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SAVANNAH RIVER RESTART
PEER EVALUATION PROGRAM
EXAMINATION REPORT

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SUMMARY

During the period of August 13, 1990 through September 14, 1990 the Savannah River Peer Evaluation Program was administered to forty-eight certified Central Control Room Operators and Supervisors assigned to the K Reactor, on the Savannah River Site (SRS). This examination was conducted in response to recommendations made by the Defense Nuclear Facilities Safety Board.

The examination process was administered by Westinghouse-Savannah River Company (WSRC) and evaluated in parallel by WSRC Peer Evaluators and Training Evaluators from Department of Energy (DOE). A detailed discussion of the examination development and administration methodology is provided in Appendices A and B.

The examination results were as follows: of the 48 certified operators and supervisors who took the examination, 28 passed the DOE evaluations and 20 failed (note: WSRC Peer Evaluators failed 4 additional individuals which is discussed in Section 2); of the 5 crews who took the simulator examination, 3 passed and 2 failed. These results are comparable to those experienced by commercial nuclear reactors during the initial examination using this format. Reevaluation of failed individuals and crews is presently scheduled for the October/November, 1990 time period. A detailed report of examination results is provided in Section 2.

A post-examination data base was established to identify specific areas of strength and weakness. The results of the data base analysis are provided in Section 3.

General observations made by the DOE evaluation team are provided in Section 4. Major areas noted for improvement were:

- Understanding of fundamental processes, reactor principles, electrical theory, and integrated plant response,
- Procedural adequacy and procedural compliance,
- Crew communications and command/control,
- The integration of the Shift Technical Engineers' role in the Central Control Room, and

- The Shift Technical Engineers ability to exercise crew "command & control".

The examination process used at the Savannah River Site is valid in both process and content. It is comparable to and consistent with a Nuclear Regulatory Commission (NRC) requalification examination used for relicensing commercial nuclear utility operators.

Conclusions drawn by the DOE Evaluators from the Peer Evaluation Program are as follows:

- Significant improvement was noted in individual and crew performance,
- Generic and individual weaknesses have been identified,
- An appropriate plan for remediation of generic and individual weaknesses is required, and
- Training of all crews is progressing towards restart.

Prior to K reactor restart, the following issues should be resolved to further ensure safety: minimum crew staffing should be achieved, and areas of generic weakness should be incorporated into operator continuing training programs.

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SECTION 1

PROGRAM OBJECTIVE/OVERVIEW

The objective of the Peer Evaluation program is to determine the readiness of the certified Central Control Room Supervisors (CCRSs) and Central Control Room Operators (CCROs) at the K Reactor, located on the Savannah River Site (SRS), to safely conduct restart and power operations following an extended shutdown.

The commitment to conduct the assessment was established in the Department of Energy (DOE) response to recommendations from the Defense Nuclear Facilities Safety Board. The specific response states:

"Prior to restart, DOE and Westinghouse will jointly conduct comprehensive evaluations of certified supervisors and senior reactor operators to ensure that they can demonstrate the appropriate knowledge and abilities required for safe restart. The examinations are intended to be conducted in August, 1990 in order to allow for proper development of the examinations and for completion of recent enhancements to the training program."

Initial examinations of five operating crews were conducted from August 13 through September 14, 1990. The examinations were jointly administered and independently evaluated by Peer Evaluators from SRS and a team of DOE Evaluators. The Westinghouse Peer Evaluators are certified supervisors or instructors at SRS who are trained in the requalification examination process. The DOE Evaluators are Nuclear Regulatory Commission (NRC) license examiners who are trained on K reactor systems and procedures. The examination program is modeled after the requalification examination program currently being conducted jointly by the NRC and licensed facilities at commercial nuclear power plants. A detailed explanation of the development of the program and the training of the evaluators is provided in Appendix A. A detailed description of the examination administration is provided in Appendix B.

This report provides a description of the examination administration phase, the examination results, an analysis of the examination results (to identify generic strengths and weaknesses), and general observations noted by the DOE examination team.

Further testing is presently scheduled for the October/November time frame for individuals and crews that demonstrated unsatisfactory performance. Additional testing for approximately 12 presently certified supervisors who will be tested at the (CCRO) level and will hold the CCRO level of certification at restart will be conducted at a later date. Newly certified personnel may be examined at that time as well.

SECTION 2

EXAMINATION RESULTS

During the five weeks of examination a total of five crews comprising forty-eight certified operators and supervisors were examined. The breakdown on certification level is; 27 Central Control Room Operators (CCROs), 15 Control Room Supervisors (CCRSs), and 6 Shift Technical Engineers (STEs).

The overall results are as follows: of the 48 certified operators who took the examination, 20 operators failed the individual examination; of the 5 crews who took the simulator examination, 2 crews failed. A breakdown of the examination results is as follows:

<u>OVERALL RESTART EXAM RESULTS</u>			
	PASS	FAIL	TOTAL

OVERALL RESULTS (Test Population)	58% (28)	42% (20)	100% (48)
=====			
WRITTEN EXAM (Test Population)	77% (37)	23% (11)	100% (48)
IN-PLANT JPMS (Test Population)	85% (41)	15% (7)	100% (48)
SIMULATOR			
INDIVIDUALS (Test Population)	79% (38)	21% (10)*	100% (48)
CREWS (Test Population)	60% (3)	40% (2)	100% (5)

* WSRC failed 4 additional individuals

=====

A certified operator had to successfully pass all three sections of the examination to achieve an overall passing score on the examination. In the event that the individual failed to pass one or more sections, that person would be required to be remediated and retested in only the failed areas.

Each section of the examination tested different facets of the universe of knowledge and abilities that are necessary for safe and competent operation. The written section of the exam primarily tested mastery of knowledge. The in-plant section primarily tested the ability to perform safety-significant plant operations on an individual basis. The simulator section tested the individual's ability to function as part of a composite crew.

The failure of a crew in the simulator section did not require that all the individual members of the crew correspondingly failed the simulator section of the exam. The individuals failed the simulator section only if they failed to perform the individual simulator critical tasks (ISCTs) during the scenario. ISCTs are considered to be so important to plant safety that the safe, competent operator must demonstrate absolute mastery (i.e., 100% satisfactory performance of each task). A detailed breakdown of the examination results may be found in Table 2-1.

If a crew was determined to have performed unsatisfactorily during the simulator examination, either by crew ISCTs or crew competencies, the crew would be required to be remediated and retested via a crew simulator examination prior to restart.

As noted earlier, the examination was independently evaluated by Westinghouse and DOE. There were five discrepancies on pass/fail decisions between the WSRC Peer Evaluators and the DOE evaluators during the examination period. Four discrepancies were on individual pass/fail decisions during the simulator examination. In each case, the WSRC Peer Evaluators failed the individual while the DOE evaluators arrived at a passing decision. Within the commercial nuclear industry it is desirable that, during the performance of requalification examinations, facility standards be more restrictive than NRC standards. A programmatic concern about the facility's ability to make pass/fail decisions is raised if the NRC evaluators are failing individuals that the facility is passing. In this examination, the facility was more restrictive on all overall pass/fail decisions for the operators. There was only one JPM, for one individual, that the facility graded as satisfactory that the DOE evaluator graded as unsatisfactory. In this case, this discrepancy did not affect the overall pass/fail decision for the individual.

The examination adequately tested the knowledge and abilities that were considered important for restart in the Savannah River K/A Catalog. Random statistical sampling of the 750 restart K/As ensured that the exam results may be extrapolated from the K/As actually tested to the complete set of relevant knowledge and abilities. Coverage achieved by the exams equalled or exceeded the coverage that is typically achieved by NRC requalification examinations at nuclear utilities.

A detailed analysis of the examination results is provided in Section 3 of this report.

TABLE 2-1
OVERALL RESTART EXAMINATION RESULTS SUMMARY

<u>EXAMINATION TYPE</u>	<u>#PASSED/#TOOK EXAM</u>	<u>%PASSED</u>	<u>AVERAGE SCORE</u>
WRITTEN-CCRO	22/27	82%	83.6%
WRITTEN-CCRS	9/15	60%	83.5%
WRITTEN-STE	6/6	100%	88.5%
WRITTEN-ALL	37/48	77%	85.2%
NOTE: PASSING SCORE IS 80% OR GREATER			
JPM-CCRO	22/27	82%	85.6%
JPM-CCRS	13/15	87%	87.3%
JPM-STE	6/6	100%	86.7%
JPM-ALL	41/48	85%	86.5%
NOTE: PASSING SCORE IS 80% OR GREATER			
SIMULATOR-CCRO	21/27*	78%	NA
SIMULATOR-CCRS	13/15**	87%	NA
SIMULATOR-STE	4/6	67%	NA
SIMULATOR-ALL	38/48***	79%	NA
NOTE: PASSING SCORE BY POSITION IS BASED ON ISCTs			
SIMULATOR-CREW	4/5	80%	NA
NOTE: PASSING SCORE FOR CREW IS BASED ON ISCTs			
SIMULATOR-CREW	4/5	80%	NA
NOTE: PASSING SCORE FOR CREW IS BASED ON CREW COMPETENCIES			
* WSRC passed 18/27 CCROs			
** WSRC passed 12/15 CCRSSs			
*** WSRC passed 35/48 in the simulator examination			

SECTION 3

ANALYSIS OF EXAMINATION RESULTS

Following the examination period, a data base was established to provide in-depth analysis of the examination results for all forty-eight certified operators. This section provides the findings generated during the analysis of examination results.

3.1 WRITTEN EXAMINATION

All of the written examination questions that were asked on the examination (239) were reviewed and analyzed. The following categories were tabulated to support the analysis: (1) total number of individuals who answered the question, (2) total number of correct responses, (3) total number of incorrect responses, and (4) percentage of individuals who correctly answered the question.

With allowance made for questions with an inadequate sample size, a total of 58 questions (24% of the questions administered) on the written examination had an average passing rate of less than 80%. A summary of those questions is provided in Table 3-1.

An analysis was performed on total operator response per Plant System, Emergency Plant Evolution, or Plant Wide Generics. Those categories that resulted in less than 80% overall passing rate were:

- Emergency Electrical Power System,
- Cooling Water Gamma Monitoring System,
- Disassembly Basin and Disassembly Basin Cooling and Filtration System,
- High Off-Site Release Rate,
- Control Room Abandonment,
- Partial or Complete Loss of AC Power, and
- Inadvertent Reactivity Addition.

Four of the seven areas of weakness were in Emergency Plant Evolutions.

An analysis was performed by reviewing total crew performance on the knowledge headers (K1 through K6), the ability headers (A1 through A4), and the generic knowledge/abilities for the 32 reactor plant systems. Those headers that had a total passing rate of less than 80% were:

- K4- Knowledge of system's design feature(s) and/or interlocks which provide for the following:
- G6- Knowledge of bases in technical specifications for limiting conditions for operation and safety limits,
- G9- Ability to locate and operate components, including local controls.

The analysis of total crew performance on the written examination for Emergency Plant Evolution questions (by the knowledge, ability, and generic headers) revealed the following areas of less than satisfactory performance:

- A2- Ability to determine and/or interpret the following as they apply to the specific Emergency Plant Evolution,
- G3- Knowledge of limiting conditions for operations and safety limits,
- G8- Ability to recognize indications for system operating parameters which are entry-level conditions for Technical Specifications, and
- G11- Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for abnormal condition control procedures.

There were no specific areas of weakness noted in Plant Wide Generics.

It is significant to note that 3 of the 7 general areas of weakness noted in plant systems and Emergency Plant Evolutions are related to the ability to accurately use Technical Specifications.

3.2 JOB PERFORMANCE MEASURES

During the performance of the examination, a total of 80 unique Job Performance Measures (JPMs) were administered. A JPM comprises a safety significant task that is evaluated by observing operator performance either in the simulator or in the plant. Nineteen JPMs (24% of the JPMs administered)

were performed at less than an eighty per cent success rate. The list of these JPMs is provided in Table 3-2. Table 3-2 also lists the certified operator level (CCRO, CCRS, or STE) that is authorized to perform the task. Tasks normally assigned to CCROs were also tested on the CCRS and STE level, since these positions could be expected to supervise the performance of these tasks. CCROs were not required to perform tasks normally assigned to the CCRS or STE positions.

Results indicate that the CCRS/STEs failed a disproportionate number of JPMs. Nine of the 19 JPMs that were performed unsatisfactorily were specific to the CCRS/STE position. Further, there were only 25 JPMs administered during the five weeks that were specific to the supervisory positions. General areas of weakness for the supervisory positions were the bypassing of safety circuits (3 JPMs) and Technical Specification interpretation (3 JPMs).

A generic area of weakness across all certified positions was the ability to perform tasks requiring calculations. Five of the 19 JPMs were limit calculations.

3.3 SIMULATOR EXAMINATION

An analysis was performed on crew competencies compiled from the simulator examination. Each crew competency has three or four major subheadings. Each sub-heading has a one-to-three grading scale (three being the high score). The following competencies, with major sub-headings, had an overall rating of less than satisfactory:

- COMPLIANCE/USE OF PROCEDURES AND TECHNICAL SPECIFICATIONS, SECTION B, "Correctly implement procedures, including following procedural steps in correct sequence, abiding by cautions and limitations, selecting correct paths on decision blocks, and correctly transitioning between procedures.
- DIAGNOSIS OF EVENTS/CONDITIONS BASED ON SIGNALS/READINGS, SECTION A, "Recognize off-normal trends/status"
- DIAGNOSIS OF EVENTS/CONDITIONS BASED ON SIGNALS/READINGS, SECTION C, "Correctly diagnose plant conditions based on those control room indications"

- UNDERSTANDING/INTERPRETATION OF ANNUNCIATORS/ALARM SIGNALS, SECTION B, "Correctly interpret the meaning and significance of alarms and annunciators (including the use of procedures.)"

The full report on crew competencies is provided in Table 3-3.

An analysis of Individual Simulator Critical Tasks (ISCfs) revealed the following general areas of weakness:

- Nuclear Console Operators' ability to maintain control of reactor power level and flux distribution while correcting Roof Top Ratio (flux Tilt) problems,
- STEs' ability to correctly determine Emergency Action Level (EAL) event classifications,
- Operators'/crews' ability to operate the Electrical Distribution Control Panel correctly and in a timely manner,
- Supervisors' ability to maintain overall control of crew response during events and to provide proper oversight of off-site communications (EAL declarations), and
- Supervisors' ability to properly transition to higher priority ACCs (Abnormal Condition Control Procedures) during an event.

TABLE 3-1

WRITTEN EXAMINATION-QUESTIONS WITH LESS THAN
OVERALL SATISFACTORY RESULTS

K/A	QUESTION SUMMARY
105K6.04	Design performance of breakers in the Emergency electrical Power system
107K5.01	Fuel assembly decay heat as it applies to the Process Room Spray system
201K2.05	Interrelationship between rod drive system and ATWS
203K3.06	Reason for activating Confinement Heat Removal during a fuel failure
204K1.02	Knowledge of thermal limits as they apply to a loss of Core flow circulation
205A2.04	Determine plant shutdown requirements as a result of a loss of blanket gas
203K2.07	Interrelationship between ECS and fuel failure
202K2.07	Interrelationship between reactor power and an inadvertent reactivity addition
105G.009	Ability to locate controls associated with Emergency Electrical power
104K4.04	Interlocks between Confinement system (AACS) and damper alignment during incident action
108A1.06	Ability to predict changes in disassembly basin level as affected by Confinement Heat Removal
123K4.01	Design features/interlocks between a failed PWS tube and the Cooling Water Gamma Monitoring system
201K1.07	Operational implications of an uncontrolled reactivity excursion causing an ATWS
202A2.03	Ability to determine the cause of an inadvertent reactivity excursion
201G.003	Knowledge of LCOs associated with an ATWS
210A1.05	Ability to monitor reactor power, tank level, and assembly temperature during a loss of AC power
101K1.01	Knowledge of the cause-effect relationship between Nuclear Instrumentation and the Scram system
204A1.08	Ability to operate or monitor ECS during a loss of Forced circulation
104K4.05	Knowledge of damper interlocks in the Airborne Activity Confinement System
105G.006	Knowledge of Tech Spec bases for LCOs associated with Emergency Electrical power
205A2.04	Ability to determine conditions requiring plant shutdown during a loss of blanket gas
001A1.05	Ability to make accurate, clear, and concise verbal reports

TABLE 3-1 (CONT'D))
WRITTEN EXAMINATION-QUESTIONS WITH LESS THAN
OVERALL SATISFACTORY RESULTS

K/A	QUESTION SUMMARY
109A1.03	Ability to predict or monitor changes in Bulk Moderator temperature
105K3.01	Knowledge of the effects of a loss of Emergency Electrical Power has on the ECS pumps
201A1.02	Ability to operate the Automatic Backup Shutdown system during an ATWS
207K2.05	Interrelationship between Stack Activity Monitoring system and a High Off-Site Release
001K1.03	Knowledge of radiation protection standards
102K6.06	Knowledge of the effects of an explosive valve malfunction in the SSS system
108A4.01	Ability to manually operate or monitor actuation valves in the Confinement Heat Removal system
202K2.02	Interrelationship between Fuel Thermal Limits and an inadvertent reactivity addition
203K3.02	Reason for a reactor Scram during a fuel failure
204A1.08	Ability to operate or monitor ECS during a loss of forced circulation
001A1.01	Ability to obtain or verify the latest revision
101G.004	Knowledge of Reactor Scram system purpose/function
205K1.02	Relationship between blanket gas pressure, assembly flow core cooling and steam formation in the reactor tank during a loss of blanket gas
206A2.06	Ability to determine leak location during a reactor tank low water level
207A1.01	Ability to operate and/or monitor the Airborne Activity Confinement System during a High Off-Site release
001A1.02	Ability to execute procedural steps
202G.008	Ability to recognize entry level conditions for Tech Specs due to inadvertent Reactivity Addition
109A4.03	Ability to recognize and correct saturation conditions in the PWS system
114K1.01	Knowledge of the cause-effect relationship between safety related AC systems and the Graphics Panel
208K2.01	Interrelationship between fission counters and a Charge/Discharge event
118K1.08	Knowledge of the cause-effect relationship between the Airborne Activity Confinement System and the Stack Air Activity Monitoring system

TABLE 3-1 (CONT'D)
WRITTEN EXAMINATION-QUESTIONS WITH LESS THAN
OVERALL SATISFACTORY RESULTS

K/A	QUESTION SUMMARY
210K2.07	Knowledge of the relationship between load shedding and a Loss of AC Power
001K1.05	Knowledge of plant security requirements
202K1.09	Knowledge of the operational implications of a charge/discharge error an inadvertent reactivity addition
204K3.04	Knowledge of reactor scram signals on a loss of forced circulation
001K1.06	Knowledge of safety procedures related to rotating equipment
114K2.05	Knowledge of electrical power supply to the Safety Computer
201K3.05	Knowledge of the reason for maintaining CWS flow during an ATWS
204G.011	Ability to recognize indications for entry into the ACCs during a loss of forced circulation
001K1.02	Knowledge of lock, tag, and try procedure
208A2.05	Ability to make an EAL declaration as a result of a charge/discharge event
129K3.12	Knowledge of the effects of a loss of the Disassembly Basin Cooling and Filtration system has on basin water level
207A2.05	Ability to interpret meteorological data during a High Off-Site release
205G.011	Ability too recognize indications for entry into the ACCs during a loss of blanket gas
108K3.01	Knowledge of the effect of a loss or malfunction of the Airborne activity Confinement system exhaust temperature has on the Confinement Heat Removal system
201G0.04	Knowledge of bases in Tech Specs for LCOs associated with an ATWS condition

TABLE 3-2
SUMMARY OF JPMs WITH AVERAGE SUCCESS RATE OF <80%

JPM#	JPM TITLE	POSITION
101A211	Respond to PW-305	ALL
101A403	Bypass Power Density Monitor	CCRS/STE
101A403	Bypass Safety Computer	CCRS/STE
101A403	Bypass Control Computer	CCRS/STE
102A103	Reducing SSS Storage Tank Pressure	ALL
103G111	ECS Tech Spec	CCRS/STE
104G111	AACS Tech Spec	CCRS/STE
105A201	Manual start of GM	CCRS/STE
108A401	Leakage into sump	ALL
109G112	PW system Tech Spec	CCRS/STE
111A101	Calculate ECP	STE
111G112	TPL Calculation	ALL
111G113	CPL Limit Calculation	ALL
111G11	Technical Limit Calculation	ALL
118A202	Calculate instantaneous D20 leak rate	CCRS/STE
131A202	Calculate T-Weld stress	ALL
209G21	Control Room Abandonment	CCRS/STE

TABLE 3-3
CREW COMPETENCY ANALYSIS

Competency Areas	Distribution of Scores			Average Score
	Number of Crews Achieving:			
	1.0	2.0	3.0	

UNDERSTANDING ALARMS				
Notice and Acknowledge	0	2	3	2.6
Interpret Significance	0	1	4	2.8
Verify Plant Conditions	0	2	3	2.6
DIAGNOSIS OF EVENTS				
Recognize Trends	1	4	0	1.8
Use of Information	0	2	3	2.6
Diagnose Conditions	3	2	0	1.4
PROCEDURES & TECH SPECS				
Refer to Procedures	0	3	2	2.4
Implement Procedures	4	1	0	1.2
Recognize Entry MC-2/MC-3	0	1	4	2.8
Tech Spec Compliance	0	1	3	2.7
CONTROL BOARD OPERATIONS				
Locate Controls	0	0	5	3.0
Manipulate Controls	0	2	3	2.6
Take Manual Control	0	2	3	2.6
COMMUNICATIONS				
Exchange Information	0	5	0	2.0
Interact with Others	0	2	3	2.6
Team Decision Making	1	3	1	2.0
UNDERSTANDING PLANT RESPONSE				
Interpret Indications	1	2	2	2.2
Understanding Operations	2	2	1	1.8
Effect of Actions on Plant	2	1	2	2.0

SECTION 4

GENERAL OBSERVATIONS

During each week of the assessments, the DOE Evaluators prepared a summary of general observations, which address both the strengths and weaknesses that were observed during the week. This section provides a synopsis of those observations.

4.1 STRENGTHS

The following strengths were observed during the five weeks of examinations:

1. During one week's simulator examination, two Control Room Supervisors exhibited excellent command and control skills. As a result, the crews functioned effectively as a team under these supervisors.
2. The DOE Evaluators were highly impressed with the quality of the Westinghouse Peer Evaluators. The Peer Evaluators performed the examinations professionally and evaluated the examination results objectively. The Peer Evaluators were as good, if not better, than most commercial utility "Peer Evaluators." The Westinghouse Peer Evaluators generally held the operators to more conservative standards when occasional disagreements in pass-fail judgements occurred between the DOE Evaluators and the Peer Evaluators.
3. On August 16, 1990 two DOE Evaluators were in the K Reactor CCR when a momentary power loss occurred. The crew did a good job responding to the incident. The crew pursued outside information, and it was observed that operators systematically walked down the control boards to determine overall plant status. The crew assimilated an impressive amount of relevant information in a short period of time, and did a creditable job analyzing the overall plant event. The total crew response appeared to be calmer and more systematic than has been typically observed during past simulator scenarios.
4. In general, the operating crews accepted their redefined responsibilities in a professional manner and seemed genuinely receptive to the new "safety culture" that is being implemented at Savannah River.

4.2 WEAKNESS

The following weaknesses were observed:

1. The operators have a generally poor understanding of electrical systems, electrical theory, and in particular, the operation of three phase AC electrical circuits.
2. The operators are generally unfamiliar with the expected "normal" or acceptable values for many process systems.
3. The operators are unfamiliar with the location of various system components and indications outside the Central Control Room. Once the operators locate the equipment, they are often unable to properly interpret the indications they observe.
4. During plant walk-throughs, numerous deficiencies were noted in plant radiological control practices. Examples include:
 - a) failure to properly perform whole body frisks;
 - b) failure to take appropriate actions upon receiving a Personnel Contamination Monitor (PCM) alarm; and
 - c) failure to take the proper response to a disassembly basin high radiation alarm.
5. Operators demonstrated a general inability to perform routine control room calculations. The difficulties were demonstrated in three areas:
 - a) poor mathematical skills;
 - b) an inability to locate required data points that are necessary inputs to the calculations; and
 - c) lack of understanding in the purpose of the calculations, which results in the inability to evaluate the correctness of the calculated results.
6. Several console operators failed to demonstrate the ability to control reactor power or flux under any condition other than steady state operation. They routinely shimmed the incorrect rod gang when attempting to correct an out of specification rod top ratio and disregarded gang PAD when adjusting reactor power. Some operators possess an inadequate understanding of reactor theory and kinetics, reactivity monitoring systems, and reactivity control systems as demonstrated by their actions and responses to follow-up questions. Many console operators lack the experience on either the actual plant or the simulator to fully comprehend the relationship between rod shims and reactor power/flux response.

7. WSRC management is not screening unqualified operators from the examination process.
8. The operating staff has a weak understanding of fundamental processes and the application of those principles to integrated plant response. This lack of understanding reflects itself in numerous ways:
 - a) operators do not effectively anticipate the effects of their actions on plant systems and monitor meter response during plant status changes;
 - b) operators routinely receive or give data without an analysis of the acceptability or appropriateness of the information being reported;
 - c) operators are reactive to plant status as driven by plant annunciators vice proactive in anticipating plant response or potential problems;
 - d) operators are weak in diagnostic skills;
 - e) operators perform procedures on a rote, vice informed, basis which results in numerous errors; and
 - f) operators are unable to make an informed decision when faced with a procedural ambiguity.
9. Several observations were made concerning procedures and procedural compliance.
 - a) Procedures are cumbersome and confusing from a clarity and human factors standpoint.
 - b) Operators are generally weak in procedures having multiple decision points, branches, or if/then statements.
 - c) The operators inadequately preview procedures in order to better anticipate the results of their actions.
 - d) Procedural compliance and departure guidelines which would provide more definitive guidance to operators on procedural compliance and allowed deviations are not established.
 - e) The SRS administrative procedures for revising DPSOLs do not include measures to assure operator familiarity with revised procedures, and when appropriate, training on the basis for the revisions.
10. Many CCROs are unable to operate the plant safety and control computers, including peripheral equipment.
11. The Shift Technical Engineers (STEs) lack operational experience in the decision making and command & control aspects as Control Room Supervisor. Many of the STEs demonstrated difficulty in analyzing overall plant

status and formulating a plan of action based on this assessment. The STE role (providing independent oversight of plant conditions) is not well integrated into the present conduct of operations. Few crews utilized the STE effectively in providing independent assessment and diagnosis.

12. Emergency Action Level (EAL) declarations during plant events are not always based on the most severe conditions that existed. Classifications were normally based on the conditions existing at the time the classification was made and did not consider the more severe conditions that may have previously existed.
13. Several observations were made on crew communications.
 - a) Briefings of assist personnel as they report to the Central Control Room are often insufficient to provide them with an adequate understanding of plant conditions and mitigation strategies in progress.
 - b) Control Room Supervisors do not brief the crews frequently enough or provide sufficient detail to keep the crew informed of overall plant status and mitigation strategy.
 - c) Directed messages (e.g., CRS to Graphics Panel Operator) are not consistently acknowledged to ensure that messages are received.
 - d) Precision of communications tends to degrade during high stress situations. This adds an additional element of confusion.
 - e) Operators are not cognizant of the overall importance of their reports so that high priority messages are being delayed by low priority (informational) messages.

SECTION 5

ONGOING SUPPORT ACTIVITIES

Prior to K reactor restart, the DOE evaluation team will work with WSRC to improve operator safety. Activities presently scheduled to support this objective include:

- Retesting of operators/crews who failed the initial examination,
- Testing of operators who are presently going through initial certification,
- Testing of a special class of presently certified Central Control Room Supervisors who will be tested at the Central Control Room Operator level and hold that position during restart,
- Evaluation of WSRC responses to this report and other activities that impact operator performance as appropriate. Activities to support this objective could entail additional operator testing, evaluation of classroom/simulator training, and/or evaluation of in-plant crew performance prior to or during startup.

Long term activities include the application of this process to the restart effort at the L and P reactor sites. Scheduling activities for these projects has not been finalized.

APPENDIX A

PROGRAM DEVELOPMENT PHASE

This appendix provides a detailed discussion of the overall program development process. The purpose of the discussion is to provide the background information that is required to understand the development of content-valid examinations, the basis for the program standards, and the development of Peer Evaluation qualification standards. Specific areas addressed in the appendix include:

- Program Standards Development

- Content-Valid Examination Development Process

- Peer Evaluator Training

- DOE Evaluator Training

A.1 PROGRAM STANDARDS DEVELOPMENT

The overall goals of the development process were to develop an examination process that was: (1) valid in content, (2) relevant to the safety significant knowledge and abilities of the certified operators, and (3) capable of providing credibility because of similarities in the process used at SRS and the commercial nuclear industry.

The basic model selected for program development was the requalification program that is used by the NRC for licensed operators at commercial nuclear facilities, as defined in NUREG 1021, Operator Licensing Examiner Standards, Revision 5. This model was selected because the requalification section of NUREG 1021 (ES-601) was deemed to be the most appropriate model for evaluating operator knowledge and abilities prior to restart. It emphasizes performance-based evaluations utilizing objective performance measures in lieu of the traditional oral questioning method. The validity of the examination material is tied directly to an analysis of the job requirements. Finally, the objectivity of the format lends itself to parallel evaluations.

A draft of the Peer Evaluator Standard was developed by DOE evaluators. The draft was reviewed by both DOE and Westinghouse management and revised based on their comments. Subsequently, the Peer Evaluator Standard was jointly approved by DOE and WSRC management.

The examination process administered at SRS is consistent with the process used at commercial nuclear utilities to requalify nuclear power plant operators. In particular, areas in which there are no significant differences between NUREG 1021 and the Peer Evaluator Standard include:

- The passing criteria for all examination aspects (written, JPM, and Simulator examinations) are the same.
- Simulator and JPM examination formats, complexity, and number of examinations required are similar.
- Examination forms used at SRS meet commercial nuclear utility standards for format and required elements.
- The evaluation teams (DOE and Peer) meet the knowledge, experience, and training requirements specified in NUREG 1021.
- The examination structure, sequencing, and administration requirements are as specified in NUREG 1021.
- Similar to NRC written examinations, the Peer Evaluator Standard required that a sample plan be prepared for each written examination.

A summary of significant differences between NUREG 1021 and the Peer Evaluator Standard includes:

- NUREG 1021 utilizes an open reference examination (~ 2 hours) and a static simulator written examination (~ 2 hours). The static written examination was not included in the Peer Evaluator Standard. This type of examination requires extensive training of the operators on examination format and time was not available to provide this training. In lieu of a static simulator written examination, a 4 hour open reference examination was administered. The examination used preestablished criteria for the percentages of questions requiring answers from memory, questions requiring reference material, and questions requiring the operator to synthesize multiple elements to obtain the correct answer.
- NUREG 1021 requires that at the completion of each Job Performance Measure (JPM) the operator must answer two oral, open reference questions. The open reference question portion of the examination was

not included within the Peer Evaluator Standard. The bases for making this exclusion were:

- the written examination standard for SRS significantly exceeds the requirements of NUREG 1021,
 - inclusion of questions would significantly lengthen the examination time,
 - inclusion of questions would increase operator stress due to scheduling difficulties, and
 - oral questioning does not support a performance-based testing methodology.
- NUREG 1021 was designed not only to relicense operating personnel at commercial nuclear utilities, but also to certify the facility as being capable of maintaining adequate standards of performance during internal evaluations. This "Programmatic" evaluation of the facility is an integral part of the NRC regulatory process. The process for programmatic evaluation of the operator training program was not included in the Peer Evaluator Standards since there is no regulatory basis for determining program acceptability.

A.2 CONTENT-VALID EXAMINATION DEVELOPMENT PROCESS

Establishing a performance-based examination process presented a significant departure from established training and evaluation methods at SRS. The significance of this task should not be underestimated. Many obstacles had to be overcome in order to develop the program. The establishment of a performance-based evaluation methodology took approximately five years in the commercial nuclear utility industry, while at SRS this task had to be completed in less than five months. The training department and operating staff had to quickly adjust to a new format of testing and evaluation. No Job and Task Analysis from which to identify the required skills and knowledge base for certified operators existed. Resources to develop examination material were limited by the quantity and quality of the material and manpower availability.

The initial major step in developing the examination model was to establish the knowledge and skill requirements for the certified operators. Traditionally in commercial nuclear power plants, this step is performed by conducting a Job and Task Analysis (JTA) and using the JTA to establish the

critical knowledge and skill requirements for the operating positions. With no JTA available, the approach taken at SRS utilized the "Knowledge and Abilities Catalog for Nuclear Power Plant Operators for Boiling Water Reactors", NUREG-1123, as the reference for developing an SRS specific knowledge/abilities (K/A) catalog.

The NRC K/A catalog is the document used by NRC examiners to establish safety significant knowledge and abilities. The major point of deviation between a JTA and a K/A catalog is that the JTA determines the full scope of knowledge and abilities necessary to perform a job (taking into account frequency, difficulty, and safety importance), while a K/A catalog takes into account only knowledge and abilities that are safety-related. Given that the objective of the task is to determine the readiness of the operators to "safely" operate the reactor systems, it was determined that the K/A catalog provided a high degree of validity in meeting the task objective.

Utilizing SRS training material and input from subject matter experts, the DOE Evaluators developed the draft K/A catalog. Following initial development of the K/A catalog by the DOE Evaluators, the catalog was validated by a task force of Westinghouse subject matter experts from Operations and Training.

Thirty-two reactor plant systems and ten Emergency Plant Evolutions having safety significance were identified. Additionally, 28 knowledge and abilities were identified as generic to all SRS production reactors and were grouped under the heading of "Plant-Wide Generics". The validated catalog became the basis for the development of all examination material.

Each reactor plant system lists all required safety significant knowledge grouped under one of six headings:

- K1 Knowledge of the physical connections and/or cause-effect relationships between the system and the following:
- K2 Knowledge of electrical power supplies to the following:
- K3 Knowledge of the effect that a loss or malfunction of the system will have on the following:

- K4 Knowledge of system design feature(s) and/or interlocks which provide for the following:
- K5 Knowledge of the operational applications of the following concepts as they apply to the system:
- K6 Knowledge of the applicable performance, design attributes and the effects of malfunctions of the following system components:

Similarly, each reactor plant system lists all required safety significant abilities grouped under one of four headings.

- A1 Ability to predict and/or monitor changes in parameters associated with operating the system controls including:
- A2 Ability to (a) predict the impacts of the following malfunctions or operations on the system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:
- A3 Ability to monitor automatic operations of the system including:
- A4 Ability to manually operate and/or monitor in the control room:

Additionally, each reactor plant system has identified 15 system generic K/As.

Each Emergency Plant Evolutions identifies all required knowledge under one of three categories:

- EK1 Knowledge of the operational implications of the following concepts as they apply to the event:
- EK2 Knowledge of the interrelations between the event and the following:
- EK3 Knowledge of the reasons for the following responses as they apply to the event.

Each Emergency Plant Evolutions identifies all required abilities under one of two categories:

- EA1 Ability to operate and/or monitor the following as they apply to the event:
- EA2 Ability to determine and/or interpret the following as they apply to the event.

Each Emergency Plant Evolutions identifies 12 generic K/As.

Once the K/A catalog was developed, sample plans (as discussed in the previous section) were prepared for the written, JPM, and simulator examinations. A sample plan is an outline/blueprint to ensure that the examination is a content valid test. The sample plan ensures a consistent balance of questions between the major K/A categories (i.e., reactor plant systems, emergency plant evolutions, and plant wide generics) and K/A headers (e.g., K1 through K6) to document the content validity of the examination. Each category within the sample plan had mandated percentage requirements based upon the category's overall importance to plant safety. The sample plans also ensured consistency between each week's examinations.

A total of 35 sample plans were developed: 15 sample plans for the written examinations (5 weeks of examination, 3 certification levels per examination), 15 sample plans for JPMs, and 5 sample plans for simulator examinations (1 sample plan per crew). The sample plans ensured not only that a balance of K/As existed to provide content validity but also that an excessive overlap of examination material between examination weeks did not exist.

With the sample plans developed, the scope of examination material that required development was defined. The DOE Evaluators were responsible for the development of written examination questions and WSRC personnel were assigned to develop the JPMs and simulator scenarios.

Following initial development of the examination material, each element was reviewed by the Peer Evaluators, representatives from Operations, and DOE Evaluators prior to being submitted to DOE and WSRC management for final approval. The dynamic examination elements, the JPMs and simulator scenarios, were validated during the development phase to ensure accuracy of the material, to verify the adequacy of the plant procedures to support operator performance during the examination, and to verify the accuracy and objectivity of the pass/fail criteria.

As a result of the validation phase, several plant procedures were identified as being either inadequate or inaccurate. Procedural deficiencies

were submitted to the procedures organization and modified procedures were developed in adequate time to support the examination process.

The total volume of examination material that was developed included 239 written examination questions, 104 JPMs, and 30 simulator scenarios. Detailed listing of Knowledge and Abilities (K/As) tested on the written, JPM and simulator examinations are given in Tables A-1, A-2, and A-3 respectively.

Examination security was maintained in accordance with WSRC policies, which required non-disclosure statements by all personnel having access to examination material, hand delivery of all hard-copy material, signature accountability of the transfer of any examination material, locked storage of examination material when not actually being used, and computer security to include either password protection or locked diskettes for machines not in use.

A.3 PEER EVALUATOR TRAINING

As previously discussed, the examination process closely parallels the process used by the NRC to administer requalification examinations at commercial nuclear utilities. The examination is developed and administered by the facility, and evaluated in parallel by the NRC and the facility. To support this project at SRS, WSRC and DOE management selected a dedicated team of certified operators and supervisors to develop the necessary examination material and to administer the examinations and evaluate the results.

Peer Evaluators are Westinghouse certified supervisors. The individuals were selected based on experience, overall plant knowledge, and professional standing within the certified ranks. The Peer Evaluators normally hold supervisory positions at either the L or P Reactors.

The Peer Evaluators were highly proficient in plant operations but were unfamiliar with the evaluation process scheduled for K Reactor. To familiarize the Peer Evaluators and the training support group on the examination requirements, a training course was developed and delivered by commercial industry operations and training experts during the week of

April 23, 1990. Areas covered in this course included: examination validity and reliability; the Systematic Approach to Training (SAT) methodology for development and administration of exams; the development, administration, and evaluation of Simulator, Written, and Job Performance Measures (JPM) examinations; and evaluator techniques. Practical exercises included workshops on developing JPMs and simulator sessions. The simulator sessions were evaluated by the Peer Evaluators with the DOE instructors providing feedback on questioning and evaluation techniques.

The division of responsibility within Westinghouse provided that the training support group develop examination material and the Peer Evaluators review, validate, and eventually administer the examination. The review and validation phases allowed the Peer Evaluators to increase their familiarity with the examination material and to practice evaluator techniques. Prior to the actual administration of the examinations, practice sessions were conducted by DOE and Peer Evaluators to polish evaluator techniques and to clarify roles and responsibilities. The final result was that the Peer Evaluators performed as well, if not better than, the facility evaluators normally seen in the commercial nuclear industry.

A.4 DOE EVALUATOR TRAINING

Initial discussions between the DOE Savannah River Restart Office (SRSP0) and Pacific Northwest Laboratory (PNL) to assist in the verification of operator readiness at SRS were held in the spring of 1989. A contract was established to provide PNL personnel who were certified NRC license examiners. Due to the scope of work envisioned, a competitive subcontract was issued to Sonalyst, Inc. to provide additional certified license examiners for the project.

To provide the DOE evaluators with training in heavy water reactor technology and an introduction to the reactors at SRS, a Savannah River Reactor Systems training course was developed and conducted by DOE at the National Emergency Training Center in Emmitsburg, Maryland from October 30 through November 4, 1989. The course of instruction included such topics as:

SRS reactor systems, instrumentation, Technical Specifications and Technical Standards, safety analysis, heavy water reactor physics, and plant operations. Additionally, all personnel supporting the project attended Site Orientation Training at SRS. This training was conducted in January, 1990 and included: systems overview, integrated plant operations, radiological hazards and controls, site organizations and functions, and a walk-down of the K Reactor facility. To allow the opportunity for additional study, the Sonalyst and PNL home offices were provided training material developed by the Reactor Training and Procedures (RTAP) Department. They were also supplied copies of significant operating procedures, including the Abnormal Condition Control Procedures (ACCs).

The initial on-site assignment for DOE Evaluators was the assessment of operator performance during simulator scenarios being conducted as part of the Westinghouse Management Assessment Program (MAP). The purpose of MAP was to allow Westinghouse senior management the opportunity to evaluate operator performance during simulated plant events. All MAP assessments were conducted in the SRS simulator, located in the 707-C facility. The MAP assessments provided DOE Evaluators with the opportunity to become familiar with the Central Control Room (CCR) and the operations procedures. It also gave the evaluators the opportunity to observe the conduct of operations.

The DOE Evaluators participated in a total of fourteen assessments. In preparation for the assessments, the DOE evaluators studied the appropriate operating procedures for the planned scenarios and prepared the forms for evaluating the performance of crews in the simulator. The evaluators conducted an independent evaluation of crew performance during the scenarios, and immediately following each simulator session, the DOE Evaluators were debriefed by the training instructors on the adequacy of operator performance. The DOE Evaluators then provided Westinghouse personnel with any additional findings observed during the session and offered any insights into methods observed within the commercial industry that would result in improved operator or instructor performance. At the completion of each assessment, a detailed report on both operator and Westinghouse instructor performance was provided to the on-site DOE sponsor.

These training and assessment activities provided the DOE Evaluators significant opportunities to become familiar with SRS plant design, operating procedures, and conduct of operations prior to the commencement of the examination development stages for K reactor.

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 1 CORO SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
101	*02											#####	EPE	K1	K2	K3	A1	A2	GENERIC
102							*03	*04			*04	#####	201		*05		*04		
103				*01								#####	202	*04					*04
104			*04									#####	203		*07	*06		*02	
105						*04						#####	204	*02	*04				
107					*01							#####	205			*02		*04	
108									*02			#####	206	*02				*07	
109										*03		#####	207				*03		
111	*03											#####	208	*04					
												#####	209			*02			
												#####	210						
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
112												#####							
113												#####							
114			*03			*03						#####		QUESTIONS IN GROUP 1					11
117												#####		QUESTIONS IN GROUP 2					5
118											*05	#####		QUESTIONS IN GROUP 3					1
119									*02			#####		QUESTIONS IN PWG					7
122												#####		QUESTIONS IN EPE					16
123												#####		TOTAL QUESTIONS					40
130												#####							
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
108												#####							
110												#####							
116												#####							
120												#####		LEGEND					
121												#####		GROUP: SYSTEM NO.					
124												#####		PWG: PLANT WIDE GENERIC					
125												#####		EPE: EMERGENCY PLANT EVOLUTIONS					
127									*01			#####							
128												#####							
129												#####							
131												#####							
132												#####							
												#####	EXAMPLE						
												#####	"02" IN BOX ON LINE 101, COLUMN K1 = KA 101K1.02						
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

[illegible]

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 1 STE SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
101											*****	EPE	K1	K2	K3	A1	A2	GENERIC	
102							*/03	*/04			*****	201						*/02	
103											*****	202	*/04					*/04	
104											*/05	*****	203	*/07		*/05			
105	*/02		*/06								*****	204	*/05		*/06	*/04			
107					*/01						*****	205			*/02		*/04		
108									*/02		*****	206	*/02		*/01			*/07	
109							*/07			*/03	*****	207						*/09	
111								*/03	*/01		*****	208		*/01				*/02	
*****												*****	209						
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
112											*****	210		*/07					
113				*/05							*****								
114	*/01										*****								
117											*****								
118	*/08										*****		QUESTIONS IN GROUP 1					11	
119						*/14					*****		QUESTIONS IN GROUP 2					4	
122											*****		QUESTIONS IN GROUP 3					1	
123											*****		QUESTIONS IN PWG					7	
130											*****		QUESTIONS IN EPE					17	
*****												*****		TOTAL QUESTIONS					40
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
106											*****								
110					*/02						*****								
116											*****								
120											*****								
121											*****								
124											*****								
125											*****								
127											*****								
128											*****								
129											*****								
131											*****								
132											*****								
*****												*****							
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 2 CQRO SAMPLE PLAN																
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC					
101											GENERIC	####	EPE	K1	K2	K3
102							*06			*06		####	201	*07	*03	*03
103								*19	*04			####	202	*04	*08	*03
104				*04								####	203			
105											*09	####	204	*04		*06
107												####	205			*01
108						*02	*06					####	206	*11		*01
109					*05				*01			####	207	*02		*05
111	*03											####	208			*01
#####												####	209			
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC	####	210			*05
112												####				
113												####				
114		*03										####				
117				*01								####				
118												####	QUESTIONS IN GROUP 1			11
119								*05				####	QUESTIONS IN GROUP 2			5
122												####	QUESTIONS IN GROUP 3			1
123				*01								####	QUESTIONS IN PWG			7
130					*02							####	QUESTIONS IN EPE			18
#####												####	TOTAL QUESTIONS			40
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC	####				
108			*03									####				
110												####				
116												####				
120												####				
121												####				
124												####				
125												####				
127												####				
128												####				
129												####				
131												####				
132												####				
#####												####				
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 2 CORRS SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
101						*01						#####	EPE	K1	K2	K3	A1	A2	
102							*06					#####	201			*03		*04	
103	*05											#####	202	*09				*03	
104				*05								#####	203		*07				
105	*02										*06	#####	204				*08		
107												#####	205					*04	
108								*02			*08	#####	206		*01	*01		*01	
109					*08							#####	207	*02			*05		
111								*08				#####	208		*01				
#####												209				*18			
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210				*05		
112												#####							
113												#####							
114												#####							
117				*04								#####							
118				*01								#####		QUESTIONS IN GROUP 1				11	
119								*05				#####							
122												#####		QUESTIONS IN GROUP 2				5	
123	*02											#####							
130					*02							#####		QUESTIONS IN GROUP 3				1	
#####																			
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC			QUESTIONS IN PWG				7	
108												#####							
110												#####		QUESTIONS IN EPE				18	
116												#####							
120											*03	#####		TOTAL QUESTIONS				40	
121												#####							
124												#####							
125												#####							
127												#####							
128												#####							
129												#####							
131												#####							
132												#####							
#####																			
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 2 STE SAMPLE PLAN																		
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC							
101						*01						####	EPE	K1	K2	K3	A1	
102							*08			*05		####	201				*03	
103								*13	*04		*15	####	202	*04			*04	
104												####	203		*07			
105	*02											####	204				*08	
107												####	205				*04	
108						*02					*08	####	206		*11		*01	
109					*05				*01			####	207	*02			*05	
111												####	208				*02	
#####												####	209			*16		
#####												####	210					
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC							
112								*08				####						
113												####						
114												####						
117				*01								####						
118												####	QUESTIONS IN GROUP 1				11	
119			*01									####	QUESTIONS IN GROUP 2				5	
122												####	QUESTIONS IN GROUP 3				1	
123				*01								####	QUESTIONS IN PWG				7	
130					*02							####	QUESTIONS IN EPE				16	
#####												####	TOTAL QUESTIONS				40	
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC							
106												####						
110												####						
116												####						
120												####						
121												####						
124												####						
125											*09	####						
127												####						
128												####						
129												####						
131												####						
132												####						
#####												####						
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13					
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15			

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 3 CCRO SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
101	*01								*05			*****	EPE	K1	K2	K3	A1	A2	GENERIC
102	*03										*04	*****	201				*02		*11
103											*15	*****	202					*02	
104				*06								*****	203			*06			
105			*01					*01				*****	204	*02			*06		
107					*01							*****	205						*05
108												*****	206			*05		*01	
109							*03			*03		*****	207		*05			*05	
111												*****	208				*06	*06	
*****												*****	209		*01		*06		
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210	*07		*02			
112												*****							
113				*01								*****							
114		*03										*****							
117												*****							
118											*05	*****		QUESTIONS IN GROUP 1				11	
119								*05				*****		QUESTIONS IN GROUP 2				4	
122												*****		QUESTIONS IN GROUP 3				1	
123												*****		QUESTIONS IN PWG				7	
130												*****		QUESTIONS IN EPE				17	
*****												*****		TOTAL QUESTIONS				40	
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
106												*****							
110					*02							*****		QUESTIONS IN EPE				17	
116												*****							
120												*****		TOTAL QUESTIONS				40	
121												*****							
124												*****							
125												*****							
127												*****							
128												*****							
129												*****							
131												*****							
132												*****							
*****												*****							
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

[illegible]

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 3 STE SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
101			*04	*03					*05			####	EPE	K1	K2	K3	A1	A2	GENERIC
102	*08										*04	####	201			*05	*04		
103												####	202					*03	
104				*05							*05	####	203		*07				
105								*02				####	204				*06		*01
107					*01							####	205					*04	*01
108												####	206	*02		*04		*01	
109							*03			*03		####	207		*05			*05	
111												####	208		*01				
#####												####	209				*06		
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210			*02			
112		*03										####							
113												####							
114		*03										####							
117				*01								####							
118	*08											####		QUESTIONS IN GROUP 1					11
119							*04					####		QUESTIONS IN GROUP 2					5
122												####		QUESTIONS IN GROUP 3					1
123												####		QUESTIONS IN PWG					7
130												####		QUESTIONS IN EPE					16
#####												####		TOTAL QUESTIONS					40
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
106												####							
110					*02							####							
116												####							
120												####							
121												####							
124												####							
125												####							
127												####							
128												####							
129												####							
131												####							
132												####							
#####												####							
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13						
	.	.	.				.												
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				
	.						.												

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 4 CCRO SAMPLE PLAN																					
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC										
101	*01						*04	*04				####	EPE	K1	K2	K3	A1	A2	GENERIC		
102			*01						*04			####	201	*04			*02				
103										*04		####	202		*02			*03			
104				*06								####	203		*07	*02					
105						*04					*08	####	204	*02			*08				
107												####	205			*02					
108										*01		####	206				*02	*08			
109					*07							####	207			*01					
111												####	208	*03					*01		
#####													####	209			*01				
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210			*02					
112			*01									####									
113												####									
114		*03										####									
117								*01				####									
118												####		QUESTIONS IN GROUP 1					11		
119												####									
122												####		QUESTIONS IN GROUP 2					5		
123				*01								####									
130					*02							####		QUESTIONS IN GROUP 3					1		
#####													####								
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC			QUESTIONS IN PWG					7		
106			*03									####									
110												####		QUESTIONS IN EPE					16		
116												####									
120												####		TOTAL QUESTIONS					40		
121												####									
124												####									
125												####									
127												####									
128												####									
129												####									
131												####									
132												####									
#####													####								
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13								
	.	.	.																		
	.	.	.																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15						
	.	.	.																		

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 4 CCRS SAMPLE PLAN																				
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC									
101	*01											#####	EPE	K1	K2	K3	A1	A2	GENERIC	
102							*06				*01	#####	201		*02	*05				
103												#####	202	*04				*03		
104				*05								#####	203		*07					
105			*06									#####	204				*08			
107												#####	205					*04	*05	
108	*05					*02			*02			#####	206	*02		*01				
109								*03		*03		#####	207				*05		*09	
111					*02							#####	208		*01			*05		
#####												#####	209				*016			
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210		*07					
112												#####								
113				*05								#####								
114	*01											#####								
117												#####								
118											*015	#####		QUESTIONS IN GROUP 1					11	
119												#####								
122												#####		QUESTIONS IN GROUP 2					5	
123						*04						#####								
130					*02							#####		QUESTIONS IN GROUP 3					1	
#####												#####								
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC			QUESTIONS IN PWG					7	
106			*03									#####								
110												#####		QUESTIONS IN EPE					16	
116												#####								
120												#####		TOTAL QUESTIONS					40	
121												#####								
124												#####								
125												#####								
127												#####								
128												#####								
129												#####								
131												#####								
132												#####								
#####												#####								
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13							
	.	.	.	.	.	.	.	.	.	.	.	.	.							
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15					
	.	.	.	.	.	.	.	.	.	.	.	.	.							

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 4 STE SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
101				*03		*01						####	EPE	K1	K2	K3	A1	A2	GENERIC
102	*08									*05		####	201				*03		*04
103									*04			####	202	*04				*03	
104											*05	####	203		*07				
105			*06									####	204	*05			*08		
107					*01							####	205			*02			*05
108			*01									####	209		*11	*01			
109							*07					####	20	*02					*02
111								*01				####	208					*05	
#####														####	210			*02	
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
112												####							
113				*05								####							
114		*03										####							
117												####							
118												####		QUESTIONS IN GROUP 1					11
119												####		QUESTIONS IN GROUP 2					5
122												####		QUESTIONS IN GROUP 3					1
123				*01								####		QUESTIONS IN GROUP 3					1
130				*02							*03	####		QUESTIONS IN PWG					7
#####														####					
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC								
106			*03									####							
110												####		QUESTIONS IN EPE					16
116												####		TOTAL QUESTIONS					40
120												####							
121												####							
124												####							
125												####							
127												####							
128												####							
129												####							
131												####							
132												####							
#####														####					
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 5 CCRO SAMPLE PLAN																			
GROUP 1	K1	K2	K3	K4	K5	K8	A1	A2	A3	A4	GENERIC								
101							*04		*05		*04	#####	EPE	K1	K2	K3	A1	A2	GENERIC
102					*07							#####	201					*01	*11
103	*01						*09			*02		#####	202		*02			*02	
104				*04								#####	203	*06					
105								*01				#####	204				*08		*10
107												#####	205	*02					*05
108											*08	#####	206			*01		*06	*07
109					*07							#####	207		*03		*01		
111												#####	208						
#####												#####	209				*01		
GROUP 2	K1	K2	K3	K4	K5	K8	A1	A2	A3	A4	GENERIC		210				*05		
112						*01						#####							
113				*06								#####							
114		*03										#####							
117			*04									#####							
118												#####			QUESTIONS IN GROUP 1				11
119												#####							
122								*02				#####			QUESTIONS IN GROUP 2				5
123												#####							
130												#####			QUESTIONS IN GROUP 3				1
#####												#####							
GROUP 3	K1	K2	K3	K4	K5	K8	A1	A2	A3	A4	GENERIC			QUESTIONS IN PWG				7	
106			*01									#####							
110												#####			QUESTIONS IN EPE				18
116												#####							
120												#####			TOTAL QUESTIONS				40
121												#####							
124												#####							
125												#####							
127												#####							
128												#####							
129												#####							
131												#####							
132												#####							
#####												#####							
PWG	K1	K2	K3	K4	K5	K8	K7	K8	K9	K10	K11	K12	K13						
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15				

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 6 CORG SAMPLE PLAN																		
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC							
101												#####	EPE	K1	K2	K3	A1	
102							*03			*05		#####	201		*02		*02	
103												#####	202	*09			*03	
104												#####	203				*05	
105				*08	*03		*04					#####	204	*02			*08	
107						*01						#####	205			*02		
108	*05									*02		#####	206		*11	*01		
109									*03	*01		#####	207				*05	
111						*02						#####	208				*05	
#####												#####	209			*06		
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210					
112												#####						
113												#####						
114	*01											#####						
117												#####						
118												#####		QUESTIONS IN GROUP 1			11	
119												#####						
122												#####		QUESTIONS IN GROUP 2			6	
123							*04					#####						
130												#####		QUESTIONS IN GROUP 3			1	
#####												#####						
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC			QUESTIONS IN PWG			7	
106												#####						
110												#####		QUESTIONS IN EPE			18	
116												#####						
120												#####		TOTAL QUESTIONS			40	
121												#####						
124												#####						
125												#####						
127												#####						
128												#####						
129												#####						
131												#####						
132												#####						
#####												#####						
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13					
	.	.	.			.												
	.					.												
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15			
	.																	

TABLE A-1: SRS PEER EVALUATION WRITTEN EXAMINATION SAMPLE PLAN

WEEK 5 STE SAMPLE PLAN																				
GROUP 1	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC									
101				*/03								#####	EPE	K1	K2	K3	A1	A2	GENERIC	
102										*/05	*/11	#####	201						*/04	
103										*/04		#####	202	*/04					*/05	
104				*/06								#####	203		*/07		*/05			
105												#####	204	*/05		*/06				
107					*/01			*/02				#####	205					*/04		
108		*/01				*/02						#####	206	*/02		*/04			*/07	
109							*/03					#####	207						*/02	
111											*/11	#####	208		*/01			*/05		
#####												209				*/03				
GROUP 2	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		210		*/07					
112								*/06			*/13	#####								
113												#####								
114			*/03									#####								
117				*/01								#####								
118												#####	QUESTIONS IN GROUP 1						11	
119												#####	QUESTIONS IN GROUP 2						5	
122												#####	QUESTIONS IN GROUP 3						1	
123				*/01								#####	QUESTIONS IN PWG						7	
130												#####	QUESTIONS IN EPE						16	
#####																				
GROUP 3	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	GENERIC		QUESTIONS IN PWG						7	
108												#####	QUESTIONS IN EPE						16	
110												#####								
116												#####	TOTAL QUESTIONS						40	
120												#####								
121												#####								
124												#####								
125												#####								
127												#####								
128												#####								
129				*/12								#####								
131												#####								
132												#####								
#####																				
PWG	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13							
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15					

TABLE A-2
JOB PERFORMANCE MEASURES AND K/A REFERENCE

A. CENTRAL CONTROL ROOM OPERATORS, SUPERVISORS,
 AND SHIFT TECHNICAL ENGINEER
 STATIC JOB PERFORMANCE MEASURES

K/A JOB PERFORMANCE MEASURE TITLE

101A2.01	Reactor Scram, Low Cooling Water Supply Header Flow
101A2.14	Reactor Scram-Septifoil Supply Header Pressure Very Low
101A4.03	High Level Flux Monitor Adjustment
101A4.08	Failure of the Safety Rods to Fully Insert
102A1.03	Reducing SSS Storage Tank Pressure
102A1.03	Increasing SSS Nitrogen System Pressure
102A4.01	Failure Of the Safety Rods to Scram
103G9.1	Shift Booster Pump Cooling Water Strainer
103G.13	Manual Start of the Booster Pump Diesel
104K4.04	Align Ventilation System for Incident Action
104G.13	Standby Air Compressor Operation
105A4.02	Restoring Power to the Emergency Bus Using GM Diesel
105K4.03	Response to GM Diesel Failure
107G9.1	Emergency Spray Water Operations
108A4.01	Leakage into the Sump
108A4.01	Charging Nitrogen to CHR Nitrogen Tank
108A4.01	Reducing CHR Nitrogen Tank High Pressure
108A4.01	Determine and Isolate the Leakage into the Sump
109A1.04	Response to Abnormal Reactor Overflow Supply
109A2.01	Process Water System Isolation
111G.9	Control Rod Fault Determination
111G.9	Control Rod Inadvertent Withdrawal
111G.11	Transient Protection Limit Calculation for Assembly Average Effluent Temperature
111G.11	Technical Limit Calculation for Assembly Average Effluent Temperature
111G.11	Confinement Protection Limit Calculation for Assembly Average Effluent Temperature
112G.13	Starting the Pump Diesel Generator
112G.13	Transfer of the CW Recirculation Pump Power Supply from the DG to Normal in Preparation for Pump Shutdown

TABLE A-2 (CONT'D)
JOB PERFORMANCE MEASURES AND K/A REFERENCE

**A. CENTRAL CONTROL ROOM OPERATORS, SUPERVISORS,
AND SHIFT TECHNICAL ENGINEER
STATIC JOB PERFORMANCE MEASURES**

K/A JOB PERFORMANCE MEASURE TITLE

113A2.01	Malfunction of Sump Pump
114A2.05	NIM Panel Power Failure
115A4.03	Long Term Core Recirculation Cooling
118A2.02	Calculate Instantaneous D2O Loss Rate
120G.9	Transferring Instrument Power From Transformer Room MG Set
120G.9	Transferring Instrument Power from the Alternator to Transformer Room
124A2.02	Perform Memorized Portions of Reactor Incident for Correct Combinations of Alarms
130A2.01	Determination of Reactor Tank Level After a Seismic Event
130A2.06	Respond to NIM Alarm
131A2.02	Calculation of Reactor T-weld Stress
201A1.03	Performing the Memorized Actions of Acting as the Console Operator
201K3.05	Respond to Heat Exchanger Flow Down 10%
202A1.01	Perform the Memorized Portion of acting as the Console Operator
204A1.01	Establish Process Water Flow Per AC Motor Failure
205A2.04	Loss of Blanket Gas Circulation
208A1.06	Respond to an Inadvertent Reactivity Increase During C&D Operations
209A1.06	Remacs-Deny Control
209A1.16	Initiation of Emergency and Incident Actions on A Remote Area Using Remacs
210A1.02	Restore AC Power to the Emergency Buses

TABLE A-2 (CONT'D)
JOB PERFORMANCE MEASURES AND K/A REFERENCE

**B. CENTRAL CONTROL ROOM OPERATORS DYNAMIC
 JOB PERFORMANCE MEASURES**

K/A	JOB PERFORMANCE MEASURE TITLE
101A2.01	Reactor Scram, Low Cooling Water Supply Header Flow
101A2.11	Reactor Scram, Plenum Pressure Down 10%
101A2.14	Reactor Scram, Septifoil Supply Header Pressure Very Low
101A4.03	High Level Flux Monitor Adjustment
101A4.08	Failure of the Safety Rods to Fully Insert
102A4.01	Failure of the Safety Rods to Scram
104K4.04	Align Ventilation System for Incident Action
105A4.02	Restoring Power to the Emergency Bus Using GM Diesel
105K4.03	Response to GM Diesel Failure
108A4.01	Leakage into the Sump
109A1.04	Response to Abnormal Reactor Overflow Supply
115A1.01	Initiation of Long Term Moderator Recirculation Using the Moderator Recovery System
124A2.02	Perform Memorized Portions of Reactor Incident for Correct Combinations of Alarms
130A2.01	Determination of Reactor Tank Level After a Seismic Event
130A2.06	Nuclear Incident Monitor Alarm
201A1.03	Performing the Memorized Actions of Acting as the Console Operator
201K3.05	Respond to Heat Exchanger Flow Down 10%
204A1.01	Loss of Forced Core Cooling-AC Motor Trip
205A2.04	Loss of Blanket Gas Circulation
209A1.16	Initiation of Emergency and Incident Actions On A Remote Area Using Remacs
210A1.02	Restor AC Power To Emergency Buses

C. SHIFT TECHNICAL ENGINEER STATIC
JOB PERFORMANCE MEASURES

111A1.01	Calculation of Estimated Critical Position for Cycle Startup
111A1.01	Calculation of Estimated Critical Position for Cycle Startup
111A1.01	Calculation of Estimated Critical Position for Cycle Startup
111A1.01	Calculation of Estimated Critical Position for Scram Recovery Startup From Equilibrium Shutdown Conditions
111A1.01	Calculation of Estimated Critical Position for Scram Recovery Startup From Equilibrium Shutdown Conditions
111A1.01	Calculation of Estimated Critical Position for Scram Recovery Startup From Equilibrium Shutdown Conditions
111A1.01	Calculation of Estimated Critical Position for Scram Recovery From Equilibrium Shutdown Conditions
111A1.01	Calculation of Estimated Critical Position for Scram Recovery Startup Non-Equilibrium Shutdown Conditions
111A1.01	Calculation of Estimated Critical Position for Scram Recovery Startup Non-Equilibrium Shutdown Conditions
111A1.01	Calculation of Estimated Critical Position for Scram Recovery Startup Non-Equilibrium Shutdown Conditions

TABLE A-2 (CONT'D)
JOB PERFORMANCE MEASURES AND K/A REFERENCE

D. SUPERVISOR AND SHIFT TECHNICAL ENGINEER
STATIC JOB PERFORMANCE MEASURES

K/A	JOB PERFORMANCE MEASURE TITLE
101A4.03	Bypassing of Near Side Heat Exchanger Cooling Water Flow
101A4.03	Bypassing of Power Density Monitor
101A4.03	Bypassing of High Level Flux Monitor
101A4.03	Bypassing of Safety Computer
101A4.03	Bypassing of the Control Computers
102G.3	Supplementary Safety System, Classification and Declaration of an Event
103G.11	Emergency Cooling System-Ability to Determine Entry Level Conditions for Technical Specifications
104G.3	Airborne Activity Confinement System, Classification and Declaration of an Event
104G.11	Airborne Activity Confinement System-Ability to Determine Entry Level Conditions for Technical Specifications
105A2.01	Manual Start of GM Diesel
105A2.01	Energizing Transformer Room from GM DG
105G.3	Emergency Electrical Power-Classification and Declaration of an Event
109G.3	Process Water System, Classification and Declaration of an Event
109G.3	Process Water System, Classification and Declaration of an Event
109G.11	Process Water System-Ability to Determine Entry Level Conditions for Technical Specifications
109G.11	Process Water System-Ability to Determine Entry Level Conditions for Technical Specifications
109G.11	Process Water System-Ability to Determine Entry Level Conditions for Technical Specifications

TABLE A-2 (CONT'D)
JOB PERFORMANCE MEASURES AND K/A REFERENCE

D. SUPERVISOR AND SHIFT TECHNICAL ENGINEER
STATIC JOB PERFORMANCE MEASURES

K/A	JOB PERFORMANCE MEASURE TITLE
111G.11	Technical Limit Calculation for Assembly Average Effluent Temperature
111G.11	Transient Protection Limit Calculation for Assembly Average Effluent Temperature
111G.11	Confinement Protection Limit Calculation for Assembly Average Effluent Temperature
111G.11	Control and Safety Rod System-Ability to Determine Entry Level Conditions for Technical Specifications
111G.11	Control and Safety Rod System-Ability to Determine Entry Level Conditions for Technical Specifications
111G.11	Control and Safety Rod System-Ability to Determine Entry Level Conditions for Technical Specifications
111G.11	Transient Protection Limit Calculation for Channel Effluent Temperature
111G.11	Technical Limit Calculation for Channel Effluent Temperature
112G.3	Cooling Water System, Classification and Declaration of an Event
209G.2	Control Room Abandonment-Classification and Declaration of an Event

TABLE A-3
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE01 REV. 0

NORMAL EVENTS - High RTR
INSTRUMENT FAILURE - Basin level
COMPONENT FAILURE - Rx fine level
MAJOR INCIDENT - PW Leak

KA REFERENCE -	109.K6.03	109.A2.01	109.G.5	112.A2.06	112.K6.01
	109.A1.04	109.A2.03	109.G.11	112.K1.01	112.G.5
	109.A1.06	109.A2.04	109.G.14	112.K1.06	112.G.13
	109.A1.07	109.A3.01	109.K5.05	112.K3.01	112.G.15
	109.A1.08	109.A4.04	109.K5.07	112.K3.02	109.K6.12
	109.A1.09	109.G.3	112.A2.05	112.K4.05	112.G.3

Scenario PE02 REV. 0

NORMAL EVENT - 2/5 Tilt out of operational specs.
INSTRUMENT FAILURE - RX tank very low level sensor.
COMPONENT FAILURE - 4 safety rods fail to scram.
MAJOR INCIDENT - CW pump discharge valve closes.

KA REFERENCE -	112.K3.01	112.A2.06	112.G13	111.K1.03	111.A1.01
	101.K4.04	101.A1.02	101.A3.02	101.A3.03	101.A4.01
	101.A4.05	101.A4.07	101.G4	101.G5	101.G7
	101.G9	101.G11	101.G12	101.G14	101.G15
					101.G8

Scenario PE03 REV. 0

NORMAL EVENTS - Obtain data for Rx. engineering
INSTRUMENT FAILURE - DC motor status indicator
COMPONENT FAILURE - GM auto start
MAJOR ACCIDENT - Loss of transformer rooms

KA REFERENCE -	105.K1.01	105.K4.01	105.G6	105.K1.02	105.K4.03
	105.K5.06	105.K6.01	105.K6.03	105.K6.05	105.A2.01
	105.A3.01	105.A4.02	105.A4.03	105.G5	105.G9
	105.G15				105.G11

Scenario PE04 REV. 0

NORMAL EVENT - Correct RTR
INSTRUMENT FAILURE - Control Computer
COMPONENT FAILURE - Trip pushbutton for CW header
MAJOR ACCIDENT - CW leak

KA REFERENCE -	112.K3.01	112.A2.05	112.A2.06
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TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE05 REV. 0

NORMAL EVENT - 2/5 tilt out of operational specs.

INSTRUMENT FAILURE - CW valve Scram Circuit

COMPONENT FAILURE - power loss

MAJOR ACCIDENT - Scram with no safety rod response

KA REFERENCE - 111.K1.03 111.A1.01 111.A2.04 111.G.9

Scenario PE06 REV. 0

NORMAL EVENT - Obtain reactor engineering data.

INSTRUMENT FAILURE - Hx Outlet power loss.

COMPONENT FAILURE - Sump level indication.

MAJOR ACCIDENT - CW leak.

KA REFERENCE - 112.K3.01 112.A2.05 112.A2.06

Scenario PE07 REV. 0

NORMAL EVENTS - Correct RTR

INSTRUMENT FAILURE - Rx tank coarse level indicator

COMPONENT FAILURE - Shield water pump

MAJOR INCIDENT - PW leak

KA REFERENCE - 109.K6.03 109.A1.04 109.A1.06 109.A1.07 109.A1.08
109.A1.09

Scenario PE08 REV. 0

NORMAL EVENT - 2/5 tilt out of specs.

INSTRUMENT FAILURE - GM auto start

COMPONENT FAILURE - Gang full rods fail on scram

MAJOR ACCIDENT - Loss of all power

KA REFERENCE - 105.K4.01 105.G6

Scenario PE09 REV. 0

NORMAL EVENT - Obtain data for RX engineering

INSTRUMENT FAILURE - GM auto start

COMPONENT FAILURE - AC motor

MAJOR ACCIDENT - Loss of transformer room

KA REFERENCE - 105.K4.01 105.K1.01 105.K4.01 105.K1.02 105.K4.03
105.K5.06 105.K6.01 105.K6.03 105.K6.05 105.A2.01
105.A3.01 105.A4.02 105.A4.03 105.G6 105.G5 105.G9
105.G11 105.G15

TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE10 REV. 0
NORMAL EVENT - High RTR correction
INSTRUMENT FAILURE - PDM
COMPONENT FAILURE - GM auto start
MAJOR ACCIDENT - Loss of offsite power

KA REFERENCE - 105.K4.01 105.G6

Scenario PE11 REV. 0
NORMAL EVENT - 2/5 Tilt out of operational specs.
INSTRUMENT FAILURE - GTM Detector.
COMPONENT FAILURE - Feeder breaker to containment sub-station.
MAJOR ACCIDENT - Loss of CW pumps.

KA REFERENCE - 105.K1.01 105.G3 112.K3.01 105.K3.01 105.G5
112.A2.05 105.K4.01 105.G15 112.G5 105.K6.04
112.K1.01 112.G15 105.K4.04 112.K1.06 112.G13

Scenario PE12 REV. 0
NORMAL EVENT - Obtain data for RX engineering
INSTRUMENT FAILURE - AIA fault
COMPONENT FAILURE - Incident switch
MAJOR ACCIDENT - PW leak

KA REFERENCE - 109.K6.03 109.A1.04 109.A1.06 109.A1.07 109.A1.08
109.A1.09

Scenario PE13 REV. 0
NORMAL EVENT - Correct RTR
INSTRUMENT FAILURE - Gas Blower
COMPONENT FAILURE - PW Valve
MAJOR INCIDENT - PW Valve closes

KA REFERENCE - 122.K4.01 122.G5 122.G6 122.G8 122.G11 122.G15
109.K1.08 109.K6.02 109.K6.12 109.A1.04 109.A1.07
109.A1.08 109.A4.02 109.G3 109.G5 109.G11 109.G14
109.G15

TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE14 REV. 0

NORMAL EVENT - Correct tilt

INSTRUMENT FAILURE - Gang Control Drive Circuit

COMPONENT FAILURE - All Control Rods

MAJOR INCIDENT - Control rods fail to scram

KA REFERENCE -	101.K1.01	101.K1.15	101.K4.04	101.K4.05	101.K6.01	
	101.A1.02	101.A1.04	101.A1.05	101.A3.02	101.A3.03	
	101.A4.01	101.A4.05	101.A4.06	101.A4.08	101.G5	101.G7
	101.G8	101.G9	101.G11	101.G13	101.G14	101.G15

Scenario PE15 REV. 0

NORMAL EVENT - Get data for Rx Engineering

INSTRUMENT FAILURE - HLFM

COMPONENT FAILURE - CW Header

MAJOR INCIDENT - CW leak

KA REFERENCE -	111.K1.05	111.K3.01	111.K3.02	111K6.04	111.G8	111.G9
	111.G14	111.G12	112.K1.01	112.K1.06	112.K3.01	
	112.K3.02	112.K4.04	112.A2.05	112.A2.06	112.G3	112.G4
	112.G13	112.G15				

Scenario PE16 REV. 0

NORMAL EVENT - Correct High RTR

INSTRUMENT FAILURE - EEM

COMPONENT FAILURE - Pushbutton for CW Header

MAJOR INCIDENT - CW leak

KA REFERENCE -	112.K3.01	112.A2.05	112.A2.06	112.K1.01	112.K3.02	112.G3
	112.G5	112.G13	112.G15			

TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE17 REV. 0

NORMAL EVENT - Correct tilt

INSTRUMENT FAILURE - Blanket Gas Blower

COMPONENT FAILURE - All control rods

MAJOR INCIDENT - Control rods fail to drive down on scram signal

KA REFERENCE -	122.K3.01	122.K4.02	122.G5	122.G6	122.G8	122.G11
	101.K4.04	101.A1.02	101.A1.05	101.A2.01	101.A3.05	
	101.A4.01	101.A4.05	101.G4	101.G5	101.G7	101.G8
	101.G9	101.G11	101.G12	101.G13	101.G14	101.G15

Scenario PE18 REV. 0

NORMAL EVENTS - Calculate loss rate

INSTRUMENT FAILURE - NONE

COMPONENT FAILURE - Small PW leak

MAJOR INCIDENT - Large PW leak

KA REFERENCE -	109.K1.08	109.K5.07	109.K6.03	109.K6.13	109.A1.04	
	109.A2.01	109.A3.01	109.A4.02	109.G3	109.G5	109.G11
	109.G15					

Scenario PE19 REV. 0

NORMAL EVENT- Obtain Data for Reactor Engineering

INSTRUMENT FAILURE- EG Set

COMPONENT FAILURE- Fan

MAJOR EVENT- CW Leak

KA REFERENCE -	112.K1.01	112.K1.06	112.K3.01	112.K3.02	112.A2.05	
	112.A2.05	112.A2.06	112.G3	112.G5	112.G14	
	112.G.15	104.K3.02	104.K3.03	104.K4.05	104.A4.04	
	104.A3.01	104.A4.02	104.K3.01	104.G5	104.G7	104.G8
	104.G11	104.G13				

TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE20 REV. 0
NORMAL EVENT - Correct CW
INSTRUMENT FAILURE - header flow sensor
COMPONENT FAILURE - GM
MAJOR EVENT - Loss of Power

KA REFERENCE - 105.K4.01 105.G6 105.K1.01 105.K4.01 105.K1.02
 105.K4.03 105.K5.06 105.K6.01 105.K6.03 105.K6.05
 105.A2.01 105.A3.01 105.A4.02 105.A4.03 105.G5 105.G9
 105.G11 105.G15

Scenario PE21 REV. 0
NORMAL EVENT - Obtain data for RX Engineering.
INSTRUMENT FAILURE - RX overflow pump
COMPONENT FAILURE - Trip Circuit
MAJOR EVENT - CW Leak

KA REFERENCE - 112.K1.01 112.K1.06 112.K3.01 112.K3.02 112.K4.06
 112.A2.05 112.A2.06 112.G3 112.G13 112.G15

Scenario PE22 REV. 0
NORMAL EVENT - Correct tilt
INSTRUMENT FAILURE - Switch D.C. motors
COMPONENT FAILURE - D.C. motors
MAJOR EVENT - PW Leak

KA REFERENCE - 109.K1.14 109.A1.04 109.A4.03 109.K5.05 109.A1.06 109.G3
 109.K5.07 109.A1.07 109.G5 109.K6.02 109.A1.08 109.G11
 109.K6.03 109.A2.03 109.G14 109.A1.03 109.A4.02 109.G15

Scenario PE23 REV. 0
NORMAL EVENT- Obtain data for RX engineering
INSTRUMENT FAILURE- Low Flow circuit for HX
COMPONENT FAILURE- Instrument Air Receiver Tank Relief Valve
MAJOR ACCIDENT- Safety Rods Fail to Insert on SCRAM

KA REFERENCE - 111.K1.03 111.A1.03 111.A4.06 111.G14 112.A2.06
 111.K1.05 111.A2.02 111.A4.09 111.G15 112.G3
 111.K3.01 111.A3.02 111.G3 112.K1.01 112.G5
 111.K3.03 111.A4.02 111.G8 112.K1.06 112.G13
 111.K4.04 111.A4.04 111.G11 112.K3.01 112.G15
 111.K6.04 111.A4.05 111.G12 112.K3.02

TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE24 REV. 0

NORMAL EVENT- Sparger Low Flow response.

INSTRUMENT FAILURE- NONE

COMPONENT FAILURE- AC Motor Fails to Trip

MAJOR ACCIDENT- PW Leak in Ring Header

KA REFERENCE -	109.K5.07	109.K6.02	109.K6.03	109.A1.04	109.A2.01
	109.A3.01	109.G3	109.G5	109.G11	109.G15

Scenario PE25 REV. 0

NORMAL EVENT- Correct High RTR

INSTRUMENT FAILURE- Tritium Monitor Alarm circuit

COMPONENT FAILURE- Valve CW Header

MAJOR ACCIDENT- CW Leak

KA REFERENCE -	112.K1.01	112.K1.06	112.K3.01	112.K3.02	112.K4.06
	112.A2.05	112.A2.06	112.G3	112.G13	112.G15

Scenario PE26 REV. 0

NORMAL EVENT- Tilt Ratio for 2/5 out of operational Specs.

INSTRUMENT FAILURE- NONE

COMPONENT FAILURE- Incident Relay for AIA and Incident Switch

MAJOR ACCIDENT- Large PW leak

KA REFERENCE -	109.K1.08	109.K5.07	109.K6.03	109.K6.13	109.A1.04
	109.A2.01	109.A3.01	109.A4.02	109.G3	109.G5
	109.G15				109.G11

Scenario PE27 REV. 0

NORMAL EVENT- Obtain Data for Reactor Engineering

INSTRUMENT FAILURE- NONE

COMPONENT FAILURE- Breaker and CW Pump

MAJOR ACCIDENT- SCRAM and Explosive Valves Fail

KA REFERENCE -	111.K1.03	111.A1.03	111.A4.06	111.G14	112.A2.06
	111.K1.05	111.A2.02	111.A4.09	111.G15	112.G3
	111.K3.01	111.A3.02	111.G3	112.K1.01	112.G5
	111.K3.03	111.A4.02	111.G8	112.K1.06	112.G13
	111.K4.04	111.A4.04	111.G11	112.K3.01	112.G15
	111.K6.04	111.A4.05	111.G12	112.K3.02	

TABLE A-3 (CONT'D)
SIMULATOR SCENARIOS AND K/A REFERENCES

Scenario PE28 REV. 0

NORMAL EVENT- Correct 2/5 Tilt

INSTRUMENT FAILURE- Rod Drive out

COMPONENT FAILURE- Both GM diesels fail to auto start

MAJOR ACCIDENT- Loss of All Power

KA REFERENCE -	111.G15	111.A3.02	105.K1.01	105.K6.03	105.G6	111.G12
	111.A1.02	105.K1.02	105.A2.01	105.G9	111.G11	
	111.K3.02	105.K4.01	105.A3.01	105.G11	111.G8	
	111.K3.04	105.K4.03	105.A4.02	105.G15	111.G5	
	111.K5.03	105.K5.06	105.A4.04	111.A4.02	111.K1.01	
	105.K6.01	105.G3				

Scenario PE29 REV. 0

NORMAL EVENT - Correct RTR

INSTRUMENT FAILURE - BG supply valve

COMPONENT FAILURE - All control rods

MAJOR INCIDENT - Control rods fail to SCRAM

KA REFERENCE -	111.K1.03	111.K6.04	111.A4.04	111.G8	111.K1.05	
	111.A1.03	111.A4.05	111.G11	111.K3.01	111.A2.02	
	111.A4.06	111.G12	111.K3.03	111.A3.02	111.A4.09	111.G14
	111.K4.04	111.A4.02	111.G3	111.G15		

Scenario PE30 REV. 0

NORMAL EVENT - Obtain Data for Reactor Engineering

INSTRUMENT FAILURE - Gang Rods

COMPONENT FAILURE - All Control Rods

MAJOR INCIDENT - Control rods fail to SCRAM

KA REFERENCE -	111.K1.03	111.K6.04	111.A4.04	111.G8	111.K1.05	
	111.A1.03	111.A4.05	111.G11	111.K3.01	111.A2.02	
	111.A4.06	111.G12	111.K3.03	111.A3.02	111.A4.09	111.G14
	111.K4.04	111.A4.02	111.G3	111.G15		

APPENDIX B

EXAMINATION ADMINISTRATION PHASE

Examinations for K Reactor certified personnel commenced on August 13, 1990 and continued for five consecutive weeks. The following is a typical schedule of activities during an examination week.

MONDAY: The open reference written examination was administered on Monday mornings, approximately 8 a.m. to 12 p.m. The examination was administered by the training support group and observed by a DOE evaluator. A comment sheet was maintained by the examination proctor to document any questions asked by operators during the course of the examination. The comment sheet assists in identifying any question(s) that were ambiguous or confusing to the operators.

The remaining Peer and DOE evaluators used this period for conducting a dry run of the simulator scenarios and dynamic JPMs.

During the afternoon, the examinations were graded separately by Westinghouse and the DOE evaluator. Following completion of grading, a statistical item analysis was conducted to identify questions that resulted in less than overall satisfactory performance. Additionally, all responses were reviewed for an individual having less than satisfactory performance. The questions failed by an individual were scrutinized to ensure question validity and reliability. The examination answer key was modified if any questions were determined to have more than one correct response or were confusing in format. Once the answer key was finalized, the examinations were regraded to determine final results. Any discrepancies between Westinghouse and DOE on final results were resolved.

TUESDAY: Tuesday of the examination week was dedicated to conducting the simulator examination. The examination consisted of four or five individual simulator scenarios. Each simulator scenario required the crew to respond to a normal event (typically the recovery of an out of specification condition in the reactor flux distribution), an instrument and/or component failure, and a major plant transient such as a Loss of Coolant Accident or Loss of Off-site power. Each simulator session was approximately one hour in length.

Prior to the initial simulator session, the crew was briefed on examination guidelines as specified in the Peer Evaluation Standard and crew assignments were distributed. The crew is

normally ten individuals with four of the crew members assigned to the simulator for the scenario and the rest in standby to offer additional assistance during major plant transients.

Both DOE and Westinghouse evaluators were present in the simulator during the scenario. Each organization had established monitoring assignments for each scenario. The lead DOE and Westinghouse evaluators worked together to direct the simulator instructor on when to transition to the next simulator event and when to terminate the scenario session. Following completion of the scenario, the evaluators asked any follow-up questions of the operator they were evaluating in order to clarify any actions observed during the scenario. Both the Westinghouse and DOE evaluators were present for any follow-up questioning.

Following completion of the follow-up questioning, the crew was released to their classroom. The two evaluation teams then met separately to review the previous scenario to identify the Individual Simulator Critical Tasks (ISCTs) that were performed and to assign individual responsibility for ISCTs that were successfully or not successfully performed. An ISCT is a task which, if omitted or incorrectly performed by an operator, will result in adverse consequence(s) which significantly alter the event mitigation strategy to the detriment of plant or public safety. Each ISCT must have plant or public safety significance, must provide the operator responsible for completing the task with appropriate cues, must have measurable performance indicators and must give the operator feedback regarding the effect of his/her action or inaction. ISCTs for each simulator scenario were preestablished during the validation phase. It was the responsibility of each evaluation team to review, at the end of each scenario, the ISCTs performed to ensure they still met the definition, identify any additional ISCTs that were performed, and assign individual responsibility for performance of an ISCT. The Peer Evaluation Standard required that each individual on a crew must perform a minimum of one ISCT for the simulator examination to be considered valid.

Simulator scenarios were conducted, with rotation of crew personnel, until all requirements of the Peer Evaluation Standard for administration of a valid and reliable simulator examination were met. At this point, the crew was released and the evaluation teams caucused separately to arrive at overall simulator examination results. Each evaluation team arrived at the following pass/fail decisions:

1. Individual performance based on ISCTs
2. Crew performance based on ISCTs. If an ISCT was such that the crew had the opportunity to correct an individuals

unsuccessful performance and mitigate an event, the ISCT was additionally considered a "crew" ISCT. The failure of a crew on two or more "crew" ISCTs required an overall crew failure.

3. Crew performance based on crew competencies. The competencies reflect the major knowledge and ability requirements of the crew. The competencies are:
 - a. Understanding/interpretation of Annunciator/Alarm signals
 - b. Diagnosis of Event/Conditions based on Signals/Readings
 - c. Compliance/use of Procedures and Technical Specifications
 - d. Control Board Operations
 - e. Communications/Crew Interactions, and
 - f. Understanding of Plant/System response.

Each competency is sectionalized into three or four sub-categories, each of which has a one to three point grading scale. The pass/fail criteria for crew competencies is specified in the Peer Evaluator Standard.

Following completion of the simulator evaluation phase, the evaluation teams conducted a debrief to compare final results and supporting basis. Any discrepancies in results were identified and analyzed to ascertain the basis for the discrepancy.

WEDNESDAY: Wednesday was dedicated to the conduct of the Job Performance Measure (JPM) portion of the examination process. Each operator was required to perform ten JPMs, three of which had to be in the plant (outside of the central control room). JPMs conducted either in-plant or the K Reactor central control room were simulated (operators not permitted to manipulate the controls), while JPMs conducted on the training simulator were usually conducted dynamically requiring the operator to take the appropriate control board operations.

The JPMs were administered by the Westinghouse Peer Evaluators and evaluated in parallel by DOE and Peer Evaluators. A JPM was performed unsatisfactorily if no critical steps were performed incorrectly or omitted. A critical step is any step within a task, which if omitted or performed incorrectly, would result in a failure to meet the task standard (complete the task correctly).

Critical steps were identified during the development and validation phases of the JPMs. An operator had to successfully perform 80% or more of the JPMs to pass this phase of the examination.

THURSDAY: Thursday was dedicated to completion of JPMs, finalization of results, and completion of supporting documentation. The DOE evaluators provided documentation of failed ISCTs, justifications for grades assigned to crew competencies, and general observations of observed program strengths and areas for improvement. These results were presented to DOE management for final approval.

FRIDAY: On this day, exit meetings were conducted with DOE and WSRC management to present results on the examination for the week. Differences in results between Peer Evaluators and DOE were highlighted with supporting arguments. Following management debrief, the crew was presented with the week's results. The training department reviewed the examination results to develop remedial training for individual or crew failures and to provide lessons learned and training improvements for future crews.

This schedule was maintained for four of the five weeks the examination was administered. During one week the schedule was shifted due to the simulator being committed for use during a site emergency exercise. An analysis of that specific week's results determine the schedule shift had no adverse impacts on the crew's performance.

- END -

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