March 14, 2002

NOTE TO: File

FROM: James H. Wilson, Senior **/s/JHWilson**
Environmental Project Manager
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation.

SUBJECT: INFORMATION PROVIDED BY DUKE ENERGY CORPORATION RELATED TO SEVERE ACCIDENT MITIGATION ALTERNATIVES IN ITS LICENSE RENEWAL APPLICATION FOR THE MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 (TAC NOS. MB2021 AND MB2022)

As followup to the NRC request for additional information dated November 19, 2001, related to the staff's environmental review for McGuire license renewal, and the Duke Energy Corporation (Duke) response dated January 29, 2002, the staff held two telephone conferences with Duke.

In a telephone conference call held on February 7, 2002, Duke provided additional information to supplement its McGuire Nuclear Station Severe Accident Mitigation Alternatives (SAMA) Analysis Final Report, submitted in the environmental report (ER) for McGuire license renewal. Attachment 1 summarizes the questions asked by the staff, as well as Duke's responses. Duke is currently developing Revision 3 to the McGuire PRA, but has not submitted this information to the NRC elsewhere. Attachment 2 is a McGuire PRA Revision 3 results summary. Attachment 3 is the printout of 2 data files containing the McGuire release category matrices (RCMs) used in the PRA analyses and the modified RCMs assuming the NUREG/CR-6427 weighted early containment failure probabilities.

Another telephone conference call was held on February 25, 2002, to further supplement information in the McGuire ER and the material provided after the February 7, 2002, telephone conference. Attachment 4 summarizes the questions asked by the staff, as well as Duke's responses.

The Duke Energy Corporation (Duke) provided the information in the designated attachments to the NRC staff via e-mails dated February 13 and March 13, 2002. Because the staff may rely on some of this information in its environmental review of Duke's application for renewal of the McGuire Nuclear Station, Units 1 and 2, licenses, this information is being docketed and made publicly available.

Docket Nos. 50-369 and 50-370

Attachments: As stated

March 14, 2002

NOTE TO: File

FROM: James H. Wilson, Senior **/s/JHWilson**
Environmental Project Manager
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation.

SUBJECT: INFORMATION PROVIDED BY DUKE ENERGY CORPORATION RELATED TO SEVERE ACCIDENT MITIGATION ALTERNATIVES IN ITS LICENSE RENEWAL APPLICATION FOR THE MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 (TAC NOS. MB2021 AND MB2022)

As followup to the NRC request for additional information dated November 19, 2001, related to the staff's environmental review for McGuire license renewal, and the Duke Energy Corporation (Duke) response dated January 29, 2002, the staff held two telephone conferences with Duke.

In a telephone conference call held on February 7, 2002, Duke provided additional information to supplement its McGuire Nuclear Station Severe Accident Mitigation Alternatives (SAMA) Analysis Final Report, submitted in the environmental report (ER) for McGuire license renewal. Attachment 1 summarizes the questions asked by the staff, as well as Duke's responses. Duke is currently developing Revision 3 to the McGuire PRA, but has not submitted this information to the NRC elsewhere. Attachment 2 is a McGuire PRA Revision 3 results summary. Attachment 3 is the printout of 2 data files containing the McGuire release category matrices (RCMs) used in the PRA analyses and the modified RCMs assuming the NUREG/CR-6427 weighted early containment failure probabilities.

Another telephone conference call was held on February 25, 2002, to further supplement information in the McGuire ER and the material provided after the February 7, 2002, telephone conference. Attachment 3 summarizes the questions asked by the staff, as well as Duke's responses.

The Duke Energy Corporation (Duke) provided the information in the designated attachments to the NRC staff via e-mails dated February 13 and March 14, 2002. Because the staff may rely on some of this information in its environmental review of Duke's application for renewal of the McGuire Nuclear Station, Units 1 and 2, licenses, this information is being docketed and made publicly available.

Docket Nos. 50-369 and 50-370

Attachments: As stated

DISTRIBUTION:
Environmental R/F JHWilson RPalla JTappert SUttal RHarty (PNNL)
Accession nos.
1. Note to file, Att(s) 1, 2, and 4: **ML020740318**
2. Att. 3 McGuire Base Case RCMs:**ML 020770345**

*See previous concurrence
DOCUMENT NAME: G:\RPRP\McGuire\Docketing note-SAMA.wpd

OFFICE	PM:RLEP	SCSB	SC:RLEP
NAME	JHWilson*	RPalla*	JTappert*
DATE	03/14/02	03/14/02	03/14/02

OFFICIAL FILE COPY

Documentation of Information Provided in Teleconference held on February 7, 2002

1. Provide the core damage frequency estimates from Rev 3 of the McGuire PRA, broken out by the major contributors in a way that they can be directly compared to the Rev 2 results reported in Section 4.1 of the ER, and in the response to RAI 1a. Please be certain to include the frequencies of the following events: transients, LOCAs, internal flood, ATWS, SBO/LOOP, SGTR, and ISLOCA. A further break down by internal events, external events, and combined would be helpful.

   RESPONSE: (See McGuire PRA Revision 3 results summary - Attachment 2)

2. Provide the release category matrix for the baseline risk study and for the sensitivity case used to develop the response to RAI 4.

   RESPONSE: In determining the risk impact based on the NUREG/CR-6427 weighted value of 58% for early containment failure probability, the McGuire PRA Revision 2 release category matrix (RCM) is modified by reallocating only the release category frequencies for those PDSs identified as SBOs in the RCM such that the early containment failure probability is 58%. From the McGuire PRA revision 2 analysis the fast station blackout PDSs are 8PI and 14PI, and the slow station blackout PDSs are 4PI, 7PI, 7PS, and 15PI (note that small containment isolation failures are included since some of these PDSs end up in early containment failures) - a description of the PDSs can be found in the section 6.1 of the McGuire IPE report. The early containment failure frequencies in the RCM (RC501 and RC502) were increased proportionally.

   Attached (Attachment 3) is a data file containing the McGuire and Catawba release category matrices (RCMs) used in the PRA analyses and the modified RCMs assuming the NUREG/CR-6427 weighted early containment failure probabilities.

3. Provide an approximate estimate of the costs associated with implementing the following 2 SAMAs at the Duke plants, broken down by general cost categories, such as engineering, materials, labor, administrative, or equivalent. It is our expectation that: (1) all equipment/hardware would be non-safety related, (2) procedures and any related training would be developed and maintained in accordance with existing plant practices applicable to the severe accident management guidelines, (3) no licensee submittals or changes to the FSAR or technical specifications would be involved.

   RESPONSE:

   Option 1 - (a severe accident management procedure to power a subset of the igniters [e.g., one train] from a portable generator or equivalent ac-independent power source. This change would not address backup power to air return fans. [The generator need not be dedicated or pre-staged if there is sufficient time to locate, position, and connect it prior to the onset of core damage, e.g., several hours in the frequency-dominant SBO.])

This potential modification would require a 50.59 review which may result in changes to the design and additional costs not contained in the present estimate. This option does not provide for tornado protection of the generating source and is not seismically designed. Seismic and tornado are significant contributors to the overall SBO CDF. Including such features to the design would significantly increase the cost of the option.

Engineering	$5,000
Materials	$50,000
Installation Labor	$110,000
Maint and Operations	$40,000
TOTAL	$205,000

Option 2 - (a severe accident management procedure to power a subset of the igniters plus one air return fan from an ac-independent power source)

This potential modification would require a 50.59 review which may result in changes to the design and additional costs not contained in the present estimate.This option does not provide for tornado protection of the generating source and is not seismically designed. Seismic and tornado are significant contributors to the overall SBO CDF. Including such features to the design would significantly increase the cost of the option.

Engineering	$50,000
Materials	$210,000
Installation Labor	$240,000
Maint and Operations	$40,000
TOTAL	$540,000

4. Provide the basis for the cost estimates provided for the following 2 SAMAs, and a specific dollar value or range of dollar values (in lieu of the general statement ">1$M"): (1) Install automatic swap-over to high pressure recirculation, and (2) Install automatic swap to RV cooling/other unit RN system upon loss of RN.

RESPONSE:

From Page 7-8 of the Watts Bar SAMA report (reference NUREG-0498, Supp. 1), an alternative considered in the cost benefit analysis was:

> "Category I - Improve Availability of ECCS Recirculation -- Install automatic high-pressure recirculation (I.4) : automate the alignment of ECCS recirculation to the high-pressure charging and safety injection pumps. This would reduce the potential for related human errors made during manual realignment."

On Page 7-9 of the above mentioned report, Table 7.4 (Summary of Value/Impact Study Results) provides the cost estimate for this alternative to be on the order of $2.1 million. This cost estimate applies to both SAMAs (1) and (2).

McGuire PRA Revision 3 results summary

Initiator	Core Damage	% of CDF
SEISMIC	8.9E-06	19.3%
TORNSW	1.5E-06	3.3%
FIRES	6.3E-06	13.7%
Internal Floods	5.4E-06	11.7%
Transients	2.8E-06	6.2%
LOCAs	1.9E-05	40.4%
RPV Rupture	1.0E-06	2.2%
SGTR	5.3E-07	1.1%
ATWS	5.3E-07	1.1%
ISLOCA	9.8E-07	2.1%
Total CDF	**4.6E-05** [1]	
SBO Frequency	1.0E-05	22.2%
Seismic	7.4E-06	
Tornado	1.5E-06	
LOOP	1.3E-06	

1. This is the CDF found in the official results file, summing the contributors as listed in this table provides a slightly higher number due to round-off error.

Documentation of Information Provided in Teleconference held on February 25, 2002

1. Provide a description of the assumptions on which the risk reduction for the 3rd diesel was based (i.e.., diverse but not seismic), and the types of sequences/failures that would not be addressed by the 3rd (non-seismic) diesel.

   RESPONSE: Section 4.3 of the SAMA submittal (see Attachment K of the Environmental Report) provides a discussion of how the seismic and non-seismic initiators were treated separately in the SAMA analysis. The reason for separating out the seismic from non-seismic initiators in the SAMA analysis is that for the seismic initiator extensive plant damage is expected to occur resulting in failures of multiple pieces of equipment/components. Therefore, to mitigate such an event would require substantial upgrades to the plant systems seismic ruggedness. The CDF reductions reported in the SAMA submittal are for the non-seismic initiating events.

   The intent of our estimation of the risk reduction associated with the installation of a third diesel was to maximize the potential benefit by assuming that the third diesel was perfectly reliable, no random failure modes and no common cause connections to the essential diesels. This was to be accomplished by setting the existing diesel generator failure modes to 0 in the cutset file thus eliminating all blackout sequences. In practice, we did this by identifying and setting to 0 the dominant failure modes of the diesel generators, as described in Attachment K of the Environmental Report. Some residual CDF related to diesel failures did remain in the solution. The SAMA analysis estimated the change in CDF from installation of a third diesel to be 8.4E-06. This change comes from the reduction in the CDF contributions from the LOOP and tornado initiators. Remember that the seismic considerations were addressed independently. This reduction is approximately 92% of the estimated benefit (~9.0E-6) if every single diesel generator failure event had been set to 0 rather than simply addressing the dominant contributors. The change in CDF provided in the SAMA submittal provides a reasonable estimate of the reduction expected by a highly reliable and diverse alternate ac power source.

   The intent was to present a change in CDF consistent with the complete elimination of all diesel generator failure modes, perfect reliability and diversity.

2. Provide a description of the additional risk reduction that would be achieved by making the 3rd diesel seismic (i.e., 1.3E-6/y), and the types of sequences/failures that would not be addressed by the 3rd (seismic) diesel.

   RESPONSE: A sensitivity study has been conducted to evaluate the impact that a third diesel could have on the seismic results. No cost estimate has been developed for providing a seismically qualified diesel. As was done for the non-seismic analysis, the random failure modes of the diesels were removed form the model. The resulting

seismic CDF reduction is 1.3 E-06. The seismic results are dominated by seismic failures in the 4 kV power system for which improving diesel generator availability provides no benefit.

3. Provide the expected risk reduction for the dedicated power line from the nearby hydro station (i.e., equivalent to adding a 3rd (seismic?) diesel), and the supporting rationale (i.e., that the HCLPF for hydro stations would typically be less than for a seismic diesel).

   RESPONSE: A dedicated and tornado protected line from the Cowan's Ford hydro-electric station could provide a CDF reduction similar to the estimate provided for the third diesel in the SAMA analysis. However, the result does not address potential common cause failure of the hydro-electric station as a result of the same tornado that causes the loss of offsite power to occur. The seismic fragilities of the hydro-electric plant would be expected to be lower than most of the essential systems at McGuire.

4. Provide a brief description of the SAMA on which the $205K and $540K estimates (from the February 7, 2002, telephone conference) were based. This information is needed in order to put the various cost elements (engineering, materials, installation labor, and maintenance) in perspective. The response should clarify whether the SAMA/cost estimates: assume the generator is dedicated? pre-staged? would be located inside or outdoors?; include the cost of a pad or enclosure building? power cables (and their approximate length)? installing disconnects? routine surveillance and maintenance costs for remaining plant life?

   RESPONSE: The design requires an installed dedicated diesel because powering of the igniters needs to occur prior to the onset of core damage. The diesel is located outdoors for ventilation and exhaust considerations. Initiation and operation of the diesel will occur prior to the onset of core damage and thus will be covered by the emergency operating procedures rather than the severe accident management guidelines which are entered after core damage occurs.

   The cost estimates provided assumed one new dedicated diesel generator set, prestaged and located outside on a concrete pad for each station. No enclosure was included in the estimate. Approximately 300 feet of cable and three circuit breakers would need to be installed and are included in the cost estimate. Initial procedure development costs were included in the cost estimate. However, ongoing routine surveillance and maintenance costs were not included. Also, this cost estimate does not include tornado protection of the diesel generator set nor does it include any seismic design.

   These cost-estimates are for scoping purposes only and are subject to change.