UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

April 12, 2004

EA-03-230

Joseph E. Venable
Vice President Operations
Waterford 3
Entergy Operations, Inc.
17265 River Road
Killona, LA 70066-0751

SUBJECT: FINAL SIGNIFICANCE DETERMINATION FOR A WHITE FINDING AND NOTICE OF VIOLATION (NRC Inspection Report No. 50-382/03-007) WATERFORD 3

Dear Mr. Venable:

The purpose of this letter is to provide you the final results of our significance determination of the preliminary "Greater Than Green" finding identified in the subject inspection report. Our preliminary finding was discussed with your staff during an exit briefing conducted on January 5, 2004. The inspection finding was assessed using the Significance Determination Process and was preliminarily characterized as "Greater Than Green" (i.e., an issue of greater than very low safety significance). The finding involved the failure to establish appropriate instructions and accomplish those instructions for installation of a fuel line for the Train A emergency diesel generator in May 2003. The associated performance deficiency resulted in uneven and excessive scoring of the fuel line tubing that ultimately led to a complete 360-degree failure of the fuel supply line on September 29, 2003, during a monthly surveillance test, rendering the Train A emergency diesel generator inoperable.

At your request, a Regulatory Conference was held on March 8, 2004, to further discuss your views on this issue. During the meeting, your staff acknowledged the performance deficiency and described your assessment of the risk significance of the finding. In a supplemental response, dated March 15, 2004, you provided additional information regarding your risk evaluation of the event. A copy of your supplemental response is enclosed. A summary of the Regulatory Conference was issued March 16, 2004. During the Regulatory Conference you agreed that the failure to establish appropriate instructions and accomplish those instructions for installation of a fuel oil line for Train A emergency diesel generator in May 2003 was a performance deficiency and a violation of your Technical Specifications. However, you took exception to certain aspects of the NRC's evaluation of risk associated with this event. After considering all of the information available, and for reasons explained below, the NRC has concluded that the finding is appropriately characterized as "White."

During the Regulatory Conference, your staff provided an overview of the event and the root cause, described your assessment of the significance of the finding, and provided your regulatory perspectives. We agree with your overall view of the event and the root cause determination. However, we do not agree with the approach that your staff undertook in assessing the safety significance for crediting repair of the Train A emergency diesel generator. With regard to applying credit for repair in this case, the NRC evaluated credit for repair in determining the significance of this performance deficiency. However, the modeling of specific maintenance repair activities in the context of probabilistic risk assessment (PRA) sequences is inherently complex and typically requires detailed analysis with appropriate supporting data. NRC Manual Chapter 0609, "Significance Determination Process," dated March 21, 2003, Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," and the ASME PRA Standard provide guidance for modeling equipment repair. The NRC acknowledges that a fraction of PRA models (including the NRC's SPAR 3i models) credit repair of emergency diesel generators by treating all emergency diesel generator failure modes in the aggregate, irrespective of the failure mechanisms, and establishing a mean or median-time-to-repair (MTTR). In general, these models have MTTR in the range of four to eight hours, which is a significantly longer period of time than that considered in your risk assessment.

The analysis that your staff performed for the emergency diesel generator repair at Waterford 3 deviated from the guidance provided in Regulatory Guide 1.200 and is different from the accepted approach for the use of repair, which addresses the spectrum of failure causes and the distribution of repair times for all causes. The NRC accepts that you have demonstrated the feasibility of accomplishing the repair for this particular failure mechanism under a certain set of conditions. However, in order to credit the repair of the emergency diesel generator fuel line rupture in the risk assessment, it is incumbent upon you to demonstrate the feasibility of accomplishing the repair under a reasonably bounding set of conditions. The NRC found your analysis was based on assumptions that did not appropriately consider the dependencies among those actions as well as human error probabilities. The analysis that was performed for the repair did not present sufficient justification for deviating from the guidance provided by Regulatory Guide 1.200.

During the Regulatory Conference, your staff noted that NRC had previously allowed consideration of manual actions in performing significance determination assessments and therefore the precedent had been set for allowing credit for repair in this specific instance. In reviewing the supplemental information that you provided following the conference (enclosed), each of the examples that you identified concerned situations where the NRC had allowed the use of manual actions for recovery, not repair. There are different approaches that are used for analyzing recovery and repair actions. Recovery actions lend themselves to human reliability assessment techniques, and are in principle acceptable given certain conditions where procedures exist that address the necessary actions, training has been conducted for the existing procedures under conditions similar to the scenario assumed, and any equipment needed to complete these actions is available and ready to use. The repair situation that you faced was quite different than the situations in which NRC has credited recovery actions. Plant operators and maintenance personnel were not specifically trained to make the repair to the

EDG fuel supply line under a reasonably bounding set of conditions, there were no specific repair procedures in place, and there was no pre-staged equipment or tools. Also, Regulatory Guide 1.200 does not provide credit for repair actions in which no actuarial data exists, which is the case in this instance.

As a result of non-conservative assumptions in your analysis, including the reasons noted in the preceding discussions, the NRC concluded that you did not make a compelling argument for crediting the repair of the emergency diesel generator in the time assumed in your analysis. As discussed during the Regulatory Conference, the failure of the Train A emergency diesel generator fuel supply line was a stochastic occurrence that occurred after a 2.8-hour run time during a surveillance test. Depending on the operating history of the emergency diesel generator after the performance deficiency occurred, the failure could have occurred in significantly less than 2.8 hours or could have occurred in significantly greater than 2.8 hours. The NRC staff noted that a failure in less than 2.8 hours would have caused a greater increase in the risk estimation than the corresponding decrease in risk estimation associated with a failure following a period of greater than 2.8 hours. We also noted that your analysis did not adequately consider the spectrum of conditions that could occur in a station blackout scenario, some of which may be less conducive to successful timely repair.

The NRC staff agrees that there were conservatisms in our safety assessment for the emergency diesel generator run failure rate and the 4-hour battery depletion time. However, we do not agree that we neglected the 2.8-hour Train A emergency diesel generator run time before fuel oil line failure. Notwithstanding that an earlier failure was possible, the initiating event frequency was adjusted to account for the 2.8-hour run time. Overall, the NRC found that these conservatisms were sufficient to change the NRC ’s overall safety significance determination from "Yellow" to "White" for the case in which no repair of the Train A emergency diesel generator is credited.

Therefore, after considering the information developed during the inspection and the information you provided at the conference, as well as the information provided in your supplemental response, the NRC has concluded that the inspection finding is appropriately characterized as White, (i.e., an issue with low to moderate increased importance to safety, which may require additional NRC inspection).

You have 30 calendar days from the date of this letter to appeal the staff’s determination of significance for the identified White finding. Such appeals will be considered to have merit only if they meet the criteria given in NRC Inspection Manual Chapter 0609, Attachment 2.

The violation of the requirements of 10 CFR Part 50, Appendix B, Criterion V, is cited in the attached Notice of Violation (Notice). In accordance with the NRC Enforcement Policy, NUREG-1600, the Notice of Violation is considered escalated enforcement action because it is associated with a White finding.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response.

Because plant performance for this issue has been determined to be in the regulatory response column, we will use the NRC Action Matrix to determine the most appropriate NRC response for this event. We will notify you by separate correspondence, of that determination.

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

Sincerely,

/RA/

Bruce S. Mallett
Regional Administrator

Docket: 50-382
License: NPF-38

Enclosures:
1. Notice of Violation
2. Entergy Supplemental Response

cc w/Enclosures:

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ENCLOSURE 1

NOTICE OF VIOLATION

Entergy Operations, Inc.
Waterford 3

Docket No. 50-382
License No. NPF-38
EA-03-230

During an NRC inspection completed January 5, 2004, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violation is listed below:

> 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” states in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, and drawings.
>
> Contrary to this requirement, during the overhaul of Train A emergency diesel generator in May 2003, the licensee failed to establish adequate instructions to ensure proper installation of the fuel supply line of Train A emergency diesel generator. This failure resulted in uneven and excessive scoring of the tubing that ultimately led to a complete 360 degree failure of the fuel supply line on September 29, 2003, during a monthly surveillance test.
>
> This violation is associated with a white significance determination process finding.

Pursuant to the provisions of 10 CFR 2.201, Entergy Operations, Incorporated is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555 with a copy to the Regional Administrator, Region IV, and a copy to the NRC Resident Inspector at the facility that is the subject of this Notice of Violation (Notice), within 30 days of the date of the letter transmitting this Notice. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previously docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC’s document system (ADAMS), to the extent possible, it should not include any personal privacy,

proprietary, or safeguards information so that it can be made available to the public without redaction. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room). If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Dated this 12th day of April 2004

Enclosure 2

Supplemental Response Provided by Entergy
Following March 8, 2004 Regulatory Conference

Question 1: Clarify where NRC has given credit for manual action.

Response to Question 1:
A sample review of industry events indicates the NRC has given credit for manual actions in PRA and also used manual actions as a credit for concluding the safety significance of a violations is Green.

The following NRC Inspection Reports are examples.

NRC Integrated Inspection Report 50-285/02-03 - Fort Calhoun Station, dated April 10, 2002
This inspection report identified an issue where the licensee revised a procedure to permit a full flow test of the turbine driven pump and to credit operator action to manipulate valves and change line-ups to maintain operability of the motor driven pump. The NRC determined that during the test both turbine driven and motor driven pumps were inoperable at the same time. As stated in the inspection report, "This finding is determined to have a credible impact on safety, in that, it involved a flawed analysis that ultimately led to operation of the plant in a manner not anticipated in the original license." Although the NRC concluded the licensee could not credit operator action as a condition for Technical Specification operability, the NRC did give credit for operator action under the Significant Determination Process. The NRC concluded in the NRC Inspection Report, "Using Phase 1 of the Significant Determination Process, the team determined that only the mitigating systems cornerstone was affected and that the reliability of the operator actions needed to restore system operability was very high."

NRC Inspection Report 50-440/01-13 – Perry Nuclear Power Plant, dated December 11, 2001
This inspection report identified an issue where due to an inadequate calculation, NRC determined that with the ESW alternate intake sluice gates open, recirculated discharge water would raise ESW suction temperature above the design input value resulting in potential inadequate cooling during a design basis accident. This condition rendered all three trains of ESW inoperable for the period of time that the gates were open and not able to be closed. In the inspection report the NRC stated, "…this issue had a credible impact on safety and could potentially impact the operability of ESW system, a support system for several mitigating systems." The NRC inspection report stated, "…there were several instances…where the gates were opened and removed from service, such that operator restoration of the gate would have been difficult. In those cases, mitigation of an event would require dispatching an operator to the auxiliary building to reposition the swale valves. Upon conducting the Phase 1 SDP, the inspectors concluded the finding was potentially risk significant." Nonetheless, the NRC credited manual action to reposition the swale valves as a basis to conclude the violation was a Green violation. The NRC inspection report stated, "This issue was determined to be of very low safety significance due to the availability of the nonsafety-related service water system and credit for manual operator action, either of which would mitigate the adverse effects of the open sluice gates."

NRC Inspection Report 50-315/2000013(DRP); 50-316/2000013(DRP) – D.C. Cook, dated June 13, 2000

This inspection report identifies an issue where the NRC concluded that past operation of the ESW system with both ESW pumps in a unit out of service with the cross ties opened would have resulted in both ESW loops being inoperable, and therefore the condition was prohibited by Technical Specification and should have been reported under 10 CFR 50.73(a)(2)(i)(B). The licensee had relied on operator action to restore ESW system configuration. Although the NRC concluded the licensee could not credit operator action as a condition for Technical Specification operability, the NRC implied credit for manual operator action in determining safety impact was acceptable. The inspection report stated, "Although manual action credit for determining safety impact may have been warranted, crediting manual actions to maintain TS operability was inappropriate."

NRC Inspection Report 50-272/02-010 and 50-311/02-010 – Salem Generating Station, dated March 31, 2003

This inspection report identifies a potential White violation for failure of the 1C EDG turbocharger that was attributed to a fatigue failure of an inducer blade. This event was evaluated under Phase 3 of the Significant Determination Process. The Licensee took the position that recovery credit for operator action was warranted in the event that the 1A EDG was the only onsite emergency AC power source following a LOOP. In this scenario, the non-essential service water loads would not be automatically isolated. This would result in the only available service water pump operating in a runout condition. The Licensee asserted that the pump would operate in this condition for in excess of 30 minutes before it would fail, which was sufficient time for the operators to diagnose the condition and take recovery action in accordance with Emergency Operating Procedures (EOPs). Although the NRC disallowed credit for operator manual action, the discussion in the NRC inspection report clearly articulated criteria for allowing operator manual action. The NRC inspection report stated, "…the licensee had not performed a rigorous analysis of the likelihood of the operator failure to diagnose the condition and take action. The analyst determined there was a lack of assurance of sufficient time for the operators to progress through the EOPs to the point where they would be directed to manually operate the service water isolation valves and take action before the EDG failed due to inadequate cooling." Clearly, the elements inherent in the NRC inspection report discussion for acceptance of operator manual actions are (1) a rigorous analysis, (2) ease of diagnosis, and (3) sufficient time to complete action. At the Regulatory Conference Waterford 3 personnel discussed why we believe we presented a rigorous analysis for repair, why a tubing break reflects ease of diagnosis, and our justification why the repair could be completed within 1 hour.

NRC Final Significance Determination for a White Finding, EA-03-180, dated December 31, 2003, (NRC Inspection Report 50-255/03-05)

This NRC letter dealt with an event at Palisades Nuclear Plant during shutdown for a planned refueling outage during which there was a loss of offsite power and loss of shutdown cooling. The licensee presented information regarding the time available to operators to perform necessary recovery actions to prevent core damage. Although the NRC did not allow recovery action due to justification concerns, the discussion appears to allow necessary operator recovery actions provided there is robust justification.

Question 2: Waterford 3 will review whether guidance is necessary to respond to EDG failures and demands (LOOP).

Response to Question 2:

CASE 1: Loss of Off-Site Power with one EDG Operable and in operation

RESPONSE: An Auxiliary Operator would be sent to the EDG to monitor its performance throughout the event. He/she would be required to walk the diesel down for any evidence of malfunctions and monitor the EDG operating parameters.

CASE 2: Loss of Off-Site with the failure of both EDGs

RESPONSE: An Auxiliary Operator would be sent to the EDG Rooms to investigate and try to determine the failure mode(s). Maintenance would be directed to start troubleshooting on both EDGs immediately to determine the failure mode and commence the appropriate repairs. An Operations representative (Auxiliary Operator or Licensed Operator based on availability) would closely monitor troubleshooting and repair of the EDGs to insure the emphasis on restoration is present, and the time to restore is as minimal as possible.

ADDITIONAL DISCUSSION:

Both, the Operations Manager Shift and Administrative discussed these scenarios and agree no additional actions need to be taken to address the significance of these two cases by the Operations Department. These expectations are reinforced during training in the simulator during scenarios involving EDG failures. In addition, the Emergency Operating Procedures prioritize Safety Functions and in the event a Safety Function is not met it is required continuous efforts be implemented to restore the function as soon as possible.

Question 3: One of the questions raised by the NRC at the EDG-A SDP Regulatory Conference concerned fire-induced loss of offsite power (LOSP).

Response to Question 3:

The risk impact of a fire in the EDG-A room (RAB-16) was already included in Entergy's risk assessment. The risk impact of a fire in other fire areas, with the fuel line condition on EDG-A, was assessed using the most recent fire model cut sets by setting the EDG-A fail to run event (EDG0DG3ASF) to a probability of 1.0. The resulting changes in CDF by fire area were summed to give a total ICDF, which was multiplied by the non-repair probability (0.1, since the EDG-A room would not be affected) and by the duration of the condition (138 days, 5/16/03 to 9/30/03) to give the ICDP. The resulting ICDP was 2.9E-8. This risk increase was almost all in the turbine building and RAB switchgear rooms, and was associated with (partial or complete) fire-induced LOSP. This can be added to the ICDP for internal events and fire in the EDG-A room (4.8E-7) to give a total ICDP of 5.1E-7.

Question 4: What is impact on day tank if EDG A leak continues for 15 minutes?

Response to Question 4:

The maximum flow capacity of the fuel oil booster pump is 12.5 gpm, and the EDG A fuel oil transfer pump IST requirement of a minimum of 30 gpm is maintained. Therefore, with continued EDG operation and the tubing failure leakage remaining active, the fuel oil transfer pump is fully capable of maintained the EDG A feed (day) tank within the normal operating band. Therefore required fuel oil volume will be maintained within the feed tank to support subsequent EDG starts.

Question 5: Has vendor been contacted to determine if there is potential to damage EDG if EDG runs for extended period with fuel tubing failure?

Response to Question 5:

Cooper Energy Services (CES) was contacted, and CES provided the following information:

If the diesel were at 2200 KW or less, the load on the active cylinders would not exceed their rating. The engine could probably carry 3000 KW for a short period without damage to the active cylinders.

The fuel injection pumps would probably seize on the side without fuel, if operated for an extended period of time. The Haynes Corporation, fuel injection pump manufacturer, indicated that permanent damage may occur after fuel pump operation without fuel within 15 minutes. In the repair timeline, the diesel was secured in about 6 minutes. Extended operation would probably not affect any other engine components except the fuel injection pumps.

Because of the relaying and associated protective functions, Waterford 3 is confident that the EDG would unload immediately following loss of fuel to the right side cylinders. Therefore, the diesel would operate unloaded in this impaired condition.

During the actual fuel line failure of September 29, 2003, the EDG was secured in about 15 seconds and before fuel oil supply was actually lost to the right cylinders.

Question 6: What is meant by Swageloc training that says over tightening is not an issue?

Response to Question 6:
Waterford 3 review page 43 of Lesson Plan W-3-LEC-GMAD-0000 “Swageloc Fittings”

Page 43 of the lesson plan states the following:

> State the safety aspects of properly made up fittings verses fittings incorrectly made-up
> -Use Go-No-go gauge to measure sufficient pull-up
> -Over-tightened – not a safety problem, however, will only be able to remake union about 2 or 3 times

This page of the lesson plan is a review page near the end of the lesson. This page references the industrial safety hazard of improperly installed fittings. This is discussed during the lesson, page 13. A significant industrial safety concern exists for pressurization of the fittings if not tightened sufficiently. The tubing can be ejected with extreme force causing serious injuries.

Over tightening is not intended to be encouraged here but is being compared to the industrial safety hazard of a poorly tightened fitting.

While proper assembly of the Swageloc fittings is discussed in detail within this lesson plan, reference pages 33-40, page 43 could be misunderstood. A change has been initiated to revise this page and eliminate any potential for misinterpretation.

Question 7: Determine if any significance to EDG fuel oil being transferred from one fire area, EDG A room, to another fire area, RAB -35

Response to Question 7:

Diesel fuel oil is expected to drain from the Emergency Diesel Generator Rooms to Oil Sump #3 located on the -35 RAB in Fire Area RAB-39. Oil Sump #3 has a volume of 869.5 gallons. Introduction of Diesel Fuel Oil into Fire Area RAB-39 would have a combustible loading and associated fire severity affect of 140,479 BTU/Gal or 0.026 minutes fire severity / gallon (i.e. 55 gallon diesel fuel oil spill would equate to a fire severity increase in RAB-39 of 0.4 minutes). Diesel fuel oil is a combustible liquid with a flashpoint of >100 degrees F, and presents no vapor or explosive hazard. This, accompanied with the closed piping and sump arrangement, would present negligible impact to Fire Area RAB-39.

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