APPLICATION FOR CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

Fox Energy Center 3

Wisconsin Public Service

Docket No. 6690-CE-202

January 2015

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prepared for

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Green Bay, Wisconsin

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TABLE OF CONTENTS

Page No.

LIST OF APPENDICES

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ANR	ANR Pipeline
ATC	American Transmission Company, LLC
BEMG	Bald Eagle Management Guidelines
BMPs	best management practices
BRRTS	Bureau of Remediation and Redevelopment Tracking System
Btu/kWh	British thermal units per kilowatt-hour
$CaCO_3$	calcium carbonate
CC	combined cycle
CCGT	combined cycle gas turbine
CCS	carbon capture
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	Equivalent carbon dioxide
CONE	cost of new entry
CPP	Clean Power Plan
CPCN	Certificate of Public Convenience and Necessity
CT	combustion turbine
CTG	combustion turbine generator
CTI	Cooling Tower Impact Analysis

Abbreviation	**Term/Phrase/Name**
CWA	Clean Water Act
CWT	cooling water tower
dBA	Decibels A-weighted
DLC	direct load control
Dth/day	decatherms per day
$/kW	dollars per kilowatt
$/MWh	dollars per megawatt-hour
DPP	Definitive Planning Phase
DR	Demand Response
DATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
EGEAS	Electric Generation Expansion Analysis System
ER	endangered resources
^{o}F	degrees Fahrenheit
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
fps	feet per second
FTR	financial transmission rights
GCP	good combustion practices
GW	gigawatt
gpm	gallons per minute
GSU	generation step-up transformer
H_2SO_4	sulfuric acid

Abbreviation	**Term/Phrase/Name**
HAP	hazardous air pollutant
HDPE	high-density polyethylene
Hg	mercury
HHV	higher heating value
HP	high-pressure
HOV	Heart of the Valley Wastewater Treatment Plant
HRSG	heat recovery steam generator
IGG	Integrys Gas Group
IP	intermediate-pressure
IMM	Independent Market Monitor
ISO	International Organization for Standardization
^{o}K	degrees Kelvin
kg/s	kilograms per second
kV	kilovolt
kW	kilowatt
lb/hr	pounds per hour
LP	low-pressure
MBtu/h	Million British thermal units per hours
MG	million gallon
MGD	million gallons per day
mg/cm^2/month	milligrams per square centimeters per month
mg/l	milligrams per liter

Abbreviation	**Term/Phrase/Name**
$\mu g/m^3$	micrograms per cubic meter
MIDAS	Multi-objective Integrated Decision Analysis System
MISO	Midcontinent Independent System Operator
MTEP13	MISO Transmission Expansion Planning 2013
MW	megawatt
MWh	megawatt-hour
N_2O	nitrous acid
NAAQS	National Ambient Air Quality Standards
NERC	National Electric Reliability Council
NHC	Natural Heritage Conservation
NHI	Natural Heritage Inventory
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NR	Natural Resources
NRCS	Natural Resources Conservation Service
O&M	operations and maintenance
PCB	polychlorinated biphenyl
PEM	palustrine emergent
PFO	palustrine forested
PJM	PJM Interconnection
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns

Abbreviation	Term/Phrase/Name
PM_{10}	particulate matter less than 10 microns
PPA	purchase power agreement
ppm	parts per million
PSCW	Public Service Commission of Wisconsin
PSD	Prevention of Significant Deterioration
PTC	production tax credit
PUB	palustrine unconsolidated bottom
PVRR	present value revenue requirements
RFP	request for proposal
RO	reverse osmosis
ROW	right-of-way
rpm	revolutions per minute
RPS	Renewable Portfolio Standard
SACTI	Seasonal and Annual Cooling Water Tower Impact
SCR	selective catalytic reduction
SIP	State Implementation Plan
SPCC	Spill Prevention Control and Countermeasure Plan
SO_2	sulfur dioxide
SSURGO	Soil Survey Geographic Database
STG	steam turbine generator
SWMP	Storm Water Management Plan
TBD	to be determined

Abbreviation	**Term/Phrase/Name**
TPY	tons per year
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compounds
W/m^2K	watts per square meter Kelvin
WDNR	Wisconsin Department of Natural Resources
WHS	Wisconsin Historical Society
Wis. Admin.	Wisconsin Administrative
WisDOT	Wisconsin Department of Transportation
Wis. Stat.	Wisconsin Statutes
WPDES	Wisconsin Pollutant Discharge Elimination System
WPS	Wisconsin Public Service
WRAM	Wetland Rapid Assessment Methodology

1.0 PROJECT PROPOSAL

Wisconsin Public Service (WPS) submits this application to the Public Service Commission of Wisconsin (PSCW) for a Certificate of Public Convenience and Necessity (CPCN) under Wisconsin Statutes (Wis. Stat.) § 196.491(3) and Wisconsin Administrative (Wis. Admin.) Code Chapter PSC 112 to build an electric generating facility having a capacity of approximately 400 megawatts (MW).

The proposed electric generating facility (Fox 3) will consist of a single new nominal 400-MW net natural gas combined cycle plant in a “one-on-one” (1x1) configuration (one combustion turbine generator (CTG) and one steam turbine generator (STG)).

The purpose of Fox 3 is three-fold. Fox 3 will replace older, less efficient coal-fired generating units; satisfy WPS’s forecasted need for capacity and energy to serve native retail and wholesale load, and place WPS and the State of Wisconsin in a superior position to comply with pending and future environmental regulations, such as the United States Environmental Protection Agency’s (USEPA) draft greenhouse gas regulations. WPS is proposing Fox 3 as a rate-based project, and therefore it does not depend on a leased generation structure. No leased generation contract approvals between WPS and a non-utility affiliate under Wis. Stat. § 196.52 are required for this project.

The Fox 3 project will be constructed at the existing Fox Energy Center on WPS-owned land in the Village of Wrightstown, Wisconsin. Two alternative sites being considered, referred to as Site Option 1 and Site Option 2 in this application, are located within the boundary of the existing Fox Energy Center (see location map and plant site aerial photos in Volume I, Appendices A and B, respectively). Site Option 1 is located north and Site Option 2 is located east of the existing Fox Energy Center generating units (Fox 1 and Fox 2).

Fox 1 and Fox 2 consist of two natural gas-fired combustion turbine generators and one steam turbine generator in a “two-on-one” (2x1) configuration with a total name plate capacity of 593 MW. ANR Pipeline Company (ANR) currently provides natural gas to the existing Fox Energy Center.

The estimated cost to construct Fox 3 is nominally $517 million dollars. Construction is expected to begin in March 2016 and the planned in-service date is December 2018.

In accordance with Wis. Stat. § 196.491(3)(a)3.a, WPS submitted an Engineering Plan to the Wisconsin Department of Natural Resources (WDNR) for Fox 3 on November 17, 2014. All permit and approval applications specified by WDNR on December 19, 2014 as required to support the issuance of a CPCN for Fox 3, were submitted by WPS on or before December 29, 2014 and within 10 days of WDNR's notification.

1.1 Project Facilities

The following sections provide information on the project facilities owner, contractual agreements, type of power plant proposed, and connecting facilities.

1.1.1 Owner and Operator of the Proposed Plant

Fox 3 will be 100 percent owned by WPS. WPS will be exclusively responsible for the plant's design, construction, start-up testing, and operations and maintenance. WPS is located at:

700 North Adams Street
P.O. Box 19001
Green Bay, WI 54307-9001

1.1.2 Contractual Agreements

WPS proposes to construct Fox 3 as a rate-base asset. Therefore, no leased generation contracts require PSCW approval in connection with this project.

1.1.3 Type of Power Plant Proposed

The proposed technology for Fox 3 is a 1x1 combined cycle generating unit composed of a single CTG, a single heat recovery steam generator (HRSG) and single STG. The unit will use a high temperature Brayton gas turbine cycle with a multiple pressure Rankine steam cycle in which the waste heat from the gas turbine exhaust is used as the heat input to the steam cycle. The integration of the two thermodynamic cycles increases the overall cycle efficiency above what can be achieved separately with either cycle alone. Further details of the type of power plant proposed and any planned additions, possible expansion, or modifications are provided in Section 3.1.1.

1.1.4 Potential Use for Excess Heat or Steam

WPS continues to explore cogeneration opportunities in its service territory, which includes many customers in papermaking and other industries that use steam in their production processes. WPS is willing to invest in cogeneration that provides (1) reasonably priced generation resources for its native load customers, (2) reasonably priced steam resources for its industrial customers, (3) fuel efficiency benefits for all of its customers through the use of cogeneration technology, and (4) potential uses for renewable fuels including waste products from the papermaking industry.

These opportunities cannot be forecasted unless WPS has a commitment from a company willing to utilize excess heat or steam energy produced by Fox 3. WPS currently has no such commitments that will result in a significant reduction in its forecasted need for 2019.

1.1.5 Proposed Generating Unit

The proposed project includes a nominal 400-MW 1x1 combined cycle unit designated Fox 3. The new combined cycle unit will consist of one F-Class CTG, one triple-pressure HRSG with duct burners, and one reheat STG. The plant will primarily burn natural gas with the capability of running on fuel oil as a backup fuel. The plant will be cooled by a wet cooling tower.

1.1.6 Capacity Factors

The capacity factor of a power plant is the actual output of a plant over a period of time compared to its potential output if it had operated at full nameplate capacity over the same time period. It generally relates to how often a plant is run during a year and is expressed as a ratio or a percentage.

There are a number of factors that will affect the capacity factor of Fox 3. These factors include natural gas and fuel oil pricing, temporary transmission constraints, the efficiency of the facility, maintenance requirements, etc. Based on current projections, Fox 3 is expected to run, on average, at annual capacity factors between 40 and 50 percent with monthly capacity factors reaching 73 percent. This estimate does not include the duct fired capacity. Further details on the estimated capacity factors are provided in Section 3.1.3 Table 3-1.

1.1.7 Temporary and Permanent On-site Storage

The following sections describe the fuel oil unloading and storage area, natural gas pipeline, and water line that will provide temporary or permanent on-site storage.

1.1.7.1 Fuel Supply

The proposed fuel supply is natural gas with fuel oil as a backup fuel. These two fuels are further described below.

1.1.7.1.1 Natural Gas

ANR currently provides service to Fox 1 and 2 through its natural gas transmission pipeline system via the ANR Kaukauna Gate Station. The existing connection to ANR's Kaukauna Gate Station is a 16-inch diameter WPS delivery lateral. The existing WPS delivery lateral to ANR is large enough to provide natural gas service to Fox 3 in addition to Fox 1 and Fox 2.

1.1.7.1.2 Fuel Oil

Fox 3's backup fuel will be ultra-low sulfur fuel oil. Fuel oil is currently stored on site and additional storage and unloading facilities are not required for Fox 3. The existing fuel oil storage is capable of providing approximately 12 hours of base load operation for all three combustion turbines—Fox 1, Fox 2, and Fox 3. Fuel oil is not suitable for duct firing. Should it become necessary, in the future, to increase fuel oil run time, there are several locations on the Fox Energy Center site that could accommodate the construction of a significant increase of on-site fuel oil storage.

1.1.7.2 Water

Water supply to the facility is via an existing water pipeline from the Heart of the Valley Wastewater Treatment Plant (HOV). After pretreatment at the Fox Energy Center the water will be stored in two storage ponds which are hydraulically connected via interconnecting piping and valves. A new 10 million-gallon (MG) storage pond will be constructed as part of the Fox 3 project and will be used in conjunction with the existing 5 MG storage pond.

The primary water use for the Fox Energy Center will include steam cycle makeup, cooling tower makeup, nitrogen oxides (NO_x) injection water, evaporative cooling water makeup and plant drains. The project will include a new water storage tank to store demineralized water for cycle make-up and NO_x injection water when firing fuel oil. The proposed Fox 3 water systems will be designed to maximize water reuse and recycling, minimize water consumption and manage water quality within the plant systems and Fox River discharge.

Process water used by all three units will concentrate impurities due to evaporation and contact with materials and chemicals. To maintain an acceptable water quality in these processes, wastewater (e.g., blowdown) streams from these systems will be removed, appropriately treated, and discharged to the Fox River.

1.1.7.3 Waste Disposal

The new combined cycle facility will be natural gas-fired and will not generate an ash byproduct requiring waste disposal.

Solid waste in the form of sludge will be produced by pre-treatment of process water and post-treatment of wastewater.

The pre-treatment process will be identical to the current process for Fox 1 and 2. The post-treatment process will be new and is needed to reduce the phosphorous in the Fox River Discharge to meet current requirements.

The new post-treatment co-precipitation process will be installed and utilized for treatment of the combined cooling tower blowdown from the three units prior to discharge to the existing Fox River Outfall 001. The process will introduce a coagulant (ferric chloride or ferrous sulfate) and polymers to convert inorganic phosphate into a low solubility precipitate, which will be removed via a new sludge wasting and dewatering process.

The dewatered non-hazardous sludge from the pre-treatment and post-treatment processes will be stored in roll-off dumpsters and removed from the site by truck to be disposed of in a licensed landfill facility.

1.1.8 Electric Transmission Interconnections

WPS submitted a generation interconnection request for Fox 3 to the Midcontinent Independent System Operator, Inc. (MISO) on September 9, 2013, per the requirements of Attachment X to the MISO Tariff. MISO studied the interconnection request in its February 2014 Definitive Planning Phase (DPP) cycle. Those studies demonstrate that the existing transmission system is able to accommodate the interconnection and delivery of power from Fox 3 without the need for major expansion of the transmission system.

MISO's studies indicate the need to uprate the American Transmission Company, LLC, (ATC) existing Fox to North Appleton and Kewaunee to Point Beach 345-kilovolt (kV) transmission lines by resolving clearance deficiencies identified to increase the line ratings. It also includes the existing Fox to North Appleton 345-kV line to be re-routed for re-configuration of the switchyard to accommodate the Generation Owner's new interconnections into the Fox River Switchyard expansion. The estimated cost to uprate both lines is $1.3 million.[1] Additionally, PJM Interconnection (PJM) analyzed the impact of Fox 3 on the PJM transmission system and identified the need to mitigate sag limitations on a section of conductor and upgrade a 345-kV breaker near Commonwealth Edison's Zion substation in northern Illinois. The estimated cost of that project is $3.2 million. Both ATC and PJM estimate that these upgrades can be completed by the Fox 3's expected commercial operation date.

Fox 3 will interconnect to ATC's existing Fox River 345-kV Switchyard, which is a ring-bus configuration with six termination positions that are already occupied by existing facilities. Fox 3 will

[1] This cost does not reflect contingency or escalation.

require expansion of the Fox River Switchyard to accommodate 8 termination positions in a breaker-and-a-half configuration with the ability to expand to 12 positions in the future. The expansion of the Fox River Switchyard will also require the relocation of two spans of an existing 345-kV line that terminates at Fox River. WPS owns the land that is required for both the switchyard expansion and the transmission line relocation. The estimated cost of the Fox River Switchyard expansion and the relocation of the existing 345-kV line is $18.0 million.[2]

The expansion of the Fox River Switchyard to a breaker-and-a-half configuration will have several ancillary benefits beyond interconnection of Fox 3. The breaker-and-a-half configuration will provide operational and planning flexibility with high reliability. For example, service to each line terminating at the switchyard will be unaffected by the removal of any single breaker for maintenance. Additionally, a fault on either of the buses within a breaker-and-a-half scheme will be isolated without interrupting service to the lines connected to the switchyard.

1.1.9 Project Life Span

For purposes of economic evaluation, WPS assumed a recovery of the asset investment over 36 years. The project's physical life span will depend on many future factors, but with prudent operation and maintenance the project may be capable of operation over a longer period.

1.2 Project Costs

The estimated costs to construct Fox 3 are provided in Volume III Appendix C (CONFIDENTIAL) Table C-2 and are based upon the schedule presented in Section 1.6. The estimate was developed in 2014 dollars and a total escalation factor of 7.9 percent was applied to estimate the total project cost.

1.3 Project Sites

The Site Options are further described in the following sections.

1.3.1 Locations and Footprints of Sites

The proposed site of Fox 3 is WPS's existing Fox Energy Center located in the Village of Wrightstown in Outagamie County, Wisconsin. The site is accessible from US 41 via Wrightstown Road/Golf Course Drive and East Frontage Road on the west side of the site.

The existing Fox Energy Center is located on approximately 109 acres. WPS recently purchased (2013) approximately 75 acres north of the existing facility as a buffer zone to surrounding neighbors. The

[2] This cost does not reflect contingency or escalation.

additional 75-acre buffer land is currently undeveloped and primarily used for agriculture. This purchase of buffer land increased the total acreage of the Fox Energy Center to 184 acres. Two site options are located entirely within the Fox Energy Center Property. Site Option 1 is located north of the existing switchyard and predominantly on the additional 75 acres purchased in 2013. Site Option 2 is located east of the existing Fox 1 and 2, towards the east side of the property limits, primarily on the original 109-acre site.

See Volume I Appendix A (Site Location) for map showing the location of Site Options 1 and 2 relative to major geographic features and Volume I Appendix B (Site Arrangements) for maps showing the preliminary site arrangements for each option.

1.3.2 Geology, Topography, Land Cover, and Land Use

The bedrock in the vicinity of the Fox Energy Center is from the Ordovician Period (488 to 443 million years ago) and is comprised of dolomite. For the majority of the Fox Energy Center, the bedrock is located between 50 and 100 feet below the surface; however, according to the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) data, the extreme southeastern corner of the Fox Energy Center only has between 1.5 and 3 feet of cover above the bedrock. See Volume I Appendix C (Geology Map) for a map of the geology of the area.

The soils located within the Fox Energy Center consists of six different soil series: Manawa silty clay loam, Manistee fine sandy loam, Rousseau loamy fine sand, Shawano fine sand, Shiocton silt loam, and Winneconne silty clay loam. The majority of the Fox Energy Center consists of the Shiocton silt loam series.

The topography within the Fox Energy Center is relatively flat with approximately 50 feet of vertical drop over 5,000 feet of horizontal distance from the highest point on the property (westernmost point) to the lowest point on the property (northeastern corner). In general, the land slopes from higher elevations in the southwest to lower elevations in the northeast. The most significant variations in topography within the vicinity of the Fox Energy Center can be found along the banks of the Fox River. Volume I Appendix D contains a U.S. Geological Survey (USGS) topographic map of the Fox Energy Center.

The land use within the Fox Energy Center consists of the existing power generation facility and cropland. Within the surrounding area, the primary land use is cropland with some residential developments and, to a lesser extent, commercial development. There are also areas of industrial land use within the vicinity of the Fox Energy Center as well as forested areas and a golf course. See Volume I

Appendix E for a map showing existing land use (e.g. agriculture, recreation) and land cover (e.g. forest, grasslands).

1.3.3 Special/Unique Natural or Cultural Resources

There are no identified special or unique natural resources located within the vicinity of the Fox Energy Center.

The Rapide Croche Lock and Dam Historic District is located southeast of the Fox Energy Center along the Fox River. This site was listed on the National Register of Historic Places in 1993. No other special or unique cultural resources are located in the vicinity of the Fox Energy Center.

1.3.4 Residential Concentrations

There are residential concentrations located within one-half mile of the Fox Energy Center. These areas include the Royal St. Patrick’s subdivision and the Royal St. Patrick’s condominiums located immediately north of the Fox Energy Center across Wrightstown Road/Golf Course Drive. Both of these residential areas are associated with the Royal St. Patrick’s golf course. Located southwest of the Fox Energy Center is a small residential concentration located along River Bend Drive. Located approximately one-half mile to the northwest is the Della Marcus Estates. Also to the northwest and located along the west side of US 41 is an existing residential development along Cindy Ann Lane.

In addition to these neighborhoods, there are scattered residences throughout the area that are located within one-half mile of the Fox Energy Center. See Volume I Appendix F for a map showing the Fox Energy Center in relation to the nearest residential concentrations.

1.3.5 Existing Area Utilities

Natural gas distribution service is provided to the area by WPS. Service to customers is available along the frontage road west of the Fox Energy Center, along Wrightstown Road/Golf Course Drive to the north, and along State Highway 96, but terminates just east of the Fox Energy Center.

Potable water and sewer service is available in the area north of the Fox Energy Center along Wrightstown Road/Golf Course Drive. WPS has discussed its potable water and sewer service needs with the Village of Wrightstown, which has indicated service is available by extending a tap from the existing line(s) along Wrightstown Road/Golf Course Drive into the Fox Energy Center.

Electric distribution lines, which are owned and operated by Kaukauna Utilities, are located along the frontage road west of the site, along Wrightstown Road/Golf Course Drive north of the Fox Energy Center, and along State Highway 96 to the south.

The underground natural gas transmission pipeline, owned and operated by ANR, passes through the east side of the Fox Energy Center.

Three overhead electric transmission lines interconnect with the current switchyard at the Fox Energy Center. One overhead 345-kV line enters the switchyard from the west and interconnects the switchyard with the North Appleton substation, and a double circuit 345-kV transmission line enters the switchyard from the south and interconnects the switchyard with the Forest Junction substation and the Point Beach substation.

1.3.6 Expected Connecting Utilities

Natural gas service to Fox 3 will be supplied by the existing Fox Energy Center connection to the ANR natural gas transmission pipeline. Fox 3 will connect to the existing ATC electric transmission system at the Fox Energy Center site. Volume I Appendix G contains a map of the planned connecting facilities.

1.3.7 Railroads

Located along the southern property boundary of the Fox Energy Center is the Union Pacific Railroad. There is currently no connection or proposed connection as a result of the Fox 3 project. See Volume I Appendix H for a map showing the Fox Energy Center in relation to the nearest railroad.

1.4 Site Selection Process

The site screening and selection process used to determine the proposed sites are discussed below.

1.4.1 Study Objectives

WPS's planning studies indicate that it will require approximately 400 MW of new generating resources by 2019. Accordingly, WPS conducted a siting study to investigate the feasibility of developing a 400-MW gas turbine generating facility to satisfy these needs.

1.4.2 Selection of Candidate Site Areas

A project study area was defined to include all of the area within MISO local resource (capacity) Zone 2, which generally encompasses the eastern half of Wisconsin.

Preliminary sites were identified by considering the required infrastructure access (transmission lines, natural gas pipelines, and water resources). Through a review of prior siting studies previously undeveloped or greenfield, sites as well as existing generation sites[3] owned by WPS were considered. An initial screening, using readily available maps and aerial photographs, was then completed to eliminate any of these preliminary sites with obvious development constraints or to merge similar sites that were in close proximity to one another.

In total, 18 preliminary sites were reviewed and 7 sites were carried forward for detailed evaluations. The 7 sites were designated as candidate site areas and are listed below in Table 1-1. Their locations are shown on Figure 1–1.

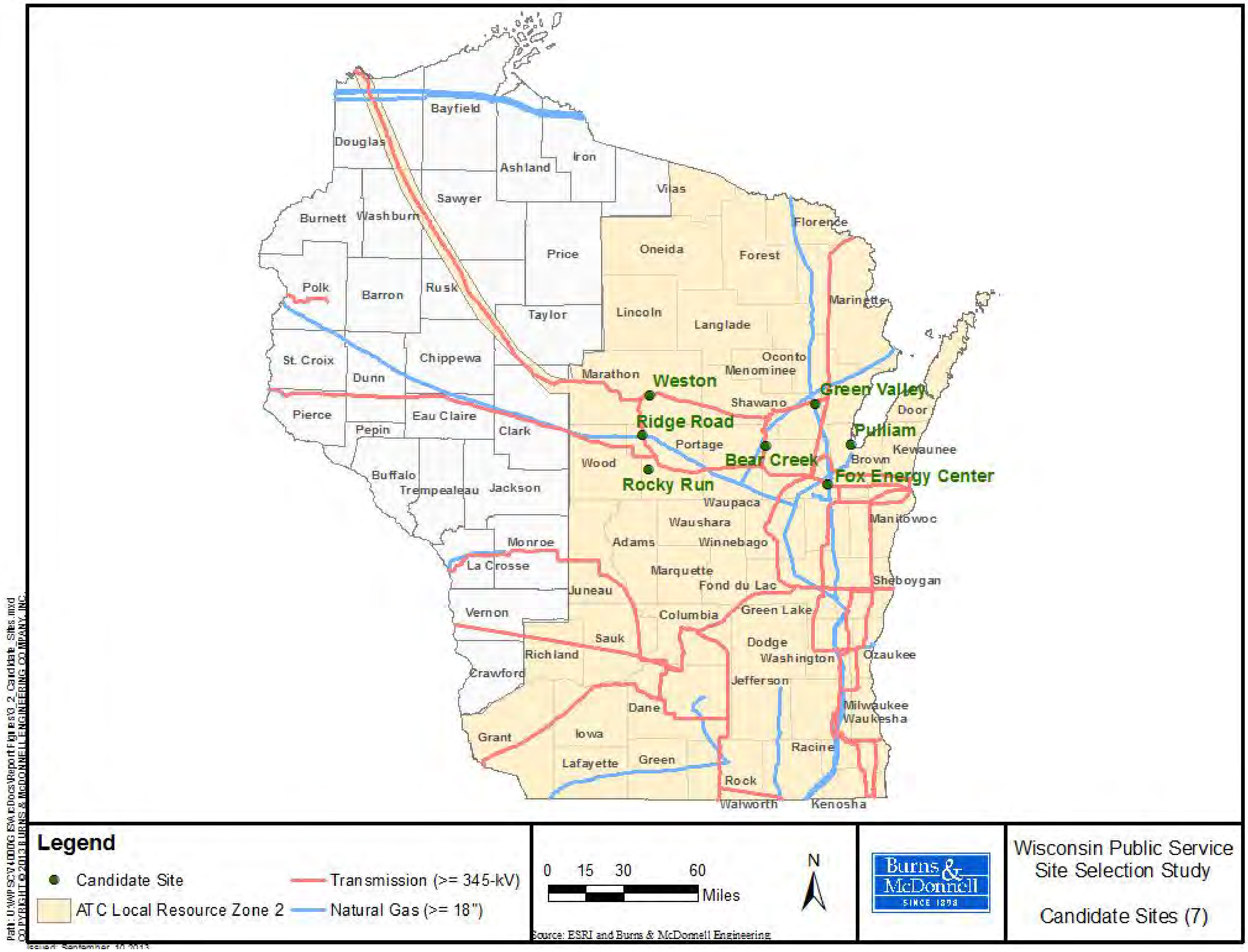
Table 1-1: Candidate Site Areas

Site Name	Type of Site	County Name
Bear Creek	Greenfield	Outagamie
Fox Energy Center	Existing Generation Site	Outagamie
Green Valley	Greenfield	Shawano
Pulliam	Existing Generation Site	Brown
Ridge Road	Greenfield	Portage
Rocky Run	Greenfield	Portage
Weston	Existing Generation Site	Marathon

Source: WPS 2013

[3] An existing generation site is defined as an existing large electric generating facility, per PSC 111.53(2)(b)3 of the Wisconsin Administration Code. Each existing generation site was evaluated based upon the property that was under the ownership of WPS at the time of the siting study and that contained sufficient space to support the new facility. The analysis did not consider any additional property that may be available for purchase to expand the site and provide an alternate site arrangement.

Figure 1–1: Candidate Site Areas



1.4.3 Candidate Site Evaluation

The seven candidate sites were evaluated using a numerical decision analysis process to rank and screen these sites. The first step in using such a process was to identify the objectives or criteria to use in evaluating the sites. These criteria varied in their importance to the decision-making process, so each criterion was assigned a weight. Criteria with the highest weights were considered most significant. These weights were assigned by organizing the evaluation criteria into major categories. These major categories are assigned weights totaling 100 percent. Within each major category, the individual evaluation criteria were assigned sub-weights. The weights were combined to yield a composite weight for each criterion.

The evaluation categories, category weights, criteria, criteria sub-weights, and composite weights are summarized in Table 1-2.

Table 1-2: Candidate Site Evaluation Criteria

Major Category	Category Weight	Criterion	Scoring	Criterion Weight	Equivalent Points (100 Pt Scale)
Electric Transmission	25%	*Transmission Ranking from Load Flow Analysis*		50%	12.5
		Top 20th percentile	50		
		21st to 40th percentile	40		
		41st to 60th percentile	30		
		61st to 80th percentile	20		
		Bottom 20th percentile	10		
		Interconnection Cost		50%	12.5
		138-kV substation	50		
		230-kV substation	40		
		345-kV substation	30		
		230-kV line tap	20		
		345-kV line tap	10		
Fuel Supply & Delivery	25%	*Distance*		30%	7.5
		Less than 2 miles to site	50		
		2-5 miles to site	30		
		Greater than 5 miles to site	10		
		Capacity and Pressure		30%	7.5
		Capacity available to meet 100% of requirements	50		
		At least 75% available and expansion required	40		
		At least 50% available and expansion required	30		

Major Category	Category Weight	Criterion	Scoring	Criterion Weight	Equivalent Points (100 Pt Scale)
		At least 25% available and expansion required	20		
		No capacity available and expansion required	10		
		Competitive Supply		20%	5.0
		2 or more fuel suppliers within 4 miles of site	50		
		Only 1 fuel supplier within 4 miles of site	10		
		Balancing		20%	5.0
		Monthly balanced	50		
		Daily balanced	10		
Water Supply & Delivery	20%	*Surface Water Availability*		40%	8.0
		Surface water availability within 5 miles	50		
		Surface water availability between 5 and 10 miles	40		
		Surface water availability between 10 and 15 miles	30		
		Surface water availability between 15 and 25 miles	20		
		Surface water availability greater than 25 miles	10		
		Groundwater Availability		30%	6.0
		High probability of water availability	50		
		Moderate probability of water availability	30		
		Low probability of water availability	10		
		Municipal Reclaim Water Availability		30%	6.0
		Large WWTP[1] within 15 miles	50		
		No large WWTP within 15 miles	10		
Site Environmental	10%	*Wetlands*		30%	3.0
		High probability of avoiding wetlands	50		
		Moderate probability of avoiding wetlands	30		
		Low probability of avoiding wetlands	10		
		Floodplain		30%	3.0
		Site outside of floodplain	50		
		Part of site within floodplain, potential developable area	30		
		Extensive floodplain, limited developable area	10		
		Cultural Resources		20%	2.0
		Limited potential for cultural resources to be present	50		
		Moderate potential for cultural resources to be present	30		
		Significant potential for cultural resources to be present	10		
		Threatened and Endangered Species		20%	2.0
		3 or fewer threatened or endangered species within County	50		

Major Category	Category Weight	Criterion	Scoring	Criterion Weight	Equivalent Points (100 Pt Scale)
		4 to 7 threatened or endangered species within county	30		
		8 or more threatened or endangered species within county	10		
Air Quality Impacts	10%	*Class I areas*		30%	3.0
		Greater than 75 kilometers from Class I Area	50		
		50 to 75 kilometers from Class I Area	30		
		Class I Area within 50 kilometers	10		
		Air Permit Feasibility		40%	4.0
		Low relative probability of having NAAQS[2] exceedances	50		
		Moderate relative probability of having NAAQS exceedances	30		
		High relative probability of having NAAQS exceedances	10		
		Nonattainment Status		30%	3.0
		Site is not in a nonattainment county	50		
		Site is in an area with high probability of going to attainment	30		
		Site is in a nonattainment county	10		
Site Development	10%	*Existing Use*		25%	2.5
		Existing generation site/brownfield site	50		
		Agricultural site area	30		
		Forested/natural/undisturbed site area	10		
		Site Access		15%	1.5
		Less than 0.5 mile to paved road	50		
		0.5 to 1.5 miles to paved road	30		
		Limited site access or greater than 1.5 miles to paved road	10		
		Equipment Delivery		10%	1.0
		Class I rail line within 1 mile of site	50		
		Class I rail line within 1 to 5 miles of site	30		
		Class I rail line greater than 5 miles from site	10		
		Site Preparation Work		15%	1.5
		Minimal site prep work expected	50		
		Moderate site prep work expected	30		
		Significant site prep work expected	10		
		Noise/Visual Receptors		25%	2.5
		Fewer than 10 receptors within 0.5 mile of site	50		
		11 to 25 receptors within 0.5 mile of site	30		

Major Category	Category Weight	Criterion	Scoring	Criterion Weight	Equivalent Points (100 Pt Scale)
		Greater than 25 receptors within 0.5 mile of site	10		
		Proximity to Federal Aviation Administration (FAA) Facilities		10%	1.0
		No FAA facilities within 5 miles of site	50		
		FAA facilities within 1 to 5 miles of site	30		
		FAA facilities within 1 mile of site	10		

[1] WWTP – wastewater treatment plant
[2] NAAQS – National Ambient Air Quality Standards
Source: WPS 2013

The individual scores for each site were used along with the corresponding weights to calculate a weighted composite score for each site. Composite scores were developed for a base case and for several sensitivity analyses.

For the base case, the weighted composite scores for each site are calculated using the base weights for each major evaluation category. In the collective judgment of the project team, these base category weights represented an appropriate balance between all factors.

1.4.4 Brownfield Sites

Wis. Stat. § 196.491(3)(d)8 requires brownfields as defined in s. 238.13(1)(a) to be used to the extent practicable for large electric generating facilities. Wis. Stat. § 238.13(1)(a) defines a brownfield as "abandoned, idle, or underused industrial or commercial facilities or sites," the "expansion or redevelopment of which is adversely affected by actual or perceived environmental contamination."

The primary driving factors in WPS's siting study were (1) access to required infrastructure (transmission lines, natural gas pipelines, and water resources), (2) sites previously undeveloped for electric generation (greenfield and brownfield), and (3) existing generation sites owned by WPS.

Under the "Site Development" major category (weighted at 10 percent), an individual evaluation criterion of "Existing Use" with a sub-weight of 25 percent was assigned. The "Existing Use" evaluation criterion was given a score of 50 points for "Existing Generation Site / Brownfield Site," a score of 30 points for "Agricultural Site Area," or a score of 10 points for "Forested/Natural/Undisturbed Site Area."

Of the seven candidate sites, comparative analyses led to the recommendation for WPS to carry forward two existing generation sites, one of which is a brownfield site (because of the proposed location on the Pulliam Ash Landfill Site) and existing generation site (Pulliam), and one that is an existing generation site (Fox Energy Center).

1.4.5 Candidate Site Evaluation Summary

The individual criterion scores and composite weights for the base case are summarized in Table 1-3. Table 1-3 and Figure 1–2 shows that the base composite evaluation scores range from a low of 30.50 for the Rocky Run site to a high of 41.50 for the Fox Energy Center site. The average (mean) and median scores are 33.51 and 31.80, respectively. These composite evaluation scores were not to be used as an absolute measure of each site's suitability for the proposed generating station, but rather as an effective screening tool.

The sensitivity of the evaluation scores to varying weights was also tested. For these sensitivity analyses, only the weights assigned to the six major evaluation categories were adjusted. The sub-weights for the criteria within their respective categories and the individual scores assigned to the sites for each criterion were not changed. Six different sensitivity cases were executed: one each for transmission, fuel, water, environmental, air quality and site development, respectively. The weight for the category that was emphasized was increased 10 percent, and then the other five categories were all assigned the same weighted percentages, equal to 2 percent less than the original value for the category being emphasized. The composite weights for each category and weighted composite scores for each site were then recalculated.

The results of the sensitivity analyses are summarized by comparing each site's ranking under the various cases. These ranks are summarized in Table 1-4.

Review of Table 1-4 shows that under most scenarios, the site rankings remained robust even when the weighting factors were adjusted. The top-ranked sites remained at or near the top under most scenarios. Likewise, the lowest-ranked sites did not significantly improve when the weighting factors were varied. However, the Weston site fell to the sixth ranked site under the fuel weighted and air quality weighted scenarios.

Table 1-3: Candidate Site Area Evaluation Summary

Major Category/Criterion	Category/Criterion Weight	Bear Creek	Fox Energy Center	Green Valley	Pulliam	Ridge Road	Rocky Run	Weston
Electric Transmission	**25%**							
Transmission Ranking from Load Flow Analysis	50%	50	50	50	50	50	50	50
Interconnection Cost	50%	10	30	10	50	10	10	30
Fuel Supply & Delivery	**25%**							
Distance	30%	50	50	50	10	50	10	10
Capacity and Pressure	30%	10	50	10	10	10	10	10
Competitive Supply	20%	10	50	10	10	10	10	10
Balancing	20%	10	10	10	10	10	10	10
Water Supply & Delivery	**20%**							
Surface Water Availability	40%	40	50	20	50	50	50	50
Groundwater Availability	30%	20	30	40	50	20	50	50
Municipal Reclaim Water Availability	30%	10	50	10	50	10	10	10
Site Environmental	**10%**							
Wetlands	30%	50	50	50	50	50	50	50
Floodplains	30%	50	50	50	30	50	50	50
Cultural Resources	20%	50	50	50	50	50	50	50
Threatened and Endangered Species	20%	50	50	50	10	50	50	50
Air Quality Impacts	**10%**							
Class I Areas	30%	50	50	50	50	50	50	50
Air Permit Feasibility	40%	50	10	50	10	30	10	10
Nonattainment Status	30%	50	50	50	30	50	50	50
Site Development	**10%**							
Existing Use	25%	30	50	30	50	30	30	50
Site Access	15%	50	50	50	50	50	50	50
Equipment Delivery	10%	10	50	10	50	30	50	50
Site Preparation Work	15%	50	50	50	30	50	50	50
Noise/Visual Receptors	25%	30	10	30	50	30	50	10
Proximity to FAA	10%	30	30	50	30	50	50	30
Total Composite Score	**100%**	**31.4**	**41.5**	**31.2**	**35.9**	**31.8**	**30.5**	**32.3**

Source: Gas Turbine Siting Study for Wisconsin Public Service, Burns and McDonnell, September 2013.

Figure 1–2: Candidate Site Evaluation Scores for Base Case

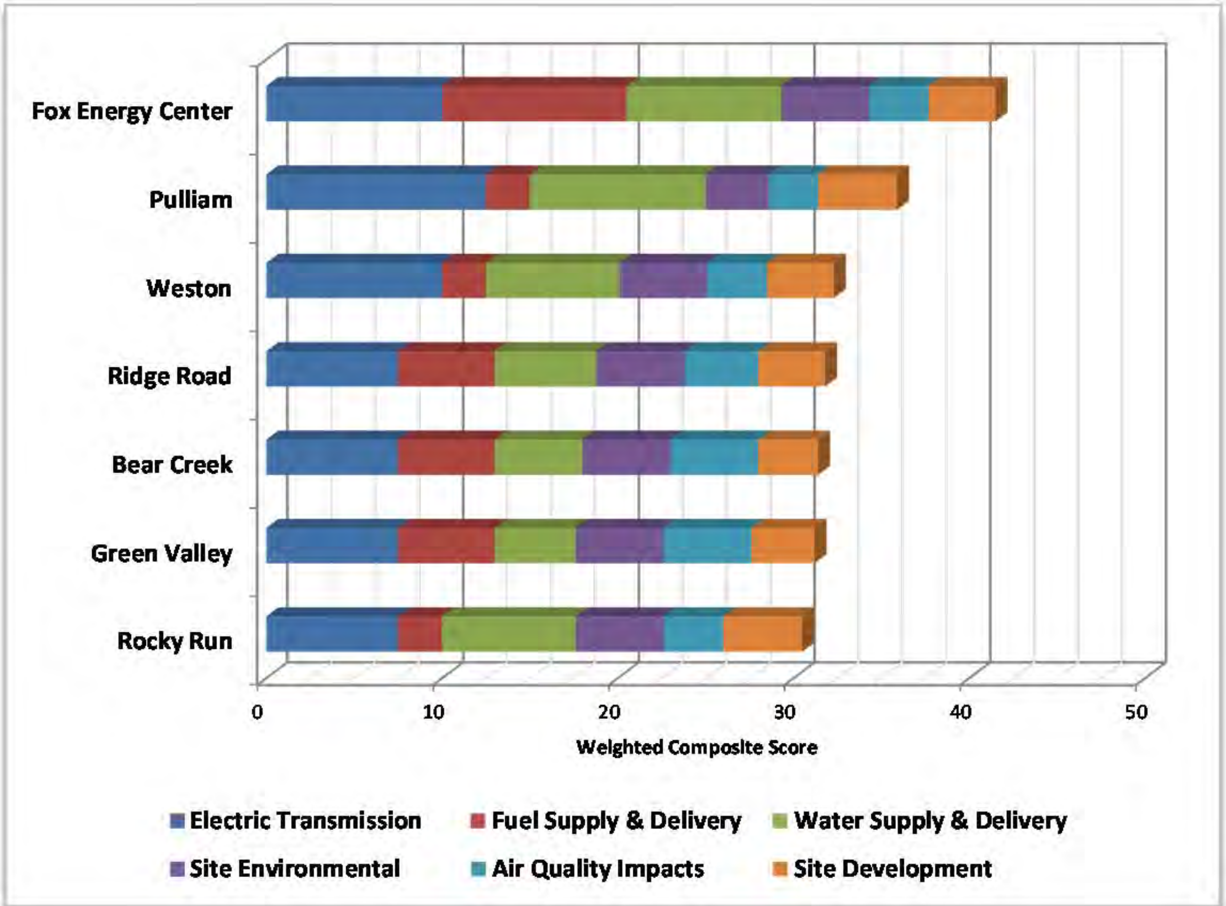


Table 1-4: Candidate Site Rankings for Sensitivity Analyses

Site Name	Weighted Rank						
	Base	Transmission	Fuel	Water	Environmental	Air Quality	Site Dev
Fox Energy Center	1	1	1	1	1	1	1
Pulliam	2	2	2	2	2	2	2
Weston	3	3	6	3	3	6	3
Ridge Road	4	4	3	4	4	5	4
Bear Creek	5	5	4	6	5	3	7
Green Valley	6	6	5	7	6	4	6
Rocky Run	7	7	7	5	7	7	5

(red) = Denotes rank moved out of the top 3 positions

(green) = Denotes rank moved in of the top 3 positions

Source: Gas Turbine Siting Study for Wisconsin Public Service, Burns and McDonnell, September 2013.

1.4.6 Selection of Preferred Site Areas

Following the candidate site evaluation and field reconnaissance of the seven preferred site areas, the project team evaluated the relative strengths and weaknesses of each site. Of the seven candidate sites, comparative analyses led to the recommendation for WPS to carry forward two existing generation sites (of which one is also a brownfield site) and one greenfield site. However, no fatal flaws were identified at any of the candidate sites.

The three sites recommended for advanced development activities were:

- Fox Energy Center
- Pulliam
- Ridge Road

A summary of the major features of the preferred sites is included in Table 1-5.

Table 1-5: Summary of Preferred Site Areas

	Name	Fox Energy Center	Pulliam	Ridge Road
Site	County	Outagamie	Brown	Portage
Fuel	Primary Fuel Supplier	Guardian[4]	ANR	ANR
	Primary Pipeline (miles)	3.9	9.8	0.1
	Capacity/Pressure Avail.	Yes	No	No
Transmission	Interconnection (miles)	At Site	At Site	At Site
	Interconnection Point	Fox Energy Center Switchyard	New Substation	New Substation
	Capacity Available	Yes	Yes	Yes
Development	Land Use	Existing Generation Site Agricultural	Existing Generation Site	Agricultural, Undisturbed
	Distance to Rail (miles)	At Existing Site	At Existing Site	1.5
Water	Water Supply Options	HOV, Fox River	Green Bay, Fox River	Wisconsin River
	Groundwater Probability	Moderate	High	Low to Moderate

Source: WPS 2013

[4] The Fox Energy Center is currently supplied with fuel from ANR. However, it was assumed in the investigation at the time of the study, ANR could not meet the gas supply needs for Fox 3 without incurring significant upgrades. At the time of the study, Guardian indicated they could meet gas supply needs without upgrades.

1.4.7 Siting Study Conclusions

The following sections provide the Siting Study conclusions. A copy of the Siting Study is provided in Volume II Appendix A.

1.4.7.1 General

The following sites were recommended as the preferred sites to proceed with advanced development activities (listed in alphabetical order):

- Fox Energy Center (existing generation site)
- Pulliam (existing generation site and brownfield site)
- Ridge Road (greenfield site)

The Fox Energy Center was the only site with a nearby fuel supply option that has capacity to support the project without requiring significant transmission system upgrades.

Compatible Existing Generation Sites may allow the existing facilities to share staff with the project, thereby reducing on-going operations and maintenance (O&M) costs. The Fox Energy Center has relative advantages as the existing units at the Fox Energy Center are combined cycle gas turbine (CCGT) units.

The Pulliam site is not compatible with a new CCGT unit for sharing staff as it has a coal-fired units and a small simple cycle gas turbine unit.

The Pulliam Site is located on the ash landfill site and would incur additional remediation costs.

Unlike the greenfield site, the Fox Energy Center and Pulliam sites have existing water supply infrastructure in place.[5]

1.4.7.2 Environmental

The following is a summary of conclusions reached as part of the environmental portion of the siting study:

- All of the candidate and preferred site areas are located in counties that are in attainment with National Ambient Air Quality Standards (NAAQS) for all criteria pollutants.
- Although there are reported occurrences of state or federal threatened and endangered species in the vicinity of many of the candidate site areas, actual impacts to any of these species from plant

[5] Based upon a cursory review at the time of the siting study, water supply infrastructure upgrades were likely to be required at both locations.

development at the candidate and preferred sites are unlikely given the type of habitat available at these sites.

- A wetland delineation will be conducted to verify the presence of any possible jurisdictional wetlands.
- Cultural resources have been evaluated in accordance with Wis. Stat. § 44.40. The potential for adverse impacts to cultural resources at each of the candidate and preferred site areas is considered low.
- Dependent on site arrangement and land availability, it is believed that all of the candidate and preferred sites will allow for plant development outside of a flood zone.

1.4.7.3 Electric Transmission

All of the candidate and preferred site areas are located in relatively close proximity to existing high-voltage transmission facilities that, according to the preliminary load flow analysis, should not require significant upgrades to support the project.

1.4.7.4 Fuel Delivery

The following is a summary of conclusions reached as part of the fuel delivery portion of the siting study:

- Each of the candidate and preferred site areas is located near an existing large diameter natural gas pipeline.
- The Fox Energy Center is the only site with nearby access to a competitive source (the Guardian pipeline).

1.4.7.5 Water Supply

The following is a summary of conclusions reached as part of the water supply portion of the siting study:

- Within the project study areas, potential water sources for a combustion turbine facility could include surface water (lakes and rivers), groundwater, or municipal reclaim water.
- The existing water supply pipeline from HOV to the Fox Energy Center will likely require upgrades to support the project at this site.[6]
- The existing water supply infrastructure at Pulliam will likely require upgrades to support the Project at the Pulliam site.

[6] At the time of the siting study, prior to conceptual design, the amount of water required was not fully known. As a result, the siting study investigation determined the water supply system would need to be upgraded. After completing conceptual design for the Fox Energy Center site, it was determined the cooling water supply system will only require the addition of on-site storage.

1.4.7.6 Final Site Selection

Based upon the results in the siting study and the preference for the two existing generation sites (Fox Energy Center and Pulliam) under PSC 111, WPS decided to move forward with conceptual design and the pursuit of permitting on an existing generation site instead of a greenfield site (Ridge Road).

The siting study results ranked the Fox Energy Center site as the most feasible site. The facility has the ability to save operation costs by using some existing staff for the new facility.

All of the preferred and candidate site areas are located in relative close proximity to existing high-voltage transmission facilities that, according to the preliminary load flow analysis, should not require significant upgrades to support the Project.

The Fox Energy Center site has three 345-kV transmission lines interconnecting with the site.

The Fox Energy Center site is expected to benefit from the close proximity to natural gas from two potential sources nearby (both the ANR and Guardian sources).

The Fox Energy Center site is currently connected via underground pipeline to HOV, and the current facility receives gray water for the cooling system.

For the reasons stated above, the Fox Energy site provides benefits well above and beyond any other site identified in the siting study.

1.4.8 Alternative Sites

Under Wis. Stat § 196.491(3)(a)(2m),

> *"If an application for a large electric generating facility is complete in all other respects, the commission shall determine that the application is complete under subd. 2. even if one or more of the following apply:*
>
> *b. The applicant proposes alternative construction sites for the facility that are contiguous or proximate, provided that at least one of the proposed sites is a brownfield, as defined in s. 238.13 (1) (a),* ***<u>or the site of a former or existing large electric generating facility.</u>****"* (emphasis added).

Since the Fox Energy Center site provides benefits well above and beyond any other site identified during the siting study, and Wis. Stat § 196.491(3)(a)(2m)b allows *"alternative construction sites that are* *contiguous or proximate,*" WPS is proposing two alternative site arrangements for the proposed project instead of two separate alterative locations.

Using a physical space evaluation, four potential site options were identified on the Fox Energy Center site.

WPS selected Site Option 1 and Site Option 2 as illustrated in Volume I Appendix B and described in Section 1.3.1 as two alternative site options for the proposed project. This selection was based upon a number of perceived environmental factors (environmental factors identified without detailed studies such as sound level assessment, cooling tower plume studies, and air emission modeling). Site Option 1 is located in the northern portion of the WPS property, and Site Option 2 is located in the southeast area of the property.

Site Option 3 is located in the west-central portion of the property and is directly north of the existing facility's cooling tower (Volume I Appendix I, Figure I-1). WPS did not consider it a viable site option because of its perceived conflicts with social factors (noise, plume impacts, etc.) due to the close proximity of the cooling tower to several residences and US 41. There are also other physical concerns that would need to be overcome such as the need to complete a major change in the topography to create a flat arrangement for the site construction.

Site Option 4 is located east of Site Option 1 and is parallel to Site Option 1 (Volume I Appendix I, Figure I-2). WPS did not consider Site Option 4 a viable site option because it would unnecessarily move the site of the facility closer to an adjacent property line and there could be perceived conflicts with social factors (noise, plume impacts, etc.) due to the close proximity of the cooling tower to one residence.

Refer to Section 3.1.2 for more information on Site Option 1 and Site Option 2.

After a review of all of the factors analyzed by WPS in this application, WPS selected Site Option 2 as the preferred site option.

1.5 Permits and Approvals

The following sections discuss the permits and approvals needed for Fox 3 at the federal, state, and local levels.

1.5.1 Potential Permits and Approvals

Table 1-6, Table 1-7, and Table 1-8 provide a list of the required approvals from federal, state, and local regulatory bodies, respectively. Included in the tables is the status of each application, filing date, agency name, points of contacts, and telephone numbers for the agencies.

1.5.2 Correspondence

Volume II Appendix B provides copies of official correspondence between WPS and state, federal, and local government agencies.

1.5.3 Federal and State Permits

Table 1-6 lists the federally required permits and approvals, and Table 1-7 lists the state required permits and approvals for Fox 3.

Table 1-6: Federally Required Permits and Approvals

Agency	Planned Activity	Type of Approval	Status	Contact (Name & Phone No.)
FAA[2]	Construction or alteration of structures more than 200 feet above ground level.	7460 Notice of Proposed Construction or Alteration (14 Code of Federal Regulations (CFR) S77.13)	Filed on 12/5/2014	Ms. Vivian Vilaro (847) 294-7575
USFWS[3]	Various land disturbance construction activities	Endangered Species Act and National Bald Eagle Management Guidelines	Guidelines to be followed	Mr. James Nuthals (920) 433-1460
USACE[4]	Discharge of dredged or fill material into waters of the U.S.	Clean Water Act (CWA) - Section 404 Permit	Filed on 12/29/2014	Mr. Nick Domer (920) 448-2824
USEPA[5]	Storage of petroleum products	Spill Prevention, Control and Countermeasures (SPCC) Plan and Facility Response Plan (40 CFR 112)	To be updated and kept on site.	Ms. Shirley Scharff (920) 433-1396
PSCW[5]	Evaluation of potential impacts to properties listed or eligible for listing on National Register	Section 106 National Historic Preservation Act	Filed with CPCN Application	Mr. Ken Rineer (608) 267-1201

[1]USDOT – U.S. Department of Transportation
[2]FAA – Federal Aviation Administration
[3]USFWS – U.S. Fish and Wildlife Service
[4]USACE – U.S. Army Corps of Engineers
[5]PSCW – Public Service Commission of Wisconsin

Table 1-7: State-Required Permits and Approvals

Agency	Planned Activity	Type of Approval	Status	Contact (Name & Phone No.)
PSCW	Construction of large electric generating facility	CPCN (Wis. Stat. §196.491(3))	Filed on January 23, 2015	Ms. Sandra Paske (608)266-1265
WDNR	Construction and operation of new source of air emissions	Construction and operating permits (Wis. Admin. Code Chs. Natural Resources (NR) 405 through 408 and 40 CFR Part 52.21) and acid rain permit (Wis. Admin. Code Ch. NR 409 and 40 CFR Part 75)	Filed on 12/22/2014	Mr. Steven Dunn (608) 267-0566
	Required for issuance of USACE Section 404/10 permits unless waived by WDNR	Section 401 Water Quality Certification (Form 3500-53N)	Filed on 12/29/2014	Mr. Ben Callan (608) 266-3524
	Removal of material from beds of navigable water; enlargement and protection of waterways; placement of structure within a waterway; withdrawal of water from a waterway; placing bridges over navigable waterway.	Chapter 30 (Navigable Waters, Harbors and Navigation) Permit: 30.20; 30.19; 30.12; 30.18; and 30.123 and Wis. Admin. Code NR 320	Filed on 12/29/2014	Mr. Ben Callan (608) 266-3524
	Discharge of wastewater for industrial activity	Modification/update of existing WPDES[1] permit number WI-0002381-05-0	Filed on 12/22/2014	Mr. Jeff Brauer (608) 267-7634
	Erosion control plan for land disturbance during construction	Storm water discharge permit (Wis. Admin. Code Ch. NR 216) (Notice of Intent) – Erosion Control Plan and Storm Water Management Plan	Filed on 12/29/2014	Ms. Christine Gonzalez (608) 267-2759
	Hydrostatic test water or water supply system water	WPDES permit (Wis. Stat. Ch. 283)	Filed on 12/22/2014	Mr. Jeff Brauer (608) 267-7634
	Modification of the water treatment facility	"Notice of Planned Change" for industrial wastewater treatment facilities (Wis. Admin. Code Ch. NR 108)	Filed on 12/22/2014	Mr. Jeff Brauer (608) 267-7634
	Water Use	Water Loss Approval Amendment (Wis.	Filed on	Ms. Nicole Clayton

Agency	Planned Activity	Type of Approval	Status	Contact (Name & Phone No.)
		Stat. §281.35)	12/22/2014	(608) 266-9254
	Invasive Species management for land disturbance during construction	Chapter NR 40 Invasive Species Identification, Classification and Control (Ch. NR 40, Wis. Adm. Code)	Guidelines to be followed	Mr. James Nuthals (920) 433-1460
	Storm water construction	Storm Water Construction Notice of Intent	Filed on 12/29/2014	Ms. Christine Gonzalez (608) 267-2759
	Various land disturbance construction activities	Bureau of Natural Heritage Conservation	Filed with CPCN Application	Ms. Stacy Rowe (608) 266-7012
Wisconsin Department of Safety And Professional Services	Construction of all buildings and structures	Approval of plans and specifications (Wis. Stat. § 101.02)	To be filed	TBD
	Installation of fuel or lubricating oil storage tanks	Approval of plans and specifications (Wis. Stat. § 101.09)	To be filed	Bureau of Weights and Measure
	Installation of dust filtering and HVAC equipment	Approval of plans and specifications (Wis. Stat. § 101.12)	To be filed	TBD
WisDOT[2]	Construction of tall structures affecting Wisconsin airspace	Approval of plans and specifications (Wis. Stat. § 114.135, Wis. Admin. Code Ch. Trans 56)	Filed on 12/18/2014	Mr. Justin Hetland (608) 267-5018
	Delivery of large/heavy components	Over Heavy Vehicles Permit	To be filed	TBD
Wisconsin Historical Society	Approval of archaeological surveys	(Wis. Stat. § 44.40) and Section 106 Cultural Resources Clearance	Filed with CPCN Application	Mr. Ken Rineer (608) 267-1201

[1] WPDES – Wisconsin Pollution Discharge Elimination System

[2] WisDOT – Wisconsin Department of Transportation

1.5.4 Local Permits

Table 1-8 lists the locally required permits and approvals for Fox 3.

Table 1-8: Locally Required Permits and Approvals

Agency	Planned Activity	Type of Approval	Status	Contact (Name & Phone No.)
Outagamie County[7]	Delivery of large/heavy components over county-controlled roads	Heavy Haul/Oversized Load permits, as authorized by Wis. Stats. §§ 348.25-348.28, Outagamie County Ordinance § 36, Article VI	TBD	TBD
Village of Wrightstown	Construction of facilities	Building, electrical, and plumbing permits, Village Ordinance § 84.1, 842, 84-5 and 84-8	TBD	Mr. Travis Coenen 920-532-0434
Village of Wrightstown	Delivery of large/heavy components over village controlled roads	Heavy Haul/Oversized Load permits, as authorized by Wis. Stats. §§ 348.25-348.28, Village Ordinance § 185-4	TBD	Mr. Travis Coenen 920-532-0434

[7] Other jurisdictions to be added if necessary.

1.5.5 Railroad Facilities

The existing Fox Energy site is bordered on the south by an active rail line owned and operated by Union Pacific Railroad. WPS does not propose any activities that will affect the operation of the rail facility.

1.5.6 Utility Pipelines

ANR has adequate infrastructure to serve the existing Fox 1 and 2 and Fox 3. The only anticipated WPS cost is associated with modifying the metering facilities to meter the gas to Fox 3.

1.5.6.1 Pipeline Owner

ANR owns and operates an interstate gas transmission pipeline that serves Fox 1 and 2. WPS owns and operates a gas pipeline lateral that connects the Fox Energy Center to ANR's Kaukauna Gate Station.

1.5.6.2 Pipeline Agreement

ANR currently provides natural gas service to the ANR Kaukauna Deliver Point (ANR's Kaukauna Gate Station) (which exclusively serves Fox 1 and 2). The proposed Fox 3 will also be served through ANR at the same delivery point. WPS has an gas transportation agreement (FTS-3) with ANR for firm transportation up to 25,600 decatherms per day (Dth/day) to the Kaukauna delivery point.

1.6 General Construction Schedule

A schedule outline for permitting and construction activities is provided in Volume II Appendix C.

1.6.1 Major Construction Activities

Construction activities will be sequenced according to an overall project schedule. Construction mobilization will begin in August 2016 with commercial operation planned for December 2018. The sequence of major construction activities for the development of the project are listed below. There are many activities in each category, and these activities overlap with activities in other categories. As such, the listing below is only a general sequence to provide an indication of the overall progression of the project.

- Site Preparation: construction of temporary roads and laydown areas, re-routing of the drainage ditch, installation of underground piping and duct banks, begin construction of an earthen landscape berm.
- Civil/Structural Construction: installation of all major foundations, storm water ponds, buildup of the site to final plant grade. Erection of steel for building and pipe racks.
- Equipment Erection: setting all major equipment upon foundations and field erection as necessary.

- Mechanical Erection: installation of above ground piping and supports, installation of balance of plant mechanical equipment such as pumps, compressors and tanks; hydrostatic testing.
- Electrical Erection: installation of cable trays and electrical/control cables, installation of balance of plant electrical equipment.
- Start/Up and Commissioning: initial check-out and testing of all equipment. Steam blows, back energization of the plant through the completed switchyard; performance testing.
- Site Finishing: Restoration of construction facilities including; seeding and removal of temporary roads, paving of permanent roads, complete construction of the earthen landscape berm.

1.6.2 Seasonal or Regulatory Construction Constraints

WPS identified one active bald eagle (federal species of special concern) nest during a site visit completed on August 16, 2014.

WPS is proposing to complete work on the existing check valve located within the Fox River. The work within the Fox River is the only work at a distance from the bald eagle nest where according to the USFWS Bald Eagle Management Guidelines (BEMG), human activity could negatively impact the bald eagle species during the critical nesting period. Because of this, WPS will adhere to the BEMG and complete the check valve work outside of the critical nesting period.

1.6.3 Critical Path Items

The critical path sequence for completion of the unit begins with licensing and continues with the following construction activities:

Activity	Critical Path Duration
Permitting and licensing	12 months
Award major equipment contracts and preliminary engineering	7 months
Site development and circulating water erection	6 months
Construction of underground facilities and foundations to CTG first fire	17 months
CTG first fire to commercial operation	6 months
Total duration	**48 months**

1.6.4 Generation or Transmission Outage Constraints

Generation and transmission outages needed to perform work at the Fox River Switchyard will be incorporated into the overall construction schedule. WPS will follow ATC's and MISO's processes to coordinate maintenance and construction outages to avoid system constraints and minimize reliability impacts.

1.7 Mailing Lists

1.7.1 Microsoft Excel Mailing Lists

See Volume II Appendix D.

1.7.2 Sources of Information

The mailing lists for the project were generated from the county property records for individuals with an ownership within one-half mile of the Fox Energy Center property. Publicly available property owner lists often have inaccuracies due to changes in property ownership or how the owner address is listed in the record.

WPS conducted several activities to improve the accuracy of the mailing lists. WPS held an initial public meeting about the project on May 21, 2014. Invitations for the meetings were sent to all individuals on the mailing list. Any returned invitations were reviewed and, where possible, hand-delivered before the meeting. The proper corrections were made to the address list for future mailings.

WPS held a second public meeting about the project on December 1, 2014. All members of the mailing list were invited by mail.

At the public meetings, names, addresses, and email addresses were collected via a sign-in sheet. Many property owners were uncomfortable in providing all of the information. However, where the information was provided, WPS cross-referenced the information with the existing mailing list and made any necessary corrections.

1.7.3 Mailing Lists

Mailing lists that consist of the property owners within one-half mile of Fox 3; county, town, village, and municipal clerks and executive officers; regional planning commissions; and state and federal agencies are discussed below.

1.7.3.1 List of Property Owners

A list of all property owners within one-half mile is found in Volume II Appendix D.

1.7.3.2 List of Public Property Owners

A list of all public property owners such as schools or other government entities within one-half mile is provided in Table 1-9. Further contact and mailing addresses are found in Volume II Appendix D.

Table 1-9: List of Public Property Owners

City of Kaukauna
Heart of Valley Metropolitan Sewer District
US Government
State of Wisconsin Department of Natural Resources
State of Wisconsin Department of Administration Division of State Facilities
Village of Wrightstown
Wrightstown Community School District
Harvest Moon Estate Park Association C/O Laura Cornette
St. John Evangelical Lutheran Congregation Wrightstown Wisconsin, Inc.

1.7.3.3 List of County, Town, or Municipal Clerks

A list of the county clerks of the applicable counties, towns, villages, or cities is provided in Table 1-10. Further contact and mailing addresses are found in Volume II Appendix D.

Table 1-10: County, Town, & Village Clerks

Clerk	County, Village, or Town
Donna Martzahl	Town of Wrightstown
Jean Brandt	Village of Wrightstown
Debbie Vander Heiden	Town of Kaukauna
Lori J. O'Bright	Outagamie County
Joel Gregozeski	Town Buchanan

1.7.3.4 List of County, Town, Village, or City Chief Executive Officers

A list of the chief executive officers of the applicable counties, towns, villages, or cities is provided in Table 1-11. Further contact and mailing addresses are found in Volume II Appendix D.

Table 1-11: Executive Officers

Executive Officer	County, Village, or Town
Steve Johnson	Village of Wrightstown
John Alferi	Town of Kaukauna
Tom Nelson	Outagamie County
Mark McAndrews	Town of Buchanan

1.7.3.5 List of Regional Planning Commissions

There are two regional planning commissions, Bay Lake Regional Planning Commission and East Central Wisconsin Regional Planning Commission, which oversee Brown and Outagamie Counties, respectively. The Regional Planning Commissions contacts and mailing addresses are found in Volume II Appendix D.

1.7.3.6 List of Applicable State and Federal Agencies

A list of the state and federal agencies is provided in Table 1-12. Further contact and mailing addresses are found in Volume II Appendix D.

Table 1-12: State and Federal Agencies

Federal Agencies	State Agencies
Public Service Commission of Wisconsin (delegated Section 106)	Wisconsin Department of Agriculture
U.S. Army Corps of Engineers	Wisconsin Department of Natural Resources
U.S. Department of Transportation – Federal Aviation Administration	Wisconsin Department of Safety And Professional Services
U.S. Environmental Protection Agency	Wisconsin Department of Transportation
U.S. Fish and Wildlife Service	

1.7.3.7 List of Local Print and Broadcast Media

All relevant news releases are posted to the project's website[8] following public distribution. News information is distributed to the following news media outlets serving the WPS area (Table 1-13).

Table 1-13: Local Print and Broadcast Media

Local Print	Broadcast Media
Appleton Post Crescent	WBAY TV
Associated Press	WDUX Radio
Brillion/Wrightstown Spirit	WFRV TV
Freedom Pursuit	WGBA TV
Kaukauna Times-Villager	WLUK TV
Green Bay Press Gazette	WPNE Radio
Milwaukee Journal-Sentinel	WTAQ Radio

The news media contacts and mailing addresses are found in Volume II Appendix D.

[8] http://www.wisconsinpublicservice.com/company/fox_energy.aspx

1.8 Project Maps and Illustrations

All required maps, figures, diagrams, etc. can be found in Volume I of the appendices. The below sections provide the appropriate appendix for each of the included maps.

1.8.1 Aerial Photographs

See Volume I Appendix J for aerial photographs of the Fox 3 site.

1.8.2 Facilities Data

The following sections provide the illustrations showing the facilities data, such as facilities footprint, utility connections, access roads, railroads, laydown, storage areas, and construction parking areas.

1.8.2.1 Facilities and Footprint Maps

See Volume I Appendix B for the maps showing the proposed facilities and footprint for each site option.

1.8.2.2 Utility Connections Map

Fox 3 will connect to the Village of Wrightstown water utility for potable water and sewer. The service is located along the northern border of the Fox Energy Center property, adjacent to Wrightstown Road/Golf Course Drive. Temporary construction power from Kaukauna Utilities will be connected to an existing electric distribution line also located along the northern border of the Fox Energy Center property, adjacent to Wrightstown Road/Golf Course Drive. Volume I Appendix G contains a map of the planned connecting facilities.

1.8.2.3 Access Roads Map

See Volume I Appendix B for the maps showing the proposed access roads for each site option.

1.8.2.4 Railroad Map

See Volume I Appendix H for the map showing the nearby railroad; there are no barge docks that will be used for this project.

1.8.2.5 Laydown, Material Storage and Construction Parking Areas Map

See Volume I Appendix B for the map showing the location of the laydown, material storage areas, and construction parking areas that will be used for this project.

1.8.3 Environmental Data

The following sections provide the illustrations showing the environmental data, such as waterways, wetlands, archaeological resources, soils, geology, rare species, topography, and floodplains.

1.8.3.1 Waterways Map

See Volume I Appendix K for the map showing the location of rivers, lakes, and other waterways relative to Fox 3.

1.8.3.2 Outstanding or Exceptional Waterways

There are no outstanding resource waters that occur within Outagamie county.

1.8.3.3 Wetland Maps

See Volume I Appendix L contains the WDNR wetland maps showing the location of the Fox 3 site.

1.8.3.4 Archaeological Map

An archaeological map is provided in Volume III Appendix A (CONFIDENTIAL).

1.8.3.5 Soil Survey Map

See Volume I Appendix M contains the soil survey map of the Fox 3 site.

1.8.3.6 Geology Map

See Volume I Appendix C contains the geology map of the Fox 3 site.

1.8.3.7 NHI Rare Species Map

No Natural Heritage Inventory (NHI) rare species were identified within the WDNR Natural Heritage Inventory (NHI) search parameters (1-mile buffer for terrestrial species and 2-mile buffer for aquatic species).

1.8.3.8 USGS Topographic Map

See Volume I Appendix D contains the U.S. Geological Survey (USGS) topographic map of the Fox 3 Site.

1.8.3.9 Floodplain Maps

See Volume I Appendix N for floodplain maps (Flood Insurance Rate Maps) showing the location of the floodplain relative to the Fox 3 site.

1.8.4 Parcel Data

The following sections provide the illustrations showing the parcel data, such as privately and publicly owned lands, tribal properties, and political subdivisions.

1.8.4.1 Privately Owned Lands Map

See Volume I Appendix O contains a map of all privately owned lands within one-half mile of the Fox 3 site.

1.8.4.2 Publicly Owned Lands Map

See Volume I Appendix P contains a map of all publicly owned lands within one-half mile of the Fox 3 site (parks, national/county/state forests, etc.).

1.8.4.3 Tribal Properties Map

There are no tribal lands within one-half mile of the Fox 3 site.

1.8.4.4 Community Map

See Volume I Appendix Q contains a map at community scale showing roads, streets, city or township boundaries, etc.

1.8.4.5 Township, Range, Section Map

See Volume I Appendix R contains a map indicating the township, range, and section of the Fox 3 site.

1.8.5 Land Use

The following sections provide references to appendices showing the land use data, such as land cover, zoning, schools, aviation, communications, and recreational area.

1.8.5.1 Land Use/Land Cover Maps

See Volume I Appendix E for a map showing existing land use (e.g. agriculture, recreation) and a map for land cover (e.g. forest, grasslands).

1.8.5.2 Zoning Map

Volume I Appendix S for a map showing existing zoning within one-half mile of the Fox 3 site.

1.8.5.3 Map of Mines and Quarries

There are no mines or quarries within one-half mile of the Fox 3 site.

1.8.5.4 Map of Schools

There are no schools up to one-half mile from the Fox 3 site. The closest schools are located in the Village of Wrightstown, approximately 2.5 miles east of the site. There are no daycare centers, hospitals or nursing homes located within one-half mile of the Fox 3 site. The nearest hospital is located in Appleton, approximately 11 miles southwest of the site.

1.8.5.5 Map of Airports

There are no airports within one-half mile of the Fox 3 site.

1.8.5.6 Map of Communication Towers

Volume I Appendix T for a map showing existing communication towers within one-half mile of the Fox 3 site.

1.8.5.7 Map of Recreation Areas

Volume I Appendix U for a map showing recreational areas within one-half mile of the Fox 3 site.

1.8.6 Utility/Infrastructure Data

The following sections provide the illustrations showing the utility/infrastructure data, such as transmission lines, pipelines, roads, highways, railroads, infrastructure ROWs, and WDNR-required information.

1.8.6.1 Existing Transmission, Pipelines, and Other Applicable Infrastructure

Volume I Appendix V for a map showing the existing transmission lines, pipelines, and other infrastructure within one-half mile of the Fox 3 site.

1.8.6.2 Existing Distribution Lines

The existing three-phase distribution line and communications underbuild located on the south side of Wrightstown Road/Golf Course Drive may need to be temporarily raised during construction (seventeen feet of clearance is required for construction vehicles).

1.8.6.3 Existing Roads, Highways, and Interstates

Volume I Appendix W for a map showing the existing roads, highways, and interstates within one-half mile of the Fox 3 site.

1.8.6.4 Existing Railroads

Volume I Appendix H for a map showing the existing railroads within one-half mile of the Fox 3 site.

1.8.6.5 Applicable Infrastructure ROWs

Volume I Appendix X for a map showing applicable infrastructure ROWs within one-half mile of the Fox 3 site.

1.8.7 WDNR Information

The following sections describe the potential impacts to streams and wetlands that will result from each site option.

1.8.7.1 Site Option 1

The impacts to streams and wetlands that will occur as a result of Site Option 1 is shown in Volume I, Appendix L, Figure L-2. The total permanent wetland impacts resulting from Site Option 1, including the proposed earthen landscape berm, are 1.28 acres of palustrine emergent (PEM) wetland. The total temporary wetland impacts are 0.10 acres, of PEM wetland and 0.01 acre of mixed PEM/palustrine forested (PFO) wetland. In addition, 0.02 acre of permanent and <0.01 acre (200 square feet) of temporary impacts will occur from the placement of permanent and temporary culverts for access roads along Stream S-1. The impacts associated with Stream S-1 are included in the wetland impact calculations above. Further details of these impacts are discussed in Section 5.11.

1.8.7.2 Site Option 2

The impacts to streams and wetlands that will occur as a result of Site Option 2 is shown in Volume I, Appendix L, Figure L-3. The total permanent wetland impacts resulting from Site Option 2, including the proposed earthen landscape berm, are 1.76 acres of palustrine emergent (PEM) wetland. The total temporary wetland impacts are 0.35 acres, of PEM wetland. In addition, 0.02 acre of permanent and <0.01 acre (200 square feet) of temporary impacts will occur from the placement of permanent and temporary culverts for access roads along Stream S-1. The impacts associated with Stream S-1 are included in the wetland impact calculations above. Further details of these impacts are discussed in Section 5.11.

1.9 ESRI ArcGIS Data Files

See Volume II Appendix E. Electronic data are files provided under separate cover.

2.0 PROJECT NEED ANALYSES

2.1 Project Need

Reduced energy margins coupled with the potential need to make major investments in older and less efficient coal units to achieve environmental compliance increases the probability that existing coal-fueled generating units will have to retire in the near future. Continued reliance on generation units that are at risk for near-term retirement significantly increases rate payer exposure to high capacity and energy market prices. In order to maintain an adequate and reliable supply portfolio, WPS has developed an achievable least-cost long range capacity and energy supply plan that includes provisions for the replacement of Pulliam 7 and 8, Weston 2, and Edgewater 4 by the 2019/20 MISO planning year. The plan includes a new 1x1 combined cycle generation asset located electrically close to the WPS load to address uncertainty over the nature and timing of future environmental regulations, market risk, deliverability risk and long-term economic impacts.

This plan assumes that WPS will comply with the USEPA Consent Decree by retiring Pulliam 5 and 6 and Weston 1 by May 31, 2015. Weston 2 will begin operating on natural gas starting June 2015. Edgewater 4 will either be retired December 2018 or WPS will no longer have an ownership share.

In addition, Pulliam 7 and 8 are subject to operating restrictions under the USEPA Consent Decree that will reduce their ability to hedge energy market prices. Given current environmental regulations, it is assumed Pulliam 7 and 8 and Weston 2 will be maintained at least until Fox 3 is a qualified planning resource in order to provide WPS with adequate capacity.

WPS's capacity need is driven by the assumed retirement of Edgewater 4 by December 31, 2018, and Pulliam 7, Pulliam 8, and Weston 2 by May 31, 2019, a total of 392 MW of capacity retired by 2019. The following table provides WPS's capacity need for the base, high, and low load forecasts. The Need Analysis was performed using the WPS fall 2012 load forecast. It should be noted that WPS, in its planning analysis, assumes all of WPS's existing combustion turbines remain in-service indefinitely. Because of their age, there is an inherent life-cycle risk with older combustion turbines like Weston 31, Weston 32, Marinette 31, and Marinette 32. Retiring these units, which total an additional 132 MW of capacity, will only increase the capacity need.

Table 2-1 indicates WPS has a capacity need in 2019 between 202 MW to 508 MW. This table assumes that current Direct Load Control (DLC) does not atrophy as equipment begins to fail. It assumes all DLC equipment is replaced and continues indefinitely. If DLC equipment is not replaced, the need in 2019 will increase approximately 37 MW from 375 to 412 MW in the base load forecast.

Table 2-1: WPS Fall 2012 Capacity Supply Need Forecast – MW 14.5% Reserve Margin (Installed Capacity Basis)

Year	Base	High	Low
2014	(12)	62	(144)
2015	(85)	1	(221)
2016	(83)	15	(228)
2017	(26)	82	(183)
2018	80	203	(77)
2019	**375**	**508**	**202**
2020	379	528	208
2021	376	539	201
2022	382	558	202
2023	374	564	189

Source: WPS Fall 2012 Load Forecast (negative values indicate surplus)

2.1.1 Monthly Demand and Energy Forecast

See Volume III Appendix B (CONFIDENTIAL) Tables B-1 and B-2, for the monthly base demand and energy forecast for the next 25 years.

2.1.2 Optimal Generation Expansion Plan

WPS uses two complimentary planning models in its long-term resource planning; Electric Generation Expansion Analysis System (EGEAS) and Ventyx's Multi-objective Integrated Decision Analysis System (MIDAS). The MIDAS model serves two distinct functions, (1) to develop market prices as described in Section 2.1.3, which is referred to in this application as the MIDAS national model, and (2) to model WPS's portfolio, similar to how EGEAS models WPS's portfolio, which is referred to in this application as the MIDAS detailed dispatch model.

The MIDAS detailed dispatch model can simulate the current MISO market where both capacity and energy can be bought and sold from the market and can be configured to simulate how the EGEAS model simulates only capacity and energy market purchases Both models are benchmarked to each other to ensure consistent results. EGEAS is used to develop the optimal expansion plan for WPS requirements customers. MIDAS is then used to optimize the resources in WPS's portfolio with the optimal expansion plan from EGEAS. The results of the Screening Analysis and Need Analysis provided in this application refer to the MIDAS detailed dispatch model present value revenue requirements (PVRR).

Based on the Need Analysis the optimal expansion plan includes a 1x1 F-Class combined cycle unit in 2019 to address WPS's capacity need as described in Section 2.1. See Volume III Appendix B

(CONFIDENTIAL) Table B-3 for the optimal expansion plan developed using the EGEAS model for the reference future (Future 1 in the Need Analysis).

2.1.3 Purchase Power Analysis

WPS analyzed the availability of purchase power by modeling market purchases and issuing a RFP in an effort to determine if there were any potential options that met WPS's resource requirements.

2.1.3.1 Contract Purchase

WPS currently has approximately 29 MW of customer-owned generation under contract. The Need Analysis assumes these contracts are perpetually extended over the study period. WPS also has purchase power agreements with Manitoba Hydro, Forward Wind Farm and Shirley Wind Farm.

2.1.3.2 Market Purchase

In modeling and dispatching WPS's portfolio of generating units to meet load requirements, WPS assumes the availability of up to 1,000 MW of purchase power from the market at any given time. This assumption is consistent with WPS's recent planning analyses supporting the installation of Weston 3 ReACT (Docket 6690-CE-193), purchase of Fox Energy Center (Docket 6690-EB-105), and conversion of Fox Energy Center (Docket 6690-CE-201). The EGEAS model assumes energy and capacity can only be purchased from the market, whereas the MIDAS detailed dispatch model assumes energy and capacity can be both purchased from and sold to the market.

Purchase power prices are calculated using the MIDAS national model, which includes Ventyx's most recent syndicated national database. The market prices used in the Screening Analysis and the Need Analysis, completed in 2013, were based on the Ventyx fall 2012 national database, whereas the market prices used in the Fox 3 Attributes Analysis (See Section 4.3), completed in 2014, were based on the Ventyx fall 2013 national database. The MISO national model simulates the entire Eastern Interconnect and dispatches units economically to meet load and establish an hourly market clearing price for a given region. WPS uses the Wisconsin-Upper Michigan regional market prices, which encompasses the ATC footprint.

WPS develops planning futures which vary according to key planning assumptions, such as natural gas prices, coal prices, load growth, and carbon legislation. The planning assumptions and planning futures are approved each year by WPS's Electric Planning Committee (EPC). The key planning assumptions for each planning future are included in the MIDAS national model to develop unique market prices for each planning future. Table 2-2 describes the planning futures used in the Need Analysis. The Need Analysis refers to an additional future, Future 1 "Prime." This planning future has the same attributes as Future 1, the reference future, but assumes all new units built in the MIDAS national model are combustion turbines. In addition, Futures 5 and 6 utilize, where noted, the key planning assumptions developed by MISO in their 2013 MISO Transmission Expansion Planning process (MTEP13) planning process.

Table 2-2: Need Analysis Description of Planning Futures

	Future 1: Reference Future	Future 2: High Economic Growth	Future 3: Low Economic Growth	Future 4: Increase Coal Retire & CO_2	Future 5: MTEP13 Environ-mental	Future 6: MTEP13 Reference
East Interconnect Coal Retire by 2016	40 GW[1]	40 GW	60 GW	60 GW	60 GW	40 GW
Load Growth	Base	High	Low	Base	Base	Base
Natural Gas Price	Base	High	Low	Base	MISO High	MISO Base
Coal Price	Base	High	Low	Base	MISO Low	MISO Base
SO_2[2]/NO_x Price	Base	Base	Low	Base	MISO Low	MISO Low
CO_2 Price	None	None	$20/ton	$7/ton	$50/ton	None
Renewable RPS[3]	Base	Base	Base	Base	Base *1.3	Base
Capacity Price	CONE[4]	CONE	50% CONE	CONE	CONE	CONE

Source: WPS, EPC Approved 2013 planning futures, and MISO 2013
[1]GW – gigawatt
[2] SO2 – sulfur dioxide
[3]RPS - Renewable Portfolio Standard
[4]CONE - cost of new entry

WPS also assesses market risk by utilizing Ventyx's Risk Module in MIDAS to statistically vary the key planning parameters mentioned in the above table, using a Latin Hypercube sampling methodology. The MIDAS national model then develops 50 unique market price trajectories for each planning future based on the multipliers generated for the key planning parameters. MIDAS detailed dispatch model then incorporates the 50 market price trajectories and the same multipliers used to vary key planning parameters for each planning future. This ensures each of the 50 simulations in a given planning future has the same complementary key planning parameters that was used to generate the market prices in the MIDAS national model.

2.1.3.1 Request for Proposal

Based on WPS's analysis as outlined in Sections 2.1 and 2.4.6, market design and tariff risks, portfolio diversity requirements and current and future environmental regulations, WPS decided to test the market for a resource that met the following requirements:

- Provides 350-500 MWs of dispatchable capacity/energy by 2019 to address WPS's capacity and energy needs.
- Provides gas-fired combined cycle capacity to take advantage of stabilized supply and prices of natural gas, as well as to provide a hedge against both energy and increasingly stringent regulation of coal-fired generation.
- Provides capacity within the ATC footprint to avoid basis and delivery risk.
- Provides an asset in Wisconsin to mitigate out-of-state risk associated with the USEPA's proposed Clean Power Plan and other future regulations with state-specific implications
- Provides ownership of assets, as opposed to a purchase power agreement (PPA).

2.1.3.2 Asset Located in MISO Local Resource Zone 2

Any asset ownership or energy purchase from outside of the ATC footprint would be exposed to the long-term basis risk associated with the delivery to the WPS load zone. This risk would either be borne outright by WPS or be built into the ownership/PPA price with an associated risk premium. Given the potential for topographical changes to the transmission system (due to both generation unit retirements and transmission infrastructure), valuing this risk long term becomes a probabilistic effort resulting in a very high risk premium.

In addition to the risks regarding long-term energy purchases outside the ATC footprint, capacity products also carry substantial risk. MISO's Resource Adequacy Tariff creates significant uncertainty as to how capacity will be valued between capacity zones and the ability to determine with certainty the deliverability of the capacity to a specific zone over a long period of time. Of specific concern, there is uncertainty related to whether or not capacity that is purchased from outside of the WPS zone (assumed to be the ATC footprint) can be properly hedged to avoid exposure to volatility between capacity prices in the WPS zone and the zone where the source of the capacity purchase resides.

Aside from the basis risk, there is also a significant risk regarding deliverability from an asset located in a region that does not have clear physical delivery to the WPS load zone. For instance, if WPS were to purchase an asset in Michigan and subsequently that zone transferred into PJM, it is unclear what exposure WPS will face regarding deliverability of energy/capacity.

For these reasons, WPS concluded that there is too much risk to justify entering into a PPA for a resource or taking ownership of an asset outside the ATC footprint unless a counter party would carry the basis and delivery risk.

In addition to the deliverability and capacity risk associated with assets outside the ATC footprint, risk due to environmental regulations implemented on a state level also add substantial risk. USEPA's proposed CO_2 regulation for existing power plants, which was published in June 2014 and called the "Clean Power Plan (CPP)," establishes a CO_2 emission rate expressed in CO_2 pounds per megawatt-hour for each state based on the generating resources that are physically located in the state. For instance, the Iowa CO_2 emission rate limit includes wind generation units physically located in Iowa even though numerous wind generation units are owned and dispatched by Wisconsin utility companies.

Although USEPA set each state's CO_2 emission rate limit, states are given significant flexibility to decide how they will comply with their targets. States can implement state or regional cap-and-trade programs, set unit-specific limits, use state-wide averaging, or propose other approaches to meet the limits.

This rule has introduced significant uncertainty how states can and will comply with the proposed CO_2 emission rate limit. In addition, USEPA did not provide clear direction as to whether new generating units can be used in the state's compliance plan or how states can treat generating resources that are owned or controlled by out-of-state utility companies. For instance, if a Wisconsin company has a combined cycle unit in Illinois, it is uncertain whether the Wisconsin company can dispatch its Illinois combined cycle unit to comply with the CPP, or whether the unit would have to be dispatched sub-optimally from the Wisconsin company's perspective in order to support Illinois' compliance with the CPP.

Given all of these uncertainties, WPS concluded there is too much risk to justify either ownership or entering into a PPA arrangement with assets located outside of Wisconsin.

2.1.3.3 Preference for Ownership

A PPA is typically entered into when the purchasing entity is not able or willing to take on the operating risks associated with the facility and there is minimal market risk to the overall portfolio at the time the PPA expires.

In general, WPS prefers asset ownership in situations where it has experience in operations of a facility or similar facilities, and where there is adequate means to mitigate risks outside its control. Ownership of the facility is generally preferable because it allows WPS the ability to manage O&M costs and increase the value of the unit in the marketplace.

The ability to execute this optimization provides a competitive advantage for the WPS ratepayer. WPS believes the risks outside its control have been greatly reduced due to the following:

- Experience in the dispatch and operations and maintenance of the Fox Energy Center has allowed WPS to acquire valuable experience in managing the dispatch of a combined cycle facility in the marketplace.
- As part of the technology conversion of the existing Fox Energy Center gas turbines, WPS has negotiated a new long term Contractual Service Agreement with General Electric. The design of this new agreement, along with years of operations under this agreement by 2019, will provide WPS greater insights and experience which can be used to even further optimize a new combined cycle unit at the Fox 3 site.
- Since June 2005, the WPS Generation & Engineering Services group has developed a robust and sustainable Combustion Turbine Maintenance Program. Initially focused on the planning and execution of combustion turbine-related major maintenance projects, the program has expanded to include preventive and predictive maintenance activities along with operational support in the form of troubleshooting; the resolution of recurring issues; and efforts to improve unit reliability, availability, and maintainability. This experience, supplemented with 6 years of operations and maintenance experience of the existing Fox Energy Center, puts WPS in a strong position to address future technical and/or operational challenges and optimize site revenue and minimize costs.
- WPS has extensive experience operating and maintaining plant equipment similar to the equipment present at the Fox Energy Center.

2.1.3.4 Request for Proposal

Based on the requirements above, WPS felt it was prudent to test the market to determine if there were any options that could compete with a Fox 3 alternative. To that end, Burns & McDonnell was retained by WPS to provide support in the collection and evaluation of potential combined cycle power supply options available, as specified in a power supply request for proposal (RFP).

Burns & McDonnell developed advertising materials, developed an advertising schedule, identified an advertising venue and submitted the final, approved advertisement for publication. The advertisement was submitted to Platt's Megawatt Daily and published each day from May 5, 2014, through May 9, 2014.

Upon review and approval of the draft RFP by WPS, Burns & McDonnell issued the final RFP and related supporting documents on the Burns & McDonnell-hosted website according to the schedule established. Burns & McDonnell also developed an extensive email distribution list of potential bidders and emailed notice of the RFP to said bidders. In conjunction with developing the RFP, Burns & McDonnell developed a project-specific email address. This email address was accessible to Burns &

McDonnell only for the use of communications between Burns & McDonnell and proposers/potential proposers.

After the RFP was issued, Burns & McDonnell provided RFP assistance by collecting proposals and responding to any clarifying questions, pending WPS's review and approval. Seven potential bidders submitted a notice of intent to bid.

Three bidders submitted a total of eight proposals. Upon receipt of each proposal, Burns & McDonnell reviewed the proposal for completeness and conformance with the minimum submittal criteria. A summary of the responses are included below.

2.1.3.4.1 Bidder A

Bidder A proposed a Build-Prove-Transfer structure in which the bidder would own and operate its proposed project for 3 years after commercial operations begin and would sell the facility to WPS thereafter. During the 3-year period, WPS would have a tolling agreement with the bidder, after which it would purchase the asset for a predetermined fixed price.

The proposed asset would be a new 693-MW (installed capacity) combined cycle power plant located in Indiana and would be located in MISO Zone 6. According to the proposal, the asset would require no network transmission upgrades however, the proposed project has not entered into MISO's DPP study phase so this assumption cannot be verified and the project's final costs are not known.

The final technology scope was not clearly defined in the proposal, but the project was originally specified to be a 540-MW two-on-one (2x1) combined cycle configuration using Siemens 501F-Class gas turbines and a Siemens steam turbine and two General Electric LM6000 units in simple cycle configuration.

2.1.3.4.2 Bidder B

Bidder B proposed a Unit Participation Agreement for 300 MW of a combined cycle power plant in Illinois. More specifically, Bidder B proposed to negotiate a definitive 20-year PPA for the sale of physical capacity, energy, and ancillary services associated with WPS's pro-rata share of the facility.

The facility is being designed as two 1x1 combined cycle units with a total nominal capacity of 580 MW. The facility's technology would consist of two General Electric 7FA.03 combustion turbine generators and two General Electric A10 steam turbines. This facility was under construction at the time the proposal was submitted and had an expected commercial online date of March 2015 for the first unit. The bidder proposed completing the second unit and ultimately being able to start to deliver capacity and energy to the PJM system by June 2019.

The project is located within PJM outside of MISO Local Resource Zone 2. The bidder executed a 600 MW Interconnection Agreement with PJM; however, firm transmission rights to deliver the capacity and energy into MISO Local Resource Zone 2 is still under study by PJM. The bidder has requested 300 MW of firm transmission capacity for delivery into the MISO zone described above; however, the costs for these rights are unknown and would be borne by WPS.

2.1.3.4.3 Bidder C

Bidder C submitted six proposals consisting of a combination of two sites and three technology configurations. Under all of the proposals, Bidder C proposed that WPS could invest in a pro-rata, undivided interest in the facility and, in conjunction, procure the remainder of the facility output via a long term power purchase agreement. Additionally, each proposed facility would be located within MISO Local Resource Zone 2 and would have access to natural gas fuel supply via an interconnect with an ANR pipeline.

Under Proposals 1 and 4, the bidder proposed a 1x1 combined cycle facility based upon an F-frame combustion turbine capable of operation on natural gas and fuel oil. Proposal 1 identifies a site in Calumet County, Wisconsin, while Proposal 4 describes locating the project at WPS's Fox Energy Center in Outagamie County, Wisconsin. Both proposals contain a June 2019 commercial operation date.

Under Proposals 2 and 5, the bidder proposed a 1x1 combined cycle facility based upon a J-frame combustion turbine capable of operation on natural gas and fuel oil. Proposal 2 identifies a site in Calumet County, Wisconsin, while Proposal 5 describes locating the project at WPS's Fox Energy Center in Outagamie County, Wisconsin. Both proposals contain a June 2019 commercial operation date.

Under Proposals 3 and 6, the bidder proposed a 2x1 combined cycle facility based upon an F-frame combustion turbine capable of operation on natural gas and fuel oil. Proposal 3 identifies a site in Calumet County, Wisconsin, while Proposal 6 describes locating the project at WPS's Fox Energy Center in Outagamie County, Wisconsin. Both proposals contain a June 2019 commercial operation date.

2.1.3.5 Bid Evaluation

Burns & McDonnell worked with WPS to develop a structured matrix based on WPS's RFP requirements. Burns & McDonnell staff reviewed each proposal and verified whether it met each RFP requirement. If the requirement was met, it was indicated within the appropriate box on the scoring matrix. If the requirement was not met, the appropriate box on the matrix was left blank. The matrix is included in Volume III Appendix B (CONFIDENTIAL) Table B-4.

As shown in the matrix, each of the proposals did not meet several RFP requirements. WPS sent a letter to all bidders who responded to the RFP on August 27, 2014, which identified the requirements not met. No bidders responded with either questions or offers to mitigate the risks associated with these requirements, WPS notified the bidders on September 30, 2014, that their bids were no longer being considered in the process.

2.1.4 Plant Retirement Forecast

WPS will be retiring Pulliam Unit 5 and 6 and Weston Unit 1 by June 2015.

In addition, the potential need to make major investments in the remaining older, less efficient coal units to achieve environmental compliance is increasing the probability that Pulliam 7 and 8 and Edgewater 4 will have to be replaced in the near future. This level of uncertainty regarding the remaining life of older less efficient coal units is further complicated by the uncertainty regarding what form Wisconsin's State Implementation Plan (SIP) will take in response to the USEPA's Clean Power Plan proposing regulation on CO_2 emissions. Reliance on a plan that assumes continued operation of older, less efficient coal units beyond the 2020 – 2025 period could result in a capacity deficiency at a time when it is reasonable to assume that the market may be short on capacity because of new regulations, including CO_2.

For purposes of this application, it was assumed WPS will retire or no longer have an ownership share in Edgewater 4 by December 2018 and will retire Pulliam Units 7 and 8 and Weston Unit 2 by May 2019.

2.2 Market Efficiency Projects

This is a generation project and this section is not applicable.

2.3 Area Load Information

Historical and coincident peak and forecasted loads are discussed below.

2.3.1 Historical Peak Load

Table 2-3 shows WPS's total system actual historic annual peak net demands (instead of substation specific net demands).

Table 2-3: WPS Actual Historic Annual Peak Net Demand 2003 – 2013

Year	Net Demand (MW)
2003	1,888
2004	1,869
2005	2,189
2006	2,360
2007	2,239
2008	2,136
2009	2,264
2010	2,292
2011	2,344
2012	2,347
2013	2,299

Source: WPS

2.3.2 Coincident Peak /Annual Peak Load

This section is not applicable since this application is for a generation project.

2.3.3 Forecasted Load

The Need Analysis relied on the WPS fall 2012 load forecast. This forecast was developed by WPS using:

- Econometric modeling techniques coupled with forecasts of key economic parameters by Moody's Analytics
- Interviews with major industrial customers
- Modeling which accounts for historic levels of energy efficiency initiatives in Wisconsin as well as federal energy efficiency mandates as forecasted by the Energy Information Administration in their 2012 Annual Energy Outlook

As part of the forecasting effort, low and high load forecasts were developed using Moody's Analytics low and high forecast of economic variables. In addition, updates were made to the forecast for direct load control and interruptible load to reflect latest information at the time the forecast was prepared.

As shown in Table 2-4, using the WPS base demand near-term forecast (2013 – 2019) growth rate of 0.6 percent per year, the WPS demand is forecasted to grow at about 14 MW per year. Using the WPS base demand long-term forecast (2013 – 2040) demand growth rate of 0.3 percent per year, the WPS demand is forecasted to grow at about 7 MW per year. At these rates, demand growth is not a major driver of WPS's supply need in 2019.

Table 2-4: WPS Fall 2012 Load Forecast Values

		Load Forecast Values		Growth Rates - %/Year	
		2013	% Base	2013-2019	2013-2040
Demand - MW	Base	2,274	n/a	0.6%	0.3%
	High	2,325	2.5%	1.0%	0.7%
	Low	2,156	-5.2%	0.3%	0.1%
Energy - MWh	Base	14,179,984	n/a	0.9%	0.3%
	High	14,368,991	1.3%	1.3%	0.7%
	Low	13,687,252	-3.5%	0.6%	0.1%

Source: WPS Fall 2012 Forecast

2.4 Discuss Energy Alternatives

The next five subsections describe the supply alternatives considered; the no-build, load reduction, and energy resources alternatives; and the justification for the proposed option.

2.4.1 Supply Alternatives

WPS's alternatives analysis was broken down into two analyses; a Screening Analysis and a Need Analysis.

The Screening Analysis, based on generic new unit data, was performed to limit the number of economic alternatives to a reasonable and feasible level. These data do not include site-specific cost assumptions. Table 2-5 includes the type of unit, description of the unit, and source of data for a given unit analyzed in the Screening Analysis.

Table 2-5: Generic Units Considered in the Screening Analysis

Unit Type	Description of Unit	Source
Wind	99-MW Wind Farm in Wisconsin	WPS Feasibility Study
Wind	99-MW Wind Farm in Dakotas	WPS Feasibility Study
Solar	150-MW Utility Solar Farm	AEO 2013
Biomass	50-MW Biomass Unit	AEO 2013
Combustion Turbine[1]	100-MW Reciprocating Engine Farm (6 units)	Burns & McDonnell
Combustion Turbine	175-MW LM6000 CT Farm (4 units)	Burns & McDonnell
Combustion Turbine	200-MW LMS100 CT Farm (2 units)	Burns & McDonnell
Combustion Turbine	160-MW 7EA CT Farm (2 units)	Burns & McDonnell
Combustion Turbine	200-MW 7FA CT (1 unit)	Burns & McDonnell
Combustion Turbine	400-MW 7FA CT Farm (2 units)	Burns & McDonnell
Combined Cycle[2]	350-MW Advanced Class 1x1 CC (unfired)	Burns & McDonnell

Unit Type	Description of Unit	Source
Combined Cycle	450-MW Advanced Class 1x1 CC w/ duct burners	Burns & McDonnell
Combined Cycle	720-MW Advanced Class 2x1 CC (unfired)	Burns & McDonnell
Combined Cycle	900-MW Advanced Class 2x1 CC w/ duct burners	Burns & McDonnell
Combined Cycle	300-MW F-Class 1x1 CC (unfired)	Burns & McDonnell
Combined Cycle	380-MW F-Class 1x1 CC w/ duct burners	Burns & McDonnell
Combined Cycle	600-MW F-Class 2x1 CC (unfired)	Burns & McDonnell
Combined Cycle	760-MW F-Class 2x1 CC w/ duct burners	Burns & McDonnell
Coal	650-MW Coal unit with Carbon Capture	AEO 2013
Nuclear	500-MW Nuclear unit	AEO 2013

[1] Combustion Turbine – CT
[2] Combined Cycle – CC
Sources: 2013 Annual Energy Outlook, Burns & McDonnell; WPS

Based on the results of the Screening Analysis, Table 2-6 provides the supply options considered further in the Need Analysis. This analysis, unlike the Screening Analysis, does include site-specific costs, based on a July 2013 Burns & McDonnell technology assessment for both the Fox Energy Center and Pulliam site for the combustible resources.

Table 2-6: Supply Alternatives in the Need Analysis

Unit Type	Description of Unit	Source
Wind	99-MW Wind Farm in Wisconsin	WPS Feasibility Study
Wind	99-MW Wind Farm in Dakotas	WPS Feasibility Study
Combustion Turbine	200-MW 7FA Combustion Turbine (1 unit)	Burns & McDonnell
Combustion Turbine	400-MW 7FA Combustion Turbine Farm (2 units)	Burns & McDonnell
Combined Cycle	380-MW F-Class 1x1 Combined Cycle w/ duct burners	Burns & McDonnell
Combined Cycle	450-MW Advanced Class 1x1 Combined Cycle w/ duct burners	Burns & McDonnell

2.4.2 Proposed Options Justification

The following sections indicate the justification for choosing the supply alternatives mentioned in Table 2-6 and used in the Need Analysis.

2.4.2.1 Renewables

WPS, through its screening process, identified wind generation as the low-cost renewable resource. Wind projects in both Wisconsin and the Dakotas were carried forward into the Need Analysis as the low-cost renewable alternative. The amount of available wind generation included in the Need Analysis was reflective of transmission and land use limitations. Table 2-7 provides the cost and operating characteristics for the renewable options analyzed in the screening analysis.

Table 2-7: Renewable Unit Parameters

Unit Parameter	Metric	WI Wind	Dakota Wind	Utility Solar	Biomass Unit
Operating Capacity	MW	99	99	150	50
Reserve Planning Capacity	MW	14.7	14.7	75	50
Capacity Factor	%	35	45	15	69
Overnight Capital Cost – 2013$	$/kW	2,462	2,774	3,959	4,204
Annual Fixed O&M – 2013$	$/kW-yr	25.75	25.75	22.67	110.11
Variable O&M – 2013$	$/MWh	0.0	0.0	0.0	5.38
Heat Rate	Btu/kWh	N/A	N/A	N/A	13,500
Tax Life	years	5 years	5 years	5 years	20 years

$/kW – dollars per kilowatt
$/MWh – dollars per megawatt-hour
Btu/kWh – British thermal units per kilowatt-hour

The following sections provide justification for using wind generation as the low cost renewable option.

2.4.2.2 Wind vs. Solar

A screening analysis was performed to analyze the economics of a utility-size solar project and a wind farm located in Wisconsin. Table 2-8 compares the cost of a Wisconsin wind project, expressed in $/MWh, to the cost of a utility solar project.

The $/MWh real levelized cost of a utility solar project, based on the assumed unit parameters, is almost four times greater than Wisconsin wind cost.

Another metric calculated was the breakeven capital cost for utility solar in order to have the same annual energy output and $/MWh cost as a 99-MW Wisconsin wind farm. Utility solar would have to have an overnight capital cost less than $1,200/kilowatt (kW) in order to have a comparable $/MWh cost to a 99-MW Wisconsin wind farm. According to the Annual Energy Outlook 2013, a 150-MW solar farm has an overnight capital cost of $3,959/kW.

Both economic metrics show utility solar as a higher-cost noncombustible renewable resource compared to wind generation.

Table 2-8: Comparison of Real Levelized "All In" Cost (Net of MISO market revenues) in 2014 $/MWh Utility Solar versus Wisconsin Wind

Future	Utility Solar	Wisconsin Wind	Delta	Solar Cost Increase over Wind	Breakeven Solar Capital Cost
	$/MWh	$/MWh	$/MWh	%	$/kW
Future 1	303.4	55.7	247.7	445%	1,166
Future 2	292.6	45.4	247.2	544%	1,171
Future 3	314.9	65.5	249.4	381%	1,147
Future 4	297.7	49.4	248.3	503%	1,159
Future 5	267.2	19.3	247.9	1,284%	1,163
Future 6	299.0	52.4	246.6	471%	1,178

2.4.2.3 Wind vs. Biomass

The screening study evaluated the cost effectiveness of a 50-MW biomass unit versus a Wisconsin wind project. Cost effectiveness is measured by back calculating what the cost of biomass fuel would have to be in order for the biomass unit to be the same cost (expressed as real levelized cost after MISO market revenues) as a wind project.

Based on the assumed unit parameters, a 50-MW biomass unit would have to secure a source of wood waste that would be willing to "pay" the biomass project $0.83/million British thermal units in order to take the biomass from the source. This would result in the 50-MW biomass unit being economically comparable to a Wisconsin wind project. In this analysis both projects assume an annual generation of 303,534 MWh, which means the 50-MW biomass unit would have a 69 percent annual capacity factor.

A negative fuel cost is driven by the higher O&M cost (fixed and variable) associated with the 50-MW biomass unit. This is in spite of the fact that the biomass unit has a 100 percent reserve rating (all 50 MW count as generating reserves) compared to a wind project having a 14 percent reserve rating (14 MW of a 99-MW wind project counts as generating reserves).

Based on the 2005 biomass resource survey conducted by the WPS Renewable group, it was concluded that biomass has market value. Biomass material is not given away nor are suppliers willing to pay someone to take it. Therefore, it can be concluded that a 50-MW biomass unit is not economic compared to a Wisconsin wind project.

2.4.2.4 Wisconsin Wind vs. Dakotas Wind

The screening study evaluated the cost effectiveness of a Wisconsin wind project versus a Dakota wind project. The Dakota wind project has a higher capital cost due to transmission impacts for a Dakota project relative to a Wisconsin project. However, a Dakota project has a higher capacity factor which offsets the higher capital cost, making it a lower-cost option than a Wisconsin wind project. Table 2-9 compares the cost of a Dakota wind project, expressed in $/MWh, to the cost of a Wisconsin wind project.

Table 2-9: Comparison of Real Levelized "All In" Cost (Net of MISO market revenues) in 2014 $/MWh Wisconsin Wind versus Dakota Wind

Future	Wisconsin Wind	Dakota Wind	Delta	WI Cost Increase Over Dakota in %
	$/MWh	$/MWh	$/MWh	%
Future 1	55.7	42.5	13.2	31%
Future 2	45.4	32.2	13.2	41%
Future 3	65.5	52.3	13.2	25%
Future 4	49.4	36.3	13.1	36%
Future 5	19.3	6.2	13.1	211%
Future 6	52.4	39.3	13.1	33%

Table 2-9 shows the Wisconsin wind project is approximately $13/MWh more expensive than the Dakota wind project. The Dakota wind project, however, has a higher transmission risk due to being remotely located. In addition the Wisconsin versus Dakota comparison assumes both projects have the same MISO market capacity value. In the 2014/15 MISO capacity auction this was not the case with Zone 1 (Dakota project) having a lower capacity value ($3.29/MW-day) than Zone 2 (Wisconsin project, $16.75/MW-day).

2.4.2.5 Combustion Turbines

Combustion turbines with an installed capacity between 100 and 400 MW were analyzed in the screening analysis. The combustion turbine configurations analyzed included multiple units at a given site, called "farms." This takes into account the advantage of economies of scale and coordination associated with the simultaneous construction of multiple simple cycle combustion turbine units at the same site. The screening analysis indicated the single 200-MW 7FA combustion turbine and 400-MW 7FA Combustion Turbine Farm (2 combustion turbines) were the low-cost combustion turbine options. Also, the capacity sizes of complement WPS's capacity need mentioned in Section 2.1. Table 2-10 provides the results of the busbar screening analysis performed for the combustion turbine options that justifies the combustion turbine alternatives analyzed further in the Need Analysis. The busbar cost is a real levelized total production cost (capital, fixed O&M, variable O&M, and fuel) at different assumed capacity factors. The comparative costs and operating characteristics for the combustion turbine busbar cost analysis can be found in Volume III Appendix B (CONFIDENTIAL) Table B-6.

Table 2-10: Combustion Turbine Busbar Analysis
Real Levelized $/MWh Total Production Cost

Capacity Factor	100-MW Recip Farm	160-MW 7EA CT Farm	180-MW LM6000 CT Farm	200-MW LMS100 CT Farm	200-MW 7FA CT	400-MW 7FA CT Farm
5%	476.2	420.9	443.4	399.1	336.8	309.2
10%	263.2	243.4	252.3	226.4	197.0	183.2
15%	192.1	184.3	188.6	168.9	150.4	141.2
20%	156.6	154.7	156.7	140.1	127.1	120.2

2.4.2.5.1 Combined Cycles

The combined cycle units carried forward in the Need Analysis were the 380-MW 1x1 F-Class and the 450-MW 1x1 Advanced Class. Both of these unit configurations include duct firing capability. The comparative costs and operating characteristics used to evaluate combined cycle units can be found in Volume III Appendix B (CONFIDENTIAL) Table B-7. The Screening Analysis identified the following three conclusions regarding the combined cycle unit configurations and supported the justification of further analysis on the F-Class 1x1 and Advanced Class 1x1 Combined Cycle units.

1. Duct-Fired versus Unfired Units
   Regardless of the type and size of unit, the combined cycle unit with duct firing capacity resulted in a lower life cycle PVRR expansion plan compared to the same units without duct firing capacity. The incremental capital cost is low for the incremental capacity of the duct burners and the heat rate for the duct burners is more efficient than combustion turbines for peaking capacity.
2. Advanced Class versus F-Class Units
   The Advanced Class combined cycle resulted in a higher life cycle PVRR plan compared to the F-Class combined cycle regardless of whether it was a 2x1 or 1x1 configuration. Even though the economics in the Screening Analysis indicated the F-Class combined cycle was more cost effective, WPS carried the 1x1 Advanced Class combined cycle forward in the Need Analysis, which includes site-specific characteristics, and this size unit complements the capacity need

mentioned in Section 2.1. Further discussion on the economics between the 1x1 combined cycle configurations in the Need Analysis can be found in Section 2.4.6.3.1.

3. 1x1 versus 2x1 Units

   There are two basic configurations for a combined cycle unit. The 1x1 combined cycle unit consists of a single combustion turbine and heat recovery boiler that feeds a single steam turbine generator. This configuration has a net output of approximately 380 MW when the F-Class combustion turbine is used. The second configuration is called a 2x1 combined cycle unit and consists of two combustion turbines with individual heat recovery boilers both feeding a single steam turbine generator. This configuration has a net output of approximately 760 MW when F-Class combustion turbines are used.

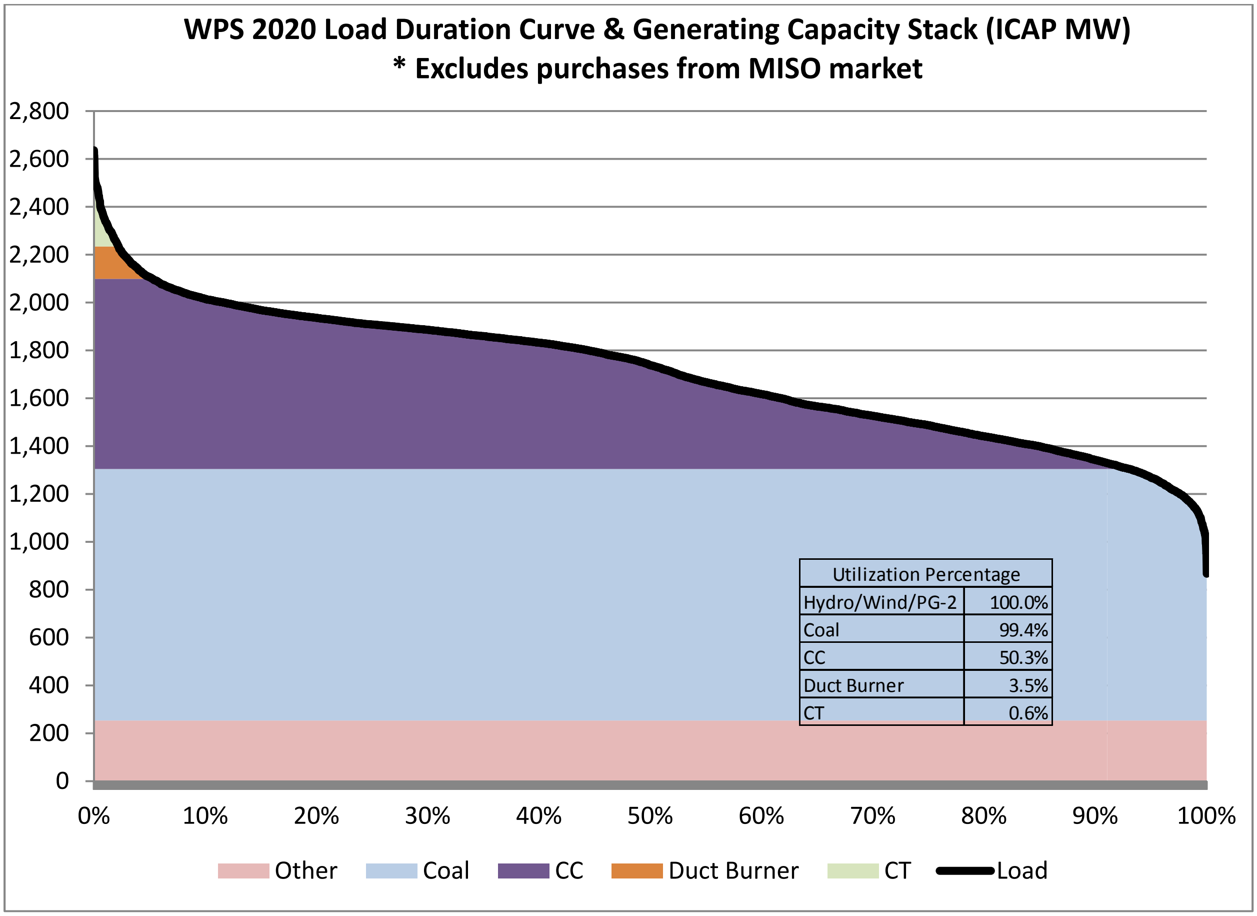
The capacity of a 760-MW F-Class 2x1 combined cycle unit exceeds the range of WPS need in 2019 (202 MW to 508 MW; refer to Table 2-1).

Graphical Analysis:

Figure 2–1 and Figure 2-2 contain a graphical analysis of the WPS system for the year 2020, assuming the new unit added to WPS's electric resource portfolio is either a new 380 MW F-Class 1x1 combined cycle unit or a new 760-MW F-Class 2x1 combined cycle unit. These figures show a sorting of 8,784 hourly demands (MW) for 2020 from maximum demand to the minimum demand. Also included on the chart is the stack of WPS electric resource capacity (ICAP) starting with WPS hydro/wind/parallel generation (defined as "Other"), coal units (base load), combined cycle units (intermediate), combined cycle duct burners (peaking) and simple cycle combustion turbine units (peaking). Embedded in this analysis is the assumption that WPS cannot rely on the MISO market to serve its load.

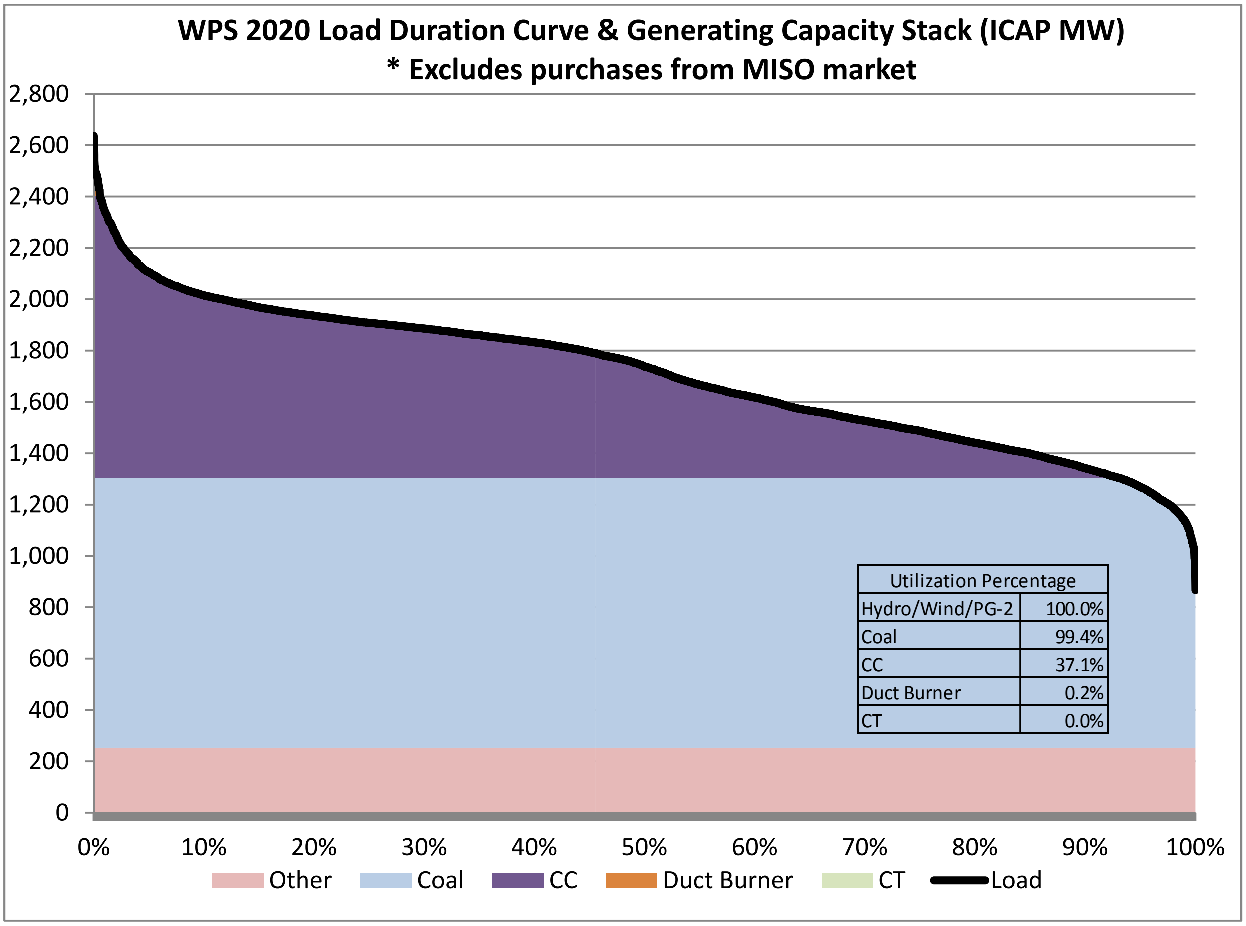
With the inclusion of a 380-MW F-Class combined cycle unit in the WPS resource mix, the combined cycle fleet (Fox 1-3 "unfired") would be utilized 50.3 percent of the time, the combined cycle duct burners would be utilized 3.5 percent of the time, and combustion turbines would be utilized 0.6 percent of the time.

Figure 2–1: Generation Stack and Load Duration Curve With New 380-MW F-Class 1x1 Combined Cycle



Conversely, with the inclusion of a 760-MW F-Class 2x1 combined cycle unit in the WPS resource mix, the combined cycle fleet (1,100 MW unfired capacity) would be utilized only 37.1 percent of the time, the combined cycle duct burners would be utilized 0.2 percent of the time, and combustion turbines would not be utilized at all. This indicates that WPS would be long on combined cycle capacity relative to its load requirements, and the unit's value to WPS's customers would depend on opportunity sales should the 2x1 combined cycle unit's energy cost be competitive with the energy market prices.

Figure 2–2: Generation Stack and Load Duration Curve With New 760 MW F-Class 2x1 Combined Cycle



System Analysis:

A 50 percent share of a 760-MW F-Class 2x1 combined cycle has a lower life cycle PVRR than a 380-MW F-Class 1x1 combined cycle unit. However, a partner is required. Without a partner and without a significant amount of opportunity sales a 760-MW F-Class 2x1 combined cycle unit would increase PVRR relative to a 380-MW F-Class 1x1 combined cycle unit.

Figure 2–3 shows the risk profile of the delta PVRR associated with both a 50 percent share of a 760-MW F-Class 2x1 combined cycle and a wholly owned 760-MW F-Class 2x1 combined cycle unit with respect to a 380-MW F-Class 1x1 combined cycle unit. This chart demonstrates the risk WPS would assume if it were to proceed with constructing a 760-MW F-Class 2x1 combined cycle unit before having secured a co-owner for 50 percent of the unit. Relative to the 380-MW F-Class 1x1 combined cycle unit, the $102 million reduction in expected PVRR associated with a 50 percent share of a 760-MW F-Class 2x1 combined cycle unit could turn into a $118 million increase in expected PVRR if WPS ended up owning the entire unit. If WPS were to wholly own a 760-MW F-Class 2x1 combined cycle unit, the increase in

PVRR could range from $63 to $153 million relative to a 380-MW F-Class 1x1 combined cycle unit. These results do not include any revenue requirement reductions that may occur as a result of making opportunity sales into the MISO market.

Figure 2–4 demonstrates the impact of being able to make both energy and capacity opportunity sales on the economics of a 760-MW F-Class 2x1 combined cycle unit compared to a 380-MW F-Class 1x1 combined cycle unit. Whether WPS has 50 percent ownership or 100 percent ownership, revenues from opportunity sales reduce PVRR by $112 million (50 percent share) to $105 million (100 percent share) relative to the 380-MW F-Class 1x1 combined cycle unit. It should be noted that the opportunity sales mentioned above do not include any limitations on the transmission grid like congestion or losses and that the excess capacity is continuously sold to a third party every year for around 50 percent the value of CONE (cost of new entry).

Also, in the comparison of a 760-MW F-Class 2x1 combined cycle unit to a 380-MW F-Class 1x1 combined cycle unit, assumptions had to be made with regards to the capital cost for natural gas lateral and electric transmission reinforcement. Although assumptions were made that resulted in the investment in infrastructure for the 2x1 combined cycle unit being greater than the investment for the 1x1 combined cycle unit, there is still uncertainty as to whether or not the infrastructure investment assumptions accurately reflect the impact of a 760-MW F-Class 2x1 combined cycle unit, which is twice the size of a 380-MW F-Class 1x1 combined cycle unit, on the electric and natural gas systems.

Due to the size of a 2x1 combined cycle being almost twice as much as WPS's capacity need, as mentioned in Section 2.1, the economics of this unit configuration depends heavily on capacity and energy opportunity sales with the MISO market.

Figure 2–3: 2x1 CC vs. 1x1 CC Delta PVRR Risk Profile
No Energy or Capacity Opportunity Sales

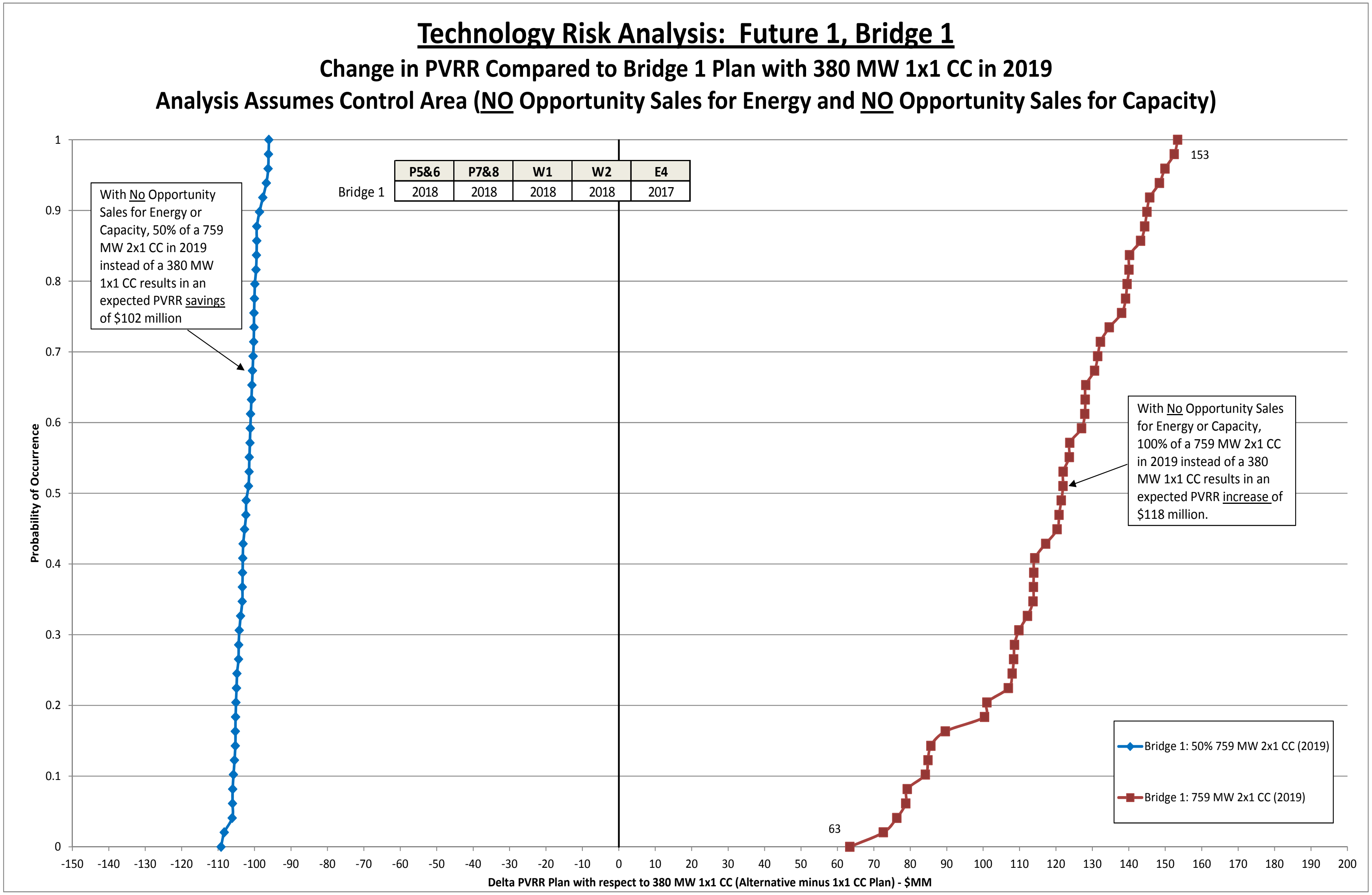
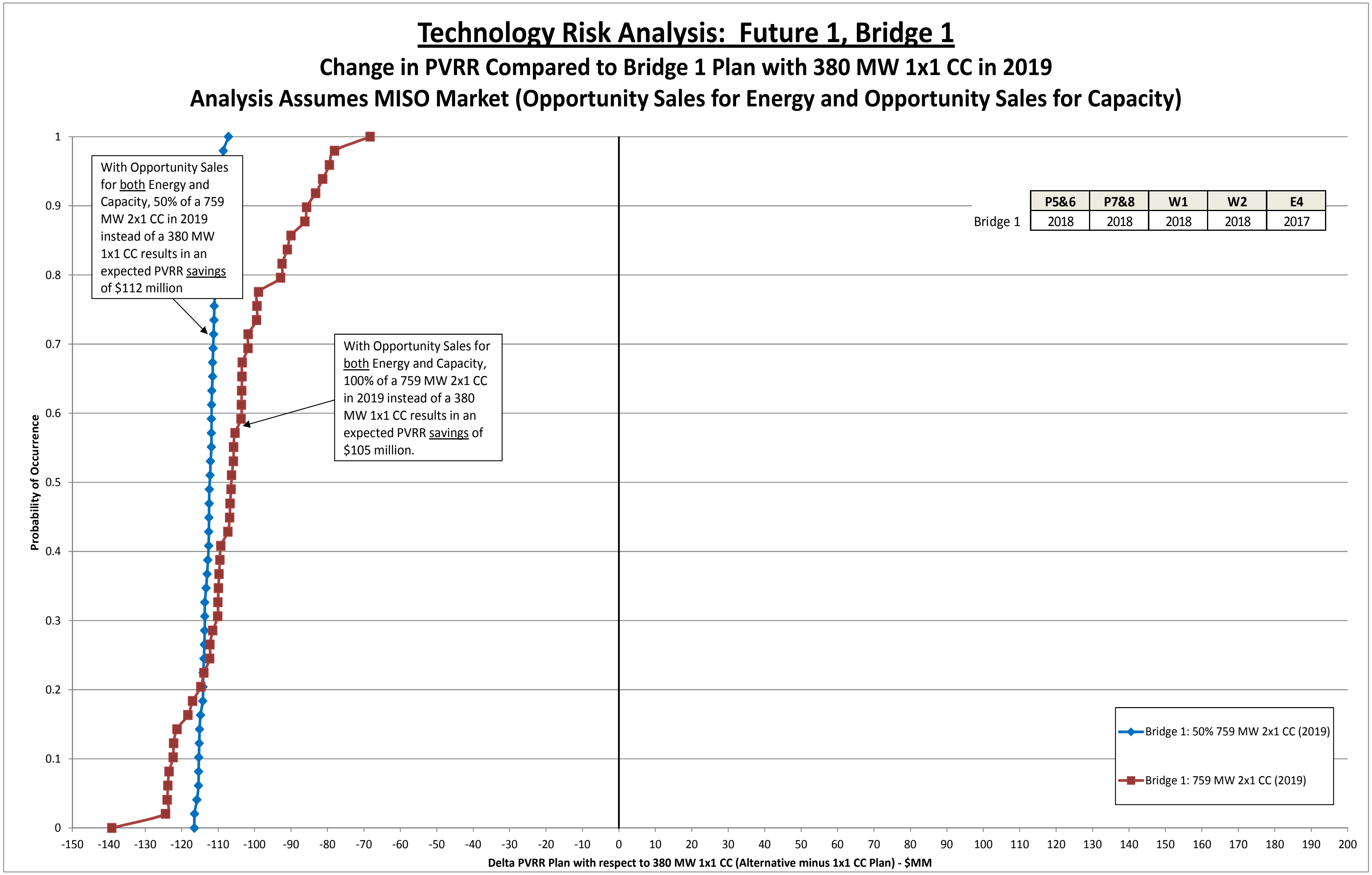


Figure 2–4: 2x1 CC vs. 1x1 CC Delta PVRR Risk Profile With Energy & Capacity Opportunity Sales



WPS pursued unit joint ownership with other utilities, co-operatives, regional energy companies and a midwest utility group during the 3rd quarter 2013 through the 1st quarter 2014. Confidentiality Agreements were executed with 4 parties. The discussions with two parties included the development of draft letters of intent. An electronic data room was established to share project information and a site visit was coordinated to facilitate preliminary due diligence. The two counterparties that WPS was working with on the letters of intent withdrew from the process prior to execution. The main reason cited for not moving forward was the timing and the uncertainty of the needs of the other parties.

WPS also had informal discussions with another utility within the state. Individual projects were discussed. The project discussed by the other utility would not accommodate WPS needs and the proposed WPS project could not meet their needs; so, discussions ended. At a later date, the other utility announced a project which was different from the original project discussed; however, no contact was made with WPS do discuss the revised project.

Given WPS was unable to secure a co-owner for its combined cycle project, the decision was made to curtail further evaluation of the 760-MW F-Class 2x1 combined cycle unit in the Need Analysis.

2.4.2.6 Coal and Nuclear

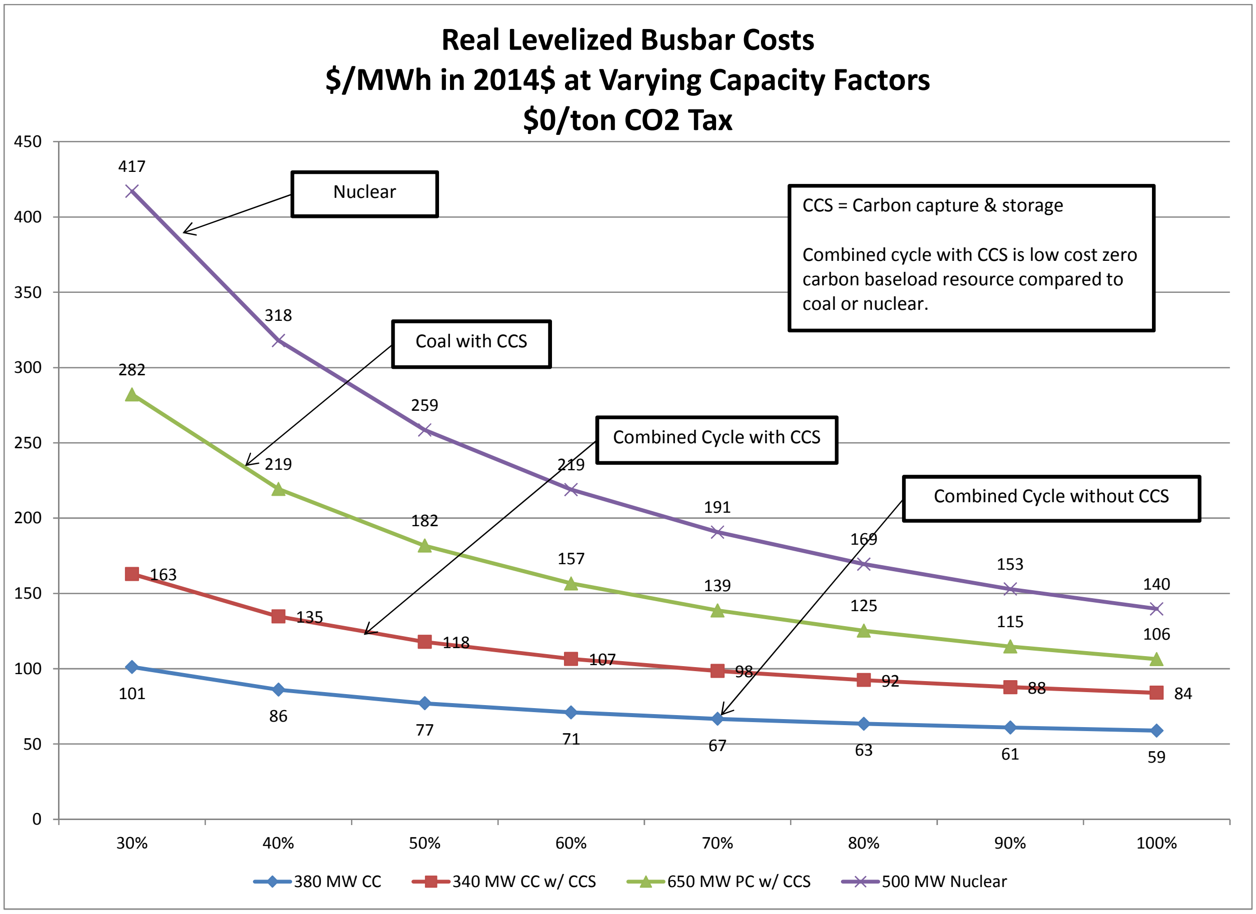
Historically coal and nuclear units have been constructed to provide base load capacity to the electric system. The Wisconsin nuclear moratorium precludes consideration of nuclear as an electric energy resource. Also, a new coal unit without carbon capture (CCS) is no longer a feasible option given the pending USEPA new source performance standard pertaining to CO_2 emissions. The standard effectively requires carbon capture and storage for new coal units in order to meet the proposed CO_2 emission rate.

At an 80 percent capacity factor, the busbar cost for nuclear and coal with CCS is $169/MWh and $125/MWh respectively. For a combined cycle unit without CCS, the busbar cost is $63/MWh, which is 63 percent and 50 percent lower than nuclear and coal with CCS, respectively. As a result, given the high busbar costs and the fact that natural gas-fueled resources are a higher priority under the Wisconsin Energy Priorities Law, nuclear and coal with CCS generating unit options were not considered further in the Need Analysis.

Figure 2–5 provides a busbar cost comparison for nuclear, coal with CCS, combined cycle with CCS, and conventional combined cycle.

As a result, given the high busbar costs and the fact that natural gas-fueled resources are a higher priority under the Wisconsin Energy Priorities Law, nuclear and coal with CCS generating unit options were not considered further in the Need Analysis.

Figure 2–5: Nuclear and Coal Busbar Cost Comparisons



2.4.3 No-build Alternative

A "no-build" alternative would expose WPS ratepayers to the market for at least 15 percent of its capacity requirements and up to 27 percent of their energy requirements.

Given the dramatic changes expected in the national and regional generation fleets, prudency requires WPS to rely on capacity resources for substantial components of its supply portfolio. Relying on the market for significant amounts of energy and capacity would expose the ratepayer to potentially substantial and unpredictable risks.

2.4.3.1 Capacity

Because WPS was unable to secure an asset in the ATC footprint through its RFP, WPS would have to rely on market purchases outside the ATC footprint in order to fulfill its obligation to meet its reserve requirement. Relying long term on year-to-year or multi-year non-local capacity purchases would have substantial risks as to cost and reliability. Capacity purchases external to WPS's capacity zone depend on physical system characteristics, tariff rules and market membership at particular points in time. Since the start of the MISO market in 2005, there have been several significant changes to both market construct and MISO membership. In less than 5 years, MISO is expected to change its resource adequacy tariff for the third time.

As an example, if WPS were to enter into a long term bilateral contract with an entity outside of WPS's local resource zone and that entity were to leave MISO during the term of the contract, WPS would be exposed to potential deliverability risks as well as market seams risk. This could result in some or all of the capacity being unavailable (no firm transmission rights in place) or at risk for additional costs (for firm transmission, capacity basis risk and/or other market seams costs). In fact, in 2014 MISO determined it had to review and modify its tariff in regards to external resources. Draft language has not been finalized, but the initial proposed changes do in fact place risk on existing contracts with sources external to MISO.

Even if MISO membership and its existing tariff remained static, the exposure to capacity basis risk is problematic for long term out-of-zone purchases. Under MISO's current construct, this risk is increasing due to changing transmission constraints, which are the direct result of unit retirements in the region. In only the second year of MISO's zonal construct, there was a deviation between capacity zones. MISO Zone 1, cleared at $3.29/MW-day and Zones 2-7 cleared at $16.75/MW-day. While not substantial in nature, the deviation has occurred. This $13.50 difference would equate to a $2 million basis for 400 MW of capacity. If large changes to generation and/or transmission system resources occur in the MISO footprint, it is entirely plausible for one zone to clear at as little as zero and others as high as CONE. In this scenario, the disparity would be on the order of $40 million basis differential for 400 MW of capacity for that year.

The results of WPS's RFP process demonstrates that there are no counterparties in the market who are willing to monetize the risks associated with capacity availability and deliverability in the form of a bid that would protect WPS ratepayers from these risks.

2.4.3.2 Energy

WPS's portfolio is in need of an intermediate to base load resource to provide an effective hedge against market prices. If no unit was built to serve this need, WPS would need to manage the exposure to market price with short and long term energy purchases, its Financial Transmission Rights (FTR) portfolio and with the existing gas derivative program. Due to the loss of the Dominion Kewaunee PPA and the pending retirement of older coal plants 27 percent of WPS's load would be exposed to the volatility of the market price in the reference future without the addition of Fox 3.

Replacing 400 MW of local generation with a capacity resource outside of the WPS capacity zone would increase WPS's customers to volatile energy prices, congestion risk, and capacity prices. In order to manage that exposure, WPS would need to greatly expand its physical electric purchases, gas for electric hedging, and FTR programs. While expanding the gas hedging program is a matter of economics, it is high unlikely that WPS could reasonably secure such a significant amount of FTRs. To secure the FTRs, WPS would have to bid in the annual and/or monthly FTR auctions. With no guarantee of winning, WPS would either be forced to pay a significant amount to acquire the FTR hedge or simply face the potential congestion risk. In the past, WPS has experienced congestion costs in its own footprint in excess of $24 million; however, since the resources were local, the company had the FTRs necessary to mitigate the exposure.

2.4.4 Load Reduction Alternative

The following sections discuss load reduction (conservation and energy efficiency) as an economic alternative to Fox 3.

2.4.4.1 Energy Efficiency

The load forecast accounts for current levels of Wisconsin energy efficiency, reflecting funding at 1.2 percent of operating revenues as well as federal mandates such as the Energy Independence and Security Act of 2007 (EISA, 2007).

The Need Analysis used the low load forecast to show the impact of expanded levels of energy efficiency and other potential factors such as an economic downturn.

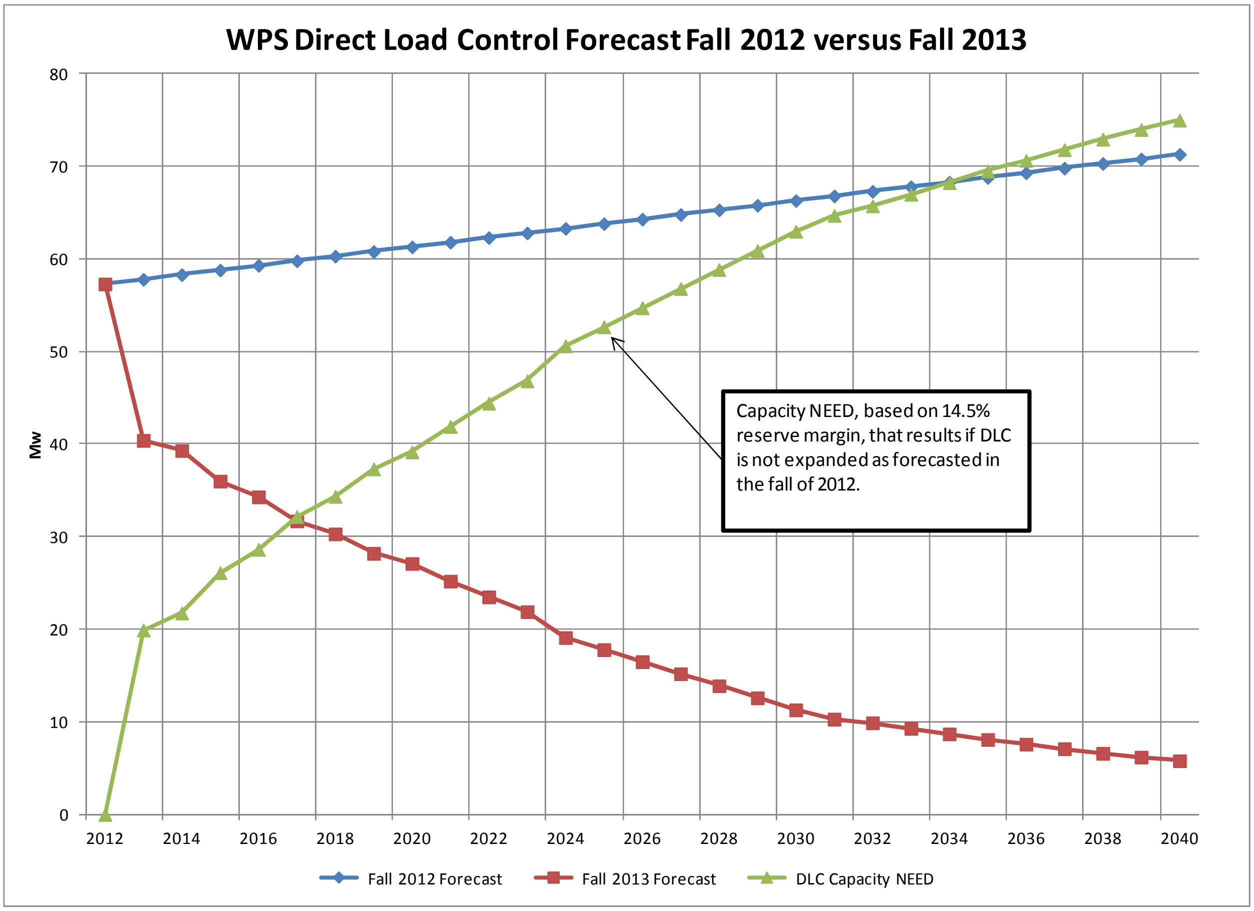
The WPS long range load forecast accounts for energy efficiency which is cost-effective and technically feasible. Refer to Volume III Appendix B for further analysis of WPS forecasted energy efficiency relative to other government/industry forecasts.

2.4.4.2 Direct Load Control (DLC)

The WPS Fall 2012 forecast assumed continued investment in controls to maintain WPS's DLC program. The WPS Fall 2013 forecast acknowledges that without continued investment in controls the DLC program would atrophy over time due to control equipment failure.

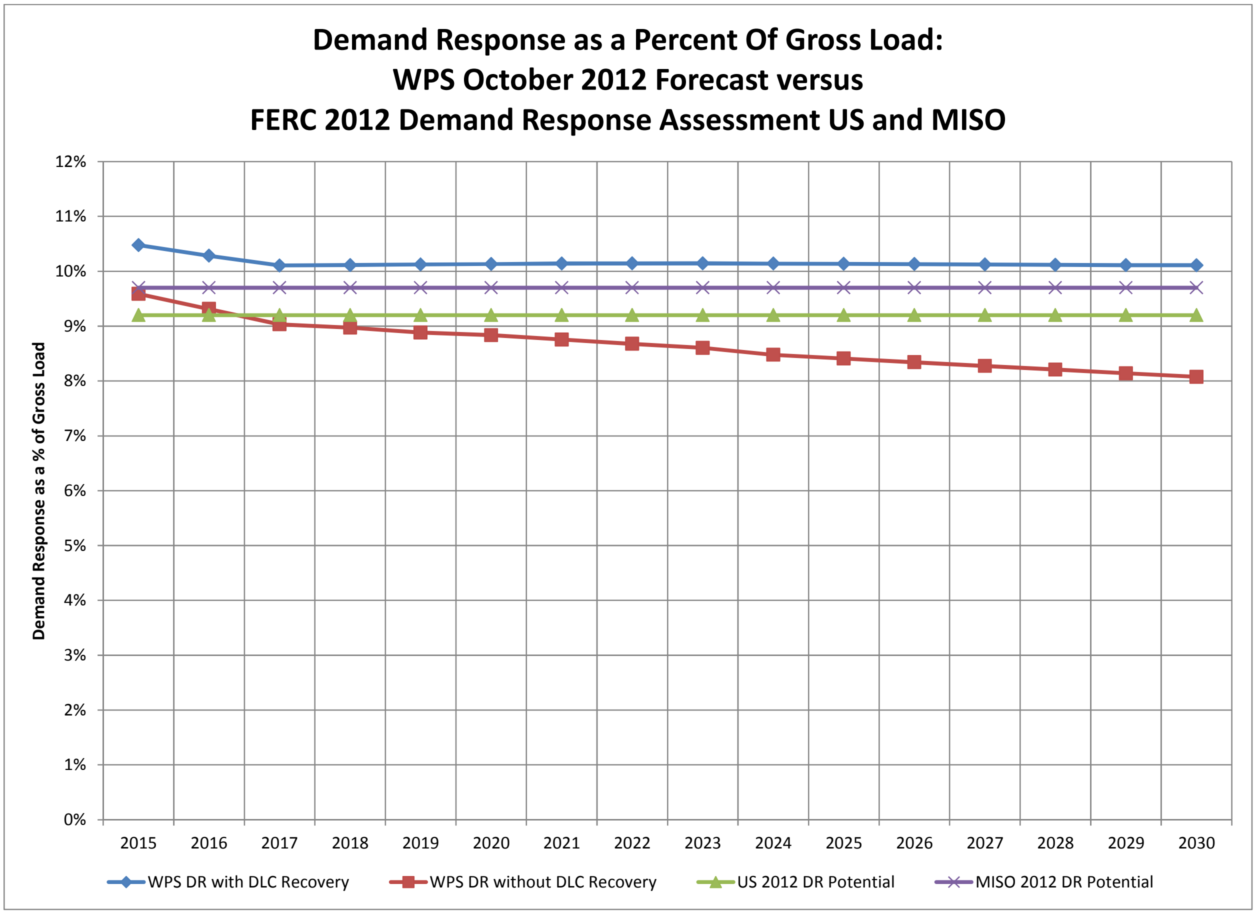
As Figure 2–6 shows, by using the WPS fall 2012 forecast, the Need Analysis assumes continued expansion of its DLC program. If the DLC program is allowed to atrophy, WPS's capacity need would to be increased by 37 MW in 2019 compared to the load forecast used in this Need Analysis.

Figure 2–6: WPS Direct Load Control Forecast Fall 2012 versus Fall 2013



If WPS continues to invest in DLC in order to preserve it as a demand response option, WPS's total demand response as a percent of gross load (10 percent) will exceed both the national (9.2 percent) and regional (9.7 percent) demand response potential as determined by the Federal Energy Regulatory Commission (FERC) 2012 Assessment of Demand Response (DR) and Advanced Metering. Figure 2–7 provides a comparison of WPS DR with and without the recovery of DLC to the U.S. and MISO potential for DR.

Figure 2–7: Demand Response



2.4.4.3 Supply Side Energy Conversion Efficiency

A new combined cycle unit will improve WPS's supply side energy conversion efficiency expressed in Btu/kWh (known as heat rate). Table 2-11 compares the heat rate of various stages of operation for a combined cycle unit to a simple cycle combustion turbine.

Table 2-11: New Generating Unit Heat Rate (Btu/kWh)

Unit	Heat Rate	Efficiency Improvement Relative to CT
200-MW CT	10,040	n/a
380-MW CC (unfired)	6,710	33%
Incremental CC Duct Burner	8,320	17%

The unfired combined cycle has a 33 percent energy conversion efficiency improvement compared to the combustion turbine. The incremental duct burning capacity on the combined cycle has a 17 percent energy conversion efficiency compared to the combustion turbine. On a WPS generating fleet basis, prior to installing a new combined cycle unit, the system heat rate varies from 9,400 to 9,650 Btu/kWh. In the analysis after a new combined cycle unit is installed and WPS's older, less efficient coal units are retired, the system heat rate varies from 9,100 to 9,250 Btu/kWh. Adding a combined cycle unit increases fuel conversion efficiency.

2.4.5 Energy Resources Alternatives

Wisconsin law establishes a priority of generation resource options, by type, that the PSCW must implement to the extent the options are cost-effective, technically feasible and environmentally sound (Wis. Stats. §§ 1.12(4), 196.025(1)). The following sections provide analyses that examine the cost-effectiveness, technical feasibility, and environmentally soundness of higher priority alternatives to Fox 3 in meeting WPS's energy demand with respect to the energy priorities. The following sections address the Priorities Law for the Need Analysis. The comparative costs and operating characteristics used to evaluate the Priorities Law in the Need Analysis can be found in Volume III Appendix B (CONFIDENTIAL) Table B-5.

2.4.5.1 Noncombustible Renewable Energy Resources

Wind generation was identified and justified in Section 2.4.2 as the low-cost noncombustible renewable energy resource compared to solar. Wind generation options from both Wisconsin and the Dakotas with assumed capacity factors of 35 percent and 45 percent, respectively, were analyzed and compared to the proposed project in the Need Analysis. The amount of available wind generation included in the feasibility analysis reflected transmission and land use limitations. Under certain planning assumptions, wind generation complemented the proposed combined cycle project, but it was not a long term replacement for a combined cycle project.

2.4.5.1.1 Dakota Wind

The Need Analysis assumed that WPS could construct up to three 99-MW wind farms in the Dakotas, which is very ambitious because the current transmission build out only provides access to wind generation needed to fulfill existing RPS requirements. The transmission build out will not support new wind projects yet to be announced.

Assuming development of Dakota wind generation follows load ratio share, if WPS assumes it has access to three 99-MW wind farms in the Dakotas, this means approximately 15,000 MW of new incremental wind generation would be developed in that region. This is new wind generation which is in addition to the wind farms that triggered the development of the transmission build out. In other words, another round of investment in transmission would be required to bring the 15,000 MW of new wind generation to the MISO market. This is evident given the results of the 2014/15 MISO capacity auction where Zone 1's (Dakota project zone) capacity prices were depressed due to constraints in Zone 1's ability to export, resulting in a generation surplus and corresponding depressed capacity prices.

The EGEAS program was used to establish the least-cost plan in each of the planning futures. Wind had to compete against other conventional generating technologies and market purchases, except that it was assumed that WPS will build one of the three Dakota wind farms in 2024 in order to enable WPS to meet its Wisconsin RPS requirement regardless of whether or not it was cost-effective relative to other generation alternatives.

Dakota wind generation was cost-effective in several planning futures. Table 2-12 summarizes the plans in which Dakota wind was found to be cost-effective.

Table 2-12: Cost-Effective Dakota Wind Generation

Future	Future Description	Wind Farms Picked Economically	In-Service Year
1	Reference Future	0	N/A
2	High Economic Growth	2	2040 & 2042
3	Low Economic Growth	0	N/A
4	Reference with CO_2 tax	2	2042 & 2042
5	MISO MTEP13 Environmental	2	2021 & 2026
6	MISO MTEP13 Business as Usual	2	2040 & 2041

2.4.5.1.2 Wisconsin Wind

The Need Analysis assumed that WPS could construct up to three 99-MW wind farms in Wisconsin.

The EGEAS program was used to establish the least-cost plan in each of the planning futures. Wind had to compete against other conventional generating technologies and market purchases in order to be selected as part of the long range least-cost expansion plan for a given future, except that it was assumed that WPS will build one of the three Wisconsin wind farms in 2023 in order to allow WPS to meet its Wisconsin RPS requirement, regardless of whether or not it was cost-effective relative to other generation alternatives.

Wisconsin wind generation was cost-effective in one planning future. Table 2-13 summarizes the plan in which Wisconsin wind was found to be cost-effective.

Table 2-13: Cost-Effective Wisconsin Wind Generation

Future	Future Description	Wind Farms Picked Economically	In-Service Year
1	Reference Future	0	N/A
2	High Economic Growth	0	N/A
3	Low Economic Growth	0	N/A
4	Reference with CO_2 tax	0	N/A
5	MISO MTEP13 Environmental	2	2028 & 2037
6	MISO MTEP13 Business as Usual	0	N/A

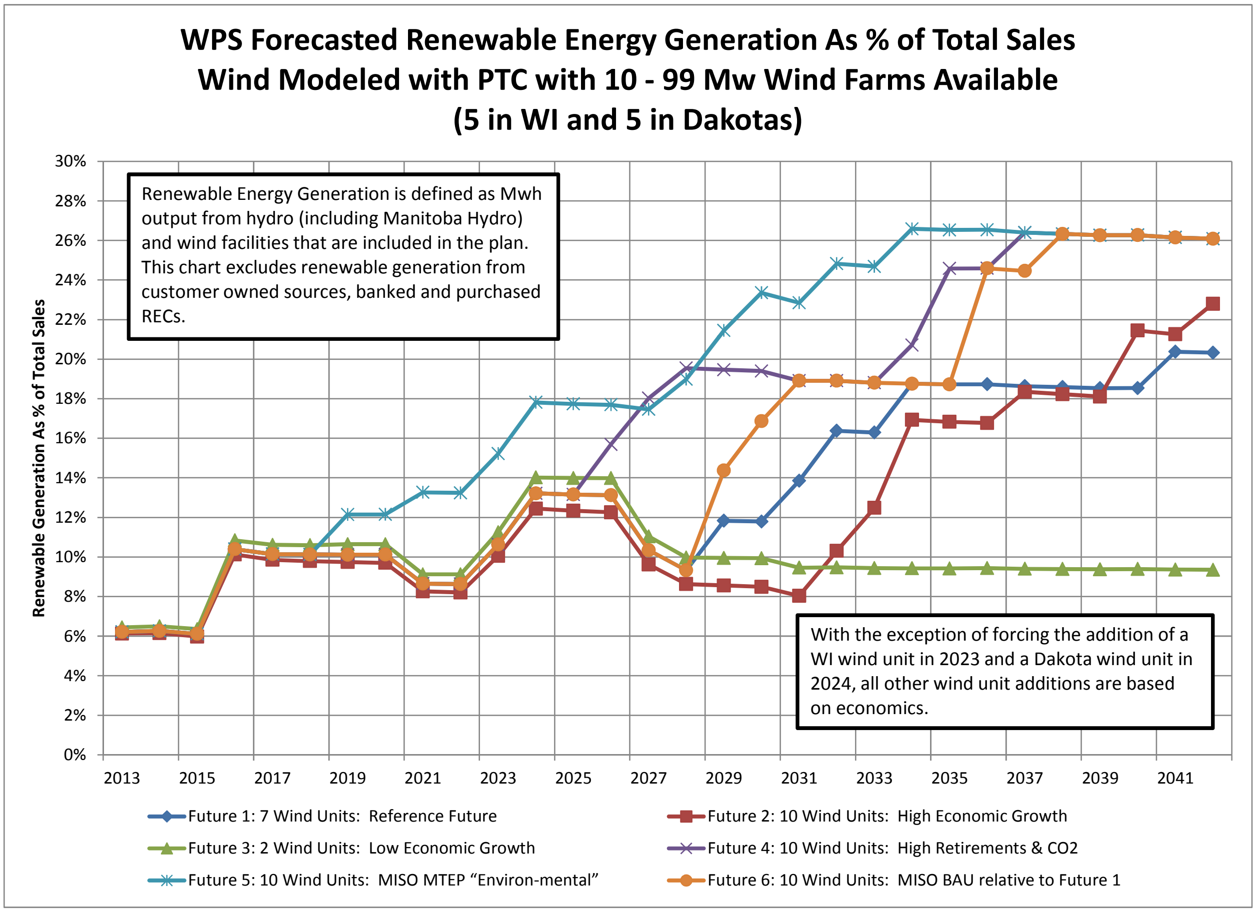
Wisconsin wind generation was cost-effective only in Future 5, which assumes high natural gas prices and a $50 per ton CO_2 tax. Under these assumptions, Wisconsin wind generation is cost-effective when added in the 2028 to 2037 time frame. In all other futures, Wisconsin wind was not cost-effective compared to other alternatives.

2.4.5.1.3 Sensitivity with Production Tax Credit

As a sensitivity, WPS re-ran EGEAS to determine the least-cost generation expansion plan for the six planning futures assuming a reduced capital cost for both the Wisconsin and Dakota wind farms to reflect the production tax credit (PTC) subsidy. The base assumption was that the PTC will not be available in the long term and therefore was not included. In addition, WPS assumed it could build up to five 99-MW wind farms in Wisconsin and five 99-MW wind farms in the Dakotas. If all 10 units are included in the WPS expansion plan, WPS generates approximately 25 percent of its base energy forecast from renewables in the long term. Refer to Figure 2–8 for the forecast of renewable generation as a percent of sales.

Even though all 10 wind farms were picked in four of the six planning futures, the proposed project was also picked as part of the least-cost expansion plan in five of the six planning futures. In the low growth/low fuels cost planning future (Future 3), the Fox 3 project was not picked and only the two wind farms that were hardwired into the plan to meet the RPS were part of the expansion plan.

Figure 2–8: WPS Forecasted Renewable Energy Generation as Percent of Total Sales



2.4.5.2 Combustible Renewable Energy Resources

The screening study of renewable projects indicated a 99-MW wind farm in Wisconsin, which is a non-combustible renewable resource and higher on the priorities list, is more cost effective than a 50-MW biomass unit. Please see Section 2.4.2 for the discussion on the economics of a 50-MW biomass unit compared to a 99-MW wind farm in Wisconsin.

2.4.5.3 Non-renewable Combustible Energy Resources

Non-renewable combustible energy resources such as natural gas, oil, or other carbon-based fuels are further discussed below.

2.4.5.3.1 WPS Non-renewable Combustible Energy Resources Need Analysis

Given the economics associated with new nuclear and new coal units in the Screening Analysis, the Need Analysis of alternative non-renewable combustible energy resources focused on natural gas-fueled alternatives that could be constructed in time to meet the June 2019 capacity need. Each Alternative is compared to a 380-MW F-Class 1x1 combined cycle unit built in 2019.

2.4.5.3.2 Natural gas

There are two basic unit designs for generating units that are fueled with natural gas. The simple cycle combustion turbine is the equivalent of a jet engine with a generator connected to it. The second unit design is a combined cycle unit that, in addition to a jet engine with a generator, also has a heat recovery steam generator uses the exhaust to generate steam for a steam turbine generator to generate additional electricity. The following analyses were performed for the natural gas options in the Need Analysis.

- Siting – Fox Energy or Pulliam
- Technology Choice – Combined Cycle versus Combustion Turbine(s)
- Combined Cycle Technology Choice – F-Class versus Advanced Class

2.4.5.3.3 Fox Energy Site versus Pulliam Site

The analysis compared the PVRR associated with installing the natural gas supply options listed in Table 2-14 at Pulliam versus the Fox Energy Center. Site-specific costs were used in this phase of the evaluation. Also, the evaluation considered a 30 year (2013-2042) and 60 year (2013-2072) study period, as well as 9.0 percent (base) and 6.7 percent (alternative) discount rates. WPS's base assumption for discount rate is 9.0 percent. A sensitivity was performed using the lower discount rate. Table 2-14 provides the increase in PVRR associated with new natural gas supply options at the Pulliam site compared to the Fox site.

Table 2-14: Increase in PVRR at Pulliam Site vs. Fox Energy Site
PVRR Expressed in Millions

Unit Type:	9.0% Discount Rate		6.7% Discount Rate Sensitivity	
	30 Year PVRR	60 Year PVRR	30 Year PVRR	60 Year PVRR
380-MW 1x1 F-Class CC	34	42	46	65
450-MW 1x1 Advanced Class CC	33	41	46	64
400-MW F-Class CT Farm (2-CTs)	19	21	25	28
200-MW F-Class CT	15	16	19	23

In all instances, regardless of the unit type, the Pulliam site increases PVRR compared to the same unit at the Fox site. If congestion and losses are not accounted for in siting a 380-MW F-Class combined cycle unit at Pulliam versus Fox, the PVRR increases $34 million (assumes Pulliam PVRR minus Fox PVRR, 30-year study period, and 9 percent discount rate) to $64 million (60-year study period and 6.7 percent discount rate). This increase is driven by the economics associated with the Fox site where a new combined cycle unit results in incremental increases in staffing and infrastructure reinforcements given the presence of the existing two combined cycle units, Fox 1 and 2. The Pulliam site, assuming coal unit retirement in 2019, would be a site with just a new combined cycle unit and an existing simple cycle combustion turbine (P31). If placed at the Pulliam site, there would be additional costs associated with staff required for long term operations and a new natural gas lateral.

2.4.5.3.4 Combined Cycle versus Combustion Turbine(s)

Generally, the simple cycle combustion turbine unit has lower capital and fixed O&M costs compared to the combined cycle unit. The combined cycle unit is more efficient and therefore has a lower energy cost. There is a tradeoff between minimizing capital investment and fixed O&M cost by installing a simple cycle combustion turbine versus reducing energy cost risk by installing a combined cycle unit. If a utility invests in a simple cycle combustion turbine, that utility will be more dependent on favorable energy market prices than the utility that installs a combined cycle unit.

Graphical Analysis

Besides assuring sufficient generating capacity (MW) to offset capacity need, the utility needs to have the right configuration of generating assets in its electric resource portfolio to meet its base load, intermediate load, and peaking load requirements in an economic manner. One approach for doing so is to perform a graphical analysis to determine if the utility system's duty cycle is appropriate for the various unit operating types (base, intermediate, and peaking).

Figure 2–9 and Figure 2–10 contain a graphical analysis of the WPS system for the year 2020 assuming a new unit added to WPS's electric resource portfolio is either a new 380-MW F-Class 1x1 combined cycle unit or two 200-MW F-Class combustion turbines (400-MW CT Farm). These figures show a sort of 8,784 hourly demands (MW) for 2020 from maximum demand to the minimum demand. Also included on the chart is the stack of WPS electric resource capacity (ICAP) starting with WPS hydro/wind/parallel generation (defined as "Other"), coal units (base load), combined cycle units (intermediate), combined cycle duct burners (peaking) and simple cycle combustion turbine units (peaking). Embedded in this analysis is the assumption that WPS cannot rely on the MISO market to serve its load.

With a 380-MW F-Class combined cycle unit included in the WPS resource mix, the combined cycle fleet (795-MW unfired capacity) would be utilized 50.3 percent of the time, the combined cycle duct burners would be utilized 3.5 percent of the time, and combustion turbines would be utilized 0.6 percent of the time. Figure 2–9 is an example of a portfolio with a balanced resource mix of baseload, intermediate and peaking capacity.

With the inclusion of two 200-MW F-Class combustion turbines (400-MW CT Farm) in the WPS resource mix, the combined cycle fleet (500-MW unfired capacity) would be utilized 67.9 percent of the time, the combined cycle duct burners would be utilized 40.3 percent of the time, and combustion turbines would be utilized 5.6 percent of the time.

Figure 2–10 is an example of a portfolio that is weighted more towards peaking capacity. With the addition of the 400-MW CT farm, WPS would rely on the energy cost of its combustion turbine fleet 34 percent of the time to serve as a price hedge against market energy prices, whereas with the addition of the 380-MW F-Class combined cycle unit, WPS would rely on the energy cost of its combustion turbine fleet only 2 percent of the time.

Figure 2–9: Generation Stack and Load Duration Curve With New 380-MW 1x1 F-Class Combined Cycle

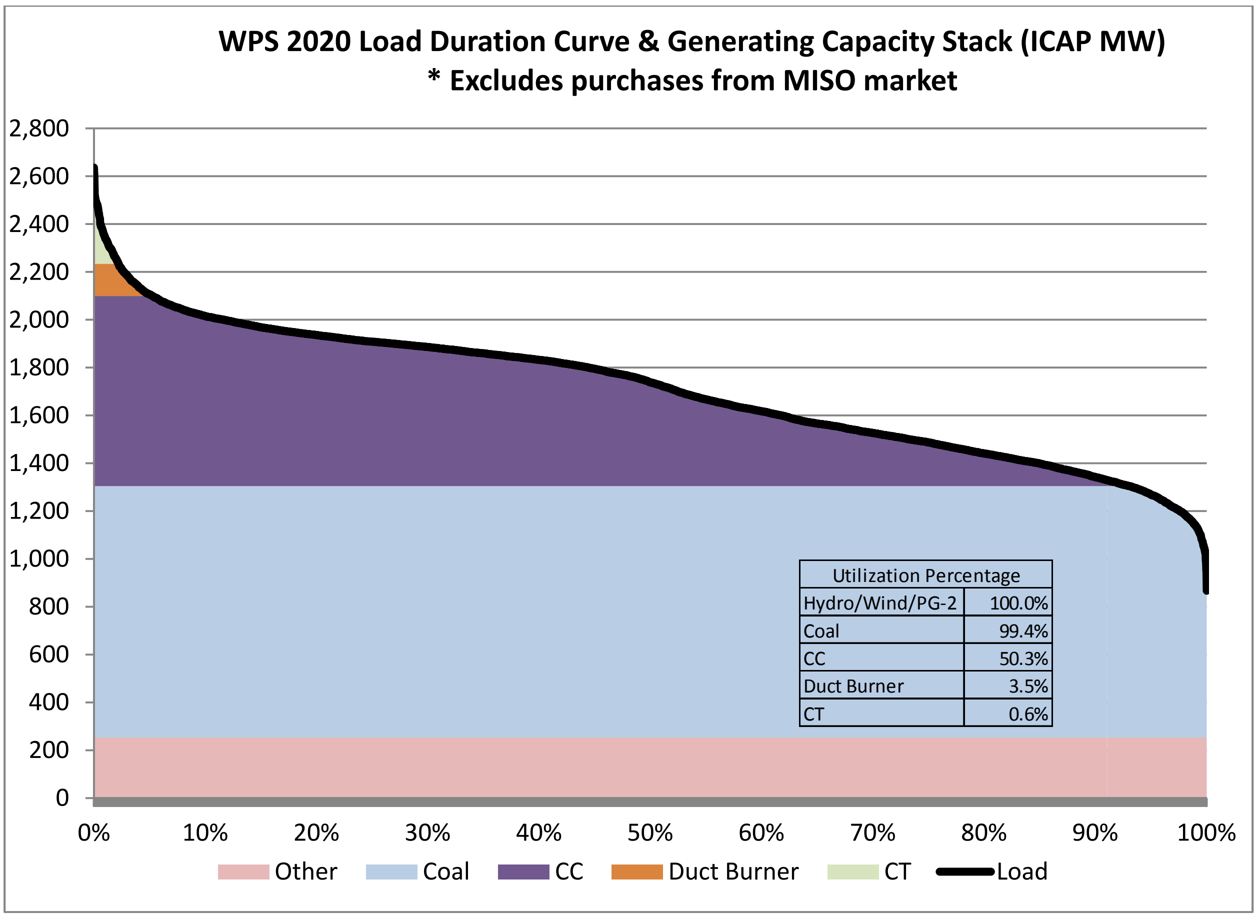
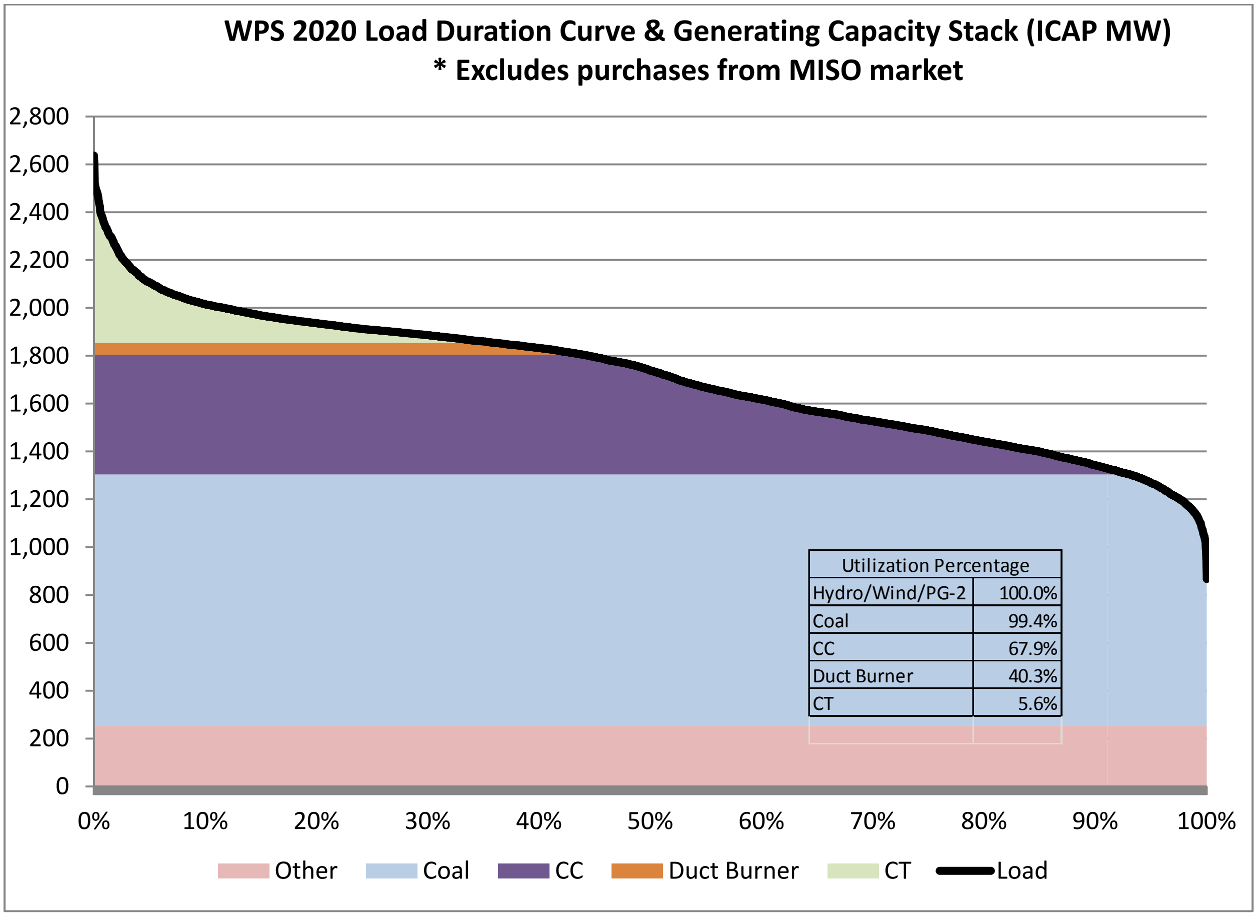


Figure 2–10: Generation Stack and Load Duration Curve With New 400-MW F-Class CT Farm



System Analysis:

The graphical analysis of the choice between simple cycle and combined cycle units does not account for how each new unit option interacts with the MISO market or the resulting impact it has on system PVRR.

In order to capture system impacts, WPS used the EGEAS model to determine which option would result in the lowest cost expansion plan. The resulting EGEAS expansion plans were modeled and simulated in the MIDAS detailed dispatch model. Uncertainty in energy cost was accounted for through 50 stochastic simulations of varying fuel prices, hourly demands, and corresponding market prices for each of the planning futures. The simulations were used to calculate life cycle PVRR for the portfolio assuming one or the other option.

In addition, WPS performed a “regrets” analysis. The reference Future (Future 1) reflects a market in which a blend of simple cycle combustion turbines and combined cycle units are built to maintain reserve margins in the Eastern Interconnect. This results in market prices that make a generic simple cycle combustion turbine alternative competitive with a generic combined cycle unit as long as WPS has access to the market. An alternative Future (Future 1 "Prime") was modeled to reflect a market in which only simple cycle CTs are built to maintain reserve margins. This future assumes the market believes simple cycle combustion turbine plants are more economic than combined cycle units.

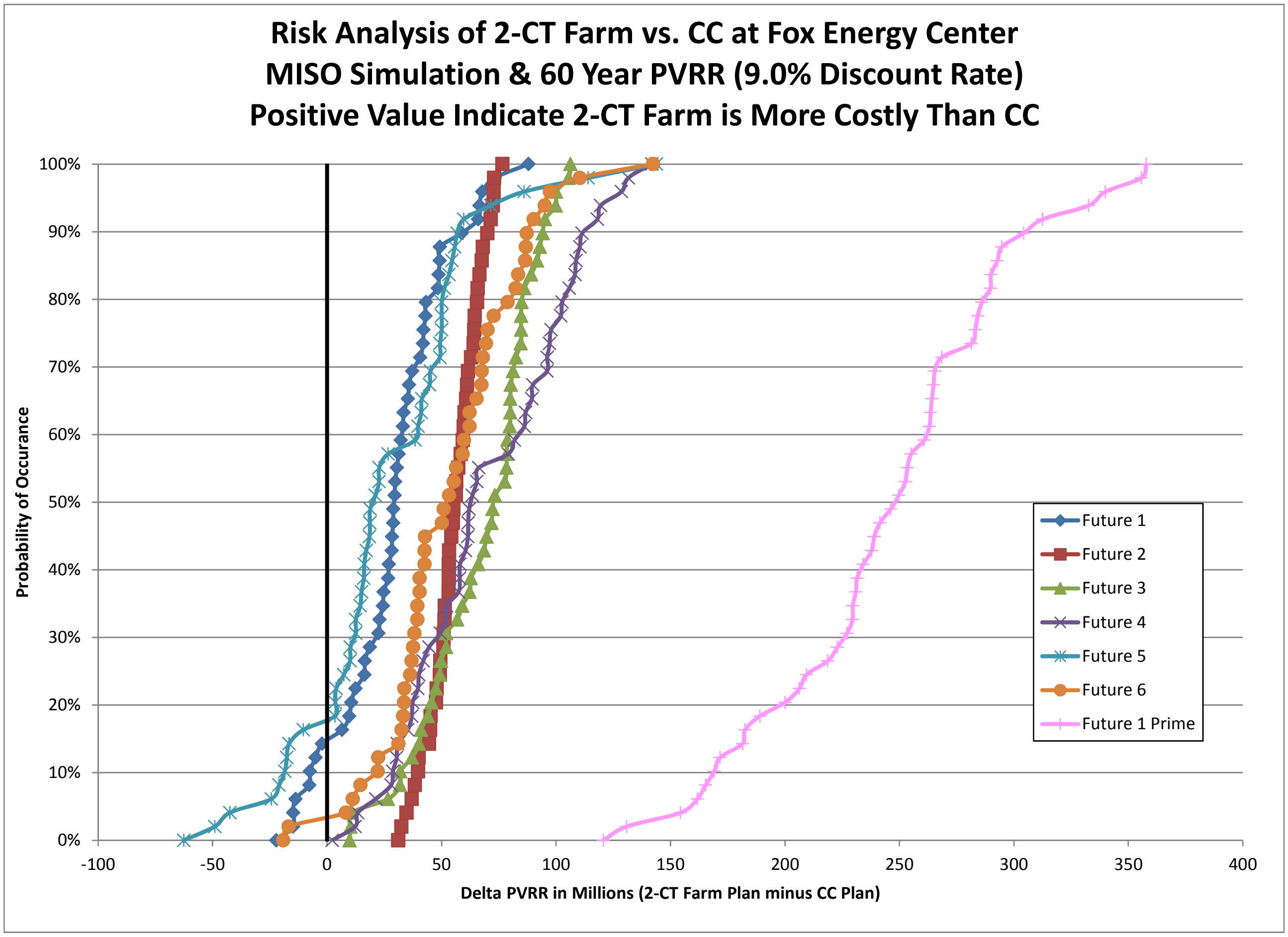
Table 2-15 provides the results of the economic analysis of the two gas technologies assuming a 9.0 percent discount rate. The table provides the increase in the expected value life cycle PVRR and the percent of outcomes resulting in a PVRR increase if a 400-MW Combustion Turbine Farm was installed at Fox as opposed to a 380-MW 1x1 combined cycle unit from the 50 stochastic simulations.

Table 2-15: 380-MW 1x1 Combined Cycle vs. 400-MW CT Farm Increase in PVRR (millions) with 400-MW CT Farm at Fox Energy

Planning Future	Expected Value Increase in PVRR with 400-MW CT Farm at Fox Energy	Percent of Outcomes Resulting in an Increase in PVRR with CT Farm
Future 1	28	84%
Future 2	56	100%
Future 3	67	100%
Future 4	70	100%
Future 5	26	82%
Future 6	54	96%
Future 1 "Prime"	244	100%

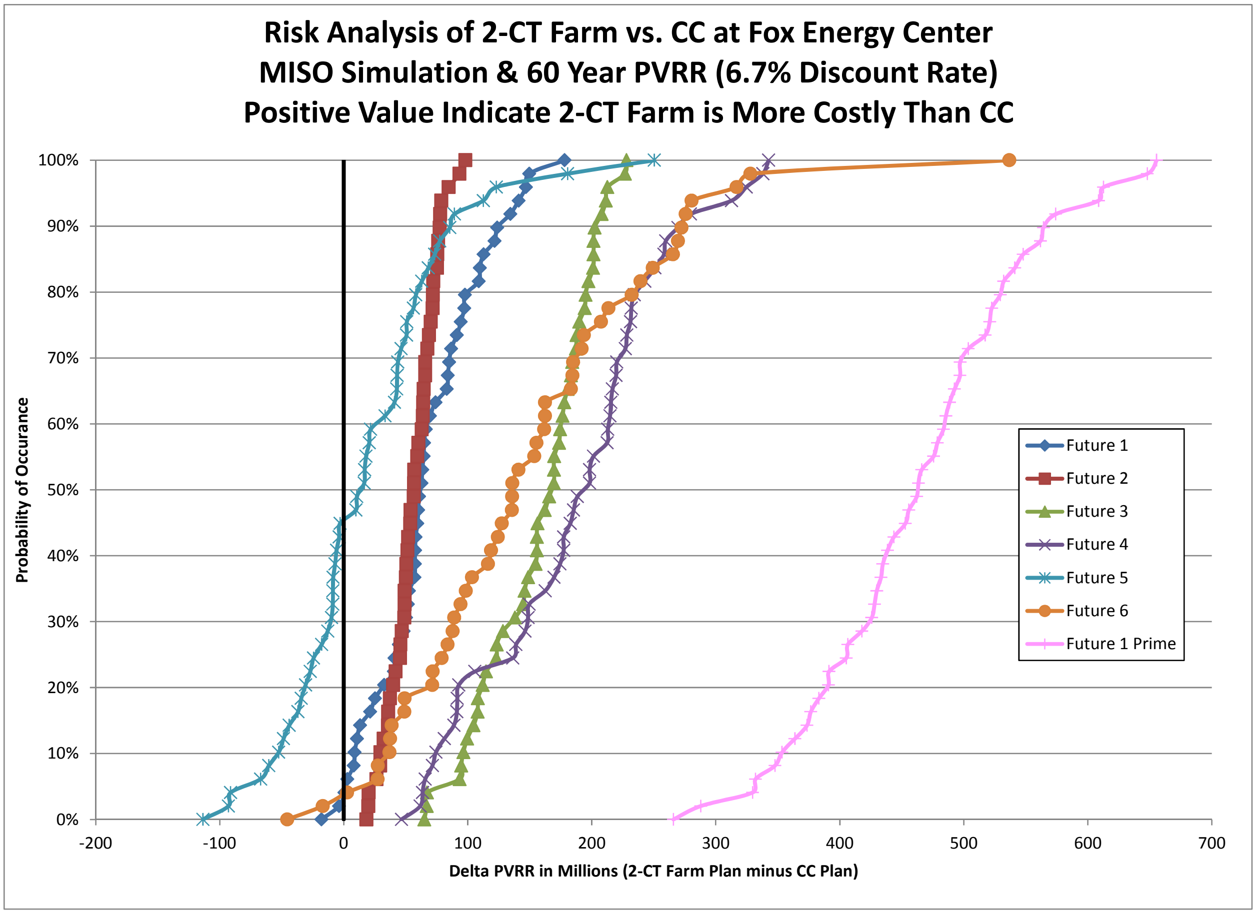
Figure 2–11 provides the risk profiles of the delta PVRR results from Table 2-15. Except for the tails of the risk profiles in three planning futures, the 400-MW simple cycle combustion turbine plant increases PVRR relative to a 380-MW 1x1 combined cycle unit. For the Future 1 "Prime," the 400-MW simple cycle combustion turbine plant increases PVRR between $121 million to $358 million relative to the 380-MW 1x1 combined cycle unit.

Figure 2–11: 380-MW 1x1 Combined Cycle vs. 400-MW CT Farm Risk Profiles of Delta PVRR (millions)



To provide a sensitivity comparison, WPS performed the same analysis with a lower discount rate (6.7 percent). With the exception of one planning future (Future 5 – MISO Environmental), a discount rate of 6.7 percent increases the magnitude of the delta PVRR compared to the same delta PVRR analysis using a 9.0 percent discount rate. This indicates the lower discount rate makes the selection of a 380-MW 1x1 combined cycle unit more economic than the 400-MW simple cycle combustion turbine plant. Figure 2–12 provides the risk profiles of the delta PVRR results from the sensitivity analysis using a lower discount rate.

Figure 2–12: 380-MW 1x1 Combined Cycle vs. 400-MW CT Farm Risk Profiles of Delta PVRR (millions) 6.7% Discount Rate Sensitivity



Accounting for WPS's ability to buy and sell into the MISO market and accounting for risk associated with market prices, the 380-MW 1x1 combined cycle unit at Fox Energy is the economic choice to fill the 2019 capacity need compared to 2-200-MW (400-MW CT farm) combustion turbines at Fox Energy.

2.4.5.3.5 Combined Cycle – F-Class versus Advanced Class

This phase of the analysis focused on the design attributes of a 1x1 combined cycle unit constructed on the Fox Energy site. A 380-MW F-Class 1x1 combined cycle unit was evaluated against a 450-MW Advanced Class 1x1 combined cycle unit. Table 2-16 summarizes a comparison of the key parameters for each combined cycle unit.

The incremental 67 MW increase in capacity from the Advanced Class technology would come at an incremental capital cost of $1,164/kW or $78 million.

Table 2-16: Comparison of Advanced Class vs F-Class CC
All Costs Shown in 2013$
Delta is Advanced Class minus F-Class Metric

Unit Parameter	Metric	Advanced Class	F-Class	Delta
Reserve Capacity (90 °F)	MW	447	380	67
Heat Rate (59 °F)	Btu/kWh	6,570	6,710	(140)
Capital Cost	$Million	472	394	78
Plant & Major Maintenance Costs	$Million/year	8.8	6.8	2.0
Firm Natural Gas Costs	$Million/year	7.8	6.3	1.5

Figure 2–13 and Figure 2–14 show the expected delta PVRR between the Advanced Class combined cycle and the F-Class combined cycle across the six planning futures analyzed. The evaluation considered a 30 year (2013-2042) and 60 year (2013-2072) study period, as well as a 9 percent and 6.7 percent discount rate.

Figure 2–13: PVRR Comparison – Advanced Class vs. F-Class CC
No Capacity or Energy Opportunity Sales

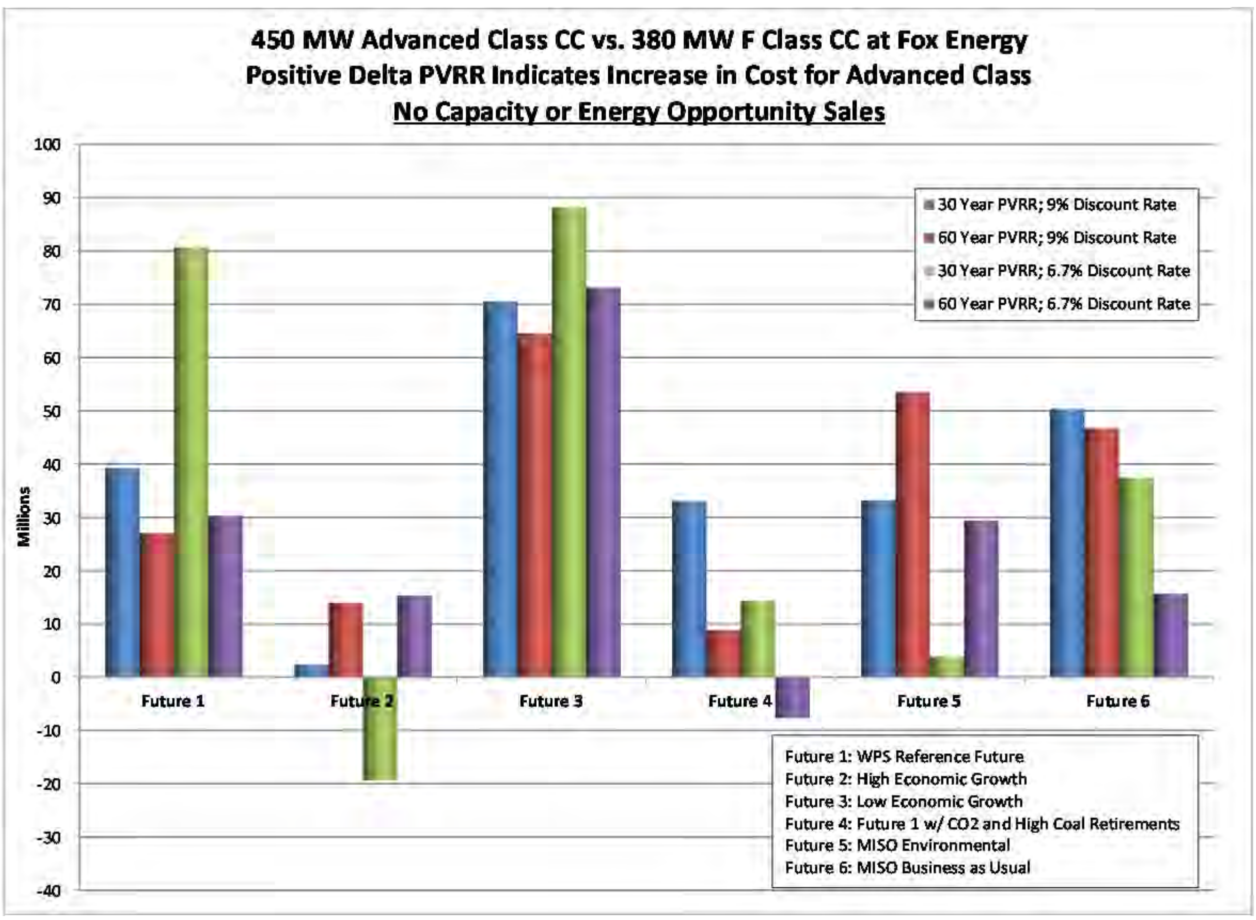
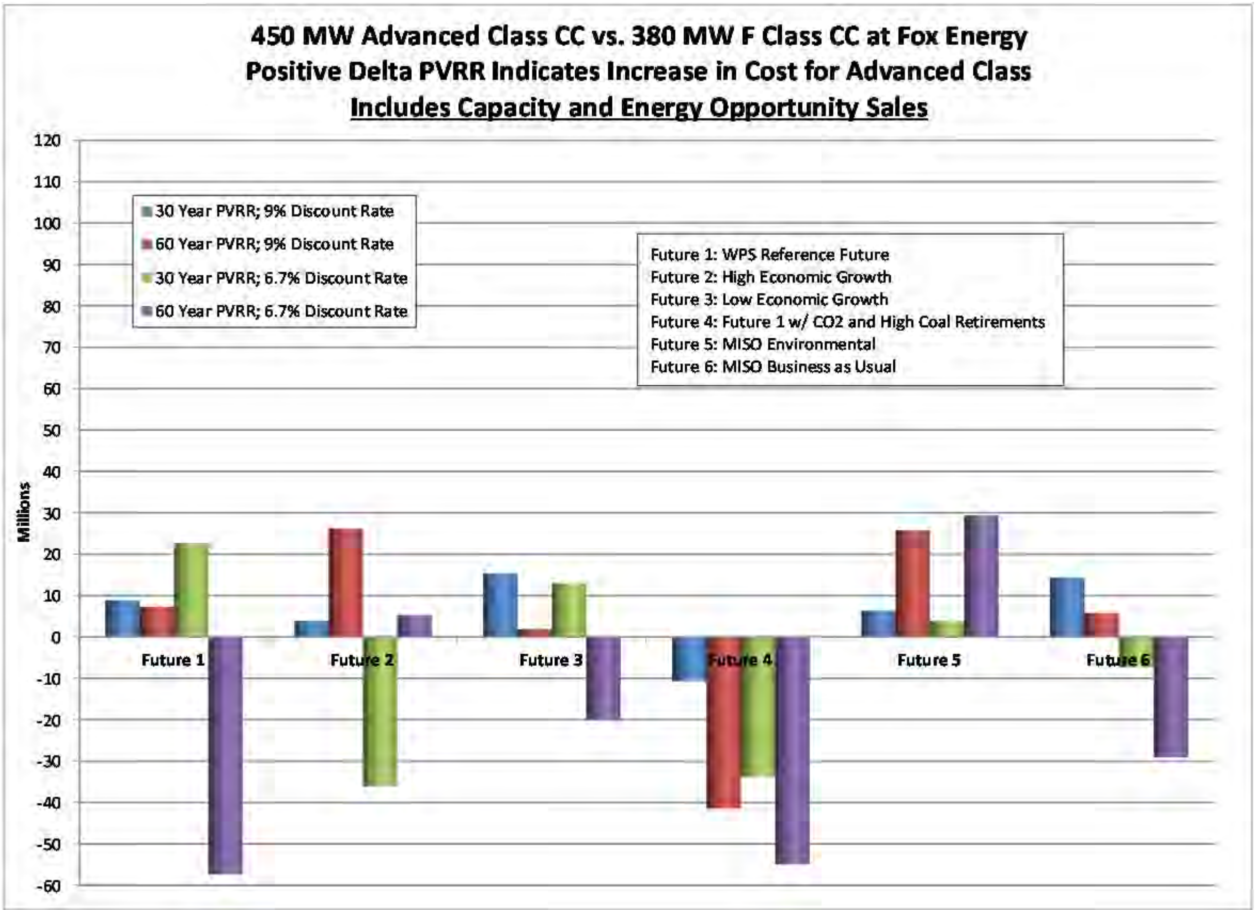


Figure 2–14: PVRR Comparison – Advanced Class vs. F-Class CC With Capacity & Energy Opportunity Sales



The following observations can be made from the results provided in Figure 2–13 and Figure 2–14:

1. Without the ability to generate capacity and energy opportunity sales, the results overwhelmingly indicate the F-Class combined cycle is a more economical unit at Fox Energy Center.
2. Even with the ability to generate capacity and energy opportunity sales, the Advanced Class combined cycle increases PVRR compared to the F-Class, assuming WPS's base assumption with a 9.0 percent discount rate, in five of the six futures analyzed. Only by using a lower discount rate, and then only in certain planning futures, do the results support the Advanced Class combined cycle over the F-Class combined cycle. This suggests most of the savings associated with the Advanced Class combined cycle occur in the later years of operation and are discounted less.

In addition to the results provided in the above figures, utilizing the F-Class combustion turbine technology complements the current F-Class combustion turbine technology already being utilized at Fox 1 and 2.

Based on these results, the decision was made to pursue the 1x1 F-Class combined cycle at the Fox Energy Center.

2.4.5.3.6 Natural Gas Technology Conclusions

Among the available gas technologies, the 1x1 F-Class combined cycle unit is being proposed for the Fox site because the unit:

1. Is the lowest cost supply option available to WPS to supply both capacity and energy beginning in June 2019.
2. Provides a better hedge against high energy market prices compared to a simple cycle combustion turbine.
3. Is a good match for the WPS 2019 capacity need, which is in the range of 202 to 508 MW. The 760-MW F-Class 2x1 combined cycle unit is larger than the 2019 capacity need.
4. Allows for operating synergy savings that more than offset the initial increase in transmission congestion and losses.
5. Is lower cost than the Advanced Class 1x1 combined cycle unit.

2.4.5.3.7 Oil

WPS did not assess oil-fired capacity. See Section 2.4.2.6 for discussion on screening analysis with coal and nuclear units.

2.4.5.3.8 Other Carbon-based Fuels

WPS did not assess other carbon-based fuels with sulfur content greater than 1 percent.

2.5 Wholesale Market Competition

In order to issue a CPCN for new generation facilities, the PSCW must find that they “will not have a material adverse impact on competition in the relevant electric wholesale market” (Wis. Stat. § 196.491(3)(d)7). Fox 3 will interconnect and operate within the wholesale electricity market administered by MISO. MISO provides transparent energy pricing and economic dispatch to a market consisting of over 175 GW of generation and 126 GW of electric load interconnected through 65,787 miles of transmission lines.[9] MISO commits and dispatches generation to serve load on an unbiased, least-cost basis through a centrally-dispatched security-constrained energy market. Offers from generation owners and bids from Load Serving Entities within MISO's energy market are closely monitored by an Independent Market Monitor (IMM) who is responsible for the identification and mitigation of market power abuses. Module D of the MISO Tariff contains the Market Monitoring and Mitigation Measures used by the IMM to provide fair, equitable and non-discriminatory access to the MISO energy market. The Market Mitigation Measures provide the means for MISO to mitigate the market effects of any conduct that may distort competitive outcomes in the Markets and Services administered by MISO.

The proposed project will interconnect to the transmission system owned by ATC. Fair and equitable access to ATC's transmission system is provided through the MISO Tariff and subject to the functional control of MISO. Since its inception in 2001, ATC has invested over $2.6 billion in additional transmission infrastructure to provide generators and load within the ATC system with comparable access to the broader MISO market.

Fox 3 will interconnect to the transmission system of the ATC and operate under the functional supervision of MISO and the IMM through the open-access and energy market provisions of the MISO Tariff. As such, Fox 3 will not have a material adverse impact on competition within the relevant electric wholesale market of MISO.

2.6 Excess Heat or Steam Energy

WPS continues to explore cogeneration opportunities in its service territory, which includes many customers in the papermaking and other industries that use steam in their production processes. WPS is willing to invest in cogeneration that provides (1) reasonably priced generation resources for its native load customers, (2) reasonably priced steam resources for its industrial customers, (3) fuel efficiency benefits for all of its customers through the use of cogeneration technology, and (4) potential uses for renewable fuels including waste products from the papermaking industry.

These opportunities cannot be forecasted unless WPS has commitments from steam hosts. WPS currently has no such commitments.

[9] MISO Corporate Information fact sheet dated March 2014.

3.0 PROJECT ENGINEERING

3.1 Facilities

The following sections describe the type of power plant proposed, proposed additions or expansions, operational hours, physical dimensions, operating characteristics, and heat balances.

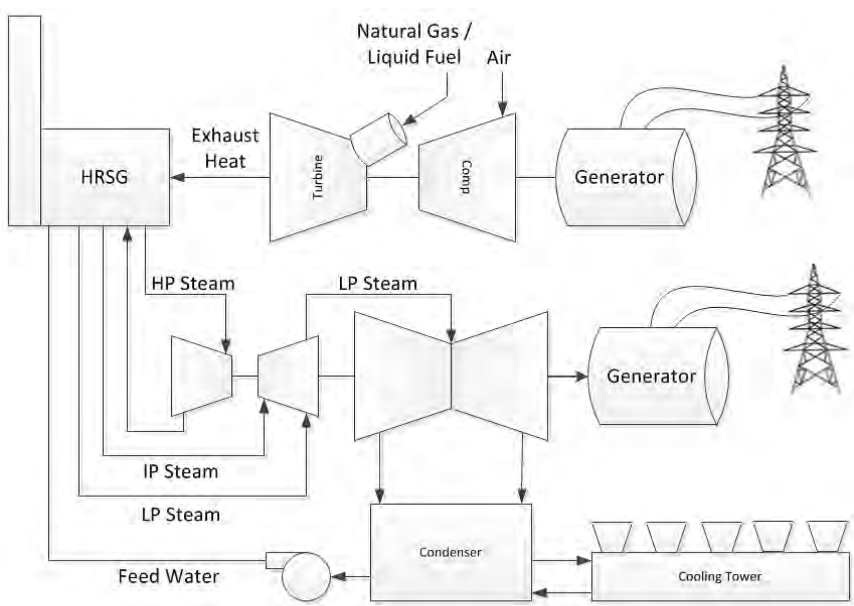
3.1.1 Type of Power Plant Proposed

Details of the proposed power plant are discussed below.

3.1.1.1 Description of Proposed Technology

The proposed technology for Fox 3 is a 1x1 combined cycle generating unit composed of a single CTG, a single HRSG and single STG. Figure 3–1 is a diagram of the combined cycle power plant. This combination uses a high temperature Brayton gas turbine cycle with a multiple pressure Rankine steam cycle. The combustion turbine is coupled to a generator and creates the waste heat used as the source for the Rankine steam cycle. In a conventional steam generating facility, the heat must be created from a boiler, which reduces the efficiency as compared to a combined cycle facility. At a simple cycle facility, the gas turbine exhaust heat is vented to the atmosphere, reducing the efficiency of the facility. The integration of the two thermodynamic cycles increases the efficiency above what can be achieved with either cycle alone. Greater plant efficiency means less fuel burned and less emissions per unit of electrical output as compared to a conventional steam cycle or a simple cycle combustion turbine.

Figure 3–1: Combined Cycle Power Plant



3.1.1.2 Major Power Generation Equipment

The major power generation equipment includes the CTG, STG, and HRSG that are described below.

3.1.1.2.1 Combustion Turbine Generator

The CTG is of F-class technology and consist of a 3,600 revolutions per minute (rpm) generator driven by a combustion turbine. The combustion turbine compressor section compresses the inlet air and conveys it to the combustion section of the turbine where fuel is introduced and combustion takes place.

Dry low-NO_x combustors minimize NO_x formation while firing natural gas. The hot combustion products expand through a multi-stage power turbine that captures energy to drive both the compressor and generator. Evaporative coolers condition the combustion turbine inlet air to enhance electrical generating capacity of the CTG during warm ambient air conditions.

The CTG is designed to operate in dry low-NO_x mode at loads from approximately 50 to 100 percent baseload rating. Operation at loads below the minimum emissions compliance load will only occur during start-up and shutdown. The CTG is also capable of running on fuel oil as backup during periods of gas curtailment. The CTG is designed to operate with water injection to control NO_x when running on fuel oil.

3.1.1.2.2 Steam Turbine Generator

The STG consists of a 3,600 rpm generator driven by a tandem compound, reheat, condensing steam turbine. The STG is designed to accept steam from the HRSG. High-pressure (HP) steam from the HRSG is admitted to the HP turbine. The steam leaves the HP turbine where it returns to the HRSG for reheating after mixing with intermediate-pressure (IP) steam from the HRSG. The reheated steam returns to the STG where it is admitted to the IP section. After passing through the IP section, the steam enters the low-pressure (LP) section of the turbine where it mixes with LP steam produced in the HRSG and is finally exhausted into the condenser.

3.1.1.2.3 Heat Recovery Steam Generator

The HRSG acts as a heat exchanger to preheat natural gas for the combustion turbine, heat feedwater, and produce steam at three pressure levels using the heat from the combustion turbine exhaust gases. The HRSG admits HP steam and LP steam to the steam turbine. The HRSG also receives cold reheat steam from the exhaust of the HP STG, further adding to the steam flow and heating the steam before re-admitting to the STG as hot reheat steam. Supplemental firing with low-NO_x natural gas burners provides additional steam production. Selective catalytic reduction (SCR) and an oxidation catalyst will be installed to control NO_x, carbon monoxide (CO) and volatile organic compounds (VOC) emissions post-combustion.

3.1.1.3 Major Systems

Major systems described below include natural gas, backup fuel, plant water, circulating water, process water, wastewater, and emissions control.

3.1.1.3.1 Natural Gas

ANR currently provides natural gas to the Fox Energy Center. The existing 16-inch WPS lateral from ANR's Kaukauna Gate Station to the Fox Energy Center site has sufficient capacity to provide service to Fox 3 (in addition to Fox 1 and 2). The on-site metering station monitors the natural gas flow rate serving the site. Modifications will be made to the existing metering station to meter the gas to Fox 3.

Two natural gas-fired, dew point heaters warm up the incoming natural gas fuel to prevent freezing of the gas regulating valves under certain gas system operating conditions and to maintain the minimum natural gas superheat requirement by the CTG manufacturer. The heaters will be capable of operating 8,760 hours per year.

Two electric natural gas compressors may be required, dependent upon the requirements of the CTG, to increase natural gas pressure to the minimum required. When the compressors are in operation, the natural gas does not pass through the dew point heaters as the heat of compression heats the gas.

A natural gas scrubber and natural gas filter/separator will remove both particulate matter and liquids from the gas prior to entering the combustion turbine. Liquid level control systems automatically maintain safe levels of accumulated liquids in the scrubbers and filter/separators. A drain tank receives mixed drains from the scrubbers and filter/separators and safely separates and vents natural gas from the waste drain stream.

A shell and tube natural gas performance heater heats the natural gas prior to entering the combustion turbine and increases plant efficiency. The heating medium is IP feedwater diverted after the IP economizer section that is returned to the cycle.

3.1.1.3.2 Backup Fuel

The backup fuel for the combustion turbine is ultra-low sulfur fuel oil. Fuel oil can be utilized by the combustion turbine when natural gas is unavailable. Fuel oil is currently stored on-site and additional storage and unloading facilities are not be required for Fox 3. The existing fuel oil storage is capable of providing approximately 12 hours of full load operation for all three combustion turbines—Fox 1, Fox 2, and Fox 3—at the site.

3.1.1.3.3 Plant Water Systems

The primary water use for Fox 3 include steam cycle makeup, cooling tower makeup, service water, NO_x injection water, evaporative cooling water makeup, and service water. The new water systems maximize water reuse and recycling, minimize water consumption, and manage the water quality within the plant systems and wastewater discharges to the Fox River. Currently, the existing Fox 1 and 2 source wastewater is from HOV. The HOV was established in 1974 to treat wastewater from the City of Kaukauna; Villages of Little Chute, Kimberly and Combined Locks; and the Darboy Sanitary District. The HOV served roughly 48,000 people as of 2010.

Treated effluent from HOV is used for process water needs. Water is supplied via an existing 4-mile long pipeline that currently serves the existing facility from HOV wastewater treatment plant (See Volume I: Appendix Y HOV Water Supply Map). The existing 5 MG storage pond and a new 10 MG storage pond will supply water for all three units.

3.1.1.3.4 Circulating Water System

The circulating water system supplies cooling water to condense the LP turbine exhaust steam and for closed loop cooling requirements, such as equipment lube oil coolers. An induced-draft cooling tower cools the circulating water primarily through evaporation. Makeup water is supplied through a new pump house to be located near the proposed storage pond. The circulating water is chemically treated to control pH and prevent scale formation, corrosion, and biological fouling.

3.1.1.3.5 Process Water Systems (Service/Demineralized)

During a pre-treatment process, the incoming water from HOV is softened in a cold lime softening clarifier system currently located at Fox Energy Center. The pre-treatment process creates the service water for the Fox Energy Center. The service water is stored in the existing 5 MG storage pond and the new 10 MG storage pond.

The service water system supplies water for the evaporative cooler, quenching the boiler blowdown, and the demineralizer. The demineralizer removes minerals from the water to make it suitable for use in the heat recovery steam generator and for water injection (NO_x injection) to the CTG when running on fuel oil. The service water is chemically treated to control pH and prevent scale formation, corrosion, and biological fouling. Demineralized water is chemically treated to control pH and corrosion.

3.1.1.3.6 Wastewater System (Process Water)

With the addition of Fox 3, the facility is required to treat the additional process wastewater associated with Fox 3 to ensure compliance with WPDES permit limits. Cooling tower blowdown from both towers (proposed and existing tower) ties into a new solids contact units for post treatment. The solids contact units effluent discharges into a common wastewater sump for the Fox Energy Center site. The discharge from the wastewater sump uses the existing wastewater discharge pipeline to the Fox River.

Oily wastes are collected and treated in an oil/water separator. Non-oily effluent from the oil/water separator is collected in a wastewater collection sump and discharged into the cooling tower basin.

3.1.1.4 Emissions Control Systems

Several types of emissions control systems are planned for Fox 3. NO_x control is achieved through a combination of low-NO_x burners and a SCR system. An oxidation catalyst controls CO and VOC emissions.

3.1.1.4.1 NO_X Control

Nitrogen oxide production is minimized through the use of low-NO_x burners in the combustion turbine and supplemental HRSG duct burners. NO_x emissions from the HRSG is subsequently reduced by a SCR system. In a SCR system, NO_x reacts with ammonia in the presence of a catalyst to form nitrogen gas and water. Ammonia is vaporized and introduced to the SCR upstream of the catalyst bed through a series of injection nozzles. The SCR system must be operated within a narrow temperature range (about 600 – 800 degrees Fahrenheit (^oF)) to achieve good NO_x removal, and will be located in the proper temperature zone as recommended by the HRSG supplier.

3.1.1.4.2 Oxidation Catalyst

CO and VOC are reduced by an oxidation catalyst. An oxidation catalyst is a post-combustion treatment technology that removes CO and VOC from the exhaust gas after formation in the combustion turbine and HRSG duct burners. In the presence of a catalyst, CO and VOC react with oxygen present in the exhaust stream, converting CO to CO_2, and VOC to CO_2 and water vapor. Oxidation catalysts operate best at temperatures greater than 700 ^oF, and will be located in the proper temperature zone as recommended by the HRSG supplier.

3.1.1.4.3 Continuous Emissions Monitoring

A continuous emissions monitoring system, as required pursuant to 40 CFR Parts 60 and 75, will be installed.

3.1.1.5 Balance of Plant

The balance of plant components described in the following sections include the stack, wastewater treatment, fire protection system, potable water system, sampling and analysis system, and ammonia storage and supply system.

3.1.1.5.1 Stack

Exhaust gases are discharged to the atmosphere via an exhaust stack from the HRSG. The stack is self-supporting and constructed of carbon steel. The estimated height of the stack is 175 feet.

3.1.1.5.2 Wastewater Treatment (Sanitary)

Sanitary wastewater from the Fox Energy Center bathrooms, showers and other employee areas is collected and routed to an interconnection with the Village of Wrightstown municipal sewer system for off-site treatment. The existing sanitary holding tanks for the site administration and water treatment buildings is replaced with lift stations. Each lift station pumps sanitary sewage to a common Fox Energy Center 3 sanitary lift station, which discharges to the Village of Wrightstown municipal sewer system.

3.1.1.5.3 Fire Protection System

A complete fire protection system for Fox 3 is supplied from the existing service water system. The existing firewater ring header is extended to the new site. Firewater is transferred through the distribution header to supply fire hydrants and water suppression stations. A secondary firewater source is provided from the Fox 3 cooling tower basin.

3.1.1.5.4 Potable Water System

The Village of Wrightstown municipal water supply will be used by both the new and existing facilities to provide on-site potable water for domestic purposes and replaces the use of well water, which is currently used for the existing Fox 1 and 2 units. The existing wells will be abandoned.

3.1.1.5.5 Sampling and Analysis System

The sampling and analysis system will provide a means to monitor the performance and operation of the steam-condensate-feedwater cycle and circulating water system, as well as the quality of various process fluids.

3.1.1.5.6 Ammonia Storage and Supply System

The ammonia storage and supply system will receive, store and transfer aqueous ammonia to the SCR system of the Fox 3 HRSG. The existing ammonia storage tank provides suction to existing forwarding pump skids, which serve the existing facility, and to a new transfer pump skid, which will serve the new facility. Ammonia will be transferred to a day tank (new) located at the new facility and then pumped from the day tank to the ammonia vaporization system at the HRSG.

3.1.2 Proposed Additions, Expansion, or Modifications

When WPS completed the siting study for the new natural gas facility, it evaluated the ability of the existing facility property (approximately 109 acres) to accommodate another natural gas facility. The siting study identified one potential location in the southeast corner of the property (Site Option 1 as described in Section 1.3.1).

Since the time the siting study was completed, WPS acquired additional acreage (approximately 75 acres in late 2013) to increase the total acreage of the Fox Energy Center to 184 acres.

The four siting options were selected through a physical space evaluation. Site Option 1 and Site Option 2 are proposed in this application and described in Section 1.3.1. Site Option 3 is to the west of Site Option 1 and is generally shown in Volume I Appendix I, Figure I-1. Site Option 4 is a mirror of Site Option 1 and is shown in Volume I Appendix I, Figure I-2.

WPS selected Site Option 1 and Site Option 2 for this application based upon a number of environmental factors identified without detailed studies such as sound level assessment, cooling tower plume studies, and air emission modeling. Site Option 1 is located in the northern portion of the WPS property, and Site Option 2 is located in the southeast area of the property.

If Site Arrangement Site Option 1 is selected by the PSCW as the best alternative, Site Option 2 would remain available as a potential future site arrangement. Site Option 4 would also be available as a mirror of Site Option 1.

If Site Option 2 is selected by the PSCW as the best alternative, Site Option 1 and its mirror site (Site Option 4) would remain available as potential future site arrangements.

Site Option 3 is not considered a viable arrangement site because of its perceived conflicts with social factors (noise, plume impacts, etc.) due to the close proximity of the cooling tower to several residences and US 41. There are also other physical site arrangement concerns that would need to be overcome such as the presence of a groundwater seep on the side of the hill and the need to complete a major change in the topography to create a flat arrangement for the site construction.

3.1.3 Expected Hours of Operation and Capacity

The capacity factor of a power plant is the actual output of a plant over a period of time compared to its potential output if it had operated at full nameplate capacity the entire time. It generally relates to how often a plant is run during a year and is expressed as a ratio or a percentage. For instance, new, more efficient combined cycle plants might have a capacity factor of 50 percent, while older, less efficient combined cycle plants might have a capacity factor of 20 percent.

There are a number of factors that will affect the capacity factor of Fox 3, including natural gas and fuel oil pricing, temporary transmission constraints, the efficiency of the facility, maintenance requirements, etc. Based on current projections, the plant is expected to run at the capacity factors in Table 3-1 for the first 10 years following commercial operation.

Table 3-1: Fox 3 Forecasted Operations

	Operating Capacity [1] - MW												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2019	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2020	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2021	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2022	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2023	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2024	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2025	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2026	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2027	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7
2028	336.5	336.5	338.9	338.9	338.9	332.4	332.4	332.4	338.9	338.9	338.9	336.5	336.7

	Hours of Operation												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2019	455	404	346	43	390	426	597	558	334	298	338	428	4,617
2020	471	431	380	43	354	400	581	572	326	320	409	434	4,721
2021	427	381	344	37	316	383	588	559	350	280	466	478	4,609
2022	444	365	315	13	314	379	579	541	317	265	309	413	4,254
2023	434	69	289	306	351	424	596	545	309	281	379	406	4,389
2024	449	376	334	29	259	396	577	548	314	310	410	474	4,476
2025	497	385	339	28	294	375	588	546	302	282	345	395	4,376
2026	438	353	31	340	324	394	592	547	302	267	377	435	4,400
2027	395	395	42	338	282	376	587	550	299	311	380	416	4,371
2028	443	362	361	0	191	339	598	524	269	308	323	370	4,088

	Generation - MWh												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2019	136,149	118,528	111,340	11,960	118,237	130,666	181,865	166,851	108,607	98,111	103,750	127,582	1,413,645
2020	138,591	125,478	119,779	12,482	110,566	125,671	178,427	173,555	106,146	99,783	119,645	128,390	1,438,513
2021	127,592	113,843	112,056	11,494	101,173	121,704	180,924	170,772	112,709	92,805	134,769	139,899	1,419,741
2022	133,312	110,536	102,228	4,406	101,018	120,025	176,138	165,121	107,436	86,188	99,557	125,294	1,331,259
2023	130,130	20,440	95,333	100,582	114,080	131,908	181,713	164,913	103,437	92,030	116,718	122,256	1,373,539
2024	134,485	113,403	107,476	9,829	84,643	123,603	178,888	164,714	104,239	101,836	119,828	138,044	1,380,987
2025	147,167	115,362	111,581	9,490	98,247	119,352	176,661	163,365	100,174	92,636	107,826	120,111	1,361,974
2026	131,293	106,152	10,332	111,398	107,369	125,509	179,007	163,878	100,087	87,180	112,149	129,438	1,363,790
2027	118,381	117,959	13,712	112,462	93,309	120,026	176,832	167,097	100,164	98,988	112,313	124,919	1,356,162
2028	130,900	108,725	114,018	0	63,165	107,229	175,713	158,445	90,053	100,805	101,009	110,825	1,260,886

	Starts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2019	10	9	20	2	18	18	13	15	19	21	16	13	174
2020	8	10	17	2	16	22	15	15	18	19	9	9	160
2021	5	11	22	3	17	21	12	16	20	18	11	10	166
2022	7	14	16	1	17	20	13	16	22	18	18	11	173
2023	9	0	18	18	20	20	12	19	20	19	17	15	187
2024	8	13	18	3	17	18	15	16	20	20	9	12	169
2025	8	11	21	3	19	21	14	15	20	19	17	17	185
2026	9	11	2	19	21	22	11	16	20	17	12	10	170
2027	7	10	3	21	18	22	12	15	21	21	15	12	177
2028	7	14	20	0	13	18	11	15	19	20	15	11	163

	Capacity Factor - %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2019	54.4	52.4	44.2	4.9	46.9	54.6	73.5	67.5	44.5	38.9	42.5	51.0	47.9
2020	55.4	55.5	47.5	5.1	43.8	52.5	72.1	70.2	43.5	39.6	49.0	51.3	48.8
2021	51.0	50.3	44.4	4.7	40.1	50.9	73.2	69.1	46.2	36.8	55.2	55.9	48.1
2022	53.3	48.9	40.5	1.8	40.1	50.2	71.2	66.8	44.0	34.2	40.8	50.0	45.1
2023	52.0	9.0	37.8	41.2	45.2	55.1	73.5	66.7	42.4	36.5	47.8	48.8	46.6
2024	53.7	50.2	42.6	4.0	33.6	51.6	72.3	66.6	42.7	40.4	49.1	55.1	46.8
2025	58.8	51.0	44.3	3.9	39.0	49.9	71.4	66.1	41.1	36.7	44.2	48.0	46.2
2026	52.4	46.9	4.1	45.7	42.6	52.4	72.4	66.3	41.0	34.6	46.0	51.7	46.2
2027	47.3	52.2	5.4	46.1	37.0	50.2	71.5	67.6	41.0	39.3	46.0	49.9	46.0
2028	52.3	48.1	45.2	0.0	25.1	44.8	71.1	64.1	36.9	40.0	41.4	44.3	42.8

	Average Hours Per Start												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2019	46	45	17	22	22	24	46	37	18	14	21	33	27
2020	59	43	22	22	22	18	39	38	18	17	45	48	30
2021	85	35	16	12	19	18	49	35	18	16	42	48	28
2022	63	26	20	13	18	19	45	34	14	15	17	38	25
2023	48	0	16	17	18	21	50	29	15	15	22	27	23
2024	56	29	19	10	15	22	38	34	16	16	46	40	26
2025	62	35	16	9	15	18	42	36	15	15	20	23	24
2026	49	32	16	18	15	18	54	34	15	16	31	44	26
2027	56	40	14	16	16	17	49	37	14	15	25	35	25
2028	63	26	18	0	15	19	54	35	14	15	22	34	25

Source: MIDAS Detailed Dispatch Model for Reference Future (EPC 2014 Approved Planning Assumptions)

[1] Data provided does not include expected operation of the duct burning capacity.

3.1.4 Facilities' Physical Dimensions

Fox 3's physical dimension and expected appearance are provided in drawings and photo simulations.

3.1.4.1 Project Drawings (1.1.11)

See Volume I Appendix B (Site Arrangements) for detailed scale drawings of all the proposed plant facilities for each site.

3.1.4.2 Photo Simulations

See Volume I Appendix Z for photo simulations of the proposed plant facilities for each site.

3.1.5 Operating Characteristics

This section describes Fox 3's operating characteristics. These characteristics include the heat rate, water balance, availability and maintenance.

3.1.5.1 Heat Rate

Table 3-2 and Table 3-3 provide estimated heat rates for each of the two potential combustion turbines currently considered Fox 3 at various load conditions based on the design summer ambient conditions. The load conditions specified by the PSCW are not consistent with the terminology used for combined cycle plants such as Fox 3. The load conditions provided in Table 3-2 correspond to the PSCW-specified load conditions as follows:

- Minimum Load Operation – CTG operating at minimum emissions compliance load which is approximately 40-50 percent load on the CTG.
- Half Load Operation – This load is equivalent to minimum load operation; therefore, this report provides an alternate load with the CTG at 75 percent of base load operation.
- Rated Load Operation – CTG operating at base load without supplemental firing of the HRSG.
- Maximum Load Operation – CTG operating as base load with supplemental firing of the HRSG.

Table 3-2: Heat Rates (GE 7FA)

Operating Mode at Summer Design Conditions	Net Plant Heat Rate HHV[1] (Btu/kWh)	Net Output (kW)
Minimum load	7,814	150,432
Half load	6,914	231,021
Rated load - Base load, unfired	6,751	309,041
Maximum load	7,102	383,632

[1] Higher heating value – HHV Source: Black & Veatch 2014

Table 3-3: Heat Rates (Siemens SGT6-5000F)

Operating Mode at Summer Design Conditions	Net Plant Heat Rate HHV (Btu/kWh)	Net Output (kW)
Minimum Load	7,639	160,861
Half Load	6,979	246,674
Rated Load or Base load, unfired	6,749	328,159
Maximum Load	7,113	409,877

Source: Black & Veatch 2014

3.1.5.2 Equivalent Availability and Capacity Factors

Following the initial commercial operation break-in period, the expected availability of Fox 3 including planned maintenance is approximately 91 percent. The reliability index for Fox 3 is approximately 94 percent, which is the expected availability excluding planned maintenance with planned maintenance accounting for approximately 2 percent of unavailability. Equipment and design issues encountered during initial equipment break-in will likely reduce the availability and the reliability indices.

3.1.6 Heat Balances

Heat balances are provided for each of the two potential combustion turbines currently considered for Fox 3. Heat balances at the summer design conditions and the following load points are provided in Volume I Appendix AA.

- Minimum CTG Emissions compliance load – Case 6
- 75 percent CTG load – Case 5
- Base load, unfired – Case 3
- Base load with duct firing – Case 1

3.2 Fuel Supply

The following sections describe fuel sources, availability, heating value, and delivery systems.

3.2.1 Proposed Primary and Backup Fuels

Fox 3 uses natural gas for the primary fuel and fuel oil for backup fuel.

3.2.1.1 Primary Fuel – Natural Gas

ANR currently provides natural gas to the Fox Energy Center. The existing 16-inch WPS lateral from ANR's Kaukauna Gate Station to the Fox Energy Center site has sufficient capacity to provide service to Fox 3 (in addition to Fox 1 and Fox 2). The on-site metering station will monitor the natural gas flow rate serving the site. Modifications will need to be made to the existing metering station to meter the gas to the Fox 3 unit.

3.2.1.2 Backup Fuel – Fuel Oil

The backup fuel for Fox 3 is ultra-low sulfur fuel oil, as it is for Fox 1 and Fox 2. Fuel oil is currently stored on-site and additional storage and unloading facilities are not required for Fox 3. The existing fuel oil storage is capable of providing approximately 12 hours of full load operation for all three combustion turbines.

3.2.2 Fuel Source and Availability

Natural gas supply for the Fox Energy Center is planned to be purchased in the Joliet Hub area near Chicago and transported to the Fox Energy Center on ANR. Natural gas supply is transported to the Joliet Hub area through interstate pipelines from gas produced in Canada, the U.S. mid-continent, the Gulf of Mexico, the Bakken, and the Marcellus/Utica areas. In addition, the Joliet Hub area has access to natural gas storage located in Michigan and Illinois. WPS anticipates that ample gas supplies at reasonable market prices will continue to be available in the Joliet Hub area.

The backup fuel oil is expected to be sourced from the Green Bay terminal, which has several suppliers and serves the existing Fox 1 and 2 as well as other existing WPS sites. Fuel oil is available around the clock on a daily basis from the Green Bay terminal. WPS expects to use fuel oil when secondary firm capacity and/or interruptible pipeline capacity is not available or uneconomical.

3.2.3 Potential Fuel Heating Value

Each interstate pipeline’s tariff contains standards with respect to the heating value and the chemical make-up of the natural gas to be transported on their pipeline. Natural gas entering each interstate pipeline must meet the gas quality specification in that pipeline tariff. Generally, each interstate pipeline’s tariff specifies that the natural gas shall be commercially free from objectionable odors, dust, water, and any other solid or liquid matter that might interfere with its merchantability or cause injury to or interference with proper operation of the equipment through which it flows and any substance that might become separated from the gas in the pipeline’s facilities.

The complete gas quality specifications for ANR can be found in its FERC Gas Tariff, Third Revised Vol. No. 1, Part 6.13 (General Terms and Conditions) – Quality. For example, the following representative specifications can be found in ANR’s above referenced tariff:

- Heating value not above 1,200 Btu per cubic feet of natural gas.

- The natural gas cannot contain more than 20 grains of sulfur per 100 cubic feet.
- The natural gas cannot contain more that 2 percent CO_2 by volume.

Because natural gas is received into interstate pipelines at various locations in the natural gas production areas (if it meets the pipeline tariff specification) and the gas may move through several interstate pipelines before being delivered to market utilization point, like the Joliet Hub area, blending of the gas occurs, creating little significant variation in the make-up of the natural gas being delivered into Wisconsin through any interstate pipeline.

3.2.4 Fuel Delivery System

Natural gas is transported via the existing ANR pipeline that currently serves the Fox Energy Center. Modifications will need to be made to the existing metering station to meter the gas to Fox 3.

Fuel oil is loaded into transport tanker trucks by the fuel oil supplier at the Green Bay terminal and transported to the Fox Energy Center, where it is pumped into one of the on-site fuel oil storage tanks. The trucks are provided by the fuel oil supplier who is responsible for making the deliveries. A typical tanker truck holds between 7,000 and 7,500 gallons of fuel oil.

3.2.5 Natural Gas

Further details of the natural gas to be supplied for the Fox 3 project are discussed below.

3.2.5.1 Pipeline Supplier

ANR currently provides natural gas to the Fox Energy Center. The existing 16-inch lateral from the Kaukauna ANR gate station to the Fox Energy Center site has sufficient capacity to provide service to Fox 3 (in addition to Fox 1 and 2). The on-site metering station monitors the natural gas flow rate serving the site. Modifications will be made to the existing metering station to meter the gas to the Fox 3 unit.

3.2.5.2 Fuel Supply

Below is a discussion of the fuel supply in terms of firm, secondary firm, and interruptible capacity.

3.2.5.2.1 Primary Firm Capacity

WPS has an annual FTS-3 firm gas transportation agreement for 25,600 Dth/day with ANR. The receipt point for this FTS-3 agreement is the Joliet Hub (Alliance interconnect) and the delivery point is Kaukauna.

3.2.5.2.2 Secondary Firm Capacity

At its maximum 24-hour fuel consumption rate of 69,600 Dth/day natural gas consumed by Fox 3 could be delivered under capacity obtained in the capacity release market or through City Gate deliveries (packaged gas supply and capacity) provided by a third party. Gas transportation capacity obtained from the capacity release market or from a third party will most likely be secondary firm in-path or out-of-path capacity. Since ANR designs for peak capacity, Secondary Firm Capacity should be available to WPS to transport natural gas to the Fox Energy Center for all but the coldest days during the year.

3.2.5.2.3 Interruptible

WPS is not planning on using interruptible pipeline capacity to deliver natural gas supply to Fox 3. However, using interruptible capacity is an option WPS can use under certain circumstances such as during periods when Secondary Firm Capacity is unavailable.

3.2.5.3 Natural Gas Pipeline Characteristics

ANR currently provides natural gas to the Fox Energy Center. ANR's interstate gas transportation system serving Wisconsin provides access to gas supplies located in the Joliet Hub area, Texas/Oklahoma (Mid-continent), and the Gulf of Mexico. In addition, ANR provides additional gas transportation services such as Gas Storage, No-Notice Load Balancing, and short notice gas scheduling. Since ANR's system includes a significant amount of pipeline infrastructure, ANR has the ability to effectively deliver natural gas under a wide variety of gas load demand conditions.

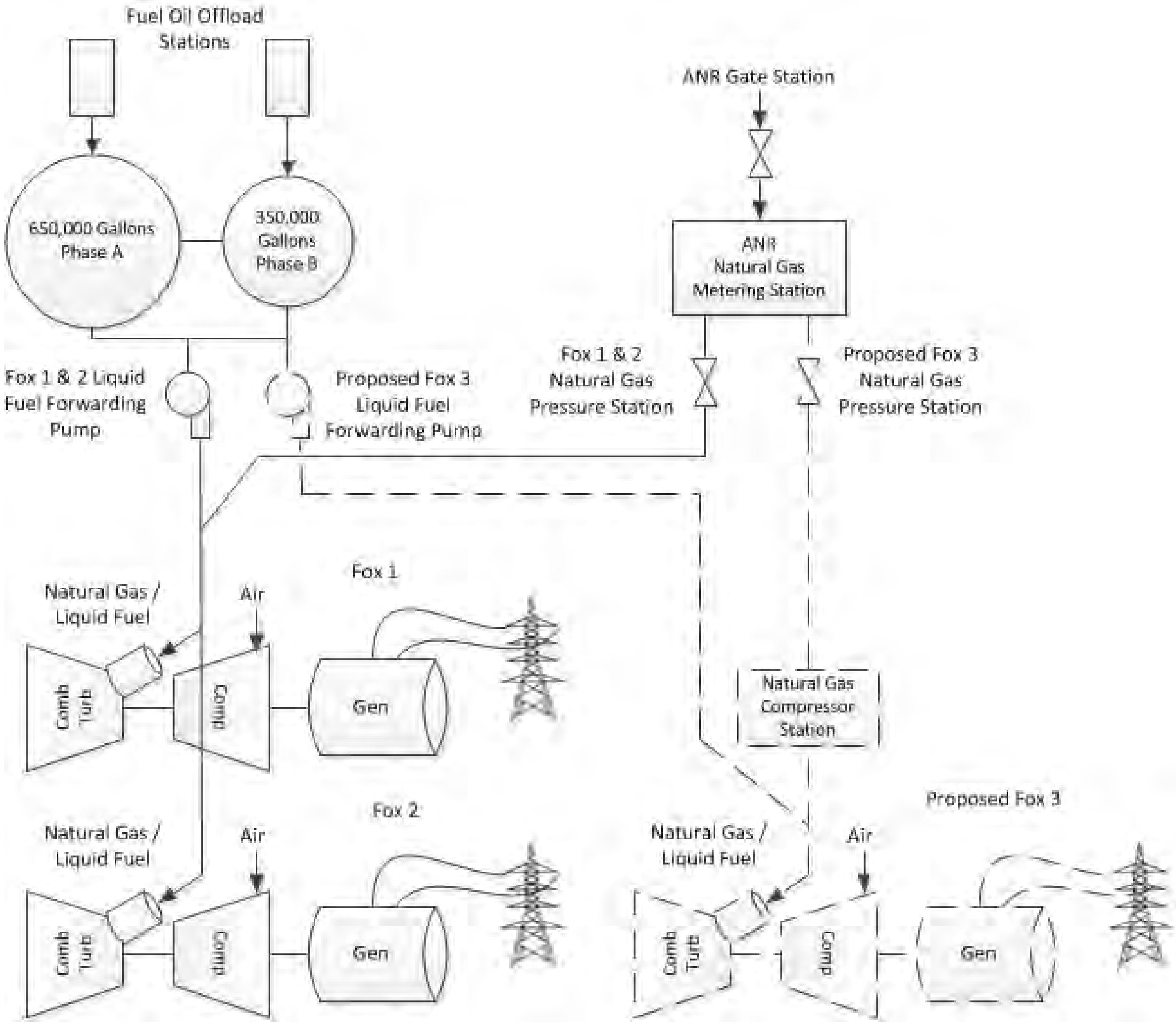
3.2.5.4 Fuel Delivery

Natural gas is delivered to the Fox Energy Center through an ANR interstate pipeline. Fuel oil, used as a backup fuel, is delivered to the Fox Energy Center by tanker trucks.

3.2.5.5 On-site Fuel Handling

Existing facilities will be used to supply both natural gas and fuel oil to Fox 3. There is an existing metering station at the Fox Energy Center that is fed from the Kaukauna ANR gate station. A new natural gas compressor station and natural gas pressure control station may be installed for Fox 3 (Figure 3–2).

Figure 3–2: Fuel Handling Diagram



3.2.6 Fuel Storage

Natural gas is not stored on-site.

Fox Energy Center currently has the capacity to store 1 MG of fuel oil on-site. There is an existing 650 MG tank and an existing 350 MG fuel oil storage tank on-site. Additional fuel oil forwarding pumps will be installed at the existing tanks to supply Fox 3.

3.2.7 Fuel Quantity

The maximum fuel heat input for either of the two proposed combustion turbines is approximately 2,250 million British thermal units per hours (MBtu/h) (HHV). The maximum fuel heat input to the duct burner is 700 MBtu/h (HHV). Therefore the maximum fuel consumption for Fox 3 is 2,950 MBtu/h (HHV). This equates to a usage of 68,400 standard cubic feet per day assuming a heating value for natural gas of 1,035 Btu/SCF (HHV). Table 3-4 provides the expected fuel quantity to be used for various modes of operation at summer design conditions. The load conditions provided in Table 3.5 correspond to the requested load conditions as follows:

- Minimum Load Operation – CTG operating at minimum emissions compliance load which is approximately 50 percent load on the CTG.
- Half Load Operation – This load is equivalent to minimum load operation; therefore, this report provides an alternate load with the CTG at 75 percent of base load operation.
- Rated Load Operation – CTG operating at base load without supplemental firing of the HRSG.
- Maximum Load Operation – CTG operating as base load with supplemental firing of the HRSG.

Table 3-4: Table of Fuel Quantity

Operating Mode at Summer Design Conditions	Quantity (MBtu/hr) GE 7FA	Quantity (MBtu/hr) Siemens SGT6-5000F
Minimum Load	1,176	1,229
Half Load	1,597	1,722
Rated Load or Base Load Unfired	2,086	2,215
Maximum Load	2,625	2,916

Source: Black & Veatch 2014

3.3 Water – Supply, Storage, Use, Discharge

The following sections describe the water supply, storage, use, and discharge.

3.3.1 Water Supply

Water supply to the facility is via an existing water pipeline from HOV. Based on preliminary MIDAS detailed dispatch modeling, a 10 MG storage pond will be added to the site. This supplies the entire requirements of the site during peak periods and allows the site to re-fill both of the storage ponds as needed.

If the capacity factor of the site should increase beyond predicted MIDAS detailed dispatch modeling, WPS may need to consider developing additional sources of water.

As is the current practice, the incoming water from HOV is softened by a clarifier and stored in the existing storage pond. With the proposed addition of the 10 MG storage pond, the two storage ponds will be hydraulically connected via interconnecting piping and valves and any facility need could be supplied by either storage pond.

The primary water use for the Fox Energy Center would include steam cycle makeup, cooling tower makeup, NO_x injection water, evaporative cooling water makeup, and service water. The proposed Fox 3 water systems will be designed to maximize water reuse and recycling.

3.3.1.1 Water Supply Sources

The Fox Energy Center uses treated effluent from HOV. The influent to HOV comes from five municipalities: Kaukauna, Kimberly, Combined Locks, Little Chute, and Darboy. The water for each of the municipalities is sourced from groundwater wells each approximately 750 feet deep:

- Kaukauna Utilities − Five groundwater wells
- Kimberly − Three groundwater wells
- Combined Locks − Purchases water from the Kimberly Water Utility
- Little Chute − Three groundwater wells
- Darboy − Two groundwater wells

3.3.1.2 Water Supply Pipelines

Water for the site is supplied via an existing 4- mile pipeline from HOV which currently serves the facility. Volume I Appendix Y (HOV Water Supply Map) shows the location of the water pipeline relative to the site.

3.3.2 Water Storage Ponds

Construction of a new 10 MG storage pond will follow the requirements of the WDNR Chapter NR 213, Wis. Admin. Code.

A new field erected steel water storage tank will be added to the site to store demineralized water for cycle make-up and NO_x water injection when firing fuel oil. The size of the storage tank will be finalized during detail design.

The proposed storm water wet detention ponds will control the storm water from the new facilities area (Volume I Appendix B (Site Arrangements). The ponds are sized to control up to 100-year 24-hour rainfall events using the requirements in the WDNR Chapter NR 151 and the WDNR Conservation Practice Standard 1001 design criteria.

3.3.3 Consumptive Use

See Volume I Appendix BB the water mass balance diagrams. Note that power augmentation is not applicable for Fox 3.

The primary water use for the Fox Energy Center will include steam cycle makeup, cooling tower makeup, NO_x injection water, evaporative cooling water makeup, and service water. Water systems for Fox 3 will be designed to maximize water reuse and recycling.

Process water used throughout the Fox Energy Center concentrates impurities due to evaporation or contact with materials and chemicals. To maintain an acceptable water quality in these processes, wastewater (e.g., blowdown) streams from these systems are removed, appropriately treated, and discharged to the Fox River.

3.3.3.1 Water Balances

See Volume I Appendix BB for the water mass balance diagrams for the following load points:

- **a)** Half load operation − Case 43 80 degree day, 42 percent CTG load.
- **b)** Rated load operation − Case 40 80 degree day, 100 percent CTG load, evaporative cooling.
- **c)** Maximum capacity operation − Case 38 80 degree day, 100 percent CTG load, duct firing, evaporative cooling.
- **d)** Maximum operation at summer design conditions − Case 1 summer day, 100 percent CTG load, duct firing, evaporative cooling.
- **e)** Maximum operation at average temperature − Case 7 average ambient, 100 percent CTG load, duct firing.
- **f)** Maximum operation at winter design conditions − Case 11 winter day, 100 percent CTG load, duct firing.

3.3.3.2 Alternatives for Reduced Water Consumption

Two alternatives were considered for reduced water consumption in cooling towers, dry cooling and anti-fog. Impacts of each alternative with respect to plant efficiency and greenhouse gas emissions are discussed below.

3.3.3.2.1 Dry Cooling with Air-Cooled Condenser

The main advantage of an air-cooled condenser is that it reduces water usage requirements by approximately 90 percent and eliminates the associated blowdown stream and plume formation from the cooling tower. The challenges of this design are higher installed costs, relatively higher noise emissions, larger footprint and visual impact, and lower plant output and cycle efficiency in the range of 1 to 3 percent. The lower plant efficiency means more fuel burned per unit of electrical output and more greenhouse gas emissions on a pound per megawatt-hour basis.

3.3.3.2.2 Anti-Fog (Plume Abated and Hybrid Cooling) Cooling Tower

The main advantages of this system are a smaller visible plume from the cooling tower and an overall reduction in water usage in the range of 15 to 30 percent. The challenges of this design are higher installed costs and lower plant output and cycle efficiency in the range of 0.2 to 0.5 percent. The lower plant efficiency means more fuel burned per unit of electrical output and more greenhouse gas emissions on a pound per megawatt-hour basis.

3.3.3.3 Water Flows in Operational Modes

See Volume I Appendix BB for the water mass balance diagrams for the following load points:

Note the minimum load and half load operation are coincident.

- **a)** Half load operation − Case 43 80 degree day, 42 percent CTG load.
- **b)** Rated load operation − Case 40 80 degree day, 100 percent CTG load, evaporative cooling.
- **c)** Maximum capacity operation − Case 38 80 degree day, 100 percent CTG load, duct firing, evaporative cooling.
- **d)** Maximum operation at summer design conditions − Case 1 summer day, 100 percent CTG load, duct firing, evaporative cooling.
- **e)** Maximum operation at average temperature − Case 7 average ambient, 100 percent CTG load, duct firing.
- **f)** Maximum operation at winter design conditions − Case 11 winter day, 100 percent CTG load, duct firing.

3.3.4 Wastewater Discharge

See Section 5.12.4and Volume I Appendix BB for the water mass balance diagrams.

3.3.4.1 Wastewater System (Process)

With the addition of Fox 3, the facility will be required to treat the additional process wastewater associated with Fox 3 to ensure compliance with WPDES permit limits. Cooling tower blowdown from both towers (proposed new and existing tower) ties into a new solids contact units for post treatment. The solids contact units effluent discharges into a common wastewater sump for the Fox Energy Center site. The discharge from the wastewater sump uses the existing wastewater discharge pipeline to the Fox River.

Oily wastes are collected and treated in an oil/water separator. Non-oily effluent from the oil/water separator is collected in a wastewater collection sump and discharged into the cooling tower basin.

3.3.4.2 Wastewater Treatment (Sanitary)

Sanitary wastewater from Fox 3 bathrooms, showers, and other employee areas will be collected and routed to an interconnection with the Village of Wrightstown municipal sewer system for off-site treatment. The existing sanitary holding tanks for the site administration and water treatment buildings will be replaced with lift stations that pump sanitary sewage to a common Fox Energy Center lift station, which will discharge to the Village of Wrightstown municipal sewer system.

3.3.4.3 Wastewater Collection Points and Pathways/Pipelines

See Section 5.12.4 below and Volume I Appendix BB (Water Mass Balances).

3.3.4.4 Water/Oil Separation Points

Oily wastes are collected and treated in an oil/water separator. Any oil that is collected is retained in the oil/water separator and is pumped out as required for disposal. Non-oily effluent from the oil/water separator will be collected in the Fox 3 wastewater collection sump and discharged into the cooling tower basin. See Volume I Appendix BB (Water Mass Balances) for diagram of water/oil separation points.

3.3.4.5 Facilities Requiring WPDES Permit

See Section 5.12.4 below and Volume I Appendix BB (Water Mass Balances).

3.4 Steam

WPS does not currently anticipate supplying excess steam from Fox 3 to a steam host.

3.5 Air Pollution Emissions Control Equipment

NO_x control will be achieved by a combination of low-NO_x burners and a SCR system. An oxidation catalyst will control CO and VOC emissions. The SCR and oxidation catalyst are integrated components of the HRSG. The location of the HRSG can be found on the site arrangement (Volume I Appendix B Site Arrangements).

3.5.1 NO_x Control

NO_x production will be minimized through the use of low-NO_x burners in the combustion turbine and supplemental HRSG duct burners. NO_x emissions from the HRSG are subsequently reduced by a SCR system. In a SCR system, NO_x reacts with ammonia in the presence of a catalyst to form nitrogen gas and water. Ammonia is vaporized and introduced to the SCR upstream of the catalyst bed through a series of injection nozzles. The SCR system must be operated within a narrow temperature range (about 600 – 800 ^{o}F) to achieve good NO_x removal. The SCR will be located in the proper temperature zone as recommended by the HRSG supplier.

3.5.2 Oxidation Catalyst

CO and VOC will be reduced by an oxidation catalyst. An oxidation catalyst is a post-combustion treatment technology that removes CO and VOC from the exhaust gas after formation in the combustion turbine and HRSG duct burners. In the presence of a catalyst, CO and VOC react with oxygen present in the exhaust stream, converting CO to CO_2, and VOC to CO_2 and water vapor. Oxidation catalysts operate best at temperatures greater than 700 ^oF. The catalyst will be located in the proper temperature zone as recommended by the HRSG supplier.

3.5.3 Continuous Emissions Monitoring

A continuous emissions monitoring system as required pursuant to 40 CFR Parts 60 and 75 will be installed.

3.5.4 Integration of Pollution Control Equipment

The SCR and oxidation catalyst described above will be provided by the supplier of the HRSG and integrated into the HRSG design to ensure proper operation. The CEMS equipment including stack probes will be provided under a separate purchase contract and installed by the contractor. The CEMS monitors HRSG stack emissions through ports provided in the stack by the HRSG supplier.

3.6 Solid, Oil, or Hazardous Wastes, Including Ash

Because it is fueled by natural gas and fuel oil, Fox 3 does not generate an ash byproduct that must be collected for reuse or disposal as a solid waste.

Solid waste in the form of sludge will be produced by both the pre-treatment process and the post-treatment process of the incoming water from HOV at the Fox Energy Center.

The pre-treatment process will remain identical to the current process for Fox 1 and 2. A new post-treatment process will be constructed to meet requirements for discharge to the Fox River.

The new post-treatment co-precipitation process will treat the combined cooling tower blowdown from the Fox 3 and the existing Fox 1 and 2 prior to discharge to the existing Fox River Outfall 001. The process introduces a coagulant (ferric chloride or ferrous sulfate) and polymers to convert the inorganic phosphate into a low solubility precipitate, which will be removed via a new sludge wasting and dewatering process.

Both sources of the dewatered non-hazardous sludge will be stored in roll-off dumpsters and removed from the site by truck to be disposed of in a licensed landfill facility. The following sections discuss the hazardous chemicals and waste products for Fox 3.

3.6.1 Hazardous Chemicals

A number of chemicals will be used during construction and operation. Table 3-5 and Table 3-6 show chemicals needed during construction, pre-operational cleaning, and for regular operations and maintenance once the plant is in-service.

Table 3-5: Typical Chemicals Stored During Construction

Product	Nominal Quantity	Storage Method
Chemicals Utilized in Pre-operational Cleaning of Piping:		
Di_Ammonia EDTA	50,000 pounds	Delivered by contractor at time of service and stored in temporary tanks on-site
Antifoam	10 gallons	
Oxygen	4,000 cubic feet	
Surfactant	400 gallons	
Corrosion Inhibitor	400 gallons	
29% Aqua Ammonia	4,000 gallons	
Paint	200 gallons	
Solvents and Cleaners	50 gallons	
Concrete Curing Compound	50 gallons	
Fuel Oil and Gasoline	5,000-10,000 pounds	Stored in separate tanks in a bermed area on-site
Turbine Cleaning		
Various Detergents		Delivered by contractor at time of service and stored in temporary tanks on-site

Table 3-6: Typical Chemicals Stored for Regular Maintenance

Product	Use	Nominal Quantity	Storage Method
HRSG/Boiler Chemicals			
Ammonia hydroxide or proprietary amine solution	Boiler water treatment – condensate pH control	400 gallons	Tote
Trisodium phosphate solution	Boiler water treatment – boiler water conditioner	400 gallons	Tote
Cooling Tower Chemicals			
Sulfuric acid 93%	Cooling tower treatment – alkalinity reduction	5,000 gallons	Bulk tank
Proprietary corrosion	Cooling tower treatment – scale	1,000 gallons	Bulk tank

Product	Use	Nominal Quantity	Storage Method
inhibitor	inhibitor		
Proprietary biodispersant	Biodispersant	1,000 gallons	Bulk tank
Sodium hypochlorite 12%	Cooling tower treatment – biocide	12,000 gallons	Bulk tank
Sodium bromide	Cooling tower treatment – biocide	6,000 gallons	Bulk tank
Demineralizer and Reverse Osmosis (RO) Chemicals			
Biocide (proprietary)	Reverse Osmosis (RO) feedwater Treatment – biofilm control	500 gallons	Bulk tank
Sodium bisulfite 44%	RO feedwater treatment – dechlorination	1,000 gallons	Bulk tank
Antiscalant - proprietary	RO feedwater treatment – antiscalant	500 gallons	Bulk tank
Muratic acid (not permanently stored)	RO membrane clean-in-place	400 gallons	Tote
Cooling Tower Blowdown Clarification Chemicals			
Aluminum sulfate or ferric chloride 40%	Cooling tower clarification – coagulant (provides storage for service water treatment)	5,000 gallons	Bulk tank
Proprietary polymer	Cooling tower blowdown clarification – coagulant aid (sludge aid)	1 container (400 gallons)	Tote
Proprietary polymer	Cooling tower blowdown dewatering aid (sludge aid)	1 container (400 gallons)	Tote
Sodium bisulfite 44% (stored near common wastewater sump)	Cooling tower blowdown clarification – dechlorination	1,000 gallons	Bulk tank
Service Water Treatment Chemicals			
Sodium hypochlorite 12%	Service water treatment – biocide	3,000 gallons	Bulk tank
Proprietary corrosion inhibitor	Service water treatment corrosion inhibitor	400 gallons	Tote
Sulfuric acid 93%	Service water treatment – pH control	3,000 gallons	Bulk tank
SCR System			
Aqueous ammonia (29% conc.)	NO_x control	5,000 gallon	Bulk tank
Steam Turbine			
Lube oil [1]	Turbine lubrication system	9,000-13,000 gallons	Reservoir
Hydraulic oil [1]	Turbine control system	200-400 gallons	Steel tank
Combustion Turbine			

Product	Use	Nominal Quantity	Storage Method
Lube oil [1]	Turbine lubrication system	5,000-10,000 gallons	Reservoir
Hydraulic oil [1]	Turbine control system	100-200 gallons	Steel tank
Closed Cooling System			
Proprietary corrosion inhibitor	Closed cooling water – corrosion inhibitor	1 drum (55 gallons)	55 gallon drum
Proprietary glycol solution	Closed cooling water – freeze protection	1 drum (55 gallons)	55 gallon drum
Steel Pressure Cylinders			
Oxygen	Welding	28 bottles ea., containing 250 cubic feet	High pressure steel tanks
Acetylene	Welding	16 bottles ea., containing 370 cubic feet	Steel tank
Hydrogen	Generator cooling	25,050 cubic feet at 2,400 pounds per square inch	
CO_2 for hydrogen purging	Generator purge	1,500 pounds	
Transformers & Breakers			
Main power transformers insulation oil	Transformer insulation	2 transformers ea.17,000 – 22,500 gallons	Transformer reservoir
Auxiliary transformer insulation oil [1]	Transformer insulation	2 transformers ea. 2,140 – 3,460 gallons	Transformer reservoir
Transmission breakers (345 kV)	Breaker insulation	2 breakers containing 85-90 cubic feet (each)	Breaker reservoir
Generator breakers (18 kV)	Breaker insulation	2 breakers containing 6 cubic feet (each)	Breaker reservoir

[1] These fluids are contained in the operating equipment. Turbine and transformer oils have long life and gradual degradation, so there will be no spare oil on-site.

The construction superintendent is responsible for oil spill containment at all equipment and storage areas on the Fox 3 site that contain a significant volume (defined as 55 gallons or more) of lubricant, fuel, grease, or other oil. During construction activities, diesel and gasoline fuel are temporarily stored on-site in tanks within aboveground containment units consisting of dikes capable of containing at least 125 percent of the storage tanks’ capacity. During re-fueling or transfer operations, appropriate preventive measures are taken to prevent an oil spill. The construction superintendent is responsible for reporting spills and overseeing the cleanup and disposal of any affected soil and spill clean-up materials. Minor spills of fuel or other chemicals are cleaned with absorbent pads or other manufactured absorbent products stored on the maintenance truck or in a marked cabinet that is readily accessible. Larger-quantity spills are not expected to exceed the capacity of a 55-gallon drum and will be removed from within the containment area using a vacuum tank truck or pumped into a suitable container. Soil or absorbent materials that come in contact with fuel or chemicals are immediately removed, stored, and disposed of in accordance with state regulations. Construction equipment is kept in good working condition so as to avoid transmission, hydraulic, or brake fluid leaks. The chemical storage areas include hose stations, spill kits, safety showers, eye wash stations, and first aid kits.

Fox 3 requires chemicals for treatment of treated wastewater, service water, demineralized water, cooling tower circulating and blowdown water, cycle water, and the SCR systems. Operation of the planned facility requires limited amounts of lubricating oils and certain other industrial chemicals, which are stored in specially designed, covered containment areas.

Outdoor transformers are located within a containment area and bordered by concrete walls for fire protection. This area is designed to contain greater than 100 percent of the mineral oil content of the largest transformer, plus sufficient capacity to allow for accumulation of storm water. The storm water collected in the sumps is monitored and periodically removed.

WPS has an existing Spill Prevention Control and Countermeasure Plan (SPCC) that has been updated according to USEPA’s SPCC regulation (40 CFR 112) issued on July 17, 2002. This plan establishes procedures, methods and equipment, and other requirements for equipment to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable waters of the United States or adjoining shorelines.

The SPCC plan was revised to include Fox Energy Center facilities. A copy of the updated plan is included in Volume II Appendix F. The existing Risk Management Plan requires updating with the addition of the Fox 3 ammonia day tank storage. The SCR system uses aqueous ammonia (29 percent ammonia and 71 percent distilled water) for NO_x control.

The Facility Response Plan also requires updating and resubmittal for approval.

3.6.2 Solid Waste Location and Capacity

The Fox Energy Center generates solid waste from both a daily refuse source and from a water treatment source (sludge). Both of the solid waste stream are disposed of in a licensed landfill facility.

The licensed landfill disposal for the Fox Energy Center may extend to any or all of those areas where waste collection, transportation, and disposal are economically feasible. The economics of waste transportation is a direct function of the number of miles that the waste must be transported to the landfill. The closer the waste disposal facility is to the source of the waste, the more favorable are the economics of transportation. For this analysis, the service area was determined to be within 50 miles of the Fox Energy Center. Kewaunee County, Outagamie County, Shawano County, Winnebago County, Advanced Disposal, and Waste Management have landfills receiving municipal solid waste within 50 miles of the Fox Energy Center. A summary of their locations and capacities is provided below.

Table 3-7: List of Solid Waste Reuse/Recycling and Disposal Facilities

Facility Name	WDNR License No.	Address	Capacity in Cubic Yards (January 2014)
Advanced Disposal – Hickory Meadows	3134	W3105 Schneider Rd Hilbert, WI 54129	11,416,527
Waste Management – Valley Trail	3066	N9101Willard Rd Berlin, WI 54923	4,281,145
Kewaunee County	2975	E3726 CTH L West Kewaunee, WI 54216	154,625
Waste Management – Ridgeview	4292	6207 Hempton Lake Rd Whitelaw, WI 54247	8,647,570
Outagamie County	3235	US 41 & Holland Rd Little Chute, WI	6,761,180
Shawano County	3069	1099 Rusch Rd Shawano, WI 54166	116,856
Winnebago County	3175	100 W County Rd Y Oshkosh, WI 54901	143,419

3.6.3 Oil/Water Separation

Oily wastes are collected and treated in an oil/water separator. Any oil that is collected is retained in the oil/water separator and then pumped out as required for disposal. See Volume I Appendix BB (Water Mass Balances) for diagram of water/oil separation points.

3.7 Electricity

3.7.1 Switchyard

The existing Fox Energy Center is connected to the ATC Fox River Switchyard with three 345-kV overhead lines. The ATC Fox River Switchyard consists of a 345-kV ring-bus that provides a transmission interconnection for the existing two combustion turbines and steam turbine.

The proposed addition of Fox 3 requires new interconnection facilities for connection to the existing Fox River Switchyard. These interconnection facilities include two new 345-18-kV generation step-up transformer (GSU) transformers, two 345-kV circuit breakers, and two overhead lines that are connected to the existing ATC-owned switchyard. The new interconnection facilities from the GSU transformers to the switchyard are shown in Volume I Appendix B (Site Arrangements) for each proposed site alternative. The interconnection facilities are also shown on the electrical one-line diagram included Volume II Appendix G (ATC Facilities Study[10]) as part of drawing 182162-APU1-E1001, Rev D.

The existing Fox River Switchyard must be expanded by ATC for interconnection of the two new overhead lines from Fox 3. ATC proposes to expand the existing switching station to breaker-and-a-half configuration with five generator positions and three line positions. The proposed arrangement of the transmission owner’s expanded Switchyard is included as Exhibit A3-1-2 of the J293 Facilities Study Report that was provided to MISO by ATC.

The upgrades to the ATC Fox River Switchyard will be the subject of a separate application for Certificate of Authority being filed by ATC later in 2015.

3.7.2 Transmission Interconnection Study

The completed interconnection System Impact Study and Facilities Study reports contain critical energy infrastructure information and are included in Volume II Appendix G (ATC Facilities Study).

3.7.3 Transmission Line Facilities

Full operation of Fox 3 necessitates the uprate of three existing transmission facilities, two owned by the ATC and one owned by Commonwealth Edison. ATC’s Fox to North Appleton and Kewaunee to Point Beach 345-kV transmission lines require the replacement of several structures to increase their ratings.

[10] ATC is in the process of finalizing the study report. At the time of printing of this document, only the enclosed draft version of the study is available.

The estimated cost of both projects is $1.3 million.[11] It also includes the existing Fox to North Appleton 345-kV to be re-routed for re-configuration of the switchyard. The estimated cost for this is $0.9 million.[12] Additionally, PJM analyzed the impact of Fox 3 on the PJM system and identified the need to mitigate sag limitations on a section of conductor and upgrade a 345-kV breaker near Commonwealth Edison's Zion substation in northern Illinois. The estimated cost of that project is $3.2 million. Both transmission owners estimate that these upgrades can be completed by the commercial operation date of Fox 3.

The uprate of ATC's two transmission lines (and the upgrades expansion to the Fox River Switchyard) will be the subject of a separate application for Certificate of Authority being filed by ATC later in 2015. Consistent with Attachment FF – ATC of the MISO Tariff, the ATC upgrades are initially paid for by the Interconnection Customer in accordance with the terms of the Interconnection Agreement and refunded at 100 percent once the generator achieves commercial operation. Therefore, the costs of the ATC upgrades are not included in this CPCN application. The feasibility and project alternatives analyses contained within Section 2.0 of this application consider and include the cost of transmission upgrades.

The cost to upgrade of the 345-kV breaker near Commonwealth Edison's facilities at the Zion substation in northern Illinois is directly assigned to the Fox 3 project and is included in this CPCN Application for Fox Energy Center 3.

[11] This cost does not reflect contingency or escalation.
[12] This cost does not reflect contingency or escalation.

4.0 PROJECT COSTS

4.1 Capital and Construction Costs

Costs for the Fox 3 project are discussed in the following sections. These include capital, construction, air pollution control, retirement, and alternative costs.

4.1.1 Capital Cost

The estimated capital cost of Fox 3, broken down by major plant accounts is provide in Volume III Appendix C (CONFIDENTIAL), Table C-1. The estimate was developed in 2014 dollars and a total escalation factor of 7.9 percent was applied to estimate the total installed cost.

4.1.2 Construction Costs

The estimated construction cost is broken down by major plant accounts is provided in Volume III Appendix C (CONFIDENTIAL), Table C-2. As in the previous sections, a total escalation factor of 7.9 percent was used for estimating the cost.

4.1.3 Air Pollution Control Costs

The air pollution control equipment cost is included in the Major Equipment (Power Plant) OEM estimate and is not a stand alone cost.

4.1.4 Retirement Costs

No existing property at the Fox Energy Center will be retired as a result of the construction of Fox 3.

4.1.5 Alternatives Costs

As explained in Section 1.4.8, WPS is proposing two alternative proximate site options for the proposed project instead of two separate alterative locations. Site Option 1 will incur additional cost to reduce sound level impacts. Site Option 2 will incur additional cost because construction access is more difficult.

The cost increase for Site Option 1 for noise mitigation is approximately the same as the cost increase for construction access to Site Option 2. Therefore, for the purposes of this analysis, there is no distinguishable difference between the cost for Site Option 1 and the total cost for Site Option 2.

4.2 Project Financing

The following sections discuss Fox 3 financing.

4.2.1 Lease Agreement Arrangements

WPS will construct Fox 3 as a rate-base asset rather than under the new lease generation law. Therefore, no leases will require PSCW approval with the CPCN.

4.2.2 Affiliated Interest Approvals

Since WPS intends to construct the project as a rate-base asset, there will be no affiliated interest approvals required for the CPCN.

4.2.3 Conditions of Wisconsin Statute 196.52(9)(a)3(b)

WPS proposes to construct the project as a rate-base asset. Therefore Wis. Stat. §196.52(9)(a)3(b) does not apply.

4.2.4 Comparison of Leased Generation, Rate-Based Proposal or Competitive Bids Received

WPS considered the potential customer impacts of financing this project through a leased generation structure and determined that there were no significant benefits of doing so. The overall cost of operating the facility will be the same under leased and owned generation structures. Additionally, the expected cost of debt and the lessor's equity return requirements would not likely be less under the leased generation structure. Finally, the cost of developing a leased generation structure would not be insignificant. Given this, WPS decided to proceed with construction of Fox 3 as a rate base asset. Please reference Section 2.1.3 regarding competitive bids.

4.3 Forecasted Costs

Forecasted costs are provided in the following sections for purchase power, fuel, annual production, capital and production, life of facility, fuel alternatives comparison, operation and reliability transmission.

The Screening and Need Analysis, as described in detail in Section 2.0, was performed based on modeling assumptions and forecasts approved by the WPS Electric Planning Committee (EPC) in 2013. WPS annually updates all modeling assumptions and forecasts in its long range EGEAS and MIDAS models. In 2014 WPS updated both the EGEAS and MIDAS models based on EPC approved modeling assumptions and forecasts. The forecasted production and capital costs provided in Sections 4.3.3 and 4.3.4 reflect WPS's most current data set and planning futures approved by the EPC in 2014 using. The analysis to estimate total production and capital costs for Fox 3 is referred to as the "Fox 3 Attributes Analysis". The current data set includes the capital and construction costs for Fox 3, as provided in Section 4.1. For modeling purposes in this application, the forecasted costs of Fox 3 reflect the Siemens

SGT6-5000F combustion turbine frame described in Section 3.1.5.1, Table 3-3: Heat Rates (Siemens SGT6-5000F) Table 3-3.

Sections 4.3.1 and 4.3.2 include purchase power and natural gas price forecasts used in the Screening/Need Analysis in Section 2.0 (2013 EPC approved) and to forecast the production and capital costs of Fox 3 (2014 EPC approved).

4.3.1 Purchase Power Analysis

The description and justification of how WPS develops purchase power forecasts is described in detail in Section 2.1.3.

4.3.1.1 Screening/Need Analysis (EPC 2013 approved):

Section 2.1.3 provides the description of the planning futures utilized in the Screening/Need Analysis. Volume III Appendix D (CONFIDENTIAL) Table D-1 identifies the annual purchase power price forecasts for each of the six planning futures described in Section 2.1.3. The purchase power price forecasts identified in Volume III Appendix D (CONFIDENTIAL) Table D-1 reflect planning assumptions and fuel forecasts approved by EPC in 2013.

4.3.1.2 Fox 3 Attributes Analysis (EPC 2014 approved)

Table 4-1 describes the planning futures used in the development of the Forecasted Costs for Fox 3. These planning futures were approved by EPC in 2014. Futures 1-5 are based on the five finalized MISO MTEP15 planning futures. Future 6 is a sensitivity of Future 4 (Generation Shift) that includes a higher CO_2 tax to reflect a greater shift in generation from coal to natural gas. Volume III Appendix D (CONFIDENTIAL) Table D-2 identifies the annual purchase power price forecasts for each of the six planning futures described in Table 4-1.

Table 4-1: 2014 EPC Approved Planning Futures

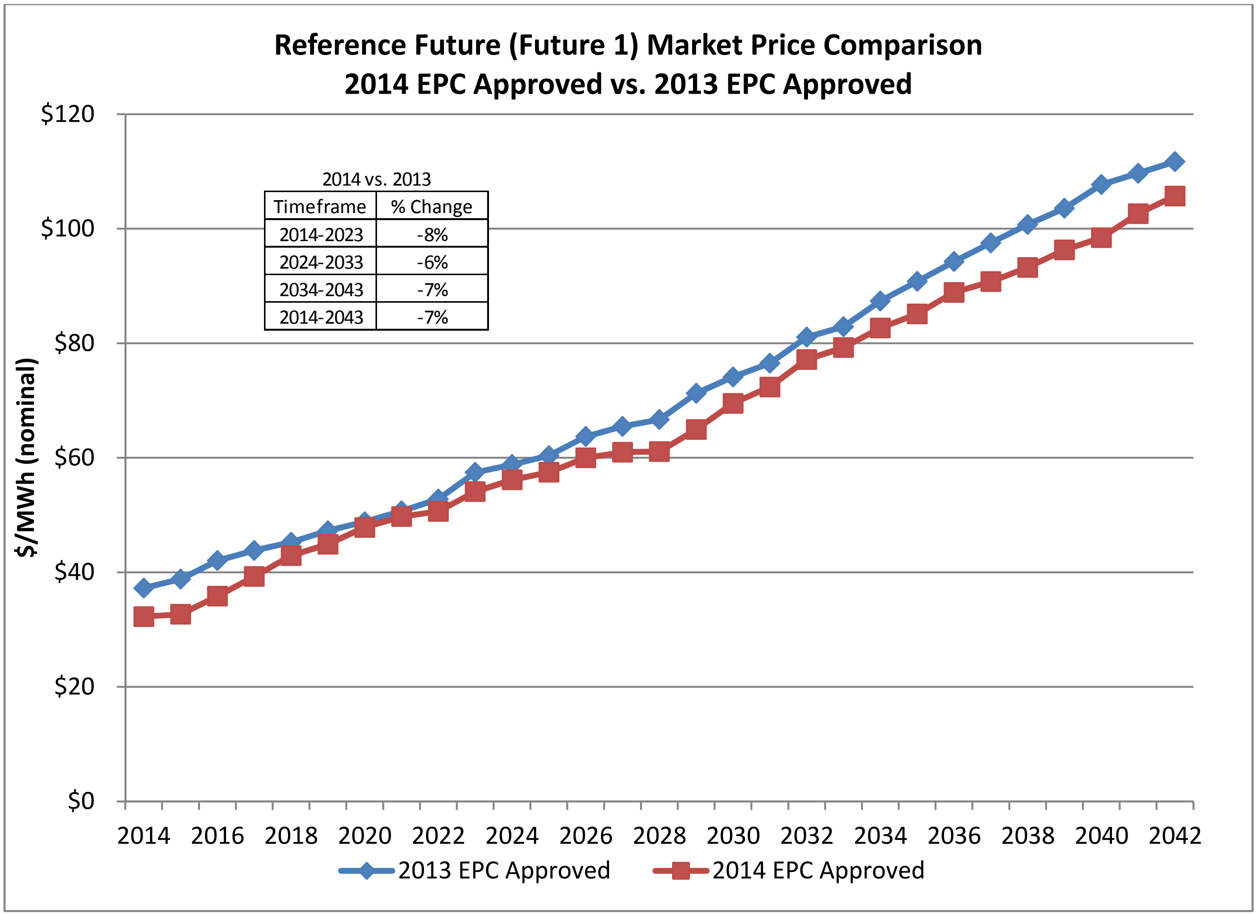
	Future 1: Reference Future	**Future 2: High Growth**	**Future 3: Low Growth**	**Future 4: Generation Shift**	**Future 5: Public Policy**	**Future 6: Generation Shift Sensitivity**
Load Growth	Base	High	Low	Base	Base	Base
Natural Gas Price	Base	High	Low	Base	Base	Base
Coal Price	Base	High	Low	Low	Low	Low
CO_2 Prices	None	None	None	$10/ton	$50/ton	$25/ton
Renewable Standards	Current State Mandates	Current State Mandates	Current State Mandates	20% MISO Wide Mandate by 2030	30% MISO Wide Mandate by 2030	20% MISO Wide Mandate by 2030
MISO Retirements	12.6 GW Coal	12.6 GW Coal	12.6 GW Coal	12.6 GW Coal + 11.6 GW age related	23 GW Coal	12.6 GW Coal + 11.6 GW age related
Capacity Price	MISO CONE	MISO CONE	50% MISO CONE [1]	MISO CONE	MISO CONE	MISO CONE

[1] Capacity priced at 50% CONE until 2022 then 100% MISO CONE thereafter

4.3.1.3 Purchase Power Price Comparison:

The Screening/Need Analysis was based on the 2013 EPC approved purchase power prices. The updated 2014 reference future (Future 1) purchase power prices are on average 7 percent lower than the 2013 reference future prices. There is not a significant difference between the 2014 EPC approved reference future and 2013 EPC approved reference future purchase power prices. Figure 4-1 provides a comparison between the reference future's annual purchase power prices approved in 2014 versus the reference future purchase power prices approved in 2013.

Figure 4–1: Reference Future Purchase Power Price Comparison



4.3.2 Fuel Forecasts

WPS natural gas forecasts are developed by the Integrys Gas Group (IGG). The Baseline IGG Long-term Forecast is a combination of daily settled pricing of the New York Mercantile Exchange (NYMEX) futures contract for natural gas, and forecast data from the following consultants:

1. Wood Mackenzie’s North American Gas and Power Long Term Market View
2. EIA’s Annual Energy Outlook
3. Energy Ventures Analysis Inc.’s Fuelcast Long Term Overview

Volume III Appendix D (CONFIDENTIAL) provides additional information on the methodology IGG used to develop the base, high and low natural gas forecasts mentioned below. The natural gas forecasts from IGG include the Henry Hub price as well as a small Chicago basis adder (Joliet Hub). Additional adders were included to these forecasts to get the natural gas from Joliet to the WPS service territory.

4.3.2.1 Screening/Need Analysis (EPC 2013 approved):

The natural gas forecasts used in the Screening/Need Analysis were developed by IGG in March 2013 and include a base, high and low forecast. Volume III Appendix D (CONFIDENTIAL) Table D-3 identifies the annual delivered natural gas forecasts used in the Screening/Need Analysis. The gas prices are in year of occurrence (nominal) dollars and include a Chicago basis adder for the Joliet Hub and deliverable adders to get natural gas from Joliet to the WPS service territory.

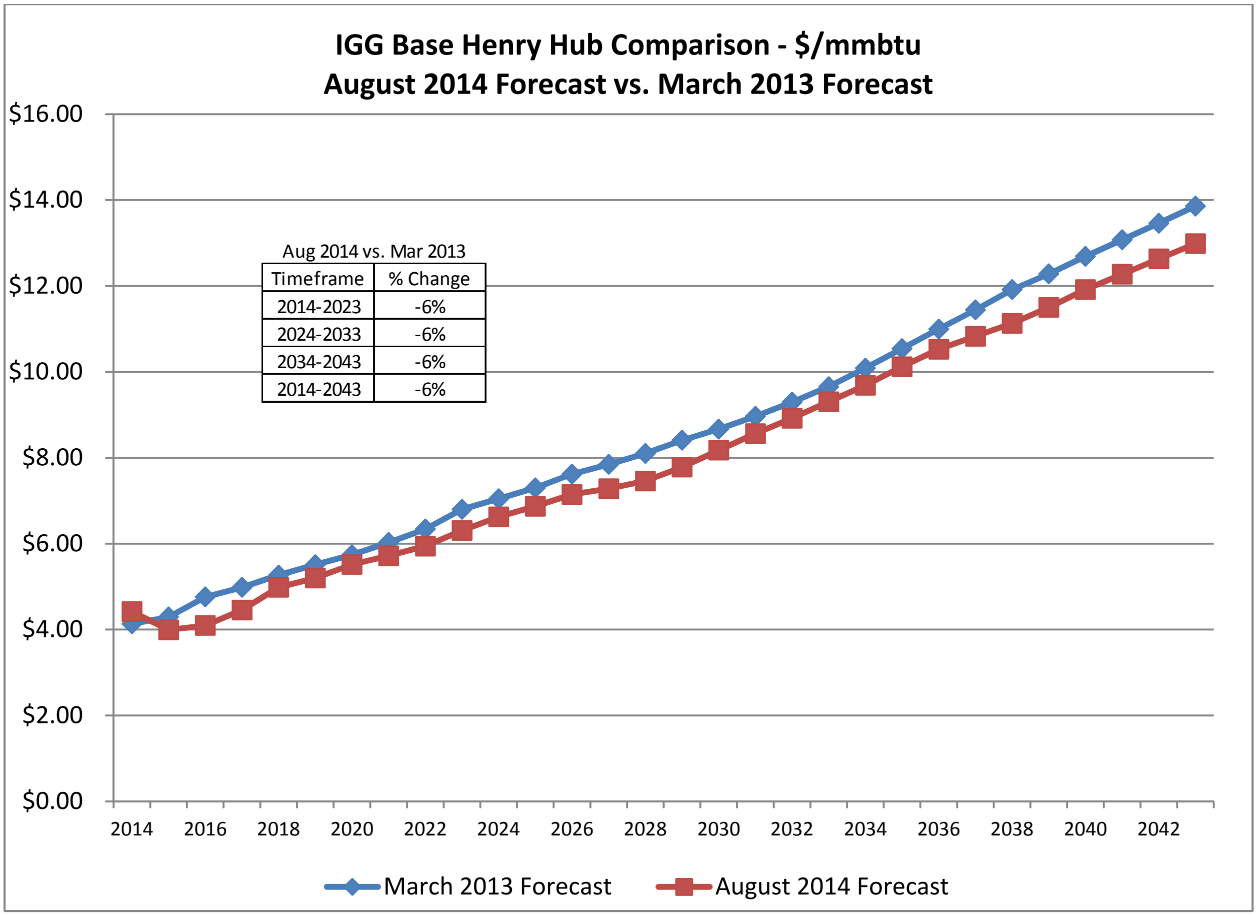
4.3.2.2 Fox 3 Attributes Analysis (EPC 2014 approved):

The natural gas forecasts used forecast Fox 3's annual production and capital costs in Sections 4.3.3 and 4.4.4 were developed by IGG in August 2014 and include a base, high and low forecast. Volume III Appendix D (CONFIDENTIAL) Table D-4 identifies the annual delivered natural gas forecasts used in the Screening/Need Analysis. The gas prices are in year of occurrence (nominal) dollars and include a Chicago basis adder for the Joliet Hub and deliverable adders to get natural gas from Joliet to the WPS service territory.

4.3.2.3 Natural Gas Price Comparison:

The Screening/Need Analysis was based on the March 2013 IGG natural gas forecast. The updated August 2014 natural gas prices IGG developed are on average 6 percent lower than the March 2013 forecast. There is not a significant difference between the March 2013 IGG natural gas forecast and the August 2014 IGG natural gas forecast. Figure 4–2 below provides a comparison between the baseline Henry Hub forecast between IGG's March 2013 forecast and August 2014 forecast.

Figure 4–2: IGG Henry Hub Price Comparison



4.3.3 Annual Production Costs

Volume III Appendix E Production Costs (CONFIDENTIAL) Figures E-1 through E-6, provide an estimation of the total annual production costs in nominal dollars. The production costs include fuel costs, variable O&M and fixed O&M. Major maintenance costs are included in the variable O&M costs. The production cost run in MIDAS utilizes the most current WPS data set approved by EPC in 2014, as mentioned above in Section 4.3. The annual production costs are provided in total annual dollars and dollars per MWh.

4.3.4 Capital and Production Costs

Volume III Appendix E Production Costs (CONFIDENTIAL) Figures E-7 through E-12, provide an estimation of the total annual capital revenue requirements, construction O&M, and annual production costs for Fox 3. The estimated capital revenue requirements are calculated using a WPS internal program called PCECON. The recovery of the capital investment for the Proposed Project is based on 36 year book life, 20 year tax life (MACRS) and a -2 percent salvage value. The capital and production costs are provided in total annual dollars and dollars per MWh.

4.3.5 Life of Facility

In developing the recovery of the capital investment of Fox 3 in Section 4.3.3, WPS assumed a 36 year book life for modeling purposes only.

4.3.6 Fuel Alternatives Comparative Costs

The comparative costs and operating characteristics of alternatives used in the Screening and Need Analysis can be found in Volume III Appendix B (CONFIDENTIAL) Tables B-5, B-6 and B-7.

4.3.7 Operation and Reliability Costs

Given the large number of coal resources retiring over the next 10 years, the expected growth of intermittent resources (wind and solar) and impact of environmental regulations, a unit that is dispatchable, with relatively low emissions, and has very flexible operating characteristics (min load, ramp rates, start-up time) will be extremely valuable to the market from a reliability standpoint.

A report issued by NERC titled "Potential Reliability Impacts of EPA's Proposed Clean Power Plan"[13], NERC stated that "the proposed CPP would reduce coal-fired generation by between 108 (54 GW due to MATs alone, the CPP would add an additional 49 GW) to 134 GW by 2020.… Developing suitable replacement generation resources to maintain adequate reserve margin levels may represent a significant reliability challenge."

Specifically regarding MISO NERC states "The proposed CPP could further exacerbate resource adequacy concerns in the MISO footprint unless additional replacement capacity is built in a timely fashion." With MISO's most recent view of a shortfall of capacity in the 2016 timeframe and the strong trend toward increasing retirements of coal units in a market where coal dominates, the value of a new dispatchable resource in MISO in the 2020 timeframe will provide a significant capacity benefit.

In addition to potential reliability issues regarding capacity availability, the NERC report highlights the potential future challenges associated with the real-time operations of the grid. The report states that "Conventional generation (e.g., steam, hydro) with large rotating mass, has inherent operating characteristics needed to reliably operate the bulk power system. These services include providing

[13] See NERC's Potential Reliability Impacts of EPA's Proposed Clean Power Plan
http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Potential_Reliability_Impacts_of_EPA_Proposed_CPP_Final.pdf

frequency and voltage support, operating reserves, ramping capability and disturbance performance." Through its Ancillary Services Market, MISO pays generators to provide many of these services. Given the potential for both scarcity of resources in the future and the additional growth of intermittent resource in the market, it is reasonable to assume these types of products will be highly valued by the market to ensure operating reliability.

4.4 Transmission Costs, if Applicable

MISO's System Impact and Facilities Studies show that Fox 3 does not require any new transmission lines or new transmission line rights-of-way (ROW). Fox 3 does not require any underground transmission lines.

Section 3.7.3 contains information on the provides details on the uprate of three existing transmission lines that is required for full operation of Fox 3; two of those transmission lines are owned by ATC and the third is owned by Commonwealth Edison. Fox 3 does not require any underground transmission lines. Consistent with Attachment FF – ATC of the MISO Tariff, the ATC upgrades are initially paid for by the Interconnection Customer and refunded at 100 percent once the generator achieves commercial operation. The uprate of the Commonwealth Edison transmission facilities are subject to Section 217.3 of the PJM Tariff and are directly assigned to the interconnection customer. This CPCN application does not include the costs of the reimbursable ATC upgrades but it does include the transmission costs allocated by PJM. The feasibility and project alternatives analyses contained within Section 2.0 of this application consider and include the cost of transmission upgrades.

Other than the reconfiguration of the existing Fox River Switchyard to accommodate the interconnection, no new transmission substations are required. The upgrades to the ATC Fox River Switchyard and the uprate of ATC's two transmission lines will be the subject of a separate application for Certificate of Authority being filed by ATC later in 2015.

5.0 NATURAL RESOURCES IN THE PROJECT AREA

5.1 Mapping Requirement

See Volume I Appendix B (Site Arrangements) for maps of both site options required for this application.

5.2 History of Site and Grounds

The property on which Fox 3 will be located has historically consisted of agricultural fields. The property for the existing Fox Energy Center was agricultural land prior to purchase in 2003 and development for the existing electric generation station by Fox Energy Company LLC occurred in 2004 and 2005.

5.2.1 Remediation

According to the WDNR's Bureau for Remediation and Redevelopment Tracking System (BRRTS) and to the best of WPS's knowledge, there is no contamination that will require remediation on the Fox 3 site. The following is a list of previous spills and a description of the remedial actions implemented:

- March 14, 2005 – BRRTS# 04-45-544421 consisted of a release of approximately 25 gallons of diesel fuel. Absorbent material was used to collect the spilled material and an outside contractor was utilized to excavate impacted soils. This site was granted closure on March 15, 2005.
- December 13, 2005 – BRRTS# 04-45-548046 consisted of a 200 gallon spill of turbine lube oil, 15 gallons of which was released to soil beyond the containment area. Absorbent material was used to collect the spilled material and an outside contractor was utilized to excavate impacted soils. This site was granted closure on August 11, 2006.

5.3 Constructions Areas

Construction areas are discussed in the following sections. These include areas for laydown, material storage, and parking.

5.3.1 Laydown, Material Storage, and Parking Areas

The construction area and laydown site arrangement is shown on Volume I Appendix B (Site Arrangements) for each proposed site alternative. The drawings show the following expected requirements necessary for successful execution of the work.

- Plant access for construction workforce and material deliveries
- Acceptable construction crane access along both sides of new construction
- Consideration for crane access during new construction tie-in to the existing plant

- Sufficient area reserved for construction offices and craft trailers (2.2 acres total), with on-site parking
- Craft break and change house area
- Identification of approximately 15 acres of yard fabrication, lay-down space for material storage and staging
- On-site temporary construction roads providing good access for construction between the site entrance, lay-down yard, and the construction area
- Controlled craft parking for approximately 250 vehicles (2.5 acres) within walking distance of the construction area
- Controlled electronic badge access point for craft entry into the plant proper
- Identification and potential means of supply for various construction utilities
- Soil spoils stockpile area
- Concrete truck wash out area

5.3.2 Expected Use Post-Construction

WPS may re-purpose portions of the parking, office trailer, and laydown areas to support plant maintenance and outage work scope during permanent plant operation.

5.3.3 Post-Construction Restoration

All temporary construction facilities such as the laydown, construction access roads, craft parking, and construction offices will be dismantled after construction is complete and the remaining areas will be restored to pre-construction conditions unless area is identified during detailed design to be left for future use.

5.4 Geology

Geology of the site is discussed in the next sections.

5.4.1 Description of Site Geology

The Fox 3 site occurs in the Lake Michigan Lacustrine Clay Plain region of Southeastern Wisconsin Till Plains ecoregion. The Southeastern Wisconsin Till Plains ecoregion has a relatively flat topography and historically supported a variety of vegetation types including hardwood forests, oak savannas, and tallgrass prairies. Soils of the Lake Michigan Lacustrine Clay Plain ecoregion are generally silty and loamy over lacustrine and calcareous loamy till deposits.

At the existing Fox 1 and 2 facilities, surficial soils consist of silty topsoil underlain by silty clay with a trace of sand, occasionally with thin layers of sand. These deposits were observed to be generally from 66 to 76 feet thick during geotechnical drilling prior to construction of Fox 1 and 2. Bedrock consisting of the Galena Dolomite and Platteville Formation underlies the surficial soil. Because of the Fox 3 facility's proximity to Fox 1 and 2, it is anticipated that subsurface conditions will be similar.

From the ground surface downward, Table 5-1 identifies the geologic units present beneath the site.

Table 5-1: Description of Geologic Units

Geologic Unit	Description
Sinnipee Group (Ordovician)	Dolomite with some limestone and shale; includes Galena, Decorah, and Platteville Formations
Waupaca Granite (Middle Proterozoic)	Rapakivi granite (wiborgite) containing 70-80 percent coarse (1.5 -5 cm) ovoid alkali feldspars mantled by plagioclase, coarse anhedral quartz, and interstitial hornblende and biotite

Source: http://mrdata.usgs.gov/sgmc/wi.html 2013.

5.4.2 Special Conditions

There are no unusual geological features or conditions related to site geology that are anticipated to require special methods or management during construction.

5.4.3 Impact on Geological Formations

Geologic impacts during construction will be limited to earthwork and regrading of the land. These activities will be accomplished utilizing heavy construction equipment. Based on the limited amount of excavation required and the type of substrate at the site, construction of Fox 3 is not expected to affect geological formations.

5.5 Topography

Topography of the site is discussed below.

5.5.1 Description of General Topography

According to the USGS topographic data, the area in the vicinity of the proposed sites range from approximately 660 to 700 feet above mean sea level. In general, the land slopes from higher elevations in the southwest to lower elevations in the northeast. Areas along US 41 to the west of the existing Fox Energy Center and along the Fox Valley and Western Railroad Corridor to the south of the existing Fox Energy Center are higher in elevation than the crop fields along Wrightstown Road/Golf Course Drive to the north of the existing Fox Energy Center. The area that includes the proposed site footprints is relatively flat but slopes downward to the northeast.

5.5.2 Changes to Site Topography

5.5.2.1 Changes to Site Topography at Site Option 1

Under existing conditions, the Fox 1 and Fox 2 facility site drains into Wetland W-1 which eventually flows into Stream S-1. Stream S-1 flows north to an existing culvert beneath Wrightstown Road/Golf Course Drive. Under Site Option 1, the proposed Fox 3 site flows into Wetlands W-1, W-3, and W-4. Wetlands W-3 and W-4 flow north towards a ditch along the south side of Wrightstown Road/Golf Course Drive, which eventually flows into Stream S-1 and a culvert under Wrightstown Road/Golf Course Drive. However, a portion of Wetland W-3 drains south and to the east into Wetland W-1 and Stream S-1.

The proposed changes to the site topography include filling the site to a similar grade as the existing Fox Energy Center. The drainage on-site will be directed to two wet-detention ponds which will be designed to control any increased runoff from the surfacing change up to the 100-year storm event. The two wet-detention ponds will empty into Stream S-1. The existing storm water from the Fox 1 and Fox 2 facility will be routed around the north side of the proposed expansion of the existing switchyard. It will be designed to have equal to or more capacity than the existing portion of Wetland W-1 north of the existing switchyard. An access road going over Wetland W-1 will be required. A culvert will be designed with sufficient capacity to accommodate the flow of water through Wetland W-1. All culverts will be designed to the applicable local or state standards.

The proposed fill will impede the portion of Wetland W-3 flowing south. Water within the southern portion of Wetland W-3 will be routed around the site to the Stream S-1. The rerouting of the water within Wetland W-3 will help prevent any backup of water onto neighboring properties.

An earthen landscape berm will be added south of Wrightstown Road/Golf Course Drive running parallel to the road. This will be used to block some of the view of the power plant. The earthen landscape berm will block the flow path for Stream S-1 and Wetlands W-1, W-3, and W-4. Culverts will be added beneath the earthen landscape berm to allow flow to continue through Stream S-1 and Wetlands W-1, W-3, and W-4.

5.5.2.2 Changes to Site Topography at Site Option 2

Under existing conditions, the Fox 1 and Fox2 facility site drains into Wetland W-1 which eventually flows into Stream S-1. Stream S-1 flows north to an existing culvert beneath Wrightstown Road/Golf Course Drive. Under Site Option 2, the proposed Fox 3 site flows into Stream S-1 and Wetlands W-1 and W-5. Wetland W-5 drains northeast toward a drainage ditch along a residential driveway. The drainage ditch along the residential driveway flows north to a ditch along the south side of Wrightstown Road/Golf Course Drive, which flows into Stream S-1 and culverts under Wrightstown Road/Golf Course Drive.

The proposed changes to the site topography include filling the site to a similar grade as the existing Fox Energy Center. The drainage on-site will be directed to two wet-detention ponds which will be designed to control any increased runoff from the surfacing change for up to the 100-year storm event. The west wet-detention pond will empty into Stream S-1. The east wet-detention pond will empty into Wetland W-5. In the case that all the on-site flow will be required to empty into Stream S-1, the wet-detention ponds will be designed to meet the pre-vs-post flow requirements. The existing storm water from the Fox 1 and Fox 2 facility will be routed around the north side of the proposed expansion of the existing switchyard. It will be designed to have equal to or more capacity than the existing portion of Wetland W-1 north of the existing switchyard. An access road going over Wetland W-1 will be required. A culvert will be designed with sufficient capacity to accommodate the flow of water through Wetland W-1. All culverts will be designed to the applicable local or state standards.

An earthen landscape berm will be added south of Wrightstown Road/Golf Course Drive running parallel to the road. This will be used to block some of the view of the power plant. The earthen landscape berm will block the flow path for Stream S-1 and Wetlands W-1, W-3, and W-4. Culverts will be added beneath the earthen landscape berm to allow flow to continue through Stream S-1 and Wetlands W-1, W-3, and W-4.

5.6 Soils

According to soils information from the U.S. Department of Agriculture (USDA) NRCS Web Soil Survey for Outagamie County (http://websoilsurvey.nrcs.usda.gov), a total of seven different soil types are mapped within Site Options 1 and 2 (Volume II Appendix J (Wetland Delineation Report, Figure A-4)). The seven soils include Manawa silty clay loam, Manistee fine sandy loam, Rousseau loamy fine sand, Shawano fine sand, Shiocton silt loam, and Winneconne silty clay loam.

5.6.1 Soil Types

The following information for each soil type at the proposed site was obtained from the USDA NRCS Web Soil Survey. More detailed soils information for each soils type is available from the NRCS.

5.6.1.1 Manawa Silty Clay Loam, 0 to 3 Percent Slopes

Manawa silty clay loam soils formed under natural vegetation of mixed hardwoods and conifers, mainly maple, oak, and white pine. They are nearly level to gently sloping, somewhat poorly drained soils in depressions and drainageways on glacial till plains. The typical water table depth for this soil is between 7 and 24 inches. The soil profile consists of silty clay loam, silty clay, and clay. According to the NRCS, this is a hydric soil that is also considered a prime farmland soil if drained. The WDNR's Surface Water Data Viewer identified this soil as a wetland indicator because it is somewhat poorly drained, has a relatively shallow water table, and may be found within areas designated as wetlands.

5.6.1.2 Manistee Fine Sandy Loam, 2 To 6 Percent Slopes

Manistee fine sandy loam soils are well-drained, gently sloping and sloping soils on lacustrine or till plains. They formed under forest vegetation of mostly northern hardwoods, typically maple, oak, hickory, and basswood. The typical water table depth for this soil is between 60 and 80 inches. The soil profile consists of fine sandy loam, loamy fine sand, sand, and clay. According to the NRCS, this soil is typically found on farmland of statewide importance.

5.6.1.3 Rousseau Loamy Fine Sand, 2 to 6 Percent Slopes

Rousseau loamy fine sand soils are well-drained, gently sloping soils on sandy lacustrine and outwash plains. They formed under forest vegetation of maple, white birch, aspen, and beech. The typical water table depth for this soil is between 60 and 80 inches. The soil profile consists of loamy fine sand and fine sand. According to the NRCS, this soil is not considered a prime farmland soil.

5.6.1.4 Shawano Fine Sand, Rolling

Shawano fine sand soils consist of excessively drained, rolling and hilly soils on sand dunes and ridges in areas of glacial outwash. The typical water table depth for this soil is between 60 and 80 inches. They formed under forests of oak, maple, white ash, basswood, white pine, and red pine. The soil profile consists of fine sand. According to the NRCS, this soil is not considered a prime farmland soil.

5.6.1.5 Shiocton Silt Loam, 0 to 3 Percent Slopes

Shiocton silt loam soils consist of somewhat poorly drained, nearly level to gently sloping soils on lacustrine plains. They formed under forests of red maple, white ash, birch, and red oak. The typical water table depth for this soil is between 0 and 6 inches. The soil profile consists of silt loam, very fine sandy loam, coarse silt, and very fine sand. According to the NRCS, this is a hydric soil that is also considered a prime farmland soil if drained. The WDNR's Surface Water Data Viewer identified this soil as a wetland indicator because it is somewhat poorly drained, has a relatively shallow water table, and may be found within areas designated as wetlands.

5.6.1.6 Winneconne Silty Clay Loam, 0 to 2 Percent Slopes

Winneconne silty clay loam soils consist of well-drained, nearly level soils on lacustrine plains that formed under prairies. The typical water table depth for this soil is between 36 and 70 inches. The soil profile consists of silty clay loam, silty clay, and clay. According to the NRCS, this is a hydric soil that is also considered a prime farmland soil.

5.6.1.7 Winneconne Silty Clay Loam, 2 to 6 Percent Slopes

Winneconne silty clay loam soils consist of well-drained, gently sloping soils on lacustrine plains and may include some small areas that are severely eroded. This soil formed under prairies. The typical water table depth for this soil is between 60 and 80 inches. The soil profile consists of silty clay loam, silty clay, and clay. According to the NRCS, this soil is considered a prime farmland soil.

5.6.2 Impacts to Soils

The main power block area for the new facility will be raised approximately 5 feet above the current grade, similar to what was done for the existing facility. There will be some excavation for underground utilities and deep structures such as pump pits. The volume of this excavation will be approximately 30,000 cubic yards. All excavated material will be reused. Depending on the quality of the excavated material, it will be reused to cover the new underground utilities, to be included as part of the fill material used to raise the grade of the new facility, or as part of the earthen landscape berm along the north side of the site. The source of the material for the earthen landscape berm has not yet been determined but will be contractor sourced and approved by WPS.

The new treated storage pond construction will result in a net excavation of approximately 50,000 cubic yards of soil. This excess material will be used as part of the material to build-up the site grade of the new facility or for the earthen landscape berm, depending on the quality of the excavated material.

5.6.3 Soil Mitigation

To mitigate soil impacts, a variety of best management practices (BMPs) erosion control techniques will be used. During construction, topsoil will be segregated and stockpiled separately from subsoils. During site restoration, the topsoil will be spread over the surface of areas that were disturbed by construction. Any compacted soils will be disked prior to final stabilization. Techniques described in the WDNR's Storm Water Management Technical Standards website (http://dnr.wi.gov/org/water/wm/nps/storm water/techstds.htm) will be implemented. Further details are provided in the Wis. Stat. § 30.025 permit application submitted to the WDNR.

5.7 Archaeological and Historic Resources

The following sections discuss the archaeological and historic resources that were found in areas of project-related construction.

5.7.1 Archaeological Report

Due to the probability of prehistoric occupation along the river corridor, WPS retained a qualified archaeological firm to complete investigations of the entire area of potential effect for the power plant site that was not disturbed during prior construction. These archaeological investigations during the summer of 2014 did not identify any cultural or historic artifacts within the area of potential effect for the project. WPS did not survey the area under the existing facility or the open area to the west of the current storage pond that was utilized as a laydown area for the construction of the existing facility. WPS does not anticipate the proposed project will have an adverse effect on any cultural or historical resources. Further details of the archaeological investigations are provided in Volume II Appendix H (Archaeological Survey Report).

5.7.2 Database Search

WPS conducted a review of the Wisconsin Historic Preservation Database for the presence of any previously recorded cultural resource sites or historic structures. The database review did not identify any cultural resource sites or historic structures on the WPS property.

5.7.3 Generation Site Location

The public land survey system locations being impacted by the proposed construction are displayed in Table 5-2.

Table 5-2: Generation Site Location

Town	Range	Section	Quarter Section
21 North	19 East	04	Northeast
21 North	19 East	04	Southeast
21 North	19 East	05	Southwest

5.7.4 Potential Effect on Archaeological or Historical Resources

The area of potential effect for the project is entirely within the area of archaeological survey work. The archaeological survey work for the site did not identify the presence of any cultural or historical resources. Therefore, WPS anticipates that there will be no historic properties affected by Fox 3.

If any cultural or historic artifacts are found during construction, work will cease in the vicinity of the find and the Wisconsin Historical Society (WHS) will be notified. WPS will coordinate with the WHS to protect any potentially significant cultural or historical resources.

5.8 Existing Vegetative Land Cover, Excluding Agricultural Uses

The existing vegetative land cover is discussed in the following sections.

5.8.1 Existing Vegetation Communities

The Fox 3 site mostly consists of agricultural fields planted with alfalfa, corn, and soybeans. Weedy vegetation was present along the field edges and in fallow fields and included yellow bristle grass (*Setaria pumila*), Canadian goldenrod (*Solidago canadensis*), Queen Anne's-lace (*Daucus carota*), annual ragweed (*Ambrosia artemisiifolia*), velvetleaf (*Abutilon theophrasti*), henbit (*Lamium amplexicaule*), and cocklebur (*Xanthium strumarium*). Wetland communities within the Fox 3 site were typically dominated by common reed (*Phragmites australis*), broad-leaf cat-tail (*Typha latifolia*), black willow (*Salix nigra*), and eastern cottonwood (*Populus deltoides*).

5.8.2 Land Cover Types

The types and acreages of land cover on the Fox 3 site were calculated using data obtained from Environmental Systems Research Institute (ERSI) (See Volume II Appendix E). Water accounts for 1.6 acres. Croplands cover 146.5 acres and utilities/communications cover 35 acres. All of the site will be impacted by the project.

5.8.3 Animal and Plant Species

A site visit was conducted on June 19, 2014. During the site visit, red-winged blackbirds (*Agelaius phoeniceus*) were observed nesting in the palustrine emergent (PEM) cattail marsh north of the existing Fox Energy Center Switchyard. Chorus frogs (*Pseudacris triseriata*) and northern leopard frogs (*Rana pipiens*) were also observed along the shore of the PEM cattail marsh north of the existing Fox Energy Center Switchyard. Sandhill cranes (*Grus canadensis*) were observed foraging in the crop fields along the stream that crosses through the Fox 3 site. This stream is designated as Stream S-1 in the wetland delineation report provided in Volume II Appendix J (Wetland Delineation Report). During the site visit, ring-billed gulls (*Larus delawarensis*) and great blue herons (*Ardea herodias*) were observed along the Stream S-1 and within a wetland that occurs along the eastern edge of the Fox 3 site. Mallard ducks (*Anas platyrhynchos*) were also present within Stream S-1.

With the exception of the red-winged blackbird, all the other bird species observed during the field survey are likely temporary visitors. Stream S-1 and the surrounding crop fields likely serves as migratory stopover and foraging habitat for a variety of common migratory birds and year-round resident bird species.

Although not directly observed, crayfish and aquatic insects such as dragonflies and damselflies likely occur in Stream S-1 and the PEM wetland north of the existing Fox Energy Center Switchyard. However, fish are not likely to occur in wetlands and the Stream S-1 within the Fox 3 site because these aquatic habitats are seasonally inundated and intermittent, respectively.

5.8.4 Expected Impacts to Plant and Animal Habitats and Populations

Construction of permanent access roads for Site Option 1 or Site Option 2 will permanently impact a portion of the PEM wetland north of the existing Fox Energy Center Switchyard, which is currently inhabited by red-winged blackbirds, chorus frogs, and northern leopard frogs. The red-winged blackbirds will be displaced to other suitable nesting sites in the vicinity of Fox 3. Similarly, Site Option 1 or Site Option 2 will permanently impact PEM wetlands in crop fields that are currently used by sandhill cranes, ring-billed gulls, and great blue herons for foraging and as migratory stopover habitat. These species will be displaced to other suitable foraging and migratory stopover habitat in the vicinity of Fox 3. The mallard ducks will be temporarily affected by construction noise and activities, but will likely return to the Stream S-1 once construction is complete. Chorus frogs and northern leopard frogs will likely also return to the stream once construction is complete.

5.8.5 Forest Lands

Wooded areas that are on the site are relatively small; occur primarily adjacent to the existing transmission line corridor, and switchyard that are north of the existing Fox Energy Center; and consist of young stands of eastern cottonwood, black willow, and ash-leaf maple trees among open areas dominated by common reed and broad-leaf cat-tail. No other forested areas are located on the site.

Other wooded areas in the vicinity of the site include an approximately 30-acre forest land area located east of the site on an adjacent property, an approximately 1,600-foot wooded screen located along the north side of the Wrightstown Road/Golf Course Drive, and a wooded corridor located along a railroad corridor south of the site.

5.8.6 Potentially Affected Forest Lands

Below is a description of the forested lands that will be potentially affected by the plant.

5.8.6.1 Type of Woods

The wooded area on-site (approximately one acre) consists of deciduous tree species. The trees are volunteer species that have grown unchecked in wetland areas north of the existing Fox Energy Center.

5.8.6.2 Dominant Species

As stated previously, the wooded areas on-site consist of young stands of eastern cottonwood, black willow, and ash-leaf maple trees among open areas dominated by common reed and broad-leaf cat-tail.

5.8.6.3 Average Age and Size of Trees

The wooded areas on-site developed after construction of the existing Fox Energy Center was completed in 2006. All of the eastern cottonwood, black willow, and ash-leaf maple trees on-site are 8 years old or younger.

5.8.6.4 Ownership (Private Versus Public)

WPS owns the entire site, including the wooded areas. WPS is working with two property owners to obtain options to purchase the 37-acre forest land parcel and the 16-acre agricultural land parcel that is located east of the site on adjacent property.

5.8.6.5 Current and Past Use

Prior to the construction of the Fox Energy Center, the site was used to raise grain crops. The wooded areas on the site are volunteer, early successional tree species that have grown unchecked. There is no planned use for the trees that are on-site.

Crop fields were present north of Wrightstown Road/Golf Course Drive prior to the development of the residential community. The wooded screen located along the north side of the Wrightstown Road/Golf Course Drive is currently used to screen the existing Fox Energy Center from residences north of Wrightstown Road/Golf Course Drive.

The approximately 37-acre forest land area that is located east of the site on an adjacent property and the wooded corridor along the railroad corridor has been present since 1978. The past and current use of these wooded areas has not changed over time.

5.8.7 Forest Land Mitigation

The only disturbance to any forest land as part of the proposed project will be in the area of the proposed switchyard expansion (approximately one acre). There are some primary pioneering tree species such as young stands of eastern cottonwood, black willow, and ash-leaf maple trees among open areas dominated by common reed and broad-leaf cat-tail as aspen and cottonwood that have begun to colonize the area. WPS does not propose any measures to replace those species that will be removed in that area.

5.8.8 Re-vegetation and Site Restoration Plan

Below is a discussion of the re-vegetation and site restoration plan.

5.8.8.1 Proposed Re-vegetation

Construction activities will include clearing, grubbing, grading, excavation, infrastructure construction, and re-vegetation. The amount of soil exposed during construction at any one time will be minimized, and existing vegetation will be preserved where practicable. In areas were restoration is required, Wisconsin Department of Transportation (WisDOT) Mix 75 – Erosion Control Native Mix.

5.8.8.2 Vegetative Monitoring Criteria

The site will be inspected by a qualified person at a minimum of once every 7 days. Where areas of concern are noticed, the site will be re-seeded and watered, and fertilizer will be applied, if applicable. Following the completion of construction and stabilization activities, the site will be inspected at least once per month to monitor vegetative growth until final stabilization is achieved.

5.8.8.3 Invasive Species Monitoring and Management

WPS will remain in compliance with the WDNR Chapter NR 40 Invasive Species Identification, Classification and Control Rule. Invasive plants are the main invasive concern. Therefore, during inspection and monitoring activities, WPS will control any prohibited plant species identified onsite and will ensure that any restricted plant species are not spread beyond their known boundaries throughout the duration of the project.

5.9 Invasive Species (Uplands and Wetlands)

A discussion of invasive plant species in both upland and wetlands is provided below.

5.9.1 Invasive Species Areas

No prohibited invasive species were identified at the project site during the April and June site visits. Common reed (*Phragmites australis*) was the only restricted invasive species that was identified at the project site during the April and June site visits. Common reed was present in Wetlands W-1, W-3, and W-5. No other invasive plant species were noted during the April and June site visits.

5.9.2 Mitigation Methods

In compliance with Chapter NR 40 Invasive Species Identification, Classification and Control Rule, WPS will mitigate the potential to spread invasive plant species during the project activities. To accomplish this, WPS has completed a survey and identified invasive plant species on the Fox 3 site. The review was completed in April and June, 2014. The only invasive plant species observed was common reed grass (*Phragmites australis*); listed as restricted by the WDNR (Volume I Appendix CC (Invasive Species).

WPS will have the invasive plant species locations placed on the construction plans and flagged on-site. WPS will then require that these areas are avoided during construction, where feasible. In areas where impacts to the invasive plant species are unavoidable, WPS will require that equipment be cleaned prior to moving from an infested to a non-infested area.

Within the Fox 3 construction boundary, cleaning will primarily be conducted by brush, broom, or other hand tools; however, WPS may periodically require equipment to be cleaned by pressure washers. In addition, equipment used to complete ground disturbing activities, will be cleaned prior to leaving the Fox 3 site. This will avoid the spread of invasive plant species beyond the Fox 3 site. If effective cleaning cannot be completed on-site, WPS may allow the equipment to be cleaned at the contractor's shop.

WPS will also require that construction equipment being brought on-site is free of muck and invasive species and that the seed used for re-vegetation has been reviewed and certified by WPS to be free of invasive plant species.

5.10 Rare Species, Natural Communities, and WDNR/USFWS Endangered Resource Reviews

The rare species, natural communities, and endangered resources are discussed in the following sections.

5.10.1 Endangered Resources Review

A NHI database review has been conducted for the Fox 3 project boundary. The NHI database is a program administered by the WDNR – Natural Heritage Conservation (NHC). The NHI database is a collection of the locations and status of rare species, natural communities, and natural features throughout the State. The review was completed by Mr. James Nuthals, WPS Environmental Services representative and Certified Endangered Resources (ER) Reviewer.

The NHI database review did not identify any state- or federally listed threatened or endangered species, species of special concern, or natural communities within the NHI database search area. The WDNR Natural Heritage Conservation ER Verification Broad Incident Take Permit/Authorization for No/Low Impact Activities Form for the Fox 3 site is included in Volume II Appendix I.

On July 3, 2014, Mr. Nuthals consulted with Ms. Angela White, WDNR Bureau of Natural Heritage Conservation representative, to confirm that no element occurrences were identified within the NHI database under the WDNR search protocols. An element occurrence is a population of a species or an example of a natural community or natural feature naturally occurring at a specific and ecologically appropriate location. Ms. White completed an independent review of the NHI database for the Fox 3 site and verified that no element occurrences were identified for the Fox 3 site.

WPS did however, identify one active bald eagle (federal species of special concern) nest during a site visit completed on August 16, 2014. According to the USFWS BEMG, the nest is at sufficient distance from Fox 3 that should not impact the bald eagle at any time of the year.

WPS is proposing to complete work on the existing check valve located within the Fox River. The work within the Fox River is at a distance from the bald eagle nest where, according to the BEMG, human activity could negatively impact the bald eagle species during the critical nesting period. Because of this, WPS will adhere to the BEMG and complete the check valve work outside of the critical nesting period.

Fox 3 is located on an active agricultural field. A site review of the Fox 3 property was completed on April 16 and June 19, 2014. No other areas of potential state or federal threatened and endangered species or special concern species habitat, natural communities, or habitat features were identified during site review.

5.10.2 General Location of Identified Resources

During field review, a bald eagle nest was identified along the south bank of the Fox River, south of the Fox Energy Center. The bald eagle nest was not identified in the NHI rare species review. A map of the location of this nest is provided in Volume III Appendix F Sensitive Species Map (CONFIDENTIAL).

5.10.3 Habitat Assessments

As stated in Section 5.8.3, sandhill cranes, red-winged blackbirds, ring-billed gulls, great blue herons, mallard ducks, chorus frogs, northern leopard frogs were all observed at the Fox 3 site. The red-winged blackbirds, chorus frogs, northern leopard frogs, and mallard ducks likely are permanent or seasonally permanent residents at the site. The sandhill cranes, ring-billed gulls, and great blue herons are likely temporary visitors, foraging at the site.

Potential habitat for state- or federal-protected species was not present at or in the immediate vicinity of the Fox 3 site. The site offers little habitat for wildlife, other than common species that are tolerant of regular human disturbances. According to the USDA Soil Survey for Outagamie County, the Fox 3 site has been farmed since at least 1978.

5.10.4 WDNR-related Follow-up Actions

WPS is proposing to complete work on the existing check valve located within the Fox River. The work within the Fox River is at a distance from the bald eagle nest were according to the BEMG, human activity could negatively impact the bald eagle species during the critical nesting period. Because of this, WPS will adhere to the BEMG and complete the check valve work outside of the critical nesting period.

5.10.5 WDNR-related Follow-up Recommendations

The WDNR has not identified any recommended actions for Fox 3 to help conserve Wisconsin's rare species and high-quality natural communities. Based on a WDNR NHI database search, no rare species or high-quality natural communities are located at or within the vicinity of the site.

5.11 Wetlands and Permits

Wetlands and the required permits for impacting wetlands are discussed below.

5.11.1 Wetlands and Waterways WDNR and USACE Permit Application

The wetlands and waterways WDNR and USACE permit application materials were submitted on December 29, 2014.

5.11.2 WDNR Waterway/Wetland Impact Location and Inventory Tables

The WDNR Waterway/Wetland Location and Environmental Inventory Tables were submitted on December 29, 2014.

5.11.3 Wetland Practicable Alternatives Analysis (Wis. Admin. Code Ch. NR 103)

The following sections provide the wetland practicable alternatives analysis.

5.11.3.1 Site Selection Process

As previously described in Section 1.4.2, preliminary sites were identified by considering the required infrastructure access (transmission lines, natural gas pipelines, and water resources). In total, 18 preliminary sites were reviewed and 7 sites were carried forward for detailed evaluations. The 7 sites were designated as candidate site areas and are listed in Table 1-1.

5.11.3.1.1 Selection of Preferred Site Areas

Field reconnaissance of the seven candidate site areas was performed in August 2013 by a multi-disciplinary project team consisting of members from WPS and Burns & McDonnell. The field reconnaissance consisted of an automobile survey along public roads in the vicinity of each potential site area.

Following the field reconnaissance of the seven preferred site areas and subsequent analyses, the project team evaluated the relative strengths and weaknesses of each site. Of the seven candidate sites, comparative analyses led to the recommendation for WPS to carry forward two existing generation sites and one greenfield site.

The three sites recommended for advanced development activities were:

- Fox Energy Center
- Pulliam Generating Station
- Ridge Road

A summary of the major features of the preferred sites is included in Table 1-5. The Fox Energy Center was selected as the site for the construction site of the proposed project.

5.11.3.1.2 Site Option Analysis

When WPS completed the siting study for the new natural gas facility, it evaluated the ability of the existing facility property (approximately 109 acres) to accommodate another natural gas facility. Since the time the siting study was completed, WPS acquired additional acreage (approximately 75 acres in late 2013). The availability of the additional land created the possibility for WPS to have more than one site option at the existing facility. Several factors were taken into consideration by WPS while developing the power plant facility and equipment layout for the site: fuel supply, water supply, transmission interconnection, construction site access, social impacts, and environmental impacts. However, not every possible layout configuration is an acceptable or efficient power plant site layout. In the investigation of proposed site layout options for this application, WPS identified at least four locations on the property where site layout options could be placed.

- Site Option 1: located in the northern portion of the WPS property (Volume I Appendix L, Figure L-2).
- Site Option 2: located in the southeast area of the property (Volume I Appendix L, Figure L-3).
- Site Option 3: located northwest of Fox 1 and 2, along the west edge of the property (Volume I Appendix L, Figure L-4).
- Site Option 4: located in the northern portion of the WPS property (Volume I Appendix L, Figure L-5).

The four site options, which were high-level conceptual site layouts, were selected from a physical space evaluation only. Another potential site arrangement option that was conceptually evaluated by WPS included siting the facility in the northeast corner of the Fox Energy Center Property along Wrightstown Road/Golf Course Drive. All of these site options were preliminarily evaluated based primarily on their potential to impact neighboring residences (e.g., cooling tower plume/fogging, air quality, and noise) and secondarily on their potential to impact wetlands at the site. The results of the preliminary evaluation are provided below.

Site Option 1

Site Option 1 was selected as an option alternative because it is a feasible design, located in a relatively flat area in the center of the property, will meet all property boundary air quality and noise level standards. Additionally, Site Option 1 ground fogging and icing is expected to stay on-site based on modeling. The cooling tower, generation block, and stack of Site Option 1, which are the primary sources for noise, air quality, and fogging and icing impacts, will be located greater than 1,000 feet from the nearest adjacent residence (Volume I Appendix DD). The proposed earthen landscape berm will partially block the view and some of the operational noise generated by Site Option 1 from residences north of Wrightstown Road/Golf Course Drive.

Site Option 1 will result in unavoidable impacts to streams and wetlands; however, WPS has worked towards designing a facility layout that will minimize and avoid wetland impacts to the extent practicable.

Site Option 2

Site Option 2 was selected as an option alternative because it is a feasible design, located in a relatively flat area towards the southeast corner of the property and will meet all property boundary air quality and noise level standards. Additionally, modeling indicated that Site Option 2 ground fogging and icing is expected to occur mostly on-site; however, there is predicted to be minimal additional off-site fogging and icing attributable to the Fox 3 cooling water tower that could occur along State Highway 96. The cooling tower, generation block, and stack of Site Option 2 will be located approximately 625 feet, 1,100 feet, and 1,322 feet, respectively, from the nearest adjacent residence, which is located east of the property (Volume I Appendix DD). A forest on the adjacent property partially blocks the eastern landowner's view of Site Option 2. The proposed earthen landscape berm will partially block the view of Site Option 2 from residences north of Wrightstown Road/Golf Course Drive.

Site Option 2 will result in unavoidable impacts to streams and wetlands; however, WPS has worked towards designing a facility layout that will minimize and avoid wetland impacts to the extent practicable.

Site Option 3

As indicated in Volume I Appendix L (Figure L-4), Site Option 3 is located northwest of Fox 1 and 2 and along the west edge of the WPS property. Site Option 3 was not selected to be carried forward primarily because of its proximity and the potential social impacts to existing adjacent landowners and public roads. There are also other physical site option concerns that will also need to be overcome with Site Option 3 such as the presence of a seep on the side of the hill and the need to complete a major change in the topography to create a flat arrangement for the site construction.

Because Site Option 3 is located adjacent to the western property boundary it will likely be unable to meet property boundary air quality standards and property boundary noise level standards. The cooling tower for Site Option 3, which is a potential source of noise, will be approximately 250 feet east of and 625 south of existing residences. The cooling tower will also be a source of fogging for the two adjacent residences and US 41 and East Frontage Road, which are located approximately 750 feet to the west.

Additionally, there is not enough space between the proposed facilities of Site Option 3 and the western property boundary to construct or install any structures to mitigate for noise, or visual impacts to the nearest residences. Although, the earthen landscape berm along Wrightstown Road/Golf Course Drive was not proposed at the time Site Option 3 was evaluated, the construction of a proposed earthen landscape berm will partially block the view and some of the operational noise generated by Site Option 3 from residences north of Wrightstown Road/Golf Course Road. The residences along US 41 and the East Frontage Road will not have anything to block their view.

The layout of Site Option 3 will result in permanent impacts to Wetlands W-1 and W-2. Temporary wetland impacts will likely occur to Wetlands W-1, W-2, and W-3 from temporary construction access roads and the temporary construction laydown, storage, contractor parking, and contractor trailer areas that would be necessary for construction.

Site Option 4

As indicated in Volume I Appendix I (Figure L-5), Site Option 4 is located north of Fox 1 and 2 within the middle of the WPS property. Site Option 4 used for this analysis is not the same Site Option 4 discussed in Sections 1.4.8 and 3.1.2 (see Volume I Appendix I, Figure I-2), which is the mirror of Site Option 1. Although Site Option 4 resulted in relatively few social impacts, it was not selected to be carried forward primarily because of its similar impacts to wetlands and greater impacts to Stream S-1 than will occur with Site Option 1.

Similar to Site Option 1, Site Option 4 is a feasible design, located in a relatively flat area in the center of the property, will meet all property boundary air quality and noise level standards, and will not result in fogging and icing impacts to adjacent landowners and public roads. The cooling tower, generation block, and stack of Site Option 4 will also be located greater than 1,000 feet from the nearest adjacent residence. Although no earthen landscape berm was proposed at the time Site Option 4 was evaluated, the construction of a proposed earthen landscape berm along Wrightstown Road/Golf Course Drive will partially block the view and some of the operational noise generated by Site Option 4 from residences north of Wrightstown Road/Golf Course Drive.

Because the layout for Site Option 4 is very similar to the layout for Site Option 1, Site Option 4 will result in similar temporary and permanent impacts to Wetlands W-1 and W-3. However, Site Option 4 will also require the relocation of 498 feet of Stream S-1. The stream realignment will need to be designed to maintain flow similar to Stream S-1, convey storm water off-site, and provide the proper stream function without impacting wetland and stream resources downstream of Fox 3. The stream realignment will need to occur prior to the start of any construction activities for Fox 3. The realigned stream will need to be monitored throughout construction and operation of Fox 3 to make certain that proper stream function is maintained. Any loss of proper stream function will need to be corrected through maintenance or reconstruction and reestablishment of the stream realignment. Due to the amount of effort and time that will be spent on realigning Stream S-1, WPS decided that Site Option 4 should not be selected to be carried forward.

Site Option in Northeast Corner

As indicated in Volume I Appendix I (Figure L-6), this site option, which was located entirely in the northeast corner of the WPS property, was not selected to be carried forward as a site option primarily because of its potential social impacts upon and proximity to existing adjacent landowners and public roads. It also has potential impacts associated with realignment of Stream S-1. Additionally, by locating Fox 3 so far from Fox 1 and 2, some synergies will be lost from not being able to share facilities.

The northeast corner site option is located east of Stream S-1, adjacent to the eastern and northern property boundaries. Because it is located along property boundaries it will likely be unable to meet property boundary air quality standards and property boundary noise level standards. The cooling tower for this site option will be approximately 200 feet south of an existing residence located on Royal St. Pats Drive, north of Wrightstown Road/Golf Course Drive. The generation block and stack for the northeast corner site option in the northeast corner will be located approximately 400 feet northwest of the nearest adjacent residence, which is located east of the property. Additionally, the cooling tower will also be a source of fogging and icing along Wrightstown Road/Golf Course Drive and for the residences north of Wrightstown Road/Golf Course Drive and east of Fox 3.

There is not enough space between the proposed facilities for this site option in the northeast corner and the eastern and northern property boundary to construct or install any structures to mitigate for noise, or visual impacts to the nearest residences. Additionally, an existing 30-inch ANR natural gas pipeline and easement is located along the eastern property boundary and will limit the size and footprint of any potential noise or visual mitigation measures. The construction of a proposed earthen landscape berm west of the this site option and along Wrightstown Road/Golf Course Road will not block the view or operational noise generated by this site option.

The northeast corner site option will result in permanent impacts to Wetland W-1 and Stream S-1. The northeast corner site option will likely require the relocation of up to 1,000 feet of Stream S-1 to accommodate the facility footprint. The stream realignment will need to be designed to maintain flow similar to Stream S-1, convey storm water off-site, and provide the proper stream function without impacting wetland and stream resources downstream. The stream realignment will need to occur prior to the start of any construction activities and will need to be monitored to make certain that proper stream function is maintained. Any loss of proper stream function will need to be corrected through maintenance or reconstruction and reestablishment of the stream realignment.

Temporary wetland impacts will still likely occur from temporary construction access roads and the temporary construction laydown, storage, contractor parking, and contractor trailer areas that will be necessary for construction.

5.11.3.2 Avoidance and Minimization of Wetland Impacts

The Fox Energy Center was selected as the site for the construction site of the proposed project for the following main reasons.

- The Fox Energy Center is the only site owned by WPS with a nearby competitive fuel supply option that has capacity to support Fox 3.
- The Fox Energy Center has relative advantages as the existing units at the Fox Energy Center are combined cycle units. The other potential sites considered were not combined cycle facilities and will not have existing staff that are trained to operate a combined cycle facility, thereby reducing on-going O&M costs.
- The Fox Energy Center site has existing water supply infrastructure in place.

Other WPS owned sites will not be compatible with a new CCGT unit or capable of sharing staff as those sites have coal-fired units and small simple cycle gas turbine units. Additionally, other WPS owned sites will require the construction of new fuel supply pipelines, transmission lines, and/or development of water supply infrastructure.

5.11.3.2.1 Fox 3 Site Layout Options

As stated previously, only two site options for Fox 3 are proposed. They are referred to as Site Option 1 and Site Option 2. Both are located within the boundary of the existing Fox Energy Center and both will result in unavoidable impacts to wetlands and waterways. Each site option provides a different site layout approach to avoid and minimize wetland impacts. Unavoidable impacts to streams and wetlands will result from the Site Option 1 and Site Option 2 layout because each of the layouts are configured to optimize the access and systems needed for the generators and cooling towers and each will take advantage of existing infrastructure and facilities at Fox 1 and 2 that may be shared with Fox 3. Additionally, the infrastructure associated with Site Option 1 and Site Option 2 has been sited to minimize wetland impacts within Wetlands W-1, W-3, and W-5.

5.11.3.2.2 Switchyard Expansion

Both Site Option 1 and Site Option 2 will require the expansion of the Fox River Switchyard. The upgrades to the ATC Fox River Switchyard will be the subject of a separate application for Certificate of Authority being filed by ATC later in 2015. ATC will apply for the necessary permits to accommodate generation interconnection.

5.11.3.2.3 Earthen Landscape Berm

Over the course of project, an earthen landscape berm was added to the proposed layouts. The earthen landscape berm will be constructed along the northern boundary of the property immediately adjacent and parallel to Wrightstown Road/Golf Course Drive. While the placement and construction of the earthen landscape berm is not a local regulatory requirement, residents north of Wrightstown Road/Golf Course

Drive support placement of additional visual screening of the facility. For this reason, the impacts to Wetlands W-1, W-3, and W-4 that will result from construction of the earthen landscape berm are unavoidable.

5.11.3.2.4 Temporary Construction Laydown Areas

The unavoidable temporary wetland and stream impacts associated with the construction laydown areas, construction contractor trailers, construction worker parking, and associated construction access roads are necessary. Construction equipment, construction workers, and construction materials need to be stored close to the construction site for safety, site security, and construction logistical reasons. Using an off-site location for areas for construction laydown areas, construction contractor trailers, and construction worker parking may result in more construction traffic along public roadways, temporary road closures, and additional off-site areas being impacted.

5.11.3.2.5 Access Roads

Unavoidable temporary and permanent impacts to Stream S-1 and Wetlands W-1 and W-3 will result from the construction of temporary and permanent access roads, including the installation of culverts, for Fox 3. The permanent construction access roads, including the placement of permanent corrugated metal culverts in Wetlands W-1 and W-3, will be necessary to safely move operation and maintenance staff, vehicles, and equipment around Fox 3. The permanent access road that crosses Wetland W-1 is necessary to provide direct access from the East Frontage Road to Fox 3 (either Site Option 1 or Site Option 2) without having to direct vehicles through the Fox 1 and 2 facility. The temporary construction access roads, including the placement of temporary corrugated metal culverts in Stream S-1 and the wetlands on-site, will be necessary to safely move construction contractors, construction vehicles, and equipment around the construction site. The culverts are necessary to provide a hydrologic connection for the stream and wetlands that are crossed and will be sized and placed within the stream and wetlands to minimize impacts and maintain flows and the functionality of the stream and wetlands.

WPS has determined that using temporary and permanent access roads with corrugated metal culverts is necessary and the most practicable alternative. Using temporary and permanent clear span bridges to avoid the impacts along access roads in Stream S-1 and Wetlands W-1 and W-3 is not feasible. A 20-foot-wide access road will be needed to accommodate construction vehicles and equipment during construction, and maintenance vehicles and equipment during operation of Fox 3. The permanent and temporary clear span bridges will have to be designed to safely handle the weight of construction vehicles, maintenance vehicles, and equipment. The footprint of the permanent and temporary clear span bridges will be significantly larger and will require substantial footings to be constructed to support the clear span bridges and anticipated loads.

5.11.3.2.6 Cost, Technological, and Construction Constraints

The cost and technological constraints are similar for both site options. Site Option 1 and Site Option 2 layouts are based on the same equipment and technology. Although the configurations of Site Option 1 and Site Option 2 differ significantly, each will use the same construction methods and result in relatively similar impacts to wetlands at Fox 3. Each site option minimized wetland impacts through avoidance to the extent practicable while still maintaining a close proximity to Fox 1 and 2 and potential shared facilities.

5.11.3.3 Construction and Restoration Methods

5.11.3.3.1 Fox 3

The main power block area for the new facility will be raised approximately 5 feet above the current grade, similar to what was done for the existing facility. There will be some excavation for underground utilities and deep structures such as pump pits. The volume of this excavation will be approximately 30,000 cubic yards. All excavated material will be reused. Depending on the quality of the excavated material, it will be reused to cover the new underground utilities, to be included as part of the fill material used to raise the grade of the new facility, or as part of the earthen landscape berm along the north side of the site.

A new storage pond will be constructed that will result in a net excavation of approximately 50,000 cubic yards of soil. This excess material will be used as part of the material to build-up the site grade of the new facility or as north site earthen landscape berm material, depending on the quality of the excavated material.

5.11.3.3.2 Access Roads and Culverts

The proposed project will include the construction of temporary and permanent access roads within Wetland W-1 and W-3 and across Stream S-1. The corrugated metal temporary and permanent culverts that will be placed within wetlands and the stream to maintain hydrologic connections will be the correct size and capacity to maintain flows where temporary and permanent access road crossings occur.

5.11.3.3.3 Construction Laydown Areas

The construction area and laydown site arrangement is shown in Volume I Appendix L, Figures L-2 and L-3 for each proposed site alternative. The drawings show the following expected requirements necessary for successful execution of the work.

- Plant access for construction manpower and material deliveries
- Acceptable construction crane access along both sides of new construction
- Consideration for crane access during new construction tie-in to the existing plant
- Sufficient area reserved for construction offices and craft trailers (2.2 acres total), with on-site parking
- Craft break and change house area
- Identification of approximately 15 acres of yard fabrication, lay-down space for material storage and staging
- On-site temporary construction roads providing good access for construction between the site entrance, lay-down yard, and the construction area
- Controlled craft parking for approximately 250 vehicles (2.5 acres) within walking distance of the construction area
- Controlled electronic badge access point for craft entry into the plant proper
- Identification and potential means of supply for various construction utilities
- Soil spoils stockpile area
- Concrete truck wash out area

5.11.3.3.4 Post Construction Restoration

All temporary construction facilities such as the laydown, construction access roads and culverts, craft parking, and construction offices will be dismantled after construction is complete and the remaining areas will be restored to pre-construction conditions unless area is identified during detailed design to be left for future use. It is anticipated that WPS may re-purpose portions of the parking, office trailer, and laydown areas to support plant maintenance and outage work scope during permanent plant operation.

5.11.4 Wetland Delineations

A wetland delineation report has been completed and is included as Volume II Appendix J (Wetland Delineation Report). A total of five wetlands (15.08 acres) were delineated within the limits of Fox 3. The wetlands are described below and their locations are shown on Volume II Appendix J (Figure A-5). According to the Wetland Rapid Assessment Methodology (WRAM) assessment provided in the wetland delineation report for Fox 3, the wetlands that are at the project site have low-to-medium functional values because they are dominated by invasive wetland plant species and occur within crop fields, along agricultural swales, and along intermittent streams that have been modified to maximize the area that can be farmed. Table 5-3 provides the types and size of each wetland delineated at the Fox 3 site.

Table 5-3: Wetlands Identified at Fox 3

Wetland Number	Sample Plot	Wetland Classification		Area in Project Limits (acres)
		Cowardin[a]	WWI[b]	
W-1	SP-2, SP-3, SP-24, SP-30, SP-31, SP-32	PEM	E2Hf	8.96
W-2	SP-25	PEM/PFO	E2/T3Ka	0.38
W-3	SP-12, SP-13, SP-15, SP-17	PEM	E2Kf	3.39
W-4	SP-10	PEM	E2Kf	0.24
W-5	SP-5, SP-22, SP-27, SP-28, SP-29	PEM	E2Kf	2.11
			Total Area:	**15.08**

(a) PEM = palustrine emergent and PFO = palustrine forested. Source: Based on Cowardin, L. M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Washington, D.C.
(b) E2 = emergent/wet meadow, narrow-leaved persistent; T3 = forested, broad-leaved deciduous; H = standing water, palustrine; K = wet soil, palustrine; f = farmed; a = abandoned, historically cultivated. Source: Wisconsin Wetland Inventory Classification Guide (http://dnr.wi.gov/topic/wetlands/documents/WWI_Classification.pdf)

5.11.4.1 Wetland 1 (W-1)

W-1 is a PEM wetland that is located in the middle of the Fox 3 site (Volume II Appendix J (Figure A-5)). W-1 contained hydric soils and hydrophytic vegetation and was inundated during the April and June 2014 site visits. This wetland receives storm water runoff from the Fox Energy Center and adjacent crop fields. Stream S-1 is located in the northern portion of this wetland. The bed and bank of Stream S-1 begins north of a tractor crossing and north of the Fox Energy Center fence. Common reed is the dominant species found in Wetland W-1. Stands of broad-leaf cat-tail and eastern cottonwood and black willow trees and shrubs are present along a berm, which is northeast of the existing switchyard. The berm was constructed to direct storm water flow from the Fox Energy Center toward Stream S-1.

5.11.4.2 Wetland 2 (W-2)

W-2 is a forested wetland located between W-1, the Fox Energy Center fence, and an overhead electrical transmission line corridor (Volume II Appendix J (Figure A-5)). This isolated wetland depression, which was inundated during the April 2014 site visit, appears only to receive storm water runoff from the overhead electrical transmission line corridor to the south and west and crop fields to the north. W-2 contained hydric soils and hydrophytic vegetation (common reed and eastern cottonwood and ash-leaf maple trees).

5.11.4.3 Wetland 3 (W-3)

W-3 is a farmed PEM wetland located in a crop field (Volume II Appendix J (Figure A-5)). Portions of W-3 were inundated during the April site visit. This wetland is hydrologically connected to a roadside ditch along the south side of Wrightstown Road/Golf Course Drive and to W-1 and Stream S-1. W-3 also contained hydric soils and hydrophytic vegetation (common reed, broad-leaf cat-tail, and spotted lady's-thumb [*Persicaria maculosa*]); however, hydrophytic vegetation was not consistently present throughout this farmed wetland.

5.11.4.4 Wetland 4 (W-4)

W-4, a farmed wetland in a crop field, was inundated during the April 2014 site visit (Volume II Appendix J (Figure A-5)). This wetland is hydrologically connected to a roadside ditch along the south side of Wrightstown Road/Golf Course Drive. Except for soybeans, no other vegetation was present in this farmed wetland. W-3, which is located west of W-4, contained hydrophytic vegetation (common reed, broad-leaf cat-tail, and spotted lady's-thumb). W-3 and W-4 have similar hydrology and soils, so it was assumed that W-4 will likely support hydrophytic vegetation if it was not regularly plowed and planted with corn and soybeans.

5.11.4.5 Wetland 5 (W-5)

W-5 is a PEM wetland located in a crop field (Volume II Appendix J (Figure A-5)). W-5 contained hydric soils and hydrophytic vegetation, and was inundated during the April and June 2014 site visits. This wetland receives storm water runoff from adjacent crop fields and is hydrologically connected to Stream S-1 by a roadside ditch along the adjacent landowner’s private driveway and the south side of Wrightstown Road/Golf Course Drive. The dominant wetland plant species in W-5 include common reed, broad-leaf cat-tail, common spike-rush, dock-leaf smartweed (*Persicaria lapathifolia*), fox-tail barley, and curly dock.

5.11.5 Significant or High-quality Wetlands

Wetlands within the Fox 3 site were evaluated per the WRAM assessment. Three of the five wetlands that are within the Fox 3 site generally have a medium functional value for shore line protection, water quality protection, and storm and floodwater storage because they contain densely rooted emergent vegetation and capture and store storm water runoff from the Fox Energy Center and surrounding crop fields before the runoff reaches the tributary to Apple Creek. Two wetlands that are within the Fox 3 site have a relatively low functional value because portions of these wetlands are regularly farmed. All of the wetlands at the Fox 3 site have a low human use value, low wildlife habitat value, low fish and aquatic life value, and low groundwater recharge value because they are currently or have historically been farmed, dominated by invasive wetland plant species, only seasonally inundated, and located within crop fields and adjacent to the existing Fox Energy Center.

5.12 Water

Water intake, consumption, and discharge are discussed in the following sections.

5.12.1 Existing Water Bodies and Waterways

A description of the existing water bodies and waterways in the vicinity of Fox 3 is discussed below.

5.12.1.1 Waterbodies and Waterways

Below is a discussion of the waterbodies and waterways for the Fox 3 site and within one-half mile of the project boundary.

5.12.1.1.1 Project Site

A total of four PEM wetlands, one small mixed PEM/PFO wetland, and one stream were identified within the limits of the Fox 3 site. Stream S-1 is the only stream within the Fox 3 site and drains northeast towards its confluence with Apple Creek. Apple Creek, which is located approximately 1 mile north of the Fox Energy Center, flows east towards the Fox River. The Fox River is located approximately 2,400 feet south of the Fox Energy Center. A tributary to Apple Creek is located on the adjacent property east of the Fox Energy Center. A pond is located on the adjacent property west of the Fox Energy Center and several ponds are located north of the Fox Energy Center within the Royal St. Patrick's Golf Links and adjacent residential community. No other streams or water bodies are located within the vicinity of the Fox Energy Center.

5.12.1.1.2 Navigable Waters of the State

Stream S-1 that is located within the Fox Energy Center and is considered a navigable water of the state under Wis. Stat. § 30, because the stream has a distinguishable bed and bank.

5.12.1.2 Other Waterways

The following sections discuss the waterways that are outstanding or exceptional, trout streams, or are considered wild and scenic rivers.

5.12.1.2.1 Outstanding or Exceptional Resource Waterbodies/Waterways

According to the WDNR, the only Exceptional Resource Water in Outagamie County is the Embarrass River, which is located in the northwest corner of the county. No Outstanding Resource Waters occur within Outagamie County. Construction and operation of Fox 3 will not result in any impacts to Outstanding or Exceptional Resource Waters; thus, no avoidance, minimization, or mitigation measures will be required.

5.12.1.2.2 Trout Streams

No trout streams are located within Outagamie County. Construction and operation of the proposed project, will not result in any impacts to trout streams; thus, no avoidance, minimization, or mitigation measures will be required.

5.12.1.2.3 Wild or Scenic Rivers

There are no state- or federal-designated wild or scenic rivers in Outagamie county; thus, no impacts will occur. Avoidance, minimization, or mitigation measures will not be required.

5.12.1.3 Potential Impacts to Wetlands.

Site Option 1, including the proposed earthen landscape berm, will result in 0.11 acre of temporary impacts and 1.28 acres of permanent impacts to wetlands. Site Option 2, including the proposed earthen landscape berm, will result in 0.35 acre of temporary impacts and 1.76 acres of permanent impacts to wetlands.

Both Site Option 1 and Site Option 2 include the construction of the proposed earthen landscape berm along Wrightstown Road/Golf Course Drive at the northern border of the Fox Energy Center. Construction of the earthen landscape berm will require the placement of permanent fill and culverts in Wetlands W-1, W-3, and W-4 and result in approximately 0.09 acre, 0.15 acre, and 0.12 acre of permanent impacts, respectively.

A detailed description of the potential wetland impacts associated with each Site Option is provided in the sections below.

5.12.1.3.1 Site Option 1

Based on the current engineering design, Site Option 1, including the proposed earthen landscape berm, will result in 0.11 acre of temporary impacts and 1.28 acres of permanent impacts to wetlands (Table 5-4). Site Option 1 is primarily sited west of Stream S-1 that crosses through the center of Fox 3. Site Option 1 is configured such that the Fox 3 facility footprint is located mostly in uplands between Wetland W-3 and Wetland W-1.

A portion of Wetland W-3 will be permanently filled (0.43 acre) to construct Fox 3. Construction of permanent access roads will result in approximately 0.49 acre of permanent fill to be placed in Wetland W-1. Temporary construction access roads will result in the placement of temporary fill and culverts in Wetlands W-1, W-2, and W-3 and result in approximately 0.10 acre of temporary impacts; however, the areas within Wetlands W-1, W-2, and W-3 that will be temporarily impacted will be restored and re-vegetated once construction is complete. To avoid temporary impacts to wetlands, temporary construction contractor parking, laydown areas, and construction site trailers are sited in upland areas between Wetlands W-1, W-3, W-4, and W-5. The permanent and temporary access roads were sited to minimize the amount of wetland impacts.

Table 5-4: Site Option 1 Proposed Wetland Impacts

Wetland	Reason for Impact	Permanent Impacts (acres)	Temporary Impacts (acres)	Minimization Efforts That Have Occurred
W-1*	Earthen Landscape Berm and Permanent Culvert	0.09	0	Minimized size and footprint while still maintaining a 15-foot tall earthen landscape berm that provides some level of visual screening, noise screening, and a reduction in off-site lighting impacts.
	Access Roads and Culverts	0.49	0.08	Moved temporary construction access roads, contractor parking, and laydown areas to eliminate some access roads.
W-2	Access Road	0	0.01	None
W-3	Earthen Landscape Berm and Permanent Culvert	0.15	0	Minimized size and footprint while still maintaining a 15-foot tall earthen landscape berm that provides some level of visual screening, noise screening, and a reduction in off-site lighting impacts.
	Fox 3	0.43	0	Moved temporary construction access roads, contractor parking, and laydown areas
	Access Roads and Culverts	0	0.01	Eliminated some access roads.
	Water Pipeline	0	0.01	None
W-4	Earthen Landscape Berm and Permanent Culvert	0.12	0	Minimized size and footprint while still maintaining a 15-foot tall earthen landscape berm that provides some level of visual screening, noise screening, and a reduction in off-site lighting impacts; Moved a permanent access road
W-5	Avoided	0	0	None
	Total	1.28	0.11	

* Includes impacts within Stream S-1.

5.12.1.3.2 Site Option 2

Based on the current engineering design, Site Option 2, including the proposed earthen landscape berm, will result in 0.35 acre of temporary impacts and 1.76 acres of permanent impacts to wetlands (Table 5-5). Site Option 2 is primarily sited southeast of Stream S-1. Site Option 2 is configured such that the Fox 3 facility footprint avoids Wetland W-1 and W-3.

Site Option 2 will require permanent fill to be placed in approximately 0.91 acre of the southern portion of Wetland W-5. Construction of permanent access roads will result in approximately 0.46 acre of permanent fill to be placed in Wetland W-1. Approximately 0.21 acre of temporary impacts to Wetland W-1 will result from temporary construction access roads, and culverts. Temporary construction contractor parking, laydown areas, and construction site trailers are primarily sited in upland areas between Wetlands W-1, W-3, and W-5; however, a portion of a temporary construction access road will temporarily impact Wetland W-1 (0.16 acre). The areas within the wetlands that will be temporarily impacted will be restored and re-vegetated once construction is complete. The permanent and temporary access roads were sited to minimize the amount of wetland impacts.

Table 5-5: Site Option 2 Proposed Wetland Impacts

Wetland	Reason for Impact	Permanent Impacts (acres)	Temporary Impacts (acres)	Minimization Efforts That Have Occurred
W-1*	Earthen Landscape Berm and Permanent Culvert	0.09	0	Minimized size and footprint while still maintaining a 15-foot tall earthen landscape berm that provides some level of visual screening, noise screening
	Access Roads and Culverts	0.46	0.21	Moved temporary construction staging and laydown areas
W-2	Avoided	0	0	None
W-3	Earthen Landscape Berm and Permanent Culvert	0.15	0	Minimized size and footprint while still maintaining a 15-foot tall earthen landscape berm that provides some level of visual screening, noise screening
	Pipelines	0	0.01	None
W-4	Earthen Landscape Berm and Permanent Culvert	0.12	0	Minimized size and footprint while still maintaining a 15-foot tall earthen landscape berm that provides some level of visual screening, noise screening
W-5	Fox 3 and Storm Water Pond	0.91	0	None
	Access Road	0.03	0	
	Contractor Parking and Laydown Area	0	0.13	Rotated and moved a temporary construction contractor parking area
	Total	1.76	0.35	

* Includes impacts within Stream S-1.

5.12.1.4 Potential Impacts to Waterways

One stream (S-1) was delineated within the limits of the project site. Additionally, the Fox River is located approximately 1,300 feet south of the Fox Energy Center. The proposed project, including both Site Option 1 and Site Option 2, will result in activities within both Stream S-1 and the Fox River. Both Site Option 1 and Site Option 2 will result in approximately 0.02 acre of permanent impacts and less than 0.01 acre (approximately 200 ft^2) of temporary impacts from the placement of permanent and temporary culverts within Stream S-1.

When installing culverts, within streams, the original and natural full bank capacity (cross-sectional area) of the channel will be maintained. The culvert will be aligned and centered with the existing stream channel. Minimal disturbance of the channel at the culvert outlet will be the priority consideration. The grade of culverts will be determined by the grade of the existing channel, but usually not less than 0.5 percent nor more than 1 percent. The outlet of the culvert will discharge at the existing channel bottom. Disturbance of the channel bottom, sides, adjacent land, and surrounding natural landscape will be kept to a minimum during installation. Energy dissipating structures and/or armor will be installed at the outlet where scour and erosion are likely to occur from high exit velocity (near proximity to channel banks, drops at the end of the culvert, etc.). At least one foot of road bed cover will be established and maintained over all culverts. Two feet or more cover will be the desired optimum. Temporary culverts will be immediately removed when they are no longer needed and the stream restored to its original cross-section. Any exposed soils will be stabilized immediately.

The final culvert size and exact impacted area will not be known until the detailed design phase of the project, which will be 3 to 4 months before construction begins. WPS will provide this information to the WDNR, as soon as the design has become available. WPS will confirm that the final culvert design is sized adequately to accommodate the flow of water through the culvert.

5.12.1.4.1 Stream S-1

A description of the potential waterway impacts to Stream S-1 that will result from Site Option 1 and Site Option 2 is provided below.

Site Option 1

Based on the current engineering design, Site Option 1 will result in the placement of permanent and temporary culverts within Stream S-1. A permanent culvert will be placed within Stream S-1 just south of Wrightstown Road/Golf Course Drive to maintain the stream's flow beneath the proposed earthen landscape berm. A temporary culvert will be placed within Stream S-1 approximately 1,375 feet south of

Wrightstown Road/Golf Course Drive to maintain the stream's flow beneath a proposed, temporary construction access road. To accommodate the flow water through the culvert, the permanent and temporary culverts will be adequately sized (approximately 36 to 48 inches in diameter and embedded 4 to 8 inches). The temporary construction access road will allow construction equipment to travel between a laydown and storage yard and the Fox 3 construction site. The permanent and temporary impacts that will result from the placement of the proposed culverts are included within the impact calculation for Wetland W-1. Once construction is complete the temporary culverts will be removed and Stream S-1 will be restored to pre-construction condition.

Due to the amount of construction equipment that will need to cross between the laydown and storage yard and the Fox 3 construction site, it was determined that clear-span bridges could not be used along the temporary construction access road to cross Stream S-1. The final culvert size and exact impacted area will not be known until the detailed design phase of the project, which will be 3 to 4 months before construction begins. WPS will confirm that the final culvert design is sized adequately to accommodate the flow of water through the culvert.

Site Option 2

Based on the current engineering design, Site Option 2 will result in the placement of permanent and temporary culverts within Stream S-1. A permanent culvert will be placed within Stream S-1 just south of Wrightstown Road/Golf Course Drive to maintain the stream's flow beneath the proposed earthen landscape berm. A temporary culvert will be placed within Stream S-1 approximately 1,000 feet south of Wrightstown Road/Golf Course Drive to maintain the stream's flow beneath a proposed, temporary construction access road. To accommodate the flow water through the culvert, the permanent and temporary culverts will be adequately sized (approximately 36 to 48 inches in diameter and embedded 4 to 8 inches). The temporary construction access road will allow construction equipment to travel between a laydown and storage yard and the Fox 3 construction site. The permanent and temporary impacts that will result from the placement of the proposed culverts are included within the impact calculation for Wetland W-1. Once construction is complete the temporary culverts will be removed and Stream S-1 will be restored to pre-construction condition.

Due to the amount of construction equipment that will need to cross between the laydown and storage yard and the Fox 3 construction site, it was determined that clear-span bridges could not be used along the temporary construction access road to cross Stream S-1. The final culvert size and exact impacted area will not be known until the detailed design phase of the project, which will be 3 to 4 months before construction begins. WPS will confirm that the final culvert design is sized adequately to accommodate the flow of water through the culvert.

5.12.1.4.2 Fox River

The discharge piping in the Fox River will have to be replaced regardless of which Site Option is constructed. The Fox Energy Center facility has had to replace the check valve in previous years and was able to complete the replacement by using divers. WPS anticipates the check valve can again be replaced by divers, eliminating the need to disturb the riverbed and minimizing impacts to the Fox River.

Replacing the check valve in the Fox River is necessary and unavoidable. By replacing the check valve, Fox 3 will be able to use the existing discharge structure that services Fox 1 and Fox 2. A potential alternative to replacing the check valve will be to not replace the check valve. The check valve is being replaced to reduce the velocity of the water being discharged. Increased velocity can lead to additional turbulence on the river surface.

5.12.1.5 Methods for Crossing

Both Site Option 1 and Site Option 2 include the construction of an earthen landscape berm at the north end of the Fox 3 site along Wrightstown Road/Golf Course Drive. The proposed landscape berm will cross the unnamed tributary to Apple Creek. A permanent culvert will be installed along the unnamed tributary to Apple Creek to allow the stream to continue flowing under the proposed earthen landscape berm.

Both Site Option 1 and Site Option 2 of the proposed project also include the placement of temporary culverts and construction access roads at two locations along the unnamed tributary to Apple Creek. The temporary culverts and construction access roads will allow construction vehicles to cross the unnamed tributary to Apple Creek as they move between construction laydown areas and the construction site. Once construction is complete, the temporary culverts and construction access roads will be removed and the unnamed tributary to Apple Creek will be restored to pre-construction condition.

Site Option 1 and Site Option 2 will also permanently fill wetlands on-site to construct the Fox 3 Facility.

5.12.1.6 Avoidance, Minimization, and Mitigation Methods

To the extent practicable, Site Options1 and 2 have been designed to avoid and minimize temporary and permanent impacts to Stream S-1 and wetlands on-site. The following sections provide a discussion of these measures.

5.12.1.6.1 Avoidance of Wetland Impacts

Before the site options were developed, wetlands were delineated within the limits of the Fox Energy Center. The wetland delineation surveys occurred April 16 through 18, 2014, and June 19, 2014. The delineation report is included with this application in Volume II Appendix J. The delineated wetlands were considered during the development of the site options.

Potential site arrangements at the existing Fox Energy Center were evaluated during preliminary planning phase of the project that occurred in spring and summer of 2014. In addition to Site Options 1 and 2, other site arrangements were considered, including the northeast corner of the Fox Energy Center Property along Wrightstown Road/Golf Course Drive and along the western edge of the site between the existing Fox 1 and 2 units and neighboring residences. However, these other sites were dropped from consideration because of one or more of the following reasons:

- Property boundary air quality standards not being met
- Property boundary noise level standards not being met
- Fogging and icing impacts to adjacent landowners and public roads, including Wrightstown Road/Golf Course Drive or US 41

Site Options 1 and 2 were selected because they are feasible designs that met all property boundary air quality standards and will result in minimal noise level and fogging and icing impacts to adjacent landowners and public roads.

5.12.1.6.2 Minimization of Wetland Impacts

Since the project began, the site layout has changed to minimize the impacts to wetlands to the extent practicable. The following section discusses how the unavoidable wetland impacts have been minimized throughout project development.

5.12.1.6.3 Initial Site Option Arrangements

An initial version of proposed Site Option 1 layout will result in 3.05 acres of temporary impacts and 0.94 acre of permanent impacts to wetlands (Volume I Appendix L, Figure L-7; Table 5-6). An initial version of proposed Site Option 2 layout will result in 2.65 acres of temporary impacts and 1.26 acres of permanent impacts to wetlands (Volume I Appendix L, Figure L-8). Neither of these initial site layout options included the construction of the earthen landscape berm that will require the placement of permanent fill and culverts in Wetlands W-1, W-3, and W-4 and result in approximately 0.09 acre, 0.15 acre, and 0.12 acre of permanent impacts, respectively. When the permanent impacts that will result from the construction of the earthen landscape berm are taken into account, the initial version of proposed Site Option 1 will result in 1.30 acres of permanent wetland impacts and the initial version of proposed Site Option 2 will result in 1.62 acres of permanent wetland impacts.

Table 5-6: Initial Versions of Proposed Site Layout Options

Wetland	Site Option 1		Site Option 2	
	Permanent Impacts (acres)	Temporary Impacts (acres)	Permanent Impacts (acres)	Temporary Impacts (acres)
W-1 (including Stream 1)	0.50	0.86	0.45	1.11
W-2	0	0.00	0	0
W-3	0.44	2.07	0	0.38
W-4	0	0.12	0	0
W-5	0	0	0.81	1.16
Total	0.94	3.05	1.26	2.65

Note: the initial versions of the site layout options do not include the construction of the earthen landscape berm that will require the placement of permanent fill and culverts in Wetlands W-1, W-3, and W-4 and will result in approximately 0.09 acre, 0.15 acre, and 0.12 acre of additional permanent wetland impacts, respectively.

5.12.1.6.4 Current Site Arrangement Options

Over the course of project development, the initial site option layouts (initial versions) were refined to avoid and minimize wetland impacts. Based on the current engineering design, Site Option 1 will result in 0.11 acre of temporary impacts and 0.92 acre of permanent impacts to wetlands (Table 5-7). Site Option 2 will result in 0.35 acre of temporary impacts and 1.40 acres of permanent impacts to wetlands. These calculations do not include the construction of the earthen landscape berm that will require the placement of permanent fill and culverts in Wetlands W-1, W-3, and W-4 and result in approximately 0.09 acre, 0.15 acre, and 0.12 acre of permanent impacts, respectively. When the permanent impacts that will result from the construction of the earthen landscape berm are taken into account, the current Version of proposed Site Option 1 will result in 1.28 acres of permanent wetland impacts and the current Version of proposed Site Option 2 will result in 1.76 acres of permanent wetland impacts.

Table 5-7: Current Proposed Site Layout Options

Wetland	Site Option 1			Site Option 2			Earthen Landscape Berm
	Permanent Impacts (acres)	Temporary Impacts (acres)	Minimization Effort	Permanent Impacts (acres)	Temporary Impacts (acres)	Minimization Effort	Permanent Impacts (acres)
W-1 (including Stream 1)	0.49	0.08	Reconfigured storm water ponds and moved temporary construction access roads, contractor parking, and laydown areas	0.46	0.21	Moved temporary construction staging and laydown areas	0.09
W-2	0	0.01	None	0	0	None	0
W-3	0.43	0.02	Moved temporary construction laydown, fabrication, and storage yard	0	0.01	Moved a temporary construction staging and laydown area	0.15
W-4	0	0	Moved a temporary construction access road	0	0	None	0.12
W-5	0	0	None	0.94	0.13	Rotated and moved a temporary construction contractor parking area	0
Total	0.92	0.11		1.40	0.35		0.36

Note: When the permanent impacts that will result from the construction of the earthen landscape berm are taken into account, the current Version of proposed Site Option 1 will result in **1.28 acres** of permanent wetland impacts and the current Version of proposed Site Option 2 will result in **1.76 acres** of permanent wetland impacts.

Site Option 1

The current version of Site Option 1 will result in less permanent wetland impacts (0.02 acre) and temporary wetland impacts (2.94 acres) than the initial version of Site Option 1. The reduction in wetland impacts can be primarily attributed to changes in the configuration of storm water ponds and moving construction contractor parking and construction laydown areas to avoid wetland impacts. Additional wetland impact reduction/minimization will be realized by moving the temporary construction access road in Wetland W-3 to a narrower portion of the wetland to the south. A description of specific design refinements that occurred to minimize impacts to each wetland is provided below.

***Wetland W-1* -** The changes to the Fox 3 layout from the initial version to the current version of Site Option 1 resulted in fewer permanent and temporary impacts to Wetland W-1. The permanent wetland impacts were reduced by approximately 0.01 acre. The shape of the storm water pond was changed from rectangular to trapezoidal to conform to the upland-wetland boundary of Wetland W-1 and reduce permanent impacts by 0.07 acre. However, a permanent access road was widened that resulted in an additional 0.06 acre of permanent impacts to Wetland W-1. This widening of the road was necessary to accommodate a pipe rack and will likely have been necessary for the initial version of Site Option 1, if the initial version of Site Option 1 was carried forward.

Temporary wetland impacts were reduced by a total of 0.78 acre from the initial version to the current version of Site Option 1. This reduction was the result of moving temporary construction staging and laydown areas from Wetland W-1 and Wetland W-3 to upland areas located east of Wetland W-1/ Stream S-1. However, moving the temporary construction staging and laydown area resulted in an additional 0.08 acre of temporary impacts to Wetland W-1/Stream S-1 associated with construction of a temporary access road and temporary culverts.

***Wetland W-2* -** Both the initial version of Site Option 1 and the current version of Site Option 1 will not result in any permanent impacts to Wetland W-2. The initial version of Site Option 1 will not result in any temporary impacts to Wetland W-2; however, the current version of Site Option 1 will only result in approximately 0.01 acre of temporary impacts to the PEM portion of Wetland W-2 from the construction of a temporary construction access road.

***Wetland W-3* -** The changes to the Fox 3 layout from the initial version to the current version of Site Option 1 resulted in a fewer permanent (0.01 acre) and temporary (2.05 acres) impacts to Wetland W-3. The permanent wetland impacts to Wetland W-3 were decreased by changing the configuration of the Fox 3 power block layout. The temporary impacts to Wetland W-3 were decreased by breaking up the construction laydown, fabrication, and storage yard and moving them to upland areas adjacent to Wetland W-3. However, moving a temporary construction staging and laydown area from the west side of Stream S-1 to the east side of Stream S-1 resulted in an additional temporary impact to Wetland W-1 and Stream S-1 associated with a temporary access road and culvert. The addition of a water supply pipeline to the current version of Site Option 1 layout added approximately 0.01 acre of temporary impacts to Wetland W-3 along the western property boundary. The additional impacts of adding the water supply pipeline will likely have been necessary for the initial version of Site Option 1, if the initial version of Site Option 1 was carried forward.

***Wetland W-4* -** To minimize impacts within Wetland W-4, an access road totaling 0.12 acre was moved to an upland area east of Wetland W-4.

***Wetland W-5* -** The initial and current versions of Site Option 1 will not result in any temporary or permanent impacts to Wetland W-5.

Site Option 2

The current version of Site Option 2 will result in more permanent wetland impacts (0.14 acre) but substantially less temporary wetland impacts (2.30 acre) than the initial Version of Site Option 2. The changes in wetland impacts can be primarily attributed to changes in the configuration of the Fox 3 layout and moving temporary construction contractor parking and construction laydown areas to avoid wetland impacts. A description of specific design refinements that occurred to minimize impacts to each wetland is provided below.

***Wetland W-1* -** The changes to the Fox 3 layout from the initial version to the current version of Site Option 2 resulted in more permanent but fewer temporary impacts to Wetland W-1. The permanent wetland impacts were increased by approximately 0.01 acre because a permanent access road was widened. This widening of the road was necessary to accommodate a pipe rack and will likely have been necessary for the initial version of Site Option 2, if the initial version of Site Option 2 was carried forward.

Temporary wetland impacts were reduced by 0.90 acre by moving temporary construction staging and laydown areas from within Wetland W-1. The temporary construction staging and laydown area located along the west side of Wetland W-1 was divided into two temporary construction staging and laydown areas and moved to upland areas between Wetlands W-1 and W-3. The temporary construction staging and laydown area located along the east side of Wetland W-1 was moved approximately 500 feet northeast and out of Wetland W-1. However, moving the temporary construction staging and laydown areas resulted in additional temporary wetland impacts from the addition of a temporary construction access road and temporary culvert across Wetland W-1 and Stream S-1. Additional temporary wetland impacts resulted from the addition of a construction access road that was necessary because of a shift in the cooling tower from the initial version to the current version of Site Option 2.

***Wetland W-2* -** The initial and current versions of Site Option 2 will not result in any temporary or permanent impacts to Wetland W-2.

***Wetland W-3* -** Neither the initial nor the current version of Site Option 2 will result in any permanent impacts to Wetland W-3. The changes to the Fox 3 layout from the initial version to the current version of Site Option 2 resulted in a reduction of 0.37 acre of temporary impacts to Wetland W-3.

Temporary wetland impacts were reduced by moving a temporary construction staging and laydown area from within Wetland W-3. The temporary construction staging and laydown area was divided into two temporary construction staging and laydown areas and moved to upland areas between Wetlands W-1 and W-3. However, the addition of a water supply pipeline to the current version of the Site Option 1 layout added approximately 0.01 acre of temporary impacts to Wetland W-3 along the western property boundary. The additional impacts of adding the water supply pipeline will likely have been necessary for the initial version of Site Option 2, if the initial version of Site Option 2 was carried forward.

***Wetland W-4* -** Neither the initial or the current version of Site Option 2 will result in any temporary or permanent impacts to Wetland W-4.

***Wetland W-5* -** The changes to the Fox 3 layout from the initial version to the current version of Site Option 2 resulted in an additional 0.13 acre of permanent impacts to Wetland W-5 and a reduction of 1.03 acres of temporary impacts to Wetland W-5. The additional permanent impacts to Wetland W-5 resulted from moving the cooling tower to the southeast. This was done to reduce the potential for fogging and icing of the air intakes for Fox 3. This site layout change will likely have been necessary for the initial version of Site Option 1, if the initial version of Site Option 1 was carried forward, and will have resulted in similar increases in permanent impacts to Wetland W-5. Temporary wetland impacts were reduced by rotating and moving a temporary construction contractor parking area from within Wetland W-5. The new temporary construction contractor parking area is located entirely in uplands between Wetland W-1 and Wetland W-5 and along the eastern property boundary.

Earthen Landscape Berm

The earthen landscape berm and permanent culverts, which were added at the request of landowners located north of the Wrightstown Road/Golf Course Road, resulted in 0.09 acre of additional permanent wetland impacts to Wetland W-1, 0.15 acre of additional permanent wetland impacts to Wetland W-3, 0.12 acre of additional permanent wetland impacts to Wetland W-4 (Table 5-7). The earthen landscape berm and its associated permanent stream and wetland impacts is necessary to provide some level of visual screening, reduction in off-site lighting impacts, and/or sound screening for the residents living north of Wrightstown Road/Golf Course Drive.

While the placement and construction of the earthen landscape berm is not a local regulatory requirement, residents north of Wrightstown Road/Golf Course Drive support placement of additional visual screening of the facility. The size and footprint for the earthen landscape berm was minimized to the extent practicable to minimize impacts to Stream S-1 and Wetlands W-1, W-3, and W-4. The proposed 15-foot-tall earthen landscape berm was designed with a 3:1 slope to provide some level of visual screening, noise screening, and a reduction in off-site lighting impacts, while still allowing it to be easily maintained by landscaping crews. Permanent culverts will be added beneath the earthen landscape berm to allow water to flow continuously through Stream S-1 and Wetlands W-1, W-3, and W-4.

Construction of the earthen landscape berm cannot avoid impacting Stream S-1 and Wetlands W-1, W-3, and W-4. If the earthen landscape berm was broken into pieces to avoid impacting Stream S-1 and Wetlands W-1, W-3, and W-4, the sound generated by Fox 3 will be funneled through the breaks in the earthen landscape berm and impact residents north of the Wrightstown Road/Golf Course Drive. Additional information for the predicted operational noise levels and proposed noise mitigation is provided in the separately bound Sound Assessment Study for Fox 3.

Using tree plantings alone in place of the earthen landscape berm will not provide an immediate noise barrier between the residents north of Wrightstown Road/Golf Course Drive and Fox 3. A noise barrier composed entirely of trees, assuming a mix of deciduous and evergreen trees, will take time to establish and will provide different noise minimization levels depending on the season. Additionally, a noise barrier composed entirely of trees will require continual maintenance by WPS until they become established.

For the reasons mentioned above, the best way to address the visual, off-site lighting impacts, and noise concerns of the residents north of Wrightstown Road/Golf Course Drive is to construct an earthen landscape berm.

5.12.2 Potential Water Sources

The following sections provide information on the potential water sources required for the project.

5.12.2.1 Water Sources

The water requirements for the Fox Energy Center include steam cycle makeup, cooling tower makeup, NO_x injection water, evaporative cooling water makeup, and service water. The water system will be designed to minimize water consumption and manage the water quality within the plant systems and Fox River discharge.

The Fox Energy Center will use water from HOV for process water needs which will be supplied via the existing 4 mile pipeline currently serving the facility.

The incoming water will be treated (softened) before it enters the storage ponds.

A new 10 MG storage pond will be constructed and will be used in conjunction with the existing 5 MG storage pond. The two storage ponds will be hydraulically connected via interconnecting pipes and valves to act as a single water source for the Fox Energy Center (See also Section 3.3.1).

There are three factors that determine water availability. The maximum water requirement for all three units at Fox Energy, projected water use for all three units at Fox Energy and average seasonal water supply capacity. Historic flow information indicates water availability is highest in the spring months when snow melt is occurring. Water availability is generally lowest during the winter months (December through February). Water availability data from HOV for the period of August 2013 through October 2014 shows significant fluctuations in daily minimum flow volumes of 3.1 million gallons per day (MGD) to daily maximum flow volumes of 23.1 MGD.

The daily average flow volume of water available over this time period was 5.3 MGD. The daily average volume of flow directed to the Fox Energy Center during this time period was 1.1 MGD. Based on current dispatch projections, HOV as a current water supply source has the capacity to supply all of Fox Energy’s water requirements, including the addition of Fox 3.

Based on current dispatch projections, HOV as a current water supply source has the capacity to supply all of Fox Energy’s water requirements, including the addition of Fox 3.

5.12.2.2 Water Usage

Refer to Volume I Appendix BB for Water Mass Balances diagrams.

5.12.2.3 Low-capacity On-site Well Sources

Fox Energy Center currently uses on-site wells for portable and sanitary water uses. These low-capacity (less than 70 gallons per minute (gpm)) wells will not be used for Fox 3. The construction water and domestic water will be supplied by a tie-in to the Village of Wrightstown Municipal water system. The entire Fox Energy Center will be connected to the Wrightstown Municipal water system and will not require on-site wells for domestic water. Fox Energy Center will not use on-site well sources and therefore have no impact on nearby wells.

5.12.2.4 High-Capacity On-site Well Sources

No high-capacity on-site well sources will be used for Fox 3.

5.12.2.5 Municipal Water Sources

The Village of Wrightstown's water supply comes from two high capacity wells in the Sandstone Aquifer. The total amount of water pumped in 2013 was 71.6 MG for a combined average daily flow of 196,225 gallons.[14] The water distribution system contains just over 18 miles of water main, and 248 fire hydrants. The village also has two water towers with a combined capacity of 500,000 gallons.[15]

WPS proposes to connect to an existing Village of Wrightstown municipal main currently located along the northern boundary of the site along Wrightstown Road/Golf Course Drive.

5.12.2.5.1 Property Owners Along Water Supply Pipeline Routes

The water supply for the Fox 3, as well as Fox 1 and 2, will be the existing water supply pipeline from HOV to Fox Energy Center and does not require any new construction or modification; therefore, a mailing list of property owners is not provided.

Potable water for the facility is available from the existing Village of Wrightstown municipal main currently located along the northern boundary of the site along Wrightstown Road/Golf Course Drive. WPS owns all property for the Fox Energy Center south of Wrightstown Road/Golf Course Drive. Therefore, the only property owner located along the water supply pipeline route is WPS.

[14] Village of Wrightstown 2013. 2103 Annual Drinking Water Quality Report.
http://www.vil.wrightstown.wi.us/Portals/0/2013%20Water%20Quality%20Report.pdf

[15] Village of Wrightstown 2012. Wrightstown Water Utility.
http://www.vil.wrightstown.wi.us/Departments/WaterUtility/tabid/414/Default.aspx

5.12.2.6 Surface Water Sources

The source of process water for Fox 3 will be treated effluent from HOV. This source is located on the east side of Kaukauna, Wisconsin, and approximately 4 miles west of the Fox Energy Center. Effluent from HOV wastewater treatment plant is the current source of process water for Fox 1 and 2. The HOV discharges to the Fox River. The process water is a diversion of effluent from the wastewater treatment plant.

5.12.2.6.1 Proposed Surface Water Source

No surface water withdrawal is proposed for Fox 3.

5.12.2.6.2 Great Lakes Compact

The Great Lakes Compact is applicable to a withdrawal from the waters of the state (surface or groundwater) using a water supply system that will have the capacity to withdraw an average of 100,000 gallons per day or more in any 30-day period. Treated effluent received from HOV for use in plant processes is not considered a withdrawal under the Great Lakes Compact (Wis. Stat.§ 281.346). Potable water used at the site is provided by two on-site wells with a withdrawal capacity of 25 gpm each. The combined capacity of these wells is less than 100,000 gallons per day. As a result, the facility is not required to obtain a water use permit for the Great Lakes Basin (Wis. Stat. § 281.346(4m)) and complies with the Great Lakes Compact.

The facility received confirmation from the WDNR that the water withdrawal at the facility does not require a water use permit on March 14, 2011(Volume II Appendix B).

5.12.3 Water Consumptive Use

Fox 3 will consume water primarily by evaporation from cooling towers and inlet air conditioners.

5.12.3.1 Water Source

The immediate source of process water for Fox 3 will be the effluent from HOV in Kaukauna, Wisconsin, which is the current source of process water for Fox 1 and 2. If not used by the facility, this effluent will discharge to the Fox River. As such, the consumptive use by Fox 3 represents a water loss from the Fox River.

5.12.3.2 Consumptive Water Usage

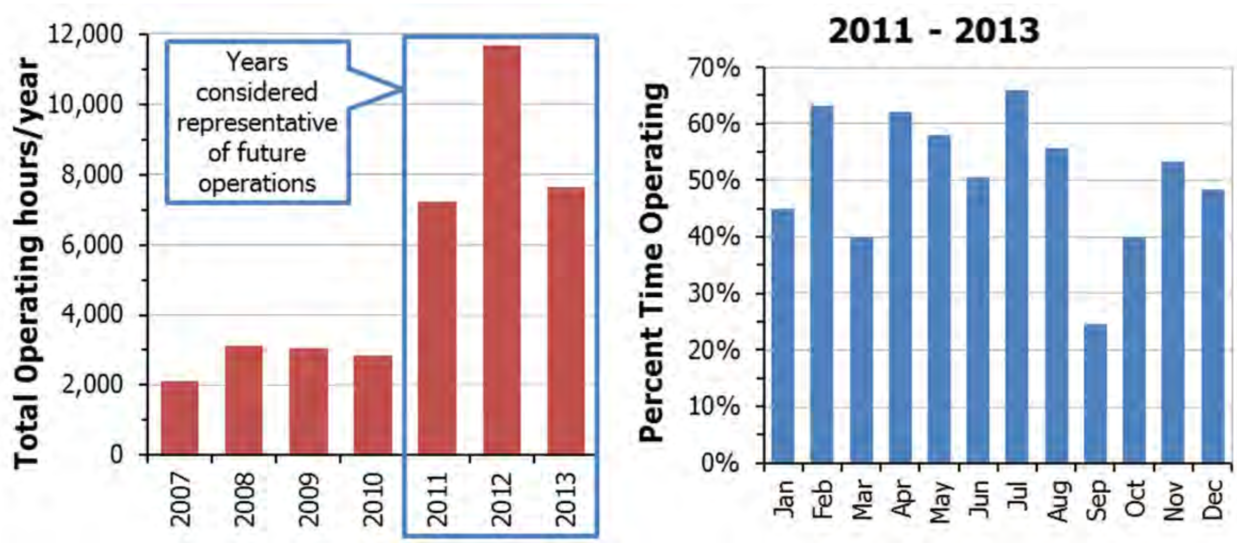
Annual and monthly withdrawal and loss rates for Fox 3 were estimated based the following conditions:

- Average monthly meteorological conditions

- Unit operating at full load with duct firing
- Inlet air conditioning in months when appropriate
- 5,300 operating hours per year
- Operating hours distributed by month based on historical operation of Fox 1 and 2

Annual operating hours for Fox 1 and 2 were summarized for 2007 through 2013. Operating hours for 2011 through 2013 were substantially greater than the previous 4 years (Figure 5–1) and were considered more representative of the future operations of the Fox Energy Center. Over these 3 years, monthly percent time operating ranged from about 40 to 65 percent with no appreciable seasonality except for September when percent time operating was only about 25 percent (Figure 5–1).

Figure 5–1: Annual and Monthly Operating Hours for Fox 1 and 2



Average daily water losses attributed to Fox 3 were estimated to vary cyclically from 1.152 MG in January to 1.367 MG in June (Table 5-8). Monthly water losses from Fox 3 were estimated to range from 35.67 MG in December to 41.73 MG in July. The average annual loss from Fox 3 was estimated to be 456.5 MG (Table 5-8).

Table 5-8: Estimated Monthly Average Volume and Rates of Water Loss from the Fox River by Fox 3

Month	Water Loss Rate When Operating (gpm)	Average Operating Hours	Average Daily Water Loss Rate (MG)	Average Monthly Water Loss Volume (MG)
January	1,489	400.3	1.153	35.74
February	1,498	513.4	1.284	35.96

Month	Water Loss Rate When Operating (gpm)	Average Operating Hours	Average Daily Water Loss Rate (MG)	Average Monthly Water Loss Volume (MG)
March	1,513	356.5	1.172	36.32
April	1,541	535.8	1.232	36.97
May	1,633	516.2	1.265	39.20
June	1,720	436.2	1.376	41.28
July	1,753	587.7	1.357	42.06
August	1,731	496.4	1.340	41.54
September	1,665	212.7	1.332	39.96
October	1,557	355.8	1.205	37.36
November	1,512	458.7	1.209	36.28
December	1,493	430.2	1.156	35.83
Total	**--**	**5,300.0**	**--**	**458.51**

5.12.3.3 Total Consumptive Use/Net Loss of Water

Water will be consumed by the Fox 3 by evaporation and drift form the cooling tower, losses from the steam cycle, and inlet air evaporative cooling. Evaporation and drift from the cooling tower will account for 98 to 99 percent of the loss (Table 5-9).

Table 5-9: Estimated Monthly Water Loss Rates from the Fox River by Plant Process for Fox 3

Month	Cooling Tower Evaporation and Drift		Steam Cycle Losses	Inlet Air Evaporative Cooler	Storage Pond Evaporation
	(gpm)	(% of Total)	(gpm)	(gpm)	(gpm)
January	1,470	98.8	18	0	2.2
February	1,478	98.8	18	0	4.3
March	1,492	98.8	18	0	5.4
April	1,516	98.8	18	0	10.8
May	1,605	98.9	18	0	16.2
June	1,679	98.3	18	11	18.4
July	1,710	98.3	18	11	21.6
August	1,692	98.4	18	10	17.3
September	1,629	98.4	18	9	14.0
October	1,532	98.8	18	0	9.7
November	1,490	98.8	18	0	6.5
December	1,473	98.8	18	0	4.3

The estimated increase in water loss due to Fox 3 is approximately 1.70 MGD above the current water loss approval volume. As the anticipated increase in water consumption is less than 2 MGD above the approved water loss rate, an amendment to the previous water loss approval application will be submitted for this project.

5.12.4 Wastewater Discharges

A description of the wastewater discharge structures and chemical and physical attributes is provided in the following sections.

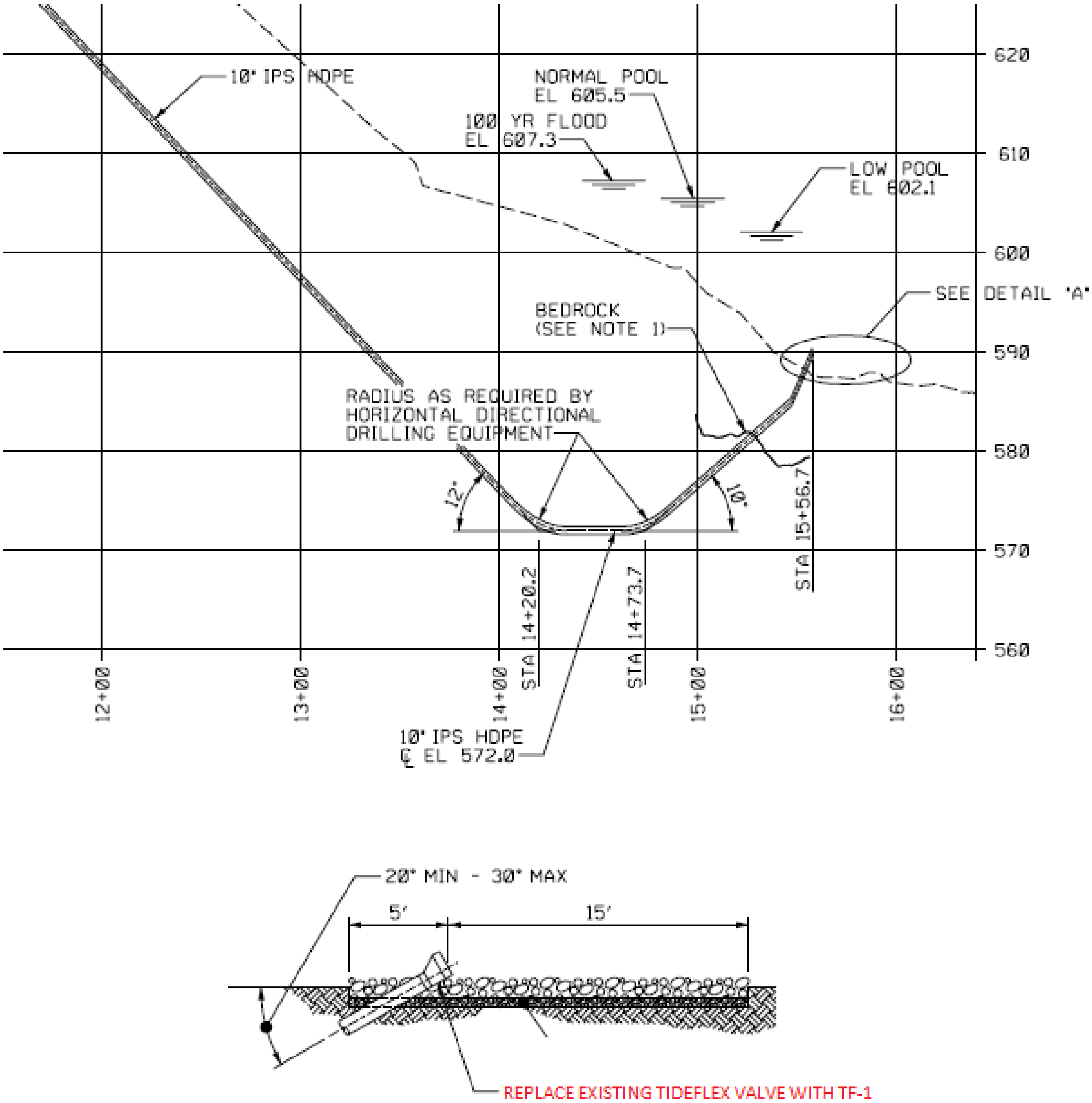
5.12.4.1 Proposed Wastewater Discharge Structures

The facility currently discharges wastewater to the Fox River, through a submerged discharge pipe, upstream of the Rapid Croche dam located just south of Fox Energy Center. The discharge piping is a 10-inch high-density polyethylene (HDPE) pipe that runs from the plant to the Fox River. The pipe enters the river from the bottom and discharges above a bed of riprap.

When discharging, the current maximum discharge flow rate from the existing facility is approximately 550 gpm. With the proposed addition, the maximum estimated discharge flow rate will be 1,331 gpm.

WPS is proposing to replace the existing 10-inch check valve (Tideflex Series TF-2) with a different 10-inch check valve (Tideflex Series TF-1) to maintain the required discharge flow rate of greater than 10 feet per second (fps). When the facility is discharging, it is expected to have a minimum discharge flow rate of 750 gpm and a maximum flow rate of 1,300 gpm. At 750 gpm, the discharge velocity is expected to be approximately 10.2 fps. At 1,331 gpm, the discharge velocity is expected to be approximately 13.9 fps.

Figure 5–2: Proposed Wastewater Discharge Location and Structures



Source: WPS 2014

5.12.4.1.1 Location and Type of Discharge Site

The facility currently discharges wastewater to the Fox River, through a submerged discharge pipe, upstream of the Rapid Croche dam located just south of Fox Energy Center. The discharge outfall structure is located on the bottom of the river, approximately 180 feet from the shore, and is typically covered by 16.5 feet of water. The discharge piping is a 10-inch HDPE pipe that runs from the plant to the Fox River. The pipe enters the river from the bottom and discharges above a bed of riprap. The wetlands and waterways WDNR and USACE permit application materials that cover activities associated with the modification to the discharge pipe were submitted on December 29, 2104.

5.12.4.1.2 Description of the Proposed Wastewater Pipes and Facilities

Cooling tower blowdown from both towers (Fox 1, 2, and 3) will tie into a new co-precipitation process for post-treatment. The post-treated effluent will discharge into a common wastewater sump for the site. The discharge from the wastewater sump will utilize the existing wastewater discharge pipeline to the Fox River.

Modifications to the existing system will be required to re-route the inlet of the pipe from the existing circulating water pipe to new discharge pumps in a new common sump. The common sump will accept blowdown from the effluent treatment system’s two clarifier units. There will be two pumps in the sump that will be either of two single speed pumps or variable speed pumps that operate on sump level. Pump configuration will be sized to keep the velocity at the outfall greater than 10 fps as required by the WPDES permit. WPS is also proposing to replace the existing check valve (Tideflex Series TF-2) with a Tideflex Series TF-1 valve.

5.12.4.1.3 Construction methods and Sequence

The facility has been able to replace the check valve in previous years using divers. WPS anticipates the check valve can again be replaced by divers, eliminating the need to disturb the riverbed.

5.12.4.2 Wastewater Chemical and Physical Attributes

Most of the makeup water entering the cooling towers will be evaporated, thereby concentrating the dissolved and suspended solids in the blowdown by a factor of four relative to the makeup water. The treatment of the process waters (e.g., clarification, demineralization, reverse osmosis) prior to use will also generate waste streams that contain concentrated dissolved and suspended constituents from the source waters. The chemical and physical attributes of the discharged waters are provided below.

5.12.4.2.1 Biocides and Metals

Process water used throughout Fox 1, 2, and 3 will concentrate impurities due to evaporation or contact with materials and chemicals. To maintain an acceptable water quality in these processes, wastewater (e.g., blowdown) streams from these systems will be treated prior to discharge to the Fox River. Wastewater treatment sludge generated will be disposed of in a licensed landfill.

The projected post-treatment combined cooling tower blowdown constituent concentrations are listed in Table 5-10 below. These values are estimated based on known water analysis data and projected water quality after several treatment processes.

Table 5-10: Post Treatment Cooling Tower Blowdown Constituent Concentrations[1]

Parameter	Concentration (ppm)	Parameter	Concentration (ppm)
Calcium (Ca), milligrams per liter (mg/l) (2.50 as calcium carbonate ($CaCO_3$))	736	Turbidity, NTU	ND
Magnesium (Mg), mg/l (4.11 as $CaCO_3$)	652	Oil and grease, mg/l	<1
Sodium (Na), mg/l (2.17 as $CaCO_3$)	1,879	Temperature, ^{o}F	<95[2]
Potassium (K), mg/l (1.28 as $CaCO_3$)	84	Biological oxygen demand (BOD5), mg/l	<5
Alkalinity (M-Alk), mg/l (0.81 as $CaCO_3$)	250	Ammonia-nitrogen (NH_3), mg/l	<1
Sulfate (SO_4), mg/l (1.04 as $CaCO_3$)	1,741	Total phosphate (TP), lbs/day	<2.68
Chloride (Cl), mg/l (1.41 as $CaCO_3$)	2,555	Total residual chlorine (Cl_2), mg/l	< 0.05
Silica (SiO_2), mg/l (0.83 as $CaCO_3$)	12	Chromium (Cr), mg/l	<0.11
pH, standard units	Range 8-9	Iron (Fe), mg/l, filtered/unfiltered	<0.38
Total hardness, mg/l as $CaCO_3$	1,325	Mercury (Hg), mg/l	<0.0000012
Spec. conductivity, umhos/centimeter	7,356	Selenium (Se), mg/l	<0.003
Total dissolved solids mg/l	5,002	Zinc (Zn), mg/l	<0.04
Total suspended solids mg/l	<30		

Notes:
[1] These values are estimated based on known water analysis data and projected water quality after several treatment processes. Values are subject to change based on detailed design.
[2] Estimated cold water temperature of cooling tower – Case 1.

The new co-precipitation process will utilize a coagulant and polymer (depending on final cooling tower blowdown pH) to remove pollutants from the discharge. Mercury that exist as a fine precipitate in the wastewater is anticipated to be precipitated out with the iron phosphate and be removed via sludge wasting.

Total residual chlorine levels will be handled with sodium bisulfite feed into the common wastewater sump pump discharge line prior to Outfall 001.

5.12.4.2.2 Discharge Temperature

Based on the meteorological conditions and operating scenarios used to estimate water loss (see Section 5.12.3), the temperature of the discharge of blowdown from the cooling towers at Fox Energy Center, which is the great majority of the wastewater generated by the Fox Energy Center, is estimated to range from 64.0 °F in January to 85.4 °F in July (Table 5-11) with a maximum of less than 95 °F (Table 5-10). This wastewater will travel at least 3,491 feet to the discharge point in the Fox River through an underground, 10-inch diameter, HDPE pipe. Given that the temperature of the ground around the pipe is 55 °F, some heat in the wastewater will be lost to the ground during transit to the river.

Table 5-11: Total Process Wastewater Discharge Rates and Temperature for Fox Energy Center

Month	Discharge Rates				Cooling Tower Outlet Temperature (°F)
	gpm	MG / Day	MG / Month	MG / Year	
January	1,083.4	1.56	47.1	-	64.0
February	1,085.7	1.56	47.1	-	68.0
March	1,085.7	1.56	47.1	-	69.5
April	1,093.2	1.57	47.4	-	73.8
May	1,152.3	1.66	50.1	-	78.7
June	1,203.1	1.73	52.2	-	83.8
July	1,224.5	1.76	53.2	-	85.4
August	1,211.8	1.74	52.5	-	85.1
September	1,168.4	1.68	50.7	-	81.5
October	1,103.8	1.59	48.0	-	76.5
November	1,080.9	1.56	47.1	-	70.8
December	1,079.8	1.56	47.1	-	68.4
Annual Average	**1,131.1**	**1.63**	**49.2**	**594.5**	**75.5**

The temperature of the effluent discharge to the Fox River (T_{exit}) was calculated from the following formula:

$$T_{exit} = T_{soil} - (T_{soil} - T_{inlet})e^{-UA/M}$$

where T_{soil} was the temperature of the ground surrounding the pipe, T_{inlet} was the temperature of the effluent entering the pipe, e was the base of the natural logarithm (≈ 2.718), U was the overall heat transfer coefficient, A was the surface area of the inside of the pipe, and M was the mass flow rate. The value for U was calculated from the heat transfer rates for the water inside the pipe, the pipe wall, and the surrounding soil based on:

$$\frac{1}{UA} = \frac{1}{h_1 A} + \frac{w}{kA} + \frac{1}{h_2 A}$$

where h_1 was the convection heat transfer coefficient for water, w was the wall thickness of the pipe, k was the thermal conductivity of the pipe material, and h_2 was the convection heat transfer coefficient for the ground around the pipe.[16] The value for A was calculated using the formula:

$$A = \pi dl$$

where π was the ratio of diameter to circumference of a circle (≈ 3.142), d was the inside diameter of the pipe and l was the length of the pipe from the WPGF to the discharge point in the Reservoir. Values entered into the equations, (except starting temperature (T_{inlet}), see Table 5-11) were in metric scales and are given in Table 5-12. Heat transfer coefficients were conservative estimates based on published ranges.

Table 5-12: Data Used to Estimate the Temperature of the Effluent Discharged into the Fox River

Parameter	Value	
	English	Metric
Soil temperature (T_{exit})	55 °F	285.9 °K[1]
Mass flow rate (M)	2000 gpm	126.2 kg/s[2]
Pipe inside diameter (d)	10 inches	0.254 meters
Pipe length (l)	3,491 feet	1,064 meters
Pipe wall thickness (w)	0.6 inches	0.015 meters
Heat transfer coefficient – water (h_1)	-	2000 W/m^2K[3]
Heat transfer coefficient – soil (h_2)	-	1 W/m^2K
Thermal conductivity – pipe wall material (k)	-	0.12 W/mK

[1] °K – degrees Kelvin
[2] kg/s – kilograms per second
[3] W/m^2K – watt per square meter Kelvin

Monthly average end-of-pipe discharge temperatures were estimated to range from 57.9 °F for January to 64.9 °F in July. The maximum end-of-pipe temperature, based on a starting temperature of 95 °F, was

[16] (http://www.engineeringtoolbox.com/overall-heat-transfer-coefficient-d_434.html)

estimated to be 68.0 °F (Table 5-13). The temperature of the discharge is not anticipated to cause adverse impacts in the Fox River.

Table 5-13: Estimated Discharge Temperatures

Month	Cooling Tower Outlet (°F)	End of Pipe in Fox River (°F)
January	64.0	57.9
February	68.0	59.2
March	69.5	59.7
April	73.8	61.1
May	78.7	62.7
June	83.8	64.4
July	85.4	64.9
August	85.1	64.8
September	81.5	63.6
October	76.5	62.0
November	70.8	60.1
December	68.4	59.3
Maximum	**95.0**	**68.0**

5.12.4.2.3 Estimated Wastewater Volumes

The process wastewater from Fox 3 will be combined with the process wastewater from Fox 1 and 2 and will be treated in a co-precipitation process. The effluent from that process will discharge into a common wastewater sump. The sump will discharge wastewater to the Fox River utilizing the existing wastewater discharge pipeline to the Fox River. The existing pipeline is a 10-inch HDPE pipeline that discharges to the Fox River below the water surface via a check valve. The flow rate from the sump will be controlled and the discharge check valve will be replaced to maintain a minimum discharge velocity to the river of 10 fps.

Cooling tower blowdown from Fox 1, 2, and 3 create 100 percent of the total discharge into the Fox River and, will have the most predictable seasonal variation in quantity. The monthly average wastewater discharge rates for Fox 1, 2, and 3 are estimated to range from 1,083 gpm in January to 1,225 gpm in July (Table 5-11). Over an annual cycle, the discharge rate for Fox 3 is estimated to be 1.63 million gallons per day and 955 million gallons per year (Table 5-11).

5.12.4.3 Surface Water Discharges

Surface water discharge characteristics and potential impacts are discussed in the following sections.

5.12.4.3.1 Location and Depth of Structure

The discharge outfall structure is located on the bottom of the river and approximately 180 feet from the shore, is typically under 16.5 feet of water, and is surrounded by a gravel mat (See Figure 5-2).

5.12.4.3.2 Description of Discharge Pipe End

Figure 5-2 depicts the existing discharge pipe in the Fox River. The existing pipeline discharges to the Fox River below the water surface via a check valve. The existing check valve will be replaced to maintain a minimum discharge velocity to the river of 10 fps.

5.12.4.3.3 Characterization of Environment at Outfall Location

Characterization of the environment of the discharge pipe and outfall location including, but not limited to:

Type of Substrate

The river substrate is predominantly fine-grained silt/clay sediments.

Water Quality

Refer to Volume I Appendix BB for the Water Mass Balances diagrams and Table 5-10. Wastewater discharge constituent levels will be maintained via clarification and chemical treatment processes. These values are estimated based on known water analysis data and projected water quality after several treatment processes.

Fish and Invertebrate Species and Communities

As a result of polychlorinated biphenyl **(**PCB) contamination and non-point source of pollution in the watershed, the fish community in the lower Fox River has been characterized as "unbalanced" and "with low populations and limited diversity."[17] This characterization is supported by a sample of the fish community collected by electrofishing in the Fox River near Wrightstown on August 28, 1996.[18] In this sample, 54 specimens representing 10 species were collected. Nearly half of the specimens (25) were common carp, a non-native species considered tolerant of pollution. Four of the species and 34 of the specimens (63 percent) were considered "rough" species; 3 species and 11 of the specimens were

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[17] (http://dnr.wi.gov/water/basin/lowerfox/)
[18] (https://cida.usgs.gov/wdnr_fishmap/map/)

considered “forage” species; and 3 species and 8 specimens were “game” species (Table 5-14). The low diversity (relatively low number of species collected and the dominance of the catch by one species), the relatively high abundance of omnivorous rough fish (including common carp), and the relatively low abundance of top-predator game fish are indicative of a poor quality fish community.

Table 5-14: Fox River Fish Community Sample near Wrightstown

Name	Genus species	Type	Number
Common carp	*Cyprinus carpio*	rough	25
Freshwater drum	*Aplodinotus grunniens*	rough	8
Smallmouth bass	*Micropterus dolomieu*	game	6
Emerald shiner	*Notropis atherinoides*	forage	5
Spotfin shiner	*Cyprinella spiloptera*	forage	5
Flathead catfish	*Pylodictis olivaris*	game	1
Gizzard shad	*Dorosoma cepedianum*	forage	1
Quillback	*Carpiodes cyprinus*	rough	1
Shorthead redhorse	*Moxostoma macrolepidotum*	rough	1
Walleye	*Sander vitreus*	game	1

The benthic macroinvertebrates in the lower Fox River include adult and larval insects, mollusks, crustaceans, and worms. Given the predominance of fine-grained silt/clay sediments in the river, the predominant species are sediment-dwelling and burrow directly into the substrate for most of their life cycle. Benthic community surveys in the lower Fox River have shown low taxa richness and diversity with midge larvae (Family Chironomidae) and worms (Class Oligochaeta) dominating.[19] Oligochaetes and chironomids are considered tolerant of organic enrichment and/or degraded habitats.

The benthic macroinvertebrates provide important ecosystem functions such as nutrient cycling and organic matter processing. As a food resource, benthic macroinvertebrates provide a conduit for the flow of nutrients and contaminants (in this case, PCBs) from the sediment to fish.

Mammal and Bird Use

The area around the Fox River at the location of the Fox Energy Center discharge consists of cultivated farmland, wood lots, and cleared transmission line ROW (Figure 5–3). Dominant mammals and birds in these open lands include songbirds, white-tailed deer, rabbits, red fox, coyote, pheasant, Hungarian

[19]WDNR. 2001. White Paper No. 8 – Habitat and Ecological Considerations as a Remedy Component for the Lower Fox River. WDNR. Madison, Wisconsin.

partridge, waterfowl, bats, small mammals, and domesticated livestock.[11] The dominant mammals and birds found in woodland habitat include white-tailed deer, squirrel, skunk, raccoon, upland game birds, songbirds, thrushes, and woodpeckers.[19] The Fox River and its shoreline provides wetland habitat for migrating and resident waterfowl such as Canada and snow geese, mallards, blue-winged teal, wood ducks, scaup, goldeneye, common and hooded mergansers, bald eagles, osprey, night herons, great blue herons; shore birds such as rails (greater and lesser yellowlegs), spotted sandpiper, Wilson's Phalarope, common snipe, woodcock, plovers (killdeer), and migratory songbirds such as red-winged black birds and sparrows. Mammals common to riverine habitat include muskrat, mink, otter, and raccoon.[19]

Figure 5–3: Area Around of the Fox Energy Center Discharge

Vegetative Cover Near Shoreline

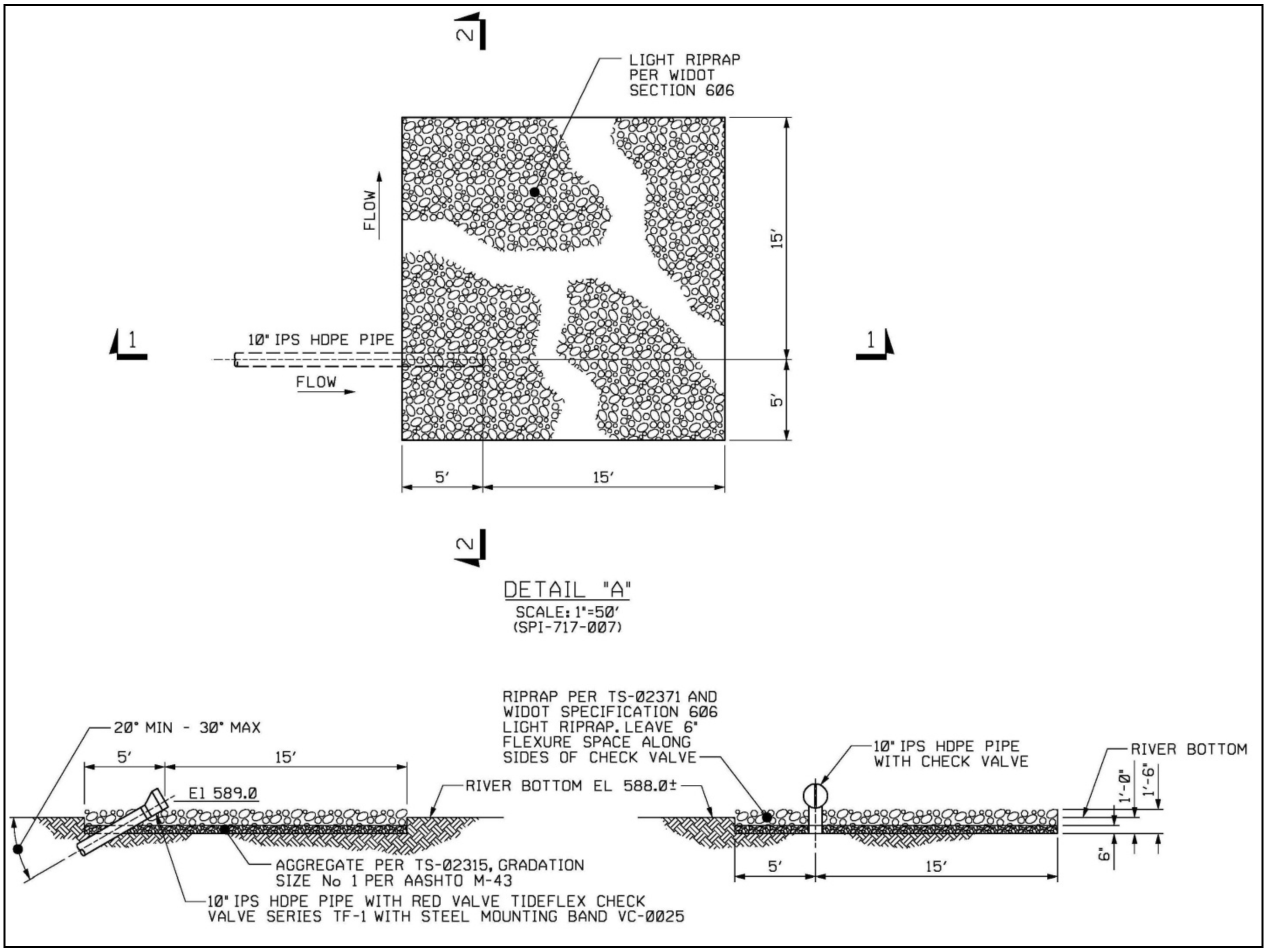
The Fox River at the location of the discharge is primarily flanked by a deciduous, wooded, riparian corridor (Figure 5–3) dominated by elm, cottonwood, ash, maple, oak, box elder, dogwood, and buckthorn.

5.12.4.3.4 Potential Impacts of Discharge on Water Body

Modeled Results of Expected Effects on Bottom Sediments, Flora, and Fauna

Wastewater from the Fox Energy Center to be discharged to the Fox River is accumulated in the basin of the cooling tower. Periodically, some of the water being pumped from the basin and through the cooling tower is diverted to the river through a 10-inch diameter pipeline terminated with a single-port diffuser located on the bottom of the river (Figure 5–4). The discharge rate is regulated to maintain a discharge velocity into the river of at least 10 fps as required by the WDNR for the rapid dilution of chlorides. The addition of Fox 3 will roughly double the amount of wastewater discharged. To accommodate this additional wastewater and still use the existing discharge pipeline, wastewater from all three units will be treated in a co-precipitation process. The effluent from that process will be directed to a common sump, which will be pumped out as needed at a rate to achieve at least 10 fps at the end of the pipe. A less restrictive nozzle (rubber Tideflex valve) will be installed on the end of the diffuser pipe to compensate for an expected higher rate while maintaining a discharge velocity of at least 10 fps.

Figure 5–4: Existing Discharge Structure



Source: Excerpt from Calpine Fox Energy Center Design Drawing, 2004

Given that the discharge structure is located on the bottom of the river and approximately 180 feet from the shore, is typically under 16.5 feet of water, is surrounded by a gravel mat, and the discharge velocity is not expected to substantially increase; no changes to bottom sediment, such as erosion and resuspension, are expected to occur after the addition of Fox 3. In addition, the location of the discharge structure is not habitat for flora and not prime habitat for fauna. As such, the additional discharge from Fox 3 is unlikely to have any effects on flora and fauna.

Anticipated Temperature Mixing Zone Configuration, and Expected Yearly Variation

The end-of-pipe and mixing zone discharge temperatures were compared to the Wisconsin water quality criteria for temperature for the lower Fox River (NR 102.25(3)). Mixing zone temperatures were calculated as the weighted average temperature of the discharge and 25 percent of the Fox River 7-day, consecutive low flow with a 10 year return frequency (7Q10) at the default ambient temperatures (NR 102.25(3)).

Monthly average end-of pipe discharge temperatures were estimated to range from 57.9 °F for January to 64.9 °F in July. The maximum end-of-pipe temperature, based on a starting temperature of 95 °F, was estimated to be 68.0 °F. All of the estimated monthly end-of-pipe temperatures will be less than (compliant with) the corresponding acute temperature criteria. The end-of-pipe temperatures for May through September and for the maximum discharge temperature will be less than the corresponding sub-lethal criteria. All of the mixing zone temperatures were several degrees less than the sub-lethal criteria. These results suggest the Fox Energy Center with the addition of Fox 3 will have no reasonable potential to exceed the water quality criteria for temperature.

Table 5-15: Estimated Discharge and Mixing Zone Temperatures Compared to Water Quality Criteria

Month	Maximum Discharge Temperature-Cooling Tower Outlet (°F)	Estimated Discharge Temperature-End of Pipe in Fox River (°F)	Default Ambient Temp of Fox River (NR102) (°F)	Calculated Mixing Zone Temperature (°F)	Sub-lethal Criteria (°F)	Acute Criteria (°F)
January	64.0	57.9	35	35.5	49	76
February	68.0	59.2	35	35.5	50	76
March	69.5	59.7	38	38.4	52	77
April	73.8	61.1	50	50.2	55	80
May	78.7	62.7	62	62.0	65	83
June	83.8	64.4	73	72.8	76	85
July	85.4	64.9	77	76.8	81	87
August	85.1	64.8	76	75.8	80	86
September	81.5	63.6	68	67.9	73	85
October	76.5	62.0	53	53.2	61	80

Month	Maximum Discharge Temperature-Cooling Tower Outlet (°F)	Estimated Discharge Temperature-End of Pipe in Fox River (°F)	Default Ambient Temp of Fox River (NR102) (°F)	Calculated Mixing Zone Temperature (°F)	Sub-lethal Criteria (°F)	Acute Criteria (°F)
November	70.8	60.1	42	42.4	50	78
December	68.4	59.3	35	35.5	49	76
Maximum	**95.0**	**68.0**	77	**76.8**	**81**	**87**

Complies with sub-lethal and acute water quality criterion.

5.12.4.3.5 Invasive Mussel Control

The most common invasive mussel in the area of the proposed project is the zebra mussel. It is a non-native mollusk species that has been introduced to many bodies of water in the Great Lakes and Mississippi River areas. These mollusks attach themselves to hard objects in the water, building up in layers as their numbers increase. This buildup tends to foul intake screens, clog pipes, and disable submerged operating equipment on facilities taking water from infested sources.

The project is proposing to use only gray water as a source of cooling water. The gray water is previously processed water that does not contain zebra mussels. Since the facility is not proposing to intake water directly from the Fox River, there is no need for zebra mussel control methods to be implemented at the intake. The discharge diffuser will be protected from zebra mussel fouling by terminating in a rubber check valve. Rubber is not a favorable substrate for zebra mussels to colonize and the vibration of the valve flaps during use also discourages mussel attachment.

5.12.4.4 Discharges to Local Municipality

Sanitary wastewater from plant bathrooms, showers and other employee areas will be collected and routed to an interconnection with the Village of Wrightstown municipal sewer system for off-site treatment. The existing sanitary holdings tanks for the site administration and water treatment buildings will be replaced with lift stations. Each lift station will pump sanitary sewage to a common sanitary lift station which will discharge to the Village of Wrightstown municipal sewer system.

5.12.5 Storm Water Management

A discussion of the storm water management and erosion control plans are provided in the next sections.

5.12.5.1 Storm Water Management Plan

See Volume II Appendix K (Storm Water Management Plan) for a copy of the storm water management plan.

5.12.5.2 Storm Water Management Facilities

Construction activities resulting in disturbance of one acre or more of land must comply with the provisions of the Clean Water Act (CWA), Section 402. Section 402 established the National Pollutant Discharge Elimination System (NPDES) permit program under the USEPA to regulate point and non-point sources discharges into Waters of the United States. In Wisconsin, the WDNR for all land, except native land, administers the NPDES permit authorizing storm water discharge associated with construction activities under the WPDES General Permit for Construction Activities – WPDES Permit No. WI-S067831-4. For this project, a Storm Water Management Plan (SWMP) will be completed to outline procedures to minimize erosion and to mitigate sediment transport during and after construction activities, and storm water facilities, such as wet detention ponds designed to meet peak flow and water quality requirements. The SWMP complies with the following applicable Wisconsin Administrative Codes: NR 216 (Storm Water Discharge Permits, Subchapter III — Construction Site Storm Water Discharge Permits); NR 151 (Runoff Management, Subchapter III — Non−Agricultural Performance Standards); and the Village of Wrightstown Construction Site Erosion Control Ordinance – Chapter 97.

5.12.5.2.1 On-site Wastewater and Storm Water Treatment Facilities

Storm water wet detention ponds are sized to remove 80 percent of the total suspended solids (TSS) using the WDNR approved Source Loading and Management Model for Windows program, otherwise known as WinSLAMM.

5.12.5.2.2 Solids/Sludges Generation

Solids on the site could be debris or sediment from soil erosion, soil on vehicles, or from plants and animals decomposition.

5.12.5.2.3 Pretreatment Facilities

Pretreatment facilities are not anticipated for this project.

5.12.5.2.4 Estimated Amount of Flow

The storm water management facilities have been designed to safely pass the 100-year peak flow event through the wet detention pond overflow spillways.

5.12.5.2.5 Location of Collection and Discharge

Storm water runoff from the new facilities will be directed to one of the two new storm water wet detention ponds. The locations of the ponds are shown on the site arrangement drawings in Volume I Appendix B (Site Arrangements). Discharge from these ponds will be to the existing drainage stream.

Required calculations are located in Volume II Appendix K provide detailed description of the storm water analysis, hydraulic structure sizing and discharge volume and rates to the existing drainage stream.

5.12.5.2.6 Erosion Control Plan

A copy of the SWMP including descriptions and typical drawings of erosion and sediment control best management practices are provided in Volume II Appendix K. The SWMP has been designed to meet or exceed compliance with the WDNR Storm Water and Erosion Control Technical Standards. Site specific erosion control plans will be developed during the final design phase of the project and provided to the WDNR for review and approval prior to commencement of construction.

5.13 Air Quality

Pursuant to the requirements specified in the Wisconsin Administrative Code Chapter NR 405, WPS is submitting a Prevention of Significant Deterioration (PSD) construction permit application.

5.13.1 WDNR Air Permits

The project will require a PSD major modification to a major source construction permit that covers both arrangements and both proposed turbine vendors.

The PSD permit application contains the following analyses/assessments regarding emissions of regulated pollutants associated with the construction and operation of Fox 3:

- Evaluation of ambient air quality in the area for each regulated pollutant for which Fox 3 will result in a significant net emissions increase
- Demonstration that emissions increases resulting from Fox 3 will not cause or contribute to an increase in ambient concentrations of pollutants exceeding the remaining available PSD increment and the NAAQS
- Assessment of any adverse impacts on soils, vegetation, visibility, and growth in the area
- A Best Available Control Technology analysis for each regulated pollutant for which Fox 3 will result in a significant net emissions increase

5.13.2 Fuel Types

The site will be fueled by natural gas with ultra-low sulfur fuel oil as backup.

5.13.3 Air Emissions Modeling

Air dispersion modeling was performed using the latest version of the AERMOD model (Version 14134). The AERMOD model is a USEPA-approved, steady-state Gaussian air dispersion model that is designed to estimate downwind ground-level concentrations from single or multiple sources using detailed meteorological data. AERMOD is a model currently approved for industrial sources and PSD permits. The WDNR requested that WPS demonstrate regulatory compliance through its use.

5.13.3.1 Control Technologies

The combustion turbine and duct burner will be controlled as follows:

- NO_x - Low-NO_x burners, SCR
- CO - Good combustion practices (GCP), oxidation catalyst
- Particulate matter (PM)/particulate matter less than 10 microns (PM_{10})/ particulate matter less than 2.5 microns ($PM_{2.5}$) - Combustion controls, Low ash fuels
- VOC – GCP, oxidation catalyst
- Sulfuric acid (H_2SO_4) mist - GCP
- Greenhouse gases (Equivalent carbon dioxide (CO_{2e})) - Use of natural gas as a fuel, monitoring and control of excess air, efficient turbine design, catalytic oxidation
- Opacity - Low-NO_x burners, combustion controls, low ash fuels

The dew point heaters will be controlled as follows:

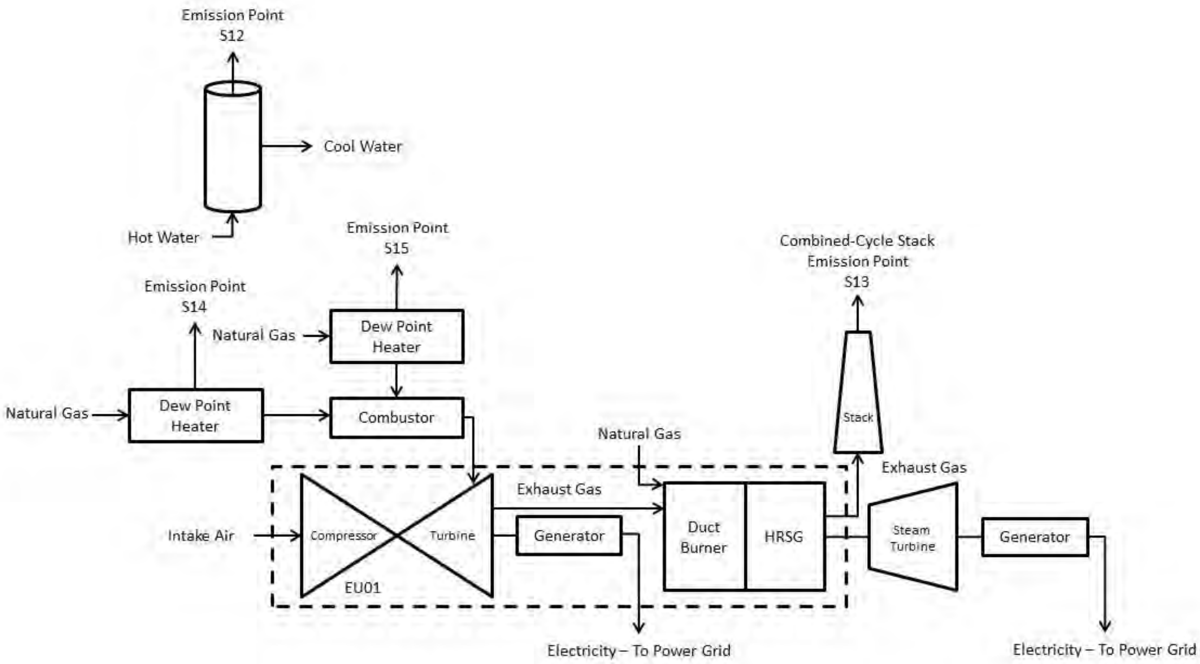
- NO_x - Low-NO_x burners / GCP/Clean Fuels
- CO - GCP/Clean Fuels
- PM/PM_{10}/$PM_{2.5}$ - GCP/Clean Fuels
- VOC - GCP/Clean Fuels
- H_2SO_4 mist - GCP/Clean Fuels
- Greenhouse gases (CO_{2e}) - GCP/Clean Fuels
- Opacity - GCP/Clean Fuels

The cooling tower will be controlled as follows:

- PM/PM_{10}/$PM_{2.5}$ - High efficiency drift eliminators
- Opacity - High efficiency drift eliminators, limits on total dissolved solids

Figure 5–5 provides a process flow diagram for the turbine and controls.

Figure 5–5: Combined Cycle Process Flow Diagram



5.13.3.2 Emission Rates

Emissions of criteria pollutants, hazardous air pollutants (HAPs), and greenhouse gases will occur from the project equipment as detailed below.

5.13.3.3 Estimated Hourly Emission Rates

The following assumptions were used to determine potential hourly and annual emission rates from the turbine (both vendor options) and duct burner for permitting purposes:

- Worst case across a range of ambient conditions

Table 5-16 presents the hourly emissions from the Fox 3 GE and Siemens options at 100 percent load plus duct burner, 100 percent without duct burner, 75 percent, 50 percent, and 25 percent loads and at start-up.

Table 5-16: Hourly Emission Rates (Turbine)

Operating Load	Air Emissions (pounds per hour (lb/hr))							
	NO_X	CO	PM_{10}	SO_2	Hg	VOC	H_2SO_4 Mist	Lead
Fox 3 GE Option – Natural Gas								
100% with Duct Burner	20.60	12.60	31.10	8.35	-	13.20	6.55	3.13E-04
100% w/o Duct Burner	16.00	9.90	13.10	6.49	-	2.50	4.62	0
75%	13.10	8.10	11.90	5.27	-	2.10	3.75	0
50%	10.40	6.40	10.80	4.19	-	1.60	2.98	0
25%	4.00	2.48	3.28	1.62	-	0.63	1.16	0
Start-up/ Shutdown	215.00	2,598.00	13.32	2.58	-	164.00	4.62	0
Fox 3 Siemens Option – Natural Gas								
100% with Duct Burner	22.00	13.10	35.10	8.66	-	13.90	6.79	3.44E-04
100% w/o Duct Burner	17.30	10.50	15.50	6.63	-	2.10	4.72	0
75%	14.20	8.50	13.20	5.46	-	1.80	3.88	0
50%	9.60	5.80	11.50	3.70	-	1.20	2.63	0
25%	4.33	2.63	3.88	1.66	-	0.53	1.18	0
Start-up/ Shutdown	137.00	3,215.00	15.53	2.5	-	333.00	4.72	0
Fox 3 GE Option – Fuel Oil								
100% w/o Duct Burner	30.50	10.90	41.30	3.49	2.73E-03	5.90	2.49	0.03
75%	24.40	8.70	40.70	2.79	2.05E-03	4.90	1.99	0.02
50%	19.00	6.80	40.10	2.18	1.37E-03	3.80	1.55	0.02
25%	7.63	2.73	10.33	0.87	6.84E-04	1.48	0.62	0.01
Start-up/ Shutdown	252.00	4,150.00	40.75	1.42	2.73E-03	81.00	2.49	0.03
Fox 3 Siemens Option – Fuel Oil								
100% w/o Duct Burner	18.60	11.20	33.40	3.53	2.76E-03	2.20	2.51	0.03
75%	14.90	9.00	32.70	2.84	2.07E-03	1.80	2.02	0.02
50%	11.70	7.20	32.10	2.22	1.38E-03	1.40	1.58	0.02
25%	4.65	2.80	8.35	0.88	6.90E-04	0.55	0.63	0.01
Start-up/ Shutdown	275.00	9,391.00	54.76	1.54	2.76E-03	1,108.00	2.51	0.03

Operating Load	Greenhouse Gases (lb/hr)					
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Fox 3 GE Option – Natural Gas						
100% with Duct Burner	332,890	6.31	0.63	0	0	0
100% w/o Duct Burner	258,616	4.90	0.49	0	0	0
75%	210,033	3.98	0.40	0	0	0
50%	166,922	3.16	0.32	0	0	0
25%	102,790	4.90	0.49	0	0	0
Start-up/ Shutdown	332,890	6.31	0.63	0	0	0
Fox 3 Siemens Option – Natural Gas						
100% with Duct Burner	345,139	6.55	0.66	0	0	0
100% w/o Duct Burner	264,247	5.01	0.50	0	0	0
75%	217,434	4.12	0.41	0	0	0
50%	147,388	4.12	0.28	0	0	0
25%	101,446	2.79	0.28	0	0	0
Start-up/ Shutdown	345,139	5.01	0.50	0	0	0
Fox 3 GE Option – Fuel Oil						
100% w/o Duct Burner	363,059.00	15.07	3.01	0	0	0
75%	290,266.00	12.05	2.41	0	0	0
50%	226,476.00	9.40	1.88	0	0	0
25%	90,764.75	3.77	0.75	0	0	0
Start-up/ Shutdown	149,516.00	15.07	3.01	0	0	0
Fox 3 Siemens Option – Fuel Oil						
100% w/o Duct Burner	366,391.00	15.21	3.04	0	0	0
75%	294,627.00	12.23	2.45	0	0	0
50%	230,992.00	9.59	1.92	0	0	0
25%	91,597.75	3.80	0.76	0	0	0
Start-up/ Shutdown	162,057.00	15.21	3.04	0	0	0

CH_4 – methane
N_2O – nitrous acid

5.13.3.4 Maximum Annual Emission Rates

The estimated maximum expected annual emissions of each pollutant for the project are presented in Table 5-17.

Table 5-17: Maximum Annual Emission Rates (lb/hr)

Pollutant	Siemens Project	GE Project
NO_x	186.04	179.08
CO	771.17	2,239.82
PM	151.42	162.08
PM_{10}	145.95	156.61
$PM_{2.5}$	145.95	156.61
SO_2	36.68	38.03
VOC	87.57	303.81
CO_2e	1,469,874.44	1,523,583.80
H_2SO_4	28.70	29.76
Lead	0.02	0.02

5.13.3.5 Projected Emissions

Facilities on the existing site consist of two dual fuel combined-cycle combustion turbines, an emergency fire pump, a cooling tower, and two natural gas-fired dew point heaters. Projected emissions at this site from these existing sources and the new sources are outlined in Table 5-18 below.

Table 5-18: Projected Emissions by Source

Sources	Air Emissions (tons per year)							
	NO_X	CO	PM_{10}	SO_2	Hg	VOC	H_2SO_4 Mist	Lead
Fox 3 GE Option								
Fox 3 Turbine and Duct Burner	177.45	763.95	143.88	36.57	1.20E-03	87.09	28.69	0.02
Fox 3 Dew Point Heaters	8.59	7.21	0.65	0.10	-	0.47	0.02	0.00
Fox 3 Cooling Tower	-	-	1.42	-	-	-	-	-
Fox 3 Switches	-	-	-	-	-	-	-	-
Fox 3 Siemens Option								
Fox 3 Turbine and Duct Burner	170.50	2,232.61	154.54	37.93	0.00	303.33	29.74	0.02
Fox 3 Dew Point Heaters	8.59	7.21	0.65	0.10	0.00	0.47	0.02	0.00
Fox 3 Cooling Tower	0.00	0.00	1.42	0.00	0.00	0.00	0.00	0.00
Fox 3 Switches	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Existing Equipment								
Fox 1 Turbine and Duct Burner	110.45	174.80	85.25	43.00	3.92E-04	38.55	6.50	0.00

Sources	Air Emissions (tons per year)							
	NO_X	CO	PM_{10}	SO_2	Hg	VOC	H_2SO_4 Mist	Lead
Fox 2 Turbine and Duct Burner	110.45	174.80	85.25	43.00	3.92E-04	38.55	6.50	0.00
Fox 1/2 Fire Pump	0.91	0.04	0.01	0.02	-	0.01	-	-
Fox 1/2 Auxiliary Boiler	18.18	13.81	1.61	0.41	4.33E-05	1.24	0.05	0.00
Fox 1/2 Natural Gas Heater #1	2.80	2.80	0.44	0.44	-	0.35	-	-
Fox 1/2 Natural Gas Heater #2	2.80	2.80	0.44	0.44	-	0.35	-	-
Fox 1/2 Lime Silo	-	-	0.44	-	-	-	-	-
Fox 1/2 Soda Ash Silo	-	-	0.44	-	-	-	-	-
Fox 1/2 Cooling Tower	-	-	9.80	-	-	-	-	-
Total Existing Plant Plus GE Option	**431.63**	**1,140.23**	**329.62**	**123.98**	**0.00**	**166.62**	**41.75**	**0.02**
Total Existing Plant Plus Siemens Option	**424.68**	**2,608.88**	**340.29**	**125.34**	**0.00**	**382.86**	**42.81**	**0.02**

Sources	Greenhouse Gases (tons per year)						
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	CO_2e
Fox 3 GE Option							
Fox 3 Turbine and Duct Burner	1,458,058.20	31.72	3.88	-	-	-	1,460,006.45
Fox 3 Dew Point Heaters	10,247.21	0.19	0.02	-	-	-	10,257.79
Fox 3 Cooling Tower	-	-	-	-	-	-	-
Fox 3 Switches	-	-	-	-	-	3.90	88,920.00
Fox 3 Siemens Option							
Fox 3 Turbine and Duct Burner	1,511,708.82	32.97	4.05	-	-	-	1,513,739.02
Fox 3 Dew Point Heaters	10,247.21	0.19	0.02	-	-	-	10,257.79
Fox 3 Cooling Tower	-	-	-	-	-	-	-
Fox 3 Switches	-	-	-	-	-	3.90	88,920.00
Existing Equipment							
Fox 1 Turbine and Duct Burner	1,353,574.62	29.49	3.69	-	-	-	1,355,410.39
Fox 2 Turbine and Duct Burner	1,353,574.62	29.49	3.69	-	-	-	1,355,410.39
Fox 1/2 Fire Pump	1,366.54	0.06	0.01	-	-	-	1,371.28
Fox 1/2 Auxiliary Boiler	11,159.63	0.21	0.02	-	-	-	11,171.16
Fox 1/2 Natural Gas Heater #1	4,098.88	0.08	0.01	-	-	-	4,103.12
Fox 1/2 Natural Gas Heater #2	4,098.88	0.08	0.01	-	-	-	4,103.12
Fox 1/2 Lime Silo	-	-	-	-	-	-	-
Fox 1/2 Soda Ash Silo	-	-	-	-	-	-	-
Fox 1/2 Cooling Tower	-	-	-	-	-	-	-
Total Existing Plant Plus GE Option	**4,196,178.60**	**91.32**	**11.32**	-	-	**3.90**	**4,290,753.68**
Total Existing Plant Plus Siemens Option	**4,249,829.22**	**92.56**	**11.49**	-	-	**3.90**	**4,344,486.26**

5.13.3.6 National Ambient Air Quality Standards (NAAQS) and PSD Increments

The NAAQS are set by the USEPA to protect human health and public welfare. The PSD increment constitutes the maximum allowable ambient air quality concentration increase that may occur for a given pollutant above a baseline concentration. In order to determine if the Fox 3 project will contribute to a NAAQS or PSD increment exceedance, the new sources proposed for Fox 3 were modeled along with the appropriate existing sources in the area. This was performed in two phases – an initial screen and then a refined model for pollutants with averaging periods that exceeded the PSD significance threshold. Based on the modeling results, it has been predicted that the project will have minimal effects on the NAAQS and PSD increment.

5.13.3.6.1 Background Ambient Levels

The background concentrations for SO_2, NO_2, PM_{10}, and $PM_{2.5}$ in Outagamie County are provided in Table 5-19.

Table 5-19: Background Concentrations of SO_2, NO_2, PM_{10}, and $PM_{2.5}$

Pollutant	Averaging Period	Background Level [micrograms per cubic meter (μg/m³)[1]]
NO_2	Annual	8.0
	1-hour	28.0
PM_{10}	24-hour	29.40
$PM_{2.5}$	Annual	7.30
	24-hour	19.80
SO_2	Annual	5.4
	24-hour	11.2
	3-hour	11.8

[1] μg/m³ - micrograms per cubic meter
Source: WDNR Website.

5.13.3.6.2 Modeling Results

Outagamie County is currently in attainment for all NAAQS. The refined modeling showed that Fox 3 will not threaten continued attainment of the NAAQS in this area. The results of the NAAQS refined models are found in Table. The emissions from the proposed new Fox 3 project were modeled along with all NAAQS sources within the Significant Impact Area. This includes the emissions from the existing Fox 1 and 2.

Table 5-20: NAAQS Modeling Results

Site Options	Vendor	Pollutant	Averaging Period	UTM Coordinates		Year	Modeled Concentration ($\mu g/m^3$)	Background ($\mu g/m^3$)	Model Plus Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Distance From Fox 3 Stack (m)	Direction
				Easting (meters) [A]	Northing (meters) [A]							
1	GE	NO_2	Annual [B]	403,594.10	4,908,080.50	2009	4.31	8.00	12.31	100	529	SSW
			1-hour [D]	403,300.00	4,907,800.00	5 Year	121.94	28.00	149.94	188	985	SSW
		$PM_{2.5}$	24-hour [D]	403,300.00	4,907,800.00	5 Year	6.28	19.80	26.08	35	1020	SW
	Siemens	NO_2	Annual [B]	403,594.10	4,908,080.50	2009	4.31	8.00	12.31	100	529	SSW
			1-hour [D]	403,300.00	4,907,800.00	5 Year	121.63	28.00	149.63	188	985	SSW
		CO	8-hour [C]	404,100.00	4,909,400.00	2007	836.59	904.70	1,741.29	10,000	795	NNE
		$PM_{2.5}$	24-hour [D]	403,300.00	4,907,800.00	5 Year	6.32	19.80	26.12	35	1021	SW
2	GE	NO_2	Annual [B]	403,594.10	4,908,080.50	2009	4.46	8.00	12.46	100	311	WSW
			1-hour [D]	403,300.00	4,907,800.00	5 Year	120.67	28.00	148.67	188	864	WSW
		$PM_{2.5}$	24-hour [D]	403,300.00	4,907,800.00	5 Year	6.06	19.80	25.86	35	868	SW
	Siemens	NO_2	Annual [B]	403,594.10	4,908,080.50	2009	4.46	8.00	12.46	100	313	WSW
			1-hour [D]	403,300.00	4,907,800.00	5 Year	120.65	28.00	148.65	188	873	SW
		CO	8-hour [C]	404,800.00	4,908,300.00	2010	803.99	904.70	1,708.69	10,000	781	E
		$PM_{2.5}$	24-hour [D]	403,300.00	4,907,800.00	5 Year	5.98	19.80	25.78	35	875	SW

5.13.3.6.3 PSD Increment Modeling Results

Sources constructed after a baseline date are subject to PSD increment analyses. The results of PSD increment modeling show that potential air quality impacts from Fox 3 will not exceed the PSD Class II Increment thresholds. The results of the PSD Class II Increment modeling are found in Table 5-21.

Table 5-21: PSD Class II Increment Modeling Results

Site Option	Vendor	Pollutant	Averaging Period	UTM Coordinates		Year	Modeled Concentration (µg/m^3)	PSD Class II Increment (µg/m^3)
				Easting (meters) [A]	Northing (meters) [A]			
1	GE	NO_2 [B]	Annual	404,168.0	4,908,438.3	2007	1.10	25.00
		$PM_{2.5}$	Annual	404,167.7	4,908,413.6	2009	0.15	4
			24-hour [C]	404,600.0	4,908,700.0	2010	1.65	9.00
		PM_{10}	Annual	403,444.2	4,908,302.9	2006	0.90	17
			24-hour [C]	404,600.0	4,908,700.0	2010	1.65	30
		SO_2	Annual	404,168.0	4,908,438.3	2007	0.03	20
			24-hour [C]	404,100.0	4,909,400.0	2007	0.31	91
			3-hour [C]	404,100.0	4,909,300.0	2007	0.86	512
	Siemens	NO_2 [B]	Annual	404,168.0	4,908,438.3	2007	1.08	25.00
		$PM_{2.5}$	Annual	404,100.0	4,909,300.0	2007	0.16	4
			24-hour [C]	404,100.0	4,909,400.0	2007	1.81	9.00
		PM_{10}	Annual	404,100.0	4,909,300.0	2007	0.16	17
			24-hour [C]	404,100.0	4,909,400.0	2007	1.81	30
		SO_2	Annual	404,167.7	4,908,413.6	2009	0.02	20
			24-hour [C]	404,100.0	4,909,300.0	2007	0.22	91
			3-hour [C]	404,000.0	4,909,200.0	2007	0.66	512

Site Option	Vendor	Pollutant	Averaging Period	UTM Coordinates		Year	Modeled Concentration (μg/m³)	PSD Class II Increment (μg/m³)
				Easting (meters) [A]	Northing (meters) [A]			
2	GE	NO_2 [B]	Annual	403760.70	4908127.30	2006	1.17	25.00
		$PM_{2.5}$	Annual	404250.00	4908900.00	2007	0.15	4
			24-hour [C]	403784.50	4908134.00	2010	2.80	9.00
		PM_{10}	Annual	404250.00	4908900.00	2007	0.15	17
			24-hour [C]	403784.50	4908134.00	2010	2.80	30
		SO_2	Annual	403760.70	4908127.30	2006	1.17	20
			24-hour [C]	404250.00	4908900.00	2007	0.15	91
			3-hour [C]	403784.50	4908134.00	2010	2.80	512
	Siemens	NO_2 [B]	Annual	403760.70	4908127.30	2006	1.15	25.00
		$PM_{2.5}$	Annual	403617.90	4908087.20	2009	0.90	4
			24-hour [C]	403784.50	4908134.00	2010	2.80	9.00
		PM_{10}	Annual	403617.90	4908087.20	2009	0.90	17
			24-hour [C]	403784.50	4908134.00	2010	2.80	30
		SO_2	Annual	403760.70	4908127.30	2006	1.15	20
			24-hour [C]	403617.90	4908087.20	2009	0.90	91
			3-hour [C]	403784.50	4908134.00	2010	2.80	512

[A] Value is 2nd highest high.

The modeling analysis demonstrates that Fox 3 will not cause or significantly contribute to a violation of the NAAQS or the PSD Increments.

5.13.4 Expected Annual Emissions of CO_2, N_2O, CH_4 and Hydrofluorocarbons

The expected annual emissions in tons per year of CO_2, N_2O, CH_4, and hydrofluorocarbons by source are provided in Table 5-22. These same emissions for the entire plant are provided in Table 5-23.

Table 5-22: Annual Emissions by Source of CO_2, N_2O, CH_4, SF_6, and Hydrofluorocarbons (Maximum Capacity)

Sources	CO_2	CH_4	N_2O	SF_6	HFCs
	(tpy)				
Fox 3 GE Option					
Fox 3 Turbine and Duct Burner	1,458,058.20	31.72	3.88	-	
Fox 3 Dew Point Heaters	10,247.21	0.19	0.02	-	-
Fox 3 Cooling Tower	-	-	-	-	-

Fox 3 Switches	-	-	-	3.90	-
Fox 3 Siemens Option					
Fox 3 Turbine and Duct Burner	1,604,792.58	32.97	4.05	-	
Fox 3 Dew Point Heaters	10,247.21	0.19	0.02	-	-
Fox 3 Cooling Tower	-	-	-	-	-
Fox 3 Switches	-	-	-	3.90	-

Table 5-23: Annual Emissions for Plant of CO_2, N_2O, CH_4, and Hydrofluorocarbons (Expected Operation)

Source	CO_2	CH_4	N_2O	SF_6	HFCs
	(tpy)				
Fox 3 GE Option					
Fox 3 Turbine and Duct Burner	1,020,640.74	22.21	2.71	-	-
Fox 3 Dew Point Heaters	7,173.05	0.14	0.01	-	-
Fox 3 Cooling Tower	-	-	-	-	-
Fox 3 Switches	-	-	-	3.90	-
Fox 3 Siemens Option					
Fox 3 Turbine and Duct Burner	1,123,354.81	23.08	2.83	-	-
Fox 3 Dew Point Heaters	7,173.05	0.14	0.01	-	-
Fox 3 Cooling Tower	-	-	-	-	-
Fox 3 Switches	-	-	-	3.90	-

5.13.4.1 Hazardous Air Pollutant Emission Estimates

Tables 5-24 through 5-26 show Fox 3 and existing facility annual organic and inorganic HAP emission estimates, with an estimated tpy emitted for each HAP and a total estimated tpy for all HAP emissions.

Table 5-24: HAP Emissions from the Existing Plant (tpy).

Chemical	Existing Aux Boiler	2 Existing Duct Burners	2 Existing Dew Point Heaters	2 Existing Turbines (NG)	Existing Fire Pump	2 Existing Turbines (FO)	Total Existing Plant HAPs
2-Methylnaphthalene	0.00	0.00	0.00	-	-	-	0.00
3-Methylchloranthrene	0.00	0.00	0.00	-	-	-	0.00
7,12-Dimethylbenz(a) anthracene	0.00	0.00	0.00	-	-	-	0.00

Chemical	Existing Aux Boiler	2 Existing Duct Burners	2 Existing Dew Point Heaters	2 Existing Turbines (NG)	Existing Fire Pump	2 Existing Turbines (FO)	Total Existing Plant HAPs
Acenaphthene	0.00	0.00	0.00	-	-	-	0.00
Acenaphthylene	0.00	0.00	0.00	-	-	-	0.00
Acetaldehyde	-	-	-	0.62	-	-	0.62
Acrolein	-	-	-	0.10	-	-	0.10
Anthracene	0.00	0.00	0.00	-	-	-	0.00
Arsenic	-	-	-	-	0.00	0.02	0.02
Benz(a)anthracene	0.00	0.00	0.00	-	-	-	0.00
Benzene	0.00	0.01	0.00	0.19	0.00	0.09	0.29
Benzo(a)pyrene	0.00	0.00	0.00	-	-	-	0.00
Benzo(b)fluoranthene	0.00	0.00	0.00	-	-	-	0.00
Benzo(g,h,I)perylene	0.00	0.00	0.00	-	-	-	0.00
Benzo(k)fluoranthene	0.00	0.00	0.00	-	-	-	0.00
Beryllium	-	-	-	-	0.00	0.00	0.00
1,3-Butadiene	-	-	-	0.01	0.00	0.03	0.03
Cadmium	-	-	-	-	0.00	0.01	0.01
Chromium	-	-	-	-	0.00	0.02	0.02
Chrysene	0.00	0.00	0.00	-	-	-	0.00
Dibenzo(a,h)anthracene	0.00	0.00	0.00	-	-	-	0.00
Dichlorobenzene	0.00	0.01	0.00	-	-	-	0.01
Ethyl benzene	-	-	-	0.49	-	-	0.49
Fluoranthene	0.00	0.00	0.00	-	-	-	0.00
Fluorene	0.00	0.00	0.00	-	-	-	0.00
Formaldehyde	0.01	0.38	0.01	3.12	0.00	0.48	3.99
Hexane	0.17	9.04	0.12	-	-	-	9.34
Indeno(1,2,3-cd)pyrene	0.00	0.00	0.00	-	-	-	0.00
Lead	0.00	0.00	0.00	-	0.00	0.02	0.03
Manganese	-	-	-	-	0.00	1.36	1.36
Mercury	-	-	-	-	0.00	0.00	0.00
Naphthalene	0.00	0.00	0.00	0.02	0.00	0.06	0.08
Nickel	-	-	-	-	0.00	0.01	0.01
PAH	-	-	-	0.03	0.00	0.69	0.72
Phenanathrene	0.00	0.00	0.00	-	-	-	0.00

Chemical	Existing Aux Boiler	2 Existing Duct Burners	2 Existing Dew Point Heaters	2 Existing Turbines (NG)	Existing Fire Pump	2 Existing Turbines (FO)	Total Existing Plant HAPs
Proplylene Oxide	-	-	-	0.45	-	-	0.45
Pyrene	0.00	0.00	0.00	-	-	-	0.00
Selenium	-	-	-	-	0.00	0.04	0.04
Toluene	0.00	0.02	0.00	2.01	-	-	2.03
Xylene	-	-	-	0.99	-	-	0.99
TOTAL	**0.18**	**9.46**	**0.13**	**8.03**	**0.00**	**2.83**	**20.62**

Table 5-25: Estimated HAP Emissions from the Fox 3 GE Project (tpy).

Chemical	Combustion Turbine (NG)	Combustion Turbine (FO)	Duct Burner	2 Dew Point Heaters	Total GE Project HAPs	Total Facility HAPs (GE Project)
2-Methylnaphthalene	-	-	0.00	0.00	0.00	0.00
3-Methylchloranthrene	-	-	0.00	0.00	0.00	0.00
7,12-Dimethylbenz(a) anthracene	-	-	0.00	0.00	0.00	0.00
Acenaphthene	-	-	0.00	0.00	0.00	0.00
Acenaphthylene	-	-	0.00	0.00	0.00	0.00
Acetaldehyde	0.27	-	-	-	0.27	0.89
Acrolein	0.04	-	-	-	0.04	0.14
Anthracene	-	-	0.00	0.00	0.00	0.00
Arsenic	-	0.01	-	-	0.01	0.03
Benz(a)anthracene	-	-	0.00	0.00	0.00	0.00
Benzene	0.08	0.05	0.00	0.00	0.14	0.43
Benzo(a)pyrene	-	-	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	-	-	0.00	0.00	0.00	0.00
Benzo(g,h,I)perylene	-	-	0.00	0.00	0.00	0.00
Benzo(k)fluoranthene	-	-	0.00	0.00	0.00	0.00
Beryllium	-	0.00	-	-	0.00	0.00
1,3-Butadiene	0.00	0.02	-	-	0.02	0.05
Cadmium	-	0.00	-	-	0.00	0.01
Chromium	-	0.01	-	-	0.01	0.03
Chrysene	-	-	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	-	-	0.00	0.00	0.00	0.00
Dichlorobenzene	-	-	0.00	0.00	0.00	0.01
Ethyl benzene	0.22	-	-	-	0.22	0.71
Fluoranthene	-	-	0.00	0.00	0.00	0.00
Fluorene	-	-	0.00	0.00	0.00	0.00
Formaldehyde	1.38	0.28	0.14	0.01	1.81	5.80
Hexane	-	-	3.45	0.15	3.61	12.94
Indeno(1,2,3-cd)pyrene	-	-	0.00	0.00	0.00	0.00
Lead	-	0.01	0.00	0.00	0.02	0.04
Manganese	-	0.79	-	-	0.79	2.15

Chemical	Combustion Turbine (NG)	Combustion Turbine (FO)	Duct Burner	2 Dew Point Heaters	Total GE Project HAPs	Total Facility HAPs (GE Project)
Mercury	-	0.00	-	-	0.00	0.00
Naphthalene	0.01	0.03	0.00	0.00	0.05	0.13
Nickel	-	0.00	-	-	0.00	0.01
PAH	0.01	0.40	-	-	0.41	1.14
Phenanathrene	-	-	0.00	0.00	0.00	0.00
Proplylene Oxide	0.20	-	-	-	0.20	0.65
Pyrene	-	-	0.00	0.00	0.00	0.00
Selenium	-	0.02	-	-	0.02	0.07
Toluene	0.89	-	0.01	0.00	0.89	2.92
Xylene	0.44	-	-	-	0.44	1.43
TOTAL	**3.54**	**1.64**	**3.61**	**0.16**	**8.96**	**29.58**

Table 5-26: Estimated HAP Emissions from the Fox 3 Siemens Project (tpy).

Chemical	Combustion Turbine (NG)	Combustion Turbine (FO)	Duct Burner	2 Dew Point Heaters	Total Siemens Project HAPs	Total Facility HAPs (Siemens Project)
2-Methylnaphthalene	-	-	0.00	0.00	0.00	0.00
3-Methylchloranthrene	-	-	0.00	0.00	0.00	0.00
7,12-Dimethylbenz(a)anthracene	-	-	0.00	0.00	0.00	0.00
Acenaphthene	-	-	0.00	0.00	0.00	0.00
Acenaphthylene	-	-	0.00	0.00	0.00	0.00
Acetaldehyde	0.28	-	-	-	0.28	0.90
Acrolein	0.04	-	-	-	0.04	0.14
Anthracene	-	-	0.00	0.00	0.00	0.00
Arsenic	-	0.01	-	-	0.01	0.03
Benz(a)anthracene	-	-	0.00	0.00	0.00	0.00
Benzene	0.08	0.06	0.00	0.00	0.14	0.43
Benzo(a)pyrene	-	-	0.00	0.00	0.00	0.00
Benzo(b)fluoranthene	-	-	0.00	0.00	0.00	0.00
Benzo(g,h,I)perylene	-	-	0.00	0.00	0.00	0.00
Benzo(k)fluoranthene	-	-	0.00	0.00	0.00	0.00
Beryllium	-	0.00	-	-	0.00	0.00
1,3-Butadiene	0.00	0.02	-	-	0.02	0.05
Cadmium	-	0.00	-	-	0.00	0.01
Chromium	-	0.01	-	-	0.01	0.03
Chrysene	-	-	0.00	0.00	0.00	0.00
Dibenzo(a,h)anthracene	-	-	0.00	0.00	0.00	0.00
Dichlorobenzene	-	-	0.00	0.00	0.00	0.01
Ethyl benzene	0.22	-	-	-	0.22	0.72
Fluoranthene	-	-	0.00	0.00	0.00	0.00
Fluorene	-	-	0.00	0.00	0.00	0.00
Formaldehyde	1.41	0.28	0.16	0.01	1.85	5.84
Hexane	-	-	3.79	0.15	3.95	13.28
Indeno(1,2,3-cd)pyrene	-	-	0.00	0.00	0.00	0.00
Lead	-	0.01	0.00	0.00	0.02	0.04

Chemical	Combustion Turbine (NG)	Combustion Turbine (FO)	Duct Burner	2 Dew Point Heaters	Total Siemens Project HAPs	Total Facility HAPs (Siemens Project)
Manganese	-	0.80	-	-	0.80	2.15
Mercury	-	0.00	-	-	0.00	0.00
Naphthalene	0.01	0.04	0.00	0.00	0.05	0.13
Nickel	-	0.00	-	-	0.00	0.01
PAH	0.02	0.40	-	-	0.42	1.14
Phenanathrene	-	-	0.00	0.00	0.00	0.00
Proplylene Oxide	0.20	-	-	-	0.20	0.65
Pyrene	-	-	0.00	0.00	0.00	0.00
Selenium	-	0.03	-	-	0.03	0.07
Toluene	0.91	-	0.01	0.00	0.91	2.94
Xylene	0.45	-	0.00E+00	-	0.45	1.43
TOTAL	**3.62**	**1.66**	**3.97**	**0.16**	**9.41**	**30.03**

5.13.5 Dust Control

During construction, steps will be taken to prevent excessive emissions of particulate matter resulting from construction activities and vehicular traffic. These steps may include compacting, seeding, covering, paving, wetting, sweeping, or otherwise controlling particulate matter emissions.

Post-construction, the areas disturbed during construction will receive final cover to eliminate dust. All exposed soil areas will be seeded to grow grass, lesser-traveled road surfaces will be graveled and compacted, and the new main roads on-site will be surfaced with asphalt. The roads will be monitored and either wetted or swept to clean any fugitive dust that may occur due to on-site wheeled traffic.

5.14 Solid Waste Handling and Disposal

The existing pre-treatment and the new post-treatment process and dewatering equipment will produce non-hazardous sludge with a concentration of approximately 30 to 40 percent solids and will be disposed of off-site at an approved landfill site. Solid sanitary waste will be routed to the Village of Wrightstown municipal sewer system for off-site treatment.

5.14.1 Solid Waste Identification

Solid waste will be produced by both the pre-treatment process and the post-treatment process of the incoming water from HOV at the Fox Energy Center. The pre-treatment process will be identical to the current process for Fox 1 and 2. The post-treatment process will be new to the Fox Energy Center and will be needed to reduce the phosphorous in the Fox River Discharge to meet current requirements.

5.14.2 Composition and Quantity of Wastes

During the pre-treatment process, the incoming water from HOV is softened in a cold lime softening clarifier system located at Fox Energy. The existing cold lime softening system produces a non-hazardous sludge with a concentration of approximately 30 to 40 percent solids that is disposed of offsite.

The current sludge from the softening process for Fox 1 and 2 has been profiled by Veolia Environmental Services and has been verified as not a hazardous or unauthorized waste. Veolia has approved this waste stream to be accepted in the Veolia ES Hickory Meadows Landfill.

The waste profile has furthermore been certified by Fox Energy as follows:

- The waste is not a hazardous waste as defined by Wisconsin Administrative Code NR661 or 40 CFR 261.
- The waste does not contain regulated quantities of PCB's.
- The waste does not contain regulated quantities of herbicides or pesticides.
- The waste does not contain regulated quantities of F500 solvents as specified in Wisconsin Administrative Code NR 605.
- The waste does not contain infectious wastes as defined in Wisconsin Administrative Code NR 526.
- Samples submitted are representative as defined in 40 CFR 261 – Appendix 1 and were obtained by using this or an equivalent sampling method.
- All relevant information regarding known or suspected hazards in the possession of the generator have been disclosed.

During the 2013 operating year, Fox Energy produced 2,918 tons of sludge at an average of 8 tons/day. This is a typical year for Fox 1 and 2. With the addition of Fox 3, the sludge production for the pre-treatment clarifiers on average will increase because of the increased throughput over time. The additional sludge production estimated to be 12 tons/day or an increase of 4 ton/day for an approximate annual total of 4,380 tons of sludge.

During the post-treatment process, the co-precipitation process will treat the combined cooling tower blowdowns to remove phosphates from the wastewater prior to discharge into the Fox River. Sufficient amounts of a coagulant or metal salt (Ferric Chloride) combined with efficient removal of suspended solids is critical to lowering the effluent phosphate loading in the wastewater to meet and exceed the discharge limit of 2.68 lbs/day. Assuming no metal loss in the effluent stream, efficient dewatering and soluble phosphates are negligible, based on a stoichiometric balance the following will be produced:

Total Sludge Produced (Fox 1, 2, and 3 combined): 1.5 tons of filter cake per day (approx. 40 percent solids) when operating at maximum load.

Sludge Composition:

~216 gallons of water (60 percent)

~1,200 lbs/day hydroxide sludge (39 percent)

~25 lbs/day phosphate sludge (1 percent)

The actual sludge production will depend on the capacity factor of the plant. The non-hazardous sludge will be removed from the filter press and hauled off for off-site disposal similar to the existing pre-treatment system sludge.

5.14.3 WDNR Solid Waste and Landfill Permits

No solid waste and landfill permits are anticipated for the project. WPS intends to continue to dispose of the waste at an existing licensed landfill facility listed in section 3.6.2.

6.0 COMMUNITY RESOURCES IN THE PROJECT AREA

6.1 Community Resource Maps and Photos

See Volume I Appendix DD for a map showing the Fox Energy Center in relation to the nearest residences and other buildings, indicating distances to both the Fox Energy Center boundary and Site Options 1 and 2 footprints.

6.2 Current Land Ownership

The current Fox Energy Center property is comprised of two main parcels. The southern parcel, where the current facility is located, contains approximately 109 acres and was acquired by WPS through the purchase of the Fox Energy Center in early 2013. The northern parcel, which is currently agriculture, contains approximately 75 acres and was acquired by WPS in late 2013.

The plans for Fox 3include two site options. Site Option 1 (the north arrangement) would be located primarily on the northern parcel, but a large portion of switchyard expansion would be on the southern parcel. Site Option 2 (the southeast arrangement) would be almost entirely on the southern parcel.[20]

6.2.1 Temporary or Permanent Acquisitions

WPS is working with the two parcel owners immediately east of the current Fox Energy Center property to obtain options to purchase them as buffer for the expanded facility.

6.2.2 Options to Purchase

The new plant will be constructed entirely within the existing Fox Energy Center (184 acres) and will occupy approximately 30 acres of the existing site. No land acquisition will be required to construct Fox 3, although WPS is working with the two parcel owners immediately east of the current Fox Energy Center property to obtain options to purchase them as buffer for the expanded facility.

6.3 Local Zoning

The following subsections discuss the local zoning for Fox 3.

6.3.1 Zoning Ordinances

See Volume II Appendix L for copies of zoning ordinances affecting the Fox 3 site and the area within one-half mile of the site boundary.

[20] A small portion of an access road is located for convenience and efficiency purposes on the northern parcel.

6.3.2 Existing Zoning and Expected Changes

Fox 3 will be constructed entirely within the existing Fox Energy Center (184 acres) and will occupy approximately 30 acres of the existing site. The Fox Energy Center was annexed into the Village of Wrightstown in 2014.

Fox 3 will require zoning changes. According to the Village of Wrightstown zoning map, the existing Fox Energy Center property is zoned I-1 General Industrial (206-25). The I-1 General Industrial District is designed to accommodate those industrial activities which by their character should be relatively remote from residential and business development. It states in 206-25 I-1D that principal structures shall be no more than 60 feet in height except as provided by 206-16. In 2016-16 G it states that accessory buildings shall not be more than 15 feet high. Due to the nature of the equipment design, the principal structure will exceed 60 feet in height. The accessory buildings are also being designed to current industrial design standards and many of them will exceed 15 feet in height. Some of the accessory structures may also exceed 60 feet. Structures such as the cooling tower and stack are excepted in the current code, however, the boiler and the turbines as well as some of the smaller accessory buildings exceed the current height restrictions.

206-25 I-1 I(1) prohibits the dissemination of excessive noise, vibration, odor, dust, smoke, gas or fumes or other atmospheric pollutants beyond the boundaries of the immediate site of the building. The existing facility currently does not meet the requirements and the proposed facility will not be remote from residents and will have emissions. Emissions, such as water vapor from the cooling tower and natural gas combustion emissions from the stack will occur and will leave the boundary. The atmospheric pollutants that will leave the boundary will meet all the WDNR restrictions for protecting public health and the environment.

139-6A.(2)(a)[2] states ambient noise is the all-encompassing noise associated with a given source, usually being a composite of sounds with many sources near and far, but excluding the noise source being measured. Ambient noise is a factor and the subject noise shall not exceed the ambient noise by 5 decibels (dB) in any octave band to be designated excessive. The increase over ambient sound levels criterion, for each octave band, is not typical especially for areas of industrial use. Many cities in Wisconsin do not have octave band limits or ambient sound level increase components at all. The City of Madison, Wisconsin limits industrial noise to 75 decibels A-weighted (dBA) at property lines and does not have octave band limits or an ambient noise increase component of the ordinance. The City of Green Bay, Wisconsin limits noise to 80 dBA measured on any property not owned by the noise producer, there is no octave band limit, or increase over ambient component of the ordinance. Town of Kaukauna, Wisconsin limits noise from Light and Heavy Industrial properties to 70 dBA, during nighttime hours, at the property line from which a sound complaint is received. The Town of Kaukauna's Noise Ordinance does not include an octave band limit or an increase over ambient component.

The Village of Wrightstown Noise Ordinance restricts the overall noise level to be 65 dBA or less at any residential property line during nighttime hours. The 65 decibel A-weighted requirements is not required during the daytime. However, this requirement, while lower than some other local requirements, can be achieved for both the daytime and nighttime hours and is being used as the design criteria for this Project.

206-17 D (2) states that the maximum height of fences for commercial and industrial properties is eight feet on all sides. The proposed project includes the placement of an earthen landscape berm along the northern boundary of the property immediately adjacent and parallel to Wrightstown Road/Golf Course Drive. The earthen landscape berm will be vegetated with native grasses and tree plantings. It is expected the earthen landscape berm will provide some level of visual screening, reduction in off-site lighting impacts, and/or sound screening. While the placement and construction of the berm is not a local regulatory requirement, neighbors support placement of additional visual screening of the facility.

6.3.3 Zoning Classifications

There is one zoning classification that applies to Fox 3, 206-25 I-1 General Industrial District. Approximately 75 of acres of General Industrial District will be impacted by Fox 3.

6.3.4 Proposed Zoning Changes

WPS met with the Village of Wrightstown Planning Commission on October 13, 2014 to discuss the zoning issues identified in Section 6.3.2. WPS proposed to the Village of Wrightstown Planning Commission that they change 206-25 I-1 I to the following language currently listed in the City of DePere's code:

> "Any use already established on the effective date of this ordinance shall be permitted to be altered, enlarged, expanded, or modified, provided that new sources of noise, vibration, smoke, and particulate matter, toxic matter, odorous matter, and glare, shall conform to the performance standards established hereinafter for the district in which such use is located.
>
> Smoke and Particulate Matter, Toxic Matter, and Odorous Matter Limitations: The performance standards shall be the standards required by the Wisconsin Air Pollution Control Standards, and such standards and amendments thereto are incorporated by reference."

WPS also proposed to the Village of Wrightstown Planning Commission that they delete 139-6(2)(a)[2] for Industrial Zoning.

No zoning change was proposed for the building height conflict (206-25 I-1D and 2016-16 G) or the fence height conflict (206-17 D (2), rather the option of seeking a variance was proposed.

The Village of Wrightstown Planning Commission will review WPS's requests and decide whether to change their code or require WPS to seek variances for all the identified issues. Either way, an application will have to be filed with the Village of Wrightstown Planning Commission and they will have to hold a public meeting and comment period on the proposed changes.

6.4 Land Use Plans

Land use plans are discussed in the next two sections.

6.4.1 Planning Documents

Fox Energy Center is located in Outagamie County in the Village of Wrightstown, and was annexed from the Town of Kaukauna into the Village of Wrightstown in January 2014. Municipalities within one-half mile of the proposed project site include the Towns of Buchanan, Kaukauna, and the Village of Wrightstown. The Town of Buchanan and the Village of Wrightstown have developed and adopted land use plans for the purpose of establishing goals for the future land use and development of their respective municipalities. The Village of Wrightstown is in the process of revising their land use plan to accommodate for the changes needed as a result of the 2013 annexation of the Fox Energy Center. In addition, Outagamie County has also adopted a land use plan. Copies of the land use plans are provided in Volume II Appendix M.

6.4.2 Conflict with Plans

Prior to the annexation into the Village of Wrightstown, the Town of Kaukauna designated the parcels associated with Fox 1 and 2 as Light Industrial and the annexed parcel was not zoned as noted on the Town of Kaukauna zoning map issued date December 2010. As noted in Section 6.3.4 above, WPS is requesting a zoning change to accommodate the industrial use of Fox 3. A review of the comprehensive plans did not reveal any significant conflicts with future land use plans for the project site. The comprehensive plan for Outagamie County represents a future land use of residential for the annexed parcel as shown on a future land use figure dated March 13, 2012. Potential conflicts with land use will be resolved at the municipal level with the village or towns affected by the project.

6.5 Agriculture

The following sections discuss the current and past on-site farming activities, impacted practices, preservation lands, and potential mitigation.

6.5.1 Past and Present Farming Activities

The current Fox Energy Center property is comprised of two main parcels. The southern parcel, where the current facility is located, contains approximately 109 acres and was acquired by WPS through the purchase of the Fox Energy Center in early 2013. The remaining areas of this parcel, not occupied by facilities, are leased on a year-to-year basis to a farmer for crop production.

The northern parcel contains approximately 75 acres and was acquired by WPS in late 2013 for a buffer for the existing facility. The parcel is currently being leased to an adjoining farmer through a year-to-year lease for crop production. In 2013, approximately 25 acres of the parcel produced corn and approximately 50 acres of the parcel produced soybeans. In 2014, approximately 25 acres of the parcel produced soybeans and approximately 50 acres of the parcel produced corn.

6.5.2 Agricultural Practices Impacted

WPS intends to continue to lease portions of both parcels not occupied by facilities on a year-to-year basis for agricultural production. Both parcels do not contain active drainage tile or irrigation and neither parcel is subject to any farmland preservation programs. The only impact upon agricultural practices will be from taking the entire parcel temporarily out of production during construction and taking the footprint of the project (approximately 30 acres) permanently out of production during the operation of the project.

6.5.3 Farmland Preservation Programs

There are no parcels of land enrolled in the farmland preservation program that will be affected by Fox 3. This includes the two parcels immediately east of the current Fox Energy Center property.

6.5.4 Mitigation of Agricultural Lands

There are no off-site agricultural lands affected by Fox 3.

6.5.5 Agricultural Impact Statement

There is no off-site agricultural land affected by Fox 3 and therefore an Agricultural Impact Statement from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) will not be prepared.

6.5.5.1 Eminent Domain

There are no off-site farm operations affected by Fox 3 and therefore eminent domain will not be required.

6.5.5.2 DATCP AIP Correspondence

There is no off-site agricultural land affected by Fox 3 and therefore coordination with the Wisconsin DATCP is not necessary.

6.5.6 Induced Voltage Issues

The proposed project does not result in the construction of any off-site new electric transmission lines.

6.6 Conservation Easements and Programs

There are no parcels of land that have conservation easements or programs that will be affected by Fox 3.

6.7 Communication with Potentially Affected Public

Below is a discussion of the methods used by WPS to communicate with and provide information to the affected public.

6.7.1 Public Communication

To provide a two-way communication process for stakeholders who may have an interest in project plans, WPS developed and initiated a Fox 3 communication plan. The goal was to establish an effective communication process during the licensing and construction phase, so key constituents will understand the project and will recognize the new generator as part of the existing 9-year-old Fox Energy Center.

The ongoing communication effort includes:

- One-on-one meetings with concerned residents.
- Establishing and updating a website.
- Issuing news information to media outlets.
- Holding community informational/update meetings with nearby residents.
- Offering informative presentations to local community groups.
- Providing regular updates to public officials and area legislators.
- Offering tours of the existing Fox Energy Center.
- Sending three update letters to nearby plant residents and landowners along the natural gas pipeline that was expected to serve Fox 3.

Initially, media interviews took place regarding WPS's 2019 projected need for power. The interviews were the result of comments made by Integrys Energy Group, Inc. President and Chief Operating Officer Larry Borgard during a financial research analyst conference call in September 2013. A news release announcing the company's plan to either buy the needed power or build a new generator was issued on September 17, 2013. On December 18, 2013, WPS announced that, if it determined that building a generator was in the best interests of its customers, the Fox Energy Center site was the preferred option.

On May 21, 2014, WPS held two sessions of meetings with nearby residents of Fox Energy Center. A mailing list of 230 neighbors living within a half-mile radius of Fox Energy Center was developed. The neighbors received invitations to the two sessions to learn more about the preliminary design of the potential project. Community leaders and local legislators were also invited. See Volume II Appendix N (Public Communications). In addition, WPS used the opportunity to solicit concerns expressed by all attendees. WPS committed to consider the list of concerns as it formulated its final design. The concerns were posted to the website. WPS also committed to holding another meeting prior to a CPCN application filing if the decision was to build Fox 3.

In May 2014, a project website was established. Updates are provided as new information becomes known.

In June 2014, WPS created a list of designated employees that could provide Fox 3 information to local civic and social organizations, upon request.

On December 1, 2014, a second community informational meeting was held to update nearby residents.

On December 18, 2014, WPS announced it determined building Fox 3 was in the best interests of its customers and the Fox Energy Center was the preferred site.

WPS representatives maintain an open dialogue with state and federal government representatives that have jurisdiction in the Brown and Outagamie County areas. These representatives also maintain an open dialogue with local government representatives of the Village of Wrightstown, the Town of Kaukauna, and Outagamie County.

WPS will continue public outreach communication efforts following the filing of the Fox 3 CPCN application in January 2015. WPS will continue to welcome questions and comments regarding the project and work to resolve any identified issues or concerns in a cordial and timely manner. WPS will continue to encourage open dialogue with local, county, and state public officials.

6.7.2 Public Meetings

On May 21, 2014, WPS held two sessions of meetings with neighbors of the Fox Energy Center and landowners adjacent to a potential natural gas pipeline route . A mailing list of 230 neighbors living within a one-half-mile radius of Fox Energy Center and 15 landowners adjacent to the potential natural gas pipeline route was developed . The neighbors and landowners received invitations to the two sessions to learn more about the preliminary design of the potential project. Community leaders and local legislators were also invited (Volume II Appendix N (Public Communications). In addition, WPS used the opportunity to solicit concerns expressed by all attendees. WPS committed to consider the list of concerns as it formulated its final design. The concerns were posted to the website. WPS also committed to holding another meeting prior to a CPCN application filing if the decision was to build the generator.

On December 1, 2014, a second, two session, community informational meeting was held to update the neighbors. The 230 neighbors received invitations to the two sessions to learn more about the preliminary design of the potential project, to review the two site options, and to provide additional comments on areas of the design. Community leaders and local legislators were also invited (Volume II Appendix N (Public Communications).

The 15 landowners along the proposed natural gas pipeline route to the Guardian Natural Gas Transmission pipeline (originally discussed in the May meeting) were not invited to the meeting because the natural gas pipeline is no longer part of the proposed project. The landowners along the proposed natural gas pipeline route were notified separately that the natural gas pipeline would no longer be part of the Fox 3 project.

6.7.3 Public Outreach Mailings and Handouts

See Volume II Appendix N (Public Communications) for copies of any outreach mailings and handouts.

6.7.4 Written Public Comments

See Volume II Appendix N (Public Communications) for copies of any written public comments received.

6.8 Demographics

The demographics of the surrounding area for Fox 3 include population, race, and income levels within one-half mile of the site, the Town of Buchanan, the Village of Wrightstown, Outagamie County, and the Town of Kaukauna. This information is provided below.

6.8.1 Population, Race, and Income Levels

Population within the vicinity of the Fox 3 site resides predominantly in the Village of Wrightstown, Wisconsin. The village population composition is 95 percent white, with very small percentages of African American, American Indian, Asian, and other races. The population within the Town of Buchanan and within one-half mile of the Fox 3 site reflects this same trend. The Town of Buchanan has an over 96 percent white population, while within one-half mile of the Fox 3 site approximately 90 percent of residents are white. Table 6-1 provides the population statistics by race for Outagamie County residents within one-half mile of the Fox 3 site, the Village of Wrightstown, the Town of Buchanan, and the Town of Kaukauna. The median household income levels within the vicinity of the Fox 3 site range from $85,299 in the Town of Buchanan, to $71,522 in the Village of Wrightstown to $46,563 for residents within one-half mile of the Fox 3 site. The poverty status for residents of the Town of Buchanan is approximately 5 percent. In the Village of Wrightstown, the poverty status is approximately 5.9 percent, while within one-half mile of the Fox 3 site the approximate poverty level is 2.3 percent.

A map of the nearby communities is provided in Volume I Appendix Q and a map of the nearest residences is provided in Volume I Appendix DD.

Table 6-1: Population Characteristics

Demographic Group	Outagamie County	Kaukauna Township	Village of Wrightstown	Town of Buchanan	One-half mile Buffer*
Total Population	176,777	15,696	2,827	6,801	4,341
White	94%	97.4%	97.5%	96.5%	90.3%
African American	1.5%	1%	0.9%	0.6%	0.3%
American Indian, Eskimo, or Inuit	2.2%	1.3%	0.5%	0.9%	0.6%
Asian	3.4%	1.1%	1.2%	2.6%	0.4%
Native Hawaiian or Pacific Islander	0.1%	0.3%	0.2%	0%	0%
Other	0.8%	0.3%	0.2%	1.4%	1.1%
Two or More	1.6%	1.1%	0.5%	1.9%	0.4%
Hispanic or Latino	3.6%	3.5%	8.7%	2.4%	1.5%
Median Household Income	$57,584	$53,402	$71,522	$85,299	$46,563
Poverty Level	8.6%	8.2%	5.9%	5.0%	2.3%

* Outagamie County Census Block 1, Census Tract 133
Sources: 2000 and 2010-2012 American Community Survey 5-Year Estimates Data via U.S. Census Bureau

6.8.2 Description of the Township and County

The Fox 3 site is located within the Town of Kaukauna, Outagamie County, Wisconsin. The Town of Kaukauna population composition is 97 percent white, with very small percentages of African American, American Indian, Asian and other races. The Outagamie County population reflects this same trend with approximately 94 percent of the population being white. Table 6-1 above provides the population statistics by race for Outagamie County, residents within one-half mile of the Fox 3 site, the Village of Wrightstown, the Town of Buchanan, and the Town of Kaukauna. The median household income in the Town of Kaukauna is approximately $53,402, while at the county level, the median household income for residents is approximately $57,584. The poverty status for residents in the Town of Kaukauna is approximately 8.2 percent, while in Outagamie County the approximate poverty level is 8.6 percent. A map of Outagamie County and the townships within is provided in Volume I Appendix Q (Community Map).

6.9 Local Government Impacts

The next six subsections discuss potential local government impacts from the Fox 3 project.

6.9.1 List of Provided Services

The majority of the municipal services required for Fox 3 are already being provided for the existing Fox Energy Center by the Village of Wrightstown.

Fox 3 will be connected to the Village of Wrightstown municipal water supply system to obtain potable water for employee use during construction and ongoing operations at Fox Energy Center. The total amount of water used from the municipal system will be 2,900 gallons per day. As a result, approximately 2,900 gallons per day could potentially be returned to the Village of Wrightstown sanitary sewer system. The project will require minimal construction of water pipelines to connect with the municipal system. There will be no change in capacity needed because the existing municipal water supply system and municipal sewer water system have sufficient capacity. The closest water and sewer service is along Wrightstown Road/Golf Course Drive adjacent to the Fox Energy Center. Because the village does not provide municipal solid waste collection and disposal services to commercial and industrial facilities, WPS will hire a private contractor to provide sanitary sewer service (holding tanks) and disposable services needed for the temporary construction facilities.

Emergency medical services are provided by County Rescue. County Rescue employs approximately 180 licensed medical personnel ranging from volunteer medical first responders to critical care-trained paramedics. In addition to Emergency 911 response, County Rescue also provides local and long distance, non-emergency stretcher transport, paramedic assistance to outlying ambulances and access to its sister agency, EAGLE III ground and air transport.

Fire protection is provided by the Wrightstown Volunteer Fire Department which is located approximately 2 miles from the Fox Energy Center. Fox 3 will also have fire suppression measures of its own, as well as facilities for the storage of hazardous materials. This storage will require coordination activities with the village Fire Department.

Police protection is provided by the Village of Wrightstown, Outagamie County, and the Wisconsin State Patrol during both construction and operations.

6.9.2 Local Government Infrastructure

WPS will fund improvements to village infrastructure (i.e., fees for Fox 3 municipal water and sewer interconnect) resulting from the projects.

6.9.3 Impacts on Local Budgets

Based on communications with the Village of Wrightstown representatives, Fox 3 will have no negative effects on municipality budgets. As no Outagamie County services are provided to the Fox Energy Center, there will be no negative effects to the county budget resulting from Fox 3 development. Community services (i.e., police, emergency medical services, and fire protection) and infrastructure are already provided to the site at the same level as will be required for Fox 3. Therefore, it is unlikely local community services will have a perceptible increase in costs for the services provided.

6.9.4 Revenue

The project will result in an estimated annual utility aid payment from the Wisconsin Department of Revenue of approximately $266,000 (first year) to Outagamie County and approximately $533,000 (first year) to the Village of Wrightstown.

6.9.5 Community Benefits

The community will benefit in general, as will all customers in WPS's service area, through continued reliable service resulting from the installation of the needed generating capacity provided by the new facility.

The addition of Fox 3 will also provide construction jobs and permanent employment positions to the benefit of the local economy. WPS estimates that the project's construction will take about 2.5 years and will provide approximately 400 construction-related jobs during the peak construction, testing, and commissioning phase of the project. An estimated 10 permanent employment positions will be added to the Fox Energy Center.

Local workers and tradesmen who live in the immediate vicinity of the project will likely benefit directly from the opportunity to be hired for many of these construction jobs. It is anticipated that the primary source of construction labor will be from the Green Bay Labor Council. In addition, it is also anticipated there will be labor from councils in other areas.

In addition to construction-related jobs, there will be a significant level of construction-related supplies and materials purchased from surrounding community businesses. Also, indirect and induced positive impacts will result from spending by construction employees at local businesses such as stores, restaurants, and motels. The indirect and induced sales impact that results from the construction phase of the project will benefit a large spectrum of the region’s industries. Service and retail sectors will be the largest beneficiaries of the indirect and induced expenditures.

6.9.6 Existing Facility Retirements

WPS will retire Pulliam Units 5 and 6 and Weston Unit 1 by June 2015 for reasons separate from the construction of Fox 3. For purposes of this application, it is assumed Edgewater 4 will either be retired by December 2018 or WPS will no longer have an ownership share. Both are for reasons separate from the construction of Fox 3.

In addition, due to uncertain timing of future environmental regulations, age related risk and production limitations due to the existing EPA consent decree, it is assumed in the planning models Weston Unit 2, Pulliam Units 7 or 8 are not available for planning capacity and energy. However, WPS will not retire these units if market conditions will support continued operation.

Therefore, there are no facilities that will be retired as a consequence of the proposed facility.

6.10 Workforce

The next two subsections describe the proposed workforce size, skills, and expected sources for construction and operation of the project.

6.10.1 Workforce Size and Skills

There will be a small number of manufacturer’s representatives on-site, for brief periods of time. However, these will not constitute large numbers of people and will not significantly increase the numbers provided below.

It is expected that as the construction progresses, the work force on-site will vary from a few hundred to approximately 400 temporary workers. These workers will be comprised of construction management staff, site superintendents, skilled craftsmen, engineers, start-up support personnel, and other miscellaneous services. Contractors will be chosen from a competitive bid process and will be local whenever practical.

Various craft labor will be required to build Fox 3. This includes but is not limited to carpenters, heavy equipment operators, laborers, millwrights, ironworkers, masons, pipefitters, and electricians. In addition, there will be management, engineering, technical, start-up and other support staff on-site during the construction period. The numbers of people will start off at nominal levels at the start of construction and then steadily increase over time as more construction activities occur, peaking 15 to 19 months after the start of construction.

The new Fox 3 permanent employment positions (approximately 10) include Control Room Operators, Water Treatment Operator, Mechanical Maintenance Technicians and Electrical, Instrument and Control Technicians.

6.10.2 Workforce Source

Management, engineering, technical, start-up and other support staff will be a combination of the engineering, procurement and construction contractor, hired sub-contractors and staff from WPS. This workforce will be sourced from different locations locally and across the country. Skilled labor such as carpenters, heavy equipment operators, laborers, millwrights, ironworkers, insulators, painters, boilermakers, sheetmetal workers, masons, pipefitters, electricians etc., will be sourced as available from sub-contractors and/or local union labor halls.

6.11 Traffic, Roads, Railroads

6.11.1 Vehicle Types

Construction traffic entering the project site from public roads will consist mainly of automobile traffic for all craft labor, construction management staff, contractors, contractor equipment, and vendors. In addition to auto traffic, material and equipment deliveries by large truck is expected as well as heavy haul vehicles for major equipment deliveries.

On-site traffic will mostly consist of heavy construction equipment and material transport equipment. The main construction roadway will be configured in a loop around the power block to allow efficient coordination of traffic moving between the various material laydown areas and the power block. Material laydown and staging areas are located in close proximity to the main power block components in order to optimize component erection schedule.

6.11.2 Access to and from the Site

The proposed construction entrance will consist of a material delivery entrance and main construction entrance located off Wrightstown Road/Golf Course Drive, running adjacent to the north end of the plant property. Craft employees will enter the main entrance and proceed south to the craft parking lot located northeast of the plant facility. Vehicle access to the site will be controlled via a guard house and site security fencing.

Generally, the construction site will be operated as a closed worksite. Craft workers, upon entering the plant site through the construction entry gate and parking in the designated parking area, will be required to “badge in” using the specified electronic badging system. After passing through security, craft personnel will travel to their work locations using designated walk paths. Craft workers are expected to remain in the construction areas on the plant site for the duration of their shifts, including the lunch break. Craft workers will “badge out” and exit the plant site through the same construction gate they used to enter the site.

6.11.3 Estimated Traffic Frequency and Volume

Construction traffic will include all craft labor, construction management staff, contractors, contractor equipment, vendors, visitors, and material and equipment deliveries. The two main sources of construction traffic will be material delivery and workforce. The frequency of the daily workforce traffic will be proportionate to, and follow, the project workforce curve. The daily automobile traffic to the site will increase from approximately 25 to 50 vehicles in the initial stages of construction to approximately 200 to 300 vehicles for peak months 15 to 19. The traffic will steadily begin to ramp down until it reaches approximately 25 vehicles in month 25, which is essentially construction completion.

In addition to the auto traffic, deliveries of construction materials, primarily by large truck, can average between 15 and 25 vehicles per day. Bulk deliveries for such items as crushed stone, hot asphalt paving, and redi-mix concrete may occasionally exceed 25 vehicles on a given day. Whenever possible, work activities requiring bulk delivery will be scheduled to avoid the peak traffic periods that occur just prior to and just after the standard work shift. A dedicated material delivery road will be provided in Site Option 1 to segregate the craft traffic from material delivery traffic flow. Both Site Option 1 and Site Option 2 include pull over areas for material delivery trucks. This will reduce congestion by allowing material traffic to exit the main construction roadways and stage in order of arrival for an orderly receipt inspection and site entry.

6.11.4 Estimated Impacts on Local Transportation System

All construction material and workforce will come to the project site via rubber-tired transport. The majority of material deliveries will utilize the Wisconsin Interstate highway system to US 41 and State Highway 96, then to the local Wrightstown Road/Golf Course Drive and into the plant entrance roads. Heavy haul components such as transformers, HRSG tube bundles, combustion turbines, and generators could be transported via barge into the Port of Manitowoc or Green Bay then transported over local roads to the site. Heavy haul transports will likely utilize Interstate 43, US 10, and US 41 to access the project site, subject to the limits imposed by the governing heavy haul permits.

6.11.4.1 Delivery Routes

The probable routes for delivering heavy and oversized plant equipment loads to the project site are as follows;

<u>From Port of Manitowoc (East of the project site)</u>

From the equipment off load facility along the Manitowoc River, turn east on Maritime Drive. Turn left onto South 8th Street and travel 1 mile. Turn left onto US 10, travel 4 miles then turn right to merge onto Interstate 43 North. Travel 3 miles on Interstate 43 North then take exit 154 for US 10 West. Travel 30 miles on US 10 West through the towns of Whitelaw, Reedsville, Brillion, and Forest Junction, then enter the traffic circle turning right onto WI-55 North. Travel 7 miles through traffic circles at major local roads Calumet St. and E College Ave, before crossing the Fox River. Turn right onto East Frontage Road and travel 3 miles. Turn right onto Wrightstown Road/Golf Course Drive for approximately 0.2 of a mile to arrive at the project site truck entrance on the right.

<u>From Green Bay (North of the project site)</u>

From an equipment off load facility located on the Fox River, turn left onto South Broadway, travel 0.2 of a mile and turn right onto Hansen Road . Travel 1 mile and turn left onto S Oneida St. Travel 0.6 of a mile and enter onto US 41 South ramp to merge onto US 41 South. Travel on US 41 South for 15 miles. Take exit 148 and turn left for 0.6 of a mile. Turn left onto Hyland Ave (East Frontage Road). Continue straight onto East Frontage Road (3 miles). Turn right onto Wrightstown Road/Golf Course Drive for approximately 0.2 of a mile to arrive at the site truck entrance on the right.

From Milwaukee (South of the project site)

There are two possible routes from Milwaukee to the project site. The first is an option to travel on US 41 North for 90 miles, then, take exit 148 and turn right onto Delanglade Street. Travel 0.6 of a mile on Delanglade then turn left onto Hyland Ave (East Frontage Rd). Continue straight onto East Frontage Road (3 miles). Turn right onto Wrightstown Road/Golf Course Drive for approximately 0.2 of a mile to arrive at the site truck entrance on the right. The second option is to travel Interstate 43 North for 89 miles and take exit 154 for US 10 West. Travel 30 miles on US 10 West through the towns of Whitelaw, Reedsville, Brillion, and Forest Junction, then enter the traffic circle turning right onto WI-55 North. Travel 7 miles through traffic circles at major local roads Calumet St. and E College Ave, before crossing the Fox River. Turn right onto East Frontage Road and travel 3 miles. Turn right onto Wrightstown Road/Golf Course Drive for approximately 0.2 of a mile to arrive at the site truck entrance on the right.

6.11.4.2 Potential Road Damage

With the mitigation measures proposed in Section 6.15.3.6, WPS does not expect any permanent damage to roads.

6.11.4.3 Traffic Congestion

WPS will work with the appropriate county or municipal authority on solutions to potential traffic congestion that may develop as a result of the construction traffic.

6.11.4.4 Rail Line Usage

A railroad runs east to west along the south side of the existing plant. There will be no changes in the rail line usage and no interference with existing rail traffic. WPS does not anticipate the use of rail to deliver directly to the site.

6.11.4.5 Management of Heavy/Large loads

Heavy haul and oversized permit loads will travel the same roadways approved for freight traffic that are described in detail in Section 6.11.4.1. The exception to this will be oversized loads that require special routing on other roadways due to height or width requirements. Oversize or overweight loads will be carefully planned and scheduled well in advance of shipping. Permits and vehicle escort services will be acquired before delivering oversize or overweight loads.

6.11.5 Operational Traffic

The addition of ten permanent employees for the Fox 3 site at the Fox Energy Center will have no significant effect on road traffic near the site during operation. All plant personnel, deliveries to and from the site will still enter the Fox Energy Center from the west off of East Frontage Road.

6.11.6 Permanent Road Changes

No permanent changes to existing roads are anticipated as part of this project.

6.12 Noise

6.12.1 Existing and Projected Noise Measurements

Environmental sound level measurements were obtained while the existing facility was nonoperational and also while it was operating at maximum load to establish baseline ambient sound levels in the area of the Fox 3 location. The measurements were taken in accordance with the PSCW Measurement Protocol for Sound and Vibration. The full sound report is included in Volume II Appendix O (Sound Assessment Study).

The land use immediately surrounding the generating station is mostly agricultural with scattered residential, with the facility bordered by two highways. There are housing developments to the southwest and northeast of Fox Energy Center. There are a few rural residences located adjacent to the facility fence line.

Sound levels at each frequency were measured for 15 minutes and logged by the sound level meter at each location. The sound levels varied at each measurement point depending on the proximity to equipment at the facility and the extraneous sounds that occurred during each measurement.

The averages of the measured existing ambient levels are considered to be representative of the existing plant sound levels and have been incorporated into the noise model. The existing plant noise was logarithmically added to the predicted project sound levels to determine compliance with the applicable property line criteria.

6.12.2 Local Noise Ordinances

Applicable federal, state, county, and city sound regulations were reviewed for the Fox 3 site. Fox 3 will be located in the Village of Wrightstown. Adjacent properties are located in the Village of Wrightstown and the Town of Kaukauna. Both locales have noise ordinances in place, which are attached in Volume II

Appendix P (Local Noise Ordinances). A summary of the applicable criteria for each property line are as follows:

- Adjacent properties to the south and east of the Fox Energy Center property are located within Town of Kaukauna and are zoned for Exclusive Agricultural use.
  - Future impacts from the project are to be 70 dBA or less at the property lines.
  - Construction noise is exempt from the noise ordinance.
- Adjacent properties to the west of the Fox Energy Center property are located within Town of Kaukauna and are zoned for Light Industrial use and are subject to the following requirements:
  - Future impacts from the project are to be 70 dBA or less at the property lines.
  - Construction noise is exempt from the noise ordinance.
- Adjacent properties to the north and northwest of the Fox Energy Center property are located within Village of Wrightstown and are subject to the following requirements:
  - Future impacts are to be 65 dBA or less at adjacent property lines.
  - If primary noise sources are tonal in nature, the residential criteria is reduced by 5 dB.
  - Construction noise shall not exceed 80 dBA at the property line, and must be limited to between the hours of 7:00 am and 9:00 pm.

6.12.3 Noise Impacts

Using industry-accepted sound modeling software (CadnaA), the expected sound pressure levels of Fox 3 were predicted. The software is a scaled, three-dimensional program which takes into account each piece of sound-emitting equipment and predicts sound-pressure levels over a gridded geographic area of interest. The model calculates sound propagation based on International Organization for Standardization (ISO) 9613-2:1996, General Method of Calculation. ISO 9613-2 assesses the sound levels based on the octave band center frequency range from 31.5 to 8,000 hertz.

As previously mentioned, Fox 3 has two potential site arrangement options, referred to as Site Option 1 and Site Option 2. Site Option 1 has Fox 3 located in the northern portion of the property, while Site Option 2 has Fox 3 located in the southeast corner of the property.

Equipment sound power and pressure levels were provided for the cooling tower, steam turbine, gas turbine, and auxiliary equipment by the equipment manufacturers. Gas turbine, steam turbine, and auxiliary equipment sound levels provided by the two equipment manufacturers are considered to be unmitigated noise sources. Other noise sources were assumed based on historical data. A summary of all unmitigated noise source sound power levels have been included in Volume II Appendix O (Sound Assessment Study).

In the model, appropriate sound generation was applied to all sound-radiating surfaces and points. The planned earthen landscape berm, located along the north property line, has been included in the model.

Modeled results for the unmitigated Site Option 1 arrangement, with either of the two gas turbine manufacturers, show a maximum total A-weighted sound level emitted from Fox 3 that would exceed the Village of Wrightstown noise limit. Site Option 1 can meet the Town of Kaukauna limits without further mitigation.

Modeled results for the unmitigated Site Option 2 arrangement, with either of the two gas turbine manufacturers, show a maximum predicted A-weighted sound level emitted from Fox 3 that would not exceed either of the Town of Kaukauna or Village of Wrightstown noise limits.

Mitigation for Fox 3 will bring sound levels into compliance with local ordinances at all property lines. To do this, additional stack silencing and HRSG casing treatments will likely be required for Site Option 1. Additionally, buildings should be acoustically treated to provide sufficient abatement of interior sources such as the steam turbine. Details of the potential mitigation are provided in Volume II Appendix O (Sound Assessment Study).

6.12.3.1 Steam Blows for Plant Start-up

Steam blows have the potential to significantly increase sound levels in the area of the Fox Energy Center during their temporary operation. Because these are not long-term sources of noise, their impact is expected to be minimal. WPS will provide notice to nearby residents of expected timeframes for steam blow operation.

6.12.3.2 Cooling Tower Operation

Cooling tower operation was considered in the predictive modeling study. Maximum noise levels were specified to various vendors in order for the Fox Energy Center to meet the local regulations. A listing of the sources and their sound levels is included in the full noise report, included as Volume II Appendix O (Sound Assessment Study).

6.12.3.3 Other Dominant Components

All of the dominant noise sources that are expected to be part of the generation project were incorporated into the predictive modeling. A listing of the sources and their sound levels is included in the full noise report, included as Volume II Appendix O (Sound Assessment Study).

6.13 Odors

No odors are expected to be perceived outside the plant boundary during construction or operation.

6.14 Fogging and Icing

6.14.1 Potential for Icing, Fogging, and Salt Deposition

A Cooling Tower Impact Analysis (CTI Analysis) was performed for the Fox 3 site (Volume II Appendix Q (Cooling Tower Analysis)). To best model the location and occurrences of potential rime icing and ground fogging the Seasonal and Annual Cooling Water Tower Impact (SACTI) model was used. SACTI is a statistical model that uses actual meteorological data to predict the locations of potential ground fogging and rime icing. The model used 8 years of hourly meteorological data (2006-2013) recorded at the Appleton-Outagamie County Regional Airport and mixing height data that was obtained from the USEPA. Seasonal morning and afternoon mixing heights were used in combination with the hourly meteorological data. These data are considered to be reasonably representative meteorological data to assess the potential cooling water tower (CWT) impacts from Fox 3.

There are a multitude of variable factors (surface temperature, air temperature, dew point, wind speed, CWT plume temperature, and moisture content) that must all interact under certain ideal conditions for ground level rime icing and fogging to occur. SACTI assumes that if the plume falls below the height of the CWT and/or reaches the ground, and the air temperature is below freezing, then ground level rime icing occurs. Likewise, in similar conditions, with the air temperature above freezing, SACTI predicts that fogging occurs. Fox 3’s proposed CWT was assessed using the SACTI model to determine the potential impact upon the following:

- Plume ground fogging
- Plume rime icing
- Elevated visible plumes (i.e. visibility of CWT plumes)
- Mineral ($CaCO_3$) deposition

The SACTI modeling predicted that Fox 3 may, under specific meteorological conditions, have minimal periods of time when the CWT plume is either below the level of the height of the CWT or is actually impacting the ground around the Fox Energy Center. When this happens, ground (rime) icing and/or ground fogging may occur. Because both options for Fox 3 would have a cooling tower located within several hundred feet of the existing cooling tower, the possibility of overlapping plumes exists. To account for this, a cumulative cooling tower plume assessment was performed. The cumulative assessment demonstrates the geographical extent and frequency of the plume impacts from the cooling towers, individually and collectively.

6.14.1.1 Plume Ground Fogging

The SACTI model predicted that the CWT for Fox 1 and 2 and the CWT for Fox 3 Site Option 1 could have the potential for ground fogging impacts extending off-property. Cumulative Site Option 1 modeling results show an average of up to only 23.4 hours of ground fogging per year, directly impacting US 41 and State Highway 96. However, Site Option 1 ground fogging is expected to stay on-site, and any predicted off-site fogging will be attributable to the existing Fox 1 and 2 CWT.

The SACTI model also predicted that the CWT for Fox 1 and 2 and the CWT for Fox 3 Site Option 2 could have the potential for ground fogging impacts extending off-property. Cumulative Site Option 2 modeling results show an average of up to only 23.4 hours of ground fogging per year, directly impacting US 41 and State Highway 96. While the Fox 3 Site Option 2 ground fogging is expected to occur mostly on-site, there is predicted to be minimal additional off-site fogging attributable to the Fox 3 CWT, with up to approximately 4 additional hours per year of ground fogging occurring on State Highway 96.

For either Site Option 1 or Site Option 2, the cumulative fogging impact is not expected to substantially vary from the existing Fox 1 and 2 CWT fogging impacts.

6.14.1.2 Plume Rime Icing

The SACTI model predicts rime icing when ground fogging occurs and the ambient temperature is below freezing. The potential for rime ice does not indicate the occurrence of rime ice, just that conditions exist for rime icing to occur.

The CWT for Fox 1 and 2 and the CWT for Fox 3 Site Option 1 are predicted to have very minimal rime icing impacts off-property. Cumulative modeling results predict an average of up to only 12.4 hours of rime icing per year. Predicted results for Fox 1 and 2 CWT combined with Fox 3 Site Option 1 CWT show less than 1 hour of icing impacts off-site per year.

The CWT for Fox 1 and 2 and the CWT for Fox 3 Site Option 2 are also predicted to have a potential for rime icing impacts off-property. Cumulative modeling results predict an average of up to only 12.4 hours of rime icing per year. Predicted results for Fox 1 and 2 CWT combined with Fox 3 Site Option 1 CWT show the potential of up to only 2 hours of icing impacts per year on State Highway 96.

6.14.1.3 Visible Plumes

In general, most elevated plumes will occur within the immediate vicinity and above each of the existing and proposed CWTs, with only a few extending beyond the Fox Energy Center's property boundary.

Fox 1 and 2 CWT combined with Fox 3 Site Option 1 CWT show the potential for a cumulative average of 765 hours per year of elevated visible plumes. Only a few of the visible plumes may extend any appreciable distance, approximately several kilometers towards the east and west.

Fox 1 and 2 CWT combined with Fox 3 Site Option 2 CWT also shows the potential for a cumulative average of 765 hours per year of elevated visible plumes. Only a few of the visible plumes may extend any appreciable distance, approximately several kilometers towards the east and west.

6.14.1.4 Mineral Deposition

The actual amount of mineral matter in the circulating water makeup varies, but is considered fairly low, primarily as $CaCO_3$. As drift droplets are emitted, the minerals in the circulating water may be deposited on adjacent structures downwind from the CWT. While there are no environmental thresholds that regulate mineral deposition from the CWT, excessive mineral deposition on facility components may cause operational problems. The Institute of Electrical and Electronics Engineers has suggested a mineral deposition rate for common salt of 0.03 milligrams per square centimeter per month ($mg/cm^2/month$) as a threshold for electrical components above which increased incidents of insulator failure and flashover may occur. CWT drift will be minimized using high efficiency drift eliminators with an efficiency of 0.0005 percent. The CWT will be emitting $CaCO_3$, which is substantially less conductive than common salt. The maximum deposition rate for Fox 3 is 0.000365 $mg/cm^2/month$, which is substantially less than the minimum impact threshold. There is little difference in the $CaCO_3$ deposition rate between Site Option 1 and Site Option 2.

Mineral deposition is expected to be minimal and inconsequential due to the low total dissolved solids in the circulating water and the use of a high-efficiency drift eliminator. The electrical equipment should not be impacted by the low amounts of mineral deposition as the maximum deposition rate is well below the potential impact threshold for salt deposition at a level that may cause arcing and conductor failure with electrical components.

SACTI models drift droplets using particle size distribution and settling velocities. The larger droplets fall out of the plume and the liquid drift deposition can deposit as a film immediately adjacent to the CWT and on vehicles parked near the tower. The deposition calculation for the very small liquid particles shows the deposition to appear at some distance from the tower. However, these smallest droplets also evaporate fairly quickly and all that remains of the drop is a tiny dust particle. SACTI counts the droplets as depositing even though the smaller droplets may actually evaporate without falling out of the plume. Therefore, mineral deposition is not expected to occur off-site for either Site Option 1 or Site Option 2.

6.14.1.5 Conclusions

Operation of the either Site Option 1 or Site Option 2 CWT is not expected to have significant fogging, icing, visible plumes, or mineral deposition impacts outside of the Fox Energy Center property boundary. Because of this, mechanical abatement was not considered.

6.14.2 Probability Maps

Graphics depicting the estimated visible plume, fogging probability, icing probability, $CaCO_3$ deposition probability, and plume length maps from the cumulative Fox 1 and 2 CWT and Fox 3 CWT based on output data from the SACTI modeling data are included in the CTI Analysis in Volume II Appendix Q (Cooling Tower Analysis). These graphics depict the worst-case impacts based on the meteorological data used for the CTI Analysis.

6.14.3 Potential Mitigation Measures

The impacts from the Fox 3 CWT are expected to be minimal. Additionally, the impacts from the existing Fox 1 and 2 CWT in comparison to the predicted cumulative impacts are very similar. Therefore, no mechanical mitigation measures were considered. Potential operational mitigation measures could include posting signage along roads and highways.

6.15 Residential and Urban Communities

The nearest residences and neighborhoods are identified in the following sections.

6.15.1 Nearby Residences

The four residences that are closest to the Fox Energy Center, one to the east, one to the north, and two to the west are depicted in Table 6-2 along with the distances to Site Options 1 and 2 footprints (See also Volume I, Appendix DD).

Table 6-2: Distances to Nearby Residences

Residence	Distances (feet)		
	Site Option 1	Site Option 2	Property Boundary
East Residence	1,100	595	140
North Residence	1,065	1,840	135
Northwest Residence	1,235	2,034	190
West Residence	2,880	3,175	40

6.15.2 Impacts to Residential/Urban Neighborhoods

The area surrounding the Fox Energy Center property is primarily rural with scattered residential and commercial properties, including a developed subdivision and golf course to the north, a small residential area to the south separated from the project by a railroad and State Highway 96 to the south, and a few residences and commercial operations to the west. Those few residences and commercial operations are located between the Fox Energy Center and US 41.

6.15.2.1 Cooling Tower Impacts

WPS conducted a conservative exercise to model the impacts of the cooling tower operation at both alternative site locations. The results of the exercise are broken down into four main components. The components are: visible plume, ground fog, rime ice, and mineral deposition.

The model predicts increased off-site visibility of the plume from the cooling tower in a northerly direction for Site Option 1. For Site Option 2, the model predicts increase plume visibility in an easterly direction.

The model predicts increased off-site ground fog to the east for Site Option 1 (one residence) and Site Option 2 (no residences). It also predicts an additional increase of ground fog (increase from 2 hours per year to 4 hours per year) for the first residence southeast of the facility on the north side of State Highway 96.

The model predicts an increase in the possibility of off-site rime ice formation to the east (one residence) for Site Option 1 (zero hours per year to 3 hours per year). For Site Option 2, the model predicts an increase in off-site potential rime ice formation for a residential and commercial area southeast of the facility on both sides of State Highway 96. The potential for rime ice formation is predicted to increase from zero hours per year to 1 to 3 hours per year. State Highway 96 is also predicted to experience the potential for rime ice formation for up to 1 hour per year in one location approximately 150 meters in length and another location approximately 500 meters in length.

The model predicts an increase in off-site mineral deposition with Site Option 1 for several residences to the north and for one residence to the south (0 milligrams per square centimeter per month ($mg/cm^2/mo$) to 0.0002 $mg/cm^2/mo$). The model also predicts an increase in mineral deposition for two residences to the west (0 $mg/cm^2/mo$ to 0.0002 $mg/cm^2/mo$) and increased mineral deposition for the one residence to the east (0 $mg/cm^2/mo$ to 0.0005 $mg/cm^2/mo$).

The model predicts an increase in off-site mineral deposition with Site Option 2 for one residence to the south (0 $mg/cm^2/mo$ to 0.0002 $mg/cm^2/mo$). The model also predicts an increase in mineral deposition for two residences to the southeast (0 $mg/cm^2/mo$ to 0.0002 $mg/cm^2/mo$) and increased mineral deposition to the one residence to the east (0$mg/cm^2/mo$ to 0.0005 $mg/cm^2/mo$).

The off-site impacts of the mineral deposition for all areas of considerable distance from the cooling tower plume (all areas except for the residence immediately east of the project site) will not be noticeable because the droplet sizes carrying the minerals will be small and will evaporate completely as they fall to the ground. Therefore, the minerals contained in the droplets will become an indistinguishable dust particle that will not deposit on the surface.

The residence immediately east of the project site, for Site Options 1 and 2, may be sufficiently close to the cooling tower that some of the droplets may be too large to evaporate before they deposit on the surface. Therefore, the dissolved minerals could be visible on the surface as the water droplet is deposited and subsequently evaporates.

For more information, please see Volume II Appendix Q (Cooling Tower Analysis) for the study report.

6.15.2.2 Noise

Sound levels are expected to increase during the construction of the facility in the daytime hours. If construction occurs during the nighttime hours, sound levels could also increase. At this time, nighttime construction is not planned to occur as a regular construction activity.

After consulting with Jim Lepinski of PSCW staff, WPS conducted a sound level study and modeling effort to measure the current sound levels and to model the anticipated sound levels resulting from the operation of the new facility.

Modeled results for the unmitigated Site Option 1 arrangement show total A-weighted sound levels emitted from the facility that would exceed the Village of Wrightstown noise limit along the property line. Site Option 1 could meet the Town of Kaukauna limits without further mitigation. Mitigation for Fox 3 would be required to bring sound levels into compliance at all property lines. To do this, additional stack silencing and HRSG casing treatments will likely be required for Site Option 1. Additionally, buildings housing loud equipment, such as the steam turbine, will be acoustically treated to provide sufficient abatement of the interior sources.

Modeled results for the unmitigated Site Option 2 arrangement show a total A-weighted sound level emitted from the facility that would not exceed either of the Town of Kaukauna or Village of Wrightstown noise limits.

Steam blow events will occur immediately after construction (during initial plant start-up and commissioning). Steam blows events are high velocity steam flows through new piping. They are used to clean the new piping and prepare it for operation with the steam turbine. During steam blows, the start-up team will install external piping and silencers to discharge the steam to the atmosphere. Noise from steam blows is mitigated by the use of silencers and attemperating water.

During normal operations the plant will discharge steam through a series of sky vents or silencers. The sky vents will typically only be used during a start-up or shutdown event. To minimize noise levels, the sky vents will be equipped with silencers designed very similar to the existing facility sky vents.

During emergencies, the plant may discharge steam through a series of pressure relief valves. The valves are employed in the steam system to prevent over-pressurization of the system. The valves are designed to “lift” should an emergency over-pressurization occur.

WPS is planning to modify some plant components such as the HRSG and the STG building to reduce sound level impacts. [21]

WPS is also planning to install an earthen landscape berm along a portion of the north property boundary to reduce the sound level impacts to the north.

For more information, please see Volume II Appendix O (Sound Assessment Study) for the study report.

[21] According to the results of the Sound Assessment, additional equipment modifications are only necessary and will occur only if Site Option 1 is constructed.

6.15.2.3 Dust

The construction of the facility will create additional airborne dust due to construction activities on-site. These off-site impacts are expected to be minimal because WPS will implement BMPs to reduce the amount of dust generated during construction.

The operation of the facility is not expected to result in generation of a noticeable amount of dust because any well-traveled surfaces will be paved to reduce dust generation.

6.15.2.4 Aesthetics

Although there is an existing power generation facility on the site that is slightly larger than the proposed addition to the site, the proposed project will result in a change in aesthetics of the site. The site will be expanded and will be noticeable from the east and west. Site Option 1 will be more noticeable from the east and west residences than Site Option 2.

Site Option 1 will be visible from the south only at certain angles.

Site Option 2 will be partially shielded from view to the south by an existing buffer of trees along the railroad and highway corridor. The tree buffer has a 250 feet opening where the existing electric transmission lines cross the buffer. The tree buffer provides a better visual shield to the south during the time of year when the leaves are on the trees.

Both Site Option 1 and Site Option 2 will be shielded and not very visible from the north due to the WPS proposal to install an earthen landscape berm along the north side of the property. The earthen landscape berm is further discussed in Section 6.15.3.

With any berm or buffer, the extent in height to which it provides a visual shield depends upon the height of the structure providing the shielding and the distance the observer is from the shield itself.

6.15.2.5 Lighting

Presently, the lighting on the Fox Energy Center was designed to reduce the off-site impacts of the lighting. The addition of Fox 3 will result in additional off-site impacts due to lighting. WPS will design the lighting for Fox 3 to continue to reduce the off-site impacts from the additional lighting. Fox 3 will increase the amount of off-site lighting impacts in the area, but the techniques discussed in Section 6.15.3 will be proposed to minimize the additional impact.

6.15.2.6 Air Emissions

Air emission will meet applicable USEPA and WDNR requirements.

6.15.2.7 Road Impacts

Construction of the facility may have an impact on area roads from a temporary traffic congestion standpoint and a permanent impact upon road condition. With the mitigation measures proposed in Section 6.15.3.6, WPS does not expect any permanent impact on roads.

The operation of the facility is not expected to have a noticeable impact above and beyond the current impact on the roads from the site construction.

6.15.3 Mitigation

6.15.3.1 Cooling Tower Impact Mitigation

WPS is working with the two parcel owners immediately east of the current Fox Energy Center property to obtain options to purchase them as buffer for the expanded facility. According to the completed study, impacts to the residences to the east should be minimal; a great majority of the impacts from the cooling tower operation on adjoining east residences will be largely eliminated if WPS acquires the property.

WPS will coordinate with WisDOT to add signage to State Highway 96 to make vehicles aware of the increased potential for fogging and icing. Any sign installation will be completed only after coordination with the WisDOT and their approval.

6.15.3.2 Off-Site Lighting Impact Mitigation

WPS will design the lighting for Fox 3 to continue to reduce the off-site impacts from the additional lighting. Where possible, the proposed project will utilize lighting techniques to reduce glare and skyglow. Such techniques currently employed on Fox Energy Center are shielded luminaires and directional lighting from above.

6.15.3.3 Off-site Dust Mitigation

To reduce the potential of dust generation during construction, WPS will implement BMPs to reduce the amount of dust generated during construction.

To reduce the potential of dust generation during operations, WPS will pave any well-traveled surfaces.

6.15.3.4 Earthen Landscape Berm Installation (Noise, Aesthetics, and Off-site Lighting Impact Mitigation)

The proposed project includes the placement of an earthen landscape berm along the northern boundary of the property immediately adjacent and parallel to Wrightstown Road/Golf Course Drive. The earthen landscape berm will be vegetated with native grasses and tree plantings. It is expected the earthen landscape berm will provide some level of visual screening, reduction in off-site lighting impacts, and/or sound screening. While the placement and construction of the earthen landscape berm is not a local regulatory requirement, neighbors support the addition.

WPS reviewed the installation of an earthen landscape berm on the south side of the facility. There are space constraints that make the installation of the earthen landscape berm infeasible. However, the tree buffer on both sides of the railroad already provides shielding for both the existing facility and the proposed addition.

6.15.3.5 River Discharge Aesthetics

One shoreline owner on the Fox River has voiced concerns about the submerged discharge in the middle of the Fox River. The discharge is visible on the river surface. WPS has consulted with the WDNR on the current aesthetics of the river discharge. The visibility is due to a permit requirement to maintain a discharge velocity of greater than 10 feet per second for the mixing of chloride discharges. The WDNR has determined WPS is in compliance with its discharge permit regarding the aesthetics of the discharge. Enclosed in Volume II, Appendix B is a copy of the letter WDNR sent to the landowner confirming that the Fox Energy Center’s existing discharge is in compliance with applicable regulations.

To mitigate adverse aesthetics from Fox 3, WPS will change the check valve at the end of the discharge pipe to limit the maximum discharge velocity, but still maintain the required minimum flow release velocity required by the discharge permit.

6.15.3.6 Road Impact Mitigation

Although WPS does not anticipate permanent damage to roads, WPS will video-document the condition of all roads on the construction vehicle route(s) from the construction entrance(s) of the Fox Energy Center leading to US 41. The purpose is to document the road condition prior to the start of construction. Any documented adverse impacts to the roads incurred during the construction of the project will be addressed through consultation with the Village, Township and County road authorities regarding WPS responsibility towards repairing the adversely impacted roads.

WPS will coordinate the proper construction signage on the roads utilized by construction vehicles for the plant site, to make vehicles aware of the increased hazards associated with the construction vehicle(s) presence.

6.15.4 Property Values

During the public meeting on May 21, 2014 attendees did not voice a concern about property values.

At the public meeting on the evening of December 1, 2014, one property owner located south of the Fox Energy Center, across the Fox River, commented that their property values have already been diminished by the construction of Fox 1 and 2. The property owner stated the proposed addition would only compound the situation. The property owner voicing the concern about property values would be impacted more by Site Option 2 than by Site Option 1.

6.15.5 Impacts to Regional Communities

On a regional basis, the area surrounding the Fox Energy Center is not known to have any special recreational or conservation use. It is an area that has a moderate level of development that is a mix of residential, commercial, and industrial development. It has a major highway (US 41) traversing the area. The area is already greatly impacted by traffic sound levels and winter salt mist generated by the highway traffic. The stretch of the Fox River where the discharge can be visible is not widely used for recreation purposes. There is currently only one boat landing that can be used to access this stretch of river from upstream in the City of Kaukauna. All other anticipated off-site impacts—aesthetics, lighting, noise, and cooling tower impacts—are not expected to adversely impact the regional community because the facility does not introduce impacts that are not already widely present in the area.

6.15.6 Concerns Raised by Groups or Communities

During the public meeting on May 21, 2014, WPS received comments on the proposed project as follows:

- Cooling tower impacts to Wrightstown Road/Golf Course Drive.
- Cooling impacts to State Highway 96 and further southeast.
- Concerns about the current amount and any increased ambient light.
- Preferences for Site Option 1.
- Preferences for Site Option 2.
- Installation of a buffer and or earthen landscape berm to the north.
- Consolidate and condense the facility footprint.
- Concerns about impacts to local wells.
- Set up a website.
- Request WPS to purchase vacant property across Wrightstown Road/Golf Course Drive and donate it to the Village of Wrightstown.
- Re-use of sludge from the water treatment process.

- Concern about construction vehicle use of Wrightstown Road/Golf Course Drive.
- Concerns about noise from a steam blow event.
- Concerns about boiling at the water surface and the presence of foam at the Fox River discharge.

During the public meeting on December 1, 2014, WPS received comments on the proposed project as follows:

- Concerned about decreased property values, quality of living diminished due to noise, light and aesthetic view. The addition only compounds the situation.
- The initial site was only approved for a single generator.
- How much condensation will result from the cooling towers and what is the average direction?
- Support of Site Option 2-most accommodating to surrounding neighborhood(s) and community.
- Earthen landscape berm to the north of the property is important for aesthetics and noise control.
- Can the entire site be covered so it is not visible from the south?
- Has there been any consideration for the operation of the facility being impacted by any derailment of rail traffic that is carrying petroleum?
- Lower the lighting on the facility.
- Preference for Site Option 1.
- Install downward lighting on the existing plant.
- Why is there only a berm proposed on the north side and not the south side?
- Utility aid payment should be provided to other Townships (Town of Buchanan) because they are impacted also.

In the proposed plan, WPS believes it has mitigated concerns from the public to the extent practicable, except for the following concerns and for the following reasons:

Table 6-3: Public Concerns

Public Concerns	Discussion
Concerns about impacts to local wells.	At this time, the current facility utilizes two potable wells to provide water to the office. Under the proposed project, WPS will abandon those two wells and will take potable water service from the Village of Wrightstown. The proposed facility and the current facility will not utilize any wells for the operation of the facility.

Public Concerns	Discussion
Request WPS to purchase vacant property across Wrightstown Road/Golf Course Drive and donate it to the Village of Wrightstown.	Since the property is across the road and not immediately contiguous to the site, the purchase of the property would not serve any direct benefit to mitigate any impacts from the operation of the facility.
Re-use of sludge from the water treatment process.	Although landfilling is not always the preferred method of disposal of solid waste, the quantity generated by the process is minimal and investigation of beneficial re-use of the material is not practicable.
Utility aid payment should be provided to other Townships (Town of Buchanan) because they are impacted also.	WPS does not have any authority to change the utility aid distribution. However, the residents with the concern indirectly benefit through the Village of Wrightstown. The Village of Wrightstown provides fire service to the portion of the Town of Buchanan where these residents are located. The fire service from the Village of Wrightstown benefits these residents through a reduction in their ratings on their home insurance.
Why is there only a berm proposed on the north side and not the south side?	WPS reviewed the installation of an earthen landscape berm on the south side of the facility. The tree buffer on both sides of the railroad already provides shielding for both the existing facility and the proposed addition. Placement of an earthen landscape berm is not possible between the property boundary and the existing facility due to space constraints. Construction of an earthen landscape berm in between the fence line and Site Option 2 also is not possible because the footprint where the buffer would need to be placed contains the underground natural gas lateral and two overhead electric transmission line structures. An earthen landscape berm constructed in the area north of the transmission line and south of the facilities proposed in Site Option 2 would have minimal shielding capability of the berm because it would be approximately 15 feet high, located within 50 feet of the facility it is shielding and be at least 400 feet from the viewer.

Public Concerns	Discussion
Install downward lighting on the existing plant.	On the new facility, WPS will employ techniques such as shielded luminaires and directional lighting from above. Lighting is provided where it is necessary to assure the operation does not compromise the safety and security of the facility. On the existing facility (Fox 1 and 2), WPS has implemented a process to change any light fixtures that do not employ techniques to minimize off-site impacts. Such techniques are the use of shielded luminaires and directional lighting from above. Currently, WPS has identified several light fixtures on Fox 1 and 2 that do not minimize the off-site impacts and is actively in the process of replacing those fixtures. Lighting will remain where it is necessary to assure the lighting plan does not compromise the safety and security of the facility.
Lower the lighting on the facility.	The lighting on the existing facility and the planned lighting is designed to minimize the off-site impacts. It employs techniques such as shielded luminaires and directional lighting from above. Lighting is provided where it is necessary to assure the lighting plan does not compromise the safety and security of the facility.
Has there been any consideration for the operation of the facility being impacted by any derailment of rail traffic that is carrying petroleum	WPS has not evaluated the risk of the facility being impacted operationally by the derailment of rail traffic carrying petroleum. Such a risk analysis is outside of WPS's evaluation criteria.
Can the entire site be covered so it is not visible from the south?	The south side of the facility is currently shielded by a tree buffer (with the exception of the area under the electric transmission line). The shielding is greater during the time of year when leaves are on the trees. The extent in elevation to which the tree buffer provides shielding is proportional to the distance from which the viewer is observing the facility. The commenter is requesting a shield that would block the entire view of the facility from across the Fox River. A buffer of that height need to be much higher and is not practical or feasible.
How much condensation will result from the cooling towers and what is the average direction?	The proposed cooling towers are designed such that only a small amount of water will actually be in the form of unevaporated water droplets that can precipitate to the ground within a few hundred feet of the cooling towers. The predicted off-site plume visibility is described in Section 6.14.2.
The initial site was only approved for a single generator.	The PSCW Final Decision dated November 8, 2002 granted approval for the installation and operation of two combustion turbine generators and one steam turbine. The addition of one additional combustion turbine generator and one additional steam turbine generator is the subjects of this current filing.

Public Concerns	Discussion
Concerned about decreased property values, quality of living diminished due to noise, light and aesthetic view. The addition only compounds the situation.	WPS does not have any data that indicates a decreased property value associated with the proposed addition to the facility. This is an addition to an existing site and any additional impacts deriving from the proposed addition have been analyzed, are expected to be minimal and are mitigated where practical.

6.15.7 Hospitals, Schools, Daycare, and Retirement Homes

There are no schools, child daycare facilities, retirement homes, or hospitals within one-half mile of either Fox 3 site option. The closest sensitive site is the Kids Care daycare facility and preschool. Kids Care is approximately 1.1 miles east of the Fox 3 site along Wrightstown Road/Golf Course Drive/County Line Road/Broadway Street in the Village of Wrightstown, Wisconsin. Kids Care has a capacity of 45 children from the ages of 6 weeks to 13 years. The facility offers daycare, preschool, and after school programs. Kids Care is open from 6 a.m. to 6 p.m., Monday to Friday.

Further east from Kids Care is the St. Clare Catholic School, approximately 1.8 miles from the Fox 3 site options. St. Clare is located on Main Street within the Village of Wrightstown. The school property abuts the Fox River on the northern shore. St. Clare Catholic School educates students from preschool to eighth grade in small class sizes. It is associated with the St. Clare Parish that has branches in Askeaton, Greenleaf, and Wrightstown, Wisconsin. St. Clare Catholic School is the closest grade school to the Fox 3 site options, and its current enrollment is approximately 150 students.

To the west of the Fox 3 site options, St. Paul Villa nursing home is approximately 4.3 miles away and is the closest senior care facility to the Fox 3 site. St. Paul Villa is part of the St. Paul Elder Services campus on 12th Street and Oakridge Avenue in Kaukauna, Wisconsin. St. Paul Elder Services provide rehabilitation after surgery, short- and long-term care for the elderly, assisted living, and hospice care. St. Paul Villa has approximately 100 residents and is consistently voted among the top two assisted living communities in the Fox Valley.

The closest hospital to the Fox 3 site options is St. Elizabeth Hospital. St. Elizabeth is located along South Oneida Street in Appleton, Wisconsin, approximately 10.4 miles southwest of the proposed Fox 3 site options. St. Elizabeth is a full service hospital serving the Fox Valley area. It has over a 350 patient capacity and is served by more than 420 medical practitioners. St. Elizabeth cares for patients of all ages through a variety of medical specialties ranging from general care to emergency surgery.

None of the aforementioned sensitive sites are less than 1.1 miles from the Fox 3 site options. Because of this distance, Fox 3 is not likely to have a significant impact.

6.16 Visual Impacts

The next two sections describe any visual impact of Fox 3 to the surrounding area.

6.16.1 Plant Profiles and Appearances

The following subsections describe the plant dimensions, provide simulations of the new plant, and identify any scenic roads in the area.

6.16.1.1 Plant Dimensions

See Volume I Appendix Z.

6.16.1.2 Photo Simulations

The photo simulations are approximations of the facility orientation and size. The completed structures will be visually similar to the existing Fox 1 and 2.

See Volume I Appendix Z for photo simulations of the Fox 3 site.

6.16.1.3 Scenic Roads

There are no scenic roads within 50 miles of Fox 3. The nearest scenic road is the Door County Coastal Byway approximately 60 miles northeast of the Fox 3 site. The Lower Wisconsin River Road Scenic Byway is 95 miles southwest of Fox 3. These are the only two scenic roads within 100 miles of the Fox 3 site. Because of the great distance between the Fox 3 site and the nearest scenic roads, no impacts to these resources are anticipated.

6.16.2 Lighting

The intent of the lighting design is to minimize off-site lighting impacts during operation.

6.16.2.1 Site Lighting Plan for Construction

No significant temporary lighting is expected to be required during construction. However, the equipment laydown areas may need to be lighted for 10-hour winter workdays or a second shift (if employed). During construction, exterior lighting will be needed for equipment laydown areas, craft parking areas, construction roadways, and around work areas used at night.

6.16.2.2 Site Lighting Plan for Operations

The change in lighting level in contrast to the facility's surroundings is expected to be minimal and not highly noticeable to off-site residents. The exterior lighting for Fox 3 will be designed to mitigate light emissions from the facility. Various methods will be used, including low-emission light fixtures, limiting lighting fixtures use only to when required for safety and security, and refracting the illumination source on light fixtures in order to limit light emissions to the specific area requiring illumination.

The only exterior lighting that will be required for the facility will be for vehicular traffic areas, safe personnel passage, and areas requiring visual inspection. Fox 3 is expected to have exterior lighting at the service roads around the facility, the parking area at pedestrian entrances to the various facility buildings and along walkways between the buildings, and the stairs and platforms on HRSG structure and cooling tower. The conceptual illumination levels expected in outdoor areas are summarized in Table 6-4.

Table 6-4: Conceptual Site Lighting Levels

Exterior Area	Illumination Level
Facility roadways	0.5 foot-candles
Parking areas	1.0 foot-candles
Security building/plant entrance	1.0 foot-candles
HRSG Ground Area	5.0 foot-candles
HRSG Elevated Platforms	2.0 foot-candles
Transformer area	2.0 foot-candles
Cooling tower deck	5.0 foot-candles

The facility service roads and parking areas will be illuminated with roadway lighting fixtures on poles. The fixtures will be designed such that the light source is not visible except near the fixture. Use of this type of fixture will make roadway lighting at Fox 3 less obtrusive than typical urban roadway lighting. The building pedestrian entrances will be illuminated with fully shielded fixtures mounted directly above the doors. These fixtures will only provide illumination in a downward direction at the door location. The fixtures used for illuminating walkways or ground level equipment will be provided with engineered glass refractors that direct the emitted illumination downward. Any floodlights required will be directed inward towards the facility and will be provided with top and side shields.

Federal Aviation Administration (FAA) requirements dictate the need for installation of aviation obstruction lighting on the Fox 3 stack. An obstruction evaluation has been completed by the FAA for the stack associated with Site Option 1 and Site Option 2. Both stacks are 175 feet above ground level and the FAA will not require lighting.

6.16.2.3 Potential Impacts of Site Lighting

The residence east and the residences west of the facility will experience an increase in lighting impact from Site Option 1 and less lighting impact from Site Option 2. The residences to the north will have views of either option obstructed by the installation of the earthen landscape berm on the northern border of the facility property. However, Site Option 1 lighting will be more prominent above the earthen landscape berm than Site Option 2.

The residences to the south of the facility will have views of either option obstructed by the exiting tree buffer along both sides of the railroad. More of Site Option 2 lighting will be visible from the south than the lighting of Site Option 1. The tree buffer is more effective at shielding when the leaves are on the trees and there is a break in the tree buffer under the existing electric transmission lines. .

Where possible, the proposed project will utilize lighting techniques to reduce off-site lighting impacts. These techniques are shielded luminaires and directional lighting from above. The techniques will be implemented only where the use of such techniques does not compromise the safety and security of the facility.

6.16.2.4 Local Ordinances

There are no local ordinances that relate to the proposed lighting plans.

6.17 Parks and Recreation Areas

6.17.1 Identification of Parks and Recreation Areas

Of the three municipal parks within one-half mile of the Fox 3 site, only one has potential to be affected by Fox 3. Other public lands in the area are all more than 2,200 feet from either site alternative. Shamrock Park is approximately 1,800 feet from Site Option 1 and 2,500 feet from Site Option 2. From the site boundary location, Shamrock Park is approximately 300 feet north, across Wrightstown Road/Golf Course Drive and Royal St. Pat’s Drive. Shamrock Park is owned and managed by the Village of Wrightstown, Wisconsin. The park is 4 acres in size and it has a children’s playground, open grassed area, and manicured landscaping. The playground equipment was installed in 2007.

6.17.2 Short and Long-term Mitigation

The impacts of Fox 3 on Shamrock Park are expected to be minimal. Two roads and a home separate the proposed site boundary and the park. A row of tightly planted trees along the north side of Wrightstown Road/Golf Course Drive provide a visual and sound buffer between the road and the home along Royal St. Pat's Drive. These trees provide another existing barrier between the proposed site alternatives and the park. Even with the distance and natural barriers, Fox 3 may have visual impacts on Shamrock Park.

In order to mitigate these short and long term impacts, WPS is proposing to construct an earthen landscape berm along Wrightstown Road/Golf Course Drive just north of the Fox 3 site. The earthen landscape berm will create an additional barrier between the Fox 3 site boundary and Shamrock Park. This proposed barrier will help to reduce the long term visual impacts and shorter term construction noise impacts of Fox 3 on Shamrock Park and its visitors.

6.18 Airports

6.18.1 Location of Airports

The nearest airport to the project site is the Antique Aerodrome, located 3.5 nautical miles northeast of the site. Other airports include the Kaukauna Community Hospital Heliport, located approximately 4 nautical miles southwest; the C.R. Acres Airport, located approximately 5 nautical miles northeast; and the Birch Creek Airport, located approximately 5 nautical miles southeast of the site. All four of these facilities are private use airports. The nearest public use airport is the Austin Straubel International Airport, located approximately 10 nautical miles north of the project site.

6.18.2 Airport Descriptions

The Antique Aerodrome has one 2,200-foot turf runway that is aligned north/south. The Kaukauna Community Hospital Heliport has a 300-foot by 90-foot asphalt landing pad. The Birch Creek Airport has one 2,800-foot turf runway aligned east/west, and the C.R. Acres Airport has one 1,300-foot turf runway also aligned east/west. The Austin Straubel International Airport has two paved runways. Runway 18/36, the nearest runway to the project site, is aligned north/south and is approximately 9 nautical miles from the project site.

6.18.3 Potential Impact to Navigable Airspace

Any structure (including permanent structures and temporary construction equipment) on the project site that exceeds 200 feet above ground level in height would be considered an obstruction to navigable airspace and could impact aircraft safety unless it is marked and lighted in accordance with criteria set forth by the FAA. The FAA does not study potential impacts to private use airports, unless that airport has instrument procedures approved by the FAA. None of the private use airports described above have such a procedure, and thus they are not subject to the FAA obstruction evaluation process. Based on the length and surface of runways at these airports and the distance to the project site, the project will not be an obstruction to navigable airspace at private use airports. An aeronautical study was completed by the FAA and a determination was made that tallest structure associated with power plant, the 175 foot tall stack, will not be a hazard to air navigation and marking and lighting will not be required (See Volume II Appendix R).

6.18.4 Construction Limitations and Permits

Any structure (including permanent structures and temporary construction equipment) on the project site that exceeds 200 feet above ground level in height would be considered an obstruction to navigable airspace and could impact aircraft safety unless it is marked and lighted in accordance with criteria set forth by the FAA. Based on the distance between the project site and the nearest public airport, no other structure height limitations will be likely. A pre-construction notification (Form 7460-1) was submitted to the FAA on November 5, 2014 and a determination of no hazard to air navigation was issued by the FAA on December 5, 2014. The general contractor will be responsible for filing pre-construction notification for the temporary cranes.

WPS consulted with the WisDOT Bureau of Aeronautics and submitted permit applications for Fox 3. The WisDOT Bureau of Aeronautics indicated the Fox 3 structures will not require tall structure permits from the Bureau of Aeronautics. Fox 3 is not close enough to a public use airport and it does not exceed 500 feet above the lowest point within one mile of the greatest height.

6.18.5 Consultation Documentation

See Volume II Appendix R for documentation of consultation with the WisDOT Bureau of Aeronautics and the FAA.

6.19 Communication Towers

To locate communication towers in the vicinity of Fox 3, WPS reviewed the Federal Communications Commission licensing database and conducted field reviews of the Fox Energy Center area. There is one cellular communication tower located adjacent to the northwest corner of the Fox Energy Center, near the intersection of Wrightstown Road/Golf Course Drive and East Frontage Road (see Volume I Appendix T).

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