of a program, function, or activity. Audits follow a defined procedure that allows for agency review and comment on draft audit reports. The audit results are also reported in the OIG's "Semiannual Report" to the Congress. Tracking of audit report recommendations and agency response is required.

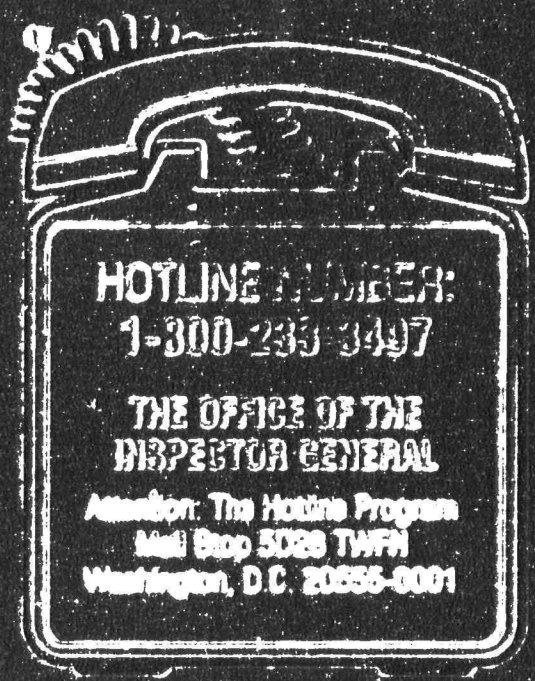
5. *SPECIAL EVALUATION REPORT - BURGUNDY COVER*

A Special Evaluation Report documents the results of short-term, limited assessments. It provides an initial, quick response to a question or issue, and data to determine whether an in-depth independent audit should be planned. Agency tracking of recommendations is not required.

### REGULATORY

6. *REGULATORY COMMENTARY - BROWN COVER*

Regulatory Commentary is the review of existing and proposed legislation, regulations, and policies so as to assist the agency in preventing and detecting fraud, waste, and abuse in programs and operations. Commentaries cite the IG Act as authority for the review, state the specific law, regulation or policy examined, pertinent background information considered and identifies OIG concerns, observations, and objections. Significant observations regarding action or inaction by the agency are reported in the OIG Semiannual Report to Congress. Each report indicates whether a response is required.



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