PUBLIC SERVICE ELECTRIC AND GAS COMPANY

CORRECTIVE ACTION PROGRAM

RELATED TO

REACTOR TRIP BREAKER FAILURES

FEBRUARY 22 AND 25, 1983

UNIT NO. 1

SALEM GENERATING STATION

DOCKET NO. 50-272

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EXECUTIVE SUMMARY

On February 25, 1983 the reactor trip breakers on Unit 1 of Salem Generating Station failed to open automatically following receipt of trip signals from the Reactor Protection System. Plant operators, taking positive, timely action, manually tripped the reactor and brought the plant to a safe shutdown condition in an orderly manner. There was no equipment damage, no personnel injury, and no impact on public health and safety.

The incident on February 25, 1983 was promptly identified as a failure of the automatic trip function. Detailed investigation revealed that a similar failure occurred on February 22, 1983 when the operator's manual action was almost coincident with the automatic signal to trip. It was determined that the failures to trip were caused by malfunctioning of the reactor trip breaker undervoltage trip attachment.

Both PSE&G and the NRC began investigations of the incidents, their cause and ramifications. PSE&G met on February 27, 1983 with the Reactor Protection System vendor, Westinghouse, to investigate the failures. Numerous meetings were held with the NRC staff between February 28 and March 14, 1983 to present the results of initial evaluations of the events and to define and respond to issues associated with restart of Unit 1. Reports

addressing the issues were submitted to the NRC on March 1, 8, and 14, with supplements on March 15, 18, and 23, 1983. PSE&G management met with NRC Commissioners on March 24 to discuss Salem's Post Trip Review and answer the Commissioners' questions regarding other aspects of the February 22 and 25, 1983 events. Additional meetings with NRC staff were held in Region 1 offices on March 30, 1983 and in Bethesda, Maryland on March 31, 1983.

PSE&G will undertake an independent management diagnostic of the structure, management systems and staffing of the Nuclear Department. Management Analysis Company (MAC), a management consultant with extensive experience in the conduct of diagnostics for nuclear utilities, has been retained to make an appraisal of nuclear activities, including the operation and support organizations. Particular emphasis will be placed on safety and regulatory activities. MAC commenced the evaluation on April 5, 1983. A draft report is scheduled for completion on May 2, 1983 and a final report on May 30, 1983. Copies of the reports will be forwarded to the Nuclear Regulatory Commission.

In addition, PSE&G has committed to establish a Nuclear Oversight Committee to provide management with an independent basis for evaluating the effectiveness of nuclear safety activities. The role of the Committee is to be oriented toward directing management attention to nuclear safety by means of disciplined, intellectual curiosity.

PSE&G has also engaged Beta Corporation, an outside consultant, to review its investigation of the events of February 22 and 25, 1983, including its corrective action program. The consultant will make an independent evaluation of the action plan and advise on the adequacy of the program to insure that Salem Unit 1 can be safely returned to power.

PSE&G considers the circumstances associated with the reactor trip breaker failures an isolated event. The management systems and QA program are basically sound. This position is based on extensive studies and reviews of procedures, practices and past activities in procurement, maintenance and operations. Some shortcomings have been identified and specific corrective actions have been undertaken to preclude recurrance. This report describes PSE&G's corrective action program in detail and provides the basis for adequate assurance that Salem Unit 1 can be safely returned to power operation.

CORRECTIVE ACTION PROGRAM

A. EQUIPMENT ISSUES

1. Safety Classification of Breakers

A question was raised following the events of February 22 and February 25 concerning the proper classification of the reactor trip breakers and whether they were, in fact, designated as safety-related equipment. The reactor trip breakers are part of the Reactor Trip System which is a safety-related system designed to automatically trip the reactor.

To verify the classification of the breakers, a review of the Preliminary Safety Analysis Report (PSAR), the Final Safety Analysis Report (FSAR), and the Updated Final Safety Analysis Report (UFSAR) was performed. The PSAR indicates that these breakers were designed to the criteria defined in the then proposed IEEE "Standards for Nuclear Power Plant Protective Systems." This document was later issued as IEEE-279-1971. The FSAR and UFSAR identify the reactor trip breakers as being designed to the IEEE-279-1971 "Criteria for Protection Systems for Nuclear Power Generating Stations." In addition, the FSAR and UFSAR indicate that the breakers are designed to meet the intent of IEEE-344-1971 "Seismic Qualification of Class I Electrical Equipment for Nuclear Power Generating Stations."

PSE&G considers the breakers to have been clearly identified throughout their life as safety related equipment and does not consider the safety classification of the reactor trip breakers to be a problem and considers the matter resolved.

2. Identification of Cause of Failure

Immediately following the February 25, 1983 event, tests were conducted which identified that the problem was not in the Reactor Protection System Logic, but isolated to the undervoltage trip attachment on the breakers.

Based on additional field investigation, combined with the input of Westinghouse, the manufacturer, PSE&G has determined that the failure of the undervoltage trip attachment (UTA) resulted from lack of proper lubrication on the latch of the undervoltage trip attachment.

Westinghouse, in its letter of March 1, 1983 to the Director of Nuclear Reactor Regulation, stated that based on its inspection, "the lack of proper lubrication either caused or greatly contributed to the failure of the device to function." Westinghouse also committed to conduct a thorough evaluation and testing program of the undervoltage coil trip attachment.

PSE&G has utilized its Research Laboratory to assist in the investigation of the failure mechanism and testing of the UTA.

a. Testing

One of the UTAs removed from the Salem reactor tripbreakers was sent to the PSE&G Research and Testing Laboratory for determination of its operating

characteristics and investigation of the cause of failure. The evaluation included a visual inspection of the UTA as received, determination of the trip latch tensile loading and strikeforces, timing and voltage measurement under various operating, temperature and lubricating conditions and hardness testing of the latch and latch pin. The results were that although the UTA had visible signs of wear, of burrs on the shaft and dirt on the surfaces of the moving parts, the relay functioned properly during the entire electrical test period, never failing to unlatch.

On March 12, 1983, the PSE&G Research and Testing Laboratory conducted tests at Salem No. 2 Unit on a reactor trip breaker and its UTA which had been removed from its normal enclosure. The purpose of this test was to develop a technique for measuring the dynamic and static force required to operate the breaker trip bar and the dynamic force imparted by the trip latch of the UTA. Physical measurements of relationships between various components of the reactor trip breakers were also included to determine any effects they might have on breaker performance. Maintenance Test Procedure T-94 was was developed to measure the force required to trip the breaker, measure the force exerted by the

undervoltage trip lever, measure the physical relationships between various components of the breakers and measure the response time of the reactor trip breakers.

On March 24 and 25, using this new test procedure, the Research and Testing Laboratory conducted tests on the Unit No. 1 reactor trip breakers "A" & "B" and the bypass breakers "A" & "B". The purpose of the testing was to develop baseline data for the breakers to be used for comparison to similar tests to be conducted in the future after maintenance on the breakers and/or replacement of the UTAs.

Test results showed the breakers operated in satisfactory manner, in that the response time of all four breakers was within specification, the dynamic force required to operate the trip bar of the breaker was in each case less than 1 pound and the dynamic force exerted by the trip latch ranged from 3.2 lbs. to 6.5 lbs. The static force required to raise the latch bar varied from 24 to 44 ounces. Although this appeared to have no significant effect on the operation of the breakers as indicated by breaker timing, values in excess of 31 ounces did not satisfy Westinghouse criteria. Westinghouse was requested to assist PSE&G in determining the cause

for the breakers being out of specification. Investigation revealed that the trip bars had overcurrent trip brackets attached however, the reactor trip breakers do not use an overcurrent trip. When the overcurrent trip brackets were removed, all breakers met the Westinghouse criteria for the force required to raise the trip bar.

As indicated in section A.4, Maintenance Procedure M3Q-2 has been revised to include the requirements for a static trip measurement on the trip bar and an output force measurement on the undervoltage trip lever.

b. Modifications to the New Undervoltage Trip Attachments (UTA)

The new UTAs installed on Salem No. 1 Unit and to be installed on Salem No. 2 Unit reactor trip breakers have incorporated all design changes identified in Westinghouse Document NCD-ELEC-18, 1971. These requirements were made part of the purchase order for the new UTAs and a Certificate of Conformance was received from Westinghouse confirming that these design changes were made. PSE&G's specification 83-8248 also contains these requirements to assure that future UTAs purchased will be so modified.

The new UTAs have been lubricated in accordance with Westinghouse drawing 3756A03, Page 1, which is part of the recently issued Westinghouse Technical Bulletin TB-83-02. PSE&G's specification 83-8248 also requires that new UTAs be lubricated in accordance with Westinghouse Technical Bulletin TB-83-02.

The lubricant specified in the Westinghouse Technical Bulletin TB-83-02, Molybdenum Disulfide has been extensively used and is highly successful in thousands of lubricating applications. Its performance in switchgear applications has also been outstanding, especially at normal operating temperatures and humidity.

c. Determination of Life Cycle and Replacement Interval for Entire Breakers and/or their Components

PSE&G will undertake a test program to determine the life cycle and replacement interval for the UTAs and to verify the adequacy of the new maintenance and surveillance programs used on the reactor trip circuit breakers. The test program and schedule will be submitted to the NRC in May 1983. It is expected that this program will be completed by October 1983.

3. Verification Testing

Comprehensive testing following maintenance on the reactor trip breakers and maintenance or replacement of the undervoltage trip attachments will provide assurance that the circuit breaker will function as required.

A comprehensive installation and maintenance program has been developed, as indicated below.

The vendor has tested each of the new UTAs 25 times without a failure. One failure is the rejection criterion used. To assure that UTAs purchased in the future will be tested in a like manner and to the same acceptance criteria, these testing requirements have been included in PSE&G Specification No. 83-8248 and referenced on the UTA procurement documents.

Each of the new UTAs has been electrically tested 10 times, without failure, after installation on the reactor trip breakers. A 30-minute interval was required between each test. A revised Maintenance Procedure M3Q-2 was used for this initial testing and will be used in the future to assure that the proper testing is completed, using the same acceptance criteria.

In addition, each of the four breakers was response time tested after the UTAs were successfully tested 10 times. This response time test was performed with the breaker removed from its enclosure. The response time test measured the time from the de-energization of the UTA coil to the opening of the breaker. A visicorder was used to measure the time in cycles. After the breakers were returned to their enclosures, a successful time response test was again completed using Technical Department Procedures. The testing requirements and acceptance criteria have been included in Maintenance Procedure M3Q-2 for assurance that identical testing and acceptance criteria are used after future maintenance of the breaker and maintenance or replacement of the UTAs.

As described in Section A.2.c, PSE&G will undertake a verification test program to verify the adequacy of the maintenance and surveillance programs used on the reactor trip circuit breakers.

4. Maintenance and Surveillance Procedures

4.1 Maintenance Procedures

As a result of the evaluation of the incidents, maintenance, surveillance and operability testing of the reactor trip and bypass breakers has been augmented and performed as described below.

A program has been implemented to provide traceability on the reactor trip breakers. This program ensures traceability of all work to a particular breaker and it's location.

PSE&G Specification 83-8248 now requires that the manufacturer mount undervoltage trip attachments on a test breaker and electrically test the device 25 times before shipping and requires the 2 cover bolts on the movable core cover and the reset lever spring adjustment screw to be sealed to ensure detection of any adjustments subsequent to installation. A certificate of conformance is required to document this testing. The Maintenance Procedure has been revised to reflect these requirements.

Cleaning of the breakers and Westinghouse recommended lubrication is performed on the undervoltage trip attachments whenever maintenance is performed on the device, during semi-annual testing, and during each

refueling outage. Cleaning of the breaker cabinets is performed each refueling outage. The circuit breaker rooms are cleaned by a custodian on normal work days.

Procedure M3Q-2 has been developed for inspection and testing of the reactor trip and reactor trip bypass breakers. This procedure ensures the mechanical and electrical integrity of the breaker, control relays, shunt and undervoltage trip attachments.

Procedure M3Q-2 incorporates a range of acceptable dropout voltages and instructions to replace any devices which fall outside the specified range. In addition, new undervoltage trip attachments installed in the plant will be tested 10 times with a 30 minute interval between each test and any devices which fail will be rejected. Three trip timing tests will be performed and the average time will be compared to previous results to detect any deterioration in the mechanisms. A static trip measurement on the trip bar and an output force measurement on the undervoltage trip attachment will be performed after maintenance on a breaker. Limits for these measurements have been incorporated into the procedure. A Technical Specification Change Request will be submitted within 30 days of unit startup to require notification of the NRC if the above limits are exceeded.

The reactor trip breakers are the only safety related application of the DB-50 type breakers at Salem. The only other DB-50 breakers in use are the rod drive motor generator set breakers which are not safety related and utilize overcurrent trip devices instead of undervoltage trip attachments.

Increased testing, evaluation of test results, improved procedures and an increased scope of maintenance provide a high degree of confidence for reliable operation of the reactor trip breakers.

4.2 Surveillance Procedures

Preceding the events of February 22 and 25, 1983, routine surveillance testing pertaining to the reactor trip breakers consisted of a) bi-monthly testing of each main reactor trip breaker utilizing the undervoltage trip attachment, b) weekly testing of each main and bypass reactor trip breaker utilizing the shunt trip, c) 7 days prior to startup and 18 month frequencies were utilized to test the manual reactor trip circuitry and d) 18 month frequencies were utilized to determine the response time of the main reactor trip breakers.

The surveillance testing procedures which were in effect prior to the February incidents and which were in compliance with the Technical Specifications, were evaluated and the following changes have been made:

a. Surveillance testing of the main reactor trip breakers utilizing the UTA has been increased to a monthly interval. This will be accomplished utilizing existing I&C Procedures, PD 18.1.008 (.009) and new I&C Procedures IC 18.1.010 (.011), "Reactor Trip Breaker Undervoltage Coil Functional - Train A (B)", which confirm operability of the main reactor trip breakers from a demand from the Solid State Protection System.

b. Surveillance testing of the main and bypass reactor trip breakers utilizing the shunt trip will be performed on a monthly basis utilizing I&C Procedures PD 18.1.004 (.005), "Train A (B) Reactor Trip Breakers and P-4 Permissive Test."

c. Surveillance testing utilizing the manual reactor trip switches will remain on the current 18 month and 7 days prior to start-up frequency with the following changes. SP (O) 4.3.1.1.1 will be superseded by I&C Procedure PD 18.1.006, "Reactor Trip Breakers and P-4 Permissive Test Prior to Start-up - Train A and B." This procedure will verify the ability of each manual reactor trip switch to independently operate both the shunt and UTA on the main and bypass reactor trip breakers. Proposed Technical Specification changes concerning the above requiring that the results of these tests, should any discrepancies be found, be reported to the NRC before any corrective action is taken will be submitted prior to exceeding 30 days of operation after plant start-up. These changes will be accomplished by April 9, 1983.

d. Concerning response time testing of the main reactor trip breakers, the following changes will be accomplished by April 9, 1983. Modifications to I&C Procedures PD 18.1.008 (.009) and IC 18.1.010 (.011)

which are to be performed on a monthly basis will be made to provide for the utilization of the Sequence of Events recorder to monitor the response time of the main trip breakers from the Solid State Protection System. This data will be recorded as part of these procedures and also in a log. Included in these procedures will be specific acceptance criteria requiring that if exceeded, the NRC be notified prior to the performance of any corrective action.

In addition, I&C Procedures PD 18.4.002 (.005) have been modified to include time response testing of both the main and bypass reactor trip breakers. The data obtained from these procedures is used as part of the master time response for each unit. This surveillance testing will continue to be performed on an 18 month interval prior to restart after refueling. Proposed Technical Specification changes concerning the above and requiring that the results of these tests, if deficiencies are identified, be reported to the NRC prior to the performance of corrective action is taken will be submitted prior to exceeding 30 days of operation after plant start-up.

Successful completion of these surveillance testing requirements and accumulation of response time data

obtained from these tests provides confidence in the capability to detect problems associated with reactor trip breakers capability to perform their intended function.

B. OPERATOR PROCEDURES, TRAINING AND RESPONSE ISSUES

1. Operating Procedure for Reactor Trips and Anticipated Transients Without Scram (ATWS)

The Emergency Instructions written to address a reactor trip did not require a manual trip based upon actuation of the "first out" annunciators. The appropriateness of the sequence of steps in the procedure identified to deal with ATWS events was also questioned.

A complete review of all Control Room indications associated with a reactor trip was conducted to determine which indications are "demand" and which are "confirmatory". The confirmatory indications have been identified to the operators as part of their training. In addition, the first out annunciators which are confirmatory indication have been highlighted with a red border so that the operators will be able to clearly distinguish these from the remainder of first out annunciators.

All procedures associated with a reactor trip have been revised to require the operator to manually trip the reactor any time he receives a demand first out annunciator and verification of this condition on the reactor protection status panel. The power supply to the status panel is taken from the 1A-28V battery. Each reactor protection status panel indicator has two

light bulbs behind a labeled lens. At the beginning of each shift a control room operator verifies that both bulbs are working, if a bulb is inoperable it is replaced by the control room operator.

The specific sequence of steps in the Emergency Instructions associated with the ATWS events were discussed at a Westinghouse Owners Group meeting during the week of March 21, 1983. The sequence of steps remains as recommended previously by the Owners Group.

The operators have been trained on the procedure and the basis for the sequence of steps. In addition, all associated procedures have been reviewed to ensure that they interface properly with the reactor trip procedure.

2. Operator Training

Because of the unique nature of this event, a need was identified to conduct training on revised procedures associated with ATWS events prior to startup. Although the current notification of changes through Information Directives is believed to be adequate, a special training program on changes to EI-I-4.3, Rev. 9 was conducted for all operators by the Nuclear Training Staff. In addition, a practical exercise of the current revision of this procedure and EI-I-4.0 will be conducted in the Control Room or on the simulator prior to April 12, 1983. This practical exercise will provide further assurance that operators can identify demand and confirmation signals and can execute the procedure. Each licensed operator will be required to perform the steps in the procedure required for his job function in the correct sequence as part of the practical exercise.

Additional training on the Reactor Protection System (RPS) and its associated indications and alarms has been conducted.

A review of drawings and prints was performed to determine which indicators are confirmatory. Each operator has been trained on the difference between demand and confirmatory indication. All operators have

been examined on the demand and confirmatory signals. In addition, this subject has become an integral part of initial license training and requalification.

A detailed review of the events of February 22 and 25 was conducted by the Nuclear Training Staff and a detailed discussion was held in training sessions with each shift. An examination was administered at the end of the training.

To ensure complete understanding of all issues covered in the examinations following the ATWS training program, a review has been conducted by an instructor and subject matter experts to identify areas of general weakness. These weaknesses will be identified in a letter sent to each operator along with a copy of the individual's graded exam and an answer key. Two individuals were identified as requiring remedial action. Both have been retrained and have successfully completed a comprehensive exam. Analysis of exams and individual graded exams with answer keys will be provided to all students by April 7, 1983. Each trainee shall be individually counselled by April 12, on all items missed as part of training on the revised procedure.

Although the ATWS training program and evaluation of students was comprehensive, additional practice in the

Control Room with procedures associated with ATWS events is desirable to ensure that the location, operation, and sequence of operation of the various controls are firmly impressed on all licensed operators. This practical demonstration will be accomplished by April 12, 1983 in conjunction with the training on revised procedures by execution of the steps in the Control Room or on the simulator. After the simulator is validated and fully operational, practical application of procedures will become an integral part of training.

Although location and type of RPS indicators and alarms has been covered in the classroom and examinations, practical exercise in these alarms and indicators would be beneficial to ensure that operators have the location and type of indicator firmly impressed in their minds. A walk-through will be conducted by April 12, 1983 jointly with training on revised procedures either in the Control Room or on the simulator. After the simulator is validated and fully operational practical application of identification of signals will become an integral part of the program.

A review of the training programs for Equipment Operators (EO) showed that operation of reactor trip breakers and control rod motor-generator set breakers, as required by ATWS procedures, is covered in class and

in practical application. Plant walk-throughs require EO's to identify the location of these and other breakers. An audit of this training will be conducted prior to April 12, 1983 by requiring each EO to identify and operate these devices.

PSE&G has reviewed the source of material contained in the ATWS training and lesson plans to ensure that it is current and properly referenced. Although all 18 training objectives were covered in the training sessions and in the student handouts, not all were tested on the examinations. The review of course material indicated that all objectives were in fact covered satisfactorily. Student handouts and lesson plans have been cross-referenced to the objectives and the revised handouts will be sent to each operator by April 12, 1983.

3. Operator Response

A review of the First Out Panel was conducted to increase familiarity with the design of the first out annunciator panel with regard to which alarms on the first out panel were demand and which were confirmatory in nature. This matter has been addressed in the Operator Training Program. Further modifications are under consideration to clarify the nature of the alarms. Changes will be completed by May 1, 1983.

All operators have been made aware of the existing design of the manual trip switches. In addition, new switches with permanently affixed handles will be installed during the next outage of sufficient length to complete the work.

As a result of the changes to our operating procedures, identification of confirmatory/demand indications of a reactor trip, increased operator training on the solid state protection system and anticipated transients without a scram we have enchanced our operator response. We are confident that Salem Unit 1 will continue to be safely operated in the future.

C. MANAGEMENT ISSUES

1. Overall Management Capability and Performance

As a result of the experiences gained with the operation and technical support of the Salem units and PSE&G's continuing desire to improve the effectiveness and efficiency of these functions, a review of the structure and capability of our nuclear operations and support organizations was performed in early 1981. Considered in detail during this review were the many requirements and recommendations resulting from the post-TMI assessment of the nuclear industry, as well as specific observations made by the NRC, INPO and PSE&G of our capabilities to efficiently support the operation of our nuclear units. In October 1981, PSE&G embarked on a major organizational change by combining its nuclear operations and support functions into a centralized, integrated Nuclear Department to be located on Artificial Island, the site of Salem Generating Station and Hope Creek Generating Station. In addition to improving the dedication and responsiveness of support personnel to plant operations, the formation of the Nuclear Department also enhances our state of emergency preparedness with respect to technical and administrative support.

One of the more significant aspects of this organizational change is that it relieves station management of certain non-operating responsibilities

plant operating and support functions are combined into a single, centralized integrated structure. Under the direction of the Vice President - Nuclear as the senior nuclear manager, responsibility for safe and efficient operation of our nuclear facilities has been clearly assigned. Additionally, the organizational structure and location provides for unambiguous management authority and effective lines of communication between responsible groups involved in the operations, technical and administrative support of our nuclear units.

Furthermore the ratio of bargining unit employees to supervisors over the past few months has been reduced to approximately 10 to 1 in the Maintenance, I&C and Radiation Protection Departments. This now makes it possible for first level supervisors in these departments to spend more time in the plant and to more effectively monitor the activities of their personnel.

Additional actions to improve management performance and effectiveness, are summarized below:

a. Nuclear Review Board

The Nuclear Review Board had performed studies to improve its effectiveness in meeting its responsibilities. As part of this review, discussions were held with several utilities regarding organization and conduct of operation of their respective off-site review

committees. The Chairman and selected members of PSE&G's NRB attended meetings of similar committees of other utilities. Pursuant to the recommendations made by the NRB and the organization establishing the Nuclear Department, the office of the NRB was established on-site with a full-time staff consisting of the chairman and a technical secretary to the Board. In January 1983, the membership was reconstitued with a provision for participation by persons from outside organizations in order to enhance the independence of NRB and to benefit from their experience. We have agreed with a neighboring utility to exchange members on each other's review board. Our efforts to improve the effectiveness continue through attending other utilities' off-site review committee meetings and monitoring their experience in this area.

b. Station Operations Review Committee

To provide independence and enhance the effectiveness of the Station Operations Review committee (SORC), a member of the Independent Safety Engineering Group (Safety Review Group) will be assigned to serve on this committee.

c. Nuclear Assurance and Regulation Department

Upper management's access to independent evaluations of safety, quality, regulatory compliance and reliability was further enhanced in January 1983 by the establishment of an independent major department reporting to the Senior Vice President - Energy Supply and Engineering. A General Manager - Nuclear Assurance and Regulation has been designated to provide management with an independent basis for evaluating the effectiveness of nuclear safety and quality programs. Staffing of this organization is to be completed by January 1984.

d. Self-Evaluation Programs

With the formation of the Nuclear Department in 1981, a program to self-evaluate the Department's performance was initiated. As a follow-up to the initial INPO evaluation of Salem in June 1981, specific recommendations made by INPO were reviewed by a PSE&G management team to determine the degree of implementation. Similarly, the recommended actions of the 1982 INPO evaluation are being tracked for resolution. PSE&G is planning additional evaluation programs to improve our management performance as follows:

- INPO Assist Visits will be utilized to help in resolving those specific management concerns identified by our various programs.

- PSE&G managment personnel will participate in plant and corporate evaluations of other utilities by INPO in order to gain additional input.

- Suggestions and recommendations from our NSSS vendor, based upon their observations and experience, will be solicited and evaluated to improve our programs and policies.

- Plant visits will continue to be arranged where common problems and concerns have been identified. Appropriate utility personnel can thereby share experience and discuss corrective actions.

With the knowledge gained from the actions identified above and review of other in-house studies, specific recommendations can be made for management action.

e. Independent Assessment of QA Program

As part of PSE&G's plan to consolidate functions and resources for its operating nuclear plants into one organization at the site, the responsibility for the Operational QA Program was transferred to the Nuclear Department in early January 1983. A plan to conduct an independent assessment of this new organization's program is

now underway. This assessment by an outside consultant will include a review of (1) the QA organizational structure and staffing, (2) the QA program content and procedures, and (3) the effectiveness of implementation of those programs and procedures. The findings and recommendations resulting from this assessment will be evaluated by PSE&G and an action plan will be prepared to improve the Nuclear Operations QA performance, as necessary.

It is planned to complete the review and have the action plan prepared by July 1, 1983.

f. Nuclear Training Program

Continued recognition by the Company of the value of training, coupled with our operational experience and increased training requirements led to a formal review of training and the development of a master plan in 1979.

This plan established a Nuclear Training Center which went into operation in August 1982. In addition to shops and labs supporting all job classifications, a replica control room and plant simulator will be in full operation by early summer of 1983. The Center has five major training departments and a staff of approximately 100.

Thirty courses have been evaluated by the regionally accredited New York State Program of Non-Collegiate Sponsored Education.

Credit recommendations have been granted for these courses. Additional courses will be reviewed in May and November of 1983. The Company has applied to INPO to have its training programs reviewed for accreditation and expects the INPO Accreditation Team will make its site visit this spring. PSE&G will be one of the first utilities to be prepared for an INPO accreditation visit.

Programs presented or under development are designed to support all Nuclear Department personnel, including Helper through Technician in the Bargaining Unit, and first line supervisor through senior management in the management staff. Efforts in nuclear training are the direct result of the Company's initiative and reflect management's dedication to training.

In an effort to develop and maintain a high caliber of supervisory personnel at our nuclear generating stations, we have initiated the development of a training program for first level supervisors. This training will be provided for

an individual prior to his assignment to supervisory responsibilities in the station, as well as, to all first level supervisors now providing supervisory functions. A needs analysis including interviews of station personnel has been completed and instructional objectives are being developed at this time. This program is scheduled for review by senior management in July, 1983 with implementation expected by September of 1983.

The following is a proposed outline of the first level supervisory training topics:

1. Orientation
   a. Company
      - Benefits
      - Appraisal system
      - Company-union agreement
      - Cost Accounting
      - Regulatory issues
      - NRC regulations
      - Codes, federal, state and local
      - Industry standards
   b. Nuclear Department
      - Organization and functions
   c. Station
      - Organization

2. Supervisory Skills

   a. Supervisor Skills

      - Leadership
      - Decision Making
      - Communications
      - Group Dynamics
      - Planning
      - Time Management
      - Motivation
      - Stress Management

   b. Ethics and Good Practices

   c. Documentation

   d. Recognizing and Coping with Aberrant Behavior

   e. Employee job specifications and training

   f. Interviewing and hiring skills

   g. Forecasting

3. Facility Administrative Procedures & Programs

   a. Administrative procedures

      - Supervisory letters
      - Directives and information bulletins
      - Administrative procedures
      - Technical Specifications

   b. Programs

      - Nuclear Safety
      - Security program
      - Fire protection program
      - ALARA program
      - Safety tagging program
      - Emergency Plan
      - Material procurement

c. Quality Assurance

- Description of program
- Audits and reports
- Requirements (10CFR21 and 10CFR50)

4. Technical

a. PWR/BWR system course

b. Cross-departmental training

c. Computer applications

d. Continuing training

Similar programs addressing training for senior supervisory level and personnel will be developed by October, 1983. A program addressing the issue of continued periodic or requalifiction training for supervisory and management personnel will be developed in spring of 1984. Technical training programs to support the professional staff not in station positions within the Nuclear Department will also be addressed in spring of 1984.

The incidents involving the reactor trip breakers at Salem, while focusing attention on certain shortcomings in our management system performance, is not indicative of any broad-base breakdown of PSE&G's overall management capabilities, performance, or commitment to safe nuclear

operations. This conclusion is based upon the results of the extensive studies and reviews which are described in Section C.2 thru C.11. These studies included a review of over 24,500 work orders for proper classification; a thorough assessment of over 2,700 purchase orders; a review of safety systems for a verification and update of the Master Equipment List; a review of station procedures for inclusion of all Westinghouse Technical Letters and Bulletins, and a review of vendor manuals for completeness and currency.

To augment the self assessment of management performance and capability, PSE&G has initiated an independent management diagnostic of the structure, management systems and staffing of the Nuclear Department. Management Analysis Company (MAC), a management consultant with extensive experience in the conduct of diagnostics for nuclear utilities, has been retained to make an appraisal of nuclear activities, including the operation and support organizations. Particular emphasis will be placed on safety and regulatory activities. MAC will commence the evaluation on April 5, 1983. A draft report is scheduled for completion on May 2, 1983 and a final report on May 30, 1983. Copies of the reports will be forwarded to the Nuclear Regulatory Commission.

Following the assessment and considerations of resultant findings and recommendations, an action plan will be developed for implementing improvements as appropriate.

In addition, PSE&G will establish a Nuclear Oversight Committee to provide management with an independent basis for evaluating the effectiveness of Nuclear Safety. The Committee shall include 3-5 members and will consist of nuclear utility operations executives, college professors and former regulators.

The Nuclear Oversight Committee shall submit reports to the Vice President - Nuclear following each quarterly meeting. Reports shall include: (1) an evaluation of overall management attention to nuclear safety, (2) progress being made towards resolving the open issues identified in the commitments made by PSE&G to the Nuclear Regulatory Commission and (3) progress on action items resulting from Management Analysis Company's evaluation. Copies of these reports will be forwarded to the Nuclear Regulatory Commission.

Also, PSE&G has engaged Beta Corporation to review its investigation of the events of February 22 and 25, 1983, including its corrective action program. The consultant will make an independent evaluation of the action plan and advise on the adequacy of the program

to insure that Salem Unit 1 can be safely returned to power.

The studies and reviews already conducted have resulted in either immediate correction or the initiation of programs to correct any deficiencies found in what we consider a basically sound management system. Our responsiveness to INPO and SALP reports, as well as the numerous initiatives promoted by our self assessment of our nuclear operations has demonstrated our willingness and ability to identify, pursue, and correct problems and deficiencies.

PSE&G is confident, having had the benefit of a concentrated in-house assessment, as well as a thorough review involving the collective expertise of the NRC Commissioners and staff, of the original breaker problem and the more far-reaching management control elements that contributed, synergistically, to the ultimate failure of the breakers, that all conceiveable deficiencies have been considered, investigated, and either corrected or included in a program to correct them.

2. Master Equipment List

As a result of the incidents on February 22 and 25, 1983, a problem was identified with the use of the Master Equipment List (MEL). The MEL was a document issued by the Engineering Department which listed those components within the plant that were safety related. The MEL was prepared as a reference document to be utilized in determining the safety classification of equipment for Station work orders and on Station procurement documents. The Q-List, which is part of the Operational Quality Assurance Program, identifies those activities, services, structures, components, and systems to which the Program applies. The Q-List references the MEL.

The MEL was developed as a successor to a construction program document call Project Directive No. 7 (PD-7). The Salem Unit 1 MEL was issued on July 15, 1981, and the Salem Unit 2 MEL was first issued on November 2, 1980, with a revision issued on January 27, 1981. The original purpose of the MEL was to provide a convenient listing of safety-related components in one document. The data in MEL was derived from various source documents such as the FSAR, System Descriptions, Equipment Specifications, and Engineering Drawings.

A program for updating and reissuing the MEL was developed. This program included the following steps:

1) To facilitate immediate utilization of the then-existing MEL, the completeness of the sets that had been issued to the Salem Station was first confirmed and a list of safety-related systems was added for use in more expedient work order classification. Additionally, a Field Directive was prepared and incorporated into the existing copies of the MEL which described the background and instructions for use of the MEL.

2) Training was provided to appropriate personnel in Nuclear Engineering, Quality Assurance, Nuclear Construction Support, and the Salem Station to explain the proper use of the MEL and to describe its function. This training was provided in conjunction with Quality Assurance training provided to the same personnel. This was a short-term commitment of the Salem Restart Report and is completed.

3) A program was initiated to review, update, and reissue the MEL as a controlled document. The process utilized was for Engineering personnel to review the MEL data against engineering drawings to determine completeness and to validate the

classification of data contained in the MEL. The reviewed and revised MEL has been issued for the following systems: ECCS (including Actuation Systems), Reactor Protection System, Auxiliary Feedwater System, and Containment Isolation System. This controlled reissue was made on March 24, 1983, and also included with it instructions on the proper use of each of the various sections of the MEL. This was a short-term commitment of the Salem Restart Report and is completed.

4) The component listing of the remaining Q-List Systems will be completed and incorporated into the MEL by May 1983.

5) A formal procedure for the use, review, and periodic update of the MEL will be issued by May 1983.

6) A formal Engineering verification of the revised MEL will also be performed. This process, following established procedures, will require that different personnel independently review each of the data entries in the MEL to verify the proper classification. This will be completed by May, 1983.

7) The systems list that was added to the MEL to aid in classification of work orders was revised, better defined and reissued on April 5, 1983.

Based on this extensive program, PSE&G is confident that the Master Equipment List provides a valid controlled document for use in classification of work orders and procurement documents.

3. Procurement Procedures

The investigation by the NRC Fact-Finding Task Force of the procurement process associated with the reactor trip breakers at Salem Generating Station indicated that PSE&G's established management and administrative controls allowed the procurement of replacement components for a safety system with a quality less than that of the original design. A review by Nuclear Engineering, Quality Assurance and Procurement personnel of 2707 procurement documents associated with non-safety related and commercial catalogue item (CCI) equipment supplied by 73 major equipment vendors (including Westinghouse, Gould Pump, Atwood Morrill, etc.) has been completed. The primary purpose of the review was to identify whether or not the discrepancies and inconsistencies identified by the NRC of the procurement process were isolated to the reactor trip breakers or were more indicative of a broad base problem. The 2707 procurement documents were evaluated to determine

1) that appropriate documentation was completed in accordance with established procurement procedures,

2) that proper classification and identification of items were accomplished by appropriate personnel,

3) that procurement documents contained the proper requirements for the vendor to supply the necessary information.

The review indicated that 2,381 purchase orders were properly classified and completed. 326 purchase orders required an additional review as a result of some discrepancy or inconsistency such as incomplete or missing information, lack of appropriate signatures and possible misclassifications. As a result of the investigation, 14 purchase orders contained items which were misclassified. These purchase orders were properly dispositioned through the use of Deficiency Reports. The items identified in the Deficiency Reports were resolved by the initiation and/or acquisition of supporting documentation and field verification. In no case was the removal of previously installed items required. The balance of 312 purchase orders were satisfactorily resolved by verification of appropriate item classification. The detailed review and investigation of these purchase orders has substantiated our confidence that none of the materials or equipment purchased compromised the safety of equipment or the plant.

A review of existing procurement procedures was completed. Interim procedures to strengthen the existing procurement program were established and implemented through the Manager - Nuclear Procurement and Material Control and the Manager - Quality Assurance Nuclear Operations. A reemphasis to appropriate personnel involved with the procurement process of the importance of adhering to established procedures and the confidence that the existing procurement program is adequate to support Salem Operations, provide further assurance that proper classifications will be properly applied to items and services procured.

By July 1983, the existing procurement program will be modified to establish improved administrative and management controls, and document processing to provide additional assurance that procurement classifications are appropriate for the identified applications, easily retrievable and consistently applied to repeat procurements. The system will continue to require item classifications by Nuclear Engineering personnel with verification by Quality Assurance personnel. Proficiency in the application of item classification techniques and the procurement process will be maintained through periodic training and indoctrination sessions. Additionally, the relocation of Procurement and Quality Assurance personnel to a new facility in

late 1983, in close proximity to Nuclear Engineering personnel, will result in improved document flow and communications between essential disciplines, as well as enhancing procedural adherence.

Quality Assurance personnel will continue to conduct periodic audits of the procurement program to ensure proper item classification, application of procurement procedures and practices, as well as, to verify procedural adherence by appropriate personnel.

As a result of the actions completed to date and the proposed improvements to be implemented by July 1983, we are confident that the misclassification of the reactor trip breakers and associated items was an isolated incident and that adherence to the established procurement program will continue to assure appropriate procurement classifications are applied to materials and services important to safety.

4. Work Order Procedures

Investigation of the reactor trip breaker incident revealed that the personnel preparing maintenance work orders were not fully complying with the instructions contained in the station administrative procedure. For work performed on the breakers in January 1983, an erroneous nonsafety classification was made. Therefore, a review within the maintenance organization had not been performed and Quality Assurance was not involved.

There had been no requirement for Quality Assurance personnel to be involved in the review of non-safety related work orders as they were processed to assure that appropriate steps were taken to assign a classification. All other work orders for maintenance on the reactor trip breakers were subsequently reveiwed and found to be properly classified as safety related.

Administrative Procedure AP-9, "Control of Station Maintenance" has been revised to clarify the work order classification process and is consistent with the instructions for use of the revised MEL.

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An independent Quality Assurance review of the classification of each non-safety-related work order is now required prior to commencing work. Indoctrination of station supervisory and QA personnel in the procedure changes and revised classification process has been completed. These measures will ensure that all work orders are properly classified, and that safety-related equipment receives proper attention during station maintenance.

To maintain proficiency in the initiation, processing and closeout of work orders ongoing training will be conducted, with emphasis on Quality Assurance requirements, test/retest requirements, and interdepartmental coordination.

A review of Salem Unit 1 non-safety-related work orders written since the issuance of the MEL in July 1981, has been completed. The effort focused on verifying the proper classification of the work orders in accordance with the revised procedures and revised MEL. Deficiency Reports were issued to appropriate

departments for disposition of any work orders which were found to be improperly classified. Deficiency Reports were also issued for items lacking substantiating documentation. Finally, items requiring corrective action were identified, and the need for inspection, testing or replacement determined.

TABLE 1: WORK ORDER REVIEW SUMMARY

Total Work Orders Reviewed	24,531	100.0%
Properly Classified Work Orders	23,842	97.2%
Deficiency Reports Issued	689	2.8%
Classification		
Items Lacking Documentation	132	0.5
Properly Classified by Previous Work Practice	522	2.2
Erroneously Classified Items	35	0.1
	689	2.8%
Disposition		
Resolved by Administrative Action	655	2.7
Resolved by Corrective Action	34	0.1
	689	2.8%

Table 1 summarizes the results of the review process. As indicated, Deficiency Reports were issued for 2.8% of the work orders. As noted, the bulk of the items resulted from the procedural changes and revised classification process. These items would not have been considered improperly classified under previous practices, such as using PD-7 and not classifying work orders for obtaining oil samples. Only a fraction of 1% involved actual administrative errors in classification, supporting a conclusion that no significant problem exists in this area. Of the erroneously classified items, none would have been handled differently had they been classified as safety related (except for Quality Assurance verifications).

Only a fraction of 1% of the items required corrective action, with the rest of the work orders necessitating only administrative action consisting of reclassification, verification of paperwork, or visual inspection to be closed. Corrective action generally involved verification of equipment operability or status following maintenance under an improperly classified work order. The review revealed no apparent adverse safety consequences.

The extremely low percentage of classification errors and no adverse safety impact associated with the

discrepancies provides assurance that the reactor trip breaker situation in January was isolated in nature and that no degradation of safety-related systems or equipment exists due to improper work order classification. Action necessary to close the deficiencies will be completed by April 11, 1983.

As noted, short-term action has been completed which ensures all non-safety-related work orders are properly classified in accordance with the MEL, and that an independent QA review of the classification is performed. These measures, together with those actions taken as part of the work order review, ensure that no problems exist in the work order program or plant safety equipment which preclude safe operation or restart of the unit.

5. Post-Trip Review

The station did have a practice for Post-Trip reviews and authorizations to restart the units following a reactor trip. In addition, a formal procedure to address the required reviews and authorization for startup was in the process of being developed at the time of the events. This procedure, Administrative Directive-16, has been implemented. This procedure provides detailed instructions regarding the type of information to be reviewed, including a detailed review of the sequence of events printout, and who has the responsibility for each review. The responsibility for authorizing restart of the unit is clearly defined in the directive. Also provided for are the additional reviews which must be completed if the cause of the event is not clearly identified. The adequacy of the directive will be evaluated based on experience and modifications made as appropriate. We are confident this formal procedure will provide for adequate review prior to startup following a reactor trip.

6. Timeliness of Event Notification

The operators delayed making the required notifications beyond the prescribed time. The delay was caused by time taken to determine whether the failure to trip was caused by malfunction of the trip breaker or solid state protection system; time to review the Emergency Plan Classification Guide for the incident; and to complete the call list. To address this, a program has been implemented to ensure a dedicated communicator is assigned to each operating shift. These individuals are knowledgeable in plant operations and have been provided specific training in the emergency plan and communications. In addition, all Operating Department supervisors responsible for the reporting of incidents have been advised as to the importance of notification within the prescribed times. We are confident this program will assure timely event notification in the future.

7. Updating Vendor-Supplied Information

7.1 Technical Bulletins

A review of the circumstances surrounding the reactor trip breaker failures resulted in a determination that PSE&G was not in possession of a Westinghouse Technical Bulletin. For this reason, PSE&G initiated an evaluation to determine if there were other occurrences where Westinghouse Technical Bulletins were not addressed in station procedures and what the implications of this may have been.

Westinghouse was requested to furnish a complete set of Technical Bulletins and Data Letters. Nuclear Engineering evaluated these Bulletins and determined which were applicable to Salem. The result of this evaluation was incorporated in a Field Directive which was issued to the Station. Station departments reviewed these documents for incorporation into Station procedures.

For those documents which were selected for incorporation into the station procedures, an evaluation

was performed by Nuclear Engineering to determine whether prior operation without the benefit of these Technical Bulletins and Data Letters would have resulted in unsafe plant operations. Nuclear Engineering concluded that there were no safety implications. Station procedures will be revised, where appropriate, by July 1, 1983.

A summary of the disposition of the Westinghouse Technical Bulletins and Data Letters is as follows:

TOTAL NUMBER OF DOCUMENTS - 379

DOCUMENTS NOT APPLICABLE - 173

DOCUMENTS PREVIOUSLY INCORPORATED - 97

DOCUMENTS FOR INFORMATION ONLY - 41

DOCUMENTS REQUIRING IMPLEMENTATION - 68

Documents requiring incorporation into station procedures or equipment modifications were entered into the station response tracking system in order to track completion of the required activity.

In light of the problem with the Westinghouse Technical Bulletins and Data Letters, PSE&G has initiated a system whereby all vendor technical documents are received by Nuclear Engineering for evaluation and determination of applicability to Salem. For this reason, we are confident that the problem addressed above no longer exists with respect to the Technical Bulletins and Data Letters from Westinghouse.

7.2 Vendor Manuals

A review has shown that vendor supplied information in general has not been received and processed in a consistent manner. Although a significant portion of vendor information was received and issued under a document control system -- some was not, making it difficult to ensure that the latest information was always identified to and used by station personnel.

It should be noted that PSE&G was aware of the concern prior to this incident, both as a result of reviews and INPO audits. Steps were already underway toward resolution.

A Vendor Manual control effort was initiated which consists of short term and long term programs. The short-term program addresses major equipment and instrumentation in safety-related systems. The long-term program will address the balance of safety-related equipment in all safety-related systems. Each program will provide verification that equipment manuals exist and are under a document control system. Each program will also confirm that the manuals contain the most recently issued applicable vendor technical information.

Short-Term Program

The short-term program includes major pumps, motors, and heat exchangers in the following safety systems:

Auxiliary Feedwater System
Control Air System
Safety Injection System
Chemical and Volume Control System
Reactor Coolant System
Chilled Water System
Fire Protection System
Containment Spray System
Diesel Generator Air and Fuel System
Residual Heat Removal System
Service Water System
Component Cooling System
Reactor Protection System
Containment Isolation Valves
Critical Equipment - Various Systems

A scope of valves was selected from the various manufacturers, taking into consideration their critical application in normal, ECCS or containment isolation functions. A scope of instrumentation and control devices was selected to assure confidence in the reactor protection systems, significant control loops pertinent

to the safe operation of the system, and various control room indications.

The short-term program consists of the following items:

1) An audit of Station and Nuclear Engineering files to identify manual existence, and ascertain revision level and date.

2) Comparison of those manuals found in Station and Nuclear Engineering files to assure that manual revision levels and dates agree. If a disparity is found, the latest manual revision is used as the basis for the remainder of the program. If the latest manual is uncontrolled, it is assigned an interim control number. A listing was generated and distributed to Nuclear Engineering and Station personnel for use in identifying the latest manual for each piece of equipment as it is included in the program.

3) Equipment manufacturers are contacted to a) confirm that manuals in the Nuclear Department's files represent the latest available technical information, b) request copies of any manuals identified as more recent.

4) Ensure that the latest known revisions are formally indexed in the document contract system.

The short term program identified that for the 233 selected components, 282 manuals would be required. 277 of these manuals were available in the station and together with Nuclear Engineering, 280 were accounted for in the Department. Sufficient technical information was available from the files to classify the components as having a manual for all but two (2) components. A manual is not published for one of the components, and the manual for the other is on order (although generic information on a smaller item is available). The short term program described above is complete, with the exception of item 4, which will be done by May 1, 1983.

Long-Term Program

The long term program will cover all safety-related equipment included in the Salem Master Equipment List.

The procedure used for manual verification and control in the short term program will be applied here, with the goal of obtaining manuals for types of equipment for which manuals are customarily used. Schedule completion dates for the long term program are as follows: (See short term program for item descriptions)

Item	Scheduled Completion Date
1	6/1/83
2	7/1/83
3	8/1/83
4	12/1/83

In addition to the Short- and Long-Term Programs, procedural modifications are being developed to address the method of controlling vendor manuals. The following elements will be encompassed:

1) Requirement that all vendor manuals (Q and non-Q) be incorporated under the Vendor Document Control System (PSBP).

2) Revision of current PSBP system to provide for controlled, numbered copy issue of vendor manuals.

3) Identification of vendors for Q-equipment who have manual updating programs, and periodic contact with these vendors to assure receipt of most recent applicable information.

4) Review of manual revisions and new manual issues by Station user departments to ensure incorporation of applicable new information into applicable procedures.

5) Review of vendor manuals by Nuclear Engineering to determine applicability to installed equipment.

6) Periodic audit of controlled copy holder files to ensure existence of latest issues.

7) Procedures regarding control of vendor manuals.

8) Identification of manuals applicable to Q-listed equipment.

9) Annual contact with vendors of safety-related equipment to ascertain the availability of the most recent applicable information.

These procedural modifications will be issued by May 1, 1983.

Based on the comprehensive scope of systems and equipment covered in the Short-Term Program and the findings of that Program, we are confident that we are in possession of the installation, maintenance, and operating information necessary to safely operate and maintain the Salem Units.

The comprehensiveness of the above program will ensure that the latest vendor supplied information is used by plant personnel in performing activities on safety

related equipment. The program elements of consistent, controlled processing of vendor information received, periodic followup with vendors who implement information updating programs to assure receipt, and periodic PSE&G audit of the Program will provide the requisite assurance.

8. Involvement of Quality Assurance Personnel With Other Departments

In 1981, PSE&G established a Nuclear Department which initiated a plan to consolidate functions and resources for its operating nuclear facilities into one organization at the site. A continuance of that plan resulted in the responsibility for the Operational QA Program being transferred into the Nuclear Department in January 1983. Currently, personnel are in the process of relocation to the site. The purpose of this change is to promote increased involvement by Quality Assurance personnel in the functions of the Nuclear Department.

Management Analysis Company (MAC), a management consultant, has been retained to perform an independent assessment of the QA program, including effectiveness of its implementation. Following assessment and consideration of findings and recommendations, an action plan for improving Quality Assurance performance will be prepared. This action plan will be prepared by July 1, 1983.

The QA organization's policy places greater emphasis on "direct" verification that line organizations are implementing the QA Program. This is accomplished by increased observation and monitoring of activities by QA personnel.

The reactor trip breaker incident identified a need to strengthen the knowledge of and adherence to procedures, including QA requirements. In order to emphasize existing QA Program requirements as well as newly instituted procedural changes, an indoctrination/ training program was conducted for all appropriate personnel regarding Classification, Work Orders, and Procurement. The following specific items were identified in the training program:

- Use of the MEL List of Systems for classification of all station work orders.

- Requirement for all non-safety related work orders to be reviewed by QA prior to implementation.

- Use of the MEL List of Systems and Component List for classification of items for procurement.

- Review of the requirements and philosophy of Commercial Catalog Items (CCI), stressing the fact that CCI classification pertains only to procurement.

- Re-emphasis of the basic QA Program objectives and reponsibilities.

Short Term Training

To ensure proper classification of work orders and procurement documents, indoctrination was provided to

appropriate personnel with emphasis on the specific criteria to be used in the determination of safety classifications. Guidelines were provided and discussed during these indoctrination sessions to ensure that appropriate personnel understand and effectively apply the different guidelines presented for classifying work orders and procurements.

Work Orders

For the determination of classification on work orders appropriate personnel were directed to consult the recently established List of Systems section of the MEL, which identifies those specific systems which are governed by the PSE&G QA Program. Any work activity performed on these systems or identified portions thereof is to be classified safety-related and conducted in accordance with the provisions of the QA Program.

Procurement

For the determination of procurement document classification, appropriate personnel were instructed to consult both the MEL List of Systems and component listing sections and to follow the prescribed criteria on the use of the listings. Any item classified as safety-related or CCI from the MEL listings will be processed and controlled in accordance with the provisions of the QA Program. Appropriate personnel

were further instructed to consult Nuclear Engineering in the event of any question in the application of the MEL.

With respect to Commercial Catalog Item purchases (CCI's), personnel were indoctrinated as to the criteria identifed by QAI 4-3, which must be satisfied to support the classification of CCI. Specific examples of CCI's and non-CCI's were provided and discussed. Personnel were advised that the QA Program controls are applied to these items throughout the life cycle including procurement, receipt inspections, storage, installation, maintenance and test. It was emphasized that the CCI classification is utilized only as a method of procurement and has no bearing on work order classification.

Further, it was emphasized that the QA Program controls applied to CCI are an acceptable method of procurement since they represent a replacement "in kind" and provide the necessary assurance that the item (CCI) may be installed in a safety-related application.

Following completion of the training program, selected attendees were interviewed to ascertain the degree of comprehension and understanding of certain key elements of the presented material. The interviews demonstrated that the key program objectives were achieved.

Long Term Training

Proficiency in determination of classification of work orders and procurement documents will be maintained by on-going periodic training and indoctrination sessions.

We are confident that the actions described above will enhance the performance of our Quality Assurance Operations and provide assurance that Salem 1 can be safely returned to power operation.

9. Post Maintenance Operability Testing

Our review of the Post-Operability Testing Program in effect at the time of the two events has indicated that certain areas needed improvement. These include the clarification of the test/retest requirements necessary to ensure operability after maintenance, the need for controlled documents containing post maintenance operability requirements and the need for interdepartmental communication in the area of test/retest.

As a result of this review, procedures utilized by the various departments performing maintenance activities are being revised to clarify the test/retest requirements necessary to determine post-maintenance operability. In certain cases, this has taken the form of supervisory witness and inspection hold points to involve Quality Control in the activity.

The directive utilized by the Operating Department to prove operability of safety related equipment will be revised to ensure testing in accordance with the Technical Specifications is completed prior to declaring equipment operable.

In addition, Administrative Procedure AP-9, "Control of Station Maintenance" will be revised to incorporate changes that will ensure standardization of post

maintenance operability testing. These changes will include definitions of the terms test and retest and establish departmental responsibilities. In addition, the changes will delineate the methods to be utilized for interdepartmental communications concerning test/retest requirements.

The procedural revisions associated with this issue will be completed by July 1, 1983.

The increased awareness of post maintenance operability testing by all responsible personnel, together with the revision to AP-9, enhances the post maintenance operability testing program and further assures continued safe operation of Salem Unit 1.

10. Preventive Maintenance

The Preventive Maintenance Program has been in effect since the initiation of plant operation. It is described in Administrative Procedure AP-10, "Inspection Order System." It has been classified by INPO as a Good Practice. The program is reviewed and improved continuously. Preventive maintenance activities are based upon Technical Specification Requirements, NRC and other regulatory requirements, equipment vendor and Nuclear Engineering recommendations, and previous operating experience.

In July 1981, PSE&G initiated a thorough review of all maintenance deficiency reports, LERs, work orders, and work sheets to estabslish equipment failure patterns. From the review, approximately 80 items were identified for additional preventive maintenance activity. These items will be incorporated into the Inspection Order System by August 1, 1983.

In July 1982, PSE&G embarked upon a Managed Maintenance Program with the support of Westinghouse Electric Corporation. It is a two-part effort: to develop a comprehensive integrated preventive maintenance routine, and to update plant system descriptions based on design changes incurred since initial plant startup. This

program gives high priority to the ALARA concept. Activity frequencies and types of repair activities are established based on radiation exposures involved. This practice will result in reduced personnel exposure.

The process for generating component maintenance recommendations begins with component selection. The selection is accomplished through review of applicable PSE&G drawings, piping diagrams, instrument schematics, and electrical drawings. A review of the valve list, component list and specification sheets provides specific component information. The Design Change Request Listing provides a record of the plant changes implemented on a system basis during plant life. Any inconsistency in the above information can be rectified by a field verification.

A management review is conducted for comment and contribution. Inputs include time requirements, manpower requirements, and skill codes required. The recommendations are presented in the form of a computer printout which includes:

Component Identification

Priority

Procedure Number

Technical Specification

Frequency

Activity Time

Plant Status

System Status

Equipment Isolation

Department

Following the management review, any necessary changes are made. Then an analysis of the preventive maintenance recommendations is performed to finalize manpower requirements. After the analysis is completed, a final PSE&G management review is conducted prior to implementation.

The program includes the Reactor Trip System, Emergency Core Cooling Systems, Auxiliary Feedwater System, Containment Isolation System, and all other safety-related systems. This program will be completed by January 1, 1984.

The additions to the Inspection Order System and the implementation of the Managed Maintenance Program provides an overall enhancement to nuclear safety.

11. Safety Review Group

The Safety Review Group (SRG) was formed in May of 1980 as part of the licensing commitment for Salem Unit 2 low power license. In an August 19, 1980, letter from R. M. Eckert to H. Denton, a commitment was made to retain the group on-site during power operation. Subsequent to that letter, the SRG function was incorporated into the Salem Unit 2 Technical Specifications. The SRG is composed of five dedicated, full-time engineers and functions to examine plant operating characteristics, NRC issuances, industry advisories, LER's, and other sources of information which may indicate areas for improvement of plant safety.

The SRG is responsible for maintaining surveillance of selected plant activities to provide independent verification that these activities are performed correctly.

The group functions under the general guidelines contained in NUREG-0737. The philosophy of the group since its inception has been such that it serves no line function, with all required reviews carried out by other departments. An exception to this general philosophy is that, since March of 1982, the SRG has

been coordinating the review of INPO SERS, SOERS and O&MRs within the Nuclear Department. In keeping with the intent of NUREG-0737, the SRG screens a large volume of material from many sources. It is intended that as many sources as possible be screened and, based upon initial screening, selected in-depth reviews are performed in those areas that are deemed to warrant further investigation or evaluation. The SRG has been, and continues to be, sensitive to root causes and generic implications.

Other sources for identifying potential areas of review include SRG attendance at Station morning meetings, SORC meetings, technical PSE&G meetings, NRB meetings, discussions with plant and engineering staff, and visual observations of plant activities or conditions.

Recommendations for improving plant safety which result from such reviews are reported to management. These formal SRG recommendations are tracked as open items until they are resolved to the satisfaction of the SRG. Mechanisms exist for escalating SRG open items through higher management if necessary. In addition, the SRG has free access to all levels of management within the Nuclear Department to discuss issues requiring immediate attention and to discuss issues having a potential impact on safety.

With regard to the reactor trip breaker failures on August 20, 1982 and January 6, 1983, Incident Report 83-008 and LERs 82-072/03L, 82-072/03X-1, and 83-001/03L which deal with the August and January breaker failures were screened by the group however, no in-depth reviews were performed. The SRG would not normally do an in-depth evaluation of an event like the August 20 failure, since it appeared to be isolated in nature, corrective action was taken, and the other breaker was satisfactorily tested during the surveillance. Following the January 6 failure, an SRG member did inquire as to the status of the failure and was informed that the vendor was being called in to inspect the breaker. A subsequent informal inquiry revealed that the vendor had been in and that no direct cause for the failure had been found although the breaker had been inspected and cleaned. The breaker was tested and returned to service.

During plant events or perturbations the SRG has no line function. Investigations, evaluations and corrective actions are the

responsibility of other departments within the Nuclear Department. The SRG's primary function in these cases is to follow the resolution and corrective actions as they evolve and provide input from its perspective or to verifyindependently, the details of the event and the adequacy of corrective actions. The depth of such followup activities or independent review can vary from informal discussions with plant or engineering staff as to the status of a given item to a complete independent investigation.

Recommendations resulting from such an independent review are formally transmitted to appropriate management for action. As of February 28, 1983, the SRG has issued 93 written recommendations which have been included in its tracking system. Of these, six were administrative in nature (recommendations of this type are no longer included in the tracking system) leaving eighty-seven (87) recommendations of a technical nature. An item is not closed until the recommendation has been addressed to the satisfaction of the SRG. Sixty-two (62) of the eighty-seven technical recommendations have been satisfactorily resolved and closed out. The remaining are open.

Because of the complexity and long-term nature of some of the recommendations, it is to be expected that the SRG will always have open items in its tracking system.

The SRG has had a positive influence on safety. Based upon its recommendations, actions have been taken to modify equipment, testing, procedures and training to improve plant safety.

PSE&G CORRECTIVE ACTION REPORT
SHORT AND LONG TERM ITEMS

ITEM	COMPLETION
A. EQUIPMENT ISSUES	
A.1 Determination of Safety Classification of Breakers	Complete
A.2 Identification of Cause of Failure	
a. Short Term Actions	
1. Confirm that new U/V trip attachments on Salem Units 1 & 2 incorporate all design changes made to these devices.	Complete
2. Measure and confirm the force required to trip the breakers using the breaker trip bar and that the breakers trip with an output force from the U/V trip lever of $\leq$ 31 ounces.	Complete
b. Long Term Actions	
1. Submit a test program to determine the life cycle & replacement interval for the UTAs & to verify the adequacy of the new maintenance & surveillance programs used on the reactor trip circuit breakers	May 1983
2. Establish a procedure for periodically measuring the force required to trip the breakers.	Complete
A.3 Verification Testing Program	
a. Short Term Actions	
1. Manufacturer will electrically test U/V trip attachment on Test CB 25 times.	Complete
2. After installation, U/V trip attachment tested 10 times.	Complete
3. After installation in appropriate breaker compartment, Response Time Test.	Complete

ITEM		COMPLETION
b.	Long Term Actions	
	1. Provide detailed test program	May, 1983
	2. Complete test program	Oct. 1983
A.4	Maintenance and Surveillance Procedures	
a.	Short Term Actions	
	1. Resolve breaker cabinet/switchgear room cleaning deficiency.	Complete
	2. Clean breaker cabinet & switchgear room	Complete
	3. Revise maintenance procedure and/or other documents to require all replacement U/V attachments to have been successfully tested 25 consecutive cycles.	Complete
	4. Provide acceptance criteria in Maintenance Procedure M3Q-2 for ten cycle test that allows NO failures for acceptance.	Complete
	5. Modify Maintenance Procedure M3Q-2, Section 9.8 to include three timing tests and an average time computed for comparison to previous tests.	Complete
	6. Revise Maintenance Procedure M3Q-2, Section 9.7 & other appropriate procedures to require that a sealant be applied to the head of the self locking screw on the U/V attachment.	Complete
	7. Specify in Maintenance Procedure M3Q-2, Enclosure 7 (Ref. Section 9.7) U/V coil dropout voltage acceptance tolerance & actions to be taken if out of specification.	Complete

ITEM	COMPLETION
B. OPERATOR PROCEDURES, TRAINING AND RESPONSE	
B.1 Operating Procedures for ATWS	
a. Short Term Actions	
1. Identify indications in conrtol room providing positive identification of reactor trip demand.	Complete
2. Revise procedures to require manual reactor trip on receipt of positive indication of reactor trip demand.	Complete
3. Review the basis for ATWS procedure steps and order of priority, revise procedures, as necessary, and train operators.	Complete
4. Train operators in revised procedures.	Complete
B.2 Operator Training	
a. Short Term Action	
1. Conduct training for operators on revised procedures.	Complete
2. Conduct additional training on RPS and associated indications and alarms.	Complete
3. Review February 22 & 25 events with all operators.	Complete
4. Conduct practical exercise in Control Room of revised procedures.	April 12,1983
5. Conduct analysis of exams with answer key.	April 7, 1983
6. Review testing weaknesses, counsel each trainee.	April 12,1983
7. Conduct walk through on alarms & RPS indicators.	April 12,1983
8. Distribution handouts to operators on ATWS training.	April 12,1983
B.3 Operator Response	
a. Short Term Action	

ITEM	COMPLETION
1. Caution operators in use of J handle control.	Complete
b. Long Term Actions	
1. Replace Reactor Trip Switch	Next outage of sufficient duration
2. Modifications to clarify First Out Annunicator Alarms	May 1, 1983
C. MANAGEMENT CAPABILITY AND PERFORMANCE	
C.1 Overall Management Capability & Performance	
Complete staffing of Nuclear Assurance & Regulation Department	Jan. 1984
Independent assessment of QA Operations	July 1, 1983
Implement training program for first level supervisors	Sept. 1983
Develop training program for senior supervisory level	Oct. 1983
Develop program for periodic or requal. training for supv. and management personnel	Spring 1984
Develop Technical Training Program for non-Station personnel	Spring 1984
MAC management diagnostic - final report	May 30, 1983
C.2 Master Equipment List (MEL)	
a. Short Term Actions	
1. Verify MEL is complete & accurate with respect to ECCS, including actuation systems, RPS, Aux. Feedwater and containment isolation systems.	Complete
2. Instruct appropriate personnel in purpose & use of MEL.	Complete
b. Long Term Actions	

ITEM	COMPLETION
1. Verify completeness & accuracy of Mel for remaining Q list systems and re-issue as a controlled document.	May 1983
2. Issue formal procedure for use, review and update of MEL.	May 1983
C.3 Procurement Procedures	
a. Long Term Actions	
1. Evaluate & modify procurement procuredures to ensure appropriate classification of items/services important to safety.	July 1983
C.4 Work Order Procedures	
a. Short Term Actions	
1. QA Department review all non-safety related work orders prior to starting work.	Complete
2. Implement a program & training to ensure that work orders are properly classified.	Complete
3. Review work orders written since issuance of the MEL for proper classification & evaluate safety consequences of those found improperly classified.	Complete
C.5 Post Trip Review	
a. Short Term Actions	
1. Develop and implement AD-16	Complete
C.6 Timeliness of Event Notification	
a. Short Term Actions	
1. Assign dedicated communicator to each shift.	
2. Review importance of reporting requirements with supervisors	Complete

ITEM	COMPLETION
7 Updating Vendor Supplied Information	
a. Short Term Actions	
1. Update existing documentation on safety equipment and ensure that vendor documentation is under a controlled system.	
a) Audit Station files for manuals existance, revision level, & date	Complete
b) Audit Nuclear Enginering files for manuals existance, revision level, and date.	Complete
c) Compare Station & Nuclear Engineering; Audit and use lastest manual revision	Complete
d) - Contact vendors to confirm that manuals are technically current.	Complete
- Request updated copies (*where identified as more recent)	*
2. Review Westinghouse Technical Bulletins and Data Letters	Complete
b. Long Term Actions	
a) Audit Station files for manuals existance, revision level, & date	June 1983
b) Audit Nuclear Enginering files for manuals existance, revision level, and date.	July 1983
c) Compare Station & Nuclear Engineering; Audit and use lastest manual revision	Aug. 1983
d) - Contact vendors to confirm that manuals are technically current.	Dec. 1983
- Request updated copies (*where identified as more recent)	
e) Revise Station procedures where appropriate	July 1983
f) Index & control new/revised manuals received	May 1983
g) Develop procedures for controlling vendor manuals	May 1983

ITEM	COMPLETION
C.8 Involvement of Quality Assurance Personnel With Other Departments	
a. Short Term Actions	
1. Retain outside consultant to assess QA program	Complete
2. Modify QA organization policy to more fully integrate with overall nuclear activities	Complete
C.9 Post Maintenance Operability Testing	
a. Long Term Actions	
1. Review and revise AP-9	July 1983
C.10 Preventive Maintenance	
a. Long Term Actions	
1. Incorporate items identified into Inspection Order System	Aug. 1983
2. Complete Managed Maintenance Program	Jan. 1984