Temporary Instruction 2515/159

REVIEW OF GENERIC LETTER 89-13: SERVICE WATER SYSTEM PROBLEMS AFFECTING SAFETY-RELATED EQUIPMENT

CORNERSTONE: MITIGATING SYSTEMS

APPLICABILITY: This temporary instruction applies to selected holders of operating licenses.

2515/159-01 OBJECTIVE

01.01 The objective of this Temporary Instruction (TI) is to support the Nuclear Regulatory Commission (NRC) review of licensees' activities in response to NRC generic communications. The generic communication selected by the NRC for TI review is Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment." This TI requires NRC inspectors to verify that the actions implemented in response to NRC Generic Letter 89-13 are programmatically controlled and, have been maintained effective. NRC Generic Letter 89-13 will be used as the technical guidance for this TI.

01.02 This TI will gather information to help the NRC staff identify and shape possible future regulatory positions and enhance the agency operating experience program.

2515/159-02 BACKGROUND

The Davis-Besse Reactor Vessel Head Degradation Lessons-Learned Task Force identified a number of implementation problems involving NRC identification of operating experience, and the follow-up of information, actions, or recommendations provided to licensees in NRC generic communications regarding primary system leakage and boric acid corrosion. Section 3.1.2, "Generic Communication Program Implementation" of the task force report provides specific observations that support problematic issues that include: (1) not verifying licensee actions or information in response to significant generic communications; (2) not assessing generic communication effectiveness following the issuance of repetitive generic communications; and (3) not placing the appropriate emphasis or context on information documented in generic communications.

The task force recommended that the staff should conduct follow-up verification of significant generic communications. Recommendation 3.1.2(5) establishes the basis for performing this TI. This recommendation reads as follows:

> The NRC should conduct follow-on verification of licensee actions associated with a sample of other significant generic communications, with emphasis on those involving generic communication actions that are primarily programmatic in nature.

The regulation that pertains to the licensees' review of operating experience is 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants And Fuel Reprocessing Plants." The NRC staff has applied Criterion XVI in requiring licensees to identify and correct conditions adverse to quality regardless of whether the licensee identified the adverse condition from its own operating experience or from the review of industry operating experience. For example, if an NRC generic communication identifies a condition adverse to quality that is within the scope of Appendix B and is applicable to a licensee facility, Criterion XVI requires the licensee to take action to correct the condition.

The NRC issued NUREG-0737, "Clarification of TMI Action Plan Requirements," which provided post-TMI guidance that had been approved for implementation. NUREG-0737, Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff," identified the development of a program for the review of both plant-specific and industry-wide operating experience. NUREG-0737, Item I.C.5, further stated that each utility shall carry out an operating experience assessment function that will involve utility personnel having collective competence in all areas important to plant safety. In connection with this assessment function, it is important that procedures exist to assure that important information on operating experience originating both within and outside the organization is continually provided to operators and other personnel and that it is incorporated into plant operating procedures and training and retraining programs.

The Reactor Operating Experience Task Force completed an evaluation of the agency's reactor operating experience program. The task force identified attributes that would support an effective operating experience program. The attribute that aligns with this TI is the conduct of periodic assessments to determine program effectiveness. The periodic assessment would determine how effective the agency has been in using operating experience to reduce the severity or recurrence rate of industry events.

The NRC selected Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," as the functional area to review licensees' activities in response to NRC generic communications after reviewing a wide range of generic communications and requesting input from internal stakeholders. The SWS was deemed an appropriate system for review for a number of reasons. Service water is a risk significant system that requires maintenance, operations, licensing and engineering support. Additionally, Generic Letter 89-13 was issued in response to significant operating experience in the nuclear industry and the recommended actions are primarily programmatic in nature. Since the issuance of Generic Letter 89-13 and the subsequent NRC follow-up, significant time has elapsed which will allow the NRC to verify that the recommended actions have been maintained effective.

2515/159-03 INSPECTION REQUIREMENTS

The inspection will be accomplished by performing a review of the SWS components and system performance including design requirements; operating, maintenance, surveillance and other testing practices; and maintenance and performance history and the implementation of corrective actions that directly relate to the five recommended actions of Generic Letter 89-13. Additional requirements are included to review recent SWS operating experience that directly relate to the five recommended actions of Generic Letter 89-13.

03.01 Verify for open-cycle SWSs, the implementation of an ongoing program of surveillance and control techniques to significantly reduce the incidence of flow blockage problems as a result of biofouling. This ongoing program is described in NRC Generic Letter 89-13, Enclosure 1, "Recommended Program to Resolve Generic Issue 51." The following key points should be considered during the Enclosure 1 review:

a. Review the licensee operational history for the SWS for the past two operating cycles (minimum of two years) or longer if necessary. Sources of information to consider are licensee event reports, NRC inspection findings, licensee corrective action program, plant system engineering reports, technical specification operability determinations, maintenance work requests, and adverse test results or recurrent test failures. The review should focus on the adverse condition(s) identified, the root-cause evaluation and the corrective actions that were implemented.

b. Review the implementation of the periodic inspection program to detect flow blockages from biofouling in other systems. This could include the fire protection system that uses the same source of water as the SWS.

03.02 Verify the implementation of a test program for the heat transfer capability of all safety-related heat exchangers cooled by the SWS. This program is described in NRC Generic Letter 89-13, Enclosure 2, "Program for Testing Heat Transfer Capability." Perform the following reviews to examine how the program is applied during the Enclosure 2 review:

a. Review the functional testing procedure(s) and test results of water-to-water heat exchangers served by the SWS to ensure proper heat transfer capability. The review of the documented test results should identify how trending is performed to identify degraded equipment.

b. Review one heat exchanger for which maintenance has been chosen in lieu of testing, if the licensee has implemented this action. The review should address maintenance frequency, the basis for this approach, acceptance criteria, and results trending. As an alternative, a sample of records and results should be reviewed.

03.03 Verify the implementation of a routine inspection and maintenance program for open-cycle service water system piping and components that ensures corrosion, erosion,

protective coating failure, silting, and biofouling cannot degrade the performance of the safety-related systems supplied by service water. The maintenance program should at least: (1) remove excessive accumulations of biofouling agents, corrosion products, and silt and (2) repair defective protective coatings and corroded SWS piping and components that could adversely affect performance of their intended safety functions.

a. Review the periodic inspection program used to detect corrosion, erosion, protective coating failure, silting, and biofouling.

b. Review the maintenance program for removal and repair of SWS piping and interface system components due to silting, biofouling, corrosion, erosion, and failure of protective coating.

03.04 Verify that the SWS will perform its intended function in accordance with the design basis for the plant. The verification will be performed by the following inspection activities:

a. Verify that the installed SWS components are tested and that the test acceptance criteria are consistent with the design basis to ensure the components will perform their intended safety function(s). Review indicators of SWS system performance (such as overall system unavailability or recurring problems) to identify if any testing inadequacies exist or if testing frequency is appropriate.

b. Review the modifications implemented on the SWS. Select at least three modification packages for a detailed review. This review should include 50.59 evaluations and should ensure that the changes have not compromised the system design bases or introduced single active failure vulnerabilities and have included revised maintenance requirements and procedures, operating procedures, training, and periodic testing as necessary.

c. Review the effectiveness of any design features installed to minimize silting and biofouling of piping and components. Verify if features are provided for the timely detection of flow degradation and if flow balancing has been conducted during various system operating modes. Flow balance verification should be done for worst case combinations of pump operation. Verify that pump run-out conditions are not present with the minimum number of pumps operating with worst case alignment of non-safety related loads. Verify that system flow balance data is consistent with key design assumptions, where available, for flow coefficients, rated pressure drops across components and piping, rated heat removal, heat exchanger fouling, and total system flow for operating modes. Review the set points for alarms and actuations to ensure they are consistent with the design basis and assumptions.

d. Conduct a system walkdown to review the SWS configuration for consistency with design drawings and for materiel condition. Refer to Attachment A of this TI for a list of suggested materiel condition examination attributes.

03.05 Verify that maintenance practices, operating and emergency procedures, and training that involve the SWS are adequate to ensure that safety-related equipment cooled by the SWS will function as intended and that the operators of this equipment will perform effectively. The intent of Recommended Action V of Generic Letter 89-13 was to reduce human errors in the operation, repair, and maintenance of the SWS. The following inspection activities should be considered:

a. Review the SWS alarm response procedures and operating procedures for normal, abnormal, and emergency system operations to assure the system is operated within design basis. Assess adequacy of SWS flow instrumentation relied upon during accident conditions. Review available operating logs to determine adequacy of temperature and flow monitoring.

b. Review the proper implementation of procedures for verifying periodic and post-maintenance alignments of valves in the SWS, especially those valves that isolate flow to safety-related components. Verify that required accident condition flow is not degraded during normal system operation valve alignments. Review the method used to verify proper SWS throttle valve position. Review control of SWS heat exchanger flow variations due to changing climate (temperature) conditions.

c. Review the local operation of equipment. Determine if the indication available to operate the equipment is in accordance with applicable operating procedures and instructions. Verify that the environmental conditions, such as expected room temperature and emergency lighting, assumed under accident conditions are adequate for remote operation of equipment.

d. Review operator classroom and simulator training for the SWS, focusing on the technical completeness and accuracy of the training lesson plans. Ensure that the lesson plans reflect system modifications and that the licensed operators have been trained on these modifications.

e. Walk through the system operating procedures and the system piping and instrument diagrams with engineering and operations staff, as appropriate. Verify that the procedures can be performed and that components and equipment are accessible for normal and emergency operation. If any special equipment is required to perform these procedures, determine if the equipment is available and in good working order. Verify that the operators' knowledge of equipment location and operation is adequate.

f. Review the SWS maintenance procedures for technical adequacy that were implemented in the work packages reviewed for maintenance history. Determine if the procedures are sufficient to perform the maintenance task and provide for identification and evaluation of equipment deficiencies. Compare the procedures to the vendors' manuals to identify any vendor recommendations not incorporated into procedures. Verify that important vendor manuals are complete and up to date.

g. Review the maintenance history for the SWS for the past two operating cycles (minimum of two years) or longer if necessary. Look for recurring equipment problems and determine if any trends exist. Evaluate the adequacy of the root cause analysis and corrective actions implemented in response to adverse trends. Review completed maintenance activities for technical adequacy, performance of appropriate post-maintenance testing and satisfactory demonstration of equipment operability. If possible, observe post-maintenance, surveillance, and in service tests that are being performed on the SWS.

h. Determine if maintenance personnel receive adequate training pertaining to the SWS and if the degree of training provided is consistent with the amount of technical detail in the procedures.

03.06 The SWS is a risk significant system that can be degraded from conditions other than the ones identified in Generic Letter 89-13. For example, related SWS operating experience could be the sudden clogging of traveling screens and strainers from debris and ice. Additionally, the sudden clogging of strainers and heat exchangers could be from debris, silt or sand. Using SWS operating experience that relates to Generic Letter 89-13, verify that the licensee procedure(s) will assess applicability, distribute information to appropriate staff and perform technical reviews considering the following criteria:

a. Organizational responsibilities for review of applicability and prioritization are defined.

b. Recipients of various categories of information can be readily related to job functions.

c. Administrative and technical guidance exist to develop plant actions.

d. Implementation strategy considers the extent of plant actions needed to address the issue.

e. Pertinent information is incorporated into training programs.

2515/159-04 GUIDANCE

General Guidance

Inspection preparation will require a thorough understanding of Generic Letter 89-13 and its associated five recommended actions. Generic Letter 89-13, Supplement 1, contains questions and answers from the four workshops held on this generic letter. The Supplement 1 information provides additional clarifying guidance on implementing the generic letter. The following information should be reviewed to enhance inspection preparation:

a. Licensee initial response to Generic Letter 89-13 recommended actions.

b. Licensee inspection results from the Service Water System Operational Performance Inspections (SWSOPIs) conducted in the early 1990s.

c. Licensee self-assessments conducted in lieu of SWSOPIs.

The TI objective is to verify that the actions implemented in response to NRC generic communications have been maintained effective. The Reactor Oversight Process Baseline Inspection Procedures such as 71111.02, "Evaluation of Changes, Tests, or Experiments," 71111.07, "Heat Sink Performance," 71111.12, "Maintenance Effectiveness," 71111.15, "Operability Evaluations," 71111.21, "Safety System Design and Performance Capability" and 71111.22, "Surveillance Testing" may be used in determining the licensee program effectiveness. Credit could be taken for the above baseline inspection procedures if the samples reviewed in accordance with this TI meet the procedures' objectives.

Specific Guidance

No specific guidance is provided.

2515/159-05 REPORTING REQUIREMENTS

Document inspection results in Section 4OA5, "Other," in a resident inspector's integrated inspection report (i.e., quarterly inspection reports) and send a copy of the applicable sections to NRR/DIPM/IROB, Attention: Anthony W. Markley at (301) 415-3165 or AWM@NRC.GOV. Any issues identified during this inspection should be processed and documented in accordance with IMC 0612, "Power Reactor Inspection Reports" and IMC 0609, "Significance Determination Process."

The documentation of inspection results will be analyzed by the Reactor Operations Branch (NRR/DIPM/IROB). Specifically, the inspectors will provide a qualitative description of how the actions implemented for Generic Letter 89-13 have been maintained effective and the effectiveness of licensee's program procedure(s) in applying lessons learned from related SWS operating experience. At a minimum, the inspectors should describe in the inspection results the following topical areas in Section 4OA5. This is an interim deviation from the requirements of IMC 0612.

a. The effectiveness of Generic Letter 89-13 in communicating information.

b. Licensee actions that are being implemented for the five recommended actions of Generic Letter 89-13.

c. Effective programmatic maintenance of the actions in response to Generic Letter 89-13.

d. As applicable, noteworthy SWS operational history that supports inspection results.

e. Effectiveness assessment of licensee's program procedure(s) on related SWS operating experience.

2515/159-06 COMPLETION SCHEDULE

The inspection activities identified in this TI will be completed by October 31, 2004.

2515/159-07 EXPIRATION

This TI will remain in effect until February 25, 2005.

2515/159-08 CONTACT

For questions regarding the performance of this TI and emergent issues, contact Anthony W. Markley at (301) 415-3165 or AWM@NRC.GOV.

2515/159-09 STATISTICAL DATA REPORTING

All direct inspection effort expended on this TI is to be charged to 2515/159 for reporting by the STARFIRE/HRMS system with an IPE code of SI.

2515/159-10 ORIGINATING ORGANIZATION INFORMATION

10.01 Organizational Responsibility

This TI was initiated by the Reactor Operations Branch (NRR/DIPM/IROB).

10.02 Resource Estimate

The estimated direct inspection effort to perform this TI is estimated to be 88 to 120 hours per site.

10.03 Training

No specialized training is needed to perform inspection requirements in this TI beyond basic training for inspectors (specified in IMC 1245, "Inspector Qualifications"). However, if technical support is needed during the inspection of licensees' determinations of compliance or interim compensatory actions, contact IROB.

10.04 References

Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

Generic Letter 89-13, Supplement 1, "Service Water System Problems Affecting Safety-Related Equipment."

TI 2515/118, "Service Water System Operational Performance Inspection (SWSOPI)."

SECY 92-355, “Implementing Service Water System Operational Performance Inspections (SWSOPIs).”

The continuation of this reference list are NRC Information Notices that provide industry operating experience related to the SWS.

Information Notice 2004-01, “Auxiliary Feedwater Pump Recirculation Line Orifice Fouling - Potential Common Cause Failure.”

Information Notice 94-79, “Microbiologically Influenced Corrosion of Emergency Diesel Generator Service Water Piping.”

Information Notice 92-49, “Recent Loss or Severe Degradation of Service Water Systems.”

Information Notice 90-73, “Corrosion of Valve-to-Torque Tube Keys in Spray Pond Cross-Connect Valves.”

Information Notice 90-39, “Recent Problems With Service Water Systems.”

Information Notice 90-26, “Inadequate Flow of Essential Service Water to Room Coolers and Heat Exchangers for Engineered Safety-Feature Systems.”

Information Notice 89-76, “Biofouling Agent: Zebra Mussel.”

Information Notice 89-49, “Failure to Close Service Water Cross-Connect Isolation Valves.”

END

Attachment:
Attachment A - SWS Walkdown Suggested Materiel Condition Examination Attributes

ATTACHMENT A

SWS Walkdown Suggested Materiel Condition Examination Attributes

The materiel condition of the SWS can be indicative of the degree of importance which the licensee attaches to the system. The following attributes are suggested for observation during walkdowns.

1. Good lubrication practices are evident. Sight glasses full of oil, spherical bearings on snubbers and adjustable rod supports are free to move.

2. Material deficiencies are included in the work control system. Note the age of maintenance deficiency tag(s) and the current state of the deficiency degradation for further review.

3. Equipment is protected from adverse environmental conditions like rust, dust, dirt, falling objects, weather changes and fluid leaks.

4. Pump motor filters are clean and unobstructed.

5. Motor operated valve operators have all fasteners installed and tight.

6. Oil or other leaks are cleaned up. Absorbent material is properly disposed of.

7. Fluid leaks from packing glands and seals are at an expected quantity. Abnormal fluid leaks are identified in the licensee's maintenance program and have been evaluated for operability.

8. Plant equipment and instruments are properly labeled.

9. Fasteners and supports are properly installed and maintained. For example, snubber pins should have keepers installed and bolts on bolted connections should have full thread engagement.

10. Inspect material condition of rubber flexible couplings for cracking and wear.

11. Evaluate SWS piping for indications of abnormal pipe movement.

12. Normal and emergency lighting is functional.

13. Emergency Operating Procedure designated valves are appropriately labeled and accessible. Ladders are available as needed.

14. Local SWS indication is functioning.

15. Fire and flood barriers are intact (e.g., doors have proper seals, administrative controls for opening, etc.).

END