Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 501 858 5000

2CAN050303

May 22, 2003

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

SUBJECT: Supplement to Amendment Request
Related to the Extension of Emergency Diesel Generator
Allowable Outage Time
Arkansas Nuclear One, Unit 2
Docket No. 50-368
License No. NPF-6

REFERENCES:
1. Letter to the NRC dated September 19, 2002, License Amendment Request for Extension of Emergency Diesel Generator Allowable Outage Time (2CAN090202)
2. Letter to the NRC dated January 8, 2003, Supplement to Amendment Request for Extension of Emergency Diesel Generator Allowable Outage Time (2CAN010303)

Dear Sir or Madam:

By letter (Reference 1), Entergy Operations, Inc. (Entergy) proposed a change to the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TSs) to extend the emergency diesel generator allowable outage time. Entergy also responded to a related Request for Additional Information (RAI) by letter dated January 8, 2003 (Reference 2).

On January 21, 2003 Entergy received two additional questions that required formal response. Entergy's response is contained in Attachment 1.

Minor changes are proposed to one of the marked up TS pages, one of the marked up TS Bases pages, and two of the commitments submitted in Reference 1. New markups are provided for the affected TS page and TS bases page in Attachment 2. The attached commitment summary (Attachment 3) supercedes those presented in Reference 1. Clarifications are made to commitments 2 and 4. New commitments, which are also reflected in Attachment 3, are contained in this letter.

There are no technical changes proposed. The original no significant hazards considerations included in Reference 1 is not affected by any information contained in this supplemental letter.

If you have any questions or require additional information, please contact Dana Millar at 601-368-5445.

A001

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 22, 2003.

Sincerely,

Sherrie R. Cotton

Sherrie R. Cotton,
Director, Nuclear Safety Assurance

SRC/dm

Attachments:
1. Response to Request for Additional Information
2. Proposed Technical Specification and Technical Specification Bases Pages (Markup)
3. List of Regulatory Commitments

cc: Mr. Ellis W. Merschoff
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P. O. Box 310
London, AR 72847

U. S. Nuclear Regulatory Commission
Attn: Mr. Thomas W. Alexion MS O-7D1
Washington, DC 20555-0001

Mr. Bernard R. Bevill
Director Division of Radiation
Control and Emergency Management
Arkansas Department of Health
4815 West Markham Street
Little Rock, AR 72205

Attachment 1

To

2CAN050303

Response to Request for Additional Information
Related to the Extension of Emergency Diesel Generator Allowable Outage Time

Response to Request for Additional Information Related to the Extension of Emergency Diesel Generator Allowable Outage Time

Question #1:

Please describe the methodology used to generate the external events risk numbers, including the final numbers generated for each external event. If aspects of the external events analysis approach used in this application are substantially different from the methods described in previous recent applications (e.g., the power uprate application), please explain and justify the use of the different approach.

Response #1:

The Arkansas Nuclear One, Unit 2 (ANO-2) PSA model does not address the risk associated with external events, such as seismic events, internal fires, and other external events (i.e., high winds, external flooding, and accidents involving nearby industries, transportation, and military facilities). Nor does this model address the risk associated with several other risk contributors, namely Anticipated Transients Without Scram (ATWS) scenarios, Interfacing System Loss of Coolant Accidents (ISLOCAs), and High and Medium Energy Line Breaks (HELBs and MELBs). Qualitative analyses were performed to assess the risk impact of these non-modeled events on extending the current emergency diesel generator (EDG) allowable outage time (AOT). These analyses are considered qualitative since they are relatively simplistic and not based on comprehensive and detailed fault tree/event tree models. The intent of these methods and results was to provide an order-of-magnitude assessment of the risk associated with these risk contributors. Both the methodology and the numerical risk results generated via this methodology are presented below. These results were reported to the NRC by letter dated September 19, 2002 (2CAN090202). A comparison of these methods with those used in the ANO-2 Power Uprate application also follows.

ATWS, ISLOCA, HELB and MELB Risk

The nominal core damage frequency (CDF) contributions associated with ATWS and ISLOCA were documented in the ANO-2 Individual Plant Examination (IPE) as reported to the NRC by letter dated August 28, 1992 (2CAN089201). The ATWS CDF estimate was subsequently updated. The nominal ATWS CDF and the nominal ISLOCA CDF are reported in Table 1-1, below. Nominal CDF contributions associated with HELB and MELB had not been estimated prior to the EDG AOT extension submittal.

The effect of removing an EDG from service on ATWS and ISLOCA contributions to CDF was assumed to be proportional to that of the modeled portion of the internal events, since neither was judged to have a unique adverse effect on the EDGs or Alternate AC Diesel Generator (AACDG). The risk impact of the extended EDG out of service (OOS) times due to preventative maintenance (PM) on the ATWS and ISLOCA events is provided in Table 1-1, below.

Table 1-1

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
Modeled Internal Events	8.326E-06	1.020E-05	1.020E-05
ATWS	1.590E-06	1.948E-06	1.948E-06
ISLOCA	3.270E-07	4.006E-07	4.006E-07

HELB contributions to risk were assumed to be bounded by the main steam line break (MSLB) risk which is included in the ANO-2 PSA model. This assumption is based on a review of the High Energy Pipe Break Outside of Containment as described in the ANO-2 Safety Analysis Report (SAR) Section 3.6.4.1. Per this SAR section, none of the postulated HELBs resulted in both safety system actuation and the loss or partial loss of an actuated safety system. Thus, the risk associated with a MSLB outside of containment, which results in a plant trip and the concurrent loss of main feedwater (MFW), is expected to be a first order estimate of the HELB risk impact. In addition, the MELB risk impact is assumed to be bounded by the HELB risk impact. Since the CDF associated with the MSLB outside of containment is a small contributor (1.211E-08) to the nominal ANO-2 CDF, the risk associated with HELB and MELB are expected to be negligible.

Seismic Events Risk

A seismic vulnerability analysis using a modified Seismic Margins Assessment (SMA) methodology was performed as part of the ANO-2 Individual Plant Examination for External Events (IPEEE) analysis and the results of this analysis were reported to the NRC by letter dated May 31, 1996 (0CAN059609). The analysis focused on verifying the seismic adequacy of equipment, tanks, distribution systems, structures, and relays at ANO-2. A 0.3g Review Level Earthquake (RLE) was used as a screening value in the analysis. If a component failed below this screening value, a High Confidence Low Probability of Failure (HCLPF) was calculated for the component. The HCLPF lowest ground acceleration was assessed to be 0.20g (for the EDG fuel tanks). It should be noted that the ANO-2 Design Basis Earthquake, a hypothetical earthquake with an intensity exceeding any expected to be felt at the site, is also 0.2g, per Section 2.5.2 of ANO-2 SAR. Other ANO-2 components reviewed for seismic vulnerability were expected to survive the 0.3g RLE.

Using general correlations between the magnitude of ground acceleration and the resulting damage to typical structures, it is conservatively assumed that ANO-2 will experience an unrecoverable loss of offsite power for ground accelerations greater than 0.05g (switchyard damage and/or transmission line damage can be expected). Based on this correlation and the expected relative ruggedness of the AACDG, its support systems, and its housing structure, it is assumed that the AACDG will be available for ground accelerations up to 0.15g. Also, based on the ANO-2 IPEEE seismic vulnerability analysis, it is assumed that ground acceleration greater than 0.2g will result in the loss of both EDGs. Ground acceleration greater than 0.3g was assumed to result in the loss of all offsite and onsite power, and the loss of steam-driven emergency feedwater (EFW) Train A; thus, the 0.3g event is assumed to lead directly to core damage.

Using the above information, the impact of various seismic magnitudes is summarized in Table 1-2, below. Per this table, only earthquakes ≥ 0.15g and < 0.2g have an effect on the risk associated with an extended EDG AOT. Earthquakes of magnitude < 0.05g were eliminated as significant risk contributors on the basis that they do not adversely affect the availability of plant equipment. Earthquakes of a magnitude greater than or equal to 0.05g and less than 0.15g were eliminated as significant risk contributors because they result only in the loss of offsite power (i.e., they do not adversely affect the EDGs or AACDG) and have a low frequency relative to the loss of offsite power (LOSP) initiator (%T3), i.e., $\nu_{0.05g}$ (7E-4/rx-yr) << ν_{LOSP} (%T3 = 3E-2/rx-yr).

Table 1-2

Seismic Magnitude, a	a < 0.05g	0.05g ≤ a < 0.15g	0.15g ≤ a < 0.2g	0.2g ≤ a < 0.3g	a ≥ 0.3g
Offsite Power	Available	Unavailable	Unavailable	Unavailable	Unavailable
AACDG	Available	Available	Unavailable	Unavailable	Unavailable
EDGs	Available	Available	Available	Unavailable	Unavailable
EFW Train A	Available	Available	Available	Available	Unavailable
Effect on Risk associated with Extended EDG AOT	No impact	Negligible impact, since $\nu_{0.05g}$ (7E-4/rx-yr) << ν_{LOSP} (3E-2/rx-yr)	Impact assessment required	No impact, since both EDGs are assumed to fail regardless of maintenance.	No impact

Using Electric Power Research Institute (EPRI) NP-6395-D, the mean frequency of an earthquake in the range 0.15g to 0.2g at ANO-2 was estimated to be 4.84E-5/yr. This value was calculated by averaging the $\log_{10}$ frequencies associated with the 0.15g and 0.2g frequencies. The CDF associated with an earthquake in this range was estimated by quantifying the internal events ANO-2 PSA model. In the model, it was assumed that the effect of the loss of offsite power initiator was representative of the effect of the seismic event and that an earthquake in the range of 0.15g to 0.2g was most representative of the risk impact of an EDG AOT extension. In addition, for an earthquake in this range, both offsite power and the AACDG were assumed to fail.

The risk impact of the EDG AOT extension on seismic risk is provided in Table 1-3.

Table 1-3

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
Modeled Internal Events	8.326E-06	1.020E-05	1.020E-05
Seismic	2.003E-07	1.324E-06	1.324E-06

An updated seismic risk analysis based on additional insights is presented below. The analysis accounts for the revision of the ANO EDG Fuel Tank HCLPF Peak Ground Acceleration (PGA) value from 0.2g to 0.3g.

Internal Fires Risk

A fire vulnerability analysis using the NRC-approved Fire Induced Vulnerability Evaluation (FIVE) methodology was performed as part of the ANO-2 IPEEE analysis and the results of this analysis were reported to the NRC by letter dated May 31, 1996 (0CAN059609). These results were subsequently updated by letter to the NRC dated June 28, 2001 (2CAN060110) as part of Entergy's response to the ANO-2 Power Uprate submittal.

The ANO-2 IPEEE analysis for the risk associated with internal fires identified no internal fire vulnerabilities at ANO-2. A single CDF associated with internal fires was not provided. However, a CDF for individual fire zones was reported if they were above 1E-6/rx-yr. Because the fire analysis was a screening analysis, these fire zone CDF values are expected to be conservatively high estimates. For the qualitative assessment of the risk impact of the ANO-2 EDG AOT extension, 1E-6/rx-yr was assumed to be the nominal value for the CDF associated with internal fires. This value was used because the fire analysis was believed to be very conservative and the nominal fire CDF was believed to be a small fraction of the internal events CDF and of the same order of magnitude as the internal flooding CDF.

For the current qualitative analysis, the ratio of the EDG OOS CDF to the nominal CDF for internal fires was assumed to be proportional to that associated with the internal events CDF. These internal events CDF ratios are shown in Table 1-4.

Table 1-4

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
Modeled Internal Events	8.326E-06	1.020E-05	1.020E-05
Internal Fire	1.000E-06	1.225E-06	1.225E-06

High Winds Risk

The ANO-2 IPEEE addressed the risk associated with high winds, including tornadoes, and concluded that high winds do not pose a significant threat to the safe operation of the ANO-2 plant. The estimated CDF associated with high winds was less than 1E-6/rx-yr. It should be noted that high winds distant from the ANO site and high winds at the site switchyard could result in the loss of offsite power; however, this effect is already accounted for in the internal events loss of offsite power initiator frequency. The qualitative assessment of the risk impact of the ANO-2 EDG AOT extension assumed the nominal value for the CDF associated with high winds was 1E-6/rx-yr.

The IPEEE analysis identified only one issue that could disproportionally affect the high winds risk of extending the EDG AOT: the possible failure of the diesel generator exhaust stacks due to tornado missile perforation damage or due to high wind loading. The former was dismissed in the IPEEE since a missile large enough to crush or block the flow of exhaust gases was considered incredible. This element of risk is further reduced by the fact that operating procedures require inspection of the diesel stacks immediately after a tornado event and initiation of corrective action to clear exhaust stack damage as quickly as possible.

Thus, for the current qualitative analysis, the ratio of the EDG OOS CDF to the nominal CDF for high winds was assumed to be proportional to that associated with the internal events CDF. The risk impact of the EDG AOT extension on the high winds risk is provided in Table 1-5.

Table 1-5

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
Modeled Internal Events	8.326E-06	1.020E-05	1.020E-05
High Winds	1.000E-06	1.225E-06	1.225E-06

External Floods Risk

The ANO-2 IPEEE analysis for the risk associated with external flooding identified no external flooding vulnerabilities on ANO-2. As such, the ANO-2 external flood CDF was assumed to be negligible.

Risk Due to Accidents Involving Nearby Industries, Transportation, and Military Facilities

The ANO-2 IPEEE analysis for the risk associated with accidents involving nearby industries, transportation, and military facilities identified no vulnerabilities to these accidents at ANO-2. As such, the CDF associated with these accidents was assumed to be negligible.

Summary of Qualitative ATWS, ISLOCA, HELB, MELB and External Risk Results

Table 1-6, below, summarizes the qualitative CDF results for the ATWS, ISLOCA, HELB, MELB and external risk contributors.

Table 1-6

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
ATWS	1.590E-06	1.948E-06	1.948E-06
ISLOCA	3.270E-07	4.006E-07	4.006E-07
Seismic	2.003E-07	1.324E-06	1.324E-06
Internal Floods	1.000E-06	1.225E-06	1.225E-06
Internal Fire	1.000E-06	1.225E-06	1.225E-06
High Winds	1.000E-06	1.225E-06	1.225E-06
Total Non-Modeled	5.117E-06	7.347E-06	7.347E-06

These results were used to generate the incremental conditional core damage probability (ICCDP) and Annual Average ΔCDF associated with the EDG AOT extension. The ICCDP for each of the EDGs was calculated as follows:

$$ICCDP = (14\ days/365\ days/yr) * (7.347E-06/yr - 5.117E-06/yr)$$
$$= 8.6E-8$$

The Annual Average ΔCDF for each of the EDGs and for both are calculated as follows:

$$\text{Annual Average CDF for EDGA} = (\text{ICCDP for EDGA})/1.5$$
$$= 5.7E-8/rx-yr$$
$$\text{Annual Average CDF for EDGB} = (\text{ICCDP for EDGB})/1.5$$
$$= 5.7E-8/rx-yr$$
$$\text{Annual Average CDF for EDGA \& B} = ((\text{ICCDP for EDGA}) + (\text{ICCDP for EDGB}))/1.5$$
$$= 1.1E-7/rx-yr$$

These ICCDP and Annual Average ΔCDF values are summarized in Tables 1-7 and 1-8, below, and are those reported to the NRC by letter dated September 19, 2002 (2CAN090202).

Table 1-7

Non-Modeled	ICCDP	
AOT (d)	**EDG A OOS**	**EDG B OOS**
14	8.6E-08	8.6E-08

Table 1-8

Non-Modeled	Yearly AOT Risk (/rx-yr)
AOT (d)	**EDG A & B OOS**
14	1.1E-07

Update to the Seismic Events Risk

As noted above, the seismic portion of the ANO-2 EDG AOT Extension Risk Analysis has been updated to incorporate additional insights and account for the revision of ANO EDG Fuel Tank HCLPF PGA values from 0.2g to 0.3g. The revised seismic risk analysis and results follow.

The impact of various seismic magnitudes on key plant systems, structures, and components (SSCs) presented in Table 1-2 were revised to those presented in Table 1-9, below.

Table 1-9

Seismic Magnitude, a	a≤0.01g	0.01g<a≤0.05g	0.05g<a≤0.1g	0.1g<a≤0.15g	0.15g<a≤0.3g	0.3g<a≤0.35g	a>0.35g
Seismic Range	0	1	2	3	4	5	6
Plant Trip	No	Yes	Yes	Yes	Yes	Yes	Yes
Off-Site Power	Available	Available	Recoverable	Unavailable	Unavailable	Unavailable	Unavailable
AACDG	Available	Available	Available	Available	Unavailable	Unavailable	Unavailable
EDGs	Available	Available	Available	Available	Available	Unavailable	Unavailable
EFW Train A	Available	Available	Available	Available	Available	Available	Unavailable
Effect on Risk Associated with Extended EDG AOT	No impact	Impact assessment	Impact assessment	Impact assessment	Impact assessment	No impact	No impact

Like those in Table 1-2, the seismic magnitude threshold effects presented in Table 1-9 are based on engineering judgment. In comparison with Table 1-2, additional seismic ranges were

developed to identify whether a plant trip was expected and to account for the possible loss of off-site power and its possible recovery as a result of a seismic event. The revised table also distinguishes the expected fragility of the EDGs and that of the turbine driven EFW train (EFW Train A). The most significant difference between Tables 1-2 and 1-9 is the threshold seismic magnitude that results in the failure of the EDGs. Previously, this value was assumed to be 0.2g based the HCLPF 0.2g PGA reported for the EDG fuel tanks in the ANO IPEEE submittal. This result was reported by letter to the NRC dated May 31, 1996 (0CAN059609). Table 1-9 incorporates the results of subsequent analyses which demonstrated a HCLPF PGA of 0.3g for these fuel tanks. Thus, in the updated seismic risk analysis, the ANO-2 EDGs were assumed to fail at 0.3g rather than 0.2g.

Since a plant trip is not expected to result from a seismic event of a magnitude ≤ 0.01g, earthquakes in this range were deemed to have a negligible effect on plant risk and hence a negligible effect on the risk associated with the EDG AOT extension. Likewise, earthquakes of a magnitude > 0.3g were deemed to have a negligible effect on the risk associated with the EDG AOT extension, since both EDGs were assumed to fail regardless of the availability prior to the event. Thus, only seismic events in the ranges between 0.01g and 0.3g were deemed to have an impact on the EDG AOT extension risk.

CDFs associated with both the nominal and EDG OOS conditions for Seismic Ranges 1, 2, 3, and 4 in Table 1-9 were calculated by summing the product of the frequency and CDP values associated with each of these ranges. The frequency associated with each range was estimated by taking the difference between the frequency of exceedence values associated with the upper and lower bounds of each seismic range. These values are either provided in EPRI NP-6395-D report or estimated by linearly interpolating the $\log_{10}$ frequencies provided in that report. The CDP values associated with each seismic range were estimated by quantifying the internal events ANO-2 PSA model. For each seismic range, both the nominal and the EDG OOS conditions were quantified assuming the SSC failures associated with the seismic range.

The updated impact of the EDG AOT extension on seismic risk is provided in Table 1-10. This table updates the results presented in Table 1-3.

Table 1-10

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
Modeled Internal Events	8.326E-06	1.020E-05	1.020E-05
Seismic	4.093E-07	4.790E-06	4.790E-06

Table 1-11, below, summarizes the qualitative CDF results for the non-modeled events, including the updated seismic results. This table updates the results presented in Table 1-6.

Table 1-11

	CDF (/rx-yr)		
Contributor	Nominal	EDG A OOS	EDG B OOS
ATWS	1.590E-06	1.948E-06	1.948E-06
ISLOCA	3.270E-07	4.006E-07	4.006E-07
Seismic	4.093E-07	4.790E-06	4.790E-06
Internal Floods	1.000E-06	1.225E-06	1.225E-06
Internal Fire	1.000E-06	1.225E-06	1.225E-06
High Winds	1.000E-06	1.225E-06	1.225E-06
Total Non-Modeled	5.326E-06	1.081E-05	1.081E-05

These results were used to update the ICCDP and Annual Average ΔCDF results associated with the EDG AOT extension. The updated ICCDP for the non-modeled risk contributors associated with each of the EDGs was calculated as follows:

$$\begin{aligned} ICCDP &= (14 \text{ days}/365 \text{ days/yr}) * (1.081E-05/yr - 5.326E-06/yr) \\ &= 2.1E-7 \end{aligned}$$

The updated Annual Average ΔCDF for the non-modeled risk contributors associated with each of the EDGs was calculated as follows:

$$\begin{aligned} \text{Annual Average CDF for EDGA} &= (\text{ICCDP for EDGA})/1.5 \\ &= 1.4E-7/rx-yr \\ \text{Annual Average CDF for EDGB} &= (\text{ICCDP for EDGB})/1.5 \\ &= 1.4E-7/rx-yr \\ \text{Annual Average CDF for EDGA \& B} &= ((\text{ICCDP for EDGA}) + (\text{ICCDP for EDGB}))/1.5 \\ &= 2.8E-7/rx-yr \end{aligned}$$

These updated ICCDP and Annual Average ΔCDF values are summarized in Tables 1-12 and 1-13, below, and replace those in Tables 1-7 and 1-8, which were earlier reported to the NRC by letter dated September 19, 2002 (2CAN090202).

Table 1-12

Non-Modeled	ICCDP	
AOT (d)	EDG A OOS	EDG B OOS
14	2.1E-07	2.1E-07

Table 1-13

Non-Modeled	Yearly AOT Risk (/rx-yr)
AOT (d)	EDG A & B OOS
14	2.8E-07

Comparison of External Events Risk Analysis Methods

With the exception of the fire risk, the qualitative methods employed to assess the impact of the EDG AOT extension on external events risk are generally consistent with those employed in the ANO-2 Power Uprate application (Letter submitted to the NRC dated June 28, 2001 (2CAN060110)). The scope of external events risk analyses associated with the EDG AOT Extension and the Power Uprate submittals were similar. Both investigated the effect of the submittal on internal fire, seismic, high winds and tornadoes, external flooding, and transportation and nearby facility accidents. The EDG AOT extension risk assessment also included the risk associated with HELBs and MELBs. Numerical values for the external risk contributors were generated in the EDG AOT extension submittal; the Power Uprate submittal generated numerical results only for the internal fire external event, since the power uprate was assessed to have a negligible impact on all of the other external risk contributors.

The fire risk assessment employed in the ANO-2 Power Uprate submittal was more detailed than that employed in the ANO-2 EDG AOT extension submittal. The former reviewed the cutset results generated for each of the unscreened fire zones and revised each to account for increased operator failure probabilities due to the decreased time available for action at the uprated power conditions. The ANO-2 EDG AOT extension, as described above, assumed that the nominal value for the CDF associated with internal fires was 1E-6/rx-yr. It assumed that the increase in the internal fire CDF due to the EDG AOT extension was proportional to the increase in the internal events CDF.

The simplistic approach used for the ANO-2 EDG AOT extension risk analysis was based on the conservative nature of the ANO-2 fire risk analysis. The existing ANO-2 fire analysis was based on the EPRI FIVE methodology as documented in EPRI TR-100370s. This methodology is a vulnerability analysis, not a risk analysis. As such, it was not intended to produce a detailed quantification of fire CDF, but rather, to identify those plant areas/zones that might represent important fire CDF contributors. Based on the belief that the existing ANO-2 fire CDF results were very conservative, it was assumed that a more realistic treatment would show that the actual ANO-2 fire risk was a small faction of the internal events CDF and of the same order of magnitude as the internal flooding CDF. Consistent with its expected relatively small contribution to the overall plant risk, the approach used to assess the impact of the EDG AOT extension was also simplistic. The increase in fire risk was assumed proportional to the increase in the internal fire risk due to the AOT extension.

Question #2:

For the fire analyses, as an alternative to justifying the use of a different approach discussed in Question 1 above, the licensee could describe how this application would impact each of the unscreened fire quadrant analyses and results identified in the June 28, 2001, letter to the U.S. Nuclear Regulatory Commission (NRC) regarding its power uprate application. The NRC staff notes that in this letter, the licensee identified 17 unscreened fire quadrants involving 15 fire areas and provided the associated post-uprate core damage frequency for each quadrant.

Response #2:

The fire portion of the ANO-2 IPEEE response as previously stated was performed using the EPRI FIVE Methodology as documented in EPRI TR-100370s. The introduction to EPRI Report TR-100370s states, "FIVE is oriented toward uncovering limiting plant design or operating

characteristics (vulnerabilities) that make certain fire-initiated events more likely than others." The FIVE methodology is not a fire risk analysis, but a fire vulnerability analysis; as such, it produces a conservatively high screening estimate, not a best-estimate value, for the CDF for each fire zone. The CDF of each of the significant fire compartments (i.e., those with a CDF > 1E-6/rx-yr) was compared to the closure guidelines provided in Section 4.3 of NEI 91-04, Revision 1, "Severe Accident Issue Closure Guidelines," dated December 1994. Closure was obtained individually on each significant fire compartment.

This perspective on the conservative nature of the FIVE methodology and on the conservative nature of its CDF results is discussed by the Staff in its draft version of NUREG-1742, Vol.1, "Perspectives Gained from the Individual Plant Examination of External Events (IPEEE) Program," dated April 2001 (Draft Report for Public Comment). In Section 3.4.1 of the report, it was noted that "FIVE ... is largely equivalent to a fire area/zone screening analysis. It is not intended to produce a detailed quantification of fire CDF, but rather, to identify those plant areas/zones that might represent important fire CDF contributors." Section 1.3 of the report notes the following: "IPEEEs are intended to yield predominantly qualitative perspectives, rather than more quantitative findings." Section 3.3 further elaborates that although "CDF is the primary measure of fire-induced plant risk that emerges from the IPEEE fire analyses ... the direct comparison of absolute CDF results was not generally considered to be appropriate ..." Section 3.4.1 states that the "perception that FIVE is generally a conservative approach in comparison to fire PRA methods appears to be confirmed when the total CDF for various methodologies are compared. ... Those submittals based solely on FIVE, in general, reported larger fire-induced CDF results than the submittals that used other methods."

The conservative nature of the FIVE methodology described in NUREG-1742 applies to the ANO-2 fire analysis. The ANO-2 IPEEE fire analysis was performed via a series of screening analyses of the various zones. The first of these screenings assumed failure of all components in the zone and components with cables (i.e., power, control, or instrumentation cables) in the zone. Any zone not screened using this approach was identified for further analysis. This additional analysis involved identifying the dominant failures in each unscreened zone. For each unscreened zone, these dominant failures were individually assessed to determine whether a fire would indeed have failed the component of interest. If a determination was made that a component would not be affected by a fire in the zone, the zone was requantified with the component set to its nominal failure value. Iterations were performed on the unscreened zones until they screened or until the CDF for the zone was reduced to some frequency that was deemed to be acceptable. Potential fire vulnerabilities were identified based on the unscreened zones. Since the iterations on the unscreened zones were concluded when the intent of GL-88-20 was met, CDF results are not indicative of a true fire risk. Thus, the conservative nature of the ANO-2 FIVE-based fire analysis and conservatisms used in this analysis make it inappropriate to make a direct comparison of the sum of the fire zone CDFs with the Regulatory Guide 1.177 and 1.174 risk acceptance guidelines. Instead, it is more appropriate to use the fire risk results to gain risk management insights that can be used to lower plant risk.

A review of the fire risk contributors was performed to obtain risk management insights that can be used to lower plant risk, especially during the EDG AOT condition. This review was conducted using the fire risk results reported to the NRC by letter dated June 28, 2001 (2CAN060110), as part of our response to the ANO-2 Power Uprate submittal. The CDFs for the unscreened fire zones post power uprate are provided in Table 2-1, below.

Table 2-1

Fire Area	Fire Zone	Description	CDF (F-2)
N/A	N/A	Transformer Yard	1.09E-06
B	B3SC	Aux Bldg Ext	1.25E-06
SS	2097-X	East DC Equip Room	1.85E-06
HH	2096-M	MCC2B63 Room	1.90E-06
G	2098-C	New CPC Room	1.92E-06
G	2199-G	Control Room	2.00E-06
HH	2063SC	Aux Bldg el. 354'	1.97E-06
II	2101-AA	North Switchgear Room	2.45E-06
SS	2100-Z	South Switchgear Room	3.90E-06
EE	2055SC	Lower South Elect/Piping Penet Rm	5.44E-06
TT	2108-S	Electrical Equipment Room	7.62E-06
JJ	2109-U	Diesel Corridor	1.68E-06
JJ	2109-U	Diesel Corridor – failure of 2 rows of 2B51	9.22E-06
OO	IS	Intake Structure	1.22E-05
G	2098-L	Cable Spreading Room	1.69E-05
B	B5	Turbine Bldg A1/A2/CST Not Failed	3.43E-06
B	B5	Turbine Bldg A1/A2/CST Failed	3.66E-05

Upon review of the contributors to fire initiation in the unscreened fire zones, several areas were identified as being most risk sensitive. These zones/areas include: the Turbine Building (B/B5), Transformer Yard, South Switchgear Room (SS/2100-Z), Cable Spreading Room (G/2098-L), Intake Structure (OO/IS), Diesel Corridor (JJ/2109-U), Lower South Elect/Piping Penetration Room (EE/2055SC), and Electrical Equipment Room (TT/2108-S). The impact on fire risk in these zones can be managed as described below.

Turbine Building (B/B5)

The 2A1/2A2/2A9 switchgear area in the turbine building is the most risk sensitive area in the turbine building because offsite power is provided via the 2A1 and 2A2 switchgear and power from the AACDG is provided via the 2A9 switchgear. Fires of greatest risk importance are those that cause the loss of all three switchgear, especially fires that occur when an EDG is out of service (OOS). The probability of fire risk in the turbine building in vicinity of 2A1/2A2/2A9 switchgear can be reduced during the EDG outage by controlling transient fire combustibles and welding, and assigning continuous fire watches to this area. The consequence of a fire in this area will be determined by the size and location of the fire. The consequences can be reduced by providing a crew brief to the ANO-2 Operations personnel as well as the ANO-1 fire brigade members who are on shift during the EDG outage. The brief will include refresher information related to fighting electrical fires, relevant industry experience, and steps for restoration if a fire were to occur.

Transformer Yard

Plant risk is sensitive to a fire in the transformer yard fire area/fire zone. This insight is a result of the fact that all offsite power is provided to the plant through the transformer yard. Fires of greatest risk importance are those that cause the loss of power from both Startup Transformer No. 3 and Startup Transformer No. 2, especially fires that occur when an EDG is OOS. Startup

Transformer No. 3 is in the ANO-2 transformer yard while Startup Transformer No. 2 is in the ANO-1 transformer yard. The two transformer yards are physically separated. The probability of a fire risk in this area can be reduced during an EDG outage by minimizing work in this area, including the control of welding and of transient combustibles. Prior to an EDG outage the consequences of fire risk can be reduced by confirming the operability of the fire suppression in the transformer yard. This will be accomplished by verifying the surveillances are current and the system is not isolated. If the system is isolated, then fire hoses will be staged to the transformer yard area during the EDG maintenance outage. As part of the crew brief to ANO-2 Operations personnel and ANO-1 fire brigade members, refresher information related to fighting fires in the transformer yard will be provided also.

South Switchgear Room (SS/2100-Z)

Plant risk is sensitive, although to a lesser extent, to a fire in fire area/fire zone SS/2100-Z (South Switchgear Room), especially fires that occur when an EDG is OOS. Again, the fire risk in this area can be reduced by controlling transient combustibles and welding.

Cable Spreading Room (G/2098-L), Intake Structure, Diesel Corridor (JJ/2109-U), Lower South Elect/Piping Penetration Room (EE/2055SC), and Electrical Equipment Room (TT/2108-S)

The removal of an EDG from service does not affect the calculated fire risk associated with these areas. However, actions which reduce the fire risk in these areas, especially when an EDG is OOS, significantly reduce the overall plant fire risk. These actions include controlling welding and transient fire combustibles in these areas during the EDG outage.

In conclusion, although the current version of the ANO-2 IPEEE fire risk results is believed to conservatively overestimate the risk of fires at ANO, insights obtained from this analysis will be used to manage the fire risk so it is minimized when an EDG is removed from service.

Attachment 2

2CAN050303

Proposed Technical Specification and Technical Specification Bases Pages (Markup)

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

LIMITING CONDITION FOR OPERATION

b. With one diesel generator of the above required A.C. electrical power source inoperable, perform the following:

1. Demonstrate the OPERABILITY of both the offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter, and

2. Demonstrate the OPERABILITY of the remaining OPERABLE diesel generator by within 24 hours by:performing Surveillance Requirement 4.8.1.1.2.a.4 within 24 hours except when:

i. Determining the OPERABLE diesel generator is not inoperable due to a A common cause failure, has been determined not to exist, or

ii. Perform Surveillance Requirement 4.8.1.1.2.a.4 unless:

iia. The remaining diesel generator is currently in operation, or

iiib. The remaining diesel generator has been demonstrated OPERABLE within the previous 24 hours, and

3. Restore the diesel generator to OPERABLE status within 72 hours14 days (See Note 1) or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Note 1 - If the Alternate AC Diesel Generator (AACDG) is determined to be inoperable during this period, then a 72 hour restoration period is applicable until either the AACDG or the diesel generator is returned to operable status (not to exceed 14 days from the initial diesel generator inoperability).

3/4.8 ELECTRICAL POWER SYSTEMS

BASES

Containment electrical penetrations and penetration conductors are protected by either de-energizing circuits not required during reactor operation or by demonstrating the OPERABILITY of primary and backup overcurrent protection circuit breakers during periodic surveillance. The 480 volt air frame protective devices utilize electro-mechanical overcurrent elements which are mounted on the protective device and, in some instances, protective relays to trip the protective device. Actuation of the overcurrent element or relay will trip the protective device. The molded case protective devices utilize magnetic or thermal-magnetic overcurrent elements which are contained in the protective device. Actuation of each overcurrent element will trip the protective device.

TS 3.8.1.1 Action "a" includes ~~An~~ an allowance ~~has been provided,~~ for extending the allowable outage time for Startup Transformer No. 2 only, for up to 30 days. The 30-day allowance is permitted not more than once in any 10-year period, which is considered sufficient for proper maintenance of the transformer. The 30-day window should permit extensive preplanned preventative maintenance without placing either unit in an action statement of short duration and would allow both units to be operating during such maintenance. Because this allowance assumes parts are prestaged, appropriate personnel are available, and proper contingencies have been established, it is not intended to be used for an unexpected loss of the transformer. Pre-established contingencies will consider the projected stability of the offsite electrical grid, the atmospheric stability projected for the maintenance window, the ability to adequately control other ongoing plant maintenance activities that coincide with the window, projected flood levels, and the availability of all other power sources. Since a station blackout is the most affected event that could occur when power sources are inoperable, the steam driven emergency feedwater pump will also be maintained available during the evolution.

TS 3.8.1.1 Action "b" allows for the extension of the EDG AOT up to 14 days. Typically, the extended AOT will be used for voluntary planned maintenance or inspections, but it may be used for corrective maintenance activities. The following contingencies shall be met prior to entering the extended EDG AOT when pre-planned maintenance activities are scheduled or within 72 hours if unplanned entry into the action is required:

1. Weather conditions will be evaluated prior to entering the extended EDG AOT for voluntary planned maintenance. An extended EDG AOT will not be entered for voluntary planned maintenance purposes if official weather forecasts are predicting severe conditions (tornado or thunderstorm warnings).
2. The condition of the offsite power supply and switchyard will be evaluated.
3. No discretionary switchyard maintenance will be allowed. In addition, no discretionary maintenance will be allowed on the main, auxiliary, or startup transformers associated with the unit.
4. No maintenance or testing that affects the reliability of the ANO-2 train associated with the OPERABLE EDG will be scheduled during the extended AOT. If any testing and maintenance activities must be performed while the extended AOT is in effect, the a 10CFR5065 (a)(4) evaluation will be performed.
5. The Alternate AC Diesel Generator (AACDG) will be available as a backup to the inoperable EDG and will not be used for non-safety functions such as power peaking to the grid. After entering the extended AOT, the AACDG will be verified available every 8 hours and treated as protected equipment.

6. ANO-1 personnel will be notified to ensure no elective maintenance activities will be scheduled on the ANO-1 EDGs.
7. The steam driven emergency feedwater pump will not be taken out of service for planned maintenance activities and will be treated as protected equipment.

Note 1 of TS 3.8.1.1 Action "b" requires operability of the AACDG when an EDG is removed from service. If the AACDG becomes inoperable, then the allowable outage time is reduced to 72 hours not to exceed 14 days from the initial entry related to the inoperable EDG. Either the AACDG or the EDG may be restored within the 72 hours. If the EDG is restored, then TS 3.8.1.1, action "b" is exited. If the AACDG is restored within the 72 hours, then restoration of the EDG must be accomplished within the initial 14 day AOT (i.e. 14 days from the time the EDG was initially declared inoperable and action "b" was entered).

TS 3.8.1.1 Action "c.4" is entered when one of the inoperable A.C. Sources is restored to an OPERABLE status as required by Action "c.3" and requires restoration of the remaining inoperable A.C. Source to an OPERABLE status. The allowable restoration time in Action "c.4" for the remaining inoperable A.C. source began when the component initially became inoperable. If not restored within the AOT, then a plant shutdown is required. The requirement associated with the AACDG (reference Action "b.3" Note 1) is applicable to the EDG AOT.

TS 3.8.1.1 Action "e.3" requires restoration of the remaining inoperable EDG to an OPERABLE status. The time allowed for restoration is based on the time at which the remaining inoperable EDG was initially declared inoperable. If not restored within the AOT, then a plant shutdown is required. The requirement associated with the AACDG (reference Action "b.3," Note 1) is applicable to the EDG AOT

TS 4.8.1.2.c.3 demonstrates the EDG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency while maintaining a specified margin to the overspeed trip. For ANO-2, the single load for each EDG is the Service Water pump, rated at 800 HP (636.9 KW).

TS 3.8.2.3 Action "b" requires the performance of SR 4.8.2.3.a.1 within one hour and at least once per 8 hours thereafter for a loss of one of the required full capacity chargers. If any Category A limit in Table 4.8-2 is not met while a charger is inoperable, the associated battery bank shall be declared inoperable and ACTION "a" entered. The Category A limits in Table 4.8-2 specify the normal limits for electrolyte level, float voltage and specific gravity for each designated pilot cell. When TS 3.8.2.3 ACTION "b" is entered without the associated battery bank being on float (i.e. charger not connected to the bus), pilot cell float voltage is determined by measuring pilot cell voltage. The term "full capacity charger" as used in TS 3.8.2.3 is defined as a charger that is capable of supplying an output of ≥ 300 amperes.

Attachment 3

To

2CAN050303

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy related to this request. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
1. Weather conditions will be evaluated prior to entering the extended EDG AOT for voluntary planned maintenance. An extended EDG AOT will not be entered for voluntary planned maintenance purposes if official weather forecasts are predicting severe conditions (tornado or thunderstorm warnings).		x	
2. The condition of the offsite power supply and switchyard will be evaluated prior to entering the extended AOT.		x	
3. No discretionary switchyard maintenance will be allowed. In addition, no discretionary maintenance will be allowed on the main, auxiliary, or startup transformers associated with the unit.		x	
4. No maintenance or testing that affects the reliability of the ANO-2 train associated with the OPERABLE EDG will be scheduled during the extended AOT. If any testing and maintenance activities must be performed while the extended AOT is in effect, a 10CFR50.65 (a)(4) evaluation will be performed.		x	
5. The Alternate A.C. Diesel Generator (AACDG) will be available as a backup to the inoperable EDG and will not be used for non-safety functions such as power peaking to the grid. After entering the extended AOT, the AACDG will be verified available every 8 hours and treated as protected equipment.		x	

List of Regulatory Commitments
Continued

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
6. ANO-1 personnel will be notified to ensure no elective maintenance activities will be scheduled on the ANO-1 EDGs and will be made aware of the dedication of the AACDG to ANO-2.		X	
7. The steam driven emergency feedwater pump will not be taken out of service for planned maintenance activities and will be treated as protected equipment.		X	
8. The system dispatcher will be contacted once per day and informed of the EDG status along with the power needs of the facility.		X	
9. Should a tornado or thunderstorm warning be issued for the local area, an operator will be available should local operation of the AACDG be required as a result of on-site weather-related damage.		X	
10. ANO-2 on-shift Operations crews will discuss and review appropriate normal and emergency operating procedures upon or prior to assuming the watch for the first time after having scheduled days off while the AOT is in effect.		X	
11. ANO-2 Operations crews will be briefed concerning the ANO-2 EDG activities, including compensatory measures established and the importance of promptly starting and aligning the AACDG following instruction of the ANO-2 Shift Manager upon the loss of power event. This briefing will be performed upon or prior to assuming the watch for the first time after having scheduled days off while the AOT is in effect.		X	
12. During the EDG outage, ANO commits to control welding and transient combustibles and to establish continuous fire watches in the vicinity of the Turbine Building Switchgear (2A1/2A2/2A9).		During EDG Outage	

List of Regulatory Commitments
Continued

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
13. During the EDG outage, ANO commits to control welding and transient combustibles in the following areas: the transformer yard; the south switchgear room (SS/2100-Z); the cable spreading room (G/ 2098-L); intake structure (OO / IS); diesel corridor (JJ/2109-U); lower south electrical/piping penetration room (EE/2055SC); and Electrical Equipment Room (TT/2108-S).		During EDG Outage	
14. Prior to the EDG outage ANO commits to provide in a crew brief to ANO-2 Operations personnel and ANO-1 fire brigade personnel refresher information related to fighting electrical fires and fires that may occur in the transformer yard. The crew brief will include relevant industry operating experience related to fires in these areas and will also include a discussion of equipment restoration.		Prior to EDG Outage	
15. Prior to an EDG outage the operability of the fire suppression in the transformer yard will be confirmed. This will be accomplished by verifying the surveillances are current and the system is not isolated. If the system is isolated, then fire hoses will be staged to the transformer yard area during the EDG maintenance outage.		Prior to the EDG Outage	