

October 8, 2002

MEMORANDUM TO: Mark A. Cunningham, Chief  
Probabilistic Risk Analysis Branch  
Division of Risk Analysis and Applications  
Office of Nuclear Regulatory Research

THRU: Alan M. Rubin, Section Chief **/RA/**  
Probabilistic Risk Analysis Branch  
Division of Risk Analysis & Applications  
Office of Nuclear Regulatory Research

FROM: Asimios Malliakos **/RA/**  
Probabilistic Risk Analysis Branch  
Division of Risk Analysis and Applications  
Office of Nuclear Regulatory Research

SUBJECT: TELECOMMUNICATION WITH DUKE ENERGY CORPORATION IN SUPPORT  
OF GENERIC SAFETY ISSUE (GSI) 189, "SUSCEPTIBILITY OF ICE  
CONDENSER AND BWR MARK III CONTAINMENTS TO EARLY FAILURE  
FROM HYDROGEN COMBUSTION DURING A SEVERE ACCIDENT"

LICENSEE : Duke Energy Corporation

FACILITIES: McGuire, Units 1 and 2, and Catawba, Units 1 and 2

On September 9, 2002, a conference call was conducted between the NRC, Brookhaven National Laboratory (BNL), and Duke Energy Corporation to discuss information closely related to GSI-189 that was provided in the "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants," NUREG-1437, Supplement 8 for McGuire Nuclear Station, Units 1 and 2, and Supplement 9 for Catawba Nuclear Station, Units 1 and 2. The NRC staff requested information that was relevant to GSI-189 pertaining to station blackout (SBO) frequency, conditional containment failure probability, and early containment failure release category for McGuire Nuclear Station, Units 1 and 2, and for Catawba Nuclear Station, Units 1 and 2. In response to the conference call Duke Energy Corporation sent an E-mail on September 20, 2002 (see Attachment 1).

On September 24, 2002, another conference call was conducted between the NRC, BNL, and Duke Energy Corporation to discuss information that was provided in the above stated E-mail. In response to this conference call, Duke Energy Corporation sent a follow-up E-mail on September 24, 2002, that includes corrections to their previous E-mail (see Attachment 2).

M. Cunningham

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Participants of the September 9, 2002, and September 24, 2002, conference calls are provided in Attachment 3.

Attachments: As stated

cc/(w/attachments)

A. Notafrancesco

Robert Martin, NRR

John Lehner, BNL

Bob Gill, Duke Energy Corporation

Robert Palla, NRR

Distribution: DRAA Chron, PRAB r/f, Malliakos, Malliakos r/f, Rubin, Cunningham, Newberry

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DATE	10/ 08 /02	10/ 08/02	10/ /02						

## ATTACHMENT 1

The following information is being provided in response to a request communicated in a September 9, 2002 conference call in which GSI-189 was discussed. The information provided consists of the following:

1. An uncertainty analysis on the SBO frequency for revision 3 of the McGuire PRA.
2. An uncertainty analysis on the SBO frequency for revision 2b of the Catawba PRA.  
This has 3 sub-parts: a) base case PRA (revision 2b), b) considering the RCP seal replacement, and c) considering the future addition of the turbine building flood wall.
3. Conditional containment failure probabilities for the McGuire PDSs.
4. Conditional containment failure probabilities for the Catawba PDSs.
5. The SBO early containment failure risk results for McGuire using the 2000 census data.
6. The SBO early containment failure risk results for Catawba using the 2000 census data.
7. The early containment failure release category definitions for McGuire.
8. The early containment failure release category definitions for Catawba.

### 1.0

Non-Seismic SBO Frequency (Includes tomado)		Tomado SBO Frequency	Seismic SBO Frequency
point estimate	2.66E-06	1.51E-06	7.41E-06
mean	2.95E-06		
5 <sup>th</sup> percentile	2.17E-07		
50 <sup>th</sup> percentile	1.25E-06		
95 <sup>th</sup> percentile	9.88E-06		

### 2.0

Current Base Case (Revision 2b)

Non-Seismic SBO Frequency (Includes tomado)		Tomado SBO Frequency	Seismic SBO Frequency
point estimate	1.65E-05	1.92E-06	8.32E-06
mean	1.87E-05		
5 <sup>th</sup> percentile	9.35E-07		
50 <sup>th</sup> percentile	5.88E-06		
95 <sup>th</sup> percentile	6.39E-05		

The seismic analysis has not been revised to incorporate the revised seal model. RCP seal LOCAs are an important contributor to the seismic core damage sequences and a reduction in the seismically induced CDF similar to what is observed in the internal event analysis would be expected.

With RCP Seal Replacement

Non-Seismic SBO Frequency (Includes toma do)		Tornado SBO Frequency	Seismic SBO Frequency
point estimate	1.10E-05	1.15E-06	N/A
mean	1.28E-05		
5 <sup>th</sup> percentile	5.25E-07		
50 <sup>th</sup> percentile	3.79E-06		
95 <sup>th</sup> percentile	4.52E-05		

With RCP Seal Replacement and Flood Wall

Non-Seismic SBO Frequency (Includes toma do)		Tornado SBO Frequency	Seismic SBO Frequency
point estimate	2.38E-06	1.15E-06	N/A
mean	2.60E-06		
5 <sup>th</sup> percentile	1.48E-07		
50 <sup>th</sup> percentile	8.32E-07		
95 <sup>th</sup> percentile	8.67E-06		

**3.0**

Containment failure probabilities are developed for each plant damage state (PDS) in the PRA. For those PDSs included in the slow station blackout frequency, the conditional containment failure probabilities for early failure fell into a range from 0.15 to 0.19. For the fast SBO PDSs, the probabilities ranged from 0.16 to 0.26. The late containment failure conditional probabilities fell into ranges of 0.34 to 0.56 and 0.17 to 0.36 for the slow and fast SBOs respectively.

**4.0**

Containment failure probabilities are developed for each plant damage state (PDS) in the PRA. For those PDSs included in the slow station blackout frequency, the conditional containment failure probabilities for early failure fell into a range from 0.16 to 0.21. For the fast SBO PDSs, the probabilities ranged from 0.16 to 0.34. The late containment failure conditional probabilities fell into ranges of 0.72 to 0.84 and 0.68 to 0.84 for the slow and fast SBOs respectively.

**5.0**

Early containment failure public health risk results for the McGuire SBO sequences are estimated as follows. These results are based on the population within 50 miles of the site from census data for the year 2000.

Initiator Class	CDF	Latent Fatalities/Yr	Early Fatalities/Yr	Early Injuries/Yr	Thyroid Cancers/Yr	Whole Body Person Rem/Yr
Internal	1.1E-06	9.21E-05	1.11E-11	9.42E-10	2.86E-06	2.09E-01
External	9.0E-06	9.78E-04	1.19E-10	1.00E-08	3.04E-05	2.22E+00

**6.0**

Early containment failure public health risk results for the Catawba SBO sequences are estimated as follows. These results are based on the population within 50 miles of the site from census data for the year 2000.

Initiator Class	CDF	Latent Fatalities/Yr	Early Fatalities/Yr	Early Injuries/Yr	Thyroid Cancers/Yr	Whole Body Person Rem/Yr
Internal	1.4E-05	1.25E-08	6.62E-08	1.22E-03	4.48E-05	2.72E+00
External	1.1E-05	9.74E-09	5.17E-08	9.54E-04	3.51E-05	2.13E+00

## 7.0

	Early failure without ex-vessel release	Early failure with ex-vessel release
<b>Time of Release</b>	6.0 hours	5.5 hours
<b>Duration of Release</b>	0.5 hours	0.5 hours
<b>Warning Time</b>	5.5 hours	5.0 hours
<b>Energy of Release</b>	2.0E+07 cal/sec	2.0E+07 cal/sec
<b>Elevation of Release</b>	10.0 meters	10.0 meters
<b>Release Fractions</b>		
<b>Xe</b>	1.0E+00	1.0E+00
<b>I</b>	4.4E-02	1.4E-02
<b>Cs-Rb</b>	3.5E-02	1.3E-02
<b>Te-Sb</b>	2.1E-02	1.2E-02
<b>Ba</b>	1.4E-03	8.7E-04
<b>Ru</b>	4.3E-03	1.8E-03
<b>La</b>	2.0E-05	3.8E-05
<b>Sr</b>	1.4E-04	2.2E-04

## 8.0

	Early Failure without ex-vessel release	Early Failure with ex-vessel release
<b>Time of Release</b>	6.0 hours	6.0 hours
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<b>Release Fractions</b>		
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<b>I</b>	5.5E-02	3.8E-02
<b>Cs-Rb</b>	4.8E-02	4.2E-02
<b>Te-Sb</b>	3.0E-02	3.0E-02
<b>Ba</b>	1.7E-03	3.6E-03
<b>Ru</b>	2.2E-03	3.0E-03
<b>La</b>	1.2E-04	1.2E-04
<b>Sr</b>	2.5E-04	7.6E-04

## ATTACHMENT 2

The following information is being provided in response to a request communicated in a September 9, 2002 conference call in which GSI-189 was discussed. The information provided consists of the following:

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6. The SBO early containment failure risk results for Catawba using the 2000 census data.
7. The early containment failure release category definitions for McGuire.
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### 1.0

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With RCP Seal Replacement

Non-Seismic SBO Frequency (Includes tornado)		Tornado SBO Frequency	Seismic SBO Frequency
point estimate	1.10E-05	1.15E-06	N/A
mean	1.28E-05		
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50 <sup>th</sup> percentile	3.79E-06		
95 <sup>th</sup> percentile	4.52E-05		

With RCP Seal Replacement and Flood Wall

Non-Seismic SBO Frequency (Includes tomado)		Tornado SBO Frequency	Seismic SBO Frequency
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External	9.0E-06	9.78E-04	1.19E-10	1.00E-08	3.04E-05	2.22E+00

**6.0**

Early containment failure public health risk results for the Catawba SBO sequences are estimated as follows. These results are based on the population within 50 miles of the site from census data for the year 2000.

Initiator Class	CDF	Early Fatalities/Yr	Early Injuries /Yr	Latent Fatalities/Yr	Thyroid Cancers/Yr	Whole Body Person Rem/Y
Internal	1.4E-05	1.25E-08	6.62E-08	1.22E-03	4.48E-05	2.72E+00
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Cs-Rb	3.5E-02	1.3E-02
Te-Sb	2.1E-02	1.2E-02
Ba	1.4E-03	8.7E-04
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La	2.0E-05	3.8E-05
Sr	1.4E-04	2.2E-04

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Cs-Rb	4.8E-02	4.2E-02
Te-Sb	3.0E-02	3.0E-02
Ba	1.7E-03	3.6E-03
Ru	2.2E-03	3.0E-03
La	1.2E-04	1.2E-04
Sr	2.5E-04	7.6E-04



## ATTACHMENT 3

### TELECOMMUNICATION PARTICIPANTS

#### Conference call of September 9, 2002

##### Staff Participants

Alan Rubin, RES

Allen Notafrancesco, RES

Robert Martin, NRR

Asimios Malliakos, RES

##### BNL Participant

John Lehner

##### Duke Energy Corporation Participants

Duncan Brewer

Bob Gill

Michael Barrett

#### Conference call of September 24, 2002

##### Staff Participant

Asimios Malliakos

##### BNL Participant

John Lehner

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