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SUBJECT: Forwards comments that resulted from util latest review of NRC draft repts on plant emergency electrical sys.Ltr & associated attachment does not contain any new commitments.

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October 1, 1998

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

Subject: Oconee Nuclear Station
Docket Nos. 50-270
Additional Information Related to the NRC's Interim Report on the Oconee Emergency Power System

In a letter dated July 8, 1996, the NRC issued for comment draft reports from the Office of Nuclear Reactor Regulation (NRR) and the Office for Analysis and Evaluation of Operational Data (AEOD). These draft reports contained analyses and recommendations regarding the testing, operation, design and reliability of the Oconee emergency power system and Standby Shutdown Facility (SSF). As requested in the July 8, 1996, NRC letter, Duke Energy reviewed the NRR and AEOD draft reports for accuracy and to determine a disposition for each recommendation.

In a meeting with the NRC on September 19, 1996, Duke Energy presented its understanding of the open issues and recommendations from the NRC draft reports, along with Duke Energy's plan for disposition of the issues. During the meeting, the NRC clarified Duke Energy's understanding of several of the open issues. A written response to the open issues and recommendations was provided by Duke Energy in a letter dated October 31, 1996. In addition, Duke Energy provided comments on the information contained in the NRC draft reports.

In a letter dated March 17, 1998, the NRC issued an interim report on the Oconee emergency electrical power system. With the issuance of the interim report, the NRC indicated that a response to the NRC letter was not necessary, but Duke Energy was encouraged to supply any additional comments or information that might prove useful in the NRC's continuing review of the Oconee emergency electrical system.

A001

Attachment 1 contains the comments that resulted from Duke Energy's latest review of the NRC draft reports on the Oconee emergency electrical system.

This letter and associated attachment does not contain any new commitments. If there are any questions regarding this submittal, please contact Michael Bailey at (864) 885-4390.

Very truly yours,

W. R. McCollum, Jr., Site Vice President
Oconee Nuclear Station

MEB

Attachment

cc:

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D. E. LaBarge, Project Manager
NRR

**Comments on the NRC Interim Report for the Oconee Emergency Electrical System**

## 1. Comments on the Keowee PRA evaluation

a. Unresolved Issues

Some issues that are associated with the development of the data for the Keowee PRA remain unresolved. These are 1) the estimation of failure rates for the components that did not experience failures during the data collection period (NRC interim report pages ES-11, 76, 134), and 2) the meaning of the Grid related loss of offsite power (LOOP) (NRC interim report pages ES-8, 87, 131). Duke believes that the Staff's suggestions relative to these issues are overly prescriptive in that only one approach or assumption is appropriate or that the method must be conservative. Duke believes that the methods applied in the Keowee PRA are technically valid. While other assumptions and techniques could certainly have been applied, sensitivity studies have been performed to assess the implications of the different approaches on the overall results and conclusions. Our concern on these issues is explained in the following sections.

Failure Rate Estimation

The intent of the Keowee PRA is to provide a best estimate of the reliability of Keowee to supply power to Oconee by developing a component level reliability model. In order to accomplish this, a number of failure rates must be estimated. It turned out that a number of components in Keowee experienced 0 failures during the 10 year component data collection period (1984 - 1993). The method selected by Duke to estimate the failure rate was based on a number of references. During the Staff's review of the Keowee PRA, the Staff suggested a more conservative method. In an effort to resolve the Staff's concern, Duke has continued its literature search on appropriate methods for failure rate estimation and a list of references is included below. These references include discussion of confidence limits as well as point estimation techniques. It is clear from these references that the method used by Duke in the Keowee PRA is founded on sound statistical considerations. Recognizing the Staff's concern, a sensitivity study was conducted using the staff approach for the failure rate estimation. The overall conclusions of the Keowee PRA are not changed when the Staff's method was substituted as the failure rate estimation.

The method of estimation proposed by the Staff is derived from considerations for a conservative upper confidence limit of a Poisson distribution (2n+2 degrees of freedom for the upper confidence limit and 2n for the lower confidence limit). As such, it should be remembered that the confidence value is derived on the number of failures (a discrete random variable) not the failure rate. The most appropriate use for this limit seems to be as an estimator of the range on the number of failures in future observations of the process. To refer to the failure rate estimate derived from the upper confidence limit on the number of failures as a confidence limit on the failure rate is questionable. Figure 1 illustrates the probability density functions and the cumulative distribution functions for Poisson distributions based on failure rates calculated by the Staff's suggested method and the method used by Duke. As seen and as expected, if the actual failure rate is as estimated with the Staff's approach (2n+2 degrees of freedom), 50% of the samples contain 0 failures and 50% contain 1 or more failures. On the other hand, using Duke's approach (2n+1 degrees of freedom), 80% of the samples contain 0 failures and 20% contain 1 or more failures. Both results are reasonable and one is more conservative in characterizing the failure rate. To relate this concept to the specific components modeled in the Keowee PRA, it implies that with zero failures in the past 10 years, the Staff's suggested model would estimate a 50% chance of 0 failures in future observations (10 year periods) while the method used in the Keowee PRA would imply that there is an 80% likelihood of seeing 0 failures (20% chance of one or more failures). Both estimates are reasonable and one should not be characterized as incorrect.

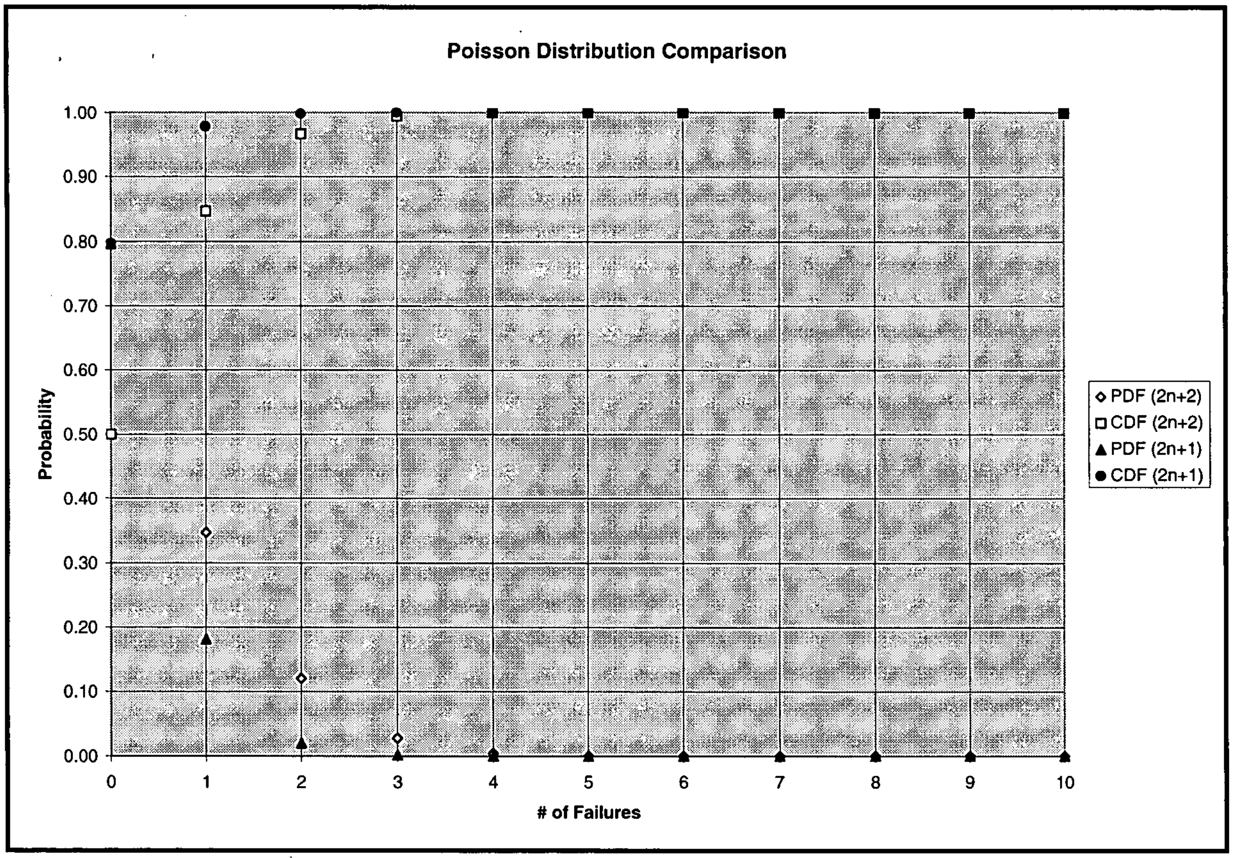


Figure 1

Because distributions such as the Binomial and the Poisson are discrete, it is not possible to establish upper and lower confidence limits that provide exactly the confidence level desired. A desired condition for an upper confidence limit is $P(\lambda>\lambda_{upper}) = 0.05$ for all $\lambda$. The limit, like the random variable, can take on only integer values. The equality can not be made true for all possible values of $\lambda$. It is customary to adopt a conservative definition by requiring instead that $P(\lambda\geq\lambda_{upper}) \leq 0.05$. A similar inequality is established for the lower limit. As a result, limits for a 90% confidence interval, for example, actually provide "at least" 90% confidence. The upper and lower limits that result can be evaluated from chi-square distributions where the degrees of freedom for the upper and lower limits are 2n+2 and 2n respectively. The upper and lower limits derived in this manner are for the Poisson random variable which is the number of observed failures. When these values are modified and applied as confidence intervals on the underlying failure rate (a continuous variable), the real meaning of these values is distorted. It is observed that as the confidence interval is shrunk (the upper and lower limits both approaching the median) the limits do not collapse to a single point due to the differing degrees of freedom. This residual

interval results from the discreteness of the original distribution and the inability to satisfy the equality in determining the confidence limits. The method used in the Keowee PRA selects a point within this interval by performing the median calculation using a degrees of freedom that is the average of the values for the upper and lower limits (2n+1 = [2n+2 +2n]/2). This can be considered to be an approximate numerical correction for the discreteness of the data.

An estimate arrived at in the manner suggested by the Staff may be reasonable for some applications, especially those in which some degree on conservatism in the estimate is desirable. This estimate can not be considered to be more correct than other estimates developed through alternative statistical analyses. The most appropriate estimate is the one that best suits the objectives of the analysis being conducted.

References:

1) NUREC/CR-2300, PRA Procedures Guide
2) Ronald E. Wright, Judy A. Steverson, William F. Zuroff, Pipe Break Frequency Estimation for Nuclear Power Plants, EGG-2421
3) M. E. Engelhardt, Events In Time: Basic Analysis of Poisson Data, EGG-RAAM-11088
4) Corwin L. Atwood, Hits per Trial: Basic Analysis of Binomial Data, EGG-RAAM-11041
5) Lee J. Bain, Max Engelhardt, Introduction to Probability and Mathematical Statistics, Duxbury Press, 1992

Grid LOOP Initiator

The purpose of the Grid LOOP initiator in the PRA is to represent those LOOP events initiated outside of the switchyard where the 230 kV feed to the Oconee Switchyard and the 100 kV feed from the Central Switchyard to CT5 are lost. The event is not intended to represent a collapse of the Duke system such that 230 kV or 100 kV voltages are not available to other plants of the Duke system including the combustion turbines at Lee. True grid failures of this magnitude are extremely rare. Duke agrees that for LOOPs characterized by a major failure of the grid (230 kV and 100 kV) only the black start Lincoln CT should be assumed to be initially available.

b. Significant Findings and Recommendations

In Section 8.3, the Staff has identified issues where it states that "the licensee should …". The Staff comments do not contain sufficient technical basis for their recommendations, considering both the expected safety improvement and the cost.

The regulatory standards that are related to these issues are ambiguous. For example, what additional failure investigation should we undertake to address potential mechanisms for a single common cause grid degradation failing both Keowee power paths when generating to the grid (item 3 on page 132)? We have already performed a number of investigations (deterministic and probabilistic) that are related to this issue in response to previous requests for additional information.

c. External Events

Section 6.6 of the report identifies that the Staff is reviewing information provided by Duke related to the scope of the external events investigation. A similar recognition is not included in Section 8.4 of the report. Section 8.4 should also be updated to reflect the results of the Staff's evaluation when it is completed.

**2. Additional information on the voltage and frequency protection modification for the Lee gas turbines**

In the October 31, 1996, letter, Duke committed to the installation of voltage and frequency protection to preclude out-of-tolerance voltage or frequency from a Lee combustion turbine from damaging Oconee's auxiliary equipment. In addition, Duke provided conceptual design information for the planned modification. The conceptual design information indicated that the modification would consist of a 2 of 3 logic configuration which would be installed at Oconee as part of the SL breaker trip logic. As part of Duke's commitment, Duke stated that the modification was in the planning stage and that the conceptual design was subject to change.

The following information provides updated information on the voltage and frequency protection modification for the Lee combustion turbines. The logic configuration that will be installed as part of the modification consists of a 2 of 3 logic. The logic is designed such that the generator breaker of the affected Lee combustion turbine will be tripped after an appropriate time delay if out-of-tolerance voltage or frequency conditions exist. In addition, the logic will prevent manual closure of the associated Lee combustion turbine generator breaker until the voltage and frequency are within acceptable tolerances. Currently, the logic is designed with relay settings that correspond to $\pm$ 10 percent of nominal voltage and frequency. The timers for the logic are setup with a time delay of 12

seconds to allow sufficient recovery time for a Lee combustion turbine following expected loading transients.

It should be noted that the conceptual information which was provided by Duke in the October 31, 1996, letter has changed such that the Lee combustion turbine generator breaker will be tripped instead of the SL breaker. This change in the modification design was made to place the protection logic at the source which was causing the out-of-tolerance voltage or frequency condition. This is similar to the conceptual design for the out-of-tolerance voltage or frequency protection modification which is being installed on the Keowee Hydro units.

As part of the modification, a selector switch which will allow the Lee operators to defeat the out-of-tolerance voltage or frequency logic is being provided in the Lee combustion turbine control panel. The position of the selector switch will be controlled by procedures. Since the Lee combustion turbines may be utilized for grid generation when not required for backup power to Oconee, the selector switch is necessary so the Lee operators can defeat the logic circuitry during periods of grid generation.

A review of the planned modification has been performed to determine if any change is required to the Oconee Technical Specifications. This review indicates that no revision of the Oconee Technical Specifications is necessary and the modification can be performed in accordance with 10 CFR 50.59. The 10 CFR 50.59 evaluation for the modification has been completed and indicates that the modification does not involve an unreviewed safety question.