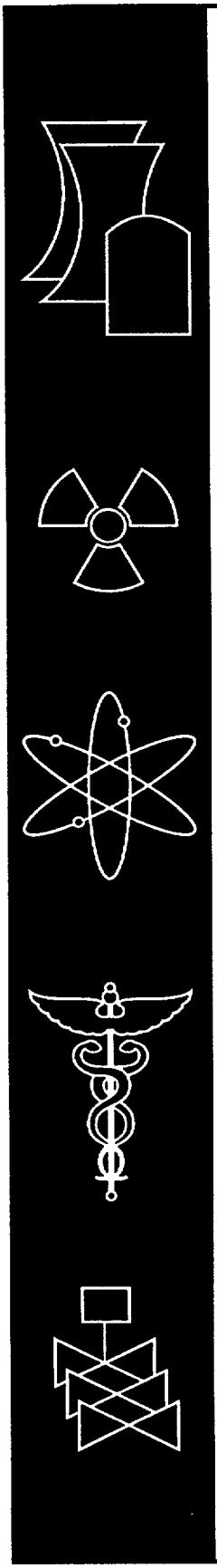
NUREG-1743



Safety Evaluation Report Related to the License Renewal of Arkansas Nuclear One, Unit 1

Docket No. 50-313

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001

AVAILABILITY OF REFERENCE MATERIALS IN NRC PUBLICATIONS

NRC Reference Material

As of November 1999, you may electronically access NUREG-series publications and other NRC records at NRC's Public Electronic Reading Room at www.nrc.gov/NRC/ADAMS/index.html.
Publicly released records include, to name a few, NUREG-series publications; *Federal Register* notices; applicant, licensee, and vendor documents and correspondence; NRC correspondence and internal memoranda; bulletins and information notices; inspection and investigative reports; licensee event reports; and Commission papers and their attachments.

NRC publications in the NUREG series, NRC regulations, and *Title 10, Energy*, in the Code of *Federal Regulations* may also be purchased from one of these two sources.

1. The Superintendent of Documents
   U.S. Government Printing Office
   Mail Stop SSOP
   Washington, DC 20402–0001
   Internet: bookstore.gpo.gov
   Telephone: 202-512-1800
   Fax: 202-512-2250
2. The National Technical Information Service
   Springfield, VA 22161–0002
   www.ntis.gov
   1–800–553–6847 or, locally, 703–605–6000

A single copy of each NRC draft report for comment is available free, to the extent of supply, upon written request as follows:
Address: Office of the Chief Information Officer,
Reproduction and Distribution
Services Section
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: DISTRIBUTION@nrc.gov
Facsimile: 301–415–2289

Some publications in the NUREG series that are posted at NRC's Web site address www.nrc.gov/NRC/NUREGS/indexnum.html are updated periodically and may differ from the last printed version. Although references to material found on a Web site bear the date the material was accessed, the material available on the date cited may subsequently be removed from the site.

Non-NRC Reference Material

Documents available from public and special technical libraries include all open literature items, such as books, journal articles, and transactions, *Federal Register* notices, Federal and State legislation, and congressional reports. Such documents as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings may be purchased from their sponsoring organization.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at—

The NRC Technical Library
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852–2738

These standards are available in the library for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from—

American National Standards Institute
11 West 42nd Street
New York, NY 10036–8002
www.ansi.org
212–642–4900

Legally binding regulatory requirements are stated only in laws; NRC regulations; licenses, including technical specifications; or orders, not in NUREG-series publications. The views expressed in contractor-prepared publications in this series are not necessarily those of the NRC.

The NUREG series comprises (1) technical and administrative reports and books prepared by the staff (NUREG–XXXX) or agency contractors (NUREG/CR–XXXX), (2) proceedings of conferences (NUREG/CP–XXXX), (3) reports resulting from international agreements (NUREG/IA–XXXX), (4) brochures (NUREG/BR–XXXX), and (5) compilations of legal decisions and orders of the Commission and Atomic and Safety Licensing Boards and of Directors' decisions under Section 2.206 of NRC's regulations (NUREG–0750).

NUREG-1743

Safety Evaluation Report
Related to the License Renewal of Arkansas Nuclear One, Unit 1

Docket No. 50-313

Manuscript Completed: April 2001
Date Published: May 2001

Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ABSTRACT

This document is a safety evaluation report regarding the application to renew the operating license for Arkansas Nuclear One, Unit 1 (ANO-1), which was filed by Entergy Operations, Inc., by letter dated January 31, 2000. The Office of Nuclear Reactor Regulation has reviewed the ANO-1 license renewal application for compliance with the requirements of Title 10 of the *Code of Federal Regulations*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and prepared this report to document its findings.

In its submittal of January 31, 2000, the Entergy Operations, Inc., requested renewal of the ANO-1 operating license (License No. DPR-51), which was issued under Section 104 of the *Atomic Energy Act of 1954*, as amended, for a period of 20 years beyond the current license expiration date of May 20, 2014. ANO-1 is located in Pope County in the central region of Arkansas on the shore of Lake Dardanelle. ANO-1 is a Babcock and Wilcox pressurized-water reactor nuclear steam supply system that is designed to generate 2568 MW thermal, or approximately 836 MW electric.

The NRC ANO-1 license renewal project manager is Robert J. Prato. Mr. Prato may be contacted by calling (301) 415-1147 or by writing to the License Renewal and Standardization Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

CONTENTS

SUMMARY

This report describes the results of a review by the Nuclear Regulatory Commission (NRC) staff of an application to renew the licenses for Arkansas Nuclear One, Unit 1(ANO-1). Under the Atomic Energy Act (AEA), the NRC issues licenses for commercial power reactors to operate for up to 40 years. The AEA also permits the licenses to be renewed. The NRC established license renewal requirements in the regulations. When those requirements are satisfied, a license can be renewed for up to 20 additional years.

Plant owners are interested in license renewal because they need to know what requirements must be satisfied to permit long-term plant operation. This knowledge helps them to predict the cost of plant operation for long-term energy planning.

The requirements for license renewal are presented in Part 54 of Title 10 to the *Code of Federal Regulations* (10 CFR Part 54). When those requirements were developed, the NRC concluded that the existing licensing basis and the regulatory process are adequate to maintain safe plant operation, except for the possible effects of aging on passive systems, structures, and components. Therefore, the requirements in 10 CFR Part 54 focus on managing the effects of aging for such passive structures and components as buildings, tanks, and pipes.

The NRC also established requirements for a license renewal environmental report in 10 CFR Part 51. Those requirements establish the scope of a review of environmental impacts, which is one part of the NRC's responsibilities under the National Environmental Policy Act (NEPA). The results of that review are described in Supplement 3 of NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding the Arkansas Nuclear One, Unit 1."

In a letter to the NRC dated January 31, 2000, the Entergy Operations, Inc., filed its request for renewal of the ANO-1 operating license (License No. DPR-51), which was issued under Section 104 of the *Atomic Energy Act of 1954*, as amended, for a period of 20 years beyond the current license expiration date of May 20, 2014. If granted the renewed license for ANO-1 would expire May 20, 2034.

ANO-1 is located in Pope County in the central region of Arkansas on the shore of Lake Dardanelle. ANO-1 is a Babcock and Wilcox pressurized-water reactor nuclear steam supply system that is designed to generate 2568 MW thermal, or approximately 836 MW electric.

This document is a safety evaluation report regarding the application to renew the operating license for ANO-1. The Office of Nuclear Reactor Regulation has reviewed the ANO-1 license renewal application for compliance with the requirements of Title 10 of the *Code of Federal Regulations*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and prepared this report to document its findings.

In accordance with Federal regulations under 10 CFR Part 51 and Part 54, and the NRC draft "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," dated September 1997, the staff has completed its review of the Arkansas Nuclear One, Unit 1(ANO-1) license renewal application and supporting documentation, and has documented its finding in this safety evaluation report (SER).

In an SER issued on January 10, 2001, regarding the review of the ANO-1 license renewal application, the staff identified six open items. Those open items have been resolved, as discussed in this SER. On the basis of its evaluation of the ANO-1 license renewal application and the applicant's response to the open items as discussed within this SER, the staff concludes the following:

1. actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require an aging management review under 10 CFR 54.21(a)(1)

2. actions have been identified and have been or will be taken with respect to time-limited aging analyses that have been identified to require review under 10 CFR 54.21(c)

Accordingly, the staff found that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis for ANO-1 for the period of extended operation and, therefore recommends granting the renewed license for an additional 20 years of operation beyond the current licensing term.

ABREVIATIONS

AAC	alternate AC
ABHVS	auxiliary building heating and ventilation systerm
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigation system actuation circuit
ANL	Argonne National Laboratory
ANO-1	Arkansas Nuclear One, Unit 1
ANSI	American National Standards Institute
APCSB	auxiliary power conversion system branch
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
B&W	Babcock and Wilcox
B&WOG	Babcock and Wilcox Owners Group
BACP	boric acid corrosion prevention
BL	bulletin
BTP	branch technical position
BWST	borated water storage tank
CAS	central alarm station
CASS	cast austenitic stainless steel
CBA	core barrel assembly
CEOG	Combustion Engineering Owners Group
CF	core flood
CFR	U. S. Code of Federal Regulations
CLB	current licensing basis
CLQL	component level Q-list
CRA	control rod assembly
CRDM	control rod drive mechanism
CRGA	control rod guide assembly
CRVS	control room ventilation system
CS	condensate system
CSA	core support assembly
CSS	cores support shield assembly
CUF	cumulative usage factor
DB	dry bulb
DBA	design-basis accident
DBE	design-basis events
DG	draft regulatory guide
DH	decay heat
DOE	Department of Energy
DOR	Division of Operating Reactors

ECCS	emergency core cooling system
ECP	emergency cooling pond
ECT	eddy current testing
EDG	emergency diesel generator
EFIC	emergency feedwater initiation and control
EFPY	effective full power years
EFS	emergency feedwater system
EFW	emergency feedwater
EIC	electrical and instrumentation controls
EPRI	Electric Power Research Institute
EQ	environmental qualification
ES	engineered safeguards
ESP	engineering support personnel
FA	fuel assemby
FAC	flow-accelerated corrosion
FERC	Federal Energy Regulatory Commission
FHA	fuel handling accident
FIV	flow-induced vibration
FP	fire protection
FSAR	final safety analysis report
FSER	final safety evaluation report
FTI	Framatome Technologies
GEIS	generic environmental impact statement
GL	generic letter
GSI	generic safety issue
HC	hydrogen control
HELB	high-energy line breaks
HEPA	high-efficiency particulate air (filter)
HPI	high-pressure injection
HUPCAPS	high-fluence supplementary weld metal surveillance capsules
HVAC	heating, ventilation, and air conditioning
IASCC	irradiation-assisted stress-corrosion cracking
IEB	Inspection and Enforcement Bulletin
IEEE	Institue of Electrical and Electronics Engineers
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IMS	in-core monitoring system
IN	information notice
INEEL	Idaho National Engineering and Environmental Laboratory
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISI	inservice inspection
IST	inservice testing
ISTS	improved standard technical specification
ITS	improved technical specification

LBB	leak-before-break
LIA	lower internals assembly
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LPI	low-pressure injection
LRA	license renewal application
MCR	main control room
MCRE	main control room environment
MFS	main feedwater system
MIC	microbiologically influenced corrosion
MRV	minimum required value
MIRVP	master integrated reactor vessel surveillance program
MSS	main steam system
MU	make-up
MUP	make-up and purification
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NPRDS	Nuclear Plant Reliability Data System (INPO)
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
NSAC	Nuclear Safety Analysis Center
NUMARC	Nuclear Management and Resource Council
NUREG	NRC technical report designation
ODSCC	outside-diameter stress-corrosion cracking
OTSG	once-through steam generator
PA	plenum assembly
PLL	prescribed lower limits
PRVS	penetration room ventilation system
PTS	pressurized thermal shock
PWR	pressurized-water reactors
PWSCC	primary water stress-corrosion cracking
QA	quality assurance
Q-CST	Q-condensate storage tank
RAI	request for additional information
RBCS	reactor building cooling system
RBCP	reactor building cooling and purge
RBI	reactor building isolation
RBIS	reactor building isolation system
RBS	reactor building spray
RCP	reactor coolant pump
RCS	reactor coolant system
RG	regulatory guide

RI-ISI	risk-informed ISI
RPV	reactor pressure vessel
RTD	resistance temperature detector
RTE	resistance temperature element
RVI	reactor vessel internals
RVIAMP	reactor vessel internals AMP
RVLMS	reactor vessel level monitoring program
SAE	Society of Automotive Engineers
SAR	safety analysis report
SC	structures and component
SCBA	self-contained breathing apparatus
SCC	stress corrosion cracking
SCS	structures and component support
SER	safety evaluation report
SFP	spent fuel pool
SFPC	spent fuel pool cooling
SH	sodium hydroxide
SMAW	shielded metal arc welding
SOC	statement of considerations
SPCS	steam and power conversion systems
SRP	standard review plan
SSC	structures, systems, and components
SSHT	surveillance specimen holder tubes
SUPCAPS	supplementary weld metal surveillance capsules
TLAA	time-limited aging analyses
TMI	Three Mile Island
TMI-1	Three Mile Island Unit 1
TMI-2	Three Mile Island Unit 2
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
ULD	upper-level design
USAS	United States of America Standards
USE	upper-shelf energy
UT	ultrasonic testing
VDIL	vents, drains, and instrument lines
VHP	vessel head penetration
WB	wet bulb
WOG	Westinghouse Owners Group

1 INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) regarding the application to renew the operating license for Arkansas Nuclear One, Unit 1 (ANO-1), which was filed by Entergy Operations, Inc. (hereafter referred to as Entergy or the applicant), by letter dated January 31, 2000. The applicant submitted its application to the United States Nuclear Regulatory Commission (NRC) for renewal of the ANO-1operating license for an additional 20 years. The Office of Nuclear Reactor Regulation reviewed the ANO-1 license renewal application (LRA) for compliance with the requirements of Title 10 of the *Code of Federal Regulations*, Part 54 (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and prepared this report to document its findings.

In its submittal of January 31, 2000, the applicant requests renewal of the ANO-1 operating license (License No. DPR-51) issued under Section 104 of the *Atomic Energy Act of 1954*, as amended, for a period of 20 years beyond the current license expiration date of May 20, 2014. ANO-1 is located in Pope County in the central region of Arkansas on the shore of Lake Dardanelle. ANO-1 is a Babcock and Wilcox pressurized-water reactor nuclear steam supply system that is designed to generate 2568 MW thermal, or approximately 836 MW electric. Details concerning the plant and the site are found in the updated final safety analysis report (UFSAR) for ANO-1.

The license renewal process requires a technical review of safety issues and an environmental review. The requirements for these reviews are stated in NRC regulations in 10 CFR Parts 54 and Part 51, respectively. The safety review is based on Entergy's LRA, the ANO-1 UFSAR, and the applicant's responses to NRC staff requests for additional information (RAIs). The applicant's answers to the RAIs are documented and docketed in letters to the NRC, and are supplemented by meeting minutes and other docketed correspondence. The public can review the LRA and all pertinent information and material, including the UFSAR, at the NRC Public Document Room, 11555 Rockville Pike, Rockville, MD 20852-2738. In addition, the ANO-1 LRA and other significant information and material relating to the license renewal review are available on the NRC Web page at www.nrc.gov.

This SER summarizes the findings of the staff's safety review of the ANO-1 LRA, and describes the technical details that the staff considered in its safety evaluation of the proposed operation of ANO-1 for an additional 20 years beyond the term of the applicant's current operating license. The staff reviewed the LRA in accordance with NRC regulations and the guidance presented in the NRC draft "Standard Review Plan (SRP) for the Review of License Renewal Applications for Nuclear Power Plants," dated August 2000.

Chapters 2 through 4 of this SER provides the staff's evaluation of the license renewal issues that were considered during the review of the LRA. Chapter 5 contains the report from the Advisory Committee on Reactor Safeguards (ACRS). The conclusions of this report are presented in Chapter 6.

Appendix A is a chronology of NRC's and the applicant's principal correspondence related to the review of the application. Appendix B is a bibliography of the documents used during the review. Appendix C is a list of the NRC staff's principal reviewers and its contractors for this project. Appendix D summarizes the on-site review activities.

In accordance with 10 CFR Part 51, the staff prepared a draft and a final plant-specific supplement to the generic environmental impact statement (GEIS) that discuss the environmental considerations related to renewing the license for ANO-1. The draft and final plant-specific supplement to the GEIS was issued separately from this report. Specifically, a draft and a final Supplement 3 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Arkansas Nuclear One, Unit 1" were issued in September 2000 and April 2001, respectively.

The NRC ANO-1 license renewal project manager is Robert J. Prato. Mr. Prato may be contacted by calling (301) 415-1147 or by writing to the License Renewal and Standardization Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

1.2 License Renewal Background

Pursuant to the *Atomic Energy Act of 1954*, as amended, and NRC regulations, licenses for the operation of commercial power reactors are issued for 40 years. These licenses can be renewed for up to 20 additional years. The original 40-year license term was selected on the basis of economic and antitrust considerations, rather than technical limitations. However, some plant equipment may have been engineered on the basis of an expected 40-year service life.

In 1982, the NRC anticipated interest in license renewal and held a workshop on aging of nuclear power plants. This workshop led the NRC to establish a comprehensive program for nuclear plant aging research (NPAR). On the basis of the results of that research, a technical review group concluded that many aging phenomena are readily manageable, and do not involve technical issues that would preclude extending the life of nuclear power plants.

In 1986, the NRC published a request for comment regarding a policy statement that would address major policy, technical, and procedural issues related to life extension for nuclear power plants.

In 1991, the NRC published the License Renewal Rule in 10 CFR Part 54. The NRC participated in an industry-sponsored demonstration program to apply the Rule to pilot plants and develop experience to establish implementation guidance. To establish a scope of review for license renewal, the Rule defined age-related degradation unique to license renewal. However, during the demonstration program, the NRC found that many aging mechanisms occur and are managed during the period of the initial license. In addition, the NRC found that the scope of the review did not allow sufficient credit for existing programs, particularly for the implementation of the Maintenance Rule in accordance with 10 CFR 50.65, which also manages plant aging phenomena.

As a result, in 1995 the NRC amended 10 CFR Part 54. The amended License Renewal Rule established a regulatory process that is expected to be simpler, more stable, and more predictable than the previous License Renewal Rule. In particular, 10 CFR Part 54 was clarified to focus on managing the adverse effects of aging rather than on identifying all aging mechanisms. The changes to the Rule were intended to ensure that important systems, structures, and components (SSCs) will continue to perform their intended function during the period of extended operation. In addition, the integrated plant assessment (IPA) process was clarified and simplified to be consistent with the revised focus on passive, long-lived structures and components (SCS).

In parallel with these efforts, the NRC pursued a separate rulemaking effort to amend 10 CFR Part 51 to focus the scope of the review of environmental impacts related to license renewal, and fulfill, in part, the NRC's responsibilities under the *National Environmental Policy Act of 1969* (NEPA).

1.2.1 Safety Reviews

License renewal requirements for power reactors are founded on two key principles:

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants provide and maintain an acceptable level of safety, with the possible exception of the detrimental effects of aging on the functionality of certain SSCs during the period of extended operation, and possibly a few other issues related to safety only during the period of extended operation.

(2) The plant-specific licensing basis must be maintained during the renewal term in the same manner, and to the same extent, as during the original licensing term.

In implementing these two principles, the Rule (in 10 CFR 54.4) defines the scope of license renewal as including those plant SSCs (a) that are safety-related, (b) whose failure could affect safety-related functions, and (c) that are relied on to demonstrate compliance with the Commission's regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout.

Pursuant to 10 CFR 54.21(a), the applicant must review all SSCs that are within the scope of the Rule to identify the SCs that are subject to an aging management review (AMR). SCs that are subject to an AMR are those that perform an intended function without moving parts, or without a change in configuration or properties, and that are not subject to replacement based on a qualified life or specified time period. As required by 10 CFR 54.21(a)(3), the applicant must demonstrate that the effects of aging will be managed in such a way that the intended function(s) of the SCs that are within the scope of license renewal will be maintained, consistent with the current licensing basis (CLB), for the period of extended operation.

Active equipment, however, is considered to be adequately monitored and maintained by existing programs. In other words, the detrimental effects of aging that may affect active equipment are more readily detectable and will be identified and corrected through routine surveillance, performance indicators, and maintenance. The surveillance and maintenance programs and activities for active equipment, as well as other aspects of maintaining plant design and licensing bases, are required to continue throughout the period of extended operation.

Pursuant to 10 CFR 54.21(d), each application is also required to include a supplement to the plant's final safety analysis report (FSAR). This FSAR Supplement must contain a summary description of the programs and activities for managing the effects of aging.

Another requirement for license renewal is the identification and updating of time-limited aging analyses (TLAAs). During the design phase for a plant, certain assumptions are made about the initial operating term of the plant, and these assumptions are incorporated into design calculations for several of the plant's SSCs. In accordance with 10 CFR 54.21(c)(1), these calculations must be shown to be valid for the period of extended operation, or must be

projected to the end of the period of extended operation, or the applicant must demonstrate that the effects of aging of these SSCs will be adequately managed for the period of extended operation.

In 1996, the NRC developed and issued a draft regulatory guide, DG-1047, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses." This guide proposes to endorse an implementation guideline prepared by the Nuclear Energy Institute (NEI) as an acceptable method of implementing the License Renewal Rule. The guideline is NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54–The License Renewal Rule," which was issued in March 1996. The NRC prepared a draft SRP for the safety review in September 1997, which was revised and reissued in August 2000. The draft regulatory guide was used, along with the initial draft SRP, to review this application and to assess topical reports involved in license renewal as submitted by industry groups. As experience is gained, the NRC will improve the SRP and clarify the regulatory guidance.

1.2.2 Environmental Reviews

In December 1996, the staff revised the environmental protection regulations in 10 CFR Part 51 to facilitate environmental reviews for license renewal. The staff prepared a "Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants," NUREG-1437, Revision 1, in which it examined the possible environmental impacts associated with renewing licenses of nuclear power plants. For certain types of environmental impacts, the GEIS establishes generic findings that are applicable to all nuclear power plants. These generic findings are identified as Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B. Pursuant to 10 CFR 51.53(c)(3)(i), an applicant for license renewal may incorporate these generic findings in its environmental report. Environmental impacts for the renewal of a plant's license, which must be analyzed on a plant-specific basis, are identified as Category 2 issues in 10 CFR Part 51, Subpart A, Appendix B. Such analyses must be included in an environmental report in accordance with 10 CFR 51.53(c)(3)(ii).

In accordance with NEPA and the requirements of 10 CFR Part 51, the NRC performs a plant-specific review of the environmental impacts of license renewal, including whether there is new and significant information that was not considered in the GEIS. Two public meetings were held in April 2000, near ANO-1 as part of the NRC's scoping process to identify environmental issues specific to the plant. The results of the environmental review and a preliminary recommendation on the license renewal action were documented in the NRC's draft plant-specific Supplement 3 to the GEIS, which was issued on October 3, 2000. An additional two public meeting were held near the site in November 2000, (during the 75-day comment period for the draft plant-specific Supplement 3 to the GEIS). At these meetings, the staff described the environmental review, and answered questions from members of the public to assist them in formulating any comments that they may have regarding the review. The final Supplement 3 to the GEIS was issued in April 2001.

Supplement 3 presents the NRC's preliminary environmental analysis associated with renewing the ANO-1 operating license for an additional 20 years that considers and weighs the environmental effects, and alternatives that are available to avoid adverse environmental effects. On the basis of (1) the analysis and findings in the "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants," NUREG-1437; (2) the environmental report submitted by the applicant; (3) consultation with other Federal, State, and local agencies; (4) its own independent review; and (5) its consideration of public comments, the staff recommended,

in Supplement 3 to NUREG-1437, that the Commission determine that the adverse environmental impacts of license renewal for ANO-1 are not so great that preserving the option of license renewal for energy planning decision-making would be unreasonable.

1.3 Summary of Principal Review Matters

The requirements for renewing operating licenses for nuclear power plants are described in 10 CFR Part 54. The staff performed its technical review of the ANO-1 LRA in accordance with Commission guidance and the requirements of 10 CFR 54.19, 54.21, 54.22, 54.23, and 54.25. The standards for renewing a license are contained in 10 CFR 54.29.

In 10 CFR 54.19(a), the Commission requires applicants for license renewal to submit general information. Entergy submitted this general information in Enclosure 1 to its letter of January 31, 2000, regarding the application for a renewed operating license for ANO-1. The staff reviewed that enclosure, and found that the applicant submitted the information required by 10 CFR 54.19(a).

In 10 CFR 54.19(b), the Commission requires that LRAs include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." Regarding the standard indemnity agreement, the applicant states the following in its LRA:

> The current Standard Indemnity Agreement for ANO-1 states in Article VII that the agreement shall terminate at the time of expiration of that license specified in Item 3 of the attachment to the Standard Indemnity Agreement. Item 3 of the attachment to the Standard Indemnity Agreement, as revised by Amendment No. 6, lists DPR-51 as an applicable license number. Entergy Operations requested that conforming changes be made to Article VII of the Standard Indemnity Agreement, and/or Item 3 of the attachment to the Standard Indemnity Agreement, specifying the extension of the Standard Indemnity Agreement until the expiration dates of the renewed ANO-1 Operating Licenses. Should the license number be changed upon issuance of the renewed license, Entergy Operations requests that conforming changes be made to Item 3 of the attachment and any other section of Standard Indemnity Agreement, as appropriate.

The staff will use the original license number for the renewed license. Therefore, there is no need to make conforming changes to the indemnity agreement, and the requirements of 10 CFR 54.19(b) have been met.

In 10 CFR 54.21, the Commission requires that each application for a renewed license for a nuclear facility contain the following information: (a) an integrated plant assessment (IPA), (b) current licensing basis changes made during the NRC review of the application, (c) an evaluation of TLAAs, and (d) a final safety analysis report (FSAR) supplement. On January 31, 2000, the applicant submitted the information required by 10 CFR 54.21(a) and (c) in Exhibit A of its LRA, entitled "License Renewal Application, Arkansas Nuclear One, Unit 1." The applicant submitted the information required by 10 CFR 54.21(b) on January 31, 2001. The

applicant submitted the information to address the license renewal requirements of 10 CFR 54.21(d) in Appendix A to Exhibit B of its LRA, entitled "Safety Analysis Report Supplement."

In 10 CFR 54.22, the Commission states the requirements regarding technical specifications. The applicant addressed the requirements of 10 CFR 54.22 in Appendix D to Exhibit B of its LRA.

The staff evaluated the technical information required by 10 CFR 54.21 and 54.22 in accordance with the NRC's regulations and the guidance provided in the initial draft SRP. The staff's evaluation of this information is documented in Chapters 2, 3, and 4 of this SER.

The staff's evaluation of the environmental information required by 10 CFR 54.23 is documented in the draft plant-specific supplement to the GEIS (NUREG-1437, Supplement 3), which states the considerations related to renewing the license for ANO-1.

The report by the Advisory Committee on Reactor Safeguards required by 10 CFR 54.25 is contained in Chapter 5 of this SER. The findings required by 10 CFR 54.29 are presented in Chapter 6 of this report.

1.3.1 Babcock and Wilcox Topical Reports

In accordance with 10 CFR 54.17(e), the applicant also references a number Babcock and Wilcox Owners Group topical reports in its LRA. These topical reports were used by the applicant to generically demonstrate that applicable aging effects for reactor coolant system components will be adequately managed for the period of extended operation. Specifically, the applicant incorporated the following topical reports into its application:

- BAW-2241P, "Fluence and Uncertainty Methodologies," May 1997
- BAW-2243A, "Demonstration of the Management of Aging Effects for the Reactor Coolant System Piping," March 1996
- BAW-2244A, "Demonstration of the Management of Aging Effects for the Pressurizer," August 1997
- BAW-2248, "Demonstration of the Management of Aging Effects for the Reactor Vessel Internals," July 1997
- BAW-2251, "Demonstration of the Management of Aging Effects for the Reactor Vessel," June 1996

The staff issued separate safety evaluations for these topical reports on the following dates: BAW-2243A on March 21, 1996; BAW-2244A on August 18, 1997; BAW-2241P on February 18, 1999; BAW-2251 on April 26, 1999; and BAW-2248 on December 9, 1999. In accordance with procedures established in NUREG-0390, "Topical Report Review Status," the staff requested that the Babcock and Wilcox Owners Group publish the accepted versions of the reports, which incorporates the transmittal letter and the staff's safety evaluation between the

title page and the abstract. The accepted versions have an "A" (for "accepted") after the report identification number.

The safety evaluations of the topical reports are intended to be stand-alone documents. An applicant incorporating the topical reports by reference into its LRA must ensure that the conditions of approval stated in the safety evaluations are met. The staff's evaluation of how the topical reports were incorporated into the application is found in Section 3.4 of this SER.

1.4 Summary of Open Items

Upon completing its initial review, the staff identified and documented six open items in an SER dated January 10, 2001. The applicant responded to each of the open items by providing additional information in a letter to the NRC dated March 14, 2001. The following describes each of the six open items, the applicant's response to each item, and the staff's evaluation of the applicant's response.

- Open Item 2.3.2.6.2-1 - The ANO-1 UFSAR, Section 6.2.2.1, identifies an in-line flow orifice as being necessary to ensure the proper sodium hydroxide injection rate for pH control. This flow orifice was not identified as a component of the sodium hydroxide system that was subject to an AMR for its flow control intended function in Table 3.3-6 of the LRA.

  In response to this concern, the applicant added the flow control function for the sodium hydroxide in-line flow orifice to its AMR. This flow orifice is constructed of stainless steel, and is susceptible to cracking and loss of material. The inspection activities used to manage similar applicable aging effects of sodium hydroxide stainless steel components will be used to manage the aging of the in-line flow orifice for the flow control intended function. Aging management activities will be completed as part of the new ASME, Section XI, ISI augmented inspections activities evaluated in this SER, Section 3.3.1.4.9. This information was documented in a letter to the NRC staff dated March 14, 2001. The staff finds this resolution to Open Item 2.3.2.6.2-1 acceptable.

- Open Item 2.3.3.2.2-1 - The applicant does not include the fire protection (FP) jockey pump, carbon dioxide systems, fire hydrants, the water supply to the low level radwaste building FP system, and the piping to the manual hose station (located downstream of FS-43) as being within the scope of license renewal and subject to an AMR. The staff requested additional information for the exclusion of these components; however, at the time the initial SER was issued, the applicant had not provided sufficient justification for the exclusion of these components.

  In a public meeting with the applicant that took place on March 7, 2001, the applicant presented its position as to why the FP jockey pump, carbon dioxide systems, fire hydrants, the water supply to the low level radwaste building FP system, and the piping to the manual hose station (located downstream of FS-43) are not included in the applicant's CLB (as documented in the applicant's F-list) in accordance with the requirements of 10 CFR 50.48. The applicant explained that each of these components is maintained to the National Fire Protection Association standards, and provided a technical justification as to why these components are not required for safe shutdown

consistent with General Design Criteria III. The staff presented its position that the requirements of10 CFR 50.48 go beyond safe shutdown, and a number of components beyond those required by GDC III are required by 10 CFR 50.48. As a result of this meeting, the applicant agreed to add the jockey pump and fire hydrants to the scope of SCs subject to an AMR and to its F-list consistent with the requirements of 10 CFR 50.48. At the same time, the applicant provided sufficient justification for not including the carbon dioxide systems, the water supply to the low level radwaste building FP system, and the piping to the manual hose station to the scope of components required by 10 CFR 50.48 for ANO-1. This information was documented in a letter to the NRC dated March 14, 2001. The staff had no additional concerns relating to the scope of FP components subject to an AMR, therefore, this item is considered closed.

- Open Item 3.3-1 - The staff reviewed the applicant's summary descriptions of the aging management programs (AMPs), and the evaluations of the time-limited aging analyses (TLAAs) provided by the applicant in Appendix A, "Safety Analysis Report Supplement," of the LRA, to ensure that they are consistent with the requirements of 10 CFR 54.21(d). The staff identified a number of summary descriptions of AMPs and TLAA evaluations that needed additional information to meet the intent of 10 CFR 54.21(d). The additional information needed include the following:

  - FSAR Item 3.3.1.2.3 - In its revised summary description of Section 16.0 of the FSAR Supplement, the applicant added a summary description of the quality assurance AMP to its FSAR Supplement. This summary description contains an adequate description of the corrective action program that specifically describes corrective actions, the confirmation process, and the administrative controls consistent with 10 CFR Part 50, Appendix B, as it applies to license renewal in accordance with 10 CFR 54.21(d). The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

  - FSAR Item 3.3.1.3.3 - In its revised summary description of Section 16.2.13 of the FSAR Supplement for the Maintenance Rule program, the applicant clarified that this program only applies to external surfaces of the SCs that are managed by this AMP. The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

  - FSAR Item 3.3.1.4.1.3 - A review of the LRA, the applicant's responses to the staff's request for additional information, and the programs credited with managing the aging of fire protection systems buried piping, the staff verified that buried pipe inspection program is not credited, and is not needed to manage the applicable aging effects. The staff finds that no change to Section 16.1.1 of the FSAR Supplemented, as submitted with the LRA, is needed.

  - FSAR Item 3.3.1.4.2.3 - In a letter to the NRC dated September 12, 2000, the applicant states that the Heat Exchanger Monitoring Program does not address fouling. The Heat Exchanger Monitoring Program will inspect heat exchangers to the extent required to ensure seismic qualification is maintained, but it is not intended to monitor for fouling. A staff review of the LRA, the applicant's

responses to the staff's request for additional information, and the applicable AMPs, verified that fouling will be adequately managed by other programs such as the Service Water Integrity Program or system surveillance testing. The staff finds that no change to Section 16.1.3 of the FSAR Supplemented, as submitted with the LRA, is needed.

- FSAR Item 3.3.1.4.3.3 - After a review of the LRA, the applicant's responses to the staff's request for additional information, and the applicable AMPs, the staff verified that the wall thinning inspection program was not limited to the chilled water components of penetrations 51 and 59. Other reactor building isolation system carbon steel components credit the Wall Thinning Inspection Program. These other penetrations are correctly listed in the program description in Appendix B of the LRA (Section 3.7) and in the FSAR Supplement as submitted with the LRA. The staff finds that no change to Section 16.1.7 of the FSAR Supplement, as submitted with the LRA, is needed.

- FSAR Item 3.3.2.4.3 - In its revised summary description of Section 16.2.7 of the FSAR Supplement, the applicant states that if an inspection program is determined to be necessary for the CRDM nozzle and other vessel closure penetrations, the applicant will analyze and evaluate axial flaws using NUMARC acceptance criteria, and address circumferential flaws with the NRC on a case-by-case basis. The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

- FSAR Item 3.3.3.3 - In its revised summary description of Section 16.2.3.7 of the FSAR Supplement, the applicant includes a one-time inspection to detect cracking and wall thinning of piping and fittings in the sodium hydroxide system in the summary description of the Augmented Inspection program. The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

- FSAR Item 3.3.7.4 - In its revised summary description of Section 16.1.2 of the FSAR Supplement for inaccessible medium-voltage cables exposed to significant moisture and voltage, the applicant states that it will either test for the presence of aging effects or implement a periodic replacement program for these cables. If periodic replacement of medium-voltage underground cables is determined to be the most effective action for this type of cable, ANO-1 will define the frequency for replacement prior to the expiration of the initial 40-year licensing term. The frequency will be based on site-specific and industry operating experience. The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

- FSAR Item 4.3.4 - In its revised summary description of Section 16.3.2 of the FSAR Supplement, the applicant provides a proposed program to address the environmental effects of fatigue that meet the requirements of 10 CFR 54.21(d). The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

- FSAR Item 4.5.5 - In its revised summary description of Sections 16.2.3.6 and 16.3.4 of the FSAR Supplement, the applicant includes an adequate summary description of the prestress monitoring and trending activities, the acceptance criteria, and corrective actions for managing prestress tendons of the ANO-1 containment in the FSAR Supplement consistent with 10 CFR 54.21(d). The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

- FSAR Item 4.7.3 - In its revised summary description of Section 16.3.6 of the FSAR Supplement, the applicant provides a summary description of the monitoring, evaluation activities, optional corrective actions, and decision criteria for the aging of Boraflex in the spent fuel pool. The staff finds the revised summary description as submitted by the applicant in a letter to the NRC dated March 14, 2001, acceptable.

- Open Item 3.3.7.2-1 - Buried (inaccessible) medium-voltage cables, exposed to ground water typically do not have comparable accessible cables exposed to a similar environment that can serve as a sample for these inaccessible cables. For buried cable exposed to ground water that are within the scope of license renewal and subject to an AMR, visual inspection is not sufficient for managing a reduced insulation resistance to ground, and potential electrical failure due to moisture intrusion, water treeing, and contamination so that the intended function will be maintained consistent with the applicant's CLB for the period of extended operation in accordance with the requirements of 10 CFR 54.21(a)(3).

  In response to this concern, the applicant committed to implement either a test or replacement program for the cables of concern. If a testing program is implemented, inaccessible medium-voltage cables exposed to moisture and voltage will be tested for the presence of aging. The specific type of test that will be performed will be identified and implemented prior to entering the period of extended operation. This test will provide an indication of insulation integrity. Along with this test, the applicant will monitor and manage groundwater in manholes containing in-scope medium-voltage cables to reduce the exposure of these cables to moisture.

  The applicant is also considering a periodic replacement program based on industry and site-specific operational experience, as an alternate approach to testing and monitoring. If the applicant determines periodic replacement to be a more effective means of managing the aging of these cables, the program will be implemented prior to entering the period of extended operation. The staff finds this resolution to Open Item 3.3.7.2-1 acceptable.

- Open Item 4.5.2-1 - In response to an NRC staff RAI, the applicant did not adequately describe the AMP for the prestress forces for the ANO-1 containment. Specifically, the applicant needed to provide additional information regarding the prestress monitoring and trending activities, the acceptance criteria, and corrective actions when acceptance criteria are not met.

In a letter to the NRC dated March 14, 2001, the applicant provided sufficient information regarding the prestress monitoring and trending activities, the acceptance criteria, and corrective actions when acceptance criteria are not met. This information provided by the applicant and the staff's evaluation of this information is discussed in Section 4.5.2 of this SER. The staff finds the additional information regarding prestress tendon forces for the ANO-1 containment acceptable to resolve Open Item 4.5.2-1.

- Open Item 4.7.2-1 - The applicant needed to provide the basis upon which the staff can conclude that there is reasonable assurance that the effects of aging of Boraflex will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, in accordance with the requirements of 10 CFR 54.21(c)(1).

  In a letter to the NRC dated March 14, 2001, the applicant acknowledges the analysis of Boraflex in the spent fuel storage racks as a time limited aging analysis. The applicant further states that the existing analysis is not valid through the license renewal period and cannot be acceptably projected to the end of the license renewal period as documented in a letter to the NRC dated September 6, 2000. In accordance with 10CFR54.21(c)(1)(iii), the applicant committed to continue its boraflex monitoring program to provide reasonable assurance that the effects of aging on the intended function will be adequately managed for the period of extended operation.

  In its March 14, 2001 letter, the applicant also provides the additional information regarding the boraflex monitoring program requested by the staff in a letter to the applicant dated May 5, 2000. This information provided by the applicant and the staff's evaluation of this information is discussed in Section 4.7.2 of this SER. The staff finds the additional information regarding the boraflex monitoring program acceptable to resolve Open Item 4.7.2-1.

2 STRUCTURES AND COMPONENTS SUBJECT TO AN AGING MANAGEMENT REVIEW

2.1 Methodology for Identifying Structures and Components Subject to Aging Management Review

2.1.1 Introduction

Title 10 of the *Code of Federal Regulations*, Part 54 (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," Section 54.21, "Contents of Application — Technical Information," requires that each application for license renewal contain an integrated plant assessment (IPA). Furthermore, the IPA must list and identify those structures and components (SCS) that are subject to an aging management review (AMR) from the systems, structures, and components (SSCs) that are within the scope of license renewal in accordance with 10 CFR 54.4.

In the LRA, Section 2.1, "Scoping and Screening Methodology," the applicant states that the Arkansas Nuclear One, Unit 1, (ANO-1) IPA was developed along traditional engineering disciplines (that is, mechanical, civil/structural, and electrical). The applicant also states that the scoping and screening methodology used to identify structures and mechanical components subject to an AMR is consistent with the industry guidance in the Nuclear Energy Institute's, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 — The License Renewal Rule" (NEI 95-10), Revision 0; the NRC's "Draft Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants"; and additional correspondence between the NRC, other applicants, and the NEI during the review and development of earlier license renewal applications (LRAs).

2.1.2 Summary of Technical Information in the Application

In the LRA, Sections 2.0 and 3.0, the applicant provides the technical information required by 10 CFR 54.21(a). In Section 2.1, "Scoping and Screening Methodology," of the LRA, the applicant describes the process used to identify the SSCs that meet the license renewal scoping criteria under 10 CFR 54.4(a), as well as the process used to identify the SCs that are subject to an AMR as required by 10 CFR 54.21(a)(1).

Additionally, Section 2.3, "Mechanical Systems Scoping and Screening Results"; Section 2.4, "Structures and Structural Components Scoping and Screening Results"; and Section 2.5, "Electrical and Instrumentation and Control System Scoping and Screening Results"; amplify the process that the applicant uses to identify the SCs that are subject to an AMR. The LRA, Chapter 3, "Aging Management Review Results," contains the following information: Section 3.1, "Common Aging Management Programs"; Section 3.2, "Reactor Coolant System"; Section 3.3, "Engineered Safeguards"; Section 3.4, "Auxiliary Systems"; Section 3.5, "Steam and Power Conversion Systems"; Section 3.6, "Structures and Structural Components"; and Section 3.7, "Electrical and Instrument and Control." Chapter 4, "Time-Limited Aging Analysis," contains the applicant's evaluation of time-limited aging analyses.

2.1.2.1 Technical Information for Identifying Systems, Structures, and Components Within the Scope of License Renewal

In the LRA, Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4," the applicant describes the scoping methodology as it relates to the safety-related scoping criteria in accordance with 10 CFR 54.4(a)(1), the non-safety-related criterion in accordance with 10 CFR 54.4(a)(2), and the regulated events scoping criteria in accordance with 10 CFR 54.4(a)(3).

With respect to the safety-related criteria, the applicant states that the scope of license renewal includes those safety-related SSCs that are relied upon to remain functional during and following design-basis events (DBEs) (as defined in 10 CFR 50.49(b)(1)). As such, those safety-related SSCs ensure the following functions: (i) integrity of the reactor coolant pressure boundary; (ii) capability to shut down the reactor and maintain it in a safe shutdown condition; or (iii) capability to prevent or mitigate the consequences of accidents that could result in the potential offsite exposure comparable to the guidelines provided in 10 CFR 50.34(a)(1) or 10 CFR 100.11, as applicable.

The updated final safety analysis report (UFSAR) for ANO-1, Table 1-2, defines "safety-related" or "Q" SSCs on the basis of 10 CFR Part 100, Appendix A, as those SSCs required to ensure the following:

- integrity of the reactor coolant pressure boundary
- capability to shut down the reactor and maintain it in a safe shutdown condition
- capability to prevent or mitigate the consequences of accidents that could result in potential offsite doses comparable to the guideline doses of 10 CFR Part 100

The ANO-1 UFSAR, Table 1-2, also includes a summary-level Q-list for ANO-1 systems and structures. In the mid-1980s, the applicant implemented a Component Level Q-list (CLQL) project, which classified "Q" devices at the component level. The applicant maintains the CLQL in a component database. The ANO-1 summary and CLQL include those SSCs that are relied upon to remain functional during or following DBEs as described in UFSAR Chapter 14, as well as all other design conditions established within the ANO-1 current licensing basis (CLB).

The ANO-1 summary-level Q-list and CLQL were used during the IPA to identify the SSCs that are safety-related and within the scope of license renewal, consistent with 10 CFR 54.4(a)(1).

With respect to the non-safety-related criteria, the applicant states that the majority of SSCs whose failure could prevent satisfactory accomplishment of any of the safety-related functions in 10 CFR 54.4 (a)(1) are classified as safety-related at ANO-1. Therefore, except for a few cases (as described below), the SSCs meeting the criteria in 10 CFR 54.4(a)(1) and (a)(2) are summarized in the ANO-1 Q-list and listed on the CLQL, and are included within the scope of license renewal.

On the basis of a review of the ANO-1 UFSAR and design documents, the applicant identifies a few cases in which passive, long-lived, non-safety-related components could impact safety-related functions. These include spatially related components for which the physical location

could result in interaction between components (including seismic or flooding interactions). Additionally, the spent fuel pool liner, although non-safety-related as documented in the ANO-1 UFSAR, has been included in the scope of license renewal, in part, because it protects the concrete walls from borated water and maintains the leak-tight integrity of the pool.

In addition, the following non-safety-related components have been included in the scope of license renewal, although they do not meet the criteria of 10 CFR 54.4(a)(2):

- non-safety-related valves and piping that are part of the pressure boundary for the main steam lines and steam generators inside the reactor building

- non-safety-related valves and piping in the auxiliary building sump system that are credited with preventing offsite releases

The few cases in which ANO-1 non-safety-related components could impact safety-related functions have been identified, and the associated components have been included in the scope of license renewal in accordance with the criterion of 10 CFR 54.4(a)(2).

With respect to other scoping criteria, the applicant reviewed all of the SSCs that are relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63) to ensure that they are adequately accounted for in the scoping methodology. Design documentation to support this review was developed as part of the upper-level design (ULD) process. The ULDs were developed by the applicant during the design configuration documentation project (initiated in April 1988) to support the design basis adequacy verification for the ANO units. The ULDs define the design criteria, requirements, and bases for ANO systems and structures, design-basis accident (DBA) analyses, and topical (generic) areas such as fire protection, environmental qualification, flooding, high energy line break, and other design conditions consistent with the plant's CLB. The internal and external sources of information embodied in the ULDs include regulatory documents, industry codes and standards, design change package information, and general correspondence related to the design of the plant.

In summary, the SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with NRC regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout, have been included in the scope of license renewal in accordance with the criteria of 10 CFR 54.4(a)(3).

2.1.2.2 Technical Information for the Structures and Components Subject to an Aging Management Review

After identifying the SSCs that are within the scope of license renewal, the applicant implemented a process to determine which of the SCs would be subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The LRA, Section 2.1.3, "Assessment using criteria in 10 CFR 54.21(a)(1)," describes the screening activities used to determine the SCs that are subject to an AMR. The results of the screening activities are

presented in the LRA, Section 2.3 for mechanical components, Section 2.4 for structures, and Section 2.5 for electrical commodities. The staff's evaluation of the screening results is contained in the corresponding sections of this safety evaluation report (SER).

Mechanical Components Review

The list of ANO-1 systems (mechanical and electrical) that are within the scope of license renewal was created from the scoping and screening methodology discussed above, as presented in Section 2.1 of the LRA. The following information contains additional detail relating to the review of mechanical components.

The ANO-1 reactor coolant system (RCS) is a typical Babcock and Wilcox (B&W) pressurized-water nuclear steam supply system with a reactor vessel, two steam generators, four reactor coolant pumps, a pressurizer, and the connecting or interfacing piping as the primary components. The RCS is an American Society of Mechanical Engineers (ASME) Class 1 system that is safety-related and, therefore, within the scope of license renewal. The components that makeup the RCS pressure boundary are within the scope of license renewal.

The non-Class 1 mechanical systems determined to meet the 10 CFR 54.4 criteria were included in the scope of license renewal. Many of these systems (such as high pressure injection, low-pressure injection, core flood, reactor building spray, emergency feedwater, reactor building cooling, emergency diesel generators (EDGs), hydrogen control, penetration room ventilation, control room ventilation, and so forth) have functions important to safety that are required during DBEs, and are clearly within the scope of license renewal. Other systems (such as service water and fuel oil systems) are needed to support the function(s) of safety-related systems, and are also included within the scope of license renewal.

Portions of some non-Class 1 systems required for normal plant operation (such as main feedwater and main steam) can perform one or more safety-related function(s) and, therefore, are included in the scope of license renewal. Portions of the instrument air system that are necessary for the operation of safety-related valves and dampers are included on the Q-list, and are within the scope of license renewal. Portions of the condensate storage and transfer system required to support emergency feedwater system operation are on the Q-list and are within the scope of license renewal. Portions of the chilled water system that support operation of safety-related cooling units are included on the Q-list, and are within the scope of license renewal.

The Halon system, portions of the fire protection system required to support 10 CFR 50.48, and the alternate AC (AAC) diesel generator and supporting equipment are also within the scope of license renewal in accordance with 10 CFR 54.4(a)(3).

Upon identifying the SSCs that are within the scope of license renewal, the applicant performed a screening review to determine which mechanical SCs would be subject to an AMR. The applicant stated that the screening process used in this review is consistent with the guidance in NEI 95-10. The mechanical components subject to an AMR were identified by a review of ANO-1 piping and instrumentation diagrams, the ANO-1 UFSAR, and the ANO-1 ULDs. The applicant determined the applicable intended function(s) for each of these components by

reviewing the ANO-1 UFSAR and other design documents. The applicant then identified the mechanical components that perform applicable intended function(s) without moving parts or without a change in configuration or properties, and that are not subject to replacement based on qualified life or specified time period.

Structures and Structural Component Review

In the LRA, Section 2.4, the applicant states that the list of ANO-1 structures that are within the scope of license renewal was identified by reviewing the UFSAR, site plans and general arrangement drawings, and other plant-specific documents. Safety-related and non-safety-related structures whose failure could prevent satisfactory accomplishment of any safety-related function(s) was classified consistent with the CLB as documented in UFSAR, Table 1-2. ANO-1 structures are designated as either seismic Category 1 or seismic Category 2. As defined in the ANO-1 UFSAR, and consistent with the requirements of 10 CFR 54.4(a)(1)(iii), seismic Category 1 structures are those that prevent uncontrolled release of radioactivity, and are designed to withstand design-basis loadings without loss of intended function. Consequently, the applicant determined that ANO-1 seismic Category 1 structures meet the criteria required in 10 CFR 54.4(a)(1) and, therefore, are within the scope of license renewal.

Seismic Category 2 structures are those structures that can withstand limited damage without causing a release of radioactivity, without limiting a controlled plant shutdown, and possibly interrupting power generation. The UFSAR, Chapter 5, states that seismic Category 2 structures do not perform a nuclear safety-related function, but its failure could possibly affect the function(s) of a safety-related system. This is consistent with the scoping requirement of 10 CFR 54.4(a)(2). Consequently, the applicant has determined that some ANO-1 seismic Category 2 structures meet the scoping requirement of 10 CFR 54.4(a)(2) and, therefore, are within the scope of license renewal.

In addition, the applicant reviewed the list of ANO-1 structures that were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(2), and concluded that this list included the structures that meet the requirements of 10 CFR 54.4(a)(3).

Upon identifying the SSCs that are within the scope of license renewal, the applicant performed a screening review to determine which structures and structural components would be subject to an AMR. In doing so, the applicant divided the structures and structural components into structural component groups for the AMR. Many structural components do not have unique equipment identifiers. Unique identifiers are not needed in this application because the structural components that makeup each grouping are well defined, all structures and structural components within a grouping were reviewed as a group, and the applicable aging management programs (AMPs) were applied to all structural components within each grouping.

The applicant then determined the intended function(s) of the various structures and structural components by reviewing information contained in the ANO-1 UFSAR, engineering documents, and NEI 95-10. The applicant identified the structures and structural components that perform applicable intended function(s) without moving parts or without a change in configuration or properties, and that are not subject to replacement based on qualified life or specified time period.

In summary, the applicant divided the various structural components into three groups on the basis of material of construction and component-level function, with sub-materials indicated, as appropriate. Structural intended functions by structural component groupings were identified and used for the AMR. Bulk commodities were also identified and grouped on the basis of materials of construction, with sub-materials indicated, as appropriate.

Electrical Components Review

The ANO-1 electrical systems include an offsite power supply from the switchyard, two essential trains (red and green) of onsite electrical distribution that supply power to safety-related components, and a non-safety-related power supply for non-safety-related equipment. Upon identifying the SSCs that are within the scope of license renewal, the applicant performed the following screening review to determine which electrical components would be subject to an AMR. As part of this effort, the applicant participated in an industry initiative, coordinated by the NEI, to develop a commodity evaluation approach. The passive, long-lived electrical components were grouped into commodities consistent with NEI 95-10, Appendix B, and the following passive electrical component groups were identified as requiring an AMR: splices, connectors, terminal blocks, and cables. Excluded from these commodities are individual splices, connectors, and terminal blocks that are classified as piece-parts of larger complex assemblies. For example, the wiring, terminal blocks, and connectors located internal to a breaker cubicle were considered piece-parts of the breaker. Because a breaker is an active component not subject to an AMR, the piece-parts that share in the intended function of that component are not subject to an AMR.

2.1.3 Staff Evaluation

In reviewing the ANO-1 LRA, the NRC staff evaluated the scoping and screening activities described in the following sections:

- Section 2.1, "Scoping and Screening Methodology," and Section 2.2, "Plant-Level Scoping Results," to ensure that the applicant describes a process for identifying SSCs at ANO-1 that are within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(1), (a)(2), and (a)(3)

- Section 2.3.1.1, "Description of the Process to Identify Reactor Coolant System Components Subject to Aging Management Review"; Section 2.5.1, "Electrical and Instrumentation and Control System Scoping and Screening Results — Purpose and Scope"; Section 3.2.1, "Description of the Process to Identify Aging Effects Requiring Management for Reactor Coolant System Components"; and Section 4.1, "Identification of Time-Limited Aging Analyses," to ensure that the applicant describes a process for determining structural, mechanical, and electrical components at ANO-1 that are subject to an AMR for renewal in accordance with the requirements of 10 CFR 54.21(a)(1) and 54.21(a)(2)

In addition, the staff performed an onsite audit of the applicant's processes to ensure that the applicant had developed and implemented adequate guidance to conduct the scoping and screening of ANO-1 SSCs in accordance with the methodologies described in the application.

2.1.3.1 Evaluation of the Methodology for Identifying Systems, Structures, and Components Within the Scope of License Renewal

From May 22 through May 24, 2000, the NRC staff conducted an audit of the ANO-1 license renewal scoping and screening methodology at ANO-1 in Russellville, Arkansas. During this audit, the staff performed a review of the scoping and screening methodology that included detailed discussions with the cognizant engineers on the implementation and control of the program, a review of administrative controls, and a review of design documents used by the applicant during the scoping and screening activities.

As a result of the audit, the staff obtained information regarding the scoping and screening methodology. Specifically, the applicant described in detail the CLQL development process and the ULD document program, which was the basis for verifying safety- and non-safety-related design functions for specific SSCs. The ULD documentation included a series of system specific evaluations, a set of DBA analysis evaluations, and a set of topical (generic) evaluations beyond those in the UFSAR Chapter 14 accident analysis, which provided the basis for initial inclusion of SSCs that are within the scope of license renewal. The combined efforts for developing the ULDs and CLQL were instrumental in identifying the design basis and design conditions considered in implementing the LRA scoping and screening methodology.

The NRC audit team reviewed a sample of the system-level and topical-level ULD reports to better understand the approach that the applicant implemented to determine which SSCs would initially be included within the scope of license renewal. The team found that the ULD documents provided a concise, well-documented discussion of the systems, including safety-related, non-safety-related, and NRC-required functions (i.e., those that were assigned as a result of commitments to the NRC, including those for the Commission regulations identified under 10 CFR 54.4 (a)(3)). Each ULD contained a detailed list of information sources which included both ANO-specific sources (such as the SER, technical specifications, quality assurance manual, and ANO-1 emergency plan), as well as non-ANO sources (such as industry codes and standards, NUREGs, regulatory guides, bulletins, notices, generic letters, and commission orders). The ULD documentation was developed in accordance with site-specific procedure GES-26, "ULD Writers Guide." The ULD documentation is controlled and maintained in accordance with the applicant's Nuclear Quality Assurance Program through the implementation of a series of site procedures including NES-16, "Accident Analysis ULD and AIM Basis Document Format and Content"; Procedure 5010.007, "Control of Upper Level Documents"; Procedure 5010.004, "Design Document Changes"; and Procedure 1000.150, "Licensing Document Maintenance." The NRC audit team reviewed the governing procedures, and determined that they presented adequate guidance for the preparation, control, and maintenance of the ULDs.

With respect to the CLQL process, ULD-0-TOP-22, "ANO Component Classification Topical," describes the applicant's CLQL project for the development of the Q-list. The applicant started the CLQL project in 1985 to provide information to support plant operation, and in response to the Salem Anticipated Transient Without Scram event (Generic Letter 83-22).

On the basis of the applicant's scoping definition, the Q-classification implies that a structure, system, or component is designed to the Class 1 seismic standards, subject to the full scope of the nuclear quality assurance program. In addition to the Q-classification, the applicant's

program defines 16 major system-level intended functions (including reactivity control, reactor core cooling geometry, RCS pressure boundary integrity, RCS inventory, secondary heat removal, containment isolation, containment pressure and temperature control, containment combustible gas control, indirect radioactive release, habitability, spent fuel storage control, display of event information for operator, structural integrity, interaction isolation, essential cooling, environmental support, and essential electrical support) which support the three functional criteria of the Q-scope definition. These system-level intended functions provided further guidance for determining if a component performed a safety-related or non-safety-related function. The CLQL is maintained and controlled in the applicant's component database in accordance with the nuclear quality assurance program through the implementation of a series of site procedures, including Procedure 1409.66, "Component Level Q-List Project Design Review"; Memorandum NEL-057-22, "CLQL Project Implementation - 10 CFR 50.59 Evaluation"; Impell Project Instruction 0260-098-PI-01, "Component-Level Q-list Development"; and procedure 5010.036, "Component Classification Process."

In reviewing the CLQL process, the NRC audit team evaluated a sample of the System Safety Function Review Forms, which were developed by the applicant during the CLQL program to describe each plant system in terms of its safety-related and non-safety-related functions, as defined by the 16 major system-level intended functions. In preparing the review forms, the applicant identified the specific design documentation referenced for each system, including the SER sections and individual design drawings for the system.

During the audit, the applicant further described the process used to incorporate the information from the CLQL and ULD projects into the LRA development process. The applicant referenced ANO-1 Engineering Reports 93-R-1009-01, "ANO-1 License Renewal Project Methodology and Management Plan"; and 93-R-1010-01, "ANO-1 License Renewal Integrated Plant Assessment System and Structures Screening," to describe the detailed process for developing the LRA, and incorporating the ULD and CLQL information into the screening process. These reports outlined the specific use of the ULD and CLQL within the scoping methodology, and presented formal guidance for use during the implementation phase. The applicant's engineering staff were cognizant of the need to use the ULD and CLQL during the scoping development phase of the LRA project.

On the basis of discussions with the applicant's cognizant engineering staff, and a review of selected design documentation in support of the process, the NRC audit team concluded that the applicant's staff understood and adequately implemented the scoping and screening methodology established in the applicant's LRA.

2.1.3.2 Evaluation of Methodology for Identifying Structures and Components Subject to an Aging Management Review

Mechanical Components

During the audit of the ANO-1 license renewal scoping and screening process, the NRC audit team reviewed the methodology used by the applicant to identify and list the mechanical components subject to an AMR, as well as the applicant's technical justification for this methodology. The team also examined the applicant's results from the implementation of this methodology by reviewing an overview of the mechanical systems identified as being within the

scope of license renewal, a sample of evaluation boundaries drawn within those systems, the resulting components determined to be within the scope of license renewal, the corresponding component-level intended functions, and the resulting list of mechanical components subject to an AMR.

The methodology for identifying mechanical components that are within the scope of license renewal included the following steps:

- Identify all systems and their intended functions that are relied upon to remain functional during and following a DBE for which the plant must be designed.

- Identify all systems and intended functions whose failure could prevent satisfactory accomplishment of any of the intended functions identified in accordance with the requirements of 10 CFR 54.4(a)(1).

- Identify all systems and intended functions necessary to demonstrate compliance with the regulated events identified in accordance with the requirements of 10 CFR 54.4(a)(3).

Beginning with the results of the CLQL, the applicant identified all of the ANO-1 systems that are within the scope of license renewal. To do so, the applicant included the reactor coolant system Class 1 components without any additional evaluation. For the remaining systems determined to be within the scope of license renewal that contain non-Class 1 components, the applicant used the CLQL to identify the system-level intended functions and evaluation boundaries. The applicant also used system drawings to highlight all of the components for those systems included in the CLQL. In addition, the applicant sampled the components outside of the established evaluation boundary to verify that none of those components contributed to the applicable intended functions. Any such mechanical components were determined to be within the scope of the Rule and subject to an AMR. The applicant also added the fire protection components from the F-list, station blackout components and non-Q-list components whose failure could prevent satisfactory accomplishment of any of the safety-related intended functions from the S-list, equipment qualification components from the EQ-list, and anticipate transient without scram (ATWS) components identified from the review of their 10 CFR 50.62 commitments to the list of components requiring an AMR. The applicant reviewed its 10 CFR 50.61 commitments, and found that no additional components needed to be added to the scope of license renewal for pressurized thermal shock.

The applicant then used the requirements of the Rule and the guidance in NEI 95-10 to identify the components that performed its intended function(s) without moving parts or without a change in configuration or properties, and that are not replaced on the basis of qualified life or specified time period to determine which components are subject to an AMR. The applicant then developed a generic guide using BAW-2270, "Non-Class 1 Implementation Guideline and Mechanical Tools," to determine the applicable aging effects for each SC subject to an AMR. The mechanical tools include a list of mechanical component types, a description of susceptible materials and environments, related aging effects that need to be managed, and guidance on how to demonstrate that the effects of aging are being managed, as is further evaluated in Sections 2.3, 3.3.2, 3.3.3, 3.3.4, and 3.3.5 of this SER.

Structures

During the audit of the ANO-1 license renewal scoping and screening process, the NRC staff also examined the structures and structural components included within the scope of license renewal, the corresponding structural-level intended functions, and the resulting list of structural components subject to an AMR.

In determining the structures and structural components included within the scope of license renewal, the applicant reviewed the CLQL, F-list, S-list, EQ-list and ATWS to identify any structure that contained any SSC that is within the scope of license renewal and subject to an AMR. Each structure that contains any of these components was included within the scope of license renewal and subject to an AMR. The only identified exception is the turbine building. The shared wall between the auxiliary building and the turbine building is designated as a turbine building wall on the site drawing. As a result of this unique configuration, the shared wall of the turbine building is designated as being within the scope of license renewal and subject to an AMR. In addition, a number of fire doors and walls required by 10 CFR 50.48 are also located in the turbine building and are subject to an AMR. However, due to the fact that fire protection components (pursuant to 10 CFR 50.48) are not required to be seismically qualified, there is no need to include the turbine building itself in the scope of license renewal.

After identifying the structures and structural components subject to an AMR, the applicant reviewed industry operating experience (from the Babcock and Wilcox Owners Group Generic License Renewal Program) to identify the applicable aging effects. This review resulted in report BAW-2279P, "Aging Effects for Structures and Structural Components," which is referred to as the structural tools. This report is used to evaluate the materials and environments applicable to ANO-1. Accordingly, these structural tools were used in the AMR for ANO-1 structures.

To facilitate the identification of aging effects, the structures and structural component groupings, that were subject to an AMR, were subdivided into the following major groups:

- steel
- threaded fasteners
- concrete
- fire barriers
- elastomers
- earthen structures
- Teflon

The applicant then performed an aging effect evaluation for each material group. The evaluation included the following activities:

- identifying the components and commodities that are within the scope of license renewal on the basis of material type(s).

- determining whether in-scope components and commodities are long-lived and, thus, subject to an AMR.

- identifying plant operating environments
- determining applicable aging effects
- demonstrating the adequacy of AMPs

The AMRs utilize the BAW-2279P methodology, along with existing industry experience, to perform the aging effect evaluation. Only those materials and environments that were determined to result in potential aging effects are evaluated in the AMRs. Potential aging effects identified by this review were determined to be applicable if a plant specific material and environment matched the material and environment of the potential aging effect.

The applicant then prepared site-specific AMRs (engineering reports 93-R-1015 series) for each of the major structures that are within the scope of license renewal (reactor building, reactor building internals, auxiliary building, and the intake structure). The applicant also prepared other reports to document the review of earthen embankments (emergency cooling pond, intake/discharge canals) and yard structures. The applicant prepared a separate report, entitled "Bulk Commodities" to document the review of non-building-specific structural commodities (piping supports, cable trays, electrical cabinets, and so forth). The structural AMR reports are formatted to provide the scope, construction materials, operating environments, applicable aging effects, and a demonstration that the effects of aging are managed as described in Sections 2.4 and 3.3.6 of this SER.

Electrical Components

During the audit of the ANO-1 license renewal scoping and screening process, the NRC staff evaluated the applicant's implementation of this methodology by reviewing the list of electrical components subject to an AMR.

The audit team reviewed the methodology described in the LRA, Section 2.5.3, entitled "Screening of Electrical SSCs." The audit team also reviewed ANO-1 engineering report 93-R-1017-1, which described the electrical AMR process. The applicant used the action plan for the generic plant spaces and commodity evaluation methodology developed by the Babcock and Wilcox Owners Group Generic License Renewal Program electrical review group. Passive, long-lived electrical components were categorized and segregated primarily using the NEI 95-10 suggested categorization as a guide.

To review passive electrical components, the applicant used a combination of the "plant spaces" and "commodity" grouping approaches, as listed in the Sandia Report, "Aging Management Guideline for Commercial Nuclear Power Plants – Electrical Cable and Terminations," as described in Sections 2.5 and 3.3.7 of this SER.

The applicant then prepared site-specific engineering reports to document its review of the passive electrical components that are within the scope of license renewal. The primary engineering report for the electrical components (93-R-1017-01) identifies the component types that the applicant considered to be within the scope of license renewal, as well as the application of the Sandia plant spaces and commodity grouping approaches. The applicant prepared a series of screening reports to identify the passive electrical components that are

within the scope of license renewal, and are exposed to the significant stressors identified in the Sandia Report. Plant walkdowns were completed, as required, to identify localized hot spots. Screening of components was performed utilizing the site component (SIMS and WMS) and the cable (PDMS) databases. The applicant then used the intended functions from the scope activities, identified the aging effects, and performed an AMR consistent with the GLRP action plan.

2.1.4 Conclusions

On the basis of the review performed above, the NRC staff finds that there is reasonable assurance that the applicant's methodology for identifying the SSCs that are within the scope of license renewal and SCs that are subject to an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1), respectively, and is, therefore, acceptable.

2.1.5 References for Section 2.1

1. ULD-0-TOP-22, "ANO, Unit 1 and 2 Component Classification Topical," Revision 0.
2. 93-R-1009-01, ANO-1 License Renewal Project Methodology and Management Plan, Revision 0
3. ANO-1 Updated Final Safety Analysis Report
4. 93-R-1010-01, "ANO-1 License Renewal Integrated Plant Assessment System and Structures Screening," Revision 0
5. Letter from C. Randy Hutchinson, Entergy Operations, Inc., to the U.S. Nuclear Regulatory Commission, "Response to NRC Request Under 10 CFR 50.54(f) Regarding Adequacy and Availability of Design Bases Information." February 7, 1997
6. NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 — The License Renewal Rule," Revision 0, March 1996
7. Working Draft, "NRC Generic Aging Lessons Learned Report (GALL)," August 2000.
8. Procedure GES-26, "ULD Writers Guide," Revision 1
9. Procedure NES-16, "Accident Analysis ULD and AIM Basis Document Format and Content," Revision 1
10. Procedure 1000.150, "Licensing Document Maintenance," Revision 2
11. Procedure 1409.66, "Component Level Q-List Project Design Review," Revision 0
12. Procedure 5010.004, "Design Document Changes," Revision 3
13. Procedure 5010.007, "Control of Upper Level Documents," Revision 3
14. DG-1047, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," Working Draft, April 21, 2000

2.2 Plant Level Scoping Results

2.2.1 Introduction

The statement of considerations (SOC) for the License Renewal Rule (60 FR 22478) indicate that an applicant has the flexibility to determine the set of SCs for which an AMR is performed, provided that this set encompasses the SCs for which the Commission has determined an AMR is required. Accordingly, the staff focused its review on verifying that the implementation of the applicant's methodology discussed in Section 2.1 of this SER did not result in the omission of SCs that are subject to an AMR in accordance with 10 CFR 54.21(a)(1). The staff performed the following two-step evaluation:

- The first step was to determine whether the applicant has properly identified the SSCs that are within the scope of license renewal, in accordance with 10 CFR 54.4. As described in more detail below, the staff reviewed selected SSCs that the applicant did not identify as being within the scope of license renewal to verify that they do not meet any of the scoping criteria in 10 CFR 54.4(a).

- The second step was to determine whether the applicant has properly identified the SCs that are subject to an AMR from among the SSCs identified in the first step in accordance with 10 CFR 54.21(a)(1). As described in more detail below, the staff evaluated the evaluation boundaries for the systems and structures included within the scope of license renewal to verify that all the SCS, that contributed to the intended function(s) within the scope of license renewal, were considered during the AMR. The staff also evaluated the SCs within the evaluation boundaries to verify that all passive/long-lived SCs were subject to an AMR. The staff did not review SCs that the applicant had identified as subject to an AMR because it is an applicant's option to include more SCs than those required by 10 CFR 54.21(a)(1).

The staff performed the following scoping and screening review to determine if there is reasonable assurance that the applicant has identified and listed those SCs that are subject to an AMR to meet the requirements stated in 10 CFR 54.21(a)(1).

2.2.2 Summary of Technical Information in the Application

In Sections 2.3 through 2.5 of the LRA, the applicant describes the SCs that are within the scope of license renewal and subject to an AMR in accordance with 10 CFR 54.4, and 54.21(a)(1), respectively.

Component supports for equipment and piping, which are common to two or more components and within the scope of license renewal, are presented as bulk commodities in Section 2.4.6.2 of the LRA. Electrical components that support the operation of the systems presented in Sections 2.3 are presented in Section 2.5 of the LRA. The staff evaluated component supports that are identified as "bulk commodities" and electrical components for all systems and structures in Section 2.4.6.2 and 2.5 of this SER, respectively.

The staff used the ANO-1 UFSAR in performing its review. Pursuant to 10 CFR 50.34(b)(2), the UFSAR contains "[a] description and analysis of the SSCs of the facility, with emphasis

upon performance requirements, the bases, with technical justification therefor, upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished." The UFSAR is required to be updated periodically pursuant to 10 CFR 50.71(e). Thus, the UFSAR contains updated plant-specific licensing-basis information regarding the systems, SSCs and their functions.

The staff reviewed Sections 2.3 through 2.5 of the LRA to determine if there is reasonable assurance that the applicant has appropriately identified and listed those SCs that are subject to an AMR to meet the requirements stated in 10 CFR 54.21(a)(1).

2.2.3 Staff Evaluation

In the LRA, Section 2.1, the applicant describes its methodology for identifying the SCs that are within the scope of license renewal and subject to an AMR. This IPA methodology typically consists of a review of all plant SSCs to determine those that are within the scope of license renewal in accordance with the requirements of 10 CFR 54.4. From those SSCs that are within the scope of license renewal, an applicant will identify and list those SCs that perform intended function(s) without moving parts, or without a change in configuration or properties, and that are not replaced based on qualified life or specified time period. The staff reviewed the scoping and screening methodology, and provided its evaluation in Section 2.1 of this SER. The applicant documents the implementation of that methodology in Sections 2.3 through 2.5 of the LRA.

To ensure that the scoping and screening methodology described in Section 2.1 of the LRA was implemented properly and identified the SCs that are subject to an AMR, the staff performed the following additional review. The staff sampled the contents of the UFSAR based on the listing of systems and structures on Tables 2.2-1 and 2.2-2 of the LRA to identify systems or structures that may have intended functions that meet the scoping requirements of 10 CFR 54.4 that the applicant does not include within the scope of license renewal. The staff selected several systems and structures, such as structures that support the ultimate heat sink, and the atmospheric vent system, and in a letter to the applicant dated May 5, 2000, the staff requested additional information about these systems and structures. In a letter to the NRC dated August 30, 2000, the applicant provides its response to the staff's requests for additional information (RAIs).

Specifically, the staff requested that the applicant provide justification for omitting the Dardanelle Dam and certain components in the atmospheric vent and main chiller cooling water systems. In a letter to the NRC dated August 30, 2000, the applicant states that although the Dardanelle Dam is part of the ultimate heat sink complex, the dam was in existence before the construction of ANO-1, and is under the jurisdiction of the U.S. Army Corps of Engineers. They are responsible for the inspection and maintenance programs that are expected to adequately manage the aging effects on the dam for the period of extended operations. The staff stated in a letter to NEI dated May 5, 1999, "License Renewal Issue 98-0100, Crediting Federal Energy Regulatory Commissions (FERC) – Required Inspection and Maintenance Programs for Dam Aging," that dam inspections and maintenance performed under the jurisdiction of FERC or the U.S. Army Corps of Engineers, continued through the period of license renewal, will be adequate for the purpose of aging management. Other structures that comprise the ultimate

heat sink complex that are under the control of the applicant (e.g., earthen embankments) are reviewed in Section 2.4 of this document.

The applicant also states that the components of concern in the atmospheric vent system and the main chiller cooling water system do not meet the criteria for being within the scope of license renewal. The staff reviewed the applicant's responses, the LRA, and ANO-1 UFSAR, and agreed with the applicant that these systems do not have components that are within the scope of license renewal.

2.2.4 Conclusions

The NRC staff reviewed the information submitted by the applicant in the LRA, information in the ANO Unit 1 FSAR, and additional information in the applicant's August 30, 2000, response to the NRC, and did not identify any SSCs with intended functions that were not already evaluated in the LRA. Therefore, the staff finds that there is reasonable assurance that the applicant has appropriately identified the SSCs that are within the scope of license renewal in accordance with 10 CFR 54.4. The NRC staff's review of the SCs that are subject to an AMR is provided in Section 2.3 through 2.5 of this SER.

2.2.5 References for Section 2.2

1. 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
2. DG-1047, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," Working Draft, April 21, 2000.
3. "Arkansas Nuclear One - Unit 1, License Renewal Application," dated January 31, 2000.
4. "ANO-1 Updated Final Safety Analysis Report."

2.3 Mechanical Systems Scoping and Screening Results

2.3.1 Reactor Coolant System

In the ANO-1 LRA, Section 2.3.1, "Reactor Coolant System Mechanical Components," the applicant describes the mechanical components of the reactor coolant system (RCS) that are within the scope of license renewal and subject to an AMR. The NRC staff reviewed this section of the LRA to determine whether the applicant has adequately demonstrated that requirements of 10 CFR 54.4, 10 CFR 54.21(a)(1), and 10 CFR 54.21(a)(2) have been met for the mechanical components of the RCS.

2.3.1.1 Technical Information in the Application

As described in the LRA, the following components are within the reactor coolant pressure boundary: reactor vessel, once-through steam generators (primary side), pressurizer, reactor coolant pump, main coolant piping, and portions of other systems attached to these components. The attached systems that contain Class 1 components include the core flood system, makeup/high-pressure injection system, and decay heat/low-pressure injection system. In addition, RCS vents, drains, and instrumentation lines also contain Class 1 components. RCS piping includes piping, fittings, branch connections, safe ends, thermal sleeves, pressure-retaining parts of RCS valves, and bolted closures and connections.

Non-Class 1 portions of the systems attached to the RCS are discussed in the following sections of the LRA:

- 2.3.2.1 - Core Flood
- 2.3.2.2 - Low-Pressure Injection/Decay Heat
- 2.3.2.3 - High-Pressure Injection/Makeup and Purification
- 2.3.2.7 - Reactor Building Isolation

Reactor Coolant System Piping

The NRC staff has reviewed the Babcock & Wilcox Owner Group (B&WOG) topical report BAW-2243A, "Reactor Coolant System Piping," and has approved its use by participating applicants for license renewal. The applicant participated in the development of BAW-2243A by providing ANO-1-specific design and operational information. The applicant has subsequently reviewed the current design and operation of the ANO-1 RCS piping, and confirms that the ANO-1 Class 1 piping is bounded by the description of Class 1 piping contained in BAW-2243A, with regard to materials and operating environment. ANO-1 specific evaluations of RCS piping components not addressed in BAW-2243A include the fast response resistance temperature element (RTE) thermowell, the letdown coolers, and the reactor vessel leakage monitoring piping connected to the reactor vessel. The staff's review of these evaluations is discussed below.

The fast-response RTE connections include a thermowell mounted within the mounting boss. The thermowell, which is constructed from Type 304 austenitic stainless steel, was not evaluated in BAW-2243A. In addition, the evaluation boundary in BAW-2243A did not include the non-Class 1 instrumentation tubing that connects the second isolation valve to the

instrumentation. These items are part of the RCS pressure boundary at ANO-1, are constructed from austenitic stainless steel, and are evaluated in Section 3.3.2 of this SER. Thus, the thermowell is included within the scope of license renewal and subject to an AMR.

The letdown coolers are heliflow shell and tube heat exchangers with spiral Type 304 stainless steel tubes and manifolds, carbon steel casing shells, and carbon steel casing end plates. The tube side was designed in accordance with ASME Section III, Class C, and the shell side was designed in accordance with ASME Section VIII. The primary water enters the tubes at approximately 290.6°C (555°F) during normal plant operation, and is cooled to approximately 48.9°C (120°F) by intermediate cooling water (treated water) flowing through the shell. The intermediate cooling water enters at approximately 35°C (95°F), and exits at less than 79.4°C (175°F). Both coolers are in service during normal plant operation, with a relatively constant intermediate cooling water flow rate. The total letdown flow rate is split between the coolers and manually varied between 170 (45) and 530 Lpm (140 gpm), as required for RCS inventory control. The letdown flow through the coolers may be manually or automatically terminated. The letdown coolers are within the scope of license renewal, and are subject to an AMR.

The reactor vessel leakage monitoring system piping at ANO-1 is 1-inch, Schedule 160, Class 3 piping. The lines do not support the RCS pressure boundary, and were not addressed in either BAW-2243A (RCS Piping Report) or BAW-2251A (Reactor Vessel Report). If the reactor vessel closure flange O-rings fail and RCS fluid is introduced into the monitoring piping, leak flow would be limited since the ½-inch diameter hole in the vessel flange, which connects the region between the O-rings to the monitoring pipe, is less than the inside diameter of the monitoring pipe. Therefore, the reactor vessel leakage monitoring piping is not within the scope of license renewal because it does not directly support the RCS pressure boundary, nor does it meet any of the other scoping criteria under 10 CFR 54.4(a).

Pressurizer

The pressurizer is a vertical cylindrical vessel with a penetration connecting the surge line to the hot-leg piping. The pressurizer contains electric heaters in its lower section, and a water spray nozzle in its upper section. Since sources of heat in the RCS are interconnected by piping with no intervening isolation valves, relief protection is provided on the pressurizer. Over-pressure protection consists of two code safety valves and one power-operated relief valve.

Piping attached to the pressurizer is Class 1 up to and including the second isolation valve (with the exception of the pressurizer code safety valve), and is discussed in Section 2.3.1.3 of the LRA. Additional descriptions of the pressurizer and related components are contained in BAW-2244. The applicant has reviewed the current design and operation of the ANO-1 pressurizer, and has confirmed that the pressurizer is bounded by the description contained in BAW-2244A. The ANO-1 pressurizer and related components are within the scope of license renewal and subject to an AMR.

Reactor Vessel

The reactor vessel consists of the cylindrical vessel shell, lower vessel head, closure head, nozzles, interior attachments, and associated pressure-retaining bolting. Coolant enters the reactor vessel through the inlet nozzles, passes down through the annulus between the thermal

shield and vessel inside wall, reverses at the lower head, passes up through the core, turns around through the plenum assembly, and leaves the reactor vessel through the outlet nozzles.

The reactor vessel has two outlet nozzles that allow reactor coolant to enter the steam generators, and four inlet nozzles that allow reactor coolant to enter the reactor vessel from the discharge of the reactor coolant pumps. Two smaller nozzles located between the inlet nozzles serve as inlets for decay heat removal and emergency core cooling water injection lines, and instrumentation nozzles penetrate the lower vessel head. Piping attached to the reactor vessel is discussed in BAW-2251A and in Section 2.3.1.3 of the LRA. The reactor vessel support skirt and control rod drive service structure are discussed in Section 2.4.2.1 of the LRA, and are evaluated in Section 2.4 of this SER.

Control rod drive mechanisms (CRDMs) are attached to flanged nozzles that penetrate the closure head. The active portions of the CRDMs are not within the scope of license renewal, however, the control rod drive motor tube assemblies, closure insert, and vent assemblies are within the scope of license renewal and subject to an AMR. These components are discussed in Section 2.3.1.9 of the LRA. In addition, one of the ANO-1 CRDMs was removed to install a reactor vessel level monitoring probe. The reactor vessel level monitoring probe is discussed in Section 2.3.1.6 of the LRA. Additional reactor vessel components are discussed in BAW-2251A.

The NRC staff has approved the use of BAW-2251A by participating applicants for license renewal. The applicant has reviewed the current design and operation of the reactor vessel, and has confirmed that the ANO-1 reactor vessel is bounded by the description contained in BAW-2251A.

Reactor Vessel Internals

The reactor vessel internals consist of two structural subassemblies, the plenum assembly and the core support assembly. These subassemblies can be removed during refueling outages, when necessary. A description of the reactor vessel internals are provided in BAW-2248A.

The applicant reviewed the current design and operation of the ANO-1 reactor vessel internals, and determined that they have the following additional intended functions that were not addressed in BAW-2248A:

- provide support for the reactor vessel level monitoring probe
- provide gamma and neutron shielding
- provide support for the surveillance specimen assemblies in the annulus between the thermal shield and the reactor vessel wall

One of the two ANO-1 CRDMs was removed, and a control rod guide assembly in the reactor vessel plenum was modified to accept a level monitoring probe. Support for this probe is an additional intended function of the reactor vessel internals. The items that support the reactor vessel level monitoring probe are fabricated from Type 304L austenitic stainless steel, and are evaluated in Section 3.3.2.5 of this SER.

The thermal shield, thermal shield upper restraint, and associated bolting are all fabricated from austenitic stainless steel, and support the intended function to "provide gamma and neutron attenuation." These items are within the scope of license renewal, are subject to an AMR, and are further evaluated in Section 3.3.2.5 of this SER.

In addition, portions of the ANO-1 surveillance specimen holder tubes are attached to the reactor vessel internals. Although all of the specimens have been removed, portions of the shroud tube and its supports are bolted to the core support shield. These items only have the function of remaining secured to prevent loose parts in the RCS. The applicant states that this function is applicable to the remaining portions of the surveillance specimen holder tubes.

Once-Through Steam Generators

ANO-1 has two once-through steam generators (OTSGs). Each is a vertical, straight-tube, once-through, counter-flow, shell-and-tube heat exchanger with shell-side boiling. The steam generator consists of upper and lower hemispherical heads welded to tubesheets that are separated by a shell assembly. Over 15,000 straight Alloy 600 tubes are held in alignment by 15 tube support plates.

Primary coolant from the reactor enters the steam generator through a single inlet nozzle in the top of the upper head. Coolant flows downward through the straight parallel tubes, is cooled by the secondary coolant on the shell side, and then exits through two outlet nozzles in the lower head. The cooling medium enters through a ring of ports that penetrate the shell approximately midway up the shell assembly. The feedwater travels downward through an annulus between the lower baffle and the shell. Near the lower tubesheet, the feedwater turns inward, and then flows upward around the tubes and through the tube support plates. As the feedwater absorbs heat from the primary coolant, it boils and then becomes superheated. The dry steam exits the steam generator through two steam outlet nozzles just above the feedwater inlet ports.

The intended functions of the OTSGs include maintaining the primary and secondary pressure boundaries, transferring heat from the primary fluid to the secondary fluid, and providing for reactor building isolation. The OTSG items that are within the scope of license renewal and subject to an AMR include the hemispherical heads, secondary shell, tubes, plugs, mechanical sleeves, tubesheets, primary nozzles, primary manway and inspection port assemblies, main and auxiliary feedwater nozzles, main and auxiliary feedwater header and riser piping, steam outlet nozzles, instrumentation nozzles, temperature sensing connections, drain nozzles, secondary manway and inspection port covers, associated pressure retaining bolting, and integral attachments inspected in accordance with ASME Section XI, Subsections IWB and IWC. Class 1 RCS piping attached to the primary once-through steam generator nozzles, including the welded joints, is addressed in Section 2.3.1.3 of the LRA. Secondary piping attached to the OTSG nozzles, including the main and auxiliary feedwater headers and riser piping, is addressed in Section 2.3.4.2 of the LRA. The steam generator supports are addressed in Section 2.4.2 of the LRA.

The OTSG items that do not support an intended function and that are not subject to an AMR include weld deposit pads on the external shell of the generator that are used for insulation supports, shell thermocouples, and grounding lugs; an internal support ring that is attached to the inside shell of the secondary side, secondary internal baffles, support plates, variable orifice

plate, and tube stabilizers; and gaskets used in bolted connections at manways inspection ports, and main and auxiliary feedwater inlet piping.

The OTSG items that are fabricated from low-alloy steel include the hemispherical heads, transition ring, tubesheets, and pressure-retaining bolting. Items that are fabricated from carbon steel include primary inlet and exit nozzles, secondary shell, secondary outlet nozzles, main and auxiliary feedwater header and riser piping, primary and secondary manway covers and inspection port covers, secondary vent nozzles, drain nozzles, level-sensing nozzles, and main and auxiliary feedwater nozzles. Items that are fabricated from Alloy 600 include the primary drain nozzle, nozzle dam support rings, tubes, plugs, sleeves, and secondary temperature sensing connections. The OTSGs were designed as Class A vessels in accordance with ASME Section III, 1965 Edition, with Addenda through Summer of 1967.

Reactor Coolant Pumps

Reactor coolant pumps propel reactor coolant through the reactor core, piping, and steam generators. The four reactor coolant pumps at ANO-1 are required during normal full-power operation. These pumps were manufactured by Byron-Jackson, and were designed, fabricated, tested, and inspected as Class A vessels, in accordance with ASME Section III, 1968 Edition.

The intended function of the reactor coolant pumps is to maintain the RCS pressure boundary. The reactor coolant pump components that perform or support this function are within the scope of license renewal, and are subject to an AMR. These components include the casing, cover, integral seal injection heat exchangers, and pressure-retaining bolting. Non-Class 1 piping, instrumentation, and other components attached to the reactor coolant pump are addressed in Section 2.3.2 of the LRA. Class 1 piping connected to the pump, including the welded joints, is discussed in Section 2.3.1.3 of the LRA. The portions of the reactor coolant pump rotating elements above the pump coupling, including the electric motor and the flywheel, are not subject to an AMR in accordance with 10 CFR 54.21(a)(1).

The reactor coolant pump casing also includes the bolted closures and connections. These are constructed of stainless steel, except for the pressure-retaining bolting, which is fabricated from low-alloy steel. The upper and lower halves of the Byron-Jackson pump casings are cast austenitic stainless steel.

The pump cover is a generic term used to describe the pressure-retaining closure of a pump casing. The reactor coolant pumps cast austenitic stainless steel covers serve as housing for the mechanical seals, radial bearings, thermal barriers, and recirculating impellers. They are clamped between the carbon steel driver mounts, and the stainless steel pump casings.

Bolts that are used to secure the covers to the casings include cover-to-case studs and nuts, which are fabricated from low-alloy steel. Bolting used to secure the seal housings and/or seal glands to the pump covers include studs and nuts. These bolting materials are less than two inches in diameter and are fabricated from low-alloy steel.

Each reactor coolant pump is supported by the cold leg piping during all modes of operation. The weight of each reactor coolant pump motor is supported by two vertical constant load supports, which are addressed in Section 2.4.2.1 of the LRA.

Control Rod Drive Mechanisms Pressure Boundary

The ANO-1 CRDM motor tube assemblies, closure insert assemblies, and vent assemblies provide the reactor coolant pressure boundary around the CRDMs. During normal operation, the CRDM motor tube assemblies are filled with borated reactor coolant at the system operating pressure. Thermal barriers in the lower motor tube mechanism and the CRDM cooling system maintain the temperatures in the housings below system temperature.

The CRDM motor tube assemblies are designed, fabricated, tested, and inspected in accordance with ASME Section III, 1965 Edition and the Summer 1967 Addendum. The material of construction is stainless steel or Alloy 82/182 clad low-alloy steel.

Two different designs of CRDMs are currently in use at ANO-1, Type B and Type C. The CRDMs themselves are active and not subject to an AMR. The CRDM items subject to an AMR include the motor tube assemblies, closure insert and vent assemblies, associated bolting, and the reactor vessel level monitoring system adapter flange assembly.

2.3.1.2 Staff Evaluation

The NRC staff reviewed the information in Section 2.3.1 of the LRA to determine whether there is reasonable assurance that the RCS components and supporting structures that are within the scope of license renewal and subject to an AMR have been identified in accordance with the requirements of 10 CFR 54.4 and 54.21(a)(1).

As part of the evaluation, the staff reviewed portions of the ANO-1 UFSAR for the RCS, and the associated pressure boundary components, and compared the information in the UFSAR with the information in the LRA to identify any instances where the applicant failed to identify SSCs that are required to be included within the scope of license renewal. The staff then evaluated the evaluation boundaries for the systems and structures included within the scope of license renewal to verify that all the SCS, that contributed to the intended function(s) within the scope of license renewal, were considered during the AMR. The staff also evaluated the SCs within the evaluation boundaries to verify that all passive/long-lived SCs were subject to an AMR.

In a letter date June 1, 2000, the staff requested that the applicant provide additional information and/or clarifications for a selected group of RCS SCs excluded from the scope of license renewal, or determined not to be subject to an AMR to verify the following:

- For those SSCs excluded from the scope of license renewal, verify that they do not have any of the intended functions delineated under 10 CFR 54.4(a).

- For those SCs that have an applicable intended function(s), but determined not to be subject to an AMR, verify that they either perform this function(s) with moving parts or a change in configuration or properties, or that they are subject to replacement based on a qualified life or specified time period, as described in 10 CFR 54.21(a)(1).

The staff also reviewed the UFSAR to identify any function(s) delineated under 10 CFR 54.4 (a) that is not identified as an intended function(s) in the LRA, to verify that the effects of aging of

SCs with such function(s) will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the extended period of operation.

The applicant responded to the staff's RAIs in letters to the NRC dated August 24, 2000, and September 6, 2000. On September 13, 2000, the staff had a follow-up telephone conference with the applicant to discuss some additional concerns and to obtain additional clarification. This telephone conference, and the applicant's response are documented in a letter to the applicant dated October 11, 2000, and a letter from the applicant dated October 3, 2000, respectively.

The staff had a concern regarding the exclusion of the reactor vessel head leakage monitoring piping from the scope of license renewal, and requested verification as to whether the ½-inch diameter hole in the vessel flange, as mentioned in Section 2.3.1.3 of the LRA, would limit leakage to less than normal RCS makeup capacity, and thereby minimize the consequences of failure of the reactor vessel monitoring pipes. In response, the applicant verifies that in the event of leakage past the inner O-ring, the leak flow rate during normal operation (i.e., heatup, cooldown, and power operation) through the ½-inch-diameter penetration downstream in the reactor vessel flange has been estimated to be within the makeup system capacity at ANO-1. The applicant, therefore, concluded that the leakage monitoring piping need not be included within the scope of license renewal and, therefore, need not be subject to an AMR. The staff found the applicant's response acceptable.

The staff also requested that the applicant provide a technical justification for the exclusion of the pressurizer and OTSG manhole gaskets from the scope of license renewal, consistent with the Rule and staff guidance. In response, the applicant states that the pressurizer and OTSG manway gaskets are not within the scope of license renewal, in accordance with the NRC's SER for BAW-2244A. In Section 3.1.1 of that SER, the staff concluded that the gasket was part of the bolted connection, exists to minimize leakage, and is not responsible for providing the pressure boundary or supporting a structural load. Furthermore, the applicant indicates that the Boric Acid Corrosion Prevention Program includes components that are exposed to boric acid leakage. The applicant states that if a gasket is the source of leakage, it would be addressed in the program regardless of its exclusion from the scope of license renewal. The staff found the applicant's response acceptable.

The staff also requested that the applicant clarify whether the reactor vessel level monitoring system probe itself is subject to an AMR and, if not, provide a justification for excluding the level probe from an AMR. In its response, the applicant states that the reactor vessel level monitoring system probe was installed to monitor the fluid level in the upper plenum and head of the reactor vessel as part of the post-Three Mile Island modifications. The applicant further states that this component was excluded from the scope of license renewal because it does not support an intended function required to satisfy the criteria in 10 CFR 54.4(a)(1), (2), or(3). The staff questioned the fact that, if the component was added as a Post-Three Mile Island requirement, it should have been predicated on an intended safety function. The staff requested additional discussion as to why the intended function of the reactor vessel level monitoring system probe does not meet the criteria defined in 10 CFR 54.4(a). In response, the applicant states that these monitors are used as an alternative/backup means of determining if a bubble has formed in the reactor vessel. However, the applicant also states that these instruments are not credited for making this determination in any design basis event (DBE)

analyses. Rather, accident mitigation for the formation of a bubble in the reactor vessel is determined by the subcooling margin in the case of a DBE. The applicant, therefore, reconfirmed its conclusion that the subject SSCs need not be included within the scope of license renewal. Upon reviewing the above information, the staff did not find any omissions in the RCS SSCs included within the scope of license renewal and subject to an AMR for ANO-1.

2.3.1.3 Conclusions

On the basis of the staff's review of the information presented in Section 2.3.1 of the LRA, the supporting information in the ANO-1 UFSAR, and the applicant's response to the staff's RAIs and clarifications, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the RCS that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2 Engineered Safeguards Scoping and Screening

In the LRA, Section 2.3.2, "Engineered Safeguards," the applicant describes the SSCs of the engineered safeguards (ES) system that are within the scope of license renewal and subject to an AMR. The NRC staff reviewed this section to determine whether the applicant has adequately demonstrated that the requirements of 10 CFR 54.4, 54.21(a)(1), and 54.21(a)(2) have been met for ES SSCs.

The following systems makeup the ES systems that are within the scope of license renewal:

- core flood
- low pressure injection/decay heat (LPI/DH)
- high pressure injection/makeup and purification (HPI/MUP)
- reactor building spray
- reactor building cooling and purge (including reactor building heating and ventilation and portions of the reactor building purge)
- sodium hydroxide (including chemical addition)
- reactor building isolation
- hydrogen control (including hydrogen purge and hydrogen recombiners)

2.3.2.1 Core Flood

In the LRA, Section 2.3.2.1, "Core Flood," the applicant describes the core flood system and the components therein that are within the scope of license renewal. The applicant also identifies the SCs that are subject to an AMR in Table 3.3-1 of the LRA. The design of the core flood system is described in Section 6.1of the ANO-1 UFSAR.

2.3.2.1.1 Technical Information in the Application

ES systems consist of SSCs designed to function under accident conditions to minimize the severity of an accident, or to mitigate the consequences of an accident. In the event of a loss-of-coolant accident (LOCA), the core flood system provides emergency coolant to ensure the structural integrity of the core, to maintain the integrity of the reactor building, and to reduce the concentration of fission products expelled to the reactor building atmosphere.

Specifically, the safety function of the core flood system is to provide core cooling after intermediate and large-break LOCAs. The core flood system is within the scope of license renewal, and its SCs that are subject to an AMR include two core flood tanks, piping, and other components up to the reactor coolant system boundary. The intended function of these SCs is to maintain the integrity of the system pressure boundary.

2.3.2.1.2 Staff Evaluation

The NRC staff reviewed Section 2.3.2 of the LRA to determine whether there is reasonable assurance that the applicant has identified the core flood system SCs that are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54.4 and 54.21(a)(1).

The staff reviewed portions of the ANO-1 UFSAR for the core flood system and associated pressure boundary components, and compared the information in the UFSAR with the information in the LRA to identify any instances where the applicant failed to identify SSCs that are required to be included within the scope of license renewal. The staff then evaluated the evaluation boundaries for the systems and structures included within the scope of license renewal to verify that all the SCS, that contributed to the intended function(s) within the scope of license renewal, were considered during the AMR. The staff also evaluated the SCs within the evaluation boundaries to verify that all passive/long-lived SCs were subject to an AMR. .

Upon completing its initial review, the staff requested that the applicant provide additional information and/or clarifications for a selected number of these SCs in a letter dated June 1, 2000, to verify the following information:

- the selected SCs do not have any of the intended functions identified in 10 CFR 54.4(a)
- the SCs that have an applicable intended function(s), perform this function(s) with moving parts or with a change in configuration or properties, or are subject to replacement based on a qualified life or specified time period, in accordance with 10 CFR 54.21(a)(1)

The staff also reviewed the UFSAR to identify any function(s) delineated under 10 CFR 54.4(a) that was not identified as an applicable intended function(s) in the LRA. The purpose of this part of the evaluation was to verify that the SSCs with such a function(s) will be included within the scope of license renewal.

The staff also requested that the applicant provide a justification for excluding from an AMR the thermal insulation of the tanks and pipes which carry borated water for ECCS injection. The

concern was boron precipitation from borated water, resulting in the reduction of required boron concentration. In a letter to the NRC dated August 30, 2000, the applicant states that the borated water storage tank (BWST) is located outdoors and exposed to ambient weather conditions. The piping of concern runs through the tank bottom, the tank foundation oiled sand, concrete, and portions of the auxiliary building. The applicant further states that the ANO-1 technical specification (TS) 3.3.1(G) requires that the boron concentration in the BWST be maintained at 2,470 +/- 200 ppm boron at a temperature not less than 4.4°C (40°F). A TS limiting condition of operation is entered if this requirement is not met. The applicant also states that for a concentration of 3,000 ppm, boron will not precipitate from solution until water temperature falls below -5.6 4.4°C (22°F). As a result of this TS requirement, the applicant will have to take corrective actions if the water temperature falls below 4.4°C (40°F) (which is well above the boron precipitation temperature) for any reason, including from the degradation of insulation, age-related or otherwise. The applicant, therefore, concludes that the insulation material of the tank and piping is not required to support any system function that is required to satisfy the criteria of 10 CFR 54.4(a) during or following any DBE. The staff found the applicant's assessment acceptable.

The NRC staff also requested that the applicant clarify whether the foundations or pads of the ECCS tanks are included within the scope of license renewal and subject to an AMR, or to provide a justification for the exclusion of these structural components from an AMR. The applicant verifies that foundations of tanks, including the ECCS tanks, are included within the scope of license renewal and are addressed in Section 2.4.6.1 of the LRA. The AMR of tank foundations is presented in Table 3.6-7 of the LRA.

The NRC staff also requested a technical justification as to why the limiting mass flow rate during postulated breaks is not an applicable intended function of the orifices identified in LRA, Table 3.3-1, in accordance with 10 CFR 54.4(a)(1)(iii). In response to the staff's request, the applicant states that the orifices listed in Table 3.3-1 do not have a safety-related function in accordance with its CLB to limit mass flow rate during postulated breaks, and that maintaining pressure boundary integrity is the only intended function these components are required to maintain during the period of extended operation. The staff found the applicant's assessment acceptable.

Upon reviewing the above information, the staff did not identify any omissions in the core flood SSCs included within the scope of license renewal, and the SCs that are subject to an AMR.

2.3.2.1.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant adequately identified those portions of the core flood system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2.2 Low Pressure Injection/Decay Heat

In the LRA, Section 2.3.2.2, "Low Pressure Injection/Decay Heat," the applicant describes the low pressure injection/decay heat (LPI/DH) system, and the component therein that are within the scope of license renewal. The applicant also identifies the SCs that are subject to an AMR

in Table 3.3-2 of the LRA. The design of the LPI/DH system is described in Section 6.1of the ANO-1 UFSAR.

2.3.2.2.1 Technical Information in the Application

The LPI/DH system is a dual-purpose system. This system operates as the DH system whose intended function is to remove decay heat from the core and sensible heat from the RCS during the latter stages of cooldown. The LPI System injects borated water into the reactor vessel to cool the core in the event of a LOCA.

The LPI system has the following safety functions:

- Inject borated water from the borated water storage tank (BWST) during postulated large-break LOCA.
- Provide long-term cooling following a LOCA by recirculating injection water from the reactor building sump.
- Supply recirculated water from the reactor building sump to the suction of the high-pressure injection pumps if RCS pressure is too high to allow the LPI pumps to function
- Supply injection water from the BWST to the DH/LPI pumps as well as the high pressure injection and the reactor building spray pumps. The BWST floods the reactor building basement to a level that will allow for recirculation from the reactor building sump under accident conditions.
- Provide water that is free of entrained air from the screened reactor building sump, when the BWST is depleted.

The DH system is credited in the fire protection analysis (10 CFR 50.48) with the capability of attaining cold shutdown. Therefore, the DH system has a function to remove decay heat from the reactor core and sensible heat from the RCS during the latter stages of cooldown such that fuel design limits and design conditions of the RCS pressure boundary are not exceeded. The DH system also supports the following functions:

- Circulate reactor coolant to prevent boron stratification and to minimize the effects of a boron dilution event.
- Provide an alternate supply of borated water from the BWST for volume contraction during cooldown to cold shutdown.
- Provide cooling, inventory addition, and instrumentation for loss of decay heat removal events.

The following LPI/DH components are within the scope of license renewal and are subject to an AMR:

- the DH system piping that passes through the reactor building penetrations, including the injection lines, drop line, pressurizer auxiliary spray line, and emergency sump lines (These portions of the DH system perform a reactor building isolation function and are within the scope of license renewal.)

- the DH drop line valves, coolers, cooler isolation valves, and pumps

- the BWST, BWST supply header, and injection lines up to the outboard RCS pressure boundary valve of the low-pressure injection lines, and the suction supply piping to the high pressure injection system

- piping and components from the reactor building sump, including some piping and components from the Post-Accident Sampling System (PASS) (used for post LOCA sump sampling), and sump screens and the vortex breakers (Sump screens and vortex breakers are reviewed in Section 2.3.3.4 of the LRA.)

- the oil side of the LPI pump lube oil coolers (The service water side of the coolers is evaluated in Section 2.3.3.10 of the LRA.)

The intended function that is within the scope of license renewal is to maintain pressure boundary integrity. For the LPI/DH heat exchangers that are within the scope of license renewal, the heat transfer intended function is performed without moving parts, or without a change in configuration or properties, and is subject to an AMR.

2.3.2.2.2 Staff Evaluation

The NRC staff reviewed Section 2.3.2 of the LRA to determine whether there is reasonable assurance that the applicant has identified the LPI/DH SCs that are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54.4 and 54.21(a)(1).

The staff reviewed portions of the ANO-1 UFSAR for the LPI/DH system and associated pressure boundary components, and compared the information in the UFSAR with the information in the LRA to identify any instances where the applicant failed to identify SSCs that are required to be included within the scope of license renewal. The staff then evaluated the evaluation boundaries for the systems and structures included within the scope of license renewal to verify that all the SCS, that contributed to the intended function(s) within the scope of license renewal, were considered during the AMR. The staff also evaluated the SCs within the evaluation boundaries to verify that all passive/long-lived SCs were subject to an AMR.

Upon completing its initial review, the staff requested that the applicant provide additional information and/or clarifications for a selected number of these SCs in a letter dated June 1, 2000, to verify the following information:

- selected SCs do not have any of the intended functions identified in 10 CFR 54.4(a)

- SCs that have an applicable intended function(s), perform this function(s) with moving parts or with a change in configuration or properties, or are subject to replacement based on a qualified life or specified time period, as described in 10 CFR 54.21(a)(1)

The staff also reviewed the UFSAR to identify any function(s) delineated under 10 CFR 54.4(a) that was not identified as an applicable intended function(s) in the LRA. The purpose of this part of the evaluation was to verify that the SSCs with such a function(s) will be included within the scope of license renewal.

The staff also requested that the applicant provide a justification for excluding from an AMR the thermal insulation of the tanks and pipes which carry borated water for ECCS injection. Because the SCs in question are common to the ECCS systems, the staff's evaluation of these components is discussed in the core flood system evaluation, above.

Upon reviewing the above information, the staff did not identify any omissions in the LPI/DH SSCs included within the scope of license renewal, and the SCs that are subject to an AMR.

2.3.2.2.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant adequately identified those portions of the LPI/DH S systems that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2.3 High-Pressure Injection/Makeup And Purification

In the LRA, Section 2.3.2.3 "High-Pressure Injection/Makeup and Purification," the applicant describes the high-pressure injection/makeup and purification (HPI/MUP) system, and the components therein that are within the scope of license renewal. The applicant also identifies the SCs that are subject to an AMR in Table 3.3-3 of the LRA. The design of the HPI/MUP system is described in Section 6.1of the ANO-1 UFSAR.

2.3.2.3.1 Technical Information in the Application

The safety function of the HPI system is to provide high-pressure injection into the RCS during emergency conditions. This system is normally operated as part of the MUP system. During normal operations, the MUP system performs various functions in support of the RCS. The HPI/MUP systems have the following safety functions:

- Inject borated water from the BWST during postulated accidents, such as the small-break LOCA.

- Provide long-term cooling following small-break LOCAs by recirculating injection water from the reactor building sump.

The HPI/MUP systems are credited in the fire protection analysis (10 CFR 50.48) with the capability to provide RCS makeup and pressure control. Some of the system valves must

remain closed to prevent a direct RCS leak path in the event of a fire. The HPI/MUP systems also support the following functions:

- Provide inventory to the RCS during operational transients, such as reactor trips and overcooling events.
- Provide a backup inventory supply to the RCS during a loss of decay heat removal event.
- Provide core cooling following a total loss of feedwater event via feed-and-bleed cooling of the RCS.
- Provide an auxiliary means to spray the pressurizer steam space when normal spray is not available.

The following HPI/MUP components are within the scope of license renewal, and are subject to an AMR:

- the seven mechanical reactor building penetrations necessary for meeting reactor building isolation requirements
- the Class 1 RCS pressure boundary that extends to the second isolation valve off of the RCS (For the letdown line, this is downstream of the letdown coolers. The letdown coolers and the Class 1 valves are reviewed in Section 2.3.1.3 of the LRA.)
- the HPI piping from the BWST supply header to the outboard RCS pressure boundary valve of the injection lines, and all portions of the system needed to support high-pressure injection, including the suction supply from the low pressure injection system
- the oil-side of the HPI pump oil coolers (The service water side of the coolers is evaluated in Section 2.3.3.10 of the LRA.)

The intended function of the HPI/MUP systems that are within the scope of license renewal is to maintain the integrity of the system pressure boundary. For the HPI/MUP heat exchangers that are within the scope of license renewal, the heat transfer intended function is performed without moving parts, or without a change in configuration or properties, and is subject to an AMR.

2.3.2.3.2 Staff Evaluation

The NRC staff reviewed Section 2.3.2 of the LRA to determine whether there is reasonable assurance that the applicant has identified the HPI/MUP SCs that are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54.4 and 54.21(a)(1).

The staff reviewed portions of the ANO-1 UFSAR for the HPI/MUP system and associated pressure boundary components, and compared the information in the UFSAR with the information in the LRA to identify any instances where the applicant failed to identify SSCs that are required to be included within the scope of license renewal. The staff then evaluated the

evaluation boundaries for the systems and structures included within the scope of license renewal to verify that all the SCS, that contributed to the intended function(s) within the scope of license renewal, were considered during the AMR. The staff also evaluated the SCs within the evaluation boundaries to verify that all passive/long-lived SCs were subject to an AMR.

Upon completing its initial review, the staff requested that the applicant provide additional information and/or clarifications for a selected number of these SCs in a letter dated June 1, 2000, to verify the following information:

- selected SCs do not have any of the intended functions identified in 10 CFR 54.4(a)
- SCs that have an applicable intended function(s), perform this function(s) with moving parts or with a change in configuration or properties, or are subject to replacement based on a qualified life or specified time period, as described in 10 CFR 54.21(a)(1)

The staff also reviewed the UFSAR to identify any function(s) delineated under 10 CFR 54.4(a) that was not identified as an applicable intended function(s) in the LRA. The purpose of this part of the evaluation was to verify that the SSCs with such a function(s) will be included within the scope of license renewal.

The staff also requested that the applicant provide a justification for excluding from an AMR the thermal insulation of the tanks and pipes which carry borated water for ECCS injection. Because the SCs in question are common to the ECCS systems, the staff evaluation of these components is discussed in the core flood system evaluation, above.

In response to another staff RAI, the applicant verifies that Drawing LRA-M-231, Sheet 3, is incorrect. Specifically, the drawing should indicate valves MU-1210E, MU-1210F, MU-1210G, and MU-1210H, as well as the associated tubing are within the scope of license renewal, and that screens or vortex breakers are not installed in the tanks from which ECCS water is drawn. The AMR for the makeup and purification system stainless steel valves and piping components is provided in Table 3.3-3 of the LRA.

Upon reviewing the above information, the staff did not identify any omissions in the HPI/MUP SSCs included within the scope of license renewal, and the SCs that are subject to an AMR for ANO-1.

2.3.2.3.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the HPI/MUP system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2.4 Reactor Building Spray System

In the LRA, Section 2.3.2.4, "Reactor Building Spray," of the LRA, the applicant describes the reactor building spray system and the components therein that are within the scope of license renewal. The applicant also identifies the SCs that are subject to an AMR in Table 3.3-4 of the

LRA. The design of the reactor building spray system is described in Section 6.2 of the ANO-1 UFSAR.

2.3.2.4.1 Technical Information in the Application

The system safety function of the reactor building spray system is to remove heat from the reactor building atmosphere following a DBA. The system also removes the fission product iodine and reduces pressure from the post-accident reactor building atmosphere. The components of the reactor building spray system that are within the scope of license renewal and subject to an AMR consist of two redundant trains that include two pumps, two reactor building spray headers, and the supporting equipment (lube oil coolers and seal water cyclone separators), piping, and valves. In addition, a tank (T10) containing sodium hydroxide is supplied for iodine removal, and for pH adjustment of the borated water. The tank is evaluated with the sodium hydroxide system in Section 2.3.2.6 of this SER. The reactor building spray system also includes the interfacing systems, which form part of the reactor building spray system pressure boundary. The interfacing system components include the valves from the sodium thiosulphate tank, the interfaces with the service air system, and the vents and drains off the spray system pump casings.

The intended function of the components that are within the scope of license renewal is to maintain the reactor building spray system pressure boundary integrity. Heat transfer is also an intended function of the heat exchangers that are within the scope of license renewal.

2.3.2.4.2 Staff Evaluation

The staff reviewed Section 2.3.2.4 of the LRA, Section 6.2 of the USAR, and the associated flow diagrams (P&ID drawings) to determine whether there is reasonable assurance that the applicant has identified the reactor building spray SSCs that are within the scope of license renewal in accordance with10 CFR 54.4(a) and SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). After completing its initial review, the staff requested additional information regarding the information provided by the applicant for the reactor building spray system in a letter dated April 18, 2000.

In a letter to the NRC dated August 30, 2000, the applicant highlights the portions of the reactor building spray system that are within the scope of license renewal on the system drawings listed in Table 2.3-6 of the LRA and identifies the components that are subject to an AMR and its intended functions in Table 3.3-4 of the LRA. The staff reviewed the components in the table and verified them with the highlighted portions of the drawings. The following component commodity groups were identified in the table as being subject to an AMR:

- bolting
- external valve parts
- piping, tubing, and valves
- separators
- pump casings
- heat exchanger (for the lube oil coolers)

However, the spray nozzles and orifices in the reactor building spray system were not listed in the table. The nozzle and orifice perform system safety functions of spraying and throttling,

respectively. The staff requested that the applicant justify excluding these nozzles and orifices from an AMR. In addition, the staff also found that the sodium thiosulfate storage tank and its piping connected to the spray system, as seen in LRA-M-236, Sheet 1, are not highlighted as being within the scope of license renewal and are not included in Table 3.3-4 of the LRA. The staff requested that the applicant justify excluding the sodium thiosulfate storage tank and its piping from an AMR.

In its response, the applicant states that orifices and nozzles were added to in the component commodity group listed as piping in Table 3.3-4 of the LRA and were subject to an AMR. The sodium thiosulfate storage tank and its piping that are connected to the spray system, are not within the scope of license renewal because they are isolated and no longer in service. Therefore, they are not required to meet any of the scoping criteria of 10 CFR 54.4(a), and are not subject to an AMR. The staff's review found that the sodium thiosulfate storage tank and its piping to the spray system do not perform the intended function of the spray system and do not require an AMR. The staff found the applicant's response acceptable.

In its submittal, the applicant also identifies a number of license renewal interface boundaries within the reactor building spray system. The interface systems include the interfacing valves of the sodium thiosulfate tank, the interfaces with the service air system and the vent and drains of the spray system pump casings. On one side of the interface boundary, the SCs are within the scope of license renewal; on the other side of the interface boundary, the SCs are not within the scope of license renewal. Appropriate isolation, which is part of the existing licensing basis for the system, is provided at each of the license renewal interfaces. Isolation capability is not evaluated for license renewal because, other than the valve body, valves are excluded from an AMR in accordance with 10 CFR 54.21(a)(1)(i). The staff reviewed the ANO-1 UFSAR to determine if any of the interface systems had a system functions that met this scoping requirement in 10 CFR 54.4 or if there were any SCs that might have been omitted from consideration as being within the scope of license renewal. The staff did not identify any omissions as a result of this review.

2.3.2.4.3 Conclusions

On the basis of the review described above, the staff did not identify any omissions by the applicant. Therefore, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the reactor building spray system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2.5 Reactor Building Cooling and Purge Systems

In the LRA, Section 2.3.2.5, "Reactor Building Cooling and Purge," the applicant describes the reactor building cooling and purge systems and the components therein that are within the scope of license renewal. The applicant also identifies the components that are subject to an AMR. The reactor building cooling and purge systems are also described in Sections 5.2.6 and 6.3 of the ANO-1 UFSAR. A flow diagram of the reactor building cooling and purge systems is shown in Figure 5-7 of the ANO-1 UFSAR.

2.3.2.5.1 Technical Information in the Application

The system function of the reactor building cooling system is to provide cooling to the reactor building that limits the reactor building pressure and temperature to the design value following a LOCA. The system accomplishes this by continuously recirculating the air-steam mixture through cooling coils that transfers heat from the reactor building to the service water system. During normal plant operation, the system is required to maintain the reactor building temperature below the maximum allowed for equipment qualification, and below accident analyses initial temperature assumptions. The reactor building purge system has no defined system function that meets any of the scoping criteria in 10 CFR 54.4, but its penetrations are required to maintain the reactor building integrity under accident conditions. All the components of the reactor building purge system are located outside of the reactor building except interior ducts and two reactor building isolation valves. The applicant identifies the following components as being within the scope of license renewal and subject to an AMR:

- four safety-related reactor building coolers
- service water cooling coils, the fan/cooler housings, and the discharge duct work, including the duct relief valves that prevent damage to the duck work during a rapid building pressurization
- reactor building isolation valves and piping at the two penetrations in the reactor building purge system

The intended function of these SCs that needs to be considered during the AMR is to maintain the pressure boundary integrity. For the heat exchangers, heat transfer is an intended function that needs to be considered during the AMR, as well.

2.3.2.5.2 Staff Evaluation

The staff reviewed Section 2.3.2.5 of the LRA, Sections 5.2.6 and 6.3 of ANO-1 USAR, and associated drawings to determine whether there is reasonable assurance that the applicant has identified the reactor building cooling and purge system and its SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). After completing its initial review, the staff requested additional information in a letter to the applicant dated April 18, 2000.

In a letter to the NRC dated August 30, 2000, the applicant identifies the portions of the reactor building cooling and purge systems that are within the scope of license renewal on the flow diagrams (highlighted on some of the drawings listed in Table 2.3-6 of the LRA). The applicant listed the component commodity groups subject to an AMR in Table 3.3-5 of the LRA. In this table, the applicant identifies the duct, dampers, pipe, valves, fan and cooler housings, and heat exchangers as the component commodity groups that require an AMR. For these component commodities subject to an AMR, maintaining the pressure boundary integrity is identified as the intended function. Heat transfer was also identified as an additional intended function for the system heat exchangers.

In Section 6.3.2 of the ANO-1 UFSAR, the applicant states that the normal cooling system consists of five reactor building cooling fans and their associated chilled water cooling coils. The post-accident cooling system uses four of the five reactor building cooling fans and four

associated service water cooling coils. However, in the LRA, Section 2.3.2.4, only the four safety-related reactor building cooling units for post accident cooling were included in the scope of license renewal. The five non-safety-related reactor building cooling units, which are used for normal plant operation, are not included in the scope of license renewal. The five normal cooling units are used to remove heat from equipment, piping, and reactor cavity during normal operation. However, the normal duty cooling units are not required to meet any of the scoping requirements in 10 CFR 54.4 and, therefore, are not in the scope of license renewal.

In P&ID LRA-M-261, Sheet 1, the staff found that the 2-inch temporary duct of the reactor building cooling system from the supply air plenum to the box of temperature detectors was not identified as being subject to an AMR. The staff requested the applicant to justify excluding this component from an AMR, as well.

In its response to the NRC, the applicant states that the 2-inch temporary duct of the reactor building cooling system from the supply air plenum to the box of temperature detectors is not within the scope of license renewal. According to its CLB, this duct is not required for the system to perform the function of reducing post-accident temperature and pressure in the reactor building or providing mixing of the reactor building atmosphere following a LOCA. Its failure would not prevent the remainder of the system from performing its intended function. The staff found the applicant's response acceptable.

In Tables 3.3-5 and 3.3-8 of the LRA, tubing is not listed as a component group that is subject to an AMR even though tubing is used in the system, and is addressed in the notes of the tables in the LRA. The staff asked the applicant to justify excluding tubing from an AMR. In its response, the applicant states that there is no tubing in the reactor building cooling and purge systems that are within the scope of license renewal. The tubes referenced in the notes of Table 3.3-5 are referring to heat exchanger tubes. Heat exchanger tubes are evaluated in the heat exchangers AMR. The staff found the applicant's response acceptable.

The staff also reviewed Section 5.2.6 of the ANO-1 UFSAR to verify that the applicant identified all the system functions that meet the scoping criteria in 10 CFR 54.4(a). Except for the intended function of the reactor building normal cooling units, which was determined not to be in the scope of license renewal, the staff did not identify any omissions.

2.3.2.5.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the reactor building cooling and purge systems that are within the scope of license renewal, and the associated SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2.6 Sodium Hydroxide

In the LRA, Section 2.3.2.6, "Sodium Hydroxide," the applicant describes the sodium hydroxide system, and identifies the SCs that are within the scope of license renewal and subject to an AMR in Table 3.3-6 of the LRA. The sodium hydroxide system is described in Section 6.2 of the ANO-1 UFSAR.

2.3.2.6.1 Technical Information in the Application

The system function of the sodium hydroxide system is to provide a solution of sodium hydroxide to the ECCS suction headers to improve iodine absorption and retention in the water as a result of increased pH, thereby minimizing the gaseous iodine, and the offsite dose following a LOCA. The applicant determines that the sodium hydroxide tank (T10) and its associated piping, and the components from the tank to the ECCS suction headers are within the scope of license renewal. The applicant identifies the following SCs as being subject to an AMR: pipe and valves, bolting, and tank. The intended function of these SCs that are within the scope of license renewal is to maintain the system pressure boundary integrity.

2.3.2.6.2 Staff Evaluation

The staff reviewed Section 2.3.2.6 of the LRA to determine whether there is reasonable assurance that the applicant has identified the sodium hydroxide system and its SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). After completing its initial review, the staff requested additional information in a letter to the applicant dated April 18, 2000. The applicant responded to the staff's RAIs in a letter to the NRC dated August 30, 2000.

In the LRA, Table 3.3-6, the applicant identifies piping, valves, bolting, external valve parts, and tanks as component commodities of the sodium hydroxide system that are subject to an AMR. Section 6.2.2.1 of the ANO-1 UFSAR states that the content of the tank (T10) is proportioned so that the proper quantity of sodium hydroxide is injected for pH control. Flow orifices in the discharge lines from the sodium hydroxide tank assist in assuring the proper injection rate. However, the flow orifice was not listed in Table 3.3-6 as the component requiring AMR. The flow orifice has the intended function to throttle the flow and should have been included in the table for the AMR. This was Open Item 2.3.2.6.2-1.

In a letter to the NRC dated March 14, 2001, the applicant states that the flow control function for the sodium hydroxide in-line flow orifices has been added to the scope of license renewal and subject to an AMR. The AMR activities as a result of adding the flow control function of this in-line flow orifice is evaluated in this SER, Section 3.3.1.4.9. The staff found this resolution to Open Item 2.3.2.6.2-1 acceptable.

The staff reviewed the system drawings listed in Table 2.3-6 of the LRA that contain the sodium hydroxide system. In Drawing LRA-M-233, Sheet 1, the sodium hydroxide recirculating pump line from the chemical addition system to the sodium hydroxide storage tank was not highlighted as the component being in-scope. The staff asked the applicant to justify excluding the pump line from the components that are subject to an AMR. In its response to the NRC, the applicant states that the sodium hydroxide recirculating pump line from the chemical addition system to the sodium hydroxide storage tank is not required for the sodium hydroxide system to perform its function of providing sodium hydroxide to the ECCS suction headers. Therefore, this line is not within the scope of license renewal. As stated in Note 2 on Drawing M-233, Sheet 1, this pump line allows recirculation prior to sampling. The sodium hydroxide recirculating line enters the tank above the normal level, and is isolated during normal plant operation. The pump line to the sodium hydroxide storage tank, therefore, does not meet any of the scoping criteria of 10 CFR 54.4, and is not in the scope of license renewal, or subject to an AMR. The staff found the applicant's response acceptable.

2.3.2.6.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the sodium hydroxide system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.2.7 Reactor Building Isolation System

In the LRA, Section 2.3.2.7, "Reactor Building Isolation," the applicant describes the reactor building isolation system and the components therein that are within the scope of license renewal. The applicant also identifies those SCs that are subject to an AMR in Table 3.3-7 of the LRA. The design of the reactor building isolation system is described in Section 5.2.5 of the ANO-1 UFSAR.

2.3.2.7.1 Technical Information in the Application

As listed in Table 3.3-7 of the LRA, the reactor building isolation system includes the isolation valves and associated piping, bolting and penetrations necessary to isolate the reactor building in the event of a LOCA. The system function of the reactor building isolation system is to provide closure of all fluid penetrations not required for operation to prevent the leakage of uncontrolled or unmonitored radioactive materials to the environment.

In the LRA, Section 2.3.27, the applicant states that the portions of the reactor building isolation system that are within the scope of license renewal are the 20 penetration mechanical components and piping that are not covered by other sections of the LRA. These penetrations include the following:

- intermediate cooling water, nitrogen, breathing air, plant heating, and gaseous radwaste
- core flood system - tank sampling and makeup and nitrogen pressurization
- sampling system - steam generator secondary sampling and quench tank sampling
- condensate storage and transfer - condensate transfer supply to quench tank
- liquid radwaste - quench tank drain
- heater vents system - steam generator secondary drains
- integrated leak rate test connection

Other system penetrations that provide the reactor building isolation function not included in the above list are discussed separately in the applicable system description. The intended function of the reactor building isolation system SCs is to maintain system pressure boundary integrity.

2.3.2.7.2 Staff Evaluation

The staff reviewed Section 2.3.2.7 of the LRA, and the ANO-1 UFSAR to determine whether there is reasonable assurance that the applicant has identified the reactor building isolation system and its SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21. After completing the initial review, the staff requested additional information in a letter to the applicant dated April 18, 2000. The applicant responded to the staff's RAIs by a letter to the NRC dated August 30, 2000.

The staff reviewed the system diagrams listed in Table 2.3-6 of the LRA, which highlight the portions of the reactor building isolation system that are within the scope of license renewal. In Drawing LRA-M-230, Sheet 1, the reactor building penetration boundary and the isolation valves of the high pressure nitrogen line are not clearly defined in the flow diagram. The staff requested the applicant to provide additional information on this portion of the reactor building isolation. In its response to the NRC, the applicant states that, due to an administrative error, a license renewal boundary flag was omitted from Drawing LRA-M-230, Sheet 1. There should be a license renewal boundary flag at valve N2-61. The line continues, as shown, to Drawing LRA-M-236, Sheet 1, in Zone 6, where it ties into Pipe FCB-1-1, just inside the reactor building penetration. In Table 5-1 of the ANO-1 UFSAR, the isolation valves for penetration 31 are identified as MU-35A, N2-3, N2-61, AND MU-36A. The applicant corrected Drawing LRA-M-230, Sheet 1. The staff found the applicant response acceptable.

In Drawing LRA-M-237, Sheet 1, the redundant isolation valves (SS-1017B, SS-1018B) for the test connections of the sampling system are not highlighted as being within the scope of license renewal. However, containment isolation provisions require double isolation at the test connections for greater assurance of containment integrity. The staff asked why the second isolation valve on each test connection were not identified as being subject to an AMR. In its response to the NRC, the applicant states that this penetration is associated with the secondary side of the steam generator, and is not required to meet General Design Criteria (GDC) 57 of Appendix A to 10 CFR Part 50. The reactor building boundary or barrier against fission product leakage to the environment is the inside surface of the steam generator tubes, the outer surface of the line emanating from the steam generator, and the outer surface of the steam generator below the lower and above the upper tube Sheet. Valves SS-1017B and SS-1018B are not within the scoping of license renewal because they do not meet any of the scoping criteria in 10 CFR 54.4(a). The staff found the applicant's response acceptable.

In the LRA, Section 2.3.2.7, the applicant states that the reactor building isolation system also seals the penetrations that are not required for operation to provide a fission product barrier between the inside of the reactor building and outside environment. However, Table 3.3-7 of the LRA only lists the piping, bolting, and valves as the components of the reactor building isolation system as being within the scope of license renewal. There should be other types of components used for containment isolation, such as leak-testable blank flanges, weld end caps, orifices, and flow monitors. Also, valve types, such as check, motor-operated, remote, manual, or hand valves, used for the reactor building isolation purposes, should be identified in the table. The staff requested the applicant to list all the isolation barriers and valve types that are subject to an AMR for the license renewal. In its response to the NRC, the applicant states that the component commodity grouping in Table 3.3-7 designated as "piping" includes pipe, fittings and flanges. The leak testable blank flanges, weld end-caps, and orifices are considered to be "fittings and flanges" that are included in the piping component commodity

group. There are no flow monitors in the reactor building isolation system. The valve types are identified in the system drawings associated with the reactor building isolation system. The legends for the drawings are provided in Drawing LRA-M-200, Sheets 1, 2, and 3. Additionally, Table 5-1 of ANO-1 UFSAR identifies the valve types for all the reactor building isolation valves. The staff reviewed these drawings and Table 5-1 of the ANO-1 UFSAR, and found the applicant's response acceptable.

The staff also reviewed Section 5.2.5 of the UFSAR to determine if the applicant should have identified any additional portions of the reactor building isolation system as being within the scope of license renewal. However, Section 2.3.2.7 of the LRA did not include all the reactor building isolation penetrations in scope. Only the 20 penetration mechanical components and piping are addressed in the section. Other components that perform the reactor building isolation function in systems not included in this section are included in other sections of the LRA. The staff compared the descriptions of the 20 penetrations in Section 2.3.2.7 to Section 5.2.5 of the ANO-1 UFSAR to verified the SCs with the drawings, and found that the SCs that are subject to an AMR are properly selected.

2.3.2.7.3 Conclusions

The staff has reviewed the information presented in Section 2.3.2.7 of the LRA, the information in the UFSAR, and the additional information provided by the applicant in response to the staff's RAI. On the basis of this review, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the reactor building isolation system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54,21(a)(1), respectively.

2.3.2.8 Hydrogen Control

In the LRA, Section 2.3.2.8, "Hydrogen Control," the applicant describes the hydrogen control system and the components therein that are within the scope of license renewal. The applicant also identifies which of those SCs are subject to an AMR in Table 3.3-8 of the LRA. The design of the hydrogen control system is described in Section 6.6 of the ANO-1 UFSAR.

2.3.2.8.1 Technical Information in the Application

The system safety function of the hydrogen control system is to provide a direct measure of the hydrogen concentration in the reactor building using the hydrogen analyzer, and to reduce the hydrogen concentration following a LOCA using the hydrogen recombiner. The SSCs of the hydrogen control system that are within the scope of license renewal are the reactor building penetrations, the mechanical components of the hydrogen samplers, and the piping to and from the hydrogen samplers. The piping to the hydrogen analyzers uses a portion of the hydrogen purge system and one of the boundary valves in the gas collection header system. These mechanical components associated with the hydrogen recombiner are also within the scope of license renewal. The control power cabinets in the penetration room and the electrical components of the hydrogen recombiners are also within the scope of license renewal, and are reviewed in Section 2.5 of this report.

2.3.2.8.2 Staff Evaluation

The staff reviewed Section 2.3.2.8 of the LRA to determine whether there is reasonable assurance that the applicant has identified the hydrogen control system, and its SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). After completing its initial review, the staff requested additional information in a letter to the applicant dated April 18, 2000. In a letter to the NRC dated August 30, 2000, the applicant provides its response to the staff's RAIs.

In the LRA, Table 3.3-8, the applicant identifies the component commodity grouping for the hydrogen control system and lists piping, valves, recombiners, heat exchangers, and sample stations as the components subject to an AMR. The intended function of these SCs is to maintain the system pressure boundary integrity. Heat transfer is also an intended function of hydrogen control system heat exchangers.

As discussed in Section 2.3.2.5 of this report, the staff also states that tubing is not listed in Table 3.3-8 of the LRA as the component subject to an AMR, even though tubing is used in the system and is discussed in the notes of the table. The staff requested the applicant to justify excluding tubing from an AMR. In its response, the applicant states that tubing is included within the "sample stations" component commodity grouping that is subject to an AMR. The staff found the applicant's response acceptable.

The staff also reviewed the drawings listed in Table 2.3-6 of the LRA that contain the components of the hydrogen control system. In Drawing LRA-M-261, Sheet 3, the staff found that some of the system lines attached to the hydrogen control system outside containment and the gas sampling system are not highlighted as being within the scope of license renewal. The staff requested the applicant to justify excluding these system lines from the scope of license renewal. In its response to the NRC the applicant states that the system lines attached to the hydrogen control system outside containment, such as the hydrogen purge air system and post-accident gas sampling system, as seen in Drawing LRA-M-261, Sheet 3, are not within the scope of license renewal because these lines are not part of the pressure boundary of the hydrogen control system and are not required to meet the scoping criteria in 10 CFR 54.4. The hydrogen purge air system is abandoned and isolated in place. The staff found the applicant's response acceptable.

2.3.2.8.3 Conclusions

On the basis of the review described above, the staff finds that the applicant has adequately identified those portions of the hydrogen control system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

2.3.3 Auxiliary Systems

2.3.3.1 Spent Fuel

In the LRA, Section 2.3.3.1, "Spent Fuel," the applicant describes the components of the spent fuel system that are within the scope of license renewal and subject to an AMR. This system is further described in Section 9.4.1 of the ANO-1 UFSAR.

2.3.3.1.1 Technical Information in the Application

The system functions of the spent fuel cooling system are to remove decay heat from the spent fuel stored in the spent fuel pool (SFP), to maintain clarity and chemistry at acceptable levels, and to transfer water within the systems. The spent fuel pool cooling system consists of two circulating water pumps, two spent fuel coolers (heat exchangers), a demineralizer, filters, and a borated water recirculation pump. The borated water recirculation pump assists operators in performing various demineralizing and filtering functions for the spent fuel pool, the transfer canal, and the borated water storage tank. The spent fuel coolers reject decay heat to the nuclear intermediate cooling water system.

The applicant describes its process for identifying the mechanical components that are within the scope of license renewal in Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4," of the LRA. The applicant determines that the cooling and purification functions of the spent fuel cooling systems do not provide any DBE mitigation functions that warrant inclusion of the system within the scope of license renewal. However, the safety functions of the spent fuel system are to maintain adequate water level in the spent fuel pool for cooling and shielding and to maintain subcritical margin. Therefore portions of the spent fuel pool cooling system piping, the stainless steel pool liner, the spent fuel storage racks, the spent fuel pool gates, the transfer tube, and other components that meet the scoping criteria of 10 CFR 54.4 are identified as being within the scope of license renewal and subject to an AMR.

Some components normally associated with the spent fuel system were identified by the applicant as being evaluated in other sections of the LRA. These components are Boraflex neutron absorbing material (Section 4.7), mechanical reactor building penetration (Section 2.4.1.1), and the spent fuel pool structure (Section 2.4.3).

On the basis of its methodology described above, the applicant identifies portions of the spent fuel system that are within the scope of license renewal on the flow diagrams listed in Table 2.3-7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant compiled a list of mechanical component commodity groupings within the license renewal boundaries that are subject to an AMR and identified their intended functions. In the LRA, Table 3.4-1, the applicant lists the following nine component commodity groups as being subject to an AMR: liner plate, gates, racks, piping, valves, fuel transfer tube, blind flanges, bolting, and external valve parts. The applicant states that maintaining the pressure boundary integrity is the only intended function of the SCs that are subject to an AMR, with the exception of the racks which provide structural support for the stored fuel.

2.3.3.1.2 Staff Evaluation

The staff reviewed Section 2.3.3.1 of the LRA to determine whether there is reasonable assurance that the applicant appropriately identified the spent fuel system SCs that are within the scope of license renewal in accordance with 10 CFR 54.4, and subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed the text and diagrams submitted by the licensee in Section 2.3.3.1 of the LRA and the ANO-1 UFSAR to determine if the applicant adequately identified the SSCs of the

spent fuel system that are within the scope of license renewal. The staff verified that those portions of the spent fuel system that meet the scoping requirements of 10 CFR 54.4 are included within the scope of license renewal, and are identified as such by the licensee in Section 2.3.3.1 of the LRA. The staff then focused its review on those portions of the spent fuel system that were not identified as being within the scope of license renewal to verify that they do not meet the scoping requirements of 10 CFR 54.4. The staff also reviewed the FSAR to determine if there were any additional system functions that were not identified in the LRA, and verified that those additional functions did not meet the scoping requirements of 10 CFR 54.4. The staff did not identify any omissions by the applicant are, therefore, there is reasonable assurance that the applicant adequately identified all portions of the spent fuel system that should be included within the scope of license renewal in accordance with 10 CFR 54.4.

The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those portions of the spent fuel system that are identified as being within the scope of license renewal. The applicant identifies and lists the SCs that are subject to an AMR for the spent fuel systems in Table 3.4-1 of the LRA using the screening methodology described in Section 2.1 of the LRA. The staff evaluated the scoping and screening methodology, and documented its findings in Section 2.1 of this SER. The staff performed its review by sampling the SCs that the applicant determined to be within the scope of license renewal, but not subject to an AMR, to verify that these SCs perform its intended function(s) with moving parts or with a change in configuration or properties or were subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists two detailed flow diagrams, LRA-M-232 and 235, of the spent fuel system, and identifies the mechanical components subject to an AMR and its intended functions in Table 3.4-1 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that are within the scope of license renewal. The applicant highlighted those components that perform at least one of the intended functions associated with the scoping criteria of 10 CFR 54.4(a). The staff compared the LRA flow diagrams to the system drawings and the descriptions in the UFSAR to ensure they were representative of the spent fuel system. The staff sampled portions of the flow diagrams that were not highlighted to verify that these components did not meet any the scoping criteria in 10 CFR 54.4.

On the basis of this review, in a letter to the applicant dated May 5, 2000, the staff requested additional information regarding several components in the spent fuel system. In its response to the NRC dated August 30, 2000, the applicant provides its response to the staff's RAI regarding certain piping segments, strainers, and flanges that may have met the scoping requirements but were not identified as being within the scope of license renewal by the applicant. In each case, the applicant justified the exclusion of the component, or identified where in the application the component was included within the scope of license renewal.

The staff reviewed the applicant's responses, and the information contained in the LRA and the UFSAR, and found the applicant's responses acceptable for the components of concern.

2.3.3.1.3 Conclusions

On the basis of the staff's review of the information contained in Section 2.3.3.1 of the LRA, the August 30, 2000, response to the staff's RAIs and the supporting information in the ANO-1

UFSAR, as described above, the staff did not identify any omissions by the applicant. Therefore, the staff find that there is reasonable assurance that the applicant has adequately identifies those portions of the spent fuel system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.2 Fire Protection System

In the LRA, Section 2.3.3.2, "Fire Protection," the applicant identifies the fire protection (FP) SSCs that are required for compliance with 10 CFR 50.48, and that are within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) and subject to an AMR. The applicant also identifies the SCs for the FP system that are subject to an AMR in Tables 3.4-2, and 3.4-6 of the LRA. In letters to the applicant dated May 2, 2000, May 5, 2000, and June 1, 2000, the NRC requested additional information regarding the FP system. In letters to the NRC dated August 30, 2000 and November 2, 2000, the applicant provides additional information in response to the staff's RAIs.

2.3.3.2.1 Technical Information in the Application

In accordance with 10 CFR 54.4(a)(3), the SSCs that are relied on in safety analyses or plant evaluation to demonstrate compliance with 10 CFR 50.48, the FP Rule, are within the scope of license renewal. The FP system is relied upon to meet the requirements of 10 CFR 50.48.

In accordance with 10 CFR 50.48, the applicant is required to implement and maintain an FP program. As stated in the ANO-1 UFSAR, Section 9.8.1, "Design Basis," the applicant's FP program is needed to satisfy Appendix A of Branch Technical Position (BTP) APCSB 9.5-1, "FP for Nuclear Power Plants," and Appendix R to 10 CFR Part 50, and other staff positions. In response to an RAI, the applicant states that a fire area analysis was performed at ANO-1 to evaluate the plant equipment required to place the plant in a safe shutdown condition for any single fire scenario. The fire analysis contains a listing of the ANO-1 components that can be used to place the plant in a safe shutdown condition following a fire. The applicant identifies these SCs as being within the scope of license renewal and subject to an AMR. In the LRA, Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4," the applicant identifies the ANO-1 component database as another means of identifying the SSCs used to fulfill the requirements of 10 CFR 50.48.

The purpose of the FP system is to minimize the effects of fires on SSCs important to safety as required by Appendix A to 10 CFR Part 50. On the basis of the methodology described above, the applicant identifies the highlighted portions of the flow diagrams LRA-M-2219, Sheet 5, and LRA-M-219, Sheet 1, as the evaluation boundaries for the portions of the FP system that are included within the scope of license renewal.

In the LRA, Section 2.3.3.2, the applicant identifies the following FP system components that are within the scope of license renewal and subject to an AMR:

- electric motor-driven fire pump

- diesel-driven fire pump, including the engine gearbox oil cooler, the jacket water heat exchanger and the lube oil cooler (The fuel oil portions of the system are discussed in Section 2.3.3.7, "Fuel Oil," of the LRA.)

- fire water distribution system, including the portion of the outside loop, hose stations, standpipes, sectional control valves, and isolation valves that are required for protection of safety-related areas sprinkler systems required to meet 10 CFR 50.48 requirements, including piping, control valves, and sprinkler heads.

- sprinkler system required to meet 10 CFR 50.48, including piping, control valves, and sprinkler heads

The intended function of the FP mechanical components, identified by the applicant, is to maintain the system pressure boundary integrity. In the LRA, Table 3.4-2, the applicant shows that the following FP mechanical component groups have pressure boundary intended functions, and are subject to an AMR: pumps, piping, valves, intake air, exhaust air, lube oil, cooling water, and heat exchangers.

2.3.3.2.2 Staff Evaluation

The Commission's regulations in 10 CFR 54.21(a)(1), states that for those SSCs that are within the scope of this part, as delineated in 10 CFR 54.4, the applicant must identify and list those SCs that are subject to an AMR. The staff reviewed Section 2.3.3.2 of the LRA, as supplemented by a letter to the NRC dated August 30, 2000, to determine whether there was reasonable assurance that the applicant has appropriately identified the SCs that serve FP intended functions that are within the scope of license renewal in accordance with 10 CFR 54.4, and are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The applicant searched its component database for SSCs required to meet 10 CFR 50.48. In a letter to the NRC dated November 2, 2000, the applicant states that the component database uses an F-List designation to identify FP equipment that is part of the ANO-1 CLB for compliance with 10 CFR 50.48. The applicant also states that the F-List was created in the mid- to late-1980's as part of the development of the overall component database. Prior to that time, no comprehensive list existed at ANO-1 to identify components relied upon for compliance with 10 CFR 50.48. The F-List was the source used by the applicant to identify components that are within the scope of license renewal.

The staff sampled portions of Section 9.8.1, "Design Basis," and Section 9.8.2, "System Description and Evaluation," of the ANO-1 UFSAR to identify any additional FP system function that met the scoping requirements of 10 CFR 54.4, but that was not identified as an intended function in the LRA. The UFSAR, Section 9.8.1, states that the ANO-1 FP program satisfies the NRC's criteria documented in Appendix A to BTP APCSB 9.5-1. The NRC staff also reviewed the August 22, 1978, "FP Safety Evaluation Report," which summarizes the FP program at ANO-1 using the guidelines of Appendix A to BTP 9.5-1. In addition, the staff reviewed the letter from the applicant dated September 17, 1976, which describes Appendix A to BTP 9.5-1, to verify that the function(s) of the FP components relied upon to satisfy the provisions of Appendix A to BTP 9.5-1 were identified as intended functions in the LRA.

The staff then compared the FP SSCs identified in the system flow diagrams LRA-M-2219, Sheet 5, and LRA-M-219, Sheet 1, to verify that the required components were highlighted as being within the evaluation boundaries on the flow diagram, and were not excluded from the scope of license renewal. As part of the evaluation, the staff also sampled portions of the same flow diagrams for the FP system to determine if there were any additional portions of the system piping or components located outside of the evaluation boundary that should have been identified as being within the scope of license renewal.

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding the exclusion of some FP components required for compliance with 10 CFR 50.48. The applicant's F-List, which designates both safety-related and non-safety-related SSCs required for compliance with 10 CFR 50.48, did not appear to include some non-safety-related SSCs, which the staff views as being required for compliance with Appendix A to BTP 9.5-1. The scope of 10 CFR 50.48 includes those FP components required to meet the provisions of Appendix A to BTP 9.5-1. Since the F-List was created in the mid-1980s, and has never been reviewed or evaluated by the NRC staff, the staff has concerns that the F-List may not adequately capture the FP SSCs required for compliance with Appendix A to BTP 9.5-1. A more detailed discussion is provided below for the components identified by the NRC as not being, but needing to be, included in the F-List.

The staff also asked the applicant to provide the technical basis for the exclusion of selected SCS, including the jockey pump casing, the carbon dioxide system, and the fire hydrants from being within the scope of license renewal. In the letter to the NRC dated November 2, 2000, the applicant states that these systems are not required for compliance with 10 CFR 50.48 for the following reasons:

- The FP jockey pump (casing) is not required on the basis that the only function of the jockey pump is to minimize cycling of the main fire pumps, and is not required to protect safe-shutdown equipment.

- The carbon dioxide system is not required on the basis that it is not needed to protect safe-shutdown equipment.

- The fire hydrants are not required on the basis that they are not a primary source of FP needed to support safe-shutdown in the event of a fire.

- The water supply to the low level radwaste building FP system is not required to protect safe-shutdown equipment.

- The piping to the manual hose station (located downstream of FS-43) is not required because it is not used to protect safe-shutdown equipment.

The staff disagreed with the basis for the exclusion of these SSCs from being within the scope of license renewal. These components do not perform its intended function(s) with moving parts or with changes in configuration or properties, and are not replaced based on qualified life or specified time period, and should be subject to an AMR in accordance with 10 CFR 54.21. The August 22, 1978, NRC-approved SER for FP states that these components satisfied the provisions of Appendix A to BTP 9.5-1. Furthermore, in a letter to the NRC dated

September 17, 1976, which describes its FP program as meeting the guidelines of Appendix A to BTP 9.5-1, the applicant identified these components as part of its FP program.

The exclusion of any FP SSC on the basis that its intended function is not required for the protection of safe-shutdown equipment is not acceptable to the staff, in itself. Compliance with 10 CFR 50.48 requires a FP program that goes beyond safe shutdown, and includes such requirements as a means to limit fire damage to SSCs that are important to safety so that the capability to safely shutdown the plan is ensured as is described in BTP APSCB 9.5-1. In the event that these components are determined to be required for compliance with 10 CFR 50.48, they will need to be subject to an AMR in accordance with 10 CFR 54.21(a).

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding the exclusion of the pipes and valves connected to the outside FP loop, shown in flow diagram LRA-M-2219, Sheet 5. In a letter to the NRC dated August 30, 2000, the applicant states that the piping and valves that are not highlighted, are not required for the protection of safety-related areas, and that their failure would not affect the capability of the portion of the outer fire water loop, that is required for compliance with 10 CFR 50.48, to perform its intended function.

The staff disagreed with the applicant's response because the piping, which is not included within the scope of license renewal, supplies water to the FP system in the low-level radwaste building. This piping is required to meet the requirements of 10 CFR 50.48 as described in BTP APSCB 9.5-1, and should be subject to an AMR in accordance with 10 CFR 54.21. Flow diagram LRA-M-2219 shows that the piping leading to the radwaste building supplies a wet and dry pipe suppression system within the radwaste building, and is required for compliance with the provisions of Appendix A to BTP 9.5-1 for the protection of areas where a fire could result in the release of radioactive materials to the environment. Furthermore, in a letter dated September 17, 1976, the applicant states in Section 14, "Radwaste Building (Auxiliary Building)," that automatic sprinklers were provided for protection of areas in the radwaste building where combustible materials are located. Therefore, in the event that this suppression system is determined to be required for compliance with 10 CFR 50.48, it will be included within the scope of license renewal and subject to an AMR in accordance with 10 CFR Part 54.

In addition, the staff requested additional information regarding the exclusion of the following FP suppression SSCs, as shown in flow diagram LRA-M-219, Sheet 1:

- lube oil tank deluge system
- lube oil storage tank T-26
- fuel oil tank sprinkler system
- MFW pump deluge system
- basement sprinkler system
- piping located off of FS-43 and FS-90
- hydrogen seal oil unit deluge system
- outside firewater loop to wall sprinkler system

In a letter to the NRC dated August 30, 2000, the applicant states that in accordance with ANO-1 CLB, the FP suppression systems listed above are not required for compliance with

10 CFR 50.48. In a letter dated November 2, 2000, the applicant provided the technical basis for the exclusion of these systems from within the scope of license renewal. On the basis of the staff's review of the letters dated September 17, 1976, and November 2, 2000, the staff agrees that the following suppression systems are not required for compliance with 10 CFR 50.48. The September 17, 1976, letter shows that the applicant never committed to providing suppression systems for the following systems to satisfy Appendix A to BTP 9.5-1:

- lube oil tank deluge system (D-3)
- lube oil storage tank T-26 (D-1)
- fuel oil tank sprinkler system (D-7)
- MFW pump deluge system (E-3)
- basement sprinkler system (E-3)
- hydrogen seal oil unit deluge system (F-3)
- outside firewater loop to wall sprinkler system (Column 1)

For the piping located off of FS-43 and FS-90, the applicant states (in its November 2, 2000 response) that the piping downstream of FS-43 supplies water to turbine building hose stations located on the east side of the structure. The applicant excludes this piping from being within the scope of license renewal on the basis that the types of fires that these hose stations would be utilized to combat would not prevent a safe shutdown of the plant.

The staff disagrees with this response. Failure of the FP piping leading to this portion of the fire suppression system would prevent the hose stations from functioning as designed. Also, hose stations are subject to an AMR in accordance with 10 CFR 54.21. In the August 22, 1978, NRC approved SER, Section 5.17.5, the applicant stated that manual hose station are provided throughout the turbine building. In addition, in Section 3(d) of their September 17, 1976, submittal, the applicant stated that hose stations are provided in the turbine building at 100 foot intervals. Furthermore, exclusion of FP SSCs on the basis that it's intended function are not required for the protection of safe shutdown equipment is not acceptable if that SSC is required for compliance with 10 CFR 50.48. This piping, which supplies the hose stations in the turbine building, is required to fulfill the manual fire suppression requirement of 10 CFR 50.48(a). Therefore, these hose stations should be included within the scope of license renewal and subject to an AMR.

With respect to the piping downstream of FS-90 that provides water to the laundry area of the auxiliary building, this piping is not required for compliance with 10 CFR 50.48 and, therefore, is not within the scope of license renewal.

At the time the initial SER was issued, the applicant did not provide sufficient justification for the exclusion of the FP jockey pump, carbon dioxide systems, fire hydrants, the water supply to the low level radwaste building FP system, and the piping to the manual hose station (located downstream of FS-43). This was Open Item 2.3.3.2.2-1.

In a public meeting with the applicant that took place on March 8, 2001, the NRC staff heard the applicant's position as to why the FP jockey pump, carbon dioxide systems, fire hydrants, the water supply to the low level radwaste building FP system, and the piping to the manual hose station are not included in the applicant's CLB (as documented in the applicant's F-list) in accordance with the requirements of 10 CFR 50.48. The applicant explained that each of these

components are maintained to the National Fire Protection Association standards, and provided a technical justification as to why these components are not required for safe shutdown consistent with General Design Criteria III. The staff presented its view that 10 CFR 50.48 goes beyond safe shutdown, and that a number of select components beyond those required by General Design Criteria III are required by 10 CFR 50.48. As a result of this meeting, the applicant agreed to add the jockey pump and fire hydrants to the scope of SCs subject to an AMR and to its F-list consistent with the requirements of 10 CFR 50.48. At the same time, the applicant provided sufficient justification for excluding the carbon dioxide systems, the water supply to the low level radwaste building FP system, and the piping to the manual hose station from the scope of components required to fulfil the requirements of 10 CFR 50.48 (as documented in the applicant's F-list) based on the following additional information.

- The carbon dioxide system is not required on the basis that it was not a requirement under BTP 9.5-1 and was never considered part of the applicant's CLB.

- The water supply to the low level radwaste building FP system is not required on the basis that a fire in the low level radwaste building will not result in the release of radioactive material that would exceed 10 CFR Part 100 limits.

- The piping to the manual hose station (located downstream of FS-43) is not required on the basis that the single manual hose station in question is located on top of the turbine building and is not used to protect equipment important to safety.

This information was documented in a letter to the NRC dated March 14, 2001. The staff had no additional concerns relating to the scope of FP components subject to an AMR, therefore, this item is considered closed.

After determining which components were within the scope of license renewal, the staff reviewed the components the applicant identified as being subject to an AMR. The staff reviewed select components that the applicant identified as being within the scope of license renewal to verify that the applicant determined those SCs that performed its intended functions without moving parts or without a change in configuration or properties, and that are not subject to replacement based on qualified life or specified time period were subject to an AMR.

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding the exclusion of system filters, fire extinguishers, fire hoses, and air packs from being subject to an AMR. In a letter to the NRC dated August 30, 2000, the applicant states that the system filters, fire extinguishers, fire hoses, and air packs (i.e., self-contained breathing apparatus) are within the scope of license renewal. However, based on the NRC letter from C.I. Grimes to D.J. Walters, NEI, "Consumables," dated March 10, 2000, filters, fire extinguishers, fire hoses, and air packs were excluded from an AMR because the applicant replaces them based on a qualified life. In its RAI, the staff noted that the exclusion of a structure or component from an AMR based on a qualified life determined by performance or condition monitoring required that each SC be identified and listed, and a site-specific evaluation for each of these SCs be included in the LRA.

In its response to the NRC dated August 30, 2000, the applicant states that filters are within the scope of license renewal at ANO-1. Furthermore, they are tested or inspected periodically and

replaced as part of ANO-1 TS or preventive maintenance activities; therefore, these filters are replaced based on a qualified life determined by performance monitoring and are not subject to an AMR. Fire extinguishers and fire hoses are routinely monitored and replaced in accordance with National Fire Protection Association (NFPA)-10 and NFPA-1962, respectively, and are also within the scope of license renewal, but not subject to an AMR. In addition, air packs are maintained and replaced in accordance with the self-contained breathing apparatus program contained in 42 CFR Part 84, 29 CFR 19.10, and 19.26, NUREG-41, and ANSI-Z88.2 and, therefore are not subject to an AMR. The staff found the applicant's response consistent with the staff's letter on consumables and, therefore, acceptable.

The staff also reviewed mechanical components, from flow diagrams LRA-M-2219, Sheet 5 and LRA-M-219, Sheet 1, and compared them to the list of components and corresponding intended function(s) presented in Table 3.4-2 of the LRA. On the basis of this review, the staff did not identify any omissions in the SCs identified by the applicant as being subject to an AMR.

2.3.3.2.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the FP system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.3 Emergency Diesel Generator

In the LRA, Section 2.3.3.3, "Emergency Diesel Generator," the applicant describes the components of the EDG system that are within the scope of license renewal and subject to an AMR. This system is further described in Section 8.3.1.1.7, "Emergency Power Supply System," of the ANO-1 UFSAR.

2.3.3.3.1 Technical Information in the Application

The system function of the emergency power supply system is to supply emergency power to the engineered safeguards bus loads following a DBA. The emergency power supply system at ANO-1 consists of two diesel generators, each connected to one of the 4160-volt engineered safeguards buses, and their associated support systems. The EDGs are required for event mitigation, and to be available following a fire and are considered included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3). The applicant identifies the following support systems of the EDG system as being within the scope of license renewal and subject to an AMR:

- safety-related portions of the EDG starting air subsystem
- EDG lubrication subsystem components
- EDG combustion air intake and exhaust subsystem components
- EDG cooling water subsystem components

Some components normally associated with the EDG system were identified by the applicant as being evaluated in other sections of the LRA. These components are the fuel oil system,

including the EDG fuel oil components (Section 2.3.3.7), and the service water side of the EDG heat exchangers (Section 2.3.3.10).

On the basis of its methodology described above, the applicant identified portions of the EDG system that are within the scope of license renewal on flow diagrams listed on Table 2.3-7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant lists the mechanical component commodity groupings that are subject to an AMR and identified its intended functions in Table 3.4-3 of the LRA.

The applicant identifies the following component commodity groups for the four support systems as being subject to an AMR:

- starting air - valves (two types), bolting, external valve parts, piping, tanks, strainers, and tubing
- air intake and exhaust - piping, filters, expansion joints, turbo chargers, valves, and heat exchangers
- lube oil - piping, valves (three types), filters (two types), pumps, strainer, heat exchanger, and sight glass
- cooling water - piping, valves (two types), pumps, tanks, thermowells, and level glass

The applicant states that maintaining the pressure boundary integrity is the only intended function for the listed components, with the exception of the heat exchangers, which also perform a heat transfer intended function.

2.3.3.3.2 Staff Evaluation

The staff reviewed Section 2.3.3.3 of the LRA to determine whether there is reasonable assurance that the applicant appropriately identified the EDG system SCs that are within the scope of license renewal in accordance with 10 CFR 54.4 and subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed the text and diagrams submitted by the licensee in Section 2.3.3.3 of the LRA, and the ANO-1 UFSAR to determine if the applicant adequately identified the SSCs of the EDG system that are within the scope of license renewal. The staff verified that those portions of the EDG system, and its support systems that meet the requirements of 10 CFR 54.4 are included within the scope of license renewal, and are identified as such by the applicant in Section 2.3.3.3 of the LRA. The staff then focused its review on those portions of the EDG systems that were not identified as being within the scope of license renewal to verify that they do not meet the scoping requirements of 10 CFR 54.4. The staff also reviewed the UFSAR to determine if there were any additional system functions that were not identified as intended functions in the LRA and verified that those additional functions did not meet the scoping requirements of 10 CFR 54.4. The staff did not identify any omissions by the applicant, therefore, there is reasonable assurance that the applicant has adequately identified all portions

of the EDG systems that should be included within the scope of license renewal in accordance with 10 CFR 54.4.

The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those portions of the EDG systems identified as being within the scope of license renewal. The applicant identifies and lists the SCs that are subject to an AMR for the EDG systems in Table 3.4-3 of the LRA using the screening methodology described in Section 2.1 of the LRA. The staff evaluated the scoping and screening methodology and documented their findings in Section 2.1 of this SER. The staff performed their review by sampling the SCs that the applicant identifies as being within the scope of license renewal, but not subject to an AMR to verify that these SCs perform its intended function(s) with moving parts or with a change in configuration or properties or were subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists three detailed flow diagrams, LRA-M-217, Sheets 2, 3, and 4, of the EDG system, and identifies the mechanical components subject to an AMR and their intended functions in Table 3.4-3 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that are within the scope of license renewal. The applicant highlighted those components that performs at least one of the intended functions associated with the scoping criteria of 10 CFR 54.4(a). The staff compared the LRA flow diagrams to the system drawings and the descriptions in the UFSAR to ensure they were representative of the EDG system. The staff sampled portions of the flow diagrams that were not highlighted to verify that those components did not perform any of the intended functions associated with the scoping criteria of 10 CFR 54.4(a).

On the basis of this review, in a letter to the applicant dated May 5, 2000, the staff requested additional information regarding several components in the EDG systems. In its response to the NRC dated August 30, 2000, the applicant provides its response to the staff's RAIs regarding room drains in the EDG building design to protect the diesel generator from flooding that were not included within the scope of license renewal. In addition, the staff identifies several components such as the turbo charger, crankcase ejector, expansion joints, and exhaust silencer that the applicant identified as being within the scope of license renewal, but not subject to an AMR. The applicant clarifies that sufficient drainage of the EDG rooms is provided by a 10-inch, through wall opening located behind a curb and, therefore the room drains are not needed for event mitigation. The structure was included within the scope of license renewal and evaluated in Section 2.4.3 of the LRA. The staff reviewed the applicant's evaluation of this auxiliary building structure in Section 2.4.3 of this SER. The applicant also clarifies where in the LRA the turbo charger, crankcase ejector, expansion joints, and exhaust silencer were evaluated in an AMR. The staff reviewed the applicant's responses and the information contained in the LRA and the UFSAR, and found the applicant's responses acceptable for the components of concern.

2.3.3.3.3 Conclusions

On the basis of the staff's review of the information contained in Section 2.3.3.3 of the LRA, the August 30,2000, response to the staff's RAIs, and the supporting information in the ANO-1 UFSAR, as described above, the staff did not identify any omissions by the applicant. Therefore, the staff finds that there is reasonable assurance that the applicant has adequately

identified those portions of the EDG system and associated subsystems that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.4 Auxiliary Building Sump and Reactor Building Drains

In the LRA, Section 2.3.3.4, "Auxiliary Building Sump and Reactor Building Drains," the applicant describes the components of the auxiliary building and reactor building sump and drain system that are within the scope of license renewal and subject to an AMR.

2.3.3.4.1 Technical Information in the Application

The overall function of the auxiliary building and reactor building sump and drain system is to collect liquids from the reactor building and auxiliary building for processing and disposal. The following specific system functions are safety-related and consistent with the scoping criteria in 10 CFR 54.4(a)(1):

- prevents flow of radioactive material from reactor building following a LOCA (reactor building penetrations)
- prevents debris from interfering with post-LOCA recirculation (system screens)
- prevents reactor building sump vortexing that could occur under accident conditions (anti-vortex device)
- prevents radioactive liquids that may be present in the decay heat pump room post-LOCA from spreading throughout the auxiliary building drains and isolation valves
- collect reactor coolant pump (RCP) motor oil leakage to reduce the chance of a fire (collection tanks, piping and valves)

The applicant describes its process for identifying the mechanical components that are within the scope of license renewal in Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4," of the LRA. On the basis of this methodology, the applicant identifies the portions of the auxiliary building and reactor building sump and drain system that are within the scope of license renewal on the flow diagrams that are listed in Table 2.3-7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant compiles a list of mechanical component commodity groupings that are subject to an AMR and identified their intended functions, in Table 3.4-4 of the LRA.

2.3.3.4.2 Staff Evaluation

The staff reviewed Section 2.3.3.4 of the LRA to determine whether there is reasonable assurance that the applicant has appropriately identified the auxiliary building and reactor building sump and drain system SCs that are within the scope of license renewal in accordance with the requirements of 10 CFR 54.4, and subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed the text and diagrams submitted by the licensee in Section 2.3.3.4 of the LRA and the ANO-1 UFSAR to determine if the applicant adequately identified the SSCs that are within the scope of license renewal. The staff verified that those portions of the auxiliary building and reactor building sump and drain system that meet the scoping requirements of 10 CFR 54.4 are included within the scope of license renewal and are identified as such by the licensee in Section 2.3.3.4 of the LRA. The staff then focused its review on those SCs of the auxiliary building and reactor building sump and drain systems that were not identified as being within the scope of license renewal to verify that they do not meet the scoping requirements of 10 CFR 54.4. The staff also reviewed the UFSAR to determine if there were any additional system functions that were not identified in the LRA and verified that those additional functions did not meet the scoping requirements of 10 CFR 54.4. The staff found no omissions by the applicant, therefore, there is reasonable assurance that the applicant adequately identified all portions of the auxiliary building and reactor building sump and drain systems that should be included within the scope of license renewal in accordance with 10 CFR 54.4.

The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those portions of the system that are identified as within the scope of license renewal. The applicant identifies and lists the SCs that are subject to an AMR for the auxiliary building and reactor building sump and drain system in Table 3.4-4 of the LRA using the screening methodology described in Section 2.1.3 of the LRA. The staff evaluated the scoping and screening methodology, and documented its findings in Section 2.1 of this SER. The staff performed its review by sampling the SCs that the applicant determines as being within the scope of license renewal but not subject to an AMR to verify that these SCs perform its intended function(s) with moving parts or with a change or configuration or properties or were subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists six detailed flow diagrams, LRA-M-213, Sheets 1 and 2, LRA-M-214, Sheet 3, LRA-M-232, Sheet 1, and LRA-M-238 Sheets 1 and 2, of the auxiliary building and reactor building sump and drain systems and identifies the mechanical components subject to an AMR and its intended functions in Table 3.4-4 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that are within the scope of license renewal. The applicant highlights those components, which perform at least one of the scoping requirements of 10 CFR 54.4. The staff compared the LRA flow diagrams to the system drawings and the descriptions in the UFSAR to ensure they were representative of the auxiliary building and reactor building sump and drain systems. The staff sampled portions of the flow diagrams that were not highlighted to verify that these components did not meet any of the scoping criteria in 10 CFR 54.4.

On the basis of this review, in a letter to the applicant dated May 5, 2000, the staff requested additional information regarding several components in the auxiliary building and reactor building sump and drain system. In its response to the NRC dated August 30, 2000, the applicant responded to the staff's RAIs, regarding the inclusion of the drain lines located in the decay heat removal pump rooms within the scope of license renewal. The decay heat removal pump rooms are credited as pressure boundaries for offsite dose calculations. The applicant states that the components in question had been included within the scope of license renewal and subject to an AMR, and should have been highlighted on the drawing. The staff find the applicant's response acceptable.

2.3.3.4.3 Conclusions

On the basis of the staff's review of the information contained in Section 2.3.3.4 of the LRA, and the supporting information in the ANO-1 UFSAR, as described above, the staff did not identify any omissions by the applicant. Therefore, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the auxiliary building and reactor building sump and drain system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.5 Alternate AC Diesel Generator

In the LRA, Section 2.3.3.5, "Alternate AC Diesel Generator," the applicant describes the components of the AAC diesel generator and its support systems that are within the scope of license renewal and subject to an AMR.

2.3.3.5.1 Technical Information in the Application

The system function of the AAC generator is to provide backup power in the event of a station blackout at ANO-1 or ANO-2. The AAC generator is a 4400 kW diesel generator and is credited with supplying power during a loss off site power concurrent with the loss of the EDGs. The applicant identifies the following support systems of the AAC generator as being within the scope of license renewal and subject to an AMR:

- portions of the AAC generator starting air subsystem
- AAC generator lubrication subsystem components
- AAC generator combustion air intake and exhaust subsystem components
- AAC generator cooling water subsystem components
- engine room exhaust fans and the corresponding inlet air dampers
- switchgear room exhaust fan and its associated inlet air damper

Some components normally associated with the AAC generator were identified by the applicant as being evaluated in other sections of the LRA. These components are the AAC generator building (Section 2.4.6.1), and fuel oil system including the AAC generator (Section 2.3.3.7).

On the basis of its methodology described above, the applicant identifies the portions of the AAC generator that are within the scope of license renewal on flow diagrams listed on Table 2.3-7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant lists the mechanical component commodity groupings that are subject to an AMR and identified their intended functions, in Table 3.4-5 of the LRA.

The applicant identifies the following component commodity groups for the four support systems as subject to an AMR:

- starting air - valves (four types), piping, tanks, filters (two types), and motor casing
- air intake and exhaust - piping, filters, expansion joints, turbo chargers, valves (two types), muffler, and heat exchanger
- lube oil - piping, valves (three types), pumps, and heat exchanger
- cooling water - piping, valves (three types), pumps, tanks, thermowells, heaters, orifices, filters, heat exchanger, and level glass
- AAC building ventilation - fans and dampers/louvers

The applicant states that maintaining the pressure boundary integrity is the only intended function for the listed components, with the exception of the heat exchangers, which also perform a heat transfer intended function.

2.3.3.5.2 Staff Evaluation

The staff reviewed Section 2.3.3.5 of the LRA to determine whether there is reasonable assurance that the applicant appropriately identified the AAC generator SCs that are within the scope of license renewal in accordance with 10 CFR 54.4 and subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed the text and diagrams submitted by the licensee in Section 2.3.3.5 of the LRA, and the ANO-1 UFSAR to determine if the applicant adequately identified the SSCs of the system that are within the scope of license renewal. The staff verified that those portions of the AAC generator system that meet the scoping requirements of 10 CFR 54.4 are included within the scope of license renewal, and are identified as such in Section 2.3.3.5 of the LRA. The staff then focused its review on those portions of the AAC generator systems that were not identified as being within the scope of license renewal to verify that they do not meet the scoping criteria of 10 CFR 54.4. The staff also reviewed the UFSAR to determine if there were any additional system functions that were not identified as intended functions in the LRA and verified that those additional functions did not meet the scoping requirements of 10 CFR 54.4. The staff did not identify any omissions by the applicant, therefore, there is reasonable assurance that the applicant has adequately identified all portions of the AAC generator systems that are within the scope of license renewal in accordance with 10 CFR 54.4.

The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those parts of the systems identified as being within the scope of license renewal. The applicant identifies and lists the SCs that are subject to an AMR for the AAC diesel generator systems in Table 3.4-5 of the LRA using the screening methodology described in Section 2.1 of the LRA. The staff performed its review by sampling the SCs that the applicant determined as being within the scope of license renewal, but not subject to an AMR to verify that these SCs perform its intended functions with moving parts or with a change

in configuration or properties or were subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists five detailed flow diagrams of the AAC generator on LRA-M-2241, Sheets 1, 2, 4 and 5, and LRA-M-2260, Sheet 4, and identified the mechanical components subject to an AMR and their intended functions in Table 3.4-5 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that are within the scope of license renewal. The applicant highlights those components which meet at least one of the scoping criteria of 10 CFR 54.4. The staff compared the LRA flow diagrams to the system drawings and the descriptions in the UFSAR to ensure they were representative of the AAC generator systems. The staff sampled portions of the flow diagrams that were not highlighted to verify that these components did not meet any of the intended functions associated with the scoping criteria of 10 CFR 54.4.

On the basis of this review, in a letter to the applicant dated May 5, 2000, the staff requested additional information regarding several components in the AAC generator systems. In a letter to the NRC dated August 30, 2000, the applicant provides its response to the staff's RAI regarding pipe segments that were not identified as being within the scope of license renewal. In addition, several other components were identified by the applicant as being within the scope of license renewal, but the staff could not determine whether these components were identified by the applicant as being subject to an AMR. In its response the applicant clarified that some of the pipe segments in question were incorrectly identified on Drawing LRA-M-2241 and should have indicated that those pipe segments were included within the scope of license renewal and subject to an AMR. The applicant states that the crankcase vent lines and pressure sensing lines did not perform an intended function and were not within the scope of license renewal. The applicant also identifies nine additional components that were evaluated in its AMR of the AAC generator systems. The staff reviewed the applicant's responses to the RAIs, and the information in the LRA and the UFSAR, and found the applicants responses acceptable in addressing these concerns.

2.3.3.5.3 Conclusions

On the basis of the staff's review of the information contained in Section 2.3.3.5 of the LRA, the August 30, 2000, response to the staff's RAIs, and the supporting information in the ANO-1 UFSAR, as described above, the staff did not identify any omissions by the applicant. Therefore, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the AAC diesel generator that are within the scope of license renewal, and associated SCs that are subject to an AMR, in accordance with 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.6 Halon System

In the LRA, Section 2.3.3.6, "Halon," the applicant describes the Halon fire suppression system equipment, which protects the areas above the ceiling tiles, and below the false floor of the ANO-1 control room as required by 10 CFR 50.48. The applicant identifies the Halon system as being within the scope of license renewal, and identifies the SCs that are subject to an AMR. In letters to the applicant dated May 2, May 5, and June 1, 2000, the NRC requested additional

information concerning the ANO-1 Halon system. The applicant responded to the staff's RAIs in letters to the NRC dated August 30, 2000 and November 2, 2000.

2.3.3.6.1 Technical Information in the Application

SSCs that are relied on in a safety analysis or plant evaluation to perform a function that demonstrates compliance with the Commission's regulations described in 10 CFR 54.4(a)(3) are within the scope of license renewal. The Halon system is relied upon to meet the Commission regulation for fire protection, 10 CFR 50.48, in accordance with 10 CFR 54.4(a)(3).

This regulation, 10 CFR 50.48, requires that an applicant implement and maintain an FP program. The ANO-1 FP program is required to satisfy the NRC criteria in Appendix A to Branch Technical Position (BTP) APCSB 9.5-1, "FP for Nuclear Power Plants," and Appendix R to 10 CFR 50, and other staff positions. In a letter to the NRC dated August 30, 2000, the applicant states that a fire area analysis was performed at ANO-1 to evaluate the plant equipment required to place the plant in a safe shutdown condition for any single fire scenario. The fire analysis contains a listing of the ANO-1 components that can be used to place the plant in a safe shutdown condition following a fire. These components are within the scope of license renewal. Additional sources used to identify 10 CFR 50.48 SSCs were the ANO-1 component database as discussed in the LRA, Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4."

In the LRA, Section 2.3.3.6, the applicant identifies the following portions of the Halon system as being within the scope of license renewal:

- Halon cylinders
- actuation valves
- pilot piping
- manual actuator cylinders and valves
- discharge piping
- outlet nozzles

The intended function identified by the applicant that was considered during the AMR of these SCs was to maintain the system pressure boundary integrity. The electrical portions of the Halon system were evaluated in LRA Section 2.5, "Electrical and Instrumentation and Controls System Scoping and Screening Results." The bottle racks, and structural and component supports, as well as ceiling tiles, marinite boards, concrete walls, concrete and false floor components that are required to enclose selected areas to allow effective use of the Halon system were addressed in Section 2.4.3 of the LRA, "Auxiliary Building."

License renewal flow diagram LRA-M-219, Sheet 2, shows the evaluation boundaries for the portions of the Halon system that are within the scope of license renewal. In the LRA, Table 3.6-4, the applicant identifies the following Halon system mechanical components that are needed to maintain system pressure boundary integrity, and that are subject to an AMR:

- valves
- pipe
- tanks

- discharge nozzles
- discharge tube
- pilot header discharge tube flexible connectors

2.3.3.6.2 Staff Evaluation

In accordance with 10 CFR 54.21(a)(1), the NRC staff reviewed Section 2.5.11 of the LRA, as supplemented by letter dated February 8, 1999, and the other documentation discussed below, to determine whether there is reasonable assurance that the applicant has appropriately identified the SSCs that serve FP-intended functions as being within the scope of license renewal in accordance with 10 CFR 54.4, and the corresponding SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The applicant searched its licensing documents for commitments to 10 CFR 50.48 and to evaluate plant equipment required to place the plant in a safe shutdown condition for any single fire scenario. In the response to NRC dated August 30, 2000, the applicant states that the scope of SSCs required by 10 CFR 50.48 is consistent with the ANO-1 CLB, and that the component database includes SSCs required to meet 10 CFR 50.48 and Appendix R, Section III.G, III.J., and III.O.

The staff sampled portions of Section 9.8.1, "Design Basis," and Section 9.8.2, "System Description and Evaluation" of the ANO-1 UFSAR to determine if there were any Halon system functions that were not identified in the LRA during the scoping of SSCs for the Halon system. The staff then compared the Halon SCs identified within the UFSAR to the Halon flow diagram, LRA-M-219, Sheet 2, to verify that the required SCs were subject to an AMR. As part of the evaluation, the staff also reviewed the same flow diagram for the Halon system to determine if there were any additional portions of the system piping or components located outside of the evaluation boundary, with intended functions that should have been identified as being within the scope of license renewal.

For the Halon system, the staff determined that the applicant identified all the SSCs that are within the scope of license renewal. In addition, the applicant identified the SCs that perform a pressure boundary intended function and are, therefore, subject to an AMR. These components include enclosures, flex hoses, pipes, tubing, and valve bodies.

The staff did identify a concern that smoke detectors located on flow diagram LRA-M-219, Sheet 2, for the Halon system, were not included within the highlighted evaluation boundaries. In a letter to the NRC dated August 30, 2000, the applicant states that smoke detectors are included within the scope of license renewal at ANO-1, but were not highlighted on the applicable drawing because the drawings were primarily intended to show the pressure boundary portions of systems that are within the scope of license renewal, and not the electrical components that are within the scope of license renewal. The staff found the applicant's response acceptable.

On the basis of the review described above, the staff determined that there is reasonable assurance that the applicant adequately identified the portions of the Halon system that are within the scope of license renewal in accordance with 10 CFR 54.4.

After determining which SSCs were within the scope of license renewal, the staff sampled the SCs that the applicant identified as being subject to an AMR. The staff sampled portions of mechanical components, from flow diagram LRA-M-219, Sheet 2, and compared them to the list of SCs and the intended functions identified by the applicant in Table 3.6-4, of the LRA to verify that there were no omissions in the SCs identified by the applicant as being subject to an AMR.

The staff was concerned that certain components, which provide an enclosure for the effective use of the Halon system, were excluded from an AMR. In a letter to the applicant dated June 1, 2000, the staff requested additional information to verify that the control room Halon system supports listed in the LRA, Table 3.6-4, included the ceiling tiles, marinite boards, concrete walls, and concrete and false floor components referred to in Section 2.3.3.6 of the LRA. The applicant's response and staff's overall evaluation of these SCs are provided in Section 3.3.6 of this SER. On the basis of the review described above, the staff did not find any omissions in the FP SCs identified by the applicant as being subject to an AMR.

2.3.3.6.3 Conclusions

On the basis of its review, the staff finds that there is reasonable assurance that the applicant has adequately identified the portions of the Halon system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.7 Fuel Oil

In the LRA Section 2.3.3.7, "Fuel Oil," the applicant describes the components of the fuel oil system that are within the scope of license renewal and subject to an AMR. This system is further described in Section 8.3.1.1.7.2 of the ANO-1 UFSAR.

2.3.3.7.1 Technical Information in the Application

The system function of the fuel oil system is to store and supply fuel oil to diesel-driven safety related and non-safety-related components. The system includes the emergency diesel fuel tanks and the EDG day tank, which have the safety-related function of storing and supplying the EDGs with fuel oil. Also included in this system is the bulk fuel oil storage tank which supplies fuel oil to non-safety-related equipment including the AAC generator and the diesel fire pump day tanks. In addition to the tanks, the equipment and piping required to transfer the fuel oil to these various components are also within scope for license renewal. The applicant identified these components as being within the scope of license renewal because they meet the requirements of 10 CFR 54.4(a).

The applicant describes its process for identifying the mechanical components that are within the scope of license renewal in Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4," of the LRA. On the basis of this methodology, the applicant identifies portions of the fuel oil system that are within the scope of license renewal on flow diagrams that are listed in Table 2.3-7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant compiles a list of mechanical component commodity groupings that are subject to an AMR and identified their intended

functions in Table 3.4-7 of the LRA. Specifically, the applicant identifies the following fourteen component commodity groups as subject to an AMR: piping, valves (three types), filters (two types), pumps (two types), tubing (two types), thermowells, strainers, tanks, and heat exchangers. The applicant states that maintaining pressure boundary integrity is the only intended function, with the exception of the heat exchangers, which provide heat transfer function for various components.

2.3.3.7.2 Staff Evaluation

The staff reviewed Section 2.3.3.7 of the LRA to determine whether there is reasonable assurance that the applicant has appropriately identified the fuel oil system SCs that are within the scope of license renewal in accordance with 10 CFR 54.4 and subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed the text and diagrams submitted by the applicant in Section 2.3.3.7 of the LRA and the ANO-1 UFSAR to determine if the applicant has appropriately identified the SSCs that are within the scope of license renewal. The staff verified that those portions of the fuel oil system that meet the scoping requirements of 10 CFR 54.4 are included within the scope of license renewal, and these SCs are identified as such in Section 2.3.3.7 of the LRA. The staff then focused its review on the SCs of the fuel oil system that were not identified as being within the scope of license renewal to verify that these SCs do not meet the scoping requirements of 10 CFR 54.4. The staff also reviewed the UFSAR to determine if there were any additional system functions that were not identified in the LRA and verified that those additional functions did not meet the scoping requirements of 10 CFR 54.4. The staff did not identify any omissions by the applicant, therefore, there is reasonable assurance that the applicant adequately identified all portions of the fuel oil system that should be within the scope of license renewal in accordance with 10 CFR 54.4.

The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those portions of the systems that are identified as being within the scope of license renewal. The applicant identifies and lists the SCs that are subject to an AMR for the fuel oil system in Table 3.4-7 of the LRA using the screening methodology described in Section 2.1 of the LRA. The staff evaluated the scoping and screening methodology and documented its findings in Section 2.1 of this SER. As described in more detail below, the staff performed its review by sampling SCs that were within the scope of license renewal but not subject to an AMR to verify that these SCs performed their intended functions with moving parts or without a change in configuration or properties, or were subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists five detailed flow diagrams, LRA-M-217, Sheets 1, 2, and 3, LRA-M-219, Sheet 1, and LRA-M-2241, Sheet 3, of the fuel oil system, and identifies the mechanical components subject to an AMR and their intended functions in Table 3.4-7 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that are within the scope of license renewal. The applicant highlighted those components which meet at least one of the scoping criteria of 10 CFR 54.4(a). The staff compared the LRA flow diagrams to the system drawings and descriptions in the UFSAR to ensure they were representative of the fuel oil system. The staff sampled portions of the flow diagrams that were

not highlighted to verify that these components did not meet any of the intended functions associated with the scoping criteria of 10 CFR 54.4(a).

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding several components in the fuel oil system. In a letter to the NRC dated August 30, 2000, the applicant responded to those RAIs. Specifically, the staff questioned whether the vent lines on the tanks in the fuel oil system should be included within the scope of license renewal. The applicant responded that no credible aging effect including the complete loss of the vent line could prevent a tank from being vented. The staff concluded that the vent lines do not perform any of the scoping criteria in 10 CFR 54.4(a). The staff also questioned whether pipe segments (tubing) for the fuel oil day tank and the governors' instrumentation should be in scope for license renewal. The applicant states that the tubing to the tank level switch is within the scope of license renewal; however, the tubing used to vent fuel oil system components are not within scope. The components identified in the governors' instrumentation were mechanical linkage and not tubing. The mechanical linkage requires a change in configuration to perform its intended function and, therefore, is not subject to an AMR.

The staff reviewed the applicant's responses, the information in the LRA, and the UFSAR, and found the applicant's responses acceptable in addressing these concerns.

2.3.3.7.3 Conclusions

On the basis of the staff's review of the information contained in Section 2.3.3.7 of the application, the August 30, 2000, response to the staff's information request, and the supporting information in the ANO-1 UFSAR, as described above, the staff did not identify any omissions by the applicant. Therefore, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the fuel oil system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.8 Instrument Air

In the LRA, Section 2.3.3.8, "Instrument Air," the applicant describes the components of the instrument air system that are within the scope of license renewal and subject to an AMR. This system is further described in Section 9.9 of the ANO-1 UFSAR.

2.3.3.8.1 Technical Information in the Application

The system function of the instrument air system is to provide a reliable supply of dry, oil-free, compressed air for pneumatic equipment operation. Most of the system is not safety-related and does not meet the scoping criteria for license renewal. However, some safety-related components utilize instrument air for operation of their pneumatic components. While many of the pneumatic components fail in the desired post-accident position upon loss of air supply the following components require that pressure boundary integrity be maintained following an accident and, therefore, are within the scope of license renewal:

- reactor building penetrations for the instrument air system

- reactor coolant pump (RCP) motor and lube oil cooling water supply valves' air supply
- letdown coolers and RCP seal coolers cooling water supply and return valves' air supply
- control room ventilation emergency fan filter unit air damper control air supply

The applicant describes it process for identifying the mechanical components that are within the scope of license renewal in Section 2.1.2, "Assessment Using Criteria in 10 CFR 54.4," of the LRA.

On the basis of its methodology described above, the applicant identifies portions of the instrument air system that are within the scope of license renewal on flow diagrams listed on Table 2.3-7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant lists the mechanical component commodity groupings that are subject to an AMR and identified their intended functions, in Table 3.4-8 of the LRA. The applicant identifies the following nine component commodity groups as subject to an AMR: piping, valves (three types), tubing (two types), tanks, flanges, and regulators. The applicant also identifies maintaining pressure boundary integrity as the only intended function.

2.3.3.8.2 Staff Evaluation

The staff reviewed Section 2.3.3.8 of the LRA to determine whether there is reasonable assurance that the applicant appropriately identified the instrument air system SCs that are within the scope of license renewal in accordance with 10 CFR 54.4 and subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed the text and diagrams submitted by the licensee in Section 2.3.3.8 of the LRA, and the ANO-1 UFSAR to determine if the applicant adequately identified the SSCs of the system that are within the scope of license renewal. The staff verified that those portions of the instrument air system that meet the scoping requirements of 10 CFR 54.4 are included within the scope of license renewal and are identified as such in Section 2.3.3.8 of the LRA. The staff then focused its review on those portions of the instrument air system that were not identified as being within the scope of license renewal to verify that they do not meet the scoping requirements of 10 CFR 54.4. The staff also reviewed the UFSAR to determine if there were any additional system functions that were not identified as intended functions in the LRA and verified that those additional functions did not meet the scoping requirements of 10 CFR 54.4. The staff did not find any omissions by the applicant, therefore, there is reasonable assurance that the applicant has adequately identified all portions of the instrument air system that are within the scope of license renewal in accordance with 10 CFR 54.4.

The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those portions of the system identified as being within the scope of license renewal. The applicant identifies and lists the SCs that are subject to an AMR for the instrument air system in Table 3.4-8 of the LRA using the screening methodology described in Section 2.1 of the LRA. The staff performed its review by sampling the SCs that the applicant identifies as being within the scope of license renewal, but not subject to an AMR to verify that

these SCs perform its intended functions with moving parts or with a change in configuration or properties, or were subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists eighteen detailed flow diagrams for the instrument air system, and identified the mechanical components subject to an AMR. The applicant also identifies the intended functions in Table 3.4-8 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that are within the scope of license renewal. The applicant highlights those components, which meet at least one of the scoping criteria of 10 CFR 54.4(a). The staff compared the LRA flow diagrams to the system drawings and the descriptions in the UFSAR to ensure they were representative of the instrument air system. The staff sampled portions of the flow diagrams that were not highlighted to verify that these components did not perform any of the intended functions associated with the scoping criteria of 10 CFR 54.4(a).

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding the instrument air system. In a letter to the NRC dated August 30, 2000, the applicant provides its response to the staff's RAI regarding the tubing that provides control air to containment isolation valves, and whether they should be included within the scope of license renewal. The applicant states that failure of the tubing would place the valve in the required position in the event of an accident. Therefore the tubing does not meet the scoping criteria in 10 CFR 54.4(a)(1). The staff reviewed the applicant's response and found it acceptable.

2.3.3.8.3 Conclusions

On the basis of the staff's review of the information contained in Section 2.3.3.8 of the LRA , the August 30, 2000, response to the staff's RAIs, and the supporting information in the ANO-1 UFSAR, as described above, the staff did not identify any omissions by the applicant. Therefore, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the instrument air system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.9 Chilled Water

In the LRA, Section 2.3.3.9, "Chilled Water," the applicant describes the components of the chilled water system that are within the scope of license renewal and subject to an AMR. This system is also described in Sections 6.3, 8.3.2.1.7, 9.7.2.1 of the ANO-1 UFSAR.

2.3.3.9.1 Technical Information in the Application

The primary function of the chilled water system is to provide chilled water to the cooling coils of a variety of room and area ventilation units.

The applicant describes its process for identifying the mechanical components that are within the scope of license renewal in Section 2.1.1, "Assessment Using Criteria in 10 CFR 54.4," of the LRA. The applicant identifies the portion of the chilled water system that supplies the electrical, switchgear, and battery room emergency coolers, as being within the scope of license renewal. The safety-related function of these SSCs is to supply chilled water for

emergency cooling to coolers that service the safety-related electrical equipment located in the above-mentioned rooms. Two emergency chillers, the internal surfaces of the six cooling coils supplied by the chillers, the associated valves, and piping are within the scope of license renewal and subject to an AMR. Also, the main chilled water system reactor building penetrations piping and valves are included in the scope of license renewal and subject to an AMR because they perform a safety function for reactor building isolation.

The applicant identifies some components associated with the chilled water system as being evaluated in other section of the LRA, including the fan/coil housing assemblies, the external surfaces of the cooling coils, the ductwork, and fire dampers in the ductwork.

Consistent with its methodology, the applicant identifies the portions of the chilled water system that are within the scope of license renewal on the flow diagrams listed in Table 2.3.7 of the LRA. Using the methodology described in the LRA, Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," the applicant compiles a list of mechanical component commodity groupings that are subject to an AMR and identifies their intended functions in Table 3.4.9 of the LRA. The following twelve component groups are subject to an AMR: piping, valves, thermowells, tanks, pumps, tubing, coils, sight glasses, filters, compressors, mufflers, and heat exchangers (condensers and evaporators). The applicant states that pressure boundary and heat transfer are the intended functions of the chilled water system mechanical components.

2.3.3.9.2 Staff Evaluation

The staff reviewed Section 2.3.3.9 of the LRA to determine whether there is reasonable assurance that the applicant appropriately identifies the chilled water system components and supporting structures as being subject to an AMR in accordance with the requirement of 10 CFR 54.21(a)(1). The staff reviewed the text and diagrams submitted by the applicant in Section 2.3.3.9 of the LRA and the ANO-1 UFSAR to identify any SCs that may have been omitted from an AMR.

The applicant identifies and lists the SCs that are subject to an AMR for the chilled water system in Table 3.4.9 of the LRA, using the screening methodology described in Section 2.1 of the LRA. The staff evaluated the scoping and screening methodology and documented their findings in Section 2.1 of this SER. The staff then performed a review of the implementation of that methodology for the chilled water system by sampling the SCs that were within the scope of license renewal, but not subject to an AMR to verify that these SCs perform its intended functions with moving parts or with a change in configuration or properties, or were subject to replacement based on a qualified or specified time period.

In the LRA, Table 2.3.7, the applicant lists two detailed flow diagrams, LRA-M-221, Sheet 2, and LRA-M-222, Sheet 1, of the chilled water system. The applicant also identifies the mechanical components subject to an AMR and its intended functions in Table 3.4.9 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that were included within the scope of license renewal. The applicant highlighted those components, which meet at least one of the scoping criteria of 10 CFR 54.4(a). The staff compared the LRA flow diagrams to the system drawings and descriptions in the UFSAR to ensure that they were representative of the chilled water system. The staff also sampled

portions of the flow diagrams that were not highlighted to ensure these components did not perform any of the functions associated with the scoping criteria of 10 CFR 54.4(a).

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding the emergency feedwater (EFW) pump room unit coolers that were not considered in the scope of license renewal. In its response to the NRC dated August 30, 2000, the applicant confirms that the EFW pump room unit coolers do not meet any of the scoping requirements in 10 CFR 54.4(a) and, therefore, were not included in the scope of license renewal. In a telephone conference with the applicant on October 31, 2000, the staff raised a question regarding the appropriate cross reference to drawing LRA-M-221 of the UFSAR. The applicant indicates that the current UFSAR does not include a drawing of the chilled water system. The staff, therefore, was unable to verify the content of LRA-M-221. However, during the license renewal scoping inspection as documented in inspection report IR 00-17, the staff performed a review of site controlled piping and instrument drawing of the chilled water system and walked-down portions of that system to verify the accuracy of LRA-M-221.

2.3.3.9.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the chilled water system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.10 Service Water

In Section 2.3.3.10, "Service Water," of the LRA, the applicant described the components of the service water system that are within the scope of license renewal and subject to an AMR. This system is further described in Section 9.3 of the ANO-1 UFSAR.

2.3.3.10.1 Technical Information in the Application

The primary function of the service water system is to transfer heat from safety-related components to an ultimate heat sink. Lake Dardanelle and the emergency cooling pond (ECP) serve as the plant's ultimate heat sink. If the water supply from Lake Dardanelle is lost, water from the ECP can be fed by gravity through the supply line to the service water compartment in the intake structure. The service water system consists of two independent but interconnected, 100 percent redundant trains to insure continuous heat removal. In the event of a loss offsite power supply, the service water pumps are powered from the diesel generators.

The applicant describes its methodology for identifying the mechanical components that are within the scope of license renewal in Section 2.1.1, "Assessment Using Criteria in 10 CFR 54.4," of the LRA. The applicant states that the safety-related service water system provides the emergency supply of water to the emergency feedwater pumps and the spent fuel pool. The service water system is also credited in the fire analysis, and is required to meet the requirements of 10 CFR 50.48. All passive, long-lived safety-related components and piping in the service water system, in addition to the piping to and from the ECP and the sluice gates, are within the scope of license renewal and subject to an AMR.

The applicant identifies some of the components associated with the service water system that are evaluated in other sections of the LRA. These components are the intake structure and the ECP (Sections 2.4.4 and 2.4.5, respectively), and the penetration assembly (section 2.4.3).

On the basis of its methodology described above, the applicant identified portions of the service water system that are within the scope of license renewal, and are shown on the flow diagrams listed on Table 2.3.7 of the LRA. Using the methodology described in Section 2.1.3, "Assessment Using Criteria in 10 CFR 54.21(a)(1)," of the LRA, the applicant lists the mechanical component commodity groupings that are subject to an AMR, and identifies its intended function(s) in Table 3.4.10 of the LRA. The applicant identifies the following eight component commodity groups that are subject to an AMR: piping, pumps, strainers, valves, flow elements, thermowells, sluice gates, and heat exchangers. The applicant also identifies maintaining the pressure boundary and heat transfers as the intended functions.

2.3.3.10.2 Staff Evaluation

The staff reviewed Section 2.3.3.10 of the LRA to determine if the applicant has adequately identified the SSCs of the service water system that are within the scope of license renewal, and the SCs that are subject to an AMR in accordance with 10 CFR 54.4(a), and 54.21(a)(1), respectively. The staff reviewed the text and diagrams submitted by the applicant in Section 2.3.3.10 of the LRA and the ANO-1 UFSAR to identify any SSCs of the service water system that may have been omitted from the scope of license renewal that meet the scoping criteria in 10 CFR 54.4. The SSCs of the service water system that meet the license renewal scoping criteria are included within the scope of license renewal, and are identified as such by the applicant in Section 2.3.3.10 of the LRA.

The applicant identifies and lists the SCs that are subject to an AMR for the service water system in Table 3.4.10 of the LRA using the screening methodology described in Section 2.1 of the LRA. The staff evaluated the scoping and screening methodology and documented their findings in Section 2.1 of this SER. The staff then performed a review of the implementation of the methodology for the service water system by sampling the SCs that were identified as being within the scope of license renewal but not subject to an AMR to verify that these SCs perform its intended functions with moving parts or with a change in configuration or properties, or are subject to replacement based on qualified life or specified time period.

In the LRA, Table 2.3-7, the applicant lists four detailed flow diagrams, LRA-M-204, Sheet 3; LRA-M-209, Sheet 1; LRA-M-210, Sheet 1; and LRA-M-221, Sheet 2, of the service water system. The applicant also identifies the mechanical components subject to an AMR and its intended functions in Table 3.4.10 of the LRA. The detailed flow diagrams were highlighted to identify those portions of the system that were included within the scope of license renewal. The applicant highlighted those components, which meet at least one of the scoping criteria of 10 CFR 54.4(a). The staff compared the LRA flow diagrams to the system drawings and descriptions in the UFSAR to ensure that they were representative of the service water system. The staff also sampled portions of the flow diagrams that were not highlighted to ensure these components did not perform any of the intended functions associated with the scoping criteria of 10 CFR 54.4(a).

In a letter to the applicant dated May 5, 2000, the staff requested additional information regarding certain valves, piping, and strainers that were not highlighted as being within the scope of license renewal, and certain orifices that were identified as being within the scope of license renewal, but not subject to an AMR. In its response to the NRC dated August 30, 2000, the applicant confirms that valves, piping, and orifices identified by the staff were subject to an AMR. The strainers, more commonly known as traveling water screens, are within the scope of license renewal but are not subject to an AMR because they perform the intended function within the scope of license renewal using moving parts and change in configuration. During the scoping inspection, the inspection team evaluated the potential of the trash racks being within the scope of license renewal but determined that these components do not meet any of the scoping criteria in 10 CFR 54(a) and, therefore, are not in the scope of license renewal and not subject to an AMR.

2.3.3.10.3 Conclusions

The staff reviewed the information submitted by the applicant in the LRA, information in the ANO-1 FSAR, and the additional information provided by the applicant in the letter dated August 30, 2000. On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant identified those portions of the service water system that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.11 Penetration Room Ventilation

In the LRA, Section 2.3.3.11, "Penetration Room Ventilation," the applicant identifies portions of the penetration room ventilation system (PRVS), and the components that are within the scope of license renewal and subject to an AMR. In this section of the LRA, the applicant also states that the PRVS is further described in Section 6.5 of the UFSAR.

The applicant evaluates component supports for equipment, piping, fire damper, and motor operated valves that are associated with the PRVS in Section 2.4.6.2 and Table 3.6-8 of the LRA. The applicant also evaluates electrical components that support the operation of the PRVS in Section 2.5 of the LRA. The staff evaluated component supports and electrical components in Sections 2.4.6.2 and 2.5 of this SER. The PRVS instrument lines are individually highlighted as being within the scope of license renewal on flow diagram, LRA-M-264 Rev. 0, Sheet 1. The applicant evaluates these instrument line components with the PRVS system in Section 2.3.3.11 of the LRA.

2.3.3.11.1 Technical Information in the Application

The PRVS schematic and characteristics are shown in the UFSAR, Figure 6-10. Penetration rooms are formed adjacent to the outside surface of the reactor building by enclosing the area around the majority of the penetrations. The only penetrations that do not pass through one of the penetration rooms are the two main steam lines, the permanent equipment hatch, the emergency personnel access lock, the refueling tube and purge lines.

The PRVS is made up of two trains, each train contains a filter assembly, fan, and duct work. Each filter assembly and each fan is designed to handle 2,000 scfm, the second filter assembly

and second fan being a full-size standby (redundant) unit. Normal system flow is approximately 1800 cfm. Particulate filtration is achieved by a medium-efficiency prefilter and a high-efficiency particulate air (HEPA) filter. Adsorption filtration is accomplished by an activated charcoal filter. The design-basis requirement for each charcoal filter is to remove 25 percent of the core iodine inventory. The 25 percent core iodine inventory release was derived using the standard assumption that during a DBA, 50 percent of the halogens are released from the core and that 50 percent of the iodine released plates out within the reactor building.

Following a loss-of-coolant accident (LOCA), a reactor building isolation signal places the lead system in operation by starting the fan and opening the power-operated butterfly damper on the outlet of the filter assembly. If the lead system does not achieve proper flow within 20 seconds, the lead system is automatically stopped, and the standby system automatically starts 5 seconds later. In the event of an excessive pressure drop across any filter, or a high radiation reading on the filter assembly discharge, the standby system can be started remotely.

Penetration room vacuum is displayed in the control room, and low vacuum is annunciated. Fan operating status and the radiation level of filter effluent are displayed in the control room, and high radiation is annunciated. Filter differential pressure (ΔP) is displayed locally and annunciated in the control room. Filter high temperature is annunciated in the control room. The system flow rate is displayed adjacent to the remote control valve stations. The system may be manually actuated from the control room.

In Section 2.3.3.11 of the LRA and Section 6.5 of the UFSAR, the applicant identifies the following intended function and system functions, respectively, for the PRVS that relate to 10 CFR 54.4(a)(1) and 54.4(a)(2):

Section 2.3.3.11 of the LRA -

- The safety function of the PRVS is to collect and process the radioactivity released to the penetration areas due to post LOCA reactor building leakage to ensure that the 10 CFR Part 100 dose values are not exceeded. The intended function of the PRVS, which needs to be considered during the AMR, is to maintain the system pressure boundary integrity.

Section 6.5 of the UFSAR -

- Control and minimize the release of radioactive materials from the reactor building to the environment in post-accident conditions .
- Maintain a negative pressure in the penetration room (with respect to outside atmosphere and auxiliary building) to ensure that any leakage goes into the penetration room when the system is in (normal) operation (to prevent uncontrolled releases).
- Collect and process potential reactor building penetration leakage to minimize environmental activity levels resulting from post-accident reactor building leaks.
- Withstand a single failure without loss of function.

On the basis of the functions identified above, the applicant determined that all PRVS safety-related components (electrical, mechanical, and instrument) are within the scope of license renewal. The applicant described its process for identifying the mechanical components that are subject to an AMR in Section 2.5.2 of the LRA. The applicant uses this methodology, to identify the portions of the PRVS that are within the scope of license renewal, and that are highlighted on flow diagrams listed in Table 2.3-7 of the LRA. Using the methodology described in Section 2.2.1 of the LRA, the applicant lists the mechanical components and component types and the intended function(s) that are within the scope of license renewal and subject to an AMR. The applicant provides this list in Table 3.4-11 of the LRA.

Specifically, the applicant identifies the following 10 device types as being within the scope of license renewal and subject to an AMR: duct (carbon steel), dampers (carbon steel), valves (carbon steel), expansion joints (carbon steel), exhaust stack (carbon steel), exhaust stack screen (stainless steel), blowers (carbon steel), filters (carbon steel), flow element (stainless steel), and tubing (copper and brass).

In LRA Table 3.4-11, the applicant further notes that the PRVS pressure boundary is the only applicable intended function associated with components of the PRVS that are subject to an AMR.

2.3.3.11.2 Staff Evaluation

The NRC staff reviewed the above information to verify that the applicant identified the components of the PRVS that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 54.21(a)(1). The staff also reviewed the information in the UFSAR, Section 6.5. After completing the initial review, the staff issued a RAI, by letter dated June 1, 2000, regarding the PRVS. The applicant responded to that RAI in a letter dated August 30, 2000.

In the LRA, Section 2.1, "Scoping and Screening Methodology," the applicant discusses the process for identifying mechanical components that are subject to an AMR. The NRC staff evaluated the applicant's scoping methodology in Section 2.1 of this SER, "Scoping and Screening Methodology."

In its review of the PRVS, the NRC staff reviewed the flow diagrams listed in LRA Table 2.3-7 (which show the evaluation boundaries for the highlighted portions of the PRVS that are within the scope of license renewal), and Table 3.4-11 (which lists those mechanical components and their intended functions that are subject to an AMR).

The NRC staff also reviewed the UFSAR, Section 6.5, to determine if there were any portions of the PRVS that met the scoping criteria in 10 CFR 54.4(a), but were not identified as being within the scope of license renewal. The staff also reviewed the UFSAR to determine if any system function was not identified as an intended function(s) in the LRA, and to determine if any SCs that have an intended function were omitted from the scope of SCs that are subject to an AMR. The staff also reviewed the PRVS flow diagrams identified in Table 2.3-7 of LRA to determine if any SCs that are within the evaluation boundaries were omitted from the scope of components that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The NRC staff also compared the functions described in the UFSAR to those identified in the LRA, and

then considered whether the applicant had properly identified the SCs that are subject to an AMR from among those identified as being within the scope of license renewal.

The applicant identifies the SCs that are subject to an AMR for the PRVS using the screening methodology described in Section 2.1 of the LRA, and lists them in Table 3.4-11 of the LRA. The NRC staff evaluated the scoping and screening methodology, and documented its findings in Section 2.1 of this SER. The NRC staff sampled the SCs from Table 3.4-11 to verify that the applicant accurately identified the SCs that are subject to an AMR. The staff also sampled the SCs that were within the scope of license renewal, but not subject to an AMR, to verify that these SCs perform their intended functions with moving parts or with a change in configuration or properties, and are subject to replacement based on qualified life or specified time period.

To help ensure that those portions of the PRVS that the applicant identifies as not being within the scope of license renewal do not perform any of the scoping functions in 10 CFR 54.4, the NRC staff requested additional information on the basis of the information in the UFSAR and the LRA. The NRC staff noted that the LRA, Section 2.3.3.11 presents a summary description of the system functions, Table 3.4-7 flow diagrams highlight the evaluation boundaries of the PRVS, and Table 3.4-11 tabulates the PRVS components that are within the scope of license renewal and subject to an AMR. The corresponding drawings for these systems in the UFSAR, however, show additional components that were not listed in Table 3.4-11 of the LRA.

The NRC staff requested specific information concerning the exclusion of the following components from the scope of license renewal and/or an AMR:

- the piping, piping reducers, piping rectangular to round transitions, plugged pitot tube connections

- bird screen or wire mesh for an exhaust stack

In a letter dated August 30, 2000, the applicant provides the following responses: the piping, piping reducers, piping rectangular to round transitions, and plugged pitot tube connections are included in the AMR in the component commodity grouping "duct" in Table 3.4-11 of the LRA; and new component commodity grouping category, "exhaust stack screen," is added in Table 3.4-11 of the LRA for the "bird screen or wire mesh" which was excluded due to an administrative error.

On the basis of the additional information provided by the applicant, the staff did not identify any omission in the component commodity groupings that were included within the scope of PRVS components requiring an AMR.

The NRC staff also requested the following specific information on the following: does the "filter" commodity group include the filter housings, prefilters, absolute HEPA filters and charcoal absorbers (as shown in P&ID M-264); and does the "blower" commodity group include the exhaust fans (VEF-38A/B) and fan housings, as stated in the text of LRA, Section 2.3.3.11, and as shown in P&ID M-264, Sheet 1.

In a letter dated August 30, 2000, the applicant provides the following responses: the "filter" component commodity grouping listed in Table 3.4-11 of the LRA includes the housings for the

prefilters, absolute (HEPA) filters; and the charcoal absorbers; prefilters, absolute (HEPA) filters, and charcoal absorbers are considered short-lived; in accordance with the NRC letter from C.I. Grimes to D.J. Walters, NEI, dated March 10, 2000, regarding License Renewal Issue No. 98-12, "Consumables." This NRC staff guidance states that system filters may be excluded, on a plant-specific basis, from an AMR under 10 CFR 54.21(a)(1)(ii); and because the performance and condition of these filters are periodically tested and the filters are replaced in accordance with ANO-1 TS 4.11, "Penetration Room Ventilation System Surveillance" they are not subject to an AMR.

On the basis of the additional information provided by the applicant, the NRC staff determined that the exclusion of the prefilters, absolute (HEPA) filters, and charcoal absorbers (except their filter housings) from the list of SCs subject to an AMR is consistent with the requirements of 10 CFR54.21(a)(1)(ii). The applicant also states that the "blower" component commodity grouping listed in Table 3.4-11 of the LRA includes the housings for the exhaust fans (VEF-38A/B), and these exhaust fans are active components and thus are not subject to an AMR. The NRC staff found the exclusion of the exhaust fans from the scope of license renewal to be acceptable because they do not meet the scoping criteria in 10 CFR 54.4(a).

Some components that are common to many systems, including the PRVS, have been separately evaluated in the LRA as commodity groups with similar components from other systems, and are evaluated by the NRC staff in other sections throughout this SER.

In Section 2.4 of the SER, the staff evaluated component supports for piping, cables, and equipment that are discussed in LRA Section 2.4 "Structures and Structural Component Scoping and Screening Results." In Section 2.5 of the SER, the staff evaluated electrical components that support the operation of the PRVS which are discussed in the LRA. Section 2.5 "Electrical and Instrumentation and Controls System Scoping and Screening Results." The PRVS instrumentation lines are evaluated with the PRVS, and are listed as "tubing" in LRA Table 3.4-11, of the LRA.

The NRC staff reviewed Exhibit A of the LRA, supporting information in the UFSAR, and the applicant's responses to the staff's RAIs. In addition, the NRC staff sampled several components in the PRVS flow diagrams (Table 2.3-7 of LRA) to determine whether the applicant properly identifies the components that are within the scope of license renewal and subject to an AMR. No omissions were identified.

2.3.3.11.3 Conclusions

On the basis of this review, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the PRVS components that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.12 Auxiliary Building Heating and Ventilation

In the LRA, Section 2.3.3.12, "Auxiliary Building Heating and Ventilation," the applicant identifies the portions of the auxiliary building heating and ventilation system (ABHVS) and its components that are within the scope of license renewal and subject to an AMR. In this section

of the LRA, the applicant states that the ABHVS is further described in Section 9.7.2.1 of the UFSAR.

The applicant evaluates component supports for equipment, piping, fire damper, and motor-operated valves within Section 2.4.6.2 and Table 3.6-8 of the LRA. The applicant evaluates electrical components that support the operation of the ABHVS in Section 2.5 of the LRA. The NRC staff evaluated component supports and electrical components in Sections 2.4.6.2 and 2.5 of this SER, respectively. The ABHVS instrument lines are individually highlighted as being within the scope of license renewal on flow diagrams LRA-M-262, Revision 0, Sheets 3 and 4, LRA-M-263, Revision 0, Sheets 2 and 3. The applicant evaluated these instrument line components with the ABHVS in Section 2.3.3.12 of the LRA.

2.3.3.12.1 Technical Information in the Application

The portions of the ABHVS that are seismic Category 1, include the decay heat removal rooms unit coolers, makeup pump rooms unit coolers, switchgear rooms unit coolers, EDG rooms ventilation system, and auxiliary building electrical rooms unit coolers. Seismic Category 1 components are designed to ensure that this equipment is capable of performing its safety-related function(s) during and following a design-basis earthquake.

Each decay heat removal engineered safeguard room is cooled by two 100-percent capacity fan coil unit coolers (one redundant) installed in each of the three interconnected makeup pump rooms. The makeup pumps remain operable without any of the unit coolers in operation. The unit coolers use service water and, therefore, the loss of the cooling system is not anticipated. The coolers are designed to maintain room temperature below 43.3°C (110 °F) dry bulb (DB) under normal conditions. The unit coolers are automatically energized when decay heat removal equipment is in operation. Service water is supplied to these unit coolers on a continuous basis. Purge systems are available for each room, and are used when access to any room is needed. The air is discharged through the radwaste exhaust system.

Each engineered safeguard switchgear room is normally cooled by air circulated through fan coil unit coolers supplied with chilled water from the control room chillers. Emergency cooling is provided by separate fan coil unit coolers supplied by emergency chillers VCH 4A and 4B. The north vital electrical equipment room is normally cooled by the radwaste auxiliary building ventilation system and the south vital electrical equipment room is normally cooled by an air-cooled refrigeration unit. Emergency cooling for both vital electrical equipment rooms is provided by fan coil unit coolers supplied by emergency chilled water.

Each EDG room is ventilated by two exhaust fan units. Makeup air to these rooms is 100 percent outside air. The capacity of each fan is predicated on the equipment heat gains within the respective room, and the capability to maintain ambient room temperature at or below 43.3°C (110 °F) DB, with two fans running. In the event that one fan fails, the room temperature is maintained by the other fan at a temperature not to exceed 48.9°C (120°F) DB. The emergency diesel electrical equipment and controls are derated to operate at 100 percent of the diesel load, without being affected by an ambient design temperature of 48.9°C (120°F).

The auxiliary building ventilation systems that are seismic Category 2, include the rad waste area ventilation system, reactor building penetration rooms normal ventilation system (reactor

building ventilation system is described in UFSAR Chapter 5 and shown on UFSAR Figure 5-7), fuel handling floor area ventilation system, battery room ventilation system, cable spreading room cooling system, relay room cooling system, heating and ventilating equipment rooms ventilation system, and boiler room exhaust fans.

The auxiliary building ventilation systems primarily uses outside air. The auxiliary building is served by separate ventilation systems for the fuel handling area, the radwaste area, and the non-radioactive area. These systems are shown in the UFSAR, Figure 9-13. The radwaste area ventilation system and fuel handling area ventilation system are not required to meet the single-failure criterion. One supply unit serves the fuel handling area, and the second supply unit serves the radwaste area. The ventilation air from these areas is discharged to the reactor building flutes (plant vents) through multiple filter units. The ventilation air from the fuel handling and radwaste areas are continuously discharged through the exhaust filters. The reactor building penetration rooms emergency exhaust air discharges into the atmosphere through an exhaust stack. The penetration rooms, fuel handling, rad waste, and reactor building purge exhaust lines are monitored separately for radiation by an isokinetic sample taken downstream of each filtering unit. These samples feed a common station vent radiation monitoring system.

The redundant battery rooms have independent exhaust fans (VEF 33, VEF 34). Both rooms are normally cooled by air-cooled refrigeration units. Emergency cooling is provided by emergency cooling units (VUC 14A & C) that are cooled by VCH-4A or 4B.

During operation, the cable spreading room is cooled by a recirculation unit located outside the room. The relay room has two recirculation type cooling units, one of which is a standby unit. The rooms are designed for an ambient temperature of 29.4°C (85°F) during normal operation. Also, a small portion of air is supplied to the relay room from Unit-2 supply fan 2VSF-6 for pressurization of the relay and cable spreading room to prevent any in-leakage from the turbine building. The air leaks to the turbine building area and is not recirculated through the system.

In the LRA, Section 2.3.3.12, and Section 9.7.1 of the UFSAR, the applicant identifies the following intended functions for the ABHVS, consistent with 10 CFR 54.4 and 54.21(a)(1):

Section 2.3.3.12 of the LRA -

- provide a suitable environment for those areas of the auxiliary building that contain equipment requiring post accident cooling
- close some of the fire dampers in the ABHVS during the unlikely event of a fire to meet the requirements of 10 CFR 50.48
- maintain the system pressure boundary integrity for the decay heat removal rooms unit coolers, makeup pump rooms unit coolers, and switchgear rooms unit coolers is the intended function that needs to be considered during the AMR
- maintain the system heat transfer integrity for the decay heat removal rooms unit coolers and switchgear rooms unit coolers is the intended function that needs to be considered during the AMR

Section 9.7.1 of the UFSAR -

- provide a suitable environment for equipment and personnel
- provide maximum safety and convenience for operating personnel, with equipment arranged in zones so that potentially contaminated areas are separated from clean areas to inhibit the spread of any radioactive contamination
- direct the flow path of the ventilation air in the auxiliary building from clean or low-activity areas toward areas of higher activity
- direct all exhaust air from the auxiliary building to the reactor building flutes (plant vents), and to monitor each exhaust separately for radiation using an isokinetic sampling which in turn feeds a common station vent radiation monitoring system.
- Maintain temperature limits in the rad waste and fuel handling areas to 40.6°C (105°F) and 42.8°C (109°F), respectively (during summer), and 15.6°C (60°F) during the winter

On the basis of the intended functions identified above, the portions of the ABHVS that are identified by the applicant as being within the scope of license renewal include all ABHVS safety-related components (electrical, mechanical, and instrument). The applicant describes its methodology for identifying the mechanical components that are subject to an AMR in Section 2.2.1 of the LRA. On the basis of this methodology, the applicant identifies the portions of the ABHVS that are within the scope of license renewal on the flow diagrams listed in Table 2.3-7 of the LRA. Using the methodology described in Section 2.2.1 of the LRA, the applicant lists the mechanical components and component types subject to an AMR that are within the evaluation boundaries highlighted on the flow diagrams, and identified their intended functions. The applicant provides this list in Table 3.4-12 of the LRA.

The following nine device types are identified as being within the scope of license renewal and subject to an AMR: exterior duct (carbon steel), louvers (carbon steel), fans (carbon steel), ductwork (carbon steel), dampers (carbon steel), heat exchangers (carbon steel), tubing for heat exchangers (copper), tubing for heat exchangers (90/10 CuNi), and sealants.

The applicant further noted in Table 3.4-12 that the ABHVS pressure boundary and heat transfer functions are the only applicable intended functions of ABHVS components that are subject to an AMR.

2.3.3.12.2 Staff Evaluation

The NRC staff reviewed the above information to verify that the applicant identified the components of the ABHVS that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 54.21(a)(1). The staff also reviewed the information in the UFSAR, Section 9.7.1. After completing the initial review, the NRC staff issued RAIs by letter dated June 1, 2000 regarding the ABHVS. The applicant provides its response to staff the RAIs in letter dated August 30, 2000.

In the LRA, Section 2.1, "Scoping and Screening Methodology," the applicant discusses the process for identifying mechanical components that are subject to an AMR. The NRC staff evaluated the applicant's methodology in Section 2.1 of this SER, "Scoping and Screening Methodology."

In its review of the ABHVS, the NRC staff reviewed the flow diagrams listed in LRA Table 2.3-7 (which show the evaluation boundaries for the highlighted portions of the ABHVS that are within the scope of license renewal), and Table 3.4-12 (which lists the mechanical components and the applicable intended functions that are subject to an AMR).

The NRC staff also reviewed the UFSAR, Section 9.7, to determine if there were any portions of the ABHVS that met the scoping criteria in 10 CFR 54.4(a), but were not identified as being within the scope of license renewal. The staff also reviewed the UFSAR to determine if there were any safety-related system function(s) that were not identified as intended function(s) in the LRA, and to determine if there were any SCs that have intended function(s) that might have been omitted from the scope of SCs that are subject to an AMR. The staff also reviewed the system flow diagrams identified in Table 2.3-7 of the LRA to determine if any SCs that are within the evaluation boundaries were omitted from the scope of components that are subject to an AMR in accordance with 10 CFR 54.21(a)(1). The NRC staff compared the functions described in the UFSAR to those identified in the LRA. The NRC staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those identified as being within the scope of license renewal.

The applicant identifies the SCs that are subject to an AMR for the ABHVS using the screening methodology described in Section 2.1 of the LRA, and lists them in Table 3.4-12 of the LRA. The NRC staff evaluated the scoping and screening methodology, and documented its findings in Section 2.1 of this SER. The NRC staff sampled the SCs listed in Table 3.4-12 of the LRA to verify that the applicant accurately identified the SCs that are subject to an AMR. The staff also sampled the SCs that the applicant identified as being within the scope of license renewal, but not subject to an AMR, to verify that these SCs perform their intended functions with moving parts or with a change in configuration or properties, and are subject to replacement on the basis of a qualified life or specified time period.

To help ensure that those portions of the ABHVS that the applicant identifies as not being within the scope of license renewal do not perform any intended functions, the NRC staff requested additional information on the basis of the information in the UFSAR and the LRA. The staff noted that in the LRA, Section 2.3.3.12, the applicant presents a summary description of the system functions, Table 3.4-7 flow diagrams highlight the evaluation boundaries of the ABHVS, and Table 3.4-12 tabulates the components that are within the scope of license renewal and subject to an AMR for the ABHVS. However, the corresponding drawings for these systems in the UFSAR, show additional components that were not listed in Table 3.4-12 of the LRA.

The NRC staff requested specific information concerning the exclusion of the following components from the scope of license renewal and/or an AMR:

- damper bodies, blower housings, and cooler housings
- auxiliary building electrical room unit coolers

- fan coil unit housings for fan coil units VUC-1A/B/C/D
- fan coil unit housings for fan coil units VUC-14A/C/D and VUC-2D/B
- diesel generator exhaust fan housings for exhaust fans VEF-24A/B/C/D
- fan coil housing for fan coil unit VUC-14B
- valve bodies for solenoid valves 2100-2108 and 2111-2116
- control valves 7621, 7622, 7635, 7636, and 7638
- fire dampers
- sealant materials

In a letter dated August 30, 2000, the applicant provided the following responses:

- The damper bodies are included in the component commodity grouping "dampers"; cooler housings are included in the component commodity grouping category "heat exchangers."
- The auxiliary building electrical room unit coolers are included in the component commodity grouping "heat exchangers" (switch gear room coolers and auxiliary building electrical room coolers).
- The fan coil housings for fan coil units VUC-1A/B/C/D are included in the component commodity grouping "heat exchangers" (decay heat room coolers).
- The fan coil housings for fan coil units VUC-14A/C/D and VUC-2D/B are included in the component commodity grouping "heat exchangers" (switch gear room coolers).
- The diesel generator exhaust fan housings for exhaust fans VEF-24A/B/C/D were included in an AMR and are included in the component commodity grouping "fans.
- The fan coil housings for fan coil units VUC-14A/B/C/D are included in the component commodity grouping "heat exchangers" (auxiliary building electrical room coolers).
- The valve bodies for solenoid valves 2100-2108 and 2111-2116 are part of the instrument air system and included in the component commodity grouping "valves" in Table 3.4-8 of the LRA and are subject to an AMR.
- The valve bodies for control valves 7635 and 7636 are part of the instrument air system, and are included in the component commodity grouping "valves" in Table 3.4-8 of the LRA and are subject to an AMR. Control valves 7621, 7622, and 7638 are dampers in the ABHVS, and the bodies of these dampers are included in the component commodity grouping "dampers" in Table 3.4-8 of the LRA and subject to an AMR.

- 10 CFR 50.48 fire dampers are within the scope of license renewal and the passive portions of the fire dampers (i.e., the mountings) were included in the AMR in the structural portions of the LRA, Section 3.6.1 and Table 3.6-8 except in the cases where fire dampers formed part of a pressure boundary.

- Sealant materials are within the scope of license renewal when they are part of components or commodities that are within the scope of license renewal and when they are important in maintaining the integrity of the component or commodity. Preventive maintenance activities are credited for managing sealant aging effects, as identified in Table 3.4-12 of the LRA. The component commodity groupings for the ABHVS are included in Table 3.4-12 of the LRA except those groupings identified in Table 3.4-8 of the LRA.

The applicant further clarifies that the fan coil units VUC-1A/B/C/D, VUC-14A/B/C/D, and VUC-2D/B, and the filters associated with those units are considered short-lived, as discussed in an NRC letter from C.I. Grimes to D.J. Walters, NEI, dated March 10, 2000, regarding License Renewal Issue No. 98-12, "Consumables." This NRC staff guidance states that the screening process allows the exclusion of component filters because they are inspected and replaced during preventive maintenance activities, and therefore, these filters are not subject to an AMR.

The staff disagreed with this statement. The guidance in the March 10, 2000, letter on consumables required the applicant to identify any SC that is excluded under 10 CFR 54.21 (a)(1)(ii) based on performance or condition monitoring, and that an applicant must provide a site-specific evaluation to justify the exclusion of any structure or component based on performance or condition monitoring. However, the applicant has provided sufficient additional information such that the NRC staff found the exclusion of the filters that are categorized as "Consumables" from the list of SCs that are subject to an AMR consistent with the requirements of 10 CFR 54.21(a) (1)(ii).

In addition, the NRC staff requested specific information regarding the exclusion of the fuel handling floor exhaust filtration system components (exhaust fans, exhaust filters, flow element, control valves, associated ductwork, and flue) from the scope of license renewal and/or an AMR. In a letter dated August 30, 2000, the applicant clarified that the fuel handling ventilation system is not within the scope of license renewal, since it is not safety-related; its failure would not prevent the satisfactory accomplishment of a safety-related function; and it is not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the NRC regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transient without scram, or station blackout. The applicant also stated that this system is not needed to mitigate the consequences of the fuel handling accident (FHA) on the basis of the following discussion. As stated in ANO-1 SAR Section 14.2.2.3.2, the criterion for reactor protection for an FHA is that the resultant doses from such an incident shall not exceed 25 percent of the 10 CFR 100 limits. The 10 CFR 100 limits at the exclusion boundary are 25 rem to the whole body and 300 rem to the thyroid, and the numerical criteria for an FHA are 25 percent of these values (based on the ANO-1 SAR criterion above), or 6.25 rem to the whole body and 75 rem to the thyroid. The UFSAR, Table 14-25, shows that an FHA with an unfiltered release would only result in a dose of 0.27 rem to the whole body and 63.599 rem to

the thyroid at the exclusion boundary. Since these doses are below the criteria, having a filtered ventilation path for an FHA is not necessary. Thus, operation of the fuel handling ventilation system is not required to meet the ANO-1 UFSAR criterion for an FHA, and the system does not meet the 10 CFR 54.4(a) criteria for inclusion within the scope of license renewal. On this basis, the NRC staff has no objections to the exclusion of the fuel handling floor exhaust filtration system components from the scope of license renewal.

The NRC staff also requested more specific information on the exclusion of the following components from the scope of license renewal and/or an AMR:

- air bottles (VRA 2 through VRA 8)
- exhaust ductwork
- fan coil units (VUC-2A/C, VUC-3, VUC 4 A/B, VUC-11, VUC-13A/B, VE-1A/B), and VUE-32 through VUE-35
- exhaust filtration units (VEF-8A/B, VEF-33, and VEF-34)
- vent (VPH-6) with associated ductwork
- fire dampers
- flow element (FE8001)
- valve bodies for control valves (CV 7603 and CV 7604)

In a letter dated August 30, 2000, the applicant states that the air bottles, fan coil units, exhaust filtration units, vent and associated ductwork, flow element, and valve bodies for control valves are not within the scope of license renewal because they do not meet the scoping criteria in 10 CFR 54.4(a). Specifically, these units are not safety-related; the failure of any of these components would not prevent the satisfactory accomplishment of a safety-related function; and they are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the NRC regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout. On that basis, the NRC staff found the exclusion of the above referenced air bottles, fan coil units, exhaust filtration units, vent with associated ductwork, flow element, and valve bodies from the scope of license renewal to be acceptable.

The applicant also stated that the exhaust ductworks for the north and south electrical penetration rooms (two zones each), the north and south piping penetration rooms, and the electrical equipment room, are subject to an AMR, and are included under the "duct" component commodity grouping "duct" in Table 3.4-11 of the ANO-1 LRA. The absence of highlighting on Drawings LRA-M-262, Sheets 1 and 2, to indicate that these exhaust ductworks (up to the associated isolation dampers) are within the scope of the license renewal was an administrative error.

The applicant also informed the NRC staff that the "fire dampers" in question do not form part of a pressure boundary of a system that is within the scope of license renewal, and are treated generically in the structural portions of the LRA, Section 3.6.1 and Table 3.6-8. On the basis of the above information, the NRC staff found the exclusion of the fire dampers in question from the scope of license renewal to be acceptable because they do not meet the scoping criteria in 10 CFR 54.4(a).

Some components that are common to many systems, including the ABHVS, have been separately evaluated in the LRA as commodity groups with similar components from other systems, and are evaluated by the NRC staff in other sections throughout this SER. In Section 2.4 of the SER the staff evaluated component supports for piping, cables, and equipment, that are discussed in LRA Section 2.4 "Structures and Structural Component Scoping and Screening Results." In Section 2.5 of the SER, the staff evaluated electrical components that support the operation of the ABHVS; these components are discussed in the LRA Section 2.5, "Electrical and Instrumentation and Controls System Scoping and Screening Results." The ABHVS instrumentation lines are evaluated with the ABHVS, and are listed as "tubing" in Table 3.4-12 of the LRA.

The NRC staff reviewed the LRA, supporting information in the UFSAR, and the applicant's responses to the staff's RAI. In addition, the NRC staff sampled several components from the ABHVS flow diagrams (Table 2.3-7 of LRA) to determine whether the applicant properly identified the components that are within the scope of license renewal and subject to an AMR. No omissions were identified.

2.3.3.12.3 Conclusions

On the basis of this review, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the ABHVS that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.3.13 Control Room Ventilation

In the LRA, Section 2.3.3.13, "Control Room Ventilation," the applicant identifies portions of the control room ventilation system (CRVS), and its components that are within the scope of license renewal and subject to an AMR. The applicant states in Section 2.3.3.13 of the LRA that the CRVS is further described in Section 9.7 of the UFSAR.

The applicant also evaluates component supports for equipment, piping, fire damper, and motor operated valves within this system in Section 2.4.6.2 and Table 3.6-8 of the LRA. The applicant evaluated electrical components that support the operation of the CRVS in Section 2.5 of the LRA. The NRC staff evaluated component supports and electrical components in Sections 2.4.6.2 and 2.5 of this SER. The CRVS instrument lines are individually highlighted as being within the scope of license renewal on flow diagrams LRA-M-2221, Rev. 0, Sheet 2, and LRA-M-263, Rev. 0, Sheet 1. The applicant evaluated these instrument line components with the CRVS system in Section 2.3.3.13 of the LRA.

2.3.3.13.1 Technical Information in the Application

Normal Ventilation System

The normal control room ventilation system serves the control room and computer room only. The control room and computer room are normally air conditioned by two 100-percent capacity air conditioning units that receive chilled water from two 100-percent capacity chillers. One air conditioning unit is normally running, with the other in standby status, and isolated from the system by shutoff dampers. The standby unit is available for manual actuation in the event of failure of the operating unit. Fan failure is monitored at the unit by a flow switch with an indicating light in the control room. The CRVS is designed to maintain ambient room temperature at 23.9°C (75°F) DB and 43 percent relative humidity given the space load, lighting load, and equipment load. Computer equipment cooling is achieved by two-out-of-three packaged air conditioning units (one standby), which are located in the computer room and circulate air through a false floor.

Control Room Isolation System

The control room air is continuously monitored, and alarmed for high radiation. The control room inlet air radiation monitor consists of an auto ranging digital rate-meter, pre-amplifier, and Beta-Gamma sensitive scintillation detector. Redundant quick-acting chlorine detectors are presently in place in the control room fresh air inlets, which initiates closure of the isolation dampers if chlorine (Cl_2) levels exceed 5 ppm in the incoming air.

Cl_2 detection system design features are consistent with the recommendations of Regulatory Guide 1.95, "Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release," February 1975. However, since elemental Cl_2 is no longer stored or used onsite, or within a 8 kilometer (5 mile) radius of the plant, the regulatory guide recommendation for seismic Category 1 designation is not necessary at ANO-1. A postulated seismic event concurrent with transport failure and offsite release of Cl_2 or other toxic gas is not considered a credible event.

In the event of high radiation or Cl_2 levels, the normal air conditioning system is automatically de-energized, and the normal control room ventilation system is completely isolated from both the outside air and the rest of the building within 5 seconds after detection. The actuation level for high radiation is sufficiently below hazardous radiation levels to minimize operator doses during an accident, and is sufficiently above normally experienced background levels to minimize spurious actuations. The control room isolation dampers in the supply and return ductwork are spring loaded, such that they fail closed upon loss of air or power. The single supply and single return isolation dampers are both actuated by either one of two solenoid valves.

To ensure initiation of control room emergency air filtration within 10 seconds after a step increase in Cl_2 concentration that results in a control room isolation, the HVAC isolation damper is interlocked with the control room emergency air filtration system. Under these conditions, control room air is recirculated by the emergency air filtering system. The emergency air filtering system consists of two redundant filter trains. One filter train consists of a fan, roughing filters, HEPA filters, and a 10.2 cm (4-inch) deep-bed charcoal absorber rated for 2,000 cfm.

The other train consists of a fan, a filter unit rated for 2,000 cfm with an outside air filter unit rated for 333 cfm, each with the necessary roughing filters, HEPA filter, and 5.1 cm (2-inch) charcoal tray absorber. For either train, 333 cfm of outside air, that is used for pressurization, will be filtered through 10.2 cm (4-inch) of charcoal absorber, and the recirculating air will go through at least 5.1 cm (2-inch) of charcoal bed. Fan flow is monitored by a flow switch with an indicating light in the control room. On an indication of low flow, the standby unit will be manually started.

The safety-related high-efficiency particulate filters and charcoal filters are tested in accordance with the guidance in Regulatory Guide 1.52, as specified in ANO-1 TS 4.10.

Emergency Ventilation System

The original DBA maximum emergency cooling pond (ECP) temperature of 54°C (129.5°F) discussed in the UFSAR, Section 9.3.2.4, exceeded earlier estimates of past ECP temperature. This change required the replacement of the Unit 2 emergency air conditioning units with larger units capable of operating with 54°C (129.5°F) cooling water. The new control room emergency air conditioning units are located in the Unit 2 control room, where they provide emergency air conditioning to both Unit 1 and Unit 2 control rooms and provide for air mixing during a control room isolation condition. Seismically supported ductwork has been added for air distribution to the Unit 1 control room.

In conjunction with installation of new control room emergency air conditioning units, a cross-connect between the Unit 1 service water system (Loop 2), and the air conditioning condensing units, were added to provide an alternate source of service water to the emergency air conditioning system.

The worst-case outside environment assumed for this analysis is a maximum of 39.4°C (103°F) DB, 28.3°C (83°F) wet bulb (WB), and 43 percent relative humidity. These environmental conditions are predicated on records of ambient conditions at the site. The capacity of the control room emergency recirculation system is based on a minimum of three room air changes per hour for the combined control room volume. The filter banks are sized in accordance with the manufacturer's recommendations for maximum efficiency. The control room operator has manual control for selecting fan, filter, and air conditioning unit operations, in order to ensure satisfactory control room conditions following an accident. Self-contained breathing apparatus (SCBA) are available for use following a toxic gas release.

All portions of the reactor protection and engineered safeguards actuation systems located in the control room are designed to operate at the ambient conditions of 43.3°C (110°F) and 80-percent-relative humidity.

Fire or smoke in the control room could be visually detected by the operator. The valves that isolate the control room from the other areas close in 5 seconds. This prevents significant quantities of smoke from entering the control room from the outside. In the unlikely event of a fire in the control room, smoke is exhausted outside of the building, and makeup air is supplied to the room by the normal ventilation system. The system is sized such that it provides 15 air-changes per hour. This ventilation rate rapidly dissipates any smoke generated or admitted to the control room. A failure analysis was performed to demonstrate the ability of the control

room emergency air conditioning system to meet single-failure criterion. The analysis is documented in the UFSAR Table 9-20.

In Section 2.3.3.13 of the LRA and Section 9.7 of the UFSAR, the applicant identifies the following intended functions for the CRVS, consistent with 10 CFR 54.4(a)(1) and 54.4(a):

Section 2.3.3.13 of the LRA -

- Isolate the control room under accident conditions.
- Provide a suitable environment for the control room operators and for equipment that requires post-accident cooling.
- Credit the fire dampers and temperature elements on the charcoal filters in the CRVS to meet the requirements of 10 CFR 50.48.
- Remove smoke from the control room during and after a fire.

Section 9.7 of the UFSAR -

- Provide a suitable environment for equipment and personnel.
- Provide maximum safety and convenience for operating personnel with equipment arranged in zones, so that potentially contaminated areas are separated from clean areas to inhibit the spread of any radioactive contamination.
- Isolate the control room on detection of high radiation or high Cl_2 (5 ppm level) in fresh air supply inlets.
- Withstand a single failure without loss of function for the control room emergency air conditioning system (failure analysis is shown in Table 9-20 of the UFSAR).
- Maintain ambient conditions of 110 °F and 80 percent relative-humidity inside the control room to protect the portions of the reactor protection and engineered safeguards actuation systems that are located in the control room.

On the basis of the above intended functions, the portions of the CRVS system that were identified by the applicant as being within the scope of license renewal include all CRVS safety-related electrical, mechanical, and instrument components. The applicant describes its methodology for identifying the mechanical components that are subject to an AMR in Section 2.5.2 of the LRA. On the basis of that methodology, the applicant identified the portions of the CRVS that are within the scope of license renewal on the highlighted flow diagrams listed in Table 2.3-7 of the LRA. Using the methodology described in the LRA, Section 2.2.1, the applicant compiles a list of the mechanical components and component types that are within the license renewal evaluation boundaries, and that are subject to an AMR in Table 3.4-13 of the LRA. This table also contains the intended functions identified by the applicant.

Specifically, the applicant identifies 12 device types as being within the scope of license renewal and subject to an AMR: duct work (carbon steel), dampers (carbon steel), heat exchangers (carbon steel), fans (carbon steel), filters (carbon steel), tubing (copper, brass and admiralty), valves (carbon steel), evaporators (carbon steel), evaporator tubing (copper), condenser (carbon steel), condenser tubing (90/10 CuNi), and compressor (carbon steel).

In the LRA, Table 3.4-13, the applicant also notes that maintaining pressure boundary and heat transfer are the only applicable intended functions associated with the components of the CRVS that are subject to an AMR.

2.3.3.13.2 Staff Evaluation

The NRC staff reviewed the above information to verify that the applicant identified the components of the CRVS that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 54.21(a)(1). The staff also reviewed the information in the UFSAR, Section 9.7.1. After completing the initial review, the NRC staff issued RAIs by letter dated June 1, 2000, regarding the CRVS. The applicant responded to that RAI in a letter dated August 30, 2000.

In the LRA, Section 2.1, "Scoping and Screening Methodology," the applicant discusses the process for identifying mechanical components subject to an AMR. The applicant's scoping methodology is evaluated in Section 2.1 of this SER, "Scoping and Screening Methodology."

In its review of the CRVS, the NRC staff reviewed the flow diagrams listed in Table 2.3-7 (which show the evaluation boundaries for the highlighted portions of the CRVS that are within the scope of license renewal) and Table 3.4-13 (which lists the mechanical components and their intended functions that are subject to an AMR).

The NRC staff also reviewed the UFSAR, Section 9.7 to determine if there were any portions of the CRVS that met the scoping criteria in 10 CFR 54.4(a) that the applicant did not identify as being within the scope of license renewal. The staff also reviewed the UFSAR to determine if there were any system function(s) that were not identified as intended function(s) in the LRA, and to determine if there were any SCs that have intended function(s) that might have been omitted from the scope of SCs that are subject to an AMR. The staff also reviewed the CRVS flow diagrams identified in Table 2.3-7 of the LRA to determine if any SCs that are within the evaluation boundaries were omitted from the scope of components that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The NRC staff compared the functions described in the UFSAR to those identified in the LRA. The staff then determined whether the applicant had properly identified the SCs that are subject to an AMR from among those identified as being within the scope of license renewal.

The applicant identifies and lists the SCs that are subject to an AMR for the CRVS in Table 3.4-13 of the LRA using the screening methodology described in Section 2.1 of Exhibit A of the LRA. The NRC staff evaluated the scoping and screening methodology, and documented its findings in Section 2.1 of this SER. The NRC staff sampled the SCs listed in Table 3.4-13 to verify that the applicant accurately identified the SCs that are subject to an AMR. The staff also sampled the SCs that were within the scope of license renewal, but not subject to an AMR to verify that these SCs perform their intended functions with moving parts

or with a change in configuration or properties, or are subject to replacement based on qualified life or specified time period.

To help ensure that those portions of the CRVS identified as not being within the scope of license renewal do not perform any applicable intended function, the NRC staff requested additional information. The NRC staff noted that the LRA, Section 2.3.3.13, presents a summary description of the system functions, Table 2.3-7 flow diagrams highlight the evaluation boundaries of the CRVS, and Table 3.4-13 tabulates the CRVS components that are within the scope of license renewal and subject to an AMR. However, the corresponding drawings for these systems in the UFSAR, show additional components that were not listed in Table 3.4-13 of the LRA.

The NRC staff requested more specific information concerning the exclusion of the following components and component groupings from the scope of license renewal:

- damper bodies, blower housings, and cooler housings
- control room emergency unit coolers
- electrical equipment room 2150 emergency cooling units
- filtration unit housings for emergency filter and fan units (VSF-9 and 2VSF-9)
- valve bodies for control valves (CV-7905, CV-7907, and CV-7910)
- air-operated dampers and operators (2PCD-8605, 2PCD-8607, 2UCD-8609, and 2UCD-8683)
- air handling unit housings, and heating and cooling coils for 2VUC-27A/B
- sealants
- radiation monitors and Cl_2 detectors

In a letter dated August 30, 2000, the applicant provided the following responses:

- The carbon steel damper bodies are included in the "dampers" component commodity group, the blower housings are included in the "fans" component commodity group, and the cooler housings are included in the "heat exchangers (evaporators), component commodity group with a "pressure boundary intended function," and are subject to an AMR. These components are listed in Table 3.4-13 of the LRA. Although aluminum damper bodies are not listed in Table 3.4-13 due to an administrative error, they are also subject to an AMR.
- The control room emergency unit coolers are included in the "heat exchangers (evaporators)" component commodity grouping in Table 3.4-13 of the LRA, and are subject to an AMR.

- Copper tubes in the electrical equipment room 2150 emergency cooling units that maintain the Freon pressure boundary are included in the "heat exchangers (evaporators)" component commodity grouping in Table 3.4-13 of the LRA, and are subject to an AMR.
- Housings for the emergency filter and fan units VSF-9 and 2VSF-9 and the outside air emergency filter unit are shown in the fans and "filters" component commodity group in Table 3.4-13 of the LRA, and are subject to an AMR.

- Valve bodies for control valves (dampers) CV-7905, CV-7907, and CV-7910 are included in Table 3.4-13 of the LRA under the "dampers" component commodity group and are subject to an AMR.

- Bodies for air-operated dampers 2PCD-8607A/B, 2UCD-8609, 2PCD-8685, and 2UCD-8683 are included in the component "dampers" commodity grouping for damper bodies made of aluminum and carbon steel (similar to item 1 above) in Table 3.4-13 of the LRA, and are subject to an AMR. Exceptions to this grouping include the dampers and their operators, which are considered to be active components, and are not subject to an AMR.

- Housings and cooling coils for the fan and cooling units 2 VUC-27A/B (which each contains a filter, cooler, and fan) are included in Table 3.4-13 of the LRA in the "heat exchangers (evaporators)" component commodity grouping with a pressure boundary intended function. (The coolers contained in these units are also evaluated in the table with regard to their heat transfer function), and are subject to an AMR.

- Sealant materials used to maintain positive pressure in the control room are within the scope of license renewal and are subject to an AMR.

- Supply vent radiation detectors 2RE8001A/B and 2RE-8750-1A/1B for the Unit 1 and 2 main control room (MCR), respectively, isolate the control rooms on high inlet air radiation, are safety-related, and are within the scope of license renewal. However, these detectors are active components, and thus are not subject to an AMR except for the passive, long-lived electrical, and instrumentation and controls components associated with these detectors which are evaluated in Sections 2.5 and 3.7 of this report. The area radiation monitor (RE-8001) inside the Unit 1 MCR and Cl_2 detectors (2CLS-8760-2, 2CLS-8761-1, 2CLS-8762-2, and 2CLS-8763-1) do not meet the scoping criteria of 10 CFR 54.4(a), and are not within the scope of license renewal. The applicant explained that these monitors are not safety-related; do not prevent the satisfactory accomplishment of a safety-related function if they were to fail; and are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the NRC regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout.

- As stated in UFSAR Section 9.7.2.1 5, the Cl_2 detection system design features are consistent with the recommendations of Regulatory Guide 1.95, "Protection of Nuclear Power Plant Control Room Operators Against an Accidental Cl_2 Release," February 1975. However, elemental Cl_2 is no longer stored or used on site, or within a 5-mile radius of the plant site; therefore, the regulatory guide recommendation for Seismic

Category I designation is not necessary for ANO-1. In addition, a postulated seismic event concurrent with transport failure and offsite release of Cl_2 or other toxic gas is not considered a credible event.

The staff also requested a verification that the CRVS components (including air handling units and fan coil units with their associated ductwork, fire damper and control valves, air intake, and exhaust fan with purge ductwork) inside the main control room environment (MCRE) are within the scope of license renewal and subject to an AMR, or for the applicant to provide a justification for excluding these components from the scope of license renewal and an AMR. In a letter dated August 30, 2000, the applicant responded that the ANO-1 MCRE includes the auxiliary building walls, floor, ceiling, and doors that encompass the control room; piping penetrations; fire dampers; and the safety-related components in the control room ventilation system. The walls, floor, ceiling, and doors of the control room and the piping penetrations were included in the structural review (see Section 2.4.3 and 3.6 of the LRA); fire dampers also were included in the structural review, except for those that form part of the pressure boundary for the safety-related portions of the control room ventilation system; these fire dampers were included in an AMR for the CRVS. The above CRVS components, which are relied on to perform the safety-related cooling and filtration functions for the MCRE, are included in the LRA, Table 3.4-13, as being within the scope of license renewal and subject to an AMR. The staff reviewed the applicant's response, and did not identify any omissions from the CRVS components that are relied on to perform the safety-related cooling and filtration functions for the MCRE.

Some components that are common to many systems, including the CRVS, have been separately evaluated in the LRA as commodity groups with similar components from other systems, and are evaluated by the NRC staff in other sections throughout this SER.

In Section 2.4 of the SER the staff evaluated component supports for piping, cables, and equipment, which are discussed in LRA Section 2.4, "Structures and Structural Component Scoping and Screening Results." In Section 2.5 of the SER, the staff evaluated the electrical components that support the operation of the CRVS; these components are discussed in the LRA Section 2.5, "Electrical and Instrumentation and Controls System Scoping and Screening Results." The CRVS instrumentation lines are listed as "tubing" in Table 3.4-13 of the LRA.

The NRC staff reviewed the LRA, supporting information in the UFSAR, and the applicant's responses to the staff's RAI. In addition, the NRC staff sampled several components from the CRVS flow diagrams (Table 2.3-7 of the LRA) to determine whether the applicant properly identified the components that are within the scope of license renewal and subject to an AMR. No omissions were identified.

2.3.3.13.3 Conclusions

On the basis of this review, the staff finds that there is reasonable assurance that the applicant has adequately identified the portions of the CRVS that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.4 Steam and Power Conversion Systems

The ANO-1 steam and power conversion systems are designed to remove heat from the reactor coolant system, and include the following systems: main steam system, main feedwater system, emergency feedwater system, and condensate storage and transfer system. In the LRA, Section 2.3.4, "Steam and Power Conversion System," the applicant describes these systems, and identifies and lists the components from these systems that are within the scope of license renewal and subject to an AMR. The applicant describes its process for identifying the mechanical components that are within the scope of license renewal and subject to an AMR in the LRA, Section 2.1 "Scoping and Screening Methodology," and Section 2.2.1, "Mechanical and Electrical Systems."

2.3.4.1 Summary of Technical Information in the Application

In the LRA, Section 2.3.4, the applicant describes the steam and power conversion systems, and identifies the following four portions of the steam and power conversion systems that are within the scope of license renewal:

- main steam
- main feedwater
- emergency feedwater
- condensate storage and transfer

In the LRA, Table 2.3-8, the applicant provides a list of scoping drawings, consisting of the P&IDs, for the four steam and power conversion systems that are within the scope of license renewal. The applicant provided a highlighted set of these drawing with the LRA, to show the portions of these systems that are within the scope of license renewal. From the components highlighted in these drawing, the applicant provided lists of the mechanical component groups that are subject to an AMR in the LRA, Table 3.5-1 through Table 3.5-4 for the main steam system, main feedwater system, emergency feedwater system, and condensate storage and transfer system, respectively.

The ANO-1 main steam system is primarily a non-safety-related system, with the majority of the system components outside the scope of license renewal. However, the non-safety-related small-bore piping and components that are attached to the steam generator shell, which perform a system pressure boundary function, are in scope. This includes valves that are part of the heater vent system. In addition, the safety-related portion of the main steam system piping between the steam generators and the main steam isolation valves, including the steam supply to the emergency feedwater (EFW) turbine, as well as the nitrogen supply to the steam generators is in the scope of license renewal.

The safety-related functions of the main steam system is to remove heat from the RCS to protect the RCS and the steam generators from over pressurization, to provide isolation for the steam generators during a postulated steam line break, and to supply steam to the emergency feedwater turbine. The components in the main steam system that are subject to an AMR include the piping between the steam generators and the main steam isolation valves, the piping from the nitrogen supply to the steam generators, the vent and drain valves from the steam generators to the main steam isolation valves, and EFW turbine steam supply piping.

This includes the main steam safety valves, the atmospheric dump and block valves, and the main steam isolation valves. The primary intended function for the components that are within the scope of license renewal is pressure boundary integrity. The following drawings are identified for the main steam system: LRA-M-204, Sheet 6, LRA-M-206, Sheets 1 and 2. The portions of the system that are within the scope of license renewal are highlighted on the main steam system drawings.

The main feedwater system is a two train system consisting of pumps, feedwater heaters, associated piping and valves. This system supplies feedwater to the steam generators to support normal plant operation. The ANO-1 main feedwater system is largely a non-safety-related system, and therefore, the majority of the system components are outside of the scope of license renewal. The piping between the main feedwater isolation valves and the steam generators is the portion of the main feedwater system that is safety-related. Other portions of the main feedwater system are non-safety-related and are outside of the scope of license renewal. The main feedwater isolation valves isolate the feedwater line during a main steam or a main feedwater line break. The components that move to provide the necessary isolation are active. However, the valve bodies and piping in the safety-related portions of the system are within the scope of license renewal and subject to an AMR because they are required to maintain the main feedwater system pressure boundary integrity.

The components in the main feedwater system that are subject to an AMR include the main feedwater isolation valves and the piping, vent, and drain valves in the piping from the isolation valves to the steam generator ring headers. The intended function of the main feedwater system components that are subject to an AMR is to maintain pressure boundary integrity. The main feedwater system drawing is LRA-M-206, Sheet 1, which is highlighted to show the portions of the system that are within the scope of license renewal. The mechanical component groups for the main feedwater system that are subject to an AMR are identified in Table 3.5-2 of the LRA, and includes piping, tubing and valves.

The EFW system is a two train system that contains pumps, associated piping, and valves used to supply emergency feedwater to the steam generators upon failure of the main feedwater system. One EFW pump is motor-driven and the other is turbine-driven. Both pumps are capable of taking suction from the safety-related condensate storage tank, the non-safety-related condensate storage tank, the service water system, or the ANO-2 condensate storage tanks. Both EFW pumps supply feedwater to both steam generators.

The EFW system provides a backup source of feedwater to the steam generators to ensure the removal of decay heat from the reactor core, and the removal of residual heat from the primary system. The EFW system removes decay heat until the plant has been cooled and depressurized sufficiently to permit use of the decay heat system.

The EFW system components that are subject to an AMR include the EFW discharge piping and valves, the EFW pumps, the safety-related portion of the minimum recirculation lines, and the pump discharge piping and valves to the steam generators EFW headers. The main steam supply valves to the EFW turbine and the steam supply piping downstream of the valves are also within the scope of license renewal and are included within the scope of this review. The steam generators EFW headers and the associated nozzles are included within the scope of the steam generator AMR.

The EFW system's primary intended function is pressure boundary integrity. For the heat exchangers included within the scope of this review, heat transfer is also an intended function that needs to be considered during the AMR.

The EFW system drawings are LRA-M-204, Sheets 3 and 6, and LRA-M-206, Sheet 1. These drawings are highlighted to show the portions of the EFW system that are within the scope of license renewal. The EFW system mechanical components are divided into commodity groups that are subject to an AMR. These mechanical components commodity groups are identified in Table 3.5-3 of the LRA, and include piping, valves, tubing, pump casings, orifice plates, steam traps, turbine casing, expansion joints, filters, and heat exchangers.

The ANO-1 condensate storage and transfer system consists of the condensate storage tank, the safety-related condensate storage tank, and the system piping and valves that are needed to supply water from the condensate storage tanks to the secondary plant systems. This system is the primary source of demineralized water to the secondary plant. The safety-related condensate storage tank and the associated piping serves as the safety-related initial (preferred) source of water to the emergency feedwater pumps. The condensate storage and transfer system mechanical components that are within the scope of license renewal and subject to an AMR include the safety-related condensate storage tank, and the piping that maintains the pressure boundary of the system from the condensate storage tanks to the emergency feedwater pumps. The primary intended function of the system is pressure boundary integrity. The condensate storage and transfer system drawings are LRA-M-204 Sheets 3 and 5. These drawings are highlighted to show the portions of the system that are within the scope of license renewal. The applicant identifies the mechanical component commodity groups that are subject to an AMR in Table 3.5-4 of the LRA, and includes piping, tubing, valves, appurtenances, tanks, and heaters.

2.3.4.2 Staff Evaluation

The staff reviewed the above information to verify that the applicant identified the components of the steam and power conversion systems that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 54.21(a)(1).

The applicant identified and listed the components subject to an AMR for the steam and power conversion systems in Table 3.5-1 through Table 3.5-4 of the LRA using the screening methodology described in Sections 2.1 and 2.2.1 of the LRA. The screening methodology is evaluated by the NRC staff in Section 2.1 of this SER.

The NRC staff reviewed the ANO-1 UFSAR, Chapter 10, "Steam and Power Conversion System," to determine if there were any system functions, not identified as intended function in accordance with 10 CFR 54.4. The NRC staff then reviewed the system drawings (LRA-M-204 Sheets 3, 5, and 6, and LRA-M-206, Sheets 1 and 2) to verify that the applicant identified all the components that are within the scope of license renewal in accordance with 10 CFR 54.4(a). Further, the NRC staff verified the accuracy of the system drawings, and completeness of Table 3.5-1 through Table 3.5-4 by sampling the components adjacent to, but outside the highlighted portion of the system to verify that all the components that are within the scope of license renewal were included in the applicant's evaluation. In addition, the NRC staff sampled the components that are within the scope of license renewal, but not subject to an AMR to verify

that all of the components that meet the requirements of 10 CFR 54.21(a)(1) were subject to an AMR.

As a result of this review, the NRC staff requested additional information in a letter to the applicant dated May 5, 2000. The applicant responded to the NRC staff's RAI in a letter to the NRC dated, August 20, 2000.

In its responses, the applicant verified that the EFW valve body for valve MS-2652 and the associated instrument tubing are within the scope of license renewal and were included in the AMR. These components, which are made of carbon steel, are included in the component commodity groupings "valves" and "tubing" in Table 3.5-1 of the ANO-1 LRA. The lack of highlighting on Drawing LRA-M-206, Sheet 1, to indicate that these components are within the scope of license renewal was an administrative error. In addition, the applicant also verified that the EFW turbine casing, which is part of the EFW system, is within the scope of license renewal and was included in an AMR. The results of the AMR for this casing are provided in Table 3.5-3 under the steam supply and exhaust subsystem.

The NRC staff had also asked the applicant to explain the exclusion of the emergency feedwater initiation and control (EFIC) system in Drawing No. LRA-M-206, Sheet 2, from the scope of license renewal. The applicant responded that the emergency feedwater initiation and control (EFIC) system is not a mechanical system, and thus it is not color coded on the drawings as being within the scope of license renewal. Drawing LRA-M-206, Sheet 2, shows three solenoid-operated valves located in the instrument air system that are within the scope of license renewal. Operation of these valves is controlled by the EFIC system. As indicated in Table 2.2-1 of the ANO-1 LRA, the EFIC system is within the scope of license renewal and was included in the review of ANO-1 electrical and instrumentation and controls systems as described in Sections 2.5 and 3.7 of the LRA.

For the main steam system, the applicant verified that no filters or expansion joints are within the scope of license renewal. Two orifices in the main steam system are within the scope of license renewal and were included in the AMR. These orifices, which are made of stainless steel, serve a pressure boundary intended function, and are included in the "piping" component commodity grouping in Table 3.5-1 of the ANO-1 LRA.

For the condensate storage and transfer system, the NRC staff asked the applicant to justify the exclusion of the demineralizer from the scope of license renewal. The applicant responded that although the condensate storage and transfer system is filled with demineralized water, it does not contain a demineralizer. The source of make-up water to the condensate storage and transfer system is from the mobile water treatment facility via the makeup water degasification system. The makeup line to the safety-related condensate storage tank is not safety-related, and its failure would not prevent the tank from performing its intended function. Thus, the makeup line is not within the scope of license renewal. Condensate demineralizers are part of another ANO-1 system (i.e., the condensate demineralizer system), and do not interface with the safety-related portions of the condensate storage and transfer system. The applicant also verifies that the condensate storage and transfer system has no filters, expansion joints, orifices, or strainers that are within the scope of license renewal.

On the basis of the NRC staff's review of the LRA and associated drawings, the ANO-1 UFSAR, and the applicant's responses to RAIs, the staff did not identify any omissions from the components highlighted in the diagrams that identify the system level scoping boundaries. The NRC staff also compared the components listed in Tables 3.5-1 through 3.5-4 of the LRA and the components highlighted in the drawings, and found them consistent.

2.3.4.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the steam and power conversion systems that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.3.5 References for Section 2.3

1. 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
2. DG-1047, "Standard Review Plan for the Review of License Renewal Application for Nuclear Power Plants," Working Draft, April 21, 2000.
3. Arkansas Nuclear One - Unit 1, License Renewal Application dated January 31, 2000.
4. ANO-1 Updated Final Safety Analysis Report.

2.4 Structures and Structural Components Scoping and Screening Results

2.4.1 Reactor Building

In the LRA, Section 2.4.1, "Reactor Building," the applicant described the reactor building structure, and identified its structural components that are within the scope of license renewal and subject to an AMR. The design of the reactor building structure is described in Sections 5.1 and 5.2 of the ANO-1 UFSAR. The NRC staff reviewed this information to determine whether the applicant has adequately demonstrated that the requirements of 10 CFR 54.4, 54.21(a)(1), and 54.21(a)(2) have been met for the reactor building structure and structural components.

2.4.1.1 Technical Information in the Application

In the LRA, Section 2.4.1, the applicant states that the reactor building is a seismic Category 1 structure that completely encloses the reactor and RCS, as well as other electrical, mechanical, and structural SSCs. Seismic Category 1 structures are designed to prevent the uncontrolled release of radioactive material as a result of a specified seismic event, and to withstand all applicable loads without loss of function.

The reactor building structure consists of a post-tensioned concrete cylindrical shaped wall, a shallow domed roof, and a flat reinforced concrete foundation. The internal surfaces of the wall, roof, and foundation are lined with a carbon steel liner to maintain a high degree of leak tightness. Various penetrations through the cylindrical wall are provided for the passage of piping, ducts, and electrical conduits that are sealed at the penetration to ensure the reactor building integrity. The reactor building and its structural components meet the intent of 10 CFR 54.4(a) for license renewal because they perform one or more of the following functions:

- provide a leak tight barrier to prevent uncontrolled release of radioactivity
- provide structural support or functional support to safety-related SSCs
- provide shelter or protection to safety-related equipment (including radiation shielding)
- provide rated fire barriers to confine or retard a fire from spreading to or from adjacent areas
- serve as external missile barriers
- provide structural or functional support to non-safety-related equipment, failure of which could directly prevent satisfactory accomplishment of required safety-related functions
- provide a heat sink during a DBA or station blackout

In the LRA, Table 3.6-2, the applicant lists the SCs of the reactor building in the following material groupings: steel (including welds), concrete (including non-shrink grout, epoxy grout, embedment, and reinforcement), and post-tensioning system. In this table, the applicant further

divides these material groupings into a total of 15 structural components or unique commodities that are subject to an AMR. Some of the components in the reactor building are common to other buildings, and these components are listed as bulk commodities in Table 3.6-8 of the LRA. The bulk commodities are discussed in Section 2.4.6.2 of the LRA, and are evaluated in Section 2.4.7 of this SER.

The structural components listed in Table 3.6-2 of the LRA are subject to an AMR in accordance with 10 CFR 54.21(a)(1) because applicable intended functions are performed without moving parts or without a change in configuration or properties, and they are not replaced based on a qualified life or specified time period.

2.4.1.2 Staff Evaluation

The NRC staff reviewed Section 2.4.1 of the LRA, and the ANO-1 UFSAR to determine if the applicant has adequately identified the SSCs of the reactor building that are within the scope of license renewal in accordance with 10 CFR 54.4(a), and the SCs that require an AMR in accordance with 10 CFR 54.21(a)(1). After completing its initial review, the staff requested additional information in a letter to the applicant dated April 18, 2000. The applicant responded to the staff's RAIs in a letter to the NRC dated August 30, 2000.

In the LRA, Section 2.4.1, the applicant states that many components are not typically associated with a unique equipment identifier and, therefore, were not individually identified as being subject to an AMR. The staff requested that the applicant provide examples of reactor building components without unique identifier, and to explain how these components were included within the scope of license renewal, were included in an AMR, and will be maintained during the period of extended operation.

In its response, the applicant states that an AMR was typically performed for component groupings, rather than for individual components. For example, "structural shapes" are made of steel, and "columns" are made of concrete. Structural shapes and columns associated with the reactor building have been included in Table 3.6-3 of the LRA, and are considered to be within the scope of license renewal and subject to an AMR. During the AMR, the aging effects were determined by the materials of construction and the environment to which, the SCs of each component grouping are exposed. As summarized in the LRA, Table 3.6-3, the aging effects for components requiring an AMR will be managed during the period of extended operation by a proposed AMP. The staff reviewed this information and did not identify any concerns relating to the scoping and screening of reactor building SCs without unique identifiers.

In the LRA, Table 3.6-2, the applicant identifies the following reactor building SCs and groupings:

- The liner plate, threaded fasteners, personnel air-lock, emergency personnel hatch, equipment hatch, mechanical penetrations, electrical penetrations, fuel transfer tube, and anchorage/embedment/attachment are identified as the steel components or unique commodities.

- The reactor building dome, cylinder wall, floor, and foundation are identified as the concrete components.

- The tendon wires and tendon anchorage are identified as the post-tensioning system.

The applicant combined many of these structures and structural components as component or commodity groupings for the AMR. For example, embedment includes plates and bolts below the concrete, reinforcement includes embedded bars, wires, and strands. In addition, the anchor, embedment, and attachments (such as angles, anchor studs) welded to the liner of the concrete cylinder wall are included within the steel component grouping. Certain anchors and attachments directly welded to the liner to support various SCs (i.e., the polar crane bracket) are also included in the steel component grouping. These attachments to the liner are integral with the liner and concrete structure at the inside surface of the reactor building. In addition, the liner plate is thickened at these attachments by a welded plate assembly embedded in the concrete.

There are two personnel air-locks in the reactor building including a personnel access lock and a personnel escape lock. The personnel air-locks are double-door, welded steel assemblies that are designed to withstand reactor building design conditions with either or both doors closed and locked. Quick-acting, equalizing valves are provided for each personnel air-lock to equalize the pressures on either side of the air-lock door to allow operation of the door. The equalizing valves are active components and, therefore, are not subject to an AMR. The applicant also considers other operating mechanisms (such as gears, latches, hinges, linkages, etc.) that are used to open and close the air-lock doors to be active components that are not subject to an AMR. The applicant states that the operating mechanism components perform its function(s) with moving parts and, therefore, are not subject to an AMR in accordance with 10 CFR 54.21. However, the staff also recognizes that the gears, latches, and hinges are needed for proper alignment of the hatches, which is an intended function that may be performed without moving parts, or without a change of configuration or properties and, therefore, may require that these components be subject to an AMR. After a number of discussions with the applicant relating to the gears, latches, and hinges, the applicant agreed to perform an AMR on these components. In a letter to the NRC dated December 20, 2000, the applicant identifies the ASME Section XI, Subsection IWE inspection activities as the program that will be used to manage the aging of these components. The staff found this acceptable because it is consistent with the current requirements for these components, and with the recommendations from the generic aging lessons learned issued by the NRC staff in August 2000.

The inner and outer doors on each of the personnel air-locks are interlocked to maintain the reactor building integrity during normal plant operation. The interlock system is an active component that is not subject to an AMR. Serviceability of the interlock system is verified during periodic inspection and maintenance. Each personnel air-lock door has flexible seals, which are short-lived components and are subject to periodic replacement. Therefore, the flexible seals do not require an AMR.

In the LRA, Section 2.4.1, the applicant identifies a single equipment hatch in the reactor building that allows passage for large items or equipment. The applicant states that the hatch is furnished with a double-sealed flange and a bolted, dished head. The space between the double seals of the hatch flange can be pressurized for local leakage testing. The seals are not subject to an AMR because they are replaced based on a qualified life or specified time period.

In the LRA, Section 2.4.1, the applicant also identifies various penetrations in the reactor building pressure boundary that are designed with leak-tight barriers to prevent uncontrolled release of radioactive material. These mechanical penetrations allow for the movement of liquids or gases across the reactor building boundary through piping. The portion of the mechanical penetrations that is within the scope of license renewal includes the entire penetration assembly and typically the process piping in the penetration. The applicant also identifies spare penetrations with welded-end caps or bolted blind flanges as also being within the scope of license renewal and subject to an AMR because they are part of the reactor building pressure boundary. The electrical penetrations provide the means for electrical and instrumentation conductors to cross the reactor building pressure boundary. The metallic components of the electrical penetration are identified as being within the scope of license renewal because they are part of the reactor building pressure boundary. The fuel transfer tube is the underwater pathway for moving fuel assemblies into and out of the reactor building during refueling operations. The closure between the transfer tube and the sleeve, that is welded to the reactor building liner, is part of the reactor building pressure boundary. The applicant identifies this portion of the transfer tube as being within the scope of license renewal and subject to an AMR. The transfer tube, blind flange, and gate valve are part of the spent fuel pool system, and are reviewed in Section 2.3.3.1 of this report. The staff reviewed the above information and did not identify any omissions relating to the scoping and screening of the personnel air-locks, the equipment hatch, and other penetrations in the reactor building.

The reinforced concrete dome and cylindrical walls are prestressed by the post-tensioning system. The cylindrical portion is prestressed by a post-tensioning system with horizontal and vertical tendons. The dome has a three-way post-tensioning system. Reinforcing steel is provided near the surface of the cylinder wall and dome. Additional reinforcing is provided at structural discontinuities to resist local loads and thermal stresses. A reinforced concrete foundation slab is designed to support the reactor building. The reactor building has a reinforced concrete floor above the embedded portion of the liner plate. The reinforced concrete structures and the post-tensioning system of the reactor building are within the scope of license renewal and subject to an AMR.

A reinforced concrete enclosure under the foundation slab (known as the lower tendon access gallery) is provided for tendon installation and surveillance activities. The applicant has determined that the lower tendon access gallery does not perform a reactor building pressure boundary function, or any other function under 10 CFR 54.4 and, therefore, is not included within the scope of license renewal. The staff reviewed this information, and determined that the post-tensioning system is the primary means of containing the internal pressure of the reactor building during DBEs. The tendon gallery protects the bottom anchorages of the tendons and provides access for tendon anchorage inspections. The staff agrees that the tendon gallery does not perform the intended function required by 10 CFR 54.4(a).

The staff reviewed the above information and did not identify any omission relating to the scoping and screening of the reactor building reinforced concrete dome, cylindrical walls, foundation and floor, and the reactor building post-tensioning system.

2.4.1.3 Conclusions

On the basis of the staff's review of the information presented in Section 2.4.1 of the LRA, Sections 5.1 and 5.2 of the ANO-1 UFSAR, the additional information submitted by the applicant in response to the staff's RAI, and the design drawings submitted by the applicant for this review, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the reactor building that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.4.2 Reactor Building Internals

In the LRA, Section 2.4.2, "Reactor Building Internals," the applicant describes the reactor building internal structures and identifies the structural components that are within the scope of license renewal and subject to an AMR. In addition, the design of the reactor building internals is described in Sections 5.1 and 5.3.1 of the ANO-1 UFSAR. The NRC staff reviewed this information to determine whether the applicant has adequately demonstrated that the requirements of 10 CFR 54.4, 54.21(a)(1), and 54.21(a)(2) have been met for the reactor building internals.

2.4.2.1 Technical Information in the Application

In the LRA, Section 2.4.2, the applicant states that the reactor building internal structures consist of the reactor cavity, two steam generator compartments, and a fuel transfer canal (located between the two steam generator compartments and above the reactor cavity). The reactor cavity, which serves as the primary shield wall, houses the reactor pressure vessel. Structural steel components, such as platforms, ladders, and grating are also in the reactor cavity that provide access for inspection and maintenance activities. Each of the two steam generator compartments houses a steam generator, reactor coolant pump and the associated reactor coolant system piping. The pressurizer is located in a compartment adjacent to and integral to one of the steam generator compartments. The primary function of the steam generator compartment, known as the D-ring walls, is to serve as the secondary shield walls that resist pressure and jet impingement as a result of a high energy line rupture. The reactor building internals are seismic Category 1 structures, and are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). Seismic Category 1 structures are designed to prevent the uncontrolled release of radioactive material as a result of a specified seismic event, and to withstand all applicable loads without loss of function.

In the LRA, Section 2.4.2, the applicant also states that the reactor building internals include various structural components, which support or protect SSCs that are within the scope of license renewal. In the LRA, Table 3.6-3, the applicant identifies anchorages, embedment attachments, threaded fasteners, structural shapes, steam generator support steel, pressurizer support steel, main fuel handling bridge, jib cranes, polar crane, control rod drive service structure, and reactor vessel support skirt as the steel components or unique commodities. The applicant also identifies the primary and secondary shield walls, reinforced concrete columns, walls, hatches, reactor missile shield, and fuel transfer canal as concrete components or unique commodities. Other components that are common to other buildings are listed as bulk commodities in Table 3.6-8 of the LRA, and are evaluated in Section 2.4.7 of this SER.

The applicant states that the components listed in Table 3.6-3 are within the scope of license renewal because they perform one or more of the following intended functions:

- provide structural support or functional support to safety-related equipment
- provide shelter or protection to safety-related equipment (including radiation shielding)
- provide rated fire barriers to confine or retard a fire from spreading to or from adjacent areas
- serve as internal missile barriers
- provide structural or functional support to non-safety-related equipment, failure of which could directly prevent satisfactory accomplishment of required safety-related functions
- provide a heat sink during DBE or station blackout

The applicant also states that these components perform the intended functions listed above without moving parts or without a change in configuration or properties, and are not subject to replacement based on qualified life or specified time period and, therefore, are subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.4.2.2 Staff Evaluation

The NRC staff reviewed Section 2.4.2 of the LRA, and the ANO-1 UFSAR to determine if there is reasonable assurance that the applicant has identified the structures and structural components that comprise the reactor building internals, and that are within the scope of license renewal and subject to an AMR in accordance with 10 CFR 54.4(a), and 54.21(a), respectively. After completing its initial review, the staff requested additional information relating to reactor building internals in a letter to the applicant dated April 18, 2000. The applicant responded to the staff's questions in a letter to the NRC dated August 30, 2000.

As part of the evaluation, the staff reviewed the portions of the ANO-1 UFSAR and the applicable drawings for the reactor building internals, and compared this information with the information in the LRA to identify any instances where the LRA did not identify SCs as being within the scope of license renewal and subject to an AMR.

As a result of this review, the staff identified the following concerns:

- The incore instrumentation tunnel and reactor building sump are not discussed in Section 2.4.2, and are not listed in Table 3.6-3. The staff requested that the applicant identify where in the LRA are these components are addressed, or to provide a technical justification as to why these components are not within the scope of license renewal.
- In the LRA, Section 2.4.2.1, the applicant states that structural steel is provided for supporting several nuclear components (i.e., the core flood tanks, reactor building cooling units, emergency core cooling system piping). The staff asked the applicant if the lateral support steel that holds the snubbers and turnbuckles for the steam

generators and reactor coolant pumps are included within the scope of license renewal, or to provide a technical justification for the exclusion of these components from an AMR.

In its response, the applicant states that the incore instrument tunnel and the reactor building sump are part of the basement floor slab that is within the scope of license renewal. The component grouping for the instrumentation tunnels and the reactor building sump was deleted from the last row of Table 3.6-3 of the LRA as a result of an administrative error. In the table, under the column heading "Component/Commodity Grouping," it should read "a basement floor slab" rather than "reinforced concrete." Reinforced concrete should be under the column heading "material."

In addition, the applicant states that the support steel for snubbers associated with the steam generators and reactor coolant pumps is included in the bulk commodity grouping "piping and tubing supports," in Table 3.6-1 of the LRA. Table 3.6-1, general note "G," states that this grouping includes mounting brackets for snubbers. Steel supporting equipment, such as the lateral support steel for turnbuckles for the steam generators and reactor coolant pumps are considered bulk commodities, and are included under the commodity grouping "equipment supports" in Table 3.6-8 of the LRA.

Major portions of the reactor building internals are reinforced concrete structures, which include basement floor slab (cover over the liner plate), columns, the walls surrounding the steam generators, reactor, and the pressurizer, the valve pits and pipe chases and the slabs on top of them, missile shields, fuel transfer canal, and removable concrete hatches and covers. The reactor building internals also contain reinforced concrete floors and galvanized steel gratings at various elevations that are supported by columns, or attached to the exterior surface of the secondary shield wall. Structural steel that is welded to the liner plate also provides grating support. The applicant identified a total of 17 commodity groupings in Table 3.6-3 of the LRA. These commodity groupings are further combined into two material groups (i.e., steel and concrete). All these steel and concrete components are in scope and subject to an AMR for license renewal because they are passive and long-lived and provide structural support or functional support to safety-related components and equipment.

In addition, the reactor building has a number of cranes that are used for different maintenance activities. The applicant determined that the following reactor building crane components are within the scope of license renewal and subject to an AMR, because of the potential for failure when lifting or carrying heavy loads, or the potential impact on safety-related SSCs:

- main fuel handling bridge
- auxiliary fuel handling bridge
- jib cranes
- polar crane

The applicant identifies other crane components, such as the fuel tilt machine and control rod drive crane, that are seismic Category 2 structures. The applicant states that failure of these components is not expected to impact safety-related SSCs and, therefore, are not within the scope of license renewal.

The control rod drive service structure, which supports the control rod drive mechanism, is within the scope of license renewal. This structure is located above the reactor vessel and consists of the following five major assemblies:

- lower control rod drive service structure skirt, which provides a seating surface to support the upper control rod drive service structure
- upper control rod drive service structure skirt, which is a carbon steel cylindrical shell that connects to the lower control rod drive service structure skirt
- closure head service structure shell, which is a carbon steel cylinder attached to the upper control rod drive service structure skirt to support the control rod drive service structure platform assembly
- control rod drive service structure strut support assembly, which is the horizontal steel beams oriented in a radial direction that are welded to the closure head service structure shell on one end and supported by angled beams on the other
- control rod drive service structure platform assembly, which is a horizontal platform that is made of steel beams, and used to restrain the lateral movement of the top ends of the control rod drive mechanisms during design basis loading

The applicant states that these assemblies are within the scope of license renewal and subject to an AMR because they provide structural support to safety-related components and equipment without any moving parts, or without a change in configuration or properties, and are not replaced based on qualified life or specified time period.

The reactor vessel supports include a support skirt and a support flange. The reactor vessel support skirt, which supports the reactor vessel, is a steel cylindrical structure. The support skirt sits on a sole plate, which is fixed to a reinforced-concrete pedestal by a steel flange that is bolted to the pedestal. The steel cylindrical structure is welded to the bottom of the reactor vessel transition forging. The cylinder has holes for ventilation of the reactor cavity. The applicant identifies the evaluation boundary for the reactor vessel support skirt to include the structural components between the weld of the skirt at the reactor vessel transition forging to the bottom of the skirt flange. The anchor bolts and shear pins are also within the scope of license renewal and subject to an AMR.

The staff reviewed the above information and did not identify any omissions by the applicant relating to the scoping and screening of reactor building internals.

2.4.2.3 Conclusions

On the basis of the staff's review of the information presented in Section 2.4.2 of the LRA, the ANO-1 UFSAR, the additional information submitted by the applicant in response to the staff's RAIs, and the design drawings submitted by the applicant for this review, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the reactor building internals that are within the scope of license renewal, and the associated SCs

that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.4.3 Auxiliary Building

In the LRA, Section 2.4.3, "Auxiliary Building," the applicant describes the auxiliary building and identifies the SCs in the auxiliary building that are within the scope of license renewal and subject to an AMR. The design of the auxiliary building is described in Sections 5.1 and 5.3.2 of the ANO-1 UFSAR.

2.4.3.1 Technical Information in the Application

The auxiliary building is located adjacent to the reactor building and turbine building, and houses the safety-related SSCs that support normal operation, shutdown, and accident conditions. It is a free-standing reinforced concrete structure founded on bedrock. The structure and structural components of the auxiliary building are designed as seismic Category 1. Seismic Category 1 structures are designed to prevent uncontrolled release of radioactivity, and to withstand system and seismic loading without loss of function. The applicant has determined that seismic Category 1 structures meet the intent of 10 CFR 54.4(a)(1).

Several structural components within the auxiliary building (i.e., the liner plate within the spent fuel pool and the small pipe chase at elevation 341') are classified as seismic Category 2 structures. The seismic Category 2 structures are those structures whose failure would not result in a release of radioactivity and would permit a controlled plant shutdown, but could interrupt power generation. The applicant has determined that seismic Category 2 structures meet the intent of 10 CFR 54.4(a)(2).

The applicant also determined that some areas in the auxiliary building (i.e., areas with 10 CFR 50.48-required fire barriers) meet the scoping requirements of 10 CFR 54.4(a)(3). The fire barriers and fire doors are grouped as steel components, while fire walls and slabs are grouped as the concrete components. In the LRA, Section 2.4.3, the applicant states that the turbine building itself is not within the scope of license renewal, but the fire doors and fire walls and slabs of the turbine building are within the scope of license renewal and subject to an AMR. These are addressed along with those for the auxiliary building.

The auxiliary building was built partially below grade. The construction joints of the exterior concrete wall contain water-stops at the joints below the plant's design flood level that are subject to an AMR. The boron holdup tank vault is located below grade and is structurally connected to the auxiliary building. The borated water storage tank sits on top of the vault. The post-accident sampling system building is anchored to the top of the ANO-1 and ANO-2 tank vaults. The building and vaults are designed to seismic Category 1 criteria. These SCs are within the scope of license renewal in accordance with 10 CFR 54.4(a)(1).

In the LRA, Table 3.6-4, the applicant lists the SCs and unique commodities of the auxiliary building that are subject to an AMR. The SCs in the auxiliary building that meet one of the scoping criteria in 10 CFR 54.4(a) are within the scope of license renewal because they perform at least one of the following intended functions, as noted in the table:

- provide essentially leak tight barriers to prevent uncontrolled release of radioactivity
- provide structural or functional support to safety-related equipment
- provide rated fire barriers to confine or retard a fire from spreading to or from adjacent areas
- serve as missile (internal or external) barriers
- provide structural or functional support to non-safety-related equipment, failure of which could directly prevent satisfactory accomplishment of required safety-related functions
- provide protective barriers for internal and external flood events
- provide for storage of spent fuel assemblies

Some of the components in the auxiliary building are common to many other buildings that are listed as the bulk commodities in Table 3.6-8 of the LRA. The bulk commodities have been reviewed by the applicant in Section 2.4.6.2 of the LRA. The SCs and commodities in the auxiliary building are subject to an AMR because they perform its intended function(s) without moving parts or without change in configuration or properties, and are not subject to periodic replacement based on qualified life or specified time limit.

2.4.3.2 Staff Evaluation

The staff reviewed Section 2.4.3 of the LRA and the supporting information in ANO-1 UFSAR to determine whether there is reasonable assurance that the SCs and commodities comprising the auxiliary building have been properly identified as being within the scope of license renewal and subject to an AMR. After completing its initial review, the staff requested additional information in a letter to the applicant dated April 18, 2000, regarding the information provided in the LRA. The applicant responded to the staff's RAIs by a letter to the NRC dated August 30, 2000.

The applicant lists the passive components and unique commodities of the auxiliary building in Table 3.6-4 of the LRA and the bulk commodities in Table 3.6-8 of the LRA. The applicant further combined these components and commodities into three groups based on their construction materials, i.e., (1) steel (including welds), (2) threaded fasteners (including structural bolts, expansion anchors and undercut anchors), and (3) concrete (including non-shrink grout, epoxy grout, embedments, and reinforcement, but not including prestressed concrete). The staff reviewed the component groupings in Table 3.6-4 to determine if there were any other components in the auxiliary building that meet the scoping criteria of 10 CFR 54.4(a), and were not included within the scope of license renewal. As a result of this review, the staff requested additional information regarding the auxiliary building and its structural components that serve as missile barriers. In the LRA, Table 3.6-4, only the missile shield doors and walls are listed. The staff asked whether any missile protective devices for resisting internal missiles are installed in the auxiliary building, such as missile barriers to protect safety-related SSCs from pipe whipping or jet forces due to main steam line ruptures or pressure relief valve failures.

In its response to this RAI, the applicant states that there are other missile protective devices in the auxiliary building in addition to missile-shield doors and walls. In LRA, Table 3.6-4, the control room extension substructure is a missile barrier. As stated in Section 2.4.3 of the LRA, the commodities considered common to the auxiliary building and other in-scope structures are listed as bulk commodities in Table 3.6-8 of the LRA. These include missile-protected hatches that are under the commodity grouping "hatch frames/covers" for steel, or under the commodity grouping "hatch covers/plugs" for concrete. Piping whip restraints and impingement barriers are also addressed in Table 3.6-8 of the LRA. The staff's review found that the applicant did include the missile barriers in the scope of components that are subject to an AMR.

In the LRA, Section 2.4.3 the applicant states that the turbine building itself is not within the scope of license renewal, some fire doors, fire walls, and slabs within the turbine building are in scope and subject to an AMR. These components are addressed along with those for the auxiliary building. The staff considers that these in-scope components of the turbine building provide a rated fire barrier to confine a fire from spreading to adjacent areas of the plant. The staff felt that turbine building should be added to the scope of license renewal because it contains components that were subject to an AMR and, therefore, asked the applicant to justify excluding the turbine building from the scope of license renewal. The staff also asked the applicant to identify any safety-related piping or cable routed through the basement of the turbine building that needs to be sheltered or protected.

In its response to this RAI, the applicant states that there are no safety-related pipes or cables in the turbine building. The turbine building has been included in the scope of license renewal as identified in Sections 2.4.3 and 2.4.6.2 of the LRA. In a letter to the NRC dated August 30, 2000, the applicant further clarified that Section 2.4 of the LRA should have included the turbine building as being within the scope of license renewal because it contains 10 CFR 50.48 SCs and commodities that are subject to an AMR. The staff reviewed the applicant's response and found that the applicant satisfied the initial questions. However, there is no place in Section 2.4 of the LRA that describes the turbine building, and therefore, the staff does not have the needed information to verify with reasonable assurance that the applicant has identified all the components in the turbine building that require an AMR. However, during the license renewal scoping inspection, the NRC evaluated the potential for the SCs that should have been included within the scope of license renewal. As documented in NRC Inspection Report, IR0017, the inspection team identified additional cables that are required to support station blackout, and the reactor protection systems (reactor-turbine trip function) that are within the scope of license renewal and subject to an AMR. These cable are not seismically qualified and were included in the applicant's AMR, therefore, no change is needed to the applicant's program as a result of the inspection team's finding.

In the LRA, Section 2.4.3, the applicant states that for the material group elastomers, none of the components or unique commodities are subject to an AMR and there are no components or unique commodities associated with the material groups earthen structures or Teflon. However, some of the components or commodities associated with the elastomers or Teflon group in the auxiliary building are listed in Table 3.6-8 of the LRA as bulk commodities that are subject to an AMR. The staff asked that the applicant explain this inconsistency.

In its response to this RAI, the applicant states that the commodities considered common to the auxiliary building are the bulk commodities discussed in Section 2.4.6.2 of the LRA. For the

material group elastomers, none of the auxiliary building's elastomer components or "unique" commodities were subject to an AMR. In contrast, the water-stops as indicated in Table 3.6-8 of the LRA are subject to an AMR because they are common to other structures and are considered in the AMR of the bulk commodity. For the material group Teflon, there are no components or unique commodities associated with this material group in the auxiliary building. However, there are several bulk commodities in the auxiliary building, as well as in other structures, constructed with polytetrafluoroethylene materials (Teflon) that are subject to an AMR. In the auxiliary building, there are no components, unique commodities or bulk commodities associated with the material group earthen structures. The staffs review found that, except for the water stops and certain Teflon materials, there are no other elastomer components in the auxiliary building that are subject to an AMR.

The staff has reviewed Section 2.4-3 of the LRA, the ANO-1 UFSAR, and additional information submitted by the applicant in response to the staff's RAIs. The staff also examined the components and commodities listed in Tables 3.6-4 and 3.6-8 of the LRA to determine if they are the SCs that are subject to an AMR in accordance with 10 CFR 54.21(a)(1). On the basis of the above review, and the scoping inspection of the turbine building, the staff did not identify any omissions by the applicant.

2.4.3.3 Conclusions

On the basis of the review described above and the scope inspection of the turbine building, the staff finds that there is reasonable assurance that the applicant has adequately identified those portions of the auxiliary building and the turbine building that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.4.4 Intake Structure

In the LRA, Section 2.4.4, "Intake Structure," the applicant describes the intake structure and identifies the structural components of the intake structure that are within the scope and subject to an AMR. The staff reviewed Section 2.4.4 to determine if there is reasonable assurance that the applicant has identified and listed the structural components of the intake structure that are subject to an AMR. The design of the intake structure is described in the ANO-1 UFSAR, Section 5.3.4.

2.4.4.1 Technical Information in the Application

The intake structure (located at the end of the intake canal) houses the circulating water, fire, and service water pumps, motor control centers, and traveling screens. It is constructed primarily of reinforced concrete that is founded on bedrock. The steel trash racks and traveling screens at the entrance of the intake structure protect the circulating water pumps from foreign materials present in the bay water. The intake structure is divided into two sections: the portion of the building area above grade elevation, and the portion of the structure below grade pump bay area that is partially submerged in water. The ANO-1 intake structure is integrally connected to the ANO-2 intake structure with a shear key and additional reinforcing in the slab at the pump level. The intake structure gantry crane is shared between the ANO-1 and ANO-2 intake structures. The gantry crane is supported by steel rail and girders on reinforced concrete

piers, and is capable of traversing the entire length of the intake structure. It is normally parked at a safe distance from the intake structure.

The building portion of the intake structure above grade contains pump motors, valve motor actuators, and related equipment. This building area has three predominant elevations, which are El 354', El 366', and El 378'. The heating, ventilation and air conditioning (HVAC) equipment is located in the penthouse at El 378'. The pump motors and valve motor actuators are located at El 366', which is above the plant design flood level of El 361'. They are required to supply water for plant protection (i.e., fire water and service water). The remaining pump motors required for normal plant operation, such as the circulating water and screen wash pumps, are located at El 354'. The system components related to plant protection, which are not adversely affected by flood waters or which would not be required during a flood event (i.e., the intake structure sluice gate actuators), are also located at El 354'.

The below grade portion of the intake structure contains the pump bays for various plant systems. The four circulating water system pump bays take suction directly from Lake Dardanelle. The three service water system pump bays are located directly behind the circulating water pump bays. There are sluice gates in the service water system pump bays that can be aligned so that the fire water and service water pumps can take suction directly from Lake Dardanelle or from the emergency cooling pond as needed.

The portions of the intake structure that provide support to service water system components are designed to seismic Category 1 criteria. The remainder of the intake structure is seismic Category 2 structures. The applicant has determined that the seismic Category 1 structures are within the scope of 10 CFR 54.4(a)(1). However, seismic Category 2 structures are not within the scope of 10 CFR 54.4(a)(2). The applicant listed the structural components and unique commodities of the intake structure in Table 3.6-5 of the LRA. These structural components are within the scope of license renewal because they contribute to at least one of the following intake structure intended functions, as noted in the table:

- provide structural support or functional support to safety-related equipment
- provide shelter or protection to safety-related equipment
- serve as missile (internal or external) barriers
- provide structural or functional support to non-safety-related equipment, failure of which could directly prevent satisfactory accomplishment of required safety-related functions
- provide protection barriers for external flood event

The applicant has determined that these SCs and commodities are subject to an AMR as required by 10 CFR 54.21(a)(1).

2.4.4.2 Staff Evaluation

The staff reviewed Section 2.4.4 of the LRA and the ANO-1 UFSAR to determine if the applicant has adequately implemented its methodologies such that there is reasonable

assurance that the structural components and commodities comprising the intake structure have been properly identified as being within the scope of license renewal and subject to an AMR. After completing the initial review, the staff requested additional information in a letter to the applicant dated
April 18, 2000. The applicant responded to these RAIs in a letter to the NRC dated August 30, 2000.

The intake structure comprises various SCs and commodities that support the SSCs that are within the scope of license renewal. The applicant lists the SCs and commodities in Table 3.6-5 of the LRA that are subject to an AMR. In the table, the applicant combined the structural components and unique commodities of the intake structure in three material groups; steel (including welds), threaded fasteners (including bolts, expansion anchors, and undercut anchors), and concrete (including non-shrink grout, epoxy grout, embedment, and reinforcement). Certain components that are common in other buildings are grouped as the bulk commodities in Table 3.6-8 of the LRA that are reviewed in Section 2.4.7 of this report. There are 18 structural component groupings listed in Table 3.6-5 of the LRA, and 24 bulk commodity groupings listed in Table 3.6-8 of the LRA. Some of the structural components that do not contribute to any of the intended functions of the intake structure are not listed in the tables. SCs and commodities listed in Table 3.6-5 and Table 3.6-8 are subject to an AMR.

In the LRA, Section 2.4.4, the applicant states that the seismic Category 2 portions of the intake structure are not within the scope of 10 CFR 54.4(a)(2). However, some of the seismic Category 2 structures appear to provide functional support to some non-safety-related equipment whose failure could directly prevent satisfactory accomplishment of safety-related functions. The staff requested the applicant to provide additional justification for not including the seismic Category 2 structural components of the intake structure that are within the scope of license renewal.

In its response to this RAI, the applicant states that seismic Category 2 SSCs are those whose failure would not result in the uncontrolled release of radioactivity and would not prevent a safe reactor shutdown, but may interrupt power generation. Section 9.3.2.1 of the ANO-1 UFSAR states that failure of seismic Category 2 equipment in the proximity of the safety-related service water system components will not impact the integrity of the service water system. Therefore, the portions of seismic Category 2 SCs in the intake structure do not meet the criteria of 10 CFR 54.4(a)(2). The staff's review found that the Category 2 SCs in the intake structure do not provide any functional support to non-safety-related equipment whose failure could prevent satisfactory accomplishment of safety-related functions.

The staff did not find any omissions in the SCs identified by the applicant as being subject to an AMR in accordance with 10 CFR 54.21(a).

2.4.4.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has appropriately identified those portions of the intake structure that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.4.5 Earthen Embankments

In the LRA, Section 2.4.5, "Earthen Embankments," the applicant describes the earthen embankments at the plant site, and identifies the structures of the earth embankments that are within the scope of license renewal. The structures identified as being within the scope of license renewal are (1) the emergency cooling pond and (2) the intake and discharge canals, which are the seismic Category 1 structures. The design of these structures are shown in the site drawings (figures No. 9-32, 9-33, and 9-35) of the ANO-1 UFSAR.

2.4.5.1 Technical Information in the Application

The earthen embankment structures are partially or totally submerged in Lake Dardanelle. The applicant lists the emergency cooling pond (ECP), intake canal, and discharge canal in Table 3.6-6 of the LRA as the structures of the earthen embankments that are subject to an AMR. The intended function(s) of these components is to provide a heat sink during a DBA or station blackout.

The ECP is a 14-acre kidney-shaped water pond located northwest of the plant. It serves as a heat sink in the unlikely event of a loss of Lake Dardanelle water inventory. The water level of the pond is maintained between 5 and 6 feet by a spillway that discharges to Lake Dardanelle. The emergency cooling pond receives hot discharge from the plant through a 100-ft long weir. The purpose of the weir is to promote a uniform flow distribution in the pond, and to direct the hot water to the surface for maximizing heat rejection. The supply and return lines are at opposite extremes to prevent any hydraulic vortices. The plant intake piping is at the lowest point of the pond. The pond is excavated in impervious clay strata with its bottom at about 4 to 16 feet above rock. The crest voids and the adjacent embankment voids are downstream of the spillway and are pumped with an elastic type of grout to preclude undercutting by water flow over the spillway. The ECP side slopes are protected against wave action with dumped rip-rap. A series of weirs are provided at the channel to the reservoir to control silt settlement.

The intake canal conveys water from Lake Dardanelle to the intake structure that supplies the reservoir water for once-through cooling of ANO-1. The intake canal is approximately 4,000-ft long and the width varies from 80-ft at the mouth to 135-ft at the intake structure with an average depth of 14 feet. The discharge canal returns the used cooling water to the reservoir. The discharge canal is approximately 600-ft long with an average width of 165 feet and depth of 11 feet. Both canals are completely excavated and contain no section formed by dikes or in-fill. Bank slopes of the canals are planted with grass or protected with rip-rap to prevent erosion.

2.4.5.2 Staff Evaluation

The staff reviewed Section 2.4.5 of the LRA, and the drawings in ANO-1 UFSAR to determine if there is reasonable assurance that the components comprising the earthen embankments have been properly identified as being within the scope of license renewal and subject to an AMR.

The applicant identifies and lists the structures of the earth embankments that are subject to an AMR in Table 3.6-6 of the LRA. As shown in the table, the ECP and the intake and discharge canals are listed as the structures subject to an AMR. However, the structures associated with the earth embankments, such as spillway, weir, canal inlet and outlet structures, are not listed

in the table as the components subject to an AMR for license renewal. The staff requested additional information regarding the exclusion of earth embankments.

In its response to the staff's RAIs, the applicant states that the spillway and weir are ECP components. They are subject to an AMR along with the overall ECP. The canal inlets and outlets are the components of the intake and discharge canals that are subject to an AMR as part of the intake and discharge canals. The staff's review found that the applicant included these components as being within the scope of license renewal and subject to an AMR, even though they are not individually listed in the table. The staff found no omissions in the SCs of earthen embankments included within the scope of license renewal and subject to an AMR.

2.4.5.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified the structures associated with the earth embankments that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.4.6 Yard Structures

In the LRA, Section 2.4.6.1, "Aboveground/Underground Yard Structures," the applicant describes the yard structures at the plant site, and identifies the SCs of the yard structures that are within the scope of license renewal. The applicant also identifies the SCs that are subject to an AMR in Table 3.6-7 of the LRA.

2.4.6.1 Technical Information in the Application

As described in Section 2.4.6.1 of the LRA, the following yard structures are within the scope of license renewal and subject to an AMR:

- Q-condensate storage tank foundation
- emergency diesel fuel oil storage tank vault
- bulk fuel oil storage tank foundation
- AAC diesel generator building foundation
- electrical manholes
- borated water storage tank foundation

The Q-condensate storage tank (Q-CST) foundation is a seismic Category 1 structure located at the west side of the ANO-1 reactor building. It is an octagon-shaped reinforced concrete mat foundation supported by concrete piers that are embedded in bedrock. Two valve pits are located partially underground, and on opposite (i.e., north and south) sides of the mat foundation. The south valve pit is for ANO-1, and the north valve pit is for ANO-2. The lower portion of the Q-CST is surrounded by a 5-ft high reinforced concrete wall for missile protection. The applicant determined that the Q-CST foundation is within the scope of 10 CFR 54.4(a)(1).

The emergency diesel fuel oil storage tank vault is a seismic Category 1 structure, which was designed as a reinforced concrete rigid-frame box. The vault is located at the northwest side of the reactor building and contains four diesel fuel storage tanks partitioned into separate rooms.

The foundation of the vault is anchored in rock, and the walls have ventilation openings above the flood elevation. The outside door of the vault is of watertight construction for flood protection. The applicant determined that the emergency diesel fuel oil storage tank vault is within the scope of 10 CFR 54.4(a)(1).

The bulk fuel oil storage tank foundation supports a 180,000-gallon fuel oil storage tank. It is a non-Q, seismic Category 2 reinforced concrete foundation. The applicant determined that the bulk fuel oil storage tank foundation is within the scope of 10 CFR 54.4(a)(2).

The AAC diesel generator building foundation is a seismic Category 2 structure designed to the Uniform Building Code requirements. The AAC diesel generator building is located at the north side berm of the bulk fuel oil storage tank, and is divided into two parts; an electrical equipment area and an engine room. The major components of the AAC diesel generator are located in this building (except the power distribution switchgear). The engine room houses the engine generator set, fuel oil transfer pump, fuel oil day tank, air start system, engine generator control cabinets, HVAC, and the fire protection system. The foundation of the AAC diesel generator building is a reinforced concrete slab founded on grade beams, which are supported by drilled piers (caissons). The AAC system is a non-Q system designed to conform to augmented quality assurance requirements based on NRC Regulatory Guide 1.155, "Station Blackout." The foundation of the AAC diesel generator building is subject to an AMR because it supports the AAC diesel generator. The applicant determined that the building foundation is within the scope of 10 CFR 54.4(a)(2).

The seismic Category 1 electrical manholes are placed at various locations at the plant site. They are relatively small reinforced concrete structures founded partially underground either on natural soil or on backfill materials. An access-opening in the top slab at grade level is provided. The access-opening is covered with a reinforced concrete or carbon steel cover for missile protection. The foundations of the manholes are completely independent from other structures. The applicant determined that the electrical manholes are within the scope of 10 CFR 54.4(a)(1).

The borated water storage tank (BWST) foundation is the reinforced concrete roof slab of the boron holdup tank vault that is part of the seismic Category 1 auxiliary building. The vault roof requires a 2-ft thick slab to support the BWST, but the vault roof was designed with a 4-ft thick slab to meeting the biological shielding requirements. A small ring wall, filled with oiled sand, was built on the roof slab to separate the tank bottom from the top of the concrete surface. The roof slab has a small slope for the tank drainage purposes. The applicant determined that the BWST foundation is within the scope of 10 CFR 54.4(a)(1).

The yard structures described above are within the scope of license renewal because they perform one or more of the following yard structure intended functions:

- structural support or functional support to safety-related equipment
- shelter or protection to safety-related equipment
- fire-rated barriers to confine or retard a fire from spreading to or from adjacent areas

- missile (internal or external) barriers
- structural or functional support to non-safety-related equipment, failure of which could directly prevent satisfactory accomplishment of required safety-related functions
- protective barriers for internal flood event

The applicant lists 11 structural components, and identifies their intended functions in Table 3.6-7 of the LRA. The 11 structural components are further combined into two groups; steel and concrete. Other structural components that are part of the yard structures, and do not contribute to any of the intended functions of the yard structures, are not included in the table. The steel group includes manhole covers and threaded fasteners. The concrete group includes walls, floor slab, columns, slabs on various foundations, tank vault, drilled piers, manhole covers, and the walls and slabs of the electrical manholes. The structural components listed in the table are subject to an AMR.

2.4.6.2 Staff Evaluation

The staff reviewed Section 2.4.6.1 of the LRA to determine if the applicant has adequately implemented its methodologies such that there is reasonable assurance that the structures and structural components comprising the yard structures have been properly identified as being within the scope of license renewal and subject to an AMR. After completing its initial review, the staff requested additional information regarding yard structures in a letter to the applicant dated April 18, 2000.

In the LRA, Section 2.4.6.1, the applicant describes the aboveground and underground yard structures and trenches. However, there is no supporting information or document that can be used to verify the content of this section. The staff asked that the applicant provide a drawing that shows the location of the yard structures and trenches and highlights the components that are within the scope of license renewal.

In its response to the NRC dated August 30, 2000, the applicant submitted the following site-drawings: Drawings C31(Yard underground utilities), C-2003 (plot plan), and C-2056 (anchor bolt locations of the condensate storage tank). Using these drawings, the applicant highlighted the SCs of the yard structures that are within the scope of license renewal. The staff compared Section 2.4.6.1 and Table 3.6-7 of the LRA with these drawings, to verified that the applicant included all the SCs of the yard structures, that meet the scoping criteria of 10 CFR 54.4(a), as being within the scope of license renewal. As a result of this review, the staff found no omissions by the applicant in scoping the yard structures as defined under 10 CFR 54.4(a). The staff also found no omissions in the SCs identified in Table 3.6-7 of the LRA that are subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.4.6.3 Conclusions

On the basis of the review described above, the staff concludes that there is reasonable assurance that the applicant has appropriately identified those portions of the yard structures that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.4.7 Bulk Commodities

In the LRA, Section 2.4.6.2, "Bulk Commodities," the applicant describes the bulk commodities, and identified the commodity groupings in the buildings and structures that are within the scope of license renewal.

2.4.7.1 Technical Information in the Application

The bulk commodities are the SCs that support or protect various SSCs that are common to two or more buildings or structures. The applicant determines that the bulk commodities that are identified as being within the scope of license renewal are in the reactor building (including reactor building internals), auxiliary building, intake structure, diesel fuel vault, BWST foundation, Q-CST foundation, and pipe trenches. Some of the commodities in the turbine building, such as fire wrap banding, fire damper mountings, fire hose reels, fire wraps, and fire stops, are also included in the scope of license renewal as bulk commodities. The applicant lists the bulk commodities and their associated structures in Table 3.6-8 of the LRA that are within the scope of license renewal because they fulfill one or more of the following intended functions:

- provide structural support and functional support to safety-related equipment
- provide shelter or protection to safety-related equipment (including radiation shielding)
- provide rated fire barriers to confine or retard a fire from spreading to or from adjacent areas
- serve as missile (internal or external) barriers
- provide structural or functional support to non-safety-related equipment, failure of which could directly prevent satisfactory accomplishment of required safety-related functions
- provide protection barrier for internal or external flood events

In the LRA, Table 3.6-8, the applicant combines the bulk commodities into six groups based on the materials of construction. These groups are; steel (including weld), threaded fasteners (including structural bolt, expansion anchor, and undercut anchor), concrete (including non-shrink grout, epoxy grout, embedment, and reinforcement, but not including prestressed concrete), fire barrier, elastomer, and Teflon. No bulk commodities are associated with the material group earthen structures. These bulk commodities are subject to an AMR in accordance with 10 CFR 54.2(a)(1).

2.4.7.2 Staff Evaluation

The staff reviewed Section 2.4.6.2 and Table 3.6-8 of the LRA to determine if there is reasonable assurance that the applicant has appropriately identified and listed the bulk commodities subject to an AMR. The applicant identifies the following bulk commodities and associated structures:

Steel Group	
piping and tubing supports	reactor bldg, aux bldg, intake, diesel fuel vault, pipe trenches
pipe whip restraints	reactor bldg, aux bldg
motor-operated valve supports	reactor bldg, aux bldg, intake, diesel fuel vault
hatch frames/covers	aux bldg, intake, Q-CST foundation
conduit supports	reactor bldg, aux bldg, intake, diesel fuel vault, pipe trenches
cable trays and supports	reactor bldg, aux bldg, intake
H+V duct supports	reactor bldg, aux bldg
cabinets, electrical panels and supports	reactor bldg, aux bldg, intake
equipment supports	reactor bldg, aux bldg, intake
hazard barrier curbs	aux bldg, intake
10 CFR 50.48-required banding for fire wraps	reactor bldg, aux bldg, turbine bldg
fire damper mountings and fire hose reels	reactor bldg, aux bldg, turbine bldg, intake, and diesel fuel vault
Threaded Fastener Group:	
threaded fasteners on piping and tubing supports, pipe whip restraints, hazard barrier curbs, cabinets, electrical panels and supports, and the supports for MOV, conduit, H+V ducts and equipment	reactor bldg, aux bldg, intake, diesel fuel vault, pipe trenches
pipe lugs, tubing clips and the threaded fasteners for hatch frames/covers	reactor bldg, aux bldg, intake, diesel fuel vault, pipe trenches
threaded fasteners for cable trays and supports	reactor bldg, aux bldg, intake

threaded fasteners for fire damper mountings and fire hose reels	aux bldg, intake, turbine bldg, and diesel fuel vault
Concrete Group	
equipment pads and foundations	reactor bldg, aux bldg, intake
hatch covers and plugs	aux bldg, intake, diesel fuel vault, BWST foundation
Fire Barrier Group	
fire wraps and fire stops	reactor bldg, aux bldg, turbine bldg, diesel fuel vault
Elastomer Group	
water-stops at the construction joints of the exterior concrete walls	reactor bldg, aux bldg, diesel fuel vault, Q-CST foundation
Teflon Group	
piping support restraints	reactor bldg, aux bldg
equipment pad, and foundation plates	reactor bldg and aux bldg

The staff reviewed Table 3.6-8 of the LRA to determine if the applicant has adequately identified the bulk commodities in the structures that are within the scope of license renewal in accordance with 10 CFR 54.4. The staff previously reviewed Table 3.6-8 of the LRA in reviewing the reactor building, reactor building internals, and auxiliary building to verify whether the listed bulk commodities are within these buildings. The staff found that these bulk commodities are part of safety-related SSCs that are common to most nuclear power plants. The staff did not identify any omissions from the bulk commodities identified by the applicant as being subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.7.3 Conclusions

On the basis of the review described above, the staff finds that there is reasonable assurance that the applicant has adequately identified the bulk commodities that are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54,4(a) and 54.21(a)(1), respectively.

2.4.8 References for Section 2.4

1. 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

2. DG-1047, "Standard Review Plan for the Review of License Renewal Application for Nuclear Power Plants," Working Draft, April 21, 2000.
3. Arkansas Nuclear One - Unit 1, License Renewal Application dated January 31, 2000.
4. ANO-1 Updated Final Safety Analysis Report.

2.5 Electrical and Instrumentation and Controls Systems Scoping and Screening Results

2.5.1 Introduction

The applicant describes it's methodology and process used to identify electrical and instrumentation and controls (EIC) SSCs that are within the scope of license renewal and subject to an AMR in Section 2.1, "Scoping and Screening Methodology," and Section 2.2, "Plant-Level Scoping Results," of the LRA. The list of systems that contain EIC components are documented in Table 2.2-1, which identified the mechanical and electrical systems included within the scope of license renewal. The applicant includes an integrated plant assessment (IPA) that is largely consistent with the guidance recommended in the Nuclear Energy Institute (NEI) document NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 — The License Renewal Rule." The EIC SCs that are subject to an AMR from the SSCs that are within the scope of license renewal are identified in Section 2.5, "Electrical and Instrumentation and Controls System Scoping and Screening Results." The NRC staff reviewed this information to determine whether the applicant has adequately demonstrated that the requirements of 10 CFR 54.4, 10 CFR 54.21(a)(1), and 54.21(a)(2) have been met for electrical SSCs that are within the scope of license renewal and the SCs subject to an AMR.

2.5.2 Scoping of Electrical Systems, Structures, and Components

The applicant's process for identifying electrical components that are subject to an AMR began with a list of all ANO-1 electrical systems. The applicant then performed an assessment to identify and list SSCs that satisfy the criteria under 10 CFR 54.4(a)(1) for safety-related SSCs that are relied upon to remain functional during and following DBEs (as defined in 10 CFR 50.49(b)(1)) to ensure the following capabilities are maintained:

- the integrity of the reactor coolant pressure boundary
- the capability to shut down the reactor and maintain it in a safe shut down condition
- the capability to prevent or mitigate the consequences of accidents that could result in potential off-site exposures comparable to the 10 CFR 100 guidelines

Table 1-2 of the ANO-1 UFSAR, identified the "safety-related" or "Q" systems and components required by the applicant's CLB. The ANO-1 Q-lists include those SSCs relied upon to remain functional during or following DBEs described in ANO-1 UFSAR Chapter 14. The ANO-1 UFSAR Chapter 14 events were based on criteria identical to the scoping criteria specified under 10 CFR 54.4(a)(1).

The scoping criterion of 10 CFR 54.4(a)(2) requires that all non-safety-related SSCs whose failure could prevent satisfactory accomplishment of any of the intended functions of safety-related SSCs be included in the scope of license renewal. The ANO-1 Q-list includes those non-safety-related SSCs whose failure could prevent satisfactory accomplishment of any of the intended functions of safety-related SSCs in accordance with the criteria in 10 CFR 54.4(a)(2).

In addition, 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform an intended function that demonstrates compliance with Commission

regulations for: environmental qualification (10 CFR 50.49), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63), fire protection (10 CFR 50.48), and, pressurized thermal shock (10 CFR 50.61). In summary, the applicant states that the following SSCs have been included within the scope of license renewal:

- components in the EQ program
- components in the diverse reactor over-pressure protection system/diverse SCRAM system (DROPS/DSS) and the DROPS/ATWS mitigation system actuation circuit (AMSAC)
- electrical commodities needed for the AAC diesel generator to perform its intended function
- fire protection equipment necessary to ensure one train of safe shutdown equipment remains free of fire damage, including emergency lighting and selected non-safety-related components
- electrical components necessary to protect against pressurized thermal shock

In the LRA, Table 2.2-1, the applicant identifies the systems, which contain EIC components, that are within the scope of license renewal. The electrical components requiring an AMR are discussed in Section 2.5.3 of the LRA. From the list of SSCs included within the scope of license renewal, the applicant identifies the intended function(s) and eliminates the structures, components, and component types that required moving parts, or a change in configuration or properties that perform those intended functions, as allowed by 10 CFR 54.21(a)(1). Next, the applicant eliminates the structures, components, and component types subject to replacement based on qualified life or specified time period as allowed by 10 CFR 54.21(a)(1)(ii). The remaining electrical components are subject to an AMR. The NRC staff evaluation of the EIC components subject to an AMR is discussed in Section 2.5.3 of this safety evaluation.

After completing its initial review of the ANO-1 LRA, the staff issued RAIs on April 17, April 25, and May 2, 2000. The response to the NRC RAIs was received on July 31, 2000. In its response dated July 31, 2000, the applicant states that NEI 95-10, Appendix B, lists typical structures, components, and commodity groupings that are applicable to an integrated plant assessment. The EIC components and component types identified in NEI 95-10, Appendix B, are representative of the components included within the scope of license renewal as identified in the applicant's response to the RAIs dated July 31, 2000. EIC components that are within the scope of license renewal at ANO-1 include the following:

power supplies # $
circuit breakers * # $
switchgear #
load centers
motor control centers
batteries * # $
cables * # $
connectors * # $
terminal blocks * # $
splices * # $
relays * # $
sensors
electrical bus
insulators
transmitters * # $
meters

diesel generators #
indicators * # $
switches * # $
controllers * #
detectors * #
transformers # $
battery chargers * # $
lights * #
annunciators # $
inverters #
motors * #
solenoid operators * #
alarm units
converters # $
isolators $
signal conditioners # $
recorders #
transducers
motor-generators
heat tracing
electric heaters

* - electrical component types included in fire protection system
# - electrical component types included in the AAC system
$ - electrical component types included in the ATWS system

In the LRA, Section 2.5.3, the applicant also states that the only components subject to an AMR are splices, connectors, terminal blocks, and cables. The "spaces" approach developed for the U.S. Department of Energy by the Sandia National Laboratory was used to perform the AMR for these component types at ANO-1. (Note: EIC components that perform a pressure boundary intended function are considered in the mechanical sections, and structural components such as electrical panels and cabinets are considered in the structural sections.)

2.5.2.1 Environmental Qualification Systems, Structures, and Components

In the LRA, Section 2.5.2.1, "EQ SSCs," the applicant states that safety-related components that must continue to operate following accidents and high-energy line breaks (HELBs), and that are located in harsh environments resulting from that accident or HELB, are controlled by the environmental qualification (EQ) program. The applicant also states that the EQ Program tracks both components with individual equipment numbers and generic components used throughout the plant (such as cables) and that all long-lived, passive EQ electrical components and commodities located in a harsh environment, which are important to safety, including safety-related and Q-list equipment, non-safety-related equipment whose failure could prevent satisfactory accomplishment of any safety-related function, and the necessary post-accident monitoring equipment is included within the scope of the EQ program and within the scope of license renewal.

In addition, the applicant states that a detailed discussion of the EQ program, and the components covered by the program is contained in Section 4.4 of the LRA. The NRC staff's evaluation and findings, including a detailed discussion of the EQ Program, and the components covered by the EQ program accordance with 10 CFR 54.21(c), are provided in Section 4.4 of this SER.

2.5.2.2 Anticipated Transient Without Scram Electrical Systems, Structures, and Components

In the LRA, Section 2.5.2.2, "ATWS Electrical SSCs," the applicant describes the anticipated transient without scram (ATWS) SSCs that are within the scope of license renewal, and

identified the electrical SSCs that are subject to an AMR. The staff reviewed this information to determine if there is reasonable assurance that the applicant has identified and listed the SCs associated with ATWS that are subject to an AMR.

2.5.2.2.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.2.2, the applicant states that, in 1990, ANO-1 installed a DROPS/DSS for a diverse reactor trip, and DROPS/AMSAC for a backup actuation of EFW and a diverse main turbine trip. The applicant also states that these systems are in compliance with 10 CFR 50.62, and that the electrical components in the DROPS/DSS and the DROPS/AMSAC are within the scope of license renewal. The AMR includes the cabling associated with field sensors (pressure, flow, and reactor power) that supply input to these systems. The applicant also states that these are small, non-Q, self-contained, microprocessor-based systems with signal isolators connected to the RCS pressure, nuclear instrumentation reactor power, and main feedwater flow signals. Trip relays are installed for interfacing with the plant components. In summary, the applicant states that electronics, in general, are considered active and, therefore, are not subject to an AMR.

2.5.2.2.2 Staff Evaluation

The NRC staff reviewed the scoping results provided in Sections 2.1, 2.2, and 2.5 of the LRA. After the initial review, the NRC staff requested additional information in letters to the applicant dated April 17, 2000, April 25, 2000, and May 2, 2000. The applicant provides Table 2.2-1 of the LRA that contains a list of systems which are in scope of license renewal. However, the applicant did not provide a list of electrical and instrumentation and control component types for the systems identified. The staff requested the applicant provide a list of electrical and instrumentation and control component types that are within the scope of license renewal for the systems identified in Table 2.2-1 and identify in the list the components that are part of ATWS SSCs. The applicant responded to these RAIs in a letter to the NRC dated July 31, 2000. In its response, the applicant provided a list of electrical and instrumentation and control component types that are within the scope of license renewal and identified in the list the components that are specifically part of the ATWS system. The NRC staff reviewed the information in Section 2.5.2.2 of the LRA and additional information provided by the applicant to verify that the applicant identified the ATWS electrical SSCs that are within the scope of license renewal in accordance with 10 CFR 54.4, and did not identify any omissions.

2.5.2.2.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has identified the ATWS electrical SSCs that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.5.2.3 Station Blackout Electrical Systems, Structures, and Components

In the LRA, Section 2.5.2.2, "Station Blackout Electrical SSCs," the applicant describes the Station Blackout (SBO) electrical SSCs that are within the scope of license renewal, and

identified the electrical SCs that are subject to an AMR. The staff reviewed this information to determine if there is reasonable assurance that the applicant has identified and listed the SCs associated with SBO that are subject to an AMR.

2.5.2.3.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.2.3, the applicant states that in order to meet the requirements of 10 CFR 50.63, it installed a 4,400-kW diesel generator in a separate structure that is totally independent of the other emergency power sources and their auxiliaries. The system is referred to as the "AAC diesel generator" or as the "station blackout diesel," and can be used to power the class 1E electrical buses of both ANO units. In summary, the applicant states that the electrical components of the AAC diesel generator that supply the Class 1E buses during a potential station blackout are included within the scope of license renewal. Specific components associated with the AAC diesel generator systems which require an AMR are discussed in Section 2.5.3 of the ANO-1 LRA.

2.5.2.3.2 Staff Evaluation

The NRC staff reviewed the scoping results presented in Sections 2.1, 2.2, and 2.5 of the ANO-1 LRA. After the initial review, the NRC staff requested additional information in letters to the applicant dated April 17, April 25, and May 2, 2000. The applicant provides Table 2.2-1 of the LRA that contains a list of systems which are in scope of license renewal. However, the applicant did not provide a list of electrical and instrumentation and control component types for the systems identified. The staff requested that the applicant provide a list of electrical and instrumentation and control component types that are within the scope of license renewal for the systems identified in Table 2.2-1 and identify in the list the components that are part of station blackout SSCs. The applicant responds to the staff's RAIs in a letter to the NRC dated July 31, 2000. In its response, the applicant provides a list of electrical and instrumentation and control component types that are within the scope of license renewal, and identifies those components that are specifically part of the station blackout system. The NRC staff reviewed Section 2.5.2.3 of the LRA and the additional information to verify that the applicant identified the SBO electrical SSCs that are within the scope of license renewal in accordance with 10 CFR 54.4(a)(3), and did not identify any omissions.

2.5.2.3.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately identified the SBO electrical SSCs that are within the scope of license renewal, and the associated SCs that are subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 54.21(a)(1), respectively.

2.5.3 Screening of Electrical Systems, Structures, and Components

In the LRA, Section 2.5.3, the applicant states that as part of the IPA for license renewal, only those SSCs that are long-lived, passive, and within the scope license renewal are subject to an AMR. The applicant also states that components at ANO-1 were categorized as long-lived and passive using NEI 95-10, Appendix B, as a guide. On that basis, the applicant identifies the following electrical component groups as being subject to an AMR at ANO-1: splices,

connectors, terminal blocks, and cables. In addition, the applicant further reduced the population of these electrical component groups requiring an AMR by eliminating those piece-parts that are part of a larger complex assembly (e.g., the wiring, terminal blocks, and connectors located internal to a circuit breaker cubicle).

In its response to NRC RAIs dated July 31, 2000, the applicant also states that items physically supporting or protecting electrical equipment that are within the scope of license renewal are discussed in the structural sections of the LRA. For the in-scope battery racks, which are unique to the auxiliary building, refer to the ANO-1 LRA, Sections 2.4.3 and 3.6, and Table 3.6-4. Cabinets, electrical panels, and supports are considered bulk commodities (i.e., common to more than one in-scope structure), and are evaluated in the LRA, Sections 2.4.6.2 and 3.6, and Table 3.6-8.

2.5.3.1 Connectors

2.5.3.1.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.3, the applicant states that connectors are generally considered to be "plug and socket" arrangements that allow easy disconnecting and reconnecting of the electrical components that are long-lived, passive, and subject to an AMR. In addition, the applicant considers cable splices, cable couplers, and insulating tape used in splices as components or sub-components of the connector commodity group that are subject to an AMR.

2.5.3.1.2 Staff Evaluation

The NRC staff reviewed the screening results presented in Section 2.5.3 of the LRA. to verify that the applicant identified all of the electrical components that needed to be included within the connector commodity group, and that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). The staff did not identify any omissions.

2.5.3.1.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately identified electrical connector components that are subject to an AMR consistent with the requirements of 10 CFR 54.21(a)(1).

2.5.3.2 Terminal Blocks

2.5.3.2.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.3, the applicant states that terminal blocks at ANO-1 are molded, solid-section, phenolic blocks capable of withstanding considerable temperature and radiation exposures. The applicant also states that terminal blocks are passive, long-lived electrical components. Therefore, those terminal blocks that are within the scope of license renewal, and that are not piece-parts of larger active assemblies, are subject to an AMR.

2.5.3.2.2 Staff Evaluation

The NRC staff reviewed the screening results relating to terminal blocks presented in Section 2.5.3 of the ANO-1 LRA. The NRC staff reviewed this information to verify that the applicant identified the terminal blocks that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1), and did not identify any omissions.

2.5.3.2.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately identified the electrical terminal blocks that are subject to an AMR consistent with the requirements of 10 CFR 54.21(a)(1).

2.5.3.3 Cables

2.5.3.3.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.3, the applicant states that an insulated cable is an assembly of a single electrical conductor (wire) that is covered with insulation, or a combination of conductors that are insulated from one another, and have an overall covering. Cable connections are used to connect the cable conductors to other cables or electrical devices and include connectors, splices, and terminal blocks. Cables in the scope of this review are those that are separate components and not part of some larger complex assembly.

2.5.3.3.2 Staff Evaluation

The NRC staff reviewed the screening results relating to cables presented in Section 2.5.3 of the ANO-1 LRA. After the initial review, the NRC staff requested additional information in letters to the applicant dated April 17, 2000, April 25, 2000, and May 2, 2000. On the basis of the information in 10 CFR 54.21, NEI 95-10, Appendix B, and Section 2.5.3.3 of the LRA, which identifies cables and connectors as being subject to an AMR, more detail with respect to type and categorization of cables in the scope of license renewal is needed for the staff to perform its evaluation. The staff requested the applicant to identify specifically where in the LRA each cable type including connections (e.g., connectors, terminal blocks, and splices) is addressed in the LRA. The applicant responded to these RAIs in a letter to the NRC dated July 31, 2000. In its response, the applicant states that the various types of cables and electrical connection at ANO-1 that are part of in-scope systems are subject to an AMR. The cable types include power cable, instrument cable, communication cable, and uninsulated cable. Connection types include splices, connectors, and terminal blocks. While the LRA did not list the individual cable and connection types, and AMR was performed for all types using the spaces approach from the DOE/Sandia aging management guideline. Table 3.7-1 of the LRA provides the results of this AMR. The NRC staff reviewed the information in Section 2.5.3.3 and additional information provided by the applicant to verify that the applicant identified the cables that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1), and did not identify any omissions.

2.5.3.3.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately identified electrical cables that are subject to an AMR consistent with the requirements of 10 CFR 54.21(a)(1).

2.5.3.4 Electrical Bus

2.5.3.4.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.4.1, the applicant states that electrical buses at ANO-1 are not in the scope of license renewal or are not subject to an AMR due to the fact that they are of a larger complex assembly or they are not safety related. The isolated-phase bus that connects the main generator to the main transformers is not safety related. The switchyard bus is likewise not safety-related. In addition, the applicant states that some safety-related 4.16-kV bus is contained within the safety-related 4.16-kV switchgear, however this bus is considered a piece-part of this switchgear. This switchgear is a large complex assembly containing the 4.16-kV bus, breakers, relays, wiring and controls. Because switchgear are considered active components in accordance with the requirements of 10 CFR 54.21(a)(1)(i), this bus is not subject to an AMR.

2.5.3.4.2 Staff Evaluation

The NRC staff reviewed the screening results related to buses presented in Section 2.5.4 of the ANO-1 LRA. After the initial review, the NRC staff requested additional information in letters to the applicant dated April 17, 2000, April 25, 2000, and May 2, 2000, regarding electrical buses under Section 2.5.4.1 of the LRA. Electrical buses were generically excluded from the scope of license renewal based on the characterization that those buses were not safety-related. A component cannot be excluded simply because they are non-safety-related. Any component, including an electrical bus, that is non-safety-related but whose failure could prevent satisfactory accomplishment of the function identified in 10 CFR 54.4(a)(2) or a(3), needs to be included within the scope of license renewal. The staff requested the applicant to provide a justification for excluding electrical buses from the scope of license renewal. The applicant responded to these RAIs in a letter to the NRC dated July 31, 2000. In its response, the applicant states that it has re-reviewed the electrical buses not included within the scope of license renewal and verified that these buses do not meet the criteria under 10 CFR 54.4(a)(1), (a)(2) or (a)(3). The applicant's response resolved the staff's concern. The NRC staff reviewed Section 2.5.4.1of the LRA and the additional information provided by the applicant to verify that there are no buses that are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54.4, and 54.21(a)(1), respectively, and did not identify any buses requiring an AMR.

2.5.3.4.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately verified that non-safety-related electrical buses are not within the scope of license renewal and the safety-related 4.16-kV bus is not subject to an AMR consistent with the requirements of 10 CFR 54.21(a)(1).

2.5.3.5 Insulators

2.5.3.5.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.4, the applicant states that electrical insulators associated with the ANO-1 switchyard are not within the scope of license renewal since they are not safety-related. Other insulators found in the plant are either not safety-related or are part of a larger complex assembly.

2.5.3.5.2 Staff Evaluation

The NRC staff reviewed the scoping and screening results relating to insulators presented in Section 2.5.4 of the ANO-1 LRA. After the initial review, the NRC staff requested additional information in letters to the applicant dated April 17, April 25, and May 2, 2000, regarding the insulators under Section 2.5.4.2 of the LRA. Insulators were generically excluded from an AMR on the characterization that they were "part of a larger complex assembly or not safety-related." A component can not be excluded from an AMR simply because it is part of a larger complex assembly. If a complex assembly is within the scope of License Renewal Rule, and component within that complex assembly is determined to be passive and long-lived, that component should be subject to an AMR. In addition, any component that is non-safety-related but whose failure could prevent satisfactory accomplishment of the functions identified in 10 CFR 54.4(a)(1), need to be included within the scope of license renewal. If any non-safety-related component within the scope of license renewal perform its intended function(s) without moving parts or without a change in configuration or properties, and is not replaced based on qualified life or specified time period, is subject to an AMR. The staff request the applicant provide a justification for excluding the insulators discussed in Section 2.5.4.2 of the LRA. The applicant responded to these RAIs in a letter to the NRC dated July 31, 2000.

In response to the NRC staff RAIs, the applicant states that "at ANO-1, only the 500 kV system contains insulators that are considered to be separate components." As identified in the RAI response, only the circuit breakers that provide an interface between the 500 kV system and other systems are within the scope of license renewal. None of the insulators in the 500 kV system are in scope of license renewal because they are not safety-related and do not meet the criteria of 10 CFR 54.4(a)(2) and 54.4(a)(3).

Many other components at ANO-1 contain parts that serve as insulating devices. However, all of these components, such as load centers, motor control centers, switchgear, and distribution panels, are active components and thus are not subject to an AMR. The staff reviewed the applicant's response and found that it resolved the staff's concern.

The NRC staff reviewed the information in Section 2.5.4.2 and additional information provided by the applicant and found that, except for insulators in circuit breakers that provide an interface between the 500 kV system and other systems that are within the scope of license renewal, no other insulators in the 500-kV system are within the scope of license renewal. The insulators that are in scope of license renewal are considered part of an active component assembly and do not required an AMR in accordance with 10 CFR 54.21(a)(1).

2.5.3.5.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately verified that no insulators are subject to an AMR consistent with the requirements of 10 CFR 54.21(a)(1).

2.5.3.6 Transmission Conductor

2.5.3.6.1 Summary of Technical Information in the Application

In the LRA, Section 2.5.4, the applicant states that transmission conductors at ANO-1 do not meet the scoping criteria of 10 CFR 54.4(a), and, therefore, are not in the scope of license renewal, and not subject to an AMR.

2.5.3.6.2 Staff Evaluation

The NRC staff reviewed the scoping and screening results relating to transmission conductors presented in Section 2.5.4 of the ANO-1 LRA. The NRC staff reviewed this information to verify that there are no transmission conductors that are within the scope of license renewal, and therefore, are not subject to an AMR in accordance with the requirements of 10 CFR 54.4 and 54.21(a)(1), respectively, and did not identify any insulators requiring an AMR.

2.5.3.6.3 Conclusions

On the basis of the review described above, the NRC staff finds that there is reasonable assurance that the applicant has adequately verified that no transmission conductors are subject to an AMR consistent with the requirements of 10 CFR 54.21(a)(1).

2.5.4 References for Section 2.5

1. 10 CFR 50.48, "Fire Protection."
2. 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."
3. 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events."
4. 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants."
5. 10 CFR 50.63, "Loss of All Alternating Current Power."
6. 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
7. DG-1047, "Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," Working Draft, April 21, 2000.
8. "Arkansas Nuclear One - Unit 1, License Renewal Application" dated January 31, 2000.
9. "ANO-1 Updated Final Safety Analysis Report."
10. NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54– The License Renewal Rule," Revision 1, January 2000.