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License Number NPF-3

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United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: Integrated Report to Support Restart of the Davis-Besse Nuclear Power Station and Request for Restart Approval

Ladies and Gentlemen:

On March 6, 2002, FirstEnergy Nuclear Operating Company (FENOC) identified a cavity in the Reactor Pressure Vessel (RPV) head for the Davis-Besse Nuclear Power Station Unit Number 1 (DBNPS). On March 13, 2002, the NRC issued Confirmatory Action Letter (CAL) No. 3-02-001 regarding the RPV head degradation. The CAL documented six sets of commitments that FENOC was required to fulfill prior to restart of the DBNPS. These commitments included the following:

> Prior to the restart of the unit, meet with the NRC to obtain restart approval. During that meeting, we expect you will discuss your root cause determination, extent of condition evaluations, and corrective actions completed and planned to repair the damage and prevent recurrence.

In order to support the restart approval meeting with the NRC pursuant to this commitment in the CAL, enclosed is the "Integrated Report to Support Restart of the Davis-Besse Nuclear Power Station."

This Report provides an overall discussion of the DBNPS restart activities. It primarily consists of consolidating information previously made available to the NRC by means of letters, root cause analysis reports, licensee event reports, inspections, meetings, etc. As explained in the Report, the causes of the RPV head degradation have been determined; the extent of condition has been determined; systems, programs, and organizations have

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been reviewed and appropriate corrective actions taken; additional actions have been implemented to improve management and human performance; and plans have been established to achieve and sustain further long-term improvement in performance at the DBNPS. Based upon these actions and plans, FENOC concludes that the plant, programs, and personnel are ready to support safe operation, subject to completion of a few remaining, well-defined work activities prior to restart. As a result, FENOC requests that the NRC schedule a meeting as required by the CAL to discuss these actions, and then provide approval for the restart of the DBNPS.

As discussed above, there are several remaining activities that are to be completed prior to restart. These activities include certain modifications (e.g., installation and testing of the modified high pressure injection pumps); certain calculations, corrective actions, and operations improvements; restart readiness reviews; and an assessment of operator performance. FENOC will continue to communicate with the NRC the status of these activities.

If you have any questions or require further information, please contact Mr. Kevin L. Ostrowski, Manager – Regulatory Affairs, at (419) 321-8450.

Very truly yours,

SPF

Enclosure

cc: J.L. Caldwell, NRC Region III Administrator
S. J. Collins, NRC Deputy Executive Director
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C.S. Thomas, DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions by the DBNPS. They are described only for information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at the DBNPS of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
As listed in Appendices A and C to the enclosed Integrated Restart Report.	As listed in Appendices A and C to the enclosed Integrated Restart Report.

Docket Number 50-346
License Number NPF-3
Serial Number 1-1336
Enclosure

INTEGRATED REPORT TO SUPPORT RESTART OF THE DAVIS-BESSE NUCLEAR POWER STATION

FENOC
FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station

INTEGRATED REPORT TO SUPPORT RESTART OF THE DAVIS-BESSE NUCLEAR POWER STATION

November 2003

Safety ✧ *People* ✧ *Reliability*

FENOC
FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station

INTEGRATED REPORT TO SUPPORT RESTART OF THE DAVIS-BESSE NUCLEAR POWER STATION

Approvals:

Mark B. Bezilla — 11/23/03
Site Vice President — Date

Lew W. Myers — 11/23/03
Chief Operating Officer — Date

Gary R. Leidich — 11/23/03
President and Chief Nuclear Officer — Date

Safety ✧ *People* ✧ *Reliability*

FirstEnergy Nuclear Operating Company

Integrated Report to Support Restart of the Davis-Besse Nuclear Power Station

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Acronyms

ANSI	American National Standards Institute
AOV	Air Operated Valve
ASME	American Society of Mechanical Engineers
BACC	Boric Acid Corrosion Control
BPC	Boron Precipitation Control
CA	Corrective Action
CAC	Containment Air Cooler
CAL	Confirmatory Action Letter
CAP	Corrective Action Program
CARB	Corrective Action Review Board
CCW	Component Cooling Water
CDF	Core Damage Frequency
CNO	Chief Nuclear Officer
CNRB	Company Nuclear Review Board
COO	Chief Operating Officer
CR	Condition Report
CRDM	Control Rod Drive Mechanism
Davis-Besse	Davis-Besse Nuclear Power Station
DBA	Design Basis Accident
DBVP	Design Basis Validation Program
DH/LPI	Decay Heat/Low Pressure Injection
DHR	Decay Heat Removal
EAB	Engineering Assessment Board
ECCS	Emergency Core Cooling System
ECP	Employee Concerns Program
EDG	Emergency Diesel Generator

Acronyms

EDS	Electrical Distribution System
ELMS	Electrical Load Management System
EOC	Extent of Condition
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
ETAP	Electrical Transient Analysis Program
EWR	Engineering Work Request
FENOC	FirstEnergy Nuclear Operating Company
HELB	High Energy Line Break
HIRD	Harassment, Intimidation, Retaliation, and Discrimination
HPES	Human Performance Evaluation System
HPI	High Pressure Injection
HVAC	Heating, Ventilation, and Air-Conditioning
IAEA	International Atomic Energy Agency
ILRT	Integrated Leak Rate Test
IMC	Inspection Manual Chapter
IMI	In-Core Monitoring Instrumentation
INPO	Institute of Nuclear Power Operations
ISI	Inservice Inspection
LER	Licensee Event Report
LERF	Large Early Release Frequency
LIR	Latent Issues Reviews
LOCA	Loss-of-Coolant Accident
MRB	Management Review Board
MS	Main Steam
NCOB	Nuclear Committee of the Board

Acronyms

NDE	Non-Destructive Examination
NOP	Normal Operating Pressure or Nuclear Operating Procedure
NQA	Nuclear Quality Assessment
NRC	U.S. Nuclear Regulatory Commission
PCSP	Permanent Cavity Seal Plate
PM	Preventive Maintenance
PRC	Project Review Committee
PSA	Probabilistic Safety Assessment
PSHA	Performance, Safety and Health Associates
PWSCC	Primary Water Stress Corrosion Cracking
QA	Quality Assessment
QC	Quality Control
RCP	Reactor Coolant Pump
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor Coolant System
RFO	Refueling Outage
ROP	Restart Overview Panel
RP	Radiation Protection
RPV	Reactor Pressure Vessel
RSMT	Restart Senior Management Team
RSRB	Restart Station Review Board
SCAQ	Significant Condition Adverse to Quality
SCWE	Safety Conscious Work Environment
SFAS	Safety Features Actuation System
SFRCS	Steam and Feedwater Rupture Control System
SFVP	Safety Function Validation Project

Acronyms

SG	Steam Generator
SLT	Senior Leadership Team
SMT	Senior Management Team
SRO	Senior Reactor Operator
SSCs	Systems, Structures and Components
SW	Service Water
USAR	Updated Safety Analysis Report

Executive Summary

A. Purpose

FirstEnergy Nuclear Operating Company (FENOC) has determined that the Davis-Besse Nuclear Power Station (Davis-Besse) has completed the actions necessary to ensure safe and reliable return to service and, subject to completion of the remaining scheduled activities, is ready to restart. This Report documents the basis for this determination.

B. Description and Event Chronology

On March 6, 2002, Davis-Besse identified a cavity in the reactor pressure vessel (RPV) head. In response, the U.S. Nuclear Regulatory Commission (NRC) issued a Confirmatory Action Letter (CAL) and established an Inspection Manual Chapter (IMC) 0350 Oversight Panel, which developed a restart checklist identifying those issues requiring resolution before restart. In response to the event and the CAL, Davis-Besse performed various root cause analyses and assessments and developed a Return to Service Plan with seven Building Blocks. These include actions to address the commitments in the CAL, the near-term corrective and preventive actions to address the causal factors associated with the RPV head degradation, and the longer-term actions necessary to assure that the underlying causal factors remain corrected and that continued safe performance at Davis-Besse is maintained. Each of these is summarized below.

C. Root Cause Analyses and Assessments

Numerous root cause analyses and assessments have been performed, including evaluations of the root causes of the RPV head degradation; assessments of Nuclear Quality Assessment (NQA), Operations, corporate management, the Corrective Action Program (CAP), the Company Nuclear Review Board (CNRB), and Engineering; and a collective significance review. As a result, it was determined that:

- The RPV head degradation resulted from primary water stress corrosion cracking (PWSCC) in control rod drive mechanism (CRDM) nozzles, which led to a through-wall leak of boric acid and boric acid corrosion of the RPV head.

- A production focus established by management, combined with taking minimum actions to meet regulatory requirements, resulted in acceptance of degraded conditions on the RPV head and other components affected by boric acid.

- There were deficiencies with respect to: (1) the implementation of the CAP; (2) the analyses of safety implications of industry information and site experience; (3) compliance with the Boric Acid Corrosion Control (BACC) and Inservice Inspection (ISI) programs; (4) NQA oversight; (5) Operations' leadership role in assuring plant safety; and (6) the safety focus of the CNRB.

In summary, both the technical and organizational causes of the head degradation have been identified. As discussed below, corrective and preventive actions have been taken to address these causes.

D. Return to Service Plan and Building Block Plans

1. Reactor Head Resolution Plan

The degraded Davis-Besse RPV head was replaced with a new one from the canceled Midland Plant. The Midland RPV head was certified in accordance with the American Society of Mechanical Engineers (ASME) Code. The procurement contractor for the new RPV head provided the required documentation, supplemental non-destructive examinations, analyses, and ASME Code reconciliation necessary to ensure the original ASME documentation remains valid, and that the replacement RPV head complies with appropriate NRC and industry requirements.

To accommodate removal of the original RPV head and installation of the replacement, access openings were installed in both the shield building and containment vessel. Following installation of the new RPV head, the containment was returned to its original design configurations, and a successful containment integrated leak rate test (ILRT) was conducted.

After installation of the new RPV head, the reactor coolant system (RCS) was brought to normal operating pressure (NOP). Visual inspections were performed for evidence of leakage. The RPV head-to-flange seals and the control rod drive mechanisms were confirmed to be leak tight. In addition, zero pressure boundary leakage was confirmed.

In summary, the replacement RPV head is in compliance with applicable NRC and industry requirements and is ready to support safe power operation.

2. Containment Health Assurance Plan

Inspections of systems, structures, and components (SSCs) within containment were performed to ensure that their condition supports safe operation. The plan focused on the extent of condition of PWSCC in the RCS and identifying damage that may have resulted from boric acid leakage and dispersion of boric acid in the containment.

As a result of its inspections, over 950 condition reports (CRs) were generated. It was determined that the containment air coolers (CACs) were significantly impacted by boric acid, and the coolers were rebuilt. Degradation of other components was identified and, as appropriate, these components were replaced or repaired. It was determined that the boric acid deposition did not impact the environmental qualification (EQ) of any equipment. Additionally, inspections, analyses and tests were performed to provide reasonable assurance that penetrations at the bottom of the RPV are not leaking.

In conclusion, comprehensive inspections have been conducted of SSCs within containment, and appropriate corrective actions have been taken. As a result, Davis-Besse concludes that the condition of the SSCs within containment supports safe restart and operation after containment closure by the Operations section.

3. Program Compliance Plan

The Program Compliance Plan consisted of a two-phase review of applicable plant programs. Phase 1 was a baseline assessment of approximately 65 plant programs to determine if the

programs are in a condition to support the restart and safe operation of Davis-Besse. Phase 2 was an in-depth systematic review of several programs.

As a result of the Phase 1 reviews, deficiencies were identified and evaluated. The restart-related deficiencies have been or are being corrected, and the responsible managers have affirmed the readiness of their programs to support return to service and safe operation. In response to the Phase 2 reviews, the following improvements have been made:

- Corrective Action Program – Davis-Besse implemented several actions to improve operability evaluations, categorization of CRs, cause determinations, effectiveness of corrective actions, and timeliness of corrective actions.

- Operating Experience Program – Davis-Besse implemented a new screening and evaluation process, expanded the operating experience information dissemination methods, formalized the internal/FENOC operating experience process, and documented the expectations for the use of operating experience.

- Quality Audits – The Quality Assessment Manager at each station now reports to the Vice-President of Oversight, who in turn reports to the President of FENOC and the Nuclear Committee of the Board of Directors. The CNRB procedure now requires the CNRB to place emphasis on nuclear safety. Quality Control Inspectors have been moved into the NQA group.

- Self-Assessments – A business practice was created to provide guidance for developing, maintaining, and assessing plant programs. Corporate program managers have been established to oversee specific programs and to facilitate the use of the best industry practices as the standard practice at FENOC's plants.

- BACC Program – Davis-Besse revised the BACC Program Manual to include the CRDM nozzles as a probable location of leakage, hired a new plant BACC Program Owner, and implemented a new Job Familiarization Guideline for boric acid inspectors and the BACC Program owner.

- RCS Integrated Leakage Program – Davis-Besse developed and implemented an RCS Integrated Leakage Program to improve the capability for detecting and correcting small leaks that are within the limits of the Technical Specifications.

- ISI Program – Davis-Besse revised the ISI program to provide for the performance of augmented examinations for selected components, including the CRDM nozzles. Additionally, a formal interface between the ISI Pressure Test and the BACC Program has been established, and training of personnel has been revised to emphasize identification of the leakage source.

- Modifications Program – Davis-Besse developed and implemented a common procedure modeled after industry best practices. A more formal design input process has been established to identify and document pertinent design

information at the beginning of the design development, and strengthen the design interface process.

- Radiation Protection (RP) – Davis-Besse hired a new FENOC RP Program Manager (who is currently serving as acting site RP Manager), several additional professional staff, and established improved RP standards and expectations. Additionally, state-of-the-art instrumentation and equipment have been purchased and placed into service.

In total, over 600 restart corrective actions for programs have been completed. Based upon its reviews and corrective actions, Davis-Besse concludes that its programs are ready to support safe and reliable operation.

4. System Health Assurance Plan

The initial scope of the System Health Assurance Plan included: (1) Operational Readiness Reviews to identify whether systems have significant shortcomings; (2) In-depth System Health Readiness Reviews to provide reasonable assurance that systems can perform their risk-significant maintenance rule functions; and (3) Latent Issues Reviews (LIRs) of five systems to provide reasonable assurance that these systems can perform their safety and accident mitigation functions. The system design reviews identified numerous discrepancies, including a number of conditions with potential safety significance (mostly due to calculation problems). Discrepancies were evaluated for the potential effect on operability. For conditions affecting operability, corrective actions have been or are being taken to restore the system, and an evaluation was performed to determine the extent of condition (EOC).

A Safety Function Validation Project (SFVP) was established to provide additional assurance that systems are capable of performing their safety functions. These reviews consisted of an evaluation of the calculations and testing for 15 systems with risk-significant safety functions. Based upon SFVP, it was determined that, with several exceptions, the 15 systems could perform their safety functions. As a result, appropriate corrective actions are being taken to restore the systems and components in question to operability before restart, and evaluations have been performed to bound the EOC.

Additionally, a collective significance review of identified conditions was performed to determine which topical areas warranted further evaluation. Five of these areas had not been the subject of previous reviews: high-energy line break (HELB), EQ, seismic, Appendix R - safe shutdown, and flooding. Therefore, topical area reviews of these areas were performed to bound their extent of condition.

As a result of these reviews and actions, Davis-Besse concludes that there is reasonable assurance that plant systems can perform their design-basis safety functions and are ready to support safe restart and operation of Davis-Besse.

5. Management and Human Performance Excellence Plan

The purpose of the Management and Human Performance Excellence Plan was to conduct a thorough assessment of the management and organizational issues surrounding the degradation

of the RPV head and create a comprehensive leadership and organizational development plan for the site. Based upon the assessments, actions have been taken to improve management and human performance, as summarized in Section E below.

The Plan also included a functional area review of the operational readiness of Plant Operations, Chemistry/Radiation Protection, Maintenance and Work Management. Based upon these reviews, Davis-Besse has identified and implemented a number of actions to improve its organizations, and concludes that the organizations are ready for restart.

6. Restart Test Plan

Testing was performed to ensure the integrity of the RCS and the containment pressure vessel, systems and components affected by RCS leakage and boric acid deposits (*e.g.*, CACs and associated duct work were evaluated). In addition, an integrated restart process is in place to ensure that proper sequencing of required restart activities is accomplished prior to mode ascension.

7. Modifications, Program Improvements, and Management Actions to Improve Safety Margins

A number of actions to improve safety margins have been implemented, including modifications to many SSCs, improvements to various plant programs, and changes to FENOC and Davis-Besse management. For example, these actions include the following:

- Expansion of the emergency containment sump screen surface area by a factor of approximately 20. This modification has placed Davis-Besse in the forefront of all pressurized water reactors (PWRs) in the United States in addressing generic issues related to containment sumps.
- Installing a permanent steel plate liner within the decay heat valve tank to improve protection against seepage of water into the tank during an accident.
- Replacing the casing-to-cover gaskets, rotating elements, and motors on two of the reactor coolant pumps (RCPs); rebuilding and replacing the mechanical seals on all four RCPs; and installing new diagnostic equipment for the RCPs.
- Installing a state-of-the art system (and first of a kind in the United States) leak detection system, FLÜS, on the lower RPV head.
- Reducing the potential for generation of debris during an accident by upgrading coatings and minimizing the amount of fibrous insulation in containment.

Changes have been made in numerous plant programs, including the CAP and RCS Integrated Leakage Program. The CAP was extensively reviewed and significantly improved. For example, the CARB has been strengthened and is chaired by a Director level position. In addition, the categorization of CRs has also been strengthened.

The RCS Integrated Leakage Program is currently being revised to incorporate lessons learned during the sensitivity test and to incorporate a new algorithm into the existing RCS Water Inventory Balance Test. Once incorporated, the program will be able to identify small changes in the amount of unidentified leakage and trend this information.

With regard to management changes, a number of new management positions have been added to the FENOC corporate organization. These include the Chief Operating Officer, Senior Vice President – Engineering and Services, Vice President – Oversight, and a corporate staff of program owners and equipment experts under the leadership of the Director – Nuclear Services. These new management positions will facilitate the consistent implementation of programs at all three nuclear plants. A new management team has also been installed at Davis-Besse. The new managers have proven records, extensive nuclear experience, and many have or had senior reactor operator (SRO) licenses or certifications. In addition, Davis-Besse managers are now graded against the new leadership principles.

8. Reviews of Extent of Condition of 10 CFR § 50.9 Issues

In an inspection report issued in October 2002, the NRC identified two documents provided to the NRC by Davis-Besse that contained information that was not complete and accurate in all material respects. In addition, this inspection identified quality records required by 10 CFR Part 50, Appendix B, which contained inaccurate or incomplete information. To help ensure the completeness and accuracy of future records and submittals to NRC, Davis-Besse issued a new policy stressing the need for complete and accurate information, provided training to personnel on the need for complete and accurate information, and issued a new procedure governing validation, review, and approval of correspondence to the NRC.

The completeness and accuracy of a sample of prior submittals to the NRC was reviewed. The review encompassed over 2,200 statements of fact and found only about 0.2% to contain material inaccuracies or omissions. Furthermore, none was found to have significant implications for public health and safety or common defense and security. These results indicate that there were no widespread noncompliances or programmatic concerns associated with Davis-Besse's correspondence to NRC.

9. Conclusions

In summary, Davis-Besse established comprehensive Building Block Plans to replace the degraded RPV head, to determine whether other SSCs may have been adversely affected by PWSCC or boric acid corrosion, to verify that SSCs can perform their design basis functions, and to ensure the adequacy of plant organizations and programs. Based upon these Plans, numerous corrective actions have been performed. Davis-Besse concludes that the organizations, programs, and SSCs will be ready to support safe and reliable operation.

E. Management and Human Performance Improvements

1. Improvements in Management/Personnel Development

FENOC has appointed a new President and has created three executive positions, including a Vice President of Oversight. Additionally, the top two levels of management at Davis-Besse

have been entirely replaced, and almost all of the third level has been replaced. The new management team is largely drawn from outside of Davis-Besse, including several proven performers from outside of the Company. The Senior Leadership and Management Teams have over 400 years of nuclear experience and all key managers have or have held senior operator licenses or certificates. See Figures 4 and 5 on pages 75 - 77.

A number of actions have been taken to strengthen management actions. For example, a common set of standards has been put in place for management personnel and new accountabilities have been set for directors and managers in the areas of Nuclear Professionalism and Nuclear Safety Consciousness. Evaluations have been performed of executives, directors, managers, and selected supervisors to verify their competence for their current positions, including the adequacy of their nuclear safety focus. Leadership training has been implemented for the management team to anchor the new standards. Additionally, a Management Observation Program was implemented, which requires management personnel to observe plant activities and provide feedback to personnel.

Various performance indicators and assessments at Davis-Besse show improved performance, reflecting upon effectiveness of the new management team. The actions of the new FENOC and Davis-Besse management team also demonstrate that they have high safety standards and are involved in directing and overseeing plant activities. Therefore, FENOC concludes that its management is ready for restart and safe operation.

2. Improvements in Safety Culture

The FirstEnergy Board of Directors has issued a resolution to communicate from the highest level the significance of nuclear safety. Additionally, the Chief Executive Officer of FirstEnergy has met with Davis-Besse personnel to express his policy that safe nuclear operations require an unrelenting and uncompromising commitment to safety.

Multiple forums have been employed to communicate high standards and obtain feedback from personnel, including town hall meetings, meetings between the Chief Operating Officer (COO) and small groups of employees, and Davis-Besse team meetings.

Case Study training was given to site personnel to ensure that they understand how the RPV head degradation event happened, what barriers broke down, and what needs to be different in the future. Additionally, employees were trained using Root Learning Tools to ensure personnel focus on safety.

FENOC has issued a policy statement on Safety Conscious Work Environment (SCWE) that emphasizes the importance of raising safety concerns and emphasizes that retaliation against individuals who raise concerns will not be tolerated. Managers and supervisors have received training on SCWE. A new Employee Concerns Program (ECP) has also been established. The ECP includes independent investigators and provisions for submitting anonymous concerns and maintaining the confidentiality of those concerns.

Davis-Besse and an independent contractor conducted assessments of safety culture in early 2003 and found several areas for improvement. In response, additional actions were taken to improve performance. In May 2003, a new department and position, Director of Organizational

Development, was created to focus on achievement of continuous improvement in safety culture and SCWE. In early September 2003, this position was changed to a FENOC corporate position to ensure alignment and improved safety culture throughout the nuclear organization.

These actions have been effective in improving the safety culture at Davis-Besse. For example, the Safety Culture Assessment performed for Mode 4b/2 showed substantial improvement relative to the results of the Mode 5 assessment, primarily due to completion of many actions needed for an improved safety culture, reduction of backlogs, and improvements in performance. As part of the Root Learning sessions conducted in the fall of 2003, a survey of site personnel was conducted to determine their perceptions of safety culture. On average, personnel agreed that Davis-Besse possesses the safety culture characteristics in three Commitment Areas (Policy Level, Management Level, and Individual Level) and personnel rated several safety culture characteristics between "agree to strongly agree," such as awareness of policies on safety culture, visible commitment to safety, and understanding of responsibility to raise safety or quality concerns. Similarly, the SCWE survey in November 2003 showed substantial improvement in almost every category compared to the survey in August 2002.

Additionally, the NOP test confirmed RCS boundary integrity and showed an unidentified RCS leak rate of essentially zero (*e.g.*, very low values for unidentified leakage), the best in the history of Davis-Besse. Furthermore, the number of concerns now being reported to the ECP far exceeds the number of allegations reported to NRC, demonstrating employee confidence in the ECP.

In summary, safety has the highest priority at Davis-Besse and takes precedence over other objectives, such as cost and production. Formal and informal surveys have demonstrated that site personnel feel free to raise safety concerns without fear of retaliation, and that concerns are investigated and resolved in a manner consistent with their safety significance. Therefore, Davis-Besse concludes that it is ready for restart in this area.

3. Improvements in Standards and Decision-Making

Improvements in this area have included establishing written technical expectations for the Davis-Besse staff; developing a Problem Solving and Decision Making Process; providing training to reinforce technical standards and problem solving skills; implementing an Operations leadership plan; and developing a checklist for pre-job briefings. Additionally, based on insights gained from the NOP Test, a change has been made to the pre-job briefings document to include reference to reverse briefings.

The results of several performance indicators show that Davis-Besse is producing better engineering products. It is recognized that there is room for improvement with respect to the quality of calculations and implementation of the problem-solving and decision-making procedure, and actions to achieve improvement in these areas have been implemented. Overall, decision-making and technical standards at Davis-Besse have a nuclear safety focus, have technical rigor, account for operating experience, and seek to correct problems rather than justifying acceptance of the problems. Therefore, Davis-Besse concludes that it is ready to restart in this area.

4. Improvements in Oversight and Assessments

An Engineering Assessment Board (EAB) has been established to review and reinforce higher and consistent standards for engineering and other selected technical documents. Additionally, a Management Observation Program has been established to improve management oversight, and actions have been taken to strengthen both NQA assessments and CNRB.

Performance indicators show that these actions have had a positive effect. For example, management has consistently met or exceeded its goal for management observations. Additionally, the results of the NQA assessments of the NOP test were similar to those of the external assessors, thereby demonstrating the effectiveness of NQA.

During the NOP test, assessments identified that management observations could be more self-critical, and actions have been taken to improve these observations. Additionally, NQA has recognized that its assessments are more effective when it uses outside personnel, and NQA plans to continue to use such personnel in its assessments.

Overall, there are adequate provisions for oversight, and assessments at Davis-Besse have been effective in identifying and obtaining correction of problems before they adversely affect safety. Opportunities for improvement have been identified and actions have been taken to achieve improved performance. Therefore, Davis-Besse concludes that it is ready for restart in this area.

5. Improvements in Corrective Actions and Procedure Compliance

As discussed in Section IV.D below, major changes have been made to the Corrective Action Program, including improvements in operability evaluations, categorization of conditions, cause evaluations, and the effectiveness of corrective actions. Performance indicators show that there have been improvements in corrective actions. For example, goals on categorization of CRs have been consistently met or exceeded (since early 2003), and the quality of the root cause analyses has shown an improving trend since August 2003 and meets the restart goals. Additionally, in the summer of 2003, NRC inspections and NQA assessments found that the root cause analyses were typically rigorous for significant conditions adverse to quality.

The assessments also identified weaknesses with respect to apparent cause analyses for conditions of lesser significance. In response, the number of Apparent Cause evaluators will be reduced and those personnel serving as evaluators will receive additional training. Additionally, the CARB is assessing the adequacy of apparent cause analyses until they meet Davis-Besse's goals. Given these actions and the effectiveness of its root cause analyses, Davis-Besse concludes that it is ready for restart in this area.

With respect to procedure compliance, standards and expectations and the need for work practice rigor have been reinforced. Licensed operators have been trained on their responsibilities for ensuring the safety and compliance with regulatory requirements and procedures. As mentioned above, a Management Observation Program was established to provide direct management observation of procedure compliance.

Performance indicator data, assessments and management observations show that personnel in general are complying with procedures. The assessments of the NOP test, however, showed

some weaknesses with respect to procedure compliance, particularly in cases where the procedures lacked details. Actions are being taken to ensure that personnel obtain appropriate revisions to procedures in cases where they lack sufficient details. Therefore, Davis-Besse concludes that it is ready for restart in the area of procedure compliance.

6. Results of Assessments during NOP Tests and Follow-up Actions

Several assessments of performance during the NOP tests were conducted in September 2003. The findings included positive conclusions with respect to hardware quality and radiation protection. They also found that, when implemented properly, the processes and procedures used at Davis-Besse support safe and reliable plant operations. Furthermore, the assessments concluded that management demonstrated safe and effective operational decision making when challenged by emergent issues.

The assessments also identified areas for improvement with respect to the level of detail of the integrated operations procedures, the consistency of the implementation of the problem solving and decision-making procedure, the self-critical nature of management observations, Operator performance, maintenance of an oversight role and command and control by Operations management, and procedural compliance.

An Operations Improvement Action Plan has been developed to address these issues prior to restart. The Plan identifies actions to strengthen the operating crews, the integrated operating procedures, Operations management, and independent oversight of Operations prior to restart. For example, Operator knowledge and standards and expectations for command and control responsibilities of shift management will be evaluated and reaffirmed. An operational oversight team, consisting of external (industry personnel) and internal personnel, will function as operations oversight managers to provide additional oversight of plant operations during restart. Finally, training will be provided to site managers on performing management observations of operations. In total, these restart actions will establish additional barriers and improve operational performance to address the areas of weakness identified by the assessments during the NOP test.

7. Conclusions

Extensive actions have been taken to improve management and personnel development, safety culture, standards and decision-making, oversight and assessments, and corrective actions, programs, and procedure compliance. Various performance indicators and assessments demonstrate that these actions have been largely effective in achieving improved performance. Recent assessments have identified some areas of weakness and actions are being taken to address these weaknesses. As a result, Davis-Besse concludes that it is ready for restart in this area.

F. Long-Term Improvement Plans

In July 2003, FENOC established a new vision for its fleet of nuclear plants. The new vision is: "People with a strong safety focus delivering top fleet operating performance." To achieve this vision, the team identified five strategic objectives and a set of metrics to track success in achieving the objectives. These strategic objectives are:

- Safe Plant Operation;
- People Development and Effectiveness;
- Excellent Material Condition;
- Fleet Efficiency and Effectiveness; and
- Improved Outage Performance.

Consistent with these objectives, several long-term actions are being implemented. For example, a number of improvements have been made to the Management Observation Program, including evaluating the results of the observations to identify focus areas for increased management observations. Additionally, the work management process will be revised to determine the appropriate level of management oversight based on safety and potential consequences of the work.

The Senior Leadership Team (SLT) is holding meetings to gain consensus on its role in leading the culture change effort, develop check points to monitor progress, and determine the infrastructures needed to drive new behavior. FENOC is also holding a series of meetings with managers, supervisors, and employees to share the outcomes of these meetings, discuss FENOC's new vision, and engage personnel in safety culture change.

Using the FirstEnergy template, management and succession planning will be improved. FENOC will develop an overall, integrated process of recruiting talent, identifying talent, proactively identifying needs and planning to fill vacancies as they become open. Additional case study training was provided to station personnel on the meaning and importance of safety culture, management's commitment to safety culture, examples of good and bad safety culture, and the role of station personnel in achieving a good safety culture.

Davis-Besse will also be improving operational performance by strengthening the management and human performance barriers (thereby preventing events). The Operational Improvement Plan for Cycle 14 (Appendix D) identifies the following initiatives to improve operational performance: Organizational Effectiveness Improvement, Operations Improvement; Maintenance Improvement; Engineering Improvement; Training Improvement; Work Management Improvement; Continuous Safety Culture Improvement; Internal and External Oversight Improvement; Corrective Action Program Improvement; and Procedure Improvement.

Performance indicators and goals have been identified for each of the barriers to assess the effectiveness of the initiatives. Periodic assessments to monitor improvements in performance in

safety culture will be conducted and actions adjusted as necessary to ensure that long-term goals will be achieved.

In summary, additional actions will be taken to continue to anchor improvements in safety culture and operational performance at Davis-Besse. Davis-Besse will use performance indicators and assessments of safety culture to verify that these actions are effective, and will take additional action as needed for any weaknesses that may be identified.

G. Comparison against NRC Criteria

The NRC and Davis-Besse have identified a number of criteria or factors for use in evaluating the readiness of Davis-Besse to restart. These include NRC's Restart Checklist and the Confirmatory Action Letter. As described in the body of this report, each of the criteria has been satisfied (or will soon be satisfied).

H. Conclusions and Readiness to Restart

In summary, Davis-Besse has identified the causes of the RPV head degradation; determined the extent of condition; reviewed its systems, programs, and organizations and taken appropriate corrective actions; implemented actions to improve management and human performance; and established plans to achieve further long-term and sustained improvement in performance at Davis-Besse.

Based upon the above, Davis-Besse concludes that the SSCs, programs, and personnel are ready to support safe operation. As a result, FENOC requests that the NRC approve restart of Davis-Besse.

Integrated Report to Support Restart of the Davis-Besse Nuclear Power Station

I. Purpose

The Davis-Besse Return to Service Plan actions necessary to ensure the safe and reliable return to service of the Davis-Besse station are almost complete. These actions include those necessary to address the six sets of commitments in the CAL, the near-term corrective and preventive actions necessary to address the causal factors associated with the RPV head degradation, and longer-term actions necessary to ensure that the underlying causal factors remain corrected and that continued performance is sustained. This Integrated Restart Report documents the basis for this determination.

II. Description and Event Chronology

A. Event Chronology

On February 16, 2002, Davis-Besse began its 13th refueling outage (13RFO), which included inspections of the RPV head CRDM nozzles in accordance with NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles." On February 27, 2002, the NRC was notified that CRDM Nozzles 1, 2, and 3 exhibited axial through-wall indications. Davis-Besse decided to repair these three nozzles and two other nozzles with crack indications that did not appear to be through-wall. On March 5, 2002, during the repair activities on CRDM Nozzle 3, it was determined that CRDM Nozzle 3 had tilted and was resting against an adjacent nozzle flange, which indicated a potential loss of RPV head material.

On March 6, 2002, an investigation was initiated to identify the cause of the CRDM Nozzle 3 displacement. A cavity in the RPV head material was discovered on the downhill side of CRDM Nozzle 3. In addition, a small cavity was identified in the RPV head during CRDM Nozzle 2 repair activities. Videotape inspections also showed a small area of corrosion where Nozzle 1 penetrates the RPV top head surface.

B. NRC's and Davis-Besse's Response to the Event

On March 13, 2002, the NRC issued CAL No. 3-02-001 regarding the RPV head degradation at Davis-Besse. The CAL documented six sets of commitments that Davis-Besse was required to fulfill prior to restart. These commitments included:

- Quarantining of components or other material from the RPV head;
- Assessing the safety significance of the RPV head degradation;
- Determining the root cause of the RPV head degradation;
- Evaluating and dispositioning the extent of condition throughout the RCS;

- Obtaining NRC review and approval of the repair or modification and testing plans for the RPV head, prior to implementation of those activities; and

- Providing plans and schedule for completing and submitting to the NRC Davis-Besse's assessment of the safety significance of the RPV degradation.

Subsequently, on May 15, 2002, the NRC revised the CAL to address FENOC's decision to replace, rather than repair, the RPV head.

In response to the event and the CAL, Davis-Besse provided the NRC with an assessment of the safety significance of the event (letter Serial Number 1-1268, dated April 8, 2002, supplemented by letter Serial Number 2968, dated August 13, 2003), performed various root cause analyses and assessments related to the event (summarized in Section III below), and developed a Return to Service Plan (summarized in Section IV.A below). That Plan described:

- Actions necessary to address each of the commitments in the CAL;

- Near-term corrective and preventive actions necessary to address the causal factors associated with the RPV head degradation event and determine their extent of condition; and

- Longer-term actions necessary to assure that the underlying causal factors remain corrected and that continued safe performance at Davis-Besse is sustained.

On April 29, 2002, the NRC informed FENOC that it would implement an IMC 0350 Oversight Panel to coordinate the agency's activities in assessing the performance problems associated with the corrosion damage to the Davis-Besse RPV head, monitor corrective actions, and evaluate the readiness of the plant to resume operations. The Oversight Panel also developed a restart checklist, which identifies those issues requiring resolution before considering a recommendation for restarting Davis-Besse. The restart checklist was first issued on August 16, 2002, and has been revised several times.

III. Root Cause Analyses and Assessments

Since discovery of the Davis-Besse RPV head degradation in March 2002, FENOC as well as other nuclear industry organizations have performed a number of root cause analyses and assessments. These analyses and assessments go far beyond the CAL commitment of determining the root cause of the RPV head degradation in that they also evaluate the organizational deficiencies that allowed the degradation to proceed without detection.

This section of the Integrated Restart Report discusses the most significant of those analyses and assessments associated with NRC's IMC 0350 Restart Checklist Items 1.a and 1.b. Those analyses and assessments are:

- Root Cause Analysis Report, "Significant Degradation of the Reactor Pressure Vessel Head; CR 2002-0891, dated 3-8-2002" (Technical Root Cause Analysis Report) (April 15, 2002 and supplemented on August 27, 2002);

- Root Cause Analysis Report, "Failure to Identify Significant Degradation of the Reactor Pressure Vessel Head; CR 02-0685, 02-0846, 02-0891, 02-1053, 02-1128, 02-1583, 02-1850, 02-2584, and 02-2585" (August 13, 2002);

- Root Cause Analysis Report, "Failure in Quality Assurance Oversight to Prevent Significant Degradation of Reactor Pressure Vessel Head; CR 2002-02578, dated 6-13-2002" (Quality Assurance Oversight Root Cause Analysis Report) (September 10, 2002);

- Root Cause Analysis Report, "Lack of Operations Centrality in Maintaining, Assuring, and Communicating the Operational Safety Focus of Davis-Besse and Lack of Accountability of Other Groups to Operations in Fulfilling that Role; CR 02-2581" (Operations Root Cause Analysis Report) (November 22, 2002);

- "Evaluation of Corporate Management Issues Arising from Degradation of the Reactor Pressure Vessel Head" (December 18, 2002);

- Root Cause Analysis Report, "Ineffective Corrective Action Problem Resolution Human Performance and Implementation; CR 02-04884, Dated 8-23-02" (Corrective Action Program Root Cause) (November 26, 2002);

- "Assessment of Company Nuclear Review Board" (August 13, 2002);

- "Root Cause Analysis Report: Assessment of Engineering Capabilities" (Engineering Root Cause Analysis) (April 9, 2003); and

- "Collective Significance Review of the Causal Factors Associated with the Reactor Pressure Vessel Head Degradation at Davis-Besse" (Collective Significance Review) (March 17, 2003).

Each of these assessments is summarized below.

A. Technical Root Cause Analysis Report

The Root Cause Analysis Report, "Significant Degradation of the Reactor Pressure Vessel Head," was originally issued on April 15, 2002 and supplemented on August 27, 2002. The NRC inspected this report and found it to be adequate. As a result, the NRC closed the associated Restart Checklist items and CAL item in a letter dated September 19, 2003, stating that "the overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The technical root cause analysis is summarized below.

1. Methodology

The Root Cause Analysis Report, "Significant Degradation of the Reactor Pressure Vessel Head," is referred to as the "technical" Root Cause Analysis Report because it focuses on the hardware deficiencies rather than the personnel and management deficiencies. Davis-Besse chose to first perform a technical root cause analysis followed by a management and human performance root cause analysis because of the complexity of the issues involved. By addressing each issue separately, the industry experts on each review team were able to focus on their respective issue.

A team of employees from Davis-Besse, Perry, and Beaver Valley prepared the technical Root Cause Analysis Reports. Nuclear power industry experts provided additional technical expertise. The team's objective was to conduct a prompt and thorough investigation into the primary causes of the damage to the Davis-Besse RPV head.

The Root Cause Analysis team employed a number of methodologies in the course of this investigation, including:

- Event and Causal Factors Charting;
- Procedure Review/Analysis;
- Difference Analysis; and
- Barrier Analysis.

This report was submitted to the NRC on April 18, 2002, by letter Serial Number 1-1270. On May 7, 2002, FENOC management met with the NRC in Rockville, Maryland, to discuss the results of this report.

2. Results

The Technical Root Cause Analysis Report identified the following probable root causes and contributing causes of the Davis-Besse RPV head degradation.

Probable Root Causes

- Material Selection – PWSCC in the CRDM nozzle interface at the J-groove weld due to material susceptibility in the presence of a suitable environment resulted in CRDM nozzle crack initiation, CRDM nozzle crack propagation led to through-wall leak of boric acid and boric acid corrosion occurred in the low-alloy steel RPV head material.

- Programs/Program Implementation – Inadequacies in the BACC and ISI programs and their implementation resulted in failure to identify the through-wall crack/leak during outages.

Contributing Causes

- Environmental Conditions – The design of the RPV head, which remained uncorrected through deferral of proposed modifications, and the high-radiation environment surrounding it, restricted access to the RPV head and resulted in failure to identify the through-wall crack/leak during outages.

- Maintenance and Testing – Corrective maintenance did not promptly correct the problem with equipment condition, which resulted in failure to identify the through wall-crack/leak during outages.

The NRC concluded that the analysis presented a "plausible scenario of the [RPV head] degradation" and closed the associated Restart Checklist item in Inspection Report 50-346/03-04.

As discussed in subsequent sections of this report, Davis-Besse has taken a number of comprehensive corrective actions to address these issues. These actions include replacement of the RPV head (Section IV.B), modification of the RPV service structure to facilitate inspections of the RPV head (Section IV.B), improving the BACC and ISI programs (Section IV.D), and improving corrective actions (Section IV.D).

B. Root Cause Analysis Report, "Failure to Identify Significant Degradation of the Reactor Pressure Vessel Head"

1. Methodology

The Technical Root Cause Analysis Report identified a number of issues, including several related to Davis-Besse management. Subsequently, the Root Cause Analysis Report, "Failure to Identify Significant Degradation of the Reactor Pressure Vessel Head," dated August 13, 2002, was prepared to identify the root causes and contributing causes of the issues associated with the failure to identify the corrosion of the RPV head.

The Root Cause Analysis Report team consisted largely of employees from Perry, Beaver Valley, and Davis-Besse who were qualified in conducting assessments and root cause analyses. The team was augmented with independent experts in conducting root cause analyses and assessments of nuclear power plants.

This investigation broadly evaluated facts and focused on the underlying management, human performance, and organizational causes of the events. The team used Event and Causal Factors Analysis, Management Oversight and Risk Tree Analysis, and Hazard-Barrier-Target Analysis to perform the investigation.

The results of this report were presented to the NRC at a public meeting on August 15, 2002, at NRC's Region III office in Lisle, Illinois. This report was subsequently submitted to the NRC on August 21, 2002, by letter Serial Number 1-1286.

2. Results

The Root Cause Analysis Report identified the following root causes and contributing causes of the failure to have earlier identified the Davis-Besse RPV head degradation.

Root Causes

- Nuclear Safety Focus – A production focus established by management, combined with taking minimum actions to meet regulatory requirements, resulted in acceptance of degraded conditions on the RPV head and other components affected by boric acid.

- Implementation of the Corrective Action Program – Implementation of the Corrective Action Program was less than adequate, as indicated by addressing symptoms rather than causes; low categorization of conditions through the CR process; and less than adequate cause determinations, corrective actions, and trending.

- Analyses of Safety Implications – Failure to integrate and apply key industry information and site knowledge/experience, effectively use vendor expertise, and compare new information to baseline knowledge led to less than adequate analyses and decision-making with regard to the nuclear safety implications of boric acid on the RPV head and in the containment.

- Compliance with BACC Procedure and Inservice Inspection Program – Contrary to the requirements of these programs, boric acid was not completely removed from the RPV head. The affected areas were not inspected for corrosion and leakage from nozzles and the sources of the leakage were not determined.

Contributing Causes

- Lack of Hazard Analyses – Evaluations and decisions were made without hazards analyses that may have led to the identification of the RPV head nozzle leakage.

- Corrective Action Program Procedure – The CAP Procedure had provisions that did not reflect state-of-the-art practice in the industry, which may have allowed less than adequate corrective actions.

As discussed in subsequent sections of this report, numerous corrective actions were developed, coordinated, and implemented using the Management and Human Performance Excellence Plan. These actions include improvements in safety culture (Section V.A.2), improvements in corrective actions (Section IV.D), improvements in analysis and decision-making (Section V.A.3), and improvements in procedure compliance (Section V.A.5).

The NRC reviewed this root cause analysis and concluded that "the completed reviews were appropriately conducted and provided meaningful insights." NRC also concluded that the "planned corrective actions, if properly implemented, are sufficient to address the issues identified in the [root cause report]." As a result, the NRC closed the associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

C. Root Cause Analysis Report, "Failure in Quality Assurance Oversight to Prevent Significant Degradation of Reactor Pressure Vessel Head"

1. Methodology

Davis-Besse CR 02-02578 identified the failure of Quality Assessment (QA) oversight to prevent significant degradation of the RPV head. FENOC subsequently formed a team to perform a root cause analysis of this issue. The focus of this investigation was to understand the key aspects of the operation of the oversight function at Davis-Besse and why it did not cause positive change in the site line organization such that the RPV head degradation would have been found at a much earlier stage. The team issued its Root Cause Analysis Report, "Failure in Quality Assurance Oversight to Prevent Significant Degradation of Reactor Pressure Vessel Head," on September 10, 2002. This report was submitted to the NRC on January 9, 2003, by letter Serial Number 1-1299.

The investigation spanned the period from late 1986 until the discovery of the RPV head degradation in early 2002. The team developed over 400 facts and observations gathered from the following sources: QA audit and surveillance reports; QA summary reports; Independent Safety Engineering Group reports and correspondence; NRC inspection reports and correspondence; personnel interviews; and miscellaneous documents developed from other sources.

2. Results

The team concluded that the QA oversight function missed earlier opportunities to identify and mitigate the RPV head degradation. The root cause was determined to be that Davis-Besse's nuclear safety values, behaviors and expectations were such that oversight was not set apart, in terms of expectations and performance standards, from the balance of the station. This affected the ability of the oversight organizations to identify problems and implement changes in station operations and standards.

As discussed in subsequent sections of this report, a number of corrective actions have been taken to address these issues. These actions include enhancing the independence and visibility of QA (Section V.A.4).

The NRC reviewed this root cause analysis and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [root cause analysis]." As a result, the NRC closed the associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

D. Operations Root Cause Analysis Report

Condition Report 02-02581 was generated to address the apparent lack of involvement of the Davis-Besse Operations section in the issues related to the RPV head degradation. An analysis was performed by a team consisting of two independent consultants who specialize in performing root cause analyses and assessments of nuclear power plant organizational performance, and a senior member of the Davis-Besse Operations section. The purpose of the analysis was to identify the root and contributing causes of the previous lack of Operations' involvement in maintaining, assuring, and communicating the operational safety focus of Davis-Besse and the lack of accountability of other groups to Operations in fulfilling that leadership role. Based upon its analysis, the Operations Root Cause Team identified one root cause and three contributing causes for the erosion of Operations' leadership in station activities. This report was submitted to the NRC on January 9, 2003, by letter Serial Number 1-1299.

Root Cause

- Senior management support for Operations' leadership role in assuring plant safety was lacking.

Contributing Causes

- Staffing was inadequate to perform the tasks assigned;
- Senior management failed to ensure that regulatory expectations for licensed personnel were effectively communicated and reinforced; and
- Senior management failed to assure that a SCWE was established and maintained in Operations.

As discussed in subsequent sections of this report, a number of corrective actions have been taken to address these issues. These actions include development of an Operations Leadership Plan, training of Operators on their regulatory responsibilities, and a staffing plan.

The NRC reviewed this root cause analysis and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [root cause analysis]." As a result, the NRC closed the associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

E. Corporate Management Evaluation

After degradation of the RPV head was discovered in March 2002, FENOC recognized that changes should be made to the structure and focus of the corporate nuclear organization. Toward that end, an "Evaluation of Corporate Management Issues" was conducted in December 2002. The purposes of this effort were to: (1) perform an evaluation of the corporate management role relative to the issues identified in the various RPV head degradation reports and analyses; and (2) ensure that the Management and Human Performance Improvement Plan (summarized in Section V below) included the necessary and sufficient actions to address the issues related to corporate management. This evaluation was submitted to the NRC on January 9, 2003, by letter Serial Number 1-1299.

FENOC evaluated various functions that were performed or could have reasonably been performed by corporate management with respect to the RPV head, including corporate management involvement; policies on safety; adequacy of resources; incentive programs; common processes for FENOC nuclear plants; sharing of information among FENOC plants; and corporate assessments (including QA and the Company Nuclear Review Board).

Issues from the root cause analyses and other assessments were collected and assigned to one or more of the functions, as applicable. For each function, the identified issues were evaluated, similar issues were combined, and a consolidated list of issues for each corporate management function was developed. For each issue on the consolidated list, a review was performed to determine whether the Management and Human Performance Improvement Plan contained an appropriate action to address the issue.

The Improvement Plan included actions that addressed the issues arising from the assessments of the Davis-Besse RPV head degradation that have implications for FENOC corporate management. In several cases, FENOC was taking or planning to take additional actions to improve corporate management that were not explicitly discussed in the Plan. The Management and Human Performance Improvement Plan was subsequently revised to discuss those actions.

The NRC reviewed this evaluation and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [evaluation]." As a result, the NRC closed the associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

F. Corrective Action Program Root Cause Analysis

The Root Cause Analysis Report described above in Section III.B found that the CAP failed to identify the corrosion problem even though numerous symptoms were identified and documented within the CR process. The CAP was also reviewed as a part of the Program Compliance Plan (summarized in Section IV.D below) that also found deficiencies with CAP implementation. As a result, this analysis was performed to determine the root causes of those problems with the CAP.

The analysis identified two root causes for the CAP deficiencies. One root cause was less than adequate managerial methods — site personnel exhibited insufficient awareness of the impact of conditions on safety and reliability and a lack of self-critical and questioning attitudes within the Davis-Besse organization.

The second root cause also concerned less than adequate managerial methods in that expectations regarding the CAP were not well-defined or understood. Past failures of senior management to convey clear expectations in support of the CAP, establish appropriate standards of CAP performance, and align organizational goals within the Davis-Besse staff caused a loss of organizational commitment to the FENOC vision for the corrective action process. This report was submitted to the NRC on January 9, 2003, by letter Serial Number 1-1299.

As discussed in subsequent sections of this report, a number of corrective actions have been taken to address these issues. These actions include improvements in safety culture (Section V.A.2) and to the CAP (Section IV.D).

The NRC reviewed this root cause analysis and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [root cause analysis]." As a result, the NRC closed the associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

G. Assessment of the Company Nuclear Review Board

In August 2002, FENOC issued a report by an independent contractor entitled "Assessment of the FENOC Company Nuclear Review Board," which assessed the CNRB's past and future oversight role as it relates to the missed opportunity to identify the Davis-Besse RPV head degradation. The assessment focused on reviewing the information provided to the CNRB, the information available to the CNRB, and the CNRB's responses to that information. This assessment was submitted to the NRC on January 9, 2003, by letter Serial Number 1-1299.

The assessment found that CNRB members received enough plant-specific information to have suggested a concern with ongoing degradation of the Davis-Besse RPV head. In view of the alerts received from other industry organizations and the NRC, CNRB should have raised questions regarding boric acid corrosion of the RPV head.

As discussed in subsequent sections of this report, a number of corrective actions have been taken to address these issues. These actions included the issuance of FENOC operating administrative procedure, NOP-LP-2006, "Company Nuclear Review Board," which requires the CNRB to focus on safety issues.

The NRC reviewed this assessment and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [assessment]." As a result, the NRC closed the

associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

H. Engineering Root Cause Analysis Report

In December 2002, FENOC commissioned an independent industry team to perform an assessment of the Davis-Besse Engineering organization. The objective of the assessment was to evaluate the organizational effectiveness of the Engineering organization and the capability of that organization to support safe plant operation and to identify potential areas for improvement. On January 3, 2003, "Root Cause Analysis Report; Assessment of Engineering Capabilities," was issued. This report was submitted to the NRC on January 9, 2003, by letter Serial Number 1-1299.

This report was subsequently revised and reissued on April 9, 2003, to address issues identified during an internal Restart Readiness Review of Engineering that was conducted in March 2003. The revised report was submitted to the NRC on May 2, 2003, by letter Serial Number 1-1314.

The analysis determined that the primary cause concerned managerial methods and the process used to control or direct work-related plant activities. The analysis also made a number of observations, including:

- Key Engineering positions were open.
- Many Engineering roles and responsibilities were either misunderstood or undefined.
- Management should provide consistent coaching to the staff to reinforce expected behaviors.
- Lessons learned from the Engineering review and assessment were not captured and catalogued for use by other FENOC personnel.
- Many plant deficiencies identified during the Containment Health, System Health, and LIRs were previously identified but were not properly addressed.

As discussed in subsequent sections of this report, a number of corrective actions have been taken to address these issues. These actions include filling key management and supervisory Engineering positions with experienced personnel, including the Manager – Plant Engineering (Section V.A.1), establishing standards and expectations for Engineering personnel (Section V.A.3), establishing a Management Observation Program (Section V.A.1), establishing an Engineering Assessment Board (Section V.A.4), and improving corrective actions (Section IV.D).

The NRC reviewed this report and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [root cause analysis]." As a result, the NRC closed the

associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

I. Collective Significance Review

On March 17, 2003, Davis-Besse issued the "Collective Significance Review of the Causal Factors Associated with the Reactor Pressure Vessel Head Degradation at Davis-Besse" and which was submitted to the NRC on March 27, 2003, by letter Serial Number 1-1306. This report provided the results of a collective evaluation of the numerous assessments associated with the RPV head degradation. The review provided an integrated, collective significance review of identified causes associated with organizational or managerial issues, and identified many underlying factors or global issues not previously identified, or not identified as being significant, by the individual sources alone. In addition to the many root cause analyses reviewed for the report, a number of other documents were reviewed, including internal assessments, NRC inspection reports, and CRs.

The Collective Significance Review identified the predominant common causes of RPV head degradation: Management/Supervisory Methods; Culture or Environment, Corrective Actions; and Work Practices.

The Collective Significance Review also identified three other "cause themes" that were not specifically identified (in these terms), or previously identified as being significant, in the individual documents reviewed: written procedures and documents; technical competency; and cross-functional organizational effectiveness.

The Collective Significance Review also found that corrective actions previously identified in the individual documents were far-reaching and broad enough to adequately address these "new" issues; consequently, no further actions were determined to be necessary.

The NRC reviewed this assessment and concluded that the "overall assessment was of appropriate depth and breadth to develop actions to correct and prevent recurrence of the management and human performance deficiencies associated with the reactor head degradation." The NRC also concluded: "if properly implemented and monitored, the corrective actions will appropriately address the issues identified in the [review]." As a result, the NRC closed the associated Restart Checklist item in Special Inspection Report 2002018 (Davis-Besse letter number Log 1-4420).

J. Conclusion

Since March 2002, Davis-Besse, as well as several external industry organizations, have performed a number of extensive root cause analyses and assessments concerning the RPV head degradation. These analyses and assessments identified both the technical and organizational causes of the RPV head degradation and the failure of Davis-Besse personnel and oversight to detect the degradation in a timely manner. NRC has inspected these assessments and found them to be adequate and that they provided a solid foundation for the performance of corrective actions. As a result, the NRC closed the associated Restart Checklist items 1a, 1b, and 4a in Inspection Reports 50-346/03-04 and 02-18, and the associated CAL item in a letter dated September 19, 2003.

IV. Return to Service Plan and Building Block Plans

A. Return to Service Plan

To guide Davis-Besse's course of action for a safe and reliable return to service, Davis-Besse developed and implemented a Return to Service Plan. The Plan included those actions necessary to address each of the commitments in the CAL, the near-term corrective and preventive actions necessary to address the causal factors associated with the RPV head degradation, and the longer term actions necessary to assure that the underlying causal factors remain corrected and that continued safe performance at Davis-Besse is sustained.

The Return to Service Plan includes seven Building Blocks designed to support safe and reliable restart of the plant and to ensure sustained performance improvements. The seven Building Blocks and associated charters are:

- Reactor Head Resolution Plan – replace the degraded RPV head with an unused one from the canceled Midland Plant.

- Containment Health Assurance Plan – perform inspections and evaluations of containment SSCs and ensure completion of required remediation activities prior to restart.

- System Health Assurance Plan – perform reviews of system health prior to restart to ensure that the condition of the plant is sufficient to support safe and reliable operation.

- Program Compliance Plan – perform a review of applicable plant programs to ensure that the programs are fulfilling required obligations, including interfaces and handoffs, and are sufficient to support the restart and safe operation of Davis-Besse.

- Management and Human Performance Excellence Plan – conduct a thorough assessment of the management and organizational issues surrounding the degradation of the RPV head and initiate a substantive and demonstrable change in Davis-Besse management and human performance.

- Restart Test Plan – perform restart testing necessary to ensure the integrity of the RCS and the containment pressure vessel, evaluate proposed testing of systems and components affected by RCS leakage and boric acid deposits, and develop an Integrated Restart Procedure to ensure that proper sequencing of required restart activities is accomplished prior to mode ascension.

- Restart Action Plan – administer the identification, coordination, monitoring and closure of actions required to meet all Company-identified objectives and requirements under the Davis-Besse Return to Service Plan.

Each of these Building Block Plans and the results of their implementation are described in the following sections. Additionally, Section IV.I below describes the results of the review to verify the completeness and accuracy of correspondence submitted to the NRC.

FENOC executive leadership has been directly involved in the direction and oversight of Davis-Besse's return to service. The following have been the key elements of the restart organization:

- The FirstEnergy CEO and FENOC President have been active players at Davis-Besse.
- The new FENOC President has spent a substantial portion of his time at Davis-Besse.
- A new Chief Operating Officer position was established and assigned to provide corporate direction and oversight of the Return to Service Plan.
- A new position, Vice President – Engineering and Services, was established to provide corporate direction and oversight of Engineering activities under the Return to Service Plan.
- A new position, Vice President – Oversight, was created to provide independent oversight of FENOC activities.
- A new site Vice President and Plant Manager were appointed.
- An EAB was established to review and reinforce higher and consistent standards for engineering and other selected technical documents, including products generated under several of the Building Blocks. The EAB included a Program Review Board.
- The SLT (which was previously named Senior Management Team (SMT)) was established, consisting of the FENOC Chief Operating Officer, the site Vice President, the Plant Manager, the Directors representing Nuclear Engineering, Support Services, Restart, and Maintenance. The SLT provided senior management review and oversight of restart activities.
- A Restart Station Review Board (RSRB), consisting of the Director of Support Services, and site managers, was chartered to identify and classify items to be corrected prior to restart through a review of CRs, Corrective Actions, work orders, and engineering change requests.
- A Restart Overview Panel (ROP), which includes independent industry experts, community representation, and FENOC executives, some of whom have extensive experience in recovery efforts at plants with long outages, was established to provide additional oversight and review of plant activities discovered or performed as part of the Return to Service Plan Building Blocks.

The ROP is responsible for making a recommendation on whether the plant is ready for restart.

Davis-Besse NQA, reporting to the Vice President – Oversight, has provided oversight and assessed key activities such as: observation of review board meetings; review of engineering products; field verification of actual conditions pre- and post-remediation; and independent reviews paralleling those performed by the line organization. Based upon these assessments, NQA verified the adequacy of activities conducted as part of the Return to Service Plan.

As described in the following sections, formal plans were developed for each of the seven Building Blocks, along with implementing procedures and action plans where appropriate.

B. Reactor Head Resolution Plan

The degraded Davis-Besse RPV head was replaced with an unused one from the canceled Midland Plant. The Reactor Head Resolution Plan building block was the project plan for performing that replacement. Its charter was to restore the degraded Davis-Besse RPV Head such that it is in full compliance with appropriate Commission rules and industry requirements.

As described in more detail below, the replacement RPV head and restored containment vessel and shield building provide an adequate level of safety and are in compliance with applicable NRC and industry requirements. Consequently, the RPV and containment are ready to support restart and safe operation.

The major attributes of the Reactor Head Resolution Plan included:

- Procurement and certification of the replacement RPV head;
- Implementing minor modifications to the replacement RPV head to ensure that it fit the Davis-Besse reactor;
- Cutting access openings in the shield building and containment vessel for removal of the original RPV head and insertion of the new RPV head;
- Installation of the new RPV head, including transfer of the existing service structure (with inspection access opening modifications to the RPV head service structure support skirt) and transfer of the existing CRDMs;
- Restoration, testing, and inspection of the RPV head and containment;
- Temporary storage and disposal of the original Davis-Besse RPV head; and
- Updating the design and licensing basis documents.

1. Replacement of Reactor Vessel Head

a. Project Scope

The Midland RPV head was purchased from Framatome ANP (Framatome), which had purchased it from Consumers Energy, the owner of the Midland Plant. The Midland RPV head was an ASME Code Section III Class A component, certified with an ASME Code N-stamp. Framatome provided the required documentation, supplemental examinations, analyses, and ASME Code reconciliation necessary to ensure the original ASME Code N-stamp documentation remains valid, and that the replacement RPV head complies with appropriate NRC and industry requirements.

Framatome's activities included modifying the RPV head, providing a Certificate of Conformance documenting that the replacement RPV head is suitable for use at Davis-Besse, and providing engineering and other required evaluations to ensure the Davis-Besse design and licensing requirements (including ASME Code criteria) are met. In addition, Bechtel was

contracted to provide engineering services for the RPV head replacement, including overall project management, detailed engineering, licensing support, quality assurance, and project controls.

b. Description of Major Activities

(1) Procurement and Certification of the Replacement RPV Head

The replacement RPV head was procured under the provisions of 10 CFR Part 21. Like the original Davis-Besse RPV head, the Midland RPV head was manufactured to the ASME Code, Section III, 1968 Edition, Summer 1968 Addenda. Following its manufacture, the Midland RPV head was hydrostatically tested at 3,125 psig in accordance with ASME Code requirements. After the Midland Plant was canceled, however, the RPV head was not maintained under a 10 CFR Part 50, Appendix B, quality assurance program. In addition, Davis-Besse was unable to obtain all the original construction radiography for the Midland RPV head and was unable to perform radiography of all the flange welds due to the presence of the lifting lugs on the head.

To resolve these nonconformances, Davis-Besse submitted letter Serial Number 2797 on August 1, 2002, requesting relief from conformance with certain ASME Code requirements. Supplemental information was provided to the NRC on September 23, 2002 by letter Serial Number 2809. In the first request, RR-A26, it was proposed, as an alternative to the ASME Code construction record requirements, to maintain the following records: (1) the original Code Data Form showing the construction activities performed; and (2) supplemental radiographic examinations of the replacement RPV head-to-flange weld and the 69 CRDM nozzle body-to-flange welds.

In the second request, RR-A27, it was proposed, as an alternative to the ASME Code requirement for a full radiograph of the RPV head-to-flange weld, to use the Manufacturer's Data Report for Nuclear Vessels - Form N-1A (Code Data Form). This form states that the RPV head conforms to the ASME Code requirements. In addition, supplemental radiographic examination records performed in 2002 (that examined approximately 95 percent of the replacement RPV head-to-flange weld) supported satisfying the ASME Code requirements. On December 13, 2002, the NRC approved the two relief requests (Davis-Besse letter Log 6037).

Framatome performed the non-destructive examinations (NDEs) described above and provided certification that the replacement RPV head meets ASME Code requirements, as modified by the two relief requests discussed above. These activities included assembling and assessing existing documentation related to the replacement RPV head, performing additional NDE tests (including ISI examinations, as necessary), and analyses of the Certificate of Conformance and other documentation to ensure acceptability of the replacement RPV head. Framatome performed additional NDEs to confirm the integrity of the RPV head.

Similar to the original RPV head for Davis-Besse, the replacement RPV head has penetrations made of Alloy 600. Because the replacement RPV head is unused, however, it currently has low susceptibility to PWSCC. Longer term, Davis-Besse plans to replace the current RPV head with a new head that uses a material that has less susceptibility to PWSCC.

(2) Shield Wall Demolition

To accommodate removal of the original RPV head and installation of the replacement, a 16.5 feet high by 21.5 feet wide access hole was cut in the containment shield building wall. The opening was made using a "hydro demolition" (high-pressure water jet) technique to remove the concrete. This high-pressure water jet process left the original rebar intact and undamaged. The shield building wall rebar was then torch-cut and removed.

(3) RPV Head Modifications

Several modifications were made to the Midland RPV head prior to its installation on the Davis-Besse RPV. The original Davis-Besse reactor service structure was mounted on the Midland RPV head service structure support skirt and inspection ports were installed on the Midland RPV head support skirt to facilitate future RPV head inspections at Davis-Besse. In addition, minor differences in the Midland RPV head O-ring grooves required the installation of new O-rings with a smaller diameter. Minor machining of the vessel-to-head keyway surfaces was performed to ensure a proper fit.

In addition, the pre-existing Davis-Besse CRDMs are being reused on the replacement RPV head; no modifications to the CRDM position locations were required. The CRDM flange index pins were modified to ensure proper mating of the CRDM flange joint with the pre-existing Davis-Besse CRDMs. The CRDM split nut rings were also modified to facilitate maintenance and to improve the leak-tight integrity of the flanged joint.

Framatome also performed an ASME Code reconciliation pursuant to ASME Code Section XI (as a repair/replacement activity). Under the provisions of 10 CFR § 50.59 as detailed in Engineering Work Request (EWR) 02-0217-00, "Reactor Vessel Head Replacement and Associated Service Structure Modifications," these modifications were minor and did not involve any changes to the Davis-Besse Operating License or Technical Specifications. Consequently, these activities did not require prior NRC approval.

(4) Restoration, Inspection, and Testing of the RPV Head and Containment

Framatome transferred the existing service structure and CRDMs onto the new RPV head utilizing Davis-Besse-approved procedures and processes. The lower service structure and upper support skirt flanges were match drilled for the replacement RPV head. After verifying alignment, the two components were welded utilizing Davis-Besse-approved procedures.

The Davis-Besse containment vessel and shield building were returned to their original design configurations by reinstalling the cut sections of rebar with rebar splices and/or rewelding rebar, as necessary, and by placing safety-related concrete to restore shield building integrity. The restoration activities were conducted in accordance with the design requirements, thus ensuring that the containment vessel and shield building are capable of performing their intended functions. Post modification testing included a local leak rate test of the repair of the containment vessel and an ILRT of the containment. This testing verified that the containment vessel was in compliance with the design and testing requirements of ASME and other industry

standards. Additionally, the ILRT was successfully performed at a pressure that exceeded the design basis pressure, thereby demonstrating additional margin for Davis-Besse.

The RCS was filled and vented, and a visual inspection was performed to look for any evidence of leakage. The plant was brought to normal operating conditions (approximately 2,155 psig) using reactor coolant pump heat. The RCS Leakage Test was performed to the requirements of Section XI of the ASME Code. A prior augmented examination occurred at 250 psig in May 2003. Both examinations used ASME Code Section XI visual examination criteria and techniques.

Results of RCS Leakage During Mode 4 Normal Operating Pressure Test

Davis-Besse inspected more than 1,100 components during the RCS Leakage Mode 3 NOP Test and identified potential minor leakage on approximately 130. Of these, about 100 were packing leaks, six were leaking pipe caps, and three were manifold leaks. None of these leaking components violated the ASME Code because they did not involve pressure boundary leakage. After the NOP Test was completed, insulation was removed from several RCS components to facilitate examinations of potential leakage at bolted connections; only one such bolted connection was found to be leaking. Based upon these results, no outstanding items have been identified.

(5) Updating of Design and Licensing Basis

The Davis-Besse design and licensing basis has been updated to reflect the RPV head modifications and replacement. This includes updating the Davis-Besse Design Specification, replacing Davis-Besse RPV head drawings, updating stress reports, updating the Updated Safety Analysis Report (USAR) and other documentation to maintain both the design and licensing basis and to maintain configuration management consistent with the requirements of 10 CFR Part 50.

c. Conclusion

The RPV head replacement was a modification to the facility and was performed under the provisions of 10 CFR § 50.59. The last action for closure of this Building Block was completed with the RCS pressure test in September 2003 and the final inspection. In addition, control rod drop surveillances will be performed when the plant returns to Mode 3. The replacement RPV head and restored containment vessel and shield building provide an adequate level of safety and are in compliance with applicable NRC and industry requirements. Therefore, the RPV and containment are ready to support restart.

In Inspection Report 50-346/03-05, the NRC discussed its inspection of Restart Checklist Item 2.b, "Containment Vessel Restoration Following Reactor Pressure Vessel Head Replacement." The NRC concluded that containment integrity had been restored where the containment had been opened for replacement of the RPV head. Consequently, the NRC closed Restart Checklist Item 2.b. NRC closure of Item 2.a concerning the RPV head is pending.

C. Containment Health Assurance Plan and Inspections of the Lower RPV Penetrations

The purpose of the Containment Health Assurance Plan was to perform inspections and evaluations of SSCs within containment and to ensure that the condition of containment supports safe and reliable operation. The plan focused on the extent of condition of PWSCC of Alloy 600 welds in the RCS, and identifying damage that may have resulted from boric acid leakage and dispersion of boric acid in the Containment Building. Additionally, inspections, analyses, and tests were performed to confirm that the penetrations in the bottom of the RPV were not leaking. Each of these is discussed below. The Containment Health methodology is shown in Figure 1 on page 33.

As discussed in more detail below, comprehensive inspections and evaluations of the condition of SSCs within containment were conducted. Additionally, inspections, analyses, and tests were performed to confirm that the penetrations in the bottom of the RPV were not leaking, and a number of modifications were made to recover and add safety margin as discussed in Section IV.J below. Overall, approximately 2,500 restart corrective actions related to containment health have been performed. As a result, Davis-Besse concludes that the condition of the SSCs within containment will support safe restart and operation.

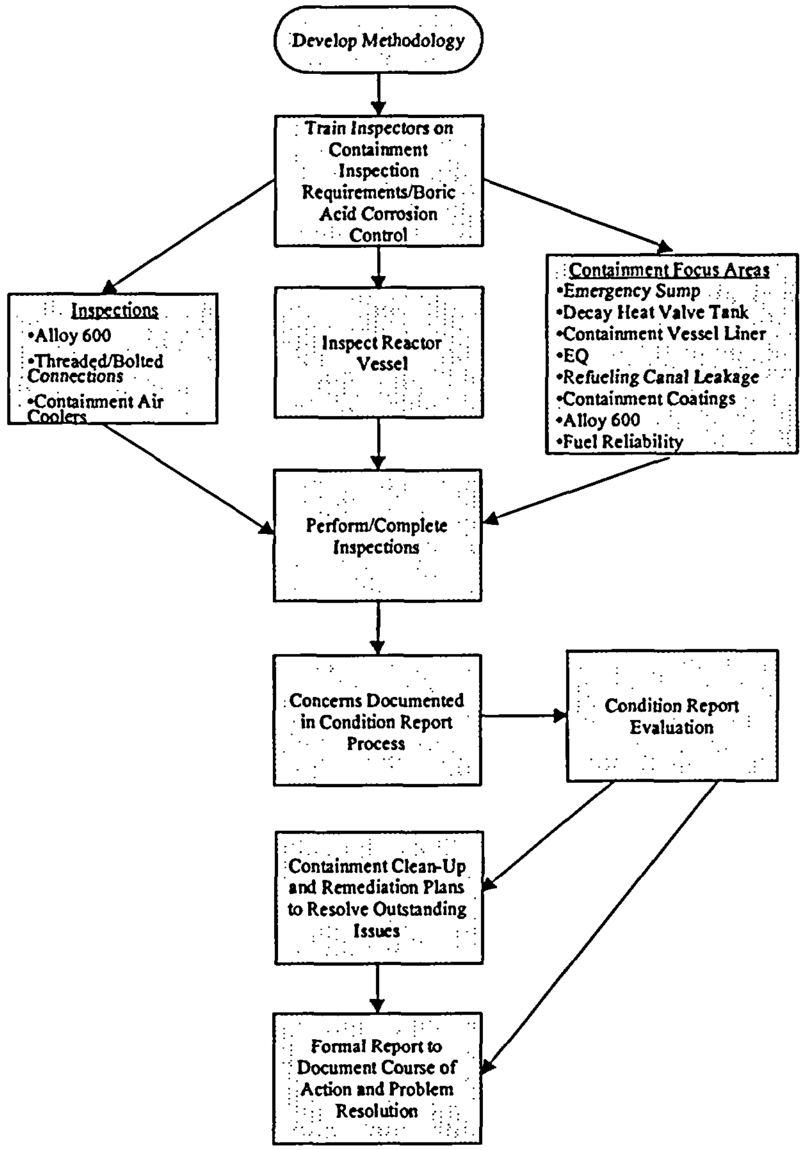
1. Inspections to Determine the Extent of Condition of PWSCC and Boric Acid Corrosion

Inspections and evaluations focused on a number of attributes and items, including:

- Boric acid-induced degradation sites;
- Containment vessel;
- Containment coatings;
- Alloy 600 material;
- Emergency Sump;
- DH Valve Pit;
- Fuel Reliability;
- PWSCC indications; and
- Threaded and bolted connections.

Action plans were developed for each of these focus areas to direct the actions necessary to meet the objectives of the plan. Procedures, work orders, and CRs were used to control field activities. Inspections were performed using qualified inspectors and evaluators. Over 1,000 CRs were generated during the inspections to document potentially adverse conditions. Additionally, the RSRB reviewed the CRs to designate restart requirements.

Figure 1 -- Containment Health Methodology



Components significantly affected by the boric acid deposition included the containment air coolers, as discussed in more detail in Licensee Event Report (LER) 2002-008. Additionally, degradation of other components such as ductwork, cable trays, conduits, and coatings was identified, and as appropriate, a number of these components were replaced or repaired. It was determined that the boric acid deposition did not impact the EQ of any equipment.

Additionally, the containment walkdowns revealed that the decay heat removal (DHR) system may not be able to maintain long-term recirculation flow because the suction screen for the containment emergency sump could become clogged by debris and because gaps in the screens could allow debris to pass through to the pump. In response, the sump has been modified to correct the problem and add safety margin (Section IV.J). Additionally, several other actions were taken, including removing materials from containment that could impact the function of the emergency sump (*e.g.*, unjacketed fibrous insulation and unqualified coatings).

2. Inspections of the Lower RPV Penetrations

During 13RFO in early 2002, a visual inspection was performed of the RPV beneath the flange level. This inspection identified stains consisting of boric acid residue and rust/corrosion running down the external RPV sides and the bottom. A video inspection of the RPV underside was completed in June 2002. This video inspection showed stains around several in-core monitoring instrumentation (IMI) nozzle penetrations. The majority of nozzles with stains were directly in the flowpaths. The stained deposits around the nozzle penetrations were flat and tightly adhering to the RPV surface. No indication of 'popcorn-type' boric acid deposits was observed around the nozzle penetrations. No wastage on the RPV underside was found, and no buildup of boric acid or corrosion products was found on top of the RPV underside insulation panels.

In an effort to determine the source of these stains, a number of activities were conducted, including: (1) obtaining samples of the stains and performing chemical analysis on the deposits; (2) laboratory simulation tests of IMI nozzle leakage to determine IMI nozzle leakage deposit characteristics; (3) cleaning the bottom of the RPV, pressurizing the RCS to 250 psig, and visually inspecting the IMI nozzle penetrations for indications of leakage; and (4) pressurizing the RCS during Mode 3 to approximately normal operating pressure (approximately 2,155 psig) and holding for approximately seven days, and visually inspecting the bare metal IMI nozzle penetrations following this test with a crawler video camera using procedure EN-DP-01500, "Reactor Vessel Inspection Procedure."

The results of these tests and analyses were as follows:

- In general, the nozzles in question were directly in the visible flow path of the boric acid and rust/corrosion stains down the side of the RPV identified in the spring of 2002. Furthermore, the refueling canal leakage occurrence at Davis-Besse in early 2003 indicated that nozzles can have stains as a result of flow down the side of the RPV, even though the nozzles are not in the visible flow trails.

- There were no "popcorn" deposits of boric acid at the IMI nozzles in the spring of 2002 (which would be expected if the nozzles were leaking).

- The concentrations of boron and lithium detected at the IMI nozzles in the spring of 2002 were significantly less than would be expected if the IMI nozzles were leaking.

- No indications of leakage from the IMI nozzles was observed as a result of the test at 250 psig in 2003.

- There was no indication of leakage from the IMI nozzles following the normal operating pressure test at Mode 3.

In conclusion, the inspections, analyses and testing that were performed provide reasonable assurance that the rust/corrosion stains and boric acid residue found around several IMI nozzle penetrations during the initial visual inspection did not result from leakage from the IMI nozzles.

3. Conclusion

Davis-Besse has conducted comprehensive inspections and evaluations of the condition of SSCs within containment. These inspections focused on the extent of condition of PWSCC of Alloy 600 welds in the RCS, and identifying damage that may have resulted from boric acid leakage and dispersion of boric acid in the Containment Building. These inspections and evaluations demonstrated that, with the exception of the CACs, the SSCs could perform their safety function. The CACs were replaced and numerous other components were cleaned of boric acid and repaired. Additionally, inspections, analyses, and tests were performed to confirm that the penetrations in the bottom of the RPV were not leaking, and a number of modifications were implemented to recover and add safety margin. As of November 21, 2003, approximately 2,500 restart corrective actions related to containment health have been completed, and less than five restart corrective actions remain open. As a result, Davis-Besse concludes that the condition of the SSCs within containment will support safe restart and operation. Additionally, as discussed in Section IV.J, Davis-Besse has exceeded industry standards by installing the FLÜS monitoring system, which allows Davis-Besse personnel to readily detect minute amounts of RPV bottom head leakage during normal plant operations, should leakage occur.

D. Program Compliance Plan

As discussed above, it was determined that program weaknesses were a contributor to the degradation of the RPV head. The program weaknesses involved standards, ownership, and oversight.

Consequently, a Program Compliance Plan was implemented to review applicable plant programs to ensure that the programs are fulfilling required obligations, including interfaces and handoffs, and are sufficient to support the restart and safe operation of Davis-Besse. As discussed below, the Plan provided for two levels of program reviews.

Phase 1 – Program Readiness Baseline Assessment

Phase 1 performed a baseline assessment of 65 plant programs to determine if the programs were in a condition to support the restart and safe operation of Davis-Besse. The program owner assessed the program by completing a standardized questionnaire. The program owner then presented the results of that assessment to a Program Review Board, which included independent, external personnel. Condition Reports were generated to document program weaknesses and recommendations. The CRs were evaluated to determine whether the corrective action should be identified as a restart restraint.

Phase 2 – Detailed Program Reviews

Phase 2 was an in-depth systematic review of specified programs. This process evaluated programs in depth to ensure that the programs are fulfilling required obligations, including interfaces and handoffs, and are sufficient to support the restart and safe operation of Davis-Besse. Phase 2 reviews were completed prior to restart for the BACC Program, ISI Program, Plant Modification Program, Corrective Action Program, Radiation Protection Program, and the Operating Experience Program. Separately, a review of the QA Audit Program was also performed. Condition Reports were generated to document program weaknesses and recommendations. The CRs were evaluated by the RSRB to determine whether the corrective action should be identified as a restart restraint. The Program Compliance organization is shown in Figure 2 on page 38.

Davis-Besse performed an assessment of the overall results of the Program Compliance reviews. The CRs generated through the detailed program reviews were assessed for collective significance and trends. The problems identified fell within three categories: (1) standards; (2) ownership; and (3) oversight. Actions have been taken to address these issues. For example, each program has an owner who monitors the program and identifies potential problems.

In addition to the CRs from the detailed program reviews, related CRs from other sources were reviewed. These included CRs generated during the baseline program assessments, by the System Health reviews, and by the general site population. Issues raised in these CRs were determined to be consistent with the results of the detailed program reviews. No new trends or previously unidentified collective significance issues were identified from the review of the data.

In total, over 600 restart corrective actions for programs have been completed. Based upon its reviews and corrective actions, and as discussed in more detail below, Davis-Besse concludes that its programs are ready to support safe and reliable operation.

1. Results – Phase 1 Programs

Deficiencies identified were documented in the Corrective Action Program. The deficiencies were categorized by the RSRB utilizing the criteria in NG-VP-00100, "Restart Action Plan Process," as restart or "non-restart related." The restart related deficiencies were corrected, the resolution reviewed and approved by the Program Review Board, and the responsible manager affirmed the readiness of the program to support return to service and safe operation. Phase 1 programs have been approved as ready to support restart. Restart actions varied widely depending on the specific program. They ranged from minor enhancements to major alterations to program ownership and implementation. Some of the more significant actions included completion of design capability calculations for Air Operated Valves and extensive user training for the Commitment Management Program.

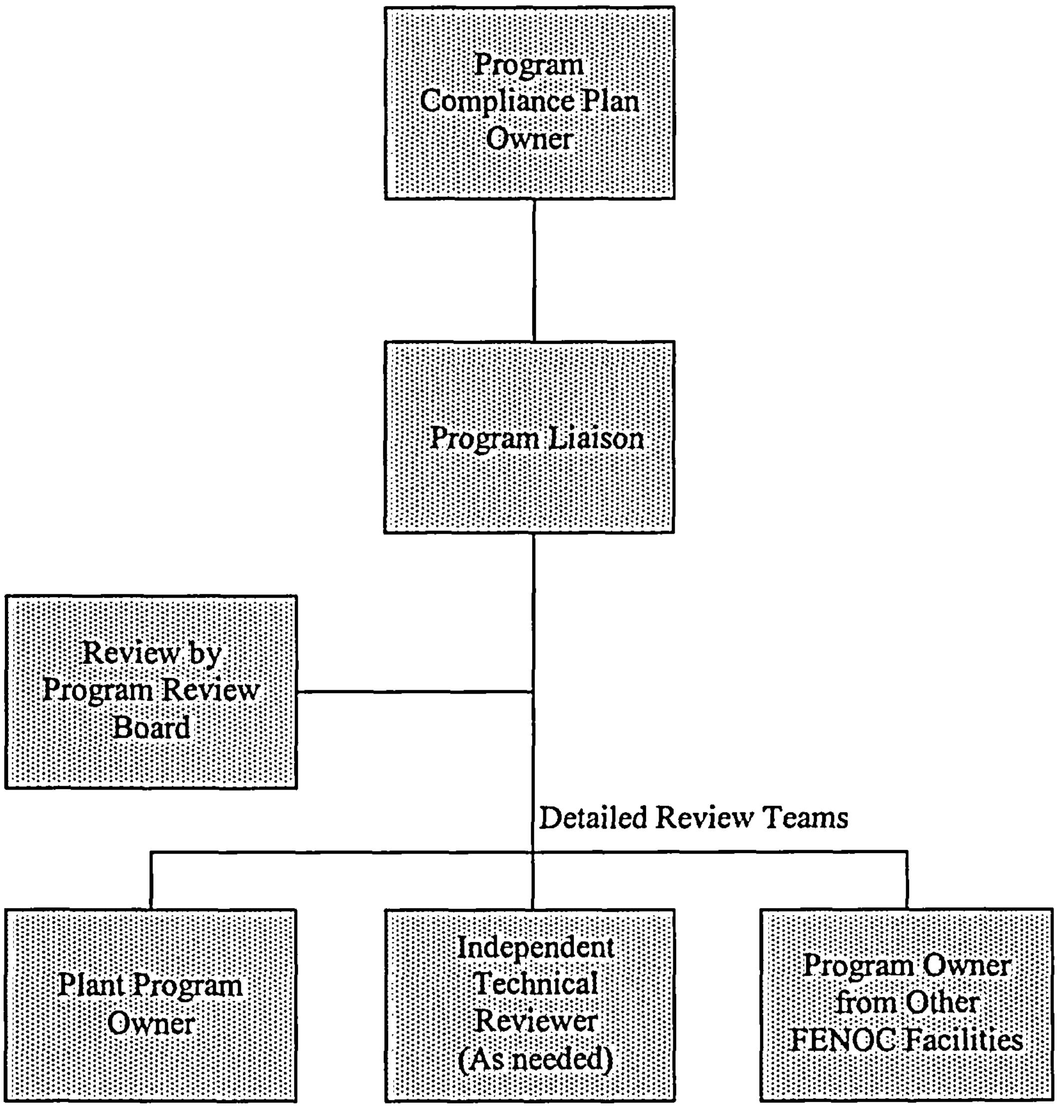
2. Results – Phase 2 Programs

a. Corrective Action Program

As part of the Program Compliance Plan, independent consultants conducted a detailed review of the CAP and its implementation. This review benchmarked the corrective action procedure against industry standards. Additionally, the CAP was reviewed to identify whether it contains appropriate provisions for ensuring the timely resolution of conditions. As a result of this review, appropriate corrective actions have been taken to address the identified weaknesses. The revised program was approved by the FENOC Executive Leadership Team and became effective on March 1, 2003. Based upon the assessments, the following improvements have been made:

- Operability Reviews – Several actions have been taken to improve reviews of the operability of SSCs with degraded and nonconforming conditions. First, at Davis-Besse, the program for performing operability evaluations has been revised to provide improved guidance and more rigor. Second, to be consistent with other FENOC plants, Davis-Besse Operations is using Engineering resources more in their initial operability evaluations. An experienced external expert has also provided training to Operations and Engineering personnel on operability evaluations.

Figure 2 -- Program Compliance Organization Chart



- Improvements in Condition Categorizations – The Management Review Board now reviews categorization of the CRs to ensure their adequacy.

- Improvements in Cause Determinations – A Problem Resolution Process used at other FENOC stations has been implemented at Davis-Besse. The corrective action procedure was revised to require the use of formal cause determination techniques for conditions in the more significant categories to ensure that sufficient analytical rigor is applied to the analyses. A tiered approach to the number and type of techniques applied was developed. Additionally, training requirements were defined and implemented for cause evaluations. Finally, senior management now reviews and approves root cause analyses.

- Improvements in Corrective Actions – The guidance on reviews of the effectiveness of corrective actions was improved to focus on verifying that causes have been fixed, and training was provided on the revised guidance. Additionally, the procedure was revised to require the use of safety precedence sequence (*e.g.*, corrective actions are determined with a preference for using design to minimize hazard; then safety devices; then safety warning; then procedures; and finally training and awareness) for correcting root causes. Additionally, at the Management Communication and Teamwork Meeting, the Management Review Board reviews CRs for applicable mode restraints, operating experience, and "good catches."

- Improvements in Timeliness of Corrective Actions – Daily meetings are currently held to provide management oversight of CRs and Corrective Actions coming due. Extensions and deferrals require management cognizance.

- Improvements in the Corrective Action Review Board (CARB) – The CARB is used to oversee the adequacy of analyses and corrective actions. The CARB has been improved in several ways. First, to provide additional leadership and pursuant to the CARB procedure, a plant Director or site Vice President is now chairing the CARB. Additionally, the reviews performed by the CARB have been expanded to enforce higher standards for cause evaluations and effective corrective action. The CARB uses indicators to show performance based on product reject rate. To meet CARB meeting quorum requirements, three members must be root cause trained.

In summary, the Corrective Action Program has been substantially upgraded. Based upon these upgrades and the improved performance in this area (as discussed in Section V.A.5), and pending final Program Review Board approval, Davis-Besse concludes that the CAP is ready for restart.

b. Operating Experience Program

Several improvements have been made to the Operating Experience program:

- In March 2003 FENOC implemented a new common policy for use of Operating Experience. The policy provides guidance on such matters as when to seek information on Operating Experience for use in proposed plant activities, where to seek the information, how to determine the validity of the information, and how to track the information for future updates and use.

- An Internal Lessons Learned Program was created to share selected Davis-Besse events with the staff and other FENOC plants. In addition, Perry and Beaver Valley events are shared with Davis-Besse.

- The Operating Experience Assessment Program was revised to evaluate Operating Experience documents through the use of CRs. The CAP is used to request extensions to evaluations.

- CARB oversees evaluations of NRC Information Notices and Institute of Nuclear Power Operations (INPO) SEE-IN documents.

- Operating experience information is now distributed to a larger population of plant personnel.

- Procedure guidance has been improved to now include specific responsibilities for the Davis-Besse staff.

- Several Operating Experience documents have been re-reviewed.

In summary, the Operating Experience program has been substantially upgraded. Based upon these upgrades Davis-Besse concludes that the program is ready for restart.

In Inspection Report 50-346/03-09, the NRC discussed its inspection of Restart Checklist Item 3.b, "Operating Experience Program." The NRC verified that the applicable regulatory, industry, and licensee guidance, as well as related CRs and corrective actions had been reviewed, and that significant issues affecting the program were identified. The NRC concluded that the overall corrective actions reasonably addressed significant program weaknesses identified by the licensee. Consequently, the NRC closed Restart Checklist Item 3.b.

c. Quality Audits

To address the shortfalls identified in the root cause analysis of QA discussed in Section III.C above, the following changes have been implemented:

- The Quality Assessment Manager at each station now reports to the Vice-President of Oversight, who in turn reports to the President of FENOC. The Vice-President of Oversight provides periodic updates of Oversight's concerns directly to the Nuclear Committee of the Board (of Directors) (NCOB). The Vice-

President of Oversight has unfettered access to the NCOB, independent of the Chief Nuclear Officer.

- The oversight board (*i.e.*, the Company Nuclear Review Board) is now governed by Nuclear Operating Procedure NOP-LP-2006. This procedure requires placing emphasis on nuclear safety, and specifies expectations for non-FENOC members, including independence from other assignments for the company.

- A process is in place to systematically review the source documents and attributes for the auditing process, in conjunction with the Continuous Assessment Process. The review captures recommended improvements throughout the course of a year, which then supports a formal annual update of the program.

- The organization has been changed so that Quality Control (QC) Inspectors report to the QA Manager. This improves the independence of the QC organization and its ability to assess field activities.

- The Quality Field Observation database has been revised to allow the inspection location to be readily recorded.

In summary, the quality audit program has been substantially upgraded. Based upon these upgrades and the improved performance of NQA (as discussed in Section V.A.4), Davis-Besse concludes that its quality audit program is ready for restart.

The NRC stated that it will close the associated Restart Checklist Item 3.c in Inspection Report 50-346/03-23.

d. Self Assessments

Davis-Besse procedure NG-EN-00386, "Program Assessment, Ownership, and Development," was created to ensure that plant programs remain strong in the future. This procedure provides guidance for developing, maintaining (owning), and assessing plant programs. The guidance also: (1) provides management expectations; and (2) facilitates the creation and preservation of strong programs that exceed regulatory and industry requirements and that have strong ownership, effective interfaces and handoffs, and reflect best industry practices and operating experience. One of the procedural requirements for program owners is to perform a program self-assessment every three years. In addition to these assessments, the procedure establishes requirements for more detailed assessments of programs selected by senior management. Criteria for selecting the programs to perform detailed assessments include input from plant performance, Quality Audits, industry experience, and regulatory schedules and performances.

Corporate program managers have been established to oversee several different disciplines, including design control, equipment reliability, and operations. These program managers facilitate the use of best industry practices. The program managers monitor indicators for their respective programs and perform industry benchmarking. These program managers provide added assurance that industry standards are maintained throughout the FENOC nuclear fleet.

In conclusion, procedural requirements have been established to ensure that programs continue to be assessed in the future to avoid undetected program degradation such that program ownership and implementation remain strong.

The NRC stated that it will close the associated Restart Checklist Item 3.c in Inspection Report 50-346/03-23.

e. Boric Acid Control Program

The BACC Program was thoroughly evaluated. Programmatic issues were documented on CRs; corrective actions (CAs) were generated to address the identified issues. A number of improvements have been made to the BACC Program. These improvements include:

- Developing and implementing procedure NOP-ER-2001, "Boric Acid Corrosion Control Program";
- Revising the BACC Program Manual and inspection procedure EN-DP-01500 to include the CRDM nozzles as a probable location of leakage;
- Revising NOP-ER-2001, to require the retention of the BACC Leakage Inspection and Periodic Monitoring Reports;
- Requiring the BACC Program Owner and System Engineers to document their review and approval of boric acid inspection reports;
- Hiring a new Davis-Besse BACC Program Owner and ensuring that individual has few, if any, collateral duties;
- Developing and implementing Job Familiarization Guideline TSM-115, "Boric Acid Corrosion Control Inspector," for the boric acid inspectors and the BACC Program owner;
- Expanding the scope of boric acid inspections to include selected Alloy 600 components and borated systems outside containment;
- Establishing a formal interface between the ISI and BACC Programs; and
- Increasing management oversight of the BACC Program.

The NRC reviewed the programmatic improvements (as documented in NRC Inspection Reports 50-346/03-09 and 02-11) and found that the BACC Program issues were properly resolved. In Inspection Report 50-346/03-17, the NRC concluded that the planned actions to address the remaining issues before restart were satisfactory. On July 22, 2003, the Davis-Besse IMC 0350 Oversight Panel concluded that the associated Restart Checklist Item 3.d was closed.

f. RCS Integrated Leakage Program

The RCS Integrated Leakage Program was developed, implemented, and subsequently reviewed by the Program Review Board. In developing this program, RCS unidentified leakage data from the last three operating cycles at Davis-Besse was used to determine methods of identifying trends and setting action levels.

As discussed with the NRC in a meeting on January 14, 2003, the program identifies various action triggers for adverse trends for unidentified leakage and for indirect leakage, such as containment activity, radiation elements, filter plugging, primary and secondary leaks. Data that exceed the trigger thresholds are documented in the CAP and evaluated for plant impact.

The action triggers for adverse trends are low to provide for ample time for implementation of remedial and preventive actions, including shutdown if warranted. Three different RCS leakage evaluation trends are obtained from the water inventory balance at least every 72 hours during steady state operation. The rate of change in the leakage rate is trended over a seven-day period. There are also trigger actions for step changes in leakage.

There are three trigger levels indicative of the increasing level of risk created by operating with low levels of leakage. Each trigger is associated with an action level that requires a more urgent response.

These trigger points have been used to perform a retrospective analysis of the 1996 to 2002 leakage data from Davis-Besse. The triggers or action levels provided in the program would have prompted the plant to take actions to resolve leakage in the summer of 1998.

As part of the program development, a program manual, Nuclear Group Program Procedure, program notebook, and an engineering implementing procedure were prepared in addition to revisions of several existing procedures. A new RCS Leakrate Sensitivity test was also prepared for obtaining data during the seven-day Mode 3 NOP hold period. This data was used to verify that the existing instrumentation could identify small induced (simulated leakage), quantifiable leak rates. This data was also used to verify the improved RCS Leakage computer algorithm against the current algorithm.

In summary, the RCS Integrated Leakage Program was designed to set industry standards for the identification and resolution of leakage. Based upon the improvements incorporated in this program, Davis-Besse concludes that the program is ready for restart.

In Inspection Report 50-346/03-09, the NRC discussed its inspection of Restart Checklist Item 3.e, "Reactor Coolant System Unidentified Leakage Monitoring Program." The NRC concluded that, if properly implemented, the RCS Integrated Leakage Program represents a conservative and structured approach to detecting and responding to RCS leakage. Consequently, the NRC closed Restart Checklist Item 3.e.

g. Inservice Inspection Program

The Davis-Besse ISI Program is committed to the 1995 Edition through the 1996 Addenda of ASME Section XI as required by 10 CFR § 50.55a. The scope of the ISI Program includes safety-related ASME Class 1, 2, and 3 systems.

In addition to examinations required by the ASME Code, augmented examinations have been established for selected components. These augmented examinations include visual examination of RPV head control rod drive nozzles as well as examination of selected Alloy 600 connections.

Several improvements were made to strengthen the ISI Program, including:

- Establishing a formal interface between the ISI Pressure Test and the Boric Acid Corrosion Control Program;
- Establishing a hard link between the ISI Program and the BACC Program that requires ISI to acknowledge and ensure appropriate corrective actions on the BACC inspection results on components within the ISI inspection boundaries;
- Requiring pre-job briefs prior to in-service inspections to emphasize awareness of evidence of boric acid leakage and the requirements of reporting evidence of boric acid leakage in accordance with the BACC Program;
- Establishing performance indicators to monitor the long-term health of the ISI Program; and
- Improving training of Visual Examination Technique Category 2 examination personnel. The improved training emphasizes the requirements of IWA-5250 of ASME Section XI to identify the source of leakage and to determine whether any areas of general corrosion exist when leakage is noted.

The ISI program has been upgraded to establish a regimented structure to ensure that thorough and comprehensive examinations and tests are conducted to identify any boric acid leaks and confirm and maintain the pressure boundary integrity of ASME Class 1, 2, and 3 systems. Based upon the improvements incorporated in this program, Davis-Besse concludes that the program is ready for restart.

In Inspection Report 50-346/03-09, the NRC discussed its inspection of Restart Checklist Item 3.f, "Inservice Inspection Program." The NRC determined that the ISI Program review was a thorough, detailed, systematic review that identified several areas for program improvement. The NRC found that although "the ISI Program was not technically "broke" prior to this review, the identified enhancements should result in a more effective implementation." Consequently, the NRC closed Restart Checklist Item 3.f.

h. Modifications Program

A review of the Plant Modification Program was performed, which included a comprehensive evaluation of the primary and associated support procedures. During the program review two

other significant activities were occurring with the Plant Modification Program. The process procedures were being replaced by the FENOC Common Process Nuclear Operating Procedure, NOP-CC-2003, "Engineering Changes." Also, a Collective Significance Root Cause Evaluation for CR 02-02408 was being finalized. Although these activities were initiated independently of the Program Review, they were included in the review. The reviews provided recommendations for program controls and program implementation improvements.

The activities described above indicated that the Modifications Program was based on sound principles incorporating the necessary standards and requirements, both internal to FENOC and external. Specific areas addressed in the results are discussed below.

Two significant issues were identified during the Program Review:

- The wording in a seldom-utilized section of the Design Verification procedure did not meet the intent of American National Standards Institute (ANSI) N45.2.11, "Quality Assurance Requirements for the Design of Nuclear Power Plants." Davis-Besse determined that the impact of using this procedure on previous engineering changes and installed plant equipment was negligible. The procedure was subsequently revised so that it conforms to the appropriate ANSI standards.

- The method used to prioritize and defer engineering changes was less than adequate. The Project Review Committee Business Practice, DBBP-BSA-0001, was revised to require full PRC concurrence on deferral of plant modifications.

As a result of the Modifications Program Review, the following improvements were made:

- Development of a common procedure within FENOC. The new procedure was modeled after the Electric Power Research Institute (EPRI) guideline for effective Engineering Change Processes, various industry best practices, and best practices among the FENOC plants. The process is based on a graded approach to modification development to ensure that the appropriate level of rigor and resources are applied, commensurate with the safety significance of the engineering change.

- Institution of a more formal design input process to identify and document pertinent design information at the beginning of the design development. This process is based on ANSI N45.2.11.

- Establishment of a comprehensive design interface and evaluation process. This design interface process includes a detailed checklist that prompts the responsible engineer to identify potentially affected disciplines and organizations across the site organization. This process is designed to obtain early involvement from affected organizations to minimize redirection and rework during the final review and approval stage of the design change. Included in this interface is an early identification of affected procedures or training activities.

- Implementation of the first phase of improvements in the post-modification review/closure process by including a requirement for field walkdowns by the responsible engineer and re-assigning the final document review to the Document Control group under Engineering. A procedural requirement to close the final Engineering package within 90 days after Operational Acceptance was also implemented.

In summary, the Modifications Program has been upgraded to conform with industry standards and provide enhanced controls of modifications (including deferral of modifications). Based upon these upgrades, FENOC concludes that the Modifications Program is ready for restart.

In Inspection Report 50-346/03-09, the NRC discussed its inspection of Restart Checklist Item 3.g, "Modification Control Program." The NRC concluded that the evaluation of the modification program adequately identified administrative deficiencies in the program, and that reasonable corrective actions were established to correct identified deficiencies. Consequently, the NRC closed Restart Checklist Item 3.g.

i. Radiation Protection

During the early stages of 13RFO, several steam generator contract workers were found to have left the Davis-Besse site with residual contamination in the form of "discrete radioactive particles." Because of this and other radiation protection program issues, the NRC's IMC 0350 Oversight Panel issued an update to the Restart Checklist on October 30, 2002, which added the radiation protection program to the Restart Checklist.

In response, both internal and external resources were employed to perform a systematic review of the Davis-Besse RP program. Included in this review were regulatory issues, INPO Best Industry Practices, and improved section efficiencies. A number of weaknesses in the program and its implementation were identified. The CAs for the more significant issues are discussed below.

Several changes to the Davis-Besse Radiation Protection Program staffing have been made, including the hiring of a new FENOC RP Program Manager (who is currently serving as acting site RP Manager) and several additional professional staff. These people have industry experience outside of FENOC. Improvements were also made to procedures and policies. New and improved standards and expectations have been established and delineated in the conduct of radiation protection, including implementation of INPO's human performance improvement criteria. Professional behaviorist and consultants were brought in to work with the section to strengthen behaviors, teamwork, and safety culture.

Senior management communicated expectations that resulted in improved ownership of radiological issues. Increased and improved communications with the entire station focused on improving radiological behaviors and the practices of workers. Additionally, state-of-the-art instrumentation and equipment have been purchased and placed into service. This has improved personnel and equipment monitoring for better radiological control.

Several teams of radiological personnel visited other nuclear plants throughout the United States to benchmark and incorporate beneficial practices. Training was provided using several different methods from just-in-time training, and mockup training to formal classroom training. The recent assessment of radiation protection during the NOP test concluded that Radiation Protection support for Operations was excellent.

In summary, significant improvements have been made to the Radiation Protection section, including implementation of lessons learned from the discreet radioactive particle event, and expanding the scope of that review to other areas of the program. Improved radiation protection policies, procedures, and training of the staff are complete, and new state-of-the-art monitoring equipment is installed. As a result, Davis-Besse concludes that the Radiation Protection program is ready for restart and safe operation.

The NRC has completed inspections into the uncontrolled release of radioactive material and the intake of radioactive material by steam generator workers. Those inspections are documented in NRC Inspection Reports 50/346/02-16 and -06. The NRC also conducted a supplemental inspection to evaluate the root cause investigation and corrective actions into the Radiation Protection program deficiencies. The supplemental inspection is documented in NRC Inspection Report 50/346/03-08. The NRC concluded that the completed and planned corrective actions were appropriate.

In addition, because there has been a series of changes in Radiation Protection management personnel during 13RFO, the NRC evaluated the effectiveness of management oversight of the Radiation Protection program in Inspection Report 50-346/03-17. The NRC concluded that management oversight of radiation protection had improved and was capable of supporting plant restart. Consequently, the NRC closed Restart Checklist Item 3.h, "Radiation Protection Program."

3. Conclusions

Davis-Besse has the following objective for programs: *Programs comply with NRC regulations, incorporate applicable operating experience, and are effectively implemented. Personnel take ownership of programs within their scope of responsibility, and program owners ensure that the objectives of their programs are achieved.*

Actions to achieve this objective include the following:

- As discussed above, the Program Compliance Building Block Plan, which provided for a two-phase review of programs, was developed and implemented.

- On a long-term basis, follow-up assessments of programs will be performed using the Focused Self-Assessment program with criteria similar to those used in the Phase 2 restart program reviews. This process will provide for a standard review of the Davis-Besse programs.

- Common processes applicable to all FENOC plants will utilize recognized best practices. The common processes will apply to those areas that are amenable to a

common process (*e.g.*, corrective action). Plant-specific procedures and processes will continue to be used in those areas that are unique to Davis-Besse (*e.g.*, plant-specific procedures will be used for operating procedures that pertain to Davis-Besse design-specific areas). The FENOC Common Process program will facilitate benchmarking and obtaining good industry practices for use at all three FENOC sites.

- A corporate organization has been established with responsibility to develop standard processes applicable to all FENOC nuclear units and assess the effectiveness of their implementation. Program Managers are assigned to work on program standardization and effectiveness on a fulltime basis. These managers are charged with determining industry best practices in their assigned area of concentration, working with plant peers to integrate these practices into FENOC processes, and following up to assure that implementation has been achieved and is effective at each FENOC site.

Davis-Besse has verified that the efforts to improve its programs have been effective. For example, Davis-Besse has a performance indicator for Program and Process Errors that measures undesirable situations caused by the lack of information in programs or processes for the performer to complete the task or evolution successfully. The program error rate is the number of program and process errors per 10,000 person-hours worked. The restart goal for this indicator is a 12-week rolling average < 0.50 program errors per 10,000 hours. As of November 9, 2003, the value for this indicator as a 12-week average is 0.24 program errors per 10,000 hours worked. Furthermore, the performance has consistently met the goal.

In summary, Davis-Besse concludes that:

- The programs at Davis-Besse comply with NRC regulations, incorporate applicable operating experience, and are effectively implemented; and

- Personnel take ownership of programs within their scope of responsibility, and program owners ensure that the objectives of their programs are achieved.

As of November 9, 2003, over 600 CRs and 650 restart corrective actions for programs have been completed, and only two restart corrective actions remain open. Based upon its reviews and corrective actions, Davis-Besse concludes that its programs are ready to support safe and reliable operation.

E. System Health Assurance Plan

The purpose of the System Health Assurance Plan was to perform reviews of plant systems prior to restart to ensure that the condition of the plant is sufficient to support safe and reliable operation.

1. Initial Scope of the System Health Assurance Plan

The initial scope of the System Health Assurance Plan included the following levels of system reviews:

Operational Readiness Reviews

The Operational Readiness Review was performed to identify whether systems have significant shortcomings, and to initiate immediate actions to correct those problems. Systems for review were selected considering system performance relative to the Maintenance Rule performance criteria, material condition, and operator burdens.

System Health Readiness Reviews

System Health Readiness Reviews were performed on risk-significant Maintenance Rule systems not covered by the more extensive LIR process. These reviews were more in-depth than the Operational Readiness Reviews and were focused to provide reasonable assurance that these systems can perform their risk-significant Maintenance Rule functions. These reviews included identification of each system's risk-significant functions, reviews of testing or review of other information (such as trending data) that assesses the system's ability to support risk-significant functions, walkdowns, and reviews of selected data sources. Problems identified during the reviews were captured in the CR process. The RSRB reviewed the CRs to determine if there were restart requirements.

Latent Issues Reviews

LIRs of the RCS, auxiliary feedwater, emergency diesel generators, service water (SW), and component cooling water systems were performed. The primary focus of these reviews was to provide reasonable assurance that these systems are capable of performing their safety and accident mitigating functions. These reviews included verification of the design basis functions of the systems and were comprised of assessment of system attributes, review of various data sources, and walkdowns.

Results

Numerous discrepancies were identified by the System Health Readiness Reviews and the Latent Issue Reviews. These discrepancies included hardware-related conditions, inconsistent or potentially non-conservative assumptions in design and licensing basis documents, missing or unavailable calculations, operating and test procedures not reflecting the design documents, and documentation problems. These were documented on CRs in accordance with the Davis-Besse CAP.

The CRs were evaluated for collective significance and the results of the evaluation were documented in the Collective Significance Report. An evaluation of the potential safety consequences associated with the conditions identified during the reviews was also performed to determine if there could have been significant consequences had an accident occurred. This evaluation identified a number of conditions with potential safety significance. Based upon these evaluations, Davis-Besse determined the potentially safety-significant issues pertained largely to calculations. The quality and maintenance of calculations that constitute the design basis of the plant were found to need improvement. Based upon these results, the initial scope of System Health Assurance Reviews was expanded, as discussed below.

The System Health Assurance Reviews also included inspections of systems containing boric acid outside of containment to check for signs of leakage and boric acid degradation. Systems outside containment were inspected pursuant to procedure EN-DP-01506, "Borated Water System Inspections (Outside Containment)." Boric acid leaks were documented on CRs and evaluated under the BACC Program. More than 250 CRs and 700 CAs were categorized as "Required for Restart."

2. Expanded Scope of System Health Assurance Reviews

As shown in Figure 3 on page 52, the approach for resolving the design-related conditions identified from the initial scope of the System Health Assurance Reviews consisted of three paths.

Path A – Resolution of Conditions and Determination of the Extent of Condition

Condition Reports were evaluated for the potential effect on the operability of the plant's SSCs. Those identified conditions that did not affect operability and were not classified as a potential restart restraint were prioritized and scheduled for resolution after restart of the plant. For conditions affecting operability, corrective actions were taken or will be taken. Additionally, an evaluation was performed to determine whether the extent of condition (EOC) was bounded by the scope of another activity being implemented by Davis-Besse, such as the SFVP under Path B, the Design Basis Validation Program (DBVP) performed in the late 1990s, or the actions to resolve the potential programmatic issues under Path C. If not, an EOC review was performed. If the EOC reviews identified other conditions affecting operability, then those conditions were also addressed.

Path B – Evaluations to Provide Additional Assurance of Significant Safety Functions Capabilities

As a result of the calculation issues identified during the LIRs, further reviews of calculations were conducted to provide additional assurance that Davis-Besse systems are capable of performing their safety functions. These reviews consisted of an evaluation of the calculations for those systems with safety-related functions that contribute significantly to risk. This approach consisted of confirming that design basis calculations demonstrate safety function capability or that applicable tests are performed which demonstrate safety function capability. This review was performed under the SFVP. The scope of the SFVP included those systems with safety-related functions that contribute greater than one percent of the total baseline CDF as

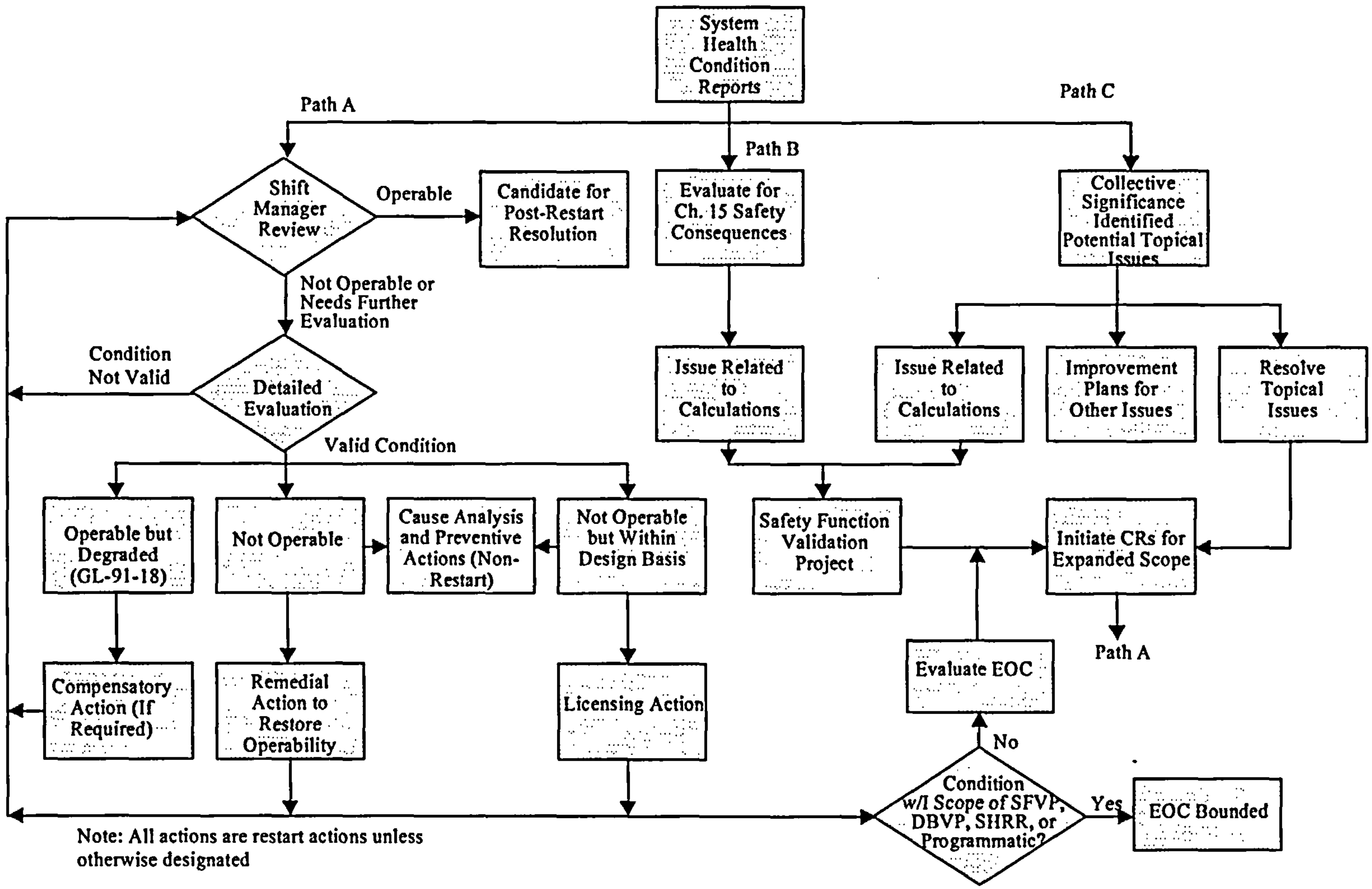
determined by the Davis-Besse probabilistic safety assessment (PSA). These systems include the systems that were already the subject of the LIRs plus 10 other systems: 125/250-volt DC, 480-volt AC, 4,160-volt AC, high pressure injection (HPI), decay heat/low pressure injection (DH/LPI), heating, ventilation, and air-conditioning (HVAC) for emergency core cooling system (ECCS) equipment, main steam (MS), safety features actuation system (SFAS), steam and feedwater rupture control system (SFRCS), and the steam generators (SG). The systems selected also provide assurance of the adequacy of the plant safety functions that provide a combined 99 percent contribution to LERF.

Path C – Resolution Of Design-Related Programmatic Issues

The collective significance of the conditions identified by the system reviews was evaluated to determine if any potential issues were identified in more than one system and, therefore, might reflect the need for process, programmatic, or product improvements. Conditions that were identified during the System Health Assurance reviews were sorted and placed into topical bins. An evaluation was then performed on the set of identified potential issues in each of those bins to determine their potential for collective significance. The evaluation considered several factors, such as the number of identified potential issues in each bin, the ratio of the number of identified potential issues to the number of times the topic attribute was checked by the LIR, and whether a potential issue was identified by more than one system review.

The evaluation identified approximately 20 topical areas where the potential collective significance warranted further evaluation. Many of the identified questions and potential issues related to calculations; others related to programmatic areas such as HELB, EQ, seismic, Appendix R - safe shutdown, flooding, and other potential issues that pertained to various other topics. The potential programmatic issues involving HELB, EQ, seismic, Appendix R – safe shutdown, and flooding were not within the scope of the DBVP. As a result, actions were taken to address these potential programmatic issues, including determining their extent of condition, as appropriate. Finally, the Collective Significance Report identified potential weaknesses in other topical areas beyond the calculation and programmatic issues discussed above. These areas do not directly impact the operability of plant SSCs and therefore do not require resolution prior to restart.

FIGURE 3 - - RESOLUTION OF ISSUES



3. Results

The SFVP system reviews determined that four (HPI, MS, SFAS, SG) of the 10 systems could perform their safety functions, three (DH/LPI, HVAC-ECCS, SFRCS) had some safety functions that could not be validated, and the three electrical systems (125/250V, 480V, 4,160V) were determined to be indeterminate based on available information.

As a result of the topical area reviews, a number of actions have been taken, including the following:

- Environmental Qualification – Modifications were made to four level transmitters with excessive bend radii of Raychem splices and unqualified splices in containment motor-operated valves.

- Seismic – Piping in the ECCS rooms and component cooling water (CCW) pump room was reviewed; no additional seismic issues were identified. General Electric HFA relays were tested for potential chatter and adjusted as required. Three pressure instruments found to have improper pressure retaining qualifications were replaced and a review was performed to identify other instruments to ensure that they have the proper qualification for pressure boundary integrity.

- Flooding – Piping in the ECCS rooms and CCW room was reviewed for additional Seismic II/I flooding concerns; none were found. Conduits that penetrate the external wall of the service water and diesel fire pump rooms are in the process of being sealed.

- HELB – An evaluation of the environmental effects of Turbine Building HELBs was performed. In accordance with Engineering Change Request 02-0627-00, equipment in the Auxiliary Feedwater Pump Turbine Rooms was modified to comply with EQ requirements. Also, high-energy piping analyses reviews identified five calculations in which stress thresholds were inappropriately used. Only one of the calculations resulted in amended results when the appropriate criteria were applied. Subsequently, that calculation was corrected and necessary plant modifications were implemented. Finally, a walkdown of the Auxiliary Building was performed to confirm free space volumes and examine openings. No deficiencies requiring corrective action prior to restart were identified.

- Appendix R Safe Shutdown Analysis – Framatome performed a rebaselining of the Appendix R transient analysis. Additionally, a sample of electrical distribution calculations credited in the Fire Hazards Analysis Report was evaluated to verify the adequacy of electrical coordination for Appendix R. No examples of inadequate coordination were identified.

In accordance with Path A of its plan for resolution of design issues, more detailed evaluations were conducted of the issues identified by the System Health Assurance Reviews (including the LIRs, Safety Function Validation Project, and Topical Area Reviews) to determine their impact

on operability. Based upon the evaluations, it was determined that the 15 systems that were reviewed in detail (comprising 99 percent of the CDF and LERF) could perform their safety functions, with several exceptions. For example:

- RPV Head (LER 2002-02) – As discussed above, through-wall cracking of the CRDM penetrations and corrosion of the RPV head was identified. As a result, the RPV head was replaced, EOC walkdowns inside and outside of the containment were conducted to identify whether other components might be similarly affected, and corrective actions for such components were taken.

- Tornado Missile Protection (LER 2002-006) – It was determined that some of the emergency diesel generator (EDG) exhaust piping was not protected against tornado missiles. Additionally, it was determined that an exterior door for the main steam line room was not adequately protected against tornado missiles. The Davis-Besse plant site was walked down to identify other unprotected SSCs associated with the systems necessary to function in the event of a tornado. A revised evaluation methodology has shown these conditions to be acceptable.

- Air Operated Valves (LER 2003-001) – An AOV Reliability Program was implemented to verify AOV actuator sizing and setpoints. As a result of this program, some AOVs were identified that could not perform their safety function. Corrective action is being taken for these valves, including modifications to install new valve actuators and new accumulators as necessary to restore operability.

- High Pressure Injection (HPI) Pumps (LER 2003-002) – It was determined that the HPI pumps could be adversely affected by debris in the containment emergency sump water during operation of the pumps in the recirculation mode. The pumps are being modified to operate with the remaining debris. Other pumps (*e.g.*, low pressure injection pumps, containment spray pumps) that might be adversely affected by the same condition were also evaluated, and it was determined that they could adequately perform their safety functions.

- Minimum HPI Recirculation Flow (LER 2003-003) – During its inspections in parallel with the System Health Assurance Reviews, the NRC identified the minimum flow protection for the HPI pumps might not be sufficient to protect the pumps against damage during certain small break loss of coolant accidents. Additional minimum flow recirculation lines have been installed to correct this condition.

- Electrical Distribution System (LER 2003-007) – It was determined that the Davis-Besse electrical distribution system (EDS) calculations were not sufficient to verify the function of the EDS. Many of the unvalidated functions in the 480V and 4,160V systems were related to deficiencies in the Electrical Load Management System (ELMS) calculation. To address these and other deficiencies, the ELMS calculation was replaced with a new Electrical Transient Analysis Program (ETAP) - based calculation. Based upon the results of the ETAP calculations, it was determined that the EDS could not perform its function

in certain system alignments and conditions involving the simultaneous occurrence of low grid voltage and a loss of coolant accident. As a result, modifications are being implemented and administrative limits established to ensure that sufficient voltage will be available for essential components. Several of these modifications and administrative limits have not yet been closed out, but are scheduled to be so before entry in to Mode 4.

In addition, several values in the Technical Specifications for the SFRCS and the SFAS were found to be non-conservative. Administrative controls have been implemented to ensure that appropriate values are used. A license amendment request (letter Serial Number 2960, dated August 25, 2003) has been submitted to revise the SFRCS Technical Specifications values. The request for revisions to the SFAS Technical Specification values will be submitted to the NRC prior to January 30, 2004. Consistent with NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety," administrative controls can be utilized until the NRC approves these license amendment requests.

In addition, as a result of an initial evaluation of a change to accept as-is the emergency diesel generators' actual frequency and voltage transient values during the automatic loading sequence, it was determined that a license amendment request was required to change the USAR's description of these values. That license amendment request is under preparation and will be submitted to the NRC prior to January 30, 2004.

It was also identified that an exemption request must be submitted to the NRC to credit the new Boron Precipitation Control (BPC) method in accordance with 10 CFR § 50.46. In the meantime, the two previously existing credited BPC methods are available. It was also determined that an exemption request will be submitted to the NRC for a fire area found to be lacking full fire suppression capability. Until that request is approved, compensatory measures (*e.g.*, hourly fire watches) will be maintained. Both of these requests will be submitted post-restart.

Finally, Davis-Besse recently issued a Systems Health Report for the third quarter of 2003. This report rated the overall system health as "Yellow," largely because corrective actions were still in progress for a number of systems in the Maintenance Rule (a)(1) category. System owners have presented their improvement plans to management, and improvement actions are being implemented. As a result, it is expected that, prior to restart, the categorization of the existing "Red" systems will improve to "Yellow" or better, with the exception of the Radiation Monitoring and Heat Trace/Freeze Protection Systems (which will have outstanding preventive measures to improve equipment reliability that are not necessary for restart). Based upon the overall improvement actions, it is expected that overall System Health will improve from "Yellow" to "White" prior to restart.

4. Conclusions

The System Health Assurance Reviews were performed to verify the safety functions of 15 systems whose functions comprise 99 percent of CDF and LERF. As a result of these reviews, it was determined that most of the safety functions could be performed. It was determined that some conditions adversely affected the safety functions of several systems. In those cases,

corrective actions have been or will be taken to restore the functionality of the systems, and reviews were performed to bound the extent of condition. Furthermore, as of November 21, 2003, almost 1,500 restart corrective actions related to system health have been completed, and less than 20 restart corrective actions remain open. As a result, Davis-Besse concludes that there is reasonable assurance that plant systems can perform their design basis safety functions and are ready to support safe restart and operation of Davis-Besse.

F. Management and Human Performance Excellence Plan

As discussed in detail in Section V below, the purpose of the Management and Human Performance Excellence Plan was to conduct a thorough assessment of the management and organizational issues surrounding the degradation of the RPV head and create a comprehensive leadership and organizational development plan for the site. The Plan consisted of three elements:

- Reviews and assessments;
- Collective significance review; and
- Specific actions to take before and after restart to ensure changes are effectively implemented.

Using data from the root cause reports and other assessments associated with the RPV head degradation, the primary management contributors to this failure were categorized into the following five areas:

- Management/personnel development;
- Nuclear safety culture;
- Standards and decision-making;
- Oversight and assessments; and
- Programs/corrective action/procedure compliance.

A Management and Human Performance Improvement Plan was prepared and implemented to address each of these areas. These improvements are summarized in Section V.

The Management and Human Performance Excellence Plan also included Functional Area Reviews of four organizations. The results of these reviews are summarized below.

Results

The following findings were made as a result of the functional area reviews:

- Work Control (Self-Assessment Report OMWC 2002-0001) – The Work Control organization was found to be ready for restart. A strength was identified regarding management making it clear that nuclear safety is the overriding priority. Areas for improvement were identified with respect to monitoring contractor performance, improving leadership, and enforcing the levels of performance established for the group. The first issue was addressed by corrective actions such as increasing the use of field observations by project managers and weekly meetings between contract supervisors and FENOC management. The second issue was addressed through a comprehensive Work

Management Organizational Development Plan and providing feedback to managers on leadership.

- Chemistry/Radiation Protection (Self-Assessment Report 2003-0003) – Eleven areas for improvement were identified. Only one of these was a restart item (*i.e.*, the RP improvement plan). These improvements in RP are discussed in Section IV.D above.

- Operations (Self-Assessment Report 2003-001) – Seven strengths were identified in the areas of safety culture, leadership and accountability, management direction and expectations, self-evaluation, corrective action, benchmarking, and use of operating experience. Areas for improvement were identified with respect to staffing resources and performance monitoring. In response, Operations issued a staffing plan to develop additional licensed operators and issued improved performance indicators.

- Maintenance (Self-Assessment Report 2002-0099) – Three strengths were identified with respect to a safe work environment, nuclear safety expectations, and problem identification. Eight areas for improvement were identified in areas such as benchmarking, corrective action, self-assessments, and leadership. None of these was designated as a restart item, and many involved issues addressed above (*e.g.*, Work Management Organizational Development Plan) and other sections of this report. As a result, the Maintenance group was found to be ready for restart and safe operation.

In summary, the functional area reviews generally found that the organizations were ready for restart and safe operation, but did identify areas for improvement among the organizations. Corrective actions have been taken for those areas designated as restart actions. Additionally, as discussed in more detail in Sections V.B and V.C, some shortfalls were identified in Operations during the NOP test in September 2003, and actions are being taken to address those issues.

G. Restart Test Plan

The purpose of the Restart Test Plan is to perform restart testing necessary to ensure the integrity of the RCS and the containment pressure vessel, and to evaluate proposed testing of systems and components affected by RCS leakage and boric acid deposits. In addition, an integrated restart process is in place to ensure that proper sequencing of required restart activities is accomplished prior to mode ascension.

This plan has four key elements to ensure that comprehensive testing is performed prior to and during restart, and that restart activities have been completed to ensure that Davis-Besse is in a condition to support sustained safe and reliable operation. These elements include:

- RCS Leakage Tests and Inspections – Testing the RCS, including components within the Reactor Coolant Pressure Boundary (RCPB) and associated piping exposed to full RCS pressure, to ensure integrity following replacement of the RPV head and maintenance of RCS piping and components. The leakage inspections include the RPV head, control rod drive nozzles and the reactor bottom incore nozzles. The results of these tests and inspections are described in Sections IV.B and IV.C, above.

- Containment Integrated Leak Rate Testing – Testing the containment by performing an ILRT in accordance with 10 CFR Part 50, Appendix J (Type A test) to ensure the integrity of containment following restoration of the containment pressure vessel. The results of this test are described in Section IV.B, above.

- Post-Maintenance and Post-Modification Testing – Evaluating the adequacy of proposed post-maintenance and post-modification testing on systems and components affected by RCS leakage and boric acid deposits to determine if additional testing is required.

- Integrated Restart Process – An integrated restart process, encompassing four plant startup, heatup, and operations procedures (DB-OP-06911, -06900, -06901, and -06902), is in place to ensure required restart activities, tests, and inspections are performed prior to mode ascension. These procedures identify the sequence of critical steps, procedures, and tests that must be performed to safely restart Davis-Besse and include the necessary administrative controls required to authorize mode changes during plant restart.

In summary, Davis-Besse has performed and will be performing comprehensive testing to ensure that it is ready for safe and reliable operation.

H. Restart Action Plan

1. Description of the Plan

The Restart Action Plan established a mechanism for identification, monitoring and control of restart actions under the Davis-Besse Return to Service Plan. The Restart Action Plan also established a process and criteria for the evaluation, disposition, and closure of restart-identified actions and has provided for the effective interaction with the NRC during the IMC 0350 Reactor Oversight Process. This plan provided the actions that the management team at Davis-Besse performed to ensure that the plant is restarted in a safe and reliable manner and that the long-term performance of the plant will be sustainable. After NRC approval to restart has been received, final authority to restart the plant resides with the FENOC Chief Operating Officer.

The Davis-Besse Restart Action Plan has been implemented by a procedure that provides details of the responsibilities and activities required to administer and control this Restart Action Plan Building Block. After restart the attached long-term Operational Improvement Plan for Cycle 14 will be used to ensure continued improvements and sustained performance in nuclear safety.

As discussed below, there were four significant phases of the Restart Action Plan process to be accomplished to return Davis-Besse to safe and reliable operations: (1) planning; (2) discovery; (3) implementation; and (4) validation/closure. The NRC has inspected these phases and stated that it will close the associated Restart Checklist Item 5.a in Inspection Report 50-346/03-22.

Planning

The planning phase ensured that restart issues were properly and thoroughly identified and characterized during the discovery phase. In addition, planning ensured that personnel were properly trained and qualified to perform discovery activities. Planning was accomplished by development of:

- Building Block Plans;
- Building Block Discovery Action Plans;
- Implementing Procedures;
- Restart Implementation Action Plans;
- Training; and
- Schedules.

Discovery

Many of the Building Block Plans included "discovery" activities. The discovery phase consisted of performing the activities identified in Discovery Action Plans using implementing procedures, and by the day-to-day activities associated with Operations, Maintenance, and Engineering. Emergent issues and findings identified during the performance of the

implementing procedures were documented on CRs and evaluated for corrective action prior to restart.

The RSRB reviewed over 16,300 CRs and 19,000 CAs to designate those items that needed to be completed prior to restart. An item was designated as restart if it satisfied one or more of the following criteria:

- The item addressed a nuclear safety issue.
- The item addressed an operability issue.
- The item addressed design margin or conformance with the design basis.
- The item addressed issues requiring a license amendment under 10 CFR § 50.59 or nonconformances with the license or license conditions.
- The issue addressed restart licensing commitments and Confirmatory Action Letter issues.
- The item addressed an organizational, programmatic or process deficiency that could prevent maintenance of adequate design margins or conformance with a design basis.
- The item addressed significant equipment material condition deficiencies that could affect safety system availability, impact plant reliability, or reduce the ability of operators to operate the plant safely.

Implementation

The RSRB categorized the CRs identified during discovery and their associated corrective actions to designate those that needed to be completed prior to restart. Corrective actions classified as restart were planned as individual activities, or "binned" into Restart Implementation Action Plans to develop a comprehensive approach to managing numerous corrective actions of a similar nature. These corrective actions were structured to fix the physical plant (structures, systems and components), programs, processes and procedures, department functions, and management and oversight prior to restarting the plant.

Validation/Closure

The validation and closure process involved a planned and organized method to gather and validate the documented evidence to demonstrate that the planning, discovery and implementation activities for Davis-Besse IMC 0350 Restart List items have been properly completed or that post restart issues are understood and properly tracked to closure after restart.

Results

As a result of the implementation of the Restart Action Plan, approximately 16,300 CRs have been reviewed by the RSRB. Approximately 6,600 were designated as restart items. Almost all

of the restart items have been completed, and the remaining restart items are scheduled for completion prior to restart.

NQA Assessments

NQA assessments concluded that the procedural criteria in NG-VP-00100, "Restart Action Plan Process," was appropriate and conservatively administered by the RSRB to ensure that work activities needed for restart were properly identified as such.

Conclusions

In summary, Davis-Besse is completing those items needed to support restart; the non-restart actions will not have an adverse impact on safety.

2. Restart Readiness Reviews

The Restart Readiness Review process is controlled by Davis-Besse Business Practice DBBP-VP-0002, which was established to ensure that the plant is ready to restart following the extended outage. This Business Practice is performed following major changes in plant conditions, such as entering Mode 4, startup following an extended outage, and fuel movement. It also establishes a detailed review process for areas not addressed by the Restart Test Plan and Davis-Besse restart procedures to ensure that the material condition, programs, processes and organization, including the organization's safety culture, are ready for restart and safe and reliable operation. The process includes a series of meetings of the combined leadership team, system engineers, and individuals responsible for IMC 0350 Checklist items. During these meetings the participants review the process and ensure that restart alignment is achieved.

This Business Practice review process is performed prior to entering modes 6, 4 and 2. Additionally, the safety culture assessment was performed prior to Mode 5 and again prior to the first Mode 4 (NOP Test and ascension to Modes 4 and 3). Attachment 1 to the Business Practice, "Restart Readiness Review Indicators," requires Section Managers and individuals responsible for IMC 0350 Checklist items to execute affirmations in which they confirm that they have reviewed approximately 20 indicators and concur that their section or IMC 0350 Checklist item is ready to support the mode change.

Plant walk-down inspections are required as a part of the process as well as affirmations from selected system engineers that their specific systems are ready to support a mode change. The Operations and Plant Engineering Managers select systems for review with concurrence from the Plant Manager.

Shift Managers are required to sign an "Operational Readiness Affirmation," indicating their concurrence that the plant is in a condition of material readiness to support safe and reliable startup (or mode change) and power operation. The Supervisor of Reactor Engineering is required to sign similar affirmations on core configuration and reactor startup.

The Safety Culture Assessment of DBBP-VP-0002 requires the Section Managers to affirm that their section's employees are ready to support the mode change based on a series of attributes for

indicators under the Commitment Areas of Policy or Corporate Commitment, Plant Management Commitment and Individual Commitment. (This is described in more detail in Section V.A.2.)

At the completion of the review process, the SLT signs a recommendation to the site Vice President and FENOC Chief Operating Officer that the plant is ready to support a mode change.

In summary, the Restart Readiness Review process provides a final check that Davis-Besse systems, programs, and organizations are ready for restart. This process will be completed prior to restart.

I. Reviews of Extent of Condition of 10 CFR § 50.9 Issues

NRC Inspection Report 50-346/02-08 for Davis-Besse identified an apparent violation of 10 CFR § 50.9 involving two documents provided to the NRC that, based upon information that was available at the time, contained information that was not complete and accurate in all material respects. This inspection report also identified quality-related records required by 10 CFR 50, Appendix B, which contained inaccurate or incomplete information. To help ensure the completeness and accuracy of future records and submittals to the NRC, several actions have been taken, including issuance of a new policy stressing the need for complete and accurate information, providing training to personnel on the need for complete and accurate information, and issuing a new procedure governing validation, review, and approval of correspondence with the NRC.

To provide additional assurance that other documents provided to the NRC do not contain similar problems, the completeness and accuracy of a sample of prior NRC submittals was performed. This review was not part of the Return to Service Plan and was not designated as a restart action because the Return to Service Plan provided sufficient activities to ensure that the plant, programs, and organizations are sufficient to support safe and reliable restart and operation. The initial reviews of regulatory correspondence were conducted prior to restart to address NRC Restart Checklist item 3.i, "Process for Ensuring Completeness and Accuracy of Required Records and Submittals to the NRC." The results of the reviews are summarized below.

Results

Initially, the reviews identified that six separate NRC submittals may have contained information that was not complete and accurate in all material respects as required by 10 CFR § 50.9(a). Davis-Besse also determined that none of the potential inaccuracies or omissions were reportable to the NRC pursuant to 10 CFR § 50.9(b). In accordance with Davis-Besse administrative procedures, those six submittals that contained potential incomplete or inaccurate information were reported to the NRC in letters dated July 15, 2003 (letter Serial Number 1-1324), August 15, 2003 (letter Serial Number 1-1325) and September 15, 2003 (letter Serial Number 1-1328). Upon further evaluation under the Corrective Action Program, however, it was determined that of the six documents identified, only four of the documents contain information that may not be complete and accurate in all material respects.

One of these four incomplete or inaccurate documents involved the apparent deletion of potentially critical information from the "Apparent Cause of Occurrence" section of LER 97-004

prior to the submittal. This discovery prompted an expansion of the scope of the Completeness and Accuracy Review to include a more focused review of select submittals. This focused review involved a determination of whether any other potentially incomplete or inaccurate information may have been omitted or introduced during the development of submittals during the period of January 1996 to December 2000. The results of this focused review found several potential minor discrepancies, none of which is material or reportable under 10 CFR § 50.9(b).

Based upon the criteria established in the Completeness and Accuracy Project Plan, an expanded sample review will be performed consisting of 53 submittals dated between January 1996 and March 2002. Based on the conclusion that none of the issues identified to date by the reviews has significant implications for public health and safety or common defense and security, the expanded sample review will be performed post-restart and will be completed by March 31, 2004.

The Completeness and Accuracy Review involved the detailed scrutiny of over 2,200 statements of fact. Of those statements scrutinized, only a small number (about 0.2 per cent) were found to contain potentially material inaccuracies or omissions. Furthermore, none was found to have significant implications for public health and safety or common defense and security. These results indicate that there were no widespread noncompliances or programmatic concerns associated with the preparation, review, and submittal of NRC correspondence at Davis-Besse. Therefore, Davis-Besse concludes that the results of this review, in conjunction with the results of other activities under the Davis-Besse Return to Service Plan, provide reasonable assurance that the plant can be restarted and will operate: (1) without endangering the public health and safety or common defense and security; and (2) in compliance with applicable NRC regulations and requirements.

The NRC stated that it would close the associated Restart Checklist Item 3.i in Inspection Report 50-346/03-19.

J. Modifications, Program Improvements, and Management Actions to Improve Safety Margins

A number of actions were implemented to improve safety margins, including modifications to many SSCs, improvements to various plant programs, and changes to FENOC and Davis-Besse management.

1. Modifications

As discussed in more detail below, a number of modifications were implemented to recover and add safety margin, including modifications of the containment emergency sump and decay heat valve tank, refurbishment of the reactor coolant pumps and diesel air starting system, and installation of the FLÜS leakage monitoring system.

Emergency Sump

During the early stages of the current outage, it was discovered that the DHR system may not be able to maintain long-term recirculation flow because the suction screen for the containment emergency sump could become clogged by debris and because gaps in the screens could allow debris to pass through to the pump. This debris could be generated by steam blowdown during a loss-of-coolant accident (LOCA) or by containment washdown during containment spray mode. This condition was reported in LER 2002-005.

In response, several actions were taken, including removing materials from containment that could be the source of such debris (*e.g.*, unjacketed fibrous insulation and unqualified coatings) and revising the design of the emergency sump screen. This revised design included removal of the existing screen and installing a strainer assembly with significantly greater surface area. This modification expanded the screen surface area from 50 square feet to approximately 1,200 square feet of available area while decreasing the individual opening size and shape from approximately $^{1}/_{4}$ inch square openings ($^{5}/_{16}$ inches diagonal) to $^{3}/_{16}$ inch circular openings.

In summary, the design of the containment emergency sump has been improved through the implementation of substantial modification. This modification has placed Davis-Besse in the forefront of all PWRs in the United States in addressing generic issues related to containment sumps.

Decay Heat Valve Tank

The two in-series DHR suction isolation valves are housed in the decay heat valve tank and are normally closed during power operation to form the RCS pressure boundary. The valves are opened during shutdown operations to provide the normal cooling path from the RPV to the DHR pumps and heat exchangers. The two valves' motor operators are located below the LOCA containment flood height and are not watertight; consequently, they can not be relied upon to function if submerged. The decay heat valve tank is designed to prevent submersion of the motor operators until they have completed their safety function.

Historically, it has been difficult to obtain an adequate seal on the decay heat valve tank. A gel type (*e.g.*, RTV) sealing material has been used to seal known leakage areas around the steel

plate that covers the decay heat valve tank. To improve performance, the sealant was removed and a steel plate liner was seal-welded within the decay heat valve pit. The decay heat valve tank design considered thermal expansion and contraction during submergence. Improved flood seals were also constructed for the three decay heat lines entering and exiting the compartment.

Reactor Coolant Pumps

Condition Report 02-03668 identified long-standing problems with RCP casing-to-cover joint leakage. To address this problem and other RCP issues, the following maintenance was performed on the four RCPs during the current outage:

- Replaced the casing-to-cover gaskets on RCPs 1-1 and 1-2;
- Replaced the rotating elements on RCPs 1-1 and 1-2;
- Installed new motors on RCPs 1-1 and 1-2; and
- Rebuilt and replaced the mechanical seals RCPs 1-1, 1-2, 2-1, and 2-2.

In addition, new Bentley-Nevada diagnostic equipment is installed on all four RCPs and is being tested. This equipment will allow for remote, real-time indication of pump vibration status and other relevant parameters in the Control Room and other selected locations in the plant.

Procedure NOP-ER-3001, "Problem Solving and Decision Making Process," was used to assess the condition of RCP 2-1 and 2-2 during the NOP test in September 2003. Results of that testing indicate that the case-to-cover gaskets have performed as designed and indicate that they are nearing the end of their operational life. Maintenance activities have been scheduled for the next refueling outage to replace the RCP 2-1 and 2-2 case-to-cover gaskets.

FLÜS Leak Monitoring System

In an effort to enhance the leak detection capabilities at Davis-Besse, a leak detection system, FLÜS, is being installed on the lower RPV head to monitor potential leakage of the incore instrumentation nozzles. This system (first of its kind in the United States) operates on the principle of humidity detection.

Permanent Reactor Cavity Seal Plate

A new permanent cavity seal plate (PCSP) was installed at Davis-Besse. Modification completion is pending testing in Mode 3. The PCSP is expected to reduce critical path time, radiation exposure, craft expense, and radwaste. Disposal of each access port O-ring is the only associated radwaste. Additionally, the PCSP should serve as protection for the RPV from the harmful effects of boric acid by controlling the flow from any potential leakage (during plant operation) from the RPV head flange or the control rod drive mechanism flanges.

Replacement of Coatings in Containment

Blistering and peeling of the containment dome top coat material was identified during visual examinations of the containment vessel surfaces during 12RFO and 13RFO. An examination performed during 13RFO found the degradation slightly more extensive than observed during 12RFO. A subsequent examination performed during 13RFO determined that the degradation was confined to the top coat material and that the primer coat material remained fully adhered to the substrate.

Engineering Work Request 01-0505 was initiated in December 2001 to remove the existing Phenoline 305 top coat material and re-coat it with Carboline 890. Per this EWR, existing Carboline Phenoline 305 top coat material was removed from the containment vessel dome area (above elevation 725'-0"), including appurtenances. New coating material was procured from an Appendix B supplier with supporting quality documentation.

In addition to the re-coating of the containment vessel dome, other significant coating work was performed during 13RFO. For example, it was determined that the CAC SW supply and return piping existing coating material was not design basis accident (DBA)-qualified and was degraded. The piping was re-coated with a DBA-qualified coating system.

It was also determined that both core flood tanks had been painted with a coating material for which no DBA qualification documentation could be located. The existing coating material was removed from both core flood tanks. The tanks were re-coated with a DBA-qualified coating system.

Davis-Besse was unable to verify that the RPV head service structure coatings applied during plant construction were DBA-qualified. Consequently, the coating material was deemed non-DBA qualified and subsequently removed. The RPV head service structure was re-coated with a DBA-qualified coating material.

It was also determined that the existing coating material applied to the CAC frames was DBA-qualified but degraded. CAC components were cleaned, prepared, and recoated with a DBA-qualified coating material, as appropriate.

Removal of Fibrous Insulation and other Debris from Containment

Significant resources were dedicated to reduce the debris sources within containment and significantly expand the sump strainer. Key aspects to reducing debris included significant efforts to upgrade coatings used in containment, as discussed previously. Additionally, steps were taken to minimize the amount of fibrous insulation in containment and the containment structure was steam cleaned to remove loose dirt and debris that had accumulated over the plant's operational lifetime. Tags and signs that could become debris were removed or replaced with materials that have demonstrated the ability to survive post-accident conditions. Procedures and specifications were put in place to ensure that the newly established conditions are maintained through the remainder of the plant life. Training of site personnel raised awareness of the need for maintaining containment cleanliness and methods used to maintain the standards.

Upgrade of Containment Cranes and Bridges

Both the polar crane and reactor service crane were upgraded. The controls and wiring for the polar crane were completely overhauled by the installation of new control boxes, wiring, electronics, and radio controls. The reactor service crane was refurbished by the addition of new wiring and electronic controls. The reactor service crane trolley, with a capacity of five tons, was replaced with a new unit able to lift seven tons.

Containment Air Cooler Modifications

The CACs were modified to correct damage from boric acid corrosion. Nearly the entire system was replaced including new CAC motors, plenum, cooling coils, and SW piping that supplies cooling water. To restore the system to its original design specification, the plenum was replaced with stainless steel, the coolers and drop-out registers were replaced. The use of stainless steel assures that boric acid corrosion will be minimized in the future, and the elimination of the galvanized steel previously used in construction of the CAC plenum and ductwork lowers the quantity of zinc in containment — a significant source of potential hydrogen generation. Finally, the service water piping that supplies the CACs was replaced to correct a prior design error.

Containment Vessel-to-Concrete Interface

Davis-Besse investigated the potential corrosion of the containment vessel. This investigation included the sampling and testing of the ingress ground water, corrosion products, and concrete on the exterior of the containment vessel. The investigation found no evidence of microbiological activity or chloride corrosion. The investigation determined that the observable corrosion above the vessel-concrete interface bounded the corrosion underneath the concrete, because of passivation of the steel vessel embedded in mass concrete. This investigation concluded that the containment vessel is acceptable for continued service.

Several modifications have been implemented to minimize the potential for future vessel corrosion and minimize the ingress of ground water at the vessel/concrete interface. These modifications included installation of a layer of non-shrink grout and a sealant to maximize the effective sealing at the vessel/concrete interface. In addition, the interior vessel-concrete interface was sealed to prevent water from collecting in the small gap between the two surfaces.

Cyclone Separators

Cyclone separators were added to the containment spray pumps' mechanical seal cooling water lines to protect the pumps' mechanical seals from debris during post-LOCA operation when the containment spray pumps take suction from the containment emergency sump. Addition of the cyclone separators to the pumps' seal cooling water supply lines reduces the potential for debris-induced mechanical seal failure, thereby increasing the plant safety margin. Moreover, the existing cyclone separators on the DH/LPI pumps were replaced with larger cyclone separators to provide more reliable debris removal from the mechanical seal cooling water supply to those pumps.

Emergency Diesel Generator Ventilation Modification

Two new modifications were implemented during 13RFO to reduce the EDG room temperatures. The first modification installed insulation on the EDG exhaust manifold, turbocharger, and flexible bellows. The second modification induced airflow through an EDG cabinet (static exciter voltage regulator). This modification was performed by drawing air from three areas of the cabinet through the EDG room ventilation fans. Post-modification test data is currently under review.

EDG Air Start System

Several deficiencies were identified in the EDG air start system, including rusting of the active components and discrepancies between the installed solenoid valves and those listed in the asset database. To address these deficiencies, selected portions of the carbon steel EDG air start system were replaced with stainless steel. The air start piping associated with the compressor was changed to stainless and air dryers were added. The carbon steel piping from the air receivers to the EDG air start motors was replaced with new carbon steel pipe.

Other Modifications

Other modifications have been implemented, including:

- Replaced numerous valves in the RCS;
- Environmentally qualified the pressurizer power-operated relief valve wiring to enhance plant safety;
- Upgraded auxiliary feedwater system; and
- Upgraded Appendix R Hot Shutdown Panels for operator indications of saturated conditions.

2. Program Improvements

As discussed in detail in Section IV.D, changes have been made to numerous plant programs, including the CAP and RCS Integrated Leakage Program. The CAP was extensively reviewed and significantly improved. In addition, the CARB has been strengthened and is chaired by a Director level position. Also, the categorization of CRs has also been strengthened.

The RCS Integrated Leakage Program is currently being revised to incorporate lessons learned during the sensitivity test and to incorporate the new algorithm into the existing RCS Water Inventory Balance Test. Once incorporated, the program will be able to identify small changes in the amount of unidentified leakage and trend this information.

3. Management Changes

As discussed in detail in Sections IV.D and V.A, a number of new management positions have been added to the FENOC corporate organization. These include the Chief Operating Officer,

Senior Vice President – Engineering and Services, Vice President – Oversight, and several program owners. These new management positions will ensure that programs are consistently implemented at all three nuclear plants. A new management team has also been installed at Davis-Besse. The new managers have proven records, extensive nuclear experience, and many have or had senior reactor operator (SRO) licenses or certifications. In addition, Davis-Besse managers are now graded to the new leadership principles.

K. Conclusions

In summary, comprehensive Building Block Plans have been developed and implemented to replace the degraded RPV head, to determine whether other SSCs may have been adversely affected by PWSCC or boric acid corrosion, to verify that SSCs can perform their design basis functions and are in a condition sufficient to support safe and reliable operation, and to ensure that plant organizations and programs are fulfilling required obligations and are sufficient to support safe and reliable operation. As a result of implementation of these Plans, numerous conditions have been identified that require corrective action prior to restart. More than 7,400 restart corrective actions have been generated; more than 7,260 have been completed. As a result, Davis-Besse concludes that the organizations, programs, and SSCs are ready to support safe and reliable operation of Davis-Besse.

V. Management and Human Performance Improvements

Following discovery of the RPV head degradation in March 2002, several root cause investigations were performed to specifically identify the root and contributing causes of the failure to identify the corrosion of the RPV head. These analyses and other assessments identified a number of management and human performance-related deficiencies. In response, the Management and Human Performance Excellence Plan and the Management and Human Performance Improvement Plan were developed and implemented.

Section V.A below describes the actions that have been taken under each area of the Management and Human Performance Excellence Plan, and indicators of the effectiveness of those actions in each area. Section V.B below discusses the overall effectiveness of these actions, as determined by performance assessments during the NOP test in September 2003. Section V.C below describes additional actions taken based upon the results of those assessments.

A. Management and Human Performance Excellence Plan

The purpose of the Management and Human Performance Excellence Plan was to conduct a thorough assessment of the management and organizational issues surrounding the degradation of the RPV head and create a comprehensive leadership and organizational development plan for the site. The Plan consisted of three elements:

- Reviews and assessments as described in the Plan.
- Collective significance reviews.
- Specific actions to take before and after restart to ensure changes are effectively implemented.

This plan will drive long-term changes, with some actions required before restart, and others occurring after startup.

Using data from the root cause reports and other assessments associated with the RPV head degradation, it was determined that the primary management contributors to this failure could be categorized into the following five areas:

- Management/personnel development;
- Nuclear safety culture;
- Standards and decision-making;
- Oversight and assessments; and
- Programs/corrective action/procedure compliance.

The Management and Human Performance Improvement Plan was prepared and implemented to address each of these areas. The activities performed and improvements to date in each of these areas are summarized below.

In summary, FENOC has built an enduring organization rooted in and consistently aligned at all levels to the core values of safe and reliable operation of Davis-Besse. These actions anchor the improvements at Davis-Besse.

1. <u>Improvements in Management/Personnel Development</u>

Davis-Besse has the following objective for its management: *Managers are experienced, have high safety standards, and are involved in directing and overseeing plant activities.*

FENOC has appointed a new president and has created three executive positions (Chief Operating Officer, Vice President of Oversight, and Senior Vice President of Engineering and Services). The individuals who have been appointed to these positions are highly qualified and collectively have had substantial nuclear experience outside of the FENOC system. Additionally, corporate groups have been established to develop and monitor the implementation of common policies, standards, processes, and practices for all of FENOC's nuclear plants. These actions provide for strong corporate governance of FENOC's nuclear plants and independent oversight by Quality Assessment. This new corporate structure and the new officers are shown in Figure 4 on page 75.

The top two levels of management at Davis-Besse (site Vice President and plant directors) have been entirely replaced, as have almost all of the third level (managers). The new management team is largely drawn from outside of Davis-Besse, and includes several proven performers from plants outside of the FENOC system. Almost all of the new management has technical degrees and most have or have had senior operator licenses or certificates. These changes are shown in Figure 5 on pages 76 and 77.

In addition to improving its corporate and site management team, other actions have been taken to strengthen management, including:

- A common set of standards for management personnel has been established. The Davis-Besse Senior Management Team Standards, Leadership Strategies, and Basic Principles are posted in various locations at Davis-Besse. These standards stress the need for management to set and communicate the proper safety values and expectations for their personnel; to personally observe the performance of personnel to ensure that they are meeting expectations; to measure performance of personnel, systems, and programs within their areas of responsibility; and to take action to correct and prevent recurrence of performance problems. FENOC established new accountabilities for directors and managers, including Nuclear Professionalism and Nuclear Safety Consciousness, and the performance evaluation process.

- Evaluations have been performed of executives, directors and managers (and selected supervisors) to verify their competence for their current positions, including the adequacy of their nuclear safety focus.

- Leadership training has been implemented for the management team to set the standards for how the management team will be expected to conduct business.

- A Management Observation Program has been implemented, using the key attributes of the program at all three FENOC plants and benchmarked in the industry for best practices. The program was implemented at Davis-Besse in September 2002. Examples of attributes that are assessed include: pre- and post-job briefs; safety observations; radiation safety; field observations; office observations; and foreign material exclusion observations. Data from these attributes are used to assess overall station performance. Many management observations are planned and scheduled in advance. Scheduled management observations focus on important safety-related work.

- Standards and Expectations were issued for the Duty Team, which includes a director and managers who are responsible for maintaining cognizance of plant conditions during their duty week. These standards and expectations include performing tours during off-normal hours, chairing plant status meetings, and maintaining a four-hour presence during each weekend day and holiday.

- In January 2003, a memorandum was issued to Shift Managers at all three FENOC stations, specifying their command responsibilities. These responsibilities include maintaining the highest safety consciousness, awareness and understanding of risk associated with plant activities; making decisions that are conservative to safety; raising safety issues and fostering an environment where people feel free to raise concerns; and being involved with important plant activities. This memorandum also specifies their responsibilities for managing abnormal or emergency conditions.

Figure 4 – New FENOC Corporate Structure

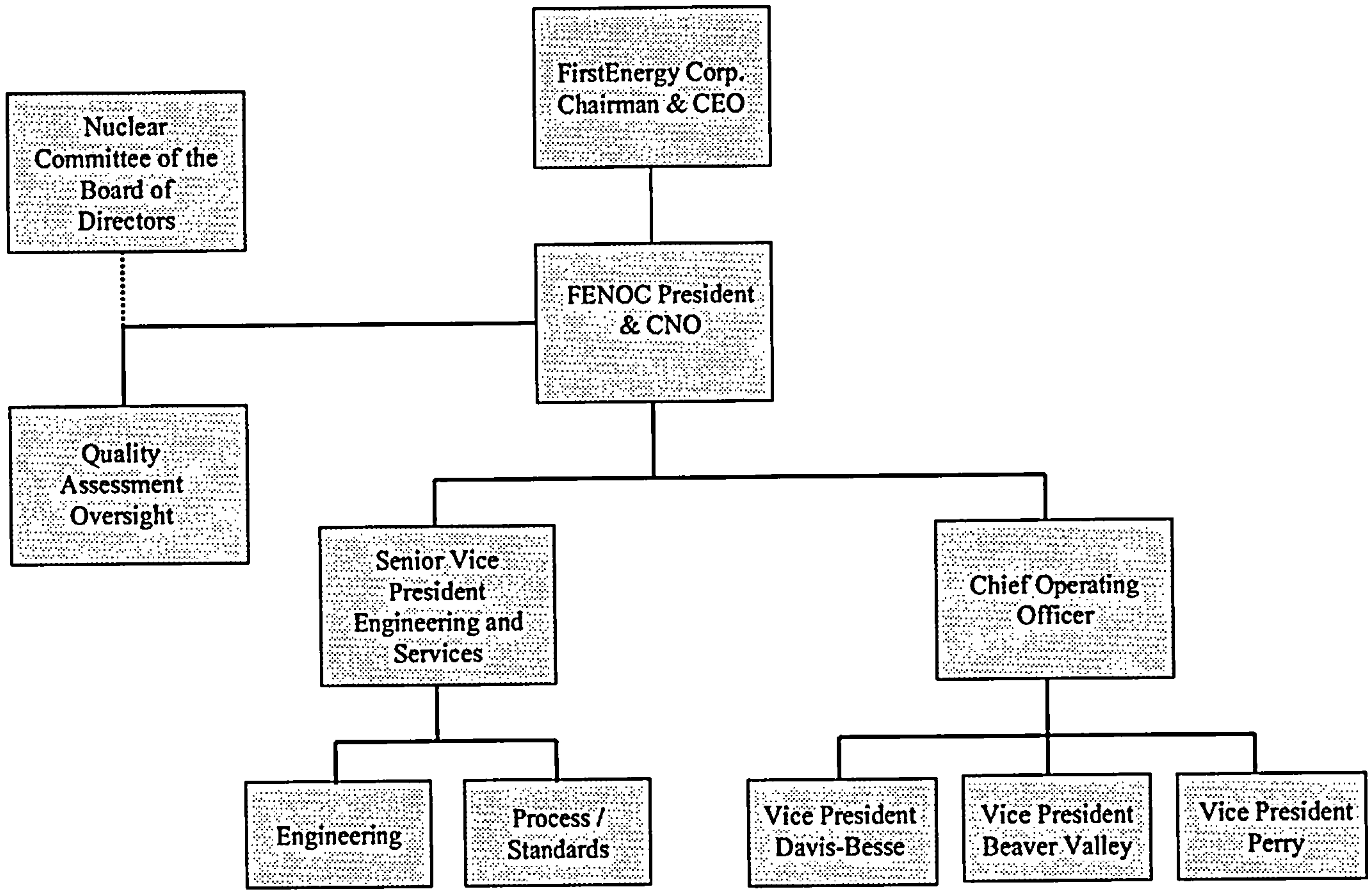
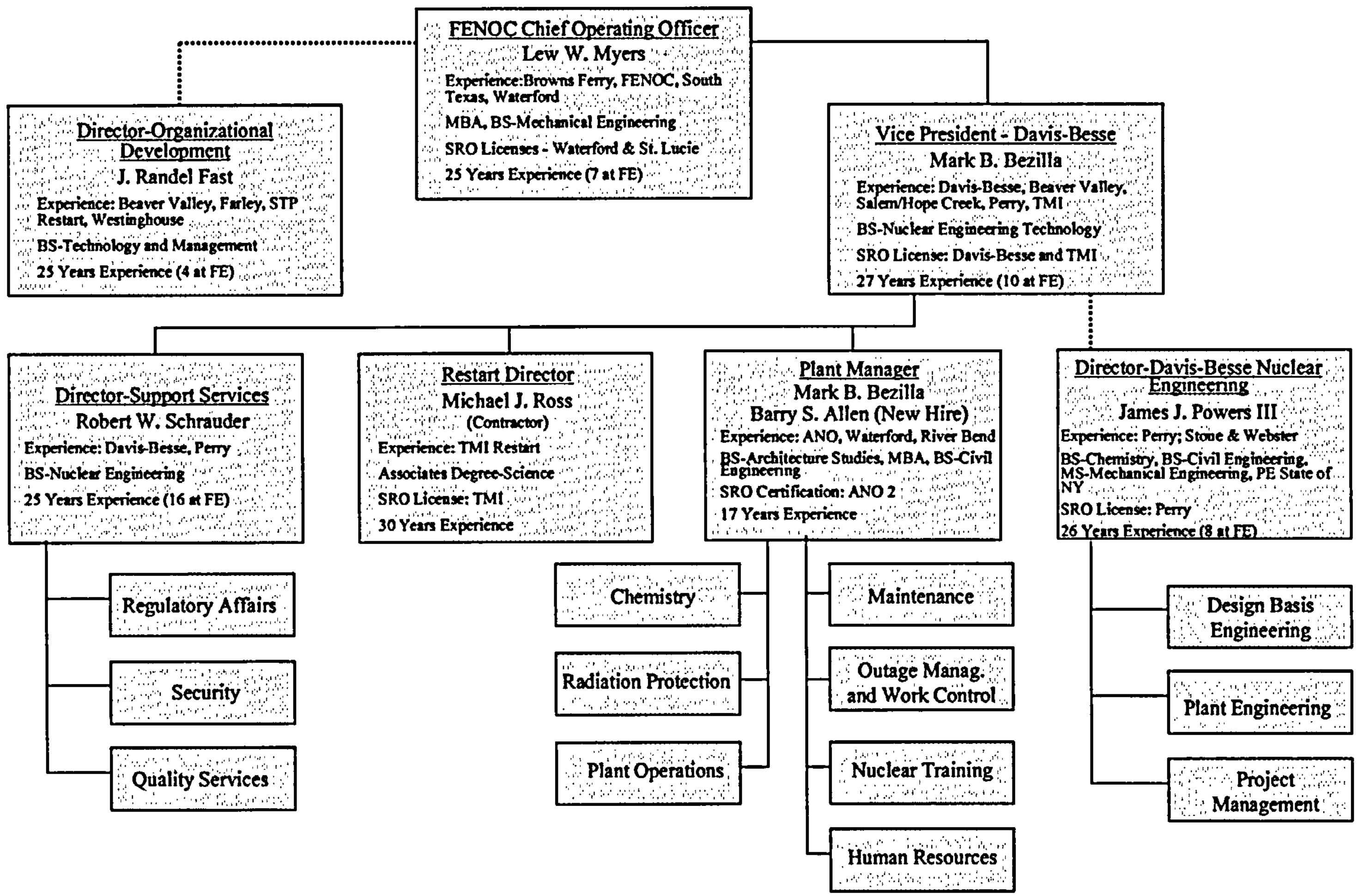
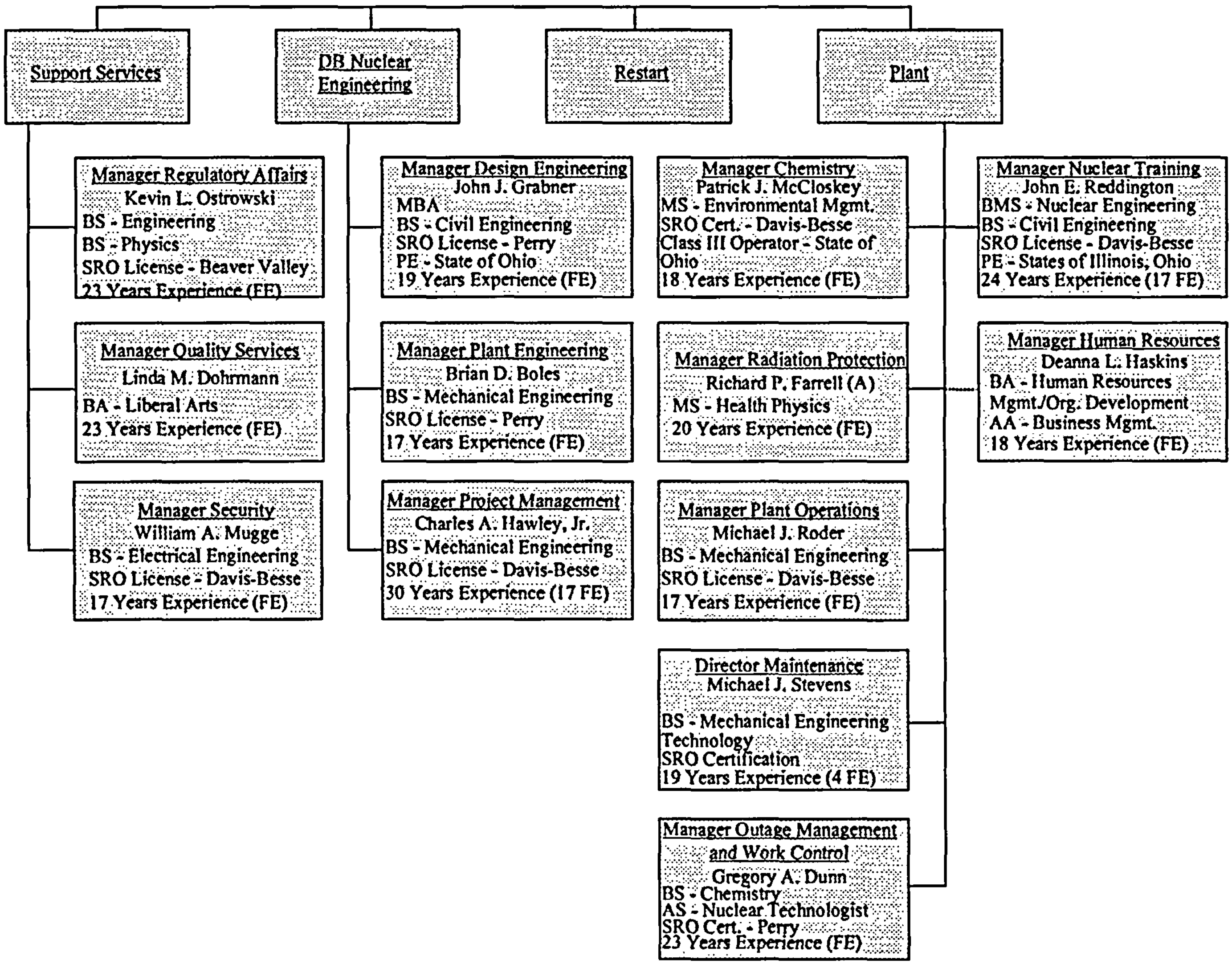


Figure 5 -- Davis-Besse Senior Leadership Team



This figure depicts the restart organization; Davis-Besse is transitioning to an operating organization.

Figure 5 -- Davis-Besse Senior Leadership Team



Results

As discussed in later sections of this report, various performance indicators and assessments at Davis-Besse show improved performance, reflecting upon effectiveness of the new management team. Additionally, Davis-Besse management is currently meeting its goal of completing at least 90 percent of scheduled management observations.

The actions of the new FENOC and Davis-Besse management team also demonstrate that they have high safety standards and are involved in directing and overseeing plant activities. For example:

- Adding Safety Margin – As discussed in Section IV.J, management has initiated modifications to add safety margins beyond those necessary to ensure operability of systems and components.

- State-of-the-Art Programs and Systems – Management has taken a number of actions to create state-of-the-art programs and systems at Davis-Besse, including the FLÜS leakage detection system, RCS Integrated Leakage Detection Program, Problem Solving and Decision-Making process, Management Observation Program, Safety Culture Assessment process, and modification of the containment vessel emergency sump.

- Strong Use of the Corrective Action Program – Management reinforced its expectations and shared the lessons learned from the CAP review and the NRC CAP inspection through a series of stand-downs for employees. The importance of using the CAP was consistently reinforced in communications and meetings focused on ensuring a Safety Conscious Work Environment. To ensure CAP implementation would improve, individuals with key responsibilities in CAP were trained to the higher standards and expectations. Section-level ownership and oversight was improved through the assignment of CR Analysts. Quality intrusive management oversight was implemented through mandatory CARB review of apparent and root cause evaluations. These actions have resulted in consistently high CR generation and improved evaluations and corrective actions.

- Conservative Approach to Safety Using Decision-Making Nuclear Operating Procedure – Management has taken a conservative approach to problem solving. For example, a complete inspection was performed of fuel for damage after finding some damage to a fuel assembly, and the reactor core internals were removed to inspect for debris in the reactor vessel. Additionally, an improved model, Electrical Transient Analysis Program (ETAP), is used to evaluate the adequacy of electrical systems rather than relying upon an older, less effective model previously used at Davis-Besse.

- Stand-Downs and Stopping Work – To ensure that work is performed properly and that personnel understand the need for the proper safety focus, management has initiated a number of stand-downs and stop work orders, including a stop work on the containment polar crane when some problems were identified in

September 2002, a stop work on a contractor on rebar cadwelding in the fall of 2002, and a stop work on fuel movement when spacer grid damage was observed in 2002. Davis-Besse also has imposed stand-downs, including a stand-down on Radiation Protection when proper RP practices were not followed, and a stand-down on Maintenance to emphasis the need for procedure compliance. Similarly, during the NOP test in September 2003, plant evolutions were halted when issues arose during plant heat-up and cool-down, thereby demonstrating the proper safety focus.

In summary, the Davis-Besse management team has been changed out and significantly strengthened, including the addition of enhanced corporate oversight. The new management team has demonstrated by its actions that it has high safety standards and is involved in directing and overseeing plant activities. FENOC has built an enduring organization rooted in and consistently aligned at all levels to the core values of safe and reliable operation of Davis-Besse. Employees constantly receive reinforcement of these core values and senior management is selected based on a fit with these core values. Therefore, Davis-Besse concludes that it is ready for restart in this area.

2. Improvements in Safety Culture

Safety culture is defined at Davis-Besse as "that assembly of characteristics and attitudes in organizations and individuals which establishes an overriding priority towards nuclear safety activities and ensures that issues receive the attention warranted by their significance."

As discussed in this section, safety culture has significantly improved at Davis-Besse during the current outage. Also, management is placing additional emphasis upon issues involving safety-related activities. Nonetheless, Davis-Besse is continuing to pursue improvements in all areas as discussed in the Operational Improvement Plan for Cycle 14.

Davis-Besse has the following objective for safety culture: *Nuclear, industrial, radiological and environmental safety have the highest priority and take precedence over other objectives, such as cost and production. Personnel feel free to raise safety concerns without fear of retaliation, and concerns are investigated and resolved in a timely manner.*

Actions to achieve this objective have included the following:

- The FirstEnergy Board of Directors issued a resolution to communicate from the highest level the significance of nuclear safety.

- The Chief Executive Officer of FirstEnergy has met with Davis-Besse personnel to express his policy that safe nuclear operations require an unrelenting and uncompromising commitment to safety, and that the highest levels of productivity are meaningless if they're not achieved with a strong focus on safety. Additionally, he met with the shift managers one-on-one to ensure that his expectations are satisfied and that the roles and the responsibilities of the shift managers are clear.

- A policy was established that incorporates FENOC's objective on safety culture.

- The existing Leadership in Action training of management was revised to include training on the need for a nuclear safety focus.

- Management incentives were realigned to place the most weight on safety and safe operation.

- Management has communicated standards of excellence at all levels. Multiple forums have been used to communicate high standards and obtain feedback from personnel. For example, until preparations for entering Mode 4 began in August 2003, town hall meetings and 4-Cs meetings were held weekly, and there were monthly Davis-Besse Team meetings. (Pursuant to the Operational Improvement Plan and Business Practices DBBP-VP-0003, -0004, and -0005, these meetings will continue post restart.)

  - The town hall meetings have included a presentation on recent developments and planned activities.

  - The 4-Cs meetings have been conducted by FENOC's Chief Operating Officer (COO) and provided small groups of employees with an open forum to express "compliments, concerns, changes and communications."

  - Management has held monthly all-site meetings with personnel to provide a picture of recent developments and upcoming activities.

- Case Study training was given to site personnel to ensure that they understand how the RPV head degradation event happened, what barriers broke down, and what needs to be different in the future. This study is now also given to new hires.

- A process has been established to monitor safety culture at Davis-Besse.

- FENOC has issued a policy statement on SCWE, which emphasizes the importance of raising safety concerns and states that retaliation against individuals who raise safety concerns will not be tolerated. Managers and supervisors have received training on SCWE. Recent surveys indicate an improvement in employee willingness to raise issues of safety and quality to management.

- A new ECP has been established, which falls under the responsibility of the President of FENOC and his direct reports. The ECP includes independent investigators and provisions for submitting anonymous concerns and maintaining the confidentiality of those concerns. Information on the new ECP has been and continues to be widely disseminated in the OnLine newsletter to site personnel, in meetings with personnel, and in posters around the site.

- A SCWE Review Team has been established, consisting of plant directors and representatives from the ECP, Human Resources, and Legal, to evaluate proposed significant adverse actions against employees before the action is taken to help detect and prevent the potential for or perception of retaliation for raising safety concerns.

- An independent consultant, Performance, Safety and Health Associates (PSHA), performed an evaluation of the Davis-Besse safety culture and management is responding to the issues identified.

Results of Assessments in Early 2003

The PSHA assessment, "Safety Culture Evaluation of the Davis-Besse Nuclear Power Station," was issued in April 2003, and found several areas warranting improvement, including:

- Although safety is a recognized value in the organization, PSHA found that it was inconsistently accepted and understood across all levels of personnel. Problems were found to exist in the transmission, comprehension, and implementation of the safety message.

- PSHA found that accountability and ownership for safety were not universally accepted in the organization. Although some individuals readily accept responsibility and take ownership of problems, PSHA found that others were still reluctant to do so.

- PSHA found that safety was not consistently integrated into all activities in the organization. Processes and programs were found to be in various stages of transition, which often reduced their effectiveness.

- PSHA found that there was no integrated and cohesive organizational safety leadership process. The values and attitudes of the workforce are generally positive, but many differences were found between work groups, and between management and staff, indicating that personnel were not yet aligned with a common set of values. PSHA found that management's safety goals were not consistently communicated to nor understood by station personnel.

- PSHA found that safety was not learning-driven in the organization. PSHA found that efforts to improve future performance by learning from the plant's past performance, from others' performance, and from the day-to-day implementation of the organization's programs and processes, were not systematic or recognized to be of high value for the organization.

Davis-Besse's own assessments found similar concerns in early 2003. For example, the March 2003 SCWE Survey Results showed that there was a continuing opportunity for site-wide improvement in areas of management internalization and espousal of "Basic Principles" in dealing with workers, management reinforcement of safety over cost and schedule, and rigorous follow-through on CAP improvements. It also found that there was a continuing opportunity for

site-wide management reinforcement of SCWE with contractors, and that significant "challenge pockets" existed in areas of RP/Chemistry, Maintenance, and Plant Engineering for both site and contractor workers. Similarly, "Davis-Besse Nuclear Quality Assessment Quarterly Assessment Report DB-C-03-01 for January 1 to April 21, 2003," identified that approximately 20 percent of personnel interviewed believed that identified concerns had not been effectively resolved, and that approximately 10 percent said they were aware of instances over the last three months in which another individual was retaliated against for raising an issue.

At the time that these assessments were conducted (*i.e.*, the first quarter of 2003), many of the improvements had not been implemented or had been in effect for only a short period of time.

Additional Actions to Improve Safety Culture

In response to these assessments, additional actions were taken to improve performance. These actions included:

- New Vision and Strategic Objectives – In July 2003, FENOC's Executive Leadership Team established a new vision for its fleet of nuclear plants. The new vision is "*People with a strong safety focus delivering top fleet operating performance.*" To help achieve this vision, the team identified four (later expanded to five) strategic objectives and a set of metrics to track success in achieving the objectives. These strategic objectives and metrics are discussed in more detail in Section VI.A.

- Training has been provided to personnel on the requirements of 10 CFR § 50.7 and 50.9:

  - Training on Completeness and Accuracy of Information (lesson FEN-50.9M), which covers the associated legal and FENOC policy requirements, was completed for Davis-Besse supervisors and above by July 30, 2003. Subsequently, each section conducted training for employees and contractors who might create records or provide information to the NRC. The majority of site-assigned individuals completed this training (lesson FEN-50.9E) by August 30, 2003. The FENOC Integrated Tracking System training database is tracking the individuals who have not completed this training.

  - Beginning September 1, 2003, the objectives of the training course FEN-50.9M and FEN-50.9E are covered by the FENOC employee orientation manual (FEN-EOM). This training consists of required reading and review of the lesson materials for FEN-50.9 followed by an evaluative check-out by a member of their management/supervision to ensure the objectives are met for new FENOC employees.

  - SCWE training (10 CFR § 50.7) was conducted for supervisors and above as required training. Beginning on September 1, 2003, this training requirement is also addressed by the FENOC employee orientation manual, FEN-EOM, in a manner similar to 10 CFR § 50.9 training described above. New FENOC

employees receive Sections 50.7 and 50.9 training when hired; supervisors receive both of these topics again as part of their supervisor training curriculum. Going forward, these two topics are anchored in FEN-EOM and supervisor training.

- Restart Readiness Review Safety Culture Assessments – Business Practice DBBP-VP-0002 was used prior to Modes 5, 4a, and 4b/2 to assess the safety culture readiness for mode changes.

- Performance Indicators – Section-specific performance indicators have been developed. Indicators have shadow-boxes to display section/department/site performance in a color format to enhance the visibility of those areas needing attention. The indicators are displayed in several locations on site.

- Daily Condition Report Meetings – Daily meetings are held to provide management oversight of Condition Reports and Corrective Actions coming due. Extensions and deferrals require management cognizance. Additionally, CRs are reviewed for mode restraints, operating experience, and good catches.

- Enhancements in the Management Observation Program – The Management Observation Program was enhanced by having the program owner and management sponsor monitor the results of the program and provide feedback for further action. Similarly, the managers for Operations and Maintenance discuss relevant observations on a routine basis. For example, areas in which weaknesses are observed become focus areas for further observations and are highlighted to the cognizant managers to enable them to take action to improve performance. Additionally, in July 2003, a three-day training session on management observations was provided to Training Instructors (now called Performance Consultants). In addition to classroom training, training includes paired observations in the field with line management to share their knowledge and provide job training on conducting and documenting observations by line management. Periodically, either requalification or refresher training will be conducted for management observations.

- Director of Organizational Development – In May 2003, a new department and position, Director of Organizational Development, was created to focus on achievement of continuous improvement in safety culture and SCWE. At the beginning of September, this position was changed to a FENOC corporate position to ensure alignment and improved safety culture throughout the organization.

- Stabilizing the Organization – Various open positions at individual, supervisor, and manager level have been filled. Additionally, a permanent Vice President and Plant Manager for the station have been appointed.

- Project Review Committee (PRC) – The PRC has been revised to provide for the involvement of executive and senior management to ensure that safety significant

modifications receive appropriate resources and are scheduled for completion in a timely manner.

- Personnel Evaluations – Davis-Besse completed a personnel evaluation of non-union employees. This was performed after the first quarter 2003 safety culture assessments were largely completed.

- Performance Consultants – Training personnel have been trained to become performance consultants. The performance consultants observe performance in the field and review various indicators (such as condition report trends, rework items, and QA trends) to proactively search for performance weaknesses and work with station personnel to identify methods for achieving improvements in performance.

- Corrective Action Program – As discussed in Section IV.D.2, the CAP was significantly revised in March 2003.

- Safety Conscious Work Environment – Meetings were held with personnel in the RP/Chemistry, Maintenance, and Plant Engineering groups in the summer of 2003, emphasizing the importance of SCWE, including the willingness to listen and respond to worker concerns and criticisms.

- Root Learning – Davis-Besse personnel were trained using Edventures Learning Tools to ensure alignment of the organization for restart and specific focus on safety culture. Nine training sessions were conducted to ensure that personnel on both day and night shift received the training. The Edventures session was an eight-hour interactive program for employees, in groups of eight to 10, led by a trained employee facilitator. The focus was on the future and the key role each employee must play to guarantee the organization is built to last and that the organization can safely move forward. Employees were guided on their responsibilities to the company, nuclear community, and the public as the station moves forward. Senior Management played a key role in each session with an informal discussion on current plant status as well as a wrap-up discussion of the restart schedule.

Results of Additional Actions

These actions have been effective in improving the safety culture at Davis-Besse, as shown by various assessments and surveys. For example, Business Practice DBBP-VP-0002, "Restart Readiness Review Extended Plant Outage," was issued to establish a safety culture model and to assess safety culture prior to entering various plant operating modes. The safety culture model is patterned after and expands upon the model provided in International Atomic Energy Agency (IAEA) Safety Series INSAG-4. In accordance with the model, safety culture is assessed in three areas: Policy Level Commitment, Managers' Commitment, and Individuals' Commitment. Within each of these areas, performance is assessed with respect to five or more criteria. In turn, performance for each criterion is assessed with respect to a number of different attributes, with specified (largely objective) acceptance criteria. Based upon the assessments, performance for

each attribute, criterion, and commitment area is given a color rating: "Green" (acceptable with a few minor deviations), "White" (acceptable with a few attributes/indicators requiring management attention), "Yellow" (acceptable with several attributes/indicators requiring prompt management attention), or "Red" (several attributes/indicators do not meet acceptable standards). The Business Practice states that restart is not permitted if any of the commitment areas is Red.

Over time, the Business Practice has been revised to make the acceptance criteria more restrictive. In accordance with the revision then in effect, safety culture assessments were conducted prior to entering Mode 5 (March 2003) and the first Mode 4 (July 2003); an additional assessment was performed in November 2003 in preparation for the Mode 4b/2. The results of the assessments are depicted on Figures 6, 7, and 8, respectively on pages 87 - 89.

The Readiness Review Safety Culture Assessment performed for Mode 5 concluded that all three of the safety culture commitment areas should be characterized as Yellow (all major areas are acceptable, with several criteria requiring prompt management attention). The Assessment performed for first Mode 4 showed substantial improvement. In particular, the Policy/Corporate and Individual commitment levels had improved from Yellow to White. The Assessment for Mode 4b/2 showed even further improvement, with all commitment levels rated White. Furthermore, there was also substantial improvement at the criteria level. For example, from the Mode 4 assessment to the Mode 4b/2 assessment, five of the criteria improved (while two worsened, in part due to the more stringent acceptance criteria). Furthermore, unlike the early assessments, none of the criteria was rated as Red as a result of the Mode 4b/2 assessment. These improvements are especially noteworthy given the more stringent acceptance criteria that were applied in the later two assessments (and especially the assessment performed in November 2003 for Mode 4b/2). The improvement is largely attributable to the fact that many of the actions needed for an improved safety culture have been completed, that backlogs have been reduced, and that performance itself has improved.

Although the Safety Culture Assessments showed improvement, there were several criteria for the Mode 4b/2 assessment that were rated as Yellow. As described below, however, these results do not indicate that Davis-Besse is unsafe to restart.

- "Commitment to Safety" was rated as Yellow, largely due to the events and assessments during the Normal Operating Pressure test in September 2003. Those events and assessments, and Davis-Besse's corrective actions, are discussed in more detail in Sections V.B and V.C.

- "Commitment to Continuous Improvement" was rated as Yellow for several reasons:

  - There are 28 open requisitions for exempt-employee positions. Pending hiring of permanent employees for these positions, Davis-Besse is using contractors to complete work activities.

  - There were a number of operator workarounds and control room deficiencies. The restart schedule, however, includes activities to reduce these numbers to the White or Green level.

- The effectiveness of Safety Conscious Work Environment Review Team in avoiding discrimination complaints was rated Red because of the number of such complaints submitted to the NRC during the past year. Most of these complaints, however, were submitted late last year or early this year. Since April 2003, the rate of discrimination complaints is less than half of the rate for 2002 and the first quarter of 2003 (though the rate is still higher than desirable).

- The "Drive for Excellence" was rated as Yellow because of the number operator workarounds, control room deficiencies, and Maintenance Rule Section (a)(1) systems. The restart schedule, however, includes activities to work these numbers down to the White or Green level. Additionally, during the previous quarter, there were a number of Condition Report evaluations that were not completed on schedule according to the CREST-established due date (though in many cases management consciously approved extensions of those due dates). This was largely a reflection of the backlog of Condition Reports that Davis-Besse is working down, and not a reflection of the quality or safety focus of organization.

In summary, while several criteria were rated Yellow during the Mode 4b/2 assessment, the overall ratings indicate that Davis-Besse is safe to restart.

Figure 6 -- Results of Safety Culture Assessment for Mode 5

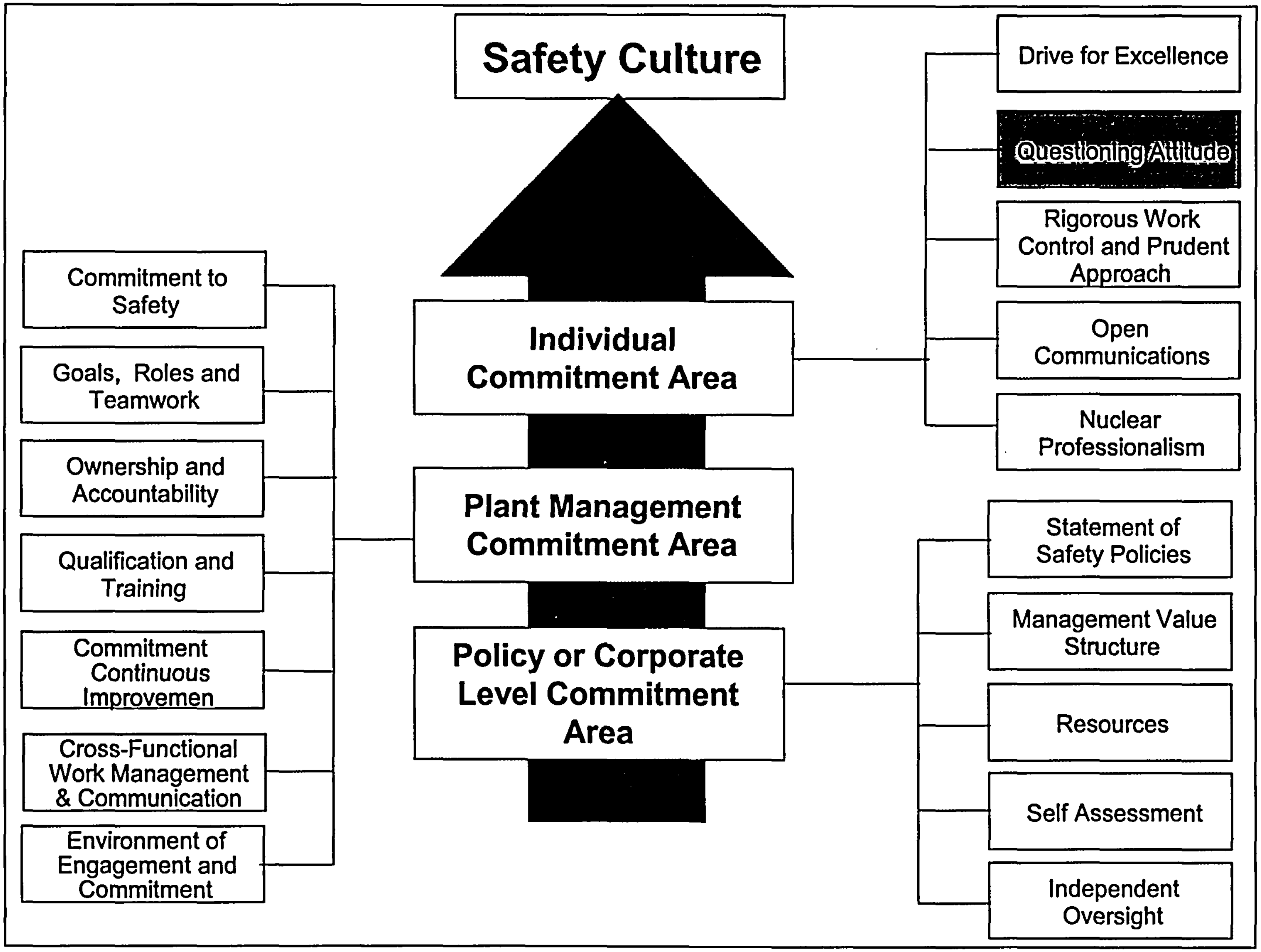


Figure 7 -- Results of Safety Culture Assessment for Mode 4

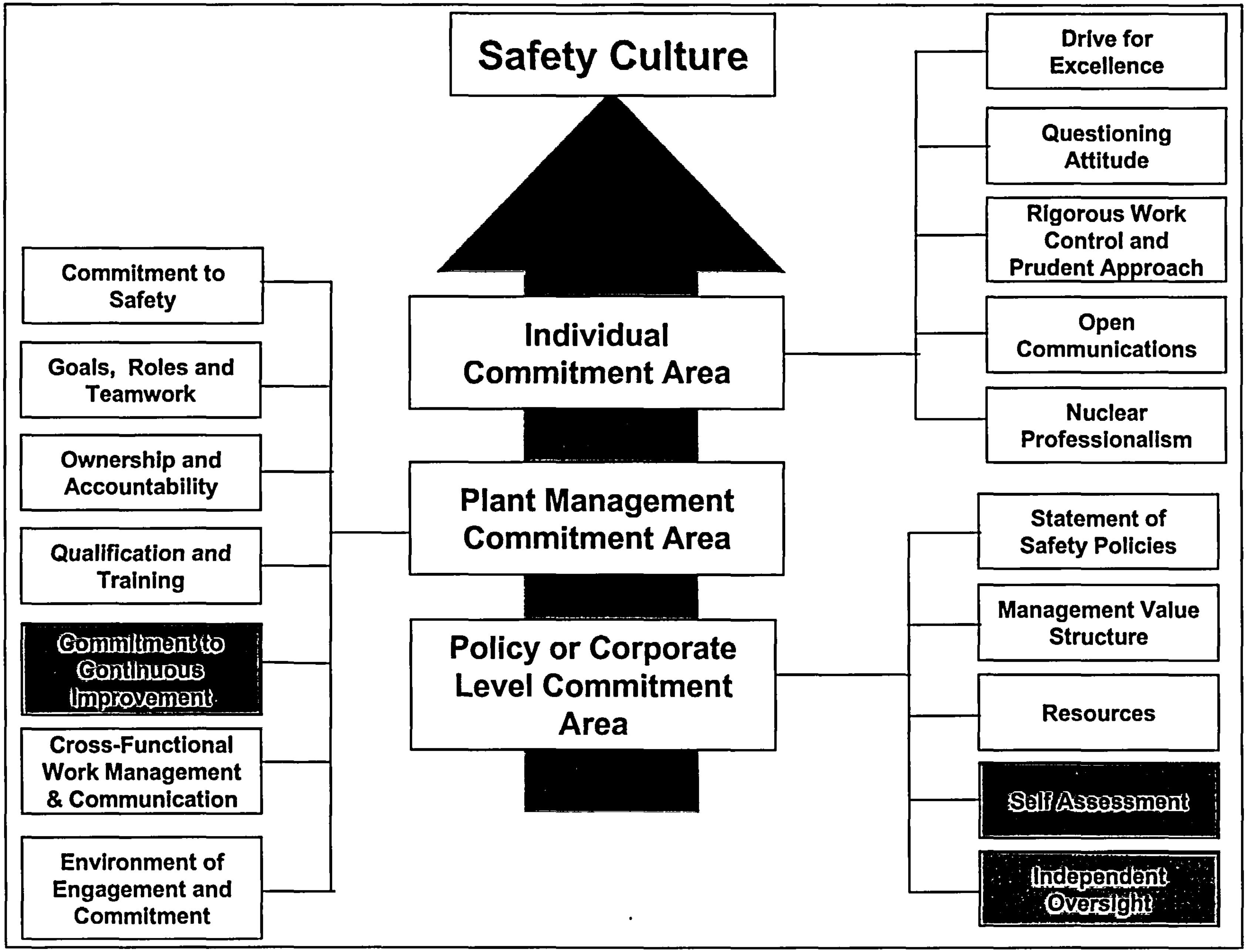
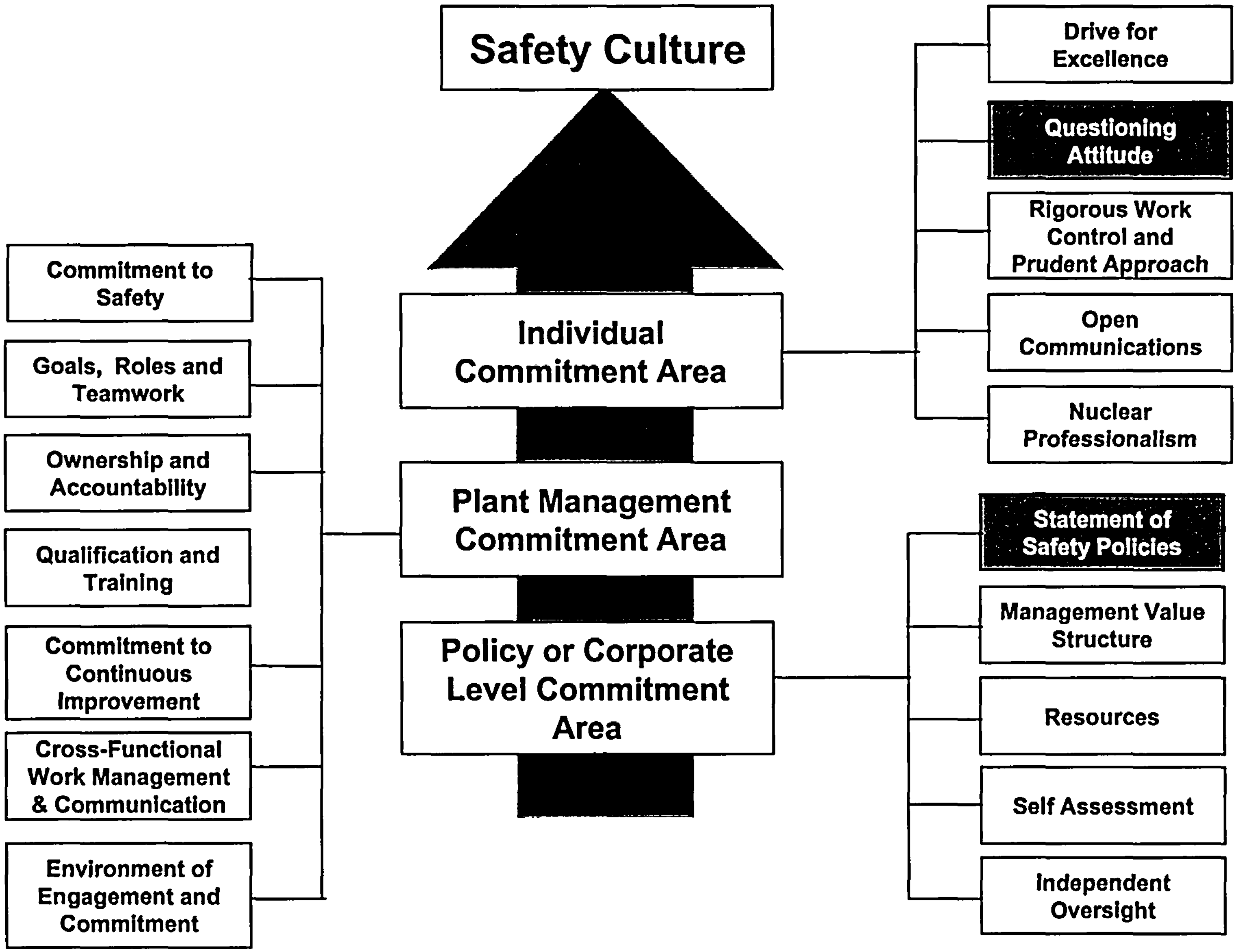


Figure 8 – Results of Safety Culture Assessment for the Mode 4b/2

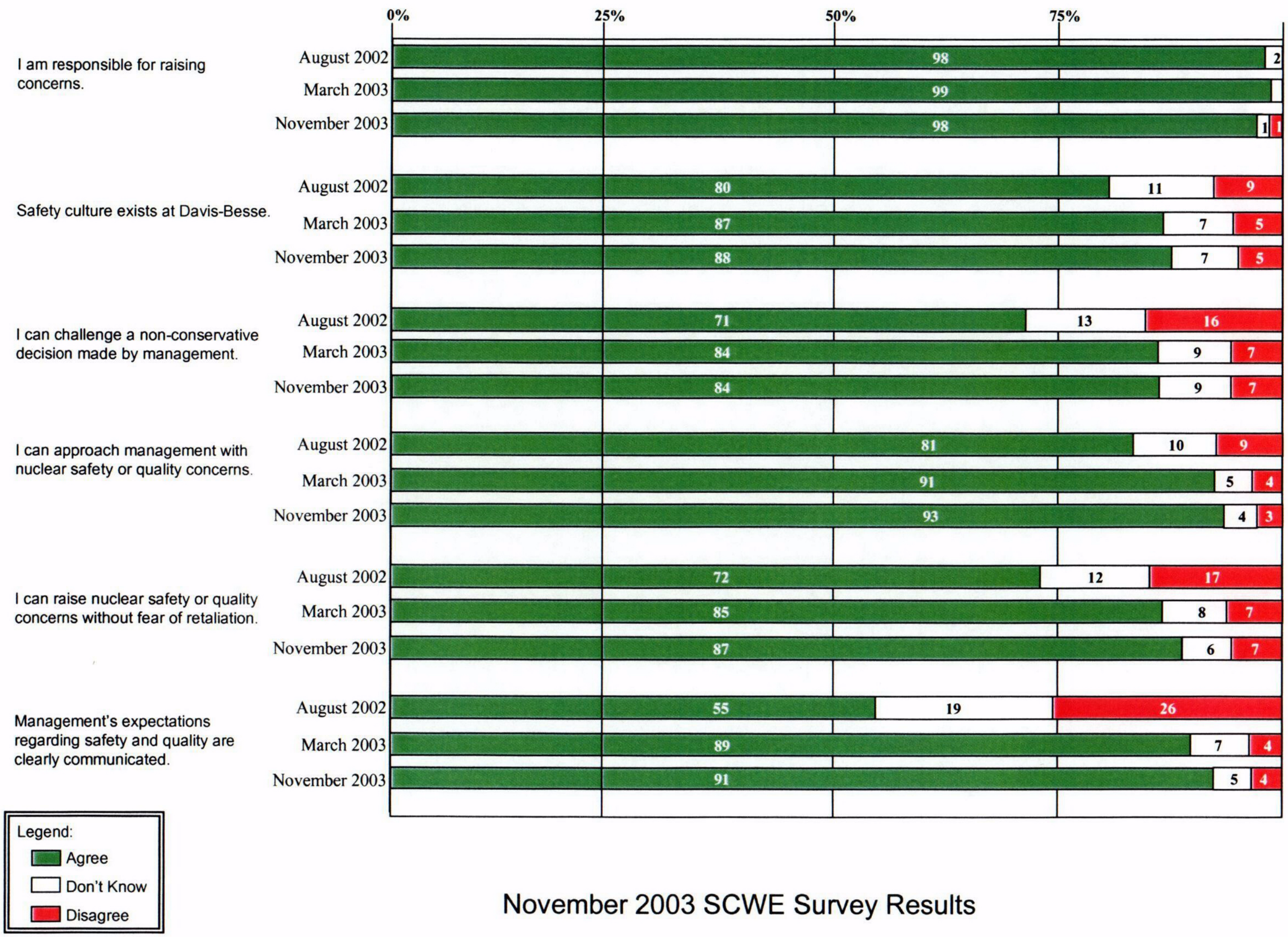


During the current outage, three SCWE surveys have been conducted: one in August 2002, one in March 2003, and one in November 2003. As shown in Table 1 on pages 91 - 96, the survey in November 2003 showed substantial improvement in almost every category relative to the results from August 2002. In particular, the results from the November 2003 SCWE Survey showed substantial improvement on 24 of 25 questions (with the results of the remaining question being about the same) relative to the August 2002 SCWE Survey. Furthermore, the results from the November 2003 SCWE Survey in general showed improvement relative to the results from the March 2003 SCWE Survey (with improvement on more than half of the questions, with the results of the other questions being the same ± 2 percentage points). Thus, the results of the three SCWE Surveys show continuous improvement over time. Furthermore, the absolute numbers from the November 2003 SCWE Survey are favorable, with positive responses outnumbering negative responses by a factor of at least 10 to 1 on all but five questions.

In addition to the results of the SCWE Survey of most site personnel in November 2003, NQA conducted interviews of a smaller population (approximately 10 percent of the site population of 841 employees) in November 2003 to determine their perceptions of safety culture and SCWE. The results of the NQA interviews are presented in Table 2 on pages 97 and 98. For a few questions, the results of the NQA interviews showed a decrease relative to early interviews in February (*e.g.*, there was a decrease in the percent of employees who reported that the proper effort is being placed on corrective action). The results of the November NQA interviews and SCWE Survey, however, still correlated well in this area (in both cases, about 75 percent of the personnel reported that timely and effective corrective action is being taken). Furthermore, in general, the results on questions from the NQA assessment in November 2003 were similar to the results on comparable questions from the SCWE Survey in November 2003. Overall, the results of the NQA interviews were positive.

Table 1 -- Improvements in Results of SCWE Surveys

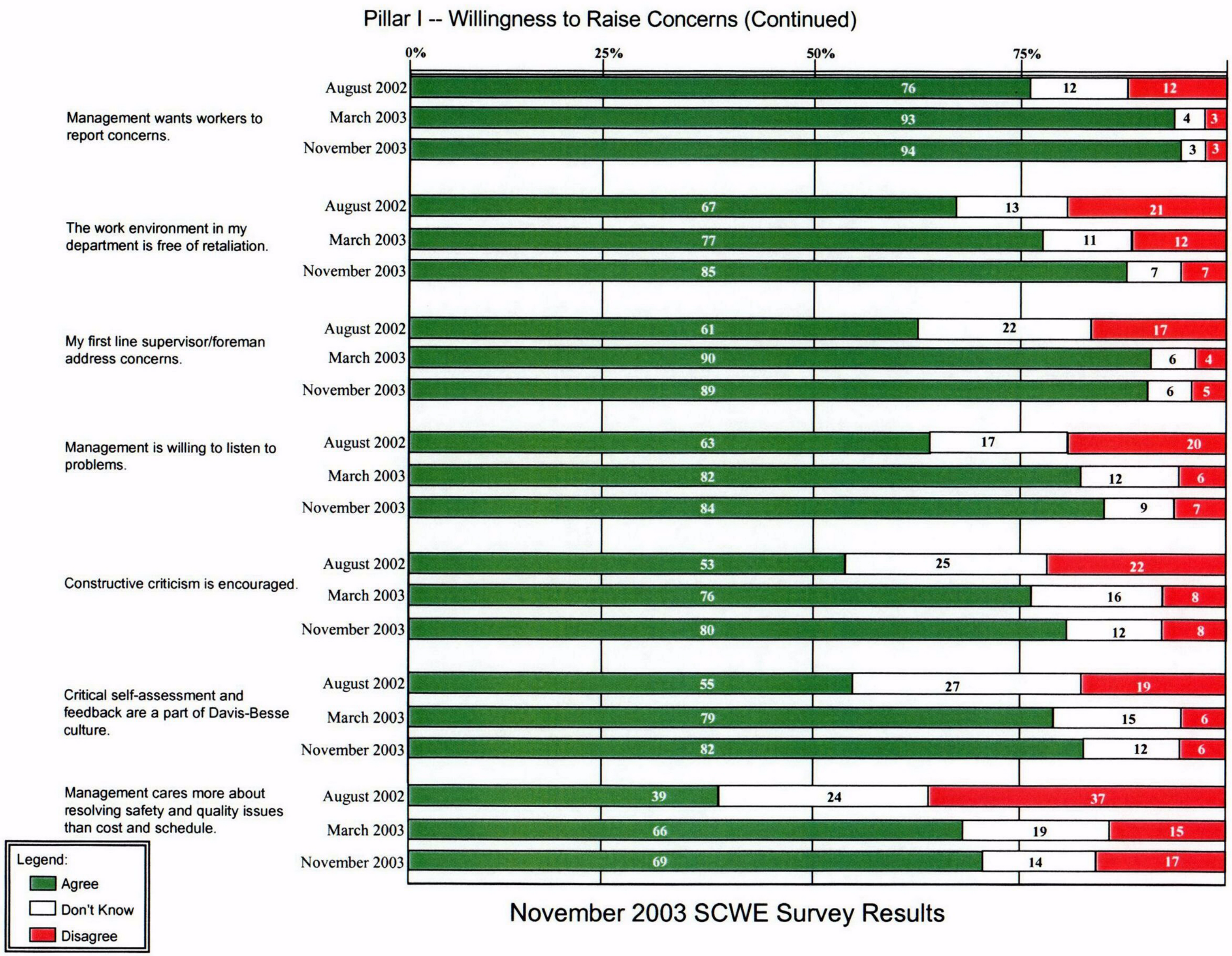
Pillar I -- Willingness to Raise Concerns



November 2003 SCWE Survey Results

C01

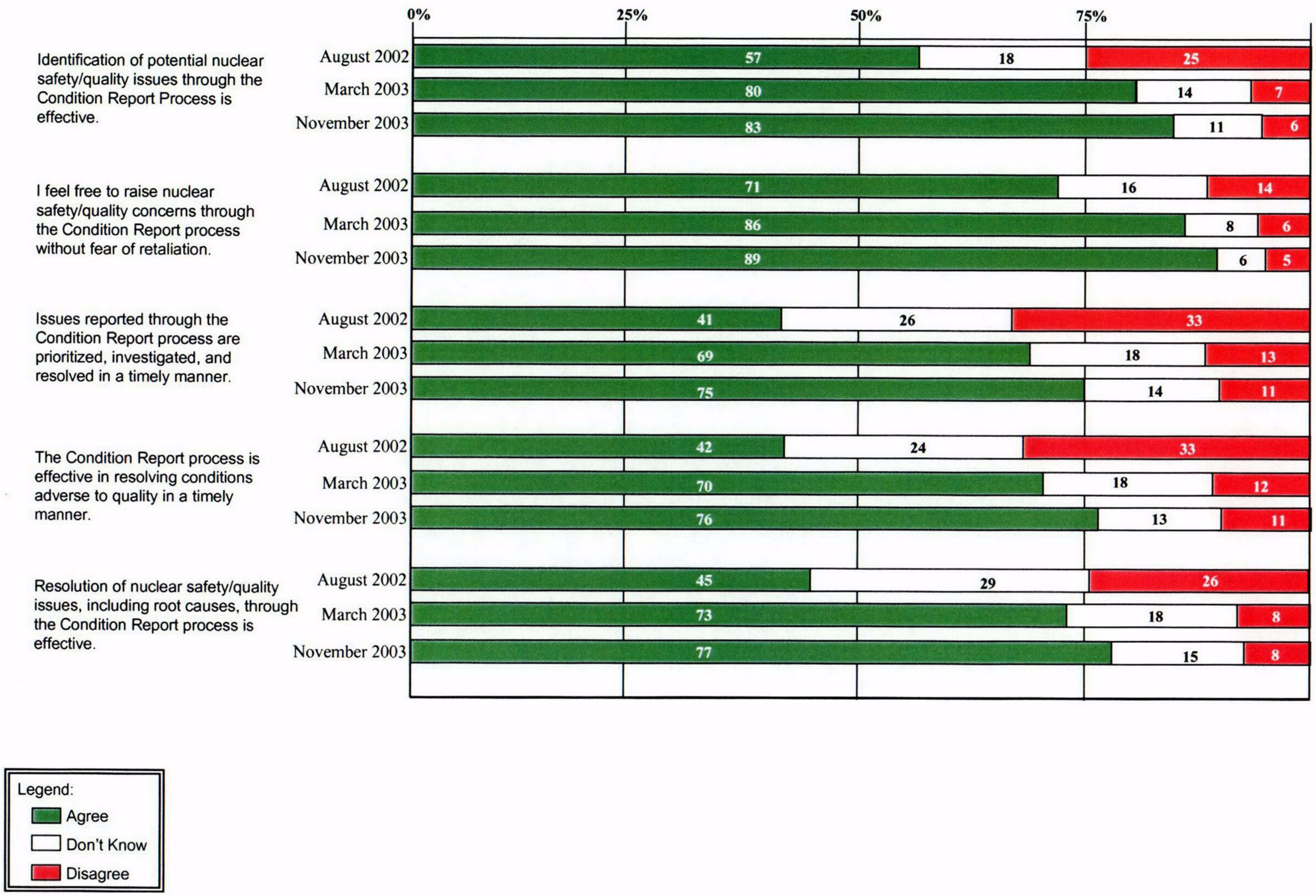
Table 1 -- Improvements in Results of SCWE Surveys (cont'd)



November 2003 SCWE Survey Results

Table 1 -- Improvements in Results of SCWE Surveys (cont'd)

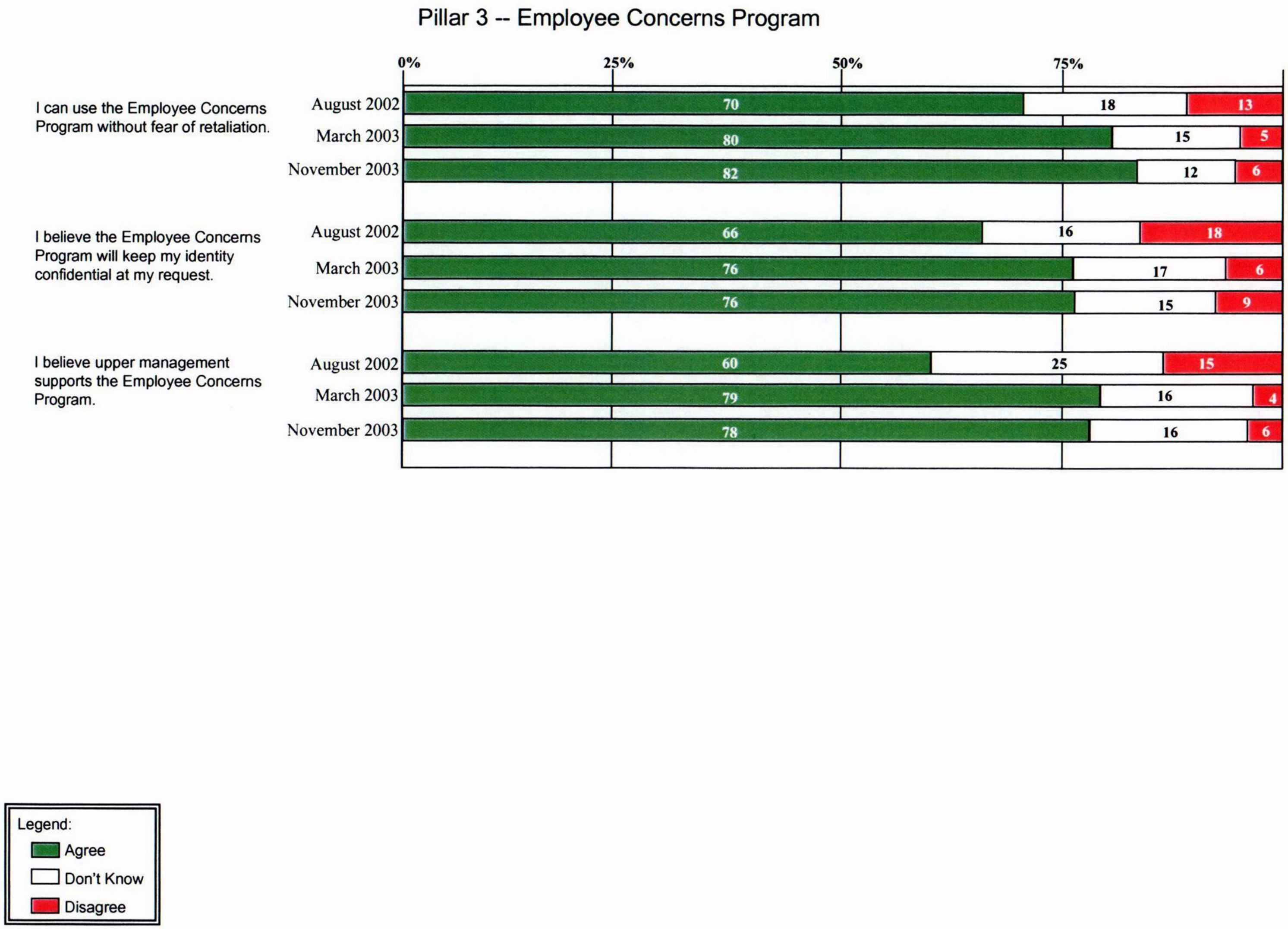
Pillar 2 -- Normal Problem Resolution Process



November 2003 SCWE Survey Results

C03

Table 1 -- Improvements in Results of SCWE Surveys (cont'd)



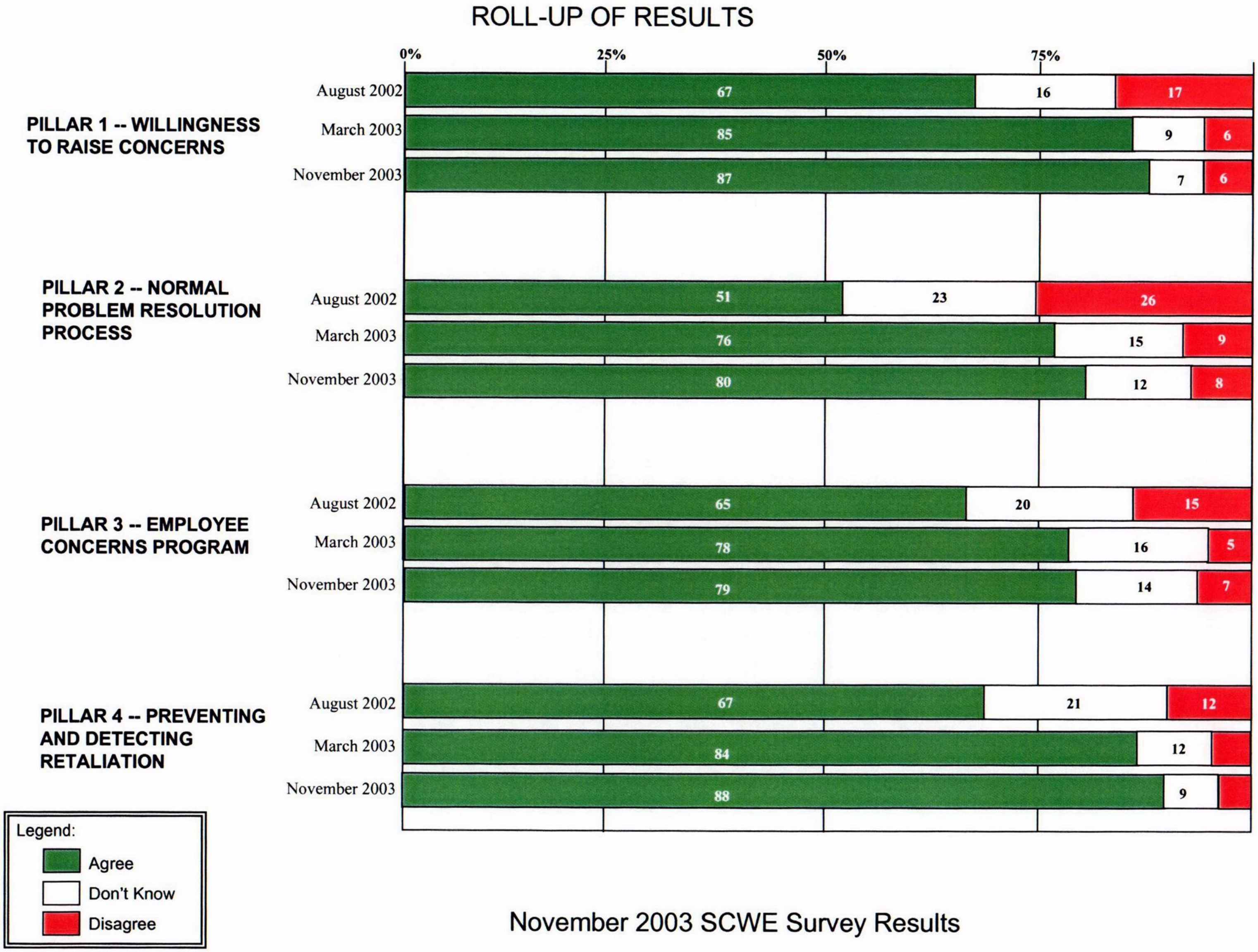
C04

Table 1 -- Improvements in Results of SCWE Surveys (cont'd)

November 2003 SCWE Survey Results

C05

Table 1 -- Improvements in Results of SCWE Surveys (cont'd)



November 2003 SCWE Survey Results

COG

Table 2
Results of NQA Interviews in November 2003

	Question	Yes	No
Q1	Is there a difference between safety conscious work environment and safety culture?	93%	7%
Q2	What is the definition of each?	92% did	8% did not
Q3	Do you believe management wants employees to report problems and adverse conditions?	93%	7%
Q4	Give an example of a nuclear safety concern.	95% did	5% did not
Q5	Have you raised any issues since February 2003, via the corrective action program?	78% did	22% did not
	Was the issue adequately addressed?	82%	18%
Q6	Are you aware of any specific instances since February 2003 in which another individual raised an issue and considered the response incomplete or unacceptable?	23%	77%
	Or was retaliated against for raising the issue?	9%	91%
Q7	Are you aware of any specific events since February 2003 which would discourage employees from raising concerns (*e.g.*, chastisement for submitting condition reports, supervisor holding up submittals)?	14%	86%
Q8	Do you believe you can raise any nuclear safety or quality concern without fear of retaliation?	95%	5%
Q9	Since February 2003 have you seen a change in management expectations concerning nuclear safety and quality?	70% & 19% said always good	9%
Q10	Do you believe Davis-Besse personnel, including all levels of management, demonstrate the "right stuff" in making nuclear safety-focused decisions?	73% & 8% said yes/no	15%

Question		Yes	No
Q11	Do we apply the right level of effort for timely and effective corrective actions according to the level of significance of the identified issue?	74%	13%
Q12	Looking at the FENOC Davis-Besse safety culture model used during the Edventures-teamwork sessions, do you believe that:		
	Individuals are ready for restart?	93%	2%
	Plant management is ready for restart?	91%	7%
	Policy/corporate level commitments support restart?	87%	8%
Q13	Do you believe we are ready for restart?	71% & 8% said close	21%

In summary, the results of the SCWE Survey and NQA interviews show convergence around overall positive SCWE and safety culture.

There is other evidence of the improved safety culture at Davis-Besse. For example:

- The need for leak tightness of the RCS has been emphasized. The NOP test of the RCS in September 2003 showed an unidentified RCS leak rate of approximately 0.008 gpm, which is the best in the history of Davis-Besse and far below the limit of 1.0 gpm in the Technical Specifications. Additionally, as discussed in Section IV.D, Davis-Besse has established a state-of-the-art RCS Integrated Leakage Program.

- The need for contamination control has been emphasized. As a result, most areas inside the containment are now sufficiently clean that personnel may enter the areas with minimal protective clothing.

- In 2002, the NRC was receiving about the same number of allegations regarding Davis-Besse as were being reported to Davis-Besse's Ombudsman. The number of concerns now being reported to the ECP far exceeds the number of allegations reported to the NRC. This demonstrates employee confidence in the ECP. Additionally, the number of allegations/concerns being reported to both the NRC and the ECP have been steadily dropping throughout 2003, indicating that employees have increased confidence in Davis-Besse management to resolve issues. This data is shown in Figure 9 on page 101 through November 20, 2003.

- In 2003, plant personnel performed a number of evolutions without any significant events, including the RCS pressure tests at 50 and 250 psig, and the containment integrated leak rate test. Additionally, in 2003, several events

occurred at Davis-Besse, including a loss of offsite power and an inadvertent opening of a core flood valve in August, and a reactor trip in September, in which plant personnel responded appropriately to mitigate the event. Furthermore, with respect to the latter event, the evolution was stopped and appropriate corrective actions are being taken as discussed in Section V.C.

Additionally, various performance indicators show a good safety culture. For example, as of November 9, 2003:

- The Condition Report self-identification rate is 89 percent, which exceeds Davis-Besse's restart goal of 85 percent. Furthermore, Davis-Besse has been consistently meeting this goal.

- The individual error rate is 0.29 per 10,000 hours worked, which is better than Davis-Besse's restart goal of 0.45. Furthermore, Davis-Besse has been consistently meeting this goal.

- The rate of review of CRs by SROs within one day of initiation is 98 percent, which exceeds Davis-Besse's restart goal of 95 percent. Furthermore, Davis-Besse has been meeting this goal since August 2003.

- As discussed elsewhere in this report, Davis-Besse is also meeting its restart goals for management observations, engineering quality, program and process error rate, condition report category accuracy, and root cause evaluation quality.

As part of the Root Learning sessions conducted in the fall of 2003, a survey of site personnel was conducted to determine their perceptions of safety culture. The survey posed a series of questions based upon various characteristics associated with Davis-Besse's Safety Culture Model, and asked personnel to state their level of agreement (ranging from strongly disagree to strongly agree) on whether Davis-Besse possessed the safety culture characteristics in question. More than 700 individuals responded to the survey. The results of the survey were positive:

- On average, personnel agreed that Davis-Besse possesses the safety culture characteristics in each of the three Commitment Areas (Policy Level, Management Level, and Individual Level Commitment Areas).

- On average, personnel rated several safety culture characteristics at Davis-Besse between agree to strongly agree, such as awareness of policies on safety culture, visible commitment to safety, and understanding of responsibility to raise safety or quality concerns.

- Even for the lowest rated characteristics (*i.e.*, management values training development; cross-functional work management is evident; cross-functional communications is evident), personnel on average somewhat agreed that those characteristics exist at Davis-Besse.

- For 26 of the 30 characteristics, 84 percent or more of the personnel expressed some level of agreement that the characteristics exist at Davis-Besse. Even with respect to the remaining four characteristics (*i.e.*, management values training development; management values the qualifications personnel hold; cross-functional work management is evident; cross-functional communications is evident), more than two-thirds of the personnel expressed some level of agreement that the characteristics exist at Davis-Besse.

- Personnel rated several characteristics extremely highly. For example, approximately 95 percent or more of the personnel expressed some level of agreement with respect to personal awareness of policies on safety culture, understanding of the policies by employees in general, visible commitment to safety, Davis-Besse's goals are clear and understood, employees at Davis-Besse exhibit a drive for excellence, and persistence and urgency in identifying and resolving problems. Significantly, 99 percent of the personnel expressed some level of agreement that they have a responsibility to raise safety or quality concerns.

Furthermore, as of the end of October 2003, the year-to-date and 12-month rolling average days between events is 34 days, which is better than the target for 2003 (30 days).

Additionally, as discussed in Section V.A.1, Davis-Besse has demonstrated good safety culture through its actions, such as implementing modifications to add safety margin, installing state-of-the-art programs and systems, taking a conservative approach to safety, and imposing stand-downs and stopping work.

In summary, safety has the highest priority at Davis-Besse and takes precedence over other objectives, such as cost and production. Both formal and informal surveys demonstrate that site personnel feel free to raise safety concerns without fear of retaliation, and that concerns are investigated and resolved in a timely manner. Therefore, Davis-Besse concludes that it is ready for restart in this area.

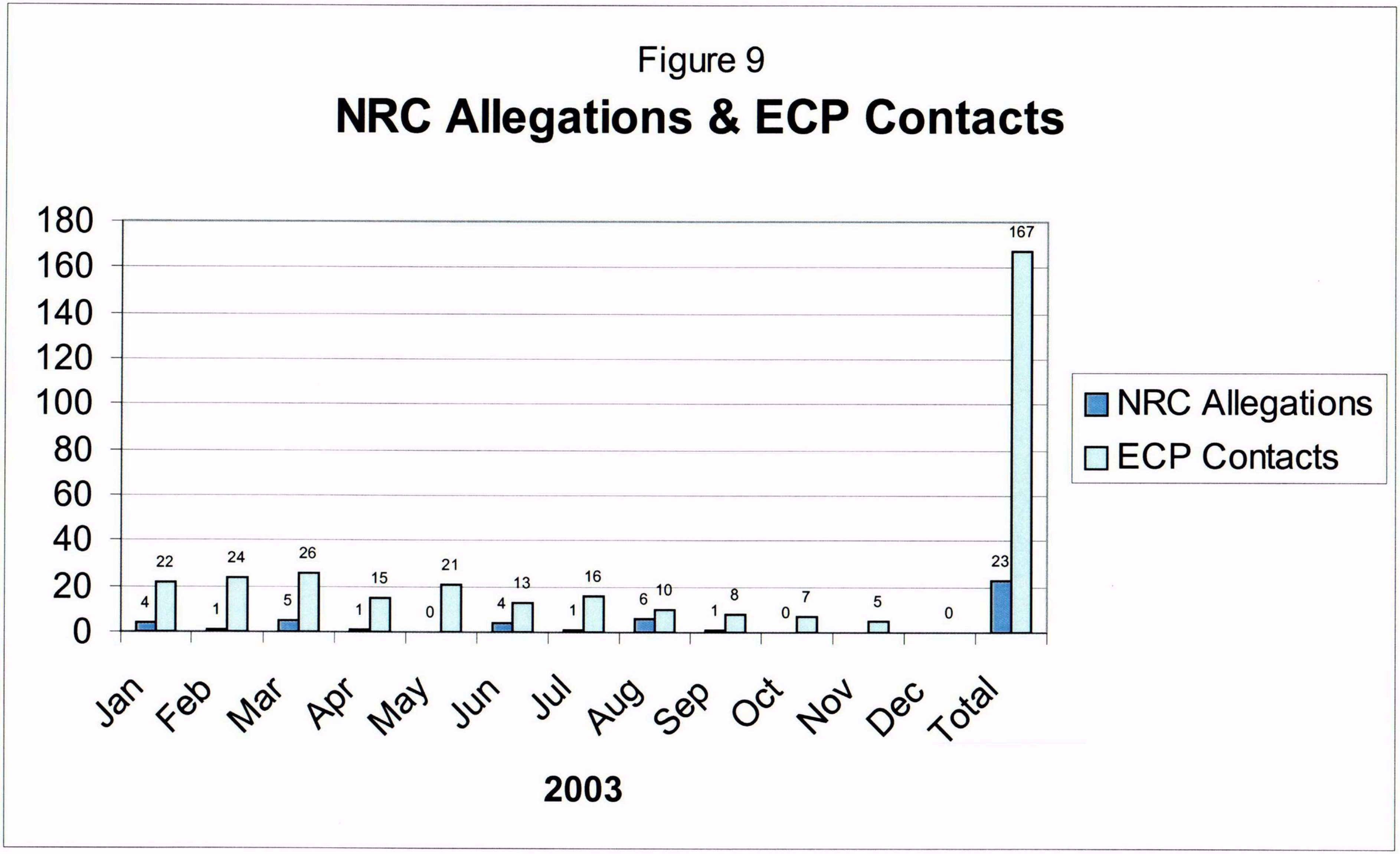


Figure 9
NRC Allegations & ECP Contacts
180
160
140
120
100
80
60
40
20
0
4
22
1
24
5
26
1
15
0
21
4
13
1
16
6
10
1
8
0
7
5
0
23
167
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Total
2003
NRC Allegations
ECP Contacts

C07

3. Improvements in Standards and Decision-Making

Davis-Besse has the following objective for decision-making and technical assessments: *Decision-making and technical standards have a nuclear safety focus, have technical rigor, account for operating experience, and seek to correct problems rather than justifying acceptance of the problems.*

Actions to achieve this objective have included the following:

- Established standards and expectations for Davis-Besse.

- Implemented procedure NOP-ER-3001, "Problem Solving and Decision Making Process," which identifies responsibilities of plant personnel for decision-making, ensures the right safety focus, and prompts a questioning attitude.

- Implemented procedure NOP-CC-3002, "Calculations," to upgrade control and quality of calculations. This procedure includes requirements for design interface evaluations and reviews under 10 CFR § 50.59. Additionally, the new procedure includes a detailed design verification checklist.

- Provided initial training to reinforce technical standards and problem solving skills of the technical staff.

- Provided training to the Engineering department on lessons-learned from recent implementation of a revision to the modification process.

- As discussed in Section IV.D.2, made improvements to the Operating Experience Program to ensure appropriate actions identified from other plants or sources of information are properly tracked and implemented.

- FENOC stations (including Davis-Besse) are sharing resources and expertise among themselves and Davis-Besse has augmented its Engineering staff with outside personnel to provide new insights and experiences.

- The Operations section developed a plan to achieve the following goals: (1) Operations is recognized as the lead organization at Davis-Besse; (2) Continuous improvement is expected, demonstrated and embraced in the Operations Section; (3) Operations maintains ownership of equipment deficiencies, nuclear fuel performance, and plant; (4) Chemistry is strong; (5) Operations management communicates, demonstrates, and reinforces desired performance standards to operate the facility at desired levels; and (6) Shift management consistently demonstrates leadership to staff, craft, and oversight personnel.

- Developed a checklist for pre-job briefings. The checklist includes checks for participation by interfacing organizations, use of the latest procedures, calibration of equipment, and discussion of permits and controls, potentially hazardous

conditions and precautions, work logistics and sequence, foreign material exclusion, critical work activities, operating experience, and avoidance of mistakes and self-checking.

- Implemented procedure NG-DB-00201, "Conduct of Infrequently Performed Tests and Evolutions." This procedure provides additional management oversight and control of infrequently performed tests or evolutions. The intent of this procedure is to maintain a high level of plant oversight.

Results

A number of performance indicators are used to measure improvements in the area of standards and decision-making, including:

- EAB Indicator – This indicator measures the quality of Engineering products, as determined by the EAB. The score is based on an assessment of quality in the following areas: Procedural Performance/Implementation, Rigor in Problem Solving, Team Approach, Analysis/Evaluation/Design, Design Basis Maintenance, and Licensing Basis Maintenance. The restart goal for this indicator is to achieve a 12-week rolling average of 1.0 or less. As of November 9, 2003, the value for this indicator is 0.7, and has met the 12-week rolling average goal for several months.

- Management Observation Indicators – The results of management observations are tracked in the Observation Card Database, and consist of observations of Field Activities, Operations, and Training. This indicator measures the percentage of management scheduled observations that are actually completed. The restart goal for this indicator is to achieve a 12-week rolling average of 90 percent or more management observations completed as scheduled. As of November 9, 2003, the value for this indicator is over 90 percent, and the 12-week rolling average has consistently exceeded the goal of 90 percent since April 2003.

- Open Control Room Deficiencies – This indicator measures the total number of open Control Room deficiencies, such as an inoperable process indicator, alarm function, or component status light and those deficiencies that prevent the operation of an automatic control system or hand operated control switch. The restart goal for this indicator is zero open Control Room deficiencies. As of November 9, 2003, the value for this indicator is four.

- Open Operator Workarounds – This indicator measures the total number of Level 1 and 2 Operator Work Arounds, which are defined as any equipment deficiency or plant condition which, during abnormal or emergency conditions, will increase operator burden or impede effective operator response. The restart goal for this indicator is zero Operator Work Arounds. As of November 9, 2003, the value for this indicator is eight (one is not planned for closure prior to restart).

- Open Temporary Modifications – This indicator measures the total number of open temporary modifications. The restart goal for this indicator is zero Open Temporary Modifications. As of November 9, 2003, the value for this indicator is five.

NRC inspections in the summer of 2003 and COO-sponsored assessments performed by an architect-engineering contractor in the fall of 2003 identified some issues with calculations (*e.g.*, calculations that did not identify the bases for assumptions; calculations that contained errors or used inadequate analytical methodologies). The contractor assessment identified that the new calculation procedure, NOP-CC-3002, in general, is a good procedure and a significant improvement from the previous calculation procedure. Enhancements to the new procedure, however, were recommended. In response to the identified issues, the actions taken to provide additional assurance that calculations being issued have appropriate quality include:

- Holding meetings with design engineers to ensure that they are aware of the calculational issues and the expectations for high quality calculations;

- Requiring EAB to review calculations using a checklist to assure the adequacy calculations;

- Requiring engineers to validate previously issued calculations prior to using them for new calculations; and

- Implementation of Calculation Utility Project electronic calculation program.

After restart, Engineering will provide engineers with examples of good calculations to use as models. Additionally, as part of the Operational Improvement Plan provided in Appendix D, a post-restart Calculational Improvement Plan will be implemented, which will ensure that the most important calculations (*e.g.*, calculations supporting the Technical Specification values) meet expectations.

The results of the assessments of the NOP Test in September 2003 showed that Davis-Besse was properly initiating the problem-solving and decision-making procedure, but that the quality of implementation was uneven. Section V.C discusses the actions that have been taken to improve the consistency of implementation of this procedure.

In summary, Davis-Besse recognizes that there is room for improvement with respect to the quality of its calculations and implementation of its problem-solving and decision-making procedure, and actions have been taken to achieve improvement in these areas. Overall, decision-making and technical standards at Davis-Besse have a nuclear safety focus, have technical rigor, account for operating experience, and seek to correct problems rather than justifying acceptance of the problems. Therefore, Davis-Besse concludes that it is ready to restart in this area, subject to completion of a few remaining restart actions as discussed in Section V.C.

4. Improvements in Oversight and Assessments

Davis-Besse has the following objective for oversight and assessments: *Davis-Besse has provisions for oversight and assessments, which are effective in identifying and obtaining correction of problems before they adversely affect safety.*

Davis-Besse's actions to achieve this objective have included the following:

- ROP was established, utilizing industry experts and community leaders, to provide an independent oversight and review of plant activities performed for restart of Davis-Besse.
- The EAB was established to review and reinforce higher and consistent standards for engineering and other selected technical documents. The EAB's critical reviews of products, along with feedback to the supervisor, reviewers and preparers, raise the standards of Davis-Besse personnel.
- A Restart Senior Management Team (RSMT) was established to review restart reports for items on the Davis-Besse IMC 0350 Restart Checklist.
- The NQA organization has performed a root cause analysis, sponsored an independent program review to uncover process and performance shortfalls, and implemented several improvements, including:
    - A process is in place to systematically improve the source documents and attributes for the auditing process in conjunction with the Continuous Assessment Process. The review process captures recommended improvements throughout the course of a year, which then supports a formal annual update of the program.
    - The organization has been changed so that the Quality Control Inspectors now come under the authority of the QA Manager. This improves the ability of the Oversight organization to assess field activities.
    - The importance of field (performance-based) observations has been emphasized to the assessors, and the observation database has been revised to allow the inspection setting to be readily recorded. The database provides a means to measure the assessors selection of inspection settings.
    - NQA adjusts its quarterly inspection plans based on plant activities projected for the upcoming quarter.

- The effectiveness of the CNRB has been reviewed and changes made to improve its safety focus. In particular, the CNRB now places less emphasis on status of plant activities and license amendment requests and engages in more review of key technical and safety issues, including reviews of the adequacy of activities during outages as well as operation. The following improvements were made to the CNRB:

  - NOP-LP-2006, "Company Nuclear Review Board (CNRB)," was issued in April 2003 and established and defined the organization, responsibilities, and administrative requirements to control the CNRB.

  - NOP-LP-2006 was reviewed by the Davis-Besse Program Review Board, which concluded that the procedure satisfies the concerns identified by the independent CNRB assessment.

  - NOP-LP-2006 establishes the Vice President of FENOC Oversight as having overall responsibility for the CNRB. This organizational arrangement eliminates the line conflict identified by the independent CNRB assessment.

  - NOP-LP-2006 requires that non-FENOC members of the CNRB be free of other assignments for the Company.

  - New members have been appointed to CNRB who have the necessary experience and qualifications to properly review issues involving safe operation of a nuclear power plant.

  - The CNRB chairman has communicated the importance of the CNRB, including the expectations of CNRB members that employees focus on safety or matters that affect safety.

- The PRC charter and membership has been changed to ensure proper level of management decision-making and to ensure items required for safe and reliable operations are not deferred.

- A formal restart readiness review process has been developed and implemented for plant restart activities. This process has provided structure and rigor for assessing the readiness of the plant to be restarted.

Results

Several actions have been taken to verify that the efforts to improve oversight and assessments at Davis-Besse are effective. For example, the following performance indicator has been used to measure improvements in oversight and assessments: the percent of management observations that are performed as scheduled. Trending of this data shows that, since spring 2003, management has consistently met or exceeded its goal of 90 percent.

Additionally, as discussed in Section V.B, the results of the NQA assessments of the NOP Test in September 2003 were similar to the results of the external assessors, thereby demonstrating the effectiveness of NQA.

NQA Assessment of the EAB

Throughout the performance of the Return to Service Plan, NQA has observed EAB activities. The EAB reviews have been consistently intrusive and have improved the quality of engineering products that they have reviewed.

NQA Assessment of the SLT and PRC

NQA observations of the PRC were often made in conjunction with SLT meetings. Generally, the NQA manager attended the SLT meetings and observed that management priorities and decisions on the scope of plant modifications were made with the appropriate emphasis on nuclear safety.

Additionally, during the NOP test in September 2003, an independent team of industry executives and managers assessed the oversight activities of NQA, as well as the oversight activities of line management. Additionally, NQA assessed management observations and oversight during the NOP test. In summary, Davis-Besse identified that its management observations could be more self-critical, and as discussed in Section V.C it has taken action to improve these observations. Additionally, NQA has recognized that its assessments are more effective when it uses outside personnel to assist in the assessments and NQA plans to continue to use non-Davis-Besse personnel in its assessments, as appropriate.

Conclusions

Overall, Davis-Besse has adequate provisions for oversight and assessments, and oversight and assessment have been effective in identifying and obtaining correction of problems before they adversely affect safety. Davis-Besse has identified opportunities for improvement, and has taken action to achieve improved performance. Therefore, Davis-Besse concludes that it is ready for restart in this area.

5. Improvements in Corrective Actions, Programs and Procedure Compliance

a. Corrective Action

Davis-Besse has the following objective for corrective actions: *Adverse conditions (including adverse trends) are promptly identified and documented. The root causes of significant conditions adverse to quality are identified, actions are taken to preclude recurrence of the conditions, and the preventive actions are effective.*

As discussed in detail in Section IV.D, the CAP has been significantly revised, including improvements in operability evaluations, categorization of conditions, cause evaluations, effectiveness of corrective actions, and the CARB.

Results

The following performance indicators are used to measure CAP improvements:

- Categorization – Davis-Besse monitors the percentage of CR categorizations recommended by the originator's supervision that do not require escalated categorization based upon the review by the Management Review Board (MRB). The goal is 90 percent. As of November 9, 2003, Davis-Besse meets this goal.

- Root Cause Quality – Davis-Besse monitors the cumulative percentage of root cause determinations presented to the CARB that were approved by that board. The restart goal is an improving trend and the long-term goal is 90 percent. As of November 9, 2003, Davis-Besse meets its long-term goal, and the quality of the root cause analyses has an improving trend since September 2003.

- CAP Effectiveness – Davis-Besse has a performance indicator for CAP effectiveness, which is a composite of four elements (CR self-identification rate, extended or delinquent CR investigations and corrective actions, repeat significant events, and CARB approval of root cause analyses). As of the end of October 2003, two of the elements were rated as Green (root cause analyses and repeat events), and one of the elements (self-identification rate) was rated as White even though it meets the restart goal. The element on percent extensions/delinquent was Red, which in turn caused the overall indicator to be rated as Yellow. This rating reflected the focus on completing restart actions needed for entering Mode 4 and deferral of non-restart actions, rather than a deficiency in the quality of performance.

Assessments have also been performed to measure performance in the area of corrective actions. For example, in the summer of 2003, NRC inspections and NQA assessments identified areas for improvement in corrective actions. Although they found that the root cause analyses were rigorous for Significant Conditions Adverse to Quality (SCAQ), they identified weaknesses with respect to apparent cause analyses for conditions of lesser significance. Additionally, they

identified a need to resume trending of adverse conditions and to improve calculations that were prepared to support certain corrective actions.

In response, the following actions have been or will be taken prior to restart to address these issues:

- The procedural requirements for apparent cause analyses have been strengthened to specify the analytical methods to be used, to require evaluation of generic implications and prior relevant experience, and to provide a checklist for attributes for apparent cause analyses.

- The number of Apparent Cause evaluators will be reduced and additional training will be provided to the evaluators (currently scheduled to be completed in January 2004). Apparent Cause evaluators will receive initial and continued training, and will be required to meet proficiency requirements.

- The CARB is now performing assessments of the apparent cause analyses being issued, and these assessments will continue until the apparent cause analyses presented to CARB meet the goal for quality of apparent cause analyses.

- Condition Report Analysts within each section will receive strengthened roles and responsibilities with respect to apparent cause analyses. They will receive the same training as Apparent Cause evaluators, and will attend CARB meetings to enhance their standards for review and acceptance of apparent cause analysis. In the long-term as described below, the Analysts will assume CARB's responsibility for review and approval of apparent cause analyses.

- Trending of CRs has been resumed.

In addition, after restart, an Apparent Cause Review Group (a subcommittee of the CARB) will be established and will assess the adequacy of apparent cause analyses. These assessments will begin when the apparent cause analyses presented to CARB meet the goal for quality of apparent cause analyses. After that time, CARB will perform reviews of selected apparent cause analyses to provide additional assurance of their continued acceptability.

In general, the actions already taken at Davis-Besse have been effective in improving the quality of apparent cause analyses. A performance indicator has been implemented that measures the percentage of apparent cause evaluations accepted (approved or approved with comments) by the CARB. As shown in Figure 10 on page 112, the percentage of apparent cause evaluations accepted by the CARB has risen from 62 percent in May 2003 to 85 percent as of November 9, 2003, which is near Davis-Besse's goal of 90 percent. The additional actions should result in even further improvement in the initial apparent cause evaluations, and the additional barriers being put into place provide reasonable assurance of the acceptability of the final apparent cause evaluations.

The NRC's Corrective Action Team inspection identified weaknesses in calculations. The calculation improvement project has been included in the Operational Improvement Plan. The

SFVP described in Section IV.E.2, together with the associated corrective actions, provide reasonable assurance that the calculations and testing for safety-significant systems support the associated safety functions.

In summary, weaknesses were identified with respect to apparent cause analyses, and actions have been taken to strengthen these analyses and impose additional barriers to ensure the effectiveness of those analyses. Overall, adverse conditions (including adverse trends) are being identified and documented. Additionally, the root causes of significant conditions adverse to quality are being identified, actions are taken to preclude recurrence of the conditions, and the preventive actions are effective. Therefore, Davis-Besse concludes that it is ready for restart in this area.

b. Procedure Compliance

Davis-Besse has the following objective for procedure compliance: *Personnel comply with procedures as written or obtain appropriate revisions to procedures*

Actions to achieve this objective have included the following:

- The standards and expectations for procedure compliance and the need for work practice rigor have been reinforced.
- Licensed operators have been trained on their responsibilities for ensuring the safety of the plant and compliance with regulatory requirements and procedures.
- A Management Observation Program has been established to provide direct management observation of procedure compliance by employees.

Results

The following performance indicator is used to measure its improvements with respect to procedure compliance:

- Davis-Besse monitors the number of CRs (both CAQs and SCAQs) generated due to failure to follow procedures. The results of this indicator show that for the month ending November 9, 2003, approximately 13 percent of the CRs generated were for failures to follow procedures.

Assessments to measure performance in the area of procedure compliance include:

- On a semiannual basis, an evaluation is performed using human performance evaluation system (HPES) techniques to determine the causes of procedure noncompliance and develop actions to improve performance. The HPES evaluations show that there were several procedure compliance issues. Site personnel will be trained on proper procedure compliance prior to restart.
- Quality Assessment checks for procedure compliance as part of its oversight of plant activities. The evaluations from third quarter indicate that there were

approximately 175 CRs assigned with cause codes related to procedural compliance. During this quarter there were approximately 2,775 investigations of procedure non-compliance completed that represent approximately 6.5 percent of the total investigation. This data indicates that procedure compliance concerns categorized in the cause codes continues to trend upward. It is unclear if this trend represents actual declining performance or an increasing sensitivity to recognition and identification of procedure noncompliance. NQA will continue to actively assess this area in the fourth quarter.

During the NOP test, several events occurred when Operators proceeded to implement procedures that were ambiguous or lacked details. Maintenance personnel engaged in similar conduct in the summer of 2003. A collective significance review of these events was performed and identified procedure quality and usage as two areas needing improvement. The Operations Improvement Action Plan (discussed below in Section V.C) addresses these deficiencies, among others. Validation and training on the improved Operations procedures is scheduled for completion by December 5, 2003.

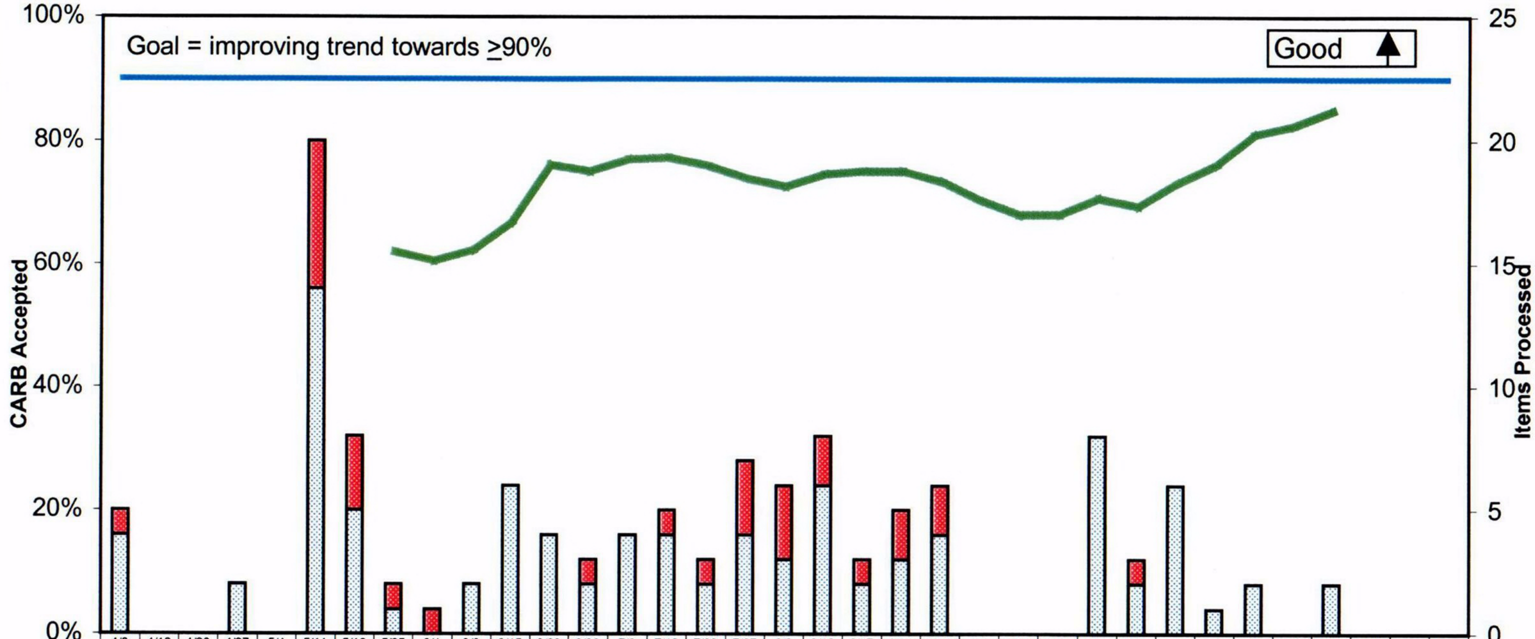
In summary, performance indicator data, assessments and management observations show that, overall, personnel are complying with procedures and are generating procedure change notices to improve those procedures. NQA is actively assessing procedure compliance with regard to trends. Actions have been and are being taken to ensure that personnel comply with procedures. Therefore, Davis-Besse concludes that it is ready for restart and safe operation in this area.

Figure 10 -- Apparent Cause Evaluation Quality

DAVIS-BESSE NUCLEAR POWER STATION

CORRECTIVE ACTION PROGRAM

APPARENT CAUSE EVALUATION QUALITY



	4/6	4/13	4/20	4/27	5/4	5/11	5/18	5/25	6/1	6/8	6/15	6/22	6/29	7/6	7/13
Reject	1	0	0	0	0	6	3	1	1	0	0	0	1	0	1
Accept	4	0	0	2	0	14	5	1	0	2	6	4	2	4	4
12 Week Avg								62%	60%	62%	67%	76%	75%	77%	77%
Goal	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%

	7/20	7/27	8/3	8/10	8/17	8/24	8/31	9/7	9/14	9/21	9/28	10/5	10/12	10/19	10/26	11/2	11/9	11/16	11/23	11/30
Reject	1	3	3	2	1	2	2	0	0	0	0	1	0	0	0	0	0			
Accept	2	4	3	6	2	3	4	0	0	0	8	2	6	1	2	0	2			
12 Week Avg	76%	74%	73%	75%	75%	75%	73%	70%	68%	68%	71%	69%	73%	76%	81%	82%	85%			
Goal	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%

Accept · Reject · 12 Week Avg

C08

c. Programs

A number of actions have been taken to ensure that Davis-Besse programs comply with NRC regulations, incorporate applicable operating experience, and are effectively implemented. These actions are summarized in Section IV.D above.

B. Results of Assessments of Performance During Normal Operating Pressure Tests

Three assessments of management and human performance were performed during the NOP tests in September 2003. NQA and an internal management assessment team performed assessments through observations of plant activities during the NOP test and interviews of personnel. In addition, an external team assessed performance during the NOP test, Davis-Besse performed a collective significance review of the information generated during the NOP test; the results are also incorporated below.

The findings of the internal and external assessment teams, NQA, and the collective significance review team included the following:

- Procedures – When implemented properly, the processes and procedures used at Davis-Besse support safe and reliable plant operations. The overall quality of procedures, however, appears to be weak in Operations (*e.g.*, too much flexibility in integrated operating procedures).

- Problem Solving and Decision-Making – Station management demonstrated safe and effective operational decision making principles when challenged by emergent issues. Situations requiring the use of the problem solving and decision-making procedure were promptly recognized. Good teamwork was displayed by personnel during problem solving and decision making activities. Inconsistencies were observed, however, in the implementation of the problem solving and decision-making procedure. Sometimes the teams diverted their attention toward troubleshooting, rather than following through on process requirements in the procedure.

- Management Observations and Coaching – New management team members were observed to display healthy self-critical behaviors. In general, however, station management needs to become more self-critical to support sustained performance improvement. When management observed performance shortfalls, coaching was not always applied. Additionally, internal management oversight was too heavily dedicated to observations of the Control Room. This diminished their opportunities to observe potential problems in activities that precede successful operation in the Control Room.

- Hardware – Management has aggressively improved plant and equipment material condition. Members of the External Assessment Team were impressed by the physical condition of the station. Additionally, NQA found that the plant displayed relatively leak-tight systems on both the primary and secondary

systems, even on systems that have not been in service for some time, and that the plant walkdowns were generally effective in identifying issues requiring attention under the BACC program.

- Radiation Protection – Radiation Protection support of the NOP test was excellent. RP personnel involved with this activity were looking ahead, working through issues, and focused on providing the best "customer service" possible.

- Operator Performance – A few operational events occurred, including a reactor trip and automatic opening of the core flood tank valve. Performance shortfalls were identified in several operational areas, including monitoring and anticipating the impact of trends in plant parameters, pre-job briefs, and Just In Time training for Operators.

- Operations Management – Operations management did not always maintain oversight of plant activities, and instead sometimes became directly involved with troubleshooting and problem solving activities. Additionally, it was observed that the chain of command and control had become diluted during the outage, and that directions for plant operations sometimes arrived from multiple sources.

- Procedure Compliance – Procedural compliance weaknesses were observed in Operations, Maintenance, and Engineering. Some of the equipment issues observed during the NOP test were directly related to procedure use.

- Knowledge Base – A potential weakness in the knowledge base of some individuals was noted in the area of design and configuration control. Additionally, training during the outage was not adequate to return Operator knowledge and skills to the previous level during operations.

- Investigations of Events – The human performance weaknesses apparent in the core flood and steam line water hammer events were not adequate to prevent the reactor trip event, and the initial investigations for two events were not done in a timely manner.

- Trending – Trending of CRs was not yet fully implemented, but has since been reinstated under the CAP.

As discussed below, actions are being taken prior to restart to address the issues raised by the assessments and collective significance review.

C. Follow-up Actions

In response to the assessments described in the previous section, an Operations Improvement Action Plan has been developed. The Plan identifies actions to strengthen Operations personnel, operating procedures, Operations management, and independent oversight of Operations prior to restart. The primary restart actions in the Plan are discussed below.

Strengthening Operating Crews – Assessment and adjustment of operating crews is complete, providing strong crew alignment. In addition, the following actions have been or will be taken to strengthen Operations:

- Assessing Operators' knowledge of standards and expectations;
- Communicating expectations to operating crews and Operations training personnel;
- Reviewing expectations for the shift engineer during plant maneuvers, testing, off-normal and transient operations;
- Ensuring that the training and performance of the shift engineers is consistent with management expectations;
- Evaluating Operations standards and expectations for command and control responsibilities of shift management and revising them as necessary;
- Reaffirming the expectations for procedure use and adherence; and
- Assessing the selection criteria for Operations training instructors and Operations personnel and revising them as necessary.

Strengthening Operating Procedures – Operations will validate procedures in the simulator governing heatup/startup, shutdown/cooldown, and power operations, including comparison against industry best practices, and incorporation of lessons learned. Significant surveillance procedures and key Operations administrative procedures will be reviewed. Training on the revised procedures will be provided to Operators. Additionally, procedure guidance has been developed for reverse pre-job briefs (*i.e.*, Operators brief their supervisors on the activities they will be conducting) and training will be provided on reverse pre-job briefs.

Strengthening Operations Management – The onshift organizational chart will be revised to clearly define reporting roles and the chain of command. Additionally, operations oversight managers, consisting of personnel from FENOC and top performing plants, will be established to provide additional oversight of plant Operations until management determines they are no longer needed. Finally, training will be provided to site managers on performing management observations of Operations.

Strengthening Independent Oversight of Operations – NQA will perform focused observations of procedure use and Operations oversight, and will monitor the effectiveness of simulator training. NQA will also use non-Davis-Besse QA personnel to perform observations and to assess NQA's methodology for performing Operations assessments. Also, senior management will coach Operations management on performing monitoring and coaching.

Additionally, Operator training needs will be evaluated with respect to Operator tasks that have not been performed or trained upon over the past few years, and Davis-Besse will determine the appropriate training to be implemented.

In addition to these actions from the Operations Improvement Action Plan, other actions are being taken to address the issues identified in the assessments and collective significance review. For example, the Operations Manager will reinforce his expectation that initial investigations and personal statements be collected immediately after significant events, and that preliminary causal findings and lessons learned be disseminated to the shift crews to help reduce the probability of recurrence.

Actions are also being taken to strengthen implementation of the problem solving and decision-making process. For example, a process owner/facilitator will be identified to improve the consistency of implementation of the process.

In total, these restart actions will enhance barriers and improve operational performance to address the areas of weakness identified by the assessments during the NOP test. Through the use of the operational oversight team discussed above, Davis-Besse will verify that these actions and barriers are effective.

D. Conclusions

During the current outage, extensive actions have been taken to improve management and personnel development, safety culture, standards and decision-making, oversight and assessments, and corrective actions, programs, and procedure compliance. Various performance indicators and assessments demonstrate that these actions have been largely effective in achieving improved performance. Recent assessments have identified some areas of weakness related to apparent cause analyses, calculations, and operations. Davis-Besse has identified actions to address these weaknesses, and is in the process of implementing these actions. As a result, Davis-Besse concludes that, upon completion of implementation of these actions, it will be ready for restart and safe operation in this area.

VI. Long-Term Improvement Plans

Two plans have been developed to implement long-term improvements. The first plan is the Safety Culture Long-Term Improvement Plan, described in Section VI.A below. The second plan is the Operational Improvement Plan, described in Section VI.B below.

A. Safety Culture Long-Term Improvement Plan

The purpose of the Safety Culture Long-Term Improvement Plan is to identify long-term actions to address the areas for improvement identified in safety culture assessments at Davis-Besse and to provide for additional assessments to ensure the effectiveness of those actions. The Plan uses the actions in the Management & Human Performance Improvement Plan as a foundation, and acts as the successor to that plan after restart to ensure that a comprehensive set of actions are in place to address known weaknesses and achieve excellence in safety culture. The Plan is structured using the same approach as the Safety Culture Model.

The actions that have already been completed and those to be completed under the Plan are summarized below.

1. Actions in the Policy Commitment Area

In July 2003, FENOC's Executive Leadership Team established a new vision for its fleet of nuclear plants. The new vision is "*People with a strong safety focus delivering top fleet operating performance.*" To help achieve this vision, the team identified four (later expanded to five) strategic objectives and a set of metrics to track success in achieving the objectives. These strategic objectives and metrics are identified below:

- Safe Plant Operation
    - Risk Performance Indicator
    - OSHA Recordable Injuries
- People Development and Effectiveness
    - Talent Management and Personnel Development
    - Leadership Development
    - Long-Term Staffing Plans
    - Training
    - Safety Culture Performance Index
- Excellent Material Condition
    - Corrective Maintenance Backlog

- System Health
- INPO Index

- Fleet Efficiency/Effectiveness
  - Corrective Action Program Effectiveness
  - People per Megawatt Installed
  - Gross Margin
  - Non-Outage, Non-Fuel Production Costs
  - Degree of Standardization

- Improved Outage Performance
  - Capacity Factor
  - Refueling Outage Cost
  - Refueling Outage Duration

2. <u>Management Commitment Area</u>

In May 2003, a new department and position, Director of Organizational Development, was created to focus on achievement of continuous improvement in safety culture and SCWE. In September, this position transitioned into a FENOC corporate position to ensure alignment and improved safety culture throughout the organization.

In direct response to the root causes of the Davis-Besse RPV head degradation, several actions were taken concerning the Management Observation Program. For example, managers are spending more time in the field observing critical path and daily activities, which:

- Fosters management alignment;
- Raises awareness of cross-disciplinary activities;
- Emphasizes high standards and the ability to be critical;
- Addresses undesired actions and creates prospective opportunities for improvement; and
- Ensures open communications and on-the-spot recognition of positive behaviors.

Additionally, changes to the Management Observation Program are under way:

- On a periodic basis, the results of management observations are evaluated to identify areas in which there is a relatively high rate of observations of unsatisfactory performance. These areas become focus areas for increased management observations and are documented on CRs to track appropriate corrective action.

- The Training section has begun using the Management Observation Program to find weaknesses and needed focus areas.

Other actions are planned by FENOC to improve management oversight of plant activities. These actions include development of common processes for areas such as configuration control, equipment reliability, materials and services, outage management, support services, training, radiation protection, chemistry, design programs, and work management (*e.g.*, determining the appropriate level of management oversight based on safety and potential consequences of the work). Benchmarking industry best practices is part of the development process.

A focus of the long-term actions is to improve leadership, teamwork and alignment. Planned actions in each of these areas are summarized below.

Team Alignment

The SLT, in concert with the ELT, is holding a series of meetings to gain consensus on its role in leading the culture change effort, develop check points along the way to monitor progress in leading the site forward, discuss and agree on the training/skill sets needed for the leadership team and site to support the culture change effort and drive to achieve the new vision for Davis-Besse, and determine the structures and infrastructures that need to be in place to drive new patterns in behavior.

Additionally, a series of meetings are being held between the SLT, managers, and supervisors to share outcomes of the SLT Alignment meeting (thinking and direction), and to discuss the vision, organizational structures and infrastructures.

All-hands meetings are being held with site personnel to reinforce FENOC's new vision, engage site personnel in that vision, align site personnel to the culture change effort, create opportunities to gain insight into issues of concern, and gain an understanding of what actions can be taken to ensure that behavior is consistent with the new vision.

Management and Succession Planning

Improvements will be made to management and succession planning. Davis-Besse will implement the FirstEnergy integrated process of recruiting talent, identifying talent, proactively identifying needs and planning to fill vacancies as they become open, developing a rotation strategy for personnel, and providing feedback regarding their potential and the corporation's desires for the individual and rotation moves and timing.

Leadership Development

FENOC will establish a leadership development curriculum for the training of managers. The purpose of this curriculum will be to provide a systematic approach for the development of new leadership approaches and corresponding behaviors for FENOC managers. The elements of this curriculum will enable managers to foster personal, team, and system dynamics that empower FENOC employees to create the highest levels of nuclear safety and nuclear professionalism, and achieve continuous improvement in performance.

3. Actions in the Individual Commitment Area

Davis-Besse has continued to use stand-downs as a means of communicating performance shortfalls and emphasizing the actions that personnel need to take to avoid such problems. Additional case study training was provided to station personnel on the meaning and importance of safety culture, management's commitment to safety culture, examples of good and bad safety culture, and the role of station personnel in achieving a good safety culture. This training will be conducted for new personnel. Additionally, Edventures "root learning" training has been provided to Davis-Besse personnel. This training addressed the causes of the current outage, what has been done to correct the causes, and Davis-Besse's goals for the future. Through a series of questions, employees received training in their role in the causes, corrective actions, and goals, to enable employees to understand how their performance contributes to Davis-Besse's overall success.

Davis-Besse completed its personnel evaluation of non-union employees. The Performance Management process is being merged into a new FirstEnergy-wide personnel evaluation program. This new program will include easy to use evaluation forms that have five rating categories to provide greater feedback to personnel. Directors and managers will be attending a Leadership Academy to improve management skills, including performance evaluations.

A number of improvements related to SCWE will be implemented, including:

- SCWE training was provided for all groups of site personnel, including contractor personnel. This training stressed management's commitment to SCWE, the freedom of personnel to raise concerns without fear of retaliation, and methods for raising employee concerns. SCWE training will also be provided to new employees and contractors during employee orientation or in-processing.

- The results of ECP feedback to employees who raise concerns and the results of SCWE collective significance reviews will be publicized in order to increase confidence in the effectiveness of the ECP. This publicity will be structured to avoid compromising the confidentiality of those employees.

Focus groups of employees will be established to obtain additional feedback. The focus groups will consist of randomly selected employees, who will meet with an independent consultant to provide any issues or concerns for action by management. Additionally, these groups will be asked to complete surveys to obtain further feedback from employees.

4. Assessments of Effectiveness of Improvements

In addition to the improvement actions described in the Safety Culture Long-Term Improvement Plan, assessments will be conducted to monitor improvements in performance, and will adjust its actions as necessary to ensure that long-term goals will be achieved. In addition to its normal oversight (*e.g.*, periodic NQA assessments, EAB assessments of Engineering products, CARB assessments of root cause analyses, CNRB assessments), the following periodic management assessments and independent assessments will be performed after restart:

Periodic Management Assessments

- Monthly Performance Monitoring – In accordance with its strategic objectives, FENOC is establishing a metric to monitor safety culture. The performance indicators are currently in development using system-wide information. FENOC will begin monitoring these performance indicators once they are implemented as part of the 2004 FENOC Business Plan.

- Management Observation Program – This program has been implemented. The results from the program are trended to provide an indication of the performance of management personnel as well as personnel in the field. When weaknesses in performance are identified, corrective actions are taken to improve overall performance.

- Safety Culture Assessments – The current safety culture assessment process in Business Practice DBBP-VP-0002, "Restart Readiness Review Extended Plant Outage," has been transformed into a Business Practice. Safety culture assessments will initially be performed at least once every two years.

Independent Assessments

- NQA Assessments – NQA will continue to perform assessments of safety culture, including interviews of personnel. Assessments will be conducted on an annual basis.

- SCWE Surveys – The ECP group will continue to conduct surveys of the station personnel to determine their views related to the condition of SCWE at Davis-Besse. Surveys will be conducted annually.

- Assessment Using PSHA Methodology – An independent contractor will perform an assessment of safety culture at Davis-Besse using a methodology similar to that previously employed by PSHA. The assessment will be performed in the fourth quarter of 2004.

B. Cycle 14 Operational Improvement Plan

The purpose of the Operational Improvement Plan is to identify long-term actions to achieve additional improvement in operational performance at Davis-Besse and to provide for additional

assessments to ensure the effectiveness of those actions. The Plan is structured around the management and human performance barriers to preventing events.

The Plan is attached as Appendix D and is summarized below:

- The Plan is designed to strengthen the four management and human performance barriers to preventing events: Individuals, Programs, Management, and Oversight.

- The Plan identifies initiatives to improve operational performance. Each of the initiatives relates to one or more of the barriers. These initiatives are as follows:

  - Organizational Effectiveness Improvement

  - Operations Improvement

  - Maintenance Improvement

  - Training Improvement

  - Work Management Improvement

  - Engineering Improvement

  - Continuous Safety Culture Improvement

  - Corrective Action Program Improvement

  - Procedure Improvement

  - Internal and External Oversight Improvement

- A number of performance indicators and goals have been identified to monitor selected attributes for the four barriers.

In summary, Davis-Besse has a comprehensive long-term plan to improve operational performance, including long-term goals, actions to achieve those goals, and tools to monitor progress in achieving the goals.

C. Conclusions

Additional long-term actions will be taken to anchor improvements in safety culture and operational performance at Davis-Besse. Additional assessments of safety culture will be performed to verify that these actions are effective, and Davis-Besse will be monitoring operational performance through the use of performance indicators. Additional actions will be taken, as needed, for any weaknesses that may be identified. These actions will ensure that Davis-Besse will achieve sustained, long-term improvements in safety culture and operational performance.

VII. Comparison Against NRC Criteria

The NRC has identified a number of criteria or factors for use in evaluating the readiness of Davis-Besse to restart and resume safe operation. These are identified in NRC's Restart Checklist and NRC's Confirmatory Action Letter. Additionally, recommendations for restart will be provided by FENOC's independent oversight groups.

A. NRC Restart Checklist

The NRC's Restart Checklist consists of seven categories:

- Adequacy of root cause determinations;
- Adequacy of safety-significant SSCs;
- Adequacy of safety-significant programs;
- Adequacy of organizational effectiveness and human performance;
- Readiness for restart;
- Licensing issue resolution; and
- CAL resolution.

There are 31 individual items in the Restart Checklist. As discussed in Appendix B, of these items, the NRC closed 23 as of November 12, 2003. With respect to the remaining eight items:

- Davis-Besse has completed the actions needed to close three of the items, has issued the associated closure packages, and is awaiting NRC closure of the item.
- For Item 2.e (HPI Pumps), Davis-Besse has modified the pumps in accordance with the plans described to the NRC in a meeting on October 21, 2003, and is in the process of installing and performing post-modification tests of the pumps to ensure their proper installation and performance.
- For Items 5.b and 5.c, restart readiness reviews are complete for Modes 6, 5, and the first Mode 4. Similar restart readiness reviews will be performed for the second Mode 4 and Mode 2, and the plant will not enter either of these modes if the results of the readiness reviews do not satisfy the standards in Business Practice DBBP-VP-0002, "Restart Readiness Review Extended Plant Outage."
- For Item 5.c, an Operations Improvement Action Plan to improve the performance of Operations is underway. As described in that Plan, there are provisions for monitoring performance of Operations.
- Item 7.a pertains to resolution of the commitments in the Confirmatory Action Letter, which is discussed in the next section.

In summary, actions are complete for almost all of the items on the NRC Restart Checklist. The remaining actions are well defined, subject to well-defined acceptance criteria, and scheduled for completion prior to restart. Therefore, subject to completion of these remaining actions, Davis-Besse is ready for restart under NRC's Restart Checklist.

B. Confirmatory Action Letter Resolution

As discussed in Appendix B, there are six commitments in the CAL. Of these six, the NRC has closed three of the commitments, and actions are complete for two of the three remaining.

The only remaining commitment is to hold a meeting with the NRC to discuss the root cause determination, extent of condition evaluations, and corrective actions completed and planned to repair the damage and prevent recurrence, and to obtain NRC approval for restart. Davis-Besse and NRC are making arrangements for this meeting, and one of the purposes of this report is to support the discussions in that meeting.

Subject to completion of the restart meeting with the NRC, Davis-Besse has satisfied the commitments in the CAL and is ready for restart.

C. Recommendation for Restart by Oversight Groups

The ROP was established to provide additional oversight and review of plant activities performed as part of the Return to Service Plan. The ROP consists of independent industry experts and FENOC executives with extensive experience in recovery efforts at plants with long outages. The ROP has conducted monthly meetings to review plant activities, and has conducted its own evaluations of performance (including review of plant documents, observation of plant activities, and interviews of plant personnel).

The ROP and CNRB will meet prior to restart to reach a conclusion on whether Davis-Besse is ready for restart. Additionally, based upon the results of its various assessments, NQA will also reach a conclusion on whether Davis-Besse is ready for restart.

VIII. Conclusions and Readiness to Restart

Based upon the following factors, FENOC concludes that it is ready to restart subject to completion of a few remaining restart actions:

- The actions specified in the NRC Confirmatory Action Letter and the NRC Restart Checklist are complete.

- The degraded RPV head has been replaced. The new head has been inspected and tested to confirm its acceptability.

- Walkdowns inside and outside containment have been conducted to identify other SSCs that may have been affected by boric acid corrosion or primary water stress corrosion cracking, and appropriate corrective action was taken for such components (including replacement of the Containment Air Coolers).

- The root causes that led to the degradation of the head have been determined, including the causes of the failure to identify the degradation.

- To determine whether other SSCs and programs may have been adversely affected by these root causes, extensive System Health Assurance Reviews and Program Compliance Reviews were performed. Based upon these reviews and the root causes, numerous improvements have been made to both SSCs and programs. Additionally, a number of plant modifications have been implemented to improve the safety margin of the plant.

- Based upon the root causes, numerous actions have been taken to improve management and human performance, including safety culture. Assessments and performance indicators have shown that these improvements have been effective in achieving improved performance.

- To anchor the improvements in management and human performance and ensure that these improvements will be sustained over the long term and to achieve still further improvements in performance, long-term improvement plans have been developed and are being implemented.

A number of activities must still be completed before Davis-Besse will be ready to enter Mode 2, for example, completion of the testing of the HPI pumps, completion of the breaker coordination modifications, and completion of various restart actions as discussed in this report. Davis-Besse currently expects, however, that these activities will be completed by mid-December 2003.

Based upon the above, FENOC concludes that the SSCs, programs, and personnel will be ready to support safe and reliable operation upon completion of these work activities. As a result, FENOC requests that the NRC approve restart of Davis-Besse.

Appendix A -- Commitments for Cycle 14

The following list identifies those post-restart actions committed to by the Davis-Besse Nuclear Power Station in this document. These commitments pertain to Cycle 14. Any other actions discussed in the submittal represent intended or planned actions by Davis-Besse. They are described only as information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

No.	Commitment	Section	Due Date
1.	On a long-term basis, follow-up assessments of programs will be performed using the Focused Self-Assessment program with criteria similar to those used in the Phase 2 restart program reviews.	IV.D.3	Periodic
2.	Davis-Besse will submit a license amendment request for revisions to the SFAS Technical Specification values.	IV.D.3	January 30, 2004
3.	Davis-Besse will submit a license amendment request to change the USAR's description of emergency diesel generators' frequency and voltage transient values during the automatic loading sequence.	IV.D.3	January 30, 2004
4.	Davis-Besse will submit an exemption request for a fire area found to be lacking full fire suppression capability. Until this request is approved, compensatory measures will be maintained.	IV.D.3	February 28, 2004
5.	Davis-Besse will submit an exemption request to credit the new Boron Precipitation Control method.	IV.D.3	February 28, 2004
6.	Maintenance activities have been scheduled for the next refueling outage to replace the RCP 2-1 and 2-2 case-to-cover gaskets.	IV.J.1	Next refueling outage
7.	Davis-Besse will perform a Completeness and Accuracy review and an expanded sample of regulatory submittals dated between January 1996 and March 2002.	IV.I	March 31, 2004
8.	An Apparent Cause Review Group (a subcommittee of the CARB) will be established and will assess the adequacy of apparent cause analyses. After that time, CARB will perform reviews of selected apparent cause analyses to provide additional assurance of their continued acceptability.	V.A.5	When the apparent cause analyses presented to CARB meet the goal for quality of apparent cause analyses.

Appendix A -- Commitments for Cycle 14

No.	Commitment	Section	Due Date
9.	The number of Apparent Cause Evaluators will be reduced and those personnel will receive additional training. An Apparent Cause Review Group will be established to assess the adequacy of apparent cause analyses.	V.A.5	January 30, 2004
10.	Requalification or refresher training will be conducted for site personnel who perform management observations.	V.A.2	Periodic
11.	Davis-Besse will implement the FirstEnergy process for recruiting talent, identifying talent, and identifying needs and planning to fill vacancies as they become open, developing a rotation strategy for personnel, and providing feedback to Davis-Besse personnel.	VI.A.2	June 2004
12.	Davis-Besse will implement the FENOC leadership development curriculum for the training of managers at Davis-Besse.	V.A.2	June 2004
13.	SCWE training will be provided to new employees and contractors.	VI.A.3	As needed
14.	The results of ECP feedback to employees who raise concerns and the results of SCWE collective significance reviews will be publicized in order to increase confidence in the effectiveness of the ECP. This publicity will be structured to avoid compromising the confidentiality of those employees.	VI.A.3	Periodic
15.	Davis-Besse will establish focus groups of employees to obtain additional SCWE feedback. The focus groups will consist of randomly selected employees, who will meet with an independent consultant to provide any issues or concerns for action by management.	VI.A.3	Periodic
16.	NQA will perform assessments of safety culture at Davis-Besse.	VI.A.4	Annually
17.	The ECP group will conduct surveys of station personnel to determine their views related to the condition of SCWE at Davis-Besse.	VI.A.4	Annually

Appendix A -- Commitments for Cycle 14

No.	Commitment	Section	Due Date
18.	Davis-Besse will arrange for an independent contractor to perform an assessment of safety culture at Davis-Besse using a methodology similar to that previously employed by PSHA.	VI.A.4	Fourth quarter of 2004
19.	Engineering will provide engineers with examples of good calculations to use as models.	V.A.3	March 30, 2004
20.	Davis-Besse will implement the Cycle 14 Operational Improvement Plan.	IV.H.1	End of Cycle 14, except as indicated in the Plan
21.	Condition Report Analysts within each section will receive strengthened roles and responsibilities with respect to apparent cause analyses.	V.A.5	Ongoing
22.	Safety culture case study training will be provided to new employees	VI.A.3	Ongoing
23.	NQA will continue to assess procedure compliance in the fourth quarter of 2003.	V.A.5	December 31, 2003

Appendix B

Matrix Demonstrating Davis-Besse's Satisfaction of Criteria in NRC's Restart Checklist

No.	Description	Davis-Besse's Action	NRC Closure
1	**Adequacy of Root Cause Determinations**		
1.a	Penetration Cracking and Reactor Pressure Vessel Corrosion	As discussed in Section III.A, Davis-Besse has completed root cause analyses of the corrosion of the RPV head.	NRC Integrated Inspection Report 50-346/03-04
1.b	Organizational, Programmatic and Human Performance Issues	As discussed in Section III.B, Davis-Besse has completed root cause analyses of the organizational, programmatic and human performance issued.	NRC Special Inspection Report 2002018
2	**Adequacy of Safety Significant Structures, Systems, and Components**		
2.a	Reactor Pressure Vessel Head Replacement	As discussed in Section IV.B, Davis-Besse has installed and tested a new reactor vessel head.	Open
2.b	Containment Vessel Restoration Following Reactor Pressure Vessel Head Replacement	As discussed in Section IV.B, Davis-Besse has restored and tested the containment vessel.	NRC Inspection Report 50-346/03-05
2.c	Structures, Systems, and Components Inside Containment	As discussed in Section IV.C.1, Davis-Besse has performed inspections inside the containment to determine the extent of condition of PWSCC and boric acid corrosion, and has taken corrective action for degraded components as appropriate. Less than five restart corrective actions remain open.	NRC Inspection Report (to be issued)
2.c.1	Emergency Core Cooling System and Containment Spray System Sump	As discussed in Section IV.J, Davis-Besse has modified the containment emergency sump to correct existing conditions and add safety margin.	NRC Inspection Report 50-346/03-17
2.d	Extent-of-Condition of Boric Acid in Systems Outside Containment	As discussed in Section VIII, Davis-Besse has performed inspections outside the containment to determine the extent of condition of PWSCC and boric acid corrosion, and has taken corrective action for degraded components as appropriate.	NRC Inspection Report 50-346/03-22 (to be issued)

Appendix B

No.	Description	Davis-Besse's Action	NRC Closure
2.e	High Pressure Injection Pump Internal Clearance/Debris Resolution	As discussed in Section IV.E, Davis-Besse has performed tests and is installing and testing modified HPI pumps to ensure that they can perform their functions under design basis debris loading conditions. The testing results and modification plans were discussed with the NRC in a meeting on October 21, 2003 (Log 6131).	Open
3	**Adequacy of Safety Significant Programs**		
3.a	Corrective Action Program	As discussed in Sections IV.D Davis-Besse has reviewed and improved its Corrective Action Program.	Open
3.b	Operating Experience Program	As discussed in Section IV.D, Davis-Besse has reviewed and improved its Operating Experience Program.	NRC Inspection Report 50-346/03-09
3.c	Quality Audits and Self-Assessments of Programs	As discussed in Section IV.D, Davis-Besse has reviewed and improved its quality audit and self-assessment programs.	NRC Inspection Report 50-346/03-23 (to be issued)
3.d	Boric Acid Corrosion Management Program	As discussed in Section IV.D, Davis-Besse has reviewed and improved its Boric Acid Corrosion Control program.	NRC Inspection Report 50-346/03-17
3.e	Reactor Coolant System Unidentified Leakage Monitoring Program	As discussed in Section IV.D, Davis-Besse has reviewed and improved its Reactor Coolant Leakage Monitoring Program.	NRC Inspection Report 50-346/03-09
3.f	In-Service Inspection Program	As discussed in Section IV.D, Davis-Besse has reviewed and improved its Inservice Inspection Program.	NRC Inspection Report 50-346/03-09
3.g	Modification Control Program	As discussed in Section IV.D, Davis-Besse has reviewed and improved its modification control program.	NRC Inspection Report 50-346/03-09
3.h	Radiation Protection Program	As discussed in Section IV.D, Davis-Besse has reviewed and improved its Radiation Protection program.	NRC Inspection Report 50-346/03-17

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No.	Description	Davis-Besse's Action	NRC Closure
3.i	Process for Ensuring Completeness and Accuracy of Required Records and Submittals to the NRC	As discussed in Section IV.I, Davis-Besse has taken action to improve the completeness and accuracy of required records and submittals to the NRC, and has performed an extent of condition review of previous NRC submittals.	NRC Inspection Report 50-346/03-19 (to be issued)
4	**Adequacy of Organizational Effectiveness and Human Performance**		
4.a	Adequacy of Corrective Action Plan	As discussed in Section V, Davis-Besse has established and implemented a Management and Human Performance Improvement Plan. Additionally, as discussed in Sections III.H and IV.F, Davis-Besse has performed an independent effectiveness review of Engineering, and has performed Functional Area Reviews of several other site organizations.	NRC Special Inspection Report 2002018
4.b	Effectiveness of Corrective Actions	As discussed in Sections V.A and V.B, Davis-Besse has demonstrated the effectiveness of its Management and Human Performance Improvement Plan. Davis-Besse has established and is implementing an Operations Improvement Action Plan to improve performance of Operations, and will be monitoring the improvements to ensure their effectiveness prior to restart.	Open
5	**Readiness for Restart**		
5.a	Review of Licensee's Restart Action Plan	As discussed in Section IV.H, Davis-Besse has issued a Restart Action Plan, and NQA has performed assessments to verify the adequacy of restart processes and categorization of restart items.	NRC Inspection Report 50-346/03-22 (to be issued)

Appendix B

No.	Description	Davis-Besse's Action	NRC Closure
5.b	Systems Readiness for Restart	As discussed in Section IV.E, Davis-Besse has performed a System Health Assurance Plan and has generated CRs for adverse conditions. As discussed in Section IV.H, Davis-Besse has performed restart readiness reviews for Modes 6 and first Mode 4, and will be performing similar reviews before entry into the second Mode 4 and Mode 2.	Open
5.c	Operations Readiness for Restart	As discussed in Section V.A, Davis-Besse has performed restart readiness reviews for Modes 6 and first Mode 4, and will be performing similar reviews before entry into the second Mode 4 and Mode 2. Additionally, as discussed in Sections V.B and V.C, Davis-Besse has performed an integrated assessment of operational readiness during the NOP test, and is taking corrective actions for the issues identified during the assessment.	Open
5.d	Test Program Development and Implementation	As discussed in Section IV.G, Davis-Besse has developed and implemented a Restart Test Plan. Additionally, as discussed in Section IV.B, Davis-Besse has performed a containment integrated leak rate test, and a NOP test of the reactor coolant system to check for leakage (including visual inspection of the in-core nozzles in the bottom of the reactor vessel).	Open
6	**Licensing Issue Resolution**		
6.a	Verification that Relief Requests A8 and A12 regarding the Shell to Flange Weld (previously submitted by letter dated September 19, 2000) is not Impacted by the Midland RPV Head	Davis-Besse submitted this verification by letter Serial Number 1-1281 on August 9, 2002.	RRs A8 and A12 approved by NRC in letter dated December 30, 2002 (NRC Inspection Report 50-346/03-04)

No.	Description	Davis-Besse's Action	NRC Closure
6.b	American Society of Mechanical Engineers (ASME) Code Relief Request for Failure to Maintain Original Radiographic Tests of the Midland Head to Flange Weld (Planned Relief Request A26)	Davis-Besse submitted the request on August 1, 2002, in letter Serial 2797 and on September 23, 2002 in letter Serial Number 2809.	RRs A26 and A27 approved by NRC in letter dated December 13, 2002 (NRC Inspection Report 50-346/03-04, Log 6037)
6.c	ASME Code Relief Request for Inability to Radiographically Test 100% of the Midland Reactor Pressure Vessel Head to Flange Weld (Relief Request A27)	Davis-Besse submitted the request on August 1, 2002, in letter Serial 2797 and on September 23, 2002 in letter Serial Number 2809.	RRs A26 and A27 approved by NRC in letter dated December 13, 2002 (NRC Inspection Report 50-346/03-04, Log 6037)
6.d	Resubmit Relief Request A2 (previously submitted by letter dated September 19, 2000) for ASME Code for Inability to Perform 100% volumetric and surface examination of Head to Flange Weld	Davis-Besse submitted the request on August 1, 2002, in letter Serial 2798.	RR A2 approved by NRC in letter dated December 17, 2002 (Log 6038)
6.e	Reconciliation Letter that Demonstrates How the New Reactor Pressure Vessel Head Correlates With the ASME Code and QA Index for Section III and Section XI – Commitments	Davis-Besse submitted this letter, Serial 1-1281, on August 9, 2002.	NRC found the reconciliation to be satisfactory in Inspection Report 50-346/03-04
6.f	Verification Letter of Technical Specification Pressure/Temperature Curves for New Vessel Head - Commitment	Davis-Besse submitted this letter, Serial 1-1285, on January 22, 2003.	NRC found the reconciliation to be satisfactory in Inspection Report 50-346/03-04, dated May 9, 2003

No.	Description	Davis-Besse's Action	NRC Closure
6.g	Request to relocate High Pressure Injection and Low Pressure Injection Subsystems Flow Balance Testing from Technical Specifications 4.5.2.h to Updated Safety Analysis Report Technical Requirements Manual	Davis-Besse submitted this request Serial 2949, on May 21, 2003.	NRC issued the amendment on August 12, 2003 (Log 6110)
7	**Confirmatory Action Letter Resolution**		
7.a	Verification that Confirmatory Action Letter Items are Resolved, Including a Public Meeting to Discuss Readiness for Restart	Davis-Besse has completed the actions in the CAL. Davis-Besse will arrange with NRC for a public meeting to discuss readiness to restart.	Open

Appendix B

Matrix Demonstrating Davis-Besse's Satisfaction of Criteria in NRC's Confirmatory Action Letter

No.	Description	Davis-Besse's Actions	NRC Closure
1.	Quarantine components or other material from the RPV head and CRDM nozzle penetrations that are deemed necessary to fully address the root cause of the occurrence of degradation of the leaking penetrations. Prior to implementation, plans for further inspection and data gathering to support determination of the root cause will be provided to the NRC for review and comment.	Davis-Besse quarantined the degraded reactor vessel head, cut samples of the areas of degradation for further data, and shipped those samples to laboratory for analysis. This analysis was completed and a report provided to the NRC.	As discussed in a letter from the NRC dated September 19, 2003, this item is closed.
2.	Determine the root cause of the degradation around the RPV head penetrations, and promptly meet with the NRC to discuss this information after you have reasonable confidence in your determination.	As discussed in Section III, Davis-Besse has performed root cause analyses of the degradation of the reactor vessel head and the failure to identify the degradation.	As discussed in a letter from the NRC dated September 19, 2003, this item is closed.
3.	Evaluate and disposition the extent of condition throughout the reactor coolant system relative to the degradation mechanisms that occurred on the RPV head.	As discussed in Section IV.C.1, Davis-Besse has performed inspections of the reactor coolant system to identify the extent of condition of PWSCC and boric acid corrosion.	Open

No.	Description	Davis-Besse's Actions	NRC Closure
4.	Obtain NRC review and approval of the repair or modification and testing plans for the existing RPV head, prior to implementation of those activities. Prior to restart of the reactor, obtain NRC review and approval of any modification and testing activity related to the reactor core or reactivity control systems. If the reactor vessel head is replaced in lieu of repair or modification, the replacement must comply with appropriate Commission rules and industry requirements.	As discussed in Section IV.B, Davis-Besse has replaced the reactor vessel head, and has performed inspections and tests of the new head and has verified its acceptability.	Open
5.	Prior to the restart of the unit, meet with the NRC to obtain restart approval. During that meeting, we expect you will discuss your root cause determination, extent of condition evaluations, and corrective actions completed and planned to repair the damage and prevent recurrence.	Davis-Besse and NRC are arranging for this meeting. One of the purposes of this report is to support the discussions at that meeting.	Open
6.	Provide a plan and schedule to the NRC, within 15 days of the date of this letter, for completing and submitting to the NRC your ongoing assessment of the safety significance for the RPV head degradation.	Davis-Besse provided the plan and schedule to the NRC on March 27, 2002 (Serial 1-1267). Davis-Besse provided an analysis of the safety significance of the head degradation on April 8, 2002 (Serial 1-1268) and August 13, 2003 (Serial 2968).	As discussed in a letter from the NRC dated April 5, 2002 (Log 1-4251), this item is closed.

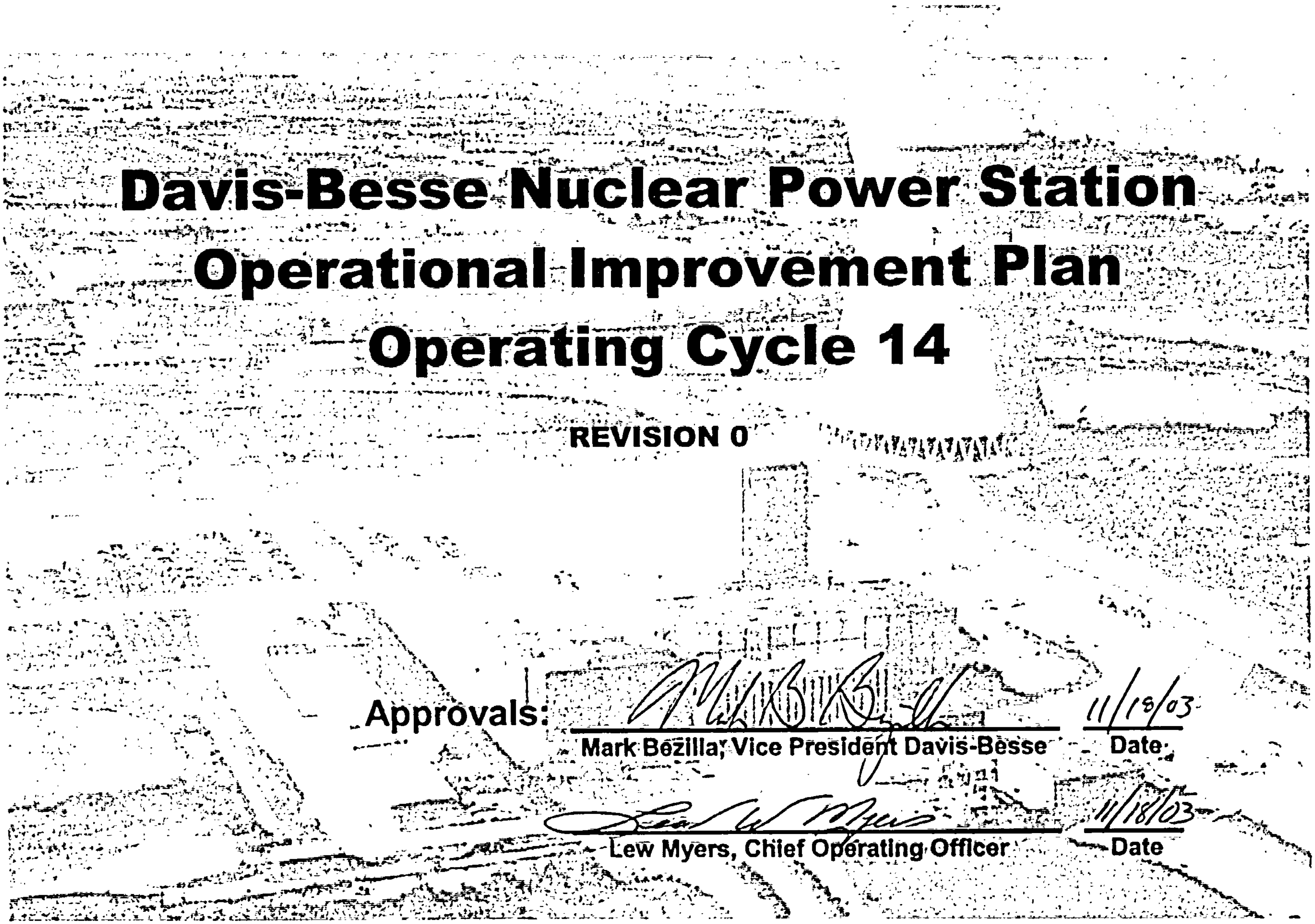
Appendix C -- Remaining Major Actions for Restart

As of November 16, 2003, the following are the principal actions that remain to be completed after November 21 and prior to restart.

No.	Action
1.	Install and test the HPI pumps.
2.	Clean and repack valves to correct conditions identified in NOP test.
3.	Complete implementation of the electrical breaker coordination modifications.
4.	Resolve CAC pressure transient issues.
5.	Complete implementation of the restart-required actions in the Operations Improvement Action Plan and related improvements, as summarized in Section V.C. Remaining actions include: • Complete evaluation and remedial actions for operator understanding of standards and expectations. • Complete assessment and validation of key administrative procedures. • Complete training of Operators and certify Operators are ready to return to Operations. • Place operations oversight managers on shift. • Enhance NQA with non-Davis-Besse personnel, and perform NQA monitoring of simulator training effectiveness. • Provide oversight monitoring and coaching. • Perform an assessment of Operator performance by the operations oversight managers. • Training will be provided to site managers on performing management observations of Operations.
6.	Complete restart actions to improve apparent cause evaluations, as summarized in Section V.A.5. Remaining actions include: • The number of Apparent Cause evaluators will be reduced. • Condition Report Analysts within each section will receive strengthened roles and responsibilities with respect to apparent cause analyses. They will receive the same training as Apparent Cause evaluators, and will attend CARB meetings to enhance their standards for review and acceptance of apparent cause analysis.
7.	A process owner/facilitator will be identified to improve the consistency of problem solving and decision-making.

Appendix C -- Remaining Major Actions for Restart

No.	Action
8.	ROP, CNRB, and NQA will make conclusions regarding the readiness of Davis-Besse to restart.
9.	Complete the Restart Readiness Reviews for the second Mode 4 and Mode 2
10.	Adjust the RCS Integrated Leakage Program to account for the results of the NOP test.
11.	Complete evaluation of SW flow balancing issue and identify and schedule corrective actions.
12.	Complete modification for Class 1E motor current overloads.
13.	Complete ETAP calculations and tap setting.
14.	Site personnel will be trained on proper procedure compliance prior to restart.
15.	Control rod drop surveillances will be performed when the plant returns to Mode 3.



Davis-Besse Nuclear Power Station
Operational Improvement Plan
Operating Cycle 14

REVISION 0

Approvals: 11/18/03
Mark Bezilla, Vice President Davis-Besse Date

11/18/03
Lew Myers, Chief Operating Officer Date

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Introduction

To ensure continued improvements and sustained performance in Nuclear Safety and Plant Operation at the Davis-Besse Nuclear Power Station, the Leadership Team has developed this Improvement Plan to focus on key improvement initiatives and safety barriers essential to safe restart from the Reactor Pressure Vessel Head degradation extended plant outage and into subsequent operating cycles. **This plan provides for a managed transition from the organizational and programmatic actions taken to support the Davis-Besse Return to Service Plan and Building Block Plans to that of normal plant operations and refueling outages.**

The initiatives discussed in this plan were derived from lessons learned during the extended plant outage which resulted from the significant Reactor Pressure Vessel Head degradation identified at the beginning of the 13th Refueling Outage. During the extended outage, numerous improvements were made in the areas of Safety Culture, Management, Human Performance, System Health and Programs as described in the Return to Service Plan and the Building Block Plans. However, additional improvements are required to achieve world class performance and to ensure that the safety barriers that failed to detect the significant RPV Head degradation are maintained to prevent a recurrence of an event in the future.

As described in the Return to Service Plan, the numerous root causes associated with the Reactor Pressure Vessel Head degradation could be grouped into the areas of Nuclear Safety Culture; Management/Personnel Development; Standards and Decision-making; Oversight and Assessments; and Programs/Corrective Actions/Procedure Compliance. Actions described in each of the Building Blocks were designed to address numerous significant improvements in each of those areas. This transition plan of Operational Improvements focuses on the four primary safety barriers of **Individual, Programs, Management**, and **Oversight** (as described in the following pages) to ensure improvements realized during the extended outage remain in place and are further built upon to improve performance in the future. This plan will ensure that the improvements made to Davis-Besse are "built to last".

This plan will be used by the Davis-Besse Leadership Team on a monthly basis to monitor safety barrier attributes that would provide early detection of declining trends in performance and to focus on major initiatives to achieve operational excellence. This plan is a living document and will be periodically updated and revised to address completed actions and add new initiatives as determined and approved by the Senior Leadership Team.

Barriers To Ensure Nuclear Safety

The safety of nuclear power relies heavily on the "defense in depth" concept. Nuclear power plants are designed with robust systems and redundant back-up safety systems in the unlikely event of a failure. However, systems and equipment must still be operated, maintained and designed by people to ensure reliability and availability if called upon to perform an intended safety function. The first barrier to ensure safety is the **Individual.** The operator, maintenance technician, engineer and all the other support personnel play an integral role in monitoring plant status and maintaining systems and equipment in top-notch condition. Thus, ensuring that the individuals that support nuclear power plant operation are highly qualified, trained and motivated to do the best job possible is an essential barrier to ensure nuclear safety.

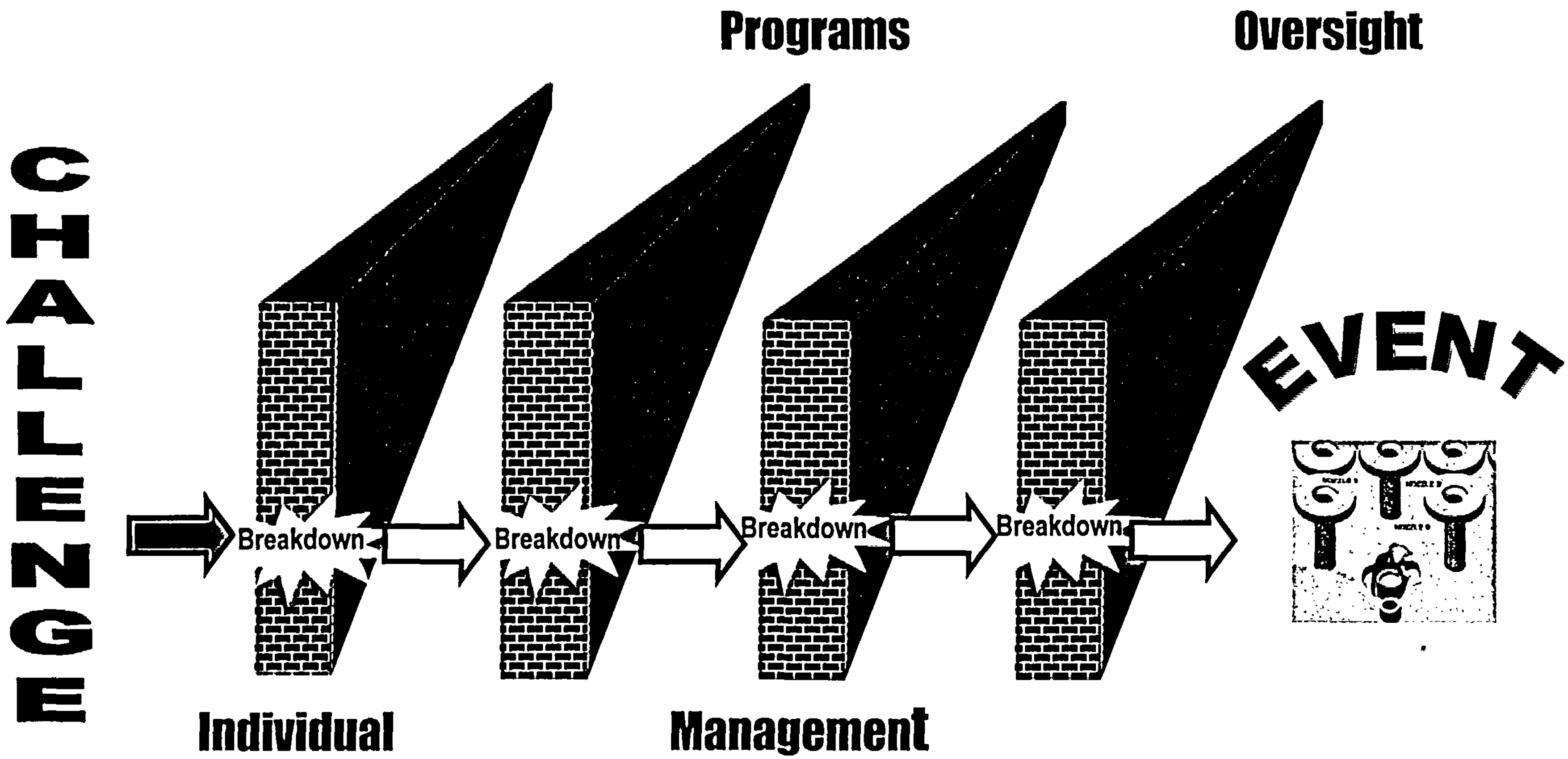
To guide the individual in performing their required job functions, numerous **Programs** have been put in place to address the operations, maintenance, design and licensing basis activities performed daily at the station. Programs are implemented by procedures and other written documents to ensure a consistent approach by the individual. Thus, programs are another essential barrier to ensure nuclear safety.

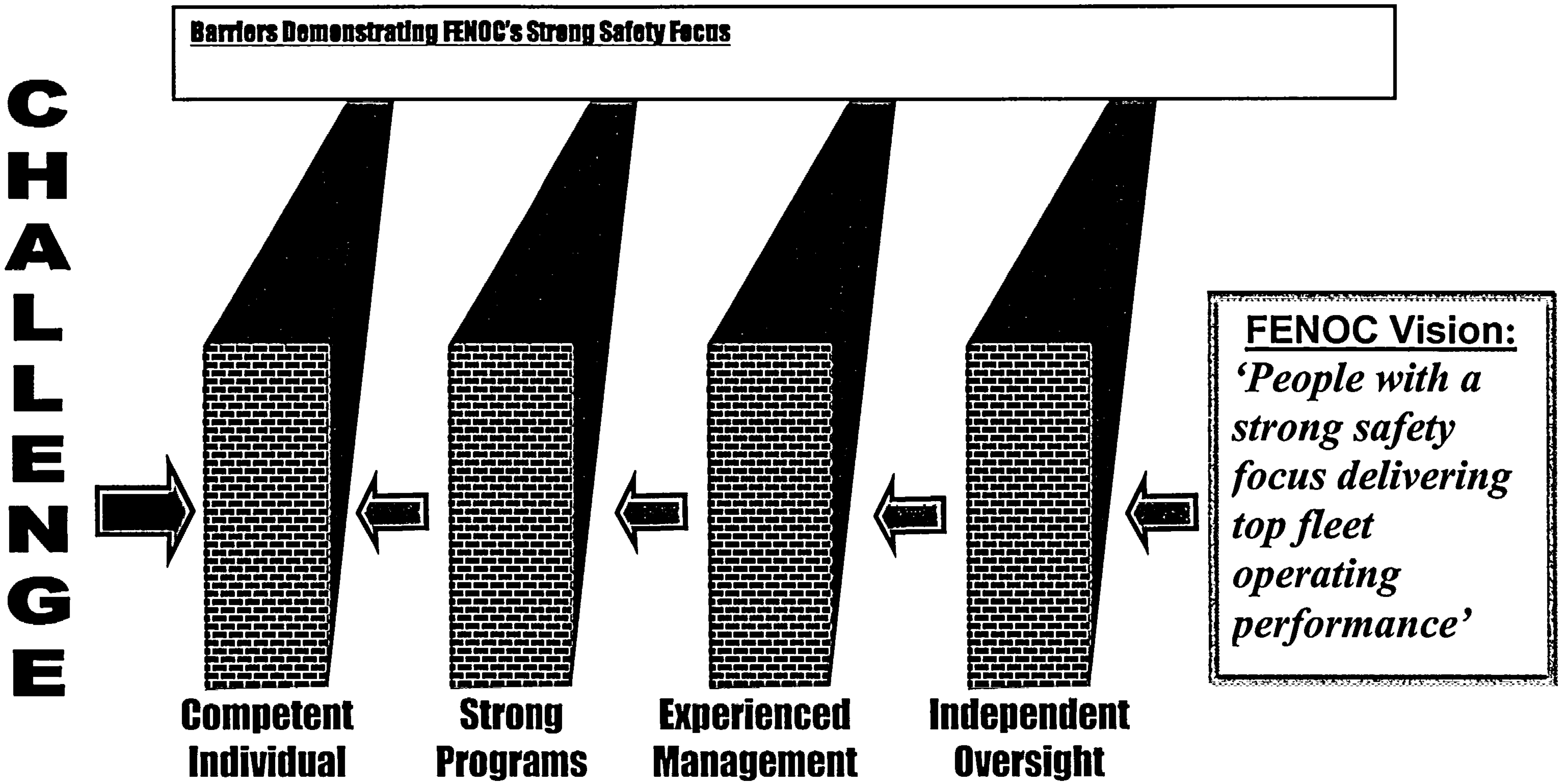
Management also plays a key role in nuclear safety. Management is responsible for providing the proper focus on priorities that ensure the plant is operated and maintained to high standards and expectations. Management is also responsible for creating a work environment that is conducive to a safety conscious work environment and strong safety culture, and to ensure there are adequate staffing levels of qualified and motivated individuals in every department. Management, therefore, is also considered one of the barriers essential to nuclear safety.

To ensure that the individual and management (using established programs and associated procedures) performs their duties to high standards and maintains the proper safety focus, **Oversight** organizations provide another barrier for nuclear safety. Oversight checks for adverse trends in performance and is independent of other pressures. Independent oversight, when properly used, can identify differences from industry norms for early detection of potential weaknesses developing in the safety barriers.

Together these four barriers work in conjunction to contribute to the safe operation of Davis-Besse.

This illustration represents how the four safety barriers failed, allowing the degradation of the RPV Head to go undetected for several years and serves to anchor the lessons learned and corrective actions taken to prevent recurrence.




Barriers Demonstrating FENOC's Strong Safety Focus
CHALLENGE
Competent Individual
Strong Programs
Experienced Management
Independent Oversight
FENOC Vision:
'People with a strong safety focus delivering top fleet operating performance'

Davis-Besse Initiatives:

Based on lessons learned from the Reactor Pressure Vessel Head degradation and during the extended plant outage, a series of key initiatives have been developed by the Leadership Team to focus on opportunities for continued improved performance. These initiatives extend beyond those significant improvements already realized during the extended outage and achieved prior to restart. These initiatives will provide additional improvements to further strengthen each of the four barriers. Details for each initiative are provided in the following pages.

Sponsor	Davis-Besse Initiatives	Barriers Enhanced			
		Individual	Programs	Management	Oversight
M. Bezilla	1. Organizational Effectiveness Improvement		X	X	
B. Allen	2. Operations Improvement		X	X	
B. Allen	3. Maintenance Improvement	X	X	X	
B. Allen	4. Training Improvement	X	X	X	
B. Allen	5. Work Management Improvement	X	X	X	
J. Powers	6. Engineering Improvement	X	X		
M. Bezilla	7. Continuous Safety Culture Improvement	X		X	X
R. Schrauder	8. Procedure Improvement	X	X		
R. Schrauder	9. Corrective Action Program Improvement	X	X	X	X
L. Myers	10. Internal and External Oversight Improvement			X	X

1. Organizational Effectiveness Improvement Initiative

DESIRED OUTCOME: ***Improved Human Performance, Leadership and Team Alignment through Critical Self-assessments, Operating Experience, Industry Benchmarking and Communications***

Sponsor: M. Bezilla

Key Actions	Owner	Completion
1. Improve individual and organizational performance and alignment through development and utilization of "alignment maps" at the Department/Section levels	J. Reddington	2nd Qtr 2004
2. Implement FENOC Business Practices for:	L. Dohrmann	
a) Focused Self-Assessments		1st Qtr 2004
b) Ongoing Self-Assessments		1st Qtr 2004
c) Benchmarking		1st Qtr 2004
d) Quarterly Collective Significance Reviews		through Cycle 14
3. Directors and Managers to attend a Leadership Academy to improve management skills	D. Haskins	2nd Qtr 2004
4. Provide formal Management Observation Skills Training	J. Reddington	2nd Qtr 2004

1. Organizational Effectiveness Improvement Initiative continued

Sponsor: M. Bezilla

Key Actions	Owner	Completion
5. Enhance the Management Observation Program by ensuring personnel providing oversight monitoring are familiar with DBBP-OPS-0001, "Operations Expectations and Standards"	K. Fehr	2nd Qtr 2004
6. Improve trending of major plant evolutions utilizing the Management Observation Program to track performance and feedback	K. Fehr	2nd Qtr 2004
7. Provide face-to-face communications training to all site supervisors and above	D. Haskins	2nd Qtr 2004
8. Re-evaluate all Davis-Besse supervisors to assess competency for current positions	D. Haskins	4th Qtr 2005
9. Conduct Supervisor and Management Talent Management Talks	D. Haskins	1st Qtr 2004
10. Continue with the 4 Cs meetings, D-B Team Meetings, Town Hall Meetings in accordance with Davis-Besse Business Practices	M. Lark-Landis	through Cycle 14

2. Operations Improvement Initiative

DESIRED OUTCOME: ***Establish the clear leadership role of Operations through improved Organizational Effectiveness and Alignment to the FENOC Processes***

Sponsor: B. Allen

Key Actions	Owner	Completion
1. Implement the Operations Excellence Plan:		
a. Implement Operations Leadership Improvements	M. Roder	1st Qtr 2004
b. Implement the 5 year staffing plan	M. Roder	1st Qtr 2004
c. Implement improvements to Operations work stations	S. Wise	3rd Qtr 2004
d. Implement common FENOC Operations work process tools	T. Stallard	4th Qtr 2004
2. Improve Operator knowledge, skills and abilities through testing, training and mentoring	J. Reddington	4th Qtr 2004

3. Maintenance Improvement Initiative

DESIRED OUTCOME: ***Improved Ownership and Materiel Condition of the Davis-Besse Nuclear Power Station***

Sponsor: B. Allen

Key Actions	Owner	Completion
1. Improve Maintenance training and standards through post-job evaluations, use of operating experience, and lessons learned from rework activities	M. Stevens	1st Qtr 2004
2. Improve Maintenance effectiveness through the assessment of work planning, scheduling, and implementation during critical equipment outages	M. Stevens	2nd Qtr 2004
3. Improve Maintenance Supervision through training and development	M. Stevens	3rd Qtr 2004
4. Improve Maintenance individual commitment area to establish improved ownership and accountability of Plant materiel condition	M. Stevens	4th Qtr 2004
5. Improve Maintenance staff knowledge, skills and abilities through testing, training and mentoring	J. Reddington	4th Qtr 2004

4. Training Improvement Initiative

DESIRED OUTCOME: ***Improved Individual And Organizational Performance through Training***

Sponsor: B. Allen

Key Actions	Owner	Completion
1. Improve individual and organizational performance and alignment by developing and providing training on design and configuration control to appropriate site staff	J. Reddington	3rd Qtr 2004
2. Establish engineering positional qualification requirements based on the standard FENOC Engineering Organization and complete qualification training for incumbent and new engineers	J. Reddington	4th Qtr 2004

5. Work Management Improvement Initiative

DESIRED OUTCOME: ***Provide for the effective and efficient cross-organizational utilization of resources in achieving a high standard of plant materiel condition by conducting the right work at the right time for the right reasons***

Sponsor: B. Allen

Key Actions	Owner	Completion
1. Common Process	G. Dunn	
a. Complete training and mentoring to support the effective transition into the FENOC Work Management Process		1st Qtr 2004
b. Resolve gaps in process implementation and station procedures		2nd Qtr 2004
c. Perform quarterly assessments of Condition Reports and Workweek critiques to ensure opportunities for improvement are addressed		through Cycle 14
d. Implement Risk Management process to improve station knowledge and awareness		**1st Qtr 2004**
e. Monitor and improve Order Quality		**2nd Qtr 2004**

5. Work Management Improvement Initiative continued

Sponsor: B. Allen

Key Actions	Owner	Completion
2. Maintenance Backlog Reduction	G. Dunn	
a. Complete walk-down and validation of the Order backlog to ensure proper category, priority, consolidation and elimination of invalid orders		4th Qtr 2003
b. Complete Cycle Plan identifying equipment outages and providing the framework for addressing backlog Order priorities and results of the System Health Report		1st Qtr 2004
c. Develop performance indicators to monitor and manage Order backlog		4th Qtr 2003
3. Outage Performance	G. Dunn	
a. Forced Outage Schedule template and readiness		1st Qtr 2004
b. Mid-Cycle Outage Preparation		1 mo. prior to Mid-Cycle Outage
c. Clarify expectations and improve contractor performance		4th Qtr 2004
d. 14th Refueling Outage Preparation		4th Qtr 2005

6. Engineering Improvement Initiative

DESIRED OUTCOME: ***Improved quality of Engineering products, increased access to Design Basis information, and continued improvement in Safety Margins of the Station***

Sponsor: J. Powers

Key Actions	Owner	Completion
1. Implement actions to improve Safety Margin:	J. Grabnar	
a. Determine the Safety Margin for the top 10 Risk Significant Systems and develop a plan to improve safety margins		2nd Qtr 2004
b. Electrical System coordination improvements		4th Qtr 2005
c. Masonry/block wall re-analyses and design changes		4th Qtr 2005
d. Service Water improvements		through Cycle 14
2. Perform additional Latent Issues Reviews	B. Boles	through Cycle 14
3. Implement the Design Calculation Improvement Plan	J. Grabnar	4th Qtr 2004
4. Enhance plant equipment performance through the FENOC Equipment Reliability Program	J. Rogers	through Cycle 14
5. Develop and implement the plan to enhance System Engineering ownership of plant systems in support of Operations	B. Boles	4th Qtr 2004

6. Engineering Improvement Initiative continued

Sponsor: J. Powers

Key Actions	Owner	Completion
6. Schedule and conduct additional Program Compliance Reviews including: a. Qualification of Program Owners b. Development of Program Manuals c. Creation of Performance Indicators	J. Powers	4th Qtr 2004
7. Establish the appropriate level of workload for Engineering Change Requests and develop a plan to reduce and maintain the backlogs to that level	J. Grabnar	2nd Qtr 2004
8. Perform semiannual effectiveness reviews to determine if the problem solving process, NOP-ER-3001 has been properly implemented during the previous period	B. Boles	through Cycle 14
9. Perform an independent outside assessment of the effectiveness of Engineering corrective and improvement actions	J. Powers	4th Qtr 2004
10. Implement ATLAS software for electronic maintenance of calculations and populate with 5 systems	C. Hawley	2nd Qtr 2004

7. Continuous Safety Culture Improvement Initiative

DESIRED OUTCOME: ***Demonstrate a continuously improving Safety Culture at the Davis-Besse Nuclear Power Station***

Sponsor: M. Bezilla

Key Actions	Owner	Completion
1. Monitor Safety Culture on a monthly basis	M. Bezilla	through Cycle 14
2. Assess Safety Culture using the FENOC Business Practice	M. Bezilla	4th Qtr 2005
3. Perform a Safety Culture assessment utilizing an independent outside organization	M. Bezilla	4th Qtr 2004
4. Provide SCWE training to Site employees who have not completed the SCWE portion of the Site Employee Orientation Manual	L. Griffith	1st Qtr 2004
5. Provide refresher training on SCWE and Safety Culture to Davis-Besse Supervisors and above	J. Reddington	3rd Qtr 2004
6. NQA to perform two Safety Culture Assessments	S. Loehlein	4th Qtr 2004/05
7. Employee Concerns Program group to perform two surveys of the Safety Conscious Work Environment	L. Griffith	4th Qtr 2004/05

8. Procedure Improvement Initiative

DESIRED OUTCOME: ***Improved procedure use and adherence and standardized procedure change process***

Sponsor: R. Schrauder

Key Actions	Owner	Completion
1. Perform Self-Assessments on procedure use and adherence	R. Schrauder	through Cycle 14
2. Review the Davis-Besse procedure change process to ensure alignment with FENOC standards for procedure preparation and revisions	L. Dohrmann	1st Qtr 2004
3. Provide training on procedure use and adherence	J. Reddington	2nd Qtr 2004
4. Perform follow-up effectiveness reviews on procedure use and adherence	L. Dohrmann	4th Qtr 2004

9. Corrective Action Program Improvement Initiative

DESIRED OUTCOME: ***Improved effectiveness and implementation of the Corrective Action Program demonstrated through improved Station performance***

Sponsor: R. Schrauder

Key Actions	Owner	Completion
1. Implement the Apparent Cause Improvement Plan:		
a. Create a Subcommittee to the Corrective Action Review Board for review of Apparent Cause Evaluations	L. Dohrmann	4th Qtr 2003
b. Identify Apparent Cause Evaluators	Managers	4th Qtr 2003
c. Develop Training Program and Expectations and provide training to the Apparent Cause Evaluators	J. Reddington	4th Qtr 2003
d. Qualify the trained Apparent Cause Evaluators using the Systematic Approach to Training	J. Reddington	1st Qtr 2004
2. Establish the appropriate level of workload for Condition Report Evaluations and Corrective Actions and develop a plan to reduce the backlogs to those levels	L. Dohrmann	1st Qtr 2004

10. Internal and External Oversight Improvement Initiative

DESIRED OUTCOME: ***Oversight activities are provided to ensure improved Station performance and the integrity of the Safety Barriers are sustained at the highest levels.***

Sponsor: L. Myers

Key Actions	Owner	Completion
1. Supplement quality oversight with off-site assistance to improve objectivity and ensure assessments are sufficiently critical	S. Loehlein	4th Qtr 2003
2. Supplement management oversight with off-site assistance to improve objectivity and ensure assessments are sufficiently critical	M. Roder	4th Qtr 2003
3. Focus more quality oversight on cross-functional activities and interfaces	S. Loehlein	1st Qtr 2004
4. Review and revise the master assessment plan at all three FENOC sites	S. Loehlein	1st Qtr 2004
5. Conduct an external assessment to evaluate the progress of organizational improvements in the areas of Critical Self-Assessments and Performance Observations	L. Myers	2nd Qtr 2004
6. Utilize INPO Assist Visits to assess the effectiveness of Improvement Initiatives	M. Bezilla	4th Qtr 2004

Safety Barrier Attributes and Goals

Safety Barrier attributes and goals have been identified within this plan to provide a focus on key parameters to assess and ensure that safety barriers are being maintained. These attributes, which are grouped by each of the four barriers, will be monitored monthly by the Davis-Besse Leadership Team.

Performance indicators contain the criteria for rating each attribute. Some attributes will be monitored by periodic assessments such as surveys or self-assessments to determine if the goal for that attribute is being met.

Individual Barrier Attributes				
Item	**Attribute**	**Goal**	**Owner**	**PI Source**
I-01	Event Free Clock	> 36.5 days on average	Reddington	P-06
I-02	Industrial Safety Performance	≤ 7 OSHA Recordables per year	Farrell	S-03
I-03	Radiation Protection events	≤ 2 events in any 4 consecutive quarters	Farrell	NRC Performance Indicator
I-04	Individual Error Rate	≤ 0.29 individual errors per 10,000 hours worked based on a 12 week rolling average	Reddington	P-03
I-05	Procedure and Orders use and adherence	Improving trend in Management Observations associated with Procedure and Order use and adherence	Allen	To be developed
I-06	Employee willingness to raise concerns	≥ 90% of individuals are willing to raise concerns to their supervisors or the Employee Concerns Program	Loehlein	NQA Interviews
I-07	Number of Operator Work Arounds	≤ 1 Level 1 and 2 Work Arounds AND Implementation plans for each Work Around	Roder	R-10
I-08	Number of Control Room Deficiencies	≤ 1 deficiencies AND Each deficiency corrected within 1 operating cycle	Roder	R-09
I-09	Percent of self-identified Condition Reports (CRs)	≥ 90% of Condition Reports are self-identified	Dohrmann	P-05

Individual Barrier Attributes				
Item	**Attribute**	**Goal**	**Owner**	**PI Source**
I-10	Cross-functional teamwork	≥ 75 Risk Assessment Indicator The Risk Assessment Indicator assesses each unit's risk of achieving safe and reliable operation. This indicator accomplishes this by measuring elements related to the probability and consequence of station events. Examples of elements making up this indicator include Probabilistic Safety Assessment, Aggregate System Health, Schedule Adherence, Activities Resulting in Reduced Trip-Logic, Schedule Stability, Scrams, Derates, Unplanned entry into Tech Specs, Entry into Abnormal Procedures	Dunn	FENOC Risk Assessment Performance Indicator for Davis-Besse
I-11	SRO reviews for Operability are performed in a timely manner	≥ 95% of SRO review required Condition Reports were reviewed for operability within 24 hours	Roder	CA-01
I-12	Employee willingness to use the Corrective Action Program	≤ 5% of individuals are not willing to use the Corrective Action Program	Griffith	SCWE/NQA Surveys
I-13	Worker confidence in raising safety concerns	> 90% of workers believe they can raise nuclear safety or quality concerns without fear of retaliation	Griffith	SCWE/NQA Surveys
I-14	Training Programs meet industry standards and effectively improve station performance as measured by NOBP-TR-1501	> 2.5 Training Program Performance Indicator	Reddington	P-02
I-15	Licensed Operator Requalification Training	≥ 95% pass rate in the Licensed Operator Requalification Training Program	Reddington	To be developed

Programs Barrier Attributes				
Item	**Attribute**	**Goal**	**Owner**	**PI Source**
P-01	Effectiveness of Condition Report Process	≥ 14 Corrective Action Program Effectiveness	Dohrmann	P-01
P-02	Condition Report (CR) category accuracy	≥ 90% CR category accuracy rate	Dohrmann	CA-08
P-03	Apparent Cause evaluation quality	≥ 90% acceptance rate of Apparent Cause evaluations (as determined by the CARB Apparent Cause Subcommittee)	Dohrmann	CA-05
P-04	Maintenance Rule System Reliability	≥ 0.987 Reliability	Boles	S-05
P-05	Number of Maintenance Rule (a)(1) Systems	No repeat Maintenance Rule (a)(1) systems within the operating cycle	Boles	New Plant Engineering PI
P-06	Program and Process Error Rate	≤ 0.30 Program and process errors per 10,000 hours worked	Reddington	P-04
P-07	Maintenance Rework	≤ 2.5 % rework	Steagall	Maintenance Rework PI
P-08	Number of late Preventative Maintenance Activities	0 PMs past their late or defer to date AND < 10% of PMs closed beyond 60% of the allowed grace period	Dunn	KPI-WM-06
P-09	Engineering Calculation Quality	≤ 1.0 score based on a 12 week rolling average (as measured by the Engineering Assessment Board Calculation Subcommittee)	Grabnar	To be developed

Management Barrier Attributes

Item	Attribute	Goal	Owner	PI Source
M-01	The Quality of Engineering Products	≤ 0.5 score based on a 12 week rolling average (as measured by the Engineering Assessment Board)	Grabnar	EN-03
M-02	Satisfaction of employees using the Employee Concerns Program (ECP)	> 75% of employees that use the Employee Concerns Program report being satisfied with the process	Griffith	SCWE 3-4
M-03	NRC substantiated allegations	<1.25 times the annual industry median of NRC substantiated allegations	Griffith	SCWE 4-2 & SCWE 4-6
M-04	Effectiveness of Safety Conscious Work Environment Review Team (SCWERT) in avoiding discrimination claims	< 2 times the annual industry median of discrimination allegations	Schrauder	SCWE 1-4
M-05	Management Observations are self critical	> 90% of the management observations performed are self-critical and recommended corrective actions were implemented	Fehr	Semiannual Assessments
M-06	Effectiveness of Management and Supervisors	Managers and supervisors are generally effective with a few exceptions	Loehlein	NQA Field Assessments
M-07	Improvements in Management Staffing	≥ 75% of open positions are filled within four months of the requisition receiving final approval AND Talent Management is in place for manager level positions and above AND Talent Management Candidates fill ≥ 70% of open leadership positions	D. Haskins	To be developed
M-08	Reactivity Management	≤ 1 Level 2 Reactivity Management Event per year AND 0 Level 1 Reactivity Management Events per year.	Roder	Operations Reactivity Management PI

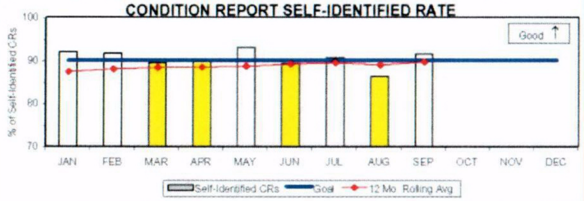
Management Barrier Attributes				
Item	**Attribute**	**Goal**	**Owner**	**PI Source**
M-09	Fuel Integrity	Zero fuel defects AND FRIp < 5.0E-4 microcuries/gram.	Kelley	R-07
M-10	Maintenance Order Backlog	Online: < 50 Corrective Maintenance Orders AND < 450 Elective Maintenance Orders Outage (prior to the startup from 14RFO): < 250 Corrective/Elective Maintenance Orders	Dunn	 KPI-WM-02 KPI-WM-02 MA-01
M-11	Number of Temporary Modifications	≤ 5 during the Operating Cycle And 0 related to equipment and design deficiencies after restart from major outages	Boles	Plant Engineering PI
M-12	Backlog of Procedure Change Requests (PCRs)	≤ 100 open Priority 1 and 2 Procedure Change Requests	Dohrmann	PR-01
M-13	Design Basis Maintenance	USAR, Design Criteria Manual, System Description, Design Basis updates completed within 3 months of schedule	Grabnar	To be developed

Oversight Barrier Attributes				
Item	**Attribute**	**Goal**	**Owner**	**PI Source**
O-01	Field Activity Assessments	$\geq$ 45 Observations completed per unit per month	Loehlein	DB-01
O-02	Responsiveness to QA Identified Issues	$\leq$ 45 days for SCAQ Condition Report Investigations AND $\leq$ 60 days for CAQ Condition Report Investigations	Loehlein	DB-02
O-03	Condition Report NQA Review	$\geq$ 90% of Condition Report Investigations reviewed by NQA are accepted or rejected within 15 days after the investigation was complete	Loehlein	DB-03
O-04	Corrective Action NQA Verification	$\geq$ 90% of Corrective Actions verified or rejected by NQA within 30 days	Loehlein	DB-04
O-05	Timeliness of NQA Audit Report Issuance	$\leq$ 25 working days from the date of the exit conference	Loehlein	DB-05
O-06	Use of Industry Peer Support	100% utilization of the scheduled INPO Assist Visits for 2004	Bezilla	To be developed

Examples of FENOC Performance Indicators for Davis-Besse

DAVIS-BESSE NUCLEAR POWER STATION

CONDITION REPORT SELF-IDENTIFIED RATE



PERFORMANCE MEASURE

Month: WHITE YTD: WHITE Year-end Expectancy: WHITE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Self-Identified CRs	92.0	91.6	89.5	89.8	93.1	89.3	90.6	86.3	91.5			
12 Mo. Rolling Avg.	87.4	88.0	88.3	88.4	88.6	89.1	89.4	88.9	89.6			

DEFINITION

This indicator reviews the population of Condition Reports (CR) originated for the month and calculates the percent self-identified compared to the total. CRs originated as a result of QA/INPO/NRC input/feedback or CRs originated as a result of a self-revealed issue are not considered self-identified.

RANKING CRITERIA

GREEN: ≥ 95% YELLOW: ≥ 80% and < 90%

WHITE: ≥ 90% and < 95% RED: < 80%

OBJECTIVE/GOAL

The Operational Excellence goal is greater than 95%. The 2003 Target is 90% of Self-Identified CRs.

ANALYSIS

The rate which CRs were self-identified was 91.5 percent (1127/1232) for August, 90.2 percent year to date, and a 12 month average of 89.6 percent. The performance measure for the month is WHITE, the performance measure for the year to date is WHITE, and the year end expectancy is WHITE.

Internal Oversight identified 6.3 percent (77/1232), External Oversight identified 1.5 percent (19/1232), and 0.7 percent (9/1232) were self-revealed.

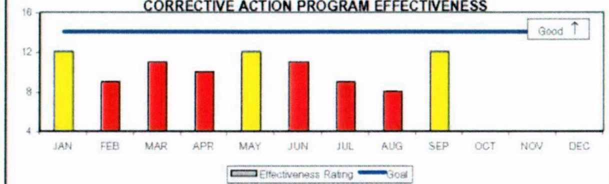
P-05

Achievement Responsibility - R.W. Schrauder / L.M. Dohrmann

Analysis Responsibility - K.L. Browning

DAVIS-BESSE NUCLEAR POWER STATION

CORRECTIVE ACTION PROGRAM EFFECTIVENESS



PERFORMANCE MEASURE

Month: YELLOW YTD: RED Yr-End Expectancy: YELLOW

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Effectiveness Rating	12	9	11	10	12	11	9	8	12			

	CARB	% Extension/Delinquent	Repeat Events	Self-Identified
Jul	R	R	G	W
Aug	R	R	G	Y
Sep	G	R	G	W

(Past 3 Months)

DEFINITION

This indicator measures the effectiveness of the Condition Report Process. The measure is a score derived from input in four elements that are keys to an effective program: 1) Condition Report (CR) Issue Identification is monitored to provide assurance that problems are being self-identified; 2) Investigation and Corrective Action Completion for Significant Conditions Adverse to Quality (SCAQ) and Conditions Adverse to Quality (CAQ) is monitored to identify the ability to appropriately schedule and meet the schedule. 3) Corrective Action Review Board (CARB) is monitored for accuracy of CR problem identification, causes, and proposed corrective actions; and 4) Repeat Events is measured to determine the ability to implement the CR Process to prevent SCAQ issues from reoccurring.

Each of these four elements contributes from 1 to 4 points to the overall score resulting in a final score of 4 to 16.

RANKING CRITERIA

GREEN: ≥ 15 WHITE: 13 or 14 YELLOW: 12 RED: ≤ 11

OBJECTIVE/GOAL

The Operational Excellence goal is to achieve a rating of 16. The 2003 Target is a Corrective Action Program Effectiveness rating of 14.

ANALYSIS

CARB accepted all five SCAQ root cause investigations which is GREEN performance (4 points). The 12 week average is 91 percent of the root cause investigations accepted by the CARB and therefore meets the long-term goal of 90 percent.

Extended or delinquent SCAQ / CAQ investigations, or corrective actions (remedial or preventive only) originally due in the month is 50.3 percent (354/704) which is RED performance (1 point). For assignments originally due in the month, 52.3 percent (174/333) of the applicable CR investigations were extended or delinquent, and 48.5 percent (180/371) of the applicable corrective actions were extended or delinquent. Non-restart corrective action document assignments have been extended to focus resources on plant heat-up to hot shutdown / hot standby.

Organizations with the highest rate of applicable corrective action document assignments extended or delinquent are Regulatory Affairs - 83.3 % (15/18), Training - 64.0 % (16/25), Plant Engineering - 60.6 % (86/142), and Design Engineering - 57.6 % (76/132).

SCAQ repeat events within the last two years is zero, which is GREEN performance (4 points).

Self-Identified rate for all CRs is 91.5 percent (1127/1232) which is WHITE performance (3 points).

C09

Appendix E – References

No.	Reference
	FENOC Documents
1.	Business Practice DBBP-BSA-0001, "Project Review Committee"
2.	Business Practice DBBP-VP-0001, "Safety Conscious Work Environment Review Team Charter"
3.	Business Practice DBBP-VP-0002, "Restart Readiness Review Extended Plant Outage"
4.	Business Practice DBBP-VP-0003, "Town Hall Meetings"
5.	Business Practice DBBP-VP-0004, "4Cs Meetings"
6.	Business Practice DBBP-VP-0005, "D-B Team Meetings"
7.	Job Familiarization Guideline TSM-115, "Boric Acid Corrosion Control Inspector"
8.	Licensee Event Report 1997-04
9.	Licensee Event Report 2002-02
10.	Licensee Event Report 2002-05
11.	Licensee Event Report 2002-06
12.	Licensee Event Report 2002-08
13.	Licensee Event Report 2003-01
14.	Licensee Event Report 2003-02
15.	Licensee Event Report 2003-03
16.	Licensee Event Report 2003-07
17.	"Operational Improvement Plan for Cycle 14"
18.	Long-Term Plan, "Operations Improvement Action Plan"
19.	Long-Term Plan, "Safety Culture Long-Term Improvement Plan"
20.	Report, "Assessment of Company Nuclear Review Board," dated August 13, 2002
21.	Report, "Collective Significance Review of the Causal Factors Associated with the Reactor Pressure Vessel Head Degradation at Davis-Besse," dated March 17, 2003
22.	Report, "Davis-Besse Nuclear Quality Assessment Quarterly Assessment Report DB-C-03-01 for January 1 to April 21, 2003," dated May 28, 2003

Appendix E – References

No.	Reference
23.	Report, "Evaluation of Corporate Management Issues Arising from Degradation of the Reactor Pressure Vessel Head," dated December 8, 2002
24.	Report, "Failure in Quality Assurance Oversight to Prevent Significant Degradation of Reactor Pressure Vessel Head; CR 2002-02578, dated 6-13-2002," dated September 10, 2002
25.	Report, "Failure to Identify Significant Degradation of the Reactor Pressure Vessel Head; CR 02-0685, 02-0846, 02-0891, 02-1053, 02-1128, 02-1583 02-1850 02-2584, and 02-2585," dated August 13, 2002
26.	Report, "Ineffective Corrective Action Problem Resolution Human Performance and Implementation; CR 02-04884, Dated 8-23-02," dated November 26, 2002
27.	Report, "Lack of Operations Centrality in Maintaining, Assuring, and Communicating the Operational Safety Focus of Davis-Besse and Lack of Accountability of Other Groups to Operations in Fulfilling that Role; CR 02-2581," dated November 22, 2002
28.	"Mode 4 Safety Culture Assessment"
29.	"Mode 5 Safety Culture Assessment"
30.	Report, "Root Cause Analysis Report: Assessment of Engineering Capabilities," dated April 9, 2003
31.	Root Cause Analysis Report, "Significant Degradation of the Reactor Pressure Vessel Head; CR 2002-0891, Dated 3-8-2002," dated April 15, 2002 and supplemented August 27, 2002
32.	Restart Building Block, "Containment Health Assurance Plan"
33.	Restart Building Block, "Management and Human Performance Excellence Plan"
34.	Restart Building Block, "Program Compliance Plan"
35.	Restart Building Block, "Reactor Head Resolution Plan"
36.	Restart Building Block, "Restart Test Plan"
37.	Restart Building Block, "System Health Assurance Plan"
38.	Restart Plan, "Management and Human Performance Improvement Plan"
39.	Restart Plan, "Restart Action Plan"
40.	Serial No. 1-1268, "Safety Significance Assessment of the Davis-Besse Nuclear Power Station, Unit I Reactor Pressure Vessel Head Degradation," dated April 8, 2002
41.	Serial No. 1-1281, "Replacement of the Reactor Pressure Vessel Head at the Davis-Besse Nuclear Power Station," dated August 9, 2002
42.	Serial No. 1-1285, "Verification of Technical Specification Pressure/Temperature Curves for Replacement Reactor Vessel Head," dated January 22, 2003

Appendix E – References

No.	Reference
43.	Serial No. 1-1286, "Confirmatory Action Letter Response - Management and Human Performance Root Cause Analysis Report on Failure to Identify Reactor Pressure Vessel Head Degradation," dated August 21, 2002
44.	Serial No. 1-1299, "Submittal of Evaluations Performed at Davis-Besse to Address U.S. NRC Inspection Manual Chapter (IMC) 0350, Item Number 1, Adequacy of Root Cause Determination," dated January 9, 2003
45.	Serial No. 1-1306, "Submittal of Collective Significance Review of the Causal Factors Associated with the RPV Head Degradation and Submittal of Revision 2 of the Management and Human Performance Improvement Plan," dated March 27, 2003
46.	Serial No. 1-1324, "Notification of Information Provided to the Nuclear Regulatory Commission that May Not Be Complete and Accurate in All Material Respects," dated July 15, 2003
47.	Serial No. 1-1325, "Notification of Information Provided to the Nuclear Regulatory Commission that May Not Be Complete and Accurate in All Material Respects," dated August 15, 2003
48.	Serial No. 1-1328, "Notification of Information Provided to the Nuclear Regulatory Commission that May Not Be Complete and Accurate in All Material Respects," dated September 15, 2003
49.	Serial No. 1-1330, "Final Report: Results of the Extent of Condition Review, NRC IMC 0350 Restart Checklist Item 3.i, 'Process for Ensuring Completeness and Accuracy of Required Records and Submittals to the NRC,'" dated October 24, 2003
50.	Serial No. 2797, "10 CFR 50.55a Requests for Alternatives Pursuant to American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Requirements at the Davis-Besse Nuclear Power Station - Third Ten-Year Interval Inservice Inspection Program (RR-A26 and RR-A27)," dated August 1, 2002
51.	Serial No. 2798, "10 CER 50.55a Request for Use of an Alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Requirements for the Davis-Besse Nuclear Power Station - Third Ten-Year Interval Inservice Inspection Program (RR-A2 Revi Si on)," dated August 1, 2002
52.	Serial No. 2809, "10 CER 50.55a Requests for Alternatives Pursuant to American Society of Mechanical Engineers Boiler and Pressure Vessel Code Requirements at the Davis-Besse Nuclear Power Station - Third Ten-Year Interval Inservice Inspection Program (RR-A26 and RR-A27)," dated September 23, 2002
53.	Serial No. 2960, "Davis-Besse Nuclear Power Station License Amendment Application to Revise Technical Specifications Regarding Steam and Feedwater Rupture Control System (SFRCS) Instrumentation Setpoints and Surveillance Intervals (License Amendment Request No. 03-0010),"dated August 25, 2003
54.	Technical Specification 3.4.6.2
55.	Training Lesson Plan FEN-50.9E
56.	Training Lesson Plan FEN-50.9M
57.	Updated Final Safety Analysis Report

Appendix E – References

No.	Reference
	NRC Documents
58.	10 CFR § 50.46
59.	10 CFR § 50.55a
60.	10 CFR § 50.59
61.	10 CFR § 50.7
62.	10 CFR § 50.9
63.	10 CFR Part 50, Appendix J
64.	Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety"
65.	Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles, dated August 3, 2001
66.	Generic Safety Issue 191, "Assessment of Debris Accumulation on PWR Sump Performance"
67.	Inspection Report (Special) 2002018 (Log 1-4420), dated July 24, 2003
68.	Inspection Report 50-346/02-08, dated October 2, 2002
69.	Inspection Report 50-346/02-11, dated July 7, 2003
70.	Inspection Report 50-346/03-04, dated May 9, 2003
71.	Inspection Report 50-346/03-08, dated May 30, 2003
72.	Inspection Report 50-346/03-09, dated July 7, 2003
73.	Inspection Report 50-346/03-17, dated September 29, 2003
74.	Letter (Log 6037) dated December 13, 2002, "Requests for Relief from American Society of Mechanical Engineers Boiler and Pressure Vessel Code Requirements for the Third 10-Year Interval Inservice Inspection Program (TAC No. MB5848)"
75.	Letter (Log 6038) dated December 13, 2002, "Requests for Relief from American Society of Mechanical Engineers Boiler and Pressure Vessel Code Requirements for the Third 10-Year Interval Inservice Inspection Program (TAC No. MB5849)"
76.	Letter dated April 29, 2002, Inspection Manual Chapter 0350 Oversight Panel
77.	Letter dated August 16, 2002, Restart Checklist (first)
78.	Letter, CAL No. 3-02-001, "Confirmatory Action Letter – Davis-Besse Nuclear Power Station," dated March 13, 2002
79.	Letter, CAL No. 3-02-001B, "Update of Confirmatory Action Letter 3-02-001A Status for Davis-Besse Nuclear Power Station," dated December 24, 2002

No.	Reference
80.	Letter, CAL No. 3-02-001C, "Update of Confirmatory Action Letter 3-02-001B Status for Davis-Besse Nuclear Power Station," dated January 21, 2003
81.	Letter, CAL No. 3-02-001D, "Update of Confirmatory Action Letter 3-02-001C Status for Davis-Besse Nuclear Power Station," dated July 17, 2003
82.	Regulatory Guide 1.82, Revision 2, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident for Boiling Water Reactors"
	Miscellaneous Documents
83.	ANSI N45.2.11, "Quality Assurance Requirements for the Design of Nuclear Power Plants"
84.	ASME Code Section XI, 1995 Edition through the 1996 Addenda