Fermi2LRANPEm Resource

From: Randall D Westmoreland [westmorelandr@dteenergy.com]
Sent: Monday, May 04, 2015 3:46 PM
To: Keegan, Elaine
Cc: Lynne S Goodman; Kevin P Lynn
Subject: Draft SAMA Response
Attachments: draft NRC-15-0045 (SAMA Set 3) 05-04-15.pdf

Elaine,

Please find the attached draft SAMA response that we discussed on our call today.

Regards,
Randall Westmoreland
DTE Electric Company
Major Enterprise Projects
Technical Expert
Fermi Office: 734-586-1445
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CARING ABOUT THE ENVIRONMENT IS THE NATURE OF OUR JOB.

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10 CFR 54

May XX, 2015
NRC-15-0045

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) DTE Electric Company Letter to NRC, "Fermi 2 License Renewal Application," NRC-14-0028, dated April 24, 2014 (ML14121A554)

3) DTE Electric Company Letter to NRC, "Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Severe Accident Mitigation Alternatives," NRC-15-0013, dated January 9, 2015 (ML15009A358)

4) DTE Electric Company Letter to NRC, "Response to NRC Request for Additional Information for the Environmental Review of the Fermi 2 License Renewal Application – Severe Accident Mitigation Alternatives Set 2," NRC-15-0023, dated March 5, 2015 (ML15064A099)

5) NRC Letter, "Request for Additional Information for the Environmental Review of the Fermi 2 License Renewal Application – Severe Accident Mitigation Alternatives," dated April 9, 2015 (ML151509A945)

Subject: Response to NRC Request for Additional Information for the Environmental Review of the Fermi 2 License Renewal Application – Severe Accident Mitigation Alternatives Set 3

In Reference 2, DTE Electric Company (DTE) submitted the License Renewal Application (LRA) for Fermi 2. In References 3 and 4, DTE responded to NRC staff requests for additional information (RAIs) regarding the Severe Accident Mitigation Alternatives (SAMA) of the Fermi 2 LRA. The NRC staff issued a follow-up RAI

letter on SAMA in Reference 5. Enclosure 1 to this letter provides the DTE response to the RAI letter in Reference 5.

Enclosure 2 provides a CD containing the electronic input and output files requested in Question 3 of Reference 5. DTE has verified with the applicable vendor that the enclosed input and output files do not contain any information considered proprietary. The file format and names on the enclosed CD do not comply with the requirements for electronic submission to the NRC, but were requested by the NRC staff in the native format required by the associated software.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Lynne Goodman at 734-586-1205.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May XX, 2015

Vito A. Kaminskas
Site Vice President
Nuclear Generation

Enclosures: 1) DTE Response to NRC Request for Additional Information for the Environmental Review of the Fermi 2 License Renewal Application – Severe Accident Mitigation Alternatives Set 3
2) CD Containing Input and Output Files Requested by Severe Accident Mitigation Alternatives Set 3 Question 3

cc: NRC Project Manager w/o Enclosure 2
NRC License Renewal Project Manager w/o Enclosure 2
NRC License Renewal Environmental Project Manager
NRC Resident Office w/o Enclosure 2
Reactor Projects Chief, Branch 5, Region III w/o Enclosure 2
Regional Administrator, Region III w/o Enclosure 2
Michigan Public Service Commission,
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Electronic Licensing Library (ELL) (200 TAC) w/o Enclosure 2
Information Management (140 NOC) w/ Enclosure 2
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NRR Chron File w/o Enclosure 2
NSRG Administrator (210 NOC) w/o Enclosure 2

Enclosure 1 to
NRC-15-0045

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

DTE Response to NRC Request for Additional Information for the Environmental Review of the Fermi 2 License Renewal Application – Severe Accident Mitigation Alternatives Set 3

Question 1 [March 5, 2015, RAI 3 Response (relating to January 9, 2015 response to RAI 2g.iii)]

a) In Table 3-5 (p. 14) the cost of SAMA 152 is erroneously given as $1,000,000. The cost should be $100,000 (as noted in ER Table D.2-1). Provide a refined analysis similar to those in Table 3-6.

b) The assessment of the 3.14E-09/year undercounting of Class IIA accident sequences in the ER cost/benefit analysis discussed in RAI 2 will impact the adjusted cost benefits in the response to RAI 3. Account for this undercounting in assessing the impact of the inclusion of Class IIA sequences in the same release category as the Class IV sequences.

Response:

a) In Table 3-5 of the DTE RAI response dated March 5, 2015 (NRC-15-0023), the implementation cost of SAMA 152 was incorrectly identified as $1,000,000. The correct value is $100,000 (as listed in ER Table D.2-1). SAMA 152 has been added to the SAMA candidates receiving a refined analysis, similar to that performed in Table 3-6 of NRC-15-0023, provided in the response to Question 1(b) below (see Table 2-2).

b) Questions 1(a) and 1(b) are both addressed in this response (i.e., the implementation cost of SAMA 152 is corrected (response to Question 1(a)) in the revised cost-benefit analysis performed in this response to Question 1(b)).

In NRC-15-0023, DTE responded to RAI 2 which related to the undercounting of the Class IIA frequency and performed sensitivity evaluations conservatively assuming that all the undercounted frequency (3.14E-09/yr) was associated with the H/E release category. In NRC-15-0023, DTE separately responded to RAI 3 addressing combining Class IIA sequences with Class IV sequences in the H/E release category. The potential impact of including Class IIA sequences in the H/E release category was evaluated using conservative consequence assumptions (i.e., using bounding offsite dose and economic cost values). The DTE response to RAI 3 in NRC-15-0023 did not include consideration of the additional 3.14E-09/yr frequency addressed in RAI 2 in NRC-15-0023. This present RAI response considers the potential impact of the additional frequency discussed in RAI 2 (from NRC-15-0023) using the general methodology of RAI 3 (also from NRC-15-0023).

To address the additional 3.14E-09/yr frequency identified in Question 1(b), Table 3-6 of the DTE RAI responses in NRC-15-0023, is revised to include an additional frequency of 3.14E-09/yr. Additionally, the scope of SAMAs considered in Table 3-6 of NRC-15-0023 is expanded to include a refined analysis for all the SAMA candidates that were listed in Table 3-5 of that same RAI response (i.e., SAMA candidates that may have an impact on Class IIA sequences). This expanded list of SAMAs includes SAMA 152, thereby addressing Question 1(a).

The additional 3.14E-09/yr frequency associated with the release undercount is added to the original Class IIA H/E release frequency of 5.32E-08/yr, provided in Table 3-2 of NRC-15-0023, RAI 3. The addition of this 3.14E-09/yr frequency to the Class IIA H/E release category is conservative since it would be expected that this additional frequency would be distributed among various release categories that contain Class IIA sequences. The new Class IIA H/E frequency is 5.32E-08/yr + 3.14E-09/yr = 5.63E-08/yr, as provided in Table 2-1 below, which represents an update of Table 3-2 from the previous RAI response.

For each of these relevant SAMAs (i.e., from Table 3-5 of NRC-15-0023), the general methodology discussed in RAI 3 and presented in Table 3-2 and Table 3-6 of NRC-15-0023 was maintained and the Class IIA H/E frequency was updated to account for the 3.14E-09/yr additional frequency. Table 2-2 of this response presents the updated version of Table 3-6, with the following aspects noted:

1. The general methodology of Table 2-2 calculates the H/E Class IIA frequency and H/E "Other" frequency that is reduced due to the SAMA candidate. For all SAMA candidates except 78 and 123 (which are discussed separately below), this reduction in frequency is based on a detailed cutset summation. The overall percent reduction of the Class IIA H/E release category is calculated and included as the third column of Table 2-2, "Class IIA Percent Reduction."
2. In order to calculate the Adjusted Cost Benefit for each SAMA (column 10 of Table 2-2) , the fraction of Class IIA frequency reduction for this SAMA candidate is applied to the new (higher) Class IIA H/E release category frequency which includes the 3.14E-09/yr additional frequency identified in the RAI. This assumes the SAMA Class IIA frequency reduction for the additional 3.14E-09/yr frequency is the same as the base Class IIA H/E release category. This assumption is judged reasonable. The H/E "Other" release category frequency and contribution to the Adjusted Cost Benefit remains the same.
3. The general methodology highlighted in Table 2-2 is used to calculate the new (higher) Adjusted Cost Benefit for comparison to the SAMA Implementation Cost. The higher Adjusted Cost Benefit is due to the increase in the Offsite Benefit portion. The Onsite Benefit portion remains unchanged. Onsite Benefit is calculated based on Level 1 CDF rather than Level 2 release category frequency. The 3.14E-9/yr undercounting is due to postulated undercounting of Level 2 frequency not Level 1 CDF.
4. An uncertainty factor of 2.5 is applied to the Adjusted Cost Benefit to account for 95% CDF uncertainty (column 11 of Table 2-2).

For the original SAMA analysis, SAMA 78 (Flooding of the DW head seal) was assumed to eliminate all Class II or Class IV accident sequences with large drywell failures. This SAMA was the subject of an RAI (i.e., RAI 6.f). DTE provided a revised benefit and implementation cost estimate in the response to RAI 6.f, dated January 9, 2015 (NRC-15-0013). Table 2-2 incorporates the revised values associated with the RAI 6.f response for SAMA 78. For this present analysis, SAMA 78 is assumed to eliminate all the H/E Class IIA frequency (i.e., Class IIA Percent Reduction of 100%).

For the original SAMA analysis, SAMA 123 (Filtered Containment Vent) was assumed to

decrease the concentration of all radionuclides (excluding noble gases) by 50% (i.e., there was no change in core damage frequency or release category frequency calculated). For this present analysis, SAMA 123 is conservatively assumed to eliminate all the H/E Class IIA frequency (i.e., Class IIA Percent Reduction of 100%). This approach bounds the 50% radionuclide concentration reduction.

Review of Table 2-2 Adjusted Cost Benefits and Implementation Costs indicates that these SAMA candidates have significant margin to being potentially cost beneficial. These SAMA candidates remain not cost beneficial even if the 95% uncertainty sensitivity factor (2.5) is included in the cost benefit calculation.

Table 2-1
FERMI 2 SAMA DOSE RISK AND COST RISK WITH SEPARATE CLASS IIA H/E RELEASE CATEGORY

Characteristics of Release Mode		Population Dose	Offsite Economic Cost	Population Dose Risk	Offsite Economic Cost Risk
Release Category		yr^{-1}	person-rem	$	person-rem/yr	$/yr
H/E-BOC		5.93E-08	2.18E+07	3.03E+10	1.29E+00	1.80E+03
H/E	Class IIA	5.63E-08	2.18E+07	3.03E+10	1.23E+00	1.71E+03
	Other	2.60E-07	8.10E+06	2.80E+10	2.11E+00	7.28E+03
H/I		7.20E-08	9.52E+06	5.26E+10	6.86E-01	3.79E+03
H/L		2.46E-10	8.98E+06	1.67E+10	2.21E-03	4.11E+00
M/E		6.17E-08	2.48E+06	8.39E+09	1.53E-01	5.18E+02
M/I		3.71E-08	2.76E+06	6.10E+09	1.03E-01	2.27E+02
L/E		4.36E-08	2.26E+05	2.26E+07	9.85E-03	9.85E-01
L/I		5.46E-08	2.14E+06	8.25E+09	1.17E-01	4.51E+02
LL/E		5.02E-10	1.31E+04	3.81E+05	6.57E-06	1.91E-04
LL/I		7.75E-08	1.29E+05	4.05E+06	1.00E-02	3.14E-01
Cl		7.83E-07	6.46E+01	1.96E+00	5.06E-05	1.54E-06
Totals					5.71E+00	1.58E+04

Table 2-2
FERMI 2 SAMA CANDIDATES WITH POTENTIAL IMPACTS ON CLASS IIA SEQUENCES

SAMA #	Description	Class IIA Percent Reduction[1]	Class IIA Frequency Reduction (per/yr)[2]	Additional Offsite Dose Benefit ($)[3]	Additional Offsite Economic Cost Benefit ($)[4]	Base Case Benefit Portion from Offsite ($)[5]	Adjusted Benefit Portion from Offsite ($)[6]	Base Case Benefit Portion from Onsite ($)[7]	Adjusted Cost Benefit ($)[8]	2.5 Uncertainty Factor Applied to Adj. Cost Benefit ($)[9]	Implementation Cost ($)[10]
21	Use firewater system as a backup source for diesel cooling	58.34%	3.29E-08	106,618	8,950	241,689	357,257	15,257	372,514	931,285	2,000,000
24	Training for offsite power recovery after SBO	0.00%	0.00E+00	0	0	2,839	2,839	3,429	6,268	15,670	50,000
50	Change procedures to allow cross connect of motor cooling for RHRSW pumps	2.88%	1.62E-09	5,258	441	11,967	17,667	1,187	18,854	47,134	50,000

Table 2-2
FERMI 2 SAMA CANDIDATES WITH POTENTIAL IMPACTS ON CLASS IIA SEQUENCES

SAMA #	Description	Class IIA Percent Reduction[1]	Class IIA Frequency Reduction (per/yr)[2]	Additional Offsite Dose Benefit ($)[3]	Additional Offsite Economic Cost Benefit ($)[4]	Base Case Benefit Portion from Offsite ($)[5]	Adjusted Benefit Portion from Offsite ($)[6]	Base Case Benefit Portion from Onsite ($)[7]	Adjusted Cost Benefit ($)[8]	2.5 Uncertainty Factor Applied to Adj. Cost Benefit ($)[9]	Implementation Cost ($)[10]
54	Enhance procedural guidance for use of cross-tied component cooling or service water pumps	0.02%	1.07E-11	35	3	2,239	2,276	998	3,275	8,186	50,000
67	Enhance procedure to trip unneeded RHR or CS pumps on loss of room ventilation	0.00%	0.00E+00	0	0	717	717	468	1,185	2,963	50,000
78	Enable flooding of drywell head seal	100.00%	5.63E-08	182,763	15,341	97,454	295,559	0	295,559	738,897	1,000,000

Table 2-2
FERMI 2 SAMA CANDIDATES WITH POTENTIAL IMPACTS ON CLASS IIA SEQUENCES

SAMA #	Description	Class IIA Percent Reduction[1]	Class IIA Frequency Reduction (per/yr)[2]	Additional Offsite Dose Benefit ($)[3]	Additional Offsite Economic Cost Benefit ($)[4]	Base Case Benefit Portion from Offsite ($)[5]	Adjusted Benefit Portion from Offsite ($)[6]	Base Case Benefit Portion from Onsite ($)[7]	Adjusted Cost Benefit ($)[8]	2.5 Uncertainty Factor Applied to Adj. Cost Benefit ($)[9]	Implementation Cost ($)[10]
123	Install an ATWS sized filtered containment vent to remove decay heat	100.00%	5.63E-08	182,763	15,341	1,102,769	1,300,874	0	1,300,874	3,252,185	40,000,000
145	Increase training and operating experience feedback to improve operator response	11.94%	6.73E-09	21,828	1,832	275,160	298,820	34,605	333,425	833,562	1,000,000
152	Proceduralize all potential 4-kV AC bus cross-tie actions	6.01%	3.39E-09	10,991	923	23,149	35,063	2,189	37,251	93,128	100,000

Table 2-2
FERMI 2 SAMA CANDIDATES WITH POTENTIAL IMPACTS ON CLASS IIA SEQUENCES

SAMA #	Description	Class IIA Percent Reduction[1]	Class IIA Frequency Reduction (per/yr)[2]	Additional Offsite Dose Benefit ($)[3]	Additional Offsite Economic Cost Benefit ($)[4]	Base Case Benefit Portion from Offsite ($)[5]	Adjusted Benefit Portion from Offsite ($)[6]	Base Case Benefit Portion from Onsite ($)[7]	Adjusted Cost Benefit ($)[8]	2.5 Uncertainty Factor Applied to Adj. Cost Benefit ($)[9]	Implementation Cost ($)[10]
177	Provide an alternate means of supplying the instrument air header	15.84%	8.92E-09	28,949	2,430	91,376	122,755	8,084	130,839	327,098	489,300
194	Provide ability to maintain suppression pool temperature lower	4.74%	2.67E-09	8,660	727	24,515	33,903	4,359	38,261	95,653	100,000

Notes to Table 2-2:

1. Class IIA Percent Reduction calculated based on detailed cutset summation, except for SAMAs 78 and 123 where 100% H/E Class IIA reduction is assumed.
2. Calculated as Class IIA Percent Reduction times the H/E Class IIA release frequency of 5.63E-08/yr (which includes the 3.14E-09/yr additional frequency).
3. These values are derived by taking the difference between the H/E Class IIA release category population dose (2.18E+07 rem, using the BOC MACCS2 results) and the "Other" H/E release category population dose (8.10E+06 rem) to calculate the additional benefit (1.37E+07 rem) to the population dose reduction and applying a dose benefit of $2000 /person-rem and the

Class IIA frequency reduction listed in Column 4. These values are multiplied by the external hazards factor (11) and the 7% discount rate factor (10.76).

4. These values are derived by taking the difference between the H/E Class IIA release category economic cost ($3.03E+10) and the "Other" H/E release category offsite economic cost ($2.80E+10) to calculate the additional benefit ($2.30E+09) to the offsite economic costs assuming the Class IIA frequency reduction listed in Column 4. These values are multiplied by the external hazards factor (11) and the 7% discount rate factor (10.76).
5. Values from Table 3-3 of the March 5, 2015 DTE RAI 3 response, except for SAMA 78 where the value has been updated based on the January 9, 2015 DTE RAI 6.f response.
6. Values from summation of Columns 5, 6, and 7.
7. Values from Table 3-3 of the March 5, 2015 DTE RAI 3 response. The SAMA 78 value is unchanged.
8. Values from summation of Columns 8 and 9.
9. Values from Column 10 times the 2.5 uncertainty factor.
10. From SAMA ER Table D.2-1, except for SAMA 78 where the value has been updated based on the January 9, 2015 DTE RAI 6.f response.

Question 2 [March 5, 2015, RAI 5 (relating to January 9, 2015 response to RAI 5.a.ii, 5.a.vi, 5.a.vii, 6.h and 7.a)]

The primary purpose of the RAI was to determine how the cost-benefit calculations performed in response to the original RAIs were performed with respect to the external events multiplier. The response for each of the RAI subsections included the statement that the analysis was performed using the same methodology as described in the ER. For all but one (6.h) it was also stated that "The same external event multiplier used in the ER was applied to this evaluation." Confirm that the external event multiplier of 11 was used for all the cited analyses including 6.h?

Response:

The external event multiplier of 11 was used for all of the analyses cited in the response to RAI 5 (DTE letter NRC-15-0023, dated March 5, 2015), including RAI 6.h (DTE letter NRC-15-0013, dated January 9, 2015). Each of the SAMA analyses associated with the listed RAIs were reviewed and confirmed to have used the external event multiplier of 11.

Question 3

Specify the U.S. permanent population, Canadian permanent population, and total transient population that sum to the total estimated population of 6,055,678 reported in Table D.1-22 of the environmental report. Provide tables showing the spatial distribution of these three population components. Justify that the total population and its spatial distribution modeled in the SAMA analysis will not underestimate offsite population doses and offsite economic cost risks, considering prevailing winds blowing from the west-southwest and the corresponding potential for atmospheric plume migration to the east-northeast. Explain how the population distribution and economic values were implemented in the SAMA analysis to account for the non-U.S. population and non-U.S. land areas. Provide WinMACCS code inputs and outputs that would allow confirmation that offsite population doses and offsite economic cost risks have not been underestimated due to these factors.

Response:

a) *Specify the U.S. permanent population, Canadian permanent population, and total transient population that sum to the total estimated population of 6,055,678 reported in Table D.1-22 of the environmental report. Provide tables showing the spatial distribution of these three population components.*

The US permanent population, Canadian permanent population, and total transient population totals for 2045 are shown in Tables 1, 2, and 3, respectively. The sums of those values are provided in Table 4. The total estimated population is 6,055,850 which is in reasonable agreement (<0.003%) with the 6,055,678 reported in Table D.1-22 of the Environmental Report which was calculated using SECPOP2000 and a population multiplier of 1.2056. The population multiplier was used to increase the population to account for population growth between 2000 and 2045, transient population (which is not included in SECPOP2000), and to account for Canadian population (which is not included in SECPOP2000). The differences between Table D.1-22 of the Environmental Report (ER) and Table 4 is due to SECPOP2000 not accounting for Canadian population (i.e. setting population to 0). In order to account for the non-US population, the original SECPOP2000 results for each of the US sectors were increased by the above population multiplier and documented in Table D.1-22 of the ER. Because of this method, the US sector populations in Table D.1-22 are higher than their corresponding values shown in Tables 1 and 4. Tables 1 through 4 provide the spatial distribution of the three population components and their total.

b) *Justify that the total population and its spatial distribution modeled in the SAMA analysis will not underestimate offsite population doses and offsite economic cost risks, considering prevailing winds blowing from the west-southwest and the corresponding potential for atmospheric plume migration to the east-northeast.*

The Level 3 analysis was reanalyzed using the populations provided in Table 4 and compared to the ER SAMA analysis results. This is shown in Tables 5 and 6. The ER SAMA analysis

was performed with three years of meteorological data (2003, 2005, and 2007). The reanalysis was performed using the same three years of meteorological data. Note that a full year of meteorological data is used as input into WinMACCS, therefore the data considers prevailing wind direction based on actual meteorological data from the site.

The worst case ER SAMA analysis results (i.e. highest dose risk and highest economic risk) were for 2007, which is reported as the ER SAMA analysis results in Tables 5 and 6. As shown in Table 5, the dose risk and economic risk for 2007 using the population data from Table 4 is lower than when using population data shown in Table D.1-22 of the ER.

From Table 5, the reanalysis resulted in a slightly increased dose (less than 3%) when using the 2003 and 2005 meteorological data, however the economic risk significantly decreased (greater than 14%) in the reanalysis. This reduction in economic risk resulted in a reduced maximum averted cost risk and modified maximum averted cost risk than used in the SAMA analyses, as shown in Table 6.

The ER SAMA analysis results provide bounding maximum averted cost risk and modified maximum averted cost risk (as shown in Table 6) when compared to the reanalysis performed using the population distribution as listed in Table 4 compared to the population distribution provided in Table D.1-22 of the ER. The ER SAMA analysis results values shown in Table 6 are used in the ER SAMA analysis, and therefore the values used in the ER SAMA analysis are bounding.

c) *Explain how the population distribution and economic values were implemented in the SAMA analysis to account for the non-U.S. population and non-U.S. land areas.*

The population distribution and economic values implemented in the SAMA analysis are taken from SECPOP2000 which does not include non-US population. A population multiplier of 1.2056 was developed using 2045 population based on permanent and transient population within 50 miles of the plant site (including both US and Canadian permanent and transient population) which was determined in a separate analysis. The results of this analysis are shown in Table 4. The initial SECPOP2000 model determined the US population within 50 miles of the plant was 5,022,962, using no population multiplier. Therefore, the 1.2056 population multiplier was used in order to increase the total population to match the total population listed in Table 4. This methodology increased the population output of SECPOP2000 to incorporate the Canadian population and transient population in areas where SECPOP2000 determined population to exist (i.e. within the US). Using the SECPOP2000 multiplier of 1.2056 gave a population result of 6,055,678 vs. 6,055,850, which is within reasonable agreement (< 0.003%).

An economic multiplier was also developed for 2013 land values within 50 miles of the plant site. The economic multiplier of 1.2964 was determined based on the consumer price index for 2013 vs 2002 as used in SECPOP2000. No other changes were made in the SAMA analysis. For the sensitivity results that are presented in Table 5 and Table 6, the economic

value for land in Canada was set to be equal to the maximum economic value of US land within 50 miles of the Fermi 2 site as determined by SECPOP2000 (including the 1.2964 multiplier) for conservatism.

d) *Provide WinMACCS code inputs and outputs that would allow confirmation that offsite population doses and offsite economic cost risks have not been underestimated due to these factors.*

Supporting WinMACCS input and output files are provided in Enclosure 2 for both the base case and the sensitivity analyses performed.

Table 1 – Estimated 2045 US Permanent Population

Direction	Distance (mi)										
	(0-1)	(1-2)	(2-3)	(3-4)	(4-5)	(5-10)	(10-20)	(20-30)	(30-40)	(40-50)	TOTAL
N	0	167	287	201	200	15,392	124,306	409,529	519,476	384,799	1,454,357
NNE	0	114	54	37	105	10,636	84,130	200,733	652,426	522,916	1,471,151
NE	0	239	155	0	0	47	6	0	74	0	521
ENE	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	8	7,913	40,313	48,234
SSE	0	0	0	0	0	0	0	1,136	13,319	22,363	36,818
S	3	562	33	0	0	0	14	6,279	15,053	34,436	56,380
SSW	4	873	26	0	0	0	43	74,870	29,104	51,584	156,504
SW	3	340	10	0	85	1,158	12,505	278,172	154,320	34,754	481,347
WSW	0	100	962	2,160	2,069	35,520	12,091	16,296	15,015	12,887	97,100
W	5	100	280	287	321	7,432	7,495	10,557	32,531	35,576	94,584
WNW	4	59	135	128	325	4,706	6,694	21,772	22,818	18,667	75,308
NW	2	126	763	665	1,167	5,986	15,093	147,248	170,808	76,272	418,130
NNW	2	165	409	631	382	4,742	26,447	217,495	170,467	164,114	584,854
TOTAL	23	2,845	3,114	4,109	4,654	85,619	288,824	1,384,095	1,803,324	1,398,681	4,975,288

Table 2 – Estimated 2045 Canadian Permanent Population

Direction	Distance(mi)										
	(0-1)	(1-2)	(2-3)	(3-4)	(4-5)	(5-10)	(10-20)	(20-30)	(30-40)	(40-50)	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	47,889	323,122	4,006	0	375,017
NE	0	0	0	0	0	527	32,879	123,232	102,482	158	259,278
ENE	0	0	0	0	0	10	11,163	25,307	17,201	21,675	75,356
E	0	0	0	0	0	0	4,221	20,210	44,702	4,404	73,537
ESE	0	0	0	0	0	0	0	2	287	0	289
SE	0	0	0	0	0	0	0	0	68	0	68
SSE	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	537	96,152	491,873	168,746	26,237	783,545

Table 3 – Estimated 2045 Transient Population

Direction	Distance(mi)										
	(0-1)	(1-2)	(2-3)	(3-4)	(4-5)	(5-10)	(10-20)	(20-30)	(30-40)	(40-50)	TOTAL
N	0	9	15	10	10	799	6,450	21,251	26,956	19,968	75,468
NNE	0	6	3	2	5	552	6,559	24,935	34,042	27,135	93,239
NE	0	12	8	0	0	25	1,416	5,305	4,416	7	11,189
ENE	0	0	0	0	0	0	481	1,089	740	933	3,243
E	0	0	0	0	0	0	182	870	1,924	190	3,166
ESE	0	0	0	0	0	0	0	0	12	0	12
SE	0	0	0	0	0	0	0	0	463	2,344	2,807
SSE	0	0	0	0	0	0	0	66	774	1,300	2,140
S	0	29	2	0	0	0	1	365	875	2,002	3,274
SSW	0	45	1	0	0	0	2	4,353	1,692	2,999	9,092
SW	0	18	1	0	4	60	650	15,683	8,972	2,021	27,409
WSW	0	5	50	112	107	1,843	627	847	808	715	5,114
W	0	5	15	15	17	386	389	548	1,688	1,846	4,909
WNW	0	3	7	7	17	244	347	1,130	1,184	969	3,908
NW	0	7	40	34	61	311	783	7,641	8,863	3,958	21,698
NNW	0	9	21	33	20	246	1,372	11,286	8,846	8,516	30,349
TOTAL	0	148	163	213	241	4,466	19,259	95,369	102,255	74,903	297,017

Table 4 – Estimated 2045 Total Population

Direction	Distance(mi)										
	(0-1)	(1-2)	(2-3)	(3-4)	(4-5)	(5-10)	(10-20)	(20-30)	(30-40)	(40-50)	TOTAL
N	0	176	302	211	210	16,191	130,756	430,780	546,432	404,767	1,529,825
NNE	0	120	57	39	110	11,188	138,578	548,790	690,474	550,051	1,939,407
NE	0	251	163	0	0	599	34,301	128,537	106,972	165	270,988
ENE	0	0	0	0	0	10	11,644	26,396	17,941	22,608	78,599
E	0	0	0	0	0	0	4,403	21,080	46,626	4,594	76,703
ESE	0	0	0	0	0	0	0	2	299	0	301
SE	0	0	0	0	0	0	0	8	8,444	42,657	51,109
SSE	0	0	0	0	0	0	0	1,202	14,093	23,663	38,958
S	3	591	35	0	0	0	15	6,644	15,928	36,438	59,654
SSW	4	918	27	0	0	0	45	79,223	30,796	54,583	165,596
SW	3	358	11	0	89	1,218	13,155	293,855	163,292	36,775	508,756
WSW	0	105	1,012	2,272	2,176	37,363	12,718	17,143	15,823	13,602	102,214
W	5	105	295	302	338	7,818	7,884	11,105	34,219	37,422	99,493
WNW	4	62	142	135	342	4,950	7,041	22,902	24,002	19,636	79,216
NW	2	133	803	699	1,228	6,297	15,876	154,889	179,671	80,230	439,828
NNW	2	174	430	664	402	4,988	27,819	228,781	179,313	172,630	615,203
TOTAL	23	2,993	3,277	4,322	4,895	90,622	404,235	1,971,337	2,074,325	1,499,821	6,055,850

Table 5 – Population Dose Risk and Economic Risk

Release Category	ER SAMA Analysis Results		2003 Met Data Sensitivity		2005 Met Data Sensitivity		2007 Met Data Sensitivity	
	Population Dose Risk (person-rem/yr)	Economic Risk ($/yr)	Population Dose Risk (person-rem/yr)	Economic Risk ($/yr)	Population Dose Risk (person-rem/yr)	Economic Risk ($/yr)	Population Dose Risk (person-rem/yr)	Economic Risk ($/yr)
H/E-BOC	1.29E+00	1.80E+03	1.33E+00	1.57E+03	1.24E+00	1.33E+03	1.26E+00	1.38E+03
H/E	2.54E+00	8.77E+03	2.55E+00	7.64E+03	2.56E+00	7.01E+03	2.40E+00	7.23E+03
H/I	6.86E-01	3.79E+03	7.56E-01	3.08E+03	7.49E-01	2.43E+03	7.05E-01	2.65E+03
H/L	2.21E-03	4.11E+00	2.22E-03	3.67E+00	2.41E-03	3.35E+00	2.33E-03	3.54E+00
M/E	1.53E-01	5.18E+02	1.55E-01	4.23E+02	1.46E-01	2.00E+02	1.49E-01	2.63E+02
M/I	1.03E-01	2.27E+02	9.68E-02	1.85E+02	9.87E-02	9.02E+01	9.76E-02	1.50E+02
L/E	9.85E-03	9.85E-01	7.24E-03	7.19E-01	4.93E-03	6.85E-01	5.67E-03	5.58E-01
L/I	1.17E-01	4.51E+02	1.16E-01	3.53E+02	1.15E-01	1.83E+02	1.16E-01	2.79E+02
LL/E	6.57E-06	1.91E-04	6.73E-06	2.99E-04	7.33E-06	2.73E-04	7.13E-06	2.88E-04
LL/I	1.00E-02	3.14E-01	7.42E-03	3.70E-01	4.97E-03	9.30E-01	6.36E-03	3.08E-01
CI	5.06E-05	1.54E-06	4.13E-05	1.12E-06	3.20E-05	2.18E-04	3.48E-05	2.52E-06
TOTAL	**4.91E+00**	**1.56E+04**	**5.02E+00**	**1.33E+04**	**4.92E+00**	**1.13E+04**	**4.75E+00**	**1.20E+04**

Table 6 – Maximum Averted Cost Risk

Cost	ER SAMA Analysis Results		2003 Met Data Sensitivity		2005 Met Data Sensitivity		2007 Met Data Sensitivity	
	7% Real Discount Rate	3% Discount Rate Sensitivity	7% Real Discount Rate	3% Discount Rate Sensitivity	7% Real Discount Rate	3% Discount Rate Sensitivity	7% Real Discount Rate	3% Discount Rate Sensitivity
Off-Site Exposure Cost (W_{PHA}) ($/yr)	105,676	147,667	108,060	150,998	105,907	147,990	102,248	142,876
Off-Site Economic Cost (W_{EA}) ($/yr)	167,403	233,921	143,147	200,027	121,621	169,948	129,155	180,475
On-Site Exposure Cost (W_{O}) ($/yr)	572	930	572	930	572	930	572	930
On-Site Cleanup Cost (W_{CD}) ($/yr)	17,450	29,293	17,450	29,293	17,450	29,293	17,450	29,293
Replacement Power Cost (W_{RP}) ($/yr)	15,247	14,278	15,247	14,278	15,247	14,278	15,247	14,278
Maximum Averted Cost Risk (MACR) ($/yr)	306,348	426,090	284,476	395,527	260,798	362,440	264,672	367,854
External Event Multiplier	11		11		11		11	
Modified MACR (MMACR) ($/yr)	3,369,832	4,686,991	3,129,238	4,350,795	2,868,776	3,986,836	2,911,397	4,046,393
Difference from ER Results	**0.0%**	**0.0%**	**-7.1%**	**-7.2%**	**-14.9%**	**-14.9%**	**-13.6%**	**-13.7%**

Question 4

To support an NRC evaluation of potential replacement power costs from a temporary suspension of Fermi 3 power generation during site cleanup and decontamination activities following a severe accident at the Fermi 2 plant, confirm that 1655 MWe is an appropriate value for the Fermi 3 power output or recommend a more appropriate value.

Response:

The Fermi 3 Final Safety Analysis Report, Revision 8, Section 1.1.2.7, titled, "Rated Core Thermal Power," states, "The estimated net electrical power output, which is dependent on site ambient conditions, the normal plant heat sink (NPHS) operation controls, and station electrical loads, is between approximately 1485 MWe and 1585 MWe." DTE recommends that the conservative maximum net electrical power output value of 1585 MWe be used for an evaluation of potential replacement power costs for Fermi 3.

Enclosure 2 to
NRC-15-0045

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

CD Containing Input and Output Files Requested by
Severe Accident Mitigation Alternatives Set 3 Question 3