UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

July 16, 2008

EA-08-192

Mr. J. Randy Johnson
Vice President – Farley
Southern Nuclear Operating Company
7388 North State Highway 95
Columbia, AL 36319

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT UNIT 1, NRC INSPECTION REPORT 05000348/2008011 AND PRELIMINARY WHITE FINDING

Dear Mr. Johnson:

On June 26, 2008, the Nuclear Regulatory Commission (NRC) completed an inspection of the 1B Emergency Diesel Generator (EDG) exhaust header failure which occurred on March 13, 2008. The enclosed report documents the inspection results which were discussed with you on June 26, 2008.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Based on the results of this inspection, a finding was identified involving inadequate work instructions to install the 1B EDG exhaust header. These work instructions did not adequately provide the vendor's installation instructions which led to failure of the exhaust header causing the 1B EDG to be declared inoperable on March 13, 2008. On March 17, 2008, the exhaust header was repaired and the 1B EDG returned to service.

This finding was assessed based on the best available information, including influential assumptions, using the applicable Significance Determination Process (SDP) and was preliminarily determined to be a low to moderate safety significance (White) finding. The final resolution of this finding will convey the increment in the importance to safety by assigning the corresponding color, i.e., White, a finding with low to moderate increased importance to safety that may require additional NRC inspections. The calculated risk increase over the base case was determined to be between 1E-5 and 1E-6 which is a White finding under the SDP. The dominant accident sequence is Unit 1 in a Train B alignment when a loss of offsite power occurs. The 1B EDG fails due to the exhaust header failure causing a loss of power to all Train B components along with a failure of the Train A of Component Cooling Water (CCW). These events ultimately could result in the loss of both RCP seal injection and thermal barrier cooling resulting in an unmitigated RCP seal loss-of-coolant accident leading to core damage. The

exposure time assumed was one-half of the period from February 10 to March 13 plus approximately 60 hours repair time for the exhaust header. The SDP analysis is included as Enclosure 2.

The finding is also an apparent violation of Technical Specification 5.4.1, Regulatory Guide 1.33, for inadequate work instructions to install the 1B EDG exhaust header and is being considered for escalated enforcement in accordance with the Enforcement Policy, which can be found on the NRC's web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

The SDP encourages an open dialogue between the staff and the licensee; however, the dialogue should not impact the timeliness of the staff's final determination. Before we make a final decision on this matter, we are providing you an opportunity to: (1) present to the NRC your perspectives on the facts and assumptions used by the NRC to arrive at the finding and its significance at a Regulatory Conference or (2) submit your position on the finding to the NRC in writing. If you request a Regulatory Conference, it should be held within approximately 30 days of the receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference. If you decide to submit only a written response, such a submittal should be sent to the NRC within 30 days of the receipt of this letter.

Please contact Mr. Scott Shaeffer at (404) 562-4521 within 10 business days of the date of your receipt of this letter to notify the NRC of your intentions. If we have not heard from you within 10 business days, we will continue with our significance determination and enforcement decision and you will be advised by separate correspondence of the results of our deliberations on this matter.

Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for this inspection finding at this time. In addition, please be advised that the number and characterization of the apparent violation(s) may change as a result of further NRC review.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/
Leonard D. Wert, Jr., Director
Division of Reactor Projects

Docket No.: 50-348
License No.: NPF-2

Enclosures: 1. NRC Inspection Report 05000348/2008011
2. SDP Phase 3 Summary
cc w/encls: (See page 3)

exposure time assumed was one-half of the period from February 10 to March 13 plus approximately 60 hours repair time for the exhaust header. The SDP analysis is included as Enclosure 2.

The finding is also an apparent violation of Technical Specification 5.4.1, Regulatory Guide 1.33, for inadequate work instructions to install the 1B EDG exhaust header and is being considered for escalated enforcement in accordance with the Enforcement Policy, which can be found on the NRC's web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

The SDP encourages an open dialogue between the staff and the licensee; however, the dialogue should not impact the timeliness of the staff's final determination. Before we make a final decision on this matter, we are providing you an opportunity to: (1) present to the NRC your perspectives on the facts and assumptions used by the NRC to arrive at the finding and its significance at a Regulatory Conference or (2) submit your position on the finding to the NRC in writing. If you request a Regulatory Conference, it should be held within approximately 30 days of the receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference. If you decide to submit only a written response, such a submittal should be sent to the NRC within 30 days of the receipt of this letter.

Please contact Mr. Scott Shaeffer at (404) 562-4521 within 10 business days of the date of your receipt of this letter to notify the NRC of your intentions. If we have not heard from you within 10 business days, we will continue with our significance determination and enforcement decision and you will be advised by separate correspondence of the results of our deliberations on this matter.

Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for this inspection finding at this time. In addition, please be advised that the number and characterization of the apparent violation(s) may change as a result of further NRC review.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Leonard D. Wert, Jr., Director
Division of Reactor Projects

Docket No.: 50-348
License No.: NPF-2

Enclosures: 1. NRC Inspection Report 05000348/2008011
2. SDP Phase 3 Summary

cc w/encls: (See page 3)

X PUBLICLY AVAILABLE NON-PUBLICLY AVAILABLE SENSITIVE X NON-SENSITIVE
ADAMS: ☐ Yes ACCESSION NUMBER:_____ SUNSI REVIEW X SMS

OFFICE	RII:EICS	RII:DRP	RII:DRP	RII:DRS	RII:DRP	RII:DRP	RII:DRP
SIGNATURE	CFE /RA/	SMS /RA/	LDW /RA for/	WGR /RA/	SRS /via email/	ELC /via email/	TXL /RA/
NAME	CEvans	SShaeffer	JMoorman	WRogers	SSandal	ECrowe	TLighty
DATE	07/15/2008	07/15/2008	07/16/2008	07/15/2008	07/16/2008	07/16/2008	07/16/2008
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY DOCUMENT NAME: I:\RPB2\FARLEY\REPORTS\08-11\1B EDG CHOICE LETTER FULL RELEASE.DOC

cc w/encls.:
B. D. McKinney
Licensing Services Manager
B-031
Southern Nuclear Operating Company, Inc.
Electronic Mail Distribution

Jeffrey T. Gasser
Executive Vice President
Southern Nuclear Operating Company, Inc.
Electronic Mail Distribution

William D. Oldfield
Quality Assurance Supervisor
Southern Nuclear Operating Company
Electronic Mail Distribution

L. Mike Stinson
Vice President
Fleet Operations Support
Southern Nuclear Operating Company, Inc.
Electronic Mail Distribution

David H. Jones
Vice President
Engineering
Southern Nuclear Operating Company, Inc.
Electronic Mail Distribution

Moanica Caston
Vice President and General Counsel
Southern Nuclear Operating Company, Inc.
Electronic Mail Distribution

M. Stanford Blanton, Esq.
Balch and Bingham Law Firm
Electronic Mail Distribution

Dr. D. E. Williamson
State Health Officer
Alabama Dept. of Public Health
Electronic Mail Distribution

Mr. Mark Culver
Chairman
Houston County Commission
P. O. Box 6406
Dothan, AL 36302

Jim Sommerville
(Acting) Chief
Environmental Protection Division
Department of Natural Resources
Electronic Mail Distribution

Letter to J. Randy Johnson from Leonard D. Wert dated July 16, 2008

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT UNIT 1, NRC INSPECTION REPORT 05000348/2008-011 AND PRELIMINARY WHITE FINDING

Distribution w/encl:
C. Evans, RII
L. Slack, RII
OEMail
RIDSNRRDIRS
R. Jervey, NRR

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	05000348
License No.:	NPF-2
Report No.:	05000348/2008-011
Licensee:	Southern Nuclear Operating Company, Inc.
Facility:	Joseph M. Farley Nuclear Plant, Unit 1
Location:	Columbia, AL
Dates:	June 13, 2008 – June 26, 2008
Inspectors:	E. Crowe, Senior Resident Inspector W. Rogers, Senior Reactor Analyst (Section 4OA5) T. Lighty, Project Engineer (Section 4OA5) S. Sandal, Resident Inspector
Approved by:	Scott M. Shaeffer, Chief Reactor Projects Branch 2 Division of Reactor Projects

Enclosure 1

SUMMARY OF FINDINGS

IR 05000348/2008-011; 6/13/2008 – 6/26/2008 - Joseph M. Farley Nuclear Plant; Unit 1; Other Activities.

The report transmits the results of the NRC's preliminary assessment of the 1B Emergency Diesel Generator exhaust header failure. One Apparent Violation with potentially low to moderate safety significance (White) was identified. The significance of most findings is indicated by its color (Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or assigned a severity level after management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, Reactor Oversight Process.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

TBD. A self-revealing finding and Apparent Violation of Technical Specification 5.4.1 was identified for inadequate work instructions which resulted in the 1B Emergency Diesel Generator (EDG) exhaust header not being installed in accordance with the vendor's instructions. Subsequently, the 1B EDG exhaust header failed during a surveillance test. No immediate safety concern exists because the exhaust header has been repaired and the 1B EDG was returned to service. In addition, the exhaust header replacement had not been implemented on the remaining EDGs.

The failure to provide adequate work instructions for installing the 1B EDG exhaust header is a performance deficiency. This finding is more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. In addition the 1B EDG exhaust header failure potentially affected the ability of the 1B EDG to meet its mission time. This finding was assessed using the applicable SDP and preliminarily determined to White because there was a calculated risk increase over the base case between 1E-5 and 1E-6. The dominant accident sequence is a series of failures which results in a reactor coolant pump seal loss-of-coolant accident that cannot be mitigated leading to core damage. The exposure time assumed in the attached SDP analysis was one-half the period from February 10 to March 13 plus approximately 60 hours repair time for the exhaust header.

B. Licensee-Identified Violations

None.

REPORT DETAILS

4. OTHER ACTIVITIES

4OA5 Other

(Opened) Apparent Violation (AV) 05000348/2008011-001, 1B EDG Exhaust Header Failure

Inspection Scope

The inspectors conducted an in-office inspection and significance evaluation of the 1B EDG exhaust header failure.

Findings

Introduction. A self-revealing apparent violation (AV) of Technical Specification 5.4.1 was identified for inadequate work instructions which resulted in the 1B Emergency Diesel Generator (EDG) exhaust header not being installed in accordance with the vendor's instructions. Subsequently, the 1B EDG exhaust header failed during a surveillance test which resulted in EDG being manually shutdown and declared inoperable. This finding was preliminarily determined to be of low-to-moderate safety significance (White). No immediate safety concern exists because the exhaust header has been repaired and the 1B EDG was returned to service. In addition, the exhaust header replacement had not been implemented on the remaining EDGs.

Description. On February 4, 2008, the 1B EDG was removed from service for routine maintenance which included exhaust header replacement. The new exhaust header was considered a like-for-like replacement of the existing exhaust header. On February 10, the EDG passed the post maintenance test and was returned to service. Between February 10 and March 13, the EDG was intermittently operated successfully during routine surveillance and maintenance activities. On March 13, the 1B EDG was started for a post-maintenance surveillance test. Approximately 2 hours and 12 minutes into the surveillance period, the control room received fire alarms for the 1B EDG room. An operator, sent to check on the cause of the fire alarm, reported the EDG room was full of smoke and the carbon dioxide fire suppression system had discharged. The control room operator then manually shutdown the 1B EDG. Post event inspections identified that temporary welds on an exhaust header elbow had broken which resulted in the elbow separating from the exhaust header.

Work order (WO) 1052028501 provided installation instructions for the exhaust header. The WO referenced the vendor's manual for the installation process; however, the WO did not provide the specific vendor's instructions to install the exhaust header. The vendor's instructions were contained in a Service Information Letter (SIL) dated October 17, 1989, which the licensee had incorporated into the vendor manual. The SIL stated that the exhaust header assemblies were shipped with one or more flanges or fittings that were temporarily welded to allow for repositioning to fit the EDG and final welding of

the assemblies was required. The SIL also stated that after final welding, the assemblies were to be hydrostatically tested at 1.5 times the system working pressure to verify weld integrity. These instructions were not incorporated into WO 1052028501 or otherwise used during installation of the 1B EDG exhaust header. As a result, the 1B EDG exhaust header failed on March 13, 2008. On March 17, the exhaust header was repaired and the 1B EDG returned to service.

Analysis. The failure to provide adequate work instructions for installing the 1B EDG exhaust header is a performance deficiency. This finding is more than minor because it was associated with the Design Control attribute of the Mitigating Systems cornerstone and adversely affected the objective in that the failure potentially affected the ability of the 1B EDG to meet its mission time. This finding was assessed using the applicable SDP and preliminarily determined to be White because there was a calculated risk increase over the base case between 1E-5 and 1E-6. The dominant accident sequence is Unit 1 in a Train B alignment when a loss of offsite power occurs. The 1B EDG fails due to the exhaust header failure causing a loss of power to all Train B components along with the failure of the Train A of Component Cooling Water (CCW). The loss of all CCW eliminates charging/high-head safety injection pump cooling which causes a loss of reactor coolant pump (RCP) seal injection. The loss of all CCW also eliminates RCP thermal barrier cooling. Therefore, the loss of both RCP seal injection and thermal barrier cooling could result in an unmitigated RCP seal loss-of-coolant accident leading to core damage. The exposure time assumed in the attached SDP analysis was one-half the period from February 10 to March 13 plus approximately 60 hours repair time for the exhaust header. This finding may be assigned a cross-cutting aspect following the final disposition decision.

Enforcement. Technical Specification (TS) 5.4.1 states, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Section 9 of Appendix A to Regulatory Guide 1.33 states that maintenance that can affect the performance of safety-related equipment should be properly pre-planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Contrary to the above, on February 4, 2008, instructions for the conduct of maintenance activities affecting the 1B EDG, were not appropriate to the circumstances. WO1052028501 did not provide adequate instructions to ensure the replacement exhaust header was installed in accordance with the vendor's instructions. As a result, the 1B EDG exhaust header failed on March 13, 2008. Pending final significance determination, this finding is identified as AV 05000348/2008011-01, Inadequate Work Instructions Cause 1B EDG Exhaust Header Failure.

4OA6 Meetings, Including Exit

On June 26, 2008, the NRC presented the inspection results to Mr. Randy Johnson who acknowledged the findings.

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000348/2008011-01	AV	Inadequate Work Instructions Cause 1B EDG Exhaust Header Failure

Closed

None

Opened and Closed

None

SRA Analysis Number: FAR0801
Analysis Type: SDP Phase III
Inspection Report #: 2008011
Plant Name: Farley
Unit Number: 1
Enforcement Action # EA-08-192:

Background – On February 4, 2008, the licensee started a 24 month overhaul of the 1B EDG. This is a Unit 1 EDG which supplies emergency power to the Unit 1 Train B safety related electrical buses. During the overhaul, the licensee installed a new exhaust system on the engine. The licensee installed this new stainless exhaust system based on vendor recommendations related to carbonization of original design which was carbon steel. Licensee verbal conversations with the vendor indicated the stainless steel exhaust system was like-for-like. Therefore, no design change package was created. The licensee's work package referenced the vendor's manual for the header replacement process. The licensee received an addendum to their vendor manual dated October 17, 1989, in the form of a Service Information Letter (SIL). The SIL stated, "in some cases, engine piping assemblies require fitting to the engine. Since this fitting must be done on the engine, the assemblies cannot be completely welded and hydrotested at the factory. These assemblies will be shipped with one or more flanges or fitting tack welded only." The licensee became aware of this requirement following failure of the exhaust system.

On February 10, 2008, the licensee returned 1B EDG to service. Over a period of time from February 10, 2008 to March 13, 2008, this EDG was started 12 times. One of these starts included a 24 hour run on March 11. The total run time for the EDG during the above period was cumulatively 46 hours and 54 minutes. On March 13, 2008, the licensee was performing a surveillance run of the EDG to restore operability following repairs to its low speed signal generator (cable replacement and calibration). The engine was started at 14:18 and was shutdown at 16:30 (engine ran for 2 hours and 12 minutes). The operators secured the engine following a report from a system operator who was sent to the EDG room to investigate a fire alarm.

The issue is considered more that minor because it challenged the equipment performance attribute of the Mitigating Systems Cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

Performance Deficiency – The licensee failed to provide adequate work instructions to install the replacement 1B EDG exhaust header in accordance with the vendor's instructions.

Exposure Time – T/2 from 0140 on February 10, 2008 to 1630 on March 13, 2008, [16.31 days] & repair time from 1630 on March 13, 2008 to 0255 on March 16, 2008 [60.6 hours]

Date of Occurrence – February 10, 2008

Safety Impact: White

Risk Analysis/Considerations

Assumptions

1. The facility operates 50% of the time in the A Train on-service configuration and 50% of the time in B Train. An A Train or B Train on-service configuration means that the normally operating CCW, SW and Charging/HHSI pumps of that train are operating and the swing pumps are aligned to this train's power source. In the case of CCW to align the non-essential header to the opposite train requires operator actions to re-align manual valves in the Auxiliary Building.

2. Based upon inspector input, it is unknown whether the improperly assembled exhaust piping could survive the stresses associated with an emergency loading of the EDG prior to the failure on March 13. Therefore, T/2 will be used for the exposure time prior to the March 13 failure. For this period of time the surrogate for the performance deficiency will be the 1B EDG Failure to Run basic event. The full time period after the piping failure until successful restoration to service will be used as part of the exposure time with the surrogate for the performance deficiency being the 1B EDG Test & Maintenance basic event.

3. The surrogate basic events will be set to 1.0 with no recovery credit assigned. Also, no common cause factor alteration will be done. The only EDG exhaust piping that was changed to stainless steel was the 1B.

4. Since the nominal failure probabilities of the surrogate basic events are almost two magnitudes less than the non-conforming probabilities, the non-conforming CDF will suffice as a reasonable estimate of the delta CDF.

5. Loss of offsite power (LOSP) without offsite power recovery credit will be used as the surrogate for all non-fire external event initiators.

6. The fire external events portion will be based upon the dominant at-power accident sequences with fire frequencies from NRC Manual Chapter 0609, Appendix F, or NUREG/CR-6850 substituted for the specific initiator. When a LOSP is postulated to occur, due to the fire, no offsite power recovery will be credited.

Analysis Methodology & PRA Model: The licensee's full scope model will be used for the internal events evaluation. The logic in the NRC's SPAR model does not include recent changes in the success criteria of the Service Water System and provides more sophisticated loss of power sources to the 1G 4160 VAC Bus. Both of these differences make the full scope model a better choice for the risk analysis. A hand calculation using the basic framework of the dominant internal events cutsets with substitutions in the initiating event frequency will be used to derive the fire risk contribution. A hand calculation using initiating event frequencies from various sources and an NRC SPAR model solution to produce the conditional core damage probability (CCDP) portion for the tornado and earthquake risk contributions will be used to derive their risk contribution.

Significant Influence Factor(s) [if any]: In terms of affecting the numerical result, the most significant factor is not accepting the 24 hour run of March 11, 2008, as providing a credible basis for mission success from February 9, 2008 to March 11, 2008. However, when considering the external event contribution, the color result would not change.

Internal Events Delta CDF for the Exposure Time: The licensee's full scope model was solved for A Train on-service and B Train on-service with basic event 1DGGER43A502BXL, DIESEL 1B FAILS TO RUN DUE TO RANDOM FAILURE, set to 1.0. The resulting non-conforming CDFs were 4.07E-5 and 8.94E-5 respectively. Then the same model was solved for A & B on-service trains with basic event 1DGGER43A502BM1B, DIESEL 1B UNAVAILABLE DUE TO MAINTENANCE, set to 1.0. The resulting non-conforming CDFs were 4.14E-5 and 8.09E-5 respectively. Applying Assumption #1 and #2, the resulting non-conforming CDF is calculated as:

> 4.07E-5/yr (A Train FTR CDF contribution) * 0.5 (proportion of time in A Train) * 16.3 days / 365 days (FTR exposure period) + 8.94E-5/yr (B Train FTR CDF contribution) * 0.5 (proportion of time in B Train) * 16.3 days / 365 days (FTR exposure period) + 4.14-5/yr (A Train T&M CDF contribution) * 0.5 (proportion of time in A Train) * 60.6 hrs / 8760 hrs (T&M exposure period) + 8.09E-5/yr (B Train T&M CDF contribution) * 0.5 (proportion of time in B Train) * 60.6 hrs / 8760 hrs (T&M exposure period) = 9.1E-7 + 2E-6 + 1.4E-7 + 2.8E-7 = 3.3E-6

By applying Assumption #4, this is also the internal events delta CDF for this performance deficiency.

The dominant accident sequence involves the plant in the B Train on-service configuration when a Loss of Offsite Power occurs. Since EDG 1B fails, all of the B Train components lose power. Subsequently, the A Train of CCW fails and operators fail to align the swing CCW pump to the A Train. Since the plant was in the B Train on-service alignment, the swing pump is initially biased to the B Train. The loss of all CCW eliminates all RCP thermal barrier cooling and Charging Pump/HHSI Pump cooling which causes a loss of RCP seal injection. Therefore, an RCP seal LOCA happens and can not be mitigated, leading to core damage.

External Events Considerations

1. Fire – Attachment 6 provides a development of fire frequencies that were inserted into the top cutsets in the A & B on service trains. These fire frequencies then act as surrogates to the initiating events of the top cutsets. In addition, the recovery of an EDG from the nominal SPAR values for the particular time LOSP duration have been substituted for any offsite power recovery basic events in the full scope model cutsets. Given the close results between T&M & FTR in the internal events results, the surrogate basic event being set to 1.0 is the FTR basic event, 1DGGER43A502BXL, with the exposure time set as T/2 + repair time. The results of these insertions produce CDFs of 9.9E-6 for B Train on-service and 8E-7 for A Train on-service.

Applying the appropriate exposure time yields a non-conforming CDF of:

9.9E-5 * .5 * 18.83 days/365 days + 8E-7 * .5 * 18.83 days/365 days = 2.5E-6
Applying Assumption #4, this is the estimated delta CDF.

2. Flood – Internal flooding is included in the internal events full scope model. Therefore, it is included in the internal events evaluation. Due to the plant's location and grading the possibility of external flooding inducing a Loss of Offsite Power would be much less than one from earthquake or tornado. Chapter 5 of the licensee's IPEEE provides perspective on this. Based upon plant walk downs and the information in the IPEE actual quantification will not be performed.

3. Tornado – A tornado strike of the site is postulated to create a non-recoverable Loss of Offsite Power. The frequency of such an event is estimated at 8.6E-4/yr in Chapter 5.1.4 of the licensee's IPEEE. This frequency will be multiplied by a conditional core damage probability derived from NRC SPAR model runs in the GEM mode with LOSP as the initiator. A change set is exercised to change the plant configuration for A or B Train on service. The basic event, EPS-DGN-TM-DG1B, for EDG 1B on test or maintenance is set to 1.0 (always failing), all offsite power recoveries set to TRUE (always failing) and the Service Water pumps 1A & 1B fail to start probabilities have been reduced by a magnitude to account for the need for two, not one, Service Water pump failures in the dominant cutsets to produce a valid CDF estimate. This last change was to provide a surrogate for the logic alteration between the full scope and the SPAR models. For ease of analysis the T&M term only is being manipulated, since the difference between the FTR and T&M solutions are so similar in the internal events evaluation, especially with no offsite power recovery being credited. The resulting CCDP for B Train on-service is 1.36E-3 and 7.27E-4 for A Train on-service. The resulting non-conforming CDF for this exposure period is:

   8.6E-4 tornado strike of site/yr * 1.36E-3 (CCDP) * 18.83 days/365 days * 0.5 + 8.6E-4 tornado strike of site/yr * 7.27E-4 (CCDP) * 18.83 days/365 days * 0.5 = 4.6E-8

Based upon assumption # 4, this value will be used as the delta CDF.

4. Earthquake – Based upon previous calculations by the NRC's Office of Research, the frequency of an earthquake induced LOSP is estimated at 1.43E-5/yr. As with tornado, a non-recoverable LOSP CCDP of 1.36E-3 or 7.27E-4 will be multiplied by this initiating event frequency and by applying the exposure time a non-conforming CDF is derived. Based upon assumption # 4, this value will be used as the delta CDF. The delta CDF is:

   1.43E-5/yr * 1.36E-3 (CCDP) * 18.83 days/365 days * 0.5 + 1.43E-5/yr * 7.27E-4 (CCDP) * 18.83 days/365 days * 0.5 = 7.7E-10

   This numerical result indicates such a small risk contribution that it can be excluded from the final quantification.

5. Hurricane – Quantification will not be performed. The plant will be shutdown, consistent with procedures, prior to the hurricane's arrival.

Summarizing, the external events numerical contribution is in the mid-2E-6 with the fire contribution providing practically all of the risk.

Large Early Release Frequency Impact: The dominant cutsets from the internal and external events solutions do not contain Steam Generator Tube Rupture or Intersystem LOCA as an initiating event. Therefore, CDF not LERF is the appropriate risk metric for determining the significance of this performance deficiency.

Reconciliation between Phase 3 and Plant Notebook Results: Following the guidance of NRC Manual Chapter 0609, the residents used the pre-solved work sheet for the 1B EDG which indicates YELLOW if credit is given for the EDG running between February 9 & March 13. If the full time period is used (time the non-conforming exhaust system was installed, the issue screens RED. Using the exposure time selected under the Phase 3 analysis the color is YELLOW. However, the results of the more sophisticated PRA models (licensee full scope and SPAR) produce less significant results. Also, the dominant accident sequences are different from the Phase 2 results. This is partially due to the simplification needed to produce the worksheets which are the logic of the pre-solved tables. The Farley on-site emergency electrical distribution system is more robust than credited in the worksheet. The worksheet indicates that following a LOSP, only one dedicated EDG (one train = 2) and a failure of operators to provide 1 of 3 swing EDGs (operator action failure = 1) would be needed to created a station blackout condition. These are the dominant accident sequences from the Phase 2 results. As seen from the actual PRA models, three EDGs must fail, worth 5 points, instead of 3. Therefore, the worksheet results are overly-conservative. The actual valid sequences in the worksheet derive from the LBACON (Loss of the On-Service 4160 VAC Bus). The nominal worksheet initiating frequency is 4. However, with the B Train on-service and EDG1B not functional the actual initiating frequency is 2. Given the exposure time of the performance deficiency (3-30 days), the initiator frequency would be 3 and four 7s equaling a 6 or White is the resulting color. These accident sequences parallel the Phase 3 results/cutsets and the color results are consistent. It should be recognized that only through a comparison of the PRA results can the truly dominant sequences can be understood because the LBASCON worksheet is not designated to be solved for a degraded EAC function.

Conclusions/Recommendations – The risk increase over the base case was between 1E-5 and 1E-6. This is White. The internal events contribution met this range and the external events contribution did also. The external events contribution is not minimal; however, it is clearly not sufficient to escalate to the next color level. Therefore, the expenditure of further resources to refine the external contribution is not justified. Recommend this be submitted to the SERP for approval and subsequent issuance to the licensee as a preliminary White finding.

Attachments

1. Phase I Screening Sheets
2. Full Scope Model Top Cutset Summary A Train On-Service FTR Set to 1.0
3. Full Scope Model Top Cutset Summary B Train On-Service FTR Set to 1.0
4. Full Scope Model Top Cutset Summary A Train On-Service T&M Set to 1.0
5. Full Scope Model Top Cutset Summary B Train On-Service T&M Set to 1.0
6. Fire Frequency Development
7. A Train On-Service Cutsets for Fire Initiator
8. B Train On-Service Cutsets for Fire Initiator
9. B Train On-Service SPAR Conditional Core Damage Cutset Summary for Non-Recoverable LOSP
10. A Train On-Service SPAR Conditional Core Damage Cutset Summary for Non-Recoverable LOSP

Analyst: W. Rogers Date: May 16, 2008