APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Operator Licensing Examination Report: 50-445/OL 90-01

Operating License: NPF-87

Docket: 50-445

Licensee: TU Electric

Facility Name: Comanche Peak Steam Electric Station

Examination at: Comanche Peak Steam Electric Station

Chief Examiner: _____ 12/31/90
S. L. McCrory, Examiner, Operator Licensing Section, Division of Reactor Safety — Date

Approved by: _____ 12/31/90
J. L. Pellet, Chief, Operator Licensing Licensing Section, Division of Reactor Safety — Date

Summary

NRC Administered Examinations Conducted During the Week of November 26, 1990 (Examination Report 50-445/OL 90-01)

NRC administered examinations to one reactor operator (RO) and six senior reactor operator (SRO) applicants. Four of the applicants passed all portions of the examination and have been issued the appropriate licenses. Three SRO applicants failed the written examination only.

The CPSES pass rate, less than 60 percent for this examination, (66 percent since 1983) continues to be a cause for concern to the NRC. In Examination Report 50-445/OL 88-01, poor applicant screening was cited as a contributor to low pass rates. The "back end" screening actions, which resulted in withdrawal of three applications, did not improve the pass rate over previous initial license examinations. Further, performance on the written examination for all applicants was very marginal with an average score of 79 percent. The average passing score was 82 percent, and the average failing score was 75 percent.

This was the first written examination for initial CPSES operator licenses which was composed mostly of multiple choice and matching test items. NRC has observed that written performance results often drop upon initial exposure to an examination of this format. Analysis of these results has caused NRC to conclude that this drop is not the result of the test format itself, but rather it is caused by the increased written examination emphasis on high order cognitive skills. In contrast, operators appear to be trained to respond at the recall level to questions concerning basic knowledge areas, and there is little evidence of reliance on higher cognitive skills. A review of these results, the facility supplied question bank, and the Requalification Examination Report 50-445/OL 89-01 indicate that a similar condition may exist at CPSES.

NRC has concern that some of the facility training staff may have weaknesses in some basic system knowledge and procedural areas. The technical adequacy of the pre-examination review was marginal. Several post examination comments were made which cited technical errors that experienced facility personnel should have identified in the pre-examination review. Further, in the pre-examination review, the reviewers manifested knowledge weaknesses in areas such as the automatic response of the rod control system and of the flow path of the emergency procedures in response to a loss of off-site power without complications. Likewise, most of the applicants missed the questions relating to these areas. Further, applicant performance on several other questions indicated that basic knowledge weaknesses on systems and procedures may be more widespread than the above examples indicated.

Applicant performance on the operating examinations was generally good. However, in the dynamic simulator examinations, communication discipline and effectiveness tended to decrease as activity level increased. Also, during the walk-through portion of the operating examinations, some applicants appeared unaccustomed to having to simulate tasks at the actual controls and indications.

The simulator shortcomings burdened examination administration. The need for several instructor overrides (IOs) for some malfunctions and the inability to preload some component failures presented operators with plant indications and responses which may not reflect actual plant behavior. The generic weaknesses reported in the Simulator Fidelity Report (Examination Report 50-445/OL 88-01) were still evident during this examination. Additionally, the documentation provided to the NRC for scenario development was sometimes incompatible or not current with the actual simulator capability.

It is evident that significant effort has been made to upgrade job performance measures (JPMs) in the area of performance standards. However, JPM followup questions were still at low cognitive levels, and many discriminated at too low a level. Additionally, the JPMs contained numerous interpretive rather than objective cues. Some had open ended initiating cues, which made it difficult for the applicant to know when the desired task had been accomplished.

NRC concludes that, even though the weaknesses noted above do not constitute a safety issue, we are concerned that the changes to the facility training

program in the last 2 years may not have redressed all the causes of poor performance on initial written examinations and that protracted or incomplete upgrades to training materials, test items, and training aids may have had an adverse effect on training.

DETAILS

1. PERSONS EXAMINED

		RO	SRO	Total
Licensee Examinations:	Pass -	1	6	7
	Fail -	0	3	3

2. EXAMINERS

S. L. McCrory, Chief Examiner
A. Lopez
E. Benjamin

3. EXAMINATION REPORT

Performance results for individual candidates are not included in this report because examination reports are placed in the NRC Public Document Room as a matter of course. Individual performance results are not subject to public disclosure.

3.1 Examination Review Comment/Resolution

In general, editorial comments or changes made as a result of facility reviews prior to the examination, during the examination, or subsequent grading reviews are not addressed by this resolution section. This section reflects resolution of substantive comments submitted to the NRC by the facility licensee after the examination. The facility licensee post-examination comments, less the supporting documentation, are included in the report immediately following the master examination key. Unless otherwise indicated in this section, the facility licensee comments were incorporated into the answer key. Where the same question appeared on both examinations, the first number refers to the reactor operator examination.

013/012 No specific recommendation was made for addressing the facility comment. Therefore, the question was not changed. The fact that the multiplier for the average temperature input is zero is not the same as saying there is no temperature input to the rod insertion limit alarm.

016/015 Deleted from the examination because more than two choices were correct.

085/084 Deleted from the examination because none of the choices were correct.

3.2 Site Visit Summary

The facility licensee was provided a copy of the examination and answer key for the purpose of commenting on the examination content validity. The facility licensee was informed that examination results could be expected on or before December 21, 1990, if there were no delays in receiving contractor results.

A working level summary discussion was held with the following persons in attendance:

NRC	FACILITY
S. L. McCrory	J. Walker

The chief examiner reported that no generic weaknesses were observed during the operating examinations. Mr. Walker asked about the general performance of the applicants on the operating examinations and was told that applicants were conversant and responsive. However, no preliminary evaluations could be disclosed. Mr. Walker remarked that his staff believed that about fifteen questions on the written examination required rote memorization and asked for an NRC perspective on memorization. The chief examiner responded that it is not the intent of the NRC to ask memorization questions except for very important knowledge areas that require memorization because of the nature of the knowledge, for example, entry conditions. The Chief Examiner further explained that most of the questions identified as memorization or recall type by facility reviewers could be answered by synthesis of basic system knowledge and general procedural understanding.

The chief examiner concluded the exit by thanking Mr. Walker for the cooperation and responsiveness of his staff throughout the examination process.

3.3 General Comments

3.3.1 Written Examination

3.3.1.1 Performance on the written examination was marginal. The average score on the written examinations was 79 percent with the highest score being 84 percent. The CPSES pass-fail ratio, 57 percent for this examination, (66 percent since 1983) continues to be less than expected. In Examination Report 50-445/OL 88-01, poor applicant screening was cited as a contributor to low pass ratios. For this examination, three applications were withdrawn about two weeks prior to the examination, indicating at least a "back end" effort to screen out applicants with low probabilities of passing the examination.

3.3.1.2 It was noted that this was the first written examination for initial CPSES operator licenses which was composed mostly of multiple choice and matching test items. NRC has observed that written performance results often drop upon initial exposure to an examination of this format. Analysis of these results has caused NRC to conclude that this drop is not the result of the test format itself, but rather it is caused by increased written examination emphasis

on high order cognitive skills. In contrast, operators appear to be trained to respond at the recall level to questions concerning basic knowledge areas, and there is little evidence of reliance on higher cognitive skills. Because of the recall conditioning, operators have difficulty approaching problems which should be answered by synthesis of basic information. Further, because test items are presented in an operational context, such that an answer may be found in a procedure, operators attempt to recall specific procedural requirements rather than synthesizing broader and more basic information to deal with the problem. A review of these results, the facility supplied question bank, and the Requalification Examination Report 50-445/OL 89-01 support the perception of basic knowledge recall emphasis in training and possibly significant weaknesses in basic knowledge areas.

3.3.1.3 The extent and nature of the post examination review comments, technical errors made in the pre-examination review, and analysis of applicant performance on the written examination raise some questions about possible basic knowledge weaknesses in the facility training staff. Most of the post-examination comments were technical in nature and were supported, for the most part, by the material submitted for examination development. The technical errors were such that operationally experienced facility personnel should have identified them in the pre-examination review. Further, in the pre-examination review, the reviewers manifested knowledge weaknesses which were mirrored by the performance of the applicants on the written examination. The reviewers demonstrated a misunderstanding of the automatic response of the rod control system to nuclear instrument failures and of the flow path of the emergency procedures in response to a loss of off-site power without complications. Likewise, most of the applicants missed the questions relating to these areas. Finally, analysis of questions missed by a significant number of applicants, indicated additional examples of weaknesses in basic system and procedure knowledge areas as described below.

3.3.1.4 The following question numbers represent those on which half or more of the applicants scored less than 70 percent of the question value and are provided to assist facility evaluation of training weaknesses. All question numbers refer to the senior reactor operator examination.

7	24	62	73	93
12	30	66	74	
19	44	69	78	
23	54	72	89	

Review of the focus of these questions indicated apparent weaknesses in both basic knowledge areas for systems and procedures and application of higher order cognitive skills.

3.3.2 Operating Examination

3.3.2.1 Performance on the dynamic simulator portion of the operating examination was generally good. However, communication discipline and effectiveness tended to decrease as activity level increased. This contributed to fragmented response by both crews to a loss of CCW concurrent with a reactor trip.

3.3.2.2 The generic weaknesses reported in the Simulator Fidelity Report (Examination Report 50-445/OL 88-01) were still evident during this examination. The need to use several instructor overrides (IOs) for fairly simple malfunctions increased the complexity of scenario administration. Further, the inability to preload some component failures burdened the simulator instructor with having to rapidly activate several instructions consecutively or simultaneously. The documentation provided to the NRC for scenario development was in some cases, misleading or not current with the actual simulator capability. For example, it was not possible to preload the malfunction to prevent automatic start of a CCW pump; this was not evident from the material submitted. This and other similar cases resulted in scenario revisions on site which could have been avoided.

3.3.2.3 On the walk-through portion of the operating examinations, it was apparent that some applicants were not accustomed to having to simulate tasks at the actual controls and indications. They frequently asked for plant information rather than indicating which instruments they would read and allowing the examiner to give a cue at that time. Some had to be reminded more than once to indicate the instruments and controls that would be used during the performance of the task.

3.3.2.4 It was evident that the JPM performance standards have been improved since the July 1989, requalification examinations. However, JPM questions continued to be mostly recall and "look-up" in nature. Additionally, the JPMs contained numerous interpretive rather than objective cues. There were several instances when the cue following a valve, breaker, or pump operation, in effect, read "the valve (breaker) is open" or "the pump is running." In actual operation, the operator is not told the status of such components but rather, determines it by observing control and instrument indications. Cues should indicate the status of those control indications or instruments which are used by the operator to determine the condition of a system or component. Some of the JPMs had open ended initiating cues which made it difficult for the applicant to know when the desired task had been accomplished. For example, the initiating cue for JPM 0085, Load Diesel Generator, tells the operator that an operating test procedure (OPT) is in progress with a diesel generator ready for loading. The operator is instructed to "continue the test." The intend of the JPM is to assess the operator's ability to parallel and load a diesel generator. However, the OPT continues through unloading and securing the diesel generator. Initiating cues should be explicit enough that a competent operator can determine when the desired task has been accomplished without further prompting from the examiner. These same weaknesses were noticed by NRC examiners during the requalification examinations in July 1989.

3.3.3 Conclusion

We conclude that these weaknesses do not constitute a safety issue. However, we are concerned that the changes to the facility training program over the last 24 months may not have redressed all the causes of poor performance on initial written examinations and that protracted or incomplete upgrades to training materials, test items, and training aids may have had an adverse effect on training.

3.4 Master Examination and Answer Key

A master copy of the CPSES license examination and answer key is attached. The facility licensee comments which have been accepted are incorporated into the answer key.

3.5 Facility Examinat on Review Comments

The facility licensee comments regarding the written examination are attached. Those comments not acceptable for incorporation into the examination answer key were addressed in the resolution section of this report.

3.6 Simulation Facility Fidelity Report

All items on the attached Fidelity Report have been brought to the attention of the facility for corrective action as appropriate.

SIMULATION FACILITY FIDELITY REPORT

Facility Licensee: TU Electric

Facility Licensee Docket No.: 50-445

Facility License No.: NPF-87

Operating Tests Administered at: Comanche Peak Steam Electric Station

Operating Tests given on: November 27-29, 1990

During the conduct of the simulator portion of the operating tests identified above, the following apparent performance and/or human factors discrepancies were observed:

The need to use instructor overrides (IOs) for fairly simple malfunctions increased the complexity of scenario administration. Further, the inability to preload some component failures burdened the simulator instructor with having to activate rapidly several instructions consecutively or simultaneously. This presented operators with plant indications and responses which may not reflect actual plant performance. The following are examples of situations encountered during this examination:

1. The inverter trouble alarm which would accompany a loss of a protection bus had to be inserted by IO sequentially to the loss of bus malfunction. In both cases the alarm was received with a significant interval before the loss of the bus.

2. Several IOs were necessary to prevent the operator from being able to trip a RCP from the control board.

3. It was not possible to preload the malfunction to prevent automatic start of a CCW pump. The pump had to be tripped after auto start.

4. A channel of rod position indication could not be failed (indication for only one rod can be failed).