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Mr. William Cavanaugh, III
Senior Vice President,
Energy Supply
Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Dear Mr. Cavanaugh:

Enclosed is our Safety Evaluation Report on NUREG Items I.A.2.1 "Upgraded RO and SRO Training" and II.B.4 "Training for Mitigating Core Damage" for Arkansas Nuclear One, Units Nos. 1 and 2 (ANO-1/2).

We have reviewed the information which you have submitted on Items I.A.2.1 and II.B.4 and the information which we obtained as a result of our inspection visit at ANO-1/2 on September 27-28, 1982 and find that ANO-1/2 meets the requirements of these two items.

Therefore, we consider Items I.A.2.1 and II.B.4 resolved for ANO-1/2.

Sincerely,

"ORIGINAL SIGNED BY
JOHN F. STOLZ"

John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

"ORIGINAL SIGNED BY:"

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Enclosure:
Safety Evaluation Report

cc w/enclosure:
See next pg.

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SURNAME	GVissing/cb	PKreutzer	JStevens	CTrammell	DWigginton	JStolz	RAClark
DATE	11/23/82	11/24/82	11/29/82	11/29/82	11/26/82	11/30/82	11/30/82

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Arkansas Power & Light Company

cc w/enclosure(s):

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 1, 1982

Dockets Nos. 50-313
and 50-368

Mr. William Cavanaugh, III
Senior Vice President,
Energy Supply
Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

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Therefore, we consider Items I.A.2.1 and II.B.4 resolved for ANO-1/2.

Sincerely,

John F. Stolz

John F. Stolz, Chief
Operating Reactors Branch #4
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Elinor G. Adensam for

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Enclosure:
Safety Evaluation Report

cc w/enclosure:
See next pg.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ARKANSAS NUCLEAR ONE, UNITS NOS. 1 AND 2 - UPGRADING RO AND SRO TRAINING AND TRAINING TO MITIGATE CORE DAMAGE

ACTION PLAN ITEMS I.A.2.1 AND II.B.4

DOCKETS NOS. 50-313 & 50-368

Introduction and Summary

The staff has required an upgrade in Reactor Operator and Senior Reactor Operator training to include enhanced training in heat transfer, fluid flow, and thermodynamics. This is NUREG-0737, item I.A.2.1. The staff has also required training for mitigating core damage through the use of currently installed equipment. This is NUREG-0737, item II.B.4.

The initial evaluation of the Arkansas Nuclear One upgrade in Reactor Operator and Senior Reactor Operator training and in the training to mitigate core damage was performed by Science Applications, Inc. (SAI), as part of a technical assistance contract program. The results of the SAI evaluation are reported in the attached SAI Technical Evaluation Report (SAI-186-029-18) dated August 31, 1982.

Based on our review of the SAI Technical Evaluation Report (TER) and on a special review conducted at Arkansas Nuclear One September 27-28, 1982, we conclude that the upgrade in Reactor Operator and Senior Reactor Operator training programs and the training to mitigate core damage by the use of installed equipment are acceptable.

Evaluation

The attached TER provides a technical evaluation of the Arkansas Nuclear One upgrade in Reactor Operator and Senior Reactor Operator training and of the training in the mitigation of core damage by the use of installed equipment. This TER concluded, "The licensee does not meet all of the requirements of NUREG-0737, items I.A.2.1 and II.B.4. . . " The specific reasons given for this conclusion were:

"I.A.2.1. Both the licensee's training and requalification programs fail to provide adequate instruction in material content and number of contact hours for the training area of accident mitigation with core damage and/or related subjects (heat transfer, fluid flow and thermodynamics).

"Two of the starred manipulations listed in Enclosure 4 (i.e., of H. R. Denton's letter to all power reactor applicants and licensees dated March 28, 1980) are not performed annually as specified in Enclosure 4 (ibid).

"II.B.4. The licensed personnel have not received adequate training in accident mitigation with core damage."

The TER identified two licensee inputs which were used to reach the above conclusions. These were a letter from J. P. O'Hanlon, General Manager, Arkansas Nuclear One, Arkansas Power and Light Company to P. F. Collins, NRC,

serial ANO-80-3228 dated August 4, 1980, and a letter from J. R .Marshall, Manager Licensing, Arkansas Power and Light Company to Messrs. R. A. Clark and J. F. Stolz, Chiefs of Operating Reactor Branchs 3 and 4 respectively. This latter letter was serial ØANØ78211 dated July 21, 1982.

Because the TER had identified the licensee as not meeting the requirements of NUREG-0737, items I.A.2.1 and II.B.4, an onsite review of the licensee's actions in these two areas was conducted. This review indicated that the licensee's response dated August 4, 1980, was written prior to full development of the training curriculum in the mitigation of core damage and that the licensee's letter of July 21, 1982, was prepared on the basis of current requalification training. Apparently, the TER conclusions were not based upon actual training conducted. A review of licensee actions in each of the elements comprising NUREG-0737, items, I.A.2.1 and II.B.4 was made.

The licensee had conducted approximately 100 contact hours of training for Unit 1 operators and approximately 90 contact hours of training for Unit 2 operators in heat transfer, fluid flow, thermodynamics and mitigation of core damage. The subject matter appeared to meet the level of detail specified in H. R. Denton's letter of March 28, 1980. Additionally, the licensee was conducting follow-on training for operators in the requalification program; the depth of coverage of this training was being determined annually, depending upon the results of the annual requalification examination. The attached TER took exception to this point as not providing 80 hours of training annually in

heat transfer, fluid flow, thermodynamics and mitigation of core damage. This requirement was clarified by D. G .Eisenhut's memorandum of September 13, 1982 (Subject: Further Definition of 80 Hour Review Criterion for Requalification Training). This memorandum stated, in part, ". . . we do not believe that the 80 hour criterion is appropriate for recurring requalification training. We believe that the subject matter areas covered by TMI tasks I.A.2.1 and II.B.4 should achieve equal emphasis with the other subjects outlined in Appendix A of 10 CFR Part 55." The licensee's initial training accomplished and follow-on training meet this criterion and are acceptable.

The licensee's revised requalification plan established a passing score of 80% overall and 70% in specific categories on the annual requalification examination. This meets NRC requirements and is acceptable.

The licensee's revised requalification plan did not indicate that two reactivity manipulations, "Manual control of steam generators and/or feedwater during startup and shutdown" and "loss of coolant including: (1) significant steam generator leaks; (2) inside and outside primary containment; (3) large and small, including leak-rate determination; and (4) saturated Reactor Coolant response," were not indicated as being conducted annually. The TER found this to be unacceptable. The special review onsite, however, determined that this apparent omission was the result of a typographical error. The licensee committed to conduct the reactivity manipulations delineated in

enclosure (4) of H. R. Denton's letter of March 28, 1980, either on the plant, or in a simulator. This is now reflected accurately in the licensee training procedures. This is acceptable.

The TER found no problems with the training for nonlicensed personnel (shift technical advisors and plant management) in the mitigation of core damage. Therefore, this portion of NUREG-0737, item II.B.4, is acceptable. Similarly, the TER found that the licensee's training on reactor and plant transients met NRC requirements; that operator training instructors were licensed; that licensed operators were kept abreast of plant modifications; and that the level of detail provided in training for mitigation of core damage for nonlicensed personnel was satisfactory. These items are considered acceptable.

Conclusion

Based on our review of the SAI TER and licensee records and procedures onsite, we conclude that the Arkansas Nuclear One upgrade in Reactor Operator and Senior Reactor Operator training and in-training for the mitigation of core damage are acceptable.

Attachment:
SAI Technical Evaluation Report

SAI-186-029-18

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

Arkansas Nuclear One
Units 1 and 2

(Docket Nos. 50-313 and 50-368)

August 31, 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

AND NOT DESIGNATED

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SAI

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 Arkansas Power and Light Company for the Arkansas Nuclear One, Unit 1 and 2 (Dockets 50-313 and 50-368) to certain requirements contained in post-TMI Action Items I.A.2.1, Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualifications, 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 Technical Assignment Control (TAC) System numbers:

	I.A.2.1	II.B.4
Unit 1	44139	44489
Unit 2	44140	44490

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.

*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.

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 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 (Arkansas Power and Light Company) 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 Arkansas plants, there were two submittals with attachments, for a total of nine items, which are listed below.

1. Letter from J.P. O'Hanlon, General Manager, Arkansas Nuclear One, Arkansas Power & Light Co., to P.F. Collins, Chief of Operator Licensing Branch, NRC. August 4, 1980. (3 pp, with enclosures: items 2 & 3). NRC Acc No: 8009050330. (re: Response to NRC letter dated March 28, 1980).

2. "Course Summary for Thermodynamics, Fluid Flow and Heat Transfer Training". Undated. (4 pp, attached to item 1).

3. "Course Summary for Mitigating Core Damage". Undated. (2 pp, attached to item 1).

4. Letter from John R. Marshall, Manager, Licensing, Arkansas Power & Light Company, to R. A. Clark, Chief Operating Reactors Branch, NRC, July 21, 1982. (1 p. with enclosures: items 5-9). (re: Response to NRC letter of April 13, 1982).

5. "Response to Specific Questions" referring to the questions in NRC's RAI of April 13, 1982. (2 pp, attached to item 4).

6. Organization Chart for Arkansas Nuclear Plants Units 1 and 2. (1 p. attached to item 4).

7. "Operations Training Program" 8 pp. (pp. 9 - 16 of Plant Manual Section on Human Resources Administration)attached to item 4.

8. "Typical Requalification Training Outline (Babcock & Wilcox Simulator" (9 pp. attached to item 4).

9. Letter from Armand Dieli Supervisor, Simulator Training, CE Power Systems, to Jim Constantin, Arkansas Power & Light Co. documenting Simulator Training for Arkansas Power and Light (21 pp. attached to item 4).

Items 4-9 were submitted in response to a request for additional information (Reference 6).

IV. EVALUATION

SAI's evaluation of the training programs at Arkansas Power and Light Company's Arkansas Nuclear One, Units 1 and 2 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.

The training Course Summary for Thermodynamics, Fluid Flow and Heat Transfer Training (submittal item 2) clearly addresses all the items listed in Enclosure 2 of the Denton's letter. Therefore, we conclude that

program is that of Enclosures 2 and 3 of Denton's letter. In addition, these instructions must involve an adequate number of contact hours.

Both training and requalification programs utilize the same course outlines, as discussed in items A.2.c(1) and A.2.c(2), and as concluded in item A.2.c(2), the course outline for accident mitigation with core damage does not meet the NRC requirement. Furthermore, the licensee stated in submittal item 5 that the area and depth of coverage in the requalification program may vary from year to year depending upon the results of the latest Annual Requalification Examination. This again does not meet the NRC requirements both in the material contents (as described in Denton's Enclosures 2 and 3) and the required contact hours of instruction.

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 Arkansas Nuclear One receives an average grade of less than 80% overall, and less than 70% in any category, on an annual examination, he is relieved from his licensed duties and is required to participate in an accelerated requalification program. This meets the NRC 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).

Although submittal item 7 shows the inclusion of all the 27 control manipulations listed in Enclosure 4, the licensee fails to perform two of the starred items listed in Enclosure 4 annually. These two starred items are identified as "Manual control of steam generators and/or feedwater during startup and shutdown" and "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)". Therefore, the frequency of performance of these two items is an unresolved issue in this review.

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 training of licensed personnel does not meet the requirements of Action Item II.B.4 because the licensed personnel receive this training through the training and requalification programs and these programs do not provide adequate instruction in both material contents and numbers of contact hours for this training area.

Arkansas Power and Light Company meets the requirements of this item in their training programs at the Arkansas plants.

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).

Although Arkansas Power and Light Company stated in submittal item 3 that their training program does address this part of training to the levels spelled out in Enclosure 3 of Denton's letter, SAI's examination of the submitted Course Summary for Mitigating Core Damage (submittal item 3) revealed that it does not address all the items listed in Enclosure 3, specifically items B.1 and C.1. Furthermore, the licensee's training program in the area of heat transfer, fluid flow, thermodynamics and accident mitigation with core damage has less than 80 contact hours of instruction. Based on these facts SAI concludes that this requirement is not met at Arkansas 1 and 2.

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 in submittal item 1 stated that an increased emphasis on reactor and plant transients is being incorporated into the operator training program in two ways. First, in the reactor operator and senior reactor operator license training program, a presentation is being added titled, "Plant Transients". Secondly, plant transients and emergencies are included in the startup certification training received at a vendor simulator. This meets the NRC requirements.

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.

The licensee in submittal item 1 stated that their operator training instructors are licensed operators and they do go through the requalification program. SAI has examined the submitted requalification program (submittal item 7) and found that it does require licensed operators to review changes in station design, procedures, facility license and emergency procedures. Therefore, SAI concludes that this requirement is met at Arkansas 1 and 2.

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

However, based on information and an organization chart supplied by Arkansas Power and Light Company in their response (submittal items 5 and 6) to NRC's request for additional information (Reference 6), it appears that this requirement for the non-licensed personnel is satisfied at Arkansas 1 and 2. Specifically, this training is given to personnel holding the following positions: General Manager, Operations Manager, Unit 1 Operations Superintendent, Unit 1 Shift Supervisors, Unit 1 Operators, Unit 2 Operations Superintendent, Unit 2 Shift Supervisors, Unit 2 Operators and Shift Technical Advisors.

V. CONCLUSION

Based on our evaluation as discussed above, SAI concludes that the licensee does not meet all the requirements of NUREG-0737 items I.A.2.1 and II.B.4 because of the following:

I.A.2.1

Both the licensee's training and requalification programs fail to provide adequate instruction in material content and number of contact hours for the training area of accident mitigation with core damage and/or related subjects,(heat transfer, fluid flow and thermodynamics).

Two of the starred manipulations listed in Enclosure 4 are not performed annually as specified in Enclosure 4.

II.B.4

The licensed personnel have not received adequate training in accident mitigation with core damage.

V. 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 John F. Stolz and Robert A. Clark, NRC to William Cavaugh, III, Senior Vice President, Arkansas Power and Light Company, transmitting request for additional information on Upgraded Senior Reactor Operator and Reactor Operator Training and Training for Mitigating Core Damage, dated 13 April 1982.