ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-528/95-01
50-529/95-01
50-530/95-01

Licenses: NPF-41
NPF-51
NPF-74

Licensee: Arizona Public Service Company
P.O. Box 53999
Phoenix, Arizona

Facility Name: Palo Verde Nuclear Generating Station, Units 1, 2, and 3

Inspection At: Wintersburg, Arizona

Inspection Conducted: March 13-24, 1995

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Inspection Summary

Areas Inspected (Units 1, 2, and 3): Routine, announced inspection of the qualifications of applicants for operating and fuel handling licenses, the licensed operator requalification training program, and the emergency operating procedures.

Results (Units 1, 2, and 3):

Operations

- All applicants for initial licenses passed the examinations (Section 1).
- Crew communication skills and discipline were evaluated as performance strengths (Sections 1.2.1 and 2.2.2).
- All crews and individuals performed satisfactorily on the requalification examinations (Sections 2.2.1, 2.2.2, and 2.2.3). This was a notable improvement over past evaluations.
- Communication effectiveness while using the emergency operating procedures was challenged by a number of human factors conditions in the control room (Section 2.2.2).
- The licensee's training feedback program was diverse and effective in focusing on important training issues. It was evaluated as a performance strength. (Section 2.4).
- The communications and interface between the operations and training organizations had improved significantly (Section 2.7).
- The use of vendor and peer plant consultants during the emergency operating procedure upgrade process was evaluated as a programmatic strength (Section 3.1). Similar peer review activity appeared to be effective as applied to training programs (Section 2.4).
- The new emergency operating procedures were notably improved over the existing emergency operating procedures (Sections 3.2 and 3.4).

Summary of Inspection Findings:

- No violations, deviations, unresolved items, or inspection followup items were identified during this inspection.

Attachments:

- Attachment 1 - Persons Contacted and Exit Meeting
- Attachment 2 - Simulation Facility Report
- Attachment 3 - Emergency Operating Procedure Related Documents Reviewed
- Attachment 4 - Emergency Operating Procedures and Related Procedure Deficiencies

DETAILS

1 LICENSED OPERATOR APPLICANT INITIAL QUALIFICATION EVALUATION (NUREG-1021)

During the inspection, the examiners evaluated the qualifications of two license applicants for senior reactor operator licenses and two applicants for senior reactor operator licenses limited to fuel handling. The examiners assessed the eligibility and administrative and technical competency of the applicants to be issued licenses to operate the reactivity controls of a commercial nuclear power facility in accordance with 10 CFR 55 AND NUREG-1021, "Operator License Examiner Standards," Revision 7, Supplement 1, Sections 200 (series), 300 (series), 400 (series), and 700 (series). Further, the inspection included evaluations of facility materials, procedures, and simulation capability used to support development and administration of the examinations. These areas were evaluated using the guidance provided in the sections of NUREG-1021 cited above. No issues involving simulator performance or fidelity were identified during preparation or administration of the examinations. However, licensee identified simulator deficiencies and scheduled enhancements are discussed in Section 2.5.

One of the applicants for a senior reactor operator license was taking a reexamination for upgrade from reactor operator. The other applicant for a senior reactor operator license was taking an initial examination; however, he had been previously licensed as a senior reactor operator at Palo Verde. The two applicants for limited senior reactor operator licenses were being reexamined. Accordingly, the written examination was waived for all applicants based on prior successful completion in accordance with 10 CFR 55.35 and 10 CFR 55.47. Similarly, the administrative topics and control room systems/facility walk-through parts of the examination were waived for the senior reactor operator upgrade applicant.

After completion of the evaluations, the examiners determined that all applicants for senior reactor operator and limited senior reactor operator licenses satisfied the requirements of 10 CFR 55.33(a)(2), and all have been issued the appropriate licenses.

1.1 Facility Materials Submitted for Examination Development

Most of the materials had been submitted for development of the initial reactor operator examinations administered by the NRC in November 1994. They were adequate in scope, depth, and variety for exam development. In addition, the licensee updated the job performance measures during an inspection planning visit prior to the exam and provided a copy of them on computer disks. The computer disks proved very useful for modifying licensee job performance measures for incorporation in the NRC examination.

1.2 Operating Examinations

The examiners developed comprehensive operating examinations in accordance with the guidelines of NUREG-1021, Revision 7, Supplement 1, Section 301. Additional guidance in Section 701 was also used in developing the limited senior reactor operator examination. The operating examinations consisted of three parts: administrative topics, control room systems and facility walkthrough, and integrated plant operation. Due to previous satisfactory performance, a waiver was granted to the senior reactor operator upgrade applicant for all portions of the examination except the integrated plant operation part. The chief examiner previewed and validated the various parts of the operating examinations in the Region IV office on March 3, 1995, and on site during the week beginning March 13, 1995, with the assistance of facility training and operations personnel under security agreement. Because of short lead time for these examinations, licensee cooperation and assistance was essential to their timely preparation. The examiners administered the senior reactor operator examinations on March 16, 1995, and the limited senior reactor operator examinations on March 17, 1995. All four applicants passed the operating examinations.

1.2.1 Integrated Plant Operations

The examiners evaluated the two senior reactor operator applicants on two scenarios using one of the Palo Verde plant-specific simulation facilities. A surrogate reactor operator was assigned as secondary operator during both scenarios. The applicants rotated between the assistant shift supervisor and primary operator positions. An examiner administered all parts of the limited senior reactor operator examination to each individual applicant. The examiners compared applicants' actual performance during the scenarios with expected performance in accordance with the requirements of NUREG-1021, Revision 7, Section 303, to evaluate applicants' competency on this part of the operating examination.

The applicants demonstrated excellent command and communication discipline during the simulator scenarios. The applicants exhibited good familiarity with facility procedures and were quick to evaluate which procedure was required and then locate and reference that procedure. Crew feedback was solicited and appropriately incorporated into responses to events. Excellent discipline was exhibited in prioritizing event responses.

1.2.2 Administrative Topics and Control Room Systems/Facility Walk-Through

The examiners evaluated the administrative capability and system operations ability of the applicants using prescripted questions and job performance measures. The questions and tasks related to the scope of potential duties of a licensed senior reactor operator or limited senior reactor operator as appropriate. The administrative portion used prescripted questions to assess the ability of the applicants to carry out their various administrative responsibilities. The scope of system-related tasks included nonlicensed operator tasks outside the control room. The senior reactor operator

applicant performed the majority of the tasks in the simulation facility in the dynamic mode. He simulated the remainder of the tasks at local operating stations throughout the plant. Each applicant was required to enter the radiologically controlled area to perform one or more tasks. To further assess the senior reactor operator applicant's system knowledge, the examiner asked prescripted questions relating to the system involved in each task. The questions solicited "short-answer" responses and permitted the applicant to use operationally controlled references to aid in their responses, unless specifically annotated, to require response from memory. The examiners combined the applicant's task performance and question responses in accordance with the guidelines of NUREG-1021, Revision 7, Supplement 1, Section 303, to evaluate performance on the control room systems/facility walk-through part of the operating examination. The examiners used a similar system to evaluate the limited senior reactor operator applicants, except there were no prescripted system questions. The limited senior reactor operator exams were administered in the fuel building and in technical libraries.

Overall, the applicants performed well. All applicants were familiar with plant status, plant procedures, and location of plant components. A minor discrepancy between two emergency plan implementing procedures was noted during the administrative part of senior reactor operator examination. The procedure with the latest revision date indicated that the site manager should relieve the shift supervisor of the affected unit as onshift emergency coordinator after declaration of an emergency classified as ALERT. The procedure with the earlier revision date provided other options. The licensee stated that this discrepancy related to the recent creation of the site manager position and initiated action to correct the affected procedure. No other discrepancies were noted.

2 LICENSED OPERATOR REQUALIFICATION PROGRAM EVALUATION (IP 71001)

During the inspection, the licensee's requalification program was assessed to determine whether the program incorporated appropriate requirements for both evaluating an operator's mastery of training objectives and revising the program in accordance with 10 CFR Part 55. The licensed operator requalification program assessment included a review of training material for the past 2 years, evaluation of the program's controls to assure a systems approach to training, and evaluation of operating crew performance during annual requalification examinations. This included a review of facility documents and an assessment of the facility evaluators' effectiveness in conducting examinations.

In the training program description, "Licensed Operator Continuing Training," Revision 6, the facility licensee incorporated, by reference, the requirements of NUREG-1021, "Operator License Examiner standards," Sections 601 through 605 into the Palo Verde licensed operator continuing training program. That incorporation did not reference a particular revision of NUREG-1021 and did not otherwise qualify or redefine any portion of the requirements therein as they applied to the Palo Verde licensed operator continuing training program.

2.1 Examination Preparation

2.1.1 Written Examination

An inspector reviewed the written examinations prepared for administration during the weeks of the inspection. The examinations contained 35 to 40 questions divided roughly equally between Part A (static scenario) and Part B (administration and procedures) and conformed to the guidelines of NUREG-1021, Section 602. The inspector noted that a few questions in Part B of the examinations evaluated system knowledge rather than procedure use or interpretation as required in Section 602 of the examiner standards. The inspector concluded that the deviation from the guidelines was minor and did not affect examination validity. The inspector discussed the deviations with the section leader for licensed operator continuing training during the weeks of the inspection.

The inspector further evaluated the measures to maintain examination integrity. The training staff developed three examination Parts A and 6 examination Parts B. While the Parts A static scenarios were each used twice during the 6-week examination cycle, more than the minimum number of questions were developed for each static scenario, which permitted some question replacement for subsequent uses of the scenario. Each of the examination Parts B were unique. Therefore, each examination was at least 50 percent unique from week to week and the static scenarios were not repeated on consecutive weeks or in any predictable pattern. Examination time validation, using licensed operators, was closely tracked and monitored to ensure that participants did not see test items that were to be a part of their examination. Finally, examination material was required to be in specified locked containers when not in the immediate possession of a responsible member of the training staff. The inspector concluded that the measures taken by the facility licensee were adequate to maintain examination integrity during examination development and administration and conformed to the guidelines of NUREG-1021.

2.1.2 Operating Examination

An inspector evaluated the dynamic scenario and walk-through portions of the operating examination with respect to the guidelines of NUREG-1021, Sections 603 and 604. From a bank of approximately 50 scenarios, the facility training staff selected 15 which were then revised and arranged into 12 scenario sets of 2 scenarios each. No two scenario sets were the same, and individual scenarios were not repeated in consecutive weeks. The format and content of the scenario sets were consistent with the guidelines of NUREG-1021 and adequate to discriminate between safe and unsafe operator performance. From a bank of 160 job performance measures, the training staff developed six unique job performance measure sets of five tasks each. Two job performance measure sets were used each week; however, no sets were used in consecutive weeks, and the combination of sets for each week was unique. The job performance measure sets were adequate to evaluate operator system operation ability.

The inspector noted that some job performance measure sets were somewhat uneven with regard to total time and number of critical elements. The sets ranged from 40 minutes with 12 critical elements to 70 minutes with 30 critical elements. Prior to the first week of the inspection, the facility training staff noted some of the imbalance among job performance measure sets and rearranged some tasks to achieve consistent time estimates for all the sets. The inspector concluded that the job performance measure sets as administered discriminated adequately.

2.2 Examination Administration and Evaluation

2.2.1 Written Examinations

The entire written examination, Parts A and B, was administered in a static simulator over a three hour period. An inspector observed the briefing given to the examinees and portions of the in-process examinations. Following the examinations in week one, the inspector performed an independent grading of the examinations which produced pass/fail results that agreed with those of the facility licensee. During week two, the inspector reviewed the facility grading results. All examinees in both weeks passed the examinations. No training issues or remedial needs were identified by the licensee during the post examination results evaluation. The inspector agreed with those findings.

2.2.2 Dynamic Simulator Examinations

An inspector observed four shift crews in the dynamic simulator examinations over the two week period of the inspection. All crews and individual operators demonstrated satisfactory performance in this part of the examinations.

During the dynamic simulator examinations, the inspector observed a number of human factors conditions which challenged the command, control and communication function during response to an emergency condition. The emergency operating procedures in use at that time required several members of the shift crew to independently observe various plant parameters to assess the plant status once an emergency event had been initiated. That resulted in considerable movement within a confined area of the control room such that operators frequently had to sidestep one another to get to the indications they were required to observe. The challenge to the operator was further increased by the number of independent and simultaneous communication activities that frequently occurred in the same confined area of the control room. The communications typically involved the assistant shift supervisor directing the primary and secondary plant operators in emergency operating procedure implementation, the third reactor operator requesting equipment status information from auxiliary operators on an open microphone, and the shift supervisor conversing with the shift technical advisor or over the telephone while implementing the emergency plan. In the actual unit control rooms, the condition was further aggravated by the ambient noise level contribution of the control room ventilation system. That was particularly

true in the Unit 2 control room where operators reported that they frequently turned off the control room ventilation fans to reduce the noise level during crew briefs at the beginning of the shift. The licensee indicated that they had begun preliminary evaluation of control room arrangement with regard to some of the conditions affecting communication; however, no specific objectives had been identified. They indicated that ambient noise levels in the unit control rooms had not been evaluated for several years and that there were no plans as yet to pursue a reevaluation or implement noise reduction efforts. However, a modification had been made to the simulators to simulate the control room ventilation noise to avoid possible negative training.

Crews exhibited well disciplined and effective communication skills. Given the human factors conditions noted above, highly disciplined communication was very important to the successful implementation of the emergency operating procedures. The inspectors identified crew communication as a performance strength and pointed out the necessity to maintain that high performance level as long as the human factors conditions persisted in the control room. The inspectors concluded that the adverse human factors conditions constituted an area of vulnerability overcome by strong communication practices.

As a result of performance exhibited in previous initial licensing examinations, the NRC developed a concern regarding emergency operating procedure implementation. The concern focused on an apparent tendency to exhaust all possible means to restore a critical safety function before completing the emergency operating procedure standard post-trip actions. The potential consequence was that other failed or jeopardized safety functions may have gone unrecognized which could have led to further plant degradation. To evaluate shift crew use of the emergency operating procedure flow charts and functional recovery procedures in this context, two shift crews were presented a scenario in which a critical safety function could not be satisfied by the standard post-trip actions. The scenario involved a loss of coolant accident inside containment for which containment spray did not actuate as required. The standard post-trip recovery actions for containment integrity provided by the emergency operating procedure flow chart were inadequate to restore containment spray. That required implementation of the functional recovery procedure once the remainder of the standard post-trip actions had been taken. The crews handled the event appropriately and implemented all the standard post-trip actions of the emergency operating procedures in a timely manner.

The inspector observed the post scenario evaluations. The observations and analyses made by the facility evaluators were detailed and well focused. The facility evaluators identified crew strengths and weaknesses, as well as individual strengths and weaknesses. When warranted, they used appropriately focused follow-up questions to further assess individual performance. The inspector concluded that the dynamic simulator evaluations were performed well.

The inspector noted that operations management was present during all but one of the dynamic simulator examinations. The managers were primarily observers to the examination but did provide input and perspective during the post scenario evaluations. Through interviews, the inspector determined that operations management routinely observed the weekly evaluations throughout the requalification cycle in addition to the annual operating examinations.

2.2.3 Walkthrough Examinations

An inspector observed two facility evaluators administer walkthrough examinations in the plant and three facility evaluators in the simulator. The inspector observed minor cuing errors committed by two of the facility evaluators during the walkthrough examinations which were discussed with the evaluators at the completion of the task in progress. The errors did not compromise examination validity or integrity and were not regarded as reflecting a generic deficiency. The inspector reviewed the facility evaluator pass/fail results for the walkthrough examinations, which assigned all passes, and concurred with the facility evaluations.

Due to computer problems on Simulator A and examination scheduling, one set of simulator job performance measures had to be simulated by oral discussions in Simulator A. That required the evaluators to develop the proper cuing information for the job performance measures in a very limited amount of time to keep the examinations on schedule. That effort was handled well. To reduce potential cuing errors, each evaluator prepared the cues for one job performance measure and then administered that job performance measure to each examinee.

2.3 Remediation

The inspectors reviewed remediation records for crews and individuals that failed licensed operator requalification examinations during 1994 and in the 1995 examination weeks preceding the inspection. The remediation plans and re-examinations were appropriate in each instance. All individuals passed the written remediation examinations. Also, the crews and individuals received few negative comments on the re-evaluation scenarios.

2.4 Training Feedback System

The training feedback system was diverse and effective. Written feedback was solicited from the students at the completion of each course. Also, anyone could initiate a written training request at any time. The course instructors compiled course summaries based on student feedback at the conclusion of each course. In most instances the instructor either stated how student concerns were addressed or provided recommendations to correct the problems. In addition, post-training surveys with selected trainees (the goal was 10 percent of courses) and trainee line management were conducted and documented. Recommendations were provided. Problems which could not be resolved directly by training management were referred to the training interface committee (which consisted of training and plant supervision) or the

training advisory board (which consisted primarily of managers outside the training department) for resolution. The inspectors selected several recommendations from these documents and determined that they had either been resolved or were being considered by the appropriate parties. The inspectors also reviewed a "1994 Annual NRC and Requalification Examination Results" report. In addition to pass-fail data, it listed strengths and weaknesses for each exam. Specific weaknesses and vulnerabilities were addressed with trainees in a 1-hour course entitled "1994 Exam Review." The inspectors reviewed a report entitled "Action Plan for LOCT Sorted by Due Date," dated March 15, 1995. This report contained 20 action items for licensed operator continuing training. The number of items and due dates appeared reasonable. During interviews, licensed operators consistently expressed satisfaction with the response to and treatment of their feedback on training activities. Communications between operations and training on training issues were excellent.

The training advisory board was required to perform an annual program evaluation and forward the results to senior management The inspectors reviewed a training advisory board report dated February 14, 1995. Among the issues it addressed was resolution of an issue involving the need for more observation of training by plant management, which was identified in a quality assurance audit report dated December 21, 1994. That was resolved by having the nuclear training department assist managers by developing an observation schedule. The managers were required to fill out an evaluation during the observation which was returned to nuclear training. The results are to be published quarterly.

Quality assurance was actively involved in monitoring training activities through audits and surveillances. The inspectors reviewed two audit reports and two surveillance reports (one was entitled "QA&M Monitoring Report" and another was entitled "Nuclear Assurance Evaluation Report") on training activities. The audits were appropriate in scope and depth and discussed substantive training issues. Deficiencies were either corrected immediately or resulted in issuance of condition reports or disposition requests. An issue involving management oversight of training was identified in Audit Report 94-013, "Training and Qualification," issued December 21, 1994. This issue was resolved by the training advisory board as discussed above. Another issue identified in this report, involving weaknesses in documentation to support electrical maintenance technician training waivers, was pursued by the inspectors and is discussed further below. The inspectors noted that this audit was supported by an outside consultant.

In addition to the quality assurance audits, the inspectors reviewed an audit report dated February 3, 1995, by outside auditors, which was entitled "Licensed Operator Continuing Training Self-Assessment Peer Group Evaluation of January 24 through January 27, 1995." This outside audit was observed by nuclear assurance. One issue identified during this audit involving a backlog of approximately 300 deficiency reports on the simulation facilities is discussed further below.

The inspectors observed that site and industry event feedback was appropriately covered in the licensed operator continuing training program. Course NLR94-02-RC-003-000 was titled "Industry Events Feedback Summary." The inspectors also selected specific plant events and determined that appropriate training had been conducted on lessons learned.

To follow up on an audit finding suggesting potential weaknesses in documentation to support electrical maintenance technician training waivers, the inspectors reviewed training program descriptions for the following disciplines: licensed operator training, nonlicensed operator training, electrical maintenance technician training, instrument and control technician training, and mechanical maintenance technician training. The inspectors then requested two job qualification cards and documentation on all training waivers for two randomly selected individuals in each of the licensed operator and nonlicensed operator disciplines and four randomly selected individuals in each of the three maintenance disciplines. The licensee was able to readily produce status reports of all training received for each individual selected. It took considerably longer for the licensee to produce documentation to support training waivers noted for some individuals. One mechanical maintenance technician had waivers on 30 job qualification cards. However, the requested job qualification cards and appropriate documentation to support all the training waivers listed for each individual were retrieved. Because of the licensee's ability to retrieve all requested records, the inspectors concluded that there were no generic deficiencies in training records with respect to qualifications and training waivers.

2.5 Simulator Fidelity

Apart from the previously noted problem on Simulator A, no other simulation facility performance problems were identified by the inspectors during the initial or requalification examinations. However, to follow up on an outside audit finding questioning the number of simulation facility deficiencies, the inspectors reviewed a report titled "Open Simulator Discrepancy Reports Sorted by APS System," dated March 21, 1995. There were 264 deficiencies identified in this report. However, many were of minor or no impact on training. The inspectors reviewed approximately 30 deficiencies which appeared to have some impact on training with the section leader for licensed operator continuing training. The inspectors learned that each deficiency had been prioritized and scheduled for resolution prior to conducting further training which would be impacted by the deficiency. The inspectors observed that there were a substantial number of deficiencies relating to the following areas: emergency response facility data acquisition system point identification; radiation monitor response to loss of coolant accidents; and instrument accuracy during mid-loop operations. Appropriate priorities had been assigned to resolving these deficiencies.

2.6 Licensed Operator License Conformance

The inspectors reviewed the licensee's records for tracking licensed operators' qualifications and status. These included the training status

reports, operations timekeeping records and watch bill, and medical records. The inspectors verified that the records for four randomly selected individuals supported the current active status of their operator licenses. Further, the inspectors verified that the licensee maintained an appropriate program for deactivating and reactivating operator licenses and reviewed associated records. The inspectors noted that the licensee had recently implemented a status list for licensed personnel which was kept in a field qualification report book in the shift supervisor's office. A shift supervisor stated that it was very user friendly. The inspectors noted that the report dated March 16, 1995, contained two discrepancies involving corrective lenses requirements under the medical restrictions. However, shift management was aware of the restrictions for these individuals. Immediate action was taken to correct these discrepancies. The inspector's concluded that the licensee's program met the requirements of 10 CFR 55.53(e), (f), and (i).

2.7 Operations and Training Organizations Interface

The inspectors interviewed several individuals from both the operations and training organizations. Through those interviews and other inspection activities, the inspectors identified a significant improvement in the communication and interface between the operations and training organizations. The operations organization had been "reengineered" with the net result being that operations became organized on a site-wide basis, rather than on a unitized basis. That reduced the number of primary interface points between operations and training from three to one. Additionally, operations training support and training liaison functions were created that provided an enhanced continual operations presence in training activities. Under the new organization, operations performance standards and management expectations became more uniform and clearly defined. Operations took a more active role in identifying training needs and providing feedback regarding training quality and effectiveness. All of these actions facilitated the training organization's task with respect to reenforcing operations standards and expectations and tailoring training to current operational needs.

3 EMERGENCY OPERATING PROCEDURES REVIEW (IP 42001)

This portion of the inspection involved the review of the licensee's upgraded emergency operating procedures and emergency support procedures. While the licensee had not finalized the emergency operating procedure verification and validation process nor approved the procedures for use, the procedures were sufficiently developed to review them for technical accuracy and human factors adequacy. The review included:

- An evaluation of the emergency operating procedures against the vendor's generic technical guidelines,
- A review of the plant specific technical guidelines,

- A review of the licensee's emergency operating procedure deviation document,
- A review of the emergency operating procedure user's guide and emergency operating procedure writer's guideline,
- Plant walkdowns of emergency operating procedure standard appendices which directed local operator actions,
- Walkdowns of emergency operating procedure support procedures, and
- Observation of upgraded emergency operating procedure usage during validation of two developed simulator scenarios and during usage in the simulator by an operating crew that had received minimal training on the new emergency operating procedures.

The review also included a review of the licensee's corrective actions to improve the existing emergency operating procedures, and whether their administrative controls provided for continued accuracy and maintenance of the emergency operating procedures.

3.1 Emergency Operating Procedures and Supporting Procedures Review

The emergency operating procedures and supporting procedures listed in Attachment 3 were verified to be technically correct by reviewing the owner's group generic technical guidelines against the plant specific emergency operating procedure technical guidelines and justifications of deviations from the generic technical guidelines. Where applicable, it was verified that the deviations were satisfactorily incorporated into the emergency operating procedures, along with the plant specific setpoint values. Transitions from normal operating procedures, abnormal operating procedures, and alarm procedures appeared well defined and easy to follow. Decision points in the procedures were evaluated to ascertain whether they could be easily discriminated and understood. Notes and cautions were verified for correct and consistent usage. During the review of verification and validation information, the inspectors noted that the licensee had involved the vendor in the emergency operating procedure upgrade process for technical and human factors reviews. Additionally, the licensee recruited the assistance of a individual from a peer plant that had been directly involved with a similar emergency operating procedure upgrade at his facility. The peer plant evaluator was used as a "Designated Skeptic" and involved in the validation of the new emergency operating procedures. The inspectors noted few human factors deficiencies in their review and considered the involvement of vendor and peer plant consultation in the emergency operating procedure upgrade process as a strength. The inspectors did note a number of minor deficiencies related to the emergency operating procedures, some of which are listed in Attachment 4. The majority of the deficiencies found were noted during plant walkdowns of the emergency operating procedure standard appendices which direct local operator actions. While none of the deficiencies identified were

considered significant, and it appeared that the licensee's verification and validation process would identify and correct them, the inspectors had a concern that the planned licensee's resources in the operational standards group currently allocated might be insufficient to complete the final verification and validation planned period of April 1-15, 1995.

In addition, the inspectors conducted discussions with key individuals in the nuclear assurance group. The discussions focused on the planned twelve person-week final concurrence review of the emergency operating procedures. Based upon the discussions, it was determined that nuclear assurance reviews would be focused on ensuring compliance with regulatory requirements and would be primarily table top reviews. The inspectors provided the results of the plant walkdowns to the nuclear assurance manager. The inspectors noted that in-depth audits of some emergency operating procedures that have completed all verification and validation will assure the quality of the verification and validation process. The licensee agreed to consider in-depth audits as part of their nuclear assurance reviews.

3.2 Simulator Scenarios

The inspectors developed two simulator scenarios to administer to an operating crew that had a minimal amount of training on the new emergency operating procedures. The scenarios were initially validated on the simulator to verify simulator modeling, fidelity, and emergency operating procedure accuracy using individuals involved in writing the emergency operating procedures. The simulator scenarios were then administered to the operating crew to verify the flow of the emergency operating procedures, problems in transitioning and diagnosing events, and potential human factors concerns.

The first scenario "RCP Malfunction/Small Break LOCA" was initiated with the plant in stable condition at 100 percent power. The "E" charging pump was placed in-service because the "B" charging pump was removed from service to investigate an oil leak on the gear reducer. The "B" charging pump was still operable, but area operators and mechanics were investigating the oil leak. The NBN-X03 engineered safety features transformer developed a sudden pressure fault and caused its feeder breaker to lockout. This condition caused the "A" diesel generator to repower the PBA-S03 bus. Shortly after the "A" diesel generator tied onto the bus it tripped on differential current resulting in a loss of the PBA-S03 bus, the two charging pumps and seal injection. The loss of seal injection resulted in seal failures on reactor coolant pump 1A. The seal failure caused a small break loss of coolant accident inside containment. Subsequently, the seal failed completely and caused the crew to trip the reactor. Post-trip, Reactor Coolant Pump 1B seal package also failed.

Two minutes following high pressure safety injection start, "B" high pressure safety injection pump degraded 100 percent, resulting in no flow to the reactor coolant system. As a result, the crew had to determine which safety functions were in jeopardy and transition to the functional recovery

procedures to restore power to the PBA-S03 bus and start the "A" train high pressure safety injection pump and the "A" and "E" charging pumps. The scenario was ended when controlled reactor coolant system cooldown and depressurization was achieved.

The second scenario "Steam Generator Tube Rupture" was initiated with the plant stable at 100 percent power when startup transformer NAN-X02 tripped. A steam generator tube leak began immediately after the electrical perturbation and ramped up in severity. The crew responded to radiation monitoring system alarms and took action to shutdown the plant in accordance with 41AO-1ZZ08, "Steam Generator Tube Leak Abnormal Operating Procedure." During this action, the main generator tripped simultaneously with a loss of offsite power. The crew entered the standard post-trip actions and transferred to the steam generator tube rupture procedure when they recognized that the leak had become a full rupture. The scenario ended when the ruptured steam generator was isolated and the plant was in a stable condition.

The inspectors observed the operating crew in the performance of their duties during the developed simulator scenarios focusing on command, control, and communications; control board operations; assistant shift supervisor use of the emergency operating procedures, diagnostics and transitions; and shift supervisor and shift technical advisor emergency operating procedure functions. The inspectors concluded that the new emergency operating procedures facilitated communications better than the current emergency operating procedures. The assistant shift supervisor was the focused center of command, control, and communication. The operators had more opportunity to look at and observe plant parameters, rather than being focused on a safety function flow chart as required by the current emergency operating procedures. Additionally, the shift supervisor and shift technical advisor performance of diagnostics and break identification served as an independent check to the assistant shift supervisor's decision making process. Followup discussions with the operators indicated that they thought the new emergency operating procedures flowed better than the existing procedures, allowed operators to focus on their control boards, and allowed for more efficient completion of the standard post-trip actions.

3.3 Plant Walkdowns

The inspectors conducted walkdowns of emergency operating procedure standard appendices and emergency operating procedure support procedures listed in Attachment 3 to verify that the procedures could be physically and correctly performed both inside and outside the control rooms for all three units. The inspectors verified component labeling, as well as whether the instruction step could be performed from a human factors perspective. This evaluation included reviews to verify instruction requirements versus meter accuracies, emergency lighting considerations, and the impact on access due to conditions such as high energy line breaks and high radiation. The inspectors verified the prior completion of these studies: Emergency Lighting, July 1991; Post-accident Radiation levels, December 1985 and March 1986; and High Energy Line Break studies, 1982, 1985, 1991, and 1995. The inspectors noted a number of

minor deficiencies, some of which are listed in Attachment 4. The inspectors reviewed the deficiencies with key managers in the operations standards group. Based upon these discussions and review of the licensee's verification and validation process, the inspectors concluded that the deficiencies would have been identified by the licensee during the final emergency operating procedures verification and validation. In addition, the inspectors observed that the licensee was highly responsive in reviewing, evaluating, and correcting the identified deficiencies. The inspectors noted that the licensee had either corrected, initiated corrective actions, or was evaluating all the deficiencies when the inspection period ended.

Additionally, the inspectors observed good housekeeping practices in Units 1 and 3. While Unit 2 was in an outage, no equipment access problems were observed.

3.4 Emergency Operating Procedure Training and Followup to Previous Inspection Findings

The inspectors also reviewed the licensee's training plans for licensed operators and non-licensed operators, as well as reviewed licensee corrective actions related to any previous findings from NRC Inspection Report 50-528/94-07; 50-529/94-07; 50-530/94-07.

Through interviews, the inspectors determined that the licensee was scheduled to implement the new emergency operating procedures on June 21, 1995, with high intensity training of licensed operators beginning May 22, 1995. High intensity training will consist of 2-week training blocks for each operating crew. Each crew will receive 40 hours classroom and 40 hours simulator training on the new emergency operating procedures. Additionally, the inspectors determined that the classroom instructors were to receive one week of emergency operating procedure training prior to instructing the operators. This training is to be administered by the emergency operating procedure writers. The inspectors further requested emergency operating procedure training lesson plans but were informed that the plans had not been completed and were not yet in a reviewable condition. The inspectors concluded that the licensee's plans for high intensity training appeared sufficient to prepare the operators for use of the new emergency operating procedures.

The inspectors also conducted interviews with licensed operators to ascertain the level of training and exposure to the new emergency operating procedures. The operators stated that a minimal amount of training had been given and that principal involvement had been in the validation of the new emergency operating procedures on the simulator. The operators further stated that they believed the new emergency operating procedures were better than the existing emergency operating procedures because they were easier to follow and not overly detailed.

Additionally, the inspectors reviewed the licensee's corrective actions to findings of NRC Inspection Report 50-528/94-07; 50-529/94-07; 50-530/94-07. The inspectors verified that the licensee had reviewed the inspection report findings and had revised emergency operating procedure programmatic procedures to incorporate the requirements of NUREG-1358, Supplement 1, "Lessons Learned from the Special Inspection Program for Emergency Operating Procedures."

The inspectors concluded that the content, format, and useability of the emergency operating procedures were greatly improved over the old format. Crew performance in the diagnosis and control of casualties should be significantly improved when the new emergency operating procedures are implemented. The new emergency operating procedures appeared technically adequate and followed the format of CEN-152, Revision 3. The procedures reviewed contained few human factors deficiencies and were easily performed by the operators during administered simulator scenarios.

ATTACHMENT 1
Persons Contacted and Exit Meeting

1 PERSONS CONTACTED

1.1 Licensee Personnel

*J. Levine, Vice President Nuclear Production
*E. Simpson, Vice President Nuclear Support
*W. Ide, Director, Operations
*J. Velotta, Director, Training
*D. Garchow, Director, Systems Engineering
*C. Seaman, Director, Nuclear Assurance
*R. Nunez, Department Leader, Nuclear Operator Training
*P. Wiley, Department Leader, Operations Support
*E. Sterling, Department Leader, Nuclear Assurance
*A. Krainik, Department Leader, Nuclear Regulatory Affairs
*M. Baughman, Section Leader, Licensed Operator Continuing Training
*J. Dennis, Section Leader, Operations Standards
*G. Box, Section Leader, Initial Licensing Training
*D. Marks, Section Leader, Nuclear Assurance
*D. Mustin, Section Leader, Maintenance Training
*L. Florence, Senior Advisor, Operations Standards (EOP Coordinator)
*R. Hazelwood, Engineer, APS Nuclear Regulatory Affairs
*R. LaPeter, Instructor, Operations Training
*D. Burns, Liaison, Operations Training

1.2 Other Personnel

*J. Draper, Site Representative, Southern California Edison
*R. Henry, Site Representative, Salt River Project
*F. Gowers, Site Representative, El Paso Electric Company

1.3 NRC Personnel

*K. Johnston, Senior Resident Inspector, Palo Verde

In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

* Denotes personnel that attended the exit meeting.

2 EXIT MEETING

An exit meeting was conducted on March 24, 1995. During this meeting, the inspectors reviewed the scope and findings of the inspection activities. The licensee did not express a position on the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

ATTACHMENT 2
Simulation Facility Report

Inspection Report: 50-528/95-01
50-529/95-01
50-530/95-01

Licensee: Arizona Public Service Company

Facility Name: Palo Verde Nuclear Generating Station

Inspection At: Wintersburg, Arizona

Operating Tests Administered on: March 13-24, 1995

This form is to be used only to report observations. These observations do not constitute audit or inspection findings and are not, without further verification and review, indicative of noncompliance with 10 CFR 55.45(b). These observations do not affect NRC certification or approval of the simulation facility other than to provide information that may be used in future evaluations. No licensee action is required in response to these observations.

While conducting the simulator portion of the operating tests, no simulator infidelities were observed.

ATTACHMENT 3

Emergency Operating Procedure Related Documents Reviewed

Programmatic Documentation

02PR-00P01 Rev. 4 - Emergency Operating Procedure Program
40DP-9AP15 Rev. 0 - Emergency Operating Procedure Writer's Guide
40DP-9AP16 Rev. 0 - Emergency Operating Procedure User's Guide
40AC-90P11 Rev. 5 - Emergency Operating Procedure Verification and Validation

Emergency Operating Procedure Setpoint Document
Emergency Operating Procedure Deviations Document
Emergency Operating Procedure Writer's Guide Basis Document

Emergency Operating Procedures:

40EP-9E001 Rev. 0 - Standard Post Trip Actions
40EP-9E002 Rev. 0 - Reactor Trip
40EP-9E004 Rev. 0 - Steam Generator Tube Rupture
40EP-9E007 Rev. 0 - Loss of Offsite Power/Loss of Forced Circulation
40EP-9E009 Rev. 0 - Functional Recovery
40EP-9E003 Rev. 0 - Loss of Coolant Accident
40EP-9E006 Rev. 0 - Loss of All Feedwater

Emergency Support Procedure:

55OP-0GT01 Rev. 5 - Gas Turbine Generator #1 Operating Instructions

Functional Recovery Success Paths:

IC-1 Rev. 0 - RCS Inventory Control: CVCS
CTPC-1 Rev. 0 - Containment Temperature and Pressure Control: CTMT Fans
RC-1 through RC-4, Rev. 0 - Reactivity Control
HR-4 Rev. 0 - Heat Removal

Emergency Operating Procedure Appendices:

Appendix 3 Rev. 0 - Manual Isolation of Blowdown Valves

Appendix 4 Rev. 0 - Condensate vs. Time Remaining in Hot Standby

Appendix 5 Rev. 0 - RCS and PZR Cooldown Log

Appendix 6 Rev. 0 - Spray Valve Actuation Data Sheet

Appendix 11 Rev. 0 - Charging Pump Alternate Suction to the SFP

Appendix 15 Rev. 0 - Aligning Blowdown to the Main Condenser

Appendix 16 Rev. 0 - RCP Trip Criteria

Appendix 18 Rev. 0 - Local ADV Operation

Appendix 19 Rev. 0 - Containment Hydrogen Control

Appendix 21 Rev. 0 - SIAS Load Shed Panels

Appendix 28 Rev. 0 - MSIS Check/Reset

Appendix 31 Rev. 0 - Local Monitoring of IA Pressure & Emergency Nitrogen Supply

Appendix 32 Rev. 0 - Minimize Release to the Environment

Appendix 34 Rev. 0 - SG 2 Level Reduction

Appendix 41 Rev. 0 - Local Operation of AFN-P01

Appendix 53 Rev. 0 - Align De-energized Buses

Appendix 55 Rev. 0 - Restore DG A to PBA-S03

Appendix 60 Rev. 0 - Align DG A to PBA-S03 (Energized from a generic technical guideline)

Appendix 66 Rev 0 - X02 or X01 to 1S06 and 1S04

Appendix 77 Rev. 0 - Align NC to the SFP

Appendix 98 Rev. 0 - Open Doors During Blackout

Abnormal Operating Procedure:

AOP 4XAO-XZZ52 Diesel Generator Operations after ESFAS Actuations

ATTACHMENT 4

Emergency Operating Procedures and Related Procedure Deficiencies

1. Review of 40EP-9E004, Rev. 0 - Steam Generator Tube Rupture

- PVNGS Emergency Operating Procedure Deviations Document, Appendix A, "PVNGS/CEN-152 Cross Reference," page 7 of 29 cross references PVNGS SGTR, Steps 51 and 54, in lieu of Steps 51 and 53 to CEN-152, Step 31. The licensee agreed that this was in error, and it was corrected.

- PVNGS Emergency Operating Procedure Deviations Document, Appendix A, "PVNGS/CEN-152 Cross Reference," page 7 of 29 cross references PVNGS SGTR Step 52, in lieu of Step 54 to CEN-152, Step 32. The licensee agreed that this was in error and it was corrected.

- PVNGS Emergency Operating Procedure Deviations Document, Appendix A, "PVNGS/CEN-152 Cross Reference," page 7 of 29 cross references PVNGS Deviation 155 to SGTR Step 53, in lieu of Step 52. The licensee agreed that this was in error.

- SGTR SFSC 3.a. logic is faulty in that a statement "Pressurizer level is greater than 70 percent..." is contained in a statement beginning with "IF pressurizer level is 10-70 percent, THEN..." The licensee agreed that this was in error and revised the emergency operating procedure.

2. Review of 40EP-9E007 Rev. 0 - Loss of Offsite Power/Loss of Forced Circulation

- PVNGS LOOP, Rev. 0, Exit Condition 2.6.c., states, "RCS conditions are being controlled and maintained in Hot Standby or Hot Shutdown." CEN-152 also includes Cold Shutdown as an option. PVNGS Deviation 204 addresses why PVNGS does not include Cold Shutdown as an option. However, PVNGS LOOP Technical Guideline, Rev. 2, Exit Condition 2.6.c., includes Cold Shutdown as an option, at variance with LOOP Rev. 0 and contrary to Deviation 204. The licensee agreed that this was in error.

- PVNGS LOOP, Rev.0, Steps 36-47 appear to carry out the intent of CEN-152, Step 12 for power restoration. The breakout into individual steps is not addressed in the deviations document. The licensee agreed that this was in error and a new deviation was written to correct this item.

- PVNGS LOOP SFSC 2., "Maintenance of Vital Auxiliaries," and LOOP Technical Guidelines SFSC 2 both have two substeps lettered "a." The licensee agreed that this was in error and revised the emergency operating procedure.

3. Review of IC-1 Rev. 0 - RCS Inventory Control; CVCS

- PVNGS Emergency Operating Procedure Deviations Document, Appendix A, "PVNGS/CEN-152 Cross Reference," page 19 of 29 cross references PVNGS FRP IC-1, Step 10, to Deviation 63 on page 33, in lieu of page 30. The licensee agreed that this was in error and revised the document.

4. Review of CTPC-1 Rev. 0 - Containment Temperature and Pressure Control; CTMT Fans

- PVNGS Emergency Operating Procedure Deviations Document, Appendix A, "PVNGS/CEN-152 Cross Reference," page 27 of 29 cross references PVNGS FRP CTPC-1, Step 1, to Deviation 27 on page 17, in lieu of page 16. This item had recently been identified by the licensee and corrected.

5. Review of Appendix 4, Rev. 0 - Condensate vs. Time Remaining in Hot Standby

- Attachment 4-A was not clear in how to choose or interpolate curves labeled "Time After Reactor Shutdown." The Appendix has been revised to provide proper direction.

6. Review of Appendix 5, Rev. 0 - RCS and PZR Cooldown Log

- From a human factors perspective, notes on selection of temperature instruments to monitor for cooldown were poorly organized. The licensee agreed that restructuring the area dealing with temperature instrument was appropriate. This table was revised.

  * There was no specific guidance as to how often temperatures are to be logged in determination of cooldown rates. This requirement was neither in the emergency operating procedure nor the training expectations, although the Technical Guidelines specified once every 30 minutes. The licensee prepared training guidelines for this item.

7. Review of Appendix 6, Rev. 0 - Spray Valve Actuation Data Sheet

- In light of notes associated with pressurizer temperature on the Appendix 5 log, it was not clear which instrument to use for pressurizer temperature on the Appendix 6 log. The licensee agreed that this needed clarification. The table has been revised.

8. Review of Appendix 15, Rev.0 - Aligning Blowdown to the Main Condenser

- Attachment 15-D uses the contingency column incorrectly in that action for SG1 are listed in the left column, and actions for SG2 are listed in the right column. The licensee stated this would be reviewed. The Attachment was revised to correct this item.

9. Review of Appendix 16, Rev. 0 - RCP Trip Criteria

- It was noted that on Unit 3 and Simulator A, on the instruments for RCP current, the 520A limit was identified with an orange triangle marking on the meter face. These markings were not present on the RCP ammeters at Units 1 and 2. The licensee stated this would be investigated, and all units/simulators would be brought into agreement.

10. Review of Appendix 19, Rev. 0 - Containment Hydrogen Control

- Attachment 19-B refers to the "Auxiliary Cable Box." The cables are in boxes marked "Cable Storage for Hydrogen Recombiner 'X'." There is only one set of cables, and it is located in Unit 1. The label plate was corrected.

- Attachment 19-C, Steps 5 and 6 require routing control room alarm Cables P104/104A & B and P110/110A & B through stuffing tubes in Junction Boxes HPA-J05 and HPB-J05. In Units 2 and 3, there are no junction box label plates for the cables as there are in Unit 1. The location where the cables are stored is not specified. In Unit 2 there are neither stuffing tubes nor holes in the junction boxes. In Unit 3, there is a single hole in the junction boxes, and the stuffing tubes have not been installed in the junction boxes. The licensee stated that the emergency operating procedure has been modified, and junction boxes were modified to make this part of the procedure operational.

- Attachment 10-C is incomplete in that Cables P104A/104A and P110A/110A are never plugged in to the recombiner power control panel. Attachments 19-D and H "Recombiner Cable Hookup" diagrams are incomplete, in that they do not include Cables 104 and 110. The licensee stated emergency operating procedure has been corrected.

- It was noted that references in presently effective emergency operating procedures for LOCA (410P-1HP02, "Containment Hydrogen Control and Hydrogen Purge Exhaust System," and the equivalent 420P-2HP02 AND 430P-3HP02 for Units 2 and 3), that Step 4 incorrectly refers to "the Control alarm cable... (Cable with two terminal lugs on the end)" when, in fact, there are two cables, Nos. 104 and 110, each with two lugs on one end. In Step 5 of these procedures, it states that the cable is to

be inserted through the bushing and lugs terminated per 5.0.1-4. The fact that there are two cables in lieu of one is not addressed. In these three procedures, Step 6 incorrectly refers to verification of terminated lugs as "Step 6.0, 1-4" in lieu of Step 5.0, 1-4. The licensee stated the emergency operating procedure would be revised.

- Some of the cable markings on the jumper cables were quite worn and hard to read. The licensee stated that the cable tags would be reviewed.

- The above comments principally address Recombiner Train A; similar conditions were observed for Train B.

11. Review of Appendix 21, Rev. 0 - SIAS Load Shed Panels

- This appendix is a list of breakers needing to be reset following a safety injection actuation system condition. In Units 1 and 2, the procedure for resetting the individual breakers is permanently posted at each of the breaker locations. These instructions are not present in Unit 3. The licensee stated this would be investigated. The licensee later stated that instructions have been posted in Unit 3.

12. Review of Appendix 28, Rev. 0 - MSIS Check/Reset

- Steps 3 and 3.1 specify use of SG WR level readings, when, in fact, the SG NR values should be used. The licensee agreed this was in error and the appendix has been corrected.

- The Attachment 28-A name for Valve SGA-HS-220 was not consistent with other names. The licensee stated this would be reviewed and the appendix corrected.

- The Attachment 28-B name for Valve SGA-HS-221 was not consistent with other names. The licensee stated this would be reviewed, and the appendix corrected.

13. Review of Appendix 33, Rev. 0 - SG 1 Level Reduction

- Several differences were noted in valve label plate-to-emergency operating procedure name correlation. The majority were valves in emergency operating procedures listed as SC-XXX, while the nameplates depict SCN-XXX. The licensee stated this area was in review or would be reviewed and later stated that the discrepancies had been resolved.

- Step 4 requires operation of 3 manual valves. All three are in a confined area, and SGE-V293, "SGB-UV-500Q BYPASS LINE INLET," is in a particularly hard to reach area. The inspectors observed that a mechanical remote operator might be necessary and operation of these valves in a loss-of-lighting condition would be more difficult. In a casualty where there is significant radioactivity in the steam lines,

radiological protection considerations must be taken prior to operating these manual valves. The licensee stated this would be reviewed and walkdowns would be made following modification completion in Units 1 and 3.

14. Review of Appendix 34, Rev. 0 - SG 2 Level Reduction

- Several differences were noted in valve label plate-to-emergency operating procedure name correlation. The majority are valves in emergency operating procedures listed as SC-XXX, while the nameplates depict SCN-XXX. The licensee stated this area was in review, and the discrepancies had been resolved prior to the end of the inspection period.

15. Review of Appendix 53, Rev. 0 - Align De-energized Buses

- Several differences were observed in circuit breaker control switch-to-emergency operating procedure name correlation. The licensee stated that the discrepancies had been corrected.

16. Review of Appendix 77, Rev. 0 - Align NC to the SFP

- Appendix 77 uses the contingency column incorrectly in that actions for Nuclear Cooling (NC) alignment to Spent Fueling Pool (SFP) Train "A" are listed in the left column, and actions for NC alignment to SFP Train "B" are listed in the right column. The licensee stated this would be reviewed and later stated that the emergency operating procedure had been changed.

17. Review of Appendix 31, Rev. 0 - Local Monitoring of IA Pressure and Emergency Nitrogen Supply

- Appendix 31; 1/4" Nitrogen Supply valves to the SG downcomer isolation valves actuators for SGB-UV130; SGB-UV135; SGA-UV175 and SGA-UV172 did not have label plates. All other components specified for emergency operating procedure appendix usage were labeled. The licensee fabricated and installed label plates for these valves.

- Regarding the nitrogen supply tank (outside), the description in procedure, Attachment to Appendix 31 states, "...GAN-V258 (outside and below LP Cabinet)," when, in fact, the valve is located (outside and behind LP Cabinet). The licensee corrected the attachment.

18. Review of Appendix 60, Rev. 0 - Align DG "A" to PBA-S03

- In Appendix 60, reference is made to PEA-S03B in lieu of the label plate designation of PEA-HS-S03B. The procedure states PBA-SS-S03B in lieu of label plate designation of PEA-SS-S03B (e.g., step 3g). The licensee agreed that this was in error, and the procedure was corrected.

19. Review of Appendix 98, Rev. 0 - Open Doors During Blackout

- With respect to Appendix 98, Smoke Detector 2JQKNAS0475 prevents opening of back panel door to 2J-SHC-CO2 QSPDS Ch 'C' (door does partially open).

In addition to the above deficiencies, the inspectors identified other items for the licensee's review, evaluation, and consideration. All items identified were considered to be of minor significance and would not have precluded a knowledgeable operator from completing the assigned task.