

CAROLINA POWER & LIGHT COMPANY  
BRUNSWICK STEAM ELECTRIC PLANT

UNIT 0

BRUNSWICK PLANT OPERATOR RETRAINING PROGRAM

TRAINING INSTRUCTION: TI-200

VOLUME I

Rev 008

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## 1.0 Purpose

- To establish the requirements for a retraining program for all Nuclear Regulatory Commission (NRC) licensed personnel at the Brunswick plant. This program is intended to meet or exceed the requirements of 10CFR55, Appendix A, for operator retraining. It should accomplish the following:
- 1.1 Maintain nuclear plant operating safety and reliability.
  - 1.2 Assure that licensed and certified personnel maintain the high level of skill and knowledge required to accomplish routine and emergency duties.
  - 1.3 Establish a system for evaluating and documenting licensed and certified personnel proficiency and competency.

## 2.0 References

- 2.1 ANSI 18.1, paragraph 5.5.1, retraining program
- 2.2 ANSI 3.1, paragraph 5.5.1, retraining program
- 2.3 INPO Guidelines Nuclear Power Plant Requalification Program for Licensed Personnel (GPG-02)
- 2.4 FSAR, Chapter 13.2
- 2.5 NUREG-0737
- 2.6 Analysis and Technology, Inc., Study - Section 2.5
- 2.7 10CFR55, Appendix A, Requalification Program for Licensed Operators

## 3.0 Procedure

### 3.1 General

- 3.1.1 The requalification program shall be conducted based upon Carolina Power & Light (CP&L) Company requirements and the USNRC approved requalification program.
- 3.1.2 All licensed and certified personnel will participate in the retraining program. Subsequent licensees will be integrated immediately into the on-shift training portion and will participate in the next annual evaluation examination. Newly licensed or certified individuals successfully completing their NRC examination less than three months prior to the annual examination may be excused from the current annual written and oral examinations.

- 3.1.3 In accordance with 10CFR50.54.i-1, no change will be permitted to be made to the Brunswick plant operator requalification program by which the scope, time allotted for the program, or frequency in conducting different parts of the program is decreased unless specifically authorized by the NRC.
- 3.1.4 The curriculum for the requalification program will be based on the following:
- 3.1.4.1 Previous years' annual written and oral examinations.
  - 3.1.4.2 Plant modifications.
  - 3.1.4.3 Operating experiences at plant, other plants, and industry.
  - 3.1.4.4 Procedure changes and issuances.
  - 3.1.4.5 Regulations.
  - 3.1.4.6 Technical specifications.
  - 3.1.4.7 Input from the plant Shift Foreman, appropriate supervisors and managers, Nuclear and Simulator Training Unit, and On-site Nuclear Safety.
  - 3.1.4.8 Program evaluation and feedback.
- 3.1.5 Instructors who teach systems, integrated responses, and transient and simulator courses are required to hold or to have held a valid SRO license or have been certified by the NRC. All licensed/certified instructors shall participate in the requalification program.
- 3.1.6 If a licensed individual has not actively carried out licensed duties for a period in excess of four months, a special training program and/or evaluation is required prior to resuming licensed duties. Active status will be maintained by participating in the annual requalification program.

The following requirements are used to demonstrate that the licensee is knowledgeable of facility operation and administration prior to resuming licensed duties:

- 3.1.6.1 Review changes in operating and administrative procedures, standing orders, and instructions for the period of absence.

3.1.6.2 Meet with Director - Training or his designee to discuss the material from all requalification lectures which were missed.

3.1.6.3 Successfully complete an oral or written examination in scope and format of the requalification examination.

3.1.6.4 Stand watches under instruction totaling at least four hours per month for the period of his absence.

3.1.6.5 The facility licensee must certify to the NRC that the operator or senior operator is requalified. This certification shall be initiated by plant management.

3.1.7 The annual requalification program will be approved by the Director - Training.

### 3.2 Operator requalification program

The operator requalification program consists of four parts:

1. Preplanned lecture series.
2. Simulator retraining.
3. On-the-job training.
4. Evaluation.

#### 3.2.1 Preplanned lecture series

The operator requalification program shall include 80 hours of preplanned training sessions conducted on a regular and continuing basis. The scheduling will be such that every licensed operator will have the opportunity to attend all lectures. Upon completion of the classroom lectures, a topical examination on that section will be given requiring a passing grade of greater than or equal to 80%. The following is an outline of what subjects may be covered, but not necessarily in the order stated.

##### 3.2.1.1 Theory and principles of operations

1. Atomic and nuclear physics
2. Subcritical multiplication
3. Xenon and samarium effects
4. Rod worth
5. Coefficients and defects
  - a. Moderator temperature
  - b. Fuel temperature
  - c. Voids
  - d. Power

6. Shutdown margins
  7. Current supplemental reload licensing submittal
- 3.2.1.2 General and specific plant operating characteristics
1. Normal plant transients
    - a. Rod worth curves
    - b. Xenon transients
    - c. Step load changes
  2. Safety analysis
    - a. Review of minor accidents
    - b. Review of major accidents
- 3.2.1.3 Plant Instrumentation and Control System
1. Incore nuclear instrumentation
  2. Rod control
  3. Rod position indication
  4. Rod worth minimizer
  5. Rod sequence control system
  6. Rod block monitor
  7. Feedwater flow control
  8. Reactor Protection System
  9. Electrohydraulic control
  10. All logics
  11. Theory of instruments
- 3.2.1.4 Normal and abnormal procedures and emergency instructions
1. Engineered safety systems
  2. Site emergency plan
  3. Overall plant operating procedures
- 3.2.1.5 Radiation control and safety
1. Nuclear radiation
  2. Biological effects of radiation
  3. 10CFR20
  4. Radiation Protection Manual
  5. Radiation Monitoring System
  6. Radiation control procedures
- 3.2.1.6 Technical specifications
1. Safety limits
  2. Limiting conditions for operation and surveillance requirements
  3. Design features
  4. Administrative controls



3.2.1.7 Chemistry

1. Chemistry control
2. Radiation chemistry
3. Specifications and criteria
4. IGSCC

3.2.1.8 Quality Assurance responsibilities

3.2.1.9 Heat transfer, fluid flow, and thermodynamics

1. Basic properties of fluids and matter
2. Fluid statics
3. Fluid dynamics
4. Heat transfer by conduction, convection, and radiation
5. Change of phase - boiling
6. Burnout and flow instability
7. Reactor heat transfer limits

3.2.1.10 Mitigating core damage

1. In-core instrumentation
2. Vital instrumentation
3. Primary chemistry
4. Radiation monitoring
5. Gas generation

3.2.1.11 Thermal shock

1. Brittle fracture and the reactor vessel
2. Heatup and cooldown limits
3. Reactor recirculation pump startup

3.2.1.12 Refueling

1. CO duties
2. SRO duties
3. Procedures
4. Technical specification requirements
5. Safety

3.2.1.13 Modifications to existing systems or installation of new systems.

3.2.1.14 Significant plant operating experiences (e.g., LERs), other plants' operating experiences and industry operating events.

3.2.1.15 Revisions to existing plant procedures and issuance of new procedures.

3.2.1.16 Plant systems.

### 3.2.2 Simulator retraining

CP&L requires that each licensed and certified individual receive approximately 40 hours of training on a simulator each year. This training is usually divided into ten 4-hour sessions.

Simulator training encompasses training on control, auxiliary, emergency systems, procedures, technical specifications, transient conditions, reactivity manipulations, and operator skills. During the simulator training, the shift team concept is utilized. Past experience critiques are conducted at the control panel following the training exercises. The simulator staff maintains a record of all manipulations performed by each crew member to ensure all members complete all required manipulations. The simulator used will have a similar arrangement of instrumentation and controls and will reproduce the general operating characteristics of the Brunswick plant. The simulator staff will base their programs on recommendations and requirements as directed by the plant Director - Training and NRC requirements. The program will include evaluation of the licensed operator's performance during abnormal/emergency conditions. A comprehensive evaluation of each individual's performance is prepared by the simulator staff. The evaluation is submitted to the plant General Manager and routed to the Director - Training for inclusion into the individual's training records.

The following control manipulations are acceptable for meeting the reactivity control manipulations requirements of Appendix A, paragraph 3.a of 10CFR55. The asterisk (\*) items shall be performed on an annual basis; all other items shall be performed on a two-year cycle. Each individual shall perform or participate in a combination of these control manipulations. Personnel with senior operator licenses are credited with these manipulations if they direct or evaluate control manipulations as they are performed.

- \*3.2.2.1 Plant or reactor startups to include a range that reactivity feedback from nuclear heat addition is noticeable.
- 3.2.2.2 Plant shutdown.
- \*3.2.2.3 Manual control of feedwater during startup and shutdown.
- \*3.2.2.4 Any significant (greater than 10%) power changes in manual rod control.



- \*3.2.2.5 Loss of coolant including:
  - 1. Significant main steam leak.
  - 2. Inside and outside containment.
  - 3. Large and small, including leak rate determination.
- 3.2.2.6 Loss of instrument air.
- 3.2.2.7 Loss of electrical power (and/or degraded power sources). System low frequency.
- \*3.2.2.8 Loss of core coolant flow/natural circulation.
- 3.2.2.9 Loss of condenser vacuum.
- 3.2.2.10 Loss of service water.
- 3.2.2.11 Loss of shutdown cooling.
- 3.2.2.12 Loss of component cooling system or cooling to an individual component.
- 3.2.2.13 Loss of normal feedwater or normal Feedwater System failure.
- \*3.2.2.14 Loss of all feedwater (normal and emergency).
- 3.2.2.15 Loss of Protective System channel.
- 3.2.2.16 Mispositioned, dropped, or uncoupled control rods(s).
- 3.2.2.17 Inability to drive control rods.
- 3.2.2.18 Conditions requiring use of emergency boration.
- 3.2.2.19 Fuel cladding failure or high activity in Reactor Coolant or Off-Gas System.
- 3.2.2.20 Generator or turbine trip.
- 3.2.2.21 Malfunction of automatic control system(s) [recirculation flow control].
- 3.2.2.22 Malfunction of feedwater level control.
- 3.2.2.23 Reactor scram.
- 3.2.2.24 Main steam line break (inside or outside containment). See 3.2.2.5(1).

3.2.2.25 Nuclear instrumentation failure(s).

3.2.3 On-the-job training

It is essential to individual and crew readiness that emphasis periodically be given to vital information on alarm settings, safety limits, abnormal condition symptoms for operation, operating sequences, and emergency immediate action steps.

Timely review of these items, significant events, plant modification, procedure changes, license amendments, etc., is the responsibility of Operations specialists. They prepare timely reviews of incoming information as directed by Manager - Operations, conduct and document training, and send reports to the Director - Training.

3.2.3.1 A quarterly report will list the information covered for each member of the shift operation crew, and will contain the Shift Foreman's judgment of each operator's familiarity with the information reviewed during that quarter, as well as each operator's ability to take the required action. During the fourth quarter, a complete walk-through of Control Room inaccessibility will be conducted individually or as a group (this training is not available in the simulator).

3.2.3.2 Staff members holding NRC license or certifications shall participate in the quarterly review of the volumes of the plant operating manuals as listed on the Quarterly Report Form. They will submit a quarterly report at the end of each quarter. This review will include a complete walk-through of Control Room inaccessibility, which is conducted in the fourth quarter individually or as a group (this training is not available in the simulator).

3.2.3.3 The Director - Training will maintain records of the reports filled out by the Shift Foreman and staff members. They may be used in compiling qualification information for NRC license renewal applications.

3.2.3.4 Design changes, facility license changes, safety-related modifications, changes to procedures, changes to license, and significant

operating experiences, will be screened and routed as appropriate to the shifts and staff for review. Major items will be covered in the preplanned lectures. This may be accomplished by group or individual review and documented in the training files.

3.2.3.5 The staff personnel holding an NRC operator license will stand an average of four hours watch in the Control Room per month. If he is regularly participating in a simulator training program, 75% of this time can be satisfied on the simulator. During these four hours, he will carry out those duties normally conducted by either the Shift Foreman, Shift Operating Supervisor, Senior Control Operator, or Control Room operator. Staff members will enter their on-shift time on their quarterly reports.

3.2.3.6 During all plant operations, a record will be kept of any major reactivity changes a licensed operator performs. The operating shift and staff licenses will report these manipulations on the reactor operator quarterly report.

#### 3.2.4 Evaluation

The evaluation phase will consist of three parts:

1. Annual written requalification examination.
2. Annual operating examination.
3. Accelerated requalification program.

The annual written and operating examinations will be conducted during scheduled training periods. Any licensee or certified individual that fails a written or operating exam will be removed from licensed duties and placed in an accelerated requalification program.

##### 3.2.4.1 Annual written requalification examination

An annual written examination shall be administered to all licensed and certified personnel each calendar year. The purpose of the examination is to determine each licensed and certified individual's knowledge and to provide a basis for determining areas in which retraining is required. The results will be recorded and be used as a reference for the next requalification program.

The requalification examination will utilize the basic format of that given by the USNRC and will be operationally oriented. The passing criteria will be 80% overall with no category less than 70%. If a licensed or certified individual shows he is deficient in any of the categories on the written examination, he will be removed from licensed duties and placed in an accelerated requalification program using the following criteria:

3.2.4.1.1 If he scores less than 70% on one and not more than two categories with an overall exam score of 80%, he will receive accelerated requalification in those categories on which he scored less than 70%.

3.2.4.1.2 If he scores less than 80% overall, he will receive accelerated requalification in all categories on which he scored less than 80%.

#### 3.2.4.2 Annual operating examination

In addition to the evaluations performed during simulator retraining (Section 3.2.2), walk-through operating examinations shall be conducted either at the simulator or at the operating plant on an annual basis for selected individuals. An NRC-type operating examination form will be used to document these examinations and the results will be analyzed and be used as appropriate.

The selection process will be such that each individual is examined at least once every five years. Individuals who tend to be weak in selected areas may be examined more frequently. An individual who fails to pass an operating exam will be removed from licensed duties and placed in an accelerated requalification program.

#### 3.2.4.3 Accelerated requalification program

The licensed or certified individual with identified deficiencies will receive a requalification program specifically structured to upgrade his skills and knowledge.

3.2.4.3.1 The Director - Training or his designee shall be responsible for formulating and approving the individual's accelerated program. The accelerated requalification program may involve a variety of training exercises including:

- 1.. Directed self-study.
2. Oral interviews and discussion sessions.
3. Preplanned lectures.
4. Skills training exercise at the plant or utilizing a simulator.

3.2.4.3.2 The program duration will be dictated by the extent of training required to rectify the deficiencies and the trainee's performance.

3.2.4.3.3 Successful completion of the accelerated requalification program will be determined by the individual successfully completing the same type exam (oral or written) previously failed.

1. The criteria for successful completion of a written accelerated requalification exam is met by exceeding 3.2.4.1.1 or 3.2.4.1.2 as applicable.
  - a. If 3.2.4.1.1 applies, the individual shall be reexamined on those categories and must make 80% on each category.
  - b. If 3.2.4.1.2 applies, the individual will be reexamined on an entire exam and must make 80% overall with no category less than 70%.
2. The criteria for successful completion of an accelerated requalification exam is met by satisfactorily passing all areas previously graded as weak or inadequate.

3.2.4.3.4 In the event that the individual does not pass the accelerated requalification examination, a second accelerated requalification program shall be structured and conducted to correct the deficiencies if it is thought appropriate by the Director - Training. In the event of a second failure, the Director - Training shall make appropriate recommendations to plant management regarding the individual's permanent removal from licensed duties.

#### 4.0 Responsibility

4.1 The Manager - Operations will be responsible for the administration and reporting of the on-shift portion of the operator requalification program.

4.2 The Director - Training will be responsible for:

4.2.1 The execution and overall conduct of the operator requalification program.

4.2.2 The administration and documentation of the classroom and evaluation phases.

4.2.3 Timely initiation of license renewal applications to the NRC.

4.2.4 The proper maintenance of all records pertaining to the operator requalification program.

#### 5.0 Documentation

The Director - Training or his designated representative assures all aspects of the requalification program are properly documented. Procedures, including forms, for this documentation will be implemented and maintained in a controlled manner.