
1982 Evaluation

**Browns Ferry
Nuclear Plant**
Tennessee Valley
Authority

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INPO 

EVALUATION

of

BROWNS FERRY NUCLEAR PLANT

Tennessee Valley Authority

SUMMARY

INTRODUCTION

The Institute of Nuclear Power Operations (INPO) conducted its second evaluation of Tennessee Valley Authority's (TVA) Browns Ferry Nuclear Plant during the weeks of May 10 and 17, 1982. Browns Ferry consists of three 1098 MWe General Electric boiling water reactor plants. It is located on the Tennessee River near Huntsville, Alabama. Unit I began commercial operation in 1974, Unit II in 1975, and Unit III in 1977.

PURPOSE AND SCOPE

INPO conducted an evaluation of site activities to make an overall determination of plant safety, to evaluate management systems and controls, and to identify areas needing improvement. Information was assembled from discussions, interviews, observations, and reviews of documentation.

The INPO evaluation team examined station organization and administration, operations, maintenance, technical support, training and qualification, radiological protection, and chemistry. The team also observed the actual performance of selected evolutions and surveillance testing. Corporate activities were not included in the scope of the evaluation, except as an incidental part of the station evaluation. As a basis for the evaluation, INPO used performance objectives and criteria relevant to each of the areas examined; these were applied and evaluated in light of the experience of team members, INPO's observations, and good practices within the industry.

INPO's goal is to assist member utilities in achieving the highest standards of excellence in nuclear plant operation. The recommendations in each area are based on best practices, rather than minimum acceptable standards or requirements. Accordingly, areas where improvements are recommended are not necessarily indicative of unsatisfactory performance.

DETERMINATION

In each of the areas evaluated, INPO has established PERFORMANCE OBJECTIVES and supporting criteria. All PERFORMANCE OBJECTIVES reviewed during the course of this evaluation are listed in APPENDIX II.

Findings and recommendations are listed under the PERFORMANCE OBJECTIVES to which they pertain. Particularly noteworthy conditions that contribute to meeting PERFORMANCE OBJECTIVES are identified as Good Practices. Other findings describe conditions that detract from meeting the PERFORMANCE OBJECTIVES. It would not be productive to list as Good Practices those things that are commonly done properly in the industry since this would be of no benefit to TVA or to INPO's other member utilities. As a result, most of the findings highlight conditions that need improvement.

The recommendations following each finding are intended to assist the utility in ongoing efforts to improve all aspects of its nuclear programs. In addressing these findings and recommendations, the utility should, in addition to correcting or improving specific conditions, pursue underlying causes and issues.

As a part of the second and succeeding evaluations of each station, the evaluation team will follow up on responses to findings in previous reports. Findings with response actions scheduled for future completion have been carried forward in APPENDIX I to this report. In areas where additional improvements were needed, a new finding that stands on its own merit has been written. Thus, this report stands alone, and reference to previous evaluation reports should not be necessary.

The evaluation staff appreciates the cooperation received from all levels of TVA.

TENNESSEE VALLEY AUTHORITY

Response Summary

In general TVA concurs with the findings listed herein. Detailed responses to each finding have been prepared and corrective actions are underway. Dates for completing corrective actions have been provided where necessary.

Many of these findings had previously been identified internally, including all six areas cited as most important by INPO, and TVA has been pursuing corrective actions on these items within the limits of manpower and budget. In some areas such as findings OA.3-1, OP.1-3, MA.3-1, MA.4-1, MA.6-1, MA.7-1, TS.4-2, TS.5-1, and others, problems were being addressed through implementation of our eight-point improvement plan. In these cases, TVA believes present policies will prevent recurring problems and no further changes are contemplated.

We have been and will continue to emphasize improvement in these areas.

We appreciate and are rightfully proud of those "Good Practices" noted. As we see these as areas where we can exceed INPO Performance Objectives, TVA plans to continue with these programs and include, where appropriate, the philosophy which developed the good practices in other areas.

ORGANIZATION AND ADMINISTRATION

MANAGEMENT ASSESSMENT AND QUALITY PROGRAMS

PERFORMANCE OBJECTIVE: Management should assess station activities to ensure and enhance quality performance of all aspects of nuclear plant operation.

Finding
(OA.3-1)

Recommendation

Response

Finding
(OA.3-2)

Recommendation

Response

Finding
(OA.3-3)

Recommendation

Response

Finding
(OA.3-4)

Recommendation

Response

INDUSTRIAL SAFETY

PERFORMANCE OBJECTIVE: Station industrial safety programs should achieve a high degree of personnel safety.

Finding
(OA.5-1)

Finding
(OA.5-2)

Recommendation

Response

OPERATIONS

OPERATIONS ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: The operations organization and administrative systems should ensure effective control and implementation of department activities.

Finding
(OP.1-1)

Finding
(OP.1-2)

Finding
(OP.1-3)

Recommendation

Response

CONDUCT OF OPERATIONS

PERFORMANCE OBJECTIVE: Operational activities should be conducted in a manner that achieves safe and reliable plant operation.

Finding
(OP.2-1)

Recommendation

Response

PLANT STATUS CONTROLS

PERFORMANCE OBJECTIVE: Operational personnel should be cognizant of the status of plant systems and equipment under their control, and should ensure that systems and equipment are controlled in a manner that supports safe and reliable operation.

Finding
(OP.3-1)

Recommendation

Response

Finding
(OP.3-2)

Recommendation

Response

Finding
(OP.3-3)

Recommendation

Response

Finding
(OP.3-4)

Recommendation

Response

Finding
(OP.3-5)

Recommendation

Response

OPERATIONS PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Operational procedures and documents should provide appropriate direction and should be effectively used to support safe operation of the plant.

Finding
(OP.5-1)

Recommendation

Response

OPERATIONS FACILITIES AND EQUIPMENT

PERFORMANCE OBJECTIVE: Operational facilities and equipment should effectively support plant operation.

Finding
(OP.6-1)

Recommendation

Response

MAINTENANCE

WORK CONTROL SYSTEM

PERFORMANCE OBJECTIVE: The control of work should ensure that identified maintenance actions are properly completed in a safe, timely, and efficient manner.

Finding
(MA.3-1)

Recommendation

Response

CONDUCT OF MAINTENANCE

PERFORMANCE OBJECTIVE: Maintenance should be conducted in a manner that ensures efficient and effective plant operation.

Finding
(MA.4-1)

Recommendation

Response

MAINTENANCE PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Maintenance procedures should provide appropriate directions for work and should be used to ensure that maintenance is performed safely and efficiently.

Finding
(MA.6-1)

Recommendation

Response

MAINTENANCE HISTORY

PERFORMANCE OBJECTIVE: The maintenance history should be used to support maintenance activities and optimize equipment performance.

Finding
(MA.7-1)

Recommendation

Response

TECHNICAL SUPPORT

OPERATING EXPERIENCE REVIEW PROGRAM

PERFORMANCE OBJECTIVE: Industrywide and in-house operating experiences should be evaluated and appropriate actions undertaken to improve plant safety and reliability.

Finding
(TS.3-1)

Recommendation

Response

Finding
(TS.3-2)

Recommendation

Response

Finding
(TS.3-3)

Recommendation

Response

Finding
(TS.3-4)

Recommendation

Response

PLANT MODIFICATIONS

PERFORMANCE OBJECTIVE: Plant modification programs should ensure proper review, control, implementation, and completion of plant design changes in a safe and timely manner.

Finding
(TS.4-1)

Finding
(TS.4-2)

Recommendation

Response

REACTOR ENGINEERING

PERFORMANCE OBJECTIVE: On-site reactor engineering activities should ensure optimum nuclear reactor operation without compromising design or safety limits.

Finding
(TS-1)

Recommendation

Response

PLANT EFFICIENCY AND RELIABILITY MONITORING

PERFORMANCE OBJECTIVE: Performance monitoring activities should optimize plant thermal performance and reliability.

Finding
(TS.6-1)

Finding
(TS.6-2)

Recommendation

Response

TRAINING AND QUALIFICATION

TRAINING ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: The training organization and administrative systems should ensure effective control and implementation of training activities.

Finding
(TQ.1-1)

Recommendation

Response

Finding
(TQ.1-2)

Recommendation

Response

LICENSED OPERATOR TRAINING AND QUALIFICATION

PERFORMANCE OBJECTIVE: The licensed operator training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

Finding
(TQ.3-1)

Recommendation

Response

Finding
(TQ.3-2)

Recommendation

Response

SHIFT TECHNICAL ADVISOR TRAINING AND QUALIFICATION

PERFORMANCE OBJECTIVE: The shift technical advisor training program should develop and improve the knowledge and skills to perform assigned job functions.

Finding
(TQ.4-1)

Finding
(TQ.4-2)

Recommendation

Response

MAINTENANCE PERSONNEL TRAINING AND QUALIFICATION

PERFORMANCE OBJECTIVE: The maintenance personnel training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

Finding
(TQ.5-1)

Recommendation

Response

Finding
(TQ.5-2)

TECHNICAL TRAINING FOR MANAGERS AND ENGINEERS

PERFORMANCE OBJECTIVE: The technical training program for engineers and managers should broaden overall knowledge of plant processes and equipment as a supplement to position-specific education and training.

Finding
(TQ.6-1)

Recommendation

Response

GENERAL EMPLOYEE TRAINING

PERFORMANCE OBJECTIVE: The general employee training program should develop a broad understanding of employee responsibilities and safe work practices.

Finding
(TQ.7-1)

Recommendation

Response

Finding
(TQ.7-2)

RADIOLOGICAL PROTECTION

RADIOLOGICAL PROTECTION ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: The organization and administrative systems should ensure effective control and implementation of the radiological protection program.

Finding
(RP.1-1)

Recommendation

Response

EXTERNAL RADIATION EXPOSURE

PERFORMANCE OBJECTIVE: External radiation exposure controls should minimize personnel radiation exposure.

Finding
(RP.4-1)

Recommendation

Response

INTERNAL RADIATION EXPOSURE

PERFORMANCE OBJECTIVE: Internal radiation exposure controls should minimize internal exposures.

Finding
(RP.5-1)

Recommendation

Response

RADIOACTIVE EFFLUENTS

PERFORMANCE OBJECTIVE: Radioactive effluent controls should minimize radioactive materials released to the environment.

Finding
(RP.6-1)

Recommendation

Response

SOLID RADIOACTIVE WASTE

PERFORMANCE OBJECTIVE: Solid radioactive waste controls should minimize the volume of radioactive waste and ensure safe transportation of radioactive material.

Finding
(RP.7-1)

Recommendation

Response

PERSONNEL DOSIMETRY

PERFORMANCE OBJECTIVE: The personnel dosimetry program should ensure that radiation exposures are accurately determined and recorded.

Finding
(RP.8-1)

Recommendation

Response

RADIOACTIVE CONTAMINATION CONTROL

PERFORMANCE OBJECTIVE: Radioactive contamination controls should minimize the contamination of areas, equipment, and personnel.

Finding
(RP.9-1)

Recommendation

Response

CHEMISTRY

CHEMISTRY ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: The organization and administrative systems should ensure effective implementation and control of the chemistry program.

Finding
(CY.1-1)

Recommendation

Response

CHEMISTRY PERSONNEL QUALIFICATION

PERFORMANCE OBJECTIVE: The chemistry qualification program should ensure that chemistry personnel have the knowledge and practical abilities necessary to implement chemistry practices effectively.

Finding
(CY.2-1)

Recommendation

Response

CHEMISTRY CONTROL

PERFORMANCE OBJECTIVE: Chemistry controls should ensure optimum chemistry conditions during all phases of plant operation.

Finding
(CY.3-1)

Recommendation

Response

Finding
(CY.3-2)

Recommendation

Response

LABORATORY ACTIVITIES

PERFORMANCE OBJECTIVE: Laboratory and counting room activities should ensure accurate measuring and reporting of chemistry parameters.

Finding
(CY.4-1).

Recommendation

Response

APPENDIX I

Summary of Outstanding Response Action from Previous Evaluation (1981)

ORGANIZATION STRUCTURE

(INPO Procedure OA-102, Revision 2)

Finding (Criteria B and C)

Recommendation

Response

Status

LICENSED OPERATOR REQUALIFICATION TRAINING

(INPO Procedure TQ-244, Revision 2)

Finding (Criterion G)

Recommendation

Response

Status

MAINTENANCE ORGANIZATION AND ADMINISTRATION
(INPO Procedure MA-401, Revision 2)

Finding (Criterion B)

Recommendation

Response

Status

WORK CONTROL SYSTEM
(INPO Procedure MA-404, Revision 1)

Finding (Criterion B) _____

Recommendation

Response _____

Status

MAINTENANCE FACILITIES AND EQUIPMENT
(INPO Procedure MA-408, Revision 1)

Finding (Criteria B and C)

Recommendation

Response

Status

ALARA PROGRAM
(INPO Procedure RC-502, Revision 1)

1. **Finding** (Criterion D-ALARA Goals)

Recommendation

Response

Status

2. Finding (Criterion E-Scope of ALARA Program)

Recommendation

Response

Status

RADIOLOGICAL SURVEY EQUIPMENT CONTROL AND CALIBRATION
(INPO Procedure RC-506, Revision 2)

Finding (General Criterion-Calibration and Check Methods)

Recommendation

Response

Status

HEALTH PHYSICS FACILITIES AND EQUIPMENT
(INPO Procedure RC-509, Revision 2)

2. Finding

Recommendation

Response

Status

APPENDIX II

Performance Objectives Reviewed

ORGANIZATION AND ADMINISTRATION

OA.1 Station Organization and Administration

Station organization and administrative systems should ensure effective implementation and control of station activities.

OA.2 Mission, Goals, and Objectives

Station mission, goals, and objectives should be established and progress-monitored through a formal program.

OA.3 Management Assessment and Quality Programs

Management should assess station activities to ensure and enhance quality performance of all aspects of nuclear plant operation.

OA.4 Personnel Planning and Qualification

Personnel programs should ensure that station positions are filled by individuals with proper job qualifications.

OA.5 Industrial Safety

Station industrial safety programs should achieve a high degree of personnel safety.

OA.6 Document Control

Document control systems should provide correct, readily accessible information to support station requirements.

OPERATIONS

OP.1 Operations Organization and Administration

The operations organization and administrative systems should ensure effective control and implementation of department activities.

OP.2 Conduct of Operations

Operational activities should be conducted in a manner that achieves safe and reliable plant operation.

OP.3 Plant Status Controls

Operational personnel should be cognizant of the status of plant systems and equipment under their control, and should ensure that systems and equipment are controlled in a manner that supports safe and reliable operation.

OP.4 Operations Knowledge and Performance

Operator knowledge and performance should support safe and reliable plant operation.

OP.5 Operations Procedures and Documentation

Operational procedures and documents should provide appropriate direction and should be effectively used to support safe operation of the plant.

OP.6 Operations Facilities and Equipment

Operational facilities and equipment should effectively support plant operation.

MAINTENANCE

MA.1 Maintenance Organization and Administration

The maintenance organization and administrative systems should ensure effective control and implementation of department activities.

MA.2 Plant Material Condition

The material condition of the plant should be maintained to support safe and reliable plant operation.

MA.3 Work Control System

The control of work should ensure that identified maintenance actions are properly completed in a safe, timely, and efficient manner.

MA.4 Conduct of Maintenance

Maintenance should be conducted in a manner that ensures efficient and effective plant operation.

MA.5 Preventive Maintenance

The preventive maintenance programs should contribute to optimum performance and reliability of plant equipment.

MA.6 Maintenance Procedures and Documentation

Maintenance procedures should provide appropriate directions for work and should be used to ensure that maintenance is performed safely and efficiently.

MA.7 Maintenance History

The maintenance history should be used to support maintenance activities and optimize equipment performance.

MA.8 Maintenance Facilities and Equipment

Facilities and equipment should effectively support the performance of maintenance activities.

TECHNICAL SUPPORT

TS.1 Technical Support Organization and Administration

The technical support organization and administrative systems should ensure effective control and implementation of department activities.

TS.2 Surveillance Testing Program

Surveillance inspection and testing activities should provide assurance that equipment important to safe and reliable plant operation will perform within required limits.

TS.3 Operations Experience Review Program

Industrywide and in-house operating experiences should be evaluated and appropriate actions undertaken to improve plant safety and reliability.

TS.4 Plant Modifications

Plant modification programs should ensure proper review, control, implementation, and completion of plant design changes in a safe and timely manner.

TS.5 Reactor Engineering

On-site reactor engineering activities should ensure optimum nuclear reactor operation without compromising design or safety limits.

TS.6 Plant Efficiency and Reliability Monitoring

Performance monitoring activities should optimize plant thermal performance and reliability.

TS.7 Technical Support Procedures and Documentation

Technical support procedures and documents should provide appropriate direction and should be effectively used to support safe operation of the plant.

TRAINING AND QUALIFICATION

TQ.1 Training Organization and Administration

The training organization and administrative systems should ensure effective control and implementation of training activities.

TQ.2 Non-Licensed Operator Training and Qualification

The non-licensed operator training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

TQ.3 Licensed Operator Training and Qualification

The licensed operator training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

TQ.4 Shift Technical Advisor Training and Qualification

The shift technical advisor training program should develop and improve the knowledge and skills to perform assigned job functions.

TQ.5 Maintenance Personnel Training and Qualification

The maintenance personnel training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

TQ.6 Technical Training for Managers and Engineers

The technical training program for engineers and managers should broaden overall knowledge of plant processes and equipment as a supplement to position-specific education and training.

TQ.7 General Employee Training

The general employee training program should develop a broad understanding of employee responsibilities and safe work practices.

TQ.8 Training Facilities and Equipment

The training facilities, equipment, and materials should effectively support training activities.

RADIOLOGICAL PROTECTION

RP.1 Radiological Protection Organization and Administration

The organization and administrative systems should ensure effective control and implementation of the radiological protection program.

RP.2 Radiological Protection Personnel Qualification

The radiological protection qualification program should ensure that radiological protection personnel have the knowledge and practical abilities necessary to effectively implement radiological protection practices.

RP.3 General Employee Training In Radiological Protection

General employee training should ensure that plant personnel, contractors, and visitors have the knowledge and practical abilities necessary to effectively implement radiological protection practices associated with their work.

RP.4 External Radiation Exposure

External radiation exposure controls should minimize personnel radiation exposure.

RP.5 Internal Radiation Exposure

Internal radiation exposure controls should minimize internal exposures.

RP.6 Radioactive Effluents

Radioactive effluent controls should minimize radioactive materials released to the environment.

RP.7 Solid Radioactive Waste

Solid radioactive waste controls should minimize the volume of radioactive waste and ensure safe transportation of radioactive material.

RP.8 Personnel Dosimetry

The personnel dosimetry program should ensure that radiation exposures are accurately determined and recorded.

RP.9 Radioactive Contamination Control

Radioactive contamination controls should minimize the contamination of areas, equipment, and personnel.

CHEMISTRY

CY.1 Chemistry Organization and Administration

The organization and administrative systems should ensure effective implementation and control of the chemistry program.

CY.2 Chemistry Personnel Qualification

The chemistry qualification program should ensure that chemistry personnel have the knowledge and practical abilities necessary to implement chemistry practices effectively.

CY.3 Chemistry Control

Chemistry controls should ensure optimum chemistry conditions during all phases of plant operation.

CY.4 Laboratory Activities

Laboratory and counting room activities should ensure accurate measuring and reporting of chemistry parameters.

CY.5 Chemical and Laboratory Safety

Work practices associated with chemistry activities should ensure the safety of personnel.