December 29, 1998

Mr. William R. McCollum, Jr.
Oconee Nuclear Site
Duke Energy Corporation
P.O. Box 1439
Seneca, SC 27679

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE OCONEE NUCLEAR STATION UNIT NOS. 1, 2, & 3 ENVIRONMENTAL REPORT ASSOCIATED WITH LICENSE RENEWAL - SAMA (TAC NOS. M99162, M99163, M99164, and M99183)

Dear Mr. McCollum:

By letter dated July 6, 1998, Duke Energy submitted its application for renewal of the Oconee Nuclear Station, Units 1, 2, and 3 licenses. As part of the application, Duke Energy submitted an environmental report (ER) prepared in accordance with 10 CFR Part 51. The staff is continuing its review of the ER, however, the staff has identified areas related to severe accident mitigation alternatives (SAMAs) where additional information is necessary in order to complete its review. The specific requests for information are contained in the enclosure and have been given unique identifiers continuing the sequence of numbers associated with the environmental review that was transmitted under separate cover.

In order to assure that staff review resources are effectively managed, you should provide your schedule for responding to the enclosed questions by close of business on January 15, 1998. Additionally, the staff is willing to meet with Duke Energy prior to submittal of the response to provide clarifications of the staff's request for additional information.

Sincerely,

James H. Wilson, Senior Project Manager
Generic Issues and Environmental Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure: As stated
cc: See next page
Distribution: See next page

DOCUMENT NAME: g:\oconee\letter\cvrltr.sam

OFFICE	PGEB	SC:PGEB	D:PDLR	BC:PGEB
NAME	JHWilson	RArchitzel for	CGrimes	TEssig
DATE	12/29/98	12/29/98	12/29/98	12/29/98

OFFICIAL RECORD COPY

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 29, 1998

Mr. William R. McCollum, Jr.
Oconee Nuclear Site
Duke Energy Corporation
P.O. Box 1439
Seneca, SC 27679

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE OCONEE NUCLEAR STATION UNIT NOS. 1, 2, & 3 ENVIRONMENTAL REPORT ASSOCIATED WITH LICENSE RENEWAL - SAMA (TAC NOS. M99162, M99163, M99164, and M99183)

Dear Mr. McCollum:

By letter dated July 6, 1998, Duke Energy submitted its application for renewal of the Oconee Nuclear Station, Units 1, 2, and 3 licenses. As part of the application, Duke Energy submitted an environmental report (ER) prepared in accordance with 10 CFR Part 51. The staff is continuing its review of the ER, however, the staff has identified areas related to severe accident mitigation alternatives (SAMAs) where additional information is necessary in order to complete its review. The specific requests for information are contained in the enclosure and have been given unique identifiers continuing the sequence of numbers associated with the environmental review that was transmitted under separate cover.

In order to assure that staff review resources are effectively managed, you should provide your schedule for responding to the enclosed questions by close of business on January 15, 1998. Additionally, the staff is willing to meet with Duke Energy prior to submittal of the response to provide clarifications of the staff's request for additional information.

Sincerely,

James H. Wilson

James H. Wilson, Senior Project Manager
Generic Issues and Environmental Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure: As stated

cc: See next page

Distribution:
Hard copy
PUBLIC
Docket File
PDLR RF
M. El-Zeftawy, ACRS T2E2

E-mail:
R. Zimmerman
J. Roe
D. Matthews
C. Grimes
T. Essig
G. Lainas
J. Strosnider
G. Bagchi
H. Brammer
T. Hiltz
G. Holahan
S. Newberry
C. Gratton
L. Spessard
R. Correia
R. Latta
J. Peralta
J. Moore
R. Weisman
M. Zobler
E. Hackett
A. Murphy
T. Martin
D. Martin
W. McDowell
S. Droggitis
PDLR Staff

H. Berkow
D. LaBarge
L. Plisco
C. Ogle
R. Trojanowski
M. Scott
C. Julian
R. Architzel
J. Wilson

R. Gill, Duke
D. Walters, NEI

OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
OCONEE NUCLEAR STATION (ONS), UNITS 1, 2, AND 3
DOCKET NOS. 50-269, 50-270, AND 50-287
LICENSE RENEWAL APPLICATION
SAMA REVIEW

Severe Accident Mitigation Alternatives (SAMAs) Analysis

31. Scope of Alternatives Considered: Page 1 of the SAMA submittal indicates that the SAMA review would include potential design alternatives along with any procedural, non-hardware, alternatives. The SAMA analysis performed appears to have focused on major design alternatives (e.g., automatic swap-over of systems, replacing the reactor vessel, installation of filtered containment vent system) and did not give much consideration to procedural, non-hardware, alternatives. Section 6.0, "Overall Results", of the SAMA submittal indicates that none of the hardware changes would be cost-beneficial to implement, but does not mention any procedural, non-hardware alternatives. Given the low residual risk discussed in the Oconee SAMA submittal and the relatively high cost of major design alternatives, one would not expect major design alternatives to be cost beneficial. The following examples are intended to illustrate where less costly, but potentially beneficial SAMAs could have been evaluated, although the staff has not evaluated whether these examples are indeed cost-beneficial at Oconee.

a. The single human action of "operators fail to initiate high pressure recirculation" was included within the Individual Plant Examination (IPE) dominant cut set in the accident sequence with the highest core damage frequency (CDF). The IPE submittal indicated that procedures existed for this action but were not practiced. Rev. 2 of the Oconee probabilistic risk assessment (PRA) identifies this human action in 2 of the top 3 cut sets for internal initiators. The Oconee SAMA analysis evaluates the installation of automatic swap over to high pressure recirculation at a cost of over $1 million. Alternatively, additional training could have been assessed as a SAMA, if it has not already been implemented.

b. Rev. 2 of the Oconee PRA indicates that the availability of the reactor building cooling units (RBCUs) was the most important factor in keeping the containment intact. Duke Power evaluated the installation of an independent containment spray system at a cost of over $1 million as a potential SAMA. Alternatively, a less costly SAMA might include use of a portable electric generator, unit cross-ties, or providing service water cooling to the RBCUs from a fire protection water supply.

c. The potential SAMA *"manning of the SSF for 24 hours a day with a trained operator"* was identified but was not found to be cost-beneficial. However, less costly SAMAs, such as improving operator training to supply RCP seal cooling water from the SSF or using high-temperature resistant RCP seal O-rings (if not already used), may be cost-beneficial.

As a result, the potential innovative use of existing plant equipment, additional training, or changes to procedures that could reduce the residual risk in a cost effective manner should be more thoroughly assessed.

32. Insights and Recommendations from Oconee Risk Assessments: Various Oconee risk assessments including the Oconee IPE, Oconee IPE staff evaluation report, Oconee IPEEE, Oconee PRA Rev. 2, Keowee PRA, and Oconee high pressure injection reliability study, identify risk insights, recommendations, and potential improvements that have either not been discussed, dispositioned, or included in the SAMA analysis. Provide a more thorough assessment of the disposition of the various risk insights and recommendations. For those that have not been implemented, provide an assessment of them within the context of SAMAs. In particular, the following should be addressed:

a. The SAMA submittal states that *"Numerous recommendations from the (turbine building) fire analysis have been made to improve fire protection ... "* Have any of these recommendations been found to be cost-effective and/or implemented? For those that have not been implemented, provide an assessment of them within the context of SAMAs.

b. The Oconee IPE identified the need to vent the containment as part of a mitigation strategy to prevent or delay core damage for severe accident scenarios initiated by internal flooding of the turbine building. The strategy involves turning off containment sprays, to conserve borated water storage tank inventory for feed-and-bleed cooling, and providing containment heat removal via containment venting. The containment venting strategy may have been implemented as part of the third alternative identified by the Oconee IPE study in Table 2-1 of the SAMA submittal, although it is unclear. Has the containment venting strategy been implemented? If not, provide an assessment of it within the context of SAMAs.

c. The SAMA submittal indicates that enhancements to plant hardware and procedural guidelines have been recommended as a result of the IPEEE examination. Provide a summary of their disposition. For those that have not been implemented, provide an assessment of them within the context of SAMAs.

d. Provide a summary of the disposition of the risk insights and recommendations from the Keowee PRA and Oconee high pressure injection reliability study. For those that have not been implemented, provide an assessment of them within the context of SAMAs.

e. The failure of elastomer material used to seal personnel and equipment hatches and electrical penetration assemblies as a result of direct containment heating was considered in the IPE. Provide a SAMA analysis evaluating the upgrading of the elastomer material to withstand elevated containment temperatures.

f. As part of the Human Reliability Analysis for the IPE, Duke Energy reviewed Oconee plant procedures and identified areas requiring potential enhancements including, guidance on operating the low pressure injection pumps during a small break LOCA, enhancement of the turbine building flood procedure, and implementation of the loss of

low pressure service water procedure. Other procedures had been developed and were being considered for implementation. What is the disposition for these other procedures? If not implemented, provide an assessment within the SAMA analysis.

g. The IPE submittal indicated that the Duke Power was considering building a simulator for the standby shutdown facility (SSF) so that operators could be trained on important operator actions and sequences related to the SSF. What is the status of the potential SSF simulator? If the simulator was not built, provide an assessment within the SAMA analysis.

h. The Oconee PRA Rev. 2 states that a separate PRA (based on the ORAM methodology) is used for cold shutdown and refueling modes. Provide a summary of the PRA results including major contributors to CDF and risk. Provide a discussion of how this shutdown risk is considered in your SAMA analysis.

33. Identification of Risk Contributors: The top 200 internal and external cut sets identified within the Oconee PRA Rev. 2 were screened using a CDF cutoff value of 4.5E-07 for internal events and 8.5E-07 for external events in order to determine which sequences should be further assessed in the SAMA process.

a. Provide the basis for the selection of the cutoff values. The Oconee IPE identified core damage sequences which bypass the containment (SGTR and ISLOCA) with frequencies greater than 1.0E-08 as potential vulnerabilities. The screening criteria selected does not include these sequences.

b. Table 6.1.3-1 of the Oconee PRA Rev.2 indicates that only 5 of the top 100 cuts sets for internal initiators pass the cutoff value screening criteria. These 5 sequences account for only 23% (5.9E-06) of the internal events CDF (2.6E-05) or only 7% of the overall CDF (8.9E-05). Table 6.1.3-2 of the Oconee PRA Rev.2 indicates that only 12 of the top 100 cuts sets for external initiators pass the screening criteria, of which 7 are for seismic events and assessed separately. The remaining 5 external event sequences account for only 12% (7.6E-06) of the external events CDF (6.6E-05) or 9% of the overall CDF (8.9E-05). As a result, the SAMAs considered to reduce CDF in Table 4-2 account for only 15% of the overall CDF. None of the SAMA improvements considered addressed transients, which represent 31% of the internal events CDF and are dominated by reactor trips and loss of low pressure service water. The evaluation of SAMA improvements should cover a much broader spectrum of the CDF sequences.

c. Table 4-1 of the SAMA submittal lists the top 15 seismic initiator severe accident sequences and Table 6.1.3-2 of the Oconee PRA Rev. 2 provides the respective CDF for these sequences . The CDF of many of these sequences is below the cutoff value screening criteria of 8.5E-07 selected for external events. What is the relationship of the cutoff value screening criteria to seismic events?

d. Although it is mentioned in the submittal (page 15 of appendix K) that *"the basic events importance ranking list (was reviewed) for events of significant F-V values,"* it appears that the identification of potential SAMAs was performed by considering separately the contribution to risk from cut sets related to each initiating event category.

Ways for reducing the frequency of initiating events but not ways for reducing failure probabilities are discussed in page 15 of Appendix K. In addition statements such as *"... the seismic and non-seismic initiators are examined separately...."* and *"This analysis divides the potential severe accident sequences for consideration of SAMAs into two sections: (1) seismic initiator plant damage states (PDS), and (2) non-seismic initiator cut sets"* are made in the submittal. It should be noted that seismic cut sets can also include mixed, seismic-random, event cut sets. This approach could overlook potential SAMAs related to events that appear in cut sets related to more than one initiating event category. For example, the event *"provide RCP seal cooling from the SSF upon loss of AC power"* appears in cut sets related to many initiating event categories (e.g., SBO, fires initiated in several plant areas, earthquakes and external flooding). A complete and systematic search for potential SAMAs would consider the values of either the Fussel-Vesely (F-V) or the Risk Reduction Worth (RRW) risk importance measures for all basic events modeled in the PRA (i.e., initiating events, failure and maintenance unavailabilities and human errors). Please clarify your approach and explain why this approach identifies and assesses all potentially important SAMAs.

34. Cost-Benefit Analysis Methodology: The SAMA analysis assessed benefits in terms of averted offsite person-rem (public dose), but did not include other averted costs that should be included in accordance with the Regulatory Analysis Guidelines. The SAMA analysis should be modified to include all potential averted costs associated with each potential improvement, including, onsite cleanup costs, power replacement, onsite dose, and offsite property damage. Reference should be provided for selected values and assumptions used. For each potential SAMA, the change in CDF and person-rem and all averted costs should be provided separately. The SAMA analysis used population data from the 1990 census, but should have used a projected population based on the end of the license renewal period. In addition, a sensitivity study should be performed to assess the value of SAMAs over the remainder of the current operating license and the license renewal period.

35. Risk Profile: The SAMA analysis indicates that a review of the current risk profile was completed to identify the severe accident sequences dominating CDF and person-rem risk. Although the majority of the needed risk information is provided in either the SAMA submittal or Oconee PRA Rev.2, a breakdown of the 50 mile person-rem dose should be provided according to (a) initiating events as defined in Table 6.1-1 of the Oconee PRA Rev 2 and (b) containment release pathway as defined in Tables 6.3-1, 6.3-2, and 6.3-3 of the Oconee PRA Rev 2.

36. SAMA Assumptions: Provide a discussion of the meteorological data and emergency planning assumptions used in performing the SAMA analysis. Provide an assessment of the impact of the license renewal period on emergency planning assumptions (i.e., effects of increased population).

37. Peer Review: Describe any differences in the peer review process for Rev.2 of the Oconee PRA as compared to Rev.1, which formed the basis for the Oconee IPE.

38. Containment Penetrations: A seismic initiator causing the auxiliary building to fail resulting in an intersystem loss-of-coolant accident (ISLOCA) contributes approximately 70% of the large early release frequency. Because of the nature of this accident, Duke has indicated that additional containment bypass instrumentation to detect ISLOCAs would not be effective. Provide a discussion of the containment isolation arrangement for the effected systems which lead to an ISLOCA and the effect of seismic events and tornados on containment isolation valves located inside and outside containment. Provide a discussion of the level of protection provided for these penetrations due to design basis requirements. Provide a discussion of how Severe Accident Management Guidelines address the issue of containment bypass instrumentation as indicated in Table 6-1 of the SAMA submittal.

39. RCP Seal LOCAs: The Oconee IPE found that reactor coolant pump (RCP) seal leaks during station blackout (SBO) accidents are important contributors to risk and that their contribution would be significantly reduced by increasing the probability of supplying RCP seal cooling water from the standby shutdown facility (SSF) using the reactor coolant makeup control system pumps. The list of Table 2-1 indicates that the licensee has not identified any cost-effective means for increasing the probability of supplying RCP seal cooling water from the SSF. The licensee considered, as a potential SAMA, the "manning of the SSF for 24 hours a day with a trained operator" and found that it is not cost-beneficial (see Table 4-2).

a. It appears that the only cut sets considered in assessing the averted risk from RCP seal LOCAs are those initiated with a turbine building fire or a random failure of the Jocassee dam. However, there are additional cut sets that were found by the licensee to be significant contributors to risk, such as internally initiated station blackout (SBO) events, cable shaft fires, unit one/two blockhouse fires and seismic failure of the Jocassee dam. Were such cut sets included in your calculations? If the answer is "no," please explain in sufficient detail the reasons and how would this affect the results.

b. Uncertainties associated with PRA models (e.g., the RCP seal failure model) and with data (e.g., failure rates for certain Keowee components, such as the voltage regulator and the field flash circuit breaker, which were obtained during grid generation and not during emergency operation) could impact the results. A different set of plausible assumptions could increase significantly the "risk reduction worth" of events appearing in RCP seal LOCA sequences. Any SAMAs that reduce the probability of such events could be cost-beneficial. Please explain how uncertainties were taken into account in identifying and assessing SAMAs that reduce risk associated with RCP seal LOCA sequences.

Oconee Nuclear Station (License Renewal)
cc:

Paul R. Newton, Esquire
Duke Energy Corporation
422 South Church Street
Mail Stop PB-05E
Charlotte, North Carolina 28201-1006

J. Michael McGarry, III, Esquire
Anne W. Cottingham, Esquire
Winston and Strawn
1400 L Street, NW.
Washington, DC 20005

Mr. Rick N. Edwards
Framatome Technologies
Suite 525
1700 Rockville Pike
Rockville, Maryland 20852-1631

Manager, LIS
NUS Corporation
2650 McCormick Drive, 3rd Floor
Clearwater, Florida 34619-1035

Senior Resident Inspector
U. S. Nuclear Regulatory Commission
7812B Rochester Highway
Seneca, South Carolina 29672

Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303

Virgil R. Autry, Director
Division of Radioactive Waste Management
Bureau of Land and Waste Management
Department of Health and
Environmental Control
2600 Bull Street
Columbia, South Carolina 29201-1708

County Supervisor of Oconee County
Walhalla, South Carolina 29621

W. R. McCollum, Jr., Vice President
Oconee Site
Duke Energy Corporation
P. O. Box 1439
Seneca, SC 29679

Mr. J. E. Burchfield
Compliance Manager
Duke Energy Corporation
Oconee Nuclear Site
P. O. Box 1439
Seneca, South Carolina 29679

Ms. Karen E. Long
Assistant Attorney General
North Carolina Department of Justice
P. O. Box 629
Raleigh, North Carolina 27602

L. A. Keller
Manager - Nuclear Regulatory Licensing
Duke Energy Corporation
526 South Church Street
Charlotte, North Carolina 28201-1006

Mr. Richard M. Fry, Director
Division of Radiation Protection
North Carolina Department of
Environment, Health, and
Natural Resources
3825 Barrett Drive
Raleigh, North Carolina 27609-7721

Gregory D. Robison
Duke Energy Corporation
Mail Stop EC-12R
P. O. Box 1006
Charlotte, North Carolina 28201-1006

Robert L. Gill, Jr.
Duke Energy Corporation
Mail Stop EC-12R
P. O. Box 1006
Charlotte, North Carolina 28201-1006
RLGILL@DUKE-ENERGY.COM

Douglas J. Walters
Nuclear Energy Institute
1776 I Street, NW
Suite 400
Washington, DC 20006-3708
DJW@NEI.ORG

Chattooga River Watershed Coalition
P. O. Box 2006
Clayton, GA 30525