



ARKANSAS POWER & LIGHT COMPANY

Arkansas Nuclear One  
Russellville, Arkansas  
August 4, 1980

ANO-80-3228

Mr. Paul F. Collins  
Chief Operator License Branch  
Division of Project Management  
Nuclear Regulatory Commission  
Washington, D.C. 20555

SUBJECT: Arkansas Nuclear One  
Response to Mr. Harold Denton's Letter  
of March 28, 1980 Addressed to All Power  
Reactor Applicants and Licensees

Dear Mr. Collins:

In response to Mr. Denton's letter, I submit for your review our responses including additions to the training program for Arkansas Nuclear One Units 1 and 2 - Docket Nos. 50-313 and 50-368 respectively.

Enclosure (1) Section A.2.c

Training programs shall be modified as necessary to provide:

- (1) Training in heat transfer fluid flow and thermodynamics
- (2) Training in the use of installed plant systems to control or mitigate an accident in which the core is severely damaged
- (3) Increased emphasis on reactor and plant transients

Effective date: Present programs have been modified in response to bulletins and orders. Revised programs should be submitted for OLB review by August 1, 1980.

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RESPONSE

Attached are summaries of courses added to the reactor operator license training program which provide:

- (1) Training in heat transfer fluid flow and thermodynamics
- (2) Training in the use of installed plant systems to control or mitigate an accident in which the core is severely damaged.

An increased emphasis on reactor and plant transients is being incorporated into the operator training program in two fashions.

First, in the reactor operator and senior reactor operator license training program, a presentation is being added titled, "Plant Transients". The objective of the presentation is to review significant transients that have occurred on the unit and have an open discussion of selected transients with the trainee. A transient package is given to the trainee for reference in the discussion and for his study.

A transient package contains:

1. A narration of the transient
2. A chronological sequence of the event
3. Significant automatic and manual actions taken
4. Procedural and equipment problems
5. Plots of the pertinent primary and secondary parameters

Secondly, plant transients and emergencies are included in the startup certification training received at a vendor simulator.

Enclosure (1) Section 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 in administrative limitations.

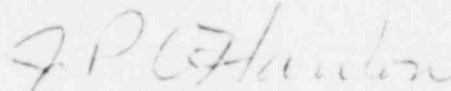
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Effective date: Programs should be initiated May 1, 1980. Programs should be submitted to OLB for review by August 1, 1980.

RESPONSE

A program change is not necessary as our operator training instructors are licensed operators and presently participate in the requalification training program including simulator training.

Yours truly,



J. P. O'Hanlon  
General Manager  
Arkansas Nuclear One

JPO:JDV:sbp

ENCLOSURES

cc: M. A. Smith (Licensing)

COURSE SUMMARY FOR  
THERMODYNAMICS, FLUID FLOW AND  
HEAT TRANSFER TRAINING

1.0 Purpose

The thermodynamics, fluid flow and heat transfer course is for reactor operators and senior reactor operators. The program is a 40-hour course designed to present the basic principles of thermodynamics, fluid flow and heat transfer and relate these principles to safe reactor operation.

2.0 Scope

The course consists of nine modules covering thermodynamics, fluid flow and heat transfer. The modules are developed towards the application of these basic principles in normal and abnormal reactor operation. The administrative controls and core protection systems commonly used to protect against adverse core thermal hydraulic phenomenon are also discussed.

3.0 Presentation

The thermodynamics, fluid flow and heat transfer training course will be offered to present employees at ANO who are candidates for R.O. and S.R.O. licenses. Classes should be no larger than 15 students. A written exam will be given after each module with a

score of 80% considered passing. Handouts will be provided to the students which will be useful for future reference.

A comprehensive course examination shall be administered following the successful completion of all nine modules.

4.0 Course Chart

Module 1 - Basic Thermodynamic Properties of Fluids and Matter

- 1) Basic Concepts
- 2) Concept of Heat Exchange
- 3) Phases of Matter

Module 2 - Work, Energy, Fluid Statics and Fluid Dynamics

- 1) Work and Energy
- 2) Fluid Statics
- 3) Fluid Dynamics

Module 3 - Heat, Work and the First Law of Thermodynamics

- 1) Heat Energy and its Relationships to Work
- 2) First Law of Thermodynamics

Module 4 - General Energy Equation

- 1) Derivation of the General Energy Equation
- 2) Application of the General Energy Equation

Module 5 - The Second Law of Thermodynamics

- 1) Elementary Cycles
- 2) General Discussion of Second Law of Thermodynamics

Module 6 - Thermodynamic Properties of Water and Steam

- 1) Steam Tables (Discussion and Definitions)
- 2) Ideal Steam Cycles
- 3) Temperature - Entropy Diagrams
- 4) Enthalpy - Entropy Diagrams
- 5) Mollier Diagram
- 6) PWR Steam Cycles

Module 7 - Principles of Heat Transfer

- 1) Conduction
- 2) Convection
- 3) Radiation

Module 8 - Changes of Phase in the Boiling Regime

- 1) Types of Boiling
- 2) Burnout/DNB and its Consequences

Module 9 - Standard PWR Administrative Controls and Core Protection Systems

- 1) Power Distribution Methodology with Relation to Reactor Heat Transfer Limits
- 2) DNB Protection
- 3) LOCA Protection

COURSE SUMMARY FOR  
MITIGATING CORE DAMAGE

Purpose: The purpose of this course is to train the reactor operator or senior reactor operator in using available installed plant systems to control or mitigate core damage following an accident with severe core damage. This course will not be concerned with the specific type of accident but will assume that the operator recognizes that an accident has occurred or is occurring and that safety systems are operating or other means are capable of maintaining the core covered and cool. The course will address normal and alternate methods of monitoring core parameters to determine the extent of core damage and controlling further damage.

Scope: The course shall consist of the following sections:

1. post-accident core cooling
2. monitoring core conditions following an accident
3. RCS and containment parameters
4. primary chemistry, radiation monitoring and gas generation

Presentation: The course shall be offered to all reactor operators and senior reactor operators. Classes shall consist of as many operators as are available but should not exceed eight. This will allow sufficient time for exchange of ideas, questions and discussions. An examination will be given at the end of the course. A passing grade shall be 80% for each section and 80% overall.



## COURSE CHART

### MITIGATING CORE DAMAGE

- Module 1 - Post-Accident Core Cooling
  - 1. ECCS
  - 2. Forced Flow (RCP's)
  - 3. Natural Circulation
  - 4. Bleed/Feed (ECCS vents)
  
- Module 2 - Monitoring Core Conditions
  - 1. Core Level
  - 2. Fuel Failure Monitoring
  - 3. Loose Parts Monitoring
  - 4. Isotopic Analysis
  - 5. Radiation Monitoring
  
- Module 3 - RCS and Containment Parameters
  - 1. RCS Parameters
  - 2. Containment Parameters
  - 3. Malfunctions
  - 4. Alternate Methods of Indication
  
- Module 4 - Primary Chemistry
  - 1. Tech Spec Requirements
  - 2. Cleanup and Disposal
  - 3. Adverse Effects
  
- Module 5 - Radiation Monitoring
  - 1. Process Monitors
  - 2. Area Monitors
  
- Module 6 - Gas Generation
  - 1. O<sub>2</sub>
  - 2. H<sub>2</sub>
  - 3. Others