Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

November 2, 1990

Mr. James Taylor
Executive Director of Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Zion Station Units 1 and 2
Commonwealth Edison's Response
to NRC Diagnostic Evaluation
NRC Docket Nos. 50-295 and 50-304

Reference: September 4, 1990, letter from
J. Taylor to J. O'Connor

Dear Mr. Taylor:

Commonwealth Edison is submitting as an attachment to this letter our response to the NRC Diagnostic Evaluation Team (DET) Report provided in the above reference. The DET was conducted to assess Zion Station's performance in June 1990. This attachment addresses each specific finding and root cause discussed in the DET Report.

The team is to be commended for the thoroughness of the report and professionalism during the evaluation of Zion Nuclear Station. We particularly appreciated the manner in which Mr. Al Gibson managed and coordinated the team's effort during the evaluation.

In response to your visit with our Board of Directors and the DET report, Commonwealth Edison has significantly increased corporate oversight of Zion Station. CECo's Board of Directors understands the significance of the DET findings and is actively interested in the rate of performance improvement at Zion Station. The Nuclear Operations Committee of the Board of Directors is proactively involved in the oversight of Zion Station improvement activities. Finally, the Zion Corporate Oversight Committee has been established to assess the adequacy of improvement actions, review and focus priorities for actions by off-site support organizations, and ensure adequate resources are allocated to improve Zion performance.

Zion's program for improvement is aggressive. Commonwealth Edison is committed to providing the additional resources necessary to fully implement these improvements. To this end, both monetary and personnel resource allocations have been significantly increased for Zion Station. Be assured that the allocation of additional resources to Zion has not and will not come at the expense of our other five nuclear generating stations. Commonwealth Edison is committed to achieving excellence in operation at all of our nuclear facilities.

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We share the NRC's concerns with respect to operator attitude, management control and teamwork. We have made improvements in these areas, including our recent control room reorganization. We recognize however, that further evaluation of the Zion Station organization is necessary to support future improvement.

To assist in the comprehensive evaluation, two organizational development consultants have been retained by Commonwealth Edison. The Management Analysis Company is in the process of performing an independent cultural assessment. Following this activity, a needs analysis will be performed and recommendations will be provided. Training will then be developed to implement the recommendations. The second consultant is supporting Zion Station Management to improve teamwork, examine the decision making process, and enhance communications. Commonwealth Edison is also planning to acquire in-house organizational development expertise to allow for future self assessments in this area, and continued organizational effectiveness improvements.

Our goals for improving Zion Station performance and achieving overall excellence in nuclear operations demands continued improvement in the area of engineering support. Engineering support improvements consist of the following initiatives. First, an immediate additional resource allocation for Zion specific, high priority tasks has been made. Second, existing Zion Engineering activities have been prioritized to resolve long standing issues. Finally, a corporate engineering effort to improve the direction and quality of engineering support for all our nuclear generating stations is in progress. Details of these engineering initiatives are described in the attached report.

To effectively transfer lessons learned from the Zion DET and future significant issues at all our facilities, a Lessons Learned support function will be created. This effort will assess applicability and provide guidance to each of our stations. Audits and Assessments will be performed to evaluate the effectiveness of the Station's implementation of the guidance.

In closing, I wish to stress that Commonwealth Edison Company strongly believes that achieving excellence in nuclear operations is essential. The actions summarized above and discussed in detail in the attached report demonstrate our commitment to achieving this goal. You can be assured that it is our intent to not only continue to operate Zion Station safely, but to establish Zion as a performance leader in the nuclear industry.

If we can be of any service by clarifying or supplementing the materials submitted by this letter, please have your staff direct questions to our Nuclear Licensing Department. We will continue to keep NRC Region III Staff informed of our progress at Zion Station. I continue to be available in the event you need any further information in this regard.

Very truly yours,

FOR Cordell Reed
Senior Vice President

Attachment
cc: A. Bert Davis-RIII
C. Patel-NRR
NRC Resident Inspector-Zion
M. Farber-Zion
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Response to Zion Station Diagnostic Evaluation Report

Commonwealth Edison Co.

November 2, 1990

RESPONSE TO ZION STATION
DIAGNOSTIC EVALUATION REPORT

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EXECUTIVE SUMMARY

Commonwealth Edison (CECo) has carefully reviewed the report by the Nuclear Regulatory Commission's (NRC) Diagnostic Evaluation Team (DET) for Zion Station. A detailed description of our corrective actions and root cause analysis is provided in sections 2 and 3 of this response. The following Executive Summary provides a concise description of our overall actions responsive to the five basic areas of concern:

- Operator Attitudes, Management Control, and Teamwork
- Overtime Control
- Operator Training
- Management Effectiveness
- Engineering Support

CECo recognizes that effective, comprehensive, and integrated efforts responsive to the DET concerns, as well as our own self-identified improvement initiatives, are required to return Zion Station to excellence. Although we agree with the DET findings and conclusions, we have confidence that the personnel at Zion Station, and in our corporate support organizations, have the ability to complete the improvements necessary to once again be considered a top performer. CECo is committed to the improvement efforts underway at Zion to accelerate the progress.

To ensure that this program results in CECo's desired improvements to Zion's performance, resources and management oversight have been increased significantly. Zion has received a substantial supplemental budget to implement the many program elements described in sections 2 and 3 of this response. Increased management oversight has been provided in three ways: (1) increased attention by CECo's Board of Directors; (2) increased attention by the Nuclear Operations Committee of CECo's Board of Directors; and (3) the establishment of a Zion Corporate Oversight Committee comprised of highly experienced members of senior management, some of whom bring experience with CECo's implementation of the Dresden Station Improvement Plan (DSIP) which guided CECo's response to the DET at that plant.

Operator Attitudes Management Control Teamwork

Improvements in control room performance have already begun. Revisions to the control room organization have clarified the lines of responsibility and authority. Unit teams have been formed to establish greater staff coherence and teamwork. Administrative duties by control room supervisors have been reassigned to provide increased time for direct supervision of operating activities. In addition, responsibilities for independent verifications of equipment has been reassigned to the nuclear station operators (NSOs). This serves to increase NSOs presence in the plant and to increase the attractiveness of supervisory positions as career advancements. Evidence of positive cultural change is demonstrated by all licensed operators now wearing CECo uniforms.

Additional actions will be taken to further improve control room performance. Two major initiatives are the performance of a cultural assessment by Management Analysis Company (MAC), as well as organizational development activities by Advanced Resources Development (ARD). The ARD effort includes process improvements to increase management effectiveness, and assistance in managing the cultural change. These initiatives, coupled with the many actions to remove barriers to excellent operator performance, should resolve the control room concerns detailed in the DET Report.

Overtime Control

Effective control of operator overtime is now being accomplished through three types of actions:

- Additional staffing
- Improved work planning
- Strict adherence to strengthened overtime guidelines

Twenty one additional equipment attendants will be qualified prior to the next refueling outage. Overtime guidelines have been revised to fully reflect Generic Letter 82-12. In addition, a corporate review and evaluation of overtime practices at all of our nuclear stations is underway. Enhanced guidance will be established as necessary by January 1, 1991.

Operator Training

Operator training has been enhanced by increasing the requalification training staff and improving the methodology for developing questions consistent with NRC guidance. To maintain these training enhancements, CECo is evaluating additional training effectiveness input to our established performance monitoring systems.

Management Effectiveness

Zion Station has a recognized history of achievement. To return Zion to a level of excellence that both we and others believe is achievable, CECo recognizes that our corrective actions must improve the effectiveness of management. To be effective, management expectations must keep pace with rising industry standards. Actions taken to improve the effectiveness of management include:

- Creation of a Management Action Plan to better organize, plan, and control improvement initiatives.
- Application of additional resources, including staff increases.
- Initiation of cultural assessment and effectiveness reviews of management.
- Infusion of successful mangers from the corporate office and other nuclear stations, as well as rotation of selected station management roles, providing new management perspectives while retaining station specific expertise.

Engineering Support

A comprehensive strategy has been developed to significantly strengthen engineering support of Zion Station. For the short-term, a Zion Project Engineering Support Group has been assembled to provide the engineering resources necessary for expediting the completion of high priority tasks. This group reports directly to the Zion Project Manager. The Project Manager also provides functional direction to the existing on-site engineering staff. For the long-term, an Engineering Action Plan is being developed to focus available engineering resources on priority issues.

These short and long-term actions will be supported by ongoing improvements in the effectiveness of the engineering organization. Actions are underway to promote the improvement of quality, to encourage proactive intervention in station activities, to become more self-reliant through the development of greater in-house expertise, and to improve the oversight of external support organizations.

Our maturing self-assessment programs will allow us to effectively transfer the lessons of the Zion DET, and to identify the operation and organization attributes that pose barriers to excellence. The DET lessons learned have been clearly and promptly communicated to all of our nuclear stations. Through our integrated audit and assessment functions we will evaluate the effectiveness of the Zion corrective actions, as well as the corrective actions of our other stations.

Zion's program is aggressive. Experience with implementation of the DSIP shows that Zion can achieve both the short and long-term improvement objectives. The resources necessary to achieve timely progress have been provided and the rate of Zion's progress will be monitored closely by enhanced oversight.

SECTION 2.1
OPERATIONS AND TRAINING

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2.1 OPERATIONS AND TRAINING

2.1.1 Operator attitudes, Management Control, and Teamwork

COMMONWEALTH EDISON RESPONSE

Zion Station has reorganized the control room to establish clear lines of authority and a strong supervisory presence within the operating shift organization while enhancing the concept of teamwork associated with unit-specific responsibilities. Figure 1 contains the previous control room organization chart and Figure 2 contains the revised control room organization chart depicting the changes that have been made.

The Shift Engineer position now assumes more of a managerial role due to the creation of the two Unit Supervisor positions that are responsible for a specific unit. The Unit Supervisors are SRO qualified and selected based on their experience and supervisory abilities. The Unit Supervisor is stationed in the Control Room to direct the activities of the Unit. Reporting to each Unit Supervisor are two Nuclear Station Operators (NSOs), one Equipment Operator (EO) and two Equipment Attendants (EA). The Unit Supervisor and the two NSOs form a team that works together on the same unit for a five week period.

The Unit Supervisor is directly responsible for the direction and supervision of his team. The Unit Supervisor ensures that the licensed operators are attentive to their control panels. The two NSO's per Unit work together to spread the workload and prevent becoming overloaded with activity of the units. The Unit Supervisor is responsible for documenting the performance of his team and if disciplinary action is necessary, he has the authority, with the support of the Shift Engineer, to take appropriate actions.

Certain Administrative duties previously assigned to the Control Room Supervisor have been redistributed to allow the Unit Supervisors to focus on Shift Supervision. The Shift Technical Advisor (STA) function is performed by one of the unit supervisors or the licensed foreman as indicated in figure 2.

Since its implementation on August 31, 1990, the operating reorganization has been generally well received.

As additional actions to improve the work environment and remove barriers to success CECo is performing cultural and organizational evaluations. This activity includes the performance of a cultural assessment by Management Analysis Company (MAC), as well as organizational development activities by Advanced Resources Development (ARD). The ARD effort includes process improvements to increase management effectiveness, and assistance in managing the cultural change. These initiatives coupled with the many actions to remove barriers to excellent operator performance, should resolve the control room concerns detailed in the DET Report.

Previous Zion Station Operating Organization

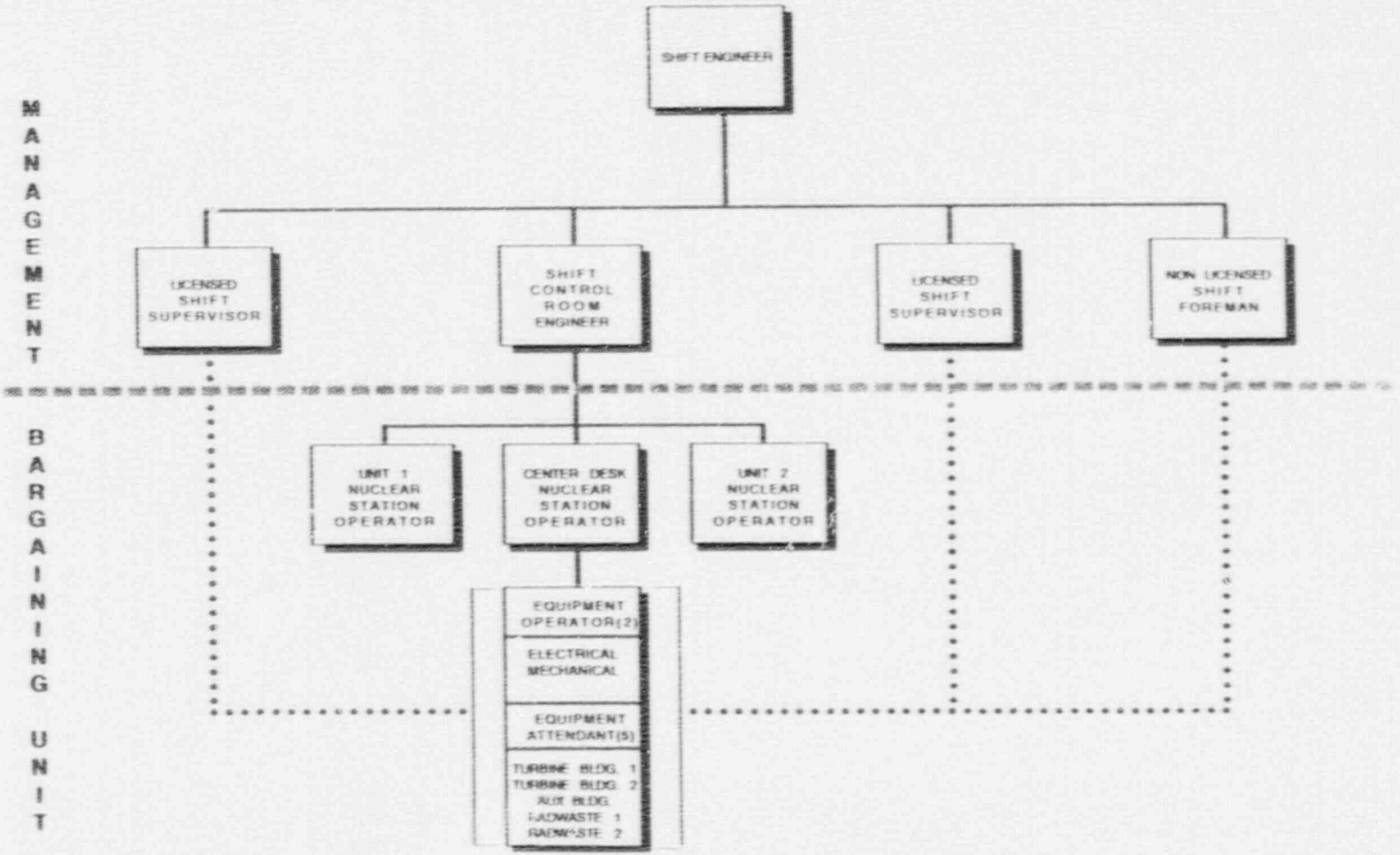

Figure 1
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Figure 2
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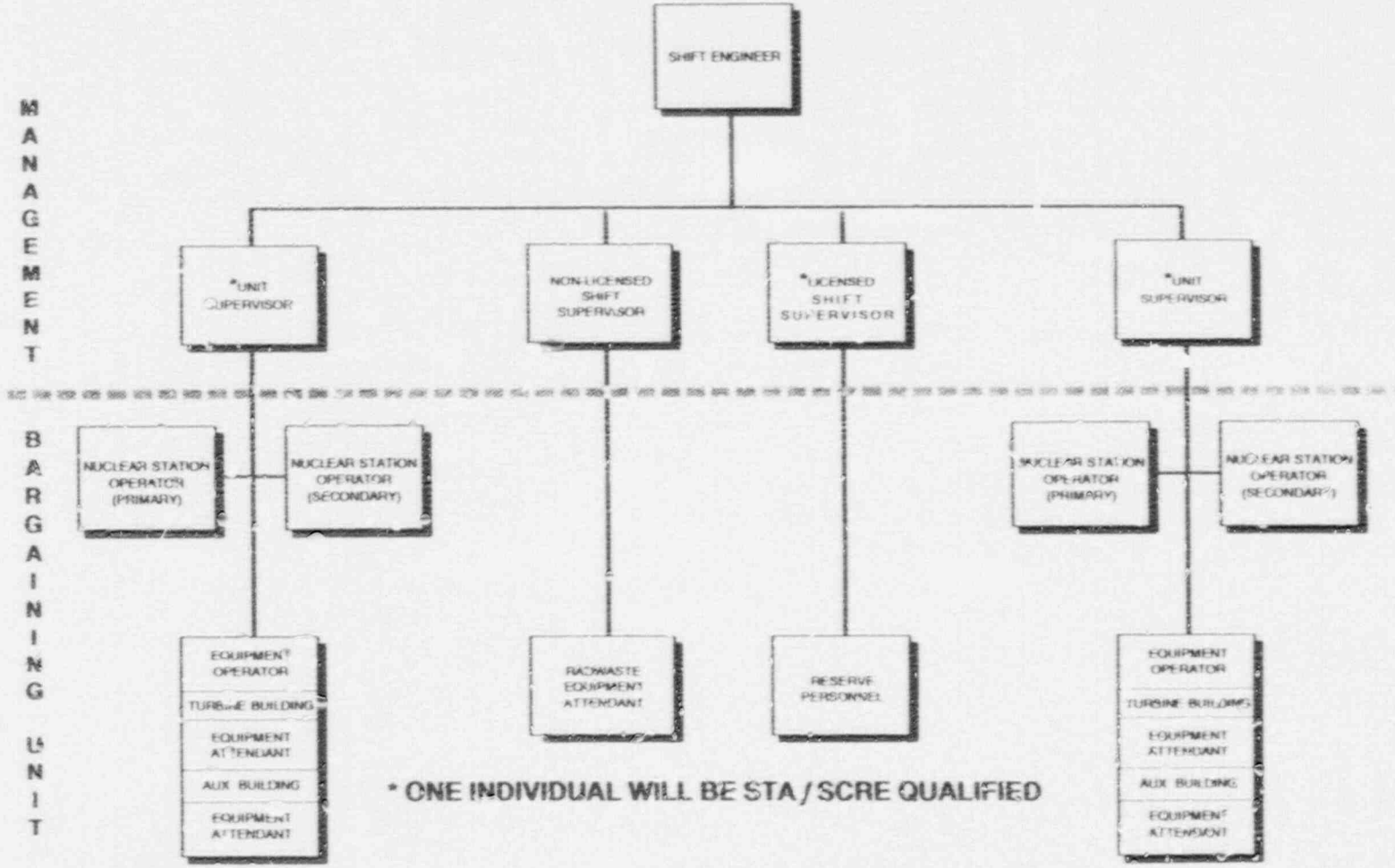
New Zion Station Operating Organization



2.1.2 **Nuclear station operators lacked confidence in some shift control room engineers, shift foreman, and shift engineers**

COMMONWEALTH EDISON RESPONSE

Commonwealth Edison believes that there are two elements involved in this issue. The first involved whether the previously existing organization allowed the Shift Control Room Engineers (SCRE) to be effective supervisors. As shown in Figure 2, Zion Station believes that the operating shift reorganization has improved the effectiveness of Shift Supervision.

The second issue directly addresses Zion Station's ability to attract Nuclear Station Operators (NSO's) to the role of management shift supervisor. Zion Station's inability to attract NSO's into these positions was primarily related to two factors:

A promotion to a management Shift Foreman would require the NSO's to change their working conditions from the control room to the field where one of their primary responsibilities would involve management verification. Zion Station's policy was to require management verification of all important valve manipulations performed by Zion operators. This meant that in effect, a management Shift Foreman position performed similar duties to those of an Equipment Attendant. This included job assignments within the containment and vertical pipe chases. This change in working environment was viewed negatively by the NSO's.

A promotional path for NSO's was limited. After promotion to an Operating Shift Foreman, there were no other likely promotions available to these individuals unless selected to be promoted to the Shift Engineer classification. Since these promotions occur infrequently, the Shift Foreman ranks had become relatively stagnant.

The first of these factors was addressed by transferring responsibilities for independent verification from management (Shift Foreman) to the bargaining unit. As of August 15, 1990, independent verification by qualified bargaining unit personnel has become the policy at Zion Station. There is no longer an explicit requirement for shift supervision to re-verify all valve lineups performed by bargaining unit personnel.

The second factor regarding the promotional path available to an NSO has been altered via the shift reorganization. A Unit Supervisor and Senior Unit Supervisor position have been created within the new Zion Station organization. The Senior Unit Supervisor position would not involve an alteration in job responsibilities, but rather would be a promotional increase that would reward performance. Details associated with the Senior Unit Supervisor are being discussed with corporate management to ensure consistency with the company's personnel policies. These changes provide for two additional promotions between the positions of Licensed Shift Foreman and that of the Shift Engineer.

2.1.3 Nuclear station operators did not feel accountable to management and felt immune to discipline

COMMONWEALTH EDISON RESPONSE

The response to item 2.1.2 discusses Commonwealth Edison's initiatives to improve Shift Supervisor effectiveness and stimulate NSO interest in promotion to management. In addition, operating shift supervision meetings have been held and are planned on a recurring basis to ensure that supervisors feel confident in their authority. The balance between managing the personnel for which they are responsible and exercising discipline has been and will continue to be stressed.

Commonwealth Edison has retained the services of an organizational development consultant, ARD Corporation, to develop management skills and capabilities throughout the station. ARD's efforts will include a management work analysis and review to allow the management team to focus on station improvement.

Commonwealth Edison has also retained the services of Management Analysis Corporation (MAC), an organizational development consultant. This consultant will perform a Zion Station culture assessment and needs analysis. MAC will then assist with training development to address results of the needs analysis. The resulting training will be presented during the Incumbent Supervisors Training Program (InSTP) Phase II. The schedule for the analysis is currently under development.

Action plans will be developed to ensure that action is taken through the needs analysis and organizational development efforts.

2.1.4 Supervision in the Control Room was limited

COMMONWEALTH EDISON RESPONSE

The response to item 2.1.1 describes the control room reorganization which has been implemented at Zion. CECo believes continued implementation of the new organization will resolve the concerns identified in item 2.1.4.

2.1.5 **Nuclear station operators' knowledge of the current condition and configuration of plant equipment was limited because they were seldom outside the control room**

COMMONWEALTH EDISON RESPONSE

As mentioned in Item 2.1.2, the previously utilized management verification practice was changed in conjunction with the control room reorganization to independent verification by qualified bargaining unit personnel. This change allows a second qualified individual to perform the verification and permits the licensed shift management to perform supervisory functions. With this change, one of the two Nuclear Station Operators assigned to each unit performs independent verification of Equipment Operator activities. Discussions with the operators are continuing with respect to other activities that require work outside the control room. These discussions are focusing on providing oversight and direction in the plant to new Equipment Attendants and Equipment Operators during plant evolutions such as pump starts and complex valving operations. An action plan will be developed to determine if additional value-added methods of utilizing NSOs in the plant will be implemented.

Zion has recognized the need for additional operators. A plan, as described in Item 2.1.6, has been developed and implemented to resolve this concern.

2.1.6 **Excessive overtime was not managed or controlled**

COMMONWEALTH EDISON RESPONSE

Commonwealth Edison has set forth overtime guidelines for nuclear station employees that perform safety-related functions in a Nuclear Operations Directive (NOD). The NOD defines the specific personnel that are required to follow the guidelines and the specific time guidelines. The time periods defined in the NOD are consistent with the NRC guidance in Generic Letter 82-12.

Zion Station has two administrative procedures that govern the implementation of the NOD. These two procedures have been reviewed and will be revised to ensure consistency with the NOD.

Zion Management and the Bargaining Unit have mutually agreed to bypass the low overtime person to strive to meet the goal of zero deviations from the NOD guidelines. Since the initiation of this practice on September 3, 1990, there have been only three occasions where work demands required that the guidelines be exceeded.

Future limited instances of exceeding the guideline may be needed until equilibrium staffing is achieved. Existing plans for escalated hiring have continued with the October 9, 1990, training class of 21 Equipment Attendants and the October 1, 1990, training class of 6 Equipment Operators. An additional class of approximately 10 Equipment Attendants is scheduled to commence April 1, 1991. This bottom-up approach ensures that future numbers of Operators are maintained to permit transfers from the Operating Department.

Additionally, 3 new Reactor Operators recently completed the final stages of parallel board standing and 3 new Senior Reactor Operators are in post license training. Both groups have successfully passed the recent NRC initial license examination. This is the maximum reasonable rate at which we are able to introduce new staff without adversely affecting organizational stability.

The current RO and SRO initial license training class has been underway since January 1990 with the NRC examination scheduled for July 1991. An additional license training class starts in January 1991, with NRC examination date in July 1992.

With completion of the Equipment Attendant Class in June 1991, and utilization of the new Licensed Operators, work demands should not challenge the overtime guidelines. Equilibrium staffing at Zion Station will be achieved by February 1992, with sufficient personnel to support the formation of either a sixth operating shift, the implementation of a twelve hour shift rotation, or expanded crews in a five week rotational scheme.

A corporate review and evaluation of overtime practices at all CECo nuclear stations will be performed to ensure that appropriate overtime guidelines are applied to station personnel. This review will encompass operating shifts and other personnel that may affect plant safety. Enhanced guidance will be established as necessary by January 1, 1991.

2.1.7 **Operators worked around problems**

COMMONWEALTH EDISON RESPONSE

A committee chaired by the Production Superintendent will meet monthly to discuss equipment or plant conditions that are causing operators or other employees problems while working. As a starting point, the Operating Engineer has solicited comments from the Operators regarding equipment problems that make their jobs more difficult to perform. To establish the committee and formalize the actions, an action plan will be created.

The System Engineer program at Zion is in the process of being strengthened. Nuclear Operations Directive (NOD) TS14, entitled "Station System Engineer Program", states the expectations and responsibilities of a System Engineer. The System Engineer is a key to improving overall station performance and reliability. The

engineer is expected to be the focal point of plant knowledge concerning all aspects of assigned system(s), including system operation, performance trending, maintenance and testing. A quarterly walkdown of the accessible portions of all systems is required as part of the NOD.

The Operating Department has been in the process of upgrading Operating procedures. The Emergency Operating Procedures were revised in the Spring of 1990, to include the Westinghouse Owners Group Revision 1A guidance. A Regional inspection earlier this spring concluded that the Emergency Operating Procedures were adequate with the successful implementation of the WOG Rev. 1A guidance. Operating Procedures requiring revision are managed under an action plan.

The following actions have been taken or are planned to resolve the three specific items identified by the DET in this item:

The excessive leakage past the feedwater regulating valves has been a problem in the past on Unit 2. These valves were repaired in 1988, with satistactory results. During the Diagnostic Evaluation these Unit 2 valves again started leaking. This repetitive problem will be discussed during the Technical Issues meeting to investigate the cause and provide a resolution. In the interim, work requests have been generated to repair the valves.

To address steam generator blowdown valve isolation, revisions to the Emergency Operating Procedures (EOPs) have now been completed and the Standing Order removed. To fully resolve this issue, a modification is planned to provide for automatic isolation of the steam generator blowdown system on a Low-Low steam generator level signal. The installation of the modification will be tracked by an action plan.

The Service Water Supply motor-operated valves (MOV) to the Auxiliary feedwater (AFW) pump have experienced seat leakage problems from what appears to be silt buildup due to the orientation of the MOVs. Work requests have been initiated to investigate the problem and identify a permanent solution. Depending on the root cause, the Technical Issues meeting will carry the item until a corrective action is identified.

2.1.8 **Performance during the simulator exercise**

COMMONWEALTH EDISON RESPONSE

The performance on the simulator was satisfactory. The weaknesses mentioned were reviewed with the trainees during the critique process. Operating management is involved in the critique process to assist in the identification of performance weaknesses.

One of the weaknesses identified in this area involved both the shift foreman and the shift engineer directing operator actions. Direction to the reactor operators is to come from the shift foreman. The shift engineer's role is to be the acting Station Director for the purpose of Emergency Classification and notifications. This has been discussed during the critique to ensure that future confusion is avoided.

2.1.9 **Shift logs and records were weak**

COMMONWEALTH EDISON RESPONSE

To improve the quality of the Operations Department logs and records, the Operations Department has recently conducted seminars, as a part of the Licensed Requalification Program, to train the operators on what is required to be included in the logs. To enhance the effectiveness of the seminars, management has developed shift training material that highlights both good and poor examples of logs and records. This material was provided to all operating shift personnel. The Conduct of Operations procedure will be revised to require LCO log entries for surveillance testing where equipment is removed from service. In addition, detailed management expectations on the type and specificity of plant log entries will be incorporated in the revised procedure. In the interim, memoranda placing this requirement in effect will be issued by November 15, 1990.

Additionally, Senior management observation has been implemented with daily reviews of the Shift Engineer's Log. Unit logs are also reviewed by Operations management on a daily basis. Management reviews have generated feedback to the operators in a continuing effort to improve the quality of Operating Department logs and records.

2.1.10 **Training instructors were overburdened and lacked time to adequately meet all their training commitments**

COMMONWEALTH EDISON RESPONSE

The ability to respond to additional Training Department commitments was adversely affected by limited personnel resources. A review of the organization was completed and a dedicated NRC license requalification program group was established. This group is comprised of Zion Station training personnel and contractor personnel which include a high level manager from the Westinghouse training organization. This group's focus was directed toward review, development and validation of examination material and the administration of both the NRC and facility license requalification examinations. This effort resulted in a successful performance in the September 1990 examination and a similar organization remains in place to support the January 1991 examination.

CECo employees will be added to the Zion Training Department to replace contractors. These additional resources will be used to address the issues of instructor preparation, material development, maintenance of accredited programs and continuing training for Training Department personnel.

2.1.11 **The training department was not well prepared for the September 1990 requalification examination.**

COMMONWEALTH EDISON RESPONSE

A group was created to upgrade the requalification examination program. This group consisted of a permanently assigned Requalification Coordinator and two other individuals from the Training Staff as well as one contract person. With help and cooperation from the Production Training Department as well as a Peer evaluation group from Commonwealth Edison's two sister PWRs, the newly formed group reviewed our previous September 1989 performance and recent DET identified concerns. The following changes to Zion Station's requalification program resulted:

Using Section 601 of NUREG-1021 as its guide, and in anticipation of Rev. 6 to Section 601, questions were developed and/or upgraded to delete/reword questions considered to be direct lookup. Questions considered to be open-ended or non-focused were rewritten. A goal was set to make greater than 75% of the questions on the written exam multiple choice with emphasis on viable distractors per ES-602 Rev. 6 and NUREG/BR-0122.

Job Performance Measures (JPMs) were reformatted and upgraded to meet both NUREG 1021 and internally generated exam standard guidelines. Included for upgrade were both cues and standards used on in-plant and control room JPMs and use of the dynamic simulator for selected control room JPMs. Also, JPM questions were revised to more specifically relate to the JPM and included making questions better focused to the answer.

The dynamic scenarios and evaluations were updated by the Zion Production Training department to ensure that the order of events was both logical in its progression and challenging. Emphasis was also placed on the use of emergency procedures. Transition from one emergency procedure to another was also stressed.

Evaluators were trained both on JPM evaluation and question techniques (especially regarding follow-up questions). Training was provided for evaluation of dynamic simulator demonstrations including practice evaluations in both JPM and dynamic settings.

As a result of these concentrated efforts, the September 1990 NRC administered examination was given a satisfactory rating. Five of six crews were rated satisfactory on crew evaluations. The crew rated unsatisfactory was comprised of staff licenses. Twenty of twenty-three individuals passed the written examination. All 23 individuals passed the JPMs. The station evaluators were all declared satisfactory with the NRC stating that a good job was done on JPM evaluations.

Efforts are continuing to improve and upgrade exam materials in anticipation of the January 1991 NRC administered examination. Plans are in place to have personnel available on a full time basis to oversee and further develop the requalification examination program.

2.1.12 Personnel errors

COMMONWEALTH EDISON RESPONSE

Commonwealth Edison is committed to continued reduction in personnel errors at Zion Station. Personnel errors (by plant work group) are monitored and the Human Performance Enhancement System (HPES) is used to resolve root causes. It is felt that the procedure upgrade effort will contribute to a continuing reduction in personnel errors.

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MAINTENANCE AND TESTING

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2.2 MAINTENANCE AND TESTING

2.2.1 The team reviewed the failure history for MOVs and found a significant number of failures.

COMMONWEALTH EDISON RESPONSE

The previous MOV Coordinator was a system engineer assigned a significant number of additional responsibilities, thus limiting the time spent on MOV activities. In recognition of this, during the 4th quarter of 1989, Zion Station obtained authorization to procure the full-time services of a qualified MOV engineer. During the 1st quarter of 1990, Zion Station assigned a full-time MOV Program Coordinator to implement and trend all MOV activities. A back-up engineer is currently being trained to provide additional support. Arrangements have been made for the back-up Coordinator to attend a root cause analysis course.

The Electrical Maintenance (EM) and Mechanical Maintenance (MM) Departments have assigned specific personnel to supervise and perform MOV overhauls. These personnel have either received or will receive advanced MOV overhaul training. In addition, MOV-specific tools have been procured and will be available for the performance of MOV preventive maintenance (PM). The MOV Coordinator has full responsibility for the implementation of the Zion MOV Program.

In some instances, root cause identification was insufficient due to lack of timely involvement of the MOV Coordinator and appropriate maintenance department(s). The resulting inaccurate root cause determination led to repeated failures in some cases. In order to improve root cause determination, CECo corporate guidelines have been provided to assist in troubleshooting efforts. The Technical Staff and the appropriate maintenance department(s) are notified of any failure prior to any subsequent stroke attempts. After reviewing the circumstance and failure type, troubleshooting efforts are initiated per procedural guidance. When possible, an attempt is made to duplicate the conditions at the time of failure.

A formal MOV Setpoint Control Procedure incorporating applicable Corporate guidance was approved for use at Zion Station on August 1, 1990. This procedure incorporates guidance contained in Corporate Directives for both MOV's and Setpoint change methodology. The Corporate Nuclear Engineering Department will perform an assessment of the implementation of this program by January 31, 1991.

The Zion Maintenance Department has completed additional training in proper torque switch installation methods.

Grease migration into the spring pack has been investigated and reorientation of the affected MOVs is being considered. Based on this investigation, it appears that only the Main Steam Line Isolation Drain Valves have experienced this problem.

The valves which were characterized as failed because of a deficient design change and inadequate post-modification testing actually failed because initial torque switch settings did not take into account packing drag. These valves were newly installed and the packing drag was not quantifiable prior to installation. The switch settings have been adjusted as appropriate and the valves have been successfully stroked.

CECo recognizes that MOV failure trending efforts were not comprehensive or effective in the past. The hiring of a dedicated MOV Coordinator has resulted in improvement of the MOV trending efforts. MOV failure trending data bases are compiled by the MOV Program Coordinator.

Additional MOV data bases are compiled for use in specific programs by the Problem Analysis Data Sheets (PADS) Coordinator, Nuclear Plant Reliability Data System (NPRDS) Coordinator and Deviation Report/Licensee Event Report (DVR/LER) Coordinator. The MOV Program Coordinator reviews the results of all MOV failure trending. MOVs with excessive failure history are discussed with Corporate Engineering for assistance in determination of root cause and corrective actions. Those MOVs needing corrective actions are prioritized based on safety significance and failure rates.

2.2.2 **The licensee failed to ensure operability of MOVs by not always maintaining torque switch settings**

COMMONWEALTH EDISON RESPONSE

As discussed in Item 2.2.1, the control of torque switch settings has not been adequate in the past at Zion Station. Inadequate procedural controls existed to maintain settings at their recommended values. A formal MOV Setpoint Control Procedure, incorporating applicable corporate guidance, was approved for use at Zion Station on August 1, 1990.

This procedure incorporates guidance contained in Corporate Directives for both MOVs and setpoint change methodology. In addition, the Corporate Nuclear Engineering Department provided Zion Station with a MOV setpoint data base. This data base was compiled utilizing vendor design data, plant modification records, applicable diagnostic testing and IEB 85-03 testing results.

The DET stated that the plant staff had performed no engineering analysis or testing to determine operability before changing torque switch setting. The current practice at Zion, if a torque switch setting is outside of the window established in the setpoint control procedure, is to perform an evaluation to determine valve operability.

In response to NRC Region III Confirmatory Action Letter (CAL RIII-90-011), CECo has determined that the IEB 85-03 MOVs in both units are OPERABLE. Unit Two IEB 85-03 MOV torque switch settings were verified correct by physical verification prior to that Unit's return to service from the last outage. For Unit One, operability determination was accomplished by either 1) physical verification of proper torque switch settings, or 2) plant operating configuration/ testing which ensured performance of safety function. In some cases, valves are administratively maintained in their accident position. In other cases, tests were performed that stroked IEB 85-03 MOVs at or near their accident delta pressure. Region III subsequently concurred with CECo's evaluation.

2.2.3 **During the evaluation, it was determined that several of the torque switch settings in the licensee's response to NRC IEB 85-03, "Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings," were suspect.**

COMMONWEALTH EDISON RESPONSE

Commonwealth Edison has performed a re-evaluation of Zion Station's IEB 85-03 submittal, focusing on the criteria used in selection of IEB 85-03 population, the calculations and assumptions used in obtaining calculated maximum accident differential pressures, and the testing methods. In addition, the CECo Corporate Nuclear Engineering Department provided Zion Station with an MOV setpoint data base. This data base was compiled utilizing vendor design data, plant modification records, applicable diagnostic testing and IEB 85-03 testing results. In all cases, torque switch setting recommendations were established in a conservative manner to assure safety functions would be performed.

Commonwealth Edison believes that the previous IEB 85-03 testing results, combined with improved setpoint control, provide adequate assurance of the continued operability of those IEB 85-03 MOVs which could be required to stroke against significant differential pressures during and/or after an accident.

2.2.4 **The licensee failed to install torque switch limiter plates on at least 48 MOVs.**

COMMONWEALTH EDISON RESPONSE

Zion Station recognizes the need to procure and install torque switch limiter plates on MOVs where missing. The new limiter plates referred to in the DET Report have subsequently been received at the station and are being installed as plant conditions allow.

To ensure that the limiter plate issue is resolved, the existing maintenance procedures, including the MOV PM procedure, specifically address checking whether or not a torque switch limiter plate is installed. Where available, new limiter plates are obtained from storeroom stock and installed. Where not available, the limiter plate will be procured and installed as plant conditions permit.

2.2.5 **Testing was being performed on some valves without measuring the full stroke**

COMMONWEALTH EDISON RESPONSE

As stated by the DET, Zion did not adequately evaluate the effects of changing the bypass settings on valve testing. The DET attributed this to not using the modification process. CECo's current Quality Assurance Manual allows setpoint changes to be administratively controlled outside the scope of CECo's major modification procedures. CECo recognizes that the preexisting torque switch setting practice did not include sufficient administrative controls or require an overall evaluation of the effects on the valve after changing the bypass settings. This problem has been resolved by the MOV Setpoint Control Procedure, which now requires an evaluation of the effects of changes to the bypass and torque switch settings (open/close) on valve testing.

The conflict between torque switch bypass settings and valve position limit switches is inherent in 2-rotor MOV design. Corporate Nuclear Operations Directive NOD MA.1 contains recommendations for setting the torque switch bypass at a minimum of 25% of the opening stroke. Recognizing the impact of this recommendation, Zion Station worked with Corporate Engineering to develop a prioritized listing of MOV's to be modified to the 4-rotor design. 4-rotor wiring changes were incorporated into an existing modification package for the Unit 1 Auxiliary Feedwater Discharge MOVs and installed during the Fall 1989 outage.

A modification package to install 4-rotor limit switch wiring for additional MOVs has been authorized. Preliminary installation schedules have been formulated with the IST stroke-timed MOVs and throttle MOVs to be among the first to be modified.

Zion Station will stroke time the appropriate IST MOVs from their Motor Control Center (MCC) via contactor observation to ensure measurement of the full stroke until the 4-rotor modifications are completed. This method of MOV stroke timing is currently used at other generating stations that utilize 2-rotor limit switches. Action Plans to affect the necessary procedure changes and personnel training have been accelerated. Implementation of the new method of MOV stroke timing will begin before December 31, 1990.

A training program was implemented in order to properly inform the operators of the effects of torque switch bypass on MOV limit switches and stroke time.

2.2.6 **The licensee did not test 42 MOVs and 2 manual valves in the SW system as required by ASME Section XI**

COMMONWEALTH EDISON RESPONSE

Zion has reviewed and evaluated the testing requirements for all ASME MOVs (including those in the Service Water system) and has directed the Operating Procedures Group to incorporate the required ASME Section XI testing into the appropriate procedures. All required MOV testing will be proceduralized by November 30, 1990. The required testing for other ASME Section XI valves (AOVs, check, relief and manual valves) is currently being evaluated by plant staff. Safety functions are being documented for all inservice testing (IST) valves as well as Code allowed exemptions (IWV-1200) for valves not to be tested in the IST program.

Approximately one-third of the valves not being tested were classified as category B passive in the original IST program and did not require testing by ASME Section XI. Other valves not previously tested by the IST program were excluded by Code allowed exemptions. However, no documented bases for exempting these valves from the IST program could be found. For this reason, the DET concluded that the Zion ASME Section XI testing program apparently received inadequate attention when it was originally developed. Zion had earlier questioned the IST program valve scope and bases in early 1989. Hence, a consultant was obtained to review system mechanical drawings for Code valves and their safety functions in taking the reactor to cold shutdown condition or in mitigating the consequences of an accident as stated by ASME Section XI. The consultant's report was to consist of a valve list with description, safety function, required testing, and references used in developing their recommendations.

The DET mentioned that Zion had failed to take appropriate and timely corrective actions when the consultant informed them of the apparent inadequacies in the Zion ASME Section XI Program. The consultant issued a draft report, dated July 12, 1989. After reviewing this draft, Zion personnel determined that the draft report was not acceptable. This decision was based on missing information on the required testing and the basis for the consultant's recommendations. Additionally, the results lacked a review of valves against the recently issued Generic Letter (GL) 89-04 (Guidance in Developing Acceptable Inservice Testing Programs). Since this vital information was lacking in the draft report, the draft could not be effectively evaluated by Zion. These comments were provided to the consultant in early August 1989. The final report, dated 1/30/90, was subsequently submitted to Zion (this was the report provided to the DET in June 1990). Zion is

currently in the process of developing and implementing an effective program using the consultants final report recommendations and the guidance from NRC Generic Letter 89-04. Valves which are still considered to be passive or are exempted by ASME Section XI will not be tested in the IST program.

The report was necessary for Zion to implement the requirements of GL 89-04. A conscious decision was made to integrate evaluation of the consultant's recommendations with the implementation of GL 89-04. Consequently, the IST Coordinator initiated action plans in January 1990 to implement GL 89-04 requirements and evaluate the consultant's recommendations concurrently in an efficient and effective manner. This effort to address GL 89-04 and the consultant recommendations will resolve the identified concern and will provide corrective action to prevent recurrence of this issue.

Due to leakage past a Service Water MOV in the suction supply to the turbine driven Auxiliary Feedwater Pump, a decision was made in 1982 to isolate the manual valve in this line to prevent steam generator chemistry induced problems. As discussed in Item 2.1.7, a permanent fix to the MOV will be determined and corrective actions implemented. Until such time that the manual valve is restored to the open position it will be added to the IST Program for testing.

2.2.7 **The licensee had not fully established periodic or post-maintenance diagnostic testing (including thrust measurements) for MOVs subject to IEB 85-03 to detect degradation and ensure operability under design conditions**

COMMONWEALTH EDISON RESPONSE

Zion Station has successfully initiated its VOTES diagnostic testing program (thrust measurement) as of the Spring 1990 Unit 2 Refueling outage. Previous attempts to initiate diagnostic testing were unsuccessful primarily due to lack of MOV-designated manpower. The addition of a full-time MOV expert as the MOV Program Coordinator, a contractor field service engineer, and a back-up MOV engineer to the on-site Technical Staff has shown benefits. Zion Station's action plan to improve its diagnostic testing program is consistent with Corporate Engineering direction. Recently, resource commitments enabled the station to order two complete VOTES diagnostic testing sets (one of which is presently on site). Training has been completed for electrical "A" mechanics that use this diagnostic equipment.

Commonwealth Edison described the methods that will be utilized to perform MOV diagnostic testing in the Generic Letter 89-10 response.

Zion MOVs within the scope of GL 89-10 are scheduled to be diagnostically tested during the next three to five refueling outages for each unit, as described in the CECo response to the Generic Letter.

2.2.8 **The licensee did not know t a condition of several safety-related SW heat exchangers**

COMMONWEALTH EDISON RESPONSE

As described in response to Generic Letter (GL)89-13, a comprehensive heat exchanger cleaning and testing schedule has been developed. All safety-related Service Water heat exchangers will either be cleaned or performance tested to ensure design heat transfer capability. For heat exchangers that have been determined to be more easily cleaned, such as oil coolers, maintenance work requests will be written for inspection and cleaning. For heat exchangers to be tested, testing procedures are currently being written.

Design heat loads have been identified and incorporated into test procedures with the appropriate extrapolation methodology. Instrumentation accuracies necessary to achieve acceptable extrapolation results have been identified. A study is currently being performed to determine what instruments will achieve needed accuracies and to complete budgetary estimates for plant modifications. This study will be completed by December 31, 1990. The initial implementation of the GL requirements will take place over the next 3 consecutive refueling outages per Unit, as described in CECo's response to the Generic Letter. After the initial implementation is completed, the frequency of the inspecting/testing may be adjusted. This adjustment will be based on the results from the initial inspections/tests.

2.2.9 **The licensee lacked a comprehensive PM program for the SW system and components**

COMMONWEALTH EDISON RESPONSE

An intensive Reliability Centered Maintenance (RCM) system program has just been completed at Zion Station. The RCM program was developed using information from EPRI, INPO, Advanced Technology Engineering Systems INC. (ATESI) and a similar program previously established at Dresden. Systems were prioritized considering safety significance, probabilistic risk analysis, and potential to impact safety sy and components. The SW system was included in the top 15 system are undergoing an RCM study in 1990.

The RCM study reviews system functions and safety significance. Each component of the system is reviewed for its impact on the different functions and is given a ranking. The components are then reviewed for maintainability and ranked accordingly. This information is used to determine the component's importance to the system's function.

Current PM activities for each component are reviewed against the vendor's recommendations and its importance to the systems function ranking. Recommendations are made in the RCM report for additions, deletions, changes to frequency and/or content of tasks in the PM Program. Each recommendation is tracked through the review cycle to complete the RCM study.

The SW system RCM study has been completed and the Zion staff is reviewing and implementing the recommendations. The report contains 304 recommendations that reflect changes to the PM program as well as one time inspections, new maintenance procedures and new test procedures. Specific recommendations include heat exchanger inspection and/or testing, strainer rebuild and service intervals, and instrument calibrations among others. MOV testing and thrust measurements are not specifically addressed by the RCM report as they are covered under Zion Station's MOV program. Tasks contained in the PM program for the SW system now have documentation to trace the task to actual system functions. The PM Improvement Program (Item 2.2.8), which includes the SW System, will be developed and implemented at Zion in accordance with the schedule set forth in the applicable action plan.

A computer program is being developed to track and retrieve the preventive to corrective maintenance ratio by system and component. This will provide a tool to assess the effectiveness of the RCM review.

2.2.10 **The licensee's previous testing of the SW pumps was inadequate to determine degradation of the pumps.**

COMMONWEALTH EDISON RESPONSE

ASME Section XI requires that hydraulic and mechanical (vibration) tests be performed in order to assess the operational readiness of various pumps. Currently, Zion is obtaining vibration data on a monthly basis. The data obtained during this test is trended by the Vibration Coordinator (ISI Group) to assess pump degradation.

Due to the plant design, and system operational needs, Zion is unable to test the hydraulic parameters (flow and pressure) in accordance with the frequency specified in ASME Section XI. Hydraulic data is currently obtained during single pump testing during refueling outages. A relief request was submitted to the NRC as part of the IST Program in December 1987, requesting permission to only perform the hydraulic testing during outages. Zion, in conjunction with CECo Engineering, is currently pursuing alternate methods for hydraulic testing of these pumps during power operation. Until an alternate method is developed, single pump testing during refueling outages will continue.

As noted by the DET, SW pumps had been rebuilt with impellers of a different design. Once rebuilt and tested, new pump curves were not generated in accordance with ASME Section XI. A review of this problem identified that Zion personnel failed to obtain the required data which was an oversight of the ASME requirements. New pump curves have been generated for the rebuilt Service Water pumps and are being used as reference values for pump testing.

2.2.11 **Corrective maintenance on the SW system had not always been performed in a timely manner.**

COMMONWEALTH EDISON RESPONSE

Major changes to the daily planning program at Zion Station were initiated on September 1, 1990. Since that time all Technical Specification surveillances and work requests are scheduled on the daily schedule. To date, surveillances have been started per the schedule in a consistent manner. The work requests have an on-time start schedule of approximately 70 percent. The planning area requires continued management attention to improve communications between the Operating Department and the other station departments to ensure that work is started per the schedule and is completed on time per approved procedures.

The Outage planning activity has been in use at Zion for a number of years. The recent track record has not been acceptable to Zion Station management. Additional attention is planned for this activity to support the next refueling outages scheduled for fall of 1991, and spring of 1992.

A 72 hour forced outage scheduling program exists, however, improvements are planned in this area. This activity will ensure that work packages are completed, scheduled, and held in readiness for any forced outage that extends for greater than 72 hours. This will enable work to begin immediately following a forced outage so that actual work in the field can start without delay. This effort has action plans developed and work is scheduled to begin following the current outage on Unit 2.

To summarize, the work planning effort has been recently revised with additional plans to improve and increase the scope of the planning effort. Continued management attention is needed to ensure proper direction and priority is established in all departments to produce desired results.

The Service Water system safety-related work requests will be prioritized based on safety significance, age of the work requests, and the system condition, and an implementation action plan will be developed.

Zion Station has prioritized the top 15 safety systems based on the PRA, operational impact, and maintainability. The Service Water System is one of the top 15 systems. To identify material condition discrepancies with the other top 14 systems, a walkdown of each of those systems will be performed by the end of the next refueling outage for each unit. An action plan will define the scope and schedule for those walkdowns. The recommendations will be prioritized and implemented.

Another issue discussed in this area during the DET was the involvement of the Zion System Engineers in periodic maintenance activities for their systems. Zion Station has had System Engineers for several years. However, the responsibilities and, more importantly, the expectations of a System Engineer were not well defined. As part of the Tech Staff improvement plans, the position descriptions for all Tech Staff positions were updated in early 1990 to include the expectations of each position. Additionally, corporate direction has been developed via a Nuclear Operations Directive (NOD) entitled "Station System Engineer Program".

This NOD is to be implemented on a phased in schedule. Requirements of the NOD will be implemented on Safety Related Systems by June 30, 1991. Other systems will be implemented by December 31, 1991.

2.2.12 **Root causes for equipment problems were not always identified.**

COMMONWEALTH EDISON RESPONSE

Two major initiatives have been undertaken to strengthen the Root Cause analysis at Zion Station. The first of those initiatives has been the implementation of the Problem Analysis Data Sheet (PADS) root cause procedure. The second major initiative undertaken has been the implementation of an integrated Root Cause Analysis Program at Zion Station.

Problem Analysis Data Sheet

The PADS procedure is a part of the Commonwealth Edison Conduct of Maintenance Program that is being implemented at all six nuclear facilities. The purpose of the program is to formally evaluate design and manufacturing deficiencies, procedure deficiencies and preventative maintenance deficiencies. To date in 1990, 96 PADS reports have been generated.

Integrated Root Cause Analysis Program

The Root Cause Analysis Program is divided into three distinct elements. The first element defines the integration of the following root cause procedures: Licensee Event Reports, Deviation Reports, Discrepancy Records, Radiation Occurrence Reports, Personnel Contamination Events, Potentially Significant Events, and PADS. This program also classifies events into four categories dependent upon severity or significance.

The second element of the integrated program is the Root Cause Analysis Procedure. This procedure contains the methodology to be followed when performing an event investigation. The purpose of the procedure is to assure consistency in the breadth and depth of root cause investigations.

The third element of the integrated program is the equipment quarantine procedure. This procedure simply established methodology to be followed for preservation of physical evidence as a result of a catastrophic failure.

Another important part of this program is root cause trending. Trending of these root causes has recently started. Causes of events are reviewed quarterly and compiled in trend reports. Adverse trends can then be reviewed with appropriate station managers to determine whether additional attention is required to solve the problem. The root cause program provides for elevating the level of investigation to more formal investigative techniques (Human Performance Enhancement System and Management Oversight Risk Tree) which are managed by higher levels of station management, depending on the severity of the event. While this program is new at Zion Station, some success can be seen as demonstrated by the reduced number of personnel errors.

2.2.13 **The team identified that the licensee did not test molded-case circuit breakers.**

COMMONWEALTH EDISON RESPONSE

Zion will develop a program to ensure that all new molded-case circuit breakers (MCCB) are properly tested. In addition, a periodic testing program for MCCB's will be developed based on industry guidance, manufacturers recommendations, and MCCB reliability. Action plans will be developed by Corporate Engineering to track development and implementation of these programs.

2.2.14 **The team observed several examples of personnel not understanding licensee programs or procedures**

COMMONWEALTH EDISON RESPONSE

The drawing control program is fully described in Item 2.3.3. In order to better inform our maintenance and technical support personnel on the Zion drawing control program, site specific training will be developed and implemented. All Maintenance and Technical Staff personnel will receive this training.

At the time of the DET inspections, only Electrical Maintenance Procedures contained specific guidance as to checking and recording torque switch settings. No explicit procedural controls were in

place which would document Technical Staff authorization. Item 2.2.3 fully addresses the setpoint control procedure that now exists.

A Human Performance Enhancement System (HPES) evaluation was performed for the procedure coordinator not understanding his responsibility to update procedures in work packages. The results of this investigation showed that the root cause included administrative control not being formally stated or defined. Corrective actions being taken are to provide training for personnel being assigned new responsibilities, formalizing procedure control, and communicating job expectations. These actions will be transmitted to all Zion management from the Station Manager informing them that it is their responsibility to implement these actions on an individual basis. A letter from the Station Manger will be transmitted by January 1, 1991.

In addition to the sampling field verification discussed in item 2.3.6, on July 26, 1990 Zion's Technical Staff along with an independent vendor performed a walkdown of the safety-related heat exchangers to determine current valve position. The positions observed were compared to the valve positions noted in the pre-operational test and the System Operating Instructions (SOIs).

Item 2.3.6 describes the methods that will be utilized to control heat exchanger flow rates and throttle valve positions.

2.2.15 **The licensee identified that administrative control of several hundred work requests had been lost.**

COMMONWEALTH EDISON RESPONSE

Zion Station has completed the installation of a work request tracking system (WRTS) to allow the location of a work package to be identified. In addition, the work request administrative procedure "Origination and Processing a Work Request", has undergone a major rewrite to bring it into conformance with the Corporate Directive for Conduct of Maintenance. This major rewrite delineates the responsibilities of each person who processes a work request.

The Total Job Management (TJM) database was reviewed and updated for the missing work requests. A thorough search was performed to identify which work requests could not be located. Technical Staff review and walkdowns were completed to identify which missing work requests described work that was still required. 616 work requests could not be found of which 173 required rewriting.

In addition to resolving the missing work package issue, Zion management has been actively monitoring and managing the Zion work request backlog. Due to this effort the backlog has continually decreased. The Zion Goal is 950 open non-outage corrective work requests; the backlog is currently less than 850. The Operating Department assigns a priority to each work request and the Maintenance Department assigns manpower to accomplish the work

requested as determined by the priority assigned. Computer generated reports are printed daily to review the aging of work requests in the backlog and point out problem areas. Work requests are prioritized based on safety significance and plant needs.

A new computer program is under development to prioritize the entire work request backlog, taking into account such factors as assigned priority based on safety significance, aging, job code, PRA report and material condition. This program is expected to be implemented by December 31, 1990.

2.2.16 **The need for improved maintenance and testing had been acknowledged and corrective action plans had been developed or recently initiated**

COMMONWEALTH EDISON RESPONSE

As stated in the DET Report, CECo had recognized the need for improved maintenance and testing and had developed corrective action plans for many of the DET issues. The DET agreed that effective implementation of these action plans should preclude recurrence of similar problems; however this success hinged on effective oversight and direction from the corporate organizations and clearly assigned site responsibilities.

Responses to item 2.3.12 and 2.5.1 describe improvements previously planned and implemented as well as future plans to address oversight and direction from Nuclear Engineering and Construction (ENC) with respect to these specific programs. Establishment of the Production Services Department in ENC provides the most direct interface/control from engineering. The Production Services area will provide functional direction to the Site Technical Staffs, coordinate development of PM programs in conjunction with implementation of the Conduct of Maintenance, and provide primary centralized work planning direction.

SECTION 2.3
ENGINEERING DESIGN AND TECHNICAL SUPPORT

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2.3 ENGINEERING DESIGN AND TECHNICAL SUPPORT

2.3.1 The SW system design basis was not well documented or understood

COMMONWEALTH EDISON RESPONSE

CECo acknowledges that SW design information was not well documented. For example, the FSAR did not contain a tabulation of the SW flow requirements for all accident scenarios of interest, nor did it contain a determination of the number of SW pumps that would be available following various postulated failure combinations. However, during the DET, such information was developed by CECo site and corporate engineering personnel and provided to the NRC. In doing so, CECo personnel utilized the FSAR and other references as appropriate. When incorrect information was encountered in the FSAR, CECo identified those errors to the NRC.

CECo acknowledges that there appeared to be a lack of detailed testing and calculations to confirm SW system capabilities. For example, although design values for flows to individual components and heat transfer characteristics of heat exchangers were retrieved and provided to the NRC, in general it has not been our past practice to verify those values by periodic testing on an ongoing basis. In addition, hydraulic calculations or pre-operational testing of pump capacity had not been performed for all possible multi-pump combinations for the accident scenarios of interest. The original plant design did not require calculations to establish the basis for MOV thrust values and to confirm adequacy of available voltage.

CECo considers such lack of detail to be indicative of the state of design practices in the late 1960's which were employed in the design of Zion Station. To the extent that such lack of detail hampers our ability to operate and maintain the plant in a manner consistent with today's expectations, CECo has taken steps to generate or reconstruct missing design information. For example, the industry programs in response to Generic Letters 89-10 and 89-13 will generate design basis information relating to MOV's and SW heat exchangers. CECo has also undertaken programs to improve the quality and retrievability of the design basis information that presently does exist. For example, we are developing System Design Documents which will compile useful design information into a single reference volume for selected systems. While this is a resource-intensive program which will extend several years, the effort will be prioritized to provide the most useful products to Zion Station in the short term.

The design basis improvement effort is planned in four interrelated steps scheduled so as to provide the most benefit to Zion Station in the shortest time frame.

CECo has established a program including budget allocations for compiling the design basis focusing on those areas that are routinely used by Station and ENC personnel in performing maintenance and design change activities. The first area of focus is the setpoint control program. This program is being implemented in two phases for all devices that require a setpoint. (i.e. instruments, fuses, MOVs, relays, overloads, etc.) The initial phase of the program is to develop a standardized CECo data base and input information to it from all six nuclear stations. Appropriate controls to maintain the accuracy of the data base will also be developed. The second phase is to verify or perform calculations to justify the setpoints found during the data base development that have questionable bases. The first phase of this program for Zion instruments will be completed during the fourth quarter of 1991.

Programs for the other devices have also been initiated. A fuse list has been developed and issued. Walkdowns have been started to validate the information in the fuse list against actual plant conditions. The Zion walkdowns are tied to refuel outages and will be completed by the fourth quarter of 1992. The MOV Program under Generic Leter 89-10, will consolidate and validate MOV information and also verify and supply MOV settings based on analysis and actual field testing. In addition, as a result of the DET, Engineering performed an assistance visit at Zion Station that focussed specifically on the control of setpoints. Recommendations from that review are currently under review.

The second step is to rebaseline the FSAR. This effort was planned in 1989 and initiated for Zion Station in July 1990. The scope of this effort is to reassemble the records generated since receipt of the facility operating license which may affect the content of the UFSAR. The UFSAR will then be completely rewritten. The revised UFSAR will be available on a computerized data base for easy word search capability. In the interim, a corporate directive has been drafted to provide better guidance to the nuclear stations on the FSAR update process to ensure that current activities are adequately represented in the UFSAR. This directive is scheduled to be issued January 1, 1991. The rebaseline effort for the Zion UFSAR is scheduled to be completed by March, 1992.

The third step involves the improvement of the present Zion Technical Specifications. Zion Station is the pilot CECo station for the Methodically Engineered Restructured and Improved (MERITS) Technical Specification program. The purpose of this effort is to improve the quality of the Technical Specifications through the use of human factors techniques and technical improvements made in cooperation with the NRC and all owners groups.

These technical improvements are aimed at producing a document that accurately reflects and preserves the assumptions made in the safety analysis. The project is expected to take approximately three years to complete. This timeframe includes NRC review and approval of revised Technical Specifications and Operator training requirements.

CECo has chosen to focus efforts on three areas (Setpoint Control, FSAR rebaseline, and MERITS) in the near term because these documents provide the most guidance in performing day-to-day activities. In this respect, CECo also recognizes that it is important that we address the limitations of these documents in the performance of design change activities. CECo has instructed personnel through procedural directions and training that references beyond these documents should be used to research design bases. In addition, various programs such as the modification process require verification of as-built configuration and input from Operating and Maintenance personnel prior to finalization of the modification design and installation.

The last step involves a longer term activity. CECo has initiated a program to develop integrated descriptions of system design bases. This program reflects the efforts of the NUMARC Design Basis Issues working group, in which CECo was an active participant. The CECo program consists of consolidating existing design basis information into concise system and topical packages, establishing a process to maintain these packages as controlled design documents and developing a computerized design data base. A task team has been established consisting of station and corporate personnel. This team coordinates this effort across the six stations. The schedule for the Zion effort in this program currently is to complete two systems in 1990, four in 1991, six in 1992, and a remaining 13 systems by 1996. The Individual Plant Examination (IPE) PRA work will be considered in prioritizing development of documents based on safety significance. One department in the Engineering organization has primary responsibility for system design documents, IPE, PRA, and configuration management, thereby providing an integrated approach to these efforts with the focus on completing first those efforts which have the most impact from a safety standpoint. Since significant information was developed during the diagnostic evaluation on the Service Water System, this information will be compiled in a reference volume for the Service Water System and is expected to be completed by May, 1991.

CECo believes that site and corporate engineering personnel have a generally good understanding of the design basis, as evidenced by their identification of the FSAR errors and their prompt response in obtaining design related information for the NRC during the DET. Several measures have been undertaken to further improve the capability of the site and corporate engineers and their understanding of the design basis.

For example, efforts are in progress to strengthen the site "system engineer" position and to develop a complementary corporate "system design engineer." Mission statements and expectations documents have been developed which emphasize responsibilities for maintaining knowledge of the system design basis, and resources ("system notebook"). Training is being developed to support them in their mission. In addition these engineers will be involved for their assigned systems in the FSAR Rebaseline, and other programs to improve the quality and utility of design-related information, further enhancing their knowledge and capability.

2.3.2 **The Zion FSAR contained incorrect information regarding SW system design**

COMMONWEALTH EDISON RESPONSE

CECo acknowledges that the Zion FSAR contains inaccuracies and inconsistencies regarding SW system design. For example, valves OMOV-SW0005 and OMOV-SW0006 provide single valve isolation of fire protection and traveling screen wash. This is clearly shown on the figure included in the FSAR, but is in apparent conflict with the text which implies that double valve isolation is provided for all nonessential SW loads. FSAR Section 9.6 is misleading, in that it fails to clearly distinguish between essential and non-essential SW loads in tabulating SW flow requirements. However, we do not agree with the DET Report's statement that confusion existed regarding the number of SW pumps required during shutdown or accident condition. Both the FSAR and the NRC SER of October 6, 1972, state that only two SW pumps are required for each unit for normal operation and that only one SW pump is required for each unit for emergency shutdown or accident conditions. We do acknowledge that the FSAR lacked sufficient detailed information to permit an independent reviewer to confirm the validity of those statements without consulting other references. Such lack of detail is not untypical for early 1970's vintage FSAR's.

During the DET, CECo prepared correct tabulations of the essential and nonessential SW loads for various accident scenarios of interest and provided them to the NRC. This information and other corrections to the FSAR SW descriptions will be submitted in a special update to the FSAR. This submittal is scheduled for March, 1991.

Primarily as a result of self-initiated SSFI's, in September 1989, CECo began planning an FSAR Rebaseline program for Zion, Dresden, and Quad Cities. The Rebaseline program will provide a comprehensive update and re-write of the entire FSAR, resolving inconsistencies and providing missing detail. A description of this voluntary program was provided to the NRC Region III on September 11, 1990. The Zion Rebaseline program is presently in progress, with an expected completion date of March, 1992.

2.3.3 **Numerous differences existed between the as-built condition of the SW system and the piping and instrumentation drawings**

COMMONWEALTH EDISON RESPONSE

CECo acknowledges the SW system piping and instrumentation diagrams (P&IDs) do not accurately reflect the as-built system, particularly small bore piping and instrumentation.

Generic Letter 89-13, Item IV requires the licensee to "ensure the as-built system will perform its intended function in accordance with the licensing basis for the plant. This confirmation should include recent system walkdown inspections". In response to this item of the Generic Letter, the safety-related portion of the Service Water system will be walked down and an as-built P&ID will be generated. All SW piping not walked down as part of the IE Bulletin (IEB) 79-14 program, and piping modified since IEB 79-14 walkdowns is included in this walkdown effort. All accessible piping will be walked down and a report containing the marked up system drawings will be issued by February 15, 1991. Non-accessible piping walkdowns will be performed during the next outage of sufficient length which allows access to these areas for each respective unit.

CECO acknowledges the drawing control system used previously at Zion was awkward. Design changes and plant modifications issued before early 1989 were drafted directly onto the original drawings prior to actual installation. Therefore, in a few instances, modifications which were not yet installed may have caused inaccuracies on a drawing. As modifications were installed, the inaccuracies should have been eliminated.

Zion Station revised the drawing control process in early 1989. Under the revised system, design changes which affect drawings are shown as bubble - encircled areas on a copy of the original drawing and are clearly labelled as Engineering Change Notices (ECN). By definition, an ECN is issued for construction. When installation is complete it is incorporated on the original drawing using a Drawing Change Request (DCR).

At the present time drawings at Zion are changed using DCRs. These DCRs are used as a mechanism to closeout ECNs to have the drawings updated to reflect changed or modified conditions in the plant. DCRs are also used directly to update drawings when new information is desired to be placed on drawings, or discrepancies between drawings and the actual plant are discovered and the actual plant can be left as is after review. After the drawings are updated by the Architect Engineer they are issued as aperture cards to the stations by Drawing Management Services.

Corporate Engineering is currently undertaking a Drawing Assessment Program that consists of the following three elements: 1) the development of a station unique drawing parameter matrix, 2) the determination of a critical control room drawing (CCRD) plan and criteria , and 3) an overall drawing update plan and criteria. The Drawing Assessment Plan was developed from work that was done at LaSalle and is being pursued on Zion and Quad Cities as lead plants.

A Specific Action plan for assessing and updating the Zion critical control room drawings (CCRD) will be developed by December 15, 1990. Updating is defined as the process of creating a concensus drawing that reflects the plant as it should exist based on a review of the modifications performed.

The plan will contain the following elements: development of a preliminary list of critical control room drawings to be updated and their priority for update by December 15, 1990; review of the company wide Critical Control Room Drawing (CCRD) plan and criteria being developed as part of the Drawing Assessment Program for impact; and initiation of drawing updates on the preliminary list of critical control room drawings by January 5, 1991.

This item in the DET Report also states that plant modifications were made using work requests, or performed without any documentation. Refer to the response to Item 2.3.8 for information on this concern.

2.3.4 **The Zion Station SW system was not analyzed for a two-pump accident scenario.**

COMMONWEALTH EDISON RESPONSE

CECo acknowledges that the specific scenario postulated by the members of the DET (the "cold shutdown scenario") had not been evaluated in the FSAR or other licensing basis documents. The Zion FSAR, the NRC's SER of October 6, 1972, and the NRC's SER for License Amendments 72/66 of December 31, 1981, state that only one service water pump is required for each unit for emergency shutdown or accident conditions. These statements in the licensing basis indicate that both CECo and the NRC had concluded that accident scenarios which resulted in two pumps available were within the design capability of the SW system.

CECo acknowledges that the "cold shutdown scenario" was credible at the time it was proposed by the DET. CECo did not state that the scenario should not be considered. However, in referencing the NRC's Inspection and Enforcement Manual Part 9900, CECo was trying to point out that the lack of explicit accident analyses for such cold shutdown accident scenarios is not untypical of established licensing practices.

In response to the NRC's concerns regarding the lack of evidence of the capability of two SW pumps to provide the required flow, a Standing Order was issued to require a minimum of four SW pumps to be operable. This action precludes the possibility of the occurrence of the "cold shutdown" or any other scenario which would result in only two pumps available. This Standing Order will remain in place until such time as we have been able to reconfirm, to the NRC's satisfaction, the conclusions of the FSAR and NRC SERs regarding the adequacy of two pumps.

2.3.5 There was a lack of objective evidence regarding SW pump capability to deliver design flow to safety-related loads during postulated two-pump or three-pump accident scenarios.

COMMONWEALTH EDISON RESPONSE

CECo acknowledges that there appeared to be a lack of detailed calculations and testing to demonstrate the capacity of various SW pump combinations in the accident scenarios of interest. For example, system head curves were not calculated as part of the original plant design for a shared-unit alignment, 2-pump accident scenario, nor did the pre-op test specifically measure system performance under those conditions.

However, the information provided by the existing design calculations and pre-op testing, as supplemented by recent testing, suggests that CECo and the NRC reached the proper conclusion during the initial plant licensing process in determining that two pumps would provide adequate capability. This information, which was provided to the DET, includes the following:

1) Original design calculations which confirmed that sufficient head would be developed at key points in the system with design flows being delivered to the essential heat exchangers.

2) Pre-op testing which measured individual pump capacities in excess of 23,000 gpm.

3) Pre-op testing performed on a single-unit basis which confirmed that a single pump could provide design flows to all essential heat exchangers.

4) Recent testing which confirmed that pump capacities remain within 10% of the pre-op pump curves.

As described in the response to Item 2.3.4, a Standing Order was issued to require a minimum of four SW pumps operable. This action precludes the possibility of occurrence of any accident scenario which could result in only two pumps available. In an effort to reconfirm the validity of the conclusions of the FSAR and NRC's SERs regarding the adequacy of two pumps, CECo will investigate the feasibility of performing calculations and/or testing of the specific scenarios of interest. The costs, benefits, and risks of these options will be weighed against the alternative of changing the plant's licensing basis (Technical Specifications and FSAR) to require an additional pump available. A decision as to which alternative to pursue will be made by February, 1991.

2.3.6 **Valves were not adjusted to balance flow in the service water system.**

COMMONWEALTH EDISON RESPONSE

CECo acknowledges that there appeared to be a lack of detailed calculations and testing to demonstrate that design flows could be delivered to all essential components under the accident scenarios of interest. CECo also acknowledges that throttle valve positions have not been maintained identical to pre-op valve positions.

However, the information provided by the existing design calculations and pre-op testing, as supplemented by recent investigations, suggests that design flows can be delivered to the essential components. This information, which was provided to the DET, includes the following:

1) Original design calculations which confirmed that sufficient head would be developed at key points in the system with design flows being delivered to the essential heat exchangers.

2) Pre-op testing performed on a single-unit basis which confirmed that a single pump could provide design flows to all essential heat exchangers.

3) An investigation of current valve positions which reviewed pre-op valve positions against current operating valve line-ups and field-verified a sample valve population. This review found that, for most valves, the current position matched the pre-operational test position.

4) A review of existing testing practices, which confirmed that major flow demand components (i.e., diesel generators and reactor containment fan coolers) are being periodically tested or verified to have sufficient flow to remove design heat loads.

As reported to the DET, our investigation did identify that there has been one significant valve position change from pre-op that could affect flow demand. The component cooling water (CCW) heat exchanger SW valves have been throttled (more fully closed than in pre-op) to maintain acceptably warm CCW temperatures during normal operation. This could result in a need for operator action to remove design heat loads for the CCW heat exchangers; i.e., adjust SW flow to maintain acceptable CCW temperatures during post-LOCA recirculation. This potential action is covered in annunciator response manuals.

CECo will perform an evaluation to determine the optimum valve position for the CCW heat exchanger SW valves, in order to satisfy the objectives of maintaining acceptable CCW temperatures and minimizing the operator actions that must be taken to establish post-LOCA recirculation. This evaluation will be completed by December 31, 1990. The other heat exchangers in the SW system will be addressed by our program for GL 89-13.

All SW heat exchangers will be confirmed to be capable of removing design basis heat loads by one of the following methods:

1) The heat exchanger will be cleaned and the capability to receive its design basis flow requirement under the post accident alignment will be verified.

2) The heat exchanger will be performance tested and demonstrated to be capable of removing its design basis heat load given the flow received under the post accident alignment.

The measurement of flows to the heat exchangers in post accident alignment is not easily achieved due to the system design and the unit shared operation of the system. Post accident flows will be identified by utilizing a system flow model. The schedule for completion of the system flow model is 7/31/91. Further flow model validation may be required during the upcoming refueling outages. The system flow model will then be used to establish a program for the control of flow/valve positions. A program to control valve positions will be completed by 9/31/91.

2.3.7 **Failure of safety and non safety-related SW components could reduce or eliminate the SW safety function.**

COMMONWEALTH EDISON RESPONSE

The following items will be discussed individually: (1) Postulated failures of 1SW-0510/2SW-0510 (2) vulnerability of RCFC'S to damage by water hammer; (3) postulated failures of 0MOV-SW0005/0006; (4) postulated failures of 0FCV SW-054. A discussion of our plans to perform additional reviews of the SW System and other systems for failure vulnerabilities is also provided.

(1) Postulated failures of 1SW-0510/2SW-0510

During the DET, the Unit 2 discharge tunnel was isolated for maintenance which configured the SW system such that all SW flow discharged through valve 1SW510 enroute to the Unit 1 discharge tunnel. CECo acknowledges that the single failure of this valve, while highly improbable, could eliminate SW flow. A System Operating Instruction (SOI) will be developed to address isolating a discharge tunnel.

For normal two unit operation, approximately 73% of the SW return flow exits through the Unit 1 discharge path. However, the SW discharge headers are normally crosstied through the SW510 valves and the discharge tunnels themselves are crosstied through the CW005 valves so that the single failure of a valve on either unit's discharge path will not eliminate the SW safety function.

(2) Vulnerability of RCFC's to damage by water hammer

The function of the RCFC's is to remove post-LOCA containment heat load. CECo acknowledges the possibility that in the event of a simultaneous two-unit loss of offsite power (LOOP), SW could partially drain out of the RCFC's in the short time (approximately 20 seconds) that the SW pumps were without power. During the DET, CECo performed calculations which demonstrated that voiding would not occur for the elevation difference between the top of the RCFC's and the "normal" level of Lake Michigan. However, our calculations indicated that for the design basis low lake level described in the FSAR, some voiding could occur.

CECo will review the LOOP and loss of SW-related procedures for possible enhancements to provide guidance and/or precautions that could be taken to prevent water hammer or mitigate its consequences.

This review will be completed by February 1991. CECo will also undertake a study to identify potential modifications which could prevent the occurrence of water hammer. This study will be completed by April, 1991. In addition, if some voiding were to occur, it does not necessarily follow that a water hammer would occur, or that sufficient pressure would be generated to challenge the integrity of the RCFC piping. However, CECo acknowledges that the methodologies for predicting the onset and magnitude of water hammer contain substantial uncertainties. Should some RCFC's be damaged at a time when their safety function is required, as a result of the occurrence of a LOCA coincident with the two-unit LOOP, each unit has five RCFC's, two of which are sufficient to remove the post-LOCA containment heat load.

(3) Postulated failures of 0MOV-SW0005/0006

SW-0005 and SW-0006 are parallel, safety-related motor operated valves that automatically isolate the traveling screen backwash piping. A single failure of either valve can only result in a diversion of SW flow from safety-related heat loads in combination with one of the following events: (1) Traveling screen backwash in operation, (2) pipe break downstream of the valves or, (3) fire requiring water suppression. Traveling screen backwash is an infrequent, short duration operation which must be initiated manually by a local operator. The probability of occurrence of an accident requiring the SW system to remove design basis heat loads (simultaneous LOCA with LOOP), coincident with traveling screen backwash operation, coupled with the failure of SW-0005 or SW-0006, is judged to be very low. We believe that this explains why the NRC concluded in their SER of October 6, 1972, that, with only single automatic valve isolation provided at this point, the system design meets the intent of the General Design Criteria. CECo will review existing procedures for possible enhancements to improve guidance for the failure of 0MOV-SW0005 or 0MOV-SW0006. This review will be completed by February, 1991.

CECo performed a break flow calculation at the DET's request for the hypothetical case of a double-ended break of the 14" piping downstream of 0MOV-SW0005 and 0MOV-SW0006. However, CECo believes that such a break is not credible for the following reasons. First, this portion of the piping was analyzed under IEB 79-14 and was

demonstrated to be fully seismically qualified. Second, it is our judgment that the remaining screen wash piping in the SW pump room downstream of the point at which the 79-14 analysis terminated would remain intact. We believe that an analysis would show that although acceptance criteria for seismic design would not be met, pipe stress levels would be less than faulted allowables, and hanger stresses would be within acceptable limits. This belief is based on the presence of lateral restraints on this portion of the piping.

Although we have concluded that pipe breaks downstream of these valves will not be caused by a design basis seismic event, one might postulate an arbitrary, non-mechanistic failure of the piping. As described in a calculation provided to the DET, use of the current regulatory guidance for postulating such breaks, Branch Technical Position MEB 3-1, would yield a break flow of only about 500 gpm for the piping in question. The effect of this break flow on the ability of the SW system to remove design heat loads would be insignificant.

Finally we note that the probability of occurrence of an accident requiring the SW system to remove design basis heat loads (simultaneous LOCA with LOOP), in combination with a design basis seismic event or postulated SW pipe break, is judged to be very low. For this reason, as described in the NRC's Inspection and Enforcement Manual Part 9900, such combinations of events are not postulated as part of established plant licensing practice.

(4) Postulated failure of OFCV-SW054

OFCV-SW054 is a safety-related air-operated, back pressure regulating valve in the common recirculation header for the six SW pumps. This valve receives an automatic closure signal in the event of an accident (LOOP or LOCA), and the valve fails closed on loss of air (loss of electrical power to the instrument air compressors, which are non-safety related, will result in loss of air).

Ceco will review existing procedures for possible enhancements to improve guidance for the failure of OFCV-SW054 to close. This review will be completed by February 1991.

CECo has undertaken programs to perform additional reviews of the SW and other systems for failure vulnerabilities. CECo will perform a single-failure review of the SW system as part of our GL 89-13 program. This review is scheduled for completion in September, 1991. In addition, the SW and all other plant systems will be examined for vulnerabilities as part of CECo's Individual Plant Evaluation (IPE) program in response to GL 88-20, which will produce a state-of-the-art, Level II PRA for Zion. Previous reviews of Zion have been performed which provide a degree of assurance that all safety-significant vulnerabilities have been previously identified. Two examples of such reviews are the Zion Probabilistic Safety Study (1981), one of the first Level III PRA's, and NSAC-148 (1990) which provided a comparative PRA review of the SW systems of Zion and other plants. The favorable results of those reviews notwithstanding, CECo remains committed to these additional efforts to identify opportunities for further plant risk reduction.

2.3.8 **Analyses for past modifications were weak or nonexistent.**

COMMONWEALTH EDISON RESPONSE

As stated in the DET report, most of the plant changes identified under this concern were made prior to the modification program upgrade in mid 1987. In addition, some of the changes were handled as temporary alterations or performed under work requests, bypassing the controls associated with the modification process existing at that time.

In 1986 and 1987, after the Dresden SSOMI, CECo completely revised the modification process by requiring more detailed technical review of the conceptual designs, verification of as-built configurations, and better documentation of references, assumptions, design parameters and safety evaluations. A decision was made at that time to implement the appropriate portion of the revised program for all modifications currently in progress as well as all future modifications. CECo considered backfitting the process to previously completed modifications but determined based on reviews and evaluations performed until that time, that there were no significant safety issues identified with previously installed modifications. Therefore, the backfit would only be providing additional detail to support the documentation currently existing. In late 1987 and early 1988, additional controls were added to the temporary alteration program. These changes consisted of adding mechanical alterations (hoses, flanges, spool pieces) to the scope of temporary alterations as well as evaluating the need for a 10 CFR 50.59 evaluation for all temporary alterations.

Current CECo practice consists of the following: work activity is identified on a work request and given to the shift (operations) for review. The Operating Engineer makes an initial determination if the work can be performed under the work request or requires Technical Staff involvement, i.e., is the work requested a modification or a temporary alteration. Procedural guidance is provided for making these determinations. Tasks clearly identified as modifications can bypass this method and either go directly to the station Technical Staff or be initiated by the Technical Staff.

The upgraded modification and temporary alteration programs have generally demonstrated acceptable results over the past few years. To enhance the 50.59 area, Zion Station revised the 10 CFR 50.59 procedure to reflect the draft NSAC-125 guidance. This revised procedure was implemented November 30, 1989. A corporate working group developed, in parallel, a Nuclear Operations Directive based on the NSAC document (CECo actively participated in the development of the NSAC document). The directive was issued in October 1990 and is scheduled for implementation in January, 1991. Zion Station will revise the Zion 10 CFR 50.59 procedure to meet the scheduled implementation date.

The 50.59 directive broadens the scope of screening for 50.59 changes to include as a minimum, screening for activities such as installation of lead shielding, water shielding, scaffolding, non-routine maintenance and equipment out-of-services which have not been previously evaluated or are covered by Technical Specifications. Implementation of this new directive should provide confidence that appropriate safety considerations are reviewed prior to making plant changes using any of the existing change mechanisms.

2.3.9 **Loss of offsite power conditions may not have been detected by the EDG load sequencers.**

COMMONWEALTH EDISON RESPONSE

CECo has evaluated a loss of offsite power (LOOP) condition occurring during unit startup or shutdown, with the diesel generator loaded to the bus. This condition would delay the proper functioning of the diesel generator, but would not defeat the automatic safeguards load sequencing. In the event of a LOOP, the diesel generator would assume on overload condition which would subsequently be cleared by the protective relays. After the overload is cleared, the diesel generator would reclose to the ESF bus and the safe shutdown timer would properly sequence the loads onto the bus. It is recognized that this is not the desired response to a loss of offsite power event.

CECo has evaluated the probability of a loss of offsite power concurrent with a unit startup or shutdown and concluded this is a relatively low probability event. For this reason and because the diesel generator would not respond properly, as stated above, Zion Station will discontinue the practice of utilizing the Emergency Diesel generator during startups and shutdowns to provide a backup power supply to the main turbine bearing oil pumps.

This action will resolve the DET concern.

2.3.10 **Service water piping was not adequately supported.**

COMMONWEALTH EDISON RESPONSE

The DET identified sections of Service Water piping that were inadequately supported. Commonwealth Edison completed an analysis of the affected sections of Service Water piping while the DET was on-site. The 3-inch SW pump seal water line downstream of SW strainer 1B (line number 1SW198-3-X1-N) was found to meet FSAR stress allowable values. The same line downstream of SW strainer 2B (line number 2SW198-3-X1-N) required an additional support to meet the FSAR piping stress allowable values. An operability assessment

was performed to demonstrate the system was operable in the degraded condition. A modification has been designed to install this additional support. It is expected to be installed by February 1, 1991.

Commonwealth Edison is completing a review of the piping required to be analyzed within the scope of IEB 79-14. The preliminary results of this review have not identified any additional lines that were not addressed in the original IEB 79-14 review. This review will be finalized by November 30, 1990.

The DET also identified an unauthorized support installed on the 3-inch line downstream of SW strainer 2B. This support (a threaded rod) was welded to the 3-inch pipe and to the 36-inch SW discharge pipe. It was verified that this support was not required by any existing piping analysis. The support was removed and NDE was performed on the piping at the attachment points of the support. The NDE verified acceptable wall thickness of the piping.

The DET found discrepancies on two axial supports for the main 48-inch SW header. One of the supports had 2 loose nuts on a connection between a strut and pipe clamp. These nuts were tightened the same day the problem was found. Both supports were also found in a condition such that seismic loads from the piping would not be properly transmitted to the structure. A work request was written to straighten and tighten the supports, thereby returning them to a configuration that was consistent with the original support design. This work will be completed by February 1, 1991.

The DET noted that these support deficiencies had not been identified by the Technical Staff during plant tours or walkdowns. CECo also recognizes that there exists the potential for support discrepancies to exist on other non safety-related systems or systems not included in the IEB 79-14 analyses. As part of the system engineer program, a system walkdown checklist will be developed for the system engineers to use during their routine plant tours. This checklist will include piping supports as an item to review.

2.3.11 **Weaknesses existed in identifying and correcting root causes of equipment problems.**

COMMONWEALTH EDISON RESPONSE

Several initiatives have been undertaken to strengthen the root cause program at Zion Station. The first of those efforts has been the implementation of a Problem Analysis Data Sheet (PADS) root cause procedure (Item 2.2.12.) This procedure is a part of Commonwealth Edison's Conduct of Maintenance Program that is being implemented at all six nuclear facilities. The purpose of this program is to formally evaluate design and manufacturing deficiencies, procedure deficiencies and PM deficiencies.

A PADS is initiated for equipment requiring more than 80 hours maintenance craft time to repair, for both safety and non-safety related equipment problems and for unsatisfactory post maintenance testing. When equipment failures reach a pre-determined failure rate, as identified in the equipment maintenance history files, a PADS is also initiated. PADS are forwarded to the System Engineer and Technical Staff Supervisor for engineering approval of maintenance proposed corrective actions.

The root cause program is fully described in item 2.2.12. These programs address the concerns identified by the Diagnostic Evaluation Team in areas of identifying root cause and adequate corrective actions. To address the issue of trained investigators, the station has incorporated two root cause methodologies. Human Performance Enhancement System (HPES) and Management Oversight Risk Tree (MORT). In 1990, seventeen evaluators have received HPES training. An additional six evaluators have been selected to receive HPES training by December 30, 1990, and four additional Technical Staff members will receive MORT training in December 1990.

Senior Station management meets each week day to review events that have occurred in the past twenty-four hours or over the weekend. On-Site Engineering and the Technical Staff Supervisor participate in those reviews. Lower level event investigations are documented on an Event Reporting form and maintained in the Regulatory Assurance files.

Long standing equipment or major system issues are directed to the Technical Staff Supervisor and addressed during Technical Issues meetings once per month for resolution.

2.3.12 **Steps were being taken to improve the effectiveness of corporate engineering.**

COMMONWEALTH EDISON RESPONSE

In response to the diagnostic evaluation, CECo Engineering compiled and analyzed the DET issues as well as past NRC inspection reports, INPO evaluations, and internal audits and assessments. The purpose of this review was to assure that initiatives underway or planned were comprehensive and addressed known significant concerns. It was determined during this review that almost all of the DET concerns had been addressed to some extent in previously planned improvement activities; however, the resources devoted to the planned improvements were, in certain instances, judged to be inadequate to demonstrate results in a timely fashion. In addition, specific action plans were needed to focus the larger corporate activity to the appropriate weak areas at Zion Station.

Corporate Engineering determined that an effective approach to address these concerns should include the following elements: First, an immediate additional resource (people and money) allocation for Zion specific, high priority tasks should be made.

Second, existing Zion Engineering activities and resources should be prioritized to address weak performance areas focusing on resolution of longstanding issues. Third, a more global overall corporate engineering effort to improve the direction and quality of engineering support of the Nuclear Stations should be established.

Zion Project Engineering Support Group

The immediate allocation of additional engineering resources to Zion Station has been made in the form of the Zion Project Engineering Support Group. The group consists of eight CECo engineers dedicated solely to the Zion improvement effort. Sufficient resources have been made available to this group to hire additional technical experts as necessary for specific tasks.

The group reports to the Zion Project Manager on site thereby linking the activities of this special project group with the ongoing activity at the station including prioritization of engineering work activities performed by offsite groups. To establish the focus for the Project Engineering Support Group, the listing of DET, past Inspection Report, INPO evaluations, internal audit and assessment weaknesses and station identified concerns were reviewed by key station and corporate personnel. The review identified short term high priority activities that could be accomplished by this special group. Other priority activities were assigned to the existing line organizations, either Corporate Engineering or site technical staff. Detailed action plans for the Zion Project Engineering Support Group tasks are currently being developed with an expected completion by December 1990. These action plans will be incorporated into the Zion Management Action Plan by the end of this year. The Zion Project Manager is responsible for focussing the necessary resources to complete the action plans as scheduled.

Although all of the specific action plans have not been completed at this time, several short term deliverables have been identified for the Zion Project Engineering Support Group. These deliverables include: Updating critical control room drawings, revising abnormal and emergency operating procedures as appropriate, investigating and resolving specific recurring equipment problems identified as part of the Technical issues meetings, reviewing current testing practices for DC breakers, Section XI testing and molded case circuit breakers, and reviewing lessons learned from EDSFI's performed at other utilities and the mock EDSFI scheduled at Quad Cities Station for applicability to Zion.

Short term deliverables have also been defined for the existing corporate engineering organization. These include: specific calculations to assess/confirm component capabilities, review and revision of select operating procedures and administrative controls, test and/or field verification of system/component performance and condition, development of a service water system design reference manual, and completion of specific plant modifications and repairs. The deliverables will be developed as engineering action plans and included in the Zion Management Action Plan by December 1990.

Longer Term Zion Engineering Action Plan

Step 2 in the process for strengthening Engineering's support of Zion Station was the review and reprioritization of work in progress by the existing corporate engineering group, including activity associated with longer term generic issues. Tasks not assigned to the special Zion Project Engineering Support Group were prioritized and assigned to the existing Engineering Support organization (onsite Technical Staff, onsite design engineering, offsite design engineering and support groups). Action plans for these tasks and a preliminary 2-5 year schedule are under development and are expected to be completed by December 1990. These Zion Engineering Action Plans will also be incorporated into the Zion Management Action Plan. Resources will be focussed on these action plans to ensure completion as scheduled and adequate resolution of concerns.

The deliverables from the longer term Engineering Action plans address four main areas: Generic Issue resolution, design record improvement, plant system improvement plans, and other regulatory related modifications/programs.

The first major area of long term activity addresses the CECo submitted responses to Generic Letter 89-13 on Service Water System Improvements and Generic Letter 89-10 on the Motor Operated Valve program. Definition, implementation, and follow-up on these program commitments is a high priority activity in the long term engineering action plan support for Zion Station. In support of Generic Letter 89-13, Corporate Engineering will develop a Service Water system computer flow model, a program for controlling Service Water system flows and/or valve positions, and review and enhancement of the Service Water system simulator model. Corporate Engineering will also have primary responsibility for monitoring and assessing the adequacy of implementation of specific GL 89-13 requirements at Zion as well as the other five CECo Nuclear Stations. Additional detail on the CECo activity under Generic Letter 89-13 is presented in the response to Item 2.2.8, 2.2.9, 2.3.3, and 2.3.6.

In support of Generic Letter 89-10 implementation, Corporate Engineering is developing thrust windows for the safety related MOVs included in the scope of the generic letter, and will evaluate diagnostic testing results and assist Zion Station in performing failure trending and evaluations. Corporate Engineering is also in the process of designing modifications to upgrade selected 2 rotor limit switches to provide 4 rotor capability. Finally, Corporate Engineering will have primary responsibility for monitoring and assessing the adequacy of implementation of the GL 89-10 program at Zion as well as the other five CECo Nuclear Stations. The first assessment of the Zion MOV Setpoint Control Program is scheduled to be completed by the end of January 1991.

Specific details on CECo's program for Generic Letter 89-10 were included in our response dated September 28, 1990. Additional details on MOV activity are included in Sections 2.2.1 through 2.2.7 of this response to the DET report.

The second major area of long term activity is Design Record Improvement. Four key programs are in place, with resources allocated and schedules developed to improve the design related information available to plant and engineering personnel. These programs include the setpoint control program, FSAR rebaseline effort, Technical Specification (MERITS) upgrade, and development of system design documents. This effort is described in detail in Section 2.3.1 of this response. The activity specific to Zion Station for each of these programs is being developed into engineering action plans and will be included in the Zion Management Action Plan by the end of 1990.

The third major area of long term activity is the development of a Plant System Improvement Plan. This activity is currently in an early development stage but will include three steps: issue identification, work prioritization, and project planning including a five year equipment/system improvement schedule. Issue identification will result from review of the output from on-going technical issues meetings, commitment and maintenance work request backlog, system walkdowns, Problem Analysis Data Sheets (PADS), NPRDS Component Failure Analysis Reports (CFAR) data on recurring equipment problems and other generic issues. Work prioritization includes targeted systems using Probablistic Risk Assessment methodology, CFAR performance information, operator identified information and performance needs and plans and engineering management analysis. Project Planning will include five year equipment/system improvement schedules and outage planning charters for up to 3 outages. Several fixed activities will be automatically included such as the MOV and SW Generic Letter commitments, diesel generator modifications and select EDSFI enhancements. It is expected that the preliminary 5 year plan for Zion Station will be issued in early 1991.

Overall Corporate Engineering Improvement

In order to strengthen our engineering support of Zion Station, we have integrated our ongoing and planned activities that relate to promoting quality improvement, providing proactive involvement in station activities, becoming more self reliant through engineering development and improving oversight of activities still planned to be performed by outside organizations. Many of these activities are either in progress or have been completed. However, some actions will require several years to fully demonstrate results. Each of these elements are discussed in summary fashion in the following sections.

Promoting Quality Improvement

CECo initiated the Incumbent Supervisors Training (InSTP) program for the Nuclear Stations in 1989 and extended it to the Engineering and Construction organization in 1990. There are many elements of the InSTP Program which emphasize the role of the nuclear professional, the need to maintain an awareness of safety in work that is performed, and the responsibility of each individual to resolve known deficiencies which could impact plant personnel or public safety.

As a recommendation from the first InSTP sessions for ENC personnel, a value-added analysis was initiated in March, 1990 to determine Engineering opportunities for improved service, and to identify barriers to achieving success. The analysis included interviews with station and corporate personnel which resulted in over 300 comments. From those comments, areas of strength and weakness were identified and the results were presented in a full Nuclear Engineering Department meeting. The results recognized the following opportunities for improved service: improved relationships with the stations, proactiveness and ownership by engineering and support groups, professionalism, prioritization of issues with the stations, and engineering training enhancements. Identified barriers to success included the quality of administrative support, slow purchasing processes, and unclear prioritization of demands from organizations outside the department. Each of these opportunities and barriers are being reviewed by the value-added task force. Recommendations and schedules for implementing changes are under evaluation and will be included in departmental and personal engineering goals for 1991.

In response to specific DET concerns about personnel working around problems and exhibiting a non questioning attitude, several specific short-term actions were taken. On October 10, 1990, and October 25, 1990, the Assistant Vice President of ENC met with ENC personnel to discuss the key points of the DET Report and the responsibility and accountability of ENC personnel, and to convey the expectation that engineering personnel provide support and direction to the station organizations in a manner which is responsive, technically sound, and respectful of the safety aspects of the issue. These meetings were open discussion sessions which allowed the individual engineers to convey their opinions and needs with respect to training and tools, and to identify barriers to their success. The meetings also provided clear expectations from the executive level for the quality of engineering's work effort.

Commonwealth Edison has also made a detailed assessment of its policies and practices, comparing them to the INPO Principles for Enhancing Professionalism of Nuclear Personnel, dated March 1, 1989. Although many of our current practices fully meet the expectations of the Principles, recommendations were made for short-and long-term enhancements to our practices. The short-term recommendations will be completed by early 1991. The long-term recommendations will be converted into key and specific objectives under the 1991-1995 Plan for Excellence Goals, and will become a part of our accountability goals.

Some of the short-term recommendations are to: communicate the principles to all nuclear personnel, emphasize first-line supervisors training, identify potential performance improvement initiatives, and implement a Code of Ethics for all station departments and Nuclear Operations support groups

Some of the long-term recommendations include development of follow-up sessions for the Incumbent Supervisor Training Program (InSTP) and organization of the safety policies into a management system for the implementation of Nuclear Operations Directives.

The Professionalism Program will improve engineering performance by: providing all engineers with an overview of corporate policies and practices concerning professionalism; affording all engineers an opportunity to give "undiluted feedback" to upper management; involving engineers in the decision-making process through participation on task forces; and providing an opportunity for engineers to participate in training programs designed to enhance their communication and management skills.

Providing Proactive Involvement

As discussed during the diagnostic evaluation, an on-site engineering organization had been established to provide a significant improvement in the ability of Corporate Engineering to support Zion Station and be proactive in problem resolution. This Site Engineering Group reports to the PWR Systems Design Superintendent in the Downers Grove office, to ensure that uniform engineering practices are implemented. The on-site group takes its day-to-day functional direction from the on-site Project Manager further ensuring that its priorities are integrated with those of Zion Station. The onsite group is empowered with the same authority as the corporate engineering groups and is responsible for: technical direction of A/E's on site, review of temporary alterations, development of safety evaluations, review of non-conformance and discrepancy reports, repair details, minor design changes, etc.

As of October 1, 1990, a supervisor and three engineers were in place on site; two additional professionals have been hired and will start within the next three months. One additional permanent staff member is authorized and interviews are in progress.

In September, 1990, an organizational change was made within ENC to allow the Design Engineering groups to better focus on design support activities by moving activities that relate more to day-to-day support of the stations to a Production Services Department within ENC. These activities include support for maintenance, work planning, inservice inspection, and equipment performance monitoring.

A functional support group for the site Technical Staffs was also established at that time within the Production Services Department. The corporate Technical Support Group sponsored a directive on System Engineers which was issued in September 1990 and is strengthening the System Engineer training program. (A pilot system engineer training was given in October 1990, and the schedule calls for completion of incumbent training by the end of this year.) A draft directive on the Conduct of Technical Staff Activity has been issued and current activities include development of a plan to eliminate or reassign tasks that distract the Technical Staff from its primary responsibilities. These corporate initiatives have been adopted and are now being implemented at Zion Station. Corporate attention will be provided to support full implementation of these initiatives at Zion in 1991.

Another action taken to improve the level and quality of engineering involvement in station activities is the establishment of system design engineers in the corporate office. Mission statements and expectations documents were developed in June 1990 which emphasize responsibilities for maintaining knowledge of the system design basis. These responsibilities include participation in special testing and design reviews, assistance in evaluating non-conformances and discrepant system performance and maintaining knowledge of industry events and initiatives. Training is being developed to support them in their mission. In addition, these engineers will be involved for their assigned systems in the FSAR Rebaseline and other programs to improve the quality and utility of design-related information further enhancing their knowledge and capability. System design engineers have been identified for select systems in the PWR design group. This program is currently being expanded to the other PWR Engineers and the BWR design groups.

An additional enhancement to the ENC organization was in the development stages at the time of the diagnostic evaluation. A Regulatory Assurance Group has been formed with responsibility for commitment tracking, coordination of responses to NRC generic communications, NRC inspection reports, INPO evaluations, and CECo self-assessments which impact Engineering or require engineering expertise. The ENC Regulatory Assurance group also provides guidance to engineering and construction personnel on regulatory-related issues. The formation of the group allows for an independent quality check of Engineering responses and removes some of the administrative burden from the engineering personnel, allowing them to focus more directly on technical activities. The ENC Regulatory Assurance Group communicates daily with the station Regulatory Assurance Departments, providing another interface between the Station and Corporate groups for upfront involvement in key issues. Finally, this group by virtue of its daily activities, heightens the level of awareness of the ENC organization with respect to regulatory impact and safety significance.

Engineering Development

A Director of Engineering Development was named in 1989 and charged with identifying opportunities for enhancing in-house cost-effective engineering capabilities and for providing plans for developing and implementing these capabilities as well as establishing and implementing technical training and personnel development initiatives to support in-house engineering activities. A critical step in this process was the development of an engineering development decision process methodology that:

1. Assesses strengths and weaknesses of the existing Engineering Services Organization.

2. Defines Engineering Service options (models) for CECo Nuclear Operations.

3. Develops and analyzes transition plans to implement those models.

4. Provides recommendation for selection of the best alternative(s).

This process is in progress and recommendations for alternatives will be considered and a long term engineering development plan established in the third quarter of 1991.

CECo has also initiated an aggressive hiring program focussing on acquiring experienced nuclear industry personnel. The 1990 staffing additions for the Corporate Engineering department total 31, of which 30 are experienced personnel. The 1990 new hires have an average industrial experience level of 12.4 years and average nuclear experience of 7.1 years, including A/E and nuclear plant experience. Since January, 1989, the total Engineering and Construction department staff has increased by 22%.

To support the improvement of in-house design capability and to address the needs of our new personnel, a significant amount of technical training has been completed. In the area of piping and structural analysis, over 1000 manhours of technical training have been given thus far in 1990. This included a 66 hour finite element training program presented by a consultant and professors from the Illinois Institute of Technology that covered both theory and program application. CECo has obtained the piping analysis code used in the design of our nuclear plants, PYPSIS, and has trained people in it's use. We are developing a "GAP PIPE" analysis technology which will provide more realistic piping analysis and allow reductions in the number of supports used.

Although the current training matrix used for corporate engineering primarily addresses engineering procedures, quality assurance, and management skills, a technical training needs analysis is in progress to identify specific training needs to enhance technical skills and performance. The enhanced training analysis is expected to be completed by February 1, 1991 and will result in additional technical training being provided to our engineers in 1991.

Lastly, CECo has already performed substantially more design/analysis activity in house in the past few years. This activity includes: Erosion/Corrosion wall thinning calculations for steam generator blowdown piping and turbine extraction steam piping; initial assessments of feedwater transient water hammer concerns at Dresden 3 and other selected piping and support analysis; and electrical and I&C activities such as determination of relay settings, technical reviews and troubleshooting for auxiliary power systems, batteries, DC grounds, and specification development for battery procurement and surveillances.

Improving Oversight of A/E's

The CECo effort to provide effective oversight of our A/E's and consultants consists of developing controls over design activity, providing evaluations and assessments of contractor performance, and developing a longer term A/E Services Strategy.

Controls over design activity performed by outside consultants were generally formalized in 1983 with the establishment of our A/E Guidebook. This Guidebook contains guidelines to be followed in performing services to ensure that a consistent product is delivered. It is updated and revised periodically based on experience and changing needs. In 1987 it received recognition by INPO as Good Practice. Additional controls were established during the modification process upgrade which occurred in 1987.

Several years ago we also established blanket purchase orders to allow CECo engineers to reduce contract administration duties and devote more time to technical activities including oversight of A/E work.

Initiatives are already in place that allow us to evaluate the performance of outside firms and provide feedback for future improvement. Written performance evaluations of selected A/E activities are prepared and reviewed with the A/E's. In addition, an Engineering Assurance Program was implemented in February 1990, in response to an internal desire to monitor and improve the quality of engineering performed by CECo, and for CECo by its contractors. This program utilizes a peer review self-assessment mechanism that is performance based rather than compliance based. Through October 1990, the program was utilized to complete assessments of selected design input requirements, design calculations, safety evaluations, and Field Change Requests. Current assessments include start-to-finish review of selected modifications, and effectiveness of field walkdowns supporting modification design. By the end of 1991 it will have been expanded to include technical and procedural training, technical inputs to procurement, adequacy of post-mod testing requirements, and implementation of the A/E Guidebook.

The expected benefits from the Engineering Assurance Program are: Strengthened CECo Engineering Department responsibility and accountability, reduced variability in quality, improved mean level of quality to well in excess of minimum requirements, and identification of opportunities for program enhancement and technical training. The assessment process includes both retrospective and in-process reviews as well as horizontal and vertical evaluations.

Finally, CECo has been actively pursuing an A/E services strategy to limit the number of engineering service organizations to a few dedicated firms. The strategy includes the transfer of technology and select design data bases to CECo and the development of improved OEM relationships with the Westinghouse and General Electric Companies. The expected benefits from this strategy are less interfacing requirements, less reliance on outside firms for design information, enhanced CECo engineering design experience, reduction in administrative requirements and improved timeliness of engineering support to station needs. CECo has attempted to focus the largest percentage of work with the original A/E designer. (For Zion Station, over 70% of the A/E support activity in the last 5 years has been provided by the original A/E designer.) Negotiations with the A/E's and OEMs performing design and design support work for us are in progress to define contract terms and expectations. A detailed implementation plan is scheduled to be completed by December, 1990.

SECTION 2.4
QUALITY PROGRAMS

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2.4.3	Performance Improvement Plan /Management Action Plan	60

2.4 QUALITY PROGRAMS

2.4.1 Licensee self-assessment capabilities had improved within the past two years and had identified performance problems.

COMMONWEALTH EDISON RESPONSE

The Management Action Plan (MAP) will be upgraded to strengthen implementation and follow-up. Additional detail is provided in item 2.4.3.

The Quality Programs & Assessments (QP&A) organization was created with the mission to promote the achievement of excellence in the operation and maintenance of our nuclear units through an integrated program of quality verification. The primary functions pursued by QP&A in the fulfillment of this mission were:

- The acquisition and organization of performance information
- The analysis of performance data in the context of company objectives, industry standards, and regulatory requirements, with prioritized conclusions and recommendations communicated to company management

As recognized by the DET, QP&A has implemented effective programs to accomplish these functions. The Company acknowledges that improved follow-up of corrective actions is needed to fully realize the benefits of our self-assessment efforts. To address this follow-up function, the Company has completed the following actions:

- Implementation of corrective action status reports by the QP&A evaluation organizations.
- A revised Nuclear Operations Directive NOD "Nuclear Tracking System (NTS)" was issued on August 20, 1990. This revision expanded the scope of commitment types that must be tracked in NTS to include internal audits and assessments.

To further improve our capabilities to provide corrective action status and effectiveness follow-up, the Company will identify and implement improvement to:

- Corrective action status reporting
- Utilization of the NTS database to define corrective actions needing self-assessment follow-up.

- The Quality Programs & Assessments Coordinating Committee (QPACC) is chaired by the Manager of Quality Programs. It provides schedule integration, as well as identification of self-assessment target areas. Areas selected for audit and assessment currently represent program elements requiring routine evaluation, or elements demonstrating adverse performance trends. The QPACC will review and enhance its processes for the identification and planning of corrective action follow-up.

These enhancements will be completed by April 30, 1991.

2.4.2 CORRECTIVE ACTIONS WERE NOT TIMELY AND/OR EFFECTIVE

2.4.2a **Many of the Dresden diagnostic evaluation deficiencies were found to exist at Zion.**

COMMONWEALTH EDISON RESPONSE

Commonwealth Edison believes that dissemination and implementation of "lessons learned" information is vital to successful and proactive operation of a multi-facility nuclear utility. To this end we have developed the following plans to improve our application of "lessons learned" information:

To effectively transfer the lessons learned from the Zion DET, Quality Program & Assessments (QP&A) is coordinating an evaluation of the deficiencies identified at the Zion Station, to determine applicability at our other nuclear facilities.

The DET report has been carefully reviewed and issues have been categorized. A committee composed of self-assessment organizations was assembled to evaluate the potential applicability of each of the issue categories to each of our nuclear stations. A matrix identifying the degree of potential applicability was developed, and provided to key corporate and station managers. As an aid in root cause identification and detailed issue applicability, members of the Zion Evaluation Support Team (ZEST) reviewed each issue and developed an inventory of questions. Using the ZEST developed questions, each station will review their programs to identify applicability, prioritize the issue, and input their corrective action plans into the Nuclear Tracking System. QP&A will coordinate self-assessment efforts to assure that the applicability evaluations and planned corrective actions adequately address root causes.

To effectively transfer future lessons learned, QP&A will develop a Lessons Learned functional area. This area will routinely assess issue applicability by reviewing NRC inspection reports, summaries of NRC enforcement/management meetings, plant event reports and INPO evaluations. In addition, periodic special issues meetings will be convened to assess applicability of significant issues (such as the Zion DET report). The Quality Programs and Assessment Coordinating Committee will direct audits and assessments as required to evaluate the effectiveness of the stations' evaluation of significant issues. The Quarterly Plant Monitor Report will identify station utilization of lessons learned information.

2.4.2.b The licensee has not implemented timely or effective corrective actions to resolve previously identified deficiencies by the licensee's safety system functional inspection (SSFI) program.

COMMONWEALTH EDISON RESPONSE

The Company agrees that closure of SSFI identified deficiencies based upon the issuance of corporate directives, without appropriate follow up review of Station implementation was a poor practice. Quality Programs completed an initial review of Zion SSFI issues during the DET visit and did not identify additional cases of inappropriate closures. A more detailed review will be completed by November 30, 1990.

To improve the timeliness of corrective action follow-up, and to provide attention to the effectiveness of corrective actions, QP will implement a three-level finding prioritization system. This prioritization described in the pending QA manual revision includes the following:

Level I A condition which does affect the safety and/or reliability of the unit(s) or a significant breakdown in the QA program

Level II A condition which may affect the safety and/or reliability of the units(s) or a major noncompliance to the accepted QA program.

Level III A condition that probably does not affect the safety and/or reliability of the unit(s) but is a substantive deviation from implementing procedures.

All findings identified after implementation of the QA Manual revision will be prioritized utilizing these criteria.

To aid in verifying that findings such as those discovered during the CECO SSFI are adequately closed, Zion has developed an effectiveness review procedure. Effectiveness reviews are performed on a periodic basis, a one-time basis, or as-needed. Corrective actions deemed "not effective" are re-opened.

2.4.2.c **The licensee had not implemented timely or effective corrective actions to resolve programmatic deficiencies identified by independent contractor assessments.**

COMMONWEALTH EDISON RESPONSE

Item 2.2.6 discussed the ASME Section XI requirement concerns raised by the DET. The timeliness of the utilization of the independent contractor's assessment is discussed in detail in item 2.2.6.

The reason the contractor MOV recommendations were not implemented in a timely manner was due to the limited MOV program resources at Zion Station. Item 2.2.1 describes the actions that have been taken to dedicate the necessary resources to the MOV program and implement MOV torque switch setting control.

2.4.2.d **The licensee had not implemented timely corrective actions for concerns raised in industry evaluations regarding reliability of safety-related check valves.**

COMMONWEALTH EDISON RESPONSE

CECo has tried to address check valve programs with a uniform and consistent technical approach for all of its six stations. CECo believes that a consistent and uniform approach is cost effective in the long run, maximizing our corporate resources and in most cases, the individual station's resources, but has a drawback that it requires more time to implement.

In retrospect, a significant amount of time was spent to reach consensus with the stations and with industry guidance on the elements and scope of the check valve program. The program was reviewed for its impact on limited resources, both manpower and financial, on outage directions and finally the program's costs and objectives balanced against other competing regulatory issues.

Implementation at the stations is often influenced by outage schedules; resources may not be available during current outages to test/inspect components and otherwise provide input in the early stages of any program. Final implementation is often governed by when the next available outage occurs. In Zion's case no work was possible in 1989 until the Fall outage for Unit 1.

Finally, there is a reluctance by both Corporate Engineering and the Stations to either issue or act on interim or draft guidance because the possibility exists that the final program would be changed resulting in some "wasted" effort.

Corporate Engineering is reviewing the best means of improving performance on the timely issuance of policy and guidance for the programs developed to address generic issues

With respect to the concern that corporate management delayed implementation of MOV diagnostic testing due to a requirement to coordinate this testing at all six stations, CECo admits that some delay occurred in performing widespread testing but it was not based on the need to coordinate among the six stations. Instead it was from the fact that several stations, including Zion, raised concerns to corporate management that the existing technology (MOVATS) was labor intensive and required instrusion into the valve to perform testing thus raising several safety concerns and increasing radiation exposure. Engineering identified and validated other technologies that resolved these concerns which resulted in the delay. CECo believes that the benefit of implementing the new VOTES technology clearly outweighs the decision to delay diagnostic testing.

2.4.3 **Action plans included in the PIP addressed most problems identified by the team and were producing slow improvement, however, improvements were limited due to insufficient resources available to fully address the large number of identified problems and due to some corrective actions that had not been timely and/or effective.**

COMMONWEALTH EDISON RESPONSE

Action plans that are developed for the DET responses and discussed throughout this report will be managed and tracked in the Zion Management Action Plan (MAP). The MAP represents a significant upgrade to its precursor, the Performance Improvement Process (PIP). The MAP will feature the following enhancements:

- An administrative procedure will be developed and implemented to formalize the program.
- Controls will be formalized for adding, changing, or deleting plan steps.
- MAP users will be given guidance on including resource estimates in plans.

The administrative procedure will describe the MAP as a comprehensive management system to develop, implement, and monitor action plans that improve performance at Zion Station. The procedure will also describe the appropriate types of plans, define responsibilities, describe the actions necessary to develop a new action plan which includes stipulating budget and manpower requirements if there is a measureable change in either manpower or money spent in order to complete the step, describe the actions needed to revise or delete a plan, and describe the methods used to monitor the program. Two actions plans were created to ensure that the administrative procedure is created and implemented.

The assessment of 1991 Zion top priority action plans is underway with completion scheduled for December 1, 1990. The MAP Administrative Procedure will require a semiannual reassessment of priorities for continuing station improvement. The resulting priority action plans will be included in a list of priority topics. These priority topics will then be used to allocate resources, focus attention, and prepare budget requests.

SECTION 2.5
MANAGEMENT AND ORGANIZATION

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2.5 MANAGEMENT AND ORGANIZATION

2.5.1 Corporate support had not been sufficient for timely resolution of problems.

COMMONWEALTH EDISON RESPONSE

Commonwealth Edison is taking actions to improve corporate ownership of the Management Action Plan and to enhance our self-assessment capabilities for management and organization concerns. Nuclear Operations has formed a Zion Corporate Oversight Committee to review Zion's progress and effectiveness. The Zion Corporate Oversight Committee is chaired by the Vice President of PWR Operations, with the standing members being the Senior Vice President-Nuclear Operations, Vice-President of BWR Operations, the Assistant Vice-President of Nuclear Engineering and Construction, the General Manager of Nuclear Services and the General Manager of Quality Programs and Assessments. The committee is meeting bimonthly to provide perspective on the adequacy of Zion performance improvement actions, review and focus the priorities for actions being taken by offsite organizations in support of Zion and to review and focus the resources applied for Zion performance improvement.

The Performance Assessment Department will add the evaluation of management and organization issues to their ongoing assessments of functional areas. Draft assessment instructions have been prepared, using INPO Organization and Administration guidelines as the primary input. The assessment instructions will be refined and finalized, with application expected to commence by June 30, 1991.

Finally, a detailed discussion on engineering support improvements is contained in the response to Item 2.3.12.

2.5.2 Responsibility had not been clearly assigned at the station.

COMMONWEALTH EDISON RESPONSE

Station management has two major vehicles that allow oversight of the activities being performed at Zion Station. The first oversight tool used is the Management Action Plan (MAP). The second oversight tool is the Nuclear Tracking System (NTS). Station management uses the "windows" report as a primary means for monitoring plant performance. This report is issued quarterly by the Quality Programs and Assessment Group.

The MAP is a management tool that allows improvement action plans to be created to address problem areas and to assign responsible individuals with due dates for the completion of the action plan steps.

In January 1990, Zion management selected the top 14 problem areas for the station to address. The Station Manager discusses the status of the action plans that were created to address those priorities with the responsible department heads on a monthly basis. The measurable results (for instance the number of personnel errors) are trended monthly to show whether the completion of the action plans are resolving the problems that they were created to address. If the actions that have been taken do not show improved trends, then additional directed action plans are created that will address the problem area.

To date, a number of priority plans have shown direct results with improving trends. In other cases additional action plans have been created to address trends that have not improved at the rate that is expected.

NTS is a computer based system that tracks commitments made by the station to other organizations both within the company and to those outside the company. Commitments are assigned to a responsible individual with a completion date that satisfies the needs of the originator and is attainable by the responsible individual. Selected commitments that are coming due that are not progressing at the desired rate and all past due commitments are identified and printed in the morning meeting notes. The name of the responsible individual is identified next to the commitment. Station management reviews the morning meeting notes each regular working day and the notes are distributed to each department head and to many other station supervisors.

in addition to the above mentioned management tools, numerous communication meetings are held to keep management aware of daily activities and to allow direction to be given to those performing the work.

The management monitoring mechanisms used include the performance assessments that evaluate station performance and identify both strengths and weaknesses. The weaknesses must be addressed by the station and follow-up assessments are used to ensure that actions resolve the identified weaknesses. The "windows" quarterly report, which is presented to station management, shows a big picture of station performance relative to CECo and industry standards.

2.5.3 **Management control and support of operator activities was weak.**

COMMONWEALTH EDISON RESPONSE

To address the weak management control and support for operator activities, item 2.1.1 describes in detail the actions that have been taken. To address the ineffective management control of overtime, item 2.1.6 describes the actions that have been taken and are planned.

To address a lack of management support for supervision, item 2.1.3 describes the cultural assessment and organizational development activities that are in progress. To address the incentives for advancement of NSO's, item 2.1.2 describes the actions that have been taken.

2.5.4 **Recommended improvements from outsiders (including other CECo plants) have not been accepted or implemented.**

COMMONWEALTH EDISON RESPONSE

Item 2.4.1 addresses the lack of outside information communicated to the Zion staff due to weak operating experience feedback and self-assessment programs. Item 2.4.2.a addresses the ineffective lessons learned program. Item 2.5.5 addresses the lack of a questioning attitude. Finally, items 2.1.7 and 2.4.2 address untimely corrective actions for long standing problems.

2.5.5 **Plant and corporate staffs were not proactive in problem resolution.**

COMMONWEALTH EDISON RESPONSE

The standards at Zion Station have been based on past experiences of Zion management that were in most cases limited to the internal culture which has developed over the years. This has led, in certain areas, to the station operating to standards that were below both the rest of the industry and the other Commonwealth Edison nuclear stations. Furthermore, problems that were resolved at other stations were slow to be resolved at Zion Station.

To address these root causes, the Station Manager at Zion Station was selected in 1989, partially because he had experience from another Commonwealth Edison facility. Additional personnel changes have been made recently to spread knowledge between stations and raise expectations at Zion Station.

Commonwealth Edison has retained the services of two organizational development consultants to assess and strengthen the teamwork at Zion.

Management Analysis Company (MAC) will perform an independent cultural assessment through interviews and questionnaires. MAC will then analyze the data comparing it to other companies, and assess the teamwork, leadership, and motivation at Zion. Next a needs analysis will be performed that will provide recommendations to address the root causes of the cultural issues. Finally, training will be developed and implemented to meet the specific needs through the Incumbent Supervisors Training Program (INSTP). The services of Advanced Resources Development Corporation (ARD), are being used to develop management skills and capabilities

throughout the station. ARD's efforts will include a management work analysis and review to allow the management team to focus on station improvement.

An area identified by the DET, which CECo had not specifically included in previous improvement initiatives, is the issue of personnel attitudes with respect to working around problems and exhibiting a questioning attitude. CECo initiated the Incumbent Supervisors Training Program in 1989 for the Nuclear Stations, however this program has only recently been provided to ENC personnel (1990). There are many elements of the INSTP Program which emphasize the role of the nuclear professional, the need to maintain an awareness of safety in work that is performed, and the responsibility of each individual to resolve known deficiencies which could impact plant personnel, or public safety.

In response to DET concerns with engineering personnel, several specific short term actions have been taken. On October 10, 1990 and October 25, 1990, the Assistant Vice President of ENC met with ENC personnel to discuss key points of the DET report, to discuss the responsibility and accountability of ENC personnel, and to convey the expectation that engineering personnel provide direction and support to the station organizations in a manner which is responsive, technically sound, and always respectful of the safety aspects of the issue. These meetings were open discussion sessions which allowed the individual engineers to convey their opinions and needs with respect to training and tools and to identify barriers to their success. It also provided clear expectations from the executive level for the quality of engineering's work effort.

The Quality Programs and Assessment departments have assisted the senior management both at the stations and at the corporate departments with self-assessment efforts. Self-assessments are performed utilizing senior employees that go to the stations or corporate departments to review a particular area where they have expertise. The good practices at one station are transferred to each of the other stations through these performance assessments. Practices at a station that do not meet expectations of the company are addressed through prioritized findings. Stations are required to respond to the findings within a period of time that is mutually acceptable to the assessing department. Corrective actions to the findings are tracked to completion through follow-up assessments and Nuclear Tracking System status updates.

2.5.6 **Recent steps taken to improve performance were appropriate and were producing slow improvement.**

COMMONWEALTH EDISON RESPONSE

In order to increase the rate of improvement at Zion the staffing and budget for 1991 will be increased. Staffing level for 1991 has been authorized to 823 people, the highest level of all of CECo's Nuclear Stations. An additional $18.1 million has been authorized

for performance improvement activities for 1991 above and beyond normal operating and maintenance expenses. A Corporate Oversight Committee has been established that will meet bimonthly to review improvement efforts at Zion. The Zion Management Action Program will reassess priorities semiannually to ensure management attention is focused on areas where the rate of improvement is slow. Cultural assessment and organizational development activities are underway to identify barriers to performance improvement and facilitate their removal.

All of these activities are discussed in detail in other areas of this report. Taken together, these activities symbolize the strong corporate commitment which will be applied to increasing the rate of performance improvement at Zion.

SECTION 3.0
ROOT CAUSE ANALYSIS

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3.3	Recognition of the Need for Change	69
3.4	Plant Design Basis	69

3.0 Root Cause Analysis

Commonwealth Edison has evaluated the DET Report and has addressed each weakness in detail in Section 2 of this response. The responses in Section 2 are directed not only at problem resolution, but also at resolution of the root cause(s) for the problem.

Commonwealth Edison has taken or will be taking actions to correct the underlying root causes of the existing weaknesses. Actions have been assigned and priorities established. Activities will be monitored via the Zion Management Action Plan to assure successful implementation.

Actions initiated or planned to address the root causes identified in section 3.0 of the DET report are discussed below.

3.1 Corporate support had not been sufficient for timely resolution of problems.

COMMONWEALTH EDISON RESPONSE

A Corporate Oversight Committee comprised of six nuclear executives has been established that will meet bimonthly to review improvement efforts at Zion. Action plan priorities will be reassessed semiannually to ensure management attention is focused on areas where the rate of improvement is slow.

In order to increase the rate of improvement at Zion the staffing and budget for 1991 has been increased. Staffing level for 1991 has been authorized to 823 people. An additional $18.1 million has been authorized for performance improvement activities for 1991 above and beyond normal operating and maintenance expenses.

A portion of these resources have been specifically allocated to Zion Station to expedite already planned improvement initiatives and to be proactive in identifying and resolving other potentially weak areas. These specific resources are in the form of a special Project Engineering management organization which supplements the currently existing line organizations. Station and corporate support groups identified categories of deliverables which have been assigned to this group to complete within the scope and schedule identified. The purpose of this group is to provide sufficient engineering resources to expedite completion of high priority tasks.

CECo has also committed to strengthening engineering as discussed in section 2.3.12. In summary, CECo is increasing engineering staffing levels and enhancing internal skills. On site engineering groups have been established. Programs are in place to improve design documentation and gradually transfer control of design data bases from A/E firms to CECo. An A/E Services Strategy is being pursued to limit the number of A/E firms serving CECo to a few A/E's and to develop partnership arrangements. An engineering

development plan is in progress to identify tasks which can be performed by CECo in-house and to define associated training tools and schedules. Focus has been established on timely resolution of problems and the need for professionalism and accountability has been reinforced. These activities are expected to demonstrate results in both the short and long term, in improved engineering support for Zion Station as well as the other CECo nuclear stations.

CECo agrees that closure of SSFI identified deficiencies based upon the issuance of corporate directives, without appropriate follow-up review of Station implementation, was a poor practice. Detailed plans to improve the timeliness and effectiveness of corrective action follow-up are discussed in item 2.4.2.b.

3.2 **Station management oversight and control was weak.**

COMMONWEALTH EDISON RESPONSE

The operator attitude, management control and teamwork concerns described in section 3.2 of the DET Report are addressed throughout the response, with the control room reorganization described in item 2.1.1, NSO career path enhancements described in item 2.1.2, overtime controls described in item 2.1.6, and the cultural assessment and organizational development activities described in item 2.5.5.

3.3 **Plant staff did not always recognize the need to make changes to improve safety performance.**

COMMONWEALTH EDISON RESPONSE

The root cause described in section 3.3 of the DET Report is specifically addressed in item 2.5.5 where the Zion Station culture is discussed as well as the organizational development consultants that are being retained by Commonwealth Edison. In addition, Commonwealth Edison plans to improve the utilization of lessons learned information as discussed in section 2.4.2.a of this response.

3.4 **The plant design basis was not well documented or understood.**

COMMONWEALTH EDISON RESPONSE

CECo acknowledges that the design basis for SW and some other systems is not well documented. CECo had identified FSAR errors and was able to respond in a timely fashion to design related concerns which indicates an adequate level of understanding of the design basis; however, CECo does agree that understanding of the design basis would be improved with better documentation.

CECo has initiated steps to correct these areas by establishing setpoint control programs, rebaselining the FSAR, improving the Technical Specifications and creating system design documents. These efforts are described in more detail in Section 2.3.1.