CHAPTER 10

ENVIRONMENTAL CONSEQUENCES OF PROPOSED ACTION

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
μgm/m^3	micrograms per cubic meter
/Q	relative air concentration
AADT	annual average daily traffic
A/B	auxiliary building
ac	acre
AC	alternating current
ac-ft	acre-feet
ACFT	acre-feet
ACRS	advisory committee on reactor safeguards
ACSR	aluminum-clad steel reinforced
ADFGR	Alaska Department of Fish and Game Restoration
AEA	Atomic Energy Act
AEC	U.S. Atomic Energy Commission
AHD	American Heritage Dictionary
agl	above ground level
ALA	American Lifelines Alliance
ALARA	as low as reasonably achievable
AMUD	Acton Municipal Utility District
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
AOO	anticipated operational occurrences
APE	areas of potential effect
APWR	Advanced Pressurized Water Reactor

ACRONYMS AND ABBREVIATIONS

ARLIS	Alaska Resources Library and Information Services
ARRS	airborne radioactivity removal system
AS	ancillary services
ASCE	American Society of Civil Engineers
AVT	all volatile treatment
AWG	American wire gauge
BAT	best available technology
bbl	barrel
BC	Business Commercial
BDTF	Blowdown Treatment Facility
BEA	U.S. Bureau of Economic Analysis
BEG	U.S. Bureau of Economic Geology
bgs	below ground surface
BLS	U.S. Bureau of Labor Statistics
BMP	best management practice
BOD	Biologic Oxygen Demand
BOP	Federal Bureau of Prisons
BRA	Brazos River Authority
bre	below reference elevation
BRM	Brazos River Mile
BSII	Big Stone II
BTI	Breakthrough Technologies Institute
BTS	U.S. Bureau of Transportation Statistics
BTU	British thermal units
BUL	Balancing Up Load

ACRONYMS AND ABBREVIATIONS

BW	Business Week
BWR	boiling water reactor
CAA	Clean Air Act
CBA	cost-benefit analysis
CBD	Central Business District
CCI	Chambers County Incinerator
CCTV	closed-circuit television
CCW	component cooling water
CCWS	component cooling water system
CDC	Centers for Disease Control and Prevention
CDF	Core Damage Frequency
CDR	Capacity, Demand, and Reserves
CEC	California Energy Commission
CEDE	committed effective dose equivalent
CEED	Center for Energy and Economic Development
CEQ	Council on Environmental Quality
CESQG	conditionally exempt small quantity generator
CFC	chlorofluorocarbon
CFE	Comisin Federal de Electricidad
CFR	Code of Federal Regulations
cfs	cubic feet per second
CFS	chemical treatment system
CG	cloud-to-ground
CGT	Cogeneration Technologies
CHL	Central Hockey League

ACRONYMS AND ABBREVIATIONS

CO	carbon monoxide
CO_2	carbon dioxide
COD	Chemical Oxygen Demand
COL	combined construction and operating license
COLA	combined construction and operating license application
CORMIX	Cornell Mixing Zone Expert System
CPI	Consumer Price Index
CPP	continuing planning process
CPS	condensate polishing system
CPNPP	Comanche Peak Nuclear Power Plant
CPSES	Comanche Peak Steam Electric Station
CRDM	control rod drive mechanism cooling system
CRP	Clean Rivers Program
CS	containment spray
Cs-134	cesium-134
Cs-137	cesium 137
CST	Central Standard Time
CST	condensate storage tank
CT	completion times
CT	cooling tower
cu ft	cubic feet
C/V	containment vessel
CVCS	chemical and volume control system
CVDT	containment vessel reactor coolant drain tank
CWA	Clean Water Act

ACRONYMS AND ABBREVIATIONS

CWS	circulating water system
DAW	dry active waste
dBA	decibels
DBA	design basis accident
DBH	diameter at breast height
DC	direct current
DCD	Design Control Document
DDT	dichlorodiphenyltrichloroethane
DF	decontamination factor
DFPS	Department of Family and Protective Services
DFW	Dallas/Fort Worth
DO	dissolved oxygen
DOE	U.S. Department of Energy
DOL	Department of Labor
DOT	U.S. Department of Transportation
DPS	Department of Public Safety
D/Q	deposition
DSHS	Department of State Health Services
DSM	Demand Side Management
DSN	discharge serial numbers
DSWD	Demand Side Working Group
DVSP	Dinosaur Valley State Park
DWS	demineralized water system
DWST	demineralized water storage tank
E	Federally Endangered

ACRONYMS AND ABBREVIATIONS

EA	Environmental Assessment
EAB	exclusion area boundary
E. coli	Escherichia coli
EDC	Economic Development Corp.
EDE	effective dose equivalent
EEI	Edison Electric Institute
EERE	Energy Efficiency and Renewable Energy
EFH	Energy Future Holdings Corporation
EFW	energy from waste
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EJ	environmental justice
ELCC	Effective Load-Carrying Capacity
EMFs	electromagnetic fields
EO	Executive Order
EOF	emergency operation facility
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPZ	emergency planning zone
ER	Environmental Report
ERA	Environmental Resource Associates
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ESP	Early Site Permit
ESRP	Environmental Standard Review Plan

ACRONYMS AND ABBREVIATIONS

ESW	essential service cooling water
ESWS	essential service water system
F&N	Freese & Nicholas, Inc.
FAA	U.S. Federal Aviation Administration
FAC	flow-accelerated corrosion
FBC	fluidized bed combustion
FCT	Fuel Cell Today
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFCA	Federal Facilities Compliance Act
FLMNH	Florida Museum of Natural History
FM	farm-to-market
FP	fire protection
FPL	Florida Power and Light
FPS	fire protection system
FPSC	Florida Public Service Commission
FR	Federal Register
FSAR	Final Safety Analysis Report
FSL	Forecast Systems Laboratory
ft	feet
FWAT	flow weighted average temperature
FWCOC	Fort Worth Chamber of Commerce
FWS	U.S. Fish and Wildlife Service
gal	gallon
GAM	General Area Monitoring

ACRONYMS AND ABBREVIATIONS

GAO	U.S. General Accountability Office
GDEM	Governor's Division of Emergency Management
GEA	Geothermal Energy Association
GEIS	Generic Environmental Impact Statement
GEOL	overall geological
GFD	ground flash density
GIS	gas-insulated switchgear
GIS	Geographic Information System
GMT	Greenwich Mean Time
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
gps	gallons per second
GRCVB	Glen Rose, Texas Convention and Visitors Bureau
GST	gas surge tank
GTC	Gasification Technologies Conference
GTG	gas turbine generators
GWMS	gaseous waste management system
H-3	radioactive tritium
HC	Heavy Commercial
HCl	Hydrochloric Acid
HCP	Ham Creek Park
HEM	hexane extractable material
HEPA	high efficiency particulate air
HIC	high integrity container

ACRONYMS AND ABBREVIATIONS

HL	high-level
HNO_3	Nitric Acid
hr	hour(s)
HRCQ	highway route-controlled quantity
H_2SO_4	Sulfuric Acid
HT	holdup tank
HTC	Historic Texas Cemetery
HUC	hydrologic unit code
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilating, and air-conditioning
I	Industrial
I-131	iodine-131
IAEA	International Atomic Energy Agency
I&C	instrumentation and control
IEC	Iowa Energy Center
IGCC	Integrated Gasification Combined Cycle
IH	Interim Holding
in	inch
INEEL	Idaho National Engineering and Environmental Laboratory
IOUs	investor-owned electric utilities
IPE	individual plant examination
ISD	Independent School District
ISFSI	independent spent fuel storage installation
ISO	independent system operator
ISO rating	International Standards Organization rating

ACRONYMS AND ABBREVIATIONS

ISU	Idaho State University
JAMA	Journal of the American Medical Association
K-40	potassium-40
KC	Keystone Center
JRB	Joint Reserve Base
km	kilometer
kVA	kilovolt-ampere
kWh	kilowatt hour
L	LARGE
LaaR	Load Acting as a Resource
LANL	Los Alamos National Laboratory
lb	pounds
LC	Light Commercial
LG	Lake Granbury
LL	low-level
LLD	lower limits of detection
LLMW	low-level mixed waste
LNG	liquid natural gas
LOCA	loss of coolant accident
LPSD	low-power and shutdown
LPZ	low population zone
LQG	large-quantity hazardous waste generators
LRS	load research sampling
LTSA	long term system assessment
Luminant	Luminant Generation Company LLC

ACRONYMS AND ABBREVIATIONS

LVW	low volume waste
LWA	Limited Work Authorization
LWMS	liquid waste management system
LWPS	liquid waste processing system
LWR	light water reactor
M	MODERATE
ma	milliamperes
MACCS2	Melcor Accident Consequence Code System
MCES	Main Condenser Evacuation System
Mcf	thousand cubic feet
MCPE	Market Clearing Price for Energy
MCR	main control room
MD-1	Duplex
MDA	minimum detected activity
MDCT	mechanical draft cooling tower
MEIs	maximally exposed individuals
MF	Multi-Family
mG	milliGauss
mg/l	milligrams per liter
mg/m^3	milligrams per cubic meter
MH	Manufactured Housing
MHI	Mitsubishi Heavy Industries
mi	mile
mi^2	square miles
MIT	Massachusetts Institute of Technology

ACRONYMS AND ABBREVIATIONS

MMbbl	million barrels
MMBtu	million Btu
MNES	Mitsubishi Nuclear Energy Systems Inc.
MOU	municipally-owned utility
MOV	motor operated valve
MOX	mixed oxide fuel
mph	miles per hour
MSDS	Materials Safety Data Sheets
msl	mean sea level
MSR	maximum steaming rate
MSW	municipal solid waste
MT	Main Transformer
MTU	metric tons of uranium
MW	megawatts
MW	monitoring wells
MWd	megawatt-days
MWd/MTU	megawatt–days per metric ton uranium
MWe	megawatts electrical
MWh	megawatt hour
MWS	makeup water system
MWt	megawatts thermal
NAAQS	National Ambient Air Quality Standards
NAPA	Natural Areas Preserve Association
NAP	National Academies Press
NAR	National Association of Realtors

ACRONYMS AND ABBREVIATIONS

NARM	accelerator-produced radioactive material
NAS	Naval Air Station
NASS	National Agricultural Statistics Service
NCA	Noise Control Act
NCDC	National Climatic Data Center
NCDENR	North Carolina Department of Environmental and Natural Resources
NCES	National Center for Educational Statistics
NCI	National Cancer Institute
NCTCOG	North Central Texas Council of Governments
ND	no discharge
NDCT	natural draft cooling towers
NEI	Nuclear Energy Institute
NELAC	National Environmental Laboratory Accreditation Conference
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation/Council
NESC	National Electrical Safety Code
NESDIS	National Environmental Satellite, Data, and Information Service
NESW	non-essential service water cooling system
NESWS	non-essential service water system
NETL	National Energy Technology Laboratory
NHPA	National Historic Preservation Act
NHS	National Hurricane Center
NINI	National Institute of Nuclear Investigations
NIOSH	National Institute for Occupational Safety and Health

ACRONYMS AND ABBREVIATIONS

NIST	U.S. National Institute of Standards and Technology
NJCEP	NJ Clean Energy Program
NLDN	National Lightning Detection Network
NOAA	National Oceanic and Atmospheric Administration
NOAEC	no observable adverse effects concentration
NOI	Notice of Intent
NOIE	non-opt-in entities
NO_x	oxides of nitrogen
NP	Nacogdoches Power
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NR	not required
NRC	U.S. Nuclear Regulatory Commission
NREL	U.S. National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRRI	National Regulatory Research Institute
NSPS	New Source Performance Standards
NSSS	nuclear steam supply system
NTAD	National Transportation Atlas Database
NVLAP	National Voluntary Laboratory Accreditation Program
NWI	National Wetlands Inventory
NWS	National Weather Service
NWSRS	National Wild and Scenic Rivers System
O_2	Oxygen
O_3	Ozone

ACRONYMS AND ABBREVIATIONS

ODCM	Off-site Dose Calculation Manual
OECD	Organization for Economic Co-operation and Development
O&M	operations and maintenance
ORNL	Oak Ridge National Laboratory
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Act
OW	observation well
P&A	plugging and abandonment
PAM	primary amoebic meningoencephalitis
PD	Planned Development
PDL	Proposed for Delisting
PE	probability of exceedances
percent g	percent of gravity
PET	Potential Evapotranspiration
PFBC	pressurized fluidized bed combustion
PFD	Process Flow Diagram
PGA	peak ground acceleration
PGC	power generation company
PH	Patio Home
P&ID	piping and instrumentation diagram
PM	particulate matter
PM_{10}	particulate matter less than 10 microns diameter
$PM_{2.5}$	particulate matter less than 2.5 microns diameter
PMF	probable maximum flood
PMH	probable maximum hurricane

ACRONYMS AND ABBREVIATIONS

PMP	probable maximum precipitation
PMWP	probable maximum winter precipitation
PMWS	probable maximum windstorm
PPE	plant parameter envelope
ppm	parts per million
PPS	preferred power supply
PRA	probabilistic risk assessment
PSD	Prevention of Significant Deterioration (permit)
PSWS	potable and sanitary water system
PUC	Public Utility Commission
PUCT	Public Utility Commission of Texas
PURA	Public Utilities Regulatory Act
PWR	pressurized water reactors
QA	quality assurance
QC	quality control
QSE	qualified scheduling entities
R10	Single-Family Residential
R12	Single-Family Residential
R7	Single-Family Residential
R8.4	Single-Family Residential
RAT	Reserve Auxiliary Transformer
RB	reactor building
R/B	reactor building
RCDS	reactor coolant drain system
RCDT	reactor coolant drain tank

ACRONYMS AND ABBREVIATIONS

RCRA	Resource Conservation and Recovery Act
RCS	reactor coolant system
RDA	Radiosonde Database Access
REC	renewable energy credit
REIRS	Radiation Exposure Information and Reporting System
RELFRC	release fractions
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
REP	retail electric providers
REPP	Renewable Energy Policy Project
RFI	Request for Information
RG	Regulatory Guide
RHR	residual heat removal
RIMS II	regional input-output modeling system
RMR	Reliability Must-Run
Rn_{222}	Radon-222
RO	reverse osmosis
ROI	region of interest
ROW	right of way
RPG	regional planning group
RRY	reactor reference year
RTHL	Recorded Texas Historic Landmarks
RTO	regional transmission organization
Ru-103	ruthenium-103
RW	test well

ACRONYMS AND ABBREVIATIONS

RWSAT	refueling waste storage auxiliary tank
RWST	refueling water storage tank
RY	reactor-year
S	SMALL
SACTI	Seasonal/Annual Cooling Tower Impact Prediction Code
SAL	State Archaeological Landmark
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SB	Senate Bill
SCR	Squaw Creek Reservoir
SCDC	Somervell County Development Commission
scf	standard cubic feet
SCWD	Somervell County Water District
SDS	sanitary drainage system
SECO	State Energy Conservation Office
SER	Safety Evaluation Report
SERC	SERC Reliability Corporation
SERI	System Energy Resources, Inc.
SFPC	spent fuel pool cooling and cleanup system
SG	steam generator
SGBD	steam generator blow-down
SGBDS	steam generator blow-down system
SGs	steam generators
SGTR	steam generator tube rupture
SH	State Highway

ACRONYMS AND ABBREVIATIONS

SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMP	State Marketing Profiles
SMU	Southern Methodist University
SOP	Standard Operations Permit
SO_2	sulfur dioxide
SO_x	sulfur
SPCCP	Spill Prevention Control and Countermeasures Plan
SPP	Southwest Power Pool
SQG	small-quantity generators
sq mi	square miles
SRCC	Southern Regional Climate Center
SRP	Standard Review Plan
SRST	spent resin storage tank
SSAR	Site Safety Analysis Report
SSC	structures, systems, and components
SSI	Safe Shutdown Impoundment
SSURGO	Soil Survey Geographic
SWATS	Surface Water and Treatment System
SWMS	solid waste management system
SWPC	spent fuel pool cooling and cleanup system
SWP3	Storm Water Pollution Prevention Plan
SWS	service water system
SWWTS	sanitary wastewater treatment system
T	Federally Threatened

ACRONYMS AND ABBREVIATIONS

t	ton
TAC	technical advisory committee
TAC	Texas Administrative Code
TB	turbine building
Tc_{99}	Technetium-99
TCEQ	Texas Commission on Environmental Quality
TCPS	Texas Center for Policy Studies
TCR	transmission congestion rights
TCS	turbine component cooling water system
TCWC	Texas Cooperative Wildlife Collection
T&D	transmission and distribution utility
TDCJ	Texas Department of Criminal Justice
TDOH	Texas Department of Health
TDOT	Texas Department of Transportation
TDPS	Texas Department of Public Safety
TDS	total dissolved solids
TDSHS	Texas Department of State Health Services
TDSP	transmission and distribution service provider
TDWR	Texas Department of Water Resources
TEDE	total effective dose equivalent
TGLO	Texas General Land Office
TGPC	Texas Groundwater Protection Committee
TH	Townhome
THC	Texas Historical Commission
THPOs	tribal historic preservation officers

ACRONYMS AND ABBREVIATIONS

TIS	Texas Interconnected System
TLD	Thermoluminescence Dosemeter
TMDLs	total maximum daily loads
TMM	Texas Memorial Museum
TOs	Transmission Owners
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TRAGIS	Transportation Routing Analysis Geographic Information System
TRB	Transportation Research Board
TRC	total recordable cases
TRE	Trinity Railway Express
TSC	technical support center
TSD	thunderstorm days per year
TSD	treatment, storage, and disposal
TSDC	Texas State Data Center
TSHA	Texas State Historical Association
TSP	transmission service provider
TSWQS	Texas Surface Water Quality Standards
TSS	total suspended sediment
TTS	The Transit System (Glen Rose)
TUGC	Texas Utilities Generating Company
TUSI	Texas Utilities Services Inc.
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board

ACRONYMS AND ABBREVIATIONS

TWR	Texas Weather Records
TWRI	Texas Water Resources Institute
TxDOT	Texas Department of Transportation
TXU	Texas Utilities Corporation
TXU DevCo	TXU Generation Development Company LLC
UC	University of Chicago
UFC	uranium fuel cycle
UHS	Ultimate Heat Sink
UIC	Uranium Information Center
UO_2	uranium dioxide
USACE	U.S. Army Corps of Engineers
US-APWR	(MHI) United States-advanced pressurized water reactor
USC	U.S. Census
USCA	United States Court of Appeals
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
USHCN	United States Historical Climatology Network
USHR	U.S. House of Representatives
USNPS	U.S. National Park Service
UTC	Universal Time Coordinated
UV	ultra-violet
VCIS	Ventilation Climate Information System

ACRONYMS AND ABBREVIATIONS

VCT	volume control tank
VERA	Virtus Energy Research Associates
VFD	Volunteer Fire Department
VOC	volatile organic compound
VRB	variable
WB	Weather Bureau
WBR	Wheeler Branch Reservoir
WDA	work development area
WDFW	Washington Department of Fish and Wildlife
weight percent	wt. percent
WHT	waste holdup tank
WMT	waste monitor tank
WNA	World Nuclear Association
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan
WRE	Water Resource Engineers, Inc.
WWS	wastewater system
WWTP	wastewater treatment plant
yr	year

CHAPTER 10

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

10.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

The National Environmental Protection Act (NEPA) of 1969 provides the basic national environmental charter for the United States. Section 102(c) of NEPA requires that an Environmental Impact Statement (EIS) be prepared for major federal actions significantly affecting the quality of the human environment. Section 102(c) also specifies three special requirements that an EIS must evaluate. This chapter evaluates these three requirements as well as a cost-benefit analysis (CBA) associated with the Luminant Generation Company LLC (Luminant) proposal to construct and operate two nuclear power plants at the Comanche Peak Nuclear Power Plant (CPNPP) Units 3 and 4. The three NEPA requirements as well as the CBA are evaluated in the following five sections:

- Section 10.1: Unavoidable Adverse Environmental Impacts.
- Section 10.2: Irreversible and Irretrievable Commitments of Resources.
- Section 10.3: Relationship between Short-term Uses and Long-term Productivity of the Human Environment.
- Section 10.4: Benefit-Cost Balance.
- Section 10.5: Cumulative Impacts.

Specifically, the proposal involves construction of two Mitsubishi Heavy Industries (MHI) United States - Advanced Pressurized Water Reactors (US-APWR) at the CPNPP site. The rated and design core thermal power of each reactor is 4451 MWt. The rated and design Nuclear Steam Supply System (NSSS) power is 4466 MWt. The rated and design gross output of each electric generator is approximately 1625 MWe for each core thermal power output of 4451 MWt. CPNPP Units 3 and 4 would each use two banks of mechanical forced draft cooling water towers, with structure heights well below some adjacent buildings such as the containment structure.

As defined in 10 CFR Part 51, impacts associated with this proposal are described or measured in terms of three metrics: SMALL, MODERATE, and LARGE. These levels of significance are defined as follows:

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

An impact can therefore be described as constituting a SMALL, MODERATE, or LARGE environmental effect; e.g., "water consumed by the cooling towers would constitute a SMALL impact." As used in this chapter, these metrics are also used to provide context to an attribute that defines, measures, or describes a specific impact; e.g., “the cooling towers would consume a relatively SMALL amount of water.”

10.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The following section describes unavoidable adverse environmental impacts for which mitigation measures are either considered impractical or do not exist. Because of the nature of the impacts and time frame involved, the analysis of unavoidable adverse impacts is divided into two sections: (1) construction impacts and (2) operational impacts.

Construction and operational impacts are evaluated in Chapter 4 and Chapter 5, respectively. The reader is referred to Chapters 4 and 5 for details as well as the justifications for conclusions presented in this Chapter.

Some mitigation measures for reducing construction-related impacts are also referred to as best management practices (BMPs). Project-specific BMPs are frequently implemented through permitting requirements, and plans and procedures developed for constructing or operating complex facilities. Project-specific BMPs supplement the mitigation measures described in this chapter and would be defined during the project implementation phase of the proposed units.

10.1.1 UNAVOIDABLE ADVERSE CONSTRUCTION IMPACTS

Impacts associated with construction of CPNPP Units 3 and 4 including pipeline and transmission corridors impacts, and measures and controls that could be implemented to reduce or eliminate such impacts are briefly summarized in Table 4.6-1. Potential mitigation measures available for reducing adverse construction impacts are summarized in Table 10.1-1. The following subsection describes the unavoidable adverse environmental and socioeconomic impacts.

10.1.1.1 Unavoidable Environmental Impacts

This subsection describes the principal unavoidable adverse environmental impacts potentially associated with constructing the two proposed nuclear power plants.

As noted in Subsection 2.2.1.1, approximately 3327.5 ac of the CPNPP site have been designated as open water, and another 1100.6 ac are designated as herbaceous/ grassland. Approximately 1064 ac within the CPNPP site are designated as prime farmland; however, this prime farmland is not utilized to grow crops. Some of this land is leased for cattle grazing. This prime farmland does not extend into areas that would be disturbed by construction and operation of CPNPP Units 3 and 4.

As described in Chapter 4, the principal unavoidable adverse environmental impacts of construction of the CPNPP Units 3 and 4, and the pipeline and transmission corridors would involve the following:

- The total number of acres of the CPNPP site is 7950 ac. Approximately 123 ac would be disturbed during construction of the CPNPP Units 3 and 4, 153 ac disturbed during construction of the cooling towers and approximately 400 ac for the construction of the Blowdown Treatment Facility (BDTF). Details related to the BDTF are presented in Subsection 3.6.1.1. The impacts are considered to be relatively SMALL in terms of the entire size of the site.

- A relatively SMALL amount of land would be disturbed during construction of the pipeline and transmission corridors. New pipelines are planned to be placed in the existing right-of-way (ROW). An estimate of the amount of area disturbed by construction of the transmission corridors is currently unavailable because the actual routes have not been determined by Oncor Electrical Delivery Company LLC (Oncor).

- A SMALL potential for limited disturbance to buried historic, archaeological, or paleontological resources could occur.

- Construction debris would be disposed of in permitted off-site landfills.

- A SMALL amount of water would be consumed in implementing various construction activities (see Subsection 4.2.1.3).

- A SMALL temporary increase in the sediment load into Lake Granbury could occur as a result of constructing the intake/discharge structures for the cooling system; minor and short-term effects upon species and habitat could occur along the shoreline of Lake Granbury.

- Construction activities near Squaw Creek Reservoir (SCR) may result in erosion, sediment discharge, and stormwater runoff into the reservoir; relatively SMALL short-term effects upon species and habitat could occur near and within the reservoir.

- Use of equipment could introduce the potential for SMALL petroleum or other related spills that could enter surfacewater.

- Construction at the edge of Lake Granbury and SCR, and transmission lines crossing water bodies might cause a SMALL short-term loss of some aquatic organisms and temporary degradation of aquatic habitat.

- Loss of some herbaceous/grassland habitat, and disruption of some species could occur near and within the construction area of CPNPP Units 3 and 4, and the pipeline and transmission corridors. Some of this land may be revegetated and allowed to enter secondary succession states once construction has been completed. Some dislocated species are expected to recover. The impacts are considered to be SMALL.

10.1.1.2 Unavoidable Socioeconomic Impacts

As discussed in Subsection 4.4.1.1, the peak number of on-site workforce is estimated to be 5201. The projected on-site workforce constitutes a relatively SMALL increase in population, with respect to the total population of the region.

The following subsection briefly identifies and describes the unavoidable adverse socioeconomic impacts that would occur as a result of constructing CPNPP Units 3 and 4:

- A SMALL potential for housing and rental space shortages.

- A SMALL visual impact as a result of constructing CPNPP Units 3 and 4, cooling towers, and corridors.

- A SMALL increased strain on fire protection, police, and other essential community services and infrastructure.

- A SMALL increase in school crowding.

- A SMALL increase in traffic congestion on local roads.

- A SMALL increase in traffic noise that could affect workers and nearby residents.

- A SMALL increase in ambient noise levels from construction of the CPNPP Units 3 and 4, and the corridors that could affect workers and nearby residents.

- A SMALL increase in air emissions from fugitive dust emissions, and increased vehicle and equipment exhaust.

- A SMALL to MODERATE potential for serious accidents among construction workers. The risk would continue through the entire construction phase.

The socioeconomic impacts from construction activities can be at least partially offset through use of selected mitigation measures. No impacts that are disproportionately high or adverse on minority or low income populations were identified in association with construction of the CPNPP Units 3 and 4.

Over the short-term, increased construction-related traffic would adversely affect traffic patterns and levels of service in the vicinity of CPNPP. Mitigation measures for partially offsetting some impacts may include promoting carpooling, implementing staggered shifts, and using signage and turn lanes to alleviate traffic concerns.

Construction of the CPNPP Units 3 and 4 could cause, over the short-term, SMALL strain to the infrastructure; e.g., road, water, utilities, and school capabilities, and community services such as teachers, and fire and police protection. Increased property and worker-related tax revenues could help alleviate any stress by providing funds to support additional services and the infrastructure.

The influx of construction workers would place a SMALL strain on housing and rental space, and a SMALL short-term strain on the local school system.

Measures that are beyond the direct control of the applicant could include changing the tax structure to generate revenue to support additional services and infrastructure improvements, rezoning to encourage beneficial changes in growth patterns, and offering incentives for construction of rentals and new housing.

10.1.2 UNAVOIDABLE ADVERSE OPERATIONAL IMPACTS

Table 5.10-1 summarizes operational impacts associated with CPNPP Units 3 and 4, the transmission and pipeline corridors, and identifies measures and controls that may be implemented to reduce or eliminate such impacts. The following subsection describes the unavoidable adverse operational impacts. Some of these impacts have greater environmental implications and are sustained over a longer period than are the impacts of construction. Compared with assessment of construction impacts, the analysis of the operational impacts involves consideration of a more capacious and varied set of effects.

Many of the operational issues are considered to have long-term effects that range over or beyond the operational life of CPNPP Units 3 and 4. Anticipated unavoidable adverse impacts and mitigation measures for reducing some of these impacts are summarized in Table 10.1-2. Because socioeconomic impacts involve a markedly different set of concerns, the following assessment is divided into two subsections: environmental impacts and socioeconomic impacts.

10.1.2.1 Unavoidable Environmental Impacts

The principal unavoidable adverse environmental operational impacts would involve:

- A continued commitment of land use of the CPNPP site, which amounts to 7950 ac. At a minimum, this land would be committed to this purpose until CPNPP Units 3 and 4 are decommissioned. Additional land would be committed to the pipeline and transmission corridors. An estimate of the amount of area disturbed by operation of the corridors is currently unavailable because the actual route has not been determined. In terms of regional land use, this proposal involves a relatively SMALL commitment of land.

- A SMALL amount of potable water (treated surface water) would be consumed in support of operation of CPNPP Units 3 and 4. Groundwater is not planned to be utilized during the operation of Units 3 and 4.

- Some solid nonradioactive industrial waste would be collected by solid waste transporters for recycling or disposal in a permitted landfill. These wastes do not affect the site terrestrial ecology, soil, or groundwater.

- The facility is classified as a small quantity generator (SQG). Hazardous waste streams from CPNPP Units 3 and 4 are expected to be similar in characteristics to CPNPP Units 1 and 2 and would be collected and stored, and then transported and disposed of at an off-site Resource Conservation and Recovery Act (RCRA)-permitted treatment, storage, and disposal (TSD) facility. Impacts on the local environment from hazardous waste management are SMALL.

- The two containment vessels, cooling towers, and the transmission corridors would be visible from nearby locations and would constitute a relatively SMALL alteration to surrounding aesthetic resources.

- Per the amendment to the 2006 Brazos G Water Plan, the maximum cooling water withdrawal from Lake Granbury is estimated to be 103,717 ac-ft/yr. Water (blowdown)

returned to Lake Granbury is estimated to be 42,100 ac-ft/yr (depending on cooling tower cycles of concentration). The estimated annual consumptive water loss (water lost to cooling tower evaporation and drift) from Lake Granbury is estimated to be approximately 61,617 ac-ft/yr (Figure 2.3-30), which constitutes a relatively SMALL usage on existing water resources.

- Construction of a pipeline from Wheeler Branch would provide 50 gpm of potable water for use at CPNPP Units 3 and 4. An additional 250 gpm will be provided for de-mineralized water makeup and system flushing. Three hundred gpm represents a relatively SMALL consumptive use of the local potable water supply.

- Blowdown water should meet Texas Pollution Discharge Elimination System (TPDES) permitted standards for discharge into the Lake Granbury and would constitute a relatively SMALL impact.

- Wastewater generation from the floor and equipment drains, stormwater, nonradioactive laboratory wastewater, auxiliary boiler blowdown, and sanitary wastes would meet TPDES permitted standards for wastewater effluents. The wastewater would also meet applicable regulatory Off-site Dose Calculation Manual (ODCM) limits for low level (LL) radioactive waste (radioactive drains, radioactive system leakage, radioactive laboratory drains, and radioactive wastewater) discharge into SCR. The environmental impact would be SMALL.

- Some TPDES permitted wastewater that would include wastewater from equipment drains is discharged into retention ponds. Small amounts of chemical constituents would evaporate into the air from these ponds. The environmental impact would be SMALL.

- Subsection 5.3.2.1 describes the thermal plume analysis and impacts from CPNPP. Summaries of the predicted thermal discharge plume analysis data are provided in Table 5.3-2. The impact would be SMALL because the discharge is unlikely to have any discernable effect on water quality or the aquatic biota.

- SMALL amounts of stormwater could drain into nearby water bodies. Routine/ maintenance activities at the site and along the pipeline and transmission corridors could result in the potential for SMALL episodic spills of petroleum or chemicals.

- Routine maintenance on the pipeline and transmission corridors could result in a SMALL adverse impact to aquatic and terrestrial species.

- Routine discharges to water in SCR and Lake Granbury could result in a SMALL adverse impact to aquatic biota.

- Water intakes and cooling towers are designed using best available technology (BAT) to minimizing impingement, which is a mitigating measure.

- A continued long-term disruption could occur of some herbaceous/grassland habitat, and disruption of some species near CPNPP Units 3 and 4. Some of this land may be returned to an unmanaged state once the construction phase is completed and the

operational phase commences. Some of this land may be revegetated and allowed to enter secondary succession stages after construction is complete. The environmental impact would be SMALL.

- Episodic loud noises (relief valve testing, diesel engines starting, sirens, helicopters, etc.) related to plant operations or maintenance on the transmission corridors would have a relatively SMALL impact on nearby species.

- A relatively SMALL deposition would occur of some mineral salts on the surrounding vicinity created by cooling tower drift. The salt deposition would be SMALL and would be unlikely to result in any measurable impact on plants and vegetation.

- Vehicles and equipment would produce SMALL amounts of atmospheric emissions.

- Discharge of an atmospheric vapor plume would occur from the four banks of mechanical forced draft cooling towers. Table 5.3-4 describes the expected cooling tower atmospheric plume lengths by season and direction for the cooling towers. The vapor would result in a limited obstructed view of the sky and could cause a minor shadowing effect on the ground that has a SMALL effect on vegetation and the view shed.

- Generation of LL radioactive waste would require storage, treatment, and disposal, and would need to be isolated. If LL radioactive waste is properly managed (as done for CPNPP Units 1 and 2), the additional incremental risk of this waste is considered to pose a SMALL risk.

- Small quantities of mixed waste (containing both hazardous waste and radioactive constituents), may be generated, stored, transported, and disposed of at permitted mixed-waste disposal facilities according to applicable regulations. If mixed waste is properly managed (as done for CPNPP Units 1 and 2), the additional incremental risk of this waste is considered to pose a SMALL risk. In addition; very limited quantities (less than one cubic yard) of mixed waste has been generated at CPNPP from the operations of CPNPP Units 1 and 2.

- Generation of high-level (HL) radioactive spent fuel would need to be either reprocessed or isolated. Properly managed, the additional incremental risk of this waste is considered to pose a MODERATE but acceptable risk.

- Uranium-235 fuel would be expended during the operations of CPNPP Units 3 and 4.

10.1.2.2 Unavoidable Socioeconomic Impacts

Because of the smaller number of workers involved in operation of the CPNPP Units 3 and 4, the socioeconomic changes are smaller than those that would take place during the construction phase; however many of the socioeconomic impacts would occur over a longer time frame.

The unavoidable socioeconomic adverse impacts resulting from the operation of the CPNPP Units 3 and 4, and the pipeline and transmission corridors would involve the following.

As described in Subsection 5.8.1.1, operation of the CPNPP Units 3 and 4 is projected to increase the worker population by 494. This brings the total to 1494 operation workers, with 1000 workers for CPNPP Units 1 and 2. Because operations commence following construction there should actually be fewer stresses on socioeconomic factors such as housing, community services and infrastructures. Some short-term impacts are discussed below.

- A SMALL short-term school crowding issue.
- A SMALL additional increase in traffic congestion on local roads. The long-term effect is smaller than that which occurs during the construction phase.
- A relatively SMALL increase in ambient noise levels that may impact workers and nearby residents as a result of increased worker traffic, plant operations, and maintenance on the transmission corridor.
- Operation of vehicles, auxiliary boilers, and the testing and operation of the standby generators, fire pumps, and other equipment would generate relatively SMALL increased quantities of air emissions in the facility's air permit as issued by the Texas Commission on Environmental Quality (TCEQ).

The operational socioeconomic impacts can be at least partially offset through the use of selected mitigation measures. No impacts that are disproportionately high or adverse on minority or low income populations were identified in association with either the construction or operational phases of CPNPP Units 3 and 4.

10.1.3 SUMMARY OF UNAVOIDABLE ADVERSE CONSTRUCTION AND OPERATIONS IMPACTS

This subsection summarizes the unavoidable adverse construction and operations impacts, and describes methods for mitigating the impacts. Through the application of mitigation measures, some of the unavoidable adverse environmental impacts associated with the construction and operation of the CPNPP Units 3 and 4 may be decreased or reduced to the point where they have no measurable effect. The unavoidable impacts are summarized.

10.1.3.1 Construction Impacts

Construction impacts and mitigation measures are summarized in Table 10.1-1. All impacts, other than socioeconomic, from the construction of CPNPP Units 3 and 4, and clearing of the pipeline and transmission corridors are SMALL and relatively short-term in nature. These environmental impacts can either be partly mitigated or may dissipate after construction is complete.

10.1.3.1.1 Environmental

This subsection summarizes the environmental impacts that would result from construction of CPNPP Units 3 and 4.

Land Use

The project would involve a continued commitment of land use of an additional 675 ac at the CPNPP site (see Subsections 4.1.1 and 4.1.1.1). Additional land may be committed to the transmission corridors; however Oncor has not determined if additional land is required for corridor expansion. The project could result in the loss of some herbaceous/grassland habitat. This impact can be partially mitigated through revegetation and returning some of the land to its preconstruction conditions.

Ecological

The project could potentially result in some destruction of habitat and disruption or loss of some individual species in the construction area. The project would include permanent alteration of some habitat areas, potentially resulting in the loss or relocation of biota over the operational lifespan. Some of these impacts could be mitigated over the long-term through revegetation and by allowing the land to return to an unmanaged state after construction is complete. The impact can also be partially mitigated by restricting construction activities as much as possible to the planned project footprint, and by following procedures and BMPs that minimize ecological impacts.

Water Resources

A SMALL amount of water would be consumed in implementing various construction activities. The amount of water is considered to be so small as to require no mitigation. Groundwater is not planned to be used to support construction.

Water Quality

Construction activities near or along Lake Granbury and the SCR shoreline could temporarily increase the sediment load and adversely affect some shoreline habitat. These impacts could be reduced through work procedures, proper construction methods, and implementation of BMPs.

Cultural Resources

There is a SMALL risk that cultural resources could be disturbed during the construction phase. A Phase 1 survey of cultural resources was completed in areas that may be disturbed during construction activities for Units 3 and 4 and their associated facilities. Ground disturbing activities in areas that were not previously cleared would be performed in compliance with the National Historic Preservation Act (NHPA) regulations. If previously unevaluated cultural resources were discovered during ground disturbing activities, associated activities would be halted until their significance would be assessed. As appropriate, the State Historical Preservation Office (SHPO) would be consulted to determine if any additional procedures need to be implemented to protect such resources.

Noise

Construction activities could have a SMALL impact on nearby wildlife. However, the impact is not considered to be significant enough to warrant mitigation. A relatively SMALL increase in ambient noise level could be mitigated through noise reduction equipment and by adhering to

procedures, BMPs, and noise level standards imposed by the Occupational Safety and Health Act (OSHA).

Atmospheric and Meteorological

Negligible air emissions that do not require mitigation would be produced by vehicles and some equipment.

10.1.3.1.2 Socioeconomic

This subsection summarizes the socioeconomic impacts that would result from construction of the CPNPP Units 3 and 4. During construction, SMALL socioeconomic impacts might occur as a result of an influx of construction workers. Socioeconomic impacts can be at least partially offset through the use of selected mitigation measures. Most people probably consider socioeconomic impacts to be generally beneficial. Increased tax revenue generated from the proposed project could be used to fund schools, road improvements, and upgrades to the fire protection infrastructure.

As outlined in Subsection 4.4.2.1, the peak workforce is projected to involve 5201 workers, a relatively small fraction of the total projected population of the region. In addition, the workforce for CPNPP Units 1 and 2 reached 10,000 and there were no significant socioeconomic impacts. Potential impacts are presented below.

Local roads in the vicinity of CPNPP would experience increased traffic. Mitigation measures that might be implemented to partially offset traffic impacts include encouraging car pooling, staggering shifts, advertising and erecting signs alerting drivers of increased construction traffic, and constructing turn lanes onto the CPNPP site.

Visual effects and noise from the four cooling towers and transmission corridor, would be limited to meet state nuisance rules and pose a SMALL aesthetic impact, which does not warrant any mitigation measures.

As with any large construction project, there is a relatively SMALL to MODERATE potential for an increase in serious accidents among construction workers. The risk would continue through the entire construction phase. The risk can be reduced by introducing a safety program, mandating safety meetings, and having a safety officer supervise construction activities.

Some construction activities may impact minority or low income populations; however, these impacts would not be disproportionately to minority or low income populations. In addition, there are no foreseen unavoidable adverse environmental justice impacts.

10.1.3.2 Operational Impacts

Operational impacts are summarized in Table 10.1-2. Many of the operational impacts tend to be smaller that those associated with the construction phase, but tend to range over a longer period of time.

10.1.3.2.1 Environmental

This subsection summarizes the environmental impacts that would result from operation of CPNPP Units 3 and 4.

Land Use

The project would involve a continued commitment of land use of the CPNPP site, which amounts to 7950 ac (675 ac for CPNPP Units 3 and 4). Much of the site has been disturbed over the last 30 years, and the project is consistent with current land-use plans. Additional land would be committed to the pipeline and transmission corridors. An estimate of the amount of area disturbed by construction of the transmission corridors is currently unavailable because the actual route is currently undetermined. In terms of mitigation, some of the land could be revegetated following the end of construction and returned to its former state following completion of construction. When compared to regional use of land, the project would have a relatively SMALL impact on land use.

Hydrological

In terms of regional usage, this proposal would involve a relatively SMALL loss of water from Lake Granbury, principally as a result of cooling system related evaporation.

Results of the predicted thermal water plume analysis data are summarized in Table 5.3-2. Based on the data presented in this table, high and low temperature plumes are predicted to dissipate in the near-field mixing zone region, and the thermal effects of plant operation would be unlikely to have a discernible effect on water quality or the aquatic biota. The use of cooling towers acts to minimize the thermal impact to Lake Granbury and no additional mitigation measures are deemed necessary.

Water effluents consisting of nonradioactive discharge of some slightly concentrated blowdown water would be discharged into the Lake Granbury, and would constitute a relatively SMALL impact. As a mitigation measure, the wastewater would be treated as required to meet the wastewater discharge permit (TPDES) requirements prior to discharge.

Wastewater generation from the floor and equipment drains, stormwater, nonradioactive laboratory wastewater, auxiliary boiler blowdown, and sanitary wastes would be discharged into SCR. The environmental impact would be SMALL. As a mitigation measure, the wastewater would be treated as required to meet the wastewater discharge permit (TPDES) requirements prior to discharge.

Very LL radioactive effluents would be treated according to applicable regulatory standards before being discharged into SCR. The impacts of radioactive effluents discharged into this reservoir would also be reduced through a waste treatment prior to discharge.

Ecological

Operation of CPNPP Units 3 and 4, and the pipeline and transmission corridors continue to pose a relatively SMALL impact on individuals of various species. Revegetating and returning some of

the land to a native state would result in a reduction of ecological impacts over time. A SMALL impact could result from bird collisions with the containment vessels, cooling towers, or transmission lines, and does not warrant mitigation.

Infrequent episodic loud noises related to plant operations and maintenance on the transmission corridor could result in a SMALL short-term disruption to wildlife.

Operation of the proposed cooling towers would result in relatively SMALL concentrations of salt deposition in the nearby vicinity of the cooling towers. The amount of salt deposition is expected to be below a level that harms leaves or other biota.

The effects of entrainment and impingement upon fish and aquatic organisms would constitute a SMALL impact on aquatic species. Water intakes and cooling towers are designed using BAT to minimizing impingement, which is a mitigating measure.

Incidental External Radiation Dose

Operational employees would be exposed to a relatively SMALL incidental external radiation dose. Such exposure can be reduced through careful monitoring, employee safety training programs, compliance with As Low As Reasonably Achievable (ALARA) program, and strict adherence to work procedures and applicable regulations.

Air Emissions

The cooling towers would emit a plume of water vapor and SMALL concentrations of chemical constituents to the atmosphere. The plume would result in a limited obstructed view of the sky, and could cause a shadowing effect on the ground that could have a SMALL to inconsequential effect on vegetation. Operation of vehicles, auxiliary boilers and the testing and operation of the standby generators contribute a SMALL amount of greenhouse gases to the atmosphere.

Non-hazardous, Hazardous, and Radiological Waste

Operation of the CPNPP Units 3 and 4 would increase the volume of radioactive and nonradioactive wastes that are required to be disposed of by permitted disposal facilities or permitted landfills.

Non-hazardous waste would be handled in accordance with TCEQ regulations (e.g. permitted landfills, incineration) and would pose a SMALL impact on the environment. Hazardous RCRA waste would be handled in accordance with RCRA regulations and disposed of at a RCRA permitted waste facility. The impacts of non-hazardous and hazardous waste are considered to be relatively SMALL.

The two proposed CPNPP units would generate small amounts of LL radioactive and potentially very small amounts of mixed waste (waste containing both hazardous and radioactive constituents) that would need to be disposed of. Mixed waste would be stored on-site and disposed of at permitted mixed-waste disposal facilities according to applicable regulations. If mixed waste is properly managed (as done for CPNPP Units 1 and 2), the additional incremental risk of this waste is considered to pose a SMALL risk. In addition, very limited quantities (less

than 1 cu yard) of mixed waste has been generated at CPNPP from the operations of CPNPP Units 1 and 2.

CPNPP Units 3 and 4 would generate high-level (HL) spent fuel waste during plant operation. Generation of HL radioactive spent fuel would need to be either reprocessed or isolated. Properly managed, the additional incremental risk of this waste is considered to pose a MODERATE but acceptable risk.

10.1.3.2.2 Socioeconomic

This subsection summarizes the socioeconomic impacts that would result from operation of the CPNPP Units 3 and 4. Some impacts such as growth induced effects may continue beyond the operational life of the CPNPP Units 3 and 4. Because of the smaller number of workers that would be required for operations as opposed to construction, the socioeconomic impacts are generally less intense but are sustained over a longer period of time when compared to that of construction.

As described in Subsection 5.8.1.1, the number of CPNPP work staff is estimated to total 1494 operation workers, with 1000 workers for CPNPP Units 1 and 2, and 494 workers for CPNPP Units 3 and 4, a relatively SMALL fraction of the total projected population of the region.

When compared to the overall hydrocarbon emission released in the local area, the operation of equipment and employee vehicles would release a relatively SMALL quantity of nonradioactive pollutants to the atmosphere and can be reduced through strict compliance with applicable air pollution control equipment. Visual impact from the plant are SMALL and do not warrant mitigation.

Infrequent loud noises from plant operations and maintenance activities on the pipeline and transmission corridors might result in a SMALL change in ambient noise levels experienced by workers and local residents. Increased noise levels experienced by workers could be mitigated with noise protection equipment. Impacts on nearby residents can be reduced by staging loud intermittent activities during times when they would result in fewer disturbances.

An influx of operational workers would likely have a SMALL short-term strain on the local school systems because construction workers and their families would relocate. The increase in operational workers could also place a SMALL strain on infrastructure, e.g., roads, water, utilities, and community services such as fire and police protection.

Increased traffic volumes from operational workers commuting to work could adversely affect traffic patterns and levels of service in the vicinity of CPNPP. Mitigation measures for partially offsetting some impacts could include promoting carpooling, implementing staggered shifts, and using signage and turn lanes to alleviate traffic concerns.

The cooling towers and the associated vapor plume would be visible from a distance, but are considered to pose a relatively SMALL alteration to local aesthetic. The transmission corridor would also be visible from a distance but would constitute a relatively SMALL disturbance upon the viewscape and does not require mitigation.

Some of the activities would affect minority or low income populations. However, there is no disproportionately high impact on minority or low income populations. Thus, there are no unavoidable adverse impacts with respect to the EPA goals of Environmental Justice.

An increase of property and sales tax revenues generated through an influx of workers and unit operations would be a beneficial impact to the local community. Additional measures outside the control of the applicant could also include changing the tax structure to generate revenue to support additional services and infrastructure improvements, and rezoning to encourage beneficial changes in growth patterns.

10.1.4 REFERENCES

None

TABLE 10.1-1 (Sheet 1 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Land Use	Approximately 123 ac of the 7950-ac site would be disturbed during construction of the CPNPP Units 3 and 4.152 ac disturbed during construction of the cooling towers, and approximately 400 ac for the BDTF. Cleared or disturbed areas could present a relatively SMALL increased potential for erosion. Land would not be available for other uses. As much of this impact would continue into the operational phase, it would constitute a long-term irreversible and irretrievable (I&I) commitment of resources.	Clear only areas necessary for installation of the power plant/infrastructure. Enhance awareness of construction workers to environmental management practices. Have environmental/safety personnel supervise activities that can alter or harm the environment. Limit construction activities to the construction footprint. Apply BMPs for erosion controls and stabilization measures, such as those provided by applicable regulations and stormwater pollution prevention practices and procedures. Limit activities to actual construction site and access corridors. Locate soil stockpiles near the construction site. To the extent feasible, restore affected temporarily-used areas to approximately their native state. Revegetate affected temporary-use areas after completion of construction. Develop appropriate project-specific BMPs to reduce impacts. Comply with requirements of applicable federal, state, and local construction permits/approvals and local ordinances.	Approximately 675 ac of the 7950-ac site would be occupied on a long-term I&I basis by the two proposed nuclear plants and associated infrastructure. Mitigation measures would allow some of this land, particularly with respect to the pipeline and transmission corridors, to be returned to its former state.

TABLE 10.1-1 (Sheet 2 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
	With respect to regional land use, construction of the proposed pipeline and transmission corridors would represent a relatively SMALL usage or restriction on land use. As much of this impact continues into the operational phase, it would constitute a long-term I&I commitment of resources.	To the degree feasible, restrict ground disturbing equipment to the corridor boundaries. Restrict maintenance access roads. Revegetate, with attention to native wildlife habitats. Reduce potential impacts through compliance with permitting requirements and BMPs. Comply with requirements of applicable federal, state, and local construction permits/approvals and local ordinances.	Long-term commitment of the proposed transmission corridor. Mitigation measures allow some off-site land to be returned to its former state.
	A SMALL potential to disturb buried historic, archaeological, or paleontological resources. Such an impact would constitute a long-term permanent I&I impact upon historic resources.	Perform a Phase 1 survey and any applicable sub-surface testing prior to start of any on-site work to identify buried historic, cultural, or paleontological resources. Comply with established NHPA regulations and procedures to assess unanticipated historic, cultural, and paleontological resource discoveries, and as appropriate, stop work and contact the State Historic Preservation Office. Promote awareness of construction workers on applicable cultural resource practices.	The potential for permanent destruction of unanticipated historic, cultural, or paleontological resources is mostly or entirely mitigated.
	Construction debris would be disposed of in permitted off-site landfills. This action would constitute a long-term I&I commitment of resources.	Introduce waste minimization program to reduce the volume of debris generated. Train appropriate employees in methods for reducing and disposing of construction waste. Maximize reuse/recycle of materials.	Some land would be used or dedicated to long-term disposal of construction debris and would not be available for other uses. This impact would constitute an I&I commitment of land use.

TABLE 10.1-1 (Sheet 3 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Hydrologic and Water Use	A SMALL amount of surfacewater would be consumed in implementing various construction activities (see Section 4.2).	Promote water conservation practices to workforce. Utilization of surfacewater vs. groundwater.	With respect to regional water supply, the project would routinely consume a relatively SMALL amount of water on a long-term basis.
	Construction activities on or near Lake Granbury and SCR would result in erosion, sediment discharge, and stormwater runoff into the reservoir; relatively SMALL short-term effects upon species and habitat could occur near and within the reservoir.	Comply with applicable regulations, permits, and plans. Apply BMPs as found in stormwater regulations and procedures. Install drainage controls to direct dewatering runoff. Revegetate unused construction area in a timely manner, following clearing. Comply with BMPs. Install drainage controls.	
	Use of equipment could introduce the potential for SMALL petroleum or other related spills that could impact surfacewater.	Invoke spill prevention procedures for construction activities. Use good maintenance practices and maintain spill supplies in readily available manner equipment, and prevent spills and leaks. Train appropriate employees in methods for preventing and/or responding to spills.	Minimal or no unavoidable adverse impacts.

TABLE 10.1-1 (Sheet 4 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Aquatic Ecology	Construction at the edge of Lake Granbury and SCR might cause a SMALL short-term disruption to individual organisms and temporary degradation of aquatic habitat.	Install engineering protective measures around the construction site, as applicable to activity.	Minimal or no unavoidable adverse impacts.
	Transmission lines crossing water bodies might cause a SMALL degradation of habitat or disruption to some organisms.	Employ BMPs to minimize erosion and sedimentation. Install stormwater drainage systems at large construction sites and stabilize disturbed soils.	Minimal or no unavoidable adverse impacts.
Terrestrial Ecology	Operation of the proposed CPNPP Units 3 and 4, and transmission corridor could impact habitat and cause relocation of some wildlife. This impact is relatively SMALL in comparison to many other activities, but would continue into the operation phase of the project.	Some of the land is revegetated and returned to a native state, which results in a reduction of ecological impacts over time. Follow procedures for minimizing noise. To the extent feasible, plan construction activities to take place on previously disturbed areas.	Minimal or no unavoidable adverse impacts.
	Clearing and grading could harm or displace some animals. This impact could be long-term, continuing into the operation phase of the project.	To the extent feasible, minimize disturbance to habitat and species.	Minimal or no unavoidable adverse impacts.
	Construction noises would startle or scare some animals. This impact would be intermittent and would continue through the construction phase.	To the extent feasible, use noise suppression equipment that reduces noise.	Minimal or no unavoidable adverse impacts.

TABLE 10.1-1 (Sheet 5 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
	There is a minor short-term potential for a SMALL number of birds to periodically collide with cranes and tall construction equipment.	No measures or controls are necessary because impacts are SMALL.	Minimal or no unavoidable adverse impacts.
Radiological	Construction employees working could be exposed to SMALL incremental doses of radiation from operating CPNPP Units 1 and 2. In addition, workers on CPNPP Unit 4 would also receive a SMALL incremental dose from the recently completed and operating CPNPP Unit 3.	Train radiation workers in radioactive safety procedures. Develop work plans that consider methods for reducing radioactive exposures. Perform general area monitoring to ensure radiological monitoring is not required.	Construction workers would be expected to receive a SMALL incremental radiation dose.
Socioeconomics	A SMALL potential for housing and rental space shortages.	Tax incentives, re-zoning, and other government actions could be adopted to encourage construction of additional living space. Such mitigation measures are beyond the purview of the applicant. Commuting assistance could be provided to workers traveling in from areas in which they live.	Minimal or no unavoidable adverse impacts.
	A SMALL visual impact as a result of construction activities.	No practical mitigation measures have been identified.	A SMALL short-term unavoidable adverse impact.
	Initially, there could be a relatively SMALL increased strain on infrastructure and services such as insufficient classroom space on a short-term basis to accommodate the influx of construction workers' families.	Business opportunities could arise providing commuting assistance to workers traveling in from areas in which they live.	In the short-term, there could be school crowding and some impact on infrastructure.

TABLE 10.1-1 (Sheet 6 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
	Construction workers and local residents would be exposed to elevated levels of traffic and traffic induced noise that would continue through the course of the construction phase.	Make public announcements or prior notification of atypical construction activities. Add turn lanes at construction entrance. Encourage use of buses, vans, carpools, or staggered shifts. Post signs near construction entrances and exits to make the public aware of potentially high construction traffic areas.	Level of service on nearby roadways would be reduced, over the construction period, particularly during shift change.
	There is a relatively SMALL to MODERATE potential for an increase in serious accidents among construction workers. The risk would continue through the entire construction phase.	Develop work plans that include safety procedures. A safety officer would be assigned to oversee construction activities. Provide on-site emergency first aid, establish arrangements with local hospital emergency rooms to accept trauma victims, and conduct health and safety monitoring awareness sessions. Provide appropriate safety meetings and job-training to construction workers. Have an environmental/safety officer oversee activities that are likely to result in injuries.	Minimal but some possible unavoidable adverse impacts.

TABLE 10.1-1 (Sheet 7 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
	Construction workers and possibly some local residents or passersby could be exposed to SMALL elevated levels of dust, exhaust emissions, and noise from construction and equipment. These impacts could continue through the construction phase.	Train and appropriately protect employees and construction workers to reduce the risk of potential exposure to noise, dust and exhaust emissions. Control access to construction areas. Make public announcements or prior notification of atypically loud construction activities. Use dust control measures (such as watering, stabilizing disturbed areas, and covering trucks). Ensure construction equipment is properly maintained. Manage concerns from adjacent residents or visitors on a case-by-case basis. Have environmental/safety officers supervise activities that can harm the environment.	Potential for some SMALL unavoidable impacts.
	A SMALL to MODERATE potential for serious accidents among construction workers. The risk would continue through the entire construction phase.	Adopt a safety program and monitor effectiveness. Assign a safety engineer to oversee construction activities. Hold regular safety meetings. Comply with all applicable Occupational, Safety, and Health Act regulations.	Adoption of the mitigation measures would substantially reduce the risk of serious injury.

TABLE 10.1-1 (Sheet 8 of 8)
CONSTRUCTION-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Potential Actions to Mitigate Impacts	Unavoidable Adverse Impacts
	As a result of population influx, there could be a relatively SMALL increased strain on fire or police protection and other services in the host county(s). This is expected to be short-term phenomena.	Increased tax revenues could be used to fund additional services and purchase equipment; however, such measures are not within the control of the applicant.	In the short-term, some community services could be strained.
	Workers and the public could be exposed to relatively SMALL nonradioactive pollutant releases to the atmosphere from equipment and employee vehicles. These construction related emissions would cease after the construction phase has ended.	Releases are well within regulatory limits. No mitigation measures are deemed necessary.	Minimal but some possible unavoidable adverse impacts.
Environmental Justice	Some activities would have a relatively SMALL affect on minority or low income populations.	There would be no disproportionate high impact on minority or low income populations. Creation of more jobs from the construction of CPNPP Units 3 and 4 could have a positive economic affect on minority or low income populations.	No unavoidable adverse impacts.

TABLE 10.1-2 (Sheet 1 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
Land Use	The proposal would involve a continued irreversible and irretrievable (I&I) commitment of land use over the operational life of this project, amounting to approximately 675 ac of the 7950 ac of the existing site for the CPNPP as well as the pipeline and transmission corridors.	Much of the existing CPNPP site has been disturbed over the last 30 years and the proposed project is consistent with current land-use plans. Some of the disturbed land would be revegetated following the end of construction and into the operational phase of the project. The project would comply with requirements of applicable federal, state, and local construction permits/approvals, and local ordinances.	Continued long-term I&I commitment of land use over the operational life of this project. Some of the land would be returned to its former state following the end of construction.
	The CPNPP Units 3 and 4 would generate non-hazardous and hazardous waste that would need to be disposed of in permitted disposal facilities or permitted landfills.	Establish waste minimization programs to minimize the volume of wastes generated. Hazardous waste would be handled, and disposed according to RCRA standards. Follow applicable regulations for disposing of non-hazardous waste.	Land dedicated on a long-term I&I basis for the disposal of this waste and would not be available for other uses.
	The two containment vessels, cooling towers, and the corridors would be visible from nearby locations and would constitute a relatively SMALL alteration to surrounding aesthetic resources.	No practical mitigation measures have been identified for reducing the impact.	The viewscape would be impacted over the operational phase of this project.

TABLE 10.1-2 (Sheet 2 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
Hydrologic and Water Use	Per the amendment to the 2006 Brazos G Water Plan, the maximum estimated annual consumptive water loss (water lost to cooling tower evaporation and drift) from Lake Granbury is estimated to be approximately 61,617 ac-ft/yr (Figure 2.3-30), which in comparison to regional usage, constitutes a relatively SMALL consumption of water. This withdrawal represents an I&I commitment of resources that continues throughout the operational life of this project.	Model water availability in the Brazos Watershed to ensure environmental flows are maintained downstream of makeup source. Amend state and regional water plans to obtain Texas Water Development Board approval.	Water loss as a result of drift and evaporation represents I&I consumption of water that is not be available for other uses.
	Relatively SMALL amounts of permitted constituents would be discharged with the cooling water into Lake Granbury.	The differences between plume temperature and ambient water temperature should be maintained within the limits set in the TPDES permit. Cooling water would be periodically tested and treated if necessary.	Little or no unavoidable adverse impacts.

TABLE 10.1-2 (Sheet 3 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
	Normal plant operations would discharge SMALL amounts of TPDES permitted constituents. Low level (LL) radioactive effluents into the SCR throughout the life of the CPNPP Units 3 and 4.	Discharges would be tested and if necessary the water would be treated to meet TPDES and permitting requirements. Ensure discharges comply with permit and applicable TPDES and OCDM requirements. Prepare a Spill Prevention Control and Countermeasures (SPCC) Plan to avoid/ minimize contamination from spills. In addition, ensure that Best Management Practices listed in SPCC are employed.	Little or no unavoidable adverse impacts.
	Summaries of the predicted water plume analysis data are provided in Table 5.3-2. The proposed units would create a relatively SMALL thermal plume in Lake Granbury that would last over the operational life of Units 3 and 4.	The cooling towers would significantly lower the temperature of the water that would be discharged. The plumes would be well below regulatory and permit limits. No mitigation measures are deemed necessary.	Little or no unavoidable adverse impacts.
	SMALL amounts of stormwater could drain into nearby water bodies.	Prepare a Stormwater Pollution Prevention Plan (SWPPP) to avoid/minimize releases of contaminated stormwater.	Little or no unavoidable adverse impacts.
	Routine/maintenance activities at the site and along the pipeline and transmission corridors could result in the potential for SMALL episodic spills of petroleum or chemicals.	Prepare an SPCC plan to minimize or avoid contamination from spills. Comply with the SPCC plan when working on transmission corridor.	Little or no unavoidable adverse impacts.

TABLE 10.1-2 (Sheet 4 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
Aquatic Ecology	Routine maintenance activities could result in relatively SMALL episodic chemical or petroleum spills near water that could affect aquatic life.	Prepare an SPCC Plan to avoid/minimize contamination from spills/leaks.	Little or no unavoidable adverse impacts.
	Routine plant operations could result in discharge of SMALL amounts of TPDES permitted chemicals effluents and LL radioactive waste, which meets applicable regulatory standards into to SCR that could affect aquatic life over the operational life of this project.	The TPDES wastewater discharge permit limits are set to ensure protection of aquatic populations and water quality.	Little or no unavoidable adverse impacts.
	The effects of entrainment and impingement would present a SMALL long-term I&I commitment or loss of some aquatic species.	The CPNPP Units 3 and 4 would use a closed-loop cooling system.	There is a SMALL long-term I&I impact to aquatic species. Best Available Technology for closed-loop cooling system would be used; the impacts of entrainment or impingement on aquatic species are relatively innocuous.
Terrestrial Ecology	A continued long-term disruption of some herbaceous/grassland habitat, and disruption of some wildlife near CPNPP Units 3 and 4.	Some of the vegetation and habitat disrupted during the construction phase could be revegetated and returned to its native state during the operational phase.	Little or no unavoidable adverse impacts.
	Relatively SMALL levels of salt drift from the cooling towers would be deposited in a nearby region around each tower.	The amount of salt deposition is less than the level that is expected to cause leaf damage. No mitigation is deemed necessary.	Little or no unavoidable adverse impacts.

TABLE 10.1-2 (Sheet 5 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
Air quality	Discharge of an atmospheric vapor plume from the four banks of mechanical forced draft cooling towers.	A drift suppression system is planned to be on the cooling towers to limit drift plume. No additional mitigation measures have been identified (see Section 5.3).	A SMALL unavoidable adverse impact would occur.
	Generators and the auxiliary boilers could contribute SMALL levels of air emissions over the course of this project.	These sources would comply with permit limits and regulations for installing and operating air emission sources (see Section 3.6 and 5.5.	Little or no unavoidable adverse impacts.
	Cooling towers would emit plume of water vapor that results in a SMALL limited obstruction of the viewscape and causes a shadowing effect on the ground that has a SMALL deleterious effect on vegetation growth.	The towers would comply with permit limits and regulations for installing and operating air emission sources (see Section 5.3). No mitigation measures are deemed necessary.	Little or no unavoidable adverse impacts.
	Relatively SMALL radioactive emissions would be generated by the two plants.	The two plants would comply with permit limits such that radioactive emissions would meet applicable regulatory standards.	Little or no unavoidable adverse impacts.
Radiological	Long-term but SMALL radiation doses to workers and members of the public from releases to air and surfacewater could occur over the operational life of this project.	All releases would be well below regulatory limits. Effluents would be treated according to applicable regulatory standards before being discharged into SCR. No additional mitigation is deemed necessary.	Little or no unavoidable adverse impacts.

TABLE 10.1-2 (Sheet 6 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
	A long-term but SMALL level of incidental external radiation dose to plant operational workers would occur over the operational life of this project.	Workers are trained in radioactive procedures, work plans address safety measures, and a safety program includes radioactive safety procedures. Perform general area monitoring to ensure radiological monitoring is not required.	While there is some long-term dose to employees, the mitigation measures could reduce this exposure to a negligible impact.
	Generation of LL and mixed radioactive waste.	Adopt existing waste management practices and procedures that are currently used for CPNPP Units 1 and 2. Implement employee training program to train employees in procedures for managing this waste. Develop a systematic monitoring program.	

TABLE 10.1-2 (Sheet 7 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
	High-level (HL) radioactive spent fuel is stored and isolated.	The impacts of high-level radioactive spent fuel are reduced through specific plant design features. Adopt existing waste management practices and procedures that are currently used for CPNPP Units 1 and 2. Impacts can be further reduced through employee monitoring, and safety training programs and work procedures, and by strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste in a geological repository.	The mitigation measures would reduce the risk of radioactive impacts, but there is still some residual risk. However, environmental risks constitute an I&I commitment of land.
	Radioactive and nonradioactive waste would need to be stored, treated, and disposed of. This impact represents a long-term I&I commitment of land.	The impacts of LL radioactive and nonradioactive hazardous waste can be reduced through waste minimization programs, employee training programs, and strict adherence to work procedures and applicable regulations.	There are some long-term I&I commitment of land. However, the mitigation measures substantially reduce potential impacts.
	While a relatively large amount of Uranium-235 fuel would be expended in this project, it represents a relatively SMALL I&I consumption in terms of global usage.	The only mitigation measure available (beyond the no action alternative) involves. In the future Uranium-235 could be reprocessed. Such measures are beyond the scope of this proposal.	This project represents a long-term I&I commitment of uranium. However, the amount consumed by the operation of CPNPP Units 3 and 4 represents a relatively SMALL amount in terms of global supply.

TABLE 10.1-2 (Sheet 8 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
Socioeconomics	Operation of the CPNPP Units 3 and 4 is projected to increase the worker population in the region to a total of 1550 operation workers, with 1000 workers for CPNPP Units 1 and 2, and 550 workers for CPNPP Units 3 and 4.	No additional mitigation is deemed necessary.	Little or no unavoidable adverse impacts.
	Operation of the CPNPP Units 3 and 4 would increase traffic on local roads during shift change. Outages at the CPNPP Units 3 and 4 would increase traffic even further. Traffic constitutes a long-term impact.	Staggering the outage shifts to reduce plant associated traffic on local roads may help mitigate traffic congestion.	Little or no unavoidable adverse impacts.
	Relatively short durations of episodic loud noises from operation of the CPNPP Units 3 and 4, and routine maintenance on the corridors could result in a SMALL increase in the ambient noise level experienced by workers, residents, and passersby over the course of this project.	Noise levels are not normally substantially above background at the site boundary. Personal protective equipment is provided to employees.	Little or no unavoidable adverse impacts.
	SMALL amounts of air emissions from diesel generators, auxiliary boilers and equipment, and vehicles over the operational life of this project.	Emissions are within limits established in permits and/or certificates of operation. No mitigation is deemed necessary.	Little or no unavoidable adverse impacts.

TABLE 10.1-2 (Sheet 9 of 9)
OPERATIONAL-RELATED UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Impacts
	The transmission line would present a very SMALL risk of potential electrical shock to people working near the line or as a result of passerby encountering a fallen line. This remote risk runs over the operational course of this project.	Construction of the transmission line is in accordance with applicable regulations and codes to minimize the risk of electric shock. Fences could be erected and signs could be posted warning people of potential danger.	Little or no unavoidable adverse impacts.
	In comparison to other large-scale projects, plant operations and maintenance on the corridors could result in a relatively SMALL increased potential for serious employee accidents over the operational course of this project.	An employee training and safety program (i.e. pre-job/post-job briefs, job hazard analysis, BEAR program, monitoring and trending all accidents) aid in reducing the risk of job related accidents. Work plans and procedures further reduce the risk of accidents.	Even with the best training and procedures, there is still the risk of job related accidents over the course of this project. However, the mitigation measures are expected to sharply reduce the risk of industrial accidents.

10.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The following section describes the irreversible and irretrievable commitments of environmental resources that would be affected or consumed as part of the proposed construction and operation of two MHI US-APWR nuclear power plants. The irreversible and irretrievable commitments are presented in Table 10.2-1.

For the purposes of this analysis, the term "irreversible commitment of resources" describes environmental resources that would be potentially changed by construction or operation of the station and that could not be restored at some later time to their respective states prior to construction or operations. Irretrievable resources refer to the commitment of material resources; e.g., steel, concrete, and petroleum products that, once used for construction or operations, cannot by practical means be recycled or restored for other uses.

10.2.1 IRREVERSIBLE ENVIRONMENTAL COMMITMENTS

Irreversible environmental commitments resulting from the construction and operation of the CPNPP Units 3 and 4 could include:

- Commitment or restriction of land use.
- Degradation of aquatic and terrestrial biota.
- Degradation in air and water quality.
- Socioeconomic changes.
- Commitment and contamination of land used for hazardous and low-level (LL) radioactive waste disposal.
- Uranium-fuel cycle and mining impacts.

10.2.1.1 Commitment or Restriction of Land Use

The impacts of construction and operation of CPNPP Units 3 and 4 are detailed in Sections 4.1 and 5.1, respectively.

Land committed to the construction and operation of CPNPP Units 3 and 4 would be largely unavailable for uses other than the project. After the units cease operations, and the CPNPP is decontaminated and decommissioned in accordance with NRC requirements, the land that supports these facilities could be returned to other industrial or non-industrial uses. Alternatively, the land might continue to be committed to use for other future electrical power projects. The proposal is judged to constitute a SMALL irreversible impact upon land use.

10.2.1.2 Degradation of Aquatic and Terrestrial Biota

Site preparation and construction-related activities would disrupt or destroy some flora and fauna on and near CPNPP Units 3 and 4. Species or habitats are not expected to be significantly impacted by such activities.

After construction of the units is complete, some of the disturbed areas that are no longer affected by construction activities may be revegetated and some flora and fauna may recover in these areas. The disruption on aquatic and terrestrial biota is considered to represent a SMALL irreversible impact to biota.

10.2.1.3 Degradation of Air and Water Quality

Release of treated sanitary, nonradioactive low volume and radioactive wastewater effluents into SCR would result in a SMALL adverse degradation in water quality. Some constituents would breakdown quickly while others, including radioactive constituents may remain in the biosphere for an extended period of time.

Sources that could potentially reduce local air quality are emergency backup power supply units such as diesel engines or gas turbines, and support vehicle exhaust (personal, trucks, cranes, fork lifts, etc.). The emissions from CPNPP Units 3 and 4 would be in compliance with applicable regulatory standards and permit requirements. The release of radioactive air emissions would result in a SMALL degradation in air quality.

All releases of nonradioactive and radioactive wastewater effluents to water or air from CPNPP Units 3 and 4 would be made in accordance with duly-issued permits. The releases would be in compliance with applicable regulatory standards.

10.2.1.4 Socioeconomic Changes

This proposed project would result in both short-term and long-term changes in the population, the nature and character of the local community, and local socioeconomic structure. The project would also spur indirect or secondary growth, which would further change the socioeconomic structure. Some of the impacts on infrastructure and services could be mitigated through property and worker taxes, and other revenue generating mechanisms. Other changes such as noise and traffic congestion may only be partially mitigated. The impact of the Units 3 and 4, particularly in terms of growth effects, would likely result in a SMALL to MODERATE irreversible socioeconomic disturbance. Some of this disturbance may be viewed as positive while other disturbances could be viewed as undesirable.

10.2.1.5 Commitment and Contamination of Land Used for Hazardous and LL Radioactive Waste Disposal

The CPNPP Units 3 and 4 would generate non-hazardous, hazardous, and mixed waste containing both hazardous and radioactive constituents, and LL radioactive waste that requires long-term isolation and disposal. Non-hazardous waste would be disposed of in permitted landfills. The remaining waste would be disposed of in permitted hazardous, mixed, or LL radioactive waste disposal facilities. Land committed to the disposal of radioactive and

hazardous waste represents an irreversible impact because the land is committed to that use, and can be used for few other purposes.

10.2.1.6 Uranium-fuel Cycle and Mining Impacts

An indirect impact of construction and operation of the CPNPP involves the uranium-fuel cycle and uranium mining operations that are performed to provide fissionable fuel to supply the CPNPP Units 3 and 4.

Generic environmental data related to the indirect effects of the uranium fuel cycle (UFC) are presented in Table 5.7-2. With the advancement of reactor designs, fuel management improvements, and utilization of imported uranium, current and future practices in each phase of the UFC have become more environmentally friendly, particularly in mining, milling, and enrichment. The environmental effects, described in detail in Section 5.7, substantiate that the environmental impact from the UFC would be considered SMALL.

Section 5.7 describes in detail the mining, processing, and fabrication of natural uranium. The in-situ mining process is the most used method to mine uranium, produces the least environmental impact, and is cost effective.

The impact of mining operations is considered to have a SMALL impact to geological resources.

10.2.2 IRRETRIEVABLE ENVIRONMENTAL COMMITMENTS

Irretrievable environmental commitments resulting from the construction and operation of CPNPP include the following:

- Construction and irradiated materials.
- Water consumption.
- Consumption of energy used in constructing the reactors.
- Consumption of uranium fuel.

10.2.2.1 Construction and Irradiated Materials

Some of the concrete, metals, and other materials used in the construction of the CPNPP Units 3 and 4 would become contaminated or irradiated over the life of CPNPP operations. Much of this material cannot be reused or recycled, and must be isolated from the biosphere.

Although the amount of construction materials is large, use of such quantities in large-scale construction projects such as nuclear reactors, hydroelectric and coal-fired plants, and many large industrial facilities, e.g., refineries and manufacturing plants, represent a relatively SMALL impact in terms of an incremental increase in the national consumption of such materials. Even if this material is eventually disposed of, use of construction materials in such quantities would constitute a SMALL irretrievable impact, with respect to the availability of these materials.

10.2.2.2 Water Consumption

Small amounts of potable water would be consumed during construction and operation of CPNPP Units 3 and 4. Some of the cooling water taken from Lake Granbury would be lost through the cooling towers by way of drift and evaporation.

The impact to surfacewater resources would be relatively SMALL, but represents an irretrievable natural resource that would no longer be available for local use. As part of the natural hydrologic cycle, some of this water would be replenished.

10.2.2.3 Consumption of Energy Used in Constructing the Reactors

Energy in the form of nonrenewable fuels (gas, oil, and diesel) and electricity would be consumed in construction and, to a much smaller extent, in the operation of the CPNPP. Beyond ancillary, e.g., vehicles and equipment usage, the operating nuclear reactors would not consume fossil fuels such as petroleum or coal.

The total amount of energy consumed during construction or operation of CPNPP Units 3 and 4 is very SMALL in comparison to the total amount consumed within the United States. On net balance, the two nuclear reactors would produce far more energy, as measured in British thermal units (BTU), than would be consumed in their construction and operation. For this reason, one of the key considerations related to the irretrievable commitment of energy is that operation of CPNPP Units 3 and 4 would contribute to a net reduction in the consumption of finite fossil fuel supplies. The proposal therefore represents a MODERATE TO LARGE cumulative beneficial impact in terms of energy consumption.

10.2.2.4 Consumption of Uranium Fuel

With approximately 440 nuclear reactors operating worldwide, these power plants currently produce approximately 16 percent of the world's electrical power generation (UIC 2007). As a finite resource, uranium-235 is used as the fuel for powering nearly all commercial nuclear power plants. Global uranium fuel consumption is increasing, as nuclear power generation continues to expand worldwide. The CPNPP Units 3 and 4 would contribute to a relatively SMALL irretrievable consumption of uranium-235.

Sources of uranium include uranium-235 that is produced through mining as well as secondary sources. Nuclear reactor uranium requirements exceed supplies produced through mining. The resulting shortfall has been covered by secondary sources that include excess inventories held by producers, utilities, other fuel cycle participants, reprocessed reactor fuel, and uranium derived from dismantling Russian nuclear weapons. The limited availability of uranium fuel may affect the future expansion of nuclear power.

Department of Energy (DOE) data indicate that sufficient uranium resources exist in the United States to fuel all operating and reactors planned for construction over the next 10 years at a U_3O_8 cost (1996 dollars) of $30.00/lb or less (EIA 1996). The resource categories designated as reserves and estimated additional resources are sufficient to supply this quantity of uranium.

The World Nuclear Association (WNA) studies supply and demand for uranium; the association states that the world's present measured resources of uranium, in the cost category somewhat above present spot prices and used only in conventional reactors, at current rates of consumption, are sufficient to last for some 70 years. Very little uranium exploration occurred between 1985 and 2005, so the significant increase in exploration that is currently being witnessed could readily double the known economic resources. On the basis of analogies with other metal minerals, a doubling in price from present levels could be expected to create about a tenfold increase in measured resources over time. (WNA 2007) The introduction of fast breeder reactors and other technologies may also reduce the supply-demand gap.

The addition of CPNPP Units 3 and 4 would increase consumption of uranium in the United States by approximately two percent and would increase worldwide consumption of uranium by about 0.5 percent (see Section 5.7). The addition of CPNPP would have a relatively SMALL irretrievable impact on either national or global uranium resources.

10.2.3 REFERENCES

(UIC 2007) Uranium Information Center. Nuclear Power in the World Today. Nuclear Issues Briefing Paper 7. August 2007. http://www.uic.com.au/nip07.htm. Accessed December 2007.

(EIA 1996) Energy Information Administration. Uranium Industry Annual 1996. DOE/EIA-0478(96), U.S. Department of Energy, http://tonto.eia.doe.gov/FTPROOT/nuclear/047896.pdf. Accessed December 2007.

(WNA 2007) World Nuclear Association 2007. Supply of Uranium. March 2007. http://www.world-nuclear.org/info/inf75.html. Accessed December 2007.

TABLE 10.2-1 (Sheet 1 of 3)
SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE
COMMITMENT OF ENVIRONMENTAL RESOURCES

Environmental and Material Resource Issues	Irreversible	Irretrievable
Land Use	Construction of CPNPP Units 3 and 4 would disturb approximately 675 ac of the 7950-ac CPNPP site. Additional land would be committed to the transmission and water pipeline corridors. Land may be reclaimed following decommissioning of the reactors.	N/A
Aquatic and Terrestrial Biota	Construction is expected to temporarily or permanently result in a SMALL disruption to biota on and near the CPNPP site. Some areas affected by construction may be revegetated and allowed to enter secondary succession stages during the operational phase of this project.	N/A
Degradation of Air and Water	Release of radioactive air emissions and water effluent resulted in a small adverse degradation of air and water quality.	N/A
Socioeconomic Changes	The proposed project results in both short-term and long-term changes in the population and nature and character of the local community, and the local socioeconomic structure. Some impacts on infrastructure and services are temporary, while other changes represent a permanent and irretrievable change in socioeconomic structure. Socioeconomic impacts would range from SMALL to MODERATE.	N/A

TABLE 10.2-1 (Sheet 2 of 3)
SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE
COMMITMENT OF ENVIRONMENTAL RESOURCES

Environmental and Material Resource Issues	Irreversible	Irretrievable
Commitment of Land Used for Hazardous and Low Level Radioactive Waste Disposal	Land committed to the disposal of radioactive and nonradioactive wastes is an irreversible impact because the land is committed to that use, and is largely unavailable for other purposes.	N/A
Destruction of Geological Resources During Uranium Mining and Fuel Cycle	Uranium mining would likely result in some destruction of geological resources, and pollution of lakes, streams, underground aquifers, and the soil. This would represent a SMALL to MODERATE irreversible impact upon geological resources.	N/A
Construction and Irradiated Materials	N/A	Some of the material used in construction and operation of the CPNPP would be contaminated or irradiated over the operational life of the project. Much of this material could not be reused or re-cycled, and would need to be isolated from the biosphere.
Water Consumption	N/A	Relatively small amounts of potable water would be used during construction and operation of the CPNPP. Cooling water extracted from Lake Granbury would be lost through drift and evaporation. The impact to surfacewater resources is relatively SMALL, but represents a natural resource that is no longer available for use.

TABLE 10.2-1 (Sheet 3 of 3)
SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE
COMMITMENT OF ENVIRONMENTAL RESOURCES

Environmental and Material Resource Issues	Irreversible	Irretrievable
Consumption of Energy	N/A	Nonrenewable energy in the form of fuels (gas, oil, and diesel) and electricity would be consumed in construction and, to a lesser extent, operation of the CPNPP Units 3 and 4.
Consumption of Uranium Fuel	N/A	The CPNPP units would contribute a relatively SMALL increase in the depletion of uranium that is used to fuel the reactors.

TABLE 10.2-2
ESTIMATED QUANTITIES OF IRRETRIEVABLY COMMITTED MATERIALS USED IN THE CONSTRUCTION OF TWO ADDITIONAL 1000-MWe NUCLEAR POWER PLANTS[a]

Material	Quantities Used for a Single 1000-MWe Reactor	Quantities Used for two 1000-MWe Reactors[a]
Concrete	179,000 cu ft	358,000 cu ft
Rebar for a Reactor Building	5000 tons	10,000 tons
Cable for a Reactor Building	4,063,000 linear ft	8,126,000 linear ft
Cable for a Complete Unit	10,563,000 linear ft	21,126,000 linear ft
Piping Greater than 2.5 in	447,000 ft	894,000 ft

a) The quantities provided in this table are estimated values only based on the referenced plant design. This information could change if the plant design is modified.

10.3 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE HUMAN ENVIRONMENT

The NEPA establishes a number of basic requirements that must be addressed in an environmental impact statement (EIS). One of the EIS requirements involves an analysis of "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Consistent with this NEPA requirement, this section focuses on describing the relationship between the proposed action's short-term use of environmental resources versus the maintenance and enhancement of long-term environmental productivity.

Unavoidable adverse impacts of construction and operation are discussed in Section 10.1 and the irreversible and irretrievable commitment of resources is discussed in Section 10.2. This section focuses on and compares the significant short-term benefit, principally the generation of electricity, with the uses of environmental resources that have long-term consequences on environmental productivity. Table 10.3-1 summarizes the proposed action's short-term uses and benefits versus the long-term consequences on environmental productivity.

For the purposes of this section, the term "short term" represents the period from start of construction through the plant life, including decommissioning. In contrast, the term "long term" represents the period extending beyond the decommissioning of the plant.

10.3.1 SHORT-TERM BENEFITS AND USES OF ENVIRONMENTAL RESOURCES

The proposed project involves a number of short-term benefits from construction and operation of CPNPP Units 3 and 4. These benefits and usage of environmental resources are described below.

10.3.1.1 Reliable Source of Electricity

A principal short-term benefit that would be derived from CPNPP Units 3 and 4 involves the generation of a relatively clean, reliable, and economically stable source of electrical power not prone to volatile price changes.

10.3.1.2 Reduced Dependence on Foreign Energy and Vulnerability to Energy Disruptions

This proposed project would contribute to a short-term reduction in the dependence on potentially unstable foreign energy (oil) supplies. It would help reduce the impact of future international embargos or disruptions in oil supplies. This proposed project supports the long-term national goal of achieving U.S. energy independence.

10.3.1.3 Fuel Diversity

Energy diversity is an element fundamental to the objective of achieving a reliable and affordable electrical power supply system. Over-reliance on any one fuel source leaves consumers vulnerable to price spikes and supply disruptions. CPNPP furthers the goal of creating nuclear baseload generating capacity. Operation of CPNPP also advances the national goal of obtaining a diversified mix of electrical generating sources.

10.3.1.4 Avoidance of Air Emissions

One of the principal short-term benefits derived from this proposed project involves the avoidance of the generation and release of atmospheric pollutants; such as SO_x, NO_x, and particulates, which would otherwise be produced if a fossil-fuel plant were built instead of CPNPP Units 3 and 4.

10.3.1.5 Land Use

Construction and operation of CPNPP Units 3 and 4 would result in the continued commitment of land at the existing CPNPP site. A small additional amount of land would also be required to support construction of a water pipeline in the existing right-of-way (ROW) and electrical transmission corridors. Land that is required for the corridors would result in additional loss of some agricultural or pastureland, or undeveloped habitats and woodlands. This land use would represent a short-term commitment, as some of the land could be returned to its former state once corridor construction has been completed and after the CPNPP has been decommissioned. In the short term, the proposed project would result in some potential loss in agricultural productivity, or natural habitats and woodlands in the transmission corridor. In general, the land required for a nuclear plant, on a Mw/ac basis, is less than or equal to land required for alternate technologies (Subsection 9.2.3). This potential loss does not represent significant long-term loss, as the land may be released for other uses or returned to its natural state after CPNPP Units 3 and 4 have been decommissioned.

10.3.1.6 Aquatic and Terrestrial Biota

Construction and operation of CPNPP Units 3 and 4 could potentially disrupt or destroy some flora and fauna on and near the site as would maintenance along the transmission corridor. No significant effect to species or habitats is expected to occur. After construction is completed, some flora and fauna may recover in areas that are no longer affected by construction or plant operations.

10.3.1.7 Socioeconomic Changes and Growth

Over the short-term, this proposed project would stimulate economic growth and productivity in the local area. Taxes paid by the CPNPP owner and construction employees would inject substantial revenue into the local economy. Wages spent by construction/operational workforce would likewise induce additional growth and development. In the short-term, this growth may strain some local infrastructure and services, resulting in problems such as overcrowding of schools and traffic congestion. Tax revenue derived from this project could fund increased infrastructure and social services that could partially or fully mitigate such impacts.

Property taxes and other payments made by the CPNPP owner and wages spent by the operational workforce would inject revenues into the local economy that may have long-lasting economic growth and development effects. This revenue would also spur indirect or secondary socioeconomic growth. Some secondary growth would likely continue after the CPNPP Units 3 and 4 have been decommissioned.

Increased growth could also lead to both short-term and long-term changes in the size and character of the community that would likely continue after the units have been decommissioned.

10.3.2 MAINTENANCE AND ENHANCEMENT OF LONG-TERM ENVIRONMENTAL PRODUCTIVITY

As stated earlier, the assessment of long-term consequences on environmental productivity does not include the short-term construction and operation impacts, or short-term benefits and uses of the environment. The CPNPP site was originally designated for construction of nuclear reactors. Construction and operation of CPNPP Units 3 and 4 would represent a continuation of the originally planned land use of the site. After the CPNPP Units 3 and 4 are shutdown and decommissioned to NRC standards, this land could be made available for other industrial or non-industrial uses. Many of the construction and operational impacts would cease or attenuate quickly over time. Potential long-term effects on the productivity of the human environment are described below.

10.3.2.1 Exposure to Hazardous and Radioactive Materials and Waste

Construction and operations workers are exposed to low doses of radiation and trace amounts of hazardous materials and waste. Workers are carefully monitored to ensure that radiation exposure is within regulatory limits. Construction worker exposure to radiation is discussed in Section 4.5. Local non-workers also receive a very small incremental dose of radiation. Radiological impacts related to operation of CPNPP Units 3 and 4 are described in Section 5.4. The doses are in compliance with applicable regulatory standards and do not significantly affect humans, biota, or air or water resources. Section 6.2 describes the CPNPP Units 3 and 4 radiological monitoring program. Radiation exposures would be in accordance with regulatory guidelines and standards.

Another adverse environmental impact involves long-term radioactive contamination of the reactor vessel, equipment, and other contaminated waste. This waste would principally involve hazardous and low-level (LL) radioactivity that would be generated over the operational life of the reactors and during decommissioning of the reactors. This waste would require management, disposal, and isolation. This waste would be disposed of in permitted off-site land disposal sites.

The uranium fuel used in the CPNPP reactors would provide a short-term supply of economical and clean energy. Once used in the reactors, the spent fuel must be managed as a high-level radioactive waste, and either reprocessed or isolated from the biosphere. This commitment represents a long-term commitment of the underground geological repository for high-level radioactive wastes. The disposal of high-level radioactive waste is the responsibility of the federal government.

Radiological emissions are not expected to contaminate CPNPP property or the surrounding land. After the plants cease to operate and are decommissioned, potential radiological releases also cease. No future issues associated with the radiological emissions from operation of the additional units are expected to affect the long-term uses of the CPNPP site.

10.3.2.2 Potential Benefit on Global Climate

With respect to long-term benefits on environmental productivity, this proposed project would help reduce the production of cumulative carbon dioxide emissions.

When combined with other nuclear and non-fossil fuel electrical generation projects, this proposed project would contribute to a substantial long-term cumulative avoidance of the generation of greenhouse gases that could have a beneficial impact on the maintenance and enhancement of environmental productivity.

10.3.2.3 Depletion of Uranium

The principal use of uranium is as a fuel for nuclear power plants. With approximately 440 nuclear reactors operating worldwide, these plants currently generate approximately 16 percent of the world's electrical power generation (UIC 2007). Global uranium fuel consumption is increasing, as nuclear power generation continues to expand worldwide. This proposed project would contribute to a small but cumulatively irreversible depletion of uranium. See Subsection 10.2.2.4 for additional information related to uranium supply.

The WNA studies uranium supply and demand issues and states that there is an approximately 70-year supply of relatively low-cost uranium. An increase in price of uranium can be expected to induce increased uranium exploration and production. According to the WNA, a doubling in market price from 2003 might increase the supply of this resource by tenfold (WNA 2007). The supply-demand gap may also be reduced through the introduction of fast breeder reactors and other technologies.

10.3.2.4 Conservation of Finite Fossil Fuel Supplies

Fossil fuels represent a finite natural resource, the use of which constitutes a cumulative irreversible commitment of a natural energy resource. Construction and operation of CPNPP Units 3 and 4 would contribute to the conservation of this important resource.

10.3.2.5 Construction and Operational Usage of Materials, Energy, and Water

This proposed project would result in a long-term irreversible use of materials and energy for the construction and operation of CPNPP Units 3 and 4. Once operational, the proposed plants would generate far more energy than would be used in the construction and operation of the plants.

A small amount of water is consumed in the construction of CPNPP Units 3 and 4. A relatively modest quantity of cooling water is also consumed through evaporation and drift from the cooling towers.

10.3.3 SUMMARY OF RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The short-term beneficial impacts of construction and operation of CPNPP Units 3 and 4 outweigh the long-term adverse impacts on environmental productivity. The principal short-term

benefit is the production of a relatively clean and stable form of electrical energy. With respect to long-term benefits, energy provided from nuclear power plants avoids the generation of carbon dioxide emissions that may have a significant long-term detrimental effect on global climate. Nuclear energy does not rely on fossil fuels for the generation of electricity.

The benefits derived from short-term use of nuclear power versus long-term environmental productivity involve both beneficial and deleterious considerations that are also more difficult to assess and balance. Some of these short term benefits to both society and the environment; i.e. the generation of electricity and the avoidance of fossil fuel emissions are partly off-set by the long-term adverse impacts; i.e., consumption of finite uranium supplies and long-term disposal of radioactive waste.

Table 10.3-1 compares the proposed action's principal short-term benefits of usage versus the long-term impacts on productivity. The key environmental and socioeconomic issues are listed along the vertical axis of the matrix. The relationship between short-term usage and benefits, and the relationship to maintenance and enhancement long-term productivity are annotated along the horizontal axis.

10.3.4 REFERENCES

(UIC 2007) Uranium Information Center. Nuclear Power in the World Today. Nuclear Issues Briefing Paper 7, August 2007, http://www.uic.com.au/nip07.htm, accessed December 19, 2007.

(WNA 2007) World Nuclear Association 2007. Supply of Uranium. www.worldnuclear.org/info/printable_information_papers/inf75print.htm, accessed December 19, 2007.

TABLE 10.3-1 (Sheet 1 of 3)
RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE HUMAN ENVIRONMENT

	Issues	Short-Term Usage, Benefits, and Impacts	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Usage of Environmental Resources	Depletion of Uranium	As a reactor fuel, uranium provides a short-term supply of relatively clean energy.	The proposed project contributes to the long-term cumulative depletion of the finite global uranium supply.
	Conservation of Finite Fossil Fuel Supplies	During its operational life, CPNPP Units 3 and 4 would reduce the consumption of fossil fuels supplies.	Over the long-term, the proposed project would reduce the depletion of global fossil fuel supplies.
	Materials, Energy, and Water	In the construction and operation phases, energy, and materials would be consumed. Once operational, the proposed plants would generate far more energy than would be used in the construction and operation of the plants. A small amount of water is consumed during the construction and operation of the units.	Construction and operation of the CPNPP Units 3 and 4 would contribute to the cumulative long-term irretrievable use of materials, energy, and water. However, the reactors would provide far more energy than would be consumed in their construction.
	Land Use	The proposed project would result in the continued commitment of land use at the existing site. A small additional amount of land may also be required for the water pipeline and transmission line corridors. In the short term, the project could result in some potential loss in agricultural productivity, and/or natural habitats and woodlands in the transmission corridors. In general, the land required for a nuclear plant, on a Mw/ac basis, is equal to or less than land required for alternative technologies.	The proposed project does not represent a significant long-term land-use impact, as the land could be released for other uses or returned to its natural state after the reactors have been decommissioned.

TABLE 10.3-1 (Sheet 2 of 3)
RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE HUMAN ENVIRONMENT

	Issues	Short-Term Usage, Benefits, and Impacts	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Benefits derived from the Project	Reliable Source of Electricity	Over the short term (life of the project), the proposed project would provide a relatively clean and economically stable form of electricity that is not prone to volatile price changes.	The generation of this electricity would have little to no effect on electrical supply over the long term (i.e. after the rectors have been decommissioned.
	Dependency on Unstable Foreign Energy	Over the short term, this proposed project would contribute to a reduction in the dependence on unstable foreign (oil) energy supplies and the risk of future embargoes or disruptions.	This proposed project supports the long-term aspiration of achieving U.S. energy independence.
	Avoidance of Air Emissions	The proposed project would result in the avoidance of the generation and release of atmospheric pollutants, which would be produced by an equivalent fossil fuel plant.	Avoiding the release of air emissions may result in a long-term beneficial environmental impact.
	Potential Benefit on Global Climate	Nuclear plants emit small amounts of greenhouse gases, thus operation of CPNPP Units 3 and 4 would result in fewer greenhouse gases being released to the environment.	Over the long-term, this proposed project would result in avoidance of the production of global greenhouse gases.
	Socioeconomic Changes and Growth	Construction and operation of the proposed project would stimulate short-term economic growth and productivity in the local area. This growth may strain local infrastructure and services. However, injection of tax revenues, plant expenditures, and employee spending would offset such problems. Increased growth could also lead to some changes in the size and character of the community.	Injection of tax revenues, plant expenditures, and employee spending would result in secondary economic growth and development effects that may continue after the reactors have been decommissioned. Socioeconomic changes such as transformation in the nature and character of the community is expected to continue after the CPNPP has been decommissioned.

TABLE 10.3-1 (Sheet 3 of 3)
RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE HUMAN ENVIRONMENT

	Issues	Short-Term Usage, Benefits, and Impacts	Relationship to Maintenance and Enhancement of Long-Term Environmental Productivity
Detrimental Impacts	Exposure to Hazardous and Radioactive Materials and Waste	Hazardous and low-level radioactive waste would be generated over the operational life of the reactors. High-level radioactive waste management is the responsibility of the federal government. Radiation exposure of construction and operation workers would be controlled in accordance with applicable standards and guidelines.	Radiological emissions are not expected to contaminate CPNPP property or the surrounding land. Once the plants cease to operate and are decommissioned, potential radiological releases also cease. No future issues associated with the radiological emissions from operation of the additional units are expected to affect the long-term uses of the CPNPP site. Contaminated waste must be managed in licensed off-site burial facilities and isolated from the biosphere. Over the long term, the spent fuel must be managed as a high-level radioactive waste and either reprocessed or isolated from the biosphere. This represents a long-term commitment of the local disposal area and the underground geological repository. Disposal of high-level radioactive waste is the responsibility of the federal government.
	Terrestrial and Aquatic Ecology	Construction and operation of CPNPP Units 3 and 4 would disrupt or destroy some flora and fauna on and near the CPNPP site and along the transmission corridor. However, no significant effect to species or habitats is expected to occur. After construction, some flora and fauna may recover in areas that are no longer affected by construction or plant operations.	The construction and operation of CPNPP Units 3 and 4 would not result in any significant long-term detrimental disturbance to biota or their habitats.

10.4 BENEFIT-COST BALANCE

This section provides the benefit-cost balance of the proposed project for CPNPP Units 3 and 4. The benefits are analyzed in Subsection 10.4.1, and the costs are analyzed in Subsection 10.4.2. These analyses are supported by the information and data provided in Tables 10.4-1, 10.4-2, 10.4-3, and 10.4-4. Subsection 10.4.3 summarizes the overall benefit-cost balance.

10.4.1 BENEFITS

The benefits associated with construction and operation of the proposed project are described in this subsection and listed in Table 10.4-1. The beneficial impacts of avoided air pollutants are listed in Table 10.4-2. Additional information can be found in Chapter 9, which provides an analysis comparing the proposed project to existing projects that satisfy the electrical power needs including alternative technologies, sites, and plant and transmission systems. Section 9.1 discusses the consequences of a no-action alternative. Section 9.2 compares impacts from alternative energy sources. Section 9.3 discusses the site-selection process and compares the proposed project site, with three alternate sites.

10.4.1.1 Monetary Benefits of Construction and Operation of the Proposed Project

The following subsections consider the monetary benefits of constructing and operating CPNPP Units 3 and 4.

10.4.1.1.1 Tax Payments

Tax payments would be accrued on the proposed project over the duration of the 40-year operating license. Somervell County is the tax district that is expected to be most directly affected by the operation of the proposed project. Tax information for the region is discussed in Subsection 2.5.2.3. Taxes related to construction of the proposed project associated with the wages and salaries of the construction workers are described in Subsection 4.4.2.2.1. Subsection 5.8.2.2.1 discusses regional and annual taxes related to operation of the proposed project. Several tax revenue categories are affected by the construction and operation of the proposed project. These categories include income taxes on corporate profits, wages, and salaries; sales and use taxes on corporate and employee purchases; real property taxes related to the proposed project; and personal property taxes associated with employees.

The state of Texas has no property taxes. Property taxes are levied by counties, cities, school districts, and special districts (junior colleges, hospitals, road districts, and others). Regional taxes and the political structure within the CPNPP region are discussed in Subsection 2.5.2.3. Ad valorem taxes are expected to be paid on the proposed project. The taxed amounts are phased in through the years of construction, with the total market value assessed January 1 of the year the units are operational. The taxes on the proposed project are expected to be assessed at the same tax rates in effect on CPNPP Units 1 and 2 for each tax jurisdiction. Taxes for CPNPP Units 1 and 2 are paid to Somervell County, Somervell County Water District, and Glen Rose Independent School District (ISD), the City of Glen Rose, Hood County, Granbury ISD, Tolar ISD and Hood County Library District. Luminant is required by Hood and Somervell counties to pay ad valorem taxes based on the existing units. Table 2.5-17 shows ad valorem taxes for CPNPP Units 1 and 2 for 2006.

During peak construction, there are an estimated 4953 construction workers and 248 operations workers on-site (Subsection 4.4.1.1). The CPNPP is expected to employ approximately 494 operations workers for CPNPP Units 3 and 4 at the start of operations (Subsection 5.8.1.1). Several types of taxes are generated by operations activities and purchases, and by the workforce expenditures within the vicinity. Employees of the CPNPP pay federal personal income taxes on their wages and salaries. Although Texas residents do not pay a state personal income tax, the counties in the region receive benefits through the increase in the amount of sales and use taxes collected. Additional sales and use taxes are generated by retail expenditures of the operating plants as well as the operating workforce.

The increase in collected taxes is viewed as a benefit to the state and local jurisdictions in the region. It is anticipated that the impacts of construction on the economic region would be beneficial and SMALL. Conversely, the impacts of construction and plant operation for Somervell County and to a lesser extent Hood County are anticipated to be LARGE and beneficial. The impacts of operations on tax revenue in the economic region are expected to be LARGE and beneficial (Sections 4.4 and 5.8).

10.4.1.1.2 Local and State Economy

The in-migration of construction workers is likely to create indirect jobs in the area and increase the amount of money used to purchase goods and services. Subsection 4.4.2.2 discusses the economic benefits related to construction of the proposed project. As stated, every construction job at CPNPP is estimated to provide 0.48 indirect jobs to the economic region. During peak construction, the proposed project is expected to employ 5201 total workers (Section 4.4). Only 70 percent of the construction workers and 50 percent of the operation workers are expected to migrate into the region. These 3467 construction workers should generate an estimated 1664 additional indirect jobs while the 124 operation workers generate 136 indirect jobs within the 50-mi region.

Subsection 5.8.2.2 discusses the economic benefits related to operating the proposed project. Every operations job is expected to provide 1.1 indirect jobs to the 50-mi region. Operations are expected to require approximately 494 full-time workers plus an estimated 800 to 1200 temporary workers during outages. The 123 in-migrating operations workers at the start of operations would result in an additional 135 indirect jobs for a total of approximately 258 additional jobs related to operations in the region. Because most indirect jobs are service-related and not highly specialized, it is assumed that most, if not all, indirect jobs are filled by the existing workforce.

In 2006, there were 48,965 people unemployed in the economic region. Some or all of the indirect jobs created by the construction workforce are expected to be filled by unemployed workers in these counties. The money spent in the local area by these additional workers, their families, and the additionally employed persons in each county would add to the economy of the area. At this time, annual expenditures for operations and maintenance during operation of CPNPP are estimated to be $65,000,000 per unit. The majority of these expenditures would be spent in the region, with portions of these funds being spent outside the region.

Expenditures and benefits include the creation of jobs, employee purchasing, and increased tax revenues. The impacts from plant construction employees are considered a MODERATE

beneficial impact in the economic region. With the anticipated loss of construction workers, the impact from plant operation employees in the economic region is considered a LARGE beneficial impact due to their influence on the local economy. Because the operations workforce creates indirect jobs in the economic region and the operations expenditures also benefit the economy, the impact of plant operations on the economic region is SMALL and also beneficial and no mitigation is required.

10.4.1.2 Non-Monetary Benefits

The following subsections consider the non-monetary benefits including technical benefits from construction and operation of CPNPP.

10.4.1.2.1 Net Electrical Generating Benefits

Chapter 8 describes the need for power. As discussed in Chapter 8, there is a growing baseload demand and growing baseload supply shortfall within the Electric Reliability Council of Texas (ERCOT) region. Luminant is the owner and operator of the proposed project. Each turbine generator at CPNPP has a rated and design net output of approximately 1625 MWe for each unit with a NSSS power rating of 4466 MWt (Section 3.2). Assuming an average capacity factor of 93 percent, the plant average annual electrical-energy generation over a three-year average is approximately 25,500,000 MWh. These units provide a benefit to ERCOT and Luminant by meeting the growing industrial, commercial, and residential baseload needs and increasing the reliability of electrical service.

10.4.1.2.2 Fuel Diversity, Dampened Price Volatility, and Enhanced Reliability

Energy diversity is an element fundamental to the objective of achieving a reliable and affordable electric power supply system. Achieving a balanced mix of electric generation technologies is crucial to the objectives of lowering the risk of future fuel disruptions, price fluctuations, and adverse consequences that result from changes in regulatory practices (EEI 2006). Recent history indicates that it is particularly risky to develop an over-reliance on any one energy source.

Maintaining fuel diversity is a matter of maintaining a balance of fuel mixes. Relying heavily on gas is a matter of choosing a more limited resource over more abundant fuels. The high natural gas prices and intense, recurring periods of price volatility experienced in recent years have been driven, at least in part, by demand for natural gas used in the electric generation sector. The large number of gas-fired electric plants built in the United States during the last decade has bolstered electric sector demand for natural gas. Natural gas plants have accounted for more than 90 percent of all new electric generating capacity added over the past five years. Natural gas has many desirable characteristics and should be part of the fuel mix, but "over-reliance on any one fuel source leaves consumers vulnerable to price spikes and supply disruptions" (NEI 2005).

The intense volatility in natural gas prices experienced in recent years is likely to continue and leave the ERCOT Market vulnerable. Nuclear plants provide forward price stability that is not available from generating plants fueled with natural gas. Although nuclear plants are capital-intensive to build, the operation costs are stable and dampen the volatility elsewhere in the electricity market (NEI 2005).

Natural gas is a finite energy source that has uses not readily served by other fuel choices, such as many manufacturing processes. This assessment led the U.S. House of Representatives to prepare a majority staff report that includes the following findings (USHR 2006):

- To enhance competitiveness and protect American jobs, natural gas must not be used for baseload electricity generation or for additional generating capacity. Natural gas should be reserved for industries that use it as a feedstock or for primary energy - and cannot substitute for it by fuel-switching.

- Nuclear energy must become the primary generator of baseload electricity, thereby relieving the pressure on natural gas prices and dramatically improving atmospheric emissions.

The CPNPP Units 3 and 4 benefits are focused mainly in the state of Texas and the ERCOT closed loop electrical system. The benefit to ERCOT would be a large baseload unit that would replace power generated by natural gas, which is currently the largest producer. Natural gas is generally a peaking unit (limited expansion capabilities) that is more expensive than a nuclear system (ERCOT 2006).

Operation of CPNPP advances the congressional goal of obtaining a diversified mix of electrical generating sources. The CPNPP also furthers the stated goal of creating new nuclear baseload generating capacity.

10.4.1.2.3 Effects on Regional Productivity

Construction of CPNPP Units 3 and 4 is anticipated to require a workforce of 4953 people (Section 4.4), which creates about 1664 indirect jobs, for a total of 5131 additional permanent or temporary jobs within the 50-mi region. Temporary construction workers and their families increase rental and property demand, spending on goods and services, and sales taxes that most people consider to be a benefit to the local economy. Operation of the plant is anticipated to require approximately 494 direct jobs (Section 5.8), with an additional 272 indirect jobs for a total of 766 additional jobs in the region.

10.4.1.2.4 Air Pollution and Emissions Avoidance

Natural gas and coal fired electrical generation plants produce air pollutant emissions (e.g., nitrogen oxides, sulfur dioxide). With respect to all industrial sources, power plants account for the following emissions in the United States:

- Sulfur dioxide, 64 percent.

- Nitrogen oxides, 26 percent.

- Carbon dioxide, 36 percent.

Coal-fired plants generate the majority of the industry's emissions (USHR 2006). Beyond steam and water vapor, modern nuclear reactors produce virtually no air emissions, and only very minor

levels of radioactive emissions. Nuclear power generation avoids local and regional air quality impacts.

Smog is a form of air pollution produced by the photochemical reaction of sunlight with hydrocarbons and nitrogen oxides that have been released into the atmosphere (AHD 2000). Ground-level ozone is a major constituent of smog. Major sources of nitrogen oxides and volatile organic compounds that produce ozone include emissions from industrial facilities, electrical utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents (EPA 2007).

Section 9.2 analyzes coal- and gas-fired alternatives to the proposed project. The beneficial impacts of avoided air pollutant emissions from building CPNPP Units 3 and 4 instead of equivalent fossil fuel plants are summarized in Table 10.4-2.

As indicated in Table 10.4-2, a nuclear generating facility the size of CPNPP Units 3 and 4, with their combined annual electricity generation, provides substantial emissions avoidance over coal- or gas-powered generation alternatives. The generation of significant air emissions is avoided by forgoing construction of a comparably sized coal- or gas-fired alternative and constructing CPNPP instead. Some of the benefits of reduced emissions related to use of nuclear power for electricity generation are offset by emissions related to the uranium fuel cycle, see Section 5.7 (e.g., emissions from mining and processing the fuel). Similar types of emissions are associated with mining and production of coal and, to some extent, drilling for natural gas.

10.4.1.2.5 Greenhouse and Global Warming Avoidance

Nuclear power is the only available and proven generation technology that provides a viable alternative to fossil-fired plants for baseload electrical generation.

10.4.1.2.6 Waste Products

Nuclear plants are beneficial because they typically do not produce the volumes of nonradioactive hazardous effluents and waste products that are associated with fossil fuel plants, particularly coal-fired plants, which produce a large volume of ash waste.

10.4.1.3 Other Benefits

Section 10.3 describes the relationship between the short-term uses and long-term productivity of the human environment.

If CPNPP Units 3 and 4 are pursued as part of a comprehensive U.S. nuclear program, over time, they would contribute to a significant reduction in dependency on foreign energy supplies, a reduction in the foreign trade deficit, and would offset the depletion of fossil fuel supplies. These benefits are listed in Table 10.4-1.

10.4.2 COSTS

This subsection describes the internal and external costs associated with construction and operation of CPNPP. Internal generally refers to the monetary costs associated with a project, while external refers to the non-monetary environmental costs of constructing and operating the

CPNPP Units 3 and 4. These costs are outlined in Table 10.4-3. Many of the cost attributes described in this subsection are detailed in Sections 10.1, 10.2, and 10.3.

10.4.2.1 Internal Costs

This subsection describes the monetary costs of constructing and operating CPNPP. Internal costs include capital costs of the plant and transmission lines, and operating costs (staffing, maintenance, fuel) as well as decommissioning costs.

10.4.2.1.1 Construction

This subsection describes projected internal monetary costs related to construction of CPNPP based on published literature. Many cost studies with a wide range of cost estimates are available. The following four studies are among the most authoritative sources because of the depth of their analyses, and the other studies tend to be based on these sources:

- Organization for Economic Co-operation and Development (OECD) study of projected electricity generating costs (OECD 2005).
- Massachusetts Institute of Technology (MIT) study on the future of nuclear power (MIT 2003).
- University of Chicago (UC) study on the economic future of nuclear power (UC 2004).
- Energy Information Administration (EIA) annual energy outlook (EIA 2006).

The Keystone Center Study (KC 2007) is more recent and also provides valuable information.

“Overnight capital cost” is a term commonly used to describe the monetary cost of constructing large capital projects such as a power plant. Capital costs are incurred during construction when actual outlays for equipment, construction, and engineering are expended. Capital costs represent about 60 percent of total nuclear energy generation costs (OECD 2005). “Overnight” capital costs are exclusive of interest and include engineering, procurement and construction costs, owner's costs, and contingencies. Owner's costs typically include site work and preparation, cooling water intake structures and cooling towers, import duties on components, insurance, spare parts, development costs, project management costs, owner's engineering, state and local permitting, legal fees, and operations staffing and training.

In these studies, estimates of overnight capital costs for constructing a nuclear reactor range from $1100 to $2500 per kW, with $1500 - $2000 per kW (in 2002 dollars) being the most representative range. Many factors account for the range in values: the specific technology and assumptions about the number of like-units built, allocations of first-of-a-kind costs, site location and parity adjustments to allow comparison between countries, and allowances for contingencies are common examples. These cost estimates are not based on nuclear plant construction experience in the United States, which is more than 20 years old. Actual construction costs overseas have generally been less than the most recent domestic construction, suggesting that the industry has learned how to reduce costs. An assumption in these studies is that the overseas' experience can be applied domestically (UC 2004).

When total costs were considered, the Keystone study estimated actual construction costs would fall in the range of $3600 – $4000 per kW (in 2007 dollars including financing costs and a five to six year construction period) (KC 2007). Considering the cost range from this study and a combined installed capacity of 3250 MWe, the total "capital cost" for the CPNPP Units 3 and 4 could range from $11.3 to $12.5 billion.

Actual project cost for CPNPP Units 3 and 4 would depend on such things as:

- Actual length of construction.
- Actual interest rates during construction.
- Transmission upgrades or improvements that may be required to support the project.
- Allowed cost recovery during construction.

Relative construction costs for the proposed site and alternative plant and transmission systems are discussed in Section 9.4. For example, the cost of constructing a system that uses a mechanical draft cooling tower (MDCT) is $232 million less than a natural draft cooling tower, $88 million less than an MDCT open cycle, and $338 million less than an air to air system (in 2007 dollars, Table 9.4-3).

Based on current Oncor studies at least one additional transmission corridor (possibly two) is proposed for the project (Subsection 2.2.2); however, these studies will not be finalized for several years. In addition, costs associated with construction and maintenance of a potential transmission corridor are not available.

10.4.2.1.2 Operation

Operational expenses are incurred throughout the life of the plant and include costs for operation and maintenance, and fuel and decommissioning (MIT 2003). According to the OECD study (OECD 2005), operations and maintenance (O&M) costs reported in the United States include operation, site monitoring, maintenance, engineering support staff, administrative staff, waste management and disposal, general expenses, insurance, support to regulatory bodies, and safeguards. The same study reports that fuel cycle costs include uranium concentrate, conversion to UF6 enrichment, fuel fabrication, spent fuel transportation, and spent fuel encapsulation and disposal. The University of Chicago (UC 2004) study lists fixed O&M costs at $60 per kW and variable O&M costs at $2.10 per MWh (in 2003 dollars). Fuel costs are listed at $4.35 per MWh. The OECD study (OECD 2005) reports O&M costs at $8.50 per MWh (in 2003 dollars) and fuel costs at $4.70, with a discount rate of 10 percent. The MIT study (MIT 2003) reported O&M and fuel costs combined at $13 per MWh, in 2002 dollars. Escalating these values to 2007 dollars results in estimates of O&M costs at $9.90 per MWh and fuel costs at $6.21 per MWh. The Keystone Study (KC 2007) provides O&M and fuel costs in 2007 dollars. According to this study, fixed O&M costs may be expected to range from $19 to $27 per MWh, with variable O&M costs at $5 per MWh ($24 – $32 per MWh total). This study also reports nuclear fuel costs (in 2007 dollars) ranging from $13 – $17. Combining the earlier studies with the recent Keystone study yields a range of estimated O&M cost and fuel costs of $16 – $37 per reactor, in 2007 dollars.

Measures to control adverse impacts related to operation are discussed in Section 5.10. Monetary costs associated with the design and implementation of these measures include such activities as training employees in environmental compliance and safety; treatment, storage, and disposal of any hazardous wastes generated; and acquisition and compliance with required operational permits and environmental requirements.

These estimates also include decommissioning, but due to the effect of discounting a cost that occurs over as much as 40 years into the future, decommissioning costs have relatively little effect on the levelized cost.

The previously cited studies also provide coal- and gas-fired generation costs for comparison with nuclear generation costs. One study (OECD 2005) showed nuclear costs competitive with those of natural gas and coal while the other studies showed nuclear costs exceeding cost estimates for gas and coal. One such study (MIT 2003) indicated that nuclear power is not economically competitive but suggested steps for the government to take to improve nuclear economic viability. Since the study was published, the government has undertaken these steps as follows:

- The U.S. government has endorsed nuclear energy as a viable carbon-free generation option.
- The Energy Policy Act of 2005 instituted a production tax credit for the first advanced reactors brought online in the United States.
- The DOE provides financial support to plants engaged in testing the NRC licensing processes for early site permits and combined operating licenses.

The recent government steps and incentives have negated the MIT study's conclusion that nuclear power is not economically competitive.

10.4.2.2 External Costs

This subsection describes the external (non-monetary) environmental and social costs of constructing and operating CPNPP. External costs are summarized in Table 10.4-3.

10.4.2.2.1 Land Use

Loss of habitat is one of the costs of constructing CPNPP Units 3 and 4. CPNPP generation units and support facilities are located on the 7950-ac CPNPP site located in Hood and Somervell counties. The site boundary encompasses the operating nuclear CPNPP Units 1 and 2, the proposed location for CPNPP Units 3 and 4, the support structures and facilities, and the entire SCR as described in Subsections 1.1.2 and 2.2.1.1. Approximately 123 ac of the 7950-ac site are expected to be disturbed for construction of Units 3 and 4 while 152 ac are expected to be disturbed for the cooling towers and approximately 400 ac could be disturbed for construction of the Blowdown Treatment Facility (BDTF). A majority of this area was previously affected by prior construction activities for CPNPP Units 1 and 2. A large portion of the area where the cooling towers for the proposed project are planned to be constructed consists of undisturbed woodland that is expected to require clearing. Additional land disturbances are anticipated due to

construction of some of the support buildings and refurbishment of existing and permanent roadways. A detailed description of land-use impacts is provided in Section 4.1.

A temporary expansion of the existing water pipeline ROW is expected during pipeline construction as it runs from the CPNPP property boundary northeast to its terminus in Lake Granbury. This expanded ROW was evaluated for potential impacts during the Phase I assessment. There are two prehistoric archaeological sites, 41HD14 and 41HD15, within the off-site APE and neither of the sites are eligible for listing in the NRHP based on their listing criteria.

One additional transmission line corridor (possibly two) is required for the proposed project. Transmission corridors are discussed in Sections 2.2, 4.1, 5.1, and 9.4. Operation of transmission lines has minimal to no effects on land use. Transmission line easements restrict placement of permanent structures in the easement or plantings that may interfere with line maintenance. Otherwise, no restrictions are placed on land use.

While the impacts of the construction of the transmission line corridors are not known at this time, the overall effect of CPNPP Units 3 and 4 construction on land use in the vicinity of the site is expected to be SMALL based on minimal impacts to local transportation systems, pipelines, rivers, and recreational areas.

10.4.2.2.2 Hydrological and Water Use

Sections 4.2 and 5.2 discuss hydrologic alterations for construction and operations. As discussed in these subsections, there are some costs associated with providing water for various needs during construction and operation. Water for construction of CPNPP Units 3 and 4 would be obtained from the Somervell County Water District (SCWD) via a pipeline from Wheeler Branch Reservoir and supplemented by water needed. Such construction activities include concrete batch plant operation, initial fills and flushes, crafts demand, and fire protection (FP) test/fill. Potable water for domestic and sanitary needs would be supplied from SCWD. Construction activities for the proposed project's facilities are expected to require an estimated average and maximum water amount of approximately 300 gpm – 1000 gpm, respectively (Section 4.2). Water would be withdrawn from SCR for dust suppression and general cleanup. Construction potable water consumptive use is estimated at 50 gpm (Section 4.2). Construction plans do not call for dewatering activities that could affect groundwater aquifer flow and quality. Environmental impacts to surface and groundwater would be SMALL and are managed under the provisions of applicable state regulatory programs.

During plant operation, cooling water would be taken from Lake Granbury, an impoundment of the Brazos River. Some of this water would be lost to evaporation and represents a permanent consumptive loss. Water loss primarily as a result of forced evaporation would result in a net consumption of approximately 60,048,000 gpd for CPNPP Units 3 and 4 during normal operation (Table 2.3-38). This volume should have a minimal effect on Lake Granbury as well as the Brazos River below Lake Granbury. An estimated 44 percent increase in future water consumption is expected in the Brazos River basin. Subsection 5.2.1.4 concludes that based on this minimal use and the majority of this water from surrounding users [DeCordova Bend electric power plant, Wolf Hollow electric power plant, Lake Granbury Surface Water and Treatment System (SWATS), and CPNPP Units 1 and 2] is returned in the form of effluent, water withdrawal is not expected to affect the available water for other water users nor for the natural aquatic

ecological communities of the Brazos River basin. Relatively small levels of nonradioactive and radioactive effluents are expected to be introduced into the SCR, where all wastewaters are discharged. Water quality effects of chemical effluents discharged into Lake Granbury during CPNPP operations are discussed in Subsection 5.2.3.4 and are described as SMALL. Subsection 5.4.3 states that radioactive releases in liquid effluents meet the standards for concentrations of released radioactive materials in water as specified in 10 CFR Part 20. Cooling water blowdown that discharges into Lake Granbury results in a small thermal plume. Subsection 5.2.2.3.1 states that impacts of discharge temperature from CPNPP are SMALL.

10.4.2.2.3 Terrestrial and Aquatic Biology

Ecological effects related to plant construction and operations are discussed in Sections 4.3 and 5.3. Construction of a pipeline to move discharge water from CPNPP to Lake Granbury is anticipated. The selected pipeline location for this project is routing east of the reservoir dam around the southern extent of SCR to the project site. Some costs due to mortality of wildlife during construction are anticipated. These losses are not expected to be large enough to affect the long-term stability of wildlife populations.

As discussed in Section 3.4, intake water taken from Lake Granbury passes through passive submerged screens designed to minimize uptake of aquatic biota and debris. The screens are composed of 3/8-in mesh and are sized for a maximum through screen velocity of less than 0.5 fps. Subsection 5.3.1.2.1 states that impacts to aquatic species from intake operations are SMALL.

10.4.2.2.4 Air Emissions, Effluents, and Wastes

Relatively small amounts of air emissions from gas turbine generators, auxiliary boilers and equipment, and vehicles would be generated. Cooling tower drift deposits some salt on the surrounding vicinity, but the level is unlikely to result in any measurable impact on plants and vegetation. The cooling tower also produces an atmospheric vapor plume.

Small amounts of liquid effluents would be discharged into Lake Granbury. Blowdown goes into Lake Granbury and is the largest effluent of the project. Relatively small amounts of hazardous wastes that need to be managed and disposed pursuant to the Resource Conservation and Recovery Act (RCRA) would be generated. Section 3.6 and Subsection 2.3.3 discuss nonradioactive waste systems while Section 5.5 discusses plant waste.

10.4.2.2.5 Materials, Energy, and Uranium

Construction of the additional nuclear units would result in an irreversible and irretrievable commitment of materials and energy (Section 10.2). Operation of the reactors would contribute to the depletion of uranium.

10.4.2.2.6 Socioeconomic Costs

Sections 4.4 and 5.8 discuss socioeconomic costs related to construction and operation of CPNPP. Additional public and social services might be required to meet the demands of people

moving into the area during construction and operation of CPNPP. These costs should be largely offset by increased tax revenues and economic input from those individuals and their families.

10.4.3 SUMMARY

As discussed in Section 8.4, there is a growing baseload demand and growing baseload supply shortfall for the ERCOT region. Timing is important for providing additional power-generating sources. Delays in planning and preparation for meeting projected baseload supply shortfalls could result in widespread rolling blackouts or brownouts. Given the lead time necessary to license and build additional plants, delays can be especially critical. CPNPP helps meet this need by supplying an average annual electrical-energy generation of about 25,500,000 MWh.

The proposed project would generate electricity that results in a significant reduction in emissions, with respect to comparably-sized coal- or gas-fired alternatives. As discussed in this subsection, the proposed CPNPP Units 3 and 4 also have important strategic implications in terms of lessening dependence of the United States on foreign energy supplies and their potential interruption, as well as vulnerability to volatile price changes. While the additional direct and indirect creation of jobs places some temporary burden on local services and infrastructure, the annual taxes and revenue generated by additional workers contribute to the local economy and fuel future growth.

A summary of the principal benefits and costs of the CPNPP Units 3 and 4 project is shown in Table 10.4-4. The benefits of the additional nuclear reactors significantly outweigh the economic, environmental, and social costs. Further, the overall benefit-cost balance, based upon the proposed plant, would not be significantly improved by the selection of an alternative site or by use of an alternative generating system.

10.4.4 REFERENCES

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TABLE 10.4-1 (Sheet 1 of 2)
MONETARY AND NON-MONETARY BENEFITS CONSTRUCTING AND OPERATING CPNPP UNITS 3 AND 4

Benefits Category	Project as Proposed	
Taxes and Revenue		
Sales Tax	1% of gross receipts less compensation or the costs of goods sold.	
Property Taxes by Jurisdiction (Total Tax Rate-2002 in $/$100 valuation	Hood County:	$0.3325
	Granbury:	$0.4400
	Lipan:	$0.3300
	Tolar:	$0.4600
	Acton MUD:	$0.1322
	Granbury ISD:	$1.7300
	Lipan ISD:	$1.7500
	Tolar ISD:	$1.6700
	Somervell County:	$0.3300
	Glen Rose:	$0.4857
	Somervell Co. Water Dist.	$0.0044
	Glen Rose ISD:	$1.0753
Ad valorem taxes paid by County (2006)	Hood County:	$42,695
	Somerville County:	$24,361,909
Effects on Regional Productivity		
Construction Workers	4953 people employed during peak construction.	
Operational Workers	494 people employed during operation.	
Indirect Jobs Created	An incremental increase in indirect jobs added.	
Net Electrical Generating Benefits		
Generating Capacity	3250 MWe	
Electricity Capacity	25,500,000 MWh annually	

TABLE 10.4-1 (Sheet 2 of 2)
MONETARY AND NON-MONETARY BENEFITS CONSTRUCTING AND OPERATING CPNPP UNITS 3 AND 4

Benefits Category	Project as Proposed
Fuel Diversity	Increases fuel mix diversity that reduces potential energy disruptions and other adverse consequences.
Improvements to Local Facilities	Road repairs and improvements and bridge repairs and improvements in the vicinity of CPNPP.
Air Emission Avoidance	Avoidance of 253 – 3933 tons per year (Tpy) sulfur dioxides; 2610 – 2676 Tpy nitrogen oxides; 1115 – 3625 Tpy carbon monoxide; 8.2 million – 35 million Tpy carbon dioxide; 142 – 18,886 Tpy fine particulates.
Global Warming and Climate Change	Significant beneficial impact in terms of avoidance of greenhouse gases.
Cultural Resources	Mitigative work adding to local historic and prehistoric knowledge base.
Electric Reliability	Enhances electric reliability.
Price Volatility	Dampens potential for price volatility.
Hazardous Wastes	Compared with fossil-fueled plants, particularly coal-fired plants, nuclear plants produce significantly less nonradioactive hazardous effluents and waste products.
Aesthetics	With the exception of a steam and vapor plume, nuclear plants do not produce negative air aesthetics that are associated with fossil-fueled plants.
Socioeconomics	Increased tax revenue supports improvements to public infrastructure and social services. The increased revenue spurs future growth and development.
Fossil Fuel Supplies	Offsets usage.

TABLE 10.4-2
AVOIDED AIR POLLUTANT EMISSIONS[a]

Pollutant	Luminant Estimate of a 3180 MW Gas-Fired Plant[b] English Tons per Year (Tpy)	Luminant Estimate of a 3180 MW Coal-Fired Plant[b] English Tons per Year (Tpy)
SO_2	253	3933
NO_x	2676	2610
CO	1115	3625
CO_2	8,200,000	35,000,000
$PM_{2.5}$	142	18,886
PM_{10}	N/A	4344

a) Air emissions were calculated using AP 42.

b) Numbers based on information presented in Subsection 9.2.3.

TABLE 10.4-3 (Sheet 1 of 2)
INTERNAL AND EXTERNAL COSTS OF CPNPP UNITS 3 AND 4

Cost Category	Cost
Internal Costs	
Overnight Capital Costs (Includes inflation and financing)	$3,600 – $4,000 per kW
Construction Costs (Two Units)	$11.3 – $12.5 billion (based on industry studies)
Operation (Two Units)	$32 – $74 per MWh (based on industry studies)
External Costs	
Land and Land Use	The CPNPP Units 3 and 4 would alter about 675 ac of the 7950-ac site. A large portion of the land utilized by the proposed project was disturbed during construction of CPNPP Units 1 and 2. A large area of undisturbed woodland would be cleared for the cooling towers and blowdown treatment facilities of the proposed project. Other areas would be disturbed during construction of the cooling water pipeline intake, discharge structures, and additional transmission corridors. Impacts related to land use are expected to be SMALL.
Hydrological and Water Use	There are some costs associated with providing water for various needs during construction and operation. Cooling water is taken from Lake Granbury. Relatively small levels of non-hazardous and/or radioactive effluents are introduced into SCR or Lake Granbury. Effects of blowdown effluent discharges to Lake Granbury are expected to be SMALL. Thermal plume resulting from cooling water blowdown discharged into Lake Granbury. The effect of consumption of cooling water is generally SMALL.

TABLE 10.4-3 (Sheet 2 of 2)
INTERNAL AND EXTERNAL COSTS OF CPNPP UNITS 3 AND 4

Cost Category	Cost
Terrestrial and Aquatic Biology	Some wildlife mortality during construction is anticipated; however, these costs are expected not to affect long-term wildlife populations. Building a water pipeline through SCR would have a MODERATE but short-lived impact. Wildlife mortality, including aquatic biota, during operation is expected to be minimal.
Hazardous and Radioactive Waste	Management and disposal of small amounts of hazardous wastes pursuant the RCRA. Storage, packaging for shipment, and disposal of low-level (LL) radioactive waste and high-level radioactive spent nuclear fuel. Commitment of geological resources for disposal of radioactive spent fuel.
Air Emissions	Air emissions from gas and diesel generators, auxiliary boilers and equipment, and vehicles that have a SMALL impact on workers and local residents. Cooling tower drift deposits some salt on the surrounding vicinity, but the level is unlikely to result in any measureable impact on plants and vegetation. Cooling tower produces atmospheric plume discharge. Impacts are SMALL.
Materials, Energy, and Uranium	Irreversible and irretrievable commitments of materials and energy, including depletion of uranium.
Socioeconomic	Construction of CPNPP may pose additional costs to public and social services in the area. These costs are believed to be more than offset by increased tax revenues generated directly and indirectly by plant construction and operation.

TABLE 10.4-4 (Sheet 1 of 4)
SUMMARY OF PRINCIPAL BENEFITS AND COSTS FOR CONSTRUCTING AND OPERATING CPNPP UNITS 3 AND 4

Attribute	Benefits	Costs
Capital and Operating Costs	Provides a relatively clean and abundant form of baseload electricity that is relatively cost-competitive with fossil fuels.	Capital costs are estimated to range between \$3600 – \$4000 per kW for a combined two-unit construction cost of \$11.3 – \$12.5 billion.
		Operational, two-unit costs are estimated to range between \$32 – \$74 per MWh. Note: These cost estimates are based on industry studies.
Taxes and Revenue	Luminant would pay 1% of gross receipts less compensation or the costs of goods sold.	N/A
	Ad valorem taxes are paid on the new CPNPP units.	N/A
	Increased property tax levied by impacted jurisdictions.	Increased services to in-migrants for housing, education, and public safety.
Regional Productivity	Provides an influx of 4953 construction workers and 494 operational workers.	N/A
	Adds 1936 indirect jobs to the 50-mi region (1801 during construction and 135 during operations).	N/A
Net Electrical Generation	Provides a combined electrical generation of 25,500,000 MWh annually.	N/A
Fuel Diversity	Increases fuel mix diversity that reduces potential energy disruptions and other adverse consequences.	N/A
Electrical Reliability	Enhances electrical reliability.	N/A

TABLE 10.4-4 (Sheet 2 of 4)
SUMMARY OF PRINCIPAL BENEFITS AND COSTS FOR CONSTRUCTING AND OPERATING CPNPP UNITS 3 AND 4

Attribute	Benefits	Costs
Price Volatility	Dampens potential for price volatility.	N/A
Air Pollution	Provides major beneficial impact in terms of avoidance of fossil-fueled power plant air emissions.	Generates some minor amounts of air emissions during construction and some minor levels of radioactive air emissions during operations.
Aesthetics	Does not contribute to smog that significantly obscures the viewscape when compared to fossil-fueled plants.	Produces a relatively small steam and vapor plume that can obscure the viewscape.
Global Warming and Climate Change	Offers significant beneficial impact in terms of avoidance of greenhouse gases that may contribute to the greenhouse effect.	N/A
Dependence on Foreign Energy	Reduces dependence on foreign energy and vulnerability to energy disruptions.	N/A
Fossil Fuel Supplies	Offsets usage of finite fossil fuel supplies.	Consumes finite supplies of uranium.
Land and Land Use	Consumes less land than a comparably gas-fired plant and a comparable coal-fired plant.	The CPNPP Units 3 and 4 construction alters approximately 123 ac, 7950 ac existing CPNPP site and approximately 400 ac are expected to be altered for the BDTF. 152 ac are altered for the cooling towers. No explanation of existing transmission corridor is expected.

TABLE 10.4-4 (Sheet 3 of 4)
SUMMARY OF PRINCIPAL BENEFITS AND COSTS FOR CONSTRUCTING AND OPERATING CPNPP UNITS 3 AND 4

Attribute	Benefits	Costs
Hydrological and Water Use	Produces a cleaner form of energy than either coal- or gas-fired plants. Consumes about the same amount of water as a coal- or gas-fired plant, but results in much lower effluent discharges.	Consumes some water. Produces a thermal plume and small amounts of radioactive waste are discharged.
Terrestrial and Aquatic Species	Produces a relatively cleaner form of energy with about the same level of impacts on terrestrial and aquatic species as is expected from either a comparable coal- or gas-fired plant.	Some cost to wildlife due to mortality as a result of construction and operation of Units 3 and 4.
Hazardous and Radioactive Waste	Produces much less hazardous waste than do fossil-fueled plants, particularly coal-fired plants.	Generates relatively small quantities of hazardous and LL radioactive waste that require storage, packaging for shipment, and disposal. Requires storage and disposal of high-level radioactive spent nuclear fuel. Commitment of geological resources for disposal of radioactive spent fuel.
Materials, Energy, and Uranium	Reduces the amount of finite fossil fuels used if a comparable coal- or gas-fired plant were built instead.	Irreversible and irretrievable commitments of materials and energy, including depletion of uranium.

TABLE 10.4-4 (Sheet 4 of 4)
SUMMARY OF PRINCIPAL BENEFITS AND COSTS FOR CONSTRUCTING AND OPERATING CPNPP UNITS 3 AND 4

Attribute	Benefits	Costs
Socioeconomic	These costs are more than offset by increased tax revenues generated and indirectly by plant construction and operation. Increased tax revenue supports improvements to public infrastructure and social services and spurs future growth and development.	Construction of the proposed project places additional burdens on public infrastructure and social services. The growth and development changes the local character of the surrounding community.

10.5 CUMULATIVE IMPACTS

This is a supplemental ER section and, therefore, is not covered by a NUREG-1555, ESRP. This section summarizes the cumulative impacts to the environment that could result from the construction, operation, and decommissioning of CPNPP Units 3 and 4. A cumulative impact is defined in the Council on Environmental Quality (CEQ) regulations (40 CFR 1508.7) as an "...impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions." The CEQ regulations specify that an EIS must discuss cumulative impacts (40 CFR 1508.25[c][3]). Regulatory positions and specific criteria to meet these regulations are in RG 4.2, Rev. 2, Preparation of Environmental Reports for Nuclear Power Stations. In an application, it requires the inclusion of an assessment of (1) cumulative and projected long-term effects from the point of view that each generation is a trustee of the environment for each succeeding generation, and (2) any cumulative buildup of radionuclides in the environment.

To meet these criteria and regulations, this section addresses the following information:

1. Identification of past, present, and known future federal, non-federal, and private actions that could have meaningful cumulative impacts with the proposed action.

2. Identification of the geographic area to be considered in evaluating cumulative impacts.

3. Information on cumulative impacts of relevant actions within the identified geographic area.

The impact characterization is consistent with the criteria that the NRC established in 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, Appendix B, Table B-1, Footnote 3, which lists impacts as SMALL, MODERATE, and LARGE. The definition of these impacts is presented in Sections 4.7 and 5.11 for construction and operations, respectively, of CPNPP Units 3 and 4. Cumulative impacts anticipated during preconstruction and construction are discussed in Section 4.7. Cumulative impacts anticipated during plant operations are discussed in Section 5.11. The environmental analysis encompassed land use; hydrology and water use; ecology, both terrestrial and aquatic; socioeconomical, historical, and cultural resources; air quality, meteorology, and radiological impacts.

10.5.1 CUMULATIVE IMPACTS OF PLANT CONSTRUCTION

Construction-related cumulative impacts are assessed in Section 4.7.

10.5.2 CUMULATIVE IMPACTS OF PLANT OPERATIONS

Operations-related cumulative impacts are assessed in Section 5.11.

10.5.3 CONCLUSION

The cumulative impacts from construction and operation of CPNPP Units 3 and 4 are not significant even when considered in conjunction with the impacts from the operation of CPNPP Units 1 and 2 and other existing, currently planned, or reasonably foreseeable future activities in the region (50-mi radius).