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DUKE POWER

February 29, 1996

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Service Water Operational Performance Inspection
Request for Review and Approval of Self Assessment Plan

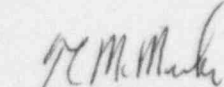
Reference: NRC IP 40501; NRC TI 2515/118, Revision 2
T. C. McMeekin's Letter dated October 9, 1995

Gentlemen:

The referenced October 9, 1995 letter declared our intention to perform a self assessment for the Service Water System at McGuire Nuclear Station. The onsite self assessment is scheduled for approximately three weeks beginning July 15, 1996. Per the provisions of NRC Inspection Procedure 40501, attached is a detailed assessment plan for your review and approval. We look forward to your approval of this assessment plan and participation in the assessment, as appropriate.

If you have any questions, please contact Randy Cross (704) 875-4179.

Very Truly Yours,


T. C. McMeekin

Attachment

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U. S. Nuclear Regulatory Commission
February 29, 1996

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**DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION ASSESSMENT PLAN
SERVICE WATER SYSTEM OPERATIONAL PERFORMANCE INSPECTION**

1.0 INTRODUCTION

In accordance with NRC Inspection Procedure (IP) 40501, "Licensee Self Assessments Related to Area-of-Emphasis Inspections," McGuire Nuclear Station is proposing to perform a SWSOPI with reduced scope NRC involvement instead of the full scope NRC inspection. We are proposing to begin the self-assessment June 24, 1996. As required by Inspection Procedure (IP) 40501, this assessment plan includes the proposed schedule, scope, level of effort, and team qualifications.

The self assessment will be conducted by a combined team from the Duke Power organization and Ogden Environmental and Energy Services. The self assessment will occur at the McGuire Nuclear Site and the Ogden Home Office in Blue Bell, Pennsylvania. A Duke Power Response Team will be organized to support and provide the needed data and information to the SWSOPI team and respond to the team's findings.

2.0 SCOPE/METHODOLOGY

2.1 Scope

NRC Inspection Manual Temporary Inspection (TI) 2515/118 provides the inspection guidance for Service Water System Operational Performance Inspections (SWSOPI). The assessment of the SWS will be accomplished by performing comprehensive reviews of SWS components and system performance, including design requirements; operating, maintenance, surveillance and other testing practices; maintenance and performance history; and implementation of corrective actions; and by performing system walkdowns and conducting personnel interviews.

2.1.1 Assessment Objectives

The operational readiness of the SWS will be assessed by determining whether:

- The system is capable of performing the safety functions required by its design basis.
- Testing is adequate to demonstrate the system would perform all required safety functions.
- System maintenance is adequate to ensure operability under postulated accident conditions.
- Training of personnel is adequate to ensure proper operations and maintenance of the system.
- Human factors (access/labeling, etc.) and supporting procedures are adequate to ensure proper system operation under normal and accident conditions.

- Adequate management controls are in place to ensure safety systems will fulfill the safety functions required by their design bases.

2.1.2 Assessment Process

The assessment will be accomplished by performing a comprehensive review of the McGuire Nuclear Service Water System (RN) components and system performance including design requirements; operations, maintenance, surveillance and other testing practices; maintenance and performance history; quality assurance and implementation of corrective actions. The proposed checklist, which is consistent with the guidance contained in NRC Temporary Instruction 2515/118, is presented as Attachment "A" of this plan submittal. This checklist may be augmented as appropriate by the team leaders.

The SWSOPI self assessment will be coordinated consistent with the methods used for previous successful SSFI's. Duke Power will be leading and conducting the self assessment with the support of an experienced consulting firm. This format was chosen as a reinforcement to our strong commitment to the self assessment process. Duke Power team members will conduct this assessment in an independent environment with the full support of Duke Power management. The assessment will be the primary responsibility for the team members during the conduct of the audit.

The combined Duke Power and Ogden SWSOPI team will be supported by a response team of people drawn from within Duke Power. This response team will be chartered to interact with the SWSOPI team to provide needed information and evaluate assessment concerns.

Questions from the SWSOPI team will be coordinated by the use of Request for Information (RFI) forms. The RFI's will be assigned to the appropriate personnel and tracked to ensure that information is retrieved in a timely manner. Duke Power's Problem Investigation Process (PIP) will be used to process items of non-conformance or operability concerns.

2.1.3 Assessment Implementation

Document Reviews

Document reviews will be conducted in each of the assessment discipline areas to ensure consistent application of the SWS design bases down through the McGuire design output and operating documents such as the FSAR, Technical Specifications, P&IDs, elementaries, logic diagrams, operating and emergency procedures, test procedures, ASME Section XI and EQ programs, and system descriptions.

The original design basis criteria, requirements, and commitments will be identified for the design of these systems. Assessment and review will be intensified as appropriate to identify any weaknesses that may exist in the baseline design bases for these systems or in the design documentation developed to substantiate modifications performed. FSAR statements related to

the design of the service water system will be verified and design basis documents (if available) reviewed.

The assessment will place a heavy emphasis on a review of McGuire's response to and implementation of Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," as well as the review of recent modifications to the service water system. In addition, a critical review of system problems that have been previously identified by McGuire will be conducted as well as a review of NRC Generic Letters, Bulletins, Notices, and other industry/regulatory experience.

Walkdowns/Interviews

System walkdowns and personnel interviews will be conducted in each of the assessment areas. Examples of walkdown focus areas include verifying valve positions are in accordance with operating procedures and assumptions used in design analyses; walking down procedures for human factors considerations; observing material condition of components and equipment, etc. Personal interviews will be conducted to determine the adequacy of technical knowledge of such items as the operation of the system, the system design basis, its role in accident mitigation, and technical specification requirements.

In addition, actual job activities will be observed (e.g., training classes, work order performances, control room activities).

Daily Meetings

During the on-site assessment, the Team Leader will conduct daily review meetings with the assessment team. Daily review meetings will allow for a cross disciplinary review, discussion of potential problem areas, and interaction between inspectors. These team meetings have been shown to be very effective in identifying deficiencies which otherwise may remain undetected. Representatives from the Duke Power response team will meet daily with the SWSOPI team leaders to allow for continuous communications of SWSOPI results and direction and to allow for important feedback. McGuire management will be briefed appropriately as to the course of the self assessment and the findings.

2.2 Methodology

A Service Water System Operational Performance Inspection (SWSOPI) is an interactive assessment in which a team of highly qualified and experienced inspectors focus on the functional capability and reliability of a system or group of systems. The proposed team of inspectors will examine plant activities in the areas of mechanical systems design, electrical systems design, operations, maintenance, surveillance and testing, and quality assurance/corrective actions. The assessment methodology relies upon two basic principles:

- Through the daily interaction of a relatively small number of experienced inspectors, deficiencies can be identified which otherwise may remain undetected.
- By conducting a detailed review of selected systems (also called deep vertical-slice reviews), conclusions can be drawn as to the overall plant design process, operations, and management controls.

The assessment will consist of an audit-level review of the McGuire Service Water System design bases, using document reviews to ensure consistent application of the design bases down through the design output and operating documents. The assessment will use "educated" selective sampling vertical-slice assessment (SWSOPI/SSFI type) level reviews of the service water system (including walkdowns and personnel interviews) to identify weaknesses or missing information in the design bases, operating, or design output documents.

The assessment will be performed in accordance with guidance contained in the NRC Temporary Instruction (TI) 2515/ 118, Service Water Systems Operational Performance Inspection, Revision 2 and will follow a schedule similar to NRC SWSOPIs (see Section 4.0). In accordance with TI 2515/118, the assessment will:

- Assess planned or completed actions in response to Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment, July 18, 1989.
- Verify that the service water system is capable of fulfilling its thermal and hydraulic performance requirements and is operated consistent with the design bases.
- Assess the service water system operational controls, maintenance, surveillance, and other testing, and personnel training to ensure the system is operated and maintained so as to perform safety-related functions.

3.0 KEY REVIEW AREAS BY DISCIPLINE

Mechanical Systems Design Review and Configuration Control

The mechanical review will follow the specific criteria contained in Section 03.01, Mechanical Systems Engineering Design Review and Configuration Control, of Temporary Instruction 2515/118, Revision 1, in reviewing the mechanical systems aspects of the service water system. For example, the mechanical inspector will:

- Review the original and updated FSAR, NSSS design and interface requirements and criteria, and other documentation provided to identify regulatory commitments and design requirements for the service water system. The review will include criteria and commitments for interfacing systems such as the diesel generator system and HVAC systems.

- Review design documentation such as system design descriptions, P&IDs, component specifications, and other SWS configuration drawings to establish how commitments and requirements were incorporated into the design documents.
- Verify the proper identification of SWS boundaries and interfaces.
- Review SWS calculations and analyses to verify consistency of design assumptions or assumed operator actions and acceptability of available margins. Review the calculation index to identify calculations related to compliance with design requirements and criteria, e.g., flow distribution in the service water system, minimum flow requirements, maximum flow and runout (NPSH), other hydraulic calculations, and capability to satisfy Regulatory Guide 1.27 requirements related to shutdown with maximum anticipated temperatures.

In addition, reviews will be performed to confirm that service water Generic Letter 89-13 design and licensing requirements (e.g., review of SWS single failures, biofouling and silting controls) have been adequately addressed and implemented and that design changes, field changes, or temporary alterations assure that system capability has not been degraded relative to established criteria and requirements.

Operations

The operations review will follow the specific criteria contained in Section 03.02, Operations, of Temporary Instruction 2515/118, Revision 1, in reviewing the operations aspects of the service water system. The operations inspector will at minimum:

- Review FSAR sections, system design descriptions, and one-lines related to the service water and interfacing systems, e.g., diesel generators, for correlation of design with operating procedures.
- Review Generic Letter 89-13 commitments with regard to confirming the adequacy of the service water operating and emergency procedures.
- Review Technical Specifications to identify operational requirements related to the safe operation of the service water system.
- Review the procedures for normal and emergency operations of the SWS and its interfacing systems. Identify any areas of operational concern, such as inadequate guidance or weaknesses in providing positive instructions in emergency situations.
- Review selected recent modification packages to assure that changes which affect the service water and interfacing systems operations have been adequately addressed in operating procedures.

- Ensure the SWS system is maintained in a state ready to respond to system demands with appropriate valve, breaker, and control lineups, and that procedures are sufficient for the proper operation and maintenance of the system.

Using the results of the above reviews as a basis, interview plant operations personnel to determine:

- The effectiveness of the operating procedures in providing adequate guidance to personnel for the proper operation of the service water system (and interfacing systems) in performing its safety functions.
- The adequacy of operator familiarity with SWS normal and emergency procedures
- Whether actions required by operators and specified response times for these actions are reasonable for postulated accident conditions
- Whether adequate information is available through existing safety-related instrumentation to execute actions required by operating procedures.

Surveillance and Testing

The surveillance and testing review will follow the specific criteria contained in Section 03.04, Surveillance and Testing, of TI 2515/118, Revision 1, in reviewing the surveillance and testing aspects of the SWS. The surveillance and testing inspector will at minimum:

- Review FSAR sections and Technical Specifications for service water and interfacing systems to identify requirements for surveillance and testing.
- Review Generic Letter 89-13 commitments with regard to verifying the capability of SWS heat exchangers and controlling biofouling.
- Review surveillance procedures for service water and interfacing systems to assure that surveillance requirements are adequately implemented and reflect actual system and component functions and design intent.
- Review surveillance procedures for service water and interfacing systems to confirm that these systems and components are tested to demonstrate that they will perform their intended safety functions for all design bases conditions. For example, testing should demonstrate:
 - capability of automatically supplying cooling water to equipment that must operate during an emergency shutdown.
 - capability of automatically supplying cooling water to equipment required for normal operation in the case of failure of the primary source of cooling water

- automatic initiation of SWS pumps on receipt of an actuation signal.
- Review trending completed on surveillance data by plant staff to determine if methods used ensure that degradation will not result in components operating outside their design bases prior to next scheduled surveillance testing.
- Identify selected modifications to the service water and interfacing systems for review to assure that appropriate surveillance and post-modification testing has been incorporated as required.
- Walk through surveillance and test procedures with surveillance and test personnel, if available, to identify any weaknesses or procedures that may not be consistent with the design basis intent.
- Interview surveillance personnel in conjunction with review of surveillance trending data to determine whether the root causes of failures have been aggressively pursued, identified, and corrected.
- Review selected modification packages to confirm that post-modification testing has been provided where necessary to demonstrate that the modified design can perform its safety functions as required by the design bases.

Maintenance

The maintenance review will follow the specific criteria contained in Section 03.03, Maintenance, of TI 2515/118, Revision 1, in reviewing the maintenance aspects of the SWS. The maintenance inspector will at minimum:

- Review FSAR sections and maintenance program documentation provided to identify maintenance commitments for the service water and interfacing systems.
- Identify maintenance-related documentation to be reviewed, e.g., maintenance procedures, work requests, and post-maintenance test procedures.
- Walk through selected SWS maintenance and maintenance test procedures with maintenance staff personnel to identify weaknesses and inconsistencies with the design intent for the component or system function.
- Interview maintenance staff personnel to determine technical adequacy of maintenance instructions provided in maintenance procedures. Identify the extent of maintenance instructions left to technician's capability in "skill of trade."

- Review selected modifications to the service water system for maintenance-related requirements, post-maintenance testing, etc. Confirm that provisions have been made to incorporate these requirements into appropriate maintenance procedures and periodic maintenance test schedules as necessary.
- Review SWS maintenance work requests and maintenance records to determine whether required maintenance was properly executed as specified in maintenance procedures.
- Review maintenance records to confirm that required post-maintenance testing was conducted as specified in maintenance test procedures and that the test adequately demonstrated that the system and components tested will perform their intended safety functions as defined in the design bases.
- Review maintenance records to determine whether repeated maintenance problems with the same components are adequately tracked and the root cause of the problems resolved.
- Review maintenance records to identify any portions of the system that were inoperable for long periods of time or found substantially degraded. Determine if adequate root cause analyses were performed and if appropriate corrective actions were taken.

Quality Assurance and Corrective Actions

The quality assurance review will follow the specific criteria contained in Section 03.05, TI 2515/118, Revision 1, in reviewing the QA aspects of the SWS. The QA inspector will at minimum:

- Review audit reports issued in the past 24 months involving corrective action processes, plant maintenance, operations, surveillance and testing, and design activities to evaluate the effectiveness of corrective measures for issues identified in the service water system.
- Review surveillance reports issued in the past 24 months involving SWSOPI concerns. Assess the timeliness and effectiveness of the corrective actions taken for identified issues (audit findings, issue reports).
- Evaluate the timeliness and effectiveness of the corrective action processes for identified concerns raised during the recent SWSOPI Project activities.
- Review any self-assessment activities performed in SWS areas by individual line organizations. Assess the timeliness and effectiveness of identified concerns.
- Review licensing activities for addressing NRC and any other commitments concerning SWS areas. Assess whether the commitments are being effectively met.

Electrical Design

- Review original and updated FSAR sections, design basis documents, Technical Specifications, and interface requirements and criteria to identify regulatory and design requirements for electrical power systems which support service water systems.
- Review the index of modification design changes to the electrical systems and interfacing systems during recent outages to identify packages that impact specific SWS components and should be inspected in detail.
- Review individual modification packages selected for assessment to determine the effect of modifications performed on the capability of electrical systems and interfacing systems to meet established SWS commitments and design requirements.
- Review selected modification packages or electrical design changes to assure that SWS capability has not been degraded relative to established criteria and requirements.
- Review documentation substantiating modifications to the service water system to confirm that analyses are verified and completed in accordance with the requirements of ANSI N45.2.11.
- Review the selection of SWS power sources, including separation requirements and availability.
- Review SWS equipment control design.
- Review the analyses for selected SWS motors and components, substantiating the selected motor overcurrent and overload protection.
- Review load engineering, timing, and alignment of electrical power supplies that support the SWS.

4.0 RESPONSIBILITIES

4.1 Manager, Regulatory Audit Group

Has overall responsibility for the SWSOPI self-assessment. Provides necessary resources for the establishment of an Assessment Team to successfully implement the requirements of this plan.

4.2 Vice President, McGuire Nuclear Station

Is responsible to provide plant support in the implementation of the assessment plan and for question/concern resolution associated with the audit process including potential operability concerns. Also provides resources to support implementation of the SWSOPI Response Team.

4.3 Assessment Team Leader

The Team Leader is responsible to direct the course of the assessment and to keep the assessment focused on important issues. The Team Leader is also responsible for providing orientation and training to team members on the approach and methodology and overall expectations. Is responsible for review of checklists, supplements, individual review plans and plant responses to all documented concerns, and for ensuring that team members appropriately follow through on questions and potential concerns. Is responsible to promptly advise appropriate management of potential safety/operability concerns. Is responsible for developing a summary report of assessment findings.

The co-team leader is responsible to assist and advise the Team Leader in carrying out his responsibilities and acts as team leader when necessary.

4.4 Assessment Team Member

Team members are responsible to develop and implement a plan to evaluate the subject area(s) assigned in the SWSOPI checklist. Each team member will maintain field notes and a list of documents reviewed and personnel interviewed during the assessment. Each team member will write a factual account of how each objective was satisfied whether or not concerns are identified during the review.

4.5 Response Team Leader

The Response Team Leader is responsible for managing the Response Team interactions with the Assessment Team, and to ensure potential operability issues are adequately addressed in a timely manner. The Response Team Leader also ensures proper staffing to enable rapid response to Assessment Team findings and requests for information. The Response Team Leader also ensures proper communication of concerns, findings, and potential operability issues to appropriate management.

4.6 Response Team Members

Team members within each assignment review area will develop responses to Assessment Team findings and requests for information, and facilitate plant walkdowns and inspections for the Assessment Team

5.0 PROPOSED SCHEDULE

The McGuire Nuclear Station proposes to follow a schedule based on the guidance of TI 2515/118. Specifically, the proposed schedule is as follows:

Week 1 (June 24, 1996)	The Assessment Plan will be finalized by Duke Power and Ogden personnel.
Week 2 (July 1, 1996)	Auditor training and badging will be conducted. The retrieval of needed documents will begin at the McGuire site.
Week 3 (July 8, 1996)	Review of documents obtained during Week 2 will be conducted at the Ogden Home Office and Duke Power General Office.
Week 4 (July 15, 1996)	Document reviews, system walkdowns and interview with McGuire site personnel will be conducted at the McGuire site.
Week 5 (July 22, 1996)	Further review of documents and development of Assessment Issues will occur at the Ogden Home Office and Duke Power General Office.
Week 6 (July 29, 1996)	Final Assessment week and exit interview at the McGuire site.
Week 7 (August 5, 1996)	Responses received on all open items and requests for information.
Week 8 (August 12, 1996)	The draft report will be prepared at the Ogden Home Office and Duke Power General Offices.
Weeks 9-10 (August 19-30, 1996)	McGuire review and comment on draft report.
Weeks 11-12 (September 2-13, 1996)	Issue of Final Report.

6.0 TEAM COMPOSITION AND QUALIFICATIONS

The combined Duke Power and Ogden team has vast relevant experience in the design and operation of service water systems and in performing self assessments. Team members were selected with diverse backgrounds to cover all aspects of this self assessment as outlined in TI 2515/118.

The SWSOPI assessment will be conducted in accordance with Duke Power's audit and assessment program. Duke Power has performed more than 10 SSFI based assessments of systems at its three nuclear sites. These audits were led by Duke Power personnel and the teams consisted of a mix of Duke Power personnel and outside consultants. Recent SSFI audits performed at the McGuire site include the following:

- McGuire Switchyard Self Initiated Technical Audit (SITA) (1994)
- McGuire EDSFI (1990)
- McGuire Nuclear Service Water System Self Initiated Technical Audit (1993)
- McGuire Diesel Generator Self Initiated Technical Audit (1988)
- McGuire Control Room Ventilation and Chilled Water System SITA (1989)

Self Initiated Technical Audits of the Nuclear Service Water Systems were also performed at the Oconee and Catawba nuclear sites and findings with generic implications were addressed by the McGuire Nuclear Site. The 1993 McGuire Nuclear Service Water System SITA was performed using the guidance of the 1992 draft TI 2515/118.

Ogden has substantial experience performing work of this nature. Ogden has performed over 100 SSFI type audits throughout the nuclear industry with many of them being SWSOPI assessments or assists.

The SWSOPI team will be lead by Jerry Standridge of Duke Power. Mr. Standridge is a Lead Auditor with the Regulatory Audit Group of the Nuclear Generation Department. Mr. Standridge has been a Lead Auditor for over 20 audits during his 12 years in the Regulatory Audit Group, including 4 SSFI type audits.

The SWSOPI team will be co-led by Mr. Stuart Klein of Ogden Environmental and Energy Services. Mr. Klein is very experienced as a Team Leader in SSFI assessments. He is well known as an industry expert to NRC staff, both in Region II and at NRC Headquarters.

The SWSOPI team members are as follows.

Team Leaders	J. A. Standridge (Duke Power) S. M. Klein (Ogden)
Mechanical Design	D. C. Prevatte (Ogden) R. T. Mitchell (Ogden)
Operations	T. Henderson (Ogden)
Maintenance and QA	J. Fuoto (Ogden)
Surveillance and Testing	W. C. Sherbin (Ogden)

Electrical Design

J. M. Hilditch (Ogden)

Their resumes are located in Attachment "B" of this submittal.

A Duke Power Senior Reactor Operator, to be determined, will also be joining the team.

Attachment A

Proposed SWSOPI Checklist

The proposed self-assessment will include interviews with personnel, system walkdown, and document reviews. The following provides the minimum set of items to be reviewed and will be added to and refined based upon the findings of the self-assessment:

1.0 Mechanical Systems Engineering Design Review and Configuration Control

- 1.1 Review the design bases, and other design documents such as calculations and analyses for the SWS, and determine the functional requirements for the SWS and each active component during accident or abnormal conditions.
- 1.2 Review the SWS configuration drawings for consistency with applicable design documents, NRC requirements, and licensing commitments.
- 1.3 Review the SWS operation as compared to design documents.
- 1.4 Evaluate single active failure vulnerabilities of the system and the resulting impact on interfacing system components. Also, examine potential common mode failures from fouling of common intakes or traveling screens.
- 1.5 Review the effectiveness of design features installed to minimize silting and biofouling of the piping and components.
- 1.6 Verify if features are provided for the timely detection of flow degradation and if flow balancing has been conducted during various system operating modes.
- 1.7 Verify that pump run out conditions are not present with minimum number of pumps operating with worst case alignment of non-safety related loads.
- 1.8 Verify that system flow balance data is consistent with key design assumptions.
- 1.9 Check whether design features are provided to mitigate the effects of flooding caused by SWS leaks. Review NUREG 1275, Volume 3, Section 3.3 for information on SWS events involving actual or potential flooding.
- 1.10 Review the safety related portion of the system for seismic qualification and verify that non-safety related portions can be isolated in accordance with the provisions specified in the system design bases.
- 1.11 Review the program for monitoring system degradation.
- 1.12 Review the setpoints for alarms and actuations to ensure they are consistent with the design bases and assumptions.
- 1.13 Review the system design bases to ensure that the required functions are met.

- 1.14 Evaluate the adequacy and consistency of the existing system/components with respect to the design bases.
- 1.15 Assure availability of power circuits under all operating and design bases conditions.
- 1.16 Review instrumentation for range and accessibility..
- 1.17 Verify the adequacy of system/component controls and protection logic.
- 1.18 Review all modifications to the SWS and select at least three significant modifications for a detailed review.
- 1.19 Evaluate the adequacy of the response to Action IV of NRC Generic Letter 89-13.

2.0 Operations

- 2.1 Perform an in-depth system walkdown. Review the SWS configuration for consistency with design drawings.
- 2.2 Review the SWS alarm response procedures and operating procedures for normal, abnormal, and emergency system operations.
- 2.3 Review operating logs to determine the adequacy of temperature and flow monitoring.
- 2.4 Review operator training for the SWS, ensuring that the lesson plans reflect the system modifications and that the licensed operators have been trained on these modifications.
- 2.5 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.
- 2.6 Verify that required accident condition flow is not degraded during normal system operation valve alignments.
- 2.7 Review control of SWS heat exchanger flow variations due to changing climate (temperature) conditions.
- 2.8 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.
- 2.9 Verify that the operators' knowledge of equipment location and operation is adequate.

- 2.10 Interview the operators to determine the adequacy of their technical knowledge of such items as the operation of the system, its role in accident mitigation, technical specification surveillance requirements, and determination of operability.
- 2.11 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, emergency lighting, and steam, assumed under accident conditions are adequate for remote operation of equipment.
- 2.12 Assess operational controls for traveling screens and circulating water pumps to preclude excessive drawdown of the intake bay, with associated loss of SWS pump suction head, as a result of clogging the traveling screens.

3.0 Maintenance

- 3.1 Conduct an in-depth system walkdown to review the as-configured system for material condition.
- 3.2 If possible, witness maintenance performed on the SWS. Review maintenance package preparation and observe quality control involvement.
- 3.3 Review maintenance procedures for technical adequacy.
- 3.4 Determine if maintenance procedures are sufficient to perform the maintenance tasks and provide for identification of equipment deficiencies.
- 3.5 Compare maintenance procedures to vendor manuals to identify any vendor recommendations not incorporated into the procedures.
- 3.6 Determine if vendor manuals are available and maintained current.
- 3.7 Review the periodic inspection program used to detect corrosion, erosion, protective coating failure, silting, and biofouling.
- 3.8 Review the maintenance program for removal and repair of SWS piping and interface system components due to silting, fouling, corrosion, erosion, and failure of protective coatings.
- 3.9 Determine if the SWS components are being adequately maintained to ensure their operability under all accident conditions.

- 3.10 Review the maintenance history for the selected components of 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.
- 3.11 Review several completed maintenance activities for technical adequacy, performance of appropriate post-maintenance testing, and satisfactory demonstration of equipment operability.
- 3.12 Determine the adequacy of the maintenance program from an overview perspective. Of importance here is a determination that the maintenance work order system ensures that the plant, system, and component design bases are adequately maintained
- 3.13 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.
- 3.14 Conduct detailed interviews with maintenance personnel to determine their technical knowledge of SWS component maintenance.
- 3.15 Assess the degree of evaluation and utilization of industry component/system specific failures and/or maintenance issues.

4.0 Surveillance and Testing

- 4.1 Review and evaluate the technical adequacy and accuracy of the technical specification surveillance procedures and inservice test procedures performed in the past two operating cycles (minimum of two years) for the SWS.
- 4.2 Review the SWS design and licensing bases.
- 4.3 Verify that test acceptance criteria are consistent with the design bases to ensure the SWS testing adequately demonstrates that the SWS will operate as designed.
- 4.4 Review indicators of SWS performance to identify if any testing inadequacies exist or if testing frequency is appropriate.
- 4.5 Determine if surveillance test procedures comprehensively address required SWS responses.
- 4.6 Review results from pre-operational testing to determine whether the SWS capabilities and limitations were appropriately demonstrated.
- 4.7 Determine whether appropriate controls were established to avoid unacceptable system or component operating regimes.

- 4.8 Evaluate the support systems and plant modifications selected for review by the engineering team to ensure that surveillance and testing has been properly performed.
- 4.9 Review the inservice test records for valves and pumps in the SWS.
- 4.10 Review how specific SWS instruments are calibrated and tested.
- 4.11 Verify that the tolerances used for instrument accuracy are acceptable.
- 4.12 If possible, witness post-maintenance, surveillance, and inservice tests performed on the SWS.
- 4.13 Review procedures for periodic testing of safety-related heat exchanger heat transfer capability and the trending of such results.
- 4.14 For the two previous operating cycles (two year minimum) preceding the self-assessment, ascertain system, train, pump, or significant component unavailability during power and shutdown conditions. Assess the degree to which the licensee has input accurate unavailability data into the IPE.
- 4.15 Verify that the installed SWS components are tested to ensure the components will perform in accordance with their design bases.
- 4.16 Review the implementation of the periodic inspection program to detect flow blockage from biofouling in other systems.
- 4.17 Review testing on one air-to-water heat exchanger served by the SWS to ensure proper heat transfer. Examine the air side for fouling.

5.0 Quality Assurance and Corrective Actions

- 5.1 Review the meeting minutes of the plant onsite safety review committee and the offsite safety review committee for the past six months for items pertaining to the SWS.
- 5.2 Review the operational history of the SWS.
- 5.3 Compare the results of the team's assessment of the areas inspected for the SWS with the results of applicable licensee quality verification activities in the same areas. Determine why quality verification activities did not uncover significant issues identified by the team.

- 5.4 Review the timeliness and technical adequacy of licensee resolution of findings from its self-assessments. Review the open item tracking system for adequate tracking and closure of identified SWS deficiencies.
- 5.5 Evaluate the interface between engineering and technical support and plant operations, regarding corrective actions to resolve operational problems.

Attachment B

SWSOPI Team Resumes

STUART M. KLEIN, P.E.

EDUCATION

B.S., Pennsylvania State University, 1960

PROFESSIONAL AFFILIATIONS

Registered Professional Engineer, Commonwealth of Pennsylvania
Member American Nuclear Society

SUMMARY OF QUALIFICATIONS

Mr. Klein's diverse experience spans more than 34 years of engineering design in such areas as nuclear power plant systems and mechanical equipment design, industrial mechanical design, design review, and project management. He has more than 12 years of nuclear power plant project assignments while employed with a major architect-engineering firm. His work has included the detailed design of mechanical systems with assignments of increasing supervisory and management responsibilities. He has participated in numerous design inspections (SSFI) with the NRC as well as utility sponsored SSFI programs and internal service water assessments (SWSOPIs). Mr. Klein was responsible for the development of studies related to configuration management controls at operating nuclear plants for the NRC.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1984 - Present

Principal Engineer. Mr. Klein is responsible for overseeing and directing the activities related to mechanical engineering design and design review of power plant process systems. He has served as a consultant to the Nuclear Regulatory Commission and participated in the design review of numerous safety-related nuclear plant systems with the NRC as well as utility-sponsored SSFIs, including service water system inspections at Crystal River, Fermi 2, Farley, and Palo Verde. Mr. Klein served as lead mechanical reviewer for internal assessments performed on a number of Service Water Operational Performance Inspections (SWSOPIs) at Browns Ferry, Salem Units 1 and 2, North Anna, Sequoyah, Surry, Calvert Cliffs, FitzPatrick, Vermont Yankee, Fort Calhoun, and Pilgrim. As a result, the NRC waived or performed reduced scope SWSOPIs at several of the latter plants where internal SWSOPIs were completed. Mr. Klein served as the Technical Team Lead for the functional reviews at Surry, North Anna, and Susquehanna nuclear plants. Mr. Klein also participated in SSFIs performed on other safety-related systems at Palisades, D. C. Cook, and Dresden (SSOMI). In addition, he served as the mechanical reviewer during an EDSFI at Clinton and performed an evaluation of the Calvert Cliffs Nuclear Power Plant safety-related salt water pumps.

Mr. Klein directed activities for the development of a transient hydraulic model of a safety-related service water system. The model is used for the analysis of potential water hammer events. Modeling techniques used in the effort were described in a paper published by EPRI in the Proceedings of the Seventh Service Water Systems Reliability Improvements Seminar, 1994.

Mr. Klein developed a training program for the NRC on vertical-slice inspection techniques used in SSFIs which he presented at the NRC Regional Offices and NRC Headquarters. He was involved in the development of studies related to configuration management at operating nuclear plants for the NRC. The results of these efforts have been published by the NRC in NUREG/CR-5147, "Fundamental Attributes of a Practical Configuration Management Program for Nuclear Plant Design Control." Mr. Klein has provided support and consultation to the NRC and utilities (Arizona Public Service and Consumers Power Company) in the development of Design Basis Documents. He has served as Design Basis Program Coordinator directing all activities related to the development of Palo Verde Nuclear Generating Station Design Basis Documents for Arizona Public Service.

Mr. Klein has written and served as Project Manager to develop Design Basis Documents for several safety-related systems at Fermi 2 Nuclear Plant.

United Engineers & Constructors, Inc., 1972-1984

Supervising Engineer. Mr. Klein had lead responsibility for the Mechanical Group, Site Support Engineering for the Seabrook Nuclear Power Station. Activities included work in all areas of the plant, both safety-related and the balance of plant systems, e.g., main steam, circulating water, feedwater systems, and related auxiliary systems. Mr. Klein's responsibilities included directing the work of the engineers and designers; reviewing and approving drawings, documents, and specifications for plant modifications; and supporting the construction and start-up efforts to complete the Seabrook project.

During this period, Mr. Klein originated the system designs for the safety-related station service water system and a number of other cooling systems, e.g., the component cooling water system. He completed extensive trade-off studies to determine optimum system concepts, equipment sizes and parameters for wet and dry cooling towers, heat exchangers, pumps, etc. He developed final detail designs and directed procurement activities associated with these systems. Much of the conceptual work for these activities was described in a paper entitled "Emergency Shutdown Cooling Towers Considerations in the Evolution of an Optimum Tower Design," which was published in Nuclear Safety.

Mr. Klein appeared before the NRC Staff to substantiate the design of essential cooling water systems.

Westinghouse, Bettis Atomic Power Laboratory, 1969- 1972

Senior Design Engineer. Mr. Klein was responsible for the design of nuclear reactor plant fluid systems for NIMITZ class nuclear aircraft carriers. He conducted design analysis to assure successful hydraulic and thermal performance of the systems.

United Aircraft Corporation, 1963-1969

Design Engineer. Mr. Klein was responsible for the design of aircraft propeller systems and components, pitch change mechanisms, and blade retention systems. He designed aircraft air inlet control systems, hydraulic actuators, and servomechanisms. He was involved in design tradeoff studies to determine optimum control configurations.

North American Aviation, Inc., 1962-1963

Research Engineer. Mr. Klein was involved in the design of the engine actuation system for the Saturn II. Space Vehicle.

United Aircraft Corporation, 1960-1962

Development Test Engineer. Mr. Klein was responsible for the development testing of jet engine fuel control systems and hydro-mechanical feedback control servo-mechanisms. He was involved in the development testing of precision control system components, e.g., flapper control valves, servo controlled linear throttle valves, linkages, pressure control valves, and force balance systems.

PUBLICATIONS

"Service Water System Transient Hydraulic Modeling Techniques," Proceedings of Seventh Service Water Systems Reliability Improvement Seminar, Electric Power Research Institute, June 29-July 1, 1994 (Co-authored with Dr. E. V. McAssey and M. J. Titone).

NUREG/CR-5147, "Fundamental Attributes of a Practical Configuration Management Program for Nuclear Plant Design Control," U.S. Nuclear Regulatory Commission, 1988.

"Emergency Shutdown Cooling Towers - Considerations in the Evolution of an Optimum Tower Design," Nuclear Safety, 1976.

JERRY A. STANDRIDGE

EDUCATION

B. S. Lander University, 1979

SUMMARY OF QUALIFICATIONS

Mr. Standridge has 16 years of Quality Assurance experience with 12 years experience as a lead auditor. Mr. Standridge has lead more that 20 regulatory audits at Duke Power's nuclear sites; 4 being Safety System Functional Inspection type audits of the McGuire Nuclear Station Swithyard, Catawba Nuclear Station Component Cooling System, Oconee Nuclear Station Emergency Power System and Catawba Nuclear Station Diesel Generator System .

PROFESSIONAL EXPERIENCE

Duke Power Company
1981 - present

Lead Auditor. As a lead auditor in Duke Power's Regulatory Audit Group of the Nuclear Generation Department, Mr. Standridge has led more that 20 audits and participated in more than 50 regulatory audits. Mr. Standridge now leads all Safety System Functional Inspection (SSFI) type audits performed internally for Duke Power. He has led and performed audits of maintenance, operations, design, and all station support activities. Mr. Standridge is also responsible for scheduling Technical Specification audits for Duke's three nuclear sites.

Soil and Material Engineers
1979-1981

Metals Inspector. Mr. Standridge was responsible for projects involving nondestructive testing of metals and weldments. Mr. Standridge was ASNT-TC-1A Level II certified in Magnetic Particle Testing, Liquid Penetrant Testing, Radiographic Testing, and Ultrasonic Testing. He was also an American Welding Society Level II Welding Inspector.

JOHN S. FUOTO, P.E.

EDUCATION

1972, B.S., Mechanical Engineering (With Distinction), Clarkson College of Technology (now Clarkson University)

Additional Training: ASME Code Familiarization, Design Review Training Course, ALARA Awareness Seminar, Nuclear Heat Transport and Reactor Design, Zion Nuclear Power Station Simulator Course, other courses in counseling, communication, management, and other technical topics

PROFESSIONAL REGISTRATIONS/AFFILIATIONS

Registered Professional Engineer - Pennsylvania (1979), Maryland (1991), Virginia (1991), District of Columbia (1991)

American Nuclear Society

SUMMARY OF QUALIFICATIONS

Mr. Fuoto has 23 years of experience in the commercial nuclear power industry in design, analysis, safety assessment, quality assurance, inspection, emergency planning, procedure development, and plant testing. Mr. Fuoto is currently evaluating the application of a centrifuge design for a liquid radwaste system for a nuclear power plant in Korea. He has supported utility-sponsored Service Water Operational Performance Inspections (SWSOPIs) at Salem and Calvert Cliffs. He has also served as an inspector on utility-sponsored SWSOPIs at Kewaunee (RHR/LPSI), Farley, (CVCS/Containment Spray), and Perry (RHR/LPCI). He has developed vertical-slice assessment programs at both Calvert Cliffs and Limerick Generating Station. While at Westinghouse, Mr. Fuoto was a lead engineer responsible for thermal-hydraulic calculations, component sizing, design reviews, plant models, emergency procedure development, Technical Specification development, and review of architect-engineer balance-of-plant designs to assure compliance with reactor system requirements. These responsibilities included review of liquid and gaseous radwaste systems interface requirements as well as ALARA reviews.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc., Fairfax, VA
1985 - Present

As part of market development activities concerning the Korean commercial nuclear power industry, Mr. Fuoto is performing an evaluation of a centrifuge-based liquid radwaste system, including review of specifications and review of various manufacturers' designs. He evaluated federal regulations and conforming state regulations applying to the licensing, operation, and post-operation of low-level radioactive waste disposal facilities.

Responsible for developing spill prevention, control, and countermeasure plans to meet Environmental Protection Agency (EPA) and state regulatory requirements related to prevention and mitigation of spills of oil and hazardous substances at Air National Guard Bases located in West Virginia, Maryland, Rhode Island, Maine, Massachusetts, Vermont, and Pennsylvania.

Developed facility (emergency) response plan for airport aviation fuel facilities to meet requirements of Oil Pollution Act. Plan included emergency notification procedures, immediate actions, hazards evaluations, and rapid response to EPA reviewer comments. Directs Emergency Action Level (EAL) upgrades for Fermi 2, Cook Nuclear Plant, Calvert Cliffs, Connecticut Yankee, Duane Arnold, and Millstone Nuclear Power Station to meet the NUMARC generic guidance as endorsed by the Nuclear Regulatory Commission (NRC). Projects include development of EAL basis information, review of plant operating procedures and Technical Specifications, review and critique of simulator-based emergency drills, development of EALs suitable for use by operations and radiation protection personnel, assistance in obtaining state, local, and NRC approvals, and development and performance of training of plant personnel as well as state and local officials. In these projects, particular attention is paid to sources of liquid and gaseous radioactive effluents to develop suitable EALs. This includes review of system design, operation, Technical Specifications, release limits, radiation monitors, and safety analyses applying to all systems that process radioactive effluents, including radwaste systems.

Served as member of utility-sponsored inspections at Salem (SWSOPI), Calvert Cliffs (SWSOPI), Farley (CVCS/Containment Spray), Perry (RCIC/LPCI), and Kewaunee (RHR/LPSI). Performed review of Grand Gulf design calculations of fluid systems flow rates, elevation heads, and pressure drops as well as containment calculations of normal and post-accident radiological conditions. Directed support for Calvert Cliffs Performance Improvement Plan (PIP), including development of improvement program, monitoring of action plans, determination of effectiveness, meeting with senior management, and developing verification process based on NRC Diagnostic Evaluation Team methodology. Project Manager for Limerick Unit 2 Readiness Verification Program, including development and scope of Independent Design and Construction Assessment. Performed technical and regulatory analysis related to nuclear plant prudence reviews, including emergency lighting systems, high energy line breaks, and motor-operated valves.

Member of design review of the hydrogen mitigation system for the Hanford N-Reactor. Member of team performing an assessment of Technical Safety Appraisals and Design Reviews of Department of Energy (DOE) facilities, including comparison with other safety appraisal mechanisms and recommending improvements. Led evaluation of Limerick 2 readiness for operation in the areas of engineering, design, and analysis, including utility, vendor, and architect-engineer programs.

Directed multi-disciplinary formal design review program, and reviewed, approved, and followed design configuration changes from initiation through implementation. This included design reviews of liquid and gaseous radwaste systems, including ALARA reviews. Provided analytical, licensing, and onsite technical support for North Anna 2 and Sequoyah 1 special low-power natural circulation tests. Participated in other plant startup tests at Beaver Valley 1 and Zion 2 to verify proposed control systems response and plant and fluid system performance.

Directed vendor efforts on application of Owners Group Emergency Response Guidelines at San Onofre 1 and Maine Yankee. Developed bases and requirements for post-accident monitoring systems. Developed control and protection system functional design changes, Technical Specification changes, and emergency procedure changes necessary to support loop-out-of-service operation. Developed methods for determining usage factors on nuclear plant components for life-extension studies and fatigue crack growth assessments for Yankee Rowe and Trino Vercellese.

Developed appropriate fluid system design transients for nuclear plants for equipment designers; efforts included plant simulation using mainframe computers, review of applicable design information, review of operating history, and onsite interviews of plant operators. Specified capacity requirements for pressurizer spray, relief, and safety valves including certification that safety valve capacity met ASME Boiler and Pressure Vessel Code requirements and thereby met reactor coolant system design bases.

Developed algorithms for plant process computer monitoring of secondary side process, including heat transfer, flow rates, pressure drops, and thermal efficiency. Reviewed architect-engineer balance-of-plant fluid system designs for consistency with reactor system requirements, including interface with the liquid and gaseous radioactive waste systems .

AWARDS

Westinghouse General Manager's Excellence Award, 1979, 1980

PATENTS

Patent No. 4,231,328, "Automatic Feedwater Isolation System," Co-holder

SELECTED PUBLICATIONS

Duane Arnold Energy Center Emergency Action Levels Technical Basis Document, May 1 1995.

Oil and Hazardous Materials Spill Prevention and Response Plan, West Virginia Air National Guard. March 1995

Oil and Hazardous Materials Spill Prevention and Response Plan, Vermont Air National Guard, March 1995

Facility Response Plan, Ogden Aviation, Washington Dulles International Airport Bulk Fuel Storage Facility, February 1995

Model Tracking System for Low Level Radioactive Waste Disposal Facilities: License Application Interrogatories and Responses, DOE/LLW-206, August 1994

Facility Response Plan, Ogden Aviation, Washington National Airport Fuel Farm, January 1994

Bases for Post-Accident Source Term and Dose Estimation, Philadelphia Electric Company (now PECO Energy Company), Revision 0, July 1991.

Methodology for Development of Emergency Action Levels, NUMARC/NESP-007, April 1 990.

Hydrogen Mitigation System for N-Reactor - Analysis and Regulatory Review, I EAL- R/8723, December 1987.

Severe Accident Issue Resolution Process, DOE/ID-10172, October 1987.

Role of Probabilistic Risk Assessment for Advanced L WRs, DOE/ID- 10173, August 1987.

"Component Cycle Monitoring System," Topical Meeting on Computer Applications for Nuclear Power Plant Operation and Control," September 1985 (Co-author).

Maine Yankee Procedures Generation Package Plant Technical Guidelines, May 1985.

TIMOTHY K. HENDERSON

EDUCATION

B.S. Chemical Engineering, University of Massachusetts
National Academy for Nuclear Training (INPO), Senior Nuclear Plant Management Course

PROFESSIONAL AFFILIATIONS

Senior Operator License, Yankee-Rowe, U.S. Nuclear Regulatory Commission
Maine Yankee Nuclear Safety Audit Review (NSAR) Committee, 1983-1995
American National Standard, ANSI/ANS-56.8-100x, Containment System Leakage Testing Requirements, Standards Committee, 1992-1994

SUMMARY OF QUALIFICATIONS

Mr. Henderson has over 21 years of experience in nuclear power plant operations, including one year as acting plant manager at Yankee Nuclear Power Station. He has direct management experience in all operating disciplines, recently extending to decommissioning. Mr. Henderson has guided major restructuring efforts in chemistry, radiation protection, operations, and training. Positive results were evidenced by improvements in regulatory (SALP) and INPO ratings, no violations in radiation protection, and near perfect results in examination pass rates for NRC operator exams.

PROFESSIONAL EXPERIENCE

Independent Consultant, Operations
1995 - Present

Principal Engineer. Mr. Henderson provides detailed assessment and recommendations for operating nuclear power facilities, decommissioning activities, and nuclear engineering organizations.

Mr. Henderson is a current member of a Senior Advisory Group for Engineering Excellence (SAGEE) for a two-unit PWR. The SAGEE is performing a review of all engineering design changes in progress, raising the quality of engineering products, and documentation packages.

Mr. Henderson served as operations reviewer for four NRC-approved Service Water System Operational Performance Inspections (SWSOPIs) at both BWR and PWR facilities, each resulting in improved plant operations and compliance.

Mr. Henderson served as Team Leader and Operations Reviewer for a comprehensive spent fuel storage self-assessment at Yankee-Rowe. The NRC review yielded high praise for the depth of the assessment and justification for continued reduced inspection status.

Mr. Henderson was Team Leader for the Decommissioning Environmental Report for Yankee-Rowe. This environmental impact statement supports the Yankee Decommissioning Plan and was accepted by the NRC with only minor comments.

Mr. Henderson was Team Leader for a comparison study of procedures-to-technical specifications surveillance requirements at a PWR, resulting in several improvements for the reactor engineering, ISI, IST, ILRT, and fire protection disciplines.

Yankee Nuclear Power Station (YNPS)
Yankee Atomic Electric Company
1974- 1995

Assistant Plant Superintendent (YNPS in Decommissioning, 1992-1995). Line management for operations, training, and radiation protection during the transition from operational to decommissioning status. Wrote the Decommissioning Technical Specifications and Decommissioning Environmental Report, enacted major staffing reductions, reduced training programs, the emergency plan, and facilities. Ultimately included this job in staff reductions, retiring the position in 1994. the final task was a comprehensive fuel storage self-assessment. The NRC review of the results served to justify continued "reduced inspection status" for YNPS.

Assistant Plant Superintendent (YNPS in Operating, 1988-1992). Senior operational line management. Direct reports included operations, maintenance, training, radiation protection, and the technical departments. Enacted a revitalizing plan for operations and maintenance which showed slow, but steady improvements. In 1991, YNPS achieved its highest ever SALP rating with six SALP 1 and a 2 + score. Served as the Acting Plant Superintendent for 14 months during 1990-1991.

Technical Director (1983-1988). Managed the restructuring of specific functional areas on site, including chemistry, radiation protection, and training. Subsequent performance in each area demonstrated dramatic improvement, evidenced by regulatory (SALP) and INPO rating, zero violations in radiation protection and near perfect results in examination pass rates for NRC exams.

Reactor Engineer/Shift Technical Advisor (1974-1983). Analyzed operating parameters, administered special nuclear materials and containment integrity (Appendix J) programs, and an early version of the inservice inspection program. Assumed department level managerial duties in 1979, creating and implementing a Shift Technical Advisor program.

United States Air Force
1970-1973

Lieutenant, Munitions Services. Officer in charge, flightline munitions, at Nellis AFB, Nevada, and Nakhon Phanom RTAFB, Thailand. Operations included conventional and classified weapons, plus search and rescue mission support.

PUBLICATIONS

"Plant License Renewal - An Operating Perspective," presented at PLEX '91 in Berlin, Germany, co-author, November 1991.

JOHN M. HILDITCH P.E.

EDUCATION

B.S.E.E., Villanova University, Magna Cum Laude, 1983
Advanced Nuclear Power Training, U.S. Navy, 1984

PROFESSIONAL AFFILIATIONS

Professional Engineer, 1990, Rhode Island
Tau Beta Pi Engineering Honor Society
Institute of Electrical and Electronics Engineers

SUMMARY OF QUALIFICATIONS

Mr. Hilditch has over 12 years of experience as an electrical engineer in electrical design, operation, and maintenance of naval and commercial power plants. He conducts various design review activities, such as vertical-slice audits, in support of commercial nuclear utilities. Mr. Hilditch provides electrical support to utility design and design basis documentation (DBD) projects. He possesses a working knowledge of IEEE Standards, NRC requirements, and other design guidelines commonly used in the commercial power generating industry.

Mr. Hilditch has participated in several utility-sponsored EDSFIs and SSFIs, investigating the design and supporting calculations at various sites, including Calvert Cliffs, Quad Cities, D. C. Cook, Zion, and Sequoyah. The electrical areas of investigation included emergency diesel generators, dc distribution system, and inverters (uninterruptible power supplies). Mr. Hilditch has evaluated several different electrical distribution systems with respect to their design, including modifications, installation, and operation. In addition, he has prepared analytical design calculations and design basis documents for existing electrical systems for utility clients.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1990 - Present

Principal Engineer. Mr. Hilditch provides electrical support to technical audits, design, and design basis documentation (DBD) projects. He has participated in several utility-sponsored EDSFIs and SSFIs, investigating and evaluating the design and supporting calculations at various sites, including Browns Ferry, Farley, Peach Bottom, Calvert Cliffs, Quad Cities, D. C. Cook, Zion, and Sequoyah. Mr. Hilditch provided direct engineering support to the utility EDSFI response teams at Quad Cities and D. C. Cook during their respective NRC inspections. He served as maintenance reviewer for the Service Water System Operational Performance Inspection (SWSOPI) conducted at Sequoyah. His electrical areas of expertise include emergency

diesel generators, dc distribution systems, protective relaying, and inverters (uninterruptible power supplies).

Mr. Hilditch is the principal author of the electrical portion of the DBDs for HPCI, RHR service water, essential service water, and diesel generator service water systems for Detroit Edison and the Control and Protective Circuits Philosophy and battery system DBDs for American Electric Power. During each DBD effort, Mr. Hilditch was responsible for the retrieval and assessment of design basis information to determine system design requirements and functions. Mr. Hilditch has provided direct technical support to utility engineering staffs. While providing support for the American Electric Power (AEP) Service Corporation, Mr. Hilditch initiated a comprehensive 250-Vdc electrical system performance study that included an integrated review of available design information. User-friendly system technical notebooks were also developed for the AEP design system engineers. He also performed and evaluated other specific electrical distribution design calculations, which included load flow and fault studies, voltage drop calculations, and coordination studies, using spreadsheet programs, CAD software programs (CAPTOR, DAPPER).

U.S. Navy
1983- 1990

Class Director, Submarine Officer Basic Course, Naval Submarine School, December 1988 to June 1990. Mr. Hilditch directly supervised the progress of 75 officers in the completion of an intensive 12-week course of advanced instruction. He followed up on scheduled events involving several outside organizations to ensure proper execution of plans, thus averting crisis management.

Combat Systems Officer, USS Greenling (SSN 614), March 1987 to November 1988. Mr. Hilditch supervised and managed a department consisting of 30 officers and technicians who maintained state-of-the-art electronic and mechanical equipment. He managed department training and planned maintenance system programs. He planned, scheduled, determined logistics, and directly supervised the testing of the sonar and fire control systems during an intensive 3-month post-overhaul evaluation. He personally organized and directed an integrated plan involving the entire ship's company to complete a myriad of post-overhaul inspections and certifications prior to an overseas deployment.

Main Propulsion Assistant, Electrical Officer, USS Greenling (SSN 614), October 1984 to March 1987. Mr. Hilditch served as principal assistant to the ship's Engineering Department Head for the operation and maintenance of the ship's main propulsion equipment during a shipyard overhaul, including the nuclear reactor plant, main and auxiliary steam plant, and radiological and water chemistry control. He actively integrated rapidly changing shipyard priorities with available personnel assets while serving as shift supervisor during several complex and lengthy engineering plant test programs.

R. THOMAS MITCHELL

EDUCATION

BS., Chemical Engineering, Rensselaer Polytechnic University, 1986
U. S. Naval Nuclear Power Training Program, 1987

SUMMARY OF EXPERIENCE

Mr. Mitchell conducts various design review activities, such as vertical-slice audits and design basis documentation (DBD) development, and Equipment Qualification activities in support of commercial nuclear utilities. He has been a member of an SSFI team at American Electric Power Service Corporation and Illinois Power Company as well as an EDSFI team at Philadelphia Electric Company. Mr. Mitchell was extensively involved in Pennsylvania Power and Light's Environmental Qualification Program Upgrade, including the initial population of a relational database system used for EQ support. Mr. Mitchell has also served as a mechanical reviewer and Deputy Project Manager for an in-depth review of Grand Gulf Nuclear Station design basis calculations over a broad range of systems. In addition, Mr. Mitchell has provided mechanical support for AEP's NRC conducted EDSFI. Mr. Mitchell is also experienced in Service Water System program management.

Mr. Mitchell also provides mechanical, chemical, maintenance, and operations support to technical audits and design basis documentation (DBD projects and provides security and safeguards work for industry and DOE projects.

Mr. Mitchell has had extensive experience in maintenance planning, oversight, and record reviews while associated with the Naval Nuclear Power Program. During refueling overhaul operations, he was responsible for the scheduling and safe completion of system verification testing. As a final assignment, he was responsible for the administration of a water chemistry controls program and a radiological controls program.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1991 - Present

Senior Engineer. Mr. Mitchell served as lead mechanical observer for an SSFI of the LPCS and RCIC systems at Clinton Station for Illinois Power Company. He was responsible for reviewing the mechanical design of both of the systems as well as supporting HVAC systems. He was also responsible for reviewing I&C setpoint calculations for the LPCS and RCIC systems.

Mr. Mitchell was a project team member responsible for reviewing design basis documents placed in long-term storage for potential design information for American Electric Power Service Corporation. The team reviewed, categorized, and cataloged documents dating back to the original design of the Donald C. Cook Nuclear Power Station. A database tracking system was developed by the team to allow subsequent preparers of the DBDs to quickly identify potentially useful documents.

Mr. Mitchell served as a project team member in the Environmental Qualification Program Upgrade database effort at Pennsylvania Power & Light Company. He was responsible for revising draft Environmental Qualification Assessment Reports (EQARs) to address technical deficiencies and to ensure compliance with PP&L's program structure. Mr. Mitchell was also responsible for closing out the old qualification binders and revising the Maintenance and Surveillance forms to reflect the new qualifications. Subsequently, Mr. Mitchell was a key member of the team selected to populate a new database for the EQ Group. This effort involved the use of a relational database software system to support the input, update, use, and analysis of the structured EQ Database. Mr. Mitchell was responsible for the extraction of data such as material properties, component requirements, and test data from existing plant controlled databases EQARs, and other controlled sources for input into the EQ Database.

Mr. Mitchell participated on a team of Ogden personnel providing project management activities associated with the service water systems at New York Power Authority's James A. FitzPatrick Nuclear Power Plant. This project involved the identification, integration, prioritization, coordination, and implementation of all open actions on the emergency service water system and related service water systems resulting from system engineer activities, validation of the service water systems' DBD, an NRC SSFI, and NYPA's pre-NRC SSFI activities. Mr. Mitchell was responsible for tracking previously identified action items and ensuring regulatory commitments were identified and met. Mr. Mitchell also assisted NYPA engineers by performing design calculations to support surveillance testing requirements.

Mr. Mitchell served as a project team member for the American Electric Power Service Corporation's Donald C. Cook Environmental Qualification (EQ) program development. He was responsible for conducting a programmatic review to assess the status of the program with respect to regulatory requirements and industry practices. This effort primarily involved the review of procedures, controls, interfaces, and actual work practices associated with EQ program development/implementation.

Also for American Electric Power Service Corporation, Mr. Mitchell provided technical direction and support to the Mechanical Engineering Department on HVAC review activities in preparation for an NRC EDSFI of the Donald C. Cook Nuclear Power Station. Mr. Mitchell was responsible for identifying and solving problem areas in design and operations of various ventilation systems. He was also responsible for maintaining and managing the work load to ensure the timely completion of all items.

Mr. Mitchell was the deputy project manager for an in-depth review of several hundred mechanical design, offsite and onsite dose, and habitability calculations for the Grand Gulf

Nuclear Station. He was also responsible for reviewing calculations supporting the standby gas treatment system and the control room ventilation system to assess the adequacy and completeness of the calculations.

Mr. Mitchell evaluated the design of the electrical distribution ventilation system and the diesel generator mechanical support systems for an EDSFI of the Philadelphia Electric Company's Limerick Generating Station. Mr. Mitchell was also involved in reviewing maintenance and operating practices to ensure completeness and compliance with applicable directives.

In an SSFI, Mr. Mitchell evaluated the adequacy of the design of safety-related ventilation systems for the Donald C. Cook Nuclear Plant. Particular emphasis was placed on the ESF and control room systems. In addition to reviewing mechanical design calculations, meteorological and airborne contamination calculations were assessed with respect to the system's ability to provide an acceptable control room environment.

Mr. Mitchell assisted Commonwealth Edison Company in the preparation of system assessment training at Quad Cities Nuclear Plant, with the purpose of teaching dally use of vertical-slice inspection techniques to the system engineers.

US. Navy
1986 - 1991

Radiological Controls Officer, December 1990 to May 1991. Mr. Mitchell served as a principal assistant to the ship's Engineer for the administration of the ship's propulsion plant water chemistry and radiological controls programs during a Naval Reactor's Operational Reactor Safeguards Exam (ORSE), similar to an NRC SSFI. Mr. Mitchell was responsible for implementing or upgrading several radiological programs to meet current standards. Part of his responsibilities included surveillance testing performance and record reviews for completeness, accuracy, and adherence to procedure

Assistant Weapons Officer, October 1988 to December 1990. Mr. Mitchell served as the principal assistant to the ship's Weapons Officer for the operation and maintenance of the strategic weapons system. He supervised and trained over 30 men through three major inspections, culminating in the ship's certification to carry nuclear weapons. He was also responsible for writing and implementing a comprehensive security program for the ship.

Reactors Control Officer, Electrical Officer, September 1987 to September 1988. Mr. Mitchell was responsible for the operation and maintenance of the reactor plant instrumentation and electrical distribution during refueling overhaul operations. As Engineering Duty Officer, he was responsible for the safe operation of the reactor plant and propulsion plant during several major testing evolutions, including steam generator chemical cleaning, reactor coolant system fill, and hydrostatic testing. As Reactor Controls Officer, Mr. Mitchell planned and supervised training, preparation, and execution of the prime standard alignment of the primary plant indication system instruments.

Naval Nuclear Power student, May 1986 to September 1987. Mr. Mitchell attended Naval Nuclear Power School and Prototype and received extensive training on the theory, design, and operation of nuclear power plants.

PUBLICATIONS

"A Review of PP&L's EQ Database Upgrade Program," EPRI/NUS Equipment Qualification Data Bank Technical Meeting, November 1993

DONALD C. PREVATTE, P.E.

EDUCATION

B.S., Mechanical Engineering, North Carolina State University, 1965

Short Courses: ALARA, PROJECT/2 Basic School, CPM Planning & Scheduling, Managerial Skills Seminar, Arc Welding, Public Speaking

PROFESSIONAL AFFILIATIONS

Registered Professional Engineer, Texas

SUMMARY OF QUALIFICATIONS

Mr. Prevatte has over 25 years of mechanical engineering experience, the last 18 years with engineering firms servicing the power industry. He has extensive multidiscipline engineering and management experience in the design, analysis, startup, testing, maintenance, and inspection of nuclear and fossil fuel power plants. In addition, he has nuclear submarine testing experience and jet engine design experience .

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co.
1986 - Present

Consulting Engineer. As a consultant to the Power Engineering Group, Mr. Prevatte is assigned to the Safety System Functional/Outage Modification Inspection (SSFI/SSOMI) teams where he has performed mechanical design reviews for numerous inspections, including SSFIs at, Monticello, Cooperi WNP-2, Point Beach, Trojan, and Browns Ferry. In addition, Mr. Prevatte has been a member of the NRC Diagnostic Evaluation Teams at McGuire and ANO.

Powerdyne Corporation
1982 - Present

Independent Consultant. Mr. Prevatte has participated in 37 performance-based team inspections (SWSOPIs, SSFIs, SSOMIs, Diagnostic Evaluations, Human Performance Appraisals, etc.) for the NRC, DOE, and nuclear utilities. He has performed reviews of design, maintenance, testing, operations, and human performance to ANSI, ASME, IEEE, INPO, NRC, and DOE codes, standards, and regulations. He has also participated in 12 inspections of emergency service water and related systems and 7 inspections of emergency power systems, including SWSOPIs at Hatch, Farley, Oconee, Surry, and Catawba.

Mr. Prevatte redesigned the 10CFR50.59 Safety Evaluation Program for the Point Beach Nuclear Plant to conform with current industry standards and NRC expectations .

For 10 years, Mr. Prevatte provided engineering and management consulting services to Pennsylvania Power & Light Company for the Susquehanna Steam Electric Station. In the Power Uprate Project, he performed systems design evaluations to support a 5% power uprate. His duties included performance of engineering analyses/ calculations, redesign of systems, and writing of reports. Calculations performed included determining the performance of safety-related coolers and the reactor building heat loads for normal and accident conditions. Systems evaluated included the reactor building HVAC system, the reactor building chilled water system, portions of the emergency service water system, the standby gas treatment system, the main condenser, and motor operated valves with regard to NRC Generic Letter 89-10 requirements.

As a participant in the Design Bases Document Project, Mr. Prevatte performed research of licensing requirements and commitments.

During plant startup and early operations, Mr. Prevatte performed analyses to resolve high energy pipe break problems inside containment and jet impingement analyses; directed leak-before-break analyses; developed plant modifications and operating procedure changes to reduce and mitigate MSIV leakage; performed suppression pool heatup problem analysis; designed diesel generator starting air system modifications; performed heat transfer analysis and modifications on auxiliary boiler feed pump seal cooling system; supervised Engineering Planning and Scheduling Group, gaining experience in the critical path method of project planning and controls using PROJECT/2. In addition, he performed cost analyses and developed position papers for the utility to support a Public Utilities Commission management audit and a rate increase request.

**General Physics Corporation
1980 - 1981**

Director, Power Engineering. Mr. Prevatte directed 28 engineers in design, analysis, and field engineering activities. His responsibilities included technical supervision, marketing, recruiting, planning and budget development. He served as Project Director for an Appendix J ILRT retest at the Brunswick Steam Electric Plant and directed the revision to the plant's LLRT program.

**Quadrex Corporation
1980 - 1981**

Site Manager. Mr. Prevatte supervised 19 engineers assigned to PP&L's Susquehanna Steam Electric Station, Nuclear Plant Engineering Department. He developed the conceptual design and performed project management services for the On-Site Low Level Radwaste Holding Facility.

**Brown & Root, Inc.
1977 - 1980**

Discipline Supervisor, Electrical and Instrumentation & Controls Groups on the South Texas Project. Mr. Prevatte was responsible for the technical direction and production output of the disciplines; developed multi-discipline system design review program; and supervised the rewrite of the System Design Descriptions. Lead Mechanical Startup Engineer, Parish Generating Station. He developed the startup schedule; wrote test procedures; performed "hands-on" testing and supervised boiler chemical cleaning and steam blows.

United Engineers & Constructors, Inc.
1972 - 1977

Lead Startup Engineer. Mr. Prevatte developed the preoperational testing program for Salem Generating Station, Unit 2, and supervised sixteen startup engineers.

Senior Startup Engineer. At the Brunswick Steam Electric Plant, he was responsible for the reactor vessel hydrostatic tests, all containment Appendix J and structural integrity tests, integrated system flushes, diesel generator acceptance tests, various systems' preoperational tests, and the main condenser tests. He coordinated completion of systems' construction to support this testing and directed the first plant outage after full power operation.

Newport News Shipbuilding & Dry Dock Company
1971 - 1972

Mechanical Test Engineer. Mr. Prevatte wrote procedures and performed post-overhaul testing of nuclear submarine reactor plant systems. In addition, he attended Shift Test Engineer's School.

Pratt & Whitney Aircraft Corporation
1969 - 1971

Design Engineer. Mr. Prevatte designed jet engine hardware for the F-15 and F-16 fighter aircraft. He performed finite element fatigue analyses, using then state-of-the art computer codes and hardware.

U.S. Navy
1965 - 1969

Lieutenant. Mr. Prevatte served as Navigator, Main Propulsion Assistant, Division Officer, and Legal Officer. He had a Top Secret Security Clearance.

WILLIAM C. SHERBIN, P.E.

EDUCATION

B.S.M.E., Bucknell University, 1971
M.S.M.E., University of Maryland, 1973

PROFESSIONAL AFFILIATIONS

Registered Professional Engineer, Maryland and Commonwealth of Pennsylvania

SUMMARY OF QUALIFICATIONS

Mr. Sherbin has 23 years of mechanical engineering experience and has worked for the past 13 years in the nuclear power industry. His principal duties involve design inspection activities for nuclear utility clients. These activities include Service Water System Operational Performance Inspections (SWSOPIs) and Safety System Functional Inspections (SSFIs). Mr. Sherbin is experienced in the area of heating, ventilation, and air conditioning (HVAC). He has assessed the effects of the loss of HVAC equipment (heat-up calculations) during his participation in numerous safety system inspections.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1987 - present

Principal Consultant. Mr. Sherbin has participated in utility-sponsored SSFIs at Palo Verde (service water and electrical distribution systems), Browns Ferry (RHR service water), Susquehanna (emergency service water), Davis-Besse (emergency diesel generators), Calvert Cliffs (LPSI), Fermi 2 (HPCI and LPCI), Point Beach Units 1 and 2 (emergency diesel generators), Vermont Yankee (HPCI and emergency diesel generators), Trojan (HVAC), Palisades (component cooling), Grand Gulf (fuel pool cooling and HPCS), River Bend (HPCS), and D. C. Cook (HVAC and containment spray). At FitzPatrick, Haddam Neck, Indian Point 3, Palo Verde, Brunswick, and Beaver Valley, Mr. Sherbin participated in emergency service water SWSOPIs and supported their GL 89-13 response efforts. He participated in a SWSOPI at Duquesne Power & Light's Beaver Valley Station and at Florida Power & Light's Crystal River 3. He also has participated in utility-sponsored Maintenance Inspections at Calvert Cliffs, San Onofre, and Palo Verde. He was a consultant to the NRC on an SSFI follow-up inspection at the Cooper Nuclear Station, and participated in Safety Systems Outage Modification Inspections at Sequoyah and Calvert Cliffs. Mr. Sherbin provided Design Basis Document verification for Palo Verde and calculation verification for Calvert Cliffs. He completed an assignment at Calvert Cliffs

where he was assigned to the Independent Safety Evaluation Group and conducted root cause investigations related to problems with instrument air systems and MOVs. He assisted BG&E in a year-long review of reactor vessel low temperature overpressurization (LTOP) issues.

In the area of motor operated valve inspections, Mr. Sherbin developed the mechanical and maintenance sections for an MOV inspection module used by the NRC. As a member of a Fermi inspection team, in the area of maintenance, he identified problems associated with the setting and control of motor operated valve torque and limit switches.

Independent Consulting Engineer, 1985 - 1987

Mr. Sherbin was a Program Manager for Liberty Technology in Philadelphia, and assisted in the development of a prototype valve operator test and evaluation system (VOTES). As a consulting engineer at the Nine Mile Point 2 Nuclear Station, he was a Senior Engineer in the Technical Support Group and was responsible for reviewing SOERs, SERs, and IE Notices and Bulletins. A detailed analysis of events was submitted to the Operations Department regarding the examination of equipment design and procedures with regard to their impact on safety and licensing.

Proto-Power Corporation, 1983- 1985

Mr. Sherbin spent two years on-site at Public Service Electric and Gas Company's Salem Nuclear Generating Station. Under a contract with Proto-Power Corporation to provide engineering services to the Nuclear Engineering Department, he served as a Senior Engineer in the Systems Analysis Group. In this position, he was responsible for preparing mechanical safety evaluations of nuclear plant primary and secondary systems, including reactor protection, chilled water, service water, HVAC systems, and seismic and vibration analyses. The evaluations and analyses were performed in accordance with ASME Codes, IEEE Standards, and NRC Regulation Guide compliance.

General Electric Company, Nuclear Energy Division, 1980 - 1983

Senior Engineer. Mr. Sherbin was responsible for seismic and dynamic qualification of nuclear plant equipment supplied to the utilities by GE. Complete equipment qualification documents were developed for the utilities and NRC seismic auditors. These documents included vibration test data, plant seismic response spectra, and the development of conceptual methodologies for the basis of the seismic and dynamic qualification of the equipment. Mr. Sherbin represented GE for seismic audits at Hanford, Limerick, Shoreham, Grand Gulf, Perry, and Susquehanna Nuclear Stations.

Westinghouse Electric Corporation, 1971 -1980

In the Heating and Cooling Division as a Senior Engineer, Mr. Sherbin developed components and systems used in more than two dozen experimental solar heating and cooling systems for solar thermal energy conversion. In the Aerospace Division, he was a Design Engineer of

equipment certified for the thermal and vibration environments encountered in
and aerospace applications, including precision gear boxes for radar, servo
ms and hydraulic control systems.

mechanical equipment certified for the thermal and vibration environments encountered in shipborne and aerospace applications, including precision gear boxes for radar, servo mechanisms and hydraulic control systems.

ALTERNATE TEAM MEMBERS

ROBERT W. DeNIGHT, JR., P.E.

EDUCATION

B.S., Mechanical Engineering, Virginia Polytechnic Institute & State University, 1990

PROFESSIONAL AFFILIATIONS

Professional Engineer, Pennsylvania, 1995
American Society of Mechanical Engineers

SUMMARY OF QUALIFICATIONS

Mr. DeNight provides mechanical design and plant support engineering services for nuclear utility projects. He has experience in preventive and corrective maintenance, surveillance and testing, and liaison engineering related to both nuclear plant and shipboard reactor systems. He has performed hydraulic transient analyses, design calculations, engineering evaluations, and modifications closeouts for utility engineering staffs. He has participated in numerous performance-based inspections (SSFIs, SSFAs, and SWSOPIs) as a mechanical design, maintenance, or surveillance and testing reviewer.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1993 - Present

Engineer. Mr. DeNight served as the mechanical maintenance reviewer for a Service Water System Operational Performance Inspection (SWSOPI) of the salt water, service water, and component cooling water systems for BGE's Calvert Cliffs Nuclear Power Plant. He was responsible for the review and assessment of the effectiveness of the preventive and corrective maintenance programs, maintenance records and associated documentation, component failure trends, and implementation of the recommendations from Generic Letter 89-13.

Mr. DeNight served as the surveillance and testing and maintenance reviewer for the auxiliary feedwater Safety System Self-Assessment (SSSA) at Farley Nuclear Plant. He was responsible for the review and assessment of the auxiliary feedwater system's In-Service Testing (IST), performance testing, and preventive and corrective maintenance programs. He has also served as a mechanical design reviewer for the instrument air system SSSA at Farley.

Mr. DeNight was a mechanical design reviewer for a SWSOPI readiness review of the service water system for PSE&G at Hope Creek and at Salem. He was responsible for the review and assessment of the service water system's design, which included hydraulic analyses, water hammer analysis, and single failure review. He provided engineering support to the engineering

staff at Salem to resolve and close out SWSOPI issues, which included design calculations and engineering evaluations.

Mr. DeNight was the maintenance reviewer for a Safety System Functional Inspection (SSFI) of the low pressure core spray and reactor core isolation cooling systems at Grand Gulf Nuclear Plant and at Clinton Power Station. He was responsible for the review and assessment of the effectiveness of the preventive and corrective maintenance programs, maintenance procedures, and component failure trends.

Mr. DeNight participated as mechanical design reviewer in SSFIs of the main feedwater system at PECO Energy Company's Peach Bottom and Limerick Stations. He reviewed and assessed mechanical documentation supporting the system design, including design calculations, plant modifications, licensing commitments, and incorporation of design requirements into testing and maintenance procedures.

Mr. DeNight provided engineering services to BGE to perform a complete revision of their salt water (service water) flow model and hydraulic analysis. This task included a review of the original flow calculations and SWS drawings. In addition, this task included developing the supporting flow analysis and running all the normal operating and postulated accident scenarios.

Mr. DeNight was the Deputy Project Manager of Entergy Operations' Grand Gulf Nuclear Plant calculation assessment program. He is responsible for reviewing mechanical design calculations for various safety-related systems, including the standby service water, component cooling water and control room HVAC.

Mr. DeNight provided engineering assistance to American Electric Power Service Corporation in support of a human factors engineering modification closeout project. His task was to close a major modification package and its associated subtasks, which made enhancements to the control room panels. The enhancements were developed from observations generated in accordance with the recommendations of NUREG-0700 during a detailed control room design review. The closeout included a review of maintenance orders, and modification packages to ensure all planned work was accomplished.

Newport News Shipbuilding & Drydock Company
1990 - 1993

Mechanical Maintenance Engineer. Mr. DeNight was involved with various nuclear reactor systems aboard U.S. Naval aircraft carriers. He was responsible for the maintenance and testing of all safety-related MOVs with Limitorque operators, and performed troubleshooting activities when system discrepancies were discovered. He wrote corrective and preventive maintenance instructions for various shipboard reactor systems. He performed stress analysis of piping to determine the acceptability of thinned pipe walls. He designed various shipyard tooling (e.g., purge gas equipment, freeze seal equipment, machine tooling, radiological containment design). He evaluated the acceptability of piping/system modifications and proposed these to the Navy. Mr. DeNight held a confidential restriction data clearance and was radiation worker qualified.

BERNARD J. GRABUSKY

EDUCATION

B.S., Nuclear Engineering, Pennsylvania State University, 1988

PROFESSIONAL AFFILIATION

Engineer-in-Training (EIT), Pennsylvania

SUMMARY OF QUALIFICATIONS

Mr. Grabusky's experience and education encompass nuclear engineering, mechanical engineering, health physics, radioactive sample analysis, software development, computers, and electronics. He has provided utility support services for Northeast Utilities (Connecticut Yankee - Millstone 1, 2, and 3), Pennsylvania Power and Light (Susquehanna), American Electric Power (Cook), Baltimore Gas and Electric (Calvert Cliffs), and New York Power Authority (FitzPatrick, Indian Point 3). He has participated in inspections, assessments, and calculation reviews at several nuclear plants, including Farley, Nine Mile Point 2, Grand Gulf, D. C. Cook, and Susquehanna.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1991 - Present

Engineer. Mr. Grabusky participated in Baltimore Gas and Electric's (BGE's) Calvert Cliffs Equipment Qualification database (EQCMS) population effort. He was responsible for the extraction of data from EQ files and development of spreadsheets for batch loading by BGE. He was also responsible for providing the relational data to BGE in the proper format and in a normalized data structure capable of being loaded into a mainframe relational database.

Mr. Grabusky served as project coordinator for New York Power Authority's (NYPA's) Indian Point 3 service water system and control room HVAC efforts. This work included review of design issues, development of solutions for design issues, tracking of internal commitments, scheduling of corrective actions, supervision of maintenance activities, and review of licensing issues. He interacted with all departments, in a manner similar to vertical-slice methodology, to ensure timely project completion.

Mr. Grabusky coordinated the refurbishment of NYPA's Indian Point 3 control room HVAC system. This effort included identification of material condition deficiencies and design deficiencies. His involvement also included review of design concerns, regulatory interfacing, and maintenance supervision.

Mr. Grabusky coordinated activities for the resolution of post-SWSOPI internal commitments for NYPA's Indian Point 3. This included tracking, review, organization, and closeout of commitment actions for service water design issues, as well as outage planning and scheduling of service water related tasks. Mr. Grabusky also provided support to the NRC SWSOPI follow-up inspection response team.

Mr. Grabusky participated in a transient analysis of the Grand Gulf service water system. This work included preparing a computer model of the service water system, suitable for transient analysis software, and running the transient analysis model software.

Mr. Grabusky served as Deputy Project Manager for the American Electric Power Service Corporation long-term storage document retrieval effort. He was responsible for reviewing and categorizing documents in a database for use in developing design basis documents, tracking project progress, and database programming.

Mr. Grabusky participated in the Environmental Qualification (EQ) database population effort at Pennsylvania Power & Light Company (PP&L). He was responsible for the population of the PP&L-developed Susquehanna Steam Electric Station (SSES) EQ Database, which included the use of relational database software systems to support the input, update, use, and analysis of the structured EQ Database. In addition, the database effort involved the extraction, manipulation, and population of quality data such as material properties, component requirements and test data from existing controlled plant databases, Equipment Qualification Assessment Reports (EQARs), and other controlled sources.

Mr. Grabusky participated in the procedural-based Emergency Action Level upgrade effort for four Northeast Utilities plants. He performed offsite dose calculations and review of emergency, abnormal, and normal operating procedures for determination of appropriate corresponding plant Emergency Classification Level.

Mr. Grabusky was the mechanical systems reviewer for a Safety System Functional Inspection performed on Pennsylvania Power & Light's Susquehanna Steam Electric Station high pressure coolant injection system.

Mr. Grabusky took part in the review of mechanical and nuclear calculations for Grand Gulf Nuclear Station. The review included a broad spectrum of calculations encompassing the residual heat removal system, standby service water system, and the determination of accident radiation dose.

Mr. Grabusky reviewed offsite dose and mechanical calculations supporting the design of the D. C. Cook containment spray system during a Safety System Functional Inspection conducted for American Electric Power Service Corporation.

Mr. Grabusky participated, as a mechanical reviewer, in the electrical distribution system functional inspection of Nine Mile Point Unit 2. The primary areas of review included HVAC, fuel oil storage and transfer, and the service water system.

Mr. Grabusky served as a mechanical and nuclear reviewer on the safety system functional assessment of the containment isolation system at Farley Nuclear Station. This assessment encompassed extensive review of calculations for offsite dose and dose to equipment in containment, as well as review of the worst accident environmental conditions in containment and the related equipment qualification.

Mr. Grabusky was involved in the resolution of post-EDSFI commitments for American Electric Power Service Corporation. To support this effort, he created and maintained databases for auxiliary electrical system cables, motors, and transformers. These indices were used to organize the 12t damage characteristics of electric equipment at the D. C. Cook plant for the Coordination Upgrade Program.

**DMA-RADTECH
1991**

Nuclear Software Engineer. Mr. Grabusky was responsible for the development of software used in the analysis of radon in water and air exposure levels. He also served as a computer technician, responsible for the maintenance of several PCs, maintaining databases, and custom software to database interfacing.

Mr. Grabusky worked on the development of new analysis and sampling techniques for radioactive samples. He was responsible for modernizing and streamlining the operations of a high volume radon testing laboratory and for analyzing environmental samples via gamma ray spectroscopy and liquid scintillation.

**Lehigh County Vo-Tech School
1990- 1991**

Substitute Teacher. Mr. Grabusky provided part-time instruction of sophomore through senior vocational students in electronics and electrical construction.

**Weir and Associates
1989- 1990**

Engineer. As a project engineer, Mr. Grabusky prepared plans for residential subdivisions, attended and presented plans to local planning commission meetings, generated rainfall and watershed reports, and designed runoff control and drainage systems.

**PSU Low Level Laboratory
1987- 1988**

Laboratory Technician. Mr. Grabusky was responsible for calibrating detection equipment, preparing environmental samples, analyzing samples for fission by-products, and generating laboratory analysis reports.

ROBERT L. GURA

EDUCATION

B.S., Engineering, Stevens Institute of Technology, 1960
Master of Management Science, Stevens Institute of Technology, 1965

PROFESSIONAL AFFILIATIONS

Instrument Society of America

SUMMARY OF QUALIFICATIONS

Mr. Gura has 34 years of engineering experience in the design, construction, and operation of commercial power plants, including 27 years of experience with an electric utility. For 6 years, Mr. Gura managed a plant engineering division responsible for providing engineering services in support of two operating nuclear power plants. The services dealt with modifications to plant equipment and systems and the development and maintenance of programs such as Appendix R fire protection and environmental qualification of electrical equipment. In this management position, he was able to demonstrate his technical and leadership abilities. In addition, Mr. Gura has extensive expertise in many facets of commercial nuclear power with emphasis on the technical aspects of nuclear project management, quality assurance, instrumentation and controls, electrical systems, and equipment and real-time computer applications. He is an experienced professional, who has designed and modified commercial nuclear plants, and dealt in a regulatory climate in resolving technical issues concerning adequacy of design or proposed modifications.

PROFESSIONAL EXPERIENCE

Ogden Environmental and Energy Services Co., Inc.
1987 - present

Principal Engineer. Mr. Gura is responsible for overseeing and directing the activities related to I&C design and design review of the nuclear power plant process. He participated as a member of the NRC AEOD diagnostic evaluation teams that evaluated the service water systems at McGuire, Brunswick, ANO-1, and Perry. During the evaluations, he demonstrated a working familiarity with regulatory requirements, codes, standards, and quality assurance-requirements and the ability to work effectively as a team member and to write clear, technically correct reports. He participated on the technical teams that performed Safety System Functional Inspections (SSFIs) for Point Beach (emergency diesel generators), Fermi 2 (RHR system), Vermont Yankee (emergency diesel generators), Farley (service water and component cooling water systems), and Calvert Cliffs (low pressure safety injection system). He directed a team that reviewed design basis manuals (DBMs) and developed a DBM validation methodology that uses SSFI techniques for Palo Verde. He assisted Palo Verde in their preparation for an NRC Electrical Distribution System Functional Inspection (EDSFI) and service water SSFI. Mr. Gura

was the team leader for SSFIs on the low pressure core spray system at Grand Gulf, River Bend, and Perry and on the high pressure core spray system at Grand Gulf, Perry, and Clinton; the inspections were part of an overall program for the BWR-6 Owners Group. He assisted Commonwealth Edison's LaSalle Station during their NRC EDSFI and assisted American Electric Power's Cook Plant in their preparation for an NRC EDSFI.

Mr. Gura served as project manager for review and validation of several Technical Specification Articles for Fermi 2. This required a review of the FSAR, other Technical Specification Articles, Regulatory Guides, standards, design documents, analyses, design changes, and IE Notices and Bulletins.

Mr. Gura has participated in evaluation of the Calvert Cliffs performance improvement plan and the Palo Verde engineering department's performance improvement program. He was involved in preparation efforts for the NRC Service Water System Operational Performance Inspection (SWSOPI) at NYPA's FitzPatrick plant and is familiar with issues related to NRC Generic Letter 89-13. He subsequently served as project manager to develop an overall service water program to fulfill NYPA short-term and long-term commitments. Mr. Gura reviewed the Generic Letter 89-13 program for the Salem SWSOPI readiness review.

Mr. Gura was the team leader for the assessment of the Palo Verde service water system with particular emphasis on the evaluation of their Generic Letter 89-13 programs and validation of the service water system design basis manuals. He assisted American Electric Power during their NRC Instrumentation and Control Inspection at the Cook Plant and provided technical support in the I&C area. For Public Service Electric & Gas, Mr. Gura performed a review of Salem's Generic Letter 89-13 program with particular emphasis on heat exchanger testing.

Public Service Electric & Gas Co.
1960- 1987

Manager- Nuclear Engineering. Mr. Gura managed an engineering staff responsible for providing engineering support for Salem Units 1 and 2 and the Hope Creek Unit 1 Nuclear Plants. The major functional areas were computers, stress analysis, piping and materials, civil engineering and system analysis. The support consisted of developing design changes, maintenance of special programs such as Appendix R fire protection and equipment qualification, and system modification design reviews which included 10CFR50.59 reviews. Some of the major projects for which Mr. Gura was responsible were an upgrade of the Salem Appendix R program, upgrade of the Salem equipment qualification program, and installation of a Safety Parameter Display System for Salem Unit 2 and Hope Creek Unit 1. Manager - Plant Engineering. Mr. Gura managed a staff of 75 engineers that covered the functional areas of instrumentation and controls, computer, electrical, civil, pump and heat exchanges, piping and material, and stress analysis. This division was responsible for providing engineering services associated with the above mentioned engineering disciplines necessary to study, design, specify, evaluate, modify, and maintain plant components and hardware. Mr. Gura was responsible for major projects such as human factors review of the Salem control rooms, redesign and replacement of moisture separator reheaters, and major pump and heat exchanger replacements.

Senior Engineer - Controls Division. Mr. Gura was the functional lead engineer for control systems at Salem Units 1 and 2. He was responsible for the design and implementation of all balance of plant controls and implementation of the NSSS supplied controls. Mr. Gura was involved in control room design, design of analog and digital control systems, design of instrumentation panels, control valve specification and purchase, and design of electrical power systems below 240 Vac.

JOSEPH J. PANCHISON, P.E.

EDUCATION

B.S., Mechanical Engineering, Drexel University Assoc. Engineering, Penn State University
Various Continuing Education Courses

PROFESSIONAL AFFILIATIONS

Professional Engineer, Pennsylvania (PE-029704-E), New Jersey (GE28024), New York (059375)

American Society of Mechanical Engineers American Nuclear Society

National Society of Professional Engineers

American Society of Heating, Refrigeration and Air Conditioning Engineers

SUMMARY OF QUALIFICATIONS

Mr. Panchison is a mechanical engineering consultant with more than 28 years of diversified experience in power plant system engineering and design process, thermal hydraulic analysis, HVAC systems design and component testing and evaluations, power piping and nuclear component codes and standards, and supervision. He has extensive experience in plant modifications and configuration management as well as a broad-based knowledge using state-of-the-art computer systems and engineering software.

PROFESSIONAL EXPERIENCE

Enerdyne Incorporated
1992 - present

Principal and Consulting Engineer. Mr. Panchison provides engineering services to both commercial and power utility clients. The primary areas of his expertise include power plant systems design and modification, system functional inspections and assessments, HVAC systems design and component design and evaluation, equipment engineering and modifications, and hydraulic network distribution analysis.

As a mechanical engineering consultant, Mr. Panchison performed an independent engineering assessment of the closed loop cooling water system at Duke Power Company's Catawba Nuclear Station Unit 1. The inspection included review of system design basis, calculations, procedures, and configuration management. The review focused on a performance and maintenance assessment of major system components, i.e., heat exchangers, pumps, and valves. All areas of the review and applicable findings were presented to the client in a written report.

As a mechanical engineering consultant, Mr. Panchison prepared and reviewed final design document changes related to Niagara Mohawk Power Corporation's Nine Mile Point Unit 2

Power Uprate Program, which included evaluation of various system components for performance under uprated conditions. He also reviewed and evaluated dynamic flow test data related to the Generic Letter 89-10 MOV program during the most recent refueling outage.

At the Watts Bar Nuclear Power Plant Unit 1, Mr. Panchison served as a mechanical engineering consultant for Tennessee Valley Authority. He performed an independent engineering assessment of the residual heat removal system (RHR). The inspection included review of system design basis, calculations, procedures, and configuration management. The review also included a performance and maintenance assessment of major system components, i.e., heat exchangers, pumps, and valves. The review and applicable findings were presented to the client in a written report.

Mr. Panchison provided mechanical engineering consulting services to Niagara Mohawk Power Corporation, in their response to Generic Letter 89-10 for Nine Mile Point Unit 2. He prepared System Design Basis Documents (DBDs). He supervised and coordinated the dynamic testing program. He wrote a computerized dynamic test analysis program to determine MOV operability and a computer program for performing MOV sizing calculations. He performed various calculations as part of the program and represented the client during NRC audits. He worked on the NMP2 Power Uprate program, preparing and reviewing the mechanical systems changes and impacts.

Stone & Webster Engineering Corporation
1977-1992

Senior Mechanical Engineer. Mr. Panchison provided consulting services to the Susquehanna Station engineering staff of Pennsylvania Power & Light. He was responsible for the engineering, design, and coordination of various modifications at two operating BWR units. The modifications included the design of a condenser waterbox pumpdown system to facilitate condenser tube maintenance. He performed studies for the redesign of the cooling tower acid injection system; coordinated modification to several severe service modulating valves; performed studies and provided recommendations on design changes to the condensate demineralizers and the resin transfer system; and provided engineering support for the main feedwater pumps alignment modification work. He was responsible for troubleshooting miscellaneous hardware and system-related operational problems. He worked on the plant upgrade program as well as calculations related to NRC Generic Letters 89-10 and 89-04. He wrote the dynamic testing specification to support the plant's GL 89-10 implementation effort.

Principal Power Engineer. At Niagara Mohawk's Nine Mile Point Unit 2, Mr. Panchison was responsible for supervision and technical direction of the Power Engineering Group. He worked with the plant heat balance and developed original plant design and system P&IDs. His responsibilities included plant BOP, fire protection, and NSSS system design, technical administration of the shop fabricated piping contract for all major piping systems in the plant, and technical administration of the field fabrication and erection piping contract. He provided engineering direction to construction on erection, installation, and testing of equipment and systems. He also was responsible for the review of specifications, documents, drawings, and

various vendor submittals. He was responsible for PE stamping piping system drawings for construction and component specifications.

During a 3-year assignment at the plant site, he supervised and was responsible for technical support and problem resolution of ECCS and BOP fluid systems design and operation, and equipment, primarily main steam, feedwater, condensate, NSSS, service water, and closed loop cooling water systems during start-up testing, fuel load, power ascension up to and including commercial operation. He prepared and coordinated modification packages for various plant system design changes. He provided technical assistance on the resolution of system and equipment problems to plant operations using system start-up testing.

Nuclear Systems Engineer. At Gulf States Utilities' River Bend Nuclear Station Unit 1, Mr. Panchison was the responsible system engineer for the spent fuel system, reactor water cleanup system, and the fuel transfer system. His responsibilities included preparation of design calculations, equipment specifications, and development of system flow diagrams.

United Engineers & Constructors, Inc.
1970-1977

Power Design Engineer. Mr. Panchison was responsible for the design and engineering of BOP systems in fossil and nuclear power plants. He participated in engineering and design from the conceptual stage through final construction and start-up. The work involved equipment evaluations, pressure drop and heat balance calculations, and travel to plant construction sites. The projects on which he worked included Washington Public Power Supply System, Texas Utilities Services, Louisiana Power & Light, Atlantic City Electric, and Delmarva Power & Light.

Gilbert Associates
1969-1970

Design Engineer. Mr. Panchison was responsible for the design of industrial boiler installations. The work involved engineering, layout, and design of equipment and piping.

PATENTS

Valve Control System for Power Generating Plants, Patent No. 4,842,244