The Detroit Edison Company
One Energy Plaza, Detroit, MI 48226-1279

10 CFR 51.45
10 CFR 52.77

February 15, 2010
NRC3-10-0005

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

References:
1) Fermi 3
   Docket No.: 52-033
2) Letter from Bruce Olson (USNRC) to Peter W. Smith (Detroit Edison), "Requests for Additional Information Letter No. 2 Related to the Environmental Review for the Combined License Application for Fermi Nuclear Power Plant, Unit 3," dated November 6, 2009
3) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Requests for Additional Information Related to the Environmental Review," NRC3-09-0012 dated July 31, 2009
4) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Requests for Additional Information Related to the Environmental Review," NRC3-09-0014 dated September 30, 2009
5) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Requests for Additional Information Related to the Environmental Review," NRC3-09-0015 dated October 30, 2009
6) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Requests for Additional Information Related to the Environmental Review," NRC3-09-0016 dated November 23, 2009
7) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Requests for Additional Information Letter No. 2 Related to the Environmental Review," NRC3-10-0004 dated January 29, 2010

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Subject: Detroit Edison Company Response to NRC Requests for Additional Information Letter No. 2 Related to the Environmental Review

In Reference 2, the NRC requested additional information to support the review of Part 3 (Environmental Report) of the Fermi 3 Combined License Application (COLA). On January 29, 2009, Detroit Edison provided responses to two of the twelve Requests for Additional Information (RAIs) (Reference 7). The subject letter contains responses to six of the ten RAIs. The remaining four RAI responses (HH3.5-1, HH4.5-5, HH5.4.3-4, and HH5.4.3-5) are being submitted under separate cover (NRC3-10-0010), in combination with a related FSAR response (FSAR RAI 11.04-2).

In addition, this letter is providing revised responses to six RAIs previously submitted in References 3 through 6. These revised RAI responses are also identified in Appendix A and are distinguished by a footnote. Detroit Edison is revising these RAI responses as a result of telephone discussions with NRC staff.

If you have any questions, or need additional information, please contact me at (313) 235-3341.

I state under penalty of perjury that the foregoing is true and correct. Executed on the 15th day of February, 2010.

Sincerely,

Peter W. Smith, Director
Nuclear Development – Licensing and Engineering
Detroit Edison Company

Appendices: Appendix A – List of RAI Responses in this Letter

Attachments: As listed in Appendix A

cc: Chandu Patel, NRC Fermi 3 Project Manager (w/o attachments)
Jerry Hale, NRC Fermi 3 Project Manager (w/o attachments)
Ilka T. Berrios, NRC Fermi 3 Project Manager (w/o attachments)
Bruce Olson, NRC Fermi 3 Environmental Project Manager (w/o attachments)
Fermi 2 Resident Inspector (w/o attachments)
NRC Region III Regional Administrator (w/o attachments)
NRC Region II Regional Administrator (w/o attachments)
Supervisor, Electric Operators, Michigan Public Service Commission (w/o attachments)
Michigan Department of Environmental Quality
Radiological Protection and Medical Waste Section (w/o attachments)

Appendix A
NRC3-10-0005

List of RAI Responses in this Letter

RAI Question	Subject	Attachment Number
AC7.1-1	Accidents[1]	1
AE2.4.2-5	Aquatic Ecology	2
CR4.1.3-4	Cultural Resources[1]	3
CR4.1.3-10	Cultural Resources	4
HH5.4.4-1	Human Health[1]	5
TE4.3.1-5	Terrestrial Ecology[1]	6
TE2.4.1-12	Terrestrial Ecology	7
TE2.4.1-13	Terrestrial Ecology	7
TE4.3.1-8	Terrestrial Ecology	7
TE4.3.1-9	Terrestrial Ecology	7
TL4.1.2-1	Transmission Lines[1]	8
TL4.1.2-2	Transmission Lines[1]	9

1. Supplemental RAI response

Attachment 1
NRC3-10-0005

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question AC7.1-1

NRC RAI AC7.1-1

Provide a reevaluation of the Design Basis Accidents (DBA) doses using the ESBWR Design Control Document (DCD) Revision 5 source terms and site-specific X/Q values for the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ).

Supporting Information

During the site audit, Detroit Edison presented new DBA doses using DCD Revision 5. The NRC staff will use the X/Q values and calculate the EAB and LPZ doses for the DBAs, and compare the results of its calculations with the results of Detroit Edison's calculations.

Response

In the original response to RAI AC7.1-1, submitted in Detroit Edison letter NRC3-09-0014 (ML093350028), dated September 30, 2009, the DBA dose estimates were based on ESBWR DCD Revision 5. Based on discussions with the NRC on October 20, 2009, it was determined that these results need to be updated to incorporate ESBWR DCD Revision 6 information. These updated analyses are reflected in the attached mark-ups.

Revision 6 to the ESBWR DCD revised several of the dose consequence results tables in Chapter 15. Accordingly, the dose analysis for Section 7.1 of the Environmental Report (ER) has been updated as shown on the attached markups. The updated analysis continues to support the conclusion of ER Section 7.1.4 that potential environmental impacts of DBAs are SMALL.

As described in the response to RAI 02.03.04-3, submitted in Detroit Edison letter NRC3-10-0003, dated February 8, 2010, concerning dispersion estimates, Detroit Edison expects to supplement this response and provide updates to affected information in the Fermi 3 COLA either in conjunction with the next COLA revision or as a supplemental response to this RAI. The next Fermi 3 COLA revision is scheduled to be submitted by March 25, 2010. If a supplemental response to this RAI is necessary, it will also be submitted by that date. The preliminary analysis presented in RAI 02.03.04-3 continues to support the conclusion of ER Section 7.1.4 that potential environmental impacts of DBAs are SMALL.

Proposed COLA Revision

Attached is a mark-up for ER Section 7.1 to reflect the updated results. For consistency, the mark-up also includes changes proposed as part of the response to RAI AQ2.7-5 in Detroit Edison letter NRC3-09-0013 (ML092400745), dated August 25, 2009.

Markup of Detroit Edison COLA
(following 16 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Chapter 7 Environmental Impacts of Postulated Accidents Involving Radioactive Materials

This chapter assesses the environmental impacts of postulated accidents involving radioactive materials at Fermi 3. The chapter is divided into the following four sections that address design basis accidents, severe accidents, severe accident mitigation design alternatives, and transportation accidents:

- Design Basis Accidents (Section 7.1)
- Severe Accidents (Section 7.2)
- Severe Accident Mitigation Alternatives (Section 7.3)
- Transportation Accidents (Section 7.4)

7.1 Design Basis Accidents

The purpose of this section is to assess the environmental risks of accidents involving radioactive material. The scope of this section is limited to a comparison of the offsite dose consequences and resulting health effects for design basis accidents (DBAs) as calculated by Detroit Edison and those contained in DCD Chapter 15 (Reference 7.1-1).

7.1.1 Selection of Accidents

The radiological consequences of accidents are assessed to demonstrate that a new unit could be constructed and operated at the Fermi site without undue risk to the health and safety of the public. The assessment uses site-specific accident meteorology with radiological analyses in DCD Chapter 15 (Reference 7.1-1). The DBAs include a spectrum of events, including those of relatively greater probability of occurrence as well as those that are less probable but have greater severity.

The set of accidents selected focuses on the ESBWR design. From Reference 7.1-1, the following DBAs are evaluated for the ESBWR:

- Feedwater Line Break Accident
- Failure of Small Line Carrying Primary Coolant Outside Containment
- Main Steamline Break Accident (MSLBA)
- Loss-of-Coolant Accident (LOCA)
- Fuel Handling Accident
- RWCU/SDC Line Break Accident
- Control Rod Drop Accident
- Spent Fuel Cask Drop Accident

As discussed in DCD Sections 15.4.6 and 15.4.10, radiological consequence analyses are not required for the control rod drop accident and the spent fuel cask drop accident.

7.1.2 Evaluation Methodology

Doses for the representative DBAs are evaluated at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ). These doses must meet the site acceptance criteria in 10 CFR 50.34 and 10 CFR 100. Although the analysis of engineered safety features demonstrate that these systems prevent core damage and mitigate releases of radioactivity, the LOCA dose analysis presumes substantial core melt with the release of significant amounts of fission products. The postulated DBA LOCA is expected to more closely approach 10 CFR 50.34 limits than the other DBAs of greater probability of occurrence but lesser magnitude of activity releases. For the accidents evaluated herein, the calculated doses are compared to the acceptance criteria in Regulatory Guide 1.183 and NUREG-0800, to demonstrate that the consequences of the postulated accidents are acceptable.

The evaluations discussed herein use short-term accident atmospheric dispersion factors (X/Q). The X/Qs are calculated using the computer code PAVAN, Version 2.0, following the methodology in Regulatory Guide 1.145 and using site-specific meteorological data. Consistent with NUREG-1555, Section 7.1.III.(2), X/Qs used for this assessment should either be the "50^{th} percentile X/Q value that was based on onsite meteorological data, or 10 percent of the levels given in Regulatory Guide 1.3 or Regulatory Guide 1.4, to represent more realistic dispersion conditions than assumed in the safety evaluation." ~~The analysis provides X/Q values at the EAB and the LPZ for each combination of wind speed, and it calculates atmospheric stability for each of 16 downwind direction sectors. For a given location, the EAB and the LPZ, the 0 – 2 hour X/Q value is the 50th percentile overall value calculated by PAVAN. For the LPZ, the X/Q values for all subsequent times are calculated by logarithmic interpolation between the 50th percentile X/Q value and the annual average X/Q value.~~ Determination of the 50th percentile X/Q values is discussed in Section 2.7.6.1. For the Fermi site, the 50^{th} percentile X/Qs are provided in Table 7.1-1.

The accident doses are expressed as total effective dose equivalent (TEDE), consistent with 10 CFR 50.34. The TEDE consists of the sum of the committed effective dose equivalent (CEDE) from inhalation and either the deep dose equivalent (DDE) or the effective dose equivalent (EDE) from external exposure. The CEDE is determined using the dose conversion factors in Federal Guidance Report 11 (Reference 7.1-2), while the DDE and the EDE are based on dose conversion factors in Federal Guidance Report 12 (Reference 7.1-3).

7.1.3 Source Terms

Doses are calculated based on the time-dependent activities released to the environment during each DBA. The activities are based on the analyses used to support the DCD safety analyses reports. The DCD source term, methodologies, and assumptions are based on the alternative source term methods outlined in Regulatory Guide 1.183. The activity releases and doses are based on a power level of 4590 MWt, which represents a core thermal power of 4500 MWt multiplied by an uncertainty factor of 1.02. DBA source terms have been updated and are presented as isotopic activity releases to the environment in the unit of megabecquerel (MBq) in DCD Section 15.4, DCD Tables 15.4-3a, 15.4-7, 15.4-12, 15.4-15, ~~15.4-18,~~ 15.4-18a, 15.4-18b, and 15.4-22.

7.1.4 Radiological Consequences

The Fermi 3 specific doses are calculated based on the doses in Reference 7.1-1. For each DBA, the Fermi 3 specific dose is calculated by multiplying the DCD dose (provided in DCD Section 15.4) by the ratio of the Fermi 3 site-specific X/Q value to the associated DCD X/Q value from DCD Section 15.4. The Fermi 3 site-specific X/Q values are the time-dependent X/Q values in Table 7.1-1. Reference 7.1-1 does not provide time-dependent LPZ doses; thus, the Fermi 3 LPZ dose is determined by multiplying the total dose from Reference 7.1-1 by the maximum X/Q ratio. The resulting X/Q ratios are shown in Table 7.1-2.

Because the Fermi 3 site-specific X/Q values are bounded by the DCD X/Q values, the Fermi 3 site-specific doses are within those calculated in DCD Section 15.4, and, in turn, within regulatory limits. The DBA doses summarized in Table 7.1-3 are based on individual accident doses presented in Table 7.1-4 through Table 7.1-~~11.~~ -13 For each DBA, the EAB dose shown is for the two-hour period that yields the maximum dose, in accordance with Regulatory Guide 1.183.

The Fermi 3 specific doses summarized in Table 7.1-3 are within the acceptance criteria of Regulatory Guide 1.183 and NUREG-0800. Thus, the potential environmental impacts of DBAs are SMALL. Refer to Section 5.4 for the impacts to the public from anticipated releases during normal operation.

7.1.5 References

7.1-1 GE-Hitachi Nuclear Energy, "ESBWR Design Control Document – Tier 2," Revision ~~4, September 2007.~~ 6, August 2009.

7.1-2 U.S. Environmental Protection Agency, Federal Guidance Report 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion," EPA-520/1-88-020, 1988.

7.1-3 U.S. Environmental Protection Agency, Federal Guidance Report 12, "External Exposure to Radionuclides in Air, Water and Soil," EPA-402-R-93-081, 1993.

Insert New Tables 7.1-1 through 7.1-13

Table 7.1-1 Maximum 50th percentile X/Q Values

Location		X/Q (sec/m³)
EAB		5.515E-05
LPZ	0-8 hr	4.078E-06
LPZ	8-24 hr	3.430E-06
LPZ	24-96 hr	2.357E-06
LPZ	96-720 hr	1.375E-06

Table 7.1-2 Determination of X/Q Ratios

Accident	Location		ESBWR DCD X/Q(1)	Fermi 3 50th % X/Q	Ratio (Fermi 3/DCD)
Feedwater Line Break	EAB		1.00E-03	5.515E-05	5.52E-02
	LPZ		1.00E-03	4.078E-06	4.08E-03
Failure of Small Line Carrying Primary Coolant Outside Containment	EAB		2.00E-03	5.515E-05	2.76E-02
	LPZ	0-8 hr	1.90E-04	4.078E-06	2.15E-02
	LPZ	8-24 hr	1.40E-04	3.430E-06	2.45E-02
	LPZ	24-96 hr	7.50E-05	2.357E-06	3.14E-02
	LPZ	96-720 hr	3.00E-05	1.375E-06	4.58E-02
MSLB (Pre-Incident Iodine Spike & Equilibrium Iodine)	EAB		2.00E-03	5.515E-05	2.76E-02
	LPZ		2.00E-03	4.078E-06	2.04E-03
LOCA	EAB		2.00E-03	5.515E-05	2.76E-02
	LPZ	0-8 hr	1.90E-04	4.078E-06	2.15E-02
	LPZ	8-24 hr	1.40E-04	3.430E-06	2.45E-02
	LPZ	24-96 hr	7.50E-05	2.357E-06	3.14E-02
	LPZ	96-720 hr	3.00E-05	1.375E-06	4.58E-02
Fuel Handling	EAB		2.00E-03	5.515E-05	2.76E-02
	LPZ		1.90E-04	4.078E-06	2.15E-02
RWCU/SDC (Coincident Iodine Spike & Pre-Incident Iodine Spike)	EAB		2.00E-03	5.515E-05	2.76E-02
	LPZ		1.90E-04	4.078E-06	2.15E-02

1. DCD X/Q values are taken from Reference 7.1-1, Section 15.4.

Table 7.1-3 Summary of Design Bases Accident Doses

Accident	Location	TEDE (rem)	Limit (rem)[1]
Feedwater Line Break	EAB	9.38E-06	2.5
	LPZ	6.93E-07	2.5
Failure of Small Line Carrying Primary Coolant Outside Containment	EAB	4.14E-03	2.5
	LPZ	5.95E-03	2.5
MSLB - Pre-Incident Iodine Spike	EAB	3.47E-01	25
	LPZ	2.57E-02	25
MSLB - Equilibrium Iodine	EAB	1.93E-02	2.5
	LPZ	1.43E-03	2.5
LOCA	EAB	3.58E-01	25
	LPZ	6.01E-01	25
Fuel Handling Accident	EAB	1.14E-01	6.3
	LPZ	8.37E-03	6.3
RWCU/SDC - Coincident Iodine Spike	EAB	1.35E-02	2.5
	LPZ	1.01E-03	2.5
RWCU/SDC - Pre-Incident Iodine Spike	EAB	2.70E-01	25
	LPZ	2.00E-02	25
Control Rod Drop	Evaluation of radiological consequences not required		
Spent Fuel Cask Drop	Evaluation of radiological consequences not required		

1. Radiological limits are taken from Regulatory Guide 1.183 and NUREG-0800.

Table 7.1-4 Feedwater Line Break (DCD Doses are from DCD Table 15.4-16)

	DCD TEDE (rem)	X/Q Ratio	Fermi 3 TEDE (rem)
EAB	1.70E-04	5.52E-02	9.38E-06
LPZ	1.70E-04	4.08E-03	6.93E-07
Limit	2.5		2.5

Table 7.1-5 Failure of Small Line Carrying Primary Coolant Outside Containment (DCD Doses are from DCD Table 15.4-19)

	DCD TEDE (rem)			Fermi 3 TEDE (rem)	
	EAB	LPZ	X/Q Ratio	EAB	LPZ
EAB	0.15		2.76E-02	4.14E-03	
LPZ 0-8 hr		0.04	2.15E-02		8.59E-04
LPZ 8-24 hr		0.05	2.45E-02		1.23E-03
LPZ 24-96 hr		0.05	3.14E-02		1.57E-03
LPZ 96-720 hr		0.05	4.58E-02		2.29E-03
Total	0.15	0.19		4.14E-03	5.95E-03
Limit	2.5	2.5		2.5	2.5

Table 7.1-6 Main Steamline Break Pre-Incident Iodine Spike (DCD Doses are from DCD Table 15.4-13)

	DCD TEDE (rem)	X/Q Ratio	Fermi 3 TEDE (rem)
EAB	12.6	2.76E-02	3.47E-01
LPZ	12.6	2.04E-03	2.57E-02
Limit	25		25

Table 7.1-7 Main Steamline Break Equilibrium Iodine (DCD Doses are from DCD Table 15.4-13)

	DCD TEDE (rem)	X/Q Ratio	Fermi 3 TEDE (rem)
EAB	0.7	2.76E-02	1.93E-02
LPZ	0.7	2.04E-03	1.43E-03
Limit	2.5		2.5

Table 7.1-8 Loss-of-Coolant Accident (DCD Doses are from DCD Table 15.4-9)

	DCD TEDE (rem)			Fermi 3 TEDE rem	
	EAB	LPZ	X/Q Ratio	EAB	LPZ
EAB	13.0		2.76E-02	3.58E-01	
LPZ 0-8 hr		3.2	2.15E-02		6.87E-02
LPZ 8-24 hr		2.7	2.45E-02		6.62E-02
LPZ 24-96 hr		5.2	3.14E-02		1.63E-01
LPZ 96-720 hr		6.6	4.58E-02		3.03E-01
Total	13.0	17.7		3.58E-01	6.01E-01
Limit	25	25		25	25

Table 7.1-9 Fuel Handling Accident (Reactor Building or Fuel Building) (DCD Doses are from DCD Table 15.4-4)

	DCD TEDE (rem)	X/Q Ratio	Fermi 3 TEDE (rem)
EAB	4.13	2.76E-02	1.14E-01
LPZ	0.39	2.15E-02	8.37E-03
Limit	6.3		6.3

Table 7.1-10 RWCU/SDC Line Break Coincident Iodine Spike (DCD Doses are from DCD Table 15.4-23)

	DCD TEDE (rem)	X/Q Ratio	Fermi 3 TEDE (rem)
EAB	0.49	2.76E-02	1.35E-02
LPZ	0.047	2.15E-02	1.01E-03
Limit	2.5		2.5

Table 7.1-11 RWCU/SDC Line Break Pre-Incident Iodine Spike (DCD Doses are from DCD Table 15.4-23)

	DCD TEDE (rem)	X/Q Ratio	Fermi 3 TEDE (rem)
EAB	9.8	2.76E-02	2.70E-01
LPZ	0.9	2.15E-02	2.00E-02
Limit	25		25

New Tables 7.1-1 through 7.1-13

Table 7.1-1 Maximum 50th percentile X/Q Values

Location		X/Q (sec/m^3)
EAB		5.779E-05
LPZ	0-8 hr	3.046E-06
LPZ	8-24 hr	2.654E-06
LPZ	24-96 hr	1.969E-06
LPZ	96-720 hr	1.282E-06

Table 7.1-2 Determination of X/Q Ratios

Accident	Location		ESBWR DCD X/Q(1)	Fermi 3 50^{th} % X/Q	Ratio (Fermi 3/DCD)
Feedwater Line Break (Pre-Incident Iodine Spike & Equilibrium Iodine Spike)	EAB		2.00E-03	5.779E-05	2.89E-02
	LPZ		1.90E-04	3.046E-06	1.60E-02
Failure of Small Line Carrying Primary Coolant Outside Containment (Pre-Incident Iodine Spike & Equilibrium Iodine Spike)	EAB		2.00E-03	5.779E-05	2.89E-02
	LPZ	0-8 hr	1.90E-04	3.046E-06	1.60E-02
	LPZ	8-24 hr	1.40E-04	2.654E-06	1.90E-02
	LPZ	24-96 hr	7.50E-05	1.969E-06	2.63E-02
	LPZ	96-720 hr	3.00E-05	1.282E-06	4.27E-02
MSLB (Pre-Incident Iodine Spike & Equilibrium Iodine Spike)	EAB		2.00E-03	5.779E-05	2.89E-02
	LPZ		1.90E-04	3.046E-06	1.60E-02
LOCA	EAB		2.00E-03	5.779E-05	2.89E-02
	LPZ	0-8 hr	1.90E-04	3.046E-06	1.60E-02
	LPZ	8-24 hr	1.40E-04	2.654E-06	1.90E-02
	LPZ	24-96 hr	7.50E-05	1.969E-06	2.63E-02
	LPZ	96-720 hr	3.00E-05	1.282E-06	4.27E-02
Fuel Handling	EAB		2.00E-03	5.779E-05	2.89E-02
	LPZ		1.90E-04	3.046E-06	1.60E-02
RWCU/SDC (Pre-Incident Iodine Spike & Equilibrium Iodine Spike)	EAB		2.00E-03	5.779E-05	2.89E-02
	LPZ		1.90E-04	3.046E-06	1.60E-02

1. DCD X/Q values are taken from Reference 7.1-1, Section 15.4.

Table 7.1-3 Summary of Design Bases Accident Doses

Accident	Location	TEDE (rem)	Limit (rem)[1]
FWLB – Pre-Incident Iodine Spike	EAB	5.23E-01	25
	LPZ	2.73E-02	25
FWLB – Equilibrium Iodine Spike	EAB	3.18E-02	2.5
	LPZ	1.60E-03	2.5
SBOC – Pre-Incident Iodine Spike	EAB	9.82E-03	25
	LPZ	4.27E-03	25
SBOC – Equilibrium Iodine Spike	EAB	2.89E-03	2.5
	LPZ	4.27E-03	2.5
MSLB – Pre-Incident Iodine Spike	EAB	7.51E-02	25
	LPZ	3.21E-03	25
MSLB – Equilibrium Iodine Spike	EAB	5.78E-03	2.5
	LPZ	1.60E-03	2.5
LOCA	EAB	6.47E-01	25
	LPZ	8.85E-01	25
FHA	EAB	1.18E-01	6.3
	LPZ	6.41E-03	6.3
RWCU/SDC Line Break – Pre-Incident Iodine Spike	EAB	1.99E-01	25
	LPZ	1.12E-02	25
RWCU/SDC Line Break – Equilibrium Iodine spike	EAB	1.16E-02	2.5
	LPZ	1.60E-03	2.5
Control Rod Drop		Evaluation of radiological consequences not required	
Spent Fuel Cask Drop		Evaluation of radiological consequences not required	

1. Radiological Limits are taken from Regulatory Guide 1.183 and NUREG-0800

Table 7.1-4 Feedwater Line Break Pre-Incident Iodine Spike (DCD Doses are from Reference 2 Table 15.4-16)

	DCD TEDE (rem)	x/Q Ratio	Fermi 3 TEDE (rem)
EAB	18.1	2.89E-02	5.23E-01
LPZ	1.7	1.60E-02	2.73E-02
Limit			25

Table 7.1-5 Feedwater Line Break Equilibrium Iodine Spike (DCD Doses are from Reference 2 Table 15.4-16)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	1.10	2.89E-02	3.18E-02
LPZ	0.10	1.60E-02	1.60E-03
Limit			2.5

Table 7.1-6 Small Line Carrying Primary Coolant Outside Containment Pre-Incident Iodine Spike (DCD Doses are from Reference 2 Table 15.4-19)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	0.34	2.89E-02	9.82E-03
LPZ	0.10	4.27E-02	4.27E-03
Limit			25

Reference 7.1-1 does not provide time-dependent LPZ doses for this incident; thus, the site LPZ dose is determined by multiplying the total DCD dose by the maximum x/Q Ratio For the LPZ.

Table 7.1-7 Small Line Carrying Primary Coolant Outside Containment Equilibrium Iodine Spike (DCD Doses are from Reference 2 Table 15.4-19)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	0.10	2.89E-02	2.89E-03
LPZ	0.10	4.27E-02	4.27E-03
Limit			2.5

Reference 7.1-1 does not provide time-dependent LPZ doses for this incident; thus, the site LPZ dose is determined by multiplying the total DCD dose by the maximum x/Q Ratio for the LPZ.

Table 7.1-8 Main Steam Line Break Pre-Incident Iodine Spike (DCD Doses are from Reference 2 Table 15.4-13)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	2.6	2.89E-02	7.51E-02
LPZ	0.2	1.60E-02	3.21E-03
Limit			25

Table 7.1-9 Main Steam Line Break Equilibrium Iodine Spike (DCD Doses are from Reference 2 Table 15.4-13)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	0.2	2.89E-02	5.78E-03
LPZ	0.1	1.60E-02	1.60E-03
Limit			2.5

Table 7.1-10 Loss of Coolant Accident (DCD Doses are from Reference 2 Table 15.4-9)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	22.4	2.89E-02	6.47E-01
LPZ	20.7	4.27E-02	8.85E-01
Limit			25

Reference 2 does not provide time-dependent LPZ doses for this incident; thus, the site LPZ dose is determined by multiplying the total DCD dose by the maximum x/Q Ratio for the LPZ.

Table 7.1-11 Fuel Handling Accident (Reactor Building or Fuel Building) (DCD Doses are from Reference 2 Table 15.4-4)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	4.10	2.89E-02	1.18E-01
LPZ	0.40	1.60E-02	6.41E-03
Limit			6.3

Table 7.1-12 RWCU/SDC Line Break Pre-Incident Iodine Spike (DCD Doses are from Reference 2 Table 15.4-23)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	6.9	2.89E-02	1.99E-01
LPZ	0.7	1.60E-02	1.12E-02
Limit			25

Table 7.1-13 RWCU/SDC Line Break Equilibrium Iodine Spike (DCD Doses are from Reference 2 Table 15.4-23)

	DCD TEDE (rem)	x/Q Ratio	Unit 3 TEDE (rem)
EAB	0.40	2.89E-02	1.16E-02
LPZ	0.10	1.60E-02	1.60E-03
Limit			2.5

Attachment 2
NRC3-10-0005

Response to RAI letter related to Fermi 3 ER

RAI Question AE2.4.2-5

NRC RAI AE2.4.2-5

Provide an analysis of the potential contribution of chemical and thermal effluents from the proposed Fermi 3 to algal production in Lake Erie, in the vicinity of the Fermi site and in the lake's western basin. The response should address Lyngbya wollei, which has recently been identified as a problematic invasive blue-green algae in Lake Erie, in addition to other algal species.

Supporting Information

The analysis provided in the Environmental Report (ER) addresses the potential for discharges from the proposed Fermi 3 facility to increase production of algae in Lake Erie, in the vicinity of the Fermi site and in the lake's western basin, including but not limited to Lyngbya wollei. The following information will be used to complete the staff's NEPA analysis of the environmental effects of operating the facility.

Table 3.3-1 in the ER (Section 3.3.2.3) identifies the use of phosphoric acid as a corrosion inhibitor in the plant service water system and discharge of this chemical into Lake Erie could contribute to phosphorus loading in the lake. Expected quantities of chemical constituents that could be released to Lake Erie at the permitted discharge are described in ER Section 3.6.1 (including Table 3.6-1) and effluent concentrations are identified in Table 3.6-2; however, estimates of the increases in ambient concentrations of nutrients (primarily phosphorus and nitrogen) in the vicinity of the permitted discharge for Fermi 3 should be calculated.

Information about historic trends regarding concentrations of nutrients in Lake Erie, in the vicinity of the Fermi site and in the lake's western basin, and the estimated changes in nutrient concentrations that would occur in those areas as a result of contributions from Fermi 3 operation would facilitate evaluation of potential changes in algal production. In addition, any available information pertaining to algal production in the vicinity of the existing Fermi 2 discharge should be provided for reference.

A sufficient analysis would combine information for both chemical and thermal changes that would be expected as a result of Fermi 3 operations to estimate the change in algal production.

Response

Lyngbya wollei is a freshwater benthic cyanobacterium, bottom mat forming species of algae that typically occurs in the southern U.S., but can respond to warm water in northern environments. To ensure that permitted chemical concentrations in cooling water discharges from Fermi 3 will not contribute to conditions in Lake Erie that might promote algal-bloom growth, including *Lyngbya wollei*, Detroit Edison is eliminating the use of phosphorus-containing corrosion and scale inhibitors, replacing them with two non-phosphorus-containing water treatment chemicals.

In addition, thermal plumes modeled in the Fermi 3 Environmental Report (ER) were small and are not expected to contribute to blooms of *Lyngbya wollei* or other species of algae.

The volume of water discharged daily by Fermi 3 will be less than Fermi 2's discharged water volume and the water temperature at the point of discharge is expected to be similar to Fermi 2. Permit-required daily visual observations have been conducted and documented since Fermi 2 began commercial operation. There have been no documented algal blooms at the Fermi 2 outfall. Fermi 2 does not appear to contribute to algal bloom production in Lake Erie and given Fermi 3's similar chemical and thermal characteristics and lower discharge volumes, it's believed that Fermi 3 will not contribute to algal bloom production.

Algal Growth at the Fermi 2 Outfall

As stated in ER Section 5.3.4.1, the Fermi 2 discharge is located along the shoreline of Lake Erie, north of Fermi 2, due east of the Fermi 2 cooling towers. The discharge creates a thermal plume and introduces low concentrations of chemicals that are maintained below National Pollution Discharge Elimination System (NPDES) permit limits at the outfall. The Michigan Department of Natural Resources and Environment (MDNRE) establish NPDES permit limits that cumulatively are protective of the Lake Erie Ecosystem as a whole. Fermi 2 has a permit requirement to visually inspect the discharge outfall into Lake Erie daily. The narrative standard requires reporting if, "unnatural turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits" are observed. As described in ER Section 5.3.4.1, there have been no documented algae blooms observed at the Fermi 2 outfall, including *Lyngbya wollei*.

Algal Growth at the Monroe Power Plant Outfall

The Monroe Power Plant, which is located several miles closer to the Maumee Bay than the Fermi site and generates a more robust thermal plume than Fermi 2, has no record of cyanobacterium, including *Lyngbya wollei*, at its outfall. This lack of observation is provided first by means of visual inspections performed by plant operators as part of the plant's NPDES permit. In addition, Detroit Edison biologists performed research within the plant's thermal plume from August through September since 2006. During the course of this research no observations of cyanobacterium, including *Lyngbya wollei*, have been made.

Algae Growth – Chemical Factors

In northern temperate waters such as Lake Erie, phosphorus is the most critical and most often the limiting nutrient that determines the amount of algal growth possible. Nitrogen also contributes to algal growth and its concentration will shift the mixture of species of algae in an ecosystem. The Maumee River, which empties into the western basin of Lake Erie, is the single greatest source of phosphorus-rich sediments entering the lake (*Maumee Bay and Western Lake*

Erie Water Quality Monitoring, Lake Erie Protection Fund (Project LEPF 03-19), http://www.lakeerie.ohio.gov/Portals/0/Closed%20Grants/large%20grants/lepf03-19.pdf).

The phosphorus-containing corrosion and scale inhibitors originally proposed for use in Fermi 3's cooling system have been replaced with treatment chemicals that do not contain phosphorus or nitrogen compounds. Fermi 3's cooling water discharge will not add to the nitrogen or phosphorus concentrations in Lake Erie. The corrosion and scale inhibitors were selected from a list of water treatment chemicals maintained on the MDNRE's website which have been previously approved for use at other Michigan facilities. The attached ER markup tables provide the necessary updates to changes in water treatment additives and predicted concentrations of chemical constituents at the Fermi 3 outfall.

Algae Growth – Temperature Factor

Increases in water temperature can increase the rate of algal growth due to faster metabolism and related processes. The Fermi 3 design utilizes a cooling tower and a closed-cycle cooling system to minimize, to the greatest extent possible, the water temperature and the discharged water volume at the outfall into Lake Erie. The proposed closed-cycle cooling system is considered Best Available Technology under Phase I of Section 316b of the Clean Water Act. Closed-cycle cooling continually recycles lake water through the plant's condenser and cooling tower, which minimizes the amount of water withdrawn from and discharged into Lake Erie. Fermi 3's discharged water volume, at 24.5 million gallons a day (MGD), is slightly greater than half of Fermi 2's discharged water volume, at 45 MGD where no enhanced algae growth has been observed.

The location of the Fermi 3 discharge pipe was selected to avoid mixing of the Fermi 2 and Fermi 3 thermal plumes and to eliminate any potential environmental impacts to nearby wetlands during rare seiche conditions. The Fermi 3 discharge pipe will extend approximately 1300 feet into Lake Erie and will be located southeast of the Fermi 2 shoreline outfall. Monthly thermal modeling of the discharge, as discussed in ER Section 5.3.2, conducted for the Fermi 3 outfall, provides an estimate of the potential area that will be affected by an increase in water temperature. The thermal modeling confirmed that with the Fermi 3 discharge located 1300 ft. in Lake Erie, under all conditions modeled, no mixing of the Fermi 2 and Fermi 3 thermal discharges is expected. The model indicates that the largest thermal plume results during the May scenario and is estimated to be an area of approximately 130 ft. by 226 ft. During August, when algal growth is typically near the annual maximum, a small thermal plume of approximately 12 ft. by 9 ft. is predicted.

The following are additional thermal factors that discourage algal growth:

- Water within the plume is advected outward from the plume and mixed with ambient lake water, rapidly cooling to ambient conditions.

- Due to the small area of the plume, it is unlikely that algal cells could remain in the plume at the higher temperatures for a sufficient amount of time to form bloom concentrations, it is unlikely that the thermal plume will substantially stimulate algal growth.

With no additive thermal increase in lake temperature expected, and with water discharge volumes slightly greater than half that of Fermi 2, where there is no observed impact on algal growth, it is believed that the operation of Fermi 3 in proximity to Fermi 2 will not trigger algal blooms in Lake Erie.

Conclusions

In summary, additional thermal impacts associated with Fermi 3 discharge to Lake Erie are unlikely to have a substantial influence on bottom mat forming algal species such as *Lyngbya wollei*. Thermal discharge impacts are expected to be SMALL. With the elimination of phosphorus from the Fermi 3 water treatment plan, chemical impacts on the water quality of Lake Erie and the affect on algal growth are also expected to be SMALL. No mitigative measures are needed.

Proposed COLA Revision

The following proposed revisions to the ER are attached:

- Table 3.3-1 - Chemical Additives for Water Treatment
- Table 3.6-1 - Chemicals Added to Liquid Effluent Streams
- Table 3.6-2 - Effluent Chemical Constituents

Markup of Detroit Edison COLA
(following 3 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

Table 3.3-1 Chemical Additives for Water Treatment

System/Injection Point	Chemical	Approximate Usage	
Circulating Water System/ Cooling tower basin/ Station Water System	Biocide/Algaecide – Sodium Hypochlorite (15%)	1200 gal/week	Normal Power Operating Conditions/ Shutdown Conditions
Circulating Water System/ Makeup water line discharge	~~Corrosion Inhibitor – Phosphoric Acid (30%)~~	~~625 gal/day~~	Normal Power Operating Conditions/ Shutdown Conditions
Circulating Water System / Makeup water line discharge	~~Scale Inhibitor – $C_2H_3OH(PO(OH)_2)_2$~~	~~25 gal/day~~	Normal Power Operating Conditions/ Shutdown Conditions
Circulating Water System blowdown	Dehalogenation – Sodium Bisulfite	175 gal/day	Normal Power Operating Conditions/ Shutdown Conditions

Corrosion Inhibitor - Sodium Silicate

400 gal/day

Scale Inhibitor/ Dispersant

220 gal/day

Table 3.6-1 Chemicals Added to Liquid Effluent Streams

System	Chemical	Maximum Amount	Average Amount	Frequency of Use	Concentration in Waste Streams
CIRC/ SWS	Biocide/Algaecide - Sodium Hypochlorite (15%)	620,000 lb/year	620,000 lb/year	Approximately 4.5 hour/week	Non-detectable, neutralized by sodium bisulfite TRC < 38ppb*
CIRC	Corrosion Inhibitor – ~~Phosphoric Acid (30%)~~ Sodium Silicate	~~2,500,000 lb/year~~ 1,700,000 lb/year	~~2,100,000 lb/year~~ 1,400,000 lb/year	Continuous	Non-detectable, dissociates in system
CIRC	~~Scale Inhibitor – $C_2H_3OH(PO(OH)_2)_2$~~ Scale Inhibitor/ Dispersant	~~83,000 lb/year~~ 830,000 lb/year	~~70,000 lb/year~~ 700,000 lb/year	Continuous	Non-detectable, dissociates in system
CIRC	Dehalogenation – Sodium Bisulfite	650,000 lb/year	550,000 lb/year	Continuous	Non-detectable, neutralizes sodium hypochlorite

*Fermi 2 NPDES permit

Ion/Chemical

Table 3.6-2 Effluent Chemical Constituents*

46.6
71.9
17.4
19.9
61.3
38.5

34.3
71.9
17.4
19.5
42.5
38.5

~~Ion~~	As	Max Conc. (ppm)	Avg Conc. (ppm)
Sodium	Na	~~37.8~~	~~25.8~~
Calcium	Ca	~~71.7~~	~~71.6~~
Magnesium	Mg	~~17.3~~	~~17.3~~
Silica	SiO_2	~~5.6~~	~~5.6~~
Chloride	Cl	~~61.1~~	~~42.4~~
Sulphate	SO_4	~~38.4~~	~~38.3~~
Potassium	K	3.6	3.6
~~Phosphorus~~	~~P~~	~~3.5~~	~~3.4~~
Bicarbonate Alk.	$CaCO_3$	~~167.3~~	~~167.1~~
TDS	-	~~396.8~~	~~365.7~~
TSS	-	~~15.9~~	~~15.9~~

167.8
428.5
16.0

167.7
397.4
16.0

*Based on 2 cycles of concentration

Scale Inhibitor/ Dispersant	Chemical	11.6	11.6

Attachment 3
NRC3-10-0005

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question CR4.1.3-4

NRC RAI CR4.1.3-4

Provide a document outlining standard procedures that Detroit Edison would follow in the event that unanticipated archaeological resources or human burials are identified during construction, including procedures required by applicable State and Federal laws for human burials.

Supporting Information

Information included in this documentation will be used to complete the NEPA analysis and to support compliance with the Section 106 process.

Supplemental Response

The original response to RAI CR4.1.3-4 was submitted in Detroit Edison letter NRC3-09-0016 (ML093380331), dated November 23, 2009. Based on discussions on December 9, 2009, the Nuclear Regulatory Commission (NRC) requested additional detail regarding the regulatory basis of the information. The following supplemental response provides, as requested;

- names of the appropriate authorities that would be contacted in the event of an unanticipated discovery of archaeological resources or human remains during construction activities
- a list of the applicable State and Federal laws, statutes, and other regulations related to the protection of archaeological resources and human remains that will be complied with.

In accordance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq), the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469), the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm), and the guidance set forth in "Protection of Historic Resources" (36 CFR Part 800), "National Register of Historic Places" (36 CFR Part 60), "Protection of Archaeological Resources" (36 CFR Part 7), and Unified Facilities Guide Specifications (UFGS), "Historical, Archaeological, and Cultural Resources," UFGS 01 57 20.00 10 Environmental Protection, Section 3.9, a plan implementing the following protective measures will be developed:

1. If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources will be temporarily suspended. Examples of such resources include: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock alignments, pavings, wall, or other constructed features; or any indication of agricultural or other human activities older than 50 years.

2. Upon such discovery or find, notify the EPC Executive or EPC Executive's representative (see FSAR Section 13AA.1.9) so that the Michigan State Historic Preservation Office (SHPO) and the Office of the State Archaeologist (OSA) may be notified and a determination made as to the significance of the discovery and what, if any, special disposition of the finds should be made.
3. Secure the area to prevent trespass on and disturbance to such resources.

Similarly, a plan will be developed that provides guidance if human remains, funerary objects, or objects of cultural patrimony are encountered during construction activities. The above protective measures will be implemented in addition to those enumerated below:

1. Treat any human or skeletal remains with dignity and respect at all times.
2. Following the Michigan Attorney General's Opinion 6585 "Disinterment of Human Remains; Reinterment of Human Remains (June 7, 1989), notify the EPC Executive or his representative (see FSAR Section 13AA 1.9) so that the Michigan SHPO and the OSA may be notified and a determination made as to the significance of the discovery and what, if any, special disposition of the finds should be made.
3. Pursuant to the Michigan Public Health Code (MCL 333.2801 *et seq.*; MSA 14.15(2801) *et seq.*), contact the Monroe County Health Department to obtain necessary permits if the remains are to be disinterred.
4. In accordance with 1982 Michigan Administrative Code AACS, R 325.8051 and following the Michigan Attorney General's Opinion 6585 "Disinterment of Human Remains; Reinterment of Human Remains (June 7, 1989), notify the Monroe County Sheriff if human remains are encountered.
5. Conduct a field examination of human remains as soon as the SHPO, OSA, and the Monroe County Sheriff are notified. The services of a physical anthropologist may be required to conduct a field examination of the remains.
6. After consultation with the SHPO and OSA, interested parties may be contacted to participate in consultation.

References:

1. Unified Facilities Guide Specifications (UFGS), "Historical, Archaeological, and Cultural Resources," UFGS 01 57 20.00 10 Environmental Protection, Section 3.9.

2. National Historic Preservation Act of 1996 (16 UCS 470)

3. 36 CFR Part 800, "Protection of Historic Properties"

Proposed COLA Revision

None

Attachment 4
NRC3-10-0005

Response to RAI letter related to Fermi 3 ER

RAI Question CR4.1.3-10

NRC RAI CR4.1.3-10

Provide a document or documents describing how ITCTransmission (ITC) would identify and protect cultural resources prior to transmission line right-of-way construction.

Supplemental Information

This information will be used to complete the NEPA cumulative impacts analysis and to support compliance with the Section 106 process. Cultural resource investigations are typically conducted prior to construction, to identify and avoid any National Register of Historic Places (NRHP)-eligible historic properties (e.g., archaeological sites). We need a description of the measures that would be used to (1) determine the presence of cultural resources before construction of the transmission line begins, and (2) determine whether any of these cultural resources have been listed, or determined eligible for listing in the NRHP. Although the NRC does not regulate transmission lines, the EIS will address these subjects in the cumulative impacts section.

Response

The transmission system and associated corridors are exclusively owned and operated by ITC*Transmission* (ITC). ITC will provide an independently constructed, regulatory site certified, and fully operational offsite power system to the Fermi 3 facilities when needed. Detroit Edison's relationship with ITC is as a stakeholder and only extends to the electrical needs and requirements of Fermi 3.

Publically available information from ITC's website was provided in response to RAI CR4.1.3-2 submitted in Detroit Edison letter NRC3-09-0012 (ML092290662), dated July 31, 2009. The material available addressed the cultural resource concerns during construction and maintenance periods but did not address the pre-construction period. ITC has provided a description of the process to be used in finalizing the transmission line routing pre-construction. The 1995 Electric Transmission Line Certification Act (Act 30) assigned the power to regulate the location and construction of electric transmission lines to the Michigan Public Service Commission (MPSC). A more detailed proposal will be submitted to the MPSC, including alternative route considerations, for final approval prior to construction. In developing this submittal, ITC will formally communicate with the State Historical Preservation Office (SHPO) to identify the presence of any listed cultural resources along the planned and/or alternate corridors. Based on SHPO's response, ITC would take action to avoid identified National Register of Historic Places (NRHP) historic properties (e.g., archaeological sites).

Proposed COLA Revision

None

Attachment 5
NRC3-10-005

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question HH5.4.4-1

NRC RAI HH5.4.4-1

Provide dose estimates for biota (including the bald eagle) inside the site boundary (0.25 mi from Fermi 3 emission sources).

Supporting Information

Biota doses are presented in Table 5.4-9 (Dose to Biota from Liquid and Gaseous Effluents) but the assumptions used with the LADTAP computer code to estimate dose to biota from liquid effluents are not provided. It is assumed that the biota would be at the site boundary to calculate the dose from gaseous effluent but biota could be inside the site boundary and very near the proposed Fermi Unit 3.

According to ESRP Section 5.4.4, "the biota to be considered in this evaluation should include those in the pathways identified in ESRP 5.4.1, those appearing on the endangered/threatened species lists, and others of significance." ER Section 2.4.1.2.1 page 2-330 states that two bald eagle nests were observed on the Fermi site in May 2008. Dose calculations for the bald eagle should be made because the species is protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Supplemental Response

In the original response to RAI HH5.4.4-1, submitted in Detroit Edison letter NRC3-09-0015 (ML093090165), dated October 30, 2009, the dose estimates for biota inside the site boundary were presented. Based on discussions with the NRC on November 16, 2009, it was determined that these estimates should be updated to present a more conservative analysis. The analysis presented below has also been updated to incorporate changes resulting from ESBWR DCD Revision 6. The dose estimates for biota (including the bald eagle) inside the site boundary are described below and are reflected in the attached mark-ups.

The analyses performed to estimate the dose to the biota are described in Section 5.4.4 of the Environmental Report (ER). As described in Section 5.4.4, the assessment uses "surrogate species that provide representative information about the various dose pathways potentially affecting broader classes of living organisms" [1st paragraph of Section 5.4.4]. The surrogate species are identified in ER Table 5.4-9. The Bald Eagle, a species of significance known to inhabit the site, is represented by the surrogate species of Table 5.4-9. The Heron is a representative surrogate for the Bald Eagle.

The evaluation below provides dose estimates for biota located inside the site boundary. Total dose to biota can be attributed to the following sources:

- Liquid Effluent
- Gaseous Effluents
- Direct Dose

As described in ER Section 5.4.4, the doses due to the liquid effluent are determined using the LADTAP II computer program. The gaseous pathway doses were taken as equivalent to human doses for the inhalation (child), plume (adult), and twice the ground (adult) pathways. The doubling of doses from ground deposition reflects the closer proximity of these organisms to the ground. Direct dose due to direct shine was not included as the dose at the assumed distances between Fermi 3 and the biota would result in this being an insignificant contribution. That is, Table 12.2-21 of the ESBWR DCD, Revision 6, shows that the projected N-16 skyshine annual dose is 5.93E-04 mrem/year at 800 meters.

As seen on ER Figure 2.1-4, the areas around the site are made up of woodlands, wetlands, etc. These areas can be home to various biota. For the purposes of this evaluation it will be assumed that these biota continuously reside 0.25 miles from the reactor building.

<u>Dose from Liquid Effluents</u>
As noted above, the LADTAP II computer program was used to determine the doses from the liquid effluent. The release source term and liquid effluent discharge flow rate identified in ER Table 5.4-1 were used in the analysis. To account for the possibility of the biota being closer to the discharge location than the locations used for the human dose determinations, a dilution factor of 10 (after discharging) with an assumed transit time set to zero hours is used in the analysis. The minimal dilution factor of 10 accounts for mixing between the discharge point (400 meters off-shore) and the shoreline. Consistent with ER Section 5.4.4, the potential dose impact to the fraction of total fish and algae population that might inhabit the immediate area of the discharge is not considered significant in terms of impact to the health of the species as a whole. The results from the LADTAP analysis are provided in ER Table 5.4-9 based on DCD Revision 5 values. As these results are based on the biota being at the shoreline near the discharge line, these are considered to be acceptable. ER Table 5.4-9 has been updated to reflect the current DCD Revision 6 liquid release values as shown in the attached mark-ups.

<u>Dose from Gaseous Effluents</u>
As noted above, the dose due to gaseous releases is based on that calculated for human doses. The inputs described in ER Table 5.4-3 are used in this gaseous release analysis. From the analysis, the maximum plume dose, maximum ground dose, and maximum inhalation dose, including distance and direction are shown below in Table 1 based on DCD Revision 6 release values.

Table 1. Selected Gaseous Pathway Doses to Maximum Exposed Individual (MEI)

Location	Pathway	Annual Total Body Dose (mrem/year)
Site Boundary (1131 meters SSE)	Plume	1.05E-01
Site Boundary (919 meters WNW)	Ground	2.57E-01
Site Boundary (919 meters WNW)	Inhalation	
	Adult	1.73E-03
	Teen	1.76E-03
	Child	1.54E-03
	Infant	9.28E-04

Regulatory Guide (RG) 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", discusses the relevant models used to determine dose due to plume exposure, ground deposition, and inhalation. Per RG 1.109, plume dose (Appendix B, Equation B-4) and inhalation dose (Appendix C, Equation C-3) are a function of the atmospheric dispersion factors (X/Q values), and the ground dose (Appendix C, Equation C-1) is a function of the ground deposition factors (D/Q values).

The X/Q values and D/Q values used in the GASPAR analysis to determine the plume dose, ground dose, and inhalation dose at the site boundary are provided in ER Tables 2.7-87, 2.7-88, and 2.7-89. At 0.25 miles, the corresponding X/Q and D/Q values will be higher. The higher X/Q and D/Q values would result in higher corresponding dose values. Values for X/Q and D/Q at 0.25 miles are provided in ER Tables 2.7-96 through 2.7-107. The dose from the plume, ground, and inhalation at 0.25 miles can be estimated based on the ratios of the X/Qs and the D/Qs at 0.25 miles to the corresponding values used in the analysis. In order to provide a conservative estimate, the largest X/Q and D/Q ratios are used regardless of the direction. For example, the highest X/Q ratio is in the ESE sector and the highest D/Q ratio is in the NNE sector, but for conservatism in the analysis they are assumed to be in the same sector.

As discussed in ER Section 5.4.4, the gaseous pathway doses to the biota were taken as equivalent to human doses for the inhalation (child), plume, and twice the ground pathways. The doubling of doses from ground deposition reflects the closer proximity of the biota to the ground than humans. Thus, based on the highest X/Q ratio of 20.5 and D/Q ratio of 9.45, the gaseous pathway dose can be conservatively estimated as;

Plume (P) = 0.105 mrem/year * 20.5 = 2.15 mrem/year

Ground (G) = 0.257 mrem/year * 9.45 = 2.43 mrem/year

Child Inhalation (I) = 0.00154 mrem/year * 20.5 = 0.0316 mrem/year

Total = P + 2*G + I = 7.04 mrem/year.

Direct Dose

The ESBWR DCD, Revision 6, Table 12.2-21, indicates that the N-16 Skyshine Annual Dose at 800 meters is 5.93E-04 mrem/year. Curves provided in Standard ANSI/ANS-6.6.1-1987, "Calculation and Measurement of Direct and Scattered Gamma Radiation for LWR Nuclear Power Plants," indicate that reducing the distance from 800 meters to 400 meters could increase the dose rate by approximately a factor of ten (10). A factor of ten increase at 400 meters would result in the annual skyshine dose from the ESBWR of 0.00593 mrem/year which would be insignificant and need not be included.

Total Dose to Biota

The estimated dose due to gaseous releases at 0.25 miles is added to the dose due to liquid effluents presented in ER Table 5.4-9 (see attached mark-ups) to develop a conservative total biota dose at 0.25 miles. This is shown below in Table 2.

Table 2. Total Doses to Biota from Liquid and Gaseous Effluents (mrem/yr)

Biota	Liquid Effluents	Gaseous Effluents	Total
Fish	2.31	0	2.31
Invertebrate	7.65	0	7.65
Algae	11.9	0	11.9
Muskrat	14.8	7.04	21.8
Raccoon	0.430	7.04	7.47
Heron	6.87	7.04	13.9
Duck	14.8	7.04	21.8

Similar to the discussion in ER Section 5.4.4, the total estimated dose is less than requirements stated in 40 CFR 190. As further discussed in ER Section 5.4.4, using the exposure requirements in 40 CFR 190, which apply to members of the public in unrestricted areas, is very conservative when evaluating calculated doses to biota.

As described in the response to RAI 02.03.04-3 in Detroit Edison letter NRC3-10-0003 dated February 8, 2010 concerning dispersion estimates, Detroit Edison expects to supplement this response and provide updates to affected information in the Fermi 3 COLA either in conjunction with the next COLA revision or as a supplemental response to this RAI. The next Fermi 3 COLA revision is scheduled to be submitted by March 25, 2010. If a supplemental response to this RAI is necessary, it will also be submitted by that date.

Proposed COLA Revision

A mark-up for ER Section 5.4.4 and ER Table 5.4-9 of the Environmental Report is provided to reflect the biota dose estimates based on a relative distance of 0.25 miles between the source and the receptors and using DCD Revision 6 information.

Markup of Detroit Edison COLA
(following 2 pages)

The following markup represents how Detroit Edison intends to reflect this RAI response in a future submittal of the Fermi 3 COLA. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be different than presented here.

about 300 mrem (Reference 5.4-3). Multiplying this by the population of 7,713,709 (Table 5.4-1), results in 2,300,000 person-rem/year. Thus, the dose from Fermi 3 is less than 0.001 percent of that received by the population from natural causes. Impacts to members of the public from operation of Fermi 3 would be SMALL and would not warrant mitigation.

, conservatively adjusted based on the assumption that the affected biota are located at 0.25 miles from the facility.

5.4.4 Impacts to Biota Other than Members of the Public

Subsection 2.4.1 and Subsection 2.4.2 identify the relevant species within the site area. Radiation exposure pathways to biota are expected to be the same as those to humans, i.e., inhalation, external (from ground, airborne plume, water submersion, and shoreline), drinking water and ingestion. These pathways were examined to determine if they could result in doses to biota significantly greater than those predicted for humans from operation of Fermi 3. This assessment used surrogate species that provide representative information about the various dose pathways potentially affecting broader classes of living organisms. The gaseous pathway doses for muskrats, raccoons, herons and ducks were taken as equivalent to human doses for the inhalation (child), plume (adult), and twice the ground (adult) pathways. The doubling of doses from ground deposition reflects the closer proximity of these organisms to the ground. Doses to those same species plus fish, invertebrate and algae are calculated by the LADTAP II computer program.

Doses to biota from liquid and gaseous effluents from Fermi 3 are shown in Table 5.4-9. The total dose is taken as the sum of the internal and external dose. Annual doses to all of the surrogates meet the requirements of 40 CFR 190.

Use of exposure guidelines, such as 40 CFR 190, which apply to members of the public in unrestricted areas, is considered very conservative when evaluating calculated doses to biota. The International Council on Radiation Protection states that "...if man is adequately protected then other living things are also likely to be sufficiently protected," and uses human protection to infer environmental protection from the effects of ionizing radiation (Reference 5.4-7 and Reference 5.4-8). This assumption is appropriate in cases where humans and other biota inhabit the same environment and have common routes of exposure. It is less appropriate in cases where human access is restricted or pathways exist that are much more important for biota than for humans.

Species in most ecosystems experience dramatically higher mortality rates from natural causes than man, as witnessed by their lesser life spans. From an ecological viewpoint, population stability is considered more important to the survival of the species than the survival of individual organisms. Thus, higher dose limits could be permitted. In addition, no biota has been discovered that show significant changes in morbidity or mortality due to radiation exposures predicted from nuclear power plants.

An international consensus has been developing with respect to permissible dose exposures to biota. The International Atomic Energy Agency (IAEA) (Reference 5.4-9) evaluated available evidence including the "Recommendations of the International Commission on Radiological Protection" (Reference 5.4-7). The IAEA found that appreciable effects in aquatic populations will not be expected at doses lower than 1 rad per day and that limiting the dose to the maximally exposed individual organisms to less than 1 rad per day will provide adequate protection of the

The Bald Eagle, a species of significance known to inhabit the site, is represented by the surrogate species of Table 5.4-9. The Heron is a representative surrogate for the Bald Eagle.

Table 5.4-9 Doses to Biota from Liquid and Gaseous Effluents

Biota	Dose (~~mrad~~ mrem per year) Liquid Effluents	Gaseous Effluents (1)	Total	40 CFR 190 Limit
Fish	~~2.75~~ 2.31	0	~~2.75~~ 2.31	25
Invertebrate	~~9.0~~ 7.65	0	~~9.0~~ 7.65	25
Algae	~~14.3~~ 11.9	0	~~14.3~~ 11.9	25
Muskrat	~~17.7~~ 14.8	~~0.62~~ 7.04	~~18.3~~ 21.8	25
Raccoon	~~0.5~~ 0.43	~~0.62~~ 7.04	~~1.1~~ 7.47	25
Heron	~~8.2~~ 6.87	~~0.62~~ 7.04	~~8.8~~ 13.9	25
Duck	~~17.6~~ 14.8	~~0.62~~ 7.04	~~18.2~~ 21.8	25

Notes:

1. Dose from gaseous effluents determined based on whole body inhalation dose for ~~infant at site boundary~~ child + whole body ground and plume exposure at ~~site boundary~~ 0.25 miles from the facility. Ground exposures increased by a factor of two to account for ground proximity.

Attachment 6
NRC3-10-0005

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question TE4.3.1-5

NRC RAI TE4.3.1-5

Provide a topographic map (1-foot contours) of the Fermi site that includes areas that would be developed and that could be used for onsite mitigation.

Supplemental Information

The potential for onsite wetlands impacts mitigation is in part dependent on small variations in topography. One-foot contour data would facilitate the analysis in the EIS of onsite mitigation potential and overall impacts to wetlands.

Supplemental Response

In the original response to RAI TE4.3.1-5, submitted in Detroit Edison letter NRC3-09-0014 (ML093350028), dated September 30, 2009, the requested topographic maps were made available for review by NRC staff and their contractors at several Detroit Edison locations. Based on discussions with the NRC staff on October 20, 2009, the NRC requested that the topographic maps be placed on the docket. This information has been docketed as an enclosure to Detroit Edison letter NRC3-09-0022 (ML092230556), dated July 29, 2009. The requested Fermi site topographical maps are available in ADAMS under the following accession numbers:

- ML092230702
- ML092230703
- ML092230704
- ML092230701
- ML092230705
- ML092230713
- ML092230679

Proposed COLA Revision

None

Attachment 7
NRC3-10-0005

Response to RAI letter related to Fermi 3 ER

RAI Question TE2.4.1-12
RAI Question TE2.4.1-13
RAI Question TE4.3.1-8
RAI Question TE4.3.1-9

NRC RAIs

The following RAIs involve the eastern fox snake and are interrelated. Accordingly, Detroit Edison has elected to address these RAIs with a single response.

A. TE2.4.1-12

Provide up-to-date and complete data on the locations and dates of sightings of the eastern fox snake (Pantherophis gloydi) on the proposed Fermi 3 site, including any sightings by Detroit Edison staff or others in the last 10 years.

Information about the numbers and locations of sightings of the eastern fox snake in recent years would facilitate evaluation of the nature of this snake's population on the project site. In a phone conversation with Ecology and Environment, the Michigan Department of Natural Resources (MDNR) indicated that its records of a viable population of eastern fox snakes on the Fermi property come at least in part from reports by Detroit Edison personnel.

Detroit Edison should investigate its own records as well as coordinate with MDNR to determine the extent of recent and historical sightings data and to provide a basis for determining potential impacts to the eastern fox snake.

B. TE2.4.1-13

Provide a delineation of potential eastern fox snake habitat within the proposed Fermi 3 site.

Provide information, including a map, describing the location of the revised project footprint with respect to potential eastern fox snake habitat.

While the ER provided a general description of potential eastern fox snake habitat, a more complete analysis of the Fermi 3 site with respect to its potential to provide habitat for this snake and a graphical representation of where the revised project footprint would overlap potential eastern fox snake habitat would provide a more complete basis for assessing impacts to this snake.

C. TE4.3.1-8

Provide an assessment of the potential impacts of the proposed Fermi 3 project on eastern fox snakes and potential eastern fox snake habitat.

Additional detail beyond the information provided in the ER in Section 4.3.2.1 is needed to adequately assess potential impacts on the eastern fox snake.

D. TE4.3.1-9

Provide a discussion of measures Detroit Edison is considering to mitigate potential impacts to the eastern fox snake and its habitat.

Detroit Edison should also provide complete documentation of any discussions or correspondence to date with the MDNR Natural Heritage Program related to the project's impact on the eastern fox snake and measures Detroit Edison would consider for mitigating impacts to this snake.

This RAI is a request to Detroit Edison to document its consideration of mitigation measures to minimize impacts on the eastern fox snake. Detroit Edison has been working with the MDNR to mitigate impacts to this snake, and documentation of those discussions is needed.

Response

A. TE2.4.1-12

Provide up-to-date and complete data on the locations and dates of sightings of the eastern fox snake (Pantherophis gloydi) on the proposed Fermi 3 site, including any sightings by Detroit Edison staff or others in the last 10 years.

A map indicating where known observations of eastern fox snakes have occurred is provided as Enclosure 1 to this response. The sightings which are indicated as having been made by Detroit Edison employees (represented by stars on the map) were made from 1990 to 2007. Two sighting made by Ducks Unlimited (represented by triangles on the map) were made during a site wetland survey conducted in 2008.

At the locations where fox snakes were sighted by Detroit Edison employees, from 1-6 snakes have been observed per occasion. In addition, multiple sightings were made at each location over the course of the 1990-2007 period of time.

B. TE2.4.1-13

Provide a delineation of potential eastern fox snake habitat within the proposed Fermi 3 site.

Provide information, including a map, describing the location of the revised project footprint with respect to potential eastern fox snake habitat.

As demonstrated on the map provided in the response to part A of this letter, eastern fox snakes have been observed in numerous locations including those that are developed and currently in use for Fermi 2 operations. Due to the observed wide distribution, all undeveloped areas on the site are considered to provide habitat for the species. While eastern fox snakes have been observed at numerous developed locations, these sites do not possess habitat (food, cover, or water) for the snakes. It is believed that the snakes observed at these locations were migrating from areas possessing habitat or using the paved and gravel surface as a means of increasing their body temperature.

The construction of the Fermi 3 power plant will impact a portion of the site's undeveloped areas resulting in an impact to eastern fox snake habitat. A revised Environmental Report (ER) Figure 2.1-4 was provided in response to RAI GE3.1-1 in Detroit Edison letter NRC3-09-0017 (ML093650121), dated December 23, 2009. This figure provided a map of the areas, including undeveloped areas, which will be impacted as a result of the construction of Fermi 3. A review of site layout changes being implemented by Detroit Edison will clearly show that environmental impacts to the undeveloped areas of the site have been significantly minimized, particularly to preferred habitat for the eastern fox snake, such as wetlands. The revised layout has decreased the impact to undeveloped areas, which are suitable as fox snake habitat, by 117 acres.

C. TE4.3.1-8

Provide an assessment of the potential impacts of the proposed Fermi 3 project on eastern fox snakes and potential eastern fox snake habitat.

All impacts to the eastern fox snake will be minimized through mitigation efforts. Plans for mitigation are provided in the response to RAI TE4.3.1-9 below.

Based on observations, it is believed that eastern fox snakes are widely distributed throughout the Fermi site. During the course of construction activities it may be possible to find eastern fox snakes in developed areas migrating from one area of habitat to another or utilized paved and rocky surfaces to raise their body temperature.

All undeveloped areas of the site are considered to provide habitat for the eastern fox snake. As a result, disturbances in these areas will have the potential to impact the snakes directly or affect their habitat. The revised ER Figure 2.1-4 mentioned in part B shows the undeveloped areas which will be impacted. Referencing this figure, the major impacts will be: EF3 Parking (~36 acres), Construction Laydown (~35 acres), and Fox Road Construction Layout (~24 acres). All three of these areas will be temporary impacts; following completion of the project they will be restored to a condition of equivalent or better ecological value. In addition, lesser impacts will occur at the location of the new meteorological tower located at the southern end of the property, the site of the Fermi 3 cooling tower (point 23) where invasive vegetation covers spoil piles from previous work, and the structures at points 32, 34 and 37 where the structures will infringe on undeveloped areas.

A review of site layout changes being implemented by Detroit Edison will clearly show that environmental impacts to the undeveloped areas of the site have been significantly minimized, particularly to preferred habitat for the eastern fox snake, such as wetlands. The revised layout has decreased the impact to undeveloped areas, which are suitable as fox snake habitat, by 117 acres.

D. TE4.3.1-9

Provide a discussion of measures Detroit Edison is considering to mitigate potential impacts to the eastern fox snake and its habitat.

Detroit Edison should also provide complete documentation of any discussions or correspondence to date with the MDNR Natural Heritage Program related to the project's impact on the eastern fox snake and measures Detroit Edison would consider for mitigating impacts to this snake.

The strategy for reducing Fermi 3 construction impacts to the eastern fox snake included modifications to the site layout. These modifications significantly reduced the amount of undeveloped area which will be impacted. The reduction in impact can be seen by comparing ER Figure 2.1-4 in Revision 0 of the ER to the revised figure discussed in the response to TE2.4.1-13 above which shows the current layout plan. Modifications to the layout have decreased the impact to undeveloped areas by 117 acres.

As a means of further reducing impacts to the eastern fox snake population, a mitigation plan will be finalized prior to construction and implemented to minimize impacts to the resident population. The draft of this plan is provided in Enclosure 2 to this response.

Documentation of discussions with the MDNR is provided in Enclosure 3 to this response. The following discussions are documented and provided:

Summary of discussion with the MDNR on the Fermi 3 impact on fox snakes held on April 14, 2009.

A letter from Lori G. Sargent (Michigan Department of Natural Resources) to Gregory P. Hatchett (US NRC) dated February 9, 2009 discussing eastern fox snakes at the Fermi site.

A letter from Lori G. Sargent (Michigan Department of Natural Resources) to Ralph E. Brooks (Black and Veatch Corporation) dated November 28, 2007 RE: Proposed new nuclear power electrical generating facility at Consumers Power Enrico Fermi Facility; B&V Project 147483

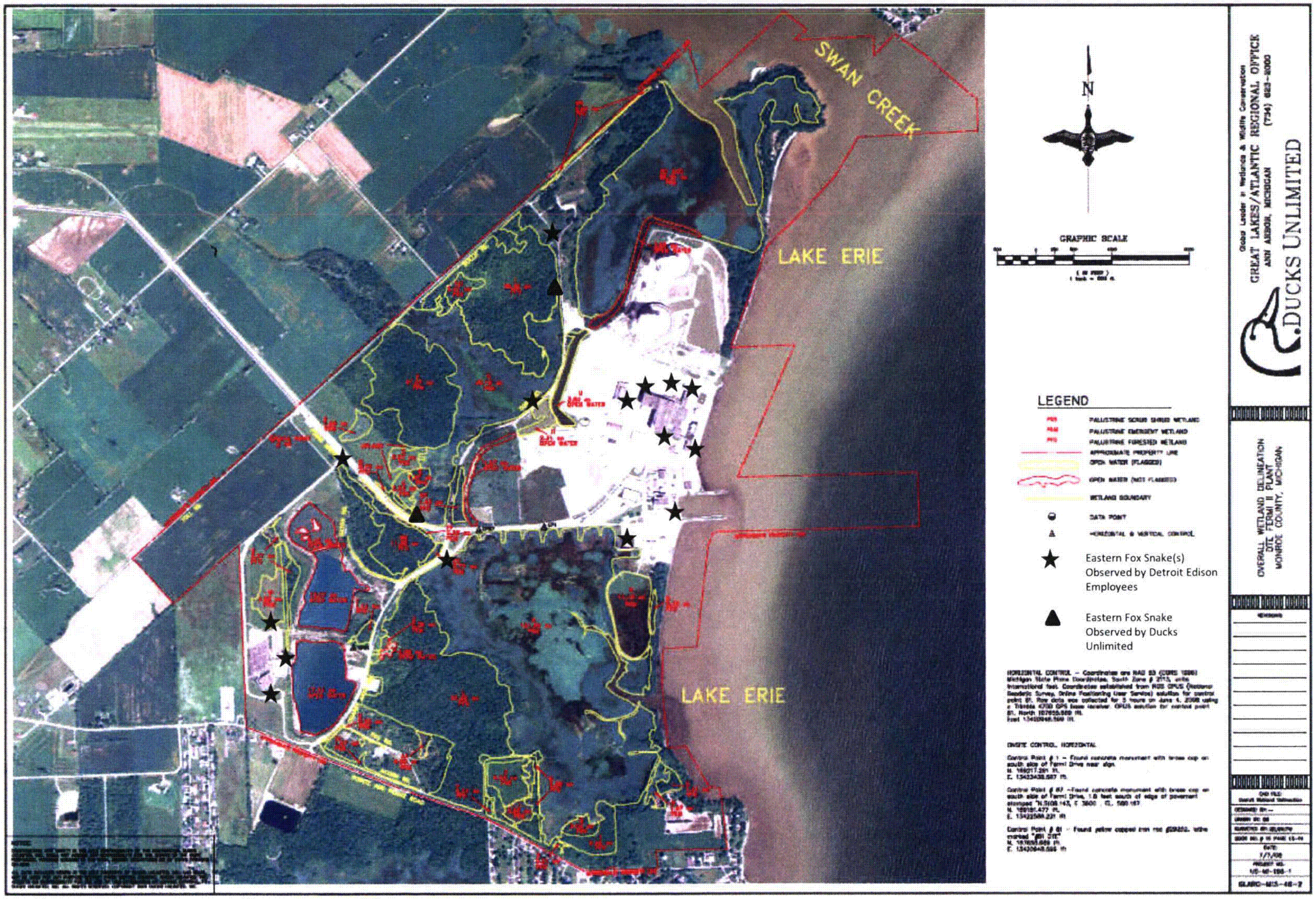
<u>Proposed COLA Revision</u>

None

Attachment 7
NRC3-10-0005

Enclosure 1

Eastern Fox Snake Sightings Map
(following 1 page)


SWAN CREEK
LAKE ERIE
LAKE ERIE
N
GRAPHIC SCALE
LEGEND
PALUSTRINE SCRUB SHRUB WETLAND
PALUSTRINE EMERGENT WETLAND
PALUSTRINE FORESTED WETLAND
APPROXIMATE PROPERTY LINE
OPEN WATER (FLAGGED)
OPEN WATER (NOT FLAGGED)
WETLAND BOUNDARY
DATA POINT
HORIZONTAL & VERTICAL CONTROL
Eastern Fox Snake(s) Observed by Detroit Edison Employees
Eastern Fox Snake Observed by Ducks Unlimited
HORIZONTAL CONTROL
ONSITE CONTROL, HORIZONTAL
Global Leader in Wetlands & Wildlife Conservation
GREAT LAKES/ATLANTIC REGIONAL OFFICE
ANN ARBOR, MICHIGAN
(734) 623-2000
DUCKS UNLIMITED
OVERALL WETLAND DELINEATION
DTE FERMI II PLANT
MONROE COUNTY, MICHIGAN

Attachment 7
NRC3-10-0005

Enclosure 2

Habitat and Species Conservation Plan
(following 12 pages)

Detroit Edison

Fermi 3

Habitat and Species Conservation Plan
Eastern Fox Snake (*Elaphe gloydi*)

Table of Contents

Executive Summary

The eastern fox snake (*Elaphe gloydi*) is a threatened species in Michigan with four known isolated populations remaining in Southeastern Michigan. Two of these populations occur in Monroe County along the shores of Lake Erie (Reference 8.1). It is known that Detroit Edison's Fermi property has a population of fox snakes. Detroit Edison currently operates one nuclear generating unit on this property and is considering building an additional unit, Fermi 3. The construction of Fermi 3 has the potential to impact the existing fox snake population and its habitat. The site's personnel have an elevated awareness of wildlife habitat and associated wildlife populations as a result of the site's Wildlife Habitat Certification (certified by the Wildlife Habitat Council), functional ISO 14001 certified Environmental Management System and a cooperative agreement with the US Fish and Wildlife Service to manage on-site habitats as part of the Detroit River International Wildlife Refuge. It is the intent of this document to describe measures to be implemented in order to create further employee awareness and decrease impacts on the population of eastern fox snakes and their habitat caused by Fermi 3 construction activities.

1.0 Introduction and Background

1.1 Overview

The construction of Detroit Edison's Fermi 3 Power Plant will involve a significant amount of heavy construction activity. During the course of these construction activities awareness about wildlife and its habitat will need to be discussed during pre-job briefings to help assure that impacts are minimized. The development of an environmental check-list will assist in making construction personnel aware that some activities and the locations in which they are performed may have impacts on wildlife in general and the eastern fox snake in particular. The use of "fox snake" and "snake" refer to the eastern fox snake in this document. Additionally, communicating the behavior, appearance and preferred habitat of the fox snake will promote greater awareness. Undeveloped areas to be impacted will be surveyed by a team of trained personnel to help remove snakes prior to construction activities.

1.2 Regulatory/Legal Framework

The Federal *Endangered Species Act of 1973* (ESA 1973), and the State of Michigan's *Natural Resources and Environmental Protection Act (NREPA), Act 451 of 1994 PART 365* require all parties to include endangered and threatened species protection within project planning. This requires projects to be reviewed by State and/or Federal agencies. This review determines if the project requires an *incidental take permit*, as outlined in ESA 1973. With the application for an incidental take permit a *Habitat Conservation Plan* (HCP) needs to be authored to demonstrate to the agencies that there is a plan in place that reduces the impact on endangered and threatened species. The eastern fox snake is not federal listed species but is listed by the state of Michigan as threatened.

1.3 Plan Area

This plan will cover activities occurring on the Fermi power plant site related directly to the construction of the Fermi 3 power plant. Areas utilized by the eastern fox snake throughout its life cycle include shorelines, wetlands and adjacent uplands which are critical habitat for the fox snake (Reference 8.2). These habitats occur throughout the Fermi Power Plant property and the wetlands are outlined in Fig. 1 in the Appendix. The Michigan Department of Natural Resources and Environment (MDNRE) maintains an *Endangered Species Assessment* website (Reference 8.3) for the specific purpose of project planning. This website is used to obtain a course overview for project planning and users can get an immediate idea if further review by the MDNRE is required for projects. The Fermi Power Plant property is entirely contained within a high priority area for endangered and threatened species as displayed on the MDNRE's map of areas with unique natural features (Reference 8.4).

2.0 *Environmental Setting/Biological Resources*

2.1 *Environmental Setting*

The Fermi site is on the west shore of Lake Erie at the mouth of Swan Creek, approximately 24 miles northeast of Toledo, Ohio and 30 miles southwest of Detroit, Michigan. The Fermi 3 power plant will be located on the current Fermi site in Frenchtown Township; Monroe County, Michigan at the following coordinates:

Latitude	Longitude
41° 57' 39" North	83° 15' 43" West

Zone 17T UTM (NAD83) Coordinates
4,647,902 m Northing   312,551 m Easting

The U.S./Canada international border runs through Lake Erie about seven miles east of the Fermi site. The Power Plant and ancillary systems are built primarily on fill materials.

2.1.1 *Climate*

Bailey's eco-region classification system (Reference 8.5) has been utilized to describe climate, and associated biological interactions, throughout the world. Bailey's eco-region system is widely used by many government and non-government groups to describe climate and associated ecology in project or management areas. The descriptors identifying the eco-region that the Fermi site is located in are as follows:

Baileys Eco-region Classification for Detroit Edison's Fermi Power Plant

Domain	Humid Temperate
Division	Hot Continental
Province	Eastern Broadleaf Forest
Section	Erie and Ontario Lake Plain

2.1.2 *Topography/Geology*

Fermi Power Plant is situated in the Lake Erie lake plain. The topography at this location is flat and formed both by the physical process of Lake Erie and Swan Creek. Historically this region was part of a vast wetland complex associated with Lake Erie, Swan Creek and in part by the hydrologic processes of the Detroit and Raisin Rivers. Large lake plain deposits of clay and sand dominate the soil types as a result of the post glacial Lake Erie formation.

2.1.3 Hydrology/Streams, Rivers and Drainages

Currently the hydrology of the area is influenced greatly by the physical processes of Lake Erie. Lake Erie has a perfect fetch for seiche activity. With a predominant southwest wind pattern Lake Erie is susceptible to great fluctuations in water levels. This is due to sustained winds pushing the lake water to the east, and then, as the winds subside, the water returns to the west. This creates large waterless expanses followed quickly by water inundating into creek and river mouths resulting in a bath tub like "sloshing" effect. This creates unique opportunities for both plants and wildlife. Other local hydrological conditions are dictated by the Swan Creek.

2.1.4 Vegetation

Vegetation varies throughout the Fermi property. A survey was conducted from 2008 through 2009 and the findings have been detailed in, "Fermi 3 Terrestrial Vegetation Survey, Final Report", November 2009. Numerous land uses preceded the Power Plant including fish farming, residential and recreational. As a result of dikes, filling activity and various other disturbances, many vegetation types are in varying stages of succession.

Undeveloped areas of the site account for 656 acres and are cooperatively managed with USFWS as part of the Detroit River International Wildlife Refuge (DRIWR) Lagoona Beach Unit. The majority of the undeveloped areas are wetlands of various types (e.g., high and low marsh, wet meadow, forested wetland, scrub-shrub wetland, shallow open water, etc.).

2.1.5 Wildlife

The Fermi site has been a certified wildlife habitat site through the Wildlife Habitat Council since 2000. The focus of wildlife habitat certification is to utilize unused lands for the benefit of wildlife. A wildlife survey was conducted on the site from 2008 through 2009 and the results are documented in "Fermi 3 Terrestrial Wildlife Survey, Final Report", September 2009. The survey contains an assessment of the fox snake as follows:

Eastern fox snake (Elaphe gloydi)

State endangered. The eastern fox snake inhabits Great Lakes emergent wetlands, preferring habitats dominated by herbaceous vegetation, such as cattails (*Typha* spp.). Although primarily a wetland species, eastern fox snakes also use drier habitats such as vegetated dunes and beaches, old fields, and open woodlands. They occasionally use disturbed areas such as farm fields, pastures, woodlots, vacant urban lots, rock riprap, ditches, dikes and residential properties. eastern fox snakes usually are found near water, and are capable of swimming long distances. Specific habitat features required by eastern fox snake are downed woody debris in Great Lakes marshes, lakeplain wet prairie, lakeplain wet-mesic prairie, emergent marsh, open dunes, sand and gravel beach, mesic sand prairie, mesic southern forest and lakeplain oak openings (MNFI, 2007).

Eastern fox snake was observed in wetlands west of Doxy Road by Ducks Unlimited field staff while conducting a wetland delineation of the Fermi site in May and June 2008. The species was not observed during the present study. Portions of habitats used by the snake, principally emergent marsh, would be filled for Fermi 3 construction and some individuals could be accidentally harmed or killed if they do not withdraw from active construction areas. Scheduling of work periods should be timed to coincide with eastern fox snake active periods (as opposed to hibernation) to allow snakes to withdraw from construction areas as needed. If ground disturbing construction work involving potential hibernacula would occur during hibernation periods, it is recommended that a biologist evaluate the work area, including all ingress/egress routes, before any work begins to determine if eastern fox snake or other protected snakes are present. Suitable hibernacula for eastern fox snake generally consist of rock piles or similar structures, including railroad berms and trestle footings. Other features that retain heat from sunlight also could be used by this snake.

Significant marsh and transitional habitat would remain intact post-construction and it is expected that the eastern fox snake population within the Fermi site would persist. A site management plan that includes provisions to protect eastern fox snake habitat during construction and after construction is recommended. Based on the available information, no significant impacts are anticipated. However, available information regarding eastern fox snake habitat requirements is sketchy and as new information becomes available, the potential for impacts should be re-evaluated. Further consultation with MDNRE is recommended before construction begins.

2.1.6 Existing Land Use

The Fermi site is 1,260 acres in area of which 656 acres are undeveloped. The remaining 604 acres is used for a variety of purposes including the Fermi 2 power plant, office buildings, parking lots and maintenance buildings. Permanent impacts resulting from the construction of the Fermi 3 power plant will occur primarily on already developed or highly disturbed areas. A minimal amount of undeveloped land will be permanently impacted and those areas containing wetlands will be mitigated appropriately. A draft mitigation plan has been prepared, "Wetland Mitigation Plan, Detroit Edison, Fermi Plant, Monroe County, MI" and a finalized plan will be written prior to beginning construction activities.

2.2 Species of Concern in Plan Area

The studies which were performed to investigate the terrestrial and aquatic ecology had a particular focus on protected species within the Fermi 3 area of potential effect (APE). In addition to the eastern fox snake a wide range of species were identified as having the potential to utilize the Fermi site. Additional information on these species can be found in these survey reports: "Fermi 3 Terrestrial Vegetation Survey, Final Report", November 2009, "Fermi 3 Terrestrial Wildlife Survey, Final Report", September 2009, and "Aquatic Ecology Characterization Report, Detroit Edison Company Fermi 3 Project, Final Report", November 2009.

3.0 Project Description/Activities Covered by Permits

3.1 Project Description

Detroit Edison proposes to construct and operate an Economic Simplified Boiling Water Reactor (ESBWR) at the Fermi Nuclear Power Plant site. The Fermi site is located in Monroe County, Michigan, approximately 30 miles southwest of Detroit. There are two existing nuclear reactors at Fermi. Fermi 1 is a non-operational demonstration liquid metal fast breeder reactor that is currently undergoing decommissioning. Fermi 2 is an operating boiling water reactor. Fermi 3 will be located adjacent to and generally to the south of Fermi 2 and west of Fermi 1.

Detroit Edison is the sole owner of the existing Fermi 1 and 2 nuclear units. Detroit Edison is the licensed operator of the existing facilities, with control of the Fermi site and existing facilities. Detroit Edison will be responsible for construction and operation of the proposed Fermi 3 power plant.

The ESBWR is a 4,500 MWt reactor that uses natural circulation for normal operation and has passive safety features. General Electric Company (GE, now GE-Hitachi Nuclear Energy Americas, LLC (GEH)) submitted an application for final design approval and standard design certification for the ESBWR on August 24, 2005, which the NRC is currently reviewing under docket number 52-010. It is anticipated that the design certification of the ESBWR will be issued in fall 2011. This COL application references and incorporates the Design Control Document (DCD) currently under review in the design certification proceeding.

All aspects of the Fermi 3 project are detailed in the Fermi 3 Combined Operating and Licensing Application. The project has been designed with a goal to minimize the impacts to undeveloped areas and wetlands. Project structures are primarily to be located in already developed or heavily disturbed areas.

3.2 Activities Covered by Permit

This mitigation plan will be provided to the MDNRE as part of the permit application process. The permit(s) obtained will help determine the scope of construction activities as they pertain to eastern fox snake impacts.

4.0 Potential Biological Impacts

Fermi 3 construction activities have the potential to kill resident eastern fox snakes as well as destroy or degrade their onsite habitat.

5.0 Conservation Program/Measures to Minimize and Mitigate Impacts

Employee Education Documentation – A document will be prepared which describes the eastern fox snake and it habitat and bring attention to its threatened status. The document will contain pictures and contact information for when sightings are made. Each construction employee will be required to review and sign in acknowledgement prior to beginning work (refer to ISO 14001 pamphlets).

Employee Education/Pre-job brief – At the beginning of each construction work shift, for those construction activities where fox snakes may be encountered, work leaders will review the possibility of discovering eastern fox snakes and the steps to be taken upon a discovery. This pre-job task will be noted on the pre-job brief checklists which are used as part of the project. Job leaders will receive additional education in order to fully understand the fox snake mitigation goals.

Prior to beginning daily work on a developed or already disturbed area, designated employees will walk down the site and observe for eastern fox snakes. Any fox snakes located in these areas will be removed by a designated Detroit Edison employee who will then relocate the snakes to undeveloped areas of the site which will not be impacted by Fermi 3 construction.

One week and again one day prior to clearing undeveloped areas, the areas will be walked through by a team led by a biologist familiar with eastern fox snakes and their habitat. Land clearing activities should be scheduled to be performed outside of the fox snakes hibernation periods so that they are active, easier to locate and safely remove from the area. During this walkthrough, any fox snakes observed will be captured and relocated to an undeveloped location on site which will not be impacted by Fermi 3 construction activities. The lead biologist will ensure that the snakes are not harmed while being captured, transported or released. Potential hiding places for the snakes will be uncovered and searched. Construction workers will continue to observe for snakes as clearing progresses. If a construction worker observes a fox snake during work activities, they are to stop work until the snake clears the area or until designated personnel can clear it from the area.

5.1 Biological Goals

The biological goals of this document have been created utilizing available literature from different sources such as the MDNRE, Michigan Natural Features Inventory, and supplemental field guides on reptiles. The over-arching goal will be to prevent the deaths of eastern fox snakes as a result of Fermi 3 construction activities through employee education and awareness, capture and release and monitoring.

5.2 Measures to Minimize Impacts

5.2.1 Redesigned site layout to minimize the impacts to undeveloped areas which provide potential habitat for eastern fox snakes. The redesign has reduced the construction impact by 117 acres.
5.2.2 Educate Employees through use of a fox snake manual to be created. Employees are to read and sign manual prior to work beginning.
5.2.3 Add fox snake to the pre-job brief checklist so that the issue is reinforced prior to work beginning each day.
5.2.4 Capture and release snakes observed during the course of construction in developed areas.

5.2.5 Search for and capture snakes found in undeveloped areas to be cleared. Release snakes to onsite undeveloped areas which will not be impacted.

5.3 Measures to Mitigate Unavoidable Impacts

5.3.1 Lead Biologist and team will walk the area(s) prior to the start of construction activities, capturing and then releasing any snakes found to a safe area.
5.3.2 Develop procedure for capture and relocation of snakes including description of devices to use and locations for release.
5.3.3 Employees are to halt work upon discovery of an eastern fox snake until the snake is clear of the activity or is removed by a designated employee.

5.4 Monitoring reports

A log will be maintained, documenting when and where monitoring is performed. In cases where a fox snake is observed while performing a walkthrough, a report will be created noting the number of snakes located and removed and where they were relocated to. A yearly report will also be created summarizing the results of the mitigation efforts. Any snakes killed in the construction process will be reported to the MDNRE as required by applicable take permits.

6.0 Funding

Funding for fox snake mitigation efforts will be provided as part of the Detroit Edison Fermi 3 construction budget.

7.0 Changed Circumstances

If during the course of construction any changes in the Fermi 3 site layout are made which will potentially impact fox snakes or fox snake habitat then those employees involved with conducting fox snake surveys will be contacted. These employees will modify the scope of their surveyed areas to include the new areas to be impacted.

8.0 *References*

8.1 Weatherby, C. A.,Michigan Nature Conservancy Elaphe vulpina gloydi and Clonophis kirtlandii 1986 contracted survey. Michigan Nature Conservancy, Unpublished, rep. 25 pp.

8.2 Lee, Y., "Special animal abstract for *Elaphe vulpina gloydi* (eastern fox snake). Michigan Natural Features Inventory, Lansing, MI. 3 pp.

8.3 Michigan Department of Natural Resources, Endangered Species Assessment http://www.mcgi.state.mi.us/esa, accessed January 15, 2010

8.4 Michigan Department of Natural Resources, Endangered Species Assessment, Map http://www.mcgi.state.mi.us/esa/map.asp?action=map_south, accessed January 15, 2010

8.5 Bailey, R.G., Ecoregions of the United States, 1978

9.0 *Appendix*

Figure 1 – Wetland Delineation

N

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)
1 inch = 500 ft.

LEGEND

PSS	PALUSTRINE SCRUB SHRUB WETLAND
PEM	PALUSTRINE EMERGENT WETLAND
PFO	PALUSTRINE FORESTED WETLAND
	APPROXIMATE PROPERTY LINE
	OPEN WATER (FLAGGED)
	OPEN WATER (NOT FLAGGED)
	WETLAND BOUNDARY
	DATA POINT
	HORIZONTAL & VERTICAL CONTROL

HORIZONTAL CONTROL – Coordinates are NAD 83 (CORS 1996) Michigan State Plane Coordinates, South Zone # 2113, units international feet. Coordinates established from NGS OPUS (National Geodetic Survey, Online Positioning User Service) solution for control point 81. Raw data was collected for 5 hours on June 4, 2008 using a Trimble 4700 GPS base receiver. OPUS solution for control point 81, North 167655.689 ift.
East 13420948.599 ift.

ONSITE CONTROL, HORIZONTAL

Control Point # 1 – Found concrete monument with brass cap on south side of Fermi Drive near sign.
N. 169217.291 ift.
E. 13423438.587 ift.

Control Point # 87 –Found concrete monument with brass cap on south side of Fermi Drive, 1.6 feet south of edge of pavement stamped "N.5106.143, E 3600 , EL. 580.167.
N. 169181.477 ift.
E. 13422586.221 ift.

Control Point # 81 – Found yellow capped iron rod #29252, lathe marked "#81 DTE"
N. 167655.689 ift.
E. 13420948.599 ift

Global Leader in Wetlands & Wildlife Conservation
GREAT LAKES/ATLANTIC REGIONAL OFFICE
ANN ARBOR, MICHIGAN (734) 623-2000
DUCKS UNLIMITED®

OVERALL WETLAND DELINEATION
DTE FERMI II PLANT
MONROE COUNTY, MICHIGAN

REVISIONS:

CAD FILE: Overall Wetland Delineation	
DESIGNED BY: –	
DRAWN BY: GB	
SURVEYED BY: GB,WW,PW	
BOOK NO. # 16 PAGE 13–19	
DATE: 7/7/08	
PROJECT NO.: US–MI–188–1	
GLARO–MI3–46–2	

Attachment 7
NRC3-10-0005

Enclosure 3

MDNR Discussions
(following 6 pages)

Summary of Discussion with the MDNR on the Fermi 3 Impact on Fox Snakes

A meeting was held on April 14, 2009 with the Michigan Department of Resources employee Chris Hoving (Threatened and Endangered Species Coordinator) to discuss the impact of the proposed Fermi 3 power plant on the resident population of the threatened eastern fox snake.

DTE Representation:

Randy Westmoreland

Matt Shackelford

Craig Tylenda

The meeting was held to primarily inform Mr. Hoving of the goal of modifying the site plan to minimize the impact to the site's coastal wetlands, a preferred habitat of the eastern fox snake, and other efforts to minimize the impact to the snake populations.

- The eastern fox snake is a subspecies of the fox snake and its habitat around Michigan is primarily around lakeshores
- A PowerPoint presentation was made and described :
  - The current site arrangement
  - The arrangement, size and flow of the site's wetlands
  - The proposed revised site arrangement
- It was apparent that Mr. Hoving had reviewed at least part of the ER and had some background based on his discussions with Lori Sargent.
- Chris appeared pleased that the revised plan would so greatly diminish the overall wetland impact.
- The DNR will need to issue a permit before construction is allowed to commence
- All relevant wildlife data and site plan information will be submitted to the DNR prior to construction and ultimately Mr. Hoving or whoever may be holding his position in the future would write the permit. The permit will describe the allowable impacts.

The meeting appeared useful in educating Mr. Hoving on the project in general and the goals of minimizing impacts to wildlife habitat and threatened and endangered species. It also appeared to be a good start toward forming a positive and productive relationship with the DNR as the project advances.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

REBECCA A. HUMPHRIES
DIRECTOR

February 9, 2009

Mr. Gregory P. Hatchett, Acting Chief
Environmental Projects Branch 2
Division of Site and Environmental Reviews
Office of New Reactors
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Hatchett:

Thank you for the Fermi 3 Combined License Application, Part 3: Environmental Report. A response to a threatened/endangered species review of the Fermi 3 proposed project in Wayne County, Michigan was sent from this office to the Black & Veatch Corporation November 28, 2007. In that response four endangered or threatened animal species were listed as being present in the area as were three species of threatened plants. Upon review of this report I noticed some discrepancies and causes for concern in regard to threatened species protection.

One animal species that is of primary concern in the area is the Eastern fox snake (*Pantherophis gloydi*). On page 2-333 of the Environmental Report it states that "nine occurrences were reported in Monroe County...the snake was sighted two times on the Fermi property in June 2008." There is a discrepancy to this statement on page 4-45 where it states "The eastern fox snake (a Michigan threatened species) has not been observed on the Fermi property, but the potential for its occurrence on the property does exist."

According to our records there is a viable population of Eastern fox snake at the site of the proposed project. We believe that going forward with the construction would not only kill snakes but destroy the habitat in which they live and possibly exterminate the species from the area. We would like to see a plan for protection of this rare species with regard to this new reactor project.

STEVENS T. MASON BUILDING • P.O. BOX 30028 • LANSING, MICHIGAN 48909-7528
www.michigan.gov/dnr • *(517) 373-2329*

Please contact me if you have questions or concerns. Thank you.

Sincerely,

Lori G. Sargent

Lori G. Sargent
Endangered Species Specialist
Wildlife Division
(517) 373-1263

cc: Dr. Ralph E. Brooks, Black & Veatch Corporation
Detroit Edison
Michigan Department of Environmental Quality, Jackson District
US Army Corps of Engineers
Peter Wyckoff, Ducks Unlimited
Frenchtown Township

STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES

LANSING

JENNIFER M. GRANHOLM
GOVERNOR

REBECCA A. HUMPHRIES
DIRECTOR

November 28, 2007

Dr. Ralph E. Brooks
Black & Veatch Corporation
4800 Meadows Road, Suite 200
Lake Oswego, OR 97035

RE: **Proposed new nuclear power electrical generating facility at Consumers Power Enrico Fermi Facility; B&V Project 147483**

Dear Dr. Brooks:

The location of the proposed project was checked against known localities for rare species and unique natural features, which are recorded in a statewide database. This continuously updated database is a comprehensive source of information on Michigan's endangered, threatened and special concern species, exemplary natural communities and other unique natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features at a site. The absence of records may mean that a site has not been surveyed. The only way to obtain a definitive statement on the presence of rare species is to have a competent biologist perform a field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, ...fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Department of Natural Resources, Wildlife Division. *Responsibility to protect endangered and threatened species is not limited to the list below. Other species may be present that have not been recorded in the database.*

The presence of threatened or endangered species does not preclude activities or development, but may require alterations in the project plan. Special concern species are not protected under endangered species legislation, but recommendations regarding their protection may be provided. Protection of special concern species will help prevent them from declining to the point of being listed as threatened or endangered in the future.

The following is a summary of the results for the project in Monroe County, sections 20, 21, 28, 29 T6S R10E.

The following list includes unique features that are known to occur on or near the site(s) and may be impacted by the project.

common name	status	scientific name
Barn owl	**state endangered**	***Tyto alba***
Common tern	**state threatened**	***Sterna hirundo***
Eastern fox snake	**state threatened**	***Pantherophis gloydi***
Bald eagle	**state threatened**	***Haliaeetus leucocephalus***

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Brindled madtom	**special concern**	***Noturus miurus***
American lotus	**state threatened**	***Nelumbo lutea***
Arrowhead	**state threatened**	***Sagittaria montevidensis***
Frank's sedge	**state threatened**	***Carex frankii***
Trailing wild bean	**special concern**	***Strophostyles helvula***

More detailed information regarding habitats and biology on these species can be found at http://web4.msue.msu.edu/mnfi/pub/abstracts.cfm .

In summary, the project site may include suitable habitat for the above listed species. Potential impacts might include direct destruction of species and disturbance of critical habitat. **Clearance from this office in the form of a "No Effect" statement will be needed before work on this project begins.** To obtain an evaluation for project clearance, please provide **at least one** of the following to this office:

1. Description of the project area with regard to the species habitat type(s) described above. A recent photo of the project site and a map that shows habitat type(s) and location(s) of the proposed project will be necessary. This can be done by the landowner, other responsible party, or knowledgeable source (i.e. botanist, ecologist, biologist, experienced birder, etc.). This level of evaluation will only define the presence or absence of available habitat. If this office determines that there is no significant available habitat, the project may be cleared at this point. If potential habitat does exist, the next level of evaluation must be undertaken (see options 2 or 3 below).

OR

2. A statement from a knowledgeable source (see above) stating that suitable habitat is or is not present and why the project will not impact the species or habitat(s) identified above.

OR

3. Results from a complete and adequate survey by a knowledgeable source (see above) showing whether or not the above listed species are present in the affected project area. Guidelines for conducting surveys can be obtained from this office on request. For additional information and guidance for conducting surveys, including consultation with MNFI staff biologists, please contact me at the number below or go to the DNR website at www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/TE_consultants.pdf .

In most situations, the most efficient, thorough, and expeditious evaluation of the project and its impacts results from option 3. Please provide information **in writing** to the mailing address or e-mail provided below.

Michigan Department of Natural Resources
Wildlife Division – Natural Heritage Program
PO Box 30180
Lansing, MI 48909

Thank you for your advance coordination in addressing the protection of Michigan's natural resource heritage. If you have further questions, please call me at 517-373-1263 or e-mail at SargenL2@michigan.gov .

Sincerely,

Lori G. Sargent

Lori G. Sargent
Endangered Species Specialist
Wildlife Division

Attachment 8
NRC3-10-0005

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question TL4.1.2-1

NRC RAI TL4.1.2-1

Provide a description of construction, operation, and maintenance BMPs that would be applied to Fermi 3 transmission line corridors to the Milan substation.

Supplemental Information

In order to evaluate the impacts of transmission line construction, operation, and maintenance, a description of BMPs related to construction, operation, and maintenance activities is needed as related to protection of aquatic habitats, wetlands, cultural resources, invasive species control, threatened and endangered species, wildlife management, and habitat maintenance. Provide manuals used by ITC Transmission that describe BMPs. This information is not publically available and is needed for the impact analysis to be presented in the EIS.

Supplemental Response

In the original response to RAI TL4.1.2-1, Detroit Edison provided a list of typical construction activities that ITC*Transmission* (ITC) would perform and included a statement that Detroit Edison has no control over the construction or operation of the transmission system. Based on discussions with the NRC on September 11, 2009, there was insufficient detail provided in the response to address information requested in the RAI related to ITC's Best Management Practices (BMPs) for operations and maintenance. The following synopsis is provided by ITC.

The transmission system and associated corridors are exclusively owned and operated by ITC. ITC will provide an independently constructed, regulatory site certified, and fully operational offsite power system to the Fermi 3 facilities when needed. The regulatory approval and certification of the transmission system is assigned to the Michigan Public Service Commission (MPSC). The Commission's process is specified by the 1995 Electric Transmission Line Certification Act. It is during this review that a more detailed transmission line proposal will be submitted. Act 30 is a public participation process. These submittals will be reviewed by state departments including Michigan's Department of Natural Resources and Environment.

ITC's current study identifies about 27 miles of transmission system routing for Fermi 3 interconnection with only about 10 miles that are not in already existing transmission line corridors. ITC has described that for construction an ITC Project Manager develops a plan uniquely for each project. A consultant is brought in for wetland delineation and to perform the appropriate threatened and endangered species assessments. These are to identify span and tower locations to minimize potential impact during the final routing and design process. The plan specifically identifies tower construction locations, construction access, and material storage. These areas are located, wetlands are staked, and special techniques (i.e. timber matting) are identified to avoid soil disturbances and environmental impacts. The plan identifies required permissions and permits that are needed from landowners and the Michigan Department of

Transportation (MDOT) as well as regulatory authorities. Examples of these authorities include the U.S. Fish and Wildlife Service and the Michigan Department of Natural Resources and Environment, Division of Land and Water Management. These agencies issue permits to insure the avoidance of wetland resources to the greatest extent possible and minimization of unavoidable wetland impacts.

Once the construction phase is completed, it will be operated and maintained just like the current 17 miles of existing developed corridor. ITC has provided a description of its current operations and maintenance practices. It operates and maintains its transmission system in accordance with standard industry practices and the requirements of the North American Electric Reliability Council (NERC) and Federal Energy Regulatory Commission (FERC). ITC's Asset Maintenance Program is designed to ensure that the poles, structures, transmission lines, and related equipment are structurally sound and operating in accordance with ITC's specifications. ITC's Transmission Vegetation Management Program is focused on transmission reliability. The program is designed to avoid vegetation-caused outages to the transmission system by maintaining the transmission line rights-of-way (ROW) and easements to achieve, at all times and under all expected conditions, an acceptable clearance between the conductors and the vegetation on or off the ROW. In addition, effective ROW management can include inspection for, and mitigation of, other ROW-based causes of outages such as encroachment, vandalism, and incompatible use.

ITC's Asset Maintenance Program requires that every pole, structure, and transmission line in the system is regularly inspected. Aerial patrols are conducted bi-annually to inspect the ROW to verify that required horizontal and vertical clearances are maintained and to visually inspect the condition of the structures, transmission lines, and associated equipment. In addition, pedestrian patrols are conducted to inspect each structure to verify its structural integrity and the integrity of associated wires and equipment. A climbing inspection and integrity test are conducted on each structure at least once every ten years; over 1,000 structures are inspected annually. Towers are inspected to determine if maintenance such as painting is needed or, in some cases, whether a pole, structure, or other piece of equipment requires replacement. Transmission lines are inspected to determine if any repairs are needed to keep the system operating within ITC's tolerances. If poles need replacing, the replacement poles are typically located in close proximity to the pole being replaced to minimize the footprint of the area disturbed for pole installation and maintenance.

The Transmission Vegetation Management Program defines a schedule for aerial and pedestrian inspections of the ROW and establishes minimal clearances necessary to prevent flashover between vegetation and overhead ungrounded supply conductors. ITC creates an annual vegetation management plan that describes the methods to be used, such as manual or mechanical clearing, herbicide treatment, and other actions to maintain conditions that ensure the reliability of the electric transmission system. The plan identifies required permissions and permits that are needed from landowners and/or regulatory authorities to implement the vegetation management program, systems for documenting and tracking vegetation management activities, and ensuring the work is completed.

Vegetation management actions may include manual, mechanical, biological, chemical, and cultural techniques. A Geographic Information System (GIS) mapping program that merges land use and environmental information with ITC's facility locations and access points is used, in combination with information gathered during aerial or pedestrian surveys, to identify the appropriate vegetation management method. Methods are chosen based on the number, height, and type of incompatible trees, the presence or lack of compatible species, terrain, water, wetlands, rare or endangered species, adjacent land uses, accessibility, worker and public safety, and economics. Methods to be used to manage vegetation include, but are not limited to pruning, wall trimming, tree removal, mowing, and herbicide application. Work is conducted under the direct supervision of Utility Specialist Foresters certified by the International Society of Arboriculture.

Access for asset and vegetation management activities is generally via the existing ROW or from non-ROW access points approved by adjacent landowners. ITC complies with all regulatory requirements to protect sensitive habitats and secure the necessary clearances or permits as needed. In wetland areas, crews conduct work on foot or operate from timber mats when necessary to minimize disruption. ITC maintains a database of known occurrences of threatened and endangered species obtained from the Michigan Natural Features Inventory (i.e. Heritage Program) to identify locations where seasonal constraints or other regulatory conditions affect vegetation management activities in habitats occupied by rare species. ITC operates in accordance with these seasonal constraints to the degree possible; however, in the event of an emergency, crews take the actions needed to safely maintain system reliability while minimizing environmental impacts to the degree feasible.

Proposed COLA Revision

None

Attachment 9
NRC3-10-0005

Supplemental Response to RAI letter related to Fermi 3 ER

RAI Question TL4.1.2-2

NRC RAI TL4.1.2-2

Provide a description of the routing process used to identify the proposed Fermi 3-to-Milan corridor.

Supplemental Information

The EIS will include a description of the process used to identify the transmission line corridors for Fermi 3. The criteria identified in the ER (Section 2.2.2.2) are very general and describe the process used in the siting of transmission lines for Fermi 2 in 1972. The methodology used to select the current proposed corridor route is needed.

Supplemental Response

In the original response to RAI TL4.1.2-2, Detroit Edison described the process for requesting Fermi 3 connection to the transmission system, which included ITC*Transmission* (ITC) being contracted by the Midwest Independent System Operator (MISO) to perform a system impact study. Based on discussions with the NRC on September 11, 2009, the NRC requested clarification of ITC's routing process from the Fermi 3 site to the Milan substation. In addition, the NRC requested ITC's planning criteria document which was referenced in the response. Detroit Edison subsequently agreed to provide the transmission planning criteria along with the system impact study.

The information contained in Environmental Report (ER) Section 2.2.2.2 was a historical reference. At the time of Fermi 2's licensing, Detroit Edison constructed, owned, and operated the interconnected transmission system. Criteria, evaluations, and implementation of corridor routing were entirely within the purview of Detroit Edison.

Today, the transmission system and associated corridors are exclusively owned and operated by ITC. ITC will provide an independently constructed, regulatory site certified, and fully operational offsite power system to the Fermi 3 facilities when needed. Detroit Edison's relationship with ITC is as a stakeholder and only extends to the electrical needs and requirements of Fermi 3.

The ITC transmission planning process has provided its initial generation interconnection evaluation. ITC's Transmission Planning Criteria is provided as Enclosure 1 to this response and is available on their website:

http://www.itctransco.com/images/projects/ITC-METC_2008_Planning_Criteria.pdf

This initial study identifies about 27 miles of transmission system routing with only about 10 miles not already part of existing transmission line corridors. The purpose of this interconnection study is to give an indication of constraints on ITC's system, Detroit Edison's system, and other neighboring systems arising from the proposed interconnection of the aggregate of the Nuclear Plant generation. In addition, this system impact study provides a preliminary, good faith estimate of the nature, extent, and cost of the facilities that may be required to inject the output of the generator facilities to the grid. The study methodologies are described in Section 2.1 of the System Impact Study Report (Enclosure 2). The entire report is publically available on the MISO website provided below by selecting G867.

http://www.midwestmarket.org/publish/Folder/66d196_115dc8fa4a2_-7fc40a48324a?rev=2

ITC has also identified the process to be used in finalizing their routing selection. In 1995, the State of Michigan assigned the power to regulate the location and construction of electric transmission lines to the Michigan Public Service Commission (MPSC). The Commission's process is specified by the Electric Transmission Line Certification Act (Act 30). It is during this review that a more detailed proposal will be submitted, including alternative route considerations by ITC and other parties in the certification process. The certification is a public participation process. These submittals will be reviewed by state departments including Michigan's Department of Natural Resources and Environment. If successful, the MPSC issues approval of only one routing alternative.

Proposed COLA Revision

None

Attachment 9
NRC3-10-0005

Enclosure 1

ITC Transmission Planning Criteria
(following 14 pages)

ITC*TRANSMISSION*
MICHIGAN ELECTRIC TRANSMISSION COMPANY

TRANSMISSION PLANNING CRITERIA[1]

[1] *This manual defines and explains the current planning criteria* ***and will be reviewed and updated as required****. The planning criteria contained in this manual are, in general, to be uniformly interpreted and utilized in the testing and planning of the transmission system unless some deviation is justified as a result of special, economic or unusual considerations. Such instances should not necessarily be considered to conflict with this criterion or to justify revising the criteria, but should be recognized as unusual and special cases. The reliability implications of all such deviations shall be quantified to the extent possible or otherwise qualified sufficiently to ensure minimal reliability impacts. The planning criteria in this manual are guidelines to assist the planning engineer in making capital project and/or operating solution proposals for anticipated system needs.*

March, 2008

TABLE OF CONTENTS

1 Goal

This is the joint planning criteria for the ITC*Transmission* and Michigan Electric Transmission Company transmission systems. For simplicity in the remainder of this report, the joint systems will be referred to as the "Transmission System". This transmission planning criteria is intended to result in a Transmission System that economically and reliably allows our transmission system customers to serve load from generation of choice.

2 NERC & ReliabilityFirst Reliability Criteria

ITC*Transmission* and Michigan Electric Transmission Company adhere to the NERC Planning Standards dated September, 1997 and the legacy ECAR Document 1 approved October 20, 1967, revised November 6, 1980 and revised again July 27, 1998. ECAR Document 1 is entitled "Reliability Criteria for Evaluation and Simulated Testing of ECAR Bulk power supply system".

As members of Reliability*First*, ITC*Transmission* and Michigan Electric Transmission Company adhere to the legacy ECAR Document No. 1 and the statement contained therein that, "...The ECAR members recognize the impossibility of anticipating, and testing for, all possible contingencies that could occur on either the present or the future Bulk Electric Systems within ECAR. They believe, therefore, that the transmission reliability criteria should serve primarily as a means to measure the strength of the systems to withstand the entire spectrum of contingencies, that may or may not be readily visualized, rather than comprise a detailed listing of probable disturbances. Ultimately, the strength of the system as planned and operated must be sufficient to assure that any load loss has not been the result of or does not result in uncontrolled power interruptions. In view of this, the selection of reliability criteria is based not on whether specific contingencies for which the system is being tested are themselves highly probable but rather on whether they constitute an effective and practical means to stress the system and thus test its ability to avoid uncontrolled power interruptions."

In Table 1 of the NERC Planning Standards, four categories of conditions have been defined as follows (SLG is single line ground and 3ϕ is three phase):

Table 1 – NERC Planning Standards

Category	Contingencies	System Limits or Impacts		
	Initiating Event(s) and Contingency Elements(s)	System Stable and both Thermal and Voltage Limits within Applicable Rating	Loss of Demand or Curtailed Firm Transfers	Cascading Outages
A No Contingencies	All Facilities in Service	Yes	No	No
B Event resulting in the loss of a single element.	Single Line to Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing:			
	1. Generator	Yes	No	No
	2. Transmission Circuit	Yes	No	No
	3. Transformer	Yes	No	No
	Loss of an Element without Fault	Yes	No	No
	Single Pole Block, Normal Clearing: 4. Single Pole (dc) Line	Yes	No	No
C Event(s) resulting in the loss of two or more (multiple) elements.	SLG Fault, with Normal Clearing:			
	1. Bus Section	Yes	Planned/Controlled	No
	2. Breaker (failure or internal fault)	Yes	Planned/Controlled	No
	SLG or 3Ø Fault, with Normal Clearing, Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing: 3. Category B (B1, B2, B3 or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3 or B4) contingency	Yes	Planned/Controlled	No
	Bipolar Block, with Normal Clearing: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing:	Yes	Planned/Controlled	No
	5. Any two circuits of a multiple circuit towerline.	Yes	Planned/Controlled	No
	SLG Fault, with Delayed Clearing (stuck breaker or protection system failure): 6. Generator	Yes	Planned/Controlled	No
	7. Transformer	Yes	Planned/Controlled	No
	8. Transmission Circuit	Yes	Planned/Controlled	No
	9. Bus Section	Yes	Planned/Controlled	No

D Extreme event resulting in two or more (multiple) elements removed or cascading out of service.	3Ø Fault, with Delayed Clearing (stuck breaker or protection system failure): 1. Generator 2. Transmission Circuit 3. Transformer 4. Bus Section	Evaluate for risks and consequences - May involve substantial loss of customer demand and generation in a widespread area or areas. - Portions of all of the interconnected systems may or may not achieve a new, stable operating point. - Evaluation of these events may require joint studies with neighboring systems.
	3Ø Fault, with Normal Clearing: 5. Breaker (failure or internal fault)	
	6. Loss of towerline with three or more circuits	
	7. All transmission lines on a common right of way	
	8. Loss of a substation (one voltage level plus transformers)	
	9. Loss of a switching station (one voltage level plus transformers)	
	10. Loss of all generating units at a station	
	11. Loss of a large load or major load center	
	12. Failure of a fully redundant Special Protection Scheme (or Remedial Action Scheme) to operate when required.	
	13. Operation, partial operation, or misoperation of a fully redundant Special Protection Scheme (or Remedial Action Scheme) in response to an event or abnormal system condition for which it was not intended to operate.	
	14. Impact of severe power swings or oscillations from disturbances in another Regional Reliability Organization.	

a) Applicable rating refers to the applicable Normal and Emergency facility thermal Rating or system voltage limit as determined and consistently applied by the system or facility owner. Applicable Ratings may include Emergency Ratings applicable for short durations as required to permit operating steps necessary to maintain system control. All Ratings must be established consistent with applicable NERC Reliability Standards addressing Facility Ratings.

b) Planned or controlled interruption of electric supply to radial customers or some local Network customers, connected to or supplied by the Faulted element or by the affected area, may occur in certain areas without impacting the overall reliability of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted Firm (non-recallable reserved) electric power Transfers.

c) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power Transfers may be necessary to maintain the overall reliability of the interconnected transmission systems.

d) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

e) Normal clearing is when the protection system operates as designed and the Fault is cleared in the time normally expected with proper functioning of the installed protection systems. Delayed clearing of a Fault is due to failure of any protection system component such as a relay, circuit breaker, or current transformer, and not because of an intentional design delay.

f) System assessments may exclude these events where multiple circuit towers are used over short distances (e.g., station entrance, river crossings) in accordance with Regional exemption criteria.

3 Introduction to Transmission System Planning Criteria

This planning criteria manual sets down the planning guidelines used to determine system needs and justify modifications to the transmission system. This manual defines and explains the current planning criteria and will be reviewed and updated as required.

The planning criteria contained in this manual are, in general, to be uniformly interpreted and utilized in the testing and planning of the transmission system unless some deviation is justified as a result of special, economical or unusual considerations. Such instances should not necessarily be considered to conflict with this criterion or to justify revising the criteria, but should be recognized as unusual and special cases. The reliability implications of all such deviations shall be quantified to the extent possible or otherwise qualified sufficiently to ensure minimal reliability impacts. The planning criteria in this manual are guidelines to assist the planning engineer in making capital project and/or operating solution proposals for anticipated system needs.

Planning for the transmission system is intended to provide a network capable of transmitting power between generating sources and loads. The Transmission System is utilized by various generation sources and load throughout the Eastern Interconnection via Network Integration Transmission Service or various other forms of Transmission Service. The implementation of the projects and operating solutions identified by application of this planning criteria shall result in a Transmission System for which the probability of initiating cascading failures is very low. The system should also provide operating flexibility including, but not limited to, allowing maintenance outages. Loss of load may be tolerated for some maintenance outage conditions, double and extreme contingencies.

In meeting the above objectives, the planning engineer must recognize the present state-of-the-art with regard to equipment, construction practices, scheduling and the practical needs of operating the electrical system. It must be recognized that thermal overloading can shorten the equipment life and lead to sudden failures and that abnormal voltages can also cause equipment failures and/or voltage sensitive equipment to be affected. The planning engineer also needs to be cognizant of intangible considerations, such as the social and political implications of his work as well as visual and ecological effects. In particular, one social implication that the planning engineer needs to consider is social benefit of the loads being able to access the most economical generation available. Many of these elements cannot be guided by exact rules and the engineer's judgment must be factored into the proposed projects. In summary, the material gathered in this manual is intended to provide basic system planning guidelines. The planning engineer, however, must still apply ingenuity, experience and judgment in order to develop projects which lead to an economic and reliable power system and supports the access to economical generation. Where judgment is used, it should be recognized as such and documented so as to be part of the record for future planning.

4 Thermal Loading and Voltage Planning Criteria

4.1 Description

The transmission system is used to transmit power and energy from interconnected generation plants to interconnected loads. Some of the generation and load that utilize the Transmission System are not directly interconnected with the Transmission System but are part of the larger interconnected grid and utilize the Transmission System through its ties with neighboring systems.

4.2 Design Considerations

The Transmission System should be designed such that foreseeable normal and contingency conditions do not result in equipment damage or in exceeding acceptable loss of load (see Table 2 – Transmission System Planning Standards for allowable load loss by contingency type). Planning studies are to be carried out for projected annual peak system load conditions, but the planning criteria also holds for any less than annual peak system load level. Planning studies to evaluate projected shutdown conditions (a single non-generator element shutdown plus a single element forced out) however, are to be evaluated at a lower load level (see Table 2 – Transmission System Planning Standards).

The Transmission System will be planned to be within its thermal capacity, to remain stable, to be within equipment short circuit capabilities, and to be within acceptable voltage limits while meeting projected needs of users of the transmission system. These needs may be communicated by reservations on the transmission system including network service or through other mechanisms.

When evaluating the system's expected performance, in the absence of specific customer identified generation resources (such as designated network resources), generation shall be dispatched on an assumed economic and probabilistic basis. In any case, including the system "normal" case, reasonable assumed forced and scheduled generator outages shall be considered. Studies to determine transmission needs for a given power plant will be based on the maximum reasonable expected generation output from that plant and adverse, but credible, dispatch scenarios for other nearby generation shall be considered.

4.3 Project Proposal Guidelines

Project proposals will be submitted if one or more of the following guidelines are met.

- Replacement of equipment which is unsafe to operate and/or presents a hazard. This includes projects required to replace interrupting devices that could be subjected to fault currents which exceed momentary or interrupting ratings, as well as projects required to replace equipment that periodic maintenance tests have shown to have incipient failure.

- Replacement of equipment that presents a costly maintenance burden. This includes projects required to replace equipment that periodic maintenance tests have shown increasing economic costs to maintain for reasons such as that equipment that is, or is becoming, obsolete.

- Interconnection of reasonably documented new customers or committed increases in load at existing customer stations. Related projects should be proposed if one or more of the guidelines under criteria Sections 4 through 7 are violated.

- Relocation of Transmission System facilities on public property as required by federal, state, county or local governmental units. Other requests for relocations are to be done only if the requestor has contracted to pay for the relocation or if economic justification exists.

- Repair, rebuild or replacement of equipment which has failed.

- Requirements to maintain spare equipment to a level sufficient to provide timely replacements for normal failure rates.

- Mitigation of instances with violations or projected violations of the planning criteria.

- Purchase of corridor, station and/or substation sites as needed for other projects. Approved property purchases can also be associated with reasonable expected future needs.

Reasonable future conditions such as load growth, changes in regional and interregional system flow patterns and future generators much be considered when developing projects. The goal is to develop a robust transmission system today which can be efficiently expanded to reliably and economically accommodate tomorrow's load and generation patterns.

4.4 Voltage and Facility Loading Criteria

4.4.1 Generally Applicable Criteria

Table 2 – Transmission System Planning Standards

ITC*Transmission* Description	NERC Category	Allowable Load Loss [i]	Ratings Used	Load Level (MW)	Minimum Voltage[h]	Maximum Voltage[h]
System Normal [e]	A	none	normal	100%	97%	105% [b]
Single Generator (no Generators in proximity off in base case) [f]	B1	none	normal	100%	97%	105% [b]
Single Generator (with other generators in proximity off in base case) [f]	B1	none	emergency [c]	100%	92%	105% [b]
Single UG Cable [f]	B2	none [a]	emergency [c]	100%	92%	105% [b]
Single OH Line [f]	B2	none [a]	emergency [c]	100%	92%	105% [b]
Single Transformer [f]	B3	none [a]	emergency [c]	100%	92%	105% [b]
Bus Section [f]	C1	100 MW [j]	emergency [c]	100%	92%	105% [b]
Circuit Breaker [f]	C2	300 MW [j]	emergency [c]	100%	92%	105% [b]
Shutdown + Contingency [f,m]	B1, B2 or B3 [k]	none [a]	emergency [c]	85%	92%	105% [b]
Double Circuit Tower (DCT) [f]	C5	300 MW [j]	emergency [c]	100%	92%	105% [b]
Double Contingencies [d,f,m]		500 MW [j]				
1. After First Contingency (Prior to System Re-Adjustment)	C3	none[a]	emergency [c]	100%	Variable [g]	105% [b]
2. After First Contingency (After System Re-Adjustment)	C3	none[a]	normal	100%	Variable [g]	105% [b]
3. After Second Contingency (Prior to System Re-Adjustment)	C3	500 MW	emergency [c]	100%	Variable [g]	105% [b]
Extreme Contingencies [d,f]	D	no cascading	emergency [c]	100%	no cascading	no cascading

a) There may be some load loss in the event of the loss of a radial circuit, a transformer in direct series with a radial circuit or the loss of a load fed from a radial tap off of a network circuit provided the load lost was served directly by the outaged facility.
b) 110% in vicinity of power plants on 120kV.
c) The emergency rating applied shall be of an appropriate duration considering both the piece of equipment limited and the contingency studied.
d) The NERC Planning Standards consider a single category B event followed by operator intervention followed by another category B event as a category C event. The loss of two elements without time between for operator action is interpreted by ITC to be more severe than category C and is treated like an extreme contingency.
e) Normal Conditions include an appropriate set of scenarios that consider appropriate generators not in the dispatch
f) Emergency conditions include an appropriate set of scenarios that consider appropriate generators not in the dispatch in addition to the single, double and multiple transmission element outages. This would typically include at least a single generator dispatched off prior to applying the contingency under study.
g) Minimum voltage during a double contingency or an extreme contingency is determined by the minimum voltage required at power plants to avoid widespread cascading outages. The minimum voltage requirements vary from plant to plant.
h) Some buses have individual voltage limits. These are reviewed on a case by case basis.
i) The voltage limits listed are steady state voltage limits. Voltage control devices (tap changers, switched shunts, phase shifting transformers...) should be set to control during the analysis.
j) In no circumstance should the contingency result in automatic tripping of a circuit or safety violations.
k) Determined by contingent element

l) Allowable load loss is the sum of 1) any load lost directly following the event such as load fed radially off an outaged line and 2) any load shed to get within applicable limits.

m) Appropriate classification for multiple outages involving generators shall depend on the status of other generators in proximity in the starting case. For example, the shutdown of a generator and subsequent contingency shall be considered a "shutdown + contingency" should generation already be off in the proximity in the normal case. If generation is not off in the proximity in the base case, this shall be considered as a simple contingency.

The reactive reserve in an area (comprised of "unused" reactive capability of generators or shunt capacitors) should be monitored in studies to identify possible voltage collapse scenarios. Low reactive reserves may be an indication of being near the "knee" of the PV curve.

Post-contingency voltages including those for the NERC category C events should be high enough to ensure that there would be no motor stalling on the distribution system. Other related tests should be applied as appropriate to examine the system's susceptibility to voltage collapse.

When studying the system, generators shall be dispatched on a basis that considers committed resources, assumed economics, and probabilities of forced and scheduled generator outages. It may be appropriate to consider conditions with multiple generator units unavailable in an area especially if the conditions being studied may be prevalent for an extended period of time. Further, as appropriate, the system should be analyzed to consider vulnerability to the extended outage or the retirement of any particular generating unit or plant.

For any reasonably expected generation dispatch pattern, or a dispatch that represent an average condition, notwithstanding documented application of judgment to the contrary, projects should be proposed if the loading on system elements (overhead conductors, underground cables and/or station equipment), minimum voltages, maximum voltages, or the amount of load loss are outside of the applicable contingency category parameters as set forth in of Table 2 - Transmission System Planning Standards.

Allowable load loss includes any load lost with the contingency plus manual load shedding. The planning engineer should evaluate any location for reductions in load that would reasonably be expected to reduce loading on the limiting circuit.

4.4.2 Shutdown Conditions

For load levels below the maximum planned for load level with shutdowns (see Table 2 - Transmission System Planning Standards) it is expected that the shutdown of a single component would result in element loadings and system voltage with normal ranges as the system will be planned to be able to withstand a pre-existing shutdown of an element at or below a pre-determined load level. Further, it is expected that contingent loss of a component on top of the shutdown of a single component would result in element loadings and system voltages within emergency ranges.

When studying shutdown conditions, generators shall be dispatched on a basis that considers committed resources, assumed economics, and probabilities of forced and scheduled generator outages. It is assumed that during shutdowns, the Transmission System Operations will minimize the risk exposure of such outages. However, it may be appropriate to consider conditions with multiple generator units unavailable related to generator maintenance outages or long generator start up times.

There must be a significant, continuous time during the year when a system element can be shutdown for inspection, maintenance, adjacent hazard and/or element replacement. Planning studies must therefore evaluate the system under shutdown conditions using the maximum planned for load level with shutdowns (see Table 2 - Transmission System Planning Standards). The maximum planned for load level with shutdowns should periodically be re-evaluated to ensure that the application of that criterion is consistent with the requirement of having a significant, continuous time during the year when a system element can be shutdown for inspection, maintenance, adjacent hazard and/or element replacement.

4.4.3 Single Contingency Followed by Operator Action Followed by Another Single Contingency

The forced outage of a single generator, transmission circuit (or portion thereof) or transformer followed by operator interaction and then followed by another forced outage of a single generator, transmission circuit (or portion thereof) or transformer is considered to be a NERC Category C event. Under these conditions, no more than a pre-determined amount of Transmission System annual system peak load can be projected to be lost. This load loss considers intentional load shedding and the forced outage of load subsequent to the contingency. For load levels below the maximum planned for load level with shutdowns, it is expected that no load would be lost under these type of conditions as the system will be planned to be able to withstand the shutdown of an element plus the contingency loss of another element (see Table 2 – Transmission Planning Standards).

4.4.5 NERC Category D – Extreme Event

The Transmission System will be evaluated using a number of extreme contingencies that are judged by Planning to be critical. It is not expected that it will be possible to evaluate all possible facility outages that fall into NERC Category D. These events may involve substantial load and generation loss in a widespread area. These critical category D contingencies should not result in cascading outages beyond the Transmission System area and any immediately adjacent areas.

5 Stability Criteria

Stability is the ability of a turbine-generator or power system to reach an acceptable steady-state operating point following a disturbance. This requires that thermal loadings, load loss, and voltage following the disturbance are within the guidelines established in Table 2 – Transmission Planning Standards.

Pre-disturbance generation conditions should be selected to maximize generator real power, and minimize generator reactive power and voltage in the area where the disturbance is to be simulated. Power plants must maintain transient and voltage stability and have no adverse impact on the rest of the system when operating anywhere in the range from 0.90 lagging to 0.93 leading power. Where the generator does not have the capability to achieve the entire power factor range described above, it must be maintain stability throughout the actual feasible power factor range at the minimum generator voltage. Turbine-generator and system stability shall be maintained during and after the most severe of the contingencies listed below:

1. With the transmission system normal, a three-phase fault at the most critical location[a] with normal[b] clearing.
2. Simultaneous phase-to-ground faults on different phases of each of two adjacent transmission circuits on a multiple circuit tower, with normal[b] clearing.
3. A double phase-to-ground fault at the most critical location[a] with delayed[c] clearing.
4. With one element (transmission line, transformer, protective relay, or circuit breaker) initially out of service, a permanent three phase-to-ground fault at the most critical location[a].
5. A permanent phase-to-ground fault on a circuit breaker with normal clearing.

Generator minimum reactive limits should be determined based on the most severe post disturbance operating point that results from applying the stability criteria above. Generator minimum reactive limits are determined with and without the automatic voltage regulators in service.

a) Faults should be placed on generators, transmission circuits, transformers, and bus sections.
b) Normal clearing means that all protective equipment worked as intended and within design guidelines.
c) Delayed clearing means that a circuit breaker, relay or communication channel has malfunctioned or failed to operate within design guidelines. If the delayed clearing is due to a failure to operate, local and remote backup clearance is appraised.

6 Short Circuit Criteria

Short circuit currents are evaluated in accordance with industry standards as specified in American National Standards report ANSI C37.5-1981 for older breakers rated on the total current (asymmetrical) basis and American Standards Association report C37.010-1979 (Reaff 1988) for new breakers rated on a symmetrical current basis.

In general, fault currents must be within specified momentary and/or interrupting ratings for studies made with all facilities in service, and with generators and synchronous motors represented by their appropriate (usually sub-transient saturated) reactance.

7 Power Quality/Reliability Criteria for Delivery Points

Details of Power Quality and Reliability Criteria for Delivery Points are covered in the individual Interconnection Agreement Documents with the Load Serving Entities. The Planning Engineer shall propose projects as required in those agreements.

8 Voltage Deviation Standards

8.1 Capacitor Switching

The maximum percent change in system voltage under normal system conditions shall be 3% when sizing capacitor banks. Banks will also be sized to avoid harmonic resonance, if possible.

8.2 Loss of Generation

Over the normal generation availability range, with all transmission elements in service, the voltage change measured anywhere in the system shall be considered for a single generator tripping.

8.3 Loss of a Transmission Element

Over the normal generation availability range, the voltage change measured anywhere in the system shall be considered for a single transmission element tripping.

9 Coordination with Other Transmission Systems

9.1 Joint Planning

The Transmission System has interconnections with neighboring systems. These systems include neighboring transmission systems as well as distribution systems. ITC*Transmission* and Michigan Electric Transmission Company also participate in the regional reliability coordination group called Reliability*First*, and have therefore agreed to certain principles for system planning and operating established therein.

The contractual commitments with the interconnected neighbors, as well as the properties of interconnected operations require coordinated joint planning with others of not only the interconnection facilities, but also consideration of the networks contiguous to those interconnections.

9.2 Interchange Capability Criteria

Interconnections with other transmission systems are intended to facilitate the economic and reliability needs of generators and loads directly interconnected with the Transmission System. In addition, these interconnections can also support the economic and reliability needs of generators and loads not directly interconnected with the Transmission System. Interchange capability is the amount of power that can be transferred across transmission systems without exceeding transmission system facility limitations. Accordingly, the evaluation and planning of interchange capability is necessarily a joint effort by the concerned utilities.

The desired import capability based on Transmission System annual peak load is to be provided for network conditions as defined in NERC document "Transfer Capability, A Reference Document" for normal and first contingency single element outages. Single elements include any single generator, transmission circuit (or portion thereof) or transformer.

10 Special Protection Systems (SPS)

Special protection schemes (SPS) are occasionally employed in response to some abnormal condition or configuration of the electric system. The intent of these schemes is generally to protect equipment from thermal overload or to protect against system instability. The use of an SPS entails the risk that it will misoperate, possibly with very severe consequences as demonstrated historically by NERC major disturbance reports.

An SPS shall not be installed as a substitute for good system design or operating practices. SPS implementation shall be generally limited to providing protection for temporary conditions that may exist due to construction delays, unusual combinations of system demand and equipment outages or availability, or specific equipment maintenance outages. An SPS may be applied in more permanent applications to preserve system integrity in the event of severe, low probability, but still credible set of conditions. The decision to employ an SPS should take into account the complexity of the scheme and the consequences of misoperation as well as its benefits. An SPS shall not be installed where misoperation or failure results in an adverse impact outside the local area.

In no circumstances shall an SPS be installed to mitigate voltage criteria violations. An SPS shall not be installed on the System to mitigate external system stability violations or external thermal criteria violations.

Once an SPS has been placed in service, periodic reviews should be performed to ensure that the scheme is deactivated when the conditions requiring its use no longer exist or system improvements to remove the SPS are warranted.

Attachment 9
NRC3-10-0005

Enclosure 2

System Impact Study Report
(following 18 pages)

SYSTEM IMPACT STUDY REPORT
(MISO G867)

GENERATION INTERCONNECTION IN

MONROE COUNTY, MI

PREPARED BY:
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MING WU - ITCTRANSMISSION

JULY 21, 2008

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ATTACHED APPENDICES

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Disclaimer

The analysis contained in this report was performed with assumed data based on preliminary results from higher queue projects, conversations with the customer, and on data provided by the manufacturer for the actual units. This assumed data includes information for these study units, other units that may become operational, and any transmission upgrades associated with these interconnection requests. Actual machine and other equipment parameters do vary and can have an impact on performance not witnessed in the study results. Future situations that differ from the assumptions contained in this report may affect the interconnection and/or operation of the facility. ITC*Transmission* makes no guarantee that these or other factors not foreseen during the study will not impact the proposed generating site.

Furthermore, the models used for this study were based on expected topology and system conditions (load, generation dispatch, reactive devices, ect.) for the 2017 time frame. The assumptions made in the models came from the best information available as of the date of this report, and are speculative in nature. The proposed network upgrades required to connect the generator that are detailed in this report should be revisited as the in-service date of the plant gets closer and the topology and system conditions can better be predicted. Ultimately, a different set of upgrades may be required.

Introduction and Purpose

This report contains information on the study of the proposed interconnection of a 1563 MW Nuclear Turbine with the ITC*Transmission* transmission system in Monroe county of Michigan. This study was performed by ITC*Transmission* with contributions from Detroit Edison, Consumer's Energy, First Energy, AEP, and Wolverine.

The ITC*Transmission* system transfers power from power plants to local distribution systems. The ITC*Transmission* system also carries power resulting from transfers from power plants to loads across the Eastern Interconnection.

The purpose of this Interconnection Study is to give an indication of constraints on ITC*Transmission*'s system, Detroit Edison's system, and other neighboring systems arising from the proposed interconnection of the aggregate of the Nuclear Plant generation. These types of constraints include thermal equipment overloads, voltage criteria violations, breakers that exceed their rated capabilities and constraints related to maintaining system stability. In addition, this System Impact Study will provide a preliminary, good faith estimate of the nature, extent, and cost of the facilities that may be required to inject the output of the generator facilities to the grid. The constraints contained in this report were identified by analyzing various load flow, short circuit, and stability results.

1. Conclusions

The power flow studies show that the full output of the proposed Enrico Fermi Nuclear Turbine #3 does contribute to post contingency overloads on ITC*Transmission* facilities. The overloads were evident on the 345 kV, 230 kV and 120 kV systems near the points of interconnection. Transmission system enhancements will be necessary, and some sub-transmission upgrades may be required, in order to facilitate the interconnection of the proposed generation to the ITC*Transmission* system.

The addition of the proposed generator did increase the available fault current enough to put the existing 345 kV breakers at the Fermi switchyard near their interrupting capabilities. Therefore the new Fermi 3 switchyard will have to be electrically separate from the existing Fermi 2 switchyard, or else all the breakers at the Fermi #2 switchyard will have to be replaced and stability issues will arise.

Based on the assumptions contained within this report including the ability of the Nuclear plant to maintain its stated power factor capabilities, it is not expected that the proposed plant would cause any steady state voltage violations. However, if any or all of the assumptions made in this study with regard to the Generator and Interconnection Facilities change, there will be a further review necessary to determine the additional reactive requirements for the proposed interconnections.

Stability results have shown several fault scenarios at both Milan Station and the new Fermi #3 switchyard caused the Fermi #3 unit to become unstable. Therefore it was necessary to keep the

Fermi 3 and Fermi 2 switchyards separated, construct a 3rd line to Milan, and to configure both Milan and the Fermi 3 switchyard as shown on the one line in appendix A.

There are several network upgrades that will be required to facilitate the interconnection of the Nuclear Plant. These would include building a new 345 kV station at Fermi, expanding the existing 345 kV station at Milan, cutting the existing 345 kV Lemoyne-Majestic circuit into Milan, and Constructing 3 new 345 kV circuits from the new Fermi station to Milan station. A one line of these upgrades can be found in appendix B, and the preliminary cost estimate for these upgrades is $97.1 Million.

MISO subsequently completed the required Deliverability Analysis for this project to be granted Network Resource Interconnection Service. Their analysis did not find any additional constraints requiring mitigation with the previously identified network upgrades modeled. Thus, the project is deemed to be fully deliverable (1563 MW) contingent upon the Network Upgrades identified in this study report.

Neighboring utility First Energy Corp. performed a short circuit review at selected substations on their transmission system to capture the effect on breaker interrupting duties as a result of the new Fermi #3 unit and the proposed network upgrades. No breakers were found to be overdutied on the FE system.

The neighboring regional transmission organization, PJM Interconnection, was also given an opportunity to review ITC*Transmission*'s study and subsequently confirmed that this project did not impact any of their facilities and no additional analysis would be required on their system.

2. STUDY SUMMARY

2.1 STUDY METHODOLOGIES

Thermal Loading and Voltage Studies

The ITC*Transmission* system was analyzed for thermal and voltage limitations for normal and post contingency conditions via power flow analysis using PTI's PSS/E and MUST power flow and contingency analysis simulation tools.

A table containing information on the Nuclear Plant proposing to connect to the ITC*Transmission* system can be found in Appendix A. A description of the models used for this analysis can be found in Appendix C.

The base case for this analysis was developed using the 2006 series RFC model for 2016 system conditions with ITC*Transmission*'s 2017 internal model inserted and scaled to match the current 2017 load forecast. The base case represents the expected system configuration and loading in 2017 including those ITC*Transmission* projects which are planned, meaning they have budgetary approval. The DTE subtransmission system used by ITC*Transmission* represents the system as given to ITC*Transmission* for the summer 2007 case building process and does not include any planned upgrades on the DTE system beyond that time. Because there are about 1107 MW of firm transmission reservations on the ties between ITC*Transmission* and Canada, the 4 phase shifting transformers between ITC*Transmission* and Canada were modeled as controlling flow in and out of ITC*Transmission* to about 1107 MW. This flow was distributed 1/6, 1/3, 1/3, and 1/6 across the B3N, L51D, L4D, and J5D interconnections respectively in the base case.

In order to determine the total amount of generation from the Nuclear Plant in aggregate that could be accommodated via the existing system, a transfer from the Nuclear plant in aggregate to all units within the MISO service territory (excluding ITCTransmission) was performed. Phase shifting transformers were held to constant flow during the transfer and at a fixed angle for contingencies and 0.5% Power Transfer Distribution Factor (PTDF) and Outage Transfer Distribution Factor (OTDF) cut offs were used.

There are several generators feeding the 345 kV in the area that the Nuclear Plant is requesting to interconnect. For the base case, the units were modeled as controlling voltage as follows:
Fermi 2 – Controlling the Fermi2 345 kV bus to 1.042 pu (359.5 kV)
Monroe 1 and 2 – Controlling the Monroe12 345 kV bus to 1.0333 pu (356.5 kV)
Monroe 3 and 4 – Controlling the Monroe34 345 kV bus to 1.0333 pu (356.5 kV)
This is consistent with the Generator Bus Voltage Schedule for peak conditions as required by NERC VAR-001-1 effective February 2, 2007. The voltage schedule for all units is subject to change.

The Nuclear Plant was modeled with MVAR capabilities based on the capability curves for these turbines provided by the interconnection customer. The G867 Nuclear Plant was modeled as attempting to hold a voltage of 1.041 pu (395.3 kV) at the point of interconnection. The study did not show any additional reactive requirements to meet ITC *Transmission*'s voltage criteria, or expected voltage schedule for this project. This finding is based on the turbine and transformer information provided by the developers. The results are subject to review and may vary if any significant changes to these assumptions occur.

Voltage analysis for the ITC*Transmission* system was performed utilizing transformer tap adjustments, applying generator VAR limits immediately, allowing switched shunts to regulate, locking phase shifting transformers, and disabling area interchange post contingency. Some switched shunts in the area were turned on pre-contingency in cases with a generator out prior to the contingency.

Cost Sharing

The total ITC*Transmission* cost estimate for the proposed upgrades was broken down into individual overhead sections and substation work. The Network Upgrades on ITC's system identified for G867 are subject to the credit according to the Article 11 of LGIA and Attachment FF of the MISO tariff.

Short Circuit Studies

ITC*Transmission*'s internal short circuit model was utilized to determine any breaker duty issues caused by the interconnection of the proposed Nuclear Plant. ITC*Transmission* utilizes Aspen Inc.'s OneLiner and Breaker Rating Module software tools to perform short circuit analysis. A subtransient reactance of 0.00923 per unit (on a 100 MVA base) was assumed for the proposed Nuclear Plant. If a more accurate subtransient reactance is determined a re-evaluation of the short circuit study will be necessary in order to verify the results contained within this report.

Breaker duties were determined for ITC*Transmission*'s planned system and then compared to those after the Nuclear Plant's interconnection and system upgrades required to support the aggregate of the proposed Nuclear Plant.

Stability Studies

ITC*Transmission's* transmission system stability standards are considered over a wide range of normal and contingency operating conditions. The procedure used, analyzes a range of test conditions, provides reasonable means of stressing the system to determine its stability limits, and consistently measures the dynamic impact of any new or increased generation capacity.

In accordance with the ITC*Transmission* planning criteria, the system was tested covering a range of probable power plant operating conditions, from 0.93 leading power factor to 0.90 lagging power factor, for generator and system dynamic response. All five ITC*Transmissio*n transmission criteria disturbance types were analyzed to test for plant and system dynamic stability. These dynamic fault clearing simulation tests included:

1. Three phase bolted faults with normal clearing by primary breakers and relays.
2. Simultaneous L-G faults on separate phases of separate circuits of multi-circuit tower lines with normal clearing by primary breakers and relays.
3. Double L-G faults with delayed clearing by backup breakers as a result of failure of a breaker to operate for any reason.
4. Three phase bolted faults with normal clearing by primary breakers and relays with a prior system element out of service.
5. Single L-G faults on breakers with normal clearing.

In addition, the faults of sudden loss of single critical generation were also simulated in the stability study.

Stability analysis was performed on ITC*Transmission*/METC 2017 80% model with the proposed Enrico Fermi3 nuclear unit and projected network upgrades included. The dynamic models and data for Enrico Fermi3 unit were provided by the customer. The other necessary dynamic models were obtained from the 2006 series RFC dynamics database. The tests under this assessment are performed as is for design purposes, for testing of the ITC*Transmission* transmission system and establishing generating plant/unit stability assessment against the ITC*Transmission* transmission testing criteria. No assurance is made that any of these simulated stability tests exactly represent the actual operating world.

The dynamic tests are performed in an effort to identify any potential instability or reduced margin of stability with the interconnection of the specific Enrico Fermi nuclear plant under study and its effect on the transmission system and other existing generating units' transient performance. Limits to plant design and/or output capacity or changes in the system and/or generator design parameter restrictions may have to be imposed to provide stability margins to meet the stability testing criteria. Such limits may include restrictions on total site capacity to avoid unit and plant instabilities, area load/generation capacity limitations and other remedies to ultimately avoid uncontrolled cascading system outages for less probable, but more severe disturbances required of the ITC*Transmission*, RFC, and NERC planning standards.

This study focused on the design requirements for the interconnection of the proposed Enrico Fermi 3 nuclear unit with the ITC*Transmission* transmission system. The study did not directly address nor perform any engineering for any of the work that the Enrico Fermi 3 nuclear unit may have to undertake to design the combined generator, step-up transformer station and attendant facilities at the plant for operation across the capacity ranges. This study, therefore, does not address any issues regarding proper design, engineering, operation or protection of the proposed Enrico Fermi 3 nuclear unit. The scope of this study was strictly limited to determining the impact that the operation of the Enrico Fermi 3 nuclear unit, at its maximum output, would have on the overall system.

Stability simulations were carried out using the PTI PSS/E suite of system simulation programs. All main disturbance simulations were run out for 10 seconds total duration and analyzed for transient stability and to access specific potential dynamic concerns (post transient). All local ITC*Transmission* transmission connected generating plants and units were monitored via output channels in each stability disturbance case run.

Significant to the simulation of the various disturbances are inherent system switching events that occur during and after fault and disturbance application. These events are modeled in a transient period and represent breaker-switching events controlled by system relaying for each system element involved in the disturbance. The switching events simulated include normal and back-up relay controlled breaker switching as well as breaker failure relay operation events. Since the disturbance simulation period covers up to 10 seconds after the initial disturbance application, no steady state control events are simulated that would only operate after a more lengthy time delay. Breaker-switching events are represented/simulated as they would actually occur in the system in real time, and as the control systems are designed. In general, these are represented by switching events at times based on total breaker clearing time and vary by system voltage level and type of relay system in use.

The 345 kV higher voltage system in ITC*Transmission* transmission system exclusively uses a pilot type relaying scheme and the clearing times simulated were 4 cycles for local and remote normal clearing, and 12 cycles for local and remote delayed clearing. The 120 kV and 230 kV systems also use a pilot type relaying scheme and the clearing times simulated were 6 cycles for local and remote normal clearing, and 16 cycles for local and remote delayed clearing. On the ITC*Transmission* transmission system, switching events were simulated as they actually occur including the inadvertent splitting of buses, line connections through middle breakers at ring busses and breaker and a half substations, inadvertent tripping of adjacent lines for breaker failure events and full bus clearing for bus faults.

2.2 INTERCONNECTION OF GENERATOR(S)

G867 is currently proposing to connect to the 345 kV at the Enrico Fermi Station in Monroe County, MI. See Appendix B one-line of interconnection facilities.

2.3 EXISTING GENERATION IN INTERNATIONAL TRANSMISSION COMPANY

In performing the studies for this report, existing power plants in the ITC*Transmission* area are connected as follows:

At 120 kV

- Conners Creek Units #15 & 16
- Harbor Beach Unit #1
- River Rouge Units #1, 2 & 3
- St. Clair Units #1 through #4
- Trenton Channel Units #7, 8, & 9
- Various Peakers
- Various Wind Farms
- Judd Units
- Dean Units

At 230 kV

- DIG Units

At 345 kV

- Belle River Units #1 & 2 and three Belle River Peakers
- Enrico Fermi Unit #2
- Greenwood Unit #1 and three Greenwood Peakers
- Monroe Units #1, 2, 3, & 4.
- St. Clair Units #6 & 7

2.4 OTHER PROSPECTIVE GENERATION

Four Units from earlier queued projects were also included in the models used to perform the impact study. The units included were as follows:

At 120 kV

- G503 Wind Farm

At 138

- G766 Wind Farm

At 345

- G687 Coal Plant

- G809 Expansion of Existing Coal

All earlier queued projects can be found on MISO's LGIP queue:

http://www.midwestmarket.org/publish/Document/2a74f7_108e84afbec_-74050a48324a

2.5 ITC*Transmission* – Hydro One Interface

The ITC*Transmission* interface with Hydro One (Canada) is planned to be controlled via four phase shifting transformers. In the past, these transformers have been normally modeled as controlling flow between ITC*Transmission* and Hydro One to 0 MW in ITC*Transmission* base case development. However, per the MISO transmission service process, it was determined that about 1107 MW of firm transmission reservations are available between ITC*Transmission* service territory and Canada. Because of this, it was necessary to model these firm reservations in the base models for this System Impact Study. It should be noted that these firm reservations are also now being modeled in MISO's base case development for there MTEP (Midwest ISO Transmission Expansion Planning) process.

2.6 Intermediate Load Analysis

At 85% of peak load, ITC*Transmission*'s criterion requires the ability to take the shutdown of one piece of equipment and be able to withstand any single contingency. Because of this, it was necessary to also analyze the system for off peak conditions.

80% peak load cases were developed for the Intermediate Load analysis. These models were used for both the transient stability analysis and shut down plus contingency off peak thermal analysis. ITC*Transmission* system load was scaled down from 100% and imports into ITC*Transmission* from METC were scaled back to offset the decrease in loads. METC load was also scaled down to 80% if its peak value. Generation in METC was scaled down to match the lower load level.

3. Discussion of Results

3.1 Power Flow Evaluation

Thermal Loading

The performance of the existing ITC*Transmission* system was analyzed with the load flow models as described in Appendix C. Tables for all ITC*Transmission* peak and 80% cases thermal results can be found in Appendix D.

For all cases (system as planned for 2008) with the proposed Nuclear Plant operating at 100% capacity the following normal overloads would occur.

ITC*Transmission* Normal Overloads:

No normal overloads were identified on the ITCTransmission system for the addition of the G867 Nuclear Plant

ITC*Transmission* Emergency Overloads:

The circuits listed below become overloaded under various contingency scenarios (the worst single contingency overload is listed below for the ITC*Transmission* system).

1. Fermi to Brownstown #2 overloads to 113% of its emergency rating of 2333 MVA for the loss of Fermi to Brownstown #3, under peak load conditions.
2. Fermi to Brownstown #3 overloads to 131.2% of its emergency rating of 2007 MVA for the loss of Fermi to Brownstown #2, under peak conditions.

The ITCTransmission system modeled for the FCITC calculation assumed all the higher queued units in place, and the FCITC results may vary with changes to the queue. Based on the FCITC analysis of a transfer from the Nuclear plant to all units within the MISO system (excluding ITC), the 2008 ITCTransmission system modeled with 1107 MW in both directions on the ITCT to Canada interface and one dispatch scenario analyzed could support about 865 MW of generation from the Nuclear Plant in this study. This number strictly looks at limits on the ITCTransmission system, and neglects limits on the sub-transmission network. If sub-transmission limits are honored, the FCITC may be reduced.

Voltage Analysis

This analysis was performed using the peak load models with and without the new Nuclear Plant modeled. No new voltage criteria violations were identified with the aggregate Nuclear Plant generation added to the model. See Appendix E for further detail

Intermediate Load Analysis Sensitivity

Contingency analysis was performed with the 80% peak load model and the overloads are identified below. This included testing the ITC*Transmission* system for ITC*Transmission's* shut down plus contingency criteria. See Appendix F for further detail.

1. The Brownstown 345/230 kV transformer 302 overloads to 131% of its emergency rating of 858 MVA for the shutdown plus contingency of Fermi to Brownstown #3 and Victor to Lenox 120 kV, under 80% peak conditions.
2. Brownstown to Elm overloads to 106.7% of its emergency rating of 853 MVA for the shutdown plus contingency of Brownstown transformer #304 and Fermi to Brownstown #3, under 80% peak conditions.
3. The Brownstown 345/120 kV transformer 304 overloads to 106.6% of its emergency rating of 700 MVA for the shutdown plus contingency of Fermi to Brownstown #3 and Brownstown to Elm/Rotunda, under 80% peak conditions.

3.2 CIRCUIT BREAKER DUTY EVALUATION (SHORT CIRCUIT)

A comparison of circuit breaker fault duty of the currently planned ITC*Transmission* system vs. the planned system including the proposed Nuclear Plant and all system enhancements identified as necessary in the thermal and voltage analysis sections of this report was performed. No breakers on the ITCTransmission system violated their interrupting capability with the new generator and system upgrades in place.

3.3 SYSTEM STABILITY EVALUATION

The 2017 ITC*Transmission*/METC 80% peak load case was adopted in the stability study. This case was developed by inserting 2017 ITC*Transmission*/METC 80% peak load and system conditions into 2006 series MMWG/ECAR case. The 2017 ITC*Transmission*/METC 80% peak load case simulated the distribution system in detail. The study analyzed the system dynamic performance at two possible extreme ends of the power factor range for Enrico Fermi nuclear plant, 0.92 lagging and 0.93 leading as measured at the high voltage side of Enrico Fermi2 22/345 kV GSU2A2B and Enrico Fermi3 27/345 kV GSU3A3B. The future Enrico Fermi nuclear plant includes existing 1148 MW Enrico Fermi2 unit and proposed 1563 MW Enrico Fermi3 unit

The load flow cases for 0.92 lagging power factor condition and 0.93 leading power factor condition were summarized in *Appendix L*. The machine terminal voltages of Enrico Fermi2 and Enrico Fermi3 units were set at lower levels but not below 0.95 PU and at full electrical power output. In general, this is the least stable condition for a generating machine.

It was shown in *Appendix L* that two load flow cases were tested for 0.93 leading power factor condition, the first case is that Enrico Fermi3 27 kV voltage was set to be 0.9588 PU and the second case is the voltage was set to be 0.9733 PU. The stability faults were tested around the switchyards of Enrico Fermi3 345 kV, Milan 345 kV, Enrico Fermi2 345 kV, Brownstown 2 345 kV and Brownstown 3 345 kV. The breaker/relay configurations for the above switchyards were presented in *Appendix B*.

The detailed descriptions of the stability fault scenarios were tabulated in *Appendix M* and the stability simulation results were summarized in *Appendix N*. The dynamic simulation plots were presented in *Appendix O* for 0.92 lagging power factor condition and in *Appendix P* for 0.93 leading power factor case. For 0.93 leading power factor condition, the plots for Double-Phase to Ground Faults with Delayed Clearing due to Stuck Breaker were the simulation results for the case when Enrico Fermi3 27 kV voltage was set to be 0.9733 PU and the plots for the rest stability faults were for the case when Enrico Fermi3 27 kV voltage was set to be 0.9588 PU as shown in *Appendix L*.

The following variables were monitored in the dynamic simulations:

1. The generator Rotor Angle in Degrees, Shaft Speed Deviation in PU, Terminal Voltage in PU, Real/Reactive Power Output in 100 MW/100 MVAR for the selected generating units of Enrico Fermi2, Enrico Fermi3, Monroe 1, Monroe 3, Trenton Channel 9 and Judd 1.
2. The Bus Voltage in PU for the selected 345 kV buses of Enrico Fermi2, Enrico Fermi3, Milan, Brownstown 2 and Brownstown 3, as well as the 120 kV bus of Enrico Fermi.

In conclusion, the stability simulation results conducted following the ITC*Transmission* transmission planning criteria do not indicate that the proposed Enrico Fermi3 unit will post significant adverse impacts on the dynamic performance of Enrico Fermi2 unit and ITC*Transmission* transmission system. Enrico Fermi3 unit can maintain its stability for all the tested stability contingencies on the designed breaker/relay configurations and schemes around Enrico Fermi3, Milan, Enrico Fermi2, Brownstown 2 and Brownstown 3 345 kV switchyards shown in *Appendix B*. The observations and recommendations drawn from stability study results are summarized as follows:

1. The existing Majestic to Lemoyne 345 kV line must be looped into Milan 345 kV switchyard. Combining with the existing Milan to Majestic 345 kV line and Milan to Lulu 345 kV line, this will provide strong and needed interconnection support to Ernico Fermi 3 unit to maintain its stability.
2. The operational restriction for Enrico Fermi3 27 kV is that the operational voltage can not be dropped below 0.975 PU. The simulation results showed that if the voltage is set to be 0.9588 PU under 0.93 leading power factor condition, for the double-phase to ground fault at Milan to Lulu 345 kV CKT 1 with delayed clearing due to stuck breaker CF or CM at Milan 345 kV switchyard, Enrico Fermi3 unit can not maintain its stability. The instability simulation plots were shown in *Appendix Q*.
3. There must be three lines connected Enrico Fermi3 345 kV switchyard to Milan 345 kV switchyard. If there were only two lines, then for the double-phase to ground faults with delayed clear due to stuck breaker at Enrico Fermi3 345 kV switchyard or at Milan 345 kV switchyard that tripped anyone of the two Enrico Fermi3 to Milan 345 kV lines, Enrico Fermi3 unit became unstable.
4. Any two of the three Enrico Fermi3 to Milan 345 kV lines can not be in the same row/column at Enrico Fermi 345 kV switchyard or Milan 345 kV switchyard that separates the two lines by only one breaker. This is to avoid the instability situation for Enrico Fermi3 unit if two Enrico Fermi3 to Milan 345 kV lines were tripped by double-phase to ground fault with delayed clear due to stuck breaker at Enrico Fermi3 345kV switchyard.
5. Milan to Lulu 345 kV CKT 1 can not be in the same row/column at Milan 345 kV switchyard with Milan 345/120 kV XFMR or Milan to Enrico Fermi3 345 kV lines or Milan to Majestic 345 kV lines that separates the two lines by only one breaker. Milan to Lulu 345 kV line carried a significant amount of reactive power from Monroe power plant into Milan to support Enrico Fermi power plant operating at 0.93 leading power factor conditions. Enrico Fermi3 unit became unstable if Milan to Lulu 345 kV CKT 1 plus any of the above lines/XFMR were tripped by double-phase to ground faults with delayed clear due to stuck breaker at Milan 345 kV.
6. Anyone of the two Milan to Majestic 345 kV lines can not be in the same row/column with anyone of the three Milan to Enrico Fermi3 345 kV lines at Milan 345 kV

switchyard that separates the two lines by only one breaker. Enrico Fermi3 unit became unstable if one Milan to Majestic 345 kV line plus one Milan to Enrico Fermi 3 345 kV line were tripped by double-phase to ground faults with delayed clear due to stuck breaker at Milan 345 kV.

7. Enrico Fermi3 unit initial constant (H) data supplied by the customer ranges from 4.84 to 6.00 kW sec/kVA. In the stability simulation, 4.84 kV sec/kVA was selected as the initial constant for Enrico Fermi3 unit to represent the least stable condition for a generating machine. The simulation results showed that although larger initial constant (H = 6.00 kW sec/kVA) did increase the stability margin of Enrico Fermi 3 unit, it was not sufficient to reverse the observations, recommendations and conclusions drwan from the stability study.

The stability study contained in this report was performed with the assumed data suggested by the customer. Actual machine and other equipment parameters do vary and can have an impact on performance not witnessed in the stability study results. Future situations that differ from the assumptions contained in this report may affect the observations, recommendations and conclusions. ITC*Transmission* makes no guarantee that these or other factors not foreseen during the study will not impact the proposed observations, recommendations and conclusions.

4. GOOD FAITH ESTIMATE OF FACILITY UPGRADES – ITC*TRANSMISSION*

Implementing system upgrades can alter the flows on and between the transmission and subtransmission systems. For this reason, testing solutions for criteria violations can be an iterative process. The upgrades discussed in this section are an estimation of the upgrades that may be required in order to mitigate all of the thermal, voltage, short circuit, and/or stability violations discussed above. It is possible that a different set of upgrades may ultimately be implemented to address the identified overloads. This will depend on several factors including any unforeseen network changes that occur before the 2017 In-Service Date of the Nuclear Plant.

Because the total power produced by the proposed Nuclear Plant exceeds the capability of the existing 345 kV system and the underlying 230 kV and 120 kV systems in the area of the ITC*Transmission* footprint, transmission upgrades would be necessary in order to facilitate the maximum capability of the proposed Nuclear Plant. System upgrades would include constructing the 345 kV Fermi #3 switchyard, building 3 new 345 kV circuits from the Fermi #3 switchyard to Milan Station, cutting the existing Lemoyne-Majestic 345 kV line into Milan station, and expanding Milan to accommodate the additional lines.

A non-binding high level estimate for the necessary system upgrades would come in at around $97.1M. See Appendix H for further detail. This estimate however is subject to change depending on actual system enhancements required, timing of the project, and actual equipment costs at the time the project would start. It is estimated that the system enhancements would take up to 36 months to complete and would depend on various issues including but not limited to; securing the necessary rights-of-way, equipment availability and deliverability lead times, other maintenance or construction schedules, weather, outage requirements, and possibly generator availability. Construction of the proposed system upgrades would require extended outages that will be very difficult to obtain and coordinate.