SAI-186-029-31

TECHNICAL EVALUATION REPORT

IMPROVEMENTS IN TRAINING AND REQUALIFICATION PROGRAMS AS REQUIRED BY TMI ACTION ITEMS I.A.2.1 AND II.B.4

for the

Brunswick Steam Electric Plant, Units 1 and 2

(Docket 50-325 and 50-324)

June 14, 1982

Prepared By:

Science Applications, Inc.
1710 Goodridge Drive
McLean, Virginia 22102

Prepared for:

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Contract NRC-03-82-096

TABLE OF CONTENTS

I. INTRODUCTION

Science Applications, Inc. (SAI), as technical assistance contractor to the U.S. Nuclear Regulatory Commission, has evaluated the response by Carolina Power and Light Company (CP&L) for the Brunswick Steam Electric Plant, Unit 1 (Docket 50-325) and Unit 2 (Docket 50-324) to certain requirements contained in post-TMI Action Items I.A.2.1, Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualification, and II.B.4, Training for Mitigating Core Damage. These requirements were set forth in NUREG-0660 (Reference 1) and were subsequently clarified in NUREG-0737 (Reference 2).*

The purpose of the evaluation was to determine whether the licensee's operator training and requalification programs satisfy the requirements. The evaluation pertains to the following Technical Assignment Control (TAC) System numbers:

	.A.2.1	II.B.4
Unit 1	44146	44496
Unit 2	44147	44497

As delineated below, the evaluation covers only some aspects of item I.A.2.1.4.

The detailed evaluation of the licensee's submittals is presented in Section IV; the conclusions are in Section V.

II. SCOPE AND CONTENT OF THE EVALUATION

A. I.A.2.1: Immediate Upgrading of RO and SRO Training and Qualifications

The clarification of TMI Action Item I.A.2.1 in NUREG-0737 incorporates a letter and four enclosures, dated March 28, 1980, from Harold R. Denton, Director, Office of Nuclear Reactor Regulation, USNRC, to all power reactor applicants and licensees, concerning qualifications of reactor operators (hereafter referred to as Denton's letter). This letter and enclosures imposes a number of training requirements on power reactor licensees. This evaluation specifically addressed a subset of the requirements stated in Enclosure 1 of Denton's letter, namely: Item A.2.c, which relates to operator training requirements; item A.2.e, which concerns instructor requalification; and Section C, which addresses operator requalification. Some of these requirements are elaborated in Enclosures 2, 3, and 4 of Denton's letter. The training requirements under evaluation are summarized in Figure 1. The elaborations of these requirements in Enclosures 2, 3, and 4 of Denton's letter are shown respectively in Figures 2, 3, and 4.

*Enclosure 1 of NUREG-0737 and NRC's Technical Assistance Control System distinguish four sub-actions within I.A.2.1 and two sub-actions within II.B.4. These subdivisions are not carried forward to the actual presentation of the requirements in Enclosure 3 of NUREG-0737. If they had been, the items of concern here would be contained in I.A.2.1.4 and II.B.4.1.

Figure 1. Training Requirements from TMI Action Item I.A.2.1*

Program Element	NRC Requirements**
OPERATIONS PERSONNEL TRAINING	Enclosure 1, Item A.2.c(1) Training programs shall be modified, as necessary, to provide training in heat transfer, fluid flow and thermodynamics. (Enclosure 2 provides guidelines for the minimum content of such training.) Enclosure 1, Item A.2.c(2) Training programs shall be modified, as necessary to provide training in the use of installed plant systems to control or mitigate an accident in which the core is severely damaged. (Enclosure 3 provides guidelines for the minimum content of such training.) Enclosure 1, Item A.2.c.(3) Training programs shall be modified, as necessary to provide increased emphasis on reactor and plant transients.
INSTRUCTOR REQUALIFICATION	Enclosure 1, Item A.2.e Instructors shall be enrolled in appropriate requalification programs to assure they are cognizant of current operating history, problems, and changes to procedures and administrative limitations.
PERSONNEL REQUALIFICATION	Enclosure 1, Item C.1 Content of the licensed operator requalification programs shall be modified to include instruction in heat transfer, fluid flow, thermodynamics, and mitigation of accidents involving a degraded core. (Enclosures 2 and 3 provide guidelines for the minimum content of such training.) Enclosure 1, Item C.2 The criteria for requiring a licensed individual to participate in accelerated requalification shall be modified to be consistent with the new passing grade for issuance of a license: 80% overall and 70% each category. Enclosure 1, Item C.3 Programs should be modified to require the control manipulations listed in Enclosure 4. Normal control manipulations, such as plant or reactor startups, must be performed. Control manipulations during abnormal or emergency operations must be walked through with, and evaluated by, a member of the training staff at a minimum. An appropriate simulator may be used to satisfy the requirements for control manipulations.

*The requirements shown are a subset of those contained in Item I.A.2.1.
**References to Enclosures are to Denton's letter of March 28, 1980, which is contained in the clarification of Item I.A.2.1 in NUREG-0737.

Figure 2. Enclosure 2 from Denton's Letter

TRAINING IN HEAT TRANSFER, FLUID FLOW AND THERMODYNAMICS

1. Basic Properties of Fluids and Matter.

   This section should cover a basic introduction to matter and its properties. This section should include such concepts as temperature measurements and effects, density and its effects, specific weight, buoyancy, viscosity and other properties of fluids. A working knowledge of steam tables should also be included. Energy movement should be discussed including such fundamentals as heat exchange, specific heat, latent heat of vaporization and sensible heat.

2. Fluid Statics.

   This section should cover the pressure, temperature and volume effects on fluids. Example of these parametric changes should be illustrated by the instructor and related calculations should be performed by the students and discussed in the training sessions. Causes and effects of pressure and temperature changes in the various components and systems should be discussed in the training sessions. Causes and effects of pressure and temperature changes in the various components and systems should be discussed as applicable to the facility with particular emphasis on safety significant features. The characteristics of force and pressure, pressure in liquids at rest, principles of hydraulics, saturation pressure and temperature and subcooling should also be included.

3. Fluid Dynamics.

   This section should cover the flow of fluids and such concepts as Bernoulli's principle, energy in moving fluids, flow measure theory and devices and pressure losses due to friction and orificing. Other concepts and terms to be discussed in this section are NPSH, carry over, carry under, kinetic energy, head-loss relationships and two phase flow fundamentals. Practical applications relating to the reactor coolant system and steam generators should also be included.

4. Heat Transfer by Conduction, Convection and Radiation.

   This section should cover the fundamentals of heat transfer by conductions. This section should include discussions on such concepts and terms as specific heat, heat flux and atomic action. Heat transfer characteristics of fuel rods and heat exchangers should be included in this section.

   This section should cover the fundamentals of heat transfer by convection. Natural and forced circulation should be discussed as applicable to the various systems at the facility. The convection current patterns created by expanding fluids in a confined area should be included in this section. Heat transport and fluid flow reductions or stoppage should be discussed due to steam and/or noncondensible gas formation during normal and accident conditions.

   This section should cover the fundamentals of heat transfer by thermal radiation in the form of radiant energy. The electromagnetic energy emitted by a body as a result of its temperature should be discussed and illustrated by the use of equations and sample calculations. Comparisons should be made of a black body absorber and a white body emitter.

5. Change of Phase - Boiling.

   This section should include descriptions of the state of matter, their inherent characteristics and thermodynamic properties such as enthalpy and entropy. Calculations should be performed involving steam quality and void fraction properties. The types of boiling should be discussed as applicable to the facility during normal evolutions and accident conditions.

6. Burnout and Flow Instability.

   This section should cover descriptions and mechanisms for calculating such terms as critical flux, critical power, DNB ratio and hot channel factors. This section should also include instructions for preventing and monitoring for clad or fuel damage and flow instabilities. Sample calculations should be illustrated by the instructor and calculations should be performed by the students and discussed in the training sessions. Methods and procedures for using the plant computer to determine quantitative values of various factors during plant operation and plant heat balance determinations should also be covered in this section.

7. Reactor Heat Transfer Limits.

   This section should include a discussion of heat transfer limits by examining fuel rod and reactor design and limitations. The basis for the limits should be covered in this section along with recommended methods to ensure that limits are not approached or exceeded. This section should cover discussions of peaking factors, radial and axial power distributions and changes of these factors due to the influence of other variables such as moderator temperature, xenon and control rod position.

Figure 3. Enclosure 3 from Denton's Letter

TRAINING CRITERIA FOR MITIGATING CORE DAMAGE

A. Incore Instrumentation

1. Use of fixed or movable incore detectors to determine extent of core damage and geometry changes.

2. Use of thermocouples in determining peak temperatures; methods for extended range readings; methods for direct readings at terminal junctions.

3. Methods for calling up (printing) incore data from the plant computer.

B. Excore Nuclear Instrumentation (NIS)

1. Use of NIS for determination of void formation; void location basis for NIS response as a function of core temperatures and density changes.

C. Vital Instrumentation

1. Instrumentation response in an accident environment; failure sequence (time to failure, method of failure); indication reliability (actual vs indicated level).

2. Alternative methods for measuring flows, pressures, levels, and temperatures.

   a. Determination of pressurizer level if all level transmitters fail.

   b. Determination of letdown flow with a clogged filter (low flow).

   c. Determination of other Reactor Coolant System parameters if the primary method of measurement has failed.

D. Primary Chemistry

1. Expected chemistry results with severe core damage; consequences of transferring small quantities of liquid outside containment; importance of using leak tight systems.

2. Expected isotopic breakdown for core damage; for clad damage.

3. Corrosion effects of extended immersion in primary water; time to failure.

E. Radiation Monitoring

1. Response of Process and Area Monitors to severe damages; behavior of detectors when saturated; method for detecting radiation readings by direct measurement at detector output (overranged detector); expected accuracy of detectors at different locations; use of detectors to determine extent of core damage.

2. Methods of determining dose rate inside containment from measurements taken outside containment.

F. Gas Generation

1. Methods of H_2 generation during an accident; other sources of gas (Xe, Ke); techniques for venting or disposal of non-condensibles.

2. H_2 flammability and explosive limit; sources of O_2 in containment or Reactor Coolant System.

Figure 4. Control Manipulations Listed in Enclosure 4.

CONTROL MANIPULATIONS

*1. Plant or reactor startups to include a range that reactivity feedback from nuclear heat addition is noticeable and heatup rate is established.

2. Plant shutdown.

*3. Manual control of steam generators and/or feedwater during startup and shutdown.

4. Boration and or dilution during power operation.

*5. Any significant (greater than 10%) power changes in manual rod control or recirculation flow.

6. Any reactor power change of 10% or greater where load change is performed with load limit control or where flux, temperature, or speed control is on manual (for HTGR).

*7. Loss of coolant including:

1. significant PWR steam generator leaks
2. inside and outside primary containment
3. large and small, including leak-rate determination
4. saturated Reactor Coolant response (PWR).

8. Loss of instrument air (if simulated plant specific).

9. Loss of electrical power (and/or degraded power sources).

*10. Loss of core coolant flow/natural circulation.

11. Loss of condenser vacuum.

12. Loss of service water if required for safety.

13. Loss of shutdown cooling.

14. Loss of component cooling system or cooling to an individual component.

15. Loss of normal feedwater or normal feedwater system failure.

*16. Loss of all feedwater (normal and emergency).

17. Loss of protective system channel.

18. Mispositioned control rod or rods (or rod drops).

19. Inability to drive control rods.

20. Conditions requiring use of emergency boration or standby liquid control system.

21. Fuel cladding failure or high activity in reactor coolant or offgas.

22. Turbine or generator trip.

23. Malfunction of automatic control system(s) which affect reactivity.

24. Malfunction of reactor coolant pressure/volume control system.

25. Reactor trip.

26. Main steam line break (inside or outside containment).

27. Nuclear instrumentation failure(s).

* Starred items to be performed annually, all others biennially.

As noted in Figure 1, Enclosures 2 and 3 indicate minimum requirements concerning course content in their respective areas. In addition, the Operator Licensing Branch in NRC has taken the position (Reference 3) that the training in mitigating core damage and related subjects should consist of at least 80 contact hours* in both the initial training and the requalification programs. The NRC considers thermodynamics, fluid flow and heat transfer to be related subjects, so the 80-hour requirement applies to the combined subject areas of Enclosures 2 and 3. The 80 contact hour criterion is not intended to be applied rigidly; rather, its purpose is to provide greater assurance of adequate course content when the licensee's training courses are not described in detail.

Since the licensees generally have their own unique course outlines, adequacy of response to these requirements necessarily depends only on whether it is at a level of detail comparable to that specified in the enclosures (and consistent with the 80 contact hour requirement) and whether it can reasonably be concluded from the licensee's description of his training material that the items in the enclosures are covered.

The Institute of Nuclear Power Operations (INPO) has developed its own guidelines for training in the subject areas of Enclosures 2 and 3. These guidelines, given in References 4 and 5, were developed in response to the same requirements and are more than adequate, i.e., training programs based specifically on the complete INPO documents are expected to satisfy all the requirements pertaining to training material which are addressed in this evaluation.

The licensee's response concerning increased emphasis on transients is considered by SAI to be acceptable if it makes explicit reference to increased emphasis on transients and gives some indication of the nature of the increase, or, if it addresses both normal and abnormal transients (without necessarily indicating an increase in emphasis) and the requalification program satisfies the requirements for control manipulations, Enclosure 1, Item C.3. The latter requirement calls for all the manipulations listed in Enclosure 4 (Figure 4 in this report) to be performed, at the frequency indicated, unless they are specifically not applicable to the licensee's type of reactor(s). Some of these manipulations may be performed on a simulator. Personnel with senior licenses may be credited with these activities if they direct or evaluate control manipulations as they are performed by others. Although these manipulations are acceptable for meeting the reactivity control manipulations required by Appendix A paragraph 3.a of 10 CFR 55, the requirements of Enclosure 4 are more demanding. Enclosure 4 requires about 32 specific manipulations over a two-year cycle while 10 CFR 55 Appendix A requires only 10 manipulations over a two-year cycle.

B. II.B.4: Training for Mitigating Core Damage

Item II.B.4 in NUREG-0737 requires that "shift technical advisors and operating personnel from the plant manager through the operations chain

*A contact hour is a one-hour period in which the course instructor is present or available for instructing or assisting students; lectures, seminars, discussions, problem-solving sessions, and examinations are considered contact periods. This definition is taken from Reference 4.

to the licensed operators" receive training on the use of installed systems to control or mitigate accidents in which the core is severely damaged. Enclosure 3 of Denton's letter provides guidance on the content of this training. "Plant Manager" is here taken to mean the highest ranking manager at the plant site.

For licensed personnel, this training would be redundant in that it is also required, by I.A.2.1, in the operator requalification program. However, II.B.4 applies also to operations personnel who are not licensed and are not candidates for licenses. This may include one or more of the highest levels of management at the plant. These non-licensed personnel are not explicitly required to have training in heat transfer, fluid flow and thermodynamics and are therefore not obligated for the full 80 contact hours of training in mitigating core damage and related subjects.

Some non-operating personnel, notably managers and technicians in instrumentation and control, health physics and chemistry departments, are supposed to receive those portions of the training which are commensurate with their responsibilities. Since this imposes no additional demands on the program itself, we do not address it in this evaluation. It would be appropriate for resident inspectors to verify that non-operating personnel receive the proper training.

* * * * *

The required implementation dates for all items have passed. Hence, this evaluation did not address the dates of implementation. Moreover, the evaluation does not cover training program modifications that might have been made for other reasons subsequent to the response to Denton's letter.

III. LICENSEE SUBMITTALS

The licensee (CP&L) has submitted to NRC a number of items (letters and various attachments) which explain their training and requalification programs. These submittals, made in response to Denton's letter, form the information base for this evaluation. For the Brunswick plants, there were three submittals with attachments, for a total of nine items, which are listed below.

1. Letter from A.C. Tollison,Jr., General Manager, Brunswick Steam Electric Plant, Carolina Power & Light Co., to P.F. Collins, Chief of Operator Licensing Branch, NRC. July 28, 1980. (2 pp, with enclosures: items 2, 3, & 4). File No.: B10-14220, Serial No.: BSEP/80-1219. (re: Transmittal, response to NRC letter dated March 28, 1980).

2. "Training Instruction TI-200, Brunswick Plant Operator Retraining Program", Brunswick Steam Electric Plant, Carolina Power & Light Co., Revision 5. Approved by A.C. Tollison, General Manager, July 25, 1980. (13 pp, attached to item 1).

3. "Training Instruction TI-201, Brunswick Plant Reactor Operator Replacement Training Program", Brunswick Steam Electric Plant, Carolina Power & Light Co., Revision 3. Approved by A.C. Tollison,Jr., General Manager, July 25, 1980. (10 pp, attached to item 1).

4. "Training Instruction TI-202, Replacement Training for Senior-Licensed Operating Personnel", Brunswick Steam Electric Plant, Carolina Power & Light Co., Revision 1. Approved by A.C. Tollison,Jr., General Manager, July 25, 1980. (7 pp, attached to item 1).

5. Letter from (unknown personnel), Brunswick Steam Electric Plant Unit Nos. 1 & 2, Carolina Power & Light Co., to D.G. Eisenhut Director of Division of Licensing, NRC. December 31, 1980. (No. of pages, unknown). NRC Acc. No: 8101060587. (re: Status of the Training Program required by NUREG-0737, Item II.B.4).

6. Letter from P.W. Howe, Vice President, Technical Services, Carolina Power & Light Co., to D.B. Vassallo, Chief of Operating Reactors Branch #2, Division of Licensing, NRC. May 10, 1982. (2 pp, with enclosures: items 7, 8, & 9).(re: Response to NRC's RAI, dated April 2, 1982).

7. "CP&L Response to Upgraded SRO & RO Training for Mitigating Core Damage - NRC Request for Additional Information (April 2, 1982)". Undated. (4 pp, attached to item 6).

8. "Mitigating Core Damage", Course Outline. Undated. (2 pp, attached to item 6).

9. "Mitigating Core Damage", Presentation. Undated. (6 pp, attached to item 6).(re: Topic Outlines).

Submittal items 2, 3 and 4 describe the basic programs at Brunswick. Submittal item 6 is the response to a request for additional information (Reference 6) made in the course of this evaluation. This letter contains details that are not in the program descriptions and, for purposes of this evaluation, is considered to be an integral part of the licensee's training program description.

IV. EVALUATION

SAI's evaluation of the training programs at Carolina Power and Light Co.'s Brunswick Steam Electric Plant is presented below. Section A addresses TMI Action Item I.A.2.1 and presents the assessment organized in the manner of Figure 1. Section B addresses TMI Action Item II.B.4.

A. I.A.2.1: Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualification.

Enclosure 1, Item A.2.c(1)

The basic requirements are that the training programs given to reactor operator and senior reactor operator candidates cover the subjects of heat transfer, fluid flow and thermodynamics at the level of detail specified in Enclosure 2 of Denton's letter.

CP&L provides separate training programs for Reactor Operators (ROs) and Senior Reactor Operators (SROs). The RO training program (Training Instruction TI-201) involves 10-12 weeks of training. The list of instruction topics includes heat transfer, fluid flow, and thermodynamics as a single major section. Within this section, the list of subtopics is identical to the numbered topics in Enclosure 2 (see Figure 2), but no further detail on training course content is provided.

The SRO training program (TI-202) responds to the NUREG-0737 requirement in precisely the same way, i.e., a new section has been added to the list of topics. In addition, heat transfer and fluid flow are also included as subtopics under Reactor Theory and implicitly in other sections.

Although detailed course content is not provided, the fact that CP&L has structured their program specifically in terms of the subtopics of Enclosure 2, combined with their assertion that they meet all the requirements, constitutes an implicit commitment to both the content and the level of detail of Enclosure 2.

Neither program gives a distribution of hours among the major topics. The section devoted to heat transfer, fluid flow, and thermodynamics is one of eleven major sections covered in the 10-12 week training period. However, CP&L's response (submittal item 6) to a request for additional information indicated that 40 classroom hours are devoted to heat transfer, fluid flow and thermodynamics in both the RO and SRO training programs. This is fully one-half of the hours required by NRC for the entire area of mitigating core damage and related subjects.

We conclude that CP&L meets the requirements of this item in their training programs at the Brunswick plant.

Enclosure 1, Item A.2.c(2)

The requirements are that the training programs for reactor and senior reactor operator candidates cover the subject of accident mitigation at the level of detail specified in Enclosure 3 of Denton's letter (see Figure 3 of this report).

The licensee responded to this requirement, just as he did with the previous one, by adding a new major section to the list of training topics. In this case, the section is called "Mitigating Core Damage" and is included in both the RO and SRO training programs. Again, the subtopics are precisely the same as in the relevant enclosure (Enclosure 3) to Denton's letter. Although no further detail is provided in the program descriptions themselves, CP&L's response (submittal item 6) to a request for additional

information (Reference 6) provides both an outline and a "Presentation," the latter being a more detailed outline written in the nature of a syllabus. These outlines provide more detail than Denton's enclosure. Moreover, they indicate that Denton's letter itself and Enclosure 3 are explicitly included as a reference to discussion topics. Students receive a copy of the enclosure. The licensee notes, however, that this material is not covered as a unit but is incorporated into all current training subjects as appropriate, e.g., ECCS training.

As of January 1982, RO and SRO training is broken down by hours approximately as follows:

40 hours	Heat Transfer, Fluid Flow and Thermodynamics
40 hours	ECCS Training
16 hours	Emergency Plan Training
8 hours	Transients
4 hours	Design Basis Accidents
4 hours	Accident Mitigation with Core Damage (AMWCD)

The 4-hour segment on accident mitigation is actually described as a "summary class" which integrates information from all training segments into the core damage context. The licensee notes that core damage mitigation is treated continuously throughout the 40 hours of ECCS training.

As described, this training program clearly meets the 80 contact hour criterion. CP&L indicates a somewhat different breakdown for training already given to present personnel, but it still includes more than 80 contact hours. We conclude the licensee meets this requirement.

Enclosure 1, Item A.2.c(3)

The requirement is that there be an increased emphasis in the training program on dealing with reactor transients.

The licensee asserts that the Lesson Plan for Plant Transients has been updated. Lectures cover all transients analyzed in the FSAR, including DBAs. The program is updated after each reload, based on supplemental reload licensing information supplied by their reactor vendor. The training related to transients includes four days at the Limerick Simulator. We conclude the licensee meets this requirement.

Enclosure 1, Item A.2.e

The requirement is that instructors for reactor operator training programs be enrolled in appropriate requalification programs to assure they are cognizant of current operating history, problems and changes to procedures and administrative limitations.

CP&L states in submittal item 6 that all licensed operator instructors participate fully in the regular retraining program for licensed operators. (The instructors are taught by an instructor who has received training from GE, the reactor vendor.) The retraining program includes a review of "...facility design changes, procedure changes, and facility license changes, significant safety-related modifications or changes to

procedures and license...." This review is documented in the training files. The licensee's response is adequate and therefore meets the requirement.

Enclosure 1, Item C.1

The primary requirement is that the requalification programs have instruction in the areas of heat transfer, fluid flow, thermodynamics and accident mitigation. The level of detail required in the requalification program is that of Enclosures 2 and 3 of Denton's letter. In addition, these instructions must involve an adequate number of contact hours.

The retraining program at Brunswick (TI-200) reflects this requirement by the addition of two major sections (as in the training programs) to the topic outline, one covering heat transfer, fluid flow and thermodynamics, the other covering mitigation of core damage. Again, the sub-topics are the unnumbered topics from Denton's Enclosures 2 and 3. The elaboration of technical content in the core mitigation section given in submittal item 6 would also apply to the retraining program. Hence, with regard to technical content, the retraining program is satisfactory to the same extent as the training programs, with a minor reservation as discussed below.

CP&L indicates that the course outlines identify topics which may be covered. Each year, the annual examination results are used to formulate the retraining program for the following year. Consequently, there is no assurance that a particular subtopic would be covered in any given year. There is no provision for this type of flexibility in NUREG-0737. However, it apparently is consistent with NRC practice with training in general and there is no obvious reason why an exception should be made here. We conclude the content of the requalification program is adequate and therefore that the requirement is satisfied.

On the other hand, CP&L allows any operator who "... clearly shows he would have passed an NRC exam ..." on a particular subject (with a score of 80% or greater) to be exempt from lectures on that subject. This would not be logically inconsistent with the practice noted earlier, but it raises the question of how one demonstrates he would have passed a test without taking the test. Presuming CP&L's practice to have been approved for other subjects, we refrain from questioning it here. We would suggest, however, that the resident inspector obtain some clarification from CP&L.

As of January 1982, the annual retraining program is broken down approximately as follows:

24 hours	Heat Transfer, Fluid Flow and Thermodynamics
24 hours	ECCS
4	Transients and DBAs
8	Emergency Plan Training
4	AMWCD

In addition, of 32 hours spent annually at the simulator, 16 are related to mitigating core damage. These, combined with the 64 hours identified above, add to 80 hours. If all the subjects listed are considered to be related to mitigating core damage, as CP&L does, the 80

contact hour requirement is clearly met on an annual basis. Actually, retraining programs are required only biennially. We assume, as CP&L implies, that all licensed operators undergo retraining each year. To some extent, this would compensate for the flexibility in formulating the annual program. We conclude that the 80 contact hour requirement is met.

Enclosure 1, Item C.2

The requirement for licensed operators to participate in the accelerated requalification program must be based on passing scores of 80% overall, 70% in each category.

If an operator at the Brunswick plant receives less than 70% in any category or less than 80% overall on an examination, he is removed from licensed duties and required to receive accelerated requalification. The accelerated requalification training is required in any category for which the score is less than 70% or in all categories if the overall score is less than 80%. This training continues until proficiency is demonstrated via written or oral examinations. This policy satisfies the requirement.

Enclosure 1, Item C.3

TMI Action Item I.A.2.1 calls for the licensed operator requalification program to include performance of control manipulations involving both normal and abnormal situations. The specific manipulations required and their performance frequency are identified in Enclosure 4 of the Denton letter (see Figure 4 of this report).

The retraining program identifies explicitly all but one of the 27 manipulations specified in Denton's Enclosure 4. Item 6 is omitted because it does not apply to boiling water reactors, the type used at Brunswick. The stated frequency of performance is also in compliance with the requirement.

B. II.B.4 Training for Mitigating Core Damage

Item II.B.4 requires that training for mitigating core damage, as indicated in Enclosure 3 of Denton's letter, be given to shift technical advisors and operating personnel from the plant manager to the licensed operators. This includes both licensed and non-licensed personnel.

The content of the licensee's training in this area is at least as comprehensive as Enclosure 3 of Denton's letter. Moreover, the requirement that core damage mitigation training be given to all operations personnel is satisfied, judging from the organization chart provided in submittal item 6. Specifically, the following receive the training and are tested on it in the final retraining exams: shift technical advisors, shift operating supervisors, shift foremen, senior control operators, reactor operators, all licensed non-operations personnel, manager-operations, manager-plant operations, and general manager. (The latter two have missed one lecture but will complete the training by June 15, 1982.) In addition, the managers of maintenance and environmental and radiation control take the training but not the test. We conclude that CP&L satisfies this requirement.

V. CONCLUSIONS

Based on our evaluation as discussed above, SAI concludes that the licensee has met the requirements of NUREG-0737 items I.A.2.1 and II.B.4 with regard to operator training programs at the Brunswick Steam Electric Plant, Units 1 and 2.

VI. REFERENCES

1. "NRC Action Plan Developed as a Result of the TMI-2 Accident." NUREG-0660, United States Nuclear Regulatory Commission. May 1980.

2. "Clarification of TMI Action Plan Requirements," NUREG-0737, United States Nuclear Regulatory Commission. November 1980.

3. The NRC requirement for 80 contact hours is an Operator Licensing Branch technical position. It was included with the acceptance criteria provided by NRC to SAI for use in the present evaluation. See letter, Harley Silver, Technical Assistance Program Management Group, Division of Licensing, USNRC to Bryce Johnson, Program Manager, Science Applications, Inc., Subject: Contract No. NRC-03-82-096, Final Work Assignment 2, December 23, 1981.

4. "Guidelines for Heat Transfer, Fluid Flow and Thermodynamics Instruction," STG-02, The Institute of Nuclear Power Operations. December 12, 1980.

5. "Guidelines for Training to Recognize and Mitigate the Consequences of Core Damage," STG-01, The Institute of Nuclear Power Operations. January 15, 1981.

6. Letter from Domenic B. Vassallo, NRC to J. A. Jones, Senior Executive Vice President, Carolina Power & Light Company, transmitting request for additional information on Upgraded SRO and RO Training and Training for Mitigating Core Damage, dated April 2, 1982.