U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	Indiana Michigan Power Company
Facility:	Donald C. Cook Nuclear Generating Plant
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EXECUTIVE SUMMARY

D. C. Cook, Units 1 and 2
NRC Inspection Reports 50-315/98017; 50-316/98017

This was a special inspection to review the licensee's conduct of a Safety System Functional Inspection on the Auxiliary Feedwater system. The findings of that inspection were then used to assess the effectiveness of a Level 1 System Readiness Review, conducted earlier by the licensee's system engineering organization on the same system. A special test, conducted to address a finding from the Safety System Functional Inspection, was reviewed and witnessed. The report covered an intermittent twelve-week period of inspection by two region-based inspectors and three consultants.

- The Safety System Functional Inspection was a thorough examination of the Auxiliary Feedwater system, conducted in a professional manner by a strong, experienced team of inspectors and documented in a well-written report. The inspection identified a number of potential operability issues which must be addressed and resolved by the licensee's engineering staff. (section E1.2)

- The special test of an Auxiliary Feedwater system suction strainer, as written, would not support an operability determination, was deficient in several areas, was not auditable, and was inappropriate for a test of a safety-related system. An unresolved item was identified in this area pending review of the completed test package. (section E1.3)

- The undetected existence of the design flaw in the AFW system revealed that the licensee's design control measures did not adequately verify the design of the system as required by 10 CFR 50, Appendix B, Criterion III. While this violation would normally be categorized at Severity Level III, the NRC has exercised discretion under Section VII.B.2 of the Enforcement Policy and is not issuing a Notice of Violation. (section E1.3)

- The System Readiness Review process was ineffective to identify substantive design and operability questions because it was too narrow in scope, did not examine systems retrospectively, and did not integrate findings of other review programs into its conclusions. The use of an uncontrolled, administrative guideline to conduct the System Readiness Reviews was not consistent with 10 CFR 50, Appendix B, Criterion V. A non-cited violation was identified in this area. (section E1.4)

- The Level 1 System Readiness Review done on the Auxiliary Feedwater system was ineffective in identifying potential operability issues as a result of the flaws in the process and a lack of technical rigor in some aspects of the review. (section E1.5)

Report Details

Summary of Plant Status

Both units were in an extended shutdown throughout the inspection period.

I. Engineering

E1 Conduct of Engineering

E1.1 Background

a. Inspection Scope

This section provides a context for the NRC's inspection of the licensee's Safety System Functional Inspection (SSFI) of the Auxiliary Feedwater (AFW) system, review and witnessing of the special AFW pump suction strainer test, and the review of the System Readiness Review (SRR) program.

b. Observations and Findings

As part of the licensee's restart strategy, an operational readiness assessment of plant systems was initiated. Guidelines for these assessments, which were named "System Readiness Reviews," were developed and the process was undertaken. To ensure that these SRRs were effective in examining the systems and that conclusions about system operability were correct, the licensee elected to test them by doing an SSFI on a system where an SRR had been completed. The AFW system was chosen for this effort. The NRC elected to monitor this SSFI to independently assess how effectively it was done and to evaluate its conclusions.

The licensee's SSFI identified a number of operability issues which the plant's engineering staff was required to address, and if validated, develop appropriate corrective actions. One of these issues was the potential for clogging of clean-water, duplex strainers installed in the suction of each AFW pump. The Essential Service Water (ESW) system, a raw lake water system with the capability for entraining debris such as silt and sand, was designed as the safety-related water source for the AFW pumps, although the preferred source was the pure water condensate storage tank (CST). In the accident scenario, entrained debris could clog these suction strainers. To address this question, the plant's engineering staff developed and attempted a test which supplied ESW to the strainer of the Unit 1 West Motor-driven AFW Pump (MDAFP). This pump was chosen because the ESW piping upstream of the strainer was considered the most likely to accumulate debris in the stagnant line. The NRC chose to review this test and to witness its performance.

The conclusions of the licensee's AFW SSFI differed substantially from the conclusion of the AFW SRR. The AFW SRR concluded that the system was in good condition and

capable of fulfilling its design functions. The SSFI raised 20 operability questions and identified 68 other deficiencies which the plant's engineering staff had to address. Because of this difference in conclusions between the two system examinations and the subsequent validation of the strainer clogging concern, discussed later in this report, the NRC chose to examine the AFW SSFI report, the SRR guidelines, and the AFW SRR in order to find out why the AFW SRR was ineffective in identifying operability issues.

The NRC monitored the licensee's AFW SSFI using Inspection Procedure (IP) 40501, "Licensee Self-Assessments Related to Team Inspection," and IP 93801, "Safety System Functional Inspection," as guidance. Review and witnessing of the special suction strainer test were done using IP61726, "Surveillance Observations." IP 40500, "Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems," was used for the review of the SRR process.

c. Conclusions

To validate the SRR process, the licensee did an SSFI on the AFW system. The conclusions of the SSFI differed substantially from the AFW SRR, raising questions about the SRR process. An attempt to resolve one of the SSFI concerns demonstrated that supplying the Unit 1 West MDAFP with ESW clogged the associated suction strainer and validated the SSFI concern. Consequently, the AFW SRR was considered ineffective in identifying operability issues.

E1.2 Auxiliary Feedwater Safety System Functional Inspection (40501)

a. Inspection Scope

The team conducted an in-process inspection of the licensee's SSFI using a number of inspection techniques. The intent was to amass a large number of observations of varying types that could be used to accurately characterize the quality and effectiveness of the SSFI. These techniques included:

- Do a confirmatory SSFI, independently identify a set of findings, and monitor to see if a reasonable proportion of the same findings were identified by the SSFI team
- Periodically attend SSFI team meetings, monitor and evaluate the interactions, the findings identified, and the process used to characterize the findings
- Review formal questions presented by the SSFI team to the response team and the answers provided by the response team
- Establish direct interfaces with counterpart team members and evaluate their performance
- Monitor and evaluate the SSFI team's approach to potential issues
- Independently identify some issues, bring these issues to the SSFI team's attention without characterizing them, and evaluate their recognition, assessment and disposition of the issue
- Review and evaluate the SSFI team's report after it was issued on October 23, 1998

During the inspection, the team examined a large number and wide variety of documents. Broadly, these included the Updated Final Safety Analysis Report (UFSAR), Design Basis Documents (DBD), Procedures, Condition Reports, Technical Manuals, drawings, permanent and temporary modification packages, surveillance and audit packages, work packages, calculations, system notebooks, and the AFW Level 1 SRR. A comprehensive listing is attached to this report.

b. Observations and Findings

The overall SSFI effort consisted of two teams, an inspection team and a response team. The licensee's inspection team was composed of two direct licensee employees who managed the inspection, and seven experienced consultants from Duke Engineering and Services. The inspection plan used by the team was based on NRC IP 93801, "Safety System Functional Inspection (SSFI)." The response team was composed of members of the plant's system engineering organization. Their purpose was to respond to technical questions raised by the inspectors and provide documents and information as requested. To measure the effectiveness of the response team, the licensee developed performance criteria for accuracy and timeliness.

The intent of the NRC's confirmatory SSFI was to independently amass a set of findings and compare these findings to those of the licensee's SSFI team. Complete overlap between the findings of the two teams was not expected; a conclusion of acceptable overlap was based on both the number of common findings and the significance of unique findings. The confirmatory SSFI involved a walkdown of the AFW system, and a review of the documents described above.

The walkdown of the system was done, accompanied by a member of the plant engineering staff who recorded questions and discrepancies identified by the NRC team, on the second day of the inspection and the results provided a foundation for the remainder of the inspection. The NRC team noted that the system was in generally good condition but noted some areas of concern. These included the suction strainers for the AFW pumps (none of the NRC team had ever seen this on an AFW system before), lack of high point vents on some of the pumps' suction piping, lack of pressure relief on some of the pumps' suction piping, damaged test instrument tubing, high energy line break considerations related to open doors, seismic questions because the seismic AFW system was housed in a non-seismic (turbine) building, and human factors considerations for the hot shutdown panel. All of these were also found by the licensee's SSFI team during their walkdown and addressed in the SSFI report.

The SSFI team's report identified 88 issues; 20 were operability questions and 68 were deficiencies or discrepancies which were not considered to have operability impacts. Three of the operability questions were considered particularly significant. These involved the potential for clogging of the AFW pump suction strainers in the event that ESW was used as the water supply, lack of protection for the preferred water source (condensate storage tank), and high energy line break impacts on the AFW pump and controls. Concerns identified during the walkdown were included, as were concerns on corrective action effectiveness. The NRC team's review of system documents resulted

in a variety of questions concerning accuracy of calculations, calibration of instruments, design basis ambiguities, impact of modifications, lack of follow-up on previously identified issues, system modifications done outside of the licensee's design change process, surveillance testing procedures, and steam generator nozzle cracking due to thermal stresses. The overlap between NRC questions and SSFI team questions was considered good. This was based on a large number of commonly identified questions and by a very small number of unique NRC questions which were considered to have above average significance. The specific questions in the categories listed above were not disclosed to the licensee until after the SSFI was completed and the report was issued.

Subsequently, the team leader met with representatives of the plant's engineering and licensing staffs and reviewed the NRC's list of questions with them. These were added to the list of 88 issues identified by the SSFI team; the complete list was to be prioritized, addressed, and corrective actions developed and implemented as necessary. The NRC will review the licensee's corrective actions for this combined list of issues during a comprehensive engineering corrective actions team inspection to be done at a time not yet scheduled but prior to plant restart. .

The licensee's SSFI team held daily meetings to examine new issues and review the status. The NRC team regularly attended these meetings to evaluate the issues raised, the safety assessment of the issues, the technical quality of the discussions, and the management of the effort. The team noted that the issues were plainly posted, a tracking and identification system for issues was implemented, and open discussion was encouraged. The tracking system worked well, allowing the SSFI team to monitor the response team's progress in addressing or providing information on the issues. Posting the issues helped keep discussions on track and the team's discussions were focused on the issues. As issues were raised, discussions addressed both technical and regulatory significance. The NRC team considered these meetings as well-managed, effective, and productive. The NRC used the discussions at these meetings to gauge the team's approach to potential issues, team members' individual and collective technical expertise, and the team's ability to evaluate, assess, and disposition issues. With one exception, discussed later in this section, the SSFI team members showed a solid understanding of technical and regulatory significance, and appropriately characterized the issues raised.

During the inspection, the response team compiled a data base of the SSFI team's questions, individual actions taken on the questions, and the status of the response to those questions. This provided a method of gauging the response team's effectiveness in addressing concerns, from both timeliness and quality perspectives. On a daily basis, the NRC team received printouts of new questions from the SSFI team as well as printouts of updates to existing ones. At the end of each week of the inspection, a complete printout was received. By reviewing these printouts, the NRC team had another method to evaluate the effectiveness of the inspection team as well as the performance of the response team. There were two types of questions sent to the response team: general information gathering and specific technical. The NRC team sampled the specific technical questions and noted that they were concise and focused

on specific aspects of system design, operation, or components. The response team, after some problems with completeness and accuracy early in the inspection, was effective and performed acceptably.

Throughout the inspection, the NRC team interfaced directly with counterpart members of the licensee's SSFI team for the purposes of information exchange, seeding in issues to evaluate responses, and assessing the team member's technical expertise. Seeding in issues involved raising an issue with a member of the SSFI team without characterizing it, and then evaluating the team's recognition, response, assessment, and disposition of the issue. In every case but one, the SSFI team's approach to the issue was appropriate from both the technical and regulatory aspects. The exception involved the lack of high point vents on the suction piping for the turbine-driven auxiliary feedwater pumps (TDAFP). This was initially identified during the system walkdown. A review of the procedures for filling and venting the AFW system revealed that the plant staff relied on sweeping through the pump, assuming that any air in the piping would be entrained and carried through to the steam generators. This ignored the conditions where an apparently adequate flow of water could go through a pipe without the pipe being completely filled. The hydraulic analysis which analytically supported the operability of the system was complex and involved consideration of the relative smoothness of the inside of piping (as expressed by the Reynolds number). The NRC team was concerned that without high-point suction vents, adequate venting of the pumps and complete filling of the piping could not be assured. The team viewed the use of high point vents to ensure complete filling of piping as fundamental to proper system operation. The NRC team viewed the lack of assurance of complete system venting as inconsistent with the sophistication of the supporting analysis. When this issue was raised, the SSFI team recognized the lack of high point vents as an anomaly, but did not recognize the technical concerns related to the analysis and seemed inclined to accept the licensee's venting procedure as adequate. Toward the end of the inspection, it was clear that the SSFI team intended to address this issue but did not consider it as a potential operability question. (Note: the SSFI report characterized this as an observation of a weakness rather than a potential operabililty issue and considered the fill and vent procedure as adequate based on operating experience.) The plant's engineering staff issued a Condition Report to address this issue (CR 98-9865) that will be examined during the engineering corrective actions inspection discussed earlier. Regardless of the difference in technical opinion on this one issue, direct interaction between counterpart team members showed that SSFI team members were exceptionally well-versed and knowledgeable in their respective disciplines.

The SSFI report was issued two weeks after the completion of the inspection. The report identified 88 issues which were classified as either "issues" or "observations." Issues were defined as findings that prevented or had the potential to prevent the system from fulfilling its safety function or meeting its design/licensing basis. Observations were defined as other findings that were important or merited attention. A series of observations which had a common theme was classified as an "issue." The report discussed 20 "issues," and 68 "observations." The report identified weaknesses in maintaining passive components, most notably the condensate storage tank and the AFW pump suction strainers, weaknesses in calculations, the hydraulic analysis, and

component design areas of the system, and lack of understanding for the impact of non-safety related components on safety-related systems. The most significant issues raised by the SSFI were:

- Lack of a design basis for the AFW pump suction strainers. The original specification for the strainers did not identify raw water as a supply source and the SSFI team was concerned that shifting to the Essential Service Water during an accident could result in clogging the strainer. (Note: this will be further developed in the next section.)

- Condensate storage tank design basis and material condition. Lack of temperature monitoring or freeze protection for the tank could adversely impact the net positive suction head for the pumps and the deteriorated condition of the internal bladder's rubber seal could result in chunks of rubber clogging the strainer.

- A lack of evidence demonstrating that temperature and humidity effects on AFW instruments and cables from a high energy line break would not disrupt or disable the AFW system.

Other issues raised by the SSFI were seismic qualification of the TDAFP exhaust piping, motor operated valve calculation inadequacies, generic calculation problems, generic configuration control, operator ability to complete required actions within required time periods, generic procedural inadequacies, hot shutdown panel materiel condition deficiencies, failure to implement commitments regarding control of microbiologically induced corrosion of piping systems, improper maintenance on a TDAFP governor valve stem nut, and generic correction action program deficiencies. Observations covered instrumentation deficiencies, documentation deficiencies, emergency operating procedure discrepancies, surveillance procedure inadequacies, and system configuration concerns. Based on the three significant findings, the number of operability issues, and the number of other observations, the SSFI report concluded that it had not been satisfactorily demonstrated that the AFW system was capable of fulfilling all of its safety functions.

The NRC review noted that many of the issues identified during the confirmatory SSFI were addressed in the licensee's report. The SSFI report was well-written and logically organized. With the exception of the issue involving system fill and vent, issues were properly characterized and the report reached an appropriate operability conclusion based on the findings it contained.

c. Conclusions

The licensee's SSFI was a thorough examination of the AFW system, conducted in a professional manner by a strong, experienced team of inspectors and documented in a well-written report. The inspection identified a number of potential operability issues which must be addressed and resolved by the licensee's engineering staff.

E1.3 AFW Suction Strainer Special Test (61726)

a. Inspection Scope

As noted in section E1.1, one of the operability issues raised by the SSFI was the potential for plugging of the suction strainer for the AFW pumps. The strainer had a 0.030 inch well-screen mesh and was suitable for use as a strainer in a pure water system, rather than a raw water system. The SSFI team was concerned that on a switch-over to ESW during an accident, debris, silt, sand, and mussel shells accumulating in the stagnant line during routine operation would plug the strainer on initiation of ESW flow to the AFW pumps. The engineering staff devised a special test intended to resolve the plugging question. The NRC team reviewed the special test procedure (01-OHP SP.196, Revision 0), documents referenced in 01-OHP SP.196, the related temporary modification package (# 1-98-25), and the related job order (# C0046873). An NRC inspector also observed portions of the testing and related maintenance actions.

The special test procedure was reviewed to ensure that it had all of the attributes necessary to make it auditable and reproducible, suitable for a test of safety-related equipment. The inspector reviewed the special procedure and raised questions on a number of aspects. Subsequently, the inspector reviewed the related work order and temporary modification package.

b. Observations and Findings

When the test was initially proposed by the licensee's engineering staff, it was offered as proof of operability of the Unit 1 West MDAFP. This pump was selected by the licensee because its suction piping configuration was considered most susceptible to accumulation of debris from the ESW system. On reviewing the test, the inspector noted that the purpose was to "aid in determining the functionality of the AFP suction strainers with ESW flow established through them." The inspector concurred with this after noting that the procedure did not require maintaining the 450 gallons per minute required flow for nine hours as specified by the Updated Final Safety Analysis Report.

The inspector's review of the special test procedure resulted in a list of concerns involving test objective, acceptance criteria, initial system and plant conditions, test methodology, procedure references, measuring and test equipment, and documentation requirements. Among the inspector's concerns were the following items:

- lack of clearly defined initial conditions
- lack of important references
- lack of criteria for certain steps, e.g., shifting strainers
- no provision for recording of measuring and test equipment data
- the test called for carrying out actions which were proscribed by procedures but did not specify those procedures
- lack of appropriate instructions for the post-test flush and recording of post-test flush results

Subsequently, the inspector reviewed the related temporary modification package and the job order. Both documents provided some resolution to the inspector's concerns but did not completely address them. A key consideration which was not addressed was the lack of initial conditions and a method for documenting them. Without these clearly defined and recorded, the test could not be reconstructed if necessary to validate its results. The same concerns were applicable to the recording of test equipment data, and the specification and use of procedures. Without this information the test was not auditable as appropriate for use as a safety-related activity. The inspector met with members of the engineering staff prior to the test being attempted and expressed his concerns. The licensee's engineering staff understood the inspector's concerns and committed to include required information in the test director's log. Incorporating this information into the test results package would result in an appropriate quality record. The acceptability of the test procedure and the test results package as a quality record for a safety-related activity is an unresolved item (URI 50-315/98017-01(DRS); 50-316/98017-01(DRS)), pending a review of the completed test results package by the inspector. During the meeting the inspector expressed concerns that the test procedure was, by itself, insufficient as a quality record. The engineering staff's response was that the procedure, the related temporary modification, and job order formed a package and this was acceptable under the Cook plant testing program. The inspector noted that in order for an acceptable package to be built, several documents, some not specified in the procedure, would need to be incorporated into the package. This was considered a weakness in the testing program, in that it resulted in a fragmented product that would be extremely difficult to validate.

Shortly after the discussion, the licensee's engineering staff attempted the test. The inspector was not informed of the attempt and did not witness it. Based on the licensee's records, criteria for considering the strainer plugged were exceeded in less than 90 seconds and the test was subsequently terminated. At that point flow had dropped below the required 450 gallons per minute, leading to the conclusion that the Unit 1 West MDAFP pump would not have performed its safety-related function had it been called upon. Similar testing was not conducted for the Unit 1 east or turbine-driven pumps, so no conclusion on their capability to perform, if required, could be drawn. The inspector witnessed the opening and cleaning of the suction strainer and noted that the debris consisted of silt, sand, and crushed zebra mussel shells. The licensee removed and collected approximately ½ gallon of debris. The test was successfully attempted the next day, with flow through the strainer for approximately 11 hours. This indicated that once the line was cleared, ESW would provide an adequate supply to the AFW pump under the lake conditions existing at the time of the test.

In 1994, a radiographic examination of the ESW supply to the AFW pumps revealed significant plugging of the piping with debris. This was documented in Condition Report 94-0546, dated March 21, 1994. A calculation was performed to show that even with an approximate 80% blockage, that adequate flow to the pumps was maintained. Memoranda attached to the condition report recognized that the debris would be flushed into the strainer but did not recognize that it would potentially be plugged. Response to that event included flushing and verifying cleanliness of the piping and installing a clean-out in the suction lines for the AFW pumps under Minor Modification MM-512. A routine

preventive maintenance action for flushing these lines was implemented and the lines were flushed during refueling outages. The licensee's records showed that the most recent flush of the affected lines was on February 5, 1998, approximately nine months before the test failure. Because the unit had been shut down prior to that date, AFW was not required to be operable at any time during the nine months. The line was also flushed on April 2, 1997, about three weeks before Unit 1 was returned to service after a refueling outage. The unit operated for approximately five months and was then shut down on September 7, 1997. Based on this, the Unit 1 West MDAFP was considered operable through the date when Unit 1 was shut down. Consequently there was no violation of Technical Specifications.

The incorporation of 0.030 inch well-screen strainers in the suction of the AFW pumps as part of the system's design was not discussed in Section 10.5.2 of the UFSAR, nor in the licensing Safety Evaluation Report issued by the Atomic Energy Commission on September 10, 1973. Incorporating these strainers resulted in the potential for the system not to be able to perform its function was it to be required. This was demonstrated by the loss of ESW supply to the Unit 1 West MDAFP under test conditions. The test revealed that the pump was incapable of performing its function after nine months of silt accumulation. Because silting rates and foreign material in the raw water source were directly affected by conditions in Lake Michigan it could not be determined how many months of accumulation would be sufficient to render the pump inoperable. It could only be concluded that at some time between immediately after the periodic flush and nine months, the pump would become inoperable. Considering that an operating cycle at D. C. Cook lasts from 16 to 18 months and using the nine-month interval, it was likely that the pump was incapable of performing its required function for extended periods during each operating cycle. Consequently, the inclusion of these strainers in the suction line for the AFW pumps was a significant design error.
10 CFR 50, Appendix B, Criterion III, requires, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program. Contrary to this, the licensee's design control measures did not verify the adequacy of the design, as evidenced by the failure to identify the design flaw in the AFW system which has existed since the plant was licensed for operation. However, because the violation was based upon activities prior to the events leading to the current extended plant shutdown, the NRC is exercising discretion in accordance with Section VII.B.2 of the Enforcement Policy and refraining from issuing a citation for this violation (NCV 50-315/98017-02(DRS); 50-316/98017-02(DRS)).

c. Conclusions

The special test of the AFW system, as written, would not support an operability determination, was deficient in several areas, was not auditable, and was not appropriate for a test of a safety-related system.

The licensee program for conducting special tests was fragmented in that it allowed the use of multiple, often independent documents to comprise a test package. As such, it

created a vulnerability where the test could not be audited, verified, or recreated should the need arise.

The undetected existence of the design flaw in the AFW system revealed that the licensee's design control measures did not adequately verify the design of the system as required by 10 CFR 50, Appendix B, Criterion III.

E1.4 System Readiness Review Process (40500)

a. Inspection Scope

As discussed in Section E1.2, the AFW SSFI was done to test the effectiveness of the Level 1 SRR process. As noted earlier, the SSFI described 20 operability issues and 68 observations; the SRR done for the AFW system did not identify any operability concerns and concluded that the system was operable and in good materiel condition. To understand how this occurred, the inspector reexamined the SSFI report and compared it to the guidelines for the SRR process. The specific documents reviewed included:

- The AFW SSFI report
- System Readiness Review Guidelines dated August 1, 1998 which contained Revision 5 of the Plant System Readiness Review Instructions
- Restart Strategy Issue 5455 titled Plant Systems Readiness Assessment
- Assorted Condition Reports, Problem Reports, Licensee Event Reports (LER), and the Maintenance Rule scoping and risk significance lists.

b. Observations and Findings

The SRR program was a three-tier process, intended to determine if a system met design requirements, had been suitably tested, and was ready to support safe and reliable startup and operation until the applicable unit's next scheduled refueling outage. Succeedingly intensive reviews were proscribed for plant systems primarily based on their safety classification and their Maintenance Rule risk significance. The 21 most risk significant, safety-related systems were selected for the most intense "Level 1," review. The inspection focused on the Level 1 process. Some evaluation of system selection was done; with only a few exceptions, the inspector concurred with the list of Level 1 systems. The exceptions were the condensate system, the N-train battery, and safety-related ventilation systems; these systems were assigned Level 2 reviews. The AFW SRR included the piping and components for CST supply to AFW but stopped at the CST itself. Because condensate was only subject to a Level 2 review, this left the preferred AFW source without the same level of review as the AFW system. The inspector was concerned that the N-train battery was not subject to Level 1 review although the system's only purpose was power for operation of the TDAFPs and the associated direct current motor operated valves. The inspector considered ventilation systems as candidates for Level 1 review because in many cases they supported the technical specification operability of other safety-related systems, were designed to minimize releases, or were needed to allow habitability of spaces essential to mitigation of an accident.

Although the SRRs were an activity affecting quality and were being used to establish the operability of safety-related systems, the guidelines were not an approved procedure that would have required quality assurance level documentation. This made the process vulnerable to inconsistent system reviews by system engineers and a lack of auditability and repeatability. The inspector's review revealed several other weaknesses and inconsistencies.

- The "Documentation," section stated that the package would have to stand on its own in terms of demonstrating system readiness. The guidelines stated that documentation requirements would be defined to ensure consistency among the various reviews. The original guidelines were issued in early 1998; revision 5 was issued in August 1998 and this information still had not been provided.

- The "Review Strategy," section allowed for variable depth of reviews based on perceived levels of system engineer experience

- The "Review Strategy," section stated that guidance on a system-by-system basis for depth of review was contained in Attachment B of the instruction. Attachment B provided what appeared to be a minimum list of attributes to be examined but contained no criteria for scaling up the reviews, nor did it contain a listing of additional attributes to be examined. No "system-by-system," guidance was provided.

- The "Actions Arising from System Readiness Reviews," section stated that guidance for identifying restraints to plant (mode) operation, i.e., restart criteria, would be forthcoming. Similar to the comment on documentation requirements, revision 5 still did not provide the information.

The SRRs were to be conducted by the assigned system engineers and focused on two interrelated areas, materiel condition and design basis conformance. Materiel condition was to be assessed using:

- a system walkdown by the system engineer with operations, maintenance, and radiation protection personnel
- a review of outstanding condition reports on the system or its components
- a review of the outstanding corrective or preventive maintenance backlog
- a review of maintenance rule performance
- operability determinations currently in effect

The inspector noted that none of this information was historical. The SRR was only looking at existing conditions and did not consider that a retrospective examination could have provided evidence of materiel condition problems. The SSFI identified a number of materiel condition deficiencies through its review of closed condition reports and job orders. The most significant of these was the improper installation of the stem nut on a turbine-driven pump governor valve. The inspector also noted that other sources of materiel condition information, such as operator work-around listings, audits and

surveillances by Quality Assurance, and third-party independent system examinations, were not specified for review.

Design basis conformance was to be evaluated by:

- reviewing functional design requirements
- reviewing recently completed surveillance testing and trends
- reviewing scheduled surveillance testing
- reviewing preoperational testing
- reviewing design modifications approved but not implemented
- reviewing design modifications in service
- reviewing temporary modifications currently in service
- reviewing industry operating experience

The inspector noted that the list did not include calculations, basic Westinghouse design documents, or licensing basis information such as NRC correspondence. The inspector also noted that the process did not require the identification and validation of the design basis for all system components. Such a requirement would have led to the discovery that there was no design basis for the AFW pump suction strainers. The inspector was aware that there were other engineering evaluation programs in progress at the time of the SRRs. Calculations, as a program, were under review, as was the Updated Final Safety Analysis Report; results from these efforts were not factored into the SRR process.

10 CFR 50, Appendix B, Criterion V, requires, in part, that activities affecting quality be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances. The use of administrative guidelines which were identified as having several significant deficiencies, rather than an approved procedure to control the process of determining the operability of a safety-related system, was considered a violation of 10 CFR 50, Appendix B, Criterion V. Independent of the inspector's review of the SRR program, the licensee's Engineering Issues Review Group, a special assessment panel commissioned by the Senior Vice President, reached the same conclusions. At a meeting held immediately prior to the exit meeting for this inspection, licensee management presented the review group's report and outlined broad corrective actions including reorganizing of the engineering department, retraining of engineers, and implementation of an expanded SRR program. The circumstances surrounding this were unique and would not have been prevented by corrective actions taken for other violations within the last two years. Consequently, this non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation (NCV 50-315/98017-03(DRS); 50-316/98017-03(DRS)), consistent with Section VII.B.1 of the NRC Enforcement Policy.

c. Conclusions

The SRR process was too narrow in scope, did not examine the system retrospectively, and did not integrate findings of other review programs into its conclusions. Use of

an uncontrolled, administrative guideline was inconsistent with the requirements in 10 CFR 50, Appendix B, Criterion V.

E1.5 AFW Level 1 System Readiness Review (40500)

a. Inspection Scope

The AFW SRR was completed and approved by licensee management on September 9, 1998. The review concluded, "... the AFW system is and has been maintained within the design basis, the Technical Specifications, and the UFSAR requirements. The AFW system is capable of providing and fulfilling its design function." As discussed earlier in this report, the conclusions of the AFW SSFI were in direct contrast to the AFW SRR. Having completed the review of the AFW SSFI and the SRR process guidelines, the inspector reviewed the AFW SRR against the guidelines to determine whether the SRR's failure to identify operability concerns was the result of flawed process, deficient execution, or some combination of both.

b. Observations and Findings

The AFW SRR contained sections addressing system boundaries and description, surveillance testing, walkdowns, outstanding conditions, operability determinations, design configuration, and maintenance rule performance. In this regard, the AFW SRR complied with the guidelines in effect at the time the review was conducted.

The system boundaries and description outlined the limits of the review but no information was provided to demonstrate that these were within or extended beyond the established system boundaries. The review explicitly excluded the condensate storage tank, ESW system, and electrical power supplies (4kV and battery busses). The error in excluding the condensate storage tank from the Level 1 process was discussed in the previous section. Excluding the ESW, 4kV, and 250 VDC station battery busses was acceptable because those systems were subject to separate Level 1 reviews. However, exclusion of the N-train batteries, as discussed earlier, was not. Instrumentation and control circuits were included; however, the inspector noted that interfaces with other systems such as instrument air and heating, ventilation, and air conditioning were not identified or addressed. These aspects of the AFW SRR complied with the existing guidelines.

The surveillance testing section described the origins and locations for surveillance requirements and devoted a considerable amount of effort (in fact, the majority of the section) to examining whether surveillance testing schedules were up to date and outlining what surveillances needed to be performed to maintain operability of the systems. While this type of information was relevant to ensuring the legal operability of the system, it missed the intent of the surveillance review which was to determine whether the plant's surveillance testing program ensured that the system could perform as required. In that regard, the review stated that special attention was paid to the nature of the surveillance requirements specified to ensure the AFW system was being tested to assure the requirements of the Technical Specifications and the UFSAR were

being met. However, no information was provided in the report to show that either the requirements spelled out in the surveillance procedures met the requirements of the Technical Specifications, UFSAR, and ASME codes, or the requirements of the Technical Specifications and UFSAR properly demonstrated that the system could fulfill its design requirements. This deficiency was the result of lack of technical rigor in the evaluation process.

Other deficiencies noted included:

- The AFW SRR indicated that commitments were reviewed but the review did not identify whether or not commitments were being met. An example was the failure to complete actions on microbiologically induced corrosion as committed in the licensee's response to Generic Letter 89-13. This was identified by the licensee's SSFI.

- The SRR guidelines specified the use of walkdown summary sheets to record deficiencies identified during the system walkdowns. These were not included in the package nor was there any indication in the package that they were used.

- The SRR guidelines in effect at the time of the AFW SRR did not contain criteria for determining whether or not an issue was a restart constraint, yet the conclusion was drawn that none of the 21 open Condition Reports related to the review was a restart constraint.

These deficiencies were a combination of both flaws in the process and a lack of technical rigor in the evaluation process.

c. Conclusions

The Level 1 SRR done on the AFW system was ineffective in identifying potential operability issues as a result of the flaws in the SRR process and a lack of technical rigor in some aspects of the review.

II. Management Meetings

X1 Exit Meeting Summary

The inspectors discussed the progress of the inspection with licensee representatives on a daily basis and presented inspection results to members of licensee management on October 16, November 25, and at the conclusion of the inspection on December 22, 1998. The licensee acknowledged the findings presented.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

G. Arent, Licensing
P. Barrett, Performance Assurance
D. Cooper, Plant Manager
E. Eckstein, Nuclear Engineering
J. Euto, AEP Counsel
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R. Powers, Senior Vice President
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J. Sampson, Site Vice President
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J. Schrader, Work Control
K. Steinmetz, Licensing
T. Taylor, Licensing
R. Vasey, Licensing
L. Weber, Operations Manager

NRC

B. Bartlett, Senior Resident Inspector
B. Fuller, Resident Inspector
J. Maynen, Resident Inspector

INSPECTION PROCEDURES USED

IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 40501	Licensee Self-Assessments Related to Team Inspections
IP 61726	Surveillance Observations
IP 93801	Safety System Functional Inspection

ITEMS OPENED, CLOSED, OR DISCUSSED

Opened

50-315/316-98017-01	URI	Auxiliary Feedwater Suction Strainer Special Test Result Package Review
50-315/316-98017-02	NCV	Design Inadequacies with the Auxiliary Feedwater Pump Suction Strainers
50-315/316-98017-03	NCV	Inadequate System Readiness Review Procedure and Process

Closed

50-315/316-98017-02	NCV	Design Inadequacies with the Auxiliary Feedwater Pump Suction Strainers
50-315/316-98017-03	NCV	Inadequate System Readiness Review Procedure and Process

LIST OF ACRONYMS USED

AFW	Auxiliary Feedwater
CFR	Code of Federal Regulations
CR	Condition Report
CST	Condensate Storage Tank
DBD	Design Basis Document
ESW	Essential Service Water
IP	Inspection Procedure
LER	Licensee Event Report
MDAFP	Motor-driven Auxiliary Feedwater Pump
PDR	Public Document Room
SRR	System Readiness Review
SSFI	Safety System Functional Inspection
TDAFP	Turbine-driven Auxiliary Feedwater Pump
UFSAR	Updated Final Safety Analysis Report

LIST OF DOCUMENTS REVIEWED

General

- Auxiliary Feedwater System Safety System Function Inspection (SSFI) Self-Assessment Plan, dtd 9/4/98
- Updated Final Safety Analysis Report, Chapters 1, 7, 8, 10, and 14
- Technical Specification 3/4-7 and 3/4-8
- Technical Specifications Bases 3/4-7 and 3/4-8
- Plant System Readiness Reviews (Guidelines for Augmented Staff) Rev. 5, dtd August 1, 1998
- Plant System Readiness Review, "Auxiliary Feedwater System," dtd September 9,1998

- Restart Strategy No. 5455, "Plant Systems Readiness Assessment, Rev 0, dtd 10/13/98
- D.C. Cook Commitment Management System report: Auxiliary Feedwater
- Westinghouse "General Design Criteria for Power Plant and Steam Systems Associated with Nuclear Steam Supply Systems"
- Plant Setpoint Document
- Cook Nuclear Plant Restart Plan, Rev. 3
- Design Basis Document (DBD) DB-12-AFWA, Rev. 0, "Auxiliary Feedwater System," dtd May 22, 1998
- System Description, SD-12-AUFXD-100, "Auxiliary Feedwater System," Rev 0, dtd 4/26/96
- Donald C. Cook Nuclear Plant Safety System Functional Inspection, "Auxiliary Feedwater System," WESTEC Services, Inc., dtd October 5, 1987
- NRC Generic Letter 96-01, "Testing of Safety-Related Logic Circuits," dtd 1/10/96
- NRC Information Notice 90-45, "Overspeed of the Turbine-Driven Auxiliary Feedwater Pumps and Overpressurization of the Associated Piping Systems," dtd July 6, 1990
- NRC Information Notice 93-12, "Off-gassing in Auxiliary Feedwater System Raw Water Sources," dtd February 11, 1993
- NRC Information Notice 93-51, "Repetitive Overspeed Tripping of Turbine-Driven Auxiliary Feedwater Pumps," dtd July 9, 1993
- NRC Information Notice 98-24, "Stem Binding in Turbine Governor Valves in Reactor Core Isolation Cooling (RCIC) and Auxiliary Feedwater (AFW) Systems," dtd June 26, 1998
- NRC Inspection Report Nos. 50-315/95009; 50-316/95009
- Power Technologies, Inc., Load Sequencing Study Report: EDG/Motor Starting"
- D.C. Cook Nuclear Plant Risk Significant Maintenance Rule Systems
- D.C. Cook Nuclear Plant Non-Risk Significant Maintenance Rule Systems
- D.C. Cook Nuclear Plant Maintenance Rule Not-in-Scope SSCs
- LER 89-017-02, "Loss of Turbine Driven Auxiliary Feed Pump Flow Retention Due to Inaccurate Flow Measurement," November 2, 1990
- LER 89-017-03, "Loss of Turbine Driven Auxiliary Feed Pump Flow Retention Due to Inaccurate Flow Measurement," February 28, 1991
- Temporary Modification 1-98-25, 1WMDAFP Suction Piping Modifications
- Job Order C0046873, Temp Mod # 1-98-25 Verify AFW Design Function
- Vendor Manual - Tate Andale Strainers

Calculations

- NEMH940110AF, Replacement FW-159, Rev. 0, 1/11/94
- NEMH94020AF, CST Usable Volume, Rev. 0,1/20/94
- TM-87-09, CST Inventory Needed to Cool RCS and Time Until CST Dryout, Rev. 1, 10/20/87
- AEPNO Procedure 227000-LTG-5400-02, Calculations, Rev. 0, 11/16/95 (superseded)
- WCAP-12135, Rerating Engineering Report, 9/89
- WCAP-12901, Section 14, Major Rupture of Main Feedwater Pipe
- ENSM980819AF, Auxiliary Feedwater Sys Design Basis Analysis, Rev. 0, 9/21/98
- HXP871023JW-3, MDAFP Speed-Torque Curve, 10/23/87
- HXP740715FK-1, Condensate Storage Tank Usable Volume, 7/15/74

- HXP740411FK-2, Error in Using Affinity Law, 4/11/74
- HXP730524FK, AFW Steam Flow, 5/24/73
- HXP730101FK, Temperature Rise Across TDAFP, 1/1/73
- HXP910411AF, AFW Temp/Press Distribution, Rev. 1, 6/29/94
- DCCHV12AF07N, AFW Pump Room Temperature, REv. 1, 9/1/88
- TH-97-07, Condensate Storage Tank Water Required for Decay Heat Removal and Steam Generator Depressurization During Station Blackout, 5/29/97
- PS-250VD-005, "250VDC Fault Study," dtd 112/19/88
- PS-250VD-005 (partial), "250VDC Fault Study," dtd 10/14/92
- PS-250VL-016, "Battery 1B Composite Battery Capactiy and Voltage Drop Calculation,"
- PS-250VL-020, "Battery 1N & 2N Composite Battery Capactiy and Voltage Drop Calculation,"
- PS-4KVP-001, "4kV Safety Motor Protection
- PS-4KVP-007, "Undervoltage/Degraded Grid Relay Settings"
- PS-4KVD-001, "D.C. Cook Voltage Performance Study, 1991-1995 Operating Period"
- PS-EPCS-001, "Electrical Protection Coordination Study"
- ECP 1-CG-38, "Condensate Storage Tank Level," Rev 2
- ECP 12-RPC-16, "Condensate Storage Tank Level," Rev 3
- ECP 12-C1-01, "Condensate Storage Tank Level," Rev 14
- ECP 12-RPC-10, "Auxiliary Feedwater Flow"
- ECP 12-F2-01, "Feedwater Flow Instrumentation"

Procedures

- 227400-STG-5400-03, Design Change Packages, Rev. 2, Change 3, effective 7/16/98, change 3, expiration 8/24/98.
- 12 EHP 5030.OIL.001, Oil Analysis Program, Rev. 1.
- 12 THP 6020 CHM.302, Oil and EHC Sampling, Rev. 3.
- 12 EHP 5030.OIL.001, Oil Analysis Program, Rev. 1.
- 12 THP 6020 CHM.302, Oil and EHC Sampling, Rev. 3.
- **12MHP5021.001.009, Torque Selection, Rev. 8.
- **12MHP5021.056.011, Auxiliary Feed Pump Turbine Governor Maintenance, Rev. 0, Change 4.
- **12MHP5021.056.003, Auxiliary Feed Pump Turbine Maintenance, Rev. 6, Change 2.
- **12MHP5021.056.010, Turbine Driven Auxiliary Feed Pump Overspeed Trip Tests, Rev. 2, Change 1.
- **12MHP5021.056.001A, Modified Motor Driven and Turbine Driven Auxiliary Feed Pump Maintenance, Rev. 0, Change 5.
- **12MHP5021 ?227400-STG-5400-03, Design Change Packages, Rev. 2, Change 3, effective 7/16/98, change 3, expiration 8/24/98.
- **12MHP5021.001.009, Torque Selection, Rev. 8.
- **12MHP5021.056.011, Auxiliary Feed Pump Turbine Governor Maintenance, Rev. 0, Change 4.
- **12MHP5021.056.003, Auxiliary Feed Pump Turbine Maintenance, Rev. 6, Change 2.
- **12MHP5021.056.010, Turbine Driven Auxiliary Feed Pump Overspeed Trip Tests, Rev. 2, Change 1.

- **12MHP5021.056.001A, Modified Motor Driven and Turbine Driven Auxiliary Feed Pump Maintenance, Rev. 0, Change 5.
- **12MHP5021.056.001, Motor Driven and Turbine Driven Auxiliary Feed Pump Maintenance, Rev. 6, Change 7.
- PMP 5040 MOD.001, Temporary Modifications, Rev. 7, Change 2, approved 11/21/97.
- PMP 1040.SES.001, Safety Screenings/Evaluations, Rev. 4, effective 4/30/98.
- PMP 5040 MOD.001, Temporary Modifications, Rev. 7, Change 2, approved 11/21/97.
- PMP 1040.SES.001, Safety Screenings/Evaluations, Rev. 4, effective 4/30/98.
- **01-OHP 4030.STP.017T, "Turbine Driven Auxiliary Feedwater System Test," Rev 11
- **01-OHP 4030.STP.017E, "East Motor Driven Auxiliary Feedwater System Test," Rev 7
- **01-OHP 4030.STP.017W, "West Motor Driven Auxiliary Feedwater System Test, " Rev 6
- **01-OHP 4030.STP.017R, "Auxiliary Feedwater Pump Response Test," Rev 6
- **01-OHP 4030.STP.017TV, "Turbine Driven Auxiliary Feedwater Pump Trip and Throttle Valve Operability Test"
- 01-OHP SP.196, "U-1 West MDAFP Strainer ESW Flow Test," Rev 0, dtd 10/31/98
- 01-OHP 4022.055.003, "Loss of Condensate to Auxiliary Feedwater Pumps," Rev 5, dtd 4/14/95
- 01-OHP 4023.FR-H.1, "Response to Loss of Secondary Heat Sink, Rev 7, dtd 1/27/98
- 01-OHP 4024.113, "Annunciator Panel Number 113, Drop 17, Steam Generator 1 and 2 - East MDAFP Suction Press Low," Rev 5
- 01-OHP 4024.114, "Annunciator Panel Number 114, Drop 7, Steam Generator 3 and 4 - TDAFP Suction Pressure Low," Rev 5
- 01-OHP 4024.114, "Annunciator Panel Number 114, Drop 8, Steam Generator 3 and 4 - TDAFP Strainer DP High," Rev 5
- 01-OHP 4024.114, "Annunciator Panel Number 114, Drop 34, Steam Generator 3 and 4 - West MDAFP Suction Press Low," Rev 5
- 01-OHP 4024.114, "Annunciator Panel Number 114, Drop 38, Steam Generator 3 and 4 - West MDAFP Strainer DP High," Rev 5
- 01-OHP 4024.116, "Annunciator Panel Number 116, Drop 43, Condensate - Condensate Storage Tank Level Low-Low," Rev 9
- **02-OHP 4030.STP.043, Safety Related Manual Valve Cycling, Rev. No. 4, CS No. 1., 3/4/97, and sample history file for auxiliary feedwater system, A/R A0082819.

Drawings

- 1-2-5904, Standard Symbols Unit No. 1 or 2, Instrument & Sampling Connection Symbols
- 12-5103-3, Flow Diagram Standard Symbols (Piping and Valves)
- OP-1-5105D, Flow Diagram Steam Generating System Unit No. 1
- OP-1-5106A-44, Flow Diagram Aux-Feedwater Unit 1
- OP-1-5113A-0, Flow Diagram Essential Service Water
- OP-1-5114-80, Flow Diagram Non Essential Service Water Unit No. 1

Modification Packages

- 01-RFC-1973, "Install Caps on Upper Inner Leak-off Line from U-1 TDAFP T&T Valve"
- 12-DCP-0817, "Revise Aux. Feedwater Flow Retention Circuit," Rev. 0
- 21-RDR-073, "Install Flow Retention"
- 12-RDR-104, "Add Check Valves and Move Piping Connection"
- 12-RDR-133, "Install New Flow Switches for Flow Retention Circuitry"
- 12-RDR-207, "Modify Test Valve Circuitry"
- 12-RDR-233, "Remove Auto-Closure of Blowdown Valves during a Manual Start of a MDAFP"
- 12-RDR-241, "Provide Drawings after Protection System Upgrade"
- 12-RDR-459, "Remove Flow Indicator Orifices from Seal Drain Lines"
- 12-RFC-840, "Install Local Controls"
- 12-RFC-1887, "Modify Fan Enclosures to Provide Access to Fire Dampers in Ventilation for WMDAFPs"
- 12-RFC-1956, "Change Flow Orifice In TDAFP Oil Cooling Water Supply Line"
- 12-RFC-2004, "Change Shared Electricals for AFW to Separate 2-unit Configuration"
- 12-RFC-2180, "Increase Overload Trip Setpoint on Safety-Related MOVs to 200% of Full Load Current vice 125%"
- 12-RFC-2447, "Replace Barton AFW FT with qualified Foxboro FT"
- 12-RFC-2540, "Replace ELO line Check Valves"
- 12-RFC-2790, "Replace Obsolete Flow Instruments"
- 12-RFC-2985, "Replace Foxboro H-line Equipment with Spec 200 Micro"
- 12-RFC-3043, "Install emergency Leakoff Lines on MDAFP"
- 12-RFC-3104, "Replace Foxboro H-line Equipment with Taylor Mod 30"
- 12-MM-176, "Correct Sneak Circuit Introduced by AMSAC Mod"
- 12-MM-269, "Replacement of Cast Iron Diffusers with Stainless Steel Diffusers on AFW Pumps"
- 12-MM-411, "Replace Limit Switch"

Audits and Surveillances

- Performance Assurance Surveillance 12-94-51, Auxiliary Feedwater Pump Performance, Quarterly Report
- Performance Assurance Surveillance 12-95-51, Auxiliary Feedwater Pump Performance, Quarterly Report
- Surveillance SURV-96-01, Auxiliary Feedwater Pumps Performance
- Quality Assurance Audit QA-96-05, Inservice Testing

Condition Reports

- CR 89-1183, Flow Indication Discrepancy
- CR 89-113, AB Battery Ground
- CR 89-420, Missed Turbine Driven Auxiliary Feedwater Pump Surveillance
- CR 89-736, Operational Problem with TDAFP when Supplied from ESWSystem
- CR 94-546, Silt Clogging of 1WMDAFP ESW Supply

- CR 96-1112, Missing Stem Nut from U2 TDAFP Governor Valve
- CR 96-1881, Impact of Main Feed Pump Testing on MDAFP ESF Logic
- CR 97-326, Use of AFW system Cross-ties
- CR98-1735, Changes in margin to overfill analysis resulting from AFW pump impeller replacement
- CR 98-2006, Open Tubing Penetration Holes in TDAFP Control Cabinets
- CR 98-3751, Calculation overestimates NPSH to pumps
- CR 98-3752, AFW pump run-out calculation no consistent with plant design
- CR 98-3787, No evaluation of impact of throttling FW-125 on hydraulic resistance to flow in the Emergency Leak-off lines for the non-operating pumps during surveillance testing.
- CR 98-3788, Calculations to determine minimum condensate storage tank level do not consider two AFW pumps
- CR 98-3789, Superceding of calculations not identified in AFW DBD
- CR 98-3864, Calculation for AFW system resistance contains several errors. Calc is an input into several other calculations
- CR 98-4054, Calculation did not address sensible heat considerations
- CR 98-4055, Calculation may have inconsistent assumptions and be non-conservative
- CR 98-4056, Some information not included in UFSAR
- CR 98-4057, Values in UFSAR table inconsistent with pump data sheets
- CR 98-4058, Some information not included in UFSAR
- CR 98-4059, 600 volt system is exceeding the 635 limit vice the UFSAR
- CR 98-4060, Discrepancy between UFSAR and manufacturers performance testing curves
- CR 98-4062, Incorrect nomenclature for vendor technical manuals
- CR 98-4065, Canceled specification not deleted from DBD
- CR 98-4981, Operability of AFW System While Being Used to Maintain Steam Generator Levels during Start-up
- CR 98-5015, Flow Retention Setpoints
- CR 98-6228, High Energy Line Break Concerns
- CR 98-7042, Auxiliary Feedwater Suction Strainer Curves

Action Requests

- A/R A0112000, AFW Flow Retention To Be Performed per **1THP6040PER.116, 1/27/98
- A/R A0106340, Turbine Driven Auxiliary Feed Pump Start Time Test, 7/30/97
- A/R A0112237, Turbine Driven Auxiliary Feed Pump Trip & Throttle Valve Above Seat Condensation Drain #DR-55, Inspection
- A/R A0143817, STP017T Turbine Driven Aux Feedwater System Test, with LO Sample, 10/2/97
- A/R A0042764, Disassemble/Inspect TDAFP Internals per PM Task 35 Step 6.1, 6/25/93
- A/R A0104894/A0106720, East/West Motor Driven Aux Feed Pump est - Appendix R, partial test, closed 4/9/98
- A/R A0033505, Inspect MDAFP Internals per PM Task 35 Step 6.2