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United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-2105, Vol. 2

Environmental Impact Statement for the Combined License (COL) for Enrico Fermi Unit 3

Final Report

Chapters 7 to Appendix D

U.S. Nuclear Regulatory Commission
Office of New Reactors
Washington, DC 20555-0001

Regulatory Office
Permit Evaluation, Eastern Branch
U.S. Army Engineer District, Detroit
U.S. Army Corps of Engineers
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Final Environmental Impact Statement
for Combined License (COL) for Enrico Fermi Unit 3

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Abstract:

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by Detroit Edison for a construction permit and operating license (combined license or COL). The proposed actions related to the Detroit Edison application are (1) NRC issuance of a COL for a new power reactor unit at the Detroit Edison Enrico Fermi Atomic Power Plant (Fermi) site in Monroe County, Michigan; and (2) U.S. Army Corps of Engineers (USACE) permit action to perform certain regulated activities on the site. The USACE is participating with the NRC in preparing this EIS as a cooperating agency and participates collaboratively on the review team.

This EIS includes the NRC staff's analysis, which considers and weighs the environmental impacts of constructing and operating a new nuclear unit at the Fermi site and at alternative sites, and mitigation measures available for reducing or avoiding adverse impacts. Based on its analysis, the staff determined that there are no environmentally preferable or obviously superior sites.

The EIS includes the evaluation, in part, of the proposed action's impacts on the public interest, including impacts on waters of the United States pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Appropriations Act of 1899. The USACE will decide whether to issue a permit on the basis of the EIS evaluation of the probable impacts on the public interest, including cumulative impacts, of Detroit Edison's proposed activities that are within the USACE scope of analysis; USACE verification of compliance with the requirements of USACE regulations and the Clean Water Act Section 404(b)(1) Guidelines; and any supplemental information, evaluations, or verifications that may be outside the NRC's scope of analysis and not included in this EIS, but are required by the USACE to support its permit decision.

After considering the environmental aspects of the proposed action, the staff's recommendation to the Commission is that the COL be issued as proposed.[(a)] This recommendation is based on (1) the application, including the Environmental Report (ER) submitted by Detroit Edison; (2) consultation with Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of comments related to the environmental review that were received during the public scoping process

(a) As directed by the Commission in CLI-12-16, the NRC will not issue the COL prior to completion of the ongoing rulemaking to update the Waste Confidence Decision and Rule (see Section 6.1.6 of this EIS).

and on the draft EIS; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. The USACE permit decision would be made following issuance of this final EIS and completion of its permit application review process and permit decision documentation.

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Executive Summary

By letter dated September 18, 2008, the U.S. Nuclear Regulatory Commission (NRC or the Commission) received an application from Detroit Edison Company (Detroit Edison) for a combined license (COL) for a new power reactor unit, the Enrico Fermi Unit 3 (Fermi 3), at the Detroit Edison Enrico Fermi Atomic Power Plant (Fermi) site in Monroe County, Michigan.

The proposed actions related to the Fermi 3 application are (1) NRC issuance of COLs for construction and operation of a new nuclear unit at the Fermi site and (2) U.S. Army Corps of Engineers (USACE) permit action pursuant to Section 404 of the Federal Water Pollution Control Act, as amended (33 USC 1251, *et seq*.) (Clean Water Act), and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 USC 403 *et seq*.) (Rivers and Harbors Act of 1899) to perform certain regulated activities associated with the Fermi 3 project, within the USACE jurisdiction and scope of analysis. The USACE is participating with the NRC in preparing this environmental impact statement (EIS) as a cooperating agency and participates collaboratively on the review team. The reactor specified in the application is an Economic Simplified Boiling Water Reactor (ESBWR) designed by GE-Hitachi Nuclear Energy Americas, LLC (GEH). The GEH design was approved by the NRC in March 2011. The final design approval was published in the *Federal Register* on March 16, 2011 (76 FR 14437).

The NRC staff completed its safety review of the ESBWR design on March 9, 2011 and issued a final safety evaluation report (FSER, Agencywide Documents Access and Management System [ADAMS] accession number ML103470210). The NRC staff also issued a standard design approval (SDA) via letter to GE Hitachi Nuclear Energy on March 9, 2011 (ADAMS accession number ML110540310). This SDA signified that the NRC staff reviewed the design and found the design met all applicable regulations.

In parallel with the SDA, the NRC staff began preparing a rulemaking to certify the design approved in the SDA. Based on the completion of its safety review, the NRC published a proposed rule on March 24, 2011 (77 FR 16549) that would certify the ESBWR design in Appendix E to 10 CFR Part 52.

In late 2011, while the NRC staff was preparing the final rule, issues were identified with the ESBWR steam dryer, which is a non-safety component. These issues called into question certain conclusions in the staff's safety review under the SDA. Resolution of these issues requires additional analyses by the applicant and review by the NRC staff in order for the NRC staff to conclude the design is acceptable for certification. The design certification rulemaking process is delayed pending resolution of these issues. If the additional analyses resolve the issues, certification, via publication of a final rule, is expected to be completed in 2013.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321 *et seq*.), directs that an EIS be prepared for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in Title 10 of the Code of Federal Regulations (CFR), Part 51. Further, in 10 CFR 51.20, the NRC has determined that the issuance of a COL under 10 CFR Part 52 is an action that requires an EIS.

The purpose of Detroit Edison's requested NRC action – issuance of the COL – is to obtain a license to construct and operate a new nuclear unit. This license is necessary but not sufficient for construction and operation of the unit. A COL applicant must obtain and maintain the necessary permits from other Federal, State, Tribal, and local agencies and permitting authorities. Therefore, the purpose of the NRC's environmental review of the Detroit Edison application is to determine if a new nuclear power plant of the proposed design can be constructed and operated at the Fermi site without unacceptable adverse impacts on the human environment. The objective of Detroit Edison's anticipated request for USACE action would be to obtain a decision on a permit application proposing structures and/or work in, over, or under navigable waters and/or the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands. Upon acceptance of the Detroit Edison application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing in the *Federal Register* (FR) a Notice of Intent (73 FR 75142) to prepare an EIS and conduct scoping. On January 14, 2009, the NRC held two scoping meetings in Monroe, Michigan, to obtain public input on the scope of the environmental review. To gather information and to become familiar with the sites and their environs, the NRC and its contractors, Argonne National Laboratory, Energy Research, Inc., and Ecology and Environment, Inc., visited the Fermi site in February 2009 and the four alternative sites, Belle River/St. Clair, Greenwood Energy Center, and two greenfield sites (Petersburg and South Britton sites) in January 2009.

During the Fermi site visit, the NRC staff, its contractors, and the USACE staff met with Detroit Edison staff, public officials, and the public. The NRC staff reviewed the comments received during the scoping process and contacted Federal, State, Tribal, regional, and local agencies to solicit comments. Included in this EIS are (1) the results of the review team's analyses, which consider and weigh the environmental effects of the proposed action (i.e., issuance of the COL) and of building and operating a new nuclear unit at the Fermi site; (2) mitigation measures for reducing or avoiding adverse effects; (3) the environmental impacts of alternatives to the proposed action; and (4) the staff's recommendation regarding the proposed action.

To guide its assessment of the environmental impacts of a proposed action or alternative actions, the NRC has established a standard of significance for impacts based on Council on Environmental Quality guidance (40 CFR 1508.27). Table B-1 of 10 CFR Part 51, Subpart A,

Appendix B, provides the following definitions of the three significance levels – SMALL, MODERATE, and LARGE:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Mitigation measures were considered for each resource category and are discussed in the appropriate sections of the EIS.

In preparing this EIS, the NRC staff and USACE staff reviewed the application, including the Environmental Report (ER) submitted by Detroit Edison; consulted with Federal, State, Tribal, and local agencies; and followed the guidance set forth in NUREG-1555, *Environmental Standard Review Plan*. In addition, the NRC staff considered the public comments related to the environmental review received during the scoping process. Comments within the scope of the environmental review are included in Appendix D of this EIS.

A 75-day comment period began on October 28, 2011, when the U.S. Environmental Protection Agency (EPA) issued a FR Notice of Availability (76 FR 66925) of the draft EIS to allow members of the public to comment on the results of the environmental review. Two public meetings were held on December 15, 2011, at Monroe County Community College, in Monroe, Michigan. During these public meetings, the review team described the results of the NRC environmental review, answered questions related to the review, and provided members of the public with information to assist them in formulating their comments. The comment period for the draft EIS ended January 11, 2012. Comments on the draft EIS and the staff's responses are provided in Appendix E of this EIS.

The USACE issued LRE-2008-00443-1-S11 public notice for a 30-day review on December 23, 2011, describing the proposed USACE-regulated activities associated with the Fermi 3 project; proposed water of the United States avoidance and minimization plan and conceptual mitigation strategy; and USACE preliminary assessment of certain impacts. The purpose of the public notice was to solicit comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of regulated activities within the USACE scope of analysis that are associated with the Fermi 3 project. The comments received during the public comment period are under review by USACE.

The NRC staff's recommendation to the Commission related to the environmental aspects of the proposed action is that the COL be issued as requested.[a] This recommendation is based on (1) the application, including the ER submitted by Detroit Edison and the applicant's supplemental letters and responses to the staff's Requests for Additional Information; (2) consultation with other Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of public comments related to the environmental review that were received during the scoping process and on the draft EIS; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. The USACE will base its evaluation of Detroit Edison's permit application on items (1), (2), (4), and (5) listed above; USACE consideration of public comments received in response to the USACE public notice; the requirements of USACE regulations and the Clean Water Act Section 404(b)(1) Guidelines; and the USACE public interest review. The USACE's permit decision will be based, in part, on this EIS and will be made after issuance of the final EIS and completion of its permit application review and decision-making process.

The NRC staff's evaluation of the site safety and emergency preparedness aspects of the proposed action will be addressed in the NRC's Safety Evaluation Report anticipated to be published in the future.

(a) As directed by the Commission in CLI-12-16, NRC will not issue the COL prior to completion of the ongoing rulemaking to update the Waste Confidence Decision and Rule (see Section 6.1.6 of this EIS).

Abbreviations/Acronyms

χ/Q	dispersion values
°F	degree(s) Fahrenheit
ABWR	advanced boiling water reactor
ac	acre(s)
AC	alternating current
ACHP	Advisory Council on Historic Preservation
ADAMS	Agencywide Documents Access and Management System
ADG	ancillary diesel generator
ADT	average daily traffic
AEC	Atomic Energy Commission
AHS	Auxiliary Heat Sink
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
APE	area of potential effects
AQCR	Air Quality Control Region
Argonne	Argonne National Laboratory
AST	aboveground storage tank
ASLB	Atomic Safety and Licensing Board
AWEA	American Wind Energy Association
BA	Biological Assessment
BACT	Best Available Control Technology
BEA	Bureau of Economic Analysis (U.S. Department of Commerce)
BEIR	Biological Effects of Ionizing Radiation
BGEPA	Bald and Golden Eagle Protection Act of 1940
BIA	Bureau of Indian Affairs
BiMAC	basemat internal melt arrest and coolability
BMP	best management practice
Bq	Becquerel
Bq/MTU	Becquerel per metric ton uranium
BRC	Blue Ribbon Commission
Btu	British thermal unit(s)
BWR	boiling water reactor
CAA	Clean Air Act
CAES	compressed air energy storage
CAIR	Clean Air Interstate Rule

CCR	coal combustion residuals
CCRG	Commonwealth Cultural Resources Group, Inc.
CCS	carbon capture and sequestering/sequestration
CDC	Centers for Disease Control and Prevention
CDF	core damage frequency
CEQ	Council on Environmental Quality
CER	Capital Expenditure and Recovery
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony forming units
CH_4	methane
CHP	combined heat and power
Ci	curie(s)
CIRC	Circulating Water System
CIS	containment isolation system
CN	Canadian National
CNF	Capacity Need Forum (MPSC)
CO	carbon monoxide
CO_2	carbon dioxide
CO_2-e	carbon dioxide-equivalent
COL	combined construction permit and operating license
CSAPR	Cross-State Air Pollution Rate
CSP	concentrated solar power
CSX	CSX Transportation
CT	combustion turbine
CWA	Clean Water Act
CWIS	Cooling Water Intake Structure
CZMA	Coastal Zone Management Act
DA	Department of the Army
dB	decibel
dBA	A-weighted decibel
DBA	design-basis accident
dbh	diameter at breast height
DC	direct current
DCD	Design Control Document
DDT	dichlorodiphenyltrichloroethane
Detroit Edison	Detroit Edison Company
DHS	U.S. Department of Homeland Security
DNL	equivalent continuous sound level

DNR	Designated Network Resource
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOT	Department of Transportation
D/Q	deposition factor
DRIWR	Detroit River International Wildlife Refuge
DSM	demand-side management
DTW	Detroit Metropolitan Wayne County Airport
DWSD	Detroit Water and Sewerage Department
E&E	Ecology and Environment, Inc.
EAB	Exclusion Area Boundary
EERE	U.S. Department of Energy Office of Energy Efficiency and Renewable Energy
EGS	engineered geothermal system
EIA	Energy Information Administration
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electromagnetic field
EOP	emergency operating procedure
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPT	Ephemeroptera, Plecoptera, Trichoptera (index)
EPZ	emergency planning zone
ER	Environmental Report
ERI	Energy Research, Inc.
ESA	Endangered Species Act of 1973, as amended
ESBWR	Economic Simplified Boiling Water Reactor
ESRP	Environmental Standard Review Plan
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Fermi	Enrico Fermi Atomic Power Plant
Fermi 1	Enrico Fermi Unit 1
Fermi 2	Enrico Fermi Unit 2
Fermi 3	Enrico Fermi Unit 3
FES	Final Environmental Statement
FIRM	Flood Insurance Rate Map
FIS	Financial Reporting and Analysis

FP	fire pump
fps	feet per second
FPS	Fire Protection System
FR	*Federal Register*
FSAR	Final Safety Analysis Report
FSER	Final Safety Evaluation Report
ft	foot (feet)
ft/day	feet per day
ft^3	cubic feet
FTE	full-time equivalent
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GAF	Generation and Fuel
gal	gallon
GBq	gigabecquerel
GC	gas centrifuge
GD	gaseous diffusion
GEH	General Electric-Hitachi Nuclear Energy Americas, LLC
GEIS	*Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GEIS-DECOM	*Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors*
GHG	greenhouse gas
GIS	geographical information system
GLC	Great Lakes Commission
GLENDA	Great Lakes Environmental Database
GLOFS	Great Lakes Operational Forecast System
GLWC	Great Lakes Wind Council
gpd	gallon(s) per day
gpm	gallon(s) per minute
GWh	gigawatt hour(s)
GWP	global warming potential
ha	hectare
HAP	hazardous air pollutant
HCMA	Huron-Clinton Metropolitan Authority
HDR	hot dry rock
HEPA	high-efficiency particulate air
HFC	hydrofluorocarbon

HFE	hydrofluorinated ether
HLW	high-level waste
HQUSACE	U.S. Army Corps of Engineers Headquarters
hr	hour(s)
HRSG	heat recovery steam generator
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilating, and air-conditioning
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IEEE	Institute of Electrical and Electronics Engineers
IGCC	integrated gasification combined cycle
IGLD 85	International Great Lakes Datum of 1985
IJC	International Joint Commission
in.	inch(es)
INAC	Indian and Northern Affairs Canada
IOU	investor-owned utility
IPCC	Intergovernmantal Panel on Climate Change
IPCS	Integrated Plant Computer System
IPP	independent power producer
IRP	Integrated Resource Plan
ISD	Intermediate School District
ISFSI	Independent Spent Fuel Storage Installation
ITC	ITC Holdings Corporation
JPA	Joint Permit Application
kg	kilogram(s)
KiKK	Childhood Cancer in the Vicinity of Nuclear Power Plants (German acronym)
km	kilometer(s)
km^2	square kilometer(s)
kV	kilovolt(s)
kW	kilowatt(s)
kWh	kilowatt hour(s)
L	liter(s)
L_{90}	sound level exceeded 90 percent of the time
LaMP	Lakewide Management Plan
lb	pound(s)
L_{dn}	day-night average sound level
LEDPA	least environmentally damaging practicable alternative

LEOFS	Lake Erie Operational Forecast System
L_{eq}	equivalent continuous sound level
LET	Lake Erie Transit
LFA	Load Forecasting Adjustment
LLW	low-level waste
LOLE	Loss of Load Expectation
LOLP	Loss-of-Load Probability
LOS	level of service
LPZ	low population zone
LRF	large release frequency
LTRA	Long-Term Reliability Assessment (NERC)
LW	long wave
LWR	light water reactor
µg	microgram(s)
m	meter(s)
m^3	cubic meter(s)
MACCS2	MELCOR Accident Consequence Code System
MBTA	Migratory Bird Treaty Act of 1918
MCCC	Monroe County Community College
mCi	millicurie
MCL	maximum contaminant level; Michigan Compiled Laws
MCRC	Monroe County Road Commission
MDCH	Michigan Department of Community Health
MDCT	mechanical draft cooling tower
MDELEG	Michigan Department of Energy, Labor and Economic Growth
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MDSP	Michigan Department of State Police
MEI	maximally exposed individual
METC	Michigan Electric Transmission Company
mGy	milliGray
MGD	million gallons per day
mi	mile(s)
mi^2	square mile(s)
MichCon	Michigan Consolidated Gas Company
MISO	Midwest Independent System Operator
MIT	Massachusetts Institute of Technology
mL	milliliter(s)
MMT	million metric tons

$MMTCO_2$-e	million metric tons of carbon dioxide equivalent
MNFI	Michigan Natural Features Inventory
mo	month(s)
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	mile(s) per hour
MPSC	Michigan Public Service Commission
mrad	milliradian
mrem	millirem(s)
MSA	Metropolitan Statistical Area
MSW	municipal solid waste
MT	metric ton(s) (or tonne[s])
MTEP	MISO Transmission Expansion Plan
MTU	metric ton(s) of uranium
MW	megawatt(s)
MW(e)	megawatt(s) electrical
MW(t)	megawatt(s) thermal
MWd	megawatt-day(s)
MWd/MTU	megawatt-day(s) per metric ton of uranium
MWh	megawatt hour(s)
NAAQS	National Ambient Air Quality Standard
NACD	Native American Consultation Database
NaCl	sodium chloride
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NAS	National Academy of Sciences
NAVD 88	North American Vertical Datum of 1988
DCDC	National Climate Data Center
NCI	National Cancer Institute
NCRP	National Council on Radiation Protection and Measurements
NDCT	natural draft cooling tower
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969, as amended
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NESHAP	National Emission Standards for Hazardous Air Pollutants
NF_3	nitrogen trifluoride
NGCC	natural gas combined-cycle
NHPA	National Historic Preservation Act of 1966, as amended
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service

NML	noise monitoring location
NNW	north-northwest
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPHS	normal power heat sink
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NREPA	Natural Resources and Environmental Protection Act
NRHP	*National Register of Historic Places*
NS	Norfolk Southern
NSPS	New Source Performance Standard
NSR	new source review
NTC	Nuclear Training Center
NTU	nephelometric turbidity unit
NWI	National Wetland Inventory
NWIS	National Water Information System
NWR	National Wildlife Refuge
O_3	ozone
ODCM	Offsite Dose Calculation Manual
ODNR	Ohio Department of Natural Resources
OGS	off-gas system
OSHA	Occupational Safety and Health Administration
PAM	primary amebic meningoencephalitis
PAP	personnel access portal
Pb	lead
PC	personal computer
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per liter
PCTMS	Plant Cooling Tower Makeup System
PEM	palustrine emergent marsh
PESP	Pesticide Environmental Stewardship Program
PFC	perfluorocarbon
PFO	palustrine forested wetland
P-IBI	Planktonic Index of Biotic Integrity

PIPP	Pollution Incident Prevention Plan
PJM	PJM Interconnection
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of less than or equal to 2.5 μm
PM_{10}	particulate matter with a mean aerodynamic diameter of less than or equal to 10 μm
PRA	probabilistic risk assessment
PRB	Powder River Basin
PSD	Prevention of Significant Deterioration
psia	pounds per square inch absolute
PSR	Physicians for Social Responsibility
PSS	palustrine scrub-shrub wetland
PSWS	Plant Service Water System
PTE	potential to emit
Pu-239	plutonium-239
PV	photovoltaic
PWSS	pretreated water supply system
RAI	Request for Additional Information
RCRA	Resource Conservation and Recovery Act of 1976, as amended
RDF	refuse-derived fuel
REIRS	Radiation Exposure Information and Reporting System
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
RESA	Regional Educational Service Agency
RFC	Reliability*First* Corporation
RHAA	Rivers and Harbors Appropriation Act of 1899
RHR	residual heat removal
RIMS II	Regional Input-Output Modeling System
ROI	region of interest
ROW	right-of-way
RPS	Renewable Portfolio Standard
RRD	Remediation and Redevelopment Division
RSICC	Radiation Safety Information Computational Center
RTO	Regional Transmission Organization
RTP	Regional Transportation Plan
RV	recreational vehicle
Ryr	reactor-year

SACTI	Seasonal/Annual Cooling Tower Impact
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SAMG	severe accident management guidelines
SBO	station blackout
SCPC	supercritical pulverized coal
SCR	selective catalytic reduction
SDA	standard design approval
SDG	standby diesel generator
sec	second(s)
SEGS	Solar Energy Generating System
SEMCOG	Southeast Michigan Council of Governments
SER	Safety Evaluation Report
SESC	soil erosion and sedimentation control
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office(r)
SO_2	sulfur dioxide
SO_x	sulfur oxides
SOARCA	State-of-the-Art Reactor Consequence Analyses
SRHP	*State Register of Historic Places*
SRREN	Special Report on Renewable Energy Sources and Climate Change Mitigation
SSC	system, structure, and component
SSE	safe shutdown earthquake ground motion
STG	steam turbine generator
STORET	Storage and Retrieval Database
SUV	sport-utility vehicle
Sv	sievert
SWMS	solid radioactive waste management system
SWPPP	Stormwater Pollution Prevention Plan
SWS	Station Water System
TDS	total dissolved solids
TEDE	total effective dose equivalent
THPO	Tribal Historic Preservation Office
TI	Temporary Instruction
TIP	Transportation Improvement program
TLD	thermoluminescent dosimeter
TMDL	total maximum daily load
TRAGIS	Transportation Routing Analysis Geographic Information System
TRU	transuranic

U.S.	United States
USC	United States Code
U_3O_8	triuranium octoxide (“yellowcake”)
UF_6	uranium hexafluoride
UMTRI	University of Michigan Transportation Research Institute
UO_2	uranium dioxide
USACE	U.S. Army Corps of Engineers
USBLS	U.S. Bureau of Labor Statistics
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VIB	Vehicle Inspection Building
VOC	volatile organic compound
WHO	World Health Organization
WNW	west-northwest
WPSCI	Wolverine Power Supply Cooperative, Inc.
WRA	Wind Resource Area
WTE	waste-to-energy
WWSL	wastewater stabilization lagoon
WWTP	wastewater treatment plant
yd^3	cubic yard(s)
yr	year(s)

7.0 Cumulative Impacts

The National Environmental Policy Act of 1969, as amended (NEPA), requires Federal agencies to consider the cumulative impacts of proposals under its review. Cumulative impacts may result when the environmental effects associated with the proposed action are overlain on or added to temporary or permanent impacts associated with past, present, and reasonably foreseeable future projects.

Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. In its proposal for a new nuclear unit at the Enrico Fermi Atomic Power Plant (Fermi) site, Detroit Edison Company (Detroit Edison) submitted a combined license (COL) application, including an Environmental Report (ER), to the U.S. Nuclear Regulatory Commission (NRC). When evaluating the potential impacts of building and operating a new unit (Fermi 3), the NRC and the U.S. Army Corps of Engineers (USACE) review team considered potential cumulative impacts on resources that could be affected by the preconstruction, construction, and operation of one General Electric-Hitachi, LLC (GEH) Economic Simplified Boiling Water Reactor (ESBWR) at the Fermi site located on the western shore of Lake Erie approximately 30 mi southwest of Detroit, Michigan, and 7 mi from the United States-Canada border.

Cumulative impacts result when the effects of an action are added to or interact with other past, present, and reasonably foreseeable future effects on the same resources. For the purposes of this analysis, past actions are those that occurred prior to receipt of the COL application. Present actions are those related to resources and taken from the time of receipt of the COL application until the start of NRC-authorized construction of Fermi 3. Future actions are those that are reasonably foreseeable throughout the building and operating of Fermi 3, including its decommissioning. The geographical area over which the past, present, and future actions could contribute to cumulative impacts depends on the type of resource considered and is described individually for each resource. The review team considered, among other actions, the cumulative effects of Fermi 3 with current operations of Fermi Unit 2 (Fermi 2) on the Fermi site.

The approach for this environmental impact statement (EIS) is outlined in the following discussion. To guide its assessment of the environmental impacts of a proposed action or alternative actions, the NRC has established a standard of significance for impacts based on guidance developed by the Council on Environmental Quality (CEQ); see Title 40 of the Code of Federal Regulations (specifically, 40 CFR 1508.27). The three significance levels established by the NRC – SMALL, MODERATE, and LARGE – are defined as follows:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The impacts of the proposed action, as described in Chapters 4 and 5, are combined in this chapter with those of other past, present, and reasonably foreseeable future actions in the general area surrounding the Fermi site that would affect the same resources as those affected by the proposed Fermi 3, regardless of what agency (Federal or non-Federal) or person undertakes such actions. These combined impacts are defined by the CEQ as "cumulative" in 40 CFR 1508.7 and include individually minor but collectively significant actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the resource's overall decline.

The description of the affected environment in Chapter 2 serves as the baseline for the cumulative impacts analysis, including the effects of past actions. The incremental impacts related to construction activities that require NRC authorization (10 CFR 50.10(a)) are described and characterized in Chapter 4, and those related to operations are described and characterized in Chapter 5. These impacts are summarized for each resource area in the sections that follow. The level of detail is commensurate with the significance of the impact for each resource area.

This chapter includes an overall cumulative impact assessment for each resource area. NRC staff performed the cumulative impact analysis according to guidance provided in the staff memorandum "Addressing Construction and Preconstruction Activities, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues In Environmental Impact Statements" (NRC 2011a). The specific resources and components that could be affected by the incremental effects of the proposed action and other actions in the same geographical area are assessed. This assessment includes the impacts of construction and operations for the proposed new unit as described in Chapters 4 and 5; impacts of preconstruction activities as described in Chapter 4; impacts of fuel cycle, transportation, and decommissioning as described in Chapter 6; and impacts from past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could affect the same resources as those affected by the proposed actions.

The team used information provided by Detroit Edison in the ER, Detroit Edison's responses to requests for additional information (RAIs) issued by the NRC and USACE staff, information from

other Federal and State agencies, and information gathered during the scoping period and visits by the staff to the Fermi site to evaluate the cumulative impacts on resources affected by building and operating a new nuclear power plant at the site. To inform the cumulative analysis, the review team researched U.S. Environmental Protection Agency (EPA) databases for recent EISs within the region, used an EPA database of permits for water discharges (NEPAssist) in the geographic area, and used the www.recovery.gov Web site to identify projects in the area funded by the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). Other actions and projects that were identified during this review and considered in the review team's independent analysis of the potential cumulative effects are described in Table 7-1.

7.1 Land Use

The description of the affected environment in Section 2.2 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.1, the impacts of NRC-authorized construction on land use would be SMALL, and no further mitigation would be warranted. As described in Section 5.1, the review team concludes that the effects of operations on land use would be SMALL, and no further mitigation would be warranted.

The combined impacts from preconstruction and construction activities on land use are described in Section 4.1 and were determined to be SMALL. In addition to the impacts from preconstruction, construction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future projects in the geographical area of interest that could affect land use (Table 7-1). For this cumulative analysis, the geographic area of interest is the area within 15 mi of the Fermi site. This geographic area of interest includes the primary communities, such as Frenchtown Township, that would be affected by the proposed Fermi 3 and its transmission lines.

Although mostly agricultural land surrounds the Fermi site, there are areas of residential development in the City of Monroe to the southwest of the plant, in the Stony Point area directly southeast of the Fermi site, along the Lake Erie shoreline, and to the north of the Fermi site near Swan Creek (Monroe County Planning Department and Commission 2010). The majority of the land west of the Fermi site is zoned for agricultural use. There are a number of industrial areas to the southwest of the site along the Lake Erie shoreline and in the City of Monroe, including the Detroit Edison Monroe Power Plant, the Automotive Components Holdings plant, and the Port of Monroe (Monroe County Planning Department and Commission 2010). Although land to the south of the site is anticipated to remain a low- and medium-density residential area, it is expected that the site will continue to be surrounded primarily by agricultural lands, open areas, and woodlands to the west and north for the foreseeable future (James D. Anulewicz Associates, Inc., and McKenna Associates, Inc. 2003). A farmland preservation and conservation program in Monroe County may prevent additional residential

Table 7-1. Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis (closest to furthest from the Fermi site)

Project Name	Summary of Project	Location	Status
Energy Projects			
Fermi Nuclear Power Plant Unit 2	1098-MW nuclear power plant	On Fermi site	Operational; current license expires March 20, 2025. On July 18, 2011, NRC received a notice of intent to submit a license renewal application for Fermi Unit 2 in 2014.[a]
Fermi Nuclear Power Plant Unit 1	Decommissioning and demolition of shutdown nuclear power plant	On Fermi site	In progress[b]
Independent Spent Fuel Storage Installation for Fermi 2	Dry spent-fuel storage	On Fermi site	Recently completed, but preoperational
Detroit Edison Monroe Power Plant	3280-MW coal-fired plant	6 mi southwest of Fermi site on Lake Erie	Operational, includes recent and planned refurbishment[c]
J.R. Whiting Power Plant, Luna Pier, Michigan	328-MW coal-fired plant	14 mi south-southwest of Fermi site on Lake Erie	Operational[d]
Bayshore Power Plant	499-MW coal-fired plant	20 mi south-southwest of Fermi site on Lake Erie in Maumee Bay	Operational[e]
Davis-Besse Nuclear Power Station Unit 1	925-MW nuclear power plant	27 mi southeast of Fermi site on Lake Erie	Operational[f]
Davis-Besse Independent Spent Fuel Storage Installation	Dry spent fuel storage	On Davis-Besse site	Operational[g]
Mining Projects			
Rockwood Quarry	Crushed and broken limestone quarry	2.5 mi north-northeast of Fermi site	Operational[h]
Stoneco Newport	Crushed and broken limestone quarry	2.5 mi north-northeast of Fermi site	Operational[i]
Sylvania Minerals	Crushed and broken limestone and crushed silica quarry	6 mi north-northwest of Fermi site	Operational[j]
Sora Limestone	Crushed and broken limestone quarry	6 mi north-northeast of Fermi site	Operational[k]

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
Mining Projects (contd)			
Stoneco Denniston	Crushed and broken limestone quarry	9 mi southwest of Fermi site	Operational[l]
Stoneco Maybee	Crushed and broken limestone quarry	13 mi west-northwest of Fermi site	Operational[m]
Sibley Quarry	Crushed and broken limestone quarry	14 mi north-northeast of Fermi site	Operational[n]
Transportation Projects			
Cleveland-Toledo-Detroit Passenger Rail Line	Addition to regional transportation hub with rail lines connecting Cleveland, Buffalo, Toronto, Pittsburgh, Cincinnati, and Detroit	Rail line would pass through Monroe County on its way to Detroit	Proposed; schedule undetermined[o]
Other Actions/Projects			
Berlin Township Wastewater Treatment Plant	Wastewater treatment plant that discharges to Swan Creek near its confluence with Lake Erie	1.1 mi northwest of Fermi site	Operational[p]
Frenchtown Township Water Plant	Water treatment plant that withdraws water from Lake Erie	2 mi southwest of Fermi site	Operational[q]
Monroe Metropolitan Wastewater Treatment Facility	Wastewater treatment plant that discharges to Lake Erie–Plum Creek–Levee Channel	6 mi southwest of Fermi site	Operational[r]
Ventower Industries	Wind turbine tower manufacturing facility	6 mi southwest of Fermi site in Monroe, Michigan	Operational[s]
Monroe Water Filtration Plant	Water treatment plant that withdraws water from Lake Erie	7 mi southwest of Fermi site	Operational
Carleton Wastewater Treatment	Wastewater treatment plant that discharges to Swan Creek	9 mi northwest of Fermi site	Operational[t]
Lazy Oak Sub Wastewater Treatment	Wastewater treatment plant that discharges to Swan Creek	9 mi northwest of Fermi site	Operational[u]
Guardian Industries Glass Plant	Manufacturing facility that discharges into Swan Creek	10 mi north-northwest of Fermi site	Operational[v]
Luna Pier Wastewater Treatment	Wastewater treatment plant that discharges to La Pointe Drain	14 mi south-southwest of Fermi site	Operational[w]
Rawsonville Woods Mobile Estates	Mobile home community with National Pollutant Discharge Elimination System (NPDES) permit	18 mi northwest of Fermi site	Operational[x]
Oil Refineries	Plants that refine crude oil for other applications	Various throughout region	Operational

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
Other Actions/Projects (contd)			
Future Urbanization	Construction of housing units and associated commercial buildings, roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land use planning documents (no specific data found on development and expansion of towns within 20 mi of site)	Throughout region	Construction would occur in the future, as described in State and local land use planning documents
Great Lakes Restoration Initiative	Restoration activities to address toxic substances, invasive species, nearshore health and nonpoint source pollution, and habitat and wildlife protection	Great Lakes watershed	Began in FY 2011[(y)]
Global Climate Change/ Natural Environmental Stressors	Short- or long-term changes in precipitation or temperature	Throughout region	Impacts would occur in the future

(a) Detroit Edison (2011d).
(b) NRC (2010a).
(c) EPA (2011c).
(d) Consumers Energy (2011).
(e) EPA (2011d).
(f) NRC (2011b).
(g) NRC (2010b).
(h) EPA (2011e).
(i) EPA (2011f).
(j) Our Good Neighbors (2011).
(k) EPA (2011g).
(l) EPA (2011h).
(m) EPA (2011i).
(n) EPA (2011j).
(o) MHR (2011).
(p) EPA (2011k).
(q) Frenchtown Charter Township (2010).
(r) EPA (2011l).
(s) Ventower (2011).
(t) EPA (2011m).
(u) EPA (2011n).
(v) EPA (2011o).
(w) EPA (2011p).
(x) EPA (2011q).
(y) EPA (2011a).

and other development from occurring on undeveloped land used for agriculture that is close to the Fermi site (Monroe County Planning Department and Commission 2010).

Most undeveloped lands on the site are managed as part of the Detroit River International Wildlife Refuge (DRIWR), which extends along the shore of Lake Erie from the River Raisin in the south to the Detroit River in the north and contains habitat for wildlife, including some wetland and water-dependent species (FWS 2010). There are proposals to add to the land included in the DRIWR; these additions to recreational and conservation land uses in the vicinity of the Fermi site would be small and would not be constrained by development and operation of Fermi 3. There are currently no plans to remove land elsewhere from the DRIWR.

As described in Sections 4.1 and 4.3, building Fermi 3 would affect more than 301 ac of land, including conversion of approximately 197 ac of naturally vegetated land to industrial/utility land, at the site and could also indirectly result in some conversions of offsite land to residential areas, roads, and businesses in order to accommodate growth, new workers, and services related to the proposed nuclear facility. Other reasonably foreseeable future projects in the geographic area of interest (see Table 7-1) – such as anticipated commercial waterfront development – would also contribute to reductions in the amount of open, forested, and wetland areas and to increases in residential areas, roads, and business; however, these projects are expected to be consistent with Monroe County's land use plans. Cumulative land use impacts within the 15-mi geographic area of interest are generally expected to be consistent with existing land use plans and zoning.

Detroit Edison anticipates that three new 345-kV transmission lines would be needed to serve Fermi 3. These lines would connect Fermi 3 to the Milan Substation and would likely follow a single 29.4-mi route in Monroe County, southwest Wayne County, and southeast Washtenaw County (Detroit Edison 2011a). Approximately 18.6 mi of the route would follow an established transmission line corridor, and approximately 10.8 mi of the route would cross undeveloped rural land. The applicant also expects to have to expand the Milan Substation. Assuming that a 300-ft-wide right-of-way (ROW) would be required, approximately 1069 ac would be used for the proposed lines, approximately 19 ac would be needed to expand the Milan Substation, and additional acreage would be needed for laydown and other activities (Detroit Edison 2011a). Land use impacts resulting from these activities are expected to be minimal. Although the precise areas of impact are not yet known, these activities would result in the loss of small areas of forests, agricultural lands, wetlands, and streams. Once the lines were installed, only the land around the transmission tower bases would be unavailable for future agricultural use, and any forested areas that are cleared to establish the corridor would have to remain cleared over the operation life of the transmission lines. At this time, it is not known whether other utility transmission lines might be developed in the area that could contribute to cumulative impacts.

Climate change could increase precipitation and lake storm surges in the geographic area of interest (USGCRP 2009), thus changing land use as a result of the inundation of low-lying areas

along the lakeshore. The rate of forest growth and growth of other vegetation may increase as a result of more carbon dioxide in the atmosphere (USGCRP 2009). In addition, climate change could change crop yields and livestock productivity (USGCRP 2009), which might alter the characteristics of land used for agriculture in the geographic area of interest. Changes resulting from climate change could cause minor shifts in land use in the geographic area of interest, which might be exacerbated by the operation of Fermi 3.

Over the expected operational life of Fermi 3, few reasonably foreseeable future land use changes, other than gradually continuing urbanization and minor changes resulting from climate change, are anticipated, including the impacts from building and operating Fermi 3. Therefore, the review team concludes that the cumulative land use impacts would be SMALL, and no mitigation would be warranted.

7.2 Water Use and Quality

This section analyzes the potential cumulative impacts of the proposed Fermi 3 in addition to other past, present, and reasonably foreseeable future projects on water use and water quality.

7.2.1 Surface Water Use

The description of the affected environment in Section 2.3 of this document serves as the baseline for the cumulative impact assessments in this resource area. As described in Section 4.2, the NRC staff concludes that the impacts of NRC-authorized construction activities on surface water use would be SMALL, and no further mitigation would be warranted. The combined surface water use impacts from preconstruction and construction activities are described in Section 4.2.2.1 and were determined by the review team to be SMALL. As described in Section 5.2, the review team concludes that the impacts of operations on surface water use would also be SMALL, and no further mitigation would be warranted.

In addition to the impacts from preconstruction, construction, and operations, the cumulative analysis for surface water use also considers other past, present, and reasonably foreseeable future actions that could potentially affect this resource (Table 7-1). For the cumulative analysis of impacts on surface water, the geographic area of interest is considered to be within a 15-mi radius surrounding the intake and discharge structures, as it is a bounding estimate of the geographical extent of potential impacts of Fermi 3 on surface water due to the significant water supply available in Lake Erie.

As described in Section 5.2.2.1, the review team determined that the annual consumptive use of surface water from the operation of Fermi 3 would not be significant compared to the relative volume of water in Lake Erie (0.006 percent), and it would also remain a small portion of the average annual consumptive water use of all users in the Lake Erie basin (4.1 percent). The impacts would be minor within the geographic area of interest's 15-mi radius. The predominant

surface water user within a 15-mi radius of the Fermi site is Fermi 2, and its withdrawals would not noticeably alter surface water availability. There are also two water intakes on Lake Erie and in the vicinity of the Fermi site for public water supply: the Frenchtown Water Plant, which uses 8 million gallons per day (MGD), and the Monroe County Water Plant, which uses 7.5 MGD (Frenchtown Charter Township 2010; AWWA 2009). The impacts of these two water plants and the other projects listed in Table 7-1 are considered in the analysis in Sections 4.2 and 5.2 and would not be detectable or would be so minor that they would not affect surface water use.

The review team also evaluated the impact of potential climate changes on water availability, as well as the cumulative impact that climate change and reactor operations could have on the availability of water resources for other uses. A recent compilation of the state of the knowledge on climate change (USGCRP 2009) was considered during the preparation of this EIS. The USGCRP report and a related study for the Great Lakes (Hayhoe et al. 2010) discuss projected changes in the climate for the region during the operating license period for Fermi 3 (estimated to be from 2020 to 2060) based on a range of CO_2 emissions scenarios simulated using the NOAA Great Lakes model. The lowest of these potential emission scenarios (B1) predicts a maximum CO_2 air concentration of 550 ppm by 2100 (roughly double pre-industrial levels), resulting in a slight increase in average air temperature but little to no significant change in Lake Erie water levels due to a corresponding increase in precipitation. The highest-emissions scenario (A1Fi) predicts a maximum CO_2 air concentration of 940 ppm by 2100 (about four times pre-industrial levels), resulting in noticeable impacts on both average air temperature and lake volume.

The predicted impacts of the highest emissions scenario include an increase in average temperature of at least 3–4°F by the end of the operating license period of Fermi 3 (about 2060) and a slight increase in precipitation in the winter and spring. Rainstorms are anticipated to be more intense throughout the year. Average water levels in Lake Erie could decrease as much as 1.5 ft because of increased evaporation of the lake, which would cause a decrease of up to 2 percent of the volume of Lake Erie. If the water volume in Lake Erie were to be reduced by 2 percent, its volume could noticeably decline from 128 trillion gallons to 125 trillion gallons. In addition, the increase in the average air temperature when combined with lower lake levels could result in an increase in the average monthly water temperature of Lake Erie.

The review team used projected population estimates presented in Section 2.5.1 of the ER and the reported water use in Monroe County as presented in the ER to estimate future water use in Monroe County by 2060. Assuming that per capita water use remains in the range of current amounts and population increases by 76 percent by 2060 (Detroit Edison 2011a) the quantity of Lake Erie water used for the public water supply in Monroe County would increase from approximately 12 MGD in 2000 to 21 MGD by 2060. The review team was not aware of studies estimating potential future water use from the Lake Erie basin between 2020 and 2060. Detroit

Edison (2011a) estimates of population growth indicate an increase of approximately 40 percent by 2060 within a 50-mi radius of Fermi 3. The review team used the projected population growth estimates and assumed that per capita water use (for all uses) remains in the range of present amounts to estimate total future use of Lake Erie water by 2060. If Lake Erie water use were to increase by 40 percent above the average water use observed from 2000 through 2006, then the total water use would be approximately 75,600 MGD, with a consumptive use of approximately 702 MGD. On an annual basis, a consumptive use of 702 MGD would be approximately 0.2 percent of the Lake Erie volume, if reduced by the effects of climate change to 125 trillion gallons.

Potential increases in Lake Erie water temperature resulting from climate change could increase the amount of cooling water needed for operation of the proposed Fermi 3 and other major users. Therefore, the operations of Fermi and other thermoelectric plants on Lake Erie could be altered as a result of climate change. If the volume of Lake Erie water decreased by 2 percent as a result of climate change, then the annual consumptive water use by Fermi 3 would still be negligible (approximately 0.006 percent of the total lake volume) even if the monthly average use increased significantly. The review team considered the cumulative consumptive use of surface water from the operation of the existing Fermi 2, proposed Fermi 3, and other (existing or reasonably foreseeable) consumptive uses and the potential effects of climate change. The greatest potential future impact on Lake Erie water availability is predicted to be from climate change. The impact predicted for the lowest-emissions scenario would not be detectable or would be so minor that it would not noticeably alter the availability of water from Lake Erie. However, if CO_2 emissions follow the trend evaluated in the highest-emissions scenario, the cumulative effects on the quantity of surface water in Lake Erie may be detectable and may noticeably alter the availability of water in the lake, resulting in the potential for water-use restrictions and less water availability. On the basis of its evaluation, the review team concludes that the potential impacts of both increased future use (assuming constant per capita use and projected population increase) and climate change on surface water quantity in Lake Erie would be SMALL to MODERATE. A SMALL impact would be expected under the condition of minimal climate change associated with the lowest-emissions scenario. A MODERATE impact would be expected under the highest-emissions scenario, which is expected to produce the highest increases in air and water temperatures. These increases in air and water temperature could noticeably alter water levels but would not do so to the point that the resource and surrounding environment become destabilized. However, the cumulative impacts of building and operating Fermi 3 would not contribute significantly to the overall cumulative impacts in the geographical area of interest. The incremental increases in water use by Fermi 3 and other present and foreseeable future uses (other than the effects of climate change) should not noticeably reduce the quantity of water within Lake Erie. The potentially increased water temperature in Lake Erie that may result from climate change could also increase the amount of cooling water needed for operation of the proposed Fermi 3 and other major users, although these effects are not

expected to be significant. Therefore, the incremental impacts from NRC-authorized activities would be SMALL, and no further mitigation would be warranted.

7.2.2 Groundwater Use

The description of the affected environment in Section 2.3 of this document serves as the baseline for the cumulative impact assessments in this resource area. As described in Section 4.2, the NRC staff concludes that the impacts of NRC-authorized construction activities on groundwater use would be SMALL, and no further mitigation would be warranted. As described in Section 5.2, the review team concludes that the impacts of operations on groundwater use would also be SMALL, and no further mitigation would be warranted.

The combined groundwater use impacts from preconstruction and construction were described in Section 4.2.2 and were determined to be SMALL. In addition to the impacts from preconstruction, construction, and operation, the cumulative analysis also considers past, present, and reasonably foreseeable future actions that could affect groundwater use. For this analysis, the geographic area of interest affected by dewatering for preconstruction and construction activities is considered to be the local aquifer in the overburden unit and the Bass Islands Group aquifer in the vicinity of the Fermi site (within 15 mi). From a local standpoint, changes within the overburden unit would not affect any other groundwater users.

From a regional standpoint, the Bass Islands Group aquifer is tapped for public water supply, industrial use, thermoelectric power facilities, agricultural irrigation, golf course irrigation, and dewatering for quarry mining operations. Approximately 75 percent of groundwater withdrawn in Monroe County is for quarry dewatering operations (Reeves et al. 2004). In the past, groundwater flow within the Bass Islands Group aquifer flowed to the east toward Lake Erie; however, in the vicinity of the Fermi site, groundwater flow within the Bass Islands Group aquifer has reversed to flow toward mining quarry dewatering operations (toward Sylvania Minerals and Stoneco Denniston Quarry listed in Table 7-1). Groundwater elevations in the vicinity of the Fermi site have declined between 10 and 15 ft since the early 1990s as a result of dewatering for offsite quarry operations elsewhere in Monroe County (Reeves et al. 2004). Detroit Edison (2011a) used U.S. Geological Survey values (from Reeves et al. 2004) for groundwater withdrawals within Monroe County and in adjacent Wayne County that will affect groundwater levels within Monroe County to estimate total freshwater groundwater withdrawals in Monroe County. It estimated that withdrawals would increase from about 28 MGD in 2000 to 49 MGD in 2060. In Monroe County, 0.8 percent of the total water use in 2000 was from groundwater.

During preconstruction and construction activities, dewatering operations would temporarily lower groundwater levels in the vicinity of the Fermi site. The overburden unit is not used at the Fermi site or the area immediately surrounding the site, because of its low yield and spatial discontinuity. The unit is assumed to be in direct contact with Lake Erie in many places; consequently, it is unlikely that there would be a noticeable drawdown in the unit outside of the

construction area. In addition, slurry walls will be in place around the dewatering operation, and dewatering wells will only pump from the Bass Islands Group aquifer. Groundwater wells that could be affected by drawdown from dewatering during the building of Fermi 3 are nearby household wells, irrigation wells, and other wells (Detroit Edison 2011a). According to modeling scenarios, it is estimated that at a distance of 1.5 mi from the Fermi site, the largest drawdown would occur 1 ft below current water levels (Detroit Edison 2011a). The offsite well with the highest amount of drawdown is a domestic water supply well located about 3800 ft from the center of the power block area where drawdown would be up to 2 ft, according to modeling scenarios. In addition, groundwater dewatering activities are not expected to affect onsite wetlands, since they are hydraulically connected to Lake Erie.

Given that (1) the proposed Fermi 3 would not use groundwater for operations, (2) there would be no discharges to groundwater from Fermi 3, and (3) temporary dewatering operations during preconstruction and construction activities would have limited spatial effect and would not affect the overall productivity of the Bass Islands Group aquifer, the review team determined that the potential impacts on groundwater use from building and operating Fermi 3 would be minimal. In addition, the review team concluded that the cumulative groundwater use impacts would be SMALL. The incremental impacts from NRC-authorized activities would be SMALL, and no further mitigation would be warranted.

7.2.3 Surface Water Quality

The description of the affected environment in Section 2.3 serves as the baseline for the cumulative impact assessments in this resource area. As described in Section 4.2.3.1, the NRC staff concludes that the impacts of NRC-authorized construction activities on surface water quality would SMALL, and no further mitigation would be warranted. As described in Section 5.2.3.1, the review team concludes that the impacts of operations on surface water quality would also be SMALL, and no further mitigation would be warranted.

The combined surface water quality impacts from preconstruction and construction are described in Section 4.2.3.1 and were determined to be SMALL. In addition to the impacts from preconstruction, construction, and operations, the cumulative analysis for surface water quality also considers other past, present, and reasonably foreseeable future actions that could potentially affect this resource. Because water within the western basin of Lake Erie is well mixed, water quality within the entire western basin could be affected by construction and operation of the proposed Fermi 3. Consequently, the geographic area of interest for surface water quality is the entire western basin of Lake Erie.

The western basin of Lake Erie near the proposed Fermi 3 receives input from two major streams: the Detroit River to the north and the River Raisin to the south. The Detroit River contributes approximately 80 percent of the inflows to Lake Erie. The Maumee River further south, however, is a major sediment source for Lake Erie and contributes the highest amount of

suspended solids per year of any other tributary to the Great Lakes (Bridgeman 2006). Sediment carried by the Maumee River is deposited in the Toledo Harbor. This sediment is currently dredged at an average rate of 850,000 tons per year by the USACE to maintain an important shipping channel (USACE 2009). The majority of dredge spoils from this procedure are disposed of in an existing two-square-mile placement area at the western basin north of the location of the shipping channel (USACE 2009). A recently completed study found that there was no significant environmental impact of this open water disposal (USACE 2009).

The current water quality in the western basin of Lake Erie is primarily influenced by these streams but also includes the impacts from operations of industrial facilities, wastewater treatment plants, and thermoelectric energy generating facilities (including Fermi 2) in the region, which are listed in Table 7-1.

Point and non-point sources of pollution have affected the water quality of the western basin of Lake Erie. The two main water quality concerns in Lake Erie are (1) increased phosphorus loading from regional agricultural activities causing toxic algal blooms, and (2) elevated concentrations of the bioaccumulative contaminants – such as dioxin, polychlorinated biphenyls (PCBs), and mercury – occurring mostly as a result of historical industrial activities (Hartig et al. 2007; Brannan 2009).

The EPA's Great Lakes National Program Office has initiated the Great Lakes Restoration Initiative program, a consortium of 11 Federal agencies that developed an action plan to address environmental issues. These issues fall into five areas: cleaning up toxics and areas of concern, combating invasive species, promoting nearshore health by protecting watersheds from polluted run-off, restoring wetlands and other habitats, and tracking progress and working with strategic partners. The results of this long-term initiative would presumably address water quality concerns in Lake Erie.

The review team also evaluated the impact of potential climate changes on water quality as well as the cumulative impact climate change and reactor operations could have on the quality of water resources for other uses. As mentioned in Section 7.2.1, potential climate change scenarios discussed in a recent compilation of the state of the knowledge in this area (USGCRP 2009) and a related study for the Great Lakes (Hayhoe et al. 2010) were considered during the preparation of this EIS. As these studies indicate, both the lowest (B1) and highest (A1Fi) CO_2 emissions scenarios are predicted to increase air and lake temperatures, with the greatest increase predicted if CO_2 emissions rate follow the highest-emissions scenario.

By the end of the operating license period of Fermi 3 (about 2060) annual average air temperatures are projected to have increased by at least 2–3°F under the lower-emissions scenario and 3–4°F under the higher-emissions scenario. This increase could result in a slight increase in precipitation in the winter and spring. Rainstorms are anticipated to be more intense throughout the year. Higher-intensity precipitation events could lead to increased erosion and

sediment loading in Lake Erie tributaries and thus increase sediment loading in Lake Erie itself. Sediment loading, phosphorus loading, and the concentrations of bioaccumulative contaminants within Lake Erie could also be exacerbated by the lowered lake levels resulting from the highest temperature increase, given that less dilution would take place with lower lake levels. Climate change scenarios indicate that while the changes in the surface water quality of Lake Erie that result from climate change may be noticeable, they would not be destabilizing.

The size of the thermal plume created by Fermi 3 discharge would increase slightly if lake levels were to decrease as a result of climate change (where reductions are projected to be as much as 1.5 ft). This decrease in lake levels would result in a larger mixing zone, which would be regulated by the Michigan Department of Environmental Quality (MDEQ). The thermal plume modeling using the CORMIX model was discussed in Section 5.2. Input data for the CORMIX simulations included discharge rate, discharge temperature, water depth, ambient lake temperature, and ambient lake current velocity and direction. Both the ambient lake temperature and the ambient lake current inputs were derived from Lake Erie Operational Forecast System (LEOFS) model estimates. LEOFS is a National Oceanic and Atmospheric Administration (NOAA) project and is a part of the Great Lakes Operational Forecast System (GLOFS). The thermal plume analysis included a scenario with a Lake Erie water depth of 7.0 ft, which is 1.5 ft below the average depth for the month associated with the largest thermal plume (May). This scenario estimated that the plume would be about 55,300 square feet, a small fraction of the western basin of Lake Erie. The thermal plume of the existing Fermi 2 would also increase with lower lake levels. The increase in the average air temperature combined with lower lake levels could lead to an increase in the average monthly temperature of Lake Erie, further leading to an increase in the average monthly use of cooling water by the proposed Fermi 3 and existing Fermi 2. Increases in cooling water use would result in a slightly larger volume of heated water discharged back into Lake Erie and would therefore further increase the size of thermal plumes. However, the thermal impacts attributable to Fermi 3 would remain minor within the western basin of Lake Erie.

Surface water quality impacts include sediment loading, and thermal and chemical discharges from the proposed Fermi 3. Thermal and chemical (i.e., biocides, metal and organic compounds) discharges from Fermi 3 would be required to meet applicable NPDES permit requirements, health standards, regulations, and total maximum daily loads (TMDLs) mandated by MDEQ and EPA (Detroit Edison 2011a). On the basis of its evaluation, the review team concluded that the cumulative impacts on surface water quality would be MODERATE; however, the cumulative impacts of building and operating Fermi 3 would not contribute significantly to the overall cumulative impacts in the geographical area of interest. Therefore, the incremental impacts from NRC-authorized activities would be SMALL, and no further mitigation would be warranted.

7.2.4 Groundwater Quality

The description of the affected environment in Section 2.3 serves as the baseline for the cumulative impact assessments in this resource area. As described in Section 4.2, the NRC staff concludes that the impacts of NRC-authorized construction activities on groundwater quality would be SMALL, and no further mitigation would be warranted. As described in Section 5.2, the review team concludes that the impacts of operations on groundwater quality would also be SMALL, and no further mitigation would be warranted.

The combined impacts on groundwater quality from preconstruction and construction activities were described in Section 4.2.3 and determined to be SMALL. In addition to the impacts from preconstruction, construction, and operations, the cumulative analysis also considers past, present, and reasonably foreseeable future actions that could affect groundwater quality. For this analysis, the geographic area of interest is considered to be the local aquifer in the overburden unit and the Bass Islands Group aquifer in the 15-mi region surrounding the proposed Fermi 3. As mentioned in Section 7.2.2, groundwater would not be used for operation of Fermi 3.

The overburden unit is not used at the Fermi site or the area immediately surrounding the site because of its low yield and spatial discontinuity. Any impacts on the quality of this aquifer at the Fermi site from activities associated with the preconstruction and construction of Fermi 3 would not affect this resource regionally. During site preparation, construction activities, and operation of the proposed Fermi 3, it is possible that spills could transport pollutants (e.g., gasoline) to groundwater in the overburden unit. Adherence to good housekeeping rules and best management practices described in the Pollution Incident Prevention Plan (PIPP) would reduce impacts to groundwater quality. These practices include conducting an inventory of potential sources, performing preventative maintenance and inspections, posting signs and labels, and planning for secondary containment.

It is anticipated that during construction and operations, the impacts on groundwater quality would be localized and temporary, because there are no plans to use groundwater or to discharge waste to groundwater during construction or operations. No other projects listed in Table 7-1 would affect groundwater quality in the vicinity of the Fermi site; therefore, the review team concludes that cumulative impacts on groundwater quality would be SMALL, and no further mitigation would be warranted.

7.3 Ecology

This section addresses the cumulative impacts on terrestrial, wetland, and aquatic ecological resources from proposed Fermi 3 and past, present, and reasonably foreseeable future activities.

7.3.1 Terrestrial and Wetland Resources

The description of the affected environment in Section 2.4.1 provides the baseline for the cumulative impact analysis for terrestrial ecological resources (including wetlands). As described in Section 4.3.1, the NRC staff concludes that the impacts of NRC-authorized construction on terrestrial ecological resources would be SMALL to MODERATE, and no further mitigation other than that proposed by the applicant and discussed in Section 4.3.1.5 would be warranted. As described in Section 5.3.1, the review team concluded that the impacts of operations of Fermi 3 on terrestrial ecological resources would be SMALL to MODERATE and no further mitigation other than that proposed by the applicant and discussed in Section 5.3.1.5 would be warranted.

The combined impacts from preconstruction and construction of Fermi 3 on terrestrial ecological resources were described in Section 4.3.1 and determined to be SMALL to MODERATE. The potential for MODERATE cumulative impacts is limited to possible adverse effects of Fermi 3 on the eastern fox snake. The staff's evaluation of the potential impacts on the eastern fox snake recognizes the potential for mitigation measures proposed by Detroit Edison (Detroit Edison 2012a, b) and approved by the MDNR to significantly reduce impacts from Fermi 3 on that species, thereby leading to SMALL impacts, but acknowledges the possibility of MODERATE impacts if proposed mitigation is not implemented as described in their plan. Although the extent of wetland impacts (involving approximately 34.5 ac of temporary and permanent impacts) is noticeable, these unavoidable wetland impacts would be compensated for by reestablishing wetlands offsite and rehabilitating temporarily disturbed wetlands onsite. In addition to the impacts from Fermi 3 preconstruction, construction, and operation, the following cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could affect the same terrestrial ecological resources. The geographic area of interest is considered to be a 50-mi radius around the Fermi 3 site (as defined in Section 2.4.1). This area is expected to encompass the ecologically relevant landscape features and species potentially affected by the proposed Fermi 3.

Current projects within the geographic area of interest that are potentially capable of affecting the same terrestrial ecological resources as Fermi 3 include the ongoing operation of Fermi 2, the ongoing decommissioning of Fermi 1, the Detroit Edison Monroe Power Plant, the Bayshore Power Plant, the J.R. Whiting Power Plant, three limestone quarries, and several wastewater treatment plants (see Table 7-1). Reasonably foreseeable future projects within the geographic area of interest that could affect the same terrestrial ecological resources include expanded regional commercial and residential development, operation of the recently constructed Ventower Industries manufacturing facility, and construction and operation of a proposed Cleveland-Toledo-Detroit passenger rail line. The Ventower facility was constructed recently on a former industrial site in the City of Monroe. Although ongoing commercial and residential

development in the region would be expected to result in the loss of various habitats and wildlife, the review team is not aware of particular development proposals that may be planned.

The geographic area of interest is located primarily in the Lower Peninsula ecoregion and on the western Lake Erie shoreline. This ecoregion has been altered considerably since European settlement, primarily by agriculture and urbanization. Before settlement, most of the region was forested with a mix of oak and oak-hickory on loamy soils and a mix of black ash (*Fraxinus nigra*), white oak (*Quercus alba*), bur oak (*Q. macrocarpa*), and American basswood (*Tilia americana*) on wetter, clayey soils (Alpert 1995). The recent devastation of the ash tree population in the region because of the emerald ash borer (*Agrilus planipennis*) has also substantially altered the composition of the remaining forested habitats (Detroit Edison 2011a). Currently, the main uses for land in the area of interest are for row crops and other agricultural uses; industrial, commercial, and residential development; deciduous upland forest; and forested and emergent wetlands (Detroit Edison 2011a). Residential and commercial urbanization is ongoing within the geographic area of interest.

The geographic area of interest includes agricultural land, including row crops; open water, including part of Lake Erie and shallow lagoons within the Fermi site; developed land, especially in the Detroit metropolitan area; upland forests; and forested and emergent wetlands. As discussed in Section 2.4.1.3, none of the habitats that would be affected by Fermi 3 has been designated as “critical habitat” by the U.S. Fish and Wildlife Service.

7.3.1.1 Wildlife and Habitat

The impacts on terrestrial wildlife and habitats, including important species and wetlands, from preconstruction, construction, and operation of Fermi 3 are described in Section 4.3.1.

Operation of the recently constructed Ventower manufacturing facility on abandoned industrial land in the City of Monroe is not expected to have adverse terrestrial ecological impacts that would substantially add to impacts from building and operating Fermi 3. The proposed Cleveland-Toledo-Detroit passenger rail line would be built primarily within existing ROWs. New rail sidings and improvements to the existing ROW could potentially result in the clearing of vegetation adjoining existing trackbeds. The review team is not aware of specific design information about the project; nevertheless, impacts on ecological resources are expected to be mostly limited to areas within or adjacent to the existing ROW. Impacts from operation of the rail line are expected to be negligible. Consequently, the review team believes that cumulative impacts on terrestrial ecological resources from building and operating the rail line would be minimal and would not substantially add to terrestrial ecological impacts from Fermi 3.

Among the reasonably foreseeable future actions in the geographic area of interest that could adversely affect terrestrial ecological resources, continuing regional urbanization has the greatest potential to contribute to the adverse effects from Fermi 3 on those resources. Absent

specific information about the location, extent, and design of future urban development, the review team draws general conclusions about the cumulative impacts on terrestrial ecological resources within the geographic area of interest. Urbanization could result in the conversion of some agricultural land, forest land, wetlands, and other wildlife habitat to urban uses. Urbanization-related activities, which usually involve the filling and/or draining of wetlands, operation of heavy equipment, and generation of noise from construction equipment, could result in many of the same terrestrial ecological impacts – including habitat loss from the clearing and grading of land (temporary and permanent), increased human activity in natural areas, increased traffic (resulting in increased wildlife mortality), and the spread of fugitive dust – as would the proposed action of building Fermi 3. Some of the effects of these activities, such as noise and dust, would be short term and localized in nature. The impacts caused by noise and dust would be temporary if routine best management practices are followed. Other effects, such as replacing wildlife habitat with urban features, would be permanent. The impacts from land clearing and grading, filling wetlands, increased human presence, and increased traffic would likely be permanent.

As temperatures increase under anticipated climate change, a long-term northward shift of plant species now associated with the southeastern United States could occur (USGCRP 2009). This shift could result in changes in the species composition of plant communities in the geographic area of interest. Higher temperatures could cause increased evaporation rates, which, along with the greater likelihood of drought, could reduce the extent of wetlands in the area. As discussed in Section 7.2.3, average annual air temperatures in the project area are projected to increase by between 2–3°F and 3–4°F by the year 2060 (USGCRP 2009). The review team concluded that the thermal impacts attributable to Fermi 3 would remain minor within the western basin of Lake Erie. Any effects on wetlands hydrologically connected to the western basin of Lake Erie would therefore similarly be minor. Impacts on forests could be mixed and represent a balance in which the benefits of higher levels of carbon dioxide might be offset by more frequent droughts and increases in destructive pests (USGCRP 2009). According to USGCRP (2009), “All major groups of [terrestrial] animals […] will be affected by impacts on local populations, and by competition from other species moving into the Midwest region.”

Building Fermi 3 could contribute to the impacts discussed above. However, much of the area affected by building Fermi 3 has already experienced disturbance by past site activities or would be restored after development. Disturbances to terrestrial habitats and wetlands in the proposed transmission corridor would be mostly limited to the loss of forest cover and some limited areas used for grading tower pads and access roads. Forested areas within the corridor would be converted to herbaceous or shrubby vegetation. Building Fermi 3 would permanently fill approximately 8.3 ac of wetland and temporarily affect 23.7 ac of wetland (Detroit Edison 2011b). The temporarily impacted wetlands would be rehabilitated. See Section 4.3.1 for additional discussion of wetlands impacts and mitigation.

As discussed in Section 4.3, preconstruction and construction activities would likely displace or destroy wildlife that inhabits affected areas. Other activities included in this cumulative analysis could affect wildlife in similar ways. In the case of some wildlife, including some individual State-listed eastern fox snakes and other Federally and State-listed species, displacement or mortality could occur during land clearing for any of the above projects. Local populations of wildlife would experience habitat loss, fragmentation, and competition for remaining resources. There would be a greater risk of mortality of less mobile animals, such as reptiles, amphibians, and small mammals, as a result of construction activities than there would be for more mobile animals, such as birds, many of which would be displaced to adjacent communities.

Wildlife would also be subjected to impacts from noise and traffic. Noise and traffic would result from other future development activities in the geographic area of interest, as well as from Fermi 3. The impact on wildlife from each noise-generating activity is expected to be temporary and minimal. Although the creation of new utility corridors, including but not limited to the proposed Fermi 3 transmission line corridors, could have negative effects on forest-dwelling birds, amphibians, reptiles, and other wildlife, some species might benefit, including those that inhabit early successional habitat or use forest-edge environments. Birds of prey that are more effective in hunting in open areas would likely exploit newly created hunting grounds.

The effects of the preconstruction and construction activities of Fermi 3 on wildlife would be limited to the Fermi site, transmission line corridors, and nearby areas. Because other reasonably foreseeable future projects would be widely dispersed in the geographic area of interest, the review team concludes that the cumulative impacts would be minimal, with the exception of wetland impacts discussed in Section 7.3.1.2.

As described in Section 5.3.1, potential operational impacts of Fermi 3 would include cooling-tower noise, salt drift from vapor plumes, bird collisions with tall structures, and transmission line operation and corridor maintenance. Even when combined with similar impacts from other past, present, and reasonably foreseeable future projects in the geographic area of interest, most would have only minimal impacts on wildlife and habitat, with the exception of the eastern fox snake impacts, as discussed in Section 7.3.1.2.

Among the past, present, and reasonably foreseeable future actions known to the review team, only future urbanization has the potential to substantially affect terrestrial ecological resources in a way similar to the operation of Fermi 3. Urbanization could lead to increases in noise, traffic, and human presence that could negatively affect some species, including the eastern fox snake, either indirectly by causing the species to avoid activities or directly through roadway mortality. Future urbanization in the region, however, is expected to be minimal. However, these impacts would be minor and dispersed and are not expected to be proximate enough to the Fermi site and transmission line to cumulatively affect terrestrial ecological resources on a substantial basis. The impacts of building or operating Fermi 3 are not expected to affect climate change on either an individual or cumulative basis with past, present, and reasonably foreseeable future

projects in the geographic area of interest. However, the impacts on terrestrial habitats and wildlife from climate change could be detectable.

7.3.1.2 Important Species and Habitats

Important Species

Although the eastern fox snake, a State-listed species, may be adversely affected by preconstruction, construction, and/or operation of the Fermi 3 project, the project would not destabilize the regional population. Detroit Edison has prepared and submitted to the Michigan Department of Natural Resources (MDNR) the Fermi 3 Construction Habitat and Species Conservation Plan and the Fermi 3 Operational Conservation and Monitoring Plan for the eastern fox snake (Detroit Edison 2012a, b). The plans identify mitigation measures to protect the species and its habitat during preconstruction, construction, and operation of Fermi 3. The plans involve awareness training, education, signage, and other measures to reduce the likelihood of vehicular collisions with eastern fox snakes when using new and existing roadways on the Fermi site. Combined impacts from preconstruction, construction, and operation activities on the eastern fox snake could be regionally noticeable, but not destabilizing in the absence of mitigation; however, mitigation performed in accordance with the Construction Habitat and Species Conservation Plan prior to conducting site preparation, preconstruction, and construction activities and the Operational Conservation and Monitoring Plan during operations could reduce these impacts to minimal levels. The review team is not aware of other particular development proposals that may be planned and, consequently, cannot speculate on the locations, regulatory controls, and further effects on the eastern fox snake and its habitats beyond the areas covered by the Plans.

Small patches of the State-listed American lotus (State-listed as threatened) may be disturbed by preconstruction activities in emergent wetlands on the site. Detroit Edison has stated its intention to develop mitigation measures addressing American lotus before site preparation activities are initiated (Detroit Edison 2011a). Any future permits issued by the MDEQ and/or USACE involving wetlands are not likely to be granted without consideration of measures to prevent and mitigate adverse effects on Federal and State-listed species; consequently, future urbanization and other future projects are unlikely to contribute substantially to cumulative impacts on American lotus populations in southeast Michigan.

Important Habitats

Although much of the coastal wetland areas once present on the western shore of Lake Erie, where the Fermi site is located, have already been drained or filled by agricultural, industrial, or urban development, the Fermi project would impact only a small portion of the remaining wetlands, and State and Federal wetland protection regulations are expected to avoid, minimize, and compensate for future unavoidable losses of coastal (and other) wetlands as a

result of future urbanization. All but 1.9 acres of the permanent wetland impacts described in Section 4.3.1 would be compensated for by the restoration of wetlands at an off-site location in the coastal zone of Lake Erie (Appendix K) (Detroit Edison 2012c), and the temporarily impacted wetlands on-site would be rehabilitated (Detroit Edison 2012d).

The transmission corridor, once exiting the Fermi site, would not traverse coastal wetlands but would cross several areas of noncoastal (inland lake and/or stream) wetlands. The review team assumes that the 93.4 ac of "woody wetlands" identified in Table 2-6 for the proposed corridor would be cleared of trees and converted to an herbaceous or shrub condition. State and/or Federal wetland regulations protect inland as well as coastal wetlands, although future urban development in the area can be expected to result in some limited losses of inland wetlands from permitted and exempted activities.

The EPA's recent Great Lakes Restoration Initiative (GLRI) program funds a variety of restoration projects. The program's action plan covers fiscal years 2010 through 2014 and addresses five urgent focus areas, including combating invasive species and restoring wetlands and other habitats. Several projects are currently funded and under way in the geographic area of concern (EPA 2011a), including one located in the Pointe Aux Peaux State Wildlife Area, which is south of and adjacent to the Fermi site. Detroit Edison's proposed compensatory mitigation would complement and expand upon the benefits to the region from the GLRI wetland restoration projects.

Overall, the cumulative impacts of Fermi 3 and other past, present, and reasonably foreseeable future activities in the geographic area of interest on wetlands are not expected to be extensive.

7.3.1.3 Summary of Terrestrial and Wetland Impacts

The analysis of the cumulative impacts on terrestrial ecology is based on information provided by Detroit Edison and the review team's independent evaluation. The review team concludes that the cumulative impacts of other past, present, and reasonably foreseeable future projects and the preconstruction, construction, and operation of Fermi 3 on terrestrial ecological resources would be SMALL to MODERATE. The potential for MODERATE cumulative impacts reflects possible adverse effects of Fermi 3 on the eastern fox snake. If also reflects the possible effects of climate change. The staff's evaluation of the potential impacts on the eastern fox snake recognizes the potential for mitigation measures proposed by Detroit Edison (Detroit Edison 2012a, b) and approved by the MDNR to significantly reduce impacts from Fermi 3 on that species, thereby leading to SMALL impacts, but acknowledges the possibility of MODERATE impacts if proposed mitigation is not implemented as described in their plan. The incremental contribution of building and operating the Fermi 3 project could be noticeable (MODERATE) with respect to the eastern fox snake but would be minor (SMALL) for other terrestrial resources. The incremental contribution of NRC-authorized elements of the Fermi 3 project, which exclude preconstruction activities such as site preparation and building

transmission lines, but which include operations, could likewise be noticeable (MODERATE) with respect to the eastern fox snake but would be minor (SMALL) with respect to other terrestrial resources.

7.3.2 Aquatic Resources

The description of the affected environment in Section 2.4.2 of this EIS provides the baseline for the cumulative impacts assessment for aquatic ecological resources. As described in Section 4.3.2, the impacts from NRC-authorized construction on aquatic ecological resources would be SMALL, provided that Detroit Edison implements the mitigation measures described in Section 4.3.2.5. The combined impacts from preconstruction and construction activities on aquatic resources of the Fermi site and transmission line corridor were described in Section 4.3.2 and were also determined to be SMALL for all aquatic species and habitats, provided that the potential mitigation measures identified in Section 4.3.2.5 are implemented.

As described in Section 5.3.2, the review team concluded that the impacts of operation of Fermi 3 and the transmission line on aquatic ecological resources would also be SMALL, provided that the mitigation measures described in Section 5.3.2.5 are implemented.

In addition to the impacts from preconstruction, construction, and operation of Fermi 3, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could affect aquatic resources within the watersheds that could be affected by construction and development of Fermi 3. The geographic area of interest for the cumulative impact analysis for aquatic resources includes primarily the lower Swan Creek watershed and the western basin of Lake Erie. This geographic area encompasses ecologically relevant aquatic habitat features and the associated populations of aquatic species that could be affected by construction and operation of the proposed Fermi 3.

Impacts on aquatic resources can result from changes in habitat availability or quality, degradation of water quality, and increased mortality of organisms. Impacts can include changes in populations or composition of communities. Activities and environmental changes that may contribute to cumulative impacts on aquatic resources within the geographic area of interest include building and operating the proposed Fermi 3, operation of other power plants (including the existing Fermi 2), discharge of treated wastewater, surface water runoff, increased urban development, agricultural activities, commercial and recreational fisheries, introduced invasive species, and global climate change. Human activities have resulted in considerable changes in the Lake Erie aquatic ecosystem during the past century (see Section 2.4.2.1 of the EIS). These changes have resulted from many causes, including overfishing, introduction and expansion of invasive exotic species, nutrient enrichment, dredging, degradation of tributary conditions and other habitat features, and introduction of contaminants.

Impacts related to building the proposed Fermi 3, associated facilities, and transmission lines on aquatic habitat and biota could result from altered hydrology, erosion, stormwater runoff of soil and contaminants, and direct disturbance or loss of aquatic habitats. In addition to having a minor potential impact on recreationally or commercially important fish species that could occur in the vicinity of the Fermi site, building Fermi 3 could also affect some Federally or State-listed aquatic species in the western basin of Lake Erie or in the lower Swan Creek watershed, including northern riffleshell (*Epioblasma torulosa rangiana*), pugnose minnow (*Opsopoeodus emeiliae*), rayed bean (*Villosa fabalis*), salamander mussel (*Simpsonaias ambigua*), sauger (*Sander canadensis*), silver chub (*Macrhybopsis storeriana*), and snuffbox (*Epioblasma triquetra*) (Section 4.3.2.3). However, the likelihood that building activities could affect these species is low and, if mitigation identified in Section 4.3.2.5 is implemented, the impacts of Fermi 3 preconstruction and construction activities, including development of associated transmission lines, would be SMALL. These effects should not measurably increase cumulative impacts on those species within the geographic area of interest. Other construction projects that occur along the shores of Lake Erie's western basin or within watersheds that drain into the western basin would contribute in similar ways to the impacts on aquatic habitats and biota within the geographic area of interest, although the overall cumulative level of impact is difficult to quantify.

The Lake Erie aquatic ecosystem is also affected by urbanization, industrialization, and agriculture. The Lake Erie basin has a greater population than do the other Great Lakes and surpasses them in the amounts of effluent received from sewage treatment plants and of sediment loading (LaMP Work Group 2008). Development of Fermi 3 and other projects in the region, such as the proposed projects identified in Table 7-1, could result in increased population and additional urbanization, with subsequent impacts on aquatic resources within the western basin of Lake Erie or in the lower Swan Creek watershed. Increased urbanization within the region could affect aquatic resources by increasing the amount of impervious surface, non-point source pollution, and water use and by altering riparian and in-stream habitat and existing hydrology patterns. Agricultural development within the basin introduces large amounts of sediment to Lake Erie (LaMP Work Group 2008).

As identified in Table 7-1, there are currently five operational power plants within the geographic area of interest, including Fermi 2 (located on the Fermi site), the Detroit Edison Monroe Power Plant (6 mi southwest of the Fermi site), the J.R. Whiting Power Plant (14 mi south-southwest of the Fermi site), the Bayshore Power Plant (20 mi south-southwest of the Fermi site), and the Davis-Besse Nuclear Power Station Unit 1 (Davis-Besse) (27 mi southeast of the Fermi site). All of these power plants withdraw cooling water from and discharge heated effluent into the western basin of Lake Erie. Fermi 2 and Davis-Besse use closed cycle cooling; the Whiting, Bayshore, and Monroe power plants employ once-through cooling.

As described for Fermi 3 in Section 5.3.2, withdrawing cooling water has a potential to affect aquatic organisms through impingement and entrainment. If the organisms being entrained or impinged at different power plants are members of the same populations, the impacts on those populations would be cumulative. Because the water intakes for Fermi 2 and Fermi 3 would be located in close proximity within the intake bay, it is estimated that the combined operation of the Fermi 2 and Fermi 3 facilities would effectively double the water intake and would likely increase entrainment and impingement rates of aquatic organisms in the immediate vicinity of the intake bay as compared to the operation of Fermi 2 alone (Detroit Edison 2011a). The mean daily entrainment of the larvae of four species of fish that are common in Lake Erie's western basin – gizzard shad (*Dorsoma cepedianum*), white bass (*Morone chrysops*), walleye (*Sander vitreus*), and freshwater drum (*Aplodinotus grunniens*) – at four power plants (i.e., the once-through Bayshore, Monroe, Acme [no longer operational], and Whiting) averaged over three seasons of production (1975–1977) ranged from nearly zero to approximately 8 percent of the larvae present within nearshore areas (Patterson 1987) and is considered to be detectable. The study suggested that the numbers of larvae surviving to reach older life stages for these species would increase substantially if the effects of power plant entrainment were removed (Patterson and Smith 1982; Patterson 1987). Cooling water intake rates for each of the four facilities (Patterson and Smith 1982; Patterson 1987) were estimated to be 4 to 15 times higher than the cooling water intake rates for the Fermi 2 facility and for the proposed Fermi 3 facility (Detroit Edison 2011a). The larval fish entrainment rates for these facilities are expected to be higher than for Fermi 3. Therefore, even though the estimated impingement and entrainment rates for Fermi 3 would be considerably lower than that reported for most of the other power stations within the western basin (Detroit Edison 2011a, Section 5.3.1.2.3.2) and individually would represent a minor incremental impact to aquatic resources (as described in Section 5.3.2 of this EIS), the cumulative impacts of impingement and entrainment from all power stations on fish populations within the western basin could have a significant impact on some aquatic species.

In addition to mortality of fish from impingement and entrainment at power plants, millions of pounds of fish are harvested annually from the western basin through recreational and commercial fishing activities (see Section 2.4.2.3), thereby contributing to cumulative mortality impacts on fish populations. The status of fish populations in the western basin are monitored by the MDNR, the Ohio Department of Natural Resources, and the Ontario Ministry of Natural Resources, and regulations and annual harvest limits for important target species are periodically adjusted by those agencies to prevent overfishing and to maintain suitable population levels. The Great Lakes Fisheries Commission, which coordinates fisheries research and facilitates cooperative fishery management among the State, Provincial, Tribal, and Federal agencies that manage fishery resources within the Great Lakes, has established a Lake Erie Committee that considers issues pertinent to Lake Erie. Therefore, the management and control of cumulative impacts on populations of harvested fish species are partially addressed through the actions of these agencies.

As described in Section 5.3.2, discharge of heated cooling water from other power plants also has the potential to affect survival and growth of organisms by altering ambient water temperatures. In most cases, thermal plumes from power plants discharging into Lake Erie would be expected to affect relatively small areas, and the plumes from Fermi 3 and the existing power plants in the western basin are not expected to overlap. Although many of the aquatic species that could be affected by the thermal plumes from different power plants are likely to belong to the same populations, the numbers of individuals that could be affected by cold shock or heat stress are expected to be small relative to the overall numbers of individuals within populations. As a consequence, the cumulative effect of thermal discharges from existing power plants and the proposed Fermi 3 on aquatic resources within the western basin of Lake Erie would be minor, and the incremental contribution of Fermi 3 would be insignificant.

Cumulative impacts on water quality associated with other projects and activities (e.g., agriculture, stormwater runoff, sewage and wastewater treatment facilities) in the western basin of Lake Erie and the lower Swan Creek watershed are significant, although the incremental contribution of Fermi 3 operations to the cumulative impact would be minor (see Section 7.2.3).

Dredging occurs in many locations within the western basin of Lake Erie and has the potential to affect aquatic biota and habitats through disturbance of benthic habitats, increased turbidity, the suspension and deposition of sediment, introduction of contaminants, and other changes in water quality. The potential for dredging to affect aquatic habitats and biota depends upon the uniqueness and sensitivity of the habitat that would be disturbed by dredging or by disposal of dredged sediments, the types of organisms present in the areas that would be affected, and the size of the area. However, activities in such aquatic habitats in waters of the United States must comply with the requirements of the CWA Section 404(b)(1) Guidelines, the substantive criteria used by the USACE to determine a project activity's environmental impact on aquatic resources attributable to the discharge of dredged or fill material, and any additional State procedural and substantive criteria. Such compliance ensures that the discharges of dredged or fill material into waters of the United States, including wetlands, should not occur unless it can be demonstrated that such discharges, either individually or cumulatively, would not result in unacceptable adverse effects on the aquatic ecosystem. In some cases, open-water disposal of dredged sediments occurs within the western basin. For example, portions of the sediment dredged periodically from the Toledo Harbor Federal navigation channels are disposed of within an authorized open-lake placement area of two square miles located in the western basin. Although some small areas of the Fermi site would be affected by dredging in order to build and operate Fermi 3, the dredged materials would be disposed of in the existing onsite spoil disposal area, not in the open waters of Lake Erie. Although dredging and disposal activities within the western basin of Lake Erie may have some degree of impact on aquatic resources, the cumulative effects of dredging for Fermi 3 on aquatic habitats and biota would be minor (see Sections 4.3.2 and 5.3.2).

The presence of invasive non-native species is one of the major stressors affecting the Lake Erie ecosystem (LaMP Work Group 2008). These species may prey on native species or compete with them for limited resources, thereby altering the structure of aquatic ecosystems. For example, invasions by quagga (*Dreissena rostriformis bugensis*) and zebra mussels (*Dreissena polymorpha*) have affected ecosystem conditions in Lake Erie by altering nutrient conditions and competing with other species that feed on phytoplankton and zooplankton. Increases in these species have been implicated in the declines of native freshwater mussels (see Section 2.4.2).

The presence of non-native invasive species is the result of intentional or unintentional introductions or range expansion and colonization. Invasive nuisance organisms that have been found or are presumed to occur in Lake Erie in the vicinity of the Fermi site include lyngbya (*Lyngbya wollei*), the fishhook water flea (*Cercopagis pengoi*), the spiny water flea (*Bythotrephes longimanus*), quagga and zebra mussels, the sea lamprey (*Petromyzon marinus*), and the round goby (*Neogobius melanostomus*) (see Section 2.4.2.3 of this EIS). Some of the above species have the potential to adversely affect the aquatic environment. For example, lyngbya can form dense algal mats on the lake bottom that could significantly affect native or introduced benthic organisms. These species are not considered abundant in the vicinity of the Fermi site. Although the cumulative impacts of invasive non-native species on the Lake Erie ecosystem are considered significant, building and operating Fermi 3 are not expected to measurably promote expansion of populations of invasive species (see Sections 4.3.2 and 5.3.2), and the incremental contribution of Fermi 3 to cumulative impacts from invasive species would be minor.

The EPA's Great Lakes National Program Office has initiated the Great Lakes Restoration Initiative to address environmental issues in five topical areas: cleaning up toxic materials and areas of concern, combating invasive species, promoting nearshore health by protecting watersheds from polluted runoff, restoring wetlands and other habitats, and tracking progress and working with strategic partners. It is expected that this long-term initiative would address some water quality and non-native species concerns that contribute to cumulative impacts of aquatic resources in the area of interest.

The review team is also aware that potential climate changes together with reactor operations could affect water quality and aquatic ecosystems. As identified in Section 7.2.3 of this EIS, a study by U.S. Global Change Research Program (USGCRP) projected that during the operating license period for Fermi 3 (estimated to be 2020 to 2060), changes in the region's climate would include a 3–4°F increase in the average temperature, slightly increased precipitation in the winter and spring, more intense rainstorms throughout the year, and a drop of 1–1.5 ft in the average water levels in Lake Erie (USGCRP 2009). These changes could lead to increased erosion and sediment loading in tributaries and in Lake Erie.

It is expected that as temperatures increase and water quality changes as a result of climate change, a long-term shift could occur in the aquatic species assemblages present within the region (USGCRP 2009). With increases in evaporation rates and longer periods between rainfalls, the likelihood of drought will increase, and water levels in rivers, streams, and wetlands are likely to decline (USGCRP 2009), thereby reducing the availability of some aquatic habitats. It is also predicted that reduced summer water levels are likely to reduce the recharge of groundwater, causing small streams to dry up and potentially reducing the habitat needed by native aquatic biota, such as freshwater mussels and fish. The size of coastal wetland areas that are important for specific life stages of many aquatic organisms within the region could also be affected. With increased water temperatures, populations of coldwater fish such as trout would be expected to decline, while populations of coolwater fish such as muskellunge (*Esox masquinongy*) and warmwater species such as smallmouth bass (*Micropterus dolomieu*) and bluegill (*Lepomis macrochirus*) would become more dominant (USGCRP 2009). Such changes in aquatic species assemblages are likely to be further affected by invasions of non-native species that could thrive under warmer conditions. USGCRP (2009) also predicts that in some lakes, increased water temperatures could lead to an earlier and longer period in summer during which mixing of the relatively warm surface lake water with the colder water below is reduced, potentially increasing the risk of developing oxygen-poor zones that could result in increased mortality of fish and other aquatic organisms. In lakes with contaminated sediment, mercury and other persistent pollutants could become more mobilized with increased temperatures, potentially increasing the quantities of contaminants entering the aquatic food chain (USGCRP 2009).

The assessment of cumulative impacts on aquatic resources is based on information provided by Detroit Edison and the review team's independent review. The building and operation of Fermi 3 would affect a small amount of aquatic habitat within the western basin of Lake Erie, including habitat used by species or taxa described in Section 2.4.2. With projected climate change, the cumulative effects of past, present, and reasonably foreseeable future actions on aquatic resources may be detectable and noticeably altered. However, it is anticipated that the incremental contributions from building and operating Fermi 3 to effects on aquatic resources – including recreational and commercially important species and Federally and State-listed species – would be minor. Therefore, the review team concludes that, with projected climate change and past, present, and reasonably foreseeable future actions in the lower Swan Creek watershed and the western basin of Lake Erie, cumulative impacts on aquatic resources would be MODERATE. The incremental contribution of impacts on aquatic resources from building and operating Fermi 3 would not contribute significantly to the overall cumulative impact to the geographical area of interest. Therefore, the incremental impacts from NRC-authorized activities would be SMALL, and no further mitigation would be warranted.

7.4 Socioeconomics and Environmental Justice

The evaluation of cumulative impacts on socioeconomics and environmental justice is presented in this section.

7.4.1 Socioeconomics

The description of the affected environment in Section 2.5 serves as the baseline for the cumulative impact assessment in this resource area. As described in Section 4.4, adverse impacts of the NRC-authorized construction activities on socioeconomics would be SMALL, with the following exceptions. The combined impacts of preconstruction and construction activities on demographics would be SMALL but beneficial. NRC-authorized construction would result in MODERATE adverse impacts on traffic, primarily during the peak construction period. NRC-authorized construction activities also would result in LARGE beneficial tax revenue impacts in Monroe County and the local jurisdictions within Monroe County. They would result in SMALL beneficial economic and tax revenue impacts elsewhere in the region.

As described in Section 5.4, the adverse impacts of operations on socioeconomics would be SMALL, with the following exceptions. The impact on demographics would be SMALL but beneficial. Impacts on traffic would be SMALL during normal operations and MODERATE during outages. SMALL beneficial impacts on the economy would occur as a result of increases in employment and wages. Tax impacts would be LARGE in the local jurisdictions within Monroe County and SMALL elsewhere in the region.

The combined impacts of construction and preconstruction activities were described in Section 4.4 and were determined to be the same as those described above for NRC-authorized construction. In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future projects that could impact socioeconomics. For this analysis, the geographic area of interest is considered to be Monroe and Wayne counties in Michigan and Lucas County in Ohio because these counties are the primary areas (1) where Fermi 3 workers would live; (2) where the economy, tax base, and infrastructure would most likely be affected; and, therefore, (3) where the socioeconomic impacts would occur.

The Fermi plant site, which is located in Monroe County, is approximately 8 mi northeast of the City of Monroe, Michigan. Wayne County is located to the north of Monroe County, and Lucas County is to the south. The region around the Fermi plant site is strongly influenced by the cities of Detroit (Wayne County) and Toledo (Lucas County) and their historic manufacturing base. Through most of the twentieth century, Detroit has been the automotive capital of the country. Manufacturers in Monroe and Lucas County have included various suppliers for three large automobile manufacturers: Ford, General Motors, and Chrysler. People migrated to

southeast Michigan for the manufacturing jobs, and by 1950, Detroit was the fourth-largest city in the country. Much of the infrastructure around southeast Michigan was built to support the large population and industrial base of the area, including the transportation routes, housing, schools, and other public services. Since its population peak in the 1970 census, Wayne County has declined in population by nearly 1 million people, and Lucas County has declined in population by nearly 40,000 people. Much of this population loss occurred in urban areas, as the population either migrated to suburban communities or left the region as the manufacturing base declined.

However, although the rate of growth has declined, the population of Monroe County has continued to grow, with only a slight decline in population (of less than 1 percent) occurring between 1980 and 1990. In addition to manufacturing, the economy of Monroe County has had a strong agricultural base, and population growth has resulted in the loss of much of the county's agricultural land. Detroit Edison is the largest employer in Monroe County, with a workforce of approximately 1500 workers at the Fermi plant site and the coal-fired Monroe County Power Plant. During outages, an additional 1200–1500 outage workers are also employed at the Fermi plant site for a period of 30 days every 18 months. Between 2009 and 2010, Detroit Edison had a construction workforce at the Monroe County Power Plant to conduct capital improvements of the air emission control equipment (Detroit Edison 2011a). Future projects involving installation of air pollution control equipment will require a workforce ranging between 100 and 550 workers. Detroit Edison expects that the work at the Monroe County Power Plant will be completed by 2014, and therefore it will be a part of the historic cumulative impacts associated with Fermi 3 but will not be a concurrent activity (Detroit Edison 2011c). The impact analyses in Chapters 4 and 5 are cumulative by nature. Past and current economic impacts associated with activities listed in Table 7-1, such as the ongoing refurbishment (e.g., installation of air pollution control equipment) at the Monroe Power Plant, have already been considered as part of the socioeconomic baseline presented in Section 2.5 or in the analyses for Sections 4.4 and 5.4. In addition, the economic impacts of existing enterprises, such as the loss of manufacturing and construction jobs and growth of health care jobs in the region, are part of the baseline used for establishing the Regional Input-Output Multiplier System (RIMS) II multipliers. Regional planning efforts and associated demographic projections formed the basis for the review team's assessment of reasonably foreseeable future impacts. State and county plans, along with modeled demographic projections such as those used in Sections 2.5, 4.4, and 5.4, include forecasts of future development (such as the proposed Cleveland-Toledo-Detroit Passenger Rail Line) and population increases. The cumulative impacts associated with the preconstruction, construction, and operation of Fermi 3 are thus evaluated in Chapters 4 and 5. The review team did not identify any other cumulative impacts associated with building and operating Fermi 3 beyond those already evaluated in Chapters 4 and 5.

On the basis of the above considerations, Detroit Edison's ER, and the review team's independent evaluation, the review team concludes that under some circumstances, the building of Fermi 3 could make a short-term, MODERATE and adverse contribution to the cumulative effects associated with traffic. However, an increase in population in Wayne County would be considered a SMALL cumulative and beneficial impact, since the income and expenditures from in-migrating workers would contribute to the tax base that supports a large infrastructure. The cumulative effects on regional economies would be SMALL and beneficial throughout the 50-mi region, with the exception of Monroe County. In Monroe County, the cumulative effects on the economy would be LARGE and beneficial. There would also be a SMALL and beneficial impact on taxes throughout the 50-mi region, with the exception of Monroe County, where there would be a LARGE beneficial cumulative effect on taxes.

The incremental economic impact of operations from NRC-authorized activities would be SMALL and beneficial in the 50-mi region, including Monroe County. Incremental tax impacts in the 50-mi region would also be SMALL and beneficial, with the exception of Monroe County, where the impact of taxes would be LARGE and beneficial. There would also be a SMALL incremental impact on traffic during normal operations, and an incremental MODERATE and adverse impact during outages on traffic along local roadways near the Fermi site. The review team concludes that the incremental cumulative impacts from NRC-authorized activities on all other socioeconomic impact categories would be SMALL.

7.4.2 Environmental Justice

The description of the affected environment in Section 2.6 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.5, the NRC staff concludes that NRC-authorized construction activities would not result in disproportionately high and adverse impacts on minority or low-income populations; therefore, the environmental justice impacts would be SMALL. As described in Section 5.5, the review team concludes that operations activities would not cause disproportionately high and adverse impacts on minorities and low-income populations. Therefore, those impacts would be SMALL, and no further mitigation would be warranted.

The combined impacts from preconstruction and construction were described in Section 4.5 and determined to be SMALL.

In addition to the impacts from preconstruction, construction, and operation, the cumulative impacts analysis also considers other past, present, and reasonably foreseeable future projects that could cause disproportionately high and adverse impacts on minority and low-income populations. For this cumulative impacts analysis, the geographic area of interest is considered to be the 50-mi region described in Section 2.5.1.

There is a potential for minority and low-income populations to experience disproportionately high and adverse impacts from the activities of other past, present, and reasonably foreseeable future projects. However, the impact analyses in Chapters 4 and 5 are cumulative by nature. Environmental justice impacts associated with past and current activities listed in Table 7-1 have already been considered as part of the environmental justice baseline presented in Sections 2.6. Census block groups classified as minority or low-income lie to the north and south of the Fermi site, in Wayne and Lucas counties within and near Detroit and Toledo. The closest census block group with a population of interest is in Monroe County. It qualifies as both minority and low-income; it is located approximately 5 mi from the Fermi site. The review team did not identify environmental pathways that could result in disproportionately high and adverse human health, environmental, physical, or socioeconomic effects beyond those identified in Sections 4.5 and 5.5 on minority or low-income populations in the 50-mi region.

On the basis of the above considerations, information provided by Detroit Edison, and the review team's independent evaluation, the review team concludes that there would be no disproportionately high and adverse cumulative impacts on minority and low-income populations beyond those described in Chapters 4 and 5; therefore, the environmental justice impacts would be SMALL. The environmental justice impacts from NRC-authorized activities would be SMALL, and no further mitigation would be warranted.

7.5 Historic and Cultural Resources

The description of the affected environment in Section 2.7 serves as a baseline for this cumulative impacts assessment in this resource area. As described in Section 4.6, the staff concluded that the impacts on cultural resources from NRC-authorized construction would be MODERATE. As described in Section 5.6, the review team concluded that the impacts on cultural resources from operations would be SMALL. See Section 4.6 for a discussion of Detroit Edison's plan to develop the procedures or guidance necessary to address the steps that Detroit Edison and its contractors will follow for unanticipated discoveries. The review team does not expect that there would be unanticipated discoveries during operation of the plant because it is unlikely that activities would involve previously undisturbed areas.

The combined impacts from preconstruction and construction activities were described in Section 4.6 and determined to be MODERATE. If preconstruction activities associated with the offsite transmission lines resulted in significant alterations to the cultural environment, then the additional impacts could be realized. In addition to the impacts from preconstruction, construction, and operations, the cumulative analysis also considers past, present, and reasonably foreseeable future projects that could affect historic and cultural resources. For this cumulative analysis, the geographic area of interest is considered to be the areas of potential effects (APEs) defined in Section 2.7. The APEs were developed in consultation with the Michigan State Historic Preservation Office (SHPO).

Cumulative Impacts

Projects identified in Table 7-1 that may impact historic and cultural resources include the decommissioning and demolition of Fermi 1, operation of the recently completed Fermi 2 Independent Spent Fuel Storage Installation (ISFSI) at the Fermi site, operation of the Ventower wind turbine tower manufacturing facility, construction of the Cleveland-Toledo-Detroit Passenger Rail Line (including a proposed Monroe station), operation of Fermi 2, operation of the Detroit Edison Monroe Power Plant, and future urbanization. Four of these projects – decommissioning and demolition of Fermi 1, operation of the Fermi 2 ISFSI at the Fermi site, continued operation of Fermi 2, and future urbanization – are or might be within the geographic area of interest as defined above. As part of its independent evaluation, the review team reviewed the cultural and historic information available at the SHPO. The activities at Fermi 1 are the only ones in the geographic area of interest to have undergone National Historic Preservation Act Section 106 review. As a result of this review, Fermi 1 was determined eligible for listing in the *National Register of Historic Places* (NRHP) and is considered a historic property. The review team concurs with the finding that the decommissioning of Fermi 1 has no adverse effect on historic properties (Conway 2011b). The review team also concurs with the finding that demolishing Fermi 1 in order to construct Fermi 3 would have an adverse effect on historic properties (Conway 2011a).

The NRC review team consulted with the Michigan SHPO, Detroit Edison, and Monroe County Community College and executed a Memorandum of Agreement (MOA) (ADAMS Accession No. ML12089A007) that stipulated measures to mitigate the adverse effects of demolishing Fermi 1 prior to building Fermi 3 (see Appendix F), pursuant to 36 CFR 800.6(c). See Sections 2.7.4 and 4.6 for discussions of the measures developed to resolve the adverse effect on the Fermi 1 historic property attributable to the proposed demolition of Fermi 1. Building and operating one additional unit at the Fermi site, in addition to the other projects identified above that could affect historic and cultural resources, would likely contribute to cumulative cultural resource impacts within the geographic area of interest for historic and cultural resources.

As described in Sections 4.6 and 5.6, the review team concludes that the incremental impacts from installation of offsite transmission lines would be minimal provided that there are no significant alterations (either physical alterations or visual intrusions) to the cultural environment. If these activities were to result in significant alterations to the cultural environment, then the additional impacts could be realized. Construction and operation of the offsite transmission lines would be the responsibility of ITC*Transmission* in consultation with the appropriate Federal and State regulatory authorities. Section 2.7.3 contains a description of known cultural resources in the transmission line corridors. Cultural resources impacts related to construction of the proposed transmission lines are discussed in Sections 10.2.1 and 10.4.1.5. Operation impacts of the proposed transmission lines on cultural resources are discussed in Sections 5.6 and 10.2.2.

Historic and cultural resources are nonrenewable; therefore, the impacts on historic and cultural resources within the APEs are cumulative. Section 4.6 described how building activities for Fermi 3 would result in the demolition of one onsite property (Fermi 1) that is eligible for listing in the NRHP and located within the associated APEs. On the basis of its evaluation, the review team concludes that the cumulative impacts on historic and cultural resources from preconstruction, construction, and operation of Fermi 3 and from other projects listed in Table 7-1 that are in the geographic area of interest would be MODERATE. If activities related to offsite transmission lines and/or urbanization within the APEs would result in alterations to the cultural environment, then additional impacts could be realized. The review team further concludes that the incremental impacts associated with the onsite NRC-authorized activities would be MODERATE, because of the demolition of Fermi 1, and no mitigation measures would be warranted beyond those discussed in Sections 4.6 and 5.6.

7.6 Air Quality

The description of the affected environment in Section 2.9 serves as the baseline for the cumulative impact assessments for air quality. As described in Section 4.7, the NRC staff concludes that the impacts of NRC-authorized construction activities on air quality, including contribution to greenhouse gas (GHG) emissions, would be SMALL, although some mitigation may be warranted, depending on the outcome of conformity applicability analyses being performed by the NRC and USACE pursuant to the Clean Air Act Section 176 (42 USC section 7506) and 40 CFR Part 93, Subpart B (NRC 2011a). As described in Section 5.7, the review team concludes that the impacts of operations on air quality, including contribution to GHG emissions, would be SMALL, and no further mitigation would be warranted.

7.6.1 Criteria Pollutants

As was discussed in Section 2.9, the Fermi 3 site is located in an area that has been designated as being in nonattainment for the $PM_{2.5}$ (particulate matter with an aerodynamic diameter of less than or equal to 2.5 μm) National Ambient Air Quality Standards (NAAQS) and in maintenance for the 8-hour ozone NAAQS (EPA 2010a). In July 2011, the MDEQ submitted a request asking the EPA to redesignate southeast Michigan as being in attainment with the $PM_{2.5}$ NAAQS (MDEQ 2011a). In July 2012, the EPA issued a proposed rule designating southeastern Michigan as having attained both the 1997 annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS, based on 2009–2011 ambient air monitoring data (77 FR 39659, dated July 5, 2012), but the final determination has yet to be made. The area around the Fermi 3 site is designated as in attainment for all other criteria pollutants.

Section 4.7 of this EIS examined air quality impacts associated with preconstruction and construction. Emissions associated with these activities would be predominately the fugitive dust from ground-disturbing activities and engine exhaust from heavy equipment and vehicles.

Emissions from preconstruction and construction are expected to be temporary and limited in magnitude. Consequently, potential impacts on ambient air quality would be SMALL. Notwithstanding these minor impacts to air quality, the NRC and USACE will perform Clean Air Act Section 176 air conformity applicability analyses pursuant to 40 CFR Part 93, Subpart B, to determine whether additional mitigation may be warranted. Section 5.7 addressed air quality impacts from operations. Air emissions from operations would be primarily particulate emissions from cooling towers and criteria pollutants from worker vehicles and stationary combustion sources such as diesel generators and an auxiliary boiler. These stationary sources would be permitted and operated in accordance with State and Federal regulatory requirements, and their operation would be infrequent and mostly for maintenance testing. Therefore, potential impacts from operations would be SMALL.

In addition to the impacts from building and operations, the cumulative impact analysis considers past, present, and reasonably foreseeable future actions that could impact air quality (Table 7-1). For this cumulative impact analysis of air quality, Detroit Edison considered Monroe County as the geographic area of interest. This geographic area of interest includes the primary communities that would be affected by the proposed Fermi 3.

No major nonresidential development projects are in progress or anticipated near the Fermi site, although industrial development may increase in the near future. However, the Monroe County Comprehensive Plan update will have a focus on farmland preservation and conservation. This focus should keep development projects from being built close to the Fermi site, as a large portion of the undeveloped land near the Fermi site is used for agriculture (Detroit Edison 2011a).

In 2002, total annual emissions from stationary sources in Monroe County were 6850 tons/yr of particulate matter with an aerodynamic diameter of less than or equal to 10 μm (PM_{10}), 4749 tons/yr of $PM_{2.5}$, 2761 tons/yr of volatile organic compounds (VOCs), 112,333 tons/yr of sulfur dioxide (SO_2), and 47,879 tons/yr of nitrogen oxides (NO_x) (EPA 2010b). Two coal-fired power plants (Detroit Edison's Monroe Power Plant and J.R. Whiting Power Plant) and Holcim Cement together accounted for most emissions of criteria pollutants and VOCs in Monroe County. In 2002, emissions from Fermi 2 operations were an insignificant portion (less than 0.1 percent on a pollutant-by-pollutant basis) of stationary source emissions in Monroe County.

On the basis of the estimates in Sections 4.7 and 5.7, emissions from construction and operation of Fermi 3 will be about 1.9 percent and 0.3 percent on a pollutant-by-pollutant basis, respectively, of the total 2002 stationary source emissions in Monroe County. These emissions will be insignificant compared to total emissions from the six neighboring counties within the $PM_{2.5}$ nonattainment area and the 8-hour ozone maintenance area. Apart from Fermi 3, the only known major construction project planned in Monroe County is the installation of pollution control equipment at the Monroe Power Plant. The Monroe Power Plant project is expected to be complete prior to initiation of major construction activities for Fermi 3 and could improve air

quality in the region (Detroit Edison 2011c). Most projects listed in Table 7-1 would not increase air emissions above their current levels. Any new industrial projects would either have *de minimis* impacts or would be subject to regulation by the MDEQ. Fermi 3 is located in an area designated as being in nonattainment for $PM_{2.5}$, although the MDEQ believes it is in compliance with the current $PM_{2.5}$ standards. Given the anticipated lack of growth and new sources of air emissions in the vicinity of Fermi 3 and the minimal contribution of emissions from preconstruction, construction, and operation, the cumulative air impacts from construction and operation of the proposed Fermi 3 would be SMALL; thus, it is unlikely that ambient air quality in the region would be degraded significantly.

7.6.2 Greenhouse Gas Emissions

As discussed in the state of the science report issued by the USGCRP (2009), it is the

> "production and use of energy that is the primary cause of global warming, and in turn, climate change will eventually affect our production and use of energy. The vast majority of U.S. greenhouse gas emissions, about 87 percent, come from energy production and use."

Approximately one-third of GHG emissions are the result of generating electricity and heat (USGCRP 2009). GHG emissions associated with building, operating, and decommissioning a nuclear power plant are addressed in Sections 4.7, 5.7, 6.1.3, and 6.3. The review team concluded that the atmospheric impacts of the emissions associated with each aspect of building, operating, and decommissioning a single nuclear power plant would be minimal. The review team also concluded that the impacts of the combined emissions for the full plant life cycle would be minimal.

It is difficult to evaluate cumulative impacts of a single source or combination of GHG emission sources because:

1. The impact is global rather than local or regional.
2. The impact is not particularly sensitive to the location of the release point.
3. The magnitude of individual GHG sources related to human activity, no matter how large compared to other sources, are small when compared to the total mass of GHGs in the atmosphere.
4. The total number and variety of GHG emission sources are extremely large and are ubiquitous.

These points are illustrated by the comparison of annual carbon dioxide emission rates in Table 7-2.

Table 7-2. Comparison of Annual Carbon Dioxide Emission Rates

Source	Metric Tons per Year
Global emissions	30,000,000,000[(a)]
United States	5,500,000,000[(a)]
1000-MW nuclear power plant (including fuel cycle, 90 percent capacity factor)	500,000[(b)]
1000-MW nuclear power plant (operations only)	5000[(b)]
Average U.S. passenger vehicle	5[(c)]

(a) Source: EPA 2011b.
(b) Source: Appendix L of this EIS.
(c) Source: EPA 2005.

Evaluation of cumulative impacts of GHG emissions requires the use of a global climate model. The USGCRP report referenced above provides a synthesis of the results of numerous climate modeling studies. The review team concludes that the cumulative impacts of GHG emissions around the world as presented in the report are an appropriate basis for its evaluation of cumulative impacts. On the basis of the impacts set forth in the USGCRP report and on the CO_2 emissions criteria in the final EPA CO_2 Tailoring Rule (75 FR 31514), the review team concludes that the national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team further concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions of the proposed project.

Consequently, the review team recognizes that GHG emissions, including carbon dioxide, from individual stationary sources and, cumulatively, from multiple sources can contribute to climate change and that the carbon footprint is a relevant factor in evaluating energy alternatives. Section 9.2.5 contains a comparison of the carbon footprints of the viable energy alternatives.

7.6.3 Summary of Cumulative Air Quality Impacts

Cumulative impacts to air quality are estimated based on the information provided by Detroit Edison and the review team's independent evaluation. Other past, present, and reasonably foreseeable future activities exist in the geographic areas of interest (local and regional for criteria pollutants and global for GHG emissions) that could affect air quality resources. The cumulative impacts on the emissions of criteria pollutants from Fermi 3 and other projects would be minimal. The national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team concludes that the cumulative impacts would be noticeable but not destabilizing with or without the GHG emissions from Fermi 3. The review team concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air quality resources in the geographic areas of interest would be SMALL for criteria pollutants and MODERATE for GHGs. The incremental contribution of impacts on air quality resources from building and operating activities for the proposed Fermi 3 would be

SMALL. The incremental contribution of impacts on air quality resources from the NRC-authorized activities would also be SMALL.

7.7 Nonradiological Health

The description of the affected environment in Section 2.10 serves as a baseline for the cumulative analysis for nonradiological health. As described in Section 4.8, the impacts from NRC-authorized construction on nonradiological health would be SMALL, and no further mitigation would be warranted. As described in Section 5.8, the review team concludes that the impacts of operations on nonradiological health would also be SMALL, and no further mitigation would be warranted.

As described in Section 4.8, the combined nonradiological health impacts from construction and preconstruction activities would be SMALL, and no further mitigation would be warranted beyond what is described in Detroit Edison's ER. In addition to the impacts from preconstruction, construction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts on nonradiological health (see Table 7-1).

Most of the nonradiological impacts of building and operation (e.g., noise, etiological agents, occupational injuries) would be localized and would not have a significant impact at offsite locations. However, impacts such as vehicle emissions arising from the activity of transporting personnel to and from the site would encompass a larger area. Therefore, for nonradiological health impacts, the geographic area of interest for cumulative impacts analysis includes projects within a 50-mi radius of Fermi 3 based on the influence of vehicle and other air emissions sources because Fermi 3 is in a nonattainment area (Section 7.6). For cumulative impacts associated with transmission lines, the geographical area of interest is the transmission line corridor (as described in Section 2.2.2). These geographical areas of interest are expected to encompass areas where public and worker health could be influenced by the proposed project and associated transmission lines, in combination with any past, present, or reasonably foreseeable future actions.

Current projects within the geographic area of interest that could contribute to cumulative nonradiological health impacts include the energy and mining projects in Table 7-1, as well as vehicle emissions and existing urbanization-related activities. Reasonably foreseeable future projects in the geographic area of interest that could contribute to cumulative nonradiological health impacts include the construction of the proposed Cleveland-Toledo-Detroit Passenger Rail Line, future transmission line development, and future urbanization.

There are no existing or future projects that could contribute to cumulative occupational injuries to workers at Fermi 3. Existing and potential development of new transmission lines could

increase nonradiological health impacts from exposure to acute electromagnetic fields (EMFs). However, as stated in Section 5.8.3, adherence to Federal criteria and State utility codes would help keep any cumulative nonradiological health impacts at the minimal level. With regard to the chronic effects of EMFs, the scientific evidence on human health does not conclusively link extremely-low-frequency EMFs to adverse health impacts. Cumulative impacts from noise and vehicle emissions associated with current urbanization, current operations of Fermi 2, and decommissioning of Fermi 1 could occur. However, as discussed in Sections 4.8 and 5.8, the Fermi 3 contribution to these impacts would be temporary and minimal, and it is expected that existing facilities would comply with local, State, and Federal regulations governing noise and emissions. Section 7.11.2 discusses cumulative nonradiological health impacts related to additional traffic on the regional and local highway networks leading to and from the Fermi site, and the review team has determined that these impacts would be minimal.

The health impacts of operating the existing Fermi 2 and the proposed Fermi 3 at the Fermi site were evaluated relative to Lake Erie and the potential propagation of etiological microorganisms. As discussed in Section 5.8, the thermal discharges from the operation of Fermi 3 would not have detrimental impacts on the concentration levels of deleterious etiological microorganisms. No recreational activity occurs in the immediate vicinity of the proposed discharge structure for Fermi 3 that would have any bearing on potential nonradiological health impacts.

The review team is also aware of the potential climate changes that could affect human health; a recent compilation of the state of knowledge in this area (USGCRP 2009) has been considered in the preparation of this EIS. Projected changes in the climate for the region during the life of proposed Fermi 3 include the following:

- Reduced cooling system efficiency at Fermi 3 (and other power generation facilities), which would result in increased temperature of the cooling-tower discharge water and possible increased growth of etiological agents;
- Increased incidence of diseases transmitted by food, water, and insects following heavy downpours and severe storms; and
- Increased severity of water pollution associated with sediments, fertilizers, herbicides, pesticides, and thermal pollution caused by projected heavier rainfall intensity and longer periods of drought.

Although the changes that are attributed to climate change in these studies are not inconsequential, their relationship to Fermi 3 operations is not clear, and the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or the incidence of waterborne diseases.

Cumulative nonradiological health impacts were determined on the basis of information from Detroit Edison and the review team's independent evaluation of impacts resulting from the proposed Fermi 3, along with a review of potential impacts from other past, present, and reasonably foreseeable future projects and from urbanization in the geographic areas of interest. The review team concludes that cumulative impacts on the nonradiological health of the public and workers would be SMALL, and that mitigation beyond what is discussed in Sections 4.8 and 5.8 would not be warranted. The review team acknowledges, however, that there is still uncertainty associated with the chronic effects of EMFs.

7.8 Radiological Health Impacts of Normal Operation

The description of the affected environment in Section 2.11 serves as the baseline for the cumulative impacts assessment in this resource area. As described in Section 4.9, the NRC staff concludes that the radiological impacts from NRC-authorized construction would be SMALL, and no further mitigation would be warranted. As described in Section 5.9, the NRC staff concludes that the radiological impacts from operations would be SMALL, and no further mitigation would be warranted.

The combined impacts from preconstruction and construction activities were described in Section 4.9 and determined to be SMALL. In addition to impacts from preconstruction, construction, and operations, this cumulative analysis also considers past, present, and reasonably foreseeable future actions that could contribute to cumulative radiological impacts. For the purpose of this analysis, the geographic area of interest is considered to be the area within a 50-mi radius of the proposed Fermi 3. Historically, the NRC has used the 50-mi radius as a standard bounding geographical area to evaluate population doses from routine releases from nuclear power plants. Within the 50-mi radius, there are the operating Fermi 2, Fermi 1 (going through decommissioning), and Davis-Besse. Detroit Edison also plans to operate the Fermi 2 ISFSI on the Fermi site. In addition, within the 50-mi radius of the site, there are likely to be medical, industrial, and research facilities that use radioactive materials.

As stated in Section 2.11, Detroit Edison has conducted a radiological environmental monitoring program (REMP) around Fermi 1 and 2 since 1978. The REMP measures radiation and radioactive materials from all sources, including existing Fermi 1 and 2, Davis-Besse, area hospitals, and industrial facilities. The results of the REMP indicate that the levels of radiation and radioactive material in the environment around the Fermi site are generally not above or only a little above natural background levels. As described in Section 2.11, sporadic and variable trace quantities of tritium were detected in a few shallow groundwater wells downwind from the Fermi 2 stack as a result of the recapturing of tritium in precipitation from the plant's gaseous effluent.

As described in Section 4.9, it is estimated that the doses to construction workers during the building of the proposed Fermi 3 would be within NRC annual exposure limits (i.e., 100 mrem), which are designed to protect public health. This estimate includes exposure to doses from the operation of Fermi 2, the decommissioned Fermi 1, and the recently completed Fermi 2 ISFSI. As described in Section 5.9, the public and occupational doses predicted from the proposed operation of Fermi 3 would be below regulatory limits and standards. In addition, the site-boundary dose to the maximally exposed individual (MEI) from existing Fermi 2 and proposed Fermi 3 at the Fermi site would be well within the regulatory standard of 40 CFR Part 190.

On the basis of the results of the REMP and the estimates of doses to biota given in Section 5.9, the NRC staff concludes that the cumulative radiological impact on biota would not be significant. The results of the REMP indicate that effluents and direct radiation from area medical, industrial, and research facilities that use radioactive materials do not contribute measurably to the cumulative dose for biota in the vicinity of the Fermi site.

Currently, there are no other nuclear facilities planned within 50 mi of the Fermi site. The NRC, U.S. Department of Energy, and State of Michigan would regulate or control any reasonably foreseeable future actions in the region that could contribute to cumulative radiological impacts. Therefore, the NRC staff concludes that the cumulative radiological impacts of operation of the proposed Fermi 3 and existing Fermi 1 (undergoing decommissioning) and Fermi 2 (operational) and the influence of other manmade sources of radiation nearby would be SMALL, and no further mitigation would be warranted.

7.9 Nonradioactive Waste

Cumulative impacts on water and air from nonradiological waste are discussed in Sections 7.2 and 7.6, respectively. The cumulative impacts of nonradioactive waste destined for land-based treatment and disposal are related to (1) the available capacity of the area treatment and disposal facilities; and (2) the amount of solid waste generated by the proposed project and the current and reasonably foreseeable future projects in Table 7-1. The geographic area of interest for this cumulative analysis is the area within 15 mi of the Fermi site. This area includes four landfills that could potentially be used by Detroit Edison (MDEQ 2011b).

Nonradioactive wastes generated at the Fermi site, including those from Fermi 3, would be managed in accordance with applicable Federal, State, and local laws and regulations and with permit requirements. As described in the ER (Detroit Edison 2011a), nonradiological waste management practices at Fermi 3 would be similar to those implemented at Fermi 2 and would include the following:

1. Nonradioactive solid waste would be collected and stored temporarily on the Fermi site and disposed of offsite only at authorized and licensed commercial waste disposal sites or recovered at an offsite permitted recycling or recovery facility, as appropriate.

2. Sanitary waste would be delivered to the Monroe Metropolitan Wastewater Treatment Facility for treatment.
3. Debris (e.g., vegetation) collected on trash screens at the water intake structure would be disposed of offsite as solid waste, in accordance with State regulations.
4. Dredge spoils resulting from construction and periodic maintenance of the discharge and intake areas would be disposed of in the existing onsite Spoils Disposal Pond.
5. Scrap metal, lead acid batteries, and paper on the Fermi site would be recycled.
6. Water discharges from cooling and auxiliary systems would be discharged directly and indirectly to Lake Erie through permitted outfalls.
7. Air emissions from Fermi 2 and Fermi 3 operations would be compliant with air quality standards as permitted by MDEQ.

During preconstruction and construction, offsite land-based waste treatment and disposal would be minimized by production and delivery of modular plant units; by segregation of recyclable materials; and by management of vegetative waste, excavated materials, and dredged materials onsite. As described in Section 4.10.1, the solid waste impacts from building Fermi 3 would be expected to be minimal with no additional mitigation warranted. The few reasonably foreseeable proposed projects listed in Table 7-1 generally either would not coincide with the building of Fermi 3 (e.g., demolition of Fermi 1) or would produce waste streams of a different nature (e.g., mining projects).

The types of nonradioactive solid waste that would be generated, handled, and disposed of during Fermi 3 operations include municipal waste, dredge spoils, sewage treatment sludge, and industrial wastes. In addition, small quantities of hazardous waste and mixed waste (waste that has both hazardous and radioactive characteristics), would be generated during Fermi 3 operations. As described in Section 5.10.1 and mentioned above, because the effective practices already in place at Fermi 2 for recycling, minimizing, and managing waste will be used, the expected impacts on land from nonradioactive wastes generated during the operation of Fermi 3 would be SMALL, and no further mitigation would be warranted. Many projects listed in Table 7-1 would generate municipal and industrial waste. However, no known capacity constraints exist for the treatment or disposal of such types of waste either within Michigan, Ohio, or the nation as a whole (EPA 2010c; MDEQ 2011b). Each reactor at the Fermi site is expected to produce about 0.5 m^3 per year of mixed waste. Detroit Edison anticipates that the Fermi 3 would claim a low-level mixed waste exemption from the State of Michigan (Fermi 2 currently operates under this exemption). Of the projects listed in Table 7-1, Fermi 2, demolition of Fermi 1, and the hospitals and industrial facilities that use radioactive materials have the potential to generate mixed waste. None of the considered projects are expected to generate mixed waste in significant quantities above the current rates, and therefore cumulative impacts would be minimal.

On the basis of the projected small quantity of nonradioactive and mixed waste that would be produced during Fermi 3 building activities and operation and the available treatment and disposal capacity, the review team concludes that cumulative impacts of nonradioactive and mixed waste would be SMALL, and additional mitigation would not be warranted.

7.10 Postulated Accidents

The following impact analysis covers radiological impacts from postulated accidents from operations of Fermi 3. The analysis also considers other past, present, and reasonably foreseeable future actions at which postulated accidents that could affect radiological health could occur, including other Federal and non-Federal projects and those projects listed in Table 7-1 within the geographic area of interest. The geographic area of interest is considered to be the area within a 50-mi radius of the proposed Fermi 3. The cumulative analysis considers the risk from potential severe accidents at all other existing and proposed nuclear power plants that have the potential to increase risks at any location within 50 mi of the proposed Fermi 3.

As described in Section 5.11.4, the NRC staff concludes that the potential environmental impacts (risk) from a postulated accident from the operation of the proposed Fermi 3 would be SMALL. Section 5.11 considers both design-basis accidents (DBAs) and severe accidents.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Fermi site would be SMALL for an ESBWR. DBAs are addressed specifically to demonstrate that a reactor design is sufficiently robust to meet NRC safety criteria. The consequences of DBAs are bounded by the consequences of severe accidents.

As described in Section 5.11.2, the NRC staff concludes that the severe-accident probability-weighted consequences (i.e., risks) of an ESBWR at the Fermi site are SMALL when compared with the risks to which the population is generally exposed, and no further mitigation would be warranted. Existing reactors within the geographic area of interest are Fermi 2 and Davis-Besse because the 50-mi radii for Fermi 2 and Davis-Besse overlap part of the 50-mi radius for the proposed Fermi 3. No other new reactors have been proposed, within the geographic area of interest.

Tables 5-34 and 5-35 in Section 5.11.2 provide comparisons of estimated risk for the proposed Fermi 3 ESBWR and for current-generation reactors. The estimated population dose risk for the proposed ESBWR at the Fermi site is well below the mean and median values for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For existing plants within the geographic area of interest (i.e., Fermi 2 and Davis-Besse), the Commission has determined that the probability-weighted consequences of

severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). It is expected that risks for any new reactors at any other locations within the geographic area of interest of the Fermi site would be well below risks for current-generation reactors and meet the Commission's safety goals. The risk of severe accident attributable to any particular nuclear power plant becomes smaller as the distance from that plant increases. However, the combined risk at any location within 50 mi of the Fermi site would be bounded by the sum of risks for all these operating nuclear power plants. Even though two or more nuclear power plants could be included in the combined risk, it would still be low.

On the basis of these findings, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Fermi site would likely be SMALL, and no further mitigation would be warranted.

7.11 Fuel Cycle, Transportation, and Decommissioning

The cumulative impacts related to the fuel cycle, transportation of radioactive materials (fuel and waste), and facility decommissioning for the proposed site are described below.

7.11.1 Fuel Cycle (Including Radioactive Waste)

As described in Section 6.1, the NRC staff concludes that the environmental impacts of the fuel cycle from the operation of Fermi 3 would be SMALL. Fuel-cycle impacts would not only occur at the Fermi site but would also be scattered throughout other locations in the United States or, in the case of foreign-purchased uranium, in other countries, as described in Section 6.1.

In addition to fuel-cycle impacts from Fermi 3, this cumulative analysis also considers fuel-cycle impacts from existing Fermi 2 and Davis-Besse, located southeast of Toledo, Ohio. There are no other nuclear power plants, existing or proposed, within 50 mi of the Fermi site. The fuel-cycle impacts of Fermi 2 and Davis-Besse would be similar to those of the proposed Fermi 3. In accordance with 10 CFR 51.51(a), the NRC staff considers the impacts to be acceptable for a 1000-MW(e) reference reactor. The impacts of producing and disposing of nuclear fuel include those from mining the uranium ore, milling the ore, converting the uranium oxide to uranium hexafluoride, enriching the uranium hexafluoride, fabricating the fuel (in which the uranium hexafluoride is converted into uranium oxide fuel pellets), and disposing of the spent fuel in a proposed Federal waste repository. As discussed in Section 6.1, advances in reactors since the development of Table S-3 in 10 CFR 51.51 have reduced the environmental impacts relative to those of the operating reference reactor. For example, a number of fuel management improvements have been adopted by nuclear power plants to improve performance and reduce fuel and separative work (enrichment) requirements. In Section 6.1, the NRC staff multiplied the values in Table S-3 by a factor of two to scale the impacts up from the 1000-MW(e) light water reactor model to address the fuel-cycle impacts of Fermi 3. Adding the fuel-cycle impacts from

Fermi 2 and Davis-Besse would increase the scaling further – but by a factor of no more than four. Therefore, the NRC staff considers the cumulative fuel-cycle impacts of operating Fermi 3 to be SMALL, and no further mitigation would be warranted.

7.11.2 Transportation

The description of the affected environment in Section 2.5.2 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Sections 4.8.3 and 5.8.6, the review team concludes that impacts of transporting personnel and nonradiological materials to and from the Fermi site would be SMALL. In addition to impacts from preconstruction, construction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative transportation impacts. For this analysis, the geographic area of interest is the 50-mi region surrounding the Fermi site.

Nonradiological impacts from transportation would be related to the additional traffic on the regional and local highway networks leading to and from the Fermi site. Additional traffic would result from the shipments of construction materials and the movements of construction personnel to and from the site. This additional traffic would increase the risk of traffic accidents, injuries, and fatalities. The most significant cumulative nonradiological impacts in the vicinity of the Fermi site would result from major construction projects. However, as shown in Table 7-1, no major construction projects are planned in the region surrounding the Fermi site. The operation of existing facilities could also result in cumulative nonradiological impacts if traffic to and from the Fermi site interacted with traffic traveling to and from operating facilities in the region. Nearby operating facilities that could contribute to traffic hazards include the existing Fermi 2 and Stoneco Newport and Rockwood Quarry mining projects. However, the Fermi site is located on the edge of the Detroit metropolitan area, where a more constant level of traffic flow across the region over extended periods of time is expected, regardless of individual projects, thus limiting any impacts from interactions with nearby facilities. Mitigation measures designed to improve traffic flow at the Fermi site have been proposed by Detroit Edison (2011a).

In Sections 4.8.3 and 5.8.6, the review team concluded that the impacts of transporting construction material and construction and operations personnel to and from the Fermi site would be a small fraction of the existing nonradiological impacts. Because of the extent of nonradiological transportation impacts of new nuclear power plant construction and operation relative to impacts from existing traffic patterns and levels, the review team considers the cumulative nonradiological transportation impacts associated with constructing and operating the proposed new reactor at the Fermi site to be minimal, and no further mitigation would be warranted.

As described in Section 6.2, the NRC staff concludes that impacts of transporting unirradiated fuel to the Fermi site and irradiated fuel and radioactive waste from the Fermi site would be SMALL. In addition to impacts from preconstruction, construction, and operations, the

cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative transportation impacts. For this analysis, the geographic area of interest is the 50-mi region surrounding the Fermi site.

Historically, the radiological impacts on the public and the environment that are associated with the transportation of radioactive materials in the region surrounding the Fermi site have been dominated by shipments of fuel and waste to and from the existing Fermi 2. Davis-Besse, which is located in Oak Harbor, Ohio (21 mi east-southeast of Toledo, Ohio), is also within 50 mi of the Fermi site, and shipments of fuel to and shipments of waste from the Davis-Besse site may also contribute to the cumulative radiological impacts of transportation as a result of sharing some highway links with Fermi 2 shipments. Additional cumulative impacts on the Fermi site would result from the additional fuel and waste shipments associated with the operation of the new unit. Radiological impacts from transporting radioactive materials would occur along the routes leading to and from the Fermi site and would also be scattered throughout the United States. For all of these historical, current, and potential future projects, the radiological transportation impacts are a small fraction of the impacts from natural background radiation. The impacts from transporting this fuel and radioactive waste to and from the Fermi site would be consistent with the environmental impacts associated with transporting fuel and radioactive waste from current-generation reactors presented in Table S-4 of 10 CFR 51.52. On the basis of 10 CFR 51.52, the NRC staff concludes that the impacts from the 1000-MW(e) reference reactor are acceptable. Advances in reactors since the development of Table S-4 of 10 CFR 51.52 would reduce the environmental impacts relative to those of the operating reference reactor. For example, fuel management improvements have been adopted by nuclear power plants to improve performance and reduce fuel requirements. The improvements have led to fewer unirradiated and spent fuel shipments than those estimated for the 1000-MW(e) reference reactor in 10 CFR 51.52. In addition, advances in shipping cask designs to increase their capacities would result in fewer shipments of spent fuel to offsite storage or disposal facilities.

Therefore, the NRC staff concludes that the cumulative nonradiological and radiological transportation impacts from operating the proposed new reactor at the Fermi site would be SMALL, and no further mitigation would be warranted.

7.11.3 Decommissioning

As discussed in Section 6.3 of this EIS, the NRC staff concludes that the environmental impacts from decommissioning the proposed Fermi 3 would be SMALL because the licensee would have to comply with decommissioning regulatory requirements.

In this cumulative analysis, the geographic area of interest is the area within a 50-mi radius of the Fermi site. In addition to Fermi 3, the other nuclear power plants within this area are the existing Davis-Besse, Fermi 2, and Fermi 1 (which is going through decommissioning). The

impacts of decommissioning nuclear power plants are bounded by the discussion in the assessment in Supplement 1 to NUREG-0586, *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (NRC 2002). In that document, the NRC found that the impacts from decommissioning a nuclear plant on the radiation dose to workers and the public, waste management, water quality, air quality, ecological resources, and socioeconomics would be small. In addition, the review team concluded in Section 6.3 of this EIS that the incremental contribution of the impact of greenhouse gas emissions on air quality during decommissioning would be small. Therefore, the cumulative impacts from decommissioning would be SMALL, and further mitigation would not be warranted.

7.12 Conclusions

The review team considered the potential cumulative impacts resulting from preconstruction, construction, and operation of one additional nuclear unit at the Fermi site together with past, present, and reasonably foreseeable future actions. The specific resources that could be affected by the proposed action and other past, present, and reasonably foreseeable future actions in the same geographical area were assessed. This assessment included the impacts of preconstruction activities as described in Chapter 4; impacts of construction and operations for the proposed new unit as described in Chapters 4 and 5; impacts of fuel cycle, transportation, radiological waste, and decommissioning as described in Chapter 6; and impacts of past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could affect the same resources affected by the proposed action, as described in Table 7-1.

Table 7-3 summarizes the cumulative impacts by resource area. The cumulative impacts for the majority of resource areas would be SMALL, although there could be MODERATE and LARGE impacts for some resources, as presented below.

Cumulative land use impacts, including impacts associated with transmission line development, are anticipated to be SMALL primarily because few land use changes are anticipated from reasonably foreseeable projects, including building and operating Fermi 3, over the period of interest (i.e., approximately 2010–2060).

With projected climate change, the cumulative effects of past, present, and reasonably foreseeable future actions on the surface water quantity of Lake Erie would be SMALL to MODERATE, with MODERATE impacts possible under the highest predicted increases in air and water temperature. The cumulative effects of past, present, and reasonably foreseeable future actions combined with the predicted impacts of climate change on the quality of surface water in Lake Erie would be MODERATE. However, the incremental increases in water use and changes in water quality resulting from operation of Fermi 3 under projected climate change conditions should not be noticeable, and the incremental contribution of Fermi 3 would be SMALL. Cumulative impacts on groundwater use and quality would be SMALL.

Together with the impacts of past, present, and reasonably foreseeable future actions, the impacts on terrestrial resources of building and operating Fermi 3 are expected to result in SMALL to MODERATE cumulative impacts on the eastern fox snake (but only minimal impacts on other terrestrial resources). This conclusion relies in part on mitigation measures proposed by Detroit Edison, and discussed in Section 7.3.1.2, regarding impacts on wetlands, eastern fox snakes, and American lotus.

With projected climate change, the cumulative effects on aquatic resources are expected to be MODERATE. However, the incremental contributions of Fermi 3 operations to effects on aquatic resources including recreational and commercially important species and Federally and State-listed species would be SMALL.

For socioeconomics, cumulative impacts in most categories would be SMALL and adverse. However, there would be a MODERATE to LARGE and beneficial cumulative impact to the economy of Monroe County and LARGE impact to tax revenues in Monroe County, as well as a SMALL beneficial impact to the economy and tax revenues on the rest of the 50-mi region. The entire 50-mi region would also experience a SMALL beneficial impact to demographics. The incremental impact from NRC-authorized activities would be SMALL and beneficial for the economies and taxes throughout the 50-mi region, with the exception of Monroe County, where the incremental tax revenue impact and impact on the economy from the NRC-authorized activities would be MODERATE to LARGE and beneficial. The review team also identified a

Table 7-3. Cumulative Impacts on Environmental Resources Including the Impacts of the Proposed Fermi 3

Resource Category	Impact Level
Land Use	SMALL
Water Resources	
Surface water use	SMALL to MODERATE
Groundwater use	SMALL
Surface water quality	MODERATE
Groundwater quality	SMALL
Ecological Resources	
Terrestrial and wetland resources	SMALL to MODERATE (potential for MODERATE limited to eastern fox snake)
Aquatic resources	MODERATE
Socioeconomics	
Physical impacts	SMALL
Demography	SMALL beneficial
Economic Impacts on the Community	
Economy	SMALL to LARGE beneficial
Taxes	SMALL to LARGE beneficial
Infrastructure and Community Services Impacts	SMALL to MODERATE
Traffic	SMALL
Recreation	SMALL
Housing	
Public services	SMALL
Education	SMALL
Environmental Justice	SMALL
Historic and Cultural Resources	MODERATE
Air Quality	SMALL to MODERATE
Nonradiological Health	SMALL
Radiological Health	SMALL
Nonradioactive Waste	SMALL
Postulated Accidents	SMALL
Fuel Cycle (including radioactive waste), Transportation, and Decommissioning	SMALL

short-term MODERATE and adverse impact associated with increased traffic on local roads near the Fermi site during construction and during periods of outages; during normal operations, the adverse impact on local roads would be SMALL. The incremental contribution from NRC-authorized activities on traffic would be MODERATE during construction and during periods of

outages. Cumulative impacts to other socioeconomic impact categories and environmental justice would be SMALL.

The cumulative impacts on historic and cultural resources are expected to be MODERATE because NRC actions would result in the demolition, which would be mitigated, of one onsite property (Fermi 1) that has been recommended for the NRHP. The incremental impacts associated with onsite NRC-authorized construction activities are the principal contributors to the MODERATE rating of cumulative impacts.

For air quality, the cumulative impacts would be MODERATE, primarily due to national and worldwide impacts of greenhouse gas emissions, but SMALL for criteria pollutants. The incremental impacts from NRC-authorized activities would be SMALL because such impacts would be minimal.

For radiological health, nonradiological health, nonradioactive waste, postulated accidents, fuel cycle (including radioactive waste), transportation, and decommissioning, cumulative impacts are expected to be SMALL.

7.13 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

36 CFR Part 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of Historic Properties."

40 CFR Part 93. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 93, "Determining Conformity of Federal Actions to State or Federal Implementation Plans."

40 CFR Part 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

40 CFR Part 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, "Terminology and Index."

51 FR 30028. August 21, 1986. "Safety Goals for the Operation of Nuclear Power Plants." *Federal Register*. U.S. Nuclear Regulatory Commission.

75 FR 31514. June 3, 2010. "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule." *Federal Register*. U.S. Environmental Protection Agency.

77 FR 39659. July 5, 2012. "Proposed Approval of Air Quality Implementation Plan; Michigan; Determination of Attainment of the 1997 Annual and 2006 24-Hour Fine Particle Standards for the Detroit-Ann Arbor Nonattainment Area." *Federal Register*. U.S. Environmental Protection Agency.

Alpert, D.A. 1995. *Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin: A Working Map and Classification*. General Technical Report NC-178. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. Available at http://nrs.fs.fed.us/pubs/gtr/other/gtr-nc178/index.html. Accessed July 17, 2012.

American Recovery and Reinvestment Act of 2009. P.L. 111-5.

American Water Works Association (AWWA). 2009. *Water Audit Report for: City of Monroe, FY 2009.* AWWA Water Loss Control Committee Free Water Audit Software v4.0. Accession No. ML112650172.

Brannan, S. 2009. "Cause and Effect: Sediment Plume Creates Perfect Incubator for Microcystis Bloom." *Twinline*, Vol. 31, No. 3, pp. 3–5.

Bridgeman, T.B. 2006. *Maumee Bay and Western Lake Erie Water Quality Monitoring*: *A Final Report to the Lake Erie Protection Fund.* Project LEPF 03-19. November.

Clean Air Act. 42 USC 7401, *et seq.*

Consumers Energy. 2011. *J.R. Whiting Generating Complex.* Available at http://www.consumersenergy.com/content.aspx?id=1336. Accessed August 15, 2011.

Conway, B.D. 2011a. Letter from Brian D. Conway (Michigan SHPO) to Bruce Olson (NRC) dated May 9, 2011, "Subject: ER06-683, Enrico Fermi Atomic Power Plant – Fermi 3 Power Plant Relicensing Sections 16, 17, 19, 20, 21, 28 & 29, T6S, R10E, Frenchtown Township, Monroe County (NRC)." Accession No. ML111590571.

Conway, B.D. 2011b. Letter from Brian D. Conway (Michigan SHPO) to Theodore Smith (NRC) dated May 9, 2011, "Subject: ER06-683, Enrico Fermi Atomic Power Plant – Unit 1 (Fermi 1) License Termination Plan (LTP), Sections 16 & 21, T6S, R10E, Frenchtown Township, Monroe County (NRC)." Accession No. ML111440368.

Detroit Edison Company (Detroit Edison). 2011a. *Fermi 3 Combined License Application, Part 3: Environmental Report*. Revision 2, Detroit, Michigan. Accession No. ML110600498.

Detroit Edison Company (Detroit Edison). 2011b. *Detroit Edison Fermi 3 Project, U.S. Army Corps of Engineers and Michigan Department of Environmental Quality, Joint Permit Application.* Revision 0, Detroit Michigan. June. Accession No. ML111940490.

Detroit Edison Company (Detroit Edison). 2011c. Letter from P.W. Smith (Detroit Edison) to NRC dated July 7, 2011, "Subject: Detroit Edison Company Response to NRC Questions Related to the Environmental Review and Supplemental Response." Accession No. ML11192A190.

Detroit Edison Company (Detroit Edison). 2011d. Letter from Joseph Plona (Detroit Edison) to NRC dated July 18, 2011, "Subject: Notice of Intent to Submit License Renewal Application." Accession No. ML112010179.

Detroit Edison Company (Detroit Edison). 2012a. *Detroit Edison Fermi 3 Construction, Habitat and Species Conservation Plan, Eastern Fox Snake (Elaphe gloydi)*. March 2012, Rev. 0. Accession No. ML12163A577.

Detroit Edison Company (Detroit Edison). 2012b. *Detroit Edison Fermi 3 Operational Conservation and Monitoring Plan, Eastern Fox Snake (Elaphe gloydi)*. March 2012, Rev. 0. Accession No. ML12188A150.

Detroit Edison Company (Detroit Edison). 2012c. "Fermi 3 Aquatic Resource Mitigation Strategy and Design." Submitted to MDEQ on August 3, 2012. Accession No. ML122580003.

Detroit Edison Company (Detroit Edison). 2012d. "Fermi 3 U.S. Army Corps of Engineers Temporary Impacts Restoration Strategy." Submitted to USACE on September 7, 2012. Accession No. ML12256A013.

Frenchtown Charter Township. 2010. *Water Plant.* Available at http://www.frenchtowntownship.org/water.php. Accessed July 1, 2010. Accession No. ML112650175.

Hartig, J.H., M.A. Zarull, J.J.H. Ciborowski, J.E. Gannon, E. Wilke, G. Norwood, and A. Vincent (eds.). 2007. *State of the Strait: Status and Trends of Key Indicators.* Occasional Publication No. 5. Great Lakes Institute for Environmental Research, University of Windsor, Ontario, Canada. Available at http://www.epa.gov/med/grosseile_site/indicators/index.html. Accession No. ML112620472.

Hayhoe, K., J. VanDorn, T. Croley II, N. Schlegal, and D. Wuebbles. 2010. *"Regional Climate Change Projections for Chicago and the US Great Lakes." Journal of Great Lakes Research* 36:7–21.

James D. Anulewicz Associates, Inc., and McKenna Associates, Inc. 2003. *Master Plan – Charter Township of Frenchtown, Monroe County, Michigan, 2003.* June. Accession No. ML112640119.

Lake Erie Lakewide Management Plan (LaMP) Work Group. 2008. *Lake Erie Lakewide Management Plan*. Prepared by the Lake Erie LaMP Management Committee, Environment Canada, and the U.S. Environmental Protection Agency. Available at http://www.epa.gov/greatlakes/lamp/le_2008/index.html. Accessed August 23, 2010. Accession No. ML112620518.

Michigan Department of Environmental Quality (MDEQ). 2011a. Letter from D. Wyant (Director, MDEQ) to S. Hedman (Regional Administrator, Region 5, U.S. Environmental Protection Agency). July 5, 2011. Accession No. ML111940431.

Michigan Department of Environmental Quality (MDEQ). 2011b. "Report of Solid Waste Landfilled in Michigan, October 1, 2009–September 30, 2010." Michigan Department of Environmental Quality Resource Management Division, April. Accession No. 112650179.

Midwest High-Speed Rail (MHR). 2011. Official website of Midwest High-Speed Rail Map. Available at http://www.connectthemidwest.com/map/. Accessed June 3, 2011. Accession No. ML112660176.

Monroe County Planning Department and Commission. 2010. *Monroe County Comprehensive Plan: 2010 Update.* Accession No. ML112620699.

National Environmental Policy Act of 1969, as amended (NEPA). 42 USC 4321, *et seq*.

National Historic Preservation Act of 1966, as amended (NHPA). 16 USC 470, *et seq*.

Our Good Neighbors. 2011. Available at http://ourgoodneighbors.com. Accessed August 16, 2011. Accession No. ML112660172.

Patterson, R.L. 1987. "Revised Estimates of Power Plant Entrainment of Ichthyoplankton in Western Lake Erie in 1975–77." *Journal of Great Lakes Research* 13:78–83.

Patterson, R.L., and K.D. Smith. 1982. "Impact of Power Plant Entrainment of Ichthyoplankton on Juvenile Recruitment of Four Fishes in Western Lake Erie in 1975–77." *Journal of Great Lakes Research* 8:558–569.

Reeves, H.W., K.V. Wright, and J.R. Nicholas. 2004. *Hydrogeology and Simulation of Regional Ground-Water-Level Declines in Monroe County, Michigan.* U.S. Geological Survey Water-Resources Investigations Report 03-4312. Available at http://pubs.usgs.gov/wri/wri03-4312.

U.S. Army Corps of Engineers (USACE). 2009. *Finding of No Significant Impact and Environmental Assessment: Operations and Maintenance Dredging and Placement of Dredged Material, Toledo Harbor, Lucas County, Ohio*. April. 170 p. Accession No. ML112650182.

U.S. Environmental Protection Agency (EPA). 2005. *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*. EPA420-F-05-004. Office of Transportation and Air Quality. February. Available at http://www.epa.gov/oms/climate/420f05004.pdf. Accessed July 14, 2011. Accession No. ML112351010.

U.S. Environmental Protection Agency (EPA). 2010a. *The Green Book Nonattainment Areas for Criteria Pollutants*. Available at http://www.epa.gov/oar/oaqps/greenbk/index.html. Accessed June 8, 2010. Accession No. ML112620332.

U.S. Environmental Protection Agency (EPA). 2010b. *AirData*: *Generating Reports and Maps*. Available at http://www.epa.gov/air/data/reports.html. Accessed August 23, 2010. Accession No. ML112351061.

U.S. Environmental Protection Agency (EPA). 2010c. "Municipal Solid Wastes in the United States: 2009 Facts and Figures." EPA530-R-10-012, December.

U.S. Environmental Protection Agency (EPA). 2011a. Great Lakes Restoration Initiative Web site. Available at http://www.epa.gov/greatlakes/glri/. Accessed April 1, 2011. Accession No. ML112351063.

U.S. Environmental Protection Agency (EPA). 2011b. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009*. EPA 430-R-11-005. April 15. Available at http://epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Complete_Report.pdf. Accessed July 14, 2011. Accession No. ML112351013.

U.S. Environmental Protection Agency (EPA). 2011c. *Water Discharge Permits (PCS) – Detroit Edison Monroe Power Plant*. Accessed August 16, 2011 at http://oaspub.epa.gov/enviro/pcs_web.report?PGM_SYS_ID=MI0001848. Accession No. ML112300887.

U.S. Environmental Protection Agency (EPA). 2011d. *Water Discharge Permits (PCS) – FirstEnergy Generation Corporation Bay Shore Plant.* Available at http://oaspub.epa.gov/enviro/pcs_web.report?PGM_SYS_ID=OH0002925. Accessed August 16, 2011. Accession No. ML112300900.

U.S. Environmental Protection Agency (EPA). 2011e. *Envirofacts –Rockwood Quarry*. Available at http://oaspub.epa.gov/enviro/afs_reports.detail_plt_view?p_state_county_compliance_src=2611500110&p_plant_id=. Accessed August 16, 2011. Accession No. ML11234A317.

U.S. Environmental Protection Agency (EPA). 2011f. *Envirofacts – Stoneco Newport.* Available at http://oaspub.epa.gov/enviro/afs_reports.detail_plt_view?p_state_county_compliance_src=2611500144&p_plant_id=. Accessed August 16, 2011. Accession No. ML11234A314.

U.S. Environmental Protection Agency (EPA). 2011g. *Envirofacts – Recycle Aggregates.* Available at http://oaspub.epa.gov/enviro/afs_reports.detail_plt_view?p_state_county_compliance_src=2616304042&p_plant_id=. Accessed August 16, 2011. Accession No. ML11234A315.

U.S. Environmental Protection Agency (EPA). 2011h. *Envirofacts – Stoneco Inc. Denniston Quarry.* Available at http://oaspub.epa.gov/enviro/afs_reports.detail_plt_view?p_state_county_compliance_src=2611500147&p_plant_id=. Accessed August 16, 2011. Accession No. ML11234A316.

U.S. Environmental Protection Agency (EPA). 2011i. *Water Discharge Permits (PCS) – Stoneco Inc.* Available at http://oaspub.epa.gov/enviro/pcs_web.report?PGM_SYS_ID=MI0004821. Accessed August 16, 2011. Accession No. ML112300907.

U.S. Environmental Protection Agency (EPA). 2011j. *Water Discharge Permits (PCS) – Sibley Limestone.* Available at http://oaspub.epa.gov/enviro/pcs_web.report?PGM_SYS_ID=MI0001953. Accessed August 16, 2011. Accession No. ML112300948.

U.S. Environmental Protection Agency (EPA). 2011k. *Water Discharge Permits (PCS) – Berlin Township Wastewater Treatment Plant.* Available at http://oaspub.epa.gov/enviro/pcs_web.report?PGM_SYS_ID=MI0020826. Accessed August 16, 2011. Accession No. ML112300984.

U.S. Environmental Protection Agency (EPA). 2011l. *Water Discharge Permits (PCS) – Monroe Metro Wastewater Facility.* Available at http://oaspub.epa.gov/enviro/pcs_det_reports.pcs_tst?npdesid=MI0028401&npvalue=1&npvalue=2&npvalue=3&npvalue=4&npvalue=5&npvalue=6&rvalue=13&npvalue=7&npvalue=8&npvalue=10&npvalue=11&npvalue=12. Accessed August 16, 2011. Accession No. ML112301039.

U.S. Environmental Protection Agency (EPA). 2011m. *Water Discharge Permits (PCS) – Carleton Wastewater Treatment Plant.* Available at http://oaspub.epa.gov/enviro/pcs_det_reports.pcs_tst?npdesid=MI0022543&npvalue=1&npvalue=2&npvalue=3&npvalue=4&npvalue=5&npvalue=6&rvalue=13&npvalue=7&npvalue=8&npvalue=10&npvalue=11&npvalue=12. Accessed August 16, 2011. Accession No. ML112301055.

U.S. Environmental Protection Agency (EPA). 2011n. *Water Discharge Permits (PCS) – Lazy Oak Sub Wastewater Treatment Plant.* Available at http://oaspub.epa.gov/enviro/pcs_det_reports.pcs_tst?npdesid=MI0057704&npvalue=1&npvalue=2&npvalue=3&npvalue=4&npvalue=5&npvalue=6&rvalue=13&npvalue=7&npvalue=8&npvalue=10&npvalue=11&npvalue=12. Accessed August 16, 2011. Accession No. ML112301070.

U.S. Environmental Protection Agency (EPA). 2011o. *Water Discharge Permits (PCS) – Guardian Industries.* Available at http://oaspub.epa.gov/enviro/pcs_det_reports.pcs_tst?npdesid=MI0037001&npvalue=1&npvalue=2&npvalue=3&npvalue=4&npvalue=5&npvalue=6&rvalue=13&npvalue=7&npvalue=8&npvalue=10&npvalue=11&npvalue=12. Accessed August 16, 2011. Accession No. ML112301079.

U.S. Environmental Protection Agency (EPA). 2011p. *Water Discharge Permits (PCS) – Luna Pier Wastewater Treatment Plant.* Available at http://oaspub.epa.gov/enviro/pcs_det_reports.pcs_tst?npdesid=MIG570026&npvalue=1&npvalue=2&npvalue=3&npvalue=4&npvalue=5&npvalue=6&rvalue=13&npvalue=7&npvalue=8&npvalue=10&npvalue=11&npvalue=12. Accessed August 18, 2011. Accession No. ML112301090.

U.S. Environmental Protection Agency (EPA). 2011q. *Water Discharge Permits (PCS) – Rawsonville Woods Mobile Estates.* Available at http://oaspub.epa.gov/enviro/pcs_det_reports.pcs_tst?npdesid=MI0056677&npvalue=1&npvalue=2&npvalue=3&npvalue=4&npvalue=5&npvalue=6&rvalue=13&npvalue=7&npvalue=8&npvalue=10&npvalue=11&npvalue=12. Accessed August 18, 2011. Accession No. ML112301103.

U.S. Fish and Wildlife Service (FWS). 2010. *Detroit River International Wildlife Refuge.* Available at http://www.fws.gov/midwest/detroitriver. Accessed February 22, 2010. Accession No. ML112630562.

U.S. Global Change Research Program (USGCRP). 2009. *Global Climate Change Impacts in the United States.* T.R. Karl, J.M. Melillo, and T.C. Peterson (eds.). Cambridge University Press, New York. Available at http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf. Accessed August 9, 2010. Accession No. ML100580077.

U.S. Nuclear Regulatory Commission (NRC). 2002. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors*. NUREG-0586, Supplement 1, Vols. 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2010a. *Fermi, Unit 1*. Available at http://www.nrc.gov/info-finder/decommissioning/power-reactor/enrico-fermi-atomic-power-plant-unit-1.html. Accessed February 22, 2010. Accession No. ML112630568.

U.S. Nuclear Regulatory Commission (NRC). 2010b. Information Digest, 2010–2011. NUREG-1350, Volume 22. Available at http://pbadupws.nrc.gov/docs/ML1024/ML102460490.pdf. Accessed September 16, 2011. Accession No. ML102460490.

U.S. Nuclear Regulatory Commission (NRC). 2011a. Staff Memorandum from Scott Flanders (NRO) to Brent Clayton (NRO). Subject: "Addressing Construction and Preconstruction Activities, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, the Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues In Environmental Impact Statements." Revision 1, March 4, 2011. Accession No. ML110380369.

U.S. Nuclear Regulatory Commission (NRC). 2011b. *Davis-Besse Nuclear Power Station, Unit 1*. Available at http://www.nrc.gov/info-finder/reactor/davi.html. Accessed August 15, 2011. Accession No. ML112660188.

Ventower. 2011. Ventower. Available at http://www.ventower.com. Accessed August 16, 2011. Accession No. ML112660175.

8.0 Need for Power

Chapter 8 of the U.S. Nuclear Regulatory Commission's (NRC) *Environmental Standard Review Plan* (ESRP) (NRC 2000), with additional clarification provided in NRC Staff Memorandum (NRC 2011), guides the NRC staff's review and analysis of the need for power from a proposed nuclear power plant. In addition to the ESRP guidance, the NRC addressed the need for power in a 2003 response to a petition for rulemaking (68 FR 55910). In the 2003 response, the NRC reviewed whether or not need for power should be considered in NRC environmental impact statements (EISs) prepared in conjunction with applications that could result in construction of a new nuclear power plant. The NRC (68 FR 55910) concluded that:

> The need for power must be addressed in connection with new power plant construction so that the NRC may weigh the likely benefits (e.g., electrical power) against the environmental impacts of constructing and operating a nuclear power reactor. The Commission emphasizes, however, that such an assessment should not involve burdensome attempts to precisely identify future conditions. Rather, it should be sufficient to reasonably characterize the costs and benefits associated with proposed licensing actions.

While the NRC will perform a need for power analysis for a new nuclear power plant in its EIS, the NRC also stated in its response to the petition that (1) the NRC does not supplant the States, which have traditionally been responsible for assessing the need for power-generating facilities, for determining their economic feasibility and for regulating rates and services; and (2) the NRC has acknowledged the primacy of State regulatory decisions regarding future energy options (68 FR 55910).

Detroit Edison Company (Detroit Edison), a wholly owned subsidiary of DTE Energy, has submitted a combined license (COL) application to the NRC for a new nuclear reactor, Enrico Fermi Unit 3 (Fermi 3), to be located at the existing Detroit Edison Enrico Fermi Atomic Power Plant (Fermi) site in Monroe County, Michigan. The proposed nuclear reactor would use the GE-Hitachi Nuclear Energy Economic Simplified Boiling Water Reactor (ESBWR) design that has a rated core thermal power of 4500 megawatts thermal (MW(t)) and a gross electrical output of approximately 1605 ± 50 megawatts electric (MW(e)). For analytical purposes, DTE determined 2021 was the appropriate year for the commencement of operations at Fermi 3. (Detroit Edison 2012). Fermi 3 would operate as a regulated investor-owned electric utility connected to the electrical grid operated by ITC*Transmission*.

In its Environmental Report (ER) (Detroit Edison 2011), Detroit Edison identified the following purposes of the proposed reactor:

- Generate at least 1535 ± 50 MW(e) of reliable electricity to address the forecasted energy and capacity needs of Detroit Edison customers.
- Provide new baseload generation capacity in 2021 to accommodate new growth in electrical demand, replace the expected retirement of aging baseload generating units, and compensate for the diminishing availability of baseload generation capacity in the Midwest Independent System Operator (MISO) service area.
- Provide price stability by minimizing the importation of power into the Detroit Edison service area.
- Establish baseload generation technology that is less subject to price fluctuations resulting from either fuel or regulatory drivers, provides fuel diversity, and reduces reliance on fossil fuels and their resulting environmental impacts.

Section 8.1 describes the Detroit Edison service area as well as the broader power generation and transmission system in which Detroit Edison participates. Section 8.1 also introduces and describes the Michigan Public Service Commission's (MPSC) 21st Century Energy Plan (hereafter, the MPSC Plan) (MPSC 2007), the first comprehensive statewide electricity planning initiative completed in Michigan and the basis for the review team's independent need for power analysis. Section 8.2 describes the factors that could influence changes in the demand for power over the licensing period for Fermi 3 that were addressed in the MPSC Plan. Section 8.3 discusses existing and potential sources of electricity supply in the Detroit Edison service area. Section 8.4 presents the review team's projected supply and demand estimates for the Detroit Edison service area, along with the review team's conclusions regarding the need for power.

8.1 Power Systems and Power Planning in Michigan

Deregulation of the electricity markets has had a significant impact on how projected power needs are met. Because of the deregulation of bulk sales markets for electricity, the advent of independent power producers, and the increased use of purchases and exchanges of electricity among utilities, the demand for electricity by ultimate consumers and wholesale customers within a utility's service area is increasingly not being met by the utility's own generating resources. Greater degrees of collaboration among transmission balancing authorities to more efficiently accommodate renewable energy sources and plans for long-distance transfers of renewable energy-generated power to distant load centers have served to further expand the geographic area from which generation resources might be routinely drawn to meet demand. Trading of electricity is further facilitated by the Federal Energy Regulatory Commission's final rule requiring all public utilities that own, control, or operate facilities used for transmitting electricity in interstate commerce to file open access nondiscriminatory transmission tariffs that contain minimum terms and conditions on nondiscriminatory service. It is therefore incumbent

on the review team to ensure that impacts from all of these issues are properly incorporated into its need for power analysis.

8.1.1 National and Michigan Electricity Generation and Consumption

Electricity generation in the United Stated in 2008 was 4119 million megawatt hours (MWh), a 0.9 percent decrease from the 2007 total of 4157 million MWh, using a variety of generating technologies: coal (48.2 percent), natural gas (21.4 percent), nuclear (19.6 percent), hydroelectric (6.0 percent), non-hydro renewables (3.1 percent), petroleum (1.1 percent), other gases (0.3 percent), and other sources (0.3 percent) (DOE/EIA 2010a). Electric utility plants accounted for 2475.5 million MWh (60.1 percent of the MWh produced), with combined heat and power (CHP) plants accounting for the remaining 1643.5 million MWh (39.9 percent).

Michigan's 2008 net summer electricity generating capacity stood at 30,419 MW, 21,885 MW of which were represented by electric utilities and 8534 MW provided by independent power producers and CHP facilities. In 2008, Michigan's electric utilities generated 94,503,953 MWh of electricity (down 2.4 percent from 96,785,842 MWh in 2007) of the statewide total production of 114,989,806 MWh (down 3.6 percent from the 2007 statewide total of 119,309,936 MWh) (EERE 2009; DOE/EIA 2010b).

8.1.2 The Detroit Edison Power System

The Detroit Edison power system is managed and/or overseen by four separate entities, each responsible for a different but integrated aspect of the generation, transmission, and distribution of electricity. The four entities, described below in greater detail are Detroit Edison (DTE Energy), ITC*Transmission*, MISO and PJM Interconnection (MISO/PJM), and North American Electric Reliability Council's (NERC's) Reliability*First* Corporation (RFC).

Detroit Edison

Detroit Edison was founded in 1903. It is a wholly owned subsidiary of DTE Energy, a diversified energy company incorporated in 1995 and involved in the development and management of energy-related businesses and services nationwide. Detroit Edison and the Michigan Consolidated Gas Company (MichCon), a natural gas utility serving 2.1 million customers in lower Michigan, are DTE Energy's two largest operating subsidiaries. Beside electricity production, other energy-related activities of DTE Energy include the ownership and management of natural gas storage facilities and pipelines, coal marketing and transporting,

conventional and unconventional natural gas resource recovery, and energy trading.[a] The MichCon and Detroit Edison service areas are shown in Figure 8-1.

Detroit Edison generates, transmits, and distributes electricity to 2.2 million customers throughout an 11-county area [b] in southeastern Michigan, an area of approximately 7600 mi^2 (DTE Energy 2008a; Detroit Edison 2010).

Detroit Edison is the largest electric utility in Michigan and the tenth largest in the country (DTE Energy 2008b). The electricity generating stations owned and operated by Detroit Edison

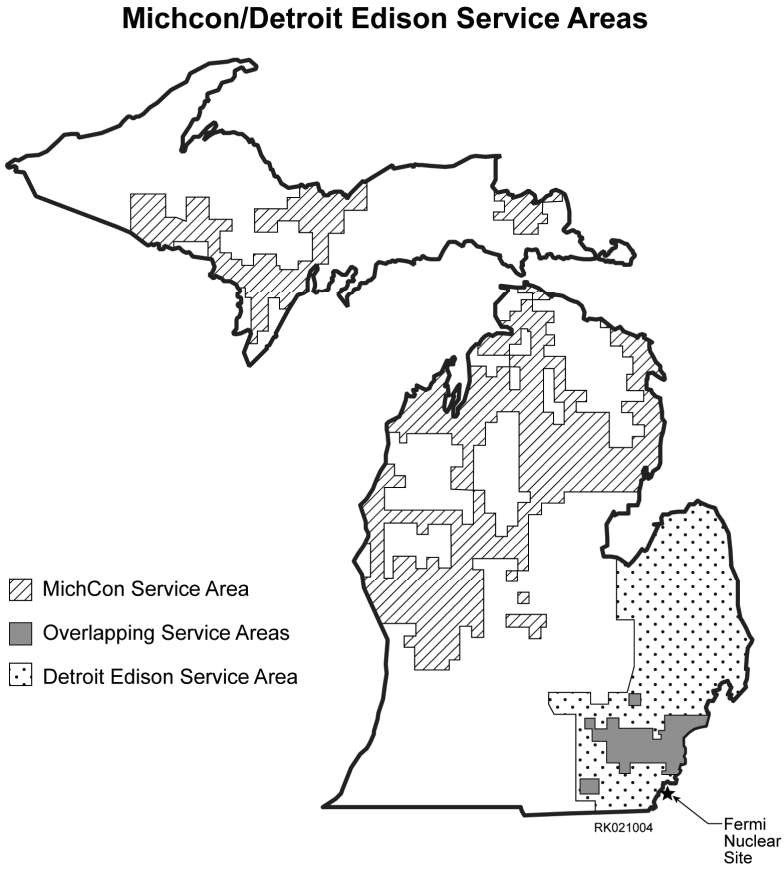

Figure 8-1. DTE Energy's MichCon and Detroit Edison Service Areas (DTE Energy 2008a)

(a) Additional details regarding the activities of DTE Energy subsidiaries are available from its corporate Web site: http://www.dteenergy.com/residentialCustomers/productsPrograms.
(b) Counties comprising Detroit Edison's service area include: Huron, Lenawee, Macomb, Monroe, Oakland, Sanilac, Tuscola, Lapeer, St. Clair, Washtenaw, and Wayne.

have an overall generating capacity of 11,518 MW (DTE Energy 2008a). Detroit Edison operates nine baseload generating plants, including Fermi 2, and is co-owner of a pumped-storage hydroelectric facility in Ludington, Michigan. In 2008, Detroit Edison operated four of the State's top ten electric generating facilities (based on net summer capacity): three coal-fired plants – Monroe (3129 MW), Belle River (1509 MW), St. Clair (1393 MW) – and Fermi 2 (1173 MW) (DOE/EIA 2010b).

Reliability of power is ensured, in part, by the mix of fuels in the Detroit Edison generating portfolio: coal, natural gas, nuclear, pumped-storage hydroelectricity, and renewable energy sources. Historically, coal has accounted for 80 to 85 percent of Detroit Edison's electricity generation with Fermi 2 accounting for the majority of the remainder of Detroit Edison's generating capacity. Of the total 11,518 MW of Detroit Edison's electricity generating capacity, 78.8 percent is provided by coal, 16.9 percent by nuclear, 2.3 percent by natural gas, 0.8 percent by oil, 0.1 percent by hydroelectric, and 1 percent by renewable sources (biomass 0.6 percent and solid waste incineration 0.4 percent) (DTE Energy 2008a). The promulgation of a State Renewable Portfolio Standard (RPS), as well as increasingly rigorous environmental regulations on fossil fuel-fired power generation[(a)] (including possible future regulations requiring the capture and sequestration of greenhouse gases, especially carbon dioxide) are likely to cause major changes in DTE's power portfolio going forward.

Detroit Edison testimony in Rate Case No. U-15244 provided highlights of Detroit Edison's Integrated Resource Plan (IRP) process, pointing out its similarities to the MPSC Plan, including use of the same planning model (MPSC 2008). The testimony also noted that the process by which MPSC would grant a Certificate of Need would require submission of an IRP at the time the regulated utility applied to the MPSC for certification and that Detroit Edison intended to follow that process.[(b)] However, Detroit Edison has not yet submitted an application to the MPSC for a Certificate of Need for Fermi 3. Fermi 3 would add approximately 1535 MW(e) of generating capacity to the Detroit Edison portfolio, should it become operational on schedule in 2021.

(a) See Sections 9.2.2.2 and 9.2.2.3 for a detailed discussion of environmental regulations applicable to coal-fired and natural gas-fired power plants, respectively.

(b) The process for obtaining a Certificate of Need that was described in the MPSC Plan has since become law. (See Michigan Compiled Laws Section 460.6s at http://www.legislature.mi.gov/doc.aspx?mcl-460-6s). A Certificate of Need must now be obtained for energy-related capital projects costing $500 million or more, including construction of new electricity generating facilities, upgrades, or acquisition of existing facilities, investments in new generating assets, or execution of long-term power purchasing agreements. The Certificate would provide authority for cost recoveries.

ITC*Transmission*

Power generated by Fermi 3 would be delivered to the high-voltage transmission system operated by ITC*Transmission* through three redundant 345-kV lines (Fermi-Milan 1, Fermi-Milan 2, and Fermi-Milan 3). The point of connection would be ITC*Transmission*'s Milan substation, approximately 29.3 mi west-northwest of the Fermi site (Detroit Edison 2010). Power would be distributed to customers by the interconnected transmission networks operated by ITC*Transmission* and the Michigan Electric Transmission Company (METC), both of which are owned by ITC Holdings Corporation and which together are responsible for the majority of electric power distribution throughout southeastern Michigan, including the entirety of the traditional Detroit Edison service area. The ITC*Transmission* service area coincides with the Detroit Edison service area, covering 7600 mi^2 and including the metropolitan areas of Detroit and Ann Arbor (ITC 2010a). METC's service area covers 18,800 mi^2 and consists of more than 5400 mi of high-voltage transmission lines (ITC 2010b). The ITC*Transmission* and METC service areas are displayed in Figures 8-2 and 8-3, respectively.

MISO/PJM

In December 2000, ITC*Transmission* joined MISO. MISO is responsible for the reliability of the nearly 94,000 mi of interconnected high-voltage electric transmission grids in 15 States and the Canadian Province of Manitoba. MISO has partnered with PJM to develop and operate a wholesale market of high-voltage electric transmission that extends to 23 States, the District of Columbia, and Manitoba. The MISO and PJM service areas are displayed in Figure 8-4. Finally, the MISO and PJM service areas are part of the RFC,[(a)] one of eight Regional Reliability Entities that comprise NERC (NERC 2008). The geographic area of RFC is displayed in Figure 8-5. The eight NERC regional entities are shown in Figure 8-6.

NERC/RFC

NERC is required by the Federal Power Act of 2005 (16 USC 791a *et seq*.) to conduct annual reliability assessments. One such Long-Term Reliability Assessment (LTRA) report (including the RFC self-assessment report contained within the system-wide NERC assessment) was published by NERC in October 2008 (NERC 2008) and covered the period 2008–2017.[(b)] NERC relies upon reports created by its component regional entities for its annual reliability assessments.

(a) Additional details on RFC are available on the RFC Web site at http://www.rfirst.org.
(b) Although more recent LTRAs have since been published, the review team has elected to refer to this 2008 version as the most appropriate analysis for use as independent corroboration of other need for power reports addressed in this analysis.

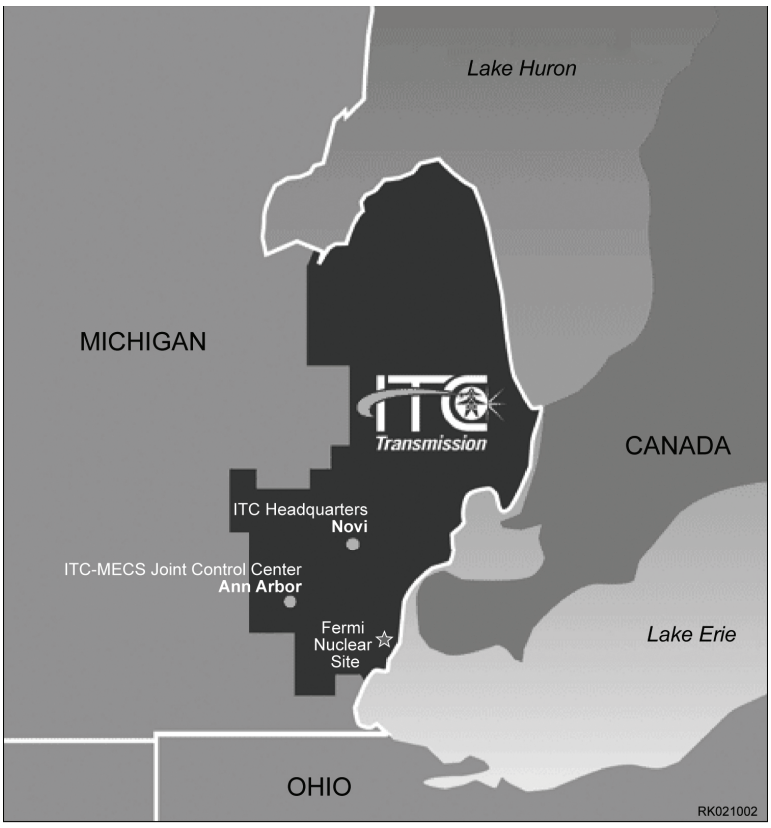

Figure 8-2. ITC*Transmission* Service Area (Detroit Edison 2011)

8.1.3 Electricity Planning in Michigan

This section discusses the electricity planning initiatives that have been completed for Michigan and the manner in which the review team relied on those initiatives for its need for power analysis.

8.1.3.1 The MPSC Plan

The need for power analysis provided by Detroit Edison in the ER was derived from the MPSC Plan (MPSC 2007). The MPSC Plan, the first comprehensive statewide electricity planning initiative completed in the State of Michigan, was developed in response to Executive Directive No. 2006-02 (Granholm 2006). The MPSC Plan has a geographic scope of the entire State and a planning horizon through 2025, well beyond the planned startup of Fermi 3.

To produce the MPSC Plan, various workgroups were assembled, each with an assignment to address different aspects of energy planning. Among the various workgroups, the Capacity Need Forum (CNF) Update Workgroup was most directly responsible for a determination of the

Figure 8-3. METC Service Area (Detroit Edison 2011)

need for power; consequently, its methodologies and results became the focus of the review team's assessment of the Plan. MPSC Plan projections were compiled for three regions of the State of Michigan – Southeast Michigan (the area served by ITC), the balance of the Lower Peninsula (primarily served by the Michigan Joint Zone), and the Upper Peninsula (served by American Transmission Company) – and then aggregated into the MPSC Plan. Because Detroit Edison represents approximately 99 percent of generation capacity in the Plan's Southeast Michigan Planning Area,[(a)] the review team determined the MPSC Plan's "Southeast Michigan" was sufficiently close in service area and customer base to the Detroit Edison service area that it could serve as representative of the Detroit Edison service area for this need for power assessment. Therefore, the review team uses the MPSC Plan's analysis and results for

(a) The City of Wyandotte, the City of Detroit, and the Lansing Board of Water and Light comprise the remainder of generating capacity in the Southeast Michigan Planning Area. See Section 5.5, MPSC Plan, Appendix Volume II, Workgroup Reports (MPSC 2007).

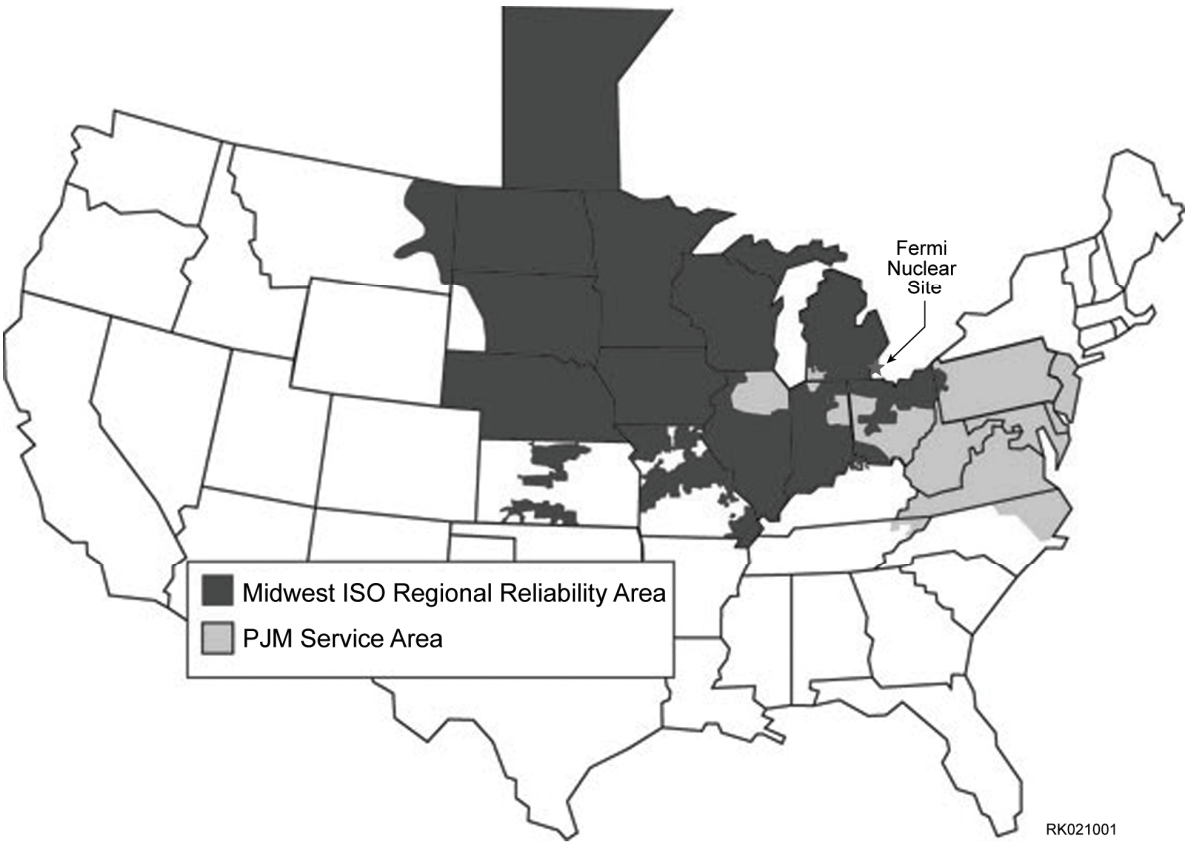

Figure 8-4. MISO (dark gray) and PJM (light gray) Service Territories (Detroit Edison 2011)

the Southeast Michigan Planning Area as the basis for its independent need for power assessment.

Because the MPSC Plan was intended to serve as the primary and official long-term electricity planning document for Michigan, and because of its appropriate geographic reach and planning horizon, the review team concluded that the results of that planning initiative could be accepted as a sufficient determination of the need for power in the Detroit Edison service area, provided the methodologies used in its development satisfied the ESRP acceptance criteria – that the MPSC Plan was systematic, comprehensive, subject to confirmation, and responsive to forecasting uncertainties. To confirm the adequacy of the MPSC Plan against these criteria, the review team reviewed the plan's data processing procedures and the methodologies employed by the CNF Update Working Group. These details had been provided in appendices contained in Volume II of the MPSC Plan (MPSC 2007). A summary of the salient points of the review team's assessment of the relevant appendices is provided below.

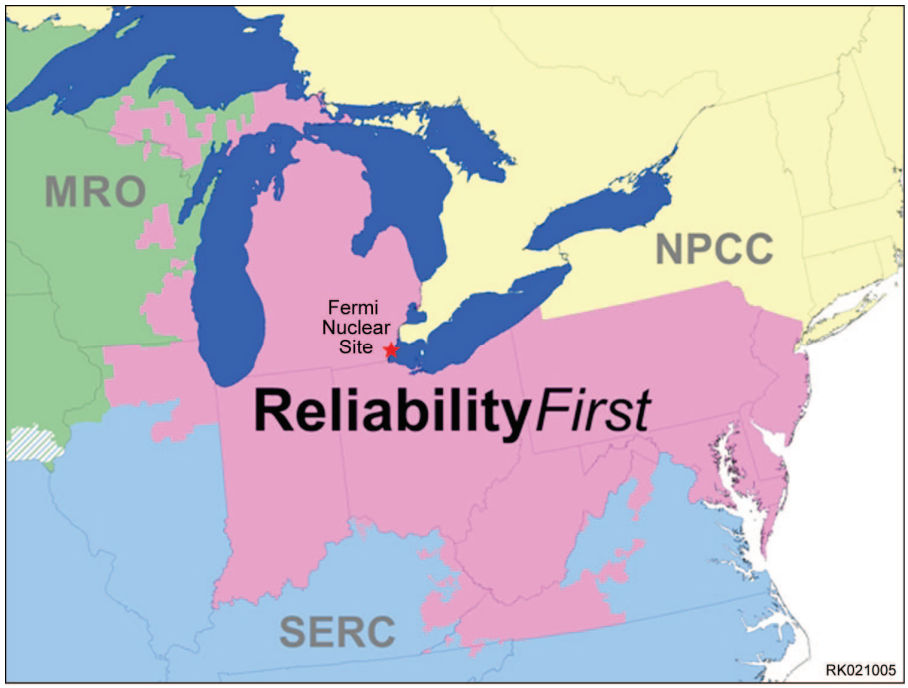

Figure 8-5. Reliability*First* Corporation Boundaries (Detroit Edison 2011)

Data used as inputs to the planning process were provided by the Michigan utilities whose representatives also comprised the members of the Plan's various working groups. *Strategist*, a proprietary computer software program developed by NewEnergy Associates, LLC, was used in data processing. The program consists of five application modules: Load Forecasting Adjustment (LFA), Generation and Fuel (GAF), PROVIEW, Capital Expenditure and Recovery, and Financial Reporting and Analysis. The CNF Update Working Group was responsible for updating the results of the 2005 CNF study, which had been independently produced in five planning areas, in the following respects:

- Confirm the inventory of generating plants currently operational in Michigan, including a review of investment and operating costs, performance, and emission profiles of central station generation technologies, and assess planning review requirements and siting issues, especially those relating to necessary air permits.
- Review the transmission analysis provided in the 2005 study to confirm the simultaneous, on-peak transmission capability and determine the capability availability for reliability support for the Lower Peninsula.
- Assess electric reliability for all regions of Michigan.

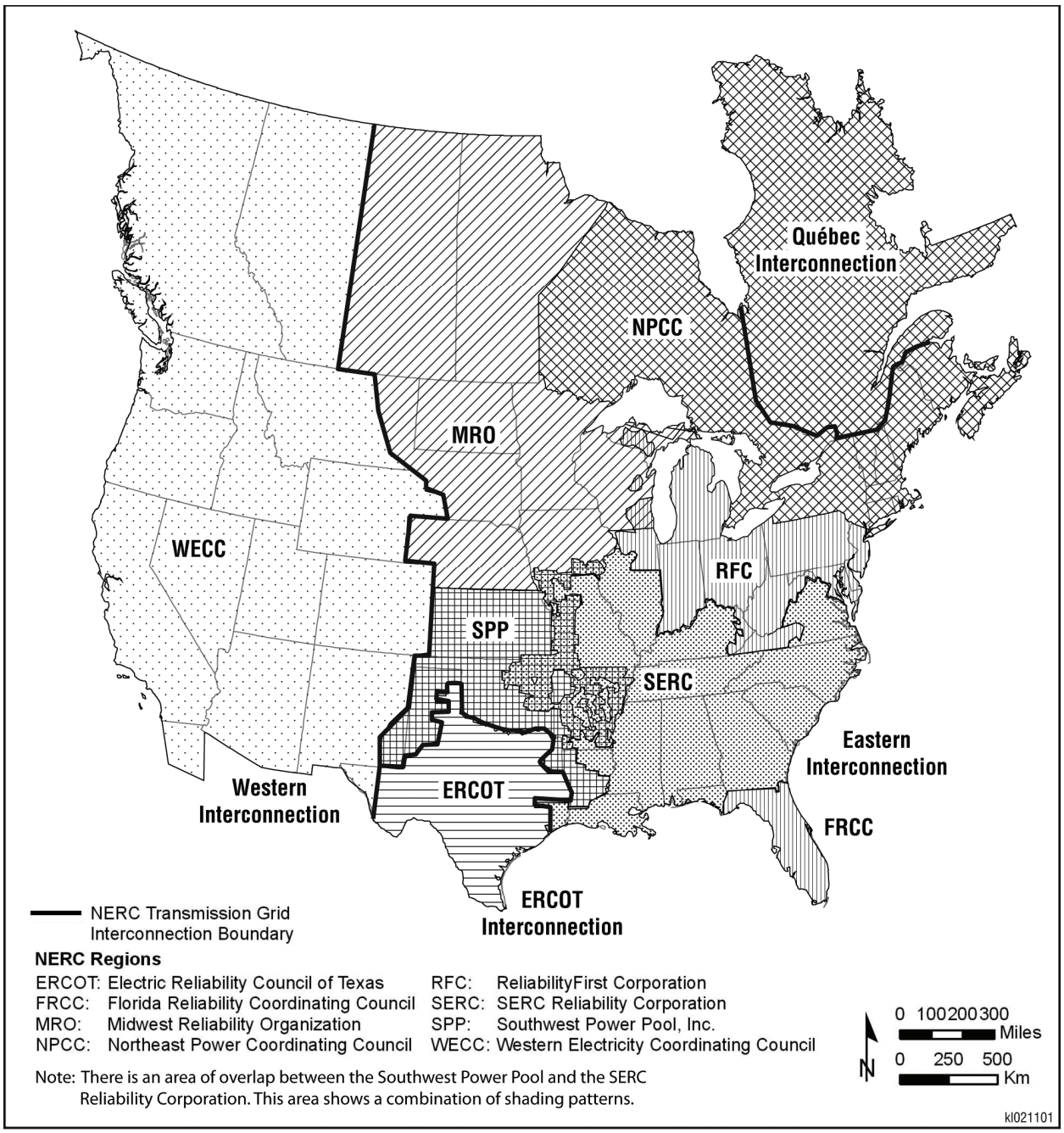

Figure 8-6. NERC Regions and Electricity Transmission Grid Interconnections (modified from NERC 2011)

- Develop an updated 20-year electric sales and peak demand forecast for each of the three planning regions (Southeast Michigan, Upper Peninsula, and Balance of Lower Peninsula) for Michigan.
- Expand the model system, providing fuel and emission cost forecasts for various scenarios and sensitivities.

The ESRP establishes four acceptance criteria for a need for power analysis. The analysis must be (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainties. The review team's evaluation of the MPSC Plan's satisfaction of these criteria is as follows:

Systematic: The architecture and operation of the *Strategist* computer program used to support development of the MPSC Plan ensure a systematic approach to data analysis. The GAF module uses probabilistic methods to simulate power system operation on an hourly basis, providing production costs and reliability estimates that are essential elements to utility supply and demand planning while providing the user with the flexibility to establish dispatch queue priorities on either a seasonal or annual basis. System load data developed by the GAF module is provided as input to the LFA module, which provides the user with additional flexibility in dispatching power, allowing non-thermal resources such as pumped storage to be dispatched before thermal resources, with imported power dispatched only after in-State resources and then only through a marginal cost-based algorithm to minimize costs. Further, the LFA module algorithm dispatches stored energy from the highest cost hour down for generation and pumps water to storage from the lowest cost hour up, thus reducing demands on other technologies at high-cost hours and increasing the load met by those other technologies at low cost hours. The LFA module also provides the user with an option of using the capacity of storage to ensure system reliability as well as for more typical economic reasons. The probabilistic methods employed by the *Strategist* software duplicate widely used production costing procedures, mimicking the typical decision-making procedures of a transmission system operator, ensuring not only the most economical dispatch of power but also that system reliability indices such as loss-of-load hours, expected emergency power, and spinning reserve margins are also satisfied. The user is also provided the flexibility to hold reliability indices constant, allowing capacity benefits that would accrue from Demand Side Management (DSM) programs to be separately calculated. Additional, more detailed evaluations of the impacts of DSM strategies are introduced through the operation of the PROVIEW module, which develops a least-cost balanced demand and supply plan for a utility system under user-prescribed sets of constraints and assumptions. The review team concludes that the data analysis methodologies contained in the *Strategist* software program are systematic, incorporating all aspects of utility planning and thus duplicating real-world decision-making procedures while providing the user with the flexibility to alter default settings to evaluate the impacts of various strategies on the Michigan power system.

Comprehensive: The CNF Update Working Group addressed all aspects of electric utility planning and strategy development, considering the existing central station generation portfolio, existing technologies, and likely future technologies such as conversion of existing coal-fired power plants to integrated gasification combined cycle or pulverized coal plants producing ultra-supercritical steam. The analysis extended into evaluations of the potential for increased efficiencies with incorporation of newer technologies as well as the costs and logistical issues associated with adoption of those new technologies. The Working Group also considered whether existing support infrastructures could support significant changes to the complexion of the State's central station generators, evaluating, for example, whether the existing natural gas pipeline infrastructure would support major shifts to natural gas combined cycle generation or whether the existing transmission system would respond to dramatic changes in central station generation or power imports without sacrificing reliability. Existing agreements and constraints that could change the effective on-peak transfer capacity of the Michigan transmission system were also considered. The review team concludes that the CNF Update Working Group's approach to meeting its responsibilities was comprehensive, addressing all major aspects of utility planning and strategy development.

Subject to Confirmation: Data used to develop the initial 2005 CNF report as well as the more recent data used by the CNF Update Working Group are subject to independent confirmation by MISO in development of statutorily prescribed annual electric system reliability assessments. Importantly, MISO's independent confirmation is for reliability purposes alone and provides no insight into the manner in which generation sources can be used to meet system reliability demands, which is the primary focus of the MPSC Plan. Nevertheless, the MISO reliability assessment still serves as an independent confirmation of the production data that are the basis for the analyses that support MPSC Plan conclusions and recommendations. Reliability modeling is performed to determine whether existing generation, together with electric transmission transfer capability and available external support, can reliably meet projected hourly peak load. The MISO staff used the MARELLI computer model to independently evaluate production data and estimate future generating reliability throughout the RFC region, which includes all of Michigan. The results of the most recent MISO analysis were incorporated into the NERC 2008 Long-Term Reliability Assessment (NERC 2008) that was discussed in Section 8.1.2 above. The MISO procedures were also determined by the review team to satisfy ESRP acceptance criteria. The review team concludes, therefore, that the annual, independent analysis of reliability performed by MISO and using the same production data as were used in the MPSC Plan constitutes an independent confirmation of the conclusions of the CNF Update Working Group and thus satisfies the ESRP criterion.

Responsive to Forecasting Uncertainties: The *Strategist* computer program used by the CNF Update Working Group has sufficient sophistication and flexibility to accommodate a variety of electric system planning scenarios. The CNF Update Working Group was responsible for updating the 20-year electric sales and peak demand forecast for Michigan provided in the

initial CNF report, which at the time of the Workgroup's deliberations was less than 3 years old. With adoption of the MARELLI default value of one day's Loss-of-Load Probability (LOLP) every 10 years as an acceptable risk target to system reliability, the CNF Update Working Group acknowledged that Michigan's reliability forecasting was significantly affected by forecasting uncertainties, including changing conditions in external markets that are interconnected with the Michigan electricity system and economic conditions in local markets served by Detroit Edison. Approximately 99 percent of the Southeast Michigan forecast that was used by the CNF Update Working Group relied on Detroit Edison's electricity projections, which are based on econometric and end-use modeling techniques and which reflected a then-current weaker economic outlook, increased conservation, and efficiency improvements over what was provided as the forecasting basis in the earlier CNF report. Because the CNF Update Working Group was directed to update the relatively recent CNF forecasts and because the Detroit Edison forecast reflected existing as well as projected local economic conditions, the review team concludes that the methodologies employed by the CNF Update Working Group were sensitive to forecasting uncertainties and that its conclusions and recommendations were based on appropriate incorporation of existing economic and market conditions. Sensitivity analyses for the LOLP risk target performed against the assumptions defining Base Case, High Load, Low Load, Expanded Transmission, and Low Imports were viewed by the review team as demonstration of the MPSC Plan's sensitivity to forecasting uncertainties.

8.2 Power Demand

This section discusses the historic and projected demand for electricity as described by the MPSC Plan. Detroit Edison identified the projected start of operations for Fermi 3 as 2021. Because the MPSC Plan projects supply and demand data to 2025, the review team determined that use of the 2025 projections was consistent with ESRP guidance to extend its need for power analysis "through the 3rd year of commercial operation of all proposed units" (NRC 2000). Section 8.2.1 discusses key factors that influence projected demand for electricity. Section 8.2.2 provides an overview of the projected peak summer demand for electricity in the Detroit Edison service area.

8.2.1 Factors Considered in Projecting Growth in Demand

The MPSC Plan included projections for demographics of the industrial, residential, and commercial electricity customer sectors and projected industrial activity levels (especially in auto and truck manufacturing, steel production, and other related industries) and major factors that resulted in forecasting uncertainties (e.g., weather and business cycles of major industrial users). Finally, energy efficiency and energy conservation can have significant impact on the growth in electricity demand. Additional details of how energy efficiency and energy conservation were considered in demand projects are provided below.

Four categories of energy efficiency were examined in detail in the MPSC Plan: (1) statewide energy efficiency programs, (2) electric utility load response programs, (3) commercial building energy efficiency code programs, and (4) State-specific energy efficiency standards for appliances. The MPSC Plan predicted that a reduction in the growth of power demand by as much as 50 percent over a 10-year period would result from the implementation of a comprehensive energy efficiency program and aggressive enforcement, resulting in statewide electric energy savings of between 6664 and 10,603 GWh (gigawatt hour) and reductions in peak electricity demand of between 876 and 1889 MW. Independently developed estimates by Detroit Edison and Consumer's Energy suggest that a 10-year load management programming effort could reduce peak electric demand by 569 MW and annual energy use by 35 GWh (Detroit Edison 2011). The MPSC Plan estimates promulgation and enforcement of energy efficient commercial building codes could result in statewide electric energy savings over that same period of 477 GWh. The adoption of energy efficiency standards for certain electric appliances could result in additional significant savings. Assuming that all appropriate policies and standards will be adopted and enforced, comparing the projected energy savings against even the more conservative estimate for growth of energy demand contained in the MPSC Plan shows the collective impacts of all such programs would slow, but not completely reverse, the long-term trend of increasing electric power demand.

Table 8-1 displays the MPSC Plan's projected energy efficiency demand savings from 2007 to 2025 for the entire State of Michigan. Of the total 96,785,842 MWh of power generated by electric utilities in Michigan in 2008, Detroit Edison was responsible for 48,816,410 MWh, or approximately 50 percent of the total (DOE/EIA 2010b). To translate MPSC's projected energy efficiency savings in Table 8-1 to an appropriate level for the Detroit Edison service area, the review team made the simplifying assumption that Detroit Edison customers would contribute to the statewide DSM reductions in the same proportion as their contribution to the total power generated in the State of Michigan. Therefore, the review team assumed Detroit Edison would be able to reduce its system-wide generating capacity by at least half of the amount shown in Table 8-1, or about 1400 MW by 2025.

If pursued and successfully executed, energy efficiency and energy conservation programs would result in meaningful energy savings and reductions in electricity demand. However, even if comprehensively structured and aggressively implemented and enforced, energy efficiency programs would have only a limited influence on the rate of growth of Michigan's need for power. Identification of potential savings does not necessarily guarantee demand response programs will be successfully implemented or that all eligible customers will participate fully; consequently, there is no guarantee that the identified potential amounts of demand reduction will actually materialize.

The review team determined that the factors described above that were considered in developing forecasting uncertainties presented in the MPSC Plan and cited in Detroit Edison's

Table 8-1. Modeled Energy Efficiency Program Demand Savings

Year	Demand Savings (MW)
2007	385
2008	513
2009	640
2010	764
2011	886
2012	1069
2013	1250
2014	1429
2015	1609
2016	1787
2017	1902
2018	2016
2019	2130
2020	2243
2021	2356
2022	2468
2023	2579
2024	2690
2025	2801

Source: MPSC Plan Appendix – Volume II (MSPC 2007)

ER were consistent with NRC guidance, were systematically developed, gave adequate consideration to historic trends in energy consumption, and were sufficiently sensitive to an appropriate array of forecasting uncertainties.

8.2.2 Independent Projections on Growth in Demand

A comprehensive transmission planning exercise, MISO Transmission Expansion Plan (MTEP), was completed in November 2008 (MISO 2008). Analyses performed in the context of that study were independent of the MPSC Plan, but nevertheless consistent with the MPSC Plan in their results. MISO assessed power resource adequacy from both resource availability (based on minimum reserve margin requirements of 14.5 percent established by State authorities) and a confidence (or risk) level over the period 2008 through 2017 over various scenarios to determine the onset of reliability problems (a level of risk defined as a Loss of Load Expectation [LOLE] of greater than 1 day in 10 years), assuming a reserve margin of 14.5 percent. Models were run for a Base Case (which assumes as much as 80 percent of capacities represented in

the requested generator interconnection requests will come on-line) and for other factors deemed to have critical impacts on reserve margins. The results as shown in Table 8-2 indicate that without new generating capacity, current resource levels would put the MISO area at risk for a load disruption by 2014, and that under scenarios that approximate reasonably expected changes in the MISO system, exposure to such disruption could begin even sooner. The 2008 MISO planning exercise predicts immediate exposure to loss of load if no power were to be imported, as displayed in Table 8-2.

Table 8-2. MISO Predicted Year of LOLE of Greater Than One Day in 10 Years

Scenario	Onset of LOLE of 1 day in 10 years
Base Case[(a)]	2014
2-year delay for all projects in the queue	2014
Increased retirements of baseload units	2013
Increase in forced outage rates	2011
Elimination of production tax credit for wind energy	2014
No firm imports of power	2009
Reduction in demand-side management	2012

Source: MISO 2008

(a) The MISO Base Case assumes that 80 percent of interconnection requests currently on the queue for which an Interconnection Agreement has been signed will come on-line and that 20 percent of all other projects on the queue will ultimately come on-line.

8.2.3 Power Demand and Energy Requirements

Statewide, the customer base for retail electricity sales in 2008 included 32.4 percent residential, 36.8 percent commercial, and 30.7 percent industrial (DOE/EIA 2010b). The distribution of electricity sales between those three rate categories in the Detroit Edison service area over that same period was 32.6 percent residential, 39.8 percent commercial, and 27.6 percent industrial (DOE/EIA 2010b).

The review team notes that despite incorporation of the downward projections of demand provided by the State's utilities, the MPCS Plan projected a modest growth in electricity demand in Southeast Michigan of 1.2 percent annually over the planning horizon represented in the Plan (2006 to 2025). Table 8-3 shows the MPSC Plan's forecasted growth in peak demand in the Southeast Michigan Planning Area over the period 2005–2025 for each of the planning scenarios addressed in the MPSC Plan: Base Case, High Growth, and Low Growth.

Table 8-3. Forecasted Annual Summer Non-Coincident Peak Electricity Demand (in MW) for the MPSC Southeast Michigan Planning Area

Year	Base Case	High Growth	Low Growth
2005	12,209	12,331	12,087
2006	12,427	12,676	12,178
2007	12,579	12,957	12,202
2008	12,682	13,190	12,175
2009	12,666	13,300	12,033
2010	12,806	13,574	12,038
2011	12,955	13,861	12,048
2012	13,144	14,196	12,092
2013	13,287	14,483	12,091
2014	13,442	14,786	12,098
2015	13,598	14,958	12,238
2016	13,728	15,101	12,355
2017	13,865	15,252	12,479
2018	14,031	15,434	12,628
2019	14,190	15,609	12,771
2020	14,414	15,856	12,973
2021	14,643	16,107	13,178
2022	14,875	16,362	13,387
2023	15,111	16,622	13,600
2024	15,351	16,886	13,816
2025	15,595	17,154	14,035

Source: MPSC Plan, Appendix – Volume II, Workgroup Reports, Tables 10, 11, and 12 (MPSC 2007)

The MPSC Plan projects a statewide growth rate for electricity consumption of 1.3 percent over the period 2006 to 2025, from 112,183 GWh to 143,094 GWh, and a growth rate in electricity consumption in Southeast Michigan of 1.2 percent. The MPSC Plan estimated a statewide summer peak demand of 23,756 MW in 2006 and 29,856 MW in 2025 (Base Case). Of this amount, 12,427 MW and 15,595 MW of peak summer demand were projected for Southeast Michigan in 2006 and 2025, respectively (MPSC 2007, Table 10, Appendix, Volume II, Workgroup Reports). In confirmation of the reliability of the MPSC Plan for this need for power assessment, the review team determined the MSPC Plan's projected growth rates are generally consistent with forecasts independently developed by MISO and incorporated into NERC's LTRA report (NERC 2008).

Table 8-4 displays the MPSC Plan's projected 2025 demand for electricity at summer peak in the Southeast Michigan Planning Area, adjusted to account for energy efficiency measures that

Table 8-4. 2025 Projected Summer Peak Demand in Southeast Michigan Planning Area (in MW)

	Demand Component	2025
A	Peak Summer Demand[(a)]	15,595
B	(Less) Energy Efficiency Measures[(b)]	1400
C	Net Peak Summer Demand (A – B)	14,195
D	Reserve Margin (C × 0.145)	2058
E	Total Peak Summer Demand (C + D)	16,253

(a) Source: MPSC 2007 (Base Case Scenario)
(b) Value calculated as 50 percent of 2025 demand savings (MPSC 2007, Plan Appendix – Volume II).

reduce overall demand and to include the reserve margin additional capacity necessary to maintain grid stability. Based upon the MPSC Plan's Base Case estimate and the assumptions discussed above, the review team identified a net peak summer demand in 2025 of 14,195 MW.

8.2.4 Reassessment of the MPSC Plan Based on Current Data

Because the MPSC 21st Century Electric Energy Plan was completed in 2007, it did not include any potential shifts in the demand for electricity due to the economic downturn that began in late 2008. The impacts of the recession were particularly severe in Michigan, due in large part to downturns in automobile manufacturing and supporting industries. Because the industrial sector represented a significant portion of electricity demand, especially in communities hosting automobile manufacturing and assembly facilities, the projections for growth in electricity demand contained in the MPSC Plan were never realized. Concurrent reductions in populations in those same communities eroded the residential electrical customer sector, further reducing the need for electricity. Consequently, the review team concluded it was prudent to determine, based on currently available electricity demand data, whether or not the projections discussed in the MPSC Plan were still relevant.

The review team's reassessment is based on Reliability*First*'s 2010 Long Term Resource Assessment, hereafter the LTRA (RFC 2010). However, unlike the MPSC Plan, the LTRA does not disaggregate its analysis into a subregion that is analogous to the DTE service area. To determine whether or not the MPSC Plan's projections were still valid, the review team had to make a limiting assumption regarding the relationship between Midwest ISO aggregated projection values and those developed for the MPSC Plan, which is a subregion of Midwest ISO:

- The summertime peak demand for electricity in the Detroit Edison Service Area is a relatively constant proportion of the total summertime peak demand for electricity in the Midwest ISO.

To determine the reasonableness of the assumption, the review team compared the 2010 through 2019 estimated summer peak demand from the MPSC Plan's Southeast Michigan region and those from the LTRA. In all cases, the summer peak demand estimates represented between 7.60 and 7.78 percent of Reliability*First*'s analogous demand, with an average over the 10 years of 7.69 percent. Because the difference between the two estimates in any given year was less than 1 percent, the review team determined it was not unreasonable to assume that the Detroit Edison portion of Reliability*First*'s electricity demand was sufficiently constant for the purposes of this EIS. The review team then compared the change in demand predicted by the MPSC Plan to that from the more contemporary estimates in the LTRA. To do this, the review team extracted the DTE portion of the LTRA's estimated demand between 2010 and 2019 by multiplying each year's peak summer demand value by the average percentage found during the confirmation stage: 7.69 percent.

As can be seen in Figure 8-7, one outstanding characteristic of the comparison needs to be addressed: the relative closeness of the two sets of estimates. At no point does the value from one estimate vary by more than about 200 MW from that of the other, with the final year of the figure carrying the largest variation, when extrapolation is least reliable, and the average difference between the two estimates is slightly more than 100 MW. The review team does not consider the relative closeness of the two trend lines to be evidence that the MPSC Plan is still valid, because the proximity of the two estimates in any given year is an artificial construct of the table created by the review team for comparative purposes only. What is more important is the similarity in the slopes of the two trend lines, which indicates that even if the gap between the two estimates were larger, the overall trend for growth in the MPSC Plan is corroborated by that of the LTRA. Therefore, the review team determined a reasonable interpretation of the data found in Figure 8-7 is that the MPSC Plan was relatively accurate until one of the factors affecting the demand for electricity – the economic downturn – changed the energy industry. However, since the slopes are still similar following that decline, the demand for electricity in the DTE Service Area has continued growing at about the same pace that had been originally projected, but from a slightly lower starting point. This scenario is supported by the PJM Regional Transmission Organization (RTO) analysis and Figure PJM-1 in the LTRA 2010–2019 report, which shows the same sort of pattern elsewhere in the Midwest ISO (RFC 2010).

Based on the confirmatory analysis performed on the Michigan 21st Century Plan using an additional independent assessment (the NERC subregion LTRA), the review team determined the original assessment made by the MPSC Plan is still representative of the potential for future growth in electricity demand in the DTE Service Area. Therefore, the review team determined the original need for power assessment performed for the DEIS is still valid, and no revisions have been made to the analysis or the conclusions of this chapter for purposes of the FEIS.

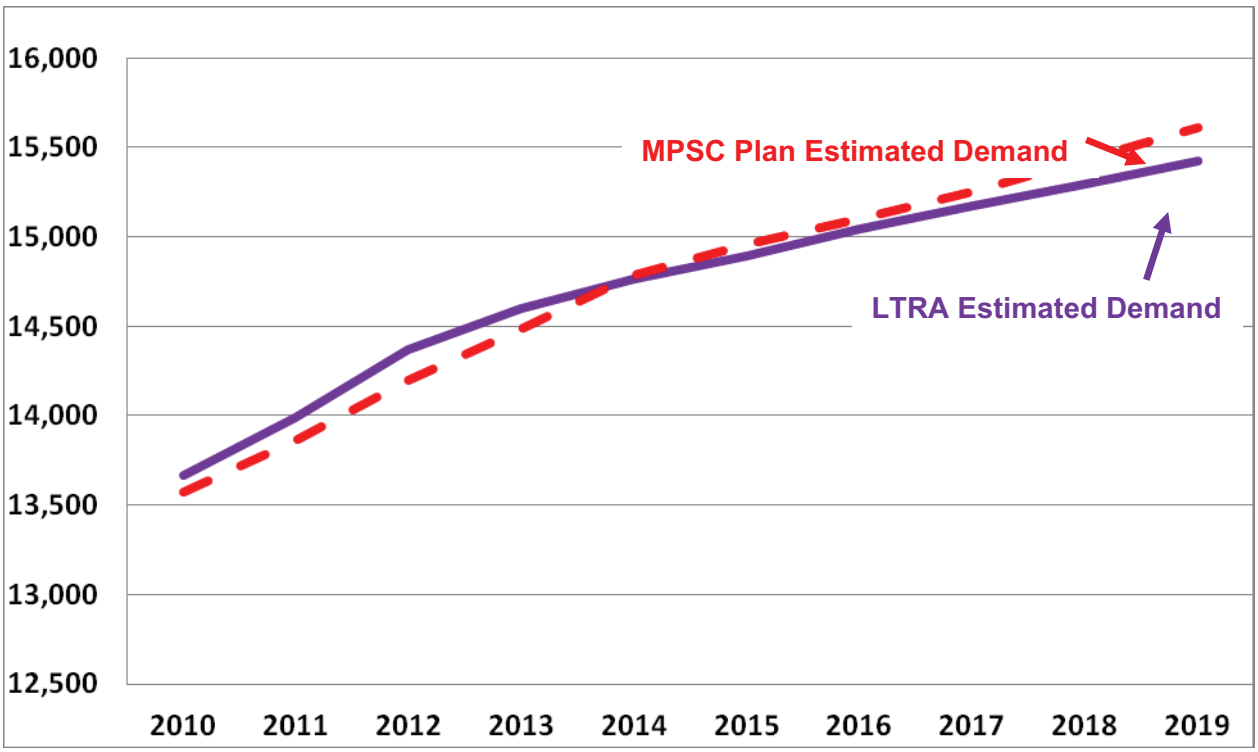

Figure 8-7. Comparison of Summer Peak Electricity Demand Estimates (MW)

8.3 Power Supply

This section assesses the evaluation by Detroit Edison of the adequacy of its existing power generating capability against current and expected future power demands. The fuel mix used in Michigan for electricity generation was outlined in Section 8.1. Within Southeast Michigan, the technology mix used by investor-owned utilities (primarily Detroit Edison) includes steam turbines supported by nuclear, coal, natural gas, and oil combined cycle plants consisting of natural gas-fired combustion turbines and combustion turbines and run-of-the-river and pumped-storage hydroelectric turbines. With a rated capacity of 1111 MW, the Fermi 2 nuclear reactor operated by Detroit Edison is the largest single generator among the 119 central station generating units operating within the region. Table 8-5 displays the electricity generating capacity within the Detroit Edison service area and the rest of the Southeast Michigan Planning Area.

Detroit Edison was the source for some of the data contained in the MPSC Plan regarding an inventory of existing generating capacity within the State (reported separately for each of the three major planning regions established in the MPSC Plan: Southeast Michigan, Balance of Lower Peninsula, and Upper Peninsula). The MPSC Plan lists central station power generating

Table 8-5. Electricity Generation Capacity in Southeast Michigan (2005 Data)

Plant Type	Summer Capacity (MW)	Winter Capacity (MW)	Number of Units
Ownership: Investor Owned Utility			
Nuclear	1110	1125	1
Steam generator	8248	8275	26
Combined cycle/gas turbine	969	1188	31
Internal combustion	152	152	61
Subtotal	10,479	10,740	119
Ownership: Municipality/Cooperative/Public Authority			
Steam generator	470	472	8
Combined cycle/gas turbine	25	30	1
Internal combustion	39	40	36
Subtotal	534	542	45
Ownership: Non-Utility			
Steam generator	326	338	7
Combined cycle/gas turbine	1502	1515	23
Hydroelectric	5	6	5
Internal combustion	76	77	76
Subtotal	1909	1936	111
Southeast Total	12,922	13,218	275

Source: MPSC Plan, Appendix Volume II, Workgroup Reports, Chapter 2, Capacity Need Forum Update Workgroup Resource Assessment, Table 1 (MPSC 2007).

facilities in Southeast Michigan as consisting of: 32 natural gas-fired combustion turbines; 26 oil-fired combustion turbines; 3 run-of-river hydroelectric plants; 34 steam turbines (supported by 8 landfill gas-fired, 21 coal-fired, 5 oil-fired, and 1 refuse-fired boilers); and 1 nuclear plant (MPSC 2007). Although some minor changes may have occurred to the operating conditions or capacities of the listed units since these tabulations were developed, the review team has determined that these data represent a sufficiently reliable inventory of existing power generating capacity as suggested by NRC's ESRP guidance.

As outlined in Section 8.1, Detroit Edison power enters the transmission grid operated by ITC*Transmission*, a member of MISO. Detroit Edison continues to rely on the Generation Interconnection Request Queue maintained by MISO for a reliable and authoritative listing of proposed new generating capacity. As of January 29, 2010, there were 47 active generator interconnection requests in the MISO interconnection queue for new generation sources in

Michigan, representing a potential infusion of 8776 MW of new generating capacity (maximum summer capacity)[a] (including Fermi 3). A facility's presence on the interconnection queue does not guarantee that it will ultimately begin operation.[b] Consequently, only 4180 MW of new capacity has actually become available to date. Future generation capacity must also account for power generated outside of Michigan and imported into the State. Although as much as 3000 MW of on-peak power transfer capability existed in 2009, firm reserves of 800 MW are in place for those likely sources of exported power from locations outside of Michigan. Consequently, reliable power import estimates used in forecasting performed in the MPSC Plan were limited to 2200 MW.

A number of other factors related to wholesale electricity markets contribute to uncertainties with respect to available future retail power in the Detroit Edison service area. Upgrades to the configurations and interconnections of ITC*Transmission* and METC transmission systems as well as various expansion projects under consideration can all dramatically change power import/export characteristics for the Detroit Edison service area. Finally, future estimates of available power must consider announced and expected retirement schedules of baseload units within the Detroit Edison service area. To anticipate retirements, the MPSC Plan assigned expected lifetimes to each type of baseload unit currently in operation: 65 years for coal, 60 years for nuclear, 40 years for combined cycle plants, and 30 years for combustion turbines. The review team concurs in the reasonableness of these lifetime assumptions. Twenty-nine fossil fuel units throughout the State are scheduled for retirement through 2024, representing a total generating capacity of 3755 MW. Table 8-6 displays the MPSC Plan's projected retirements for the State of Michigan from 2013 through 2024.

In the MPSC Plan's Southeast Michigan Planning Area, generating unit retirements are projected to total 2039 MW through 2024 (1877 MW from Detroit Edison, 93 MW from Lansing Board of Water and Light, 47 MW from the City of Detroit, and 22 MW from the City of Wyandotte). All of the units projected to be retired in Table 8-7 are currently supplying power to customers in the same area that would be served by the 1535-MW(e) Fermi 3. Introduction of Fermi 3 into the Detroit Edison power portfolio will potentially offset approximately 75 percent of the generation capacity represented by the projected unit retirements in Southeast Michigan and 82 percent of the generating capacity represented by retiring Detroit Edison-owned units.

(a) Data reported in the ER reflected the generator interconnection queue as of June 11, 2008. At that time, there were 28 active interconnection requests totaling 7015 MW maximum summer capacity. The ER did not distinguish between in-service or proposed generating units on the queue. The current MISO Generation Interconnection Request Queue can be viewed on the MISO Web site http://www.midwestiso.org/page/Generator%20Interconnection.

(b) MISO reports that historically only 20 percent of the projects in the interconnection queue for which a signed Interconnection Agreement has been executed actually go into service (MISO 2008).

Table 8-6. Aggregate Unit Retirements in Michigan

Year	Modeled Capacity Retired (MW)
2013	129
2014	0
2015	301
2016	226
2017	204
2018	439
2019	375
2020	180
2021	402
2022	584
2023	400
2024	515
Total	**3755**

Source: MPSC Plan Appendix – Volume II (MPSC 2007)

Table 8-7. Aggregate Retirements in Southeast Michigan

Plant Name	Owner	Retire Year	Capacity (MW)
TRNTNCHN	Detroit Edison	2015	210
MSTERSKY 5	City of Detroit	2015	39
CNNRSCRK	Detroit Edison	2016	215
STCLAIR 1	Detroit Edison	2018	153
STCLAIR 2	Detroit Edison	2018	162
STCLAIR 3	Detroit Edison	2019	171
STCLAIR 4	Detroit Edison	2019	158
ECKERT 1	Lansing BWL	2019	46
RVRROUGE 1	Detroit Edison	2021	242
RVRROUGE 2	Detroit Edison	2022	247
WYNDTTWY 5	Wyandotte	2022	22
RVRROUGE 3	Detroit Edison	2023	280
ECKERT 2	Lansing BWL	2023	47
MSTERSKY 6	City of Detroit	2023	47
Total			**2039**

Source: MPSC Plan Appendix – Volume II (MPSC 2007)

8.4 Summary of Need for Power

The review team has examined the methodology employed in developing the short- and long-term electric power needs discussed in the MPSC Plan and has verified that it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty (NRC 2000). The evaluation also confirmed that the planning effort represented in the MPSC Plan extended beyond supply-side projections for construction of conventional generation, transmission, and distribution systems to consider a full complement of both supply-side and demand-side projections and extended beyond conventional energy resources to examine the feasibility and potential role of renewable energy resources. The review team also examined the scope of the MPSC Plan and has verified that it met the objectives of ensuring continued electricity reliability, controlling both short- and long-term costs, minimizing environmental impacts, and enhancing overall system security by decreasing reliance on imported energy resources and maximizing the use of locally available energy resources. Next, the review team assessed the MPSC Plan and its supporting data and determined that the MPSC Plan's conclusions were reproducible and gave consideration to the influence of forecasting uncertainties to an appropriate extent. Finally, the review team reconfirmed the relevance of the MPSC Plan following the economic downturn of the economy that the Plan was unable to consider.

In summary, power from Fermi 3 would largely offset the projected loss of 2039 MW of generating capacity in the Southeast Michigan Planning Area due to unit retirements. In addition to planned retirements, the MPSC Plan Base Case Scenario projected a growth in power demand throughout the State. According to data presented in the MPSC Plan, in the Southeast Michigan Planning Area, the 2005 baseload capacity of 12,922 MW would need to increase by 3331 MW to meet the projected 2025 peak demand of 16,253 MW while still preserving adequate spinning reserve and system reliability. Notwithstanding other changes to demand or supply, Fermi 3 would meet 46 percent of that required additional power capacity. Table 8-8 provides a summary of the need for power in Southeast Michigan in 2025.

The review team finds the MPSC Plan conclusion, that the State will continue to experience growth in power demand into the foreseeable future, is not unreasonable. The review team also finds the MPSC Plan conclusion not unreasonable that new baseload capacity will be needed no later than 2015 to preserve adequate reserve margins, and that such needs exist irrespective of reductions in demand resulting from successful implementation of energy conservation programs or changes to power import/export conditions affecting the Detroit Edison service area. The review team concludes, therefore, that by 2024 (3 years after the commencement of commercial operations at Fermi 3), there will be an electricity supply shortage sufficient to accommodate the capacity of Fermi 3, and therefore there is a demonstrated need for power.

Table 8-8. Summary of MPSC Plan 2025 Need for Power in the Southeast Michigan Area (in MW)

	Component	2025
A	Total Peak Summer Demand	16,253
B	Baseline Supply of Electricity (2005 Data)	12,922
C	Loss in Generating Capacity Due to Projected Retirements	(2039)
D	Net Supply of Electricity in 2025 (B + C)	10,883
E	Surplus (Deficit) in 2025 Generating Capacity Needs (D – A)	(5370)
F	Fermi 3 Net Generating Capacity	1535
G	Surplus (Deficit) in 2025 Generating Capacity with Fermi 3 (E + F)	(3835)

Source: MPSC Plan Appendix – Volume II (MPSC 2007)

8.5 References

68 FR 55910. September 29, 2003. "Nuclear Energy Institute: Denial of Petition for Rulemaking." *Federal Register.* U.S. Nuclear Regulatory Commission. Available at http://www.epa.gov/EPA-IMPACT/2003/September/Day-29/i24474.htm. Accessed January 29, 2009.

Detroit Edison Company (Detroit Edison). 2010. *Fermi 3 Combined License Application, Part 1: General and Administrative Information*. Revision 2, Detroit Michigan. March. Accession No. ML101110278.

Detroit Edison Company (Detroit Edison). 2011. *Fermi 3 Combined License Application, Part 3: Environmental Report.* Revision 2, Detroit, Michigan. February. Accession No. ML110600498.

Detroit Edison Company (Detroit Edison). 2012. Letter from Peter W. Smith (Detroit Edison) to NRC dated June 21, 2012, "Subject: Detroit Edison Company Supplemental Response to NRC Request for Additional Information Letter No. 76." Accession No. ML12178A449.

DTE Energy. 2008a. *The DTE Energy Corporate Responsibility Report*. April. Available at http://www.socialfunds.com/shared/reports/1210091398_DTE_Energy_2008_Corporate_Responsibility_Report.pdf. Accession No. ML112660250.

DTE Energy. 2008b. *An Overview of DTE Energy*. Available at http://www.dteenergy.com/dteEnergyCompany/aboutDTEEnergy/overview.html. Accessed March 22, 2010.

Energy Efficiency and Renewable Energy (EERE). 2009. *2008 Renewable Energy Data Book*. U.S. Department of Energy. July. Available at http://www.nrel.gov/docs/fy09osti/45654.pdf. Accessed March 22, 2010. Accession No. ML112650206.

Federal Power Act of 2005. 16 USC 791a, *et seq*.

Granholm, J.M. 2006. "Executive Directive No. 2006-2, 21st Century Energy Plan." April 6. Available at http://www.michigan.gov/gov/0,1607,7-168-36898-140415--,00.html. Accessed January 7, 2009.

International Transmission Company (ITC). 2010a. *ITCTransmission*. Available at http://www.itctransco.com/aboutus/corporatefamily/itctransmission.html. Accessed March 23, 2010.

International Transmission Company (ITC). 2010b. *METC*. Available at http://www.itctransco.com/aboutus/corporatefamily/metc.html. Accessed March 23, 2010.

Michigan Public Service Commission (MPSC). 2007. *Michigan's 21st Century Electric Energy Plan*. Available at http://www.dleg.state.mi.us/mpsc/electric/capacity/energyplan/index.htm. Accessed January 6, 2010.

Michigan Public Service Commission (MPSC). 2008. "Before the Michigan Public Service Commission in Case No. U-15244, Qualifications and Direct Updated Testimony of David B. Harwood, Detroit Edison." Pp. 288–356. Electronic Docket File No. 0166. February 20. Available at http://efile.mpsc.state.mi.us/efile/docs/15244/0166.pdf. Accessed January 28, 2010.

Midwest Independent System Operator (MISO). 2008. *MTEP 08, the Midwest ISO Transmission Expansion Plan*. November. Available at https://www.midwestiso.org/Library/Repository/Study/MTEP/MTEP08/MTEP08%20Report.pdf. Accessed August 3, 2011.

North American Electric Reliability Corporation (NERC). 2008. *2008 Long-Term Reliability Assessment 2008-2017*. October. Available at http://www.nerc.com/files/LTRA2008.pdf. Accessed January 29, 2010. Accession No. ML112650214.

North American Electric Reliability Corporation (NERC). 2011. *Key Players: Regional Entities*. Available at http://www.nerc.com/page.php?cid=1%7C9%7C119. Accessed August 3, 2011. Accession No. ML112650218.

Reliability*First* Corporation (RFC). 2010. *Long Term Resource Assessment 2010-2019.* October. Available at https://rfirst.org/reliability/Pages/default.aspx. Accessed May 1, 2012. Accession No. ML12198A208.

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2010a. *Electric Power Annual, Electric Power Industry 2009: Year in Review*. January 21. Available at http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html. Accessed March 23, 2010. Accession No. ML112650195.

U.S. Department of Energy, Energy Information Administration (DOE/EIA). 2010b. "Michigan Electricity Profile." 2008 Edition DOE/EIA-0348(01)/2. Table 1. 2008 Summary Statistics and Tables 2, 3, 4, and 8. Available at http://www.eia.doe.gov/cneaf/electricity/st_profiles/michigan.html. Accessed March 22, 2010.

U.S. Nuclear Regulatory Commission (NRC). 2000. "Chapter 8: Need for Power" in: *Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan.* NUREG-1555, Washington, D.C. Includes 2007 updates. Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1555/ch8/. Accessed January 26, 2009.

U.S. Nuclear Regulatory Commission (NRC). 2011. Staff Memorandum "Addressing Construction and Preconstruction Activities, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements." Rev. 01. Accession No. ML110380369.

9.0 Environmental Impacts of Alternatives

This chapter describes alternatives to the proposed U.S. Nuclear Regulatory Commission (NRC) action for a combined license (COL) and the U.S. Army Corps of Engineers' (USACE's) action for a Department of Army (DA) permit and discusses the environmental impacts of those alternatives. Section 9.1 discusses the no-action alternative. Section 9.2 addresses alternative energy sources. Section 9.3 reviews Detroit Edison Company's (Detroit Edison's) region of interest (ROI) evaluated in the site selection process, its alternative site selection process, and issues common or generic to all the alternative sites; and summarizes the environmental impacts for the proposed and alternative sites. Section 9.4 examines plant design alternatives. Section 9.5 lists the references cited in this chapter.

The need to compare the proposed action with alternatives arises from the requirement in Section 102(2)(C)(iii) of the National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321), that environmental impact statements (EISs) include an analysis of alternatives to the proposed action. NRC implements this requirement through regulations in Title 10 of the *Code of Federal Regulations* (CFR) Part 51 and its Environmental Standard Review Plan (ESRP) (NRC 2000). The environmental impacts of the alternatives are evaluated using the NRC's three-level standard of significance – SMALL, MODERATE, or LARGE – developed using Council on Environmental Quality (CEQ) guidelines (40 CFR 1508.27) and set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. The issues evaluated in this chapter are the same as those addressed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG-1437, Volumes 1 and 2 (GEIS) (NRC 1996, 1999)[(a)] with the additional issue of environmental justice. Although NUREG-1437 was developed for license renewal, it provides useful information for this review and is referenced throughout this chapter. Additional guidance on conducting environmental reviews is provided in the NRC Staff Memorandum *Addressing Construction and Preconstruction, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements* (NRC 2011a).

As part of the evaluation of a permit application submitted to USACE that is subject to Section 404 of the Clean Water Act (CWA), USACE must define the overall project purpose in addition to the basic project purpose. The overall project purpose establishes the scope of the alternatives analysis and is used for evaluating practicable alternatives under the Environmental Protection Agency's (EPA's) CWA Section 404(b)(1) Guidelines (40 CFR Part 230). In accordance with the Guidelines and USACE Headquarters guidance (HQUSACE 1989), the

(a) NUREG-1437 was originally issued in 1996. Addendum 1 to NUREG-1437 was issued in 1999. Hereafter, all references to the GEIS or NUREG-1437 include NUREG-1437 and its Addendum 1.

overall project purpose must be specific enough to define the applicant's needs, but not so narrow and restrictive that it precludes a proper evaluation of alternatives. USACE is responsible for controlling every aspect of the Guidelines analysis. In this regard, defining the overall project purpose is the sole responsibility of USACE. While generally focusing on the applicant's statement, USACE will, in all cases, exercise independent judgment in defining the purpose and need for the project from both the applicant's and the public's perspective (33 CFR Part 325 Appendix B(9)(c)(4); see also 53 FR 3120).

Section 230.10(a) of the Guidelines requires that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." Section 230.10(a)(2) of the Guidelines states that "an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant that could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered." Thus, this analysis is necessary to determine which alternative is the least environmentally damaging practicable alternative (LEDPA) that meets the project purpose and need. Detroit Edison's proposed Fermi 3 onsite alternative analysis and LEDPA are included in Appendix J.

Where the activity associated with a discharge is proposed for a special aquatic site (as defined in 40 CFR Part 230, Subpart E) and does not require access or proximity to or siting within these types of areas to fulfill its basic project purpose (i.e., the project is not "water dependent"), practicable alternatives that avoid special aquatic sites are presumed to be available, unless clearly demonstrated otherwise (40 CFR 230.10(a)(3)).

The NRC's determination as to whether an alternative site is environmentally preferable to the proposed site for Fermi 3 is independent of the USACE's determination of a LEDPA pursuant to the CWA Section 404(b)(1) Guidelines at 40 CFR Part 230. USACE will conclude its 404(b)(1) evaluation of alternatives in its regulatory permit decision document for Detroit Edison's permit application.

9.1 No-Action Alternative

For purposes of an application for a COL, the no-action alternative refers to a scenario in which the NRC would deny the COL requested by Detroit Edison. The no-action alternative for USACE would be embodied by denial of the request for a DA permit. Upon such a denial by NRC, the construction and operation of a new nuclear unit at the proposed location on the Fermi site in accordance with 10 CFR Part 52 would not occur and the predicted environmental impacts associated with the project would not occur. Preconstruction impacts associated with

activities not within the definition of construction in 10 CFR 50.10(a) and 51.4 may occur. The no-action alternative would result in the proposed facility not being built, and the predicted environmental impacts from the project would not occur. If no other facility would be built or strategy implemented to take its place, the electrical capacity to be provided by the proposed project would not become available. If no additional conservation measures were enacted to decrease the amount of electrical capacity that would otherwise be required for power in the ROI, the need for power discussed in Chapter 8 would not be met. Therefore, the purpose of and need for this project would not be satisfied if the no-action alternative was chosen and the need for power was not met by other means.

If other generating sources were built, either at another site or using a different energy source, the environmental impacts associated with these other sources would eventually occur. As discussed in Chapter 8, Detroit Edison has regulatory responsibilities in Michigan to provide electrical service in its service area. This needed power may be provided and supported through a number of energy alternatives and alternative sites, which are discussed in Sections 9.2 and 9.3, respectively.

9.2 Energy Alternatives

The purpose and need for the proposed project identified in Section 1.3.1 of this EIS is to provide for additional large baseload electricity-generating capacity to address Michigan's expected future peak electric demand. This section examines the potential environmental impacts associated with alternatives to construction of a new baseload nuclear generating facility. Section 9.2.1 discusses energy alternatives not requiring new generating capacity. Section 9.2.2 discusses energy alternatives requiring new generating capacity. Other alternatives are discussed in Section 9.2.3. A combination of alternatives is discussed in Section 9.2.4. Section 9.2.5 compares the environmental impacts from new nuclear, coal-fired, and natural-gas-fired generating units and a combination of energy technologies at the Fermi site. For analysis of energy alternatives, Detroit Edison assumed a bounding target value of 1535 megawatt electrical (MW(e)) (net) output. The review team also used this level of output in its analysis of energy alternatives.

9.2.1 Alternatives Not Requiring New Generating Capacity

Four alternatives to the proposed action that do not require Detroit Edison to construct new generating capacity involve taking some or all of the following actions:

- Purchase the needed electric power from other suppliers
- Reactivate retired power plants
- Extend the operating life of existing power plants

- Implement conservation or demand-side management (DSM) programs.

Power to replace the capacity of a new nuclear unit would have to be purchased from sources within the United States and/or from sources within Canada, and involve a generating technology likely to be one of those previously described by the NRC staff in its GEIS for license renewal (NRC 1996) or those currently in use for electricity production (e.g., coal, natural gas, nuclear, or renewable energy sources). The description of the environmental impacts of other technologies in the GEIS is representative of the impacts associated with the construction and operation of new generating units at the Fermi site. Under the purchased-power alternative, the environmental impacts of power production would still occur but would be located elsewhere within the region or nation or in Canada. The environmental impacts of electricity-generating technologies that are feasible alternatives to nuclear power are discussed in Section 9.2.2. In addition, purchased power is generally economically adverse in that the cost of generated power is typically less than the cost of the same power provided by a third party.

If the purchased-power alternative is implemented, the most significant environmental unknown is whether new transmission line corridors would be required. The construction of new transmission lines could have environmental consequences, particularly if new transmission line corridors were needed. The review team concludes that the local environmental impacts from purchased power would be SMALL when existing transmission line corridors with sufficient uncommitted current carrying capacity are used, and could range from SMALL to LARGE, depending on the nature of the affected environment, if the existing transmission infrastructure needed to be significantly upgraded (i.e., by adding circuits on existing support towers; by upgrading voltage, including when support tower replacements are necessary; or by adding a second transmission line in the existing or expanded right-of-way [ROW]) or if acquisition of a new ROW is required to meet new power transfer levels. The environmental impacts of power generation would depend on the generation technology and location of the generation site and, therefore, are unknown at this time.

Nuclear power facilities are initially licensed by the NRC for a period of 40 years. The operating license can be renewed for up to 20 years, and NRC regulations permit additional license renewals. Detroit Edison currently operates the Fermi 2 nuclear reactor under an NRC operating license. Detroit Edison plans to submit an application to the NRC for license renewal for Fermi 2 (Detroit Edison 2011c). The environmental impacts of continued operation of a nuclear power plant are significantly smaller than those of constructing a new plant. However, continued operation of an existing nuclear plant does not provide additional generating capacity.

Older operating fossil-fueled plants, predominantly coal-fired and natural-gas-fired plants, tend to be old enough that refurbishment to extend plant life and meet current environmental requirements would be costly. The review team concludes that the environmental impacts of a refurbishment scenario would be bounded by the coal- and natural gas-fired alternatives