June 17, 2003

Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1 AND 2 - REVIEW OF HOLTEC REPORT RE: USE OF METAMIC® IN FUEL POOL APPLICATIONS (TAC NOS. MB5862 AND MB5863)

Dear Mr. Anderson:

By letter dated August 8, 2002, as supplemented by letter dated January 31, 2003, Entergy Operations, Inc., requested a review of Holtec International Report HI-2022871, "Use of Metamic® in Fuel Pool Applications," for the proposed use of Metamic® poison panels in the Arkansas Nuclear One, Units 1 and 2, spent fuel pools.

The NRC staff has evaluated the Holtec report and found it acceptable in supporting the use of Metamic® for fuel pool applications contingent upon the conditions and limitations described on its use as stated in the enclosed Safety Evaluation.

Sincerely,

/RA/

Thomas W. Alexion, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-313 and 368

Enclosure: Safety Evaluation

cc w/encl: See next page

June 17, 2003

Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1 AND 2 - REVIEW OF HOLTEC REPORT RE: USE OF METAMIC® IN FUEL POOL APPLICATIONS (TAC NOS. MB5862 AND MB5863)

Dear Mr. Anderson:

By letter dated August 8, 2002, as supplemented by letter dated January 31, 2003, Entergy Operations, Inc., requested a review of Holtec International Report HI-2022871, "Use of Metamic® in Fuel Pool Applications," for the proposed use of Metamic® poison panels in the Arkansas Nuclear One, Units 1 and 2, spent fuel pools.

The NRC staff has evaluated the Holtec report and found it acceptable in supporting the use of Metamic® for fuel pool applications contingent upon the conditions and limitations described on its use as stated in the enclosed Safety Evaluation.

Sincerely,

/RA/

Thomas W. Alexion, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-313 and 50-368
Enclosure: Safety Evaluation
cc w/encl: See next page

DISTRIBUTION:
PUBLIC
PDIV-1 r/f
RidsOgcRp
RidsAcrsAcnwMailCenter
RidsNrrDlpmLpdiv1 (RGramm)
RidsNrrPMTAlexion
RidsNrrLADJohnson
RidsRgn4MailCenter (AHowell)
CLauron
Accession No.: ML031681432

OFFICE	PDIV-1/PM	PDIV-1/LA	EMCB/SC	PDIV-1/SC
NAME	TAlexion	DJohnson	LLund	RGramm
DATE	5/29/03	6/12/03	6/6/03	6/13/03

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO HOLTEC INTERNATIONAL REPORT HI-2022871

REGARDING USE OF METAMIC® IN FUEL POOL APPLICATIONS

FACILITY OPERATING LICENSE NOS. DPR-51 AND NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NOS. 1 AND 2

DOCKET NOS. 50-313 AND 50-368

1.0 INTRODUCTION

By letter dated August 8, 2002, as supplemented by letter dated January 31, 2003, Entergy Operations, Inc. (Entergy or the licensee), requested a review of Holtec International (Holtec or HI) Report HI-2022871, "Use of Metamic® in Fuel Pool Applications," for the proposed use of Metamic® poison panels in the Arkansas Nuclear One (ANO), Units 1 and 2, spent fuel pools (SFPs).

Metamic® has not been previously used in SFP applications but has properties similar to Boral®, which is currently used in SFP applications. The Holtec report discusses the composition and physical properties of Metamic®, the manufacturing process, the results of corrosion testing, the resistance to radiation damage, and a comparison of Metamic® to Boral®.

2.0 SUMMARY OF INFORMATION IN THE HOLTEC REPORT

The Holtec report, HI-2022871, describes the tests performed on Metamic® to demonstrate its suitability for use as a neutron absorber in the SFP environment.

2.1 Composition of Metamic®

Metamic® is a fully-dense, discontinuously-reinforced, metal matrix composite material. It consists of high-purity Type 6061 aluminum (Al 6061) alloy matrix reinforced with Type 1 American Society for Testing and Materials (ASTM) C 750 isotopically-graded boron carbide (B_4C). The following table shows the relationship among the weight percentages (Wt. %) of B_4C and Al 6061, the volume percentage (Vol. %) of B_4C, and the composite density of B_4C in grams per centimeters cubed (gm/cm^3).

Wt. % B_4C	Wt. % Al 6061	Vol. % B_4C	Composite Density, gm/cm^3
14.14	85.86	15	2.673
18.92	81.08	20	2.664
28.57	71.43	30	2.646
38.36	61.64	40	2.628

A specification for 40 Wt. % Metamic® calls for high-purity aluminum powder and ASTM C 750 / Type 1 B_4C powder. The high-purity aluminum powder consists mainly of aluminum with trace amounts of magnesium, silicon, copper, iron, titanium, nickel, cobalt, manganese, and chromium. The B_4C powder consists of a minimum 98.0% total boron and carbon.

Metamic® panels can be either mill-finished or anodized. Coupons of both types were tested in addition to mill-finished Al 6061 samples.

2.2 Testing of Metamic®

The testing of Metamic® coupons included the following:

- physical properties testing for short-term (48 hour) elevated temperature (900°F) and long-term elevated temperature (750°F) for time periods in excess of one year;
- accelerated corrosion testing (195°F) for time periods in excess of one year;
- accelerated radiation testing at exposures up to 1.5 $x10^{11}$ rads gamma;
- mechanical properties testing at temperatures up to 900°F; and
- neutron transmission testing of coupons before and after corrosion testing.

2.2.1 Physical Properties Testing

Mill-finished and anodized rectangular coupons as well as mill-finished and anodized tensile coupons were tested. Both 15 Wt.% and 31 Wt.% B_4C were represented in the coupons tested. In addition, the results of 40 Wt.% B_4C coupons tested in air, at room temperature, and elevated temperatures to determine mechanical properties (i.e., yield strength and ultimate strength), were compared with the mechanical properties obtained for the 31 Wt.% coupons.

The coupons used for the testing were 2" x 4" x 0.075" (nominal thickness) in dimension. For short-term testing, the coupons were exposed to an inert atmosphere for 48 hours at 900°F. Characterization of the samples was completed before and after exposure to the elevated temperature. For long-term testing, the coupons were exposed to an air atmosphere at 750°F. After 2133 hours, 4124 hours, and 6139 hours, the coupons were cooled to room temperature and subjected to non-destructive testing (NDT), and then reinserted in the test environment. At 8523 hours, the coupons underwent NDT and destructive mechanical testing.

2.2.2 Corrosion Testing

Accelerated corrosion testing was performed on mill-finished and anodized Metamic® coupons as well as mill finished Al 6061 coupons in the following environments at 195°F for 9020 hours: deionized water to simulate boiling water reactor pool conditions, and deionized water containing 2500 parts per million boron as boric acid, to simulate pressurized water reactor pool conditions. The Metamic® coupons contained 15 Wt.% and 31 Wt.% B_4C, with the number of coupons distributed in each environment for the various types of corrosion tests as follows:

	Deionized Water		**Boric Acid**	
Coupon Type	**15 Wt.% B_4C**	**31 Wt.% B_4C**	**15 Wt.% B_4C**	**31 Wt.% B_4C**
Mill Finished	Number of coupons			
General	10	10	10	10
Crevice	10		10	
Galvanic	10		10	
Weld	10		10	
Encapsulated	10	10	10	10
Anodized Metamic®	Number of coupons			
General	10	10	10	10
General w/ Scratches	10		10	
Crevice	10		10	
Galvanic	10		10	
Weld	10		10	
Encapsulated	10	10	10	10
Mill-Finished Al 6061	10		10	

The general coupons were used to determine the rate of oxide film formation on the coupons. These coupons were precision weighed and nitric acid washed prior to weighing after testing.

The general anodized coupons with scratches were used to simulate handling scratches that would be incurred during assembly and fabrication. Performance assessment of these coupons was completed through optical microscopy.

The crevice coupons had two 0.250" holes to create a crevice upon attachment of two Teflon washers with Al 6061 screws and an insulating Teflon shoulder washer.

The galvanic coupons were Metamic® coupons mechanically fastened to 304-L stainless steel, Inconel 718, and Zircaloy to simulate contact of fuel assemblies. Performance assessment of these coupons was completed by optical microscopy and dry weight measurement.

The welded coupons had a transverse butt weld made with a series 4000 alloy. Performance assessment of these coupons were completed through optical microscopy with acid cleaning as needed.

The encapsulated coupons were enclosed by stainless steel plates on each side of a peripheral, “picture frame” plate. Limited flow was permitted to simulate the semi-stagnant condition present in some SFP racks. The Al 6061 coupons were not anodized and served as a baseline for comparison with the Metamic® coupons.

2.2.3 Radiation Testing

The radiation testing of Metamic® coupons was performed in a specially-designed canister at the Ford Nuclear Reactor at the University of Michigan. The canister was designed to minimize the amount of thermal neutron energy deposited in the coupons to simulate conditions in the SFP and included inlet and outlet ports to preclude neutron streaming. The canister is irradiated at the core face centerline where it accumulates 4.5×10^9 rads per ten-day operating cycle. Every 2.5 days, the canister is rotated one-quarter turn such that all coupons receive approximately the same exposure. The canister contained a total of 144 rectangular and tensile coupons, including 12 Al 6061 coupons. The coupons are arranged in 12 packets, each containing 12 coupons. Six packets receiving different gamma doses were removed and analyzed. The gamma doses received by these packets ranged from 4.5×10^9 rads for the first packet to 1.5×10^{11} rads for the sixth packet. The dose for the sixth packet is roughly equivalent to the exposure that Metamic® panels would receive in 40 years of actual fuel rack service.

2.2.4 Neutron Transmission Testing

Boron-10 areal density testing was performed at 48 hours for the short-term testing coupons and at 8523 hours for long-term testing coupons. In addition, neutron attenuation testing was performed on irradiated coupons.

Neutron absorption properties were determined to assess the B_4C distribution in Metamic®. These properties can be measured by the neutron transmission ratio, i.e., the ratio of the number of neutrons detected on the other side of the sample to the total number of neutrons incident upon the sample’s face. The neutron transmission measurements were performed at the Beam Hole Laboratory of the Breazeale Reactor at the Pennsylvania State University. The Triga Reactor is used as a source of neutrons. The neutron intensity is measured with only a BF_3 detector in the beam. A specimen of Metamic® is then placed between the BF_3 detector and the beam to measure the intensity of thermal neutrons transmitted through the sample. Epi-thermal neutrons which pass through the sample are absorbed by a thick neutron absorber to determine “background” beam intensity.

To develop the calibration curve for the transmission ratio and the areal density, five locations on twelve standard coupons of three B_4C loadings at four thicknesses each were measured. To establish repeatability and consistency of data, eight measurements were performed on a

single location of a 24" x 4" 15 Wt.% B_4C plate. These measurements were distributed among all the measurements of this plate as if these were eight distinct locations.

For the 15 Wt.% B_4C plate, 15 locations were measured via neutron beam port A1 and 8 locations via port A2. For the 22" x 14" 31 Wt.% B_4C plate, 14 locations were measured via neutron beam port A1 and 14 locations via port A2. These measurements were used to generate contour plots of the measured transmission ratio for each plate tested. Based on these measurements, a methodology was developed to predict the areal density of samples of varying B_4C loading. The areal density, thickness, and material constraints were further used to compute B_4C loading.

2.3 Comparison of Metamic® with Boral®

Below is a modified table from the Holtec report which compares the properties of Metamic® with Boral®.

	Metamic®	Boral®
Metal	Al 6061	Aluminum 1100
Neutron Poison Material	B_4C	B_4C
B_4C Content, %	40 throughout	44 in matrix only
Uncertainty in B_4C Content, %	± 0.5	± 8.0
Surface Finishes	Mill, glass beaded, or anodized	Mill or anodized
Yield Strength, pounds per square inch	21,000 - 33,000	9,000 - 12,000
Corrosion Resistance in Hot Water and Hot Borated Water	Very good	Very good
Resistance to Radiation Damage	Very good	Very good

3.0 TECHNICAL EVALUATION

Metamic®, a metal matrix composite, is composed primarily of B_4C and Al 6061. B_4C is the main constituent in materials known to perform effectively as neutron absorbers. In addition, Al 6061 is a marine-qualified material known for its resistance to corrosion. The staff finds that these characteristics support the assertion that Metamic® is a desirable neutron absorber for wet storage applications. However, the distribution of the B_4C in Metamic® is also an important factor in determining the overall effectiveness of this material for SFP applications. Therefore, the staff reviewed the technical assessment of the B_4C distribution in Metamic®.

The technical assessment of the B_4C distribution in Metamic® concluded that there were no significant local non-uniformities observed in the B_4C loading or in the areal density of the 15 Wt.% and 31 Wt.% B_4C plates tested. Small global non-uniformities were observed in B_4C

loading and areal density, but were concluded to be of no consequence. The staff notes that the technical assessment consisted of careful experimentation and robust statistical analyses to determine the global non-uniformities from the manufacturing process and local non-uniformities due to the dispersion of the B_4C in the aluminum.

The staff requested that the licensee discuss how the areal density variation changes with respect to the increase in thickness variation due to the manufacturing of Metamic® panels larger than those samples tested. By supplemental letter dated January 31, 2003, the licensee indicated that the B_4C content is uniformly distributed in Al 6061; therefore, the areal density variation is directly proportional to the thickness of the plate. It is expected that as the Metamic® panel thickness increases, the neutron absorption capacity provided by the B_4C increases. Based on this response and the conclusions in the technical assessment of B_4C loading, the staff finds that Metamic® panels manufactured for use in the SFP should perform effectively as a neutron absorber since the B_4C is uniformly distributed through the material.

The suitability of Metamic® as a neutron absorber for SFP applications can be determined from various tests simulating conditions in the wet storage environment. Short-term and long-term elevated temperature tests, corrosion tests, and radiation tests were performed on Metamic® coupons. The staff requested that the licensee discuss the frequency of the tests performed and the reliability of the data acquired. By supplemental letter dated January 31, 2003, the licensee indicated that the number of tests performed is not known due to the unavailability of the test data. However, each test was performed under the applicable provisions of a quality assurance program to verify the reliability and repeatability of the data. Based on this response and the analyses provided, the staff finds that the tests used to support the suitability of Metamic® were appropriately executed.

The elevated temperature tests indicate that slight darkening occurred for mill-finished coupons. There were small or no significant changes in dimensions, density, Boron-10 areal density, and Rockwell hardness. The staff notes that there are small changes in mechanical properties as expected with the increase in B_4C content to 31 Wt. % and the increased exposure to elevated temperatures. The staff requested that the licensee discuss the possible causes of the discoloration of the coupons and whether any other physical changes were observed such as blistering, peeling, or cracking of the coupons. By supplemental letter dated January 31, 2003, the licensee indicated that the discoloration of the coupon is attributed to the oxidation of the aluminum surface of the Metamic®. In addition, there were no other physical changes observed. The staff finds this response consistent with the formation of the oxide layer on aluminum.

The staff requested that the licensee discuss how the areal density for the short-term and long-term coupons were determined. By supplemental letter dated January 31, 2003, the licensee indicated that the areal densities were determined through neutron transmission measurements using a beam of thermalized neutrons with a neutron counter. The measurements were performed at a sufficient frequency to obtain desired statistical confidence limits. Based on the direct measurements provided by this technique and the analyses used, the staff finds that the observations made for the short-term and long-term tests are accurate in concluding that there were no significant changes in areal density.

The staff requested that the licensee confirm that the pre-test data coupons used to determine mechanical properties are from the same lot as the coupons used in the elevated temperature

tests. By supplemental letter dated January 31, 2003, the licensee indicated that although the lot numbers for the coupons were not reported, measurable differences between lots are not expected since quality controls were implemented during manufacturing. The staff finds that the licensee's conclusion is acceptable since the observations from the elevated temperature tests are as expected for increased B_4C content based on engineering judgement.

The corrosion testing of Metamic® included several samples for different corrosion mechanisms in both deionized and borated water environments. The results from these tests indicate that Metamic® performs well overall; however, localized pitting occurred on some coupons due to impurities on the surface. The staff requested that the licensee discuss the types of chemicals used to clean the coupons, the degree to which local pits were formed, and if there was preferential pitting on the coupons. By supplemental letter dated January 31, 2003, the licensee indicated that the coupons were initially cleaned with an alkaline wash followed by a demineralized water rinse prior to final treatment with a dilute nitric acid solution. An alternative cleaning method with glass beading was also used. The licensee further stated that the chemical cleaning did not result in the formation of the pits; rather, the cleaning process did not completely remove impurities from the surface. The presence of the impurities on the surface lead to the pitting observed during testing. In addition, since the impurities were randomly distributed on the surface of the coupons, there was no observed preferential pitting. The licensee determined that there was no indication that limited, localized pitting reduces the neutron absorption properties of Metamic®. Based on this response and the recommendation that the surfaces of Metamic® be thoroughly cleaned to remove any contaminants, the staff conditions the use of Metamic® for SFP applications upon sufficient cleaning of the surfaces prior to installation.

The corrosion testing included anodized Metamic® coupons scratched at the surface. The results of the testing indicated that the scratched regions appear to be developing a uniform oxide film where the anodic layer was initially missing. In addition, there was no observed accelerated corrosion effects noted on the scratched areas or on other areas of the coupons. The staff requested that the licensee provide details on the nature of the scratches (i.e., how the scratches were created, their lengths and depths, and if there were any residual metals left in the cracks through the scratching process). The staff also requested that the licensee describe any material changes of the scratched coupons after testing (e.g., areal density changes and observed blistering, cracking, or flaking). By supplemental letter dated January 31, 2003, the licensee indicated that the scratches were created by a scribe applied by hand. The scratches were random in nature and penetrated the anodic layer. No residual metals were found in the cracks prior to testing and the testing resulted in rapid oxidation of the Al 6061 exposed by the removal of the anodic layer. There was no corrosion detected. The licensee further responded that there were no significant differences in corrosion behavior of the coupons with or without scratches. There were no weight changes, no changes in areal density, and no blistering, cracking, or flaking observed. The observations discussed in this response indicate that scratches on Metamic® do not affect its ability to resist corrosion; however, the staff believes that periodic surveillance and testing of Metamic® coupons in the SFP are needed throughout the life of this material. This condition on the use of Metamic® in the SFP is based on the limits of detection used during testing and the creation of the scratches with a scribe by hand. The staff believes that periodic surveillance and testing of Metamic® coupons will ensure that the material is performing as observed in these tests considering the different sources for scratching of the material in the SFP environment.

The staff noted that most of the corrosion testing was performed on 15 Wt.% coupons. The staff requested that the licensee discuss the implications of the tests performed for the 15 Wt.% coupons on coupons with higher B_4C content and to provide the basis for the extrapolating the results. By supplemental letter dated January 31, 2003, the licensee indicated that 15 Wt.% was the predominant loading material available at the time of the tests. In addition, the licensee believes that the extrapolation of the results for higher loadings is applicable since Metamic® is comprised primarily of B_4C and Al 6061; therefore, material properties between the two loadings should be similar. Based on the tests performed and the response provided, the staff finds that the extrapolation of the test results for the 15 Wt.% coupons is applicable to the 31 Wt.% coupons; however, the staff believes that further justification is needed for the use of Metamic® with a B_4C content greater than 31 Wt.%. Although the Holtec report provides test results indicating that mechanical properties between 31 Wt.% and 40 Wt.% Metamic® coupons are comparable, there was no data made available indicating that corrosion and radiation tests are also comparable. Therefore, the staff limits the use of Metamic® for SFP applications to a maximum B_4C content of 31 Wt.% as justified in the data discussed in the Holtec report.

The staff requested that the licensee discuss any considerations provided in the testing for fluid movement, temperature fluctuations, radiation dose changes, and intermittent scratching of the surfaces at different instances during the testing. By supplemental letter dated January 31, 2003, the licensee indicated that fluid movement due to natural circulation was inherent in the tests. Because of this, some coupons were enclosed in stainless steel capsules to simulate semi-stagnant conditions. Temperature fluctuations occurred with all coupons during interim examinations. During these examinations, the coupons may have been subjected to scratching and abrasion although there was no intentional effort to scratch the surfaces. The corrosion coupons were not subject to radiation, but the performance of Metamic® under irradiation was investigated in other tests. Since there was no combined corrosion and irradiation test data available indicating the performance of Metamic®, the staff conditions the use of Metamic® for SFP applications upon periodic surveillance and testing of Metamic® coupons to ensure adequate performance.

In the assessment of radiation effects on Metamic®, the Holtec report notes that the embrittlement in wet storage applications is not a concern since metallic materials typically require much higher radiation doses for degradation than the levels experienced in the SFP environment. The staff requested that the licensee discuss the basis for this statement. By supplemental letter dated January 31, 2003, the licensee indicated that the radiation environment in the SFP is much less severe than those experienced near a reactor core; therefore, over the lifetime of the pool, it is expected that Metamic® panels in the SFP will not attain the exposure of the coupons tested and discussed in the report. Based on this response and the discussion of the radiation tests provided in the report, the staff finds that Metamic® used in the SFP should perform adequately and as expected (i.e., dimensionally stable and no change in areal density).

Boral®, a neutron absorber similar in composition to Metamic®, is known to liberate hydrogen as it passivates when exposed to the SFP environment. The staff requested that the licensee discuss any gas liberation (i.e., bubbling) during the formation of the oxide layer on the coupons. By supplemental letter dated January 31, 2003, the licensee indicated that the coupons were not visible during the course of the tests. Since a small amount of material was used for the tests, the licensee expects very little bubbling to occur and that if any bubbling does occur, it will soon cease. The licensee also stated that bubbling from Metamic® is less

than that from Boral®. The staff notes that the Holtec report indicates that the blistering experienced in some Boral® panels will not occur in Metamic® since it is formed from the blending of Al 6061 and B_4C powders, resulting in a homogeneous-like material with no open porosity to trap the oxidation product formed from the reaction of aluminum and water. Based on this response and the information provided in the Holtec report, the staff conditions the use of Metamic® in the SFP upon periodic surveillance and testing of Metamic® coupons to ensure adequate and consistent performance with the results provided in the Holtec report.

The staff finds, based on the discussion presented above, that Metamic® is an acceptable and suitable material for SFP application with the conditions and limitations discussed in the following section.

4.0 CONDITIONS AND LIMITATIONS ON THE APPLICATION OF THIS SAFETY EVALUATION (SE)

Metamic® is a new material to be used in the spent fuel pool environment. The staff finds that the overall properties of the material are suitable for application in the SFP environment. However, the staff conditions the use of the material upon a coupon sampling program to ensure consistent performance with that described in the Holtec report. In addition, the staff requests that any application of this SE include a discussion of the following:

- size and types of coupons to be used (i.e., similar in fabrication and layout as the proposed insert including welds and proximity to stainless steel);
- technique for measuring the initial B_4C content of the coupons;
- simulation of scratches on the coupons;
- frequency of coupon sampling and its justification; and
- tests to be performed on coupons (e.g., weight measurement, measurement of dimensions (length, width and thickness), and B_4C content); these tests should also address, as a minimum, any bubbling, blistering, cracking, flaking, or areal density changes of the coupons, any dose changes to the coupons, or the effects of any fluid movement and temperature fluctuations of the pool water.

In addition, applications for the use of Metamic® should include a description of the anodizing process if anodized Metamic® is used, and should include the cleaning technique to ensure sufficient removal of surface contaminants prior to installation.

The staff also limits the use of this SE to a B_4C content of 31 Wt.% as evaluated and discussed in the Holtec report. Although the staff notes that test data indicates that material properties between 31 Wt.% and 40 Wt.% Metamic® coupons are comparable, there was no data made available indicating the corrosion and radiation tests are also comparable. Therefore, the staff limits the use of Metamic® for SFP applications to a maximum B_4C content of 31 Wt.%.

5.0 CONCLUSION

Based on its evaluation, the staff finds the proposed use of Metamic® as a neutron absorber in the SFP is acceptable contingent upon the conditions and limitations discussed in Section 4.0 of this SE.

cc:

Executive Vice President
& Chief Operating Officer
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Director, Division of Radiation
Control and Emergency Management
Arkansas Department of Health
4815 West Markham Street, Slot 30
Little Rock, AR 72205-3867

Winston & Strawn
1400 L Street, N.W.
Washington, DC 20005-3502

Mr. Mike Schoppman
Framatome ANP, Richland, Inc.
Suite 705
1911 North Fort Myer Drive
Rosslyn, VA 22209

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 310
London, AR 72847

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

County Judge of Pope County
Pope County Courthouse
Russellville, AR 72801

Vice President, Operations Support
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Wise, Carter, Child & Caraway
P. O. Box 651
Jackson, MS 39205