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W3F1-2007-0002

January 31, 2007

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

**SUBJECT:** Response to Request for Additional Information Regarding Resolution of Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power  
Waterford Steam Electric Station, Unit 3  
Docket No. 50-382  
License No. NPF-38

**REFERENCES:**

1. NRC letter dated February 1, 2006, *Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power* (IN06-0027)
2. Entergy letter dated April 3, 2006, *Response to Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power* (W3F1-2006-0014)
3. NRC letter dated December 5, 2006 (received 12/20/06), *Request for Additional Information Regarding Resolution of Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power* (IN06-0133)
4. NRC letter dated December 13, 2006 (received 12/20/06), *Revised Response Date for Request for Additional Information Regarding Resolution of Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power* (IN06-0132)

Dear Sir or Madam:

Per Reference 1, the NRC issued Generic Letter (GL) 2006-02 to request information for determining compliance with regulatory requirements governing electric power sources. The Waterford 3 response to the requested information in the generic letter was provided in Reference 2.

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The NRC staff reviewed licensee's responses to GL 2006-02 and determined that additional information was needed to resolve the concerns discussed in the generic letter. The NRC request for additional information (RAI) on GL 2006-02 was provided to all licensees in Reference 3. The generic NRC RAIs and the plant applicability for each RAI were contained in Enclosures 2 and 3, respectively. Questions 1, 3 & 5 were determined to require a response for Entergy's Waterford-3. The responses to these questions are contained in the attachment to this letter. The requested information is being made under the requirements of 10 CFR 50.54(f).

The NRC requested that the additional information be provided within 30 days of receipt of the subject NRC RAIs. However, based on Reference 4, response date was extended to January 31, 2007.

There are no new commitments made in this letter. If you have any questions or require additional information, please contact Ronald Williams at 504-739-6255.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on January 31, 2007.

Sincerely,

A handwritten signature in cursive script that reads "R Williams for Kevin Walsh". The signature is written in black ink and is positioned above the typed name of the signatory.

KTW/OPP/RLW/ssf

Attachment: Response to Request for Additional Information for Generic Letter  
2006-02 for Waterford-3

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**Attachment 1**

**W3F1-2007-0002**

**Response to Request for Additional Information for  
Generic Letter 2006-02 for Waterford-3**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION  
RELATED TO GL 2006-02**

**Question 1: Switchyard Minimum Voltage**

In response to question 1(g) you did not identify specific minimum switchyard voltage limits (kV) that you supplied to the local transmission entity. Please, provide the following information:

What is the specific minimum acceptable switchyard voltage included in your protocol agreement with your grid operator (GO) and what was the basis for this value? How is this value related to your technical specification degraded voltage relay setpoints?

**Response:**

The minimum acceptable switchyard voltage included in Waterford 3's protocol agreement with the grid operator is 223.1 KV on 230 KV nominal base.

The Waterford 3 Technical Requirements Manual requires that the predicted post trip switchyard voltage be maintained above 223.1KV (.97 per unit on a 230KV base). This value was chosen to ensure that the degraded voltage relays would not actuate following a plant trip from allowed switchyard operating conditions.

The Waterford Degraded Voltage relay setpoint is based on a minimum allowable value of 3848V on the Safety Related 4160 Buses (92.5% of 4160). 3848 volts on the 4160 Safety Related buses corresponds to a grid voltage of 220 KV (.9566 per unit on a 230 KV base).

**Additional Information:**

The Waterford 3 response in Reference 2 to NRC Request 1(a) provided the following additional related information, which stated in part:

"Yes. Entergy Nuclear South (ENS) plants [i.e., Grand Gulf Nuclear Station, River Bend Nuclear Station, Waterford Steam Electric Station, Unit 3 (Waterford 3) and Arkansas, Nuclear One] utilize a combination of formal agreements, procedures, protocols and/or actions to have Entergy Transmission provide notification to each ENS plant if the predicted post-trip voltage does not meet the minimum value(s) specified in ENS procedure ENS-DC-1 99 'Off-Site Power Supply Design Requirements.' This procedure is an ENS controlled procedure that is jointly reviewed by both Entergy Transmission and ENS. It contains the specifics pertaining to preferred offsite sources, including acceptable voltage, frequency and power delivery requirements for each ENS plant. The formal agreement for Waterford 3 is referred to as "*Waterford Steam Electric Station Unit No.3 Switchyard and Transmission Interface Agreement.*"

The formal agreements for each site provide a general framework for the establishment of procedures and processes that are deemed by each agreement to be of importance to the safe operation of the respective ENS site. Each agreement contains the requirement that the respective ENS site be provided with an assured source of offsite power in accordance with procedures to be agreed

upon by the respective ENS site and the Entergy Transmission organization.”

This response indicated that ENS plants have a procedurally controlled minimum acceptable voltage specified for each site; that this voltage range is communicated by ENS to the Entergy Transmission Organization and used to provide ENS sites with offsite power sources that meet ENS site requirements; and thereby satisfy the intent of the indicated protocol document for each NPP and the Entergy Transmission Organization. The response indicated that these sites do have degraded voltage protection schemes that are described in existing license basis documents, including the Site Technical Specifications and UFSAR. The general relationship of the plant degraded voltage protection schemes to plant switchyard voltages are such that if the stated minimum site acceptable switchyard voltage is met, the site capability to power required loads in response to postulated design basis accidents from the preferred offsite source is acceptable, from the standpoint of minimum voltage requirements for these loads being capable to be met by the offsite source under such conditions.

**Question 3: Verification of RTCA Predicted Post-Trip Voltage**

Your response to question 2(g) indicates that you have not verified by procedure the voltages predicted by the online grid analysis tool (software program) with actual real plant trip voltage values. It is important that the programs used for predicting post-trip voltage be verified to be reasonably accurate and conservative. What is the range of accuracy for your GO's contingency analysis program? Why are you confident that the post-trip voltages calculated by the GO's contingency analysis program (that you are using to determine operability of the offsite power system) are reasonably accurate and conservative? What is your standard of acceptance?

**Response:**

The ENS plant responses to Generic Letter 2006-02, Request 2(g), including those for Grand Gulf and Waterford 3, all indicated, that, following an unscheduled, inadvertent unit trip, the affected unit's Engineering Department is required by procedure to contact Entergy Transmission and request Entergy Transmission to compare the actual pre/post trip voltage observed for the trip and the pre/post trip voltage projected for the event, to assess the accuracy of the analysis under known system conditions. The procedure identified in the response to Request 2(g) as the one requiring these actions was ENS procedure DC-201. Therefore, all ENS plants, including Grand Gulf and Waterford 3 do have a procedural tie to confirm the adequacy of the analysis tools following an inadvertent, unscheduled trip of an ENS unit.

The confidence level for use of the contingency analysis tools is provided in at least three ways:

- 1) The tools were in successful production use by Entergy Transmission for grid operations purposes prior to adaptation for ENS purposes.
- 2) The aforementioned comparisons performed by Entergy Transmission for actual versus projected cases have not revealed any significant deficiencies in the projection methodology to date.
- 3) The contingency studies that Entergy Transmission provides for ENS plants, when compared to the projections from the analysis tools, provide additional reference points for use in assessing the adequacy of the near real-time analysis tools.

Waterford 3 knows of no stated range of accuracy or standard of acceptance for the contingency analysis tools.

**Question 5: Seasonal Variation in Grid Stress (Reliability and Loss-of-offsite Power (LOOP) Probability)**

Certain regions during certain times of the year (seasonal variations) experience higher grid stress as is indicated in Electric Power Research Institute (EPRI) Report 1011759, Table 4-7, Grid LOOP Adjustment Factor, and NRC NUREG/CR-6890. Do you adjust the base LOOP frequency in your probabilistic risk assessment (PRA) and Maintenance Rule evaluations for various seasons? If you do not consider seasonal variations in base LOOP frequency in your PRA and Maintenance Rule evaluations, explain why it is acceptable not to do so.

**Response:**

NRC Information Notice (IN) 2006-06 was issued to alert the industry of the recent findings provided in NUREG/CR-6890 during seasonal summer variations. Entergy reviewed this IN as well as NUREG/CR-6890 to determine whether any changes need to be made to the Maintenance Rule (MR) (a)(4) risk assessment process to reflect concerns about increased loss of offsite power (LOOP) risk during the months of May through September (i.e., summer months). Based on our review of these documents for the Entergy Nuclear South (ENS) grid, Entergy's approach to this concern is more broadly addressed in our MR (a)(4) risk assessment, which would bound the seasonal risk increase as discussed below.

The factors that impact the frequency of LOOP are grid instability, severe weather and maintenance activities in the plant switchyard.

**Grid stability**

Grid stability is one of the factors cited in NUREG/CR-6890 as increasing the LOOP risk during the summer months. Grid stability is impacted by several factors, such as plant outages, available capacity, and peak electricity usage.

The Transmission Operations Center (TOC) and the System Operations Center (SOC) are centers within Entergy Transmission Operations. These centers are responsible for the operation and monitoring of the grid system. In accordance with Entergy Corporate Procedure ENS-DC-201, ENS Transmission Grid Monitoring, the SOC has communications channels established with ENS nuclear sites to ensure that a process exists to notify the station when the local transmission system parameters indicate a potential degraded condition or abnormal situation such that appropriate actions can be taken to maintain defense in depth. Specific alert notifications are provided to ensure grid reliability is maintained and degraded grid off-site power supply conditions are communicated. The SOC will notify the ENS site control room if critical parameter levels are outside of prescribed operating range. The ENS control room will then evaluate the grid degradation reported by SOC and take appropriate actions.

As discussed in the initial response to GL 2006-02, onsite operations procedure OI-037-000, Operations' Risk Assessment Guideline, provides the actions that site control room personnel will take when notified by the SOC that there is grid degradation. OI-037-000 provides for on-line risk assessments to satisfy the maintenance rule. Within that procedure there are instructions to calculate the elevated risk due to an increased likelihood of loss of offsite power due to grid instability. Operations can calculate the elevated risk by adjusting the slider bar in EOOS and quantifying the PRA model. Adjusting the slider bar will increase the loss of offsite power frequency.

In summary, Entergy Transmission Operations recognizes when grid degradation is present. Communication lines are in place to promptly notify the site control room of degraded grid conditions. When the control room is notified of the degraded condition personnel have procedures in place to evaluate the condition. Once the evaluation is made they have the means to calculate the risk.

### Switchyard Work

Maintenance work in the plant switchyard could also impact the frequency of a loss of offsite power due to inadvertent action that would interrupt transmission of power to the nuclear plant. Scheduled switchyard maintenance is normally performed during periods exclusive of the peak summer months.

When switchyard work is required, transmission work inside the ENS-switchyards requires communication between the TOC and the ENS Operations personnel. Work by ENS maintenance crews is controlled by the ENS work control group and is also communicated to the TOC.

Operations Instruction OI-037-000, Operations' Risk Assessment Guideline provides the actions that the onsite control room personnel will take when notified by the TOC that there is needed maintenance work in the local switchyard. Within that procedure there are instructions to calculate the elevated risk due to an increased likelihood of loss of offsite power, including switchyard work. Operations personnel can determine the elevated risk by adjusting the slider bar in EOOS and quantifying the PRA risk. Adjusting the slider bar will increase the loss of offsite power frequency to defer switchyard maintenance.

### Severe Weather

Severe weather could also impact the frequency of a loss of offsite power. Some of the severe weather impact could be seasonal, although not always associated with the summer months. Severe weather impacts of particular interest are tornados, high winds and possibly severe thunderstorms.

Waterford 3 has an Off Normal Operating Procedure for Severe Weather or Natural Emergencies (OP-901-521, Severe Weather and Flooding). Entry conditions for the procedure are either a warning issued by the National Weather Service or local indications (high wind instruments or tornado spotted locally). This procedure instructs the operators to increase the LOOP risk per the on-line maintenance procedure. Within that procedure there are instructions to calculate the elevated risk due to an increased likelihood of loss of offsite power due to severe weather.

### Conclusions

Entergy Nuclear South does not specifically increase the LOOP frequency for seasonal variations. However, the ENS sites more broadly address the conditions which would bound the seasonal risk increase. Specific conditions that would be projected by the Entergy TOC, increase the LOOP frequency by a greater extent than that denoted in IN 2006-06 and NUREG/CR-6890 for seasonal variations. The above described actions more accurately estimate the impact to plant risk for incremental and instantaneous risk assessments. Therefore, no additional actions are considered necessary by Entergy to address seasonal variations for the ENS plants.