CHAPTER 8

NEED FOR POWER

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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 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 8

NEED FOR POWER

8.0 NEED FOR POWER

Luminant Generation Company LLC (Luminant) is the applicant for Comanche Peak Nuclear Power Plant (CPNPP) Units 3 and 4. Luminant, a merchant energy company, provides electricity and related services to wholesale customers in the Electric Reliability Council of Texas (ERCOT) region (Figure 8.1-1) (TXU CORP 2006) (CPNPP 2007). The ERCOT wholesale power market has been fully competitive since 1995, and the ERCOT retail power market has been competitive since 2002 (ERCOT 2007). The ERCOT region is one of the eight North American Electric Reliability Corporation (NERC) regions (Figure 8.1-2) in the United States and geographically lies totally within the State of Texas. The ERCOT organization is responsible for the reliability of the electric grid and for ensuring nondiscriminatory access to transmission services by all market participants. This responsibility also includes assessment of long-term power needs and approval of transmission upgrades necessary to maintain grid reliability.

Luminant owns a mixture of nuclear, coal, and gas generating plants that provide wholesale electric power to the ERCOT grid. Luminant's holding company, Luminant Holding Company LLC, is a wholly-owned subsidiary of Energy Future Holdings Corporation (EFH), a Dallas-based energy company that manages a portfolio of competitive and regulated energy businesses, primarily in the ERCOT market. The Luminant business segment includes merchant electric generation, a business development group, a construction group, and a wholesale market group. In addition, Luminant is the largest purchaser of wind-generated power in Texas and the fifth largest purchaser in the United States.

Luminant proposes to construct and operate two Mitsubishi Heavy Industries (MHI)-designed U.S. Advanced Pressurized Water Reactor (US-APWR) units at its CPNPP site located in north-central Texas. The current generating assets at this site, owned and operated by Luminant, include two Westinghouse four-loop pressurized water (PWR) reactors (Units 1 and 2) and supporting infrastructures. Units 1 and 2 have been in commercial operation since 1990 and 1993, respectively (Section 1.1).

For new reactor applications, such as this application for a combined license, specific guidance is provided in Chapter 8 of NUREG-1555, Standard Review Plans for Environmental Reviews for Nuclear Power Plants (ESRP). This guidance states that "affected States and/or regions are expected to prepare a need-for-power evaluation. The NRC reviews the evaluation and determines if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. If the need-for-power evaluation is found acceptable, no additional independent review by NRC is needed, and the State's analysis can be the basis for ESRPs 8.2 through 8.4."

This chapter describes the methods used by ERCOT, as tasked by the Public Utility Commission of Texas (PUC), to assess the need for power in the ERCOT region. The description of this process is based on a series of ERCOT assessment reports designed to study the need for increased transmission and generation capacity (ERCOT 2007b), (ERCOT 2006a), (ERCOT 2006) and (ERCOT 2007a). This chapter includes four sections, as described below.

- Section 8.1, Description of Power System, presents an overview of the ERCOT region and a brief summary of EFH's subsidiaries in the ERCOT power system.
- Section 8.2, Power Demand, presents a regional demand assessment based on the ERCOT reports, assessments, and analyses.
- Section 8.3, Power Supply, presents a regional supply assessment based on the ERCOT reports, assessments, and analyses.
- Section 8.4, Assessment of Need for Power, provides conclusions regarding the need for power based on the ERCOT reports, assessments, and analyses.

Section 8.4 provides the basis for a determination that the ERCOT reports, assessments, and analyses satisfy the four Nuclear Regulatory Commission (NRC) criteria identified by the ESRP.

8.0.1 REFERENCES

(CPNPP 2007) Comanche Peak Nuclear Power Plant. Application for Order Approving Indirect Transfer of Control of Licenses and License Amendments to Reflect Proposed Licensee Name Change. October 2007.

(ERCOT 2007b) Electric Reliability Council of Texas. Report on Existing and Potential Electric System Constraints and Needs, December 2007.

(ERCOT 2006) Electric Reliability Council of Texas. Analysis of Transmission Alternatives for Competitive Renewable Energy Zones In Texas, October 2007.

(ERCOT 2006a) Electric Reliability Council of Texas. Long Term System Assessment for the ERCOT Region, October 2007.

(ERCOT 2007) Electric Reliability Council of Texas. History of ERCOT. http://www.ercot.com/about/profile/history/index.html. October 2007.

(ERCOT 2007a) Electric Reliability Council of Texas. Report on Capacity, Demand and Reserves in the ERCOT Region, November 2007.

(TXU CORP 2006) Texas Corporation. Form 10K, October 2007.

8.1 DESCRIPTION OF POWER SYSTEM

This section provides a brief introduction to the applicant's company and then focuses on the history, structure, and operation of ERCOT.

8.1.1 THE APPLICANT

Energy Future Holdings Corporation (EFH) (formally TXU Corporation) is a holding company which conducts its operations principally through the following wholly-owned subsidiaries:

- Oncor Electric Delivery Holding Company LLC (Oncor) regulated company
- Luminant Generation Company LLC (Luminant) (wholesale)
- TXU Energy Company LLC (TXU Energy) (retail)

EFH's service territory since restructuring is the entire ERCOT region (Figure 8.1-1). However, prior to this, the traditional service territory in North Texas had an estimated population in excess of 7 million, which is about one-third of the population of Texas.

Oncor, EFH's regulated company, operates the largest distribution and transmission system in Texas, providing power over more than 116,000 miles (mi) of distribution and transmission lines (Oncor 2007) (Section 3.7). The distribution grid system and transmission interties are discussed in FSAR Sections 8.1 and 8.2.

Luminant, the applicant, as a wholesale merchant generator, owns or leases 18,365 megawatts (MW) of generation, including 2300 MW of nuclear-fueled capacity (Comanche Peak Nuclear Power Plant [CPNPP] Units 1 and 2), 5837 MW of lignite/coal-fueled capacity, and 10,228 MW of natural gas-fueled capacity. In addition, Luminant is the largest purchaser of wind-generated electricity in Texas and the fifth largest in the United States. (TCEH 2007)

As of December 31, 2007, TXU Energy, the retail sales company, estimated its shares of the ERCOT retail residential and small business markets were 36 percent and 25 percent, respectively. (TCEH 2007) Approximately 1.9 million of TXU Energy's approximately 2.1 million retail electric customers are in its traditional service territory. The remaining retail electric service customers are in other areas now open to competition, including the Houston, Corpus Christi, and lower Rio Grande Valley areas of Texas (TXU Corp 2006). In North Texas, the remaining customers are served by other competitive retailers.

8.1.2 RESTRUCTURING OF THE TEXAS ELECTRIC UTILITY INDUSTRY

Legislation enacted by the Texas Legislature in 1995 and 1999 changed the traditional regulation of electric utilities by creating a competitive electric wholesale market and providing for comprehensive restructuring of the electric utility industry, including retail competition. The current responsibilities of the Public Utility Commission of Texas (PUC) under the Public Utilities Regulatory Act (PURA) include the following (PUC 2006):

- Issuance of certificates of convenience and necessity for new transmission lines.
- Licensing of retail electric providers (REPs).
- Registration of power generation companies (PGCs) and aggregators.
- Oversight of competitive wholesale and retail markets.
- Resolution of customer complaints, using informal processes whenever possible.
- Implementation of a customer education program for retail electric choice.
- Regulation of vertically integrated investor-owned utilities (IOUs) outside ERCOT.
- Jurisdiction over ratemaking, quality of service, and nondiscriminatory provision of service by transmission and distribution (T&D) utilities within ERCOT.
- Establishment of wholesale transmission rates for IOUs, cooperatives, and municipally-owned utilities (MOUs) within ERCOT.
- Regulation of ERCOT's fees and annual operating budget.

Unbundling of Traditional IOUs

In 1999, the Texas Legislature enacted Senate Bill 7 (SB 7), providing for retail electric competition. SB 7 established a number of deadlines for state agencies and market participants to perform certain restructuring activities from 1999 through 2009. All statutory deadlines have been met to date, and implementation of retail electric competition is complete. SB 7 required the state's vertically-integrated IOUs to separate their businesses activities into three components (PUC 2000):

- Competitive PGCs
- Competitive REPs
- Regulated T&D utility

This business separation, known as unbundling, was accomplished through the creation of separate affiliated companies owned by a common holding company or through the sale of assets or stock to a third party. As required by SB 7, affected utilities filed business separation plans for review and approval by the PUC (PUC 2000). A code of conduct for IOUs was adopted by the PUC in November 1999 to prevent affiliated T&D companies from subsidizing competitive affiliates with revenues from regulated activities and from giving the competitive affiliates any advantage in the marketplace. This code of conduct requires T&Ds to offer services on a nondiscriminatory basis. A similar code of conduct was adopted for MOUs and electric cooperatives (PUC 2000).

Creation of Independent System Operator (ISO)

SB 7 mandated that each power region of the state create and maintain an independent organization to monitor the transmission network, ensure nondiscriminatory access to T&D services, and settle wholesale energy transactions. This organization is commonly known as the ISO. Wholesale transactions between wholesale power buyers and sellers are settled through the ISO. The ISO does not function as a power pool and does not set prices or match buyers with sellers, except to the extent that it administers a limited auction for certain real-time or ancillary services (AS), such as balancing energy service. Wholesale contract terms and conditions are established through bilateral contracts between buyers and sellers (PUC 2000).

The ISO role is fulfilled by a restructured ERCOT organization within the ERCOT power region. The ISO functions in the non-ERCOT areas of Texas are performed by a regional transmission organization (RTO) within the Southwest Power Pool (SPP) and a privately-owned transmission company in the Entergy service territory. IOUs and independent power producers owning generation assets in the competitive market must be registered as PGCs with the PUC and must comply with certain rules that are intended to protect consumers, but they are otherwise unregulated and may sell electricity in private bilateral transactions, and at market prices (PUC 2000).

8.1.3 ELECTRIC RELIABILITY COUNCIL OF TEXAS (ERCOT)

ERCOT History

The ERCOT region is essentially electrically isolated from the other electric grids in the United States. At the beginning of World War II, several electric utilities in Texas banded together as the Texas Interconnected System (TIS) to support the war effort. The TIS members sent their excess power generation to industrial manufacturing companies on the Gulf Coast to provide reliable supplies of electricity for energy-intensive aluminum smelting. Recognizing the reliability advantages of remaining interconnected, the TIS members continued to use and develop the interconnected grid. The TIS members adopted official operating guides for their interconnected power system and established two monitoring centers within the control centers of two utilities, one in North Texas and one in South Texas. TIS formed ERCOT in 1970 to comply with North American Reliability Council (NERC) requirements (ERCOT 2007d). Figure 8.1-2 shows the eight NERC regions. The goal of TIS, and later ERCOT, was not to create ties with the rest of the country, but to ensure that the Texas grid was reliable through interconnection with utilities in Texas. ERCOT's market rules and operations are carried out in accordance with its protocols filed with and approved by the PUC. The ERCOT region is contained completely within the borders of Texas, and it does not interconnect synchronously across state lines to import or export power with neighboring reliability regions. In general, most of ERCOT is not under the jurisdiction of the Federal Energy Regulatory Commission (FERC) pursuant to express terms of the Federal Power Act. However, ERCOT can exchange about 860 MW with the SPP and Mexico through direct current (DC) links. An additional 250 MW link with Mexico was made available in 2007. FERC has regulatory authority over these DC links (FERC 2007) (ERCOT 2005). Because the DC ties represent such a small portion of generating capability, essentially all power required to supply the ERCOT region loads must be generated within the ERCOT region.

ERCOT Control Area

ERCOT manages the flow of electric power to approximately 20 million Texas customers, representing 85 percent of the state's electric load and 75 percent of the state's land area (approximately 200,000 square miles [sq mi]). The ERCOT region is shown in Figure 8.1-1. As the ISO for the region, ERCOT schedules power on an electric grid that connects 38,000 miles of high-voltage transmission lines and more than 500 generation units. ERCOT also manages financial settlements for the competitive wholesale bulk-power market and administers customer switching for 5.9 million Texans in competitive choice areas (ERCOT 2007b). In 2006, the total electricity production in the ERCOT region was 305,692 gigawatt hours (GWh), including 89,855 GWh from Luminant. (ERCOT 2006a) (TXU Corp 2006).

ERCOT Structure and Governance

ERCOT is a membership-based 501(c)(6) not-for-profit corporation governed by a Board of Directors and subject to oversight by the PUC and the Texas Legislature. ERCOT has over 250 members, including retail consumers, IOUs and MOUs, rural electric cooperatives, river authorities, independent generators, power marketers, and REPs (ERCOT 2007b). The ERCOT Board of Directors consists of independent members, consumers, and representatives from each of ERCOT's seven electric market segments. The Board of Directors appoints ERCOT's officers to direct and manage ERCOT's day-to-day operations, accompanied by a team of executives and managers responsible for critical components of ERCOT's operations areas (ERCOT 2007a).

Representatives of all segments of ERCOT's market participants collaboratively created the ERCOT Protocols, which is the governing document adopted by ERCOT that contains the scheduling, operating, planning, reliability, and settlement policies, rules, guidelines, procedures, standards, and criteria of ERCOT. These Protocols were approved by the PUC, and amendments are subject to PUC review and modification. The ERCOT Board, Technical Advisory Committee (TAC), and other ERCOT subcommittees authorized by the Board or the TAC may develop procedures, forms, and applications for the implementation of, and operation under, the Protocols. ERCOT and its market participants must abide by the Protocols (ERCOT 2007e).

ERCOT Roles and Regulatory Requirement for System Planning

ERCOT, as defined by the PUC and the Texas Legislature, performs three main roles in managing the electric power grid and marketplace (ERCOT 2007c):

- Monitors schedules submitted by wholesale buyers and sellers for the next day's electricity supply.
- Ensures electricity transmission reliability by managing the incoming and outgoing supply of electricity over the grid. ERCOT monitors the flow of power and issues instructions to generation and transmission companies to maintain balance.

- Serves as the central hub for retail customer registration. When a consumer chooses a REP, ERCOT ensures the information related to that transaction is conveyed to the appropriate companies in a timely manner.

It is the expansion and definition of the second role, maintaining stability and reliability of the grid, that focuses ERCOT on both long- and near-term detail system planning.

Since restructuring of the electric supply market in the ERCOT region, as discussed in Subsection 8.1.1, utilities no longer perform the comprehensive transmission and generation planning functions they once did. The central transmission planning organization under the new Texas market is the ERCOT ISO. State law assigns these obligations to ERCOT under the oversight of the PUC.

In 2005, Senate Bill 20 (SB 20) added the new Section 39.904(k) to the PURA. Section 39.904(k) requires the PUC and ERCOT to study the need for increased transmission and generation capacity throughout the State of Texas and report to the Legislature the results of the study and any recommendations for legislation. ERCOT analyzes the region in the context of the competitive ERCOT market using load growth scenarios, industrial growth projections, regional transmission topology, subregional modeling, and new generation characteristics. The development of these reports is subject to vigorous market participant stakeholder input and review. ERCOT only forecasts the generation and transmission capacity that may be necessary to meet the forecast load. The market economic forces drive the market participants' decisions to increase or decrease their generation capacity. The latest report was filed with the Legislature on December 31, 2007. Three separate reports have been prepared to meet the reporting requirement: (ERCOT 2006b).

- Annual Report on Constraints and Needs in the ERCOT Region - provides an assessment of the need for increased transmission and generation capacity for the next 5 years (2007 – 2011) and provides a summary of the ERCOT 5-Year Plan to meet those needs.

- Long Term System Assessment (LTSA) for the ERCOT Region - biannual report provides an analysis of the system needs in the 10th year in order to provide a longer-term view to guide near-term decisions made in the 5-Year Plan.

- Analysis of Transmission Alternative for Competitive Renewable Energy Zones in Texas - biannual report provides an assessment of the potential for wind generation development in Texas and the transmission necessary to economically provide a portion of this generation to loads in the ERCOT market.

These reports provide an overall assessment of the needs of the ERCOT System. These system planning documents have stakeholder involvement by the Regional Planning Groups throughout the process.

In summary, the electric utility industry in Texas is deregulated with open competition between PGCs and REPs. The regulated T&D utilities must ensure nondiscriminatory access to T&D services.

ERCOT is the membership-based, not-for-profit corporation, overseen by the PUC, that manages the flow of electric power, ensures transmission reliability, and serves as the central hub for retail transactions. ERCOT is required by law to study the need for increased transmission and generation capacity and to report the study results to the PUC and the Legislature.

8.1.4 MARKET ECONOMIC FORCES

Beyond compliance with operational procedures, ERCOT does not have authority over the business activities of its market participants. The economic forces of the market and signed agreements by the market participants provide the cooperative atmosphere in which the ERCOT system functions.

Since 1999, ERCOT market participants have made the economic decision to decommission 107 units with a total generation capacity of 5,099 MW. These decisions were based on economic parameters such as unit efficiency, age, capacity, cost of operation, outage frequency, outage duration, and fuel cost. Similarly, since 1999, the ERCOT market participants have made the economic decision to add 205 new units and to upgrade 2 units for a total generation capacity of 25,372 MW. These decisions were based on the same economic parameters that led to decommissioning the 107 older units. On a county-by-county basis, in accordance with the market economic forces, the decommissioned units were sometimes replaced by new units and sometimes they were not replaced by new units.

By law, ERCOT must perform extensive annual and semi-annual studies, issue reports, make recommendations for transmission system needs and resource adequacy, and make legislative recommendations to further those objectives [See e. g., Tex. Util. Code Ann. §§ 39.155(b) and 39.904(k)]. ERCOT analyzes the region in the context of the competitive ERCOT market using load growth scenarios, industrial growth projections, regional transmission topology, sub-regional modeling, and new generation characteristics. The development of these reports is subject to vigorous market participant stakeholder input and review. ERCOT only forecasts the generation and transmission capacity that may be necessary to meet the forecast load. The market economic forces drive the market participants’ decisions to increase or decrease their generation and transmission capacity.

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8.2 POWER DEMAND

The Electric Reliability Council of Texas (ERCOT) organization has the responsibility to study the need for increased transmission and generation capacity throughout the state, pursuant to Public Utility Regulatory Act (PURA) 39.904(k). Key input to this process is the evaluation of 1-15 year projections and long-term peak demand and long-term energy forecast for the ERCOT market. This section provides an overview and summarizes the ERCOT process, methodology, and resulting forecasts. The specifics and the extensive detailed data developed by ERCOT can be found in the noted attachments and references. This particular section is primarily based on the data contained in the 2007 ERCOT Planning Long-Term Hourly Peak Demand and Energy Forecast report (ERCOT 2007a) and the ERCOT Report on Existing and Potential Electric System Constraints and Needs (ERCOT 2007). These reports provide the following:

- An historical perspective of the load growth in ERCOT's territory and results of the forecast peak demands and energy from 2007 – 2025 are presented in a graphical form and summarized in a table (Figure 8.2-15 and Table 8.2-1).

- The ERCOT methodology, highlighting the major aspects involved in producing the forecast, including the data input used in the process.

- A discussion of the major drivers of peak demand and energy consumption along with the uncertainties associated with the forecast and the differences with last year's forecast.

- A summary of the results of the ERCOT forecast of electricity demand.

ERCOT's econometric forecasting methodology used in developing their demand forecast report referenced above is provided in Appendix 3 (ERCOT 2007a). As discussed in Subsection 8.4.3, ERCOT prepares regional need-for-power evaluations that are (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecast uncertainty.

8.2.1 DEVELOPMENT OF DEMAND FORECAST

Historical Consumption and Peak Load Demands

Key to all of ERCOT's planning efforts is the development of an accurate forecast of the projected demand for both average load and peak loads for the system. The long-term average load and peak demand for historical data and forecast for the ERCOT region, including the methodology, assumptions, and data, are provided in the 2007 ERCOT Planning Long-Term Hourly Peak Demand and Energy Forecast. The forecast is based on the latest historical hourly demands for the region and adjusted for economic and weather variables, primarily temperatures, heating, and cooling degree-days (ERCOT 2007a).

Historical patterns for load, peak loads and other variables, such as weather and population, provide the basis for developing ERCOT's forecast model. Figure 8.2-2 illustrates the historical peak demand and the average load from 1997 – 2006. This represents an average growth over the period of approximately 2.4 percent in peak demand and approximately 2.24 percent growth in average load. This reflects increases in demand that would require two baseload units every five years to address the average system load. The growth of the average hourly load can be forecasted with a reasonable degree of accuracy. The peak demand growth, however, has a greater degree of uncertainty due to the variable nature of the factors that affect its forecast value. The many factors affecting peak hour demand and the high degree of uncertainty in their long-range usage make system peak hourly demand a challenging variable to assess in terms of its behavior in the future. However, ERCOT also monitors the accuracy of the system forecast as represented in Figure 8.2-12 for the accuracy of the peak demand forecast and Figure 8.2-13 for the average consumption, which is less than ±5 percent. (ERCOT 2007a)

Forecast Consumption and Peak Load Demands

The historic compound growth rate for the last 10 years has been approximately 2.45 percent, with strong growth for Texas experienced since 2003. Figure 8.2-10 illustrates the forecast for average loads and peak demand from 2007 – 2017. The forecast growth rate for the next 10 years (2007 – 2017) is 2.12 percent. During this same period, average load requirements are forecasted to grow over 8000 megawatts (MW), and peak demand is projected to increase over 15,000 MW by 2017. When computed for 2007 – 2025, the rate remains high at 1.92 percent. (ERCOT 2007a).

8.2.2 ERCOT FORECAST METHODOLOGY AND KEY INPUTS

Methodology

The basic ERCOT econometric forecasting model uses a regression analysis, i.e., the development of an equation or set of equations that describes the historical load as a function of independent variables. The regression analysis is used to calculate the appropriate coefficients for each variable and to choose the best equations for describing historical patterns. The forecasting process is shown in Figure 8.2-4. Appendix 3 of the ERCOT Planning Long-Term Hourly Peak Demand and Energy Forecast provides a detailed description of the ERCOT model and methodology. (ERCOT 2007a)

The ERCOT model represents hourly load shape by weather zone for the eight major weather zones in Texas. The weather zones are shown in Figure 8.2-14, and the peak demand by zone is shown in Table 8.2-2. This level of detail is needed to provide input to ERCOT's UPLAN modeling tool for economic analysis of transmission projects. (ERCOT 2007) (ERCOT 2007a)

The long-term forecast was produced with a set of econometric models that use weather and economic and demographic data to capture and project the long-term trends from the past five years of historical data. Each of these key factors is discussed below (ERCOT 2007a).

Weather

Weather drives most of the variation in ERCOT electric demand in the short-run. Because weather also affects the variation in the electric demand in the long-run, long-term forecasting uses historical average weather profiles to indicate the future variation in weather. There are eight defined weather zones in ERCOT. The weather zones are shown in Figure 8.2-14, and the peak demand is shown in Table 8.2-2. The largest metropolitan statistical areas are located in the North Central Texas, South Central Texas, and Texas Coastal zones (ERCOT 2007) (ERCOT 2007a):

- North Central Texas (Dallas-Fort Worth)
- South Central Texas (Austin-San Antonio)
- Texas Coastal (Houston)

Twelve years of weather data were available from WeatherBank for 20 ERCOT weather stations. These weather stations were used to develop weighted hourly weather profiles for each of the eight weather zones which is used in the load shape (detailed consumption pattern) models. Monthly cooling degree days and heating degree days were used in the monthly energy models (ERCOT 2007a).

A representative hourly load shape by weather zone is forecast using an average weather profile of temperatures, cooling degree hours, and heating degree hours obtained from historical data. Seasonal daily, weekly, monthly, and yearly load variations, as well as holiday events, were considered in addition to various interactions such as weather, weekends, and weekdays. This hourly load shape only describes the hourly load fluctuations within the year and in itself does not reflect the long-term trend (ERCOT 2007a).

The long-term trend was provided by the energy consumption forecast. The monthly energy consumption forecast models by weather zones used cooling degree days and heating degree days to project the monthly energy for the next 19 years (2007 – 2025) (ERCOT 2007a).

One measure of the uncertainty associated with extreme weather impacts on the peak demand can be obtained by using a more extreme weather profile to obtain the forecasts. ERCOT developed weather profiles that rank at the 90th percentile of all the temperatures in its hourly temperature database and did the same to develop profiles with the 10th percentile of all temperatures (Figure 8.2-1). These profiles are not confidence bands in the statistical sense, but this term has commonly been used to refer to the results. A more appropriate term would be to use scenarios associated with the 90th percentile temperature distribution, or 90th percentile scenario forecasts. ERCOT has also run Monte Carlo simulations to assess the impact of extreme temperatures on the peak demands. Subsection 8.2.3 provided the results of the analysis for both normal and extreme weather patterns (ERCOT 2007a).

<u>Economic and Demographic Data</u>

Economic and demographic changes can affect the characteristics of electrical demand in the medium- to long-range forecast. Economic and demographic data at the county level were obtained on a monthly basis from Moody's Economy.com. The data were used as input to the monthly energy consumption models (ERCOT 2007a).

The regional economic outlook for Texas is projected to outperform the United States as a whole. Three of its major metropolitan areas, Houston, Dallas, and Austin, which are among the top 50 in the United States, are leading the South. Employment growth in Texas shows a stronger performance for the Dallas-Fort Worth area and the Austin-San Antonio area. The Houston area is expanding, but is expected to lose some momentum due to a slowdown in the energy industry (ERCOT 2007a).

Some of the indicators that were used in the forecast are economic and demographic drivers such as real per capita personal income, population, employment in the financial services, total nonfarm employment, and total persons employed. These drivers are presented in Figures 8.2-5, 8.2-6, 8.2-7, 8.2-8, and 8.2-9. As discussed in Section 8.4, actions to reduce the demand for power, such as demand-side management or conservation, are taken into account when determining the reserve margin (ERCOT 2007a).

Energy Efficiency and Substitution

Energy efficiency, conservation, and demand-side management can be a part of the Texas energy equation; however, they are not by themselves a reasonable alternative to baseload units. In addition, it is not the responsibility or expectation for wholesale merchant generators (US 2006). However, discussion of ERCOT's efforts and initiatives is another demonstration that their process is, as discussed in Subsection 8.4.3, ERCOT prepares regional need-for-power evaluations that are (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecast uncertainty.

Most of Texas' electricity is generated from plants that burn natural gas or coal (PUC 2005b). Lawmakers in Austin have mandated Texas' competitive retailers to increase their purchases of renewable sources every two years so that by January 1, 2015, 5880 MW of renewable resources are planned to be operating in Texas. At the end of 2007, there was over 4700 MW of renewable resources (ERCOT 2007 Annual Report). In 2006, approximately 8.2 million megawatt hours (MWh) of electricity were generated in Texas using renewable sources; that amount is about 2 percent of the state's total power consumption. More than 90 percent of the renewable energy generated was from wind power (EIA 2007c).

Renewable energy is derived from clean, nondepleting, environmentally-friendly sources such as wind, solar, biomass, hydro, and geothermal (PUC 2005b). Texas has the highest level of renewable energy potential in the nation, largely due to its climate and sheer size, and leads the nation in installed wind capacity.

Load reduction programs provide the ERCOT market with valuable reliability and economic services by acting as a means of preserving system reliability, enhancing competition, mitigating unwarranted price spikes, and encouraging the demand side of the market to respond better to wholesale price signals (ERCOT 2007c).

In collaboration with market participants, ERCOT has developed a number of load reduction programs for businesses and institutions that have the ability to curtail electricity use. These demand-side resources, or loads, may participate in the ERCOT market directly – through the bid process in the ERCOT market, or indirectly – through the voluntary reduction of load during high-demand, high-price time periods (ERCOT 2007c).

8.2.3 ERCOT DEMAND AND ENERGY FORECAST RESULTS

Addressing Uncertainty in Peak Demand

The forecast energy consumption for 2007 – 2017 using the normal weather scenario is included in Figure 8.2-3. Figure 8.2-10 provides the forecast average hourly load for 2007 – 2017 using the normal weather scenario (ERCOT 2007a). Figure 8.2-1 shows the forecast peak demand scenarios for 2007 – 2017 using the extreme weather profiles described above. The red dashed line on the top of the figure is a plot of the system peak demand forecast using temperatures above 90 percent of the historical temperatures (90th percentile) experienced during the last 10 years. This extreme forecast is referred to in the figure as the High Hourly Forecast 90 – 10. The middle line is the normal weather scenario (Base 50 – 50). The Low Hourly Forecast 10 – 90 refers to the forecast obtained by using temperatures above 10 percent of all temperatures during the last 10 years (ERCOT 2007a).

The historical peak demand for 2002 – 2006 and the forecast peak demand for 2007 – 2015 for the eight weather zones are shown in Table 8.2-2. The forecasts for the three major zones, North Central Texas, South Central Texas, and Texas Coastal, show a stable and strong growth. The forecasts for the smaller zones show an average or below-average trend in growth. A summary of the long-range forecast model results for 2007 – 2025 peak demand and energy consumption is provided in Table 8.2-1 (ERCOT 2007a).

Difference Between the 2006 and 2007 Forecasts

In the long range, the 2007 forecast is very similar to the 2006 forecast for the same period. The energy forecast from 2007 – 2015 is 0.06 percent higher than the 2006 forecast. A one-time adjustment because of economic conditions and other factors, such as Hurricane Katrina, contributed to the growth from the actual energy consumption in 2006 to the forecast for 2007. According to ERCOT's long-range planning document, one of the key factors driving the long-range higher energy consumption is an improvement in the outlook of the overall health of the economy in Texas as captured by economic indicators such as the real per capita personal income, population, and various employment measures, including nonfarm employment and total employment. A brighter economic outlook generally results in increased energy consumption (ERCOT 2007a).

The energy consumption forecast scenarios show a slight degree of variability between the 90 – 10 high weather forecasts and the median (50 – 50) base case. The same holds true for the 10 – 90 low weather forecast scenario (ERCOT 2007a). Figure 8.2-11 shows the difference between the 2006 and 2007 ERCOT forecasts of peak demand for the period of 2007 – 2015 (ERCOT 2007a).

Accuracy of the Long-Term Forecast

A comparison of the historical actual and forecast peak demand (Figure 8.2-12) and a comparison of the historical actual and forecast energy consumption (Figure 8.2-13) show that, since 1999, ERCOT long-range forecasts have been within ±5 percent of the actual peak demand. Since 2003, the accuracy of the energy consumption forecast has been very close to ±1 percent (ERCOT 2007b).

Summary of Demand and Energy Forecast Results

The ERCOT studies forecast average annual growth rate in peak demand of 2.12 percent through 2017 and 1.92 percent through 2025 (Table 8.2-1).Figures 8.2-5, 8.2-6, 8.2-7, 8.2-8, and 8.2-9 show the projected average growth in population (1.7 percent), per capita income

(2.8 percent), and total employment (2.0 percent) as contributors to growth in electric demand and inputs to the ERCOT model. These growth rates cumulate in a total growth in average load 2007 – 2017 of over 10,000 MW and peak demand growth of over 15,000 MW as shown in Figure 8.2-10. ERCOT is forecasting a demand for 385 hours (TWhr) of electricity by 2017, an increase of approximately 80 TWhr from the 306 TWhr in 2006 (Figure 8.2-3). To meet the increases in average load and peak load would roughly be equated to ten 1000 MW baseload units and six 850 MW peaking units to be added to the system capability by 2017. The ERCOT forecast through 2025 shows the increase in average load of 15,000 MW and the increase in peak load of over 27,000 MW (Figure 8.2-1) – the equivalent of 15 – 1000 MW baseload units and 15 – 850 MW peaking units just to meet the growth in demand.

Finally, to ensure stability of the grid and the ability to meet summer peak demand, ERCOT requires a 12.5 percent reserve margin above the forecasted peak load. This increases the peak load by an additional 11,000 MWs for the ERCOT region through 2025 (Table 8.2-1).

8.2.4 REFERENCES

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TABLE 8.2-1 (Sheet 1 of 2)
ERCOT DEMAND FORECAST 2002 – 2025

Average Load – Peak Load – Forecast Accuracy – Capacity Needed to Meet Forecast

Year	Forecast Energy MWh	Forecast Energy Average Load	Actual MW	Act Ave Load	Forecast Accuracy	Forecast Energy Peak Load	Peak +12.5% Reserve Margin
2002	281,930,582	32,184	280,772,959	32,052	-0.41%	56,086	63,097
2003	284,207,211	32,444	284,983,916	32,532	0.27%	60,037	67,542
2004	287,569,872	32,738	289,140,984	32,917	0.54%	58,506	65,819
2005	300,553,020	34,310	299,253,971	34,161	-0.43%	60,214	67,741
2006	305,552,884	34,880	305,740,287	34,902	0.06%	62,339	70,131
2007	313,027,658	35,734	307,800,159	35,137	-1.70%	62,188	69,962
2008	319,688,988	36,394		0		65,135	73,277
2009	325,408,664	37,147		0		66,508	74,822
2010	332,578,515	37,966		0		67,955	76,449
2011	340,089,254	38,823		0		69,456	78,138
2012	347,087,436	39,622		0		70,733	79,575
2013	354,122,426	40,425		0		72,394	81,443
2014	361,232,831	41,237		0		73,998	83,248
2015	369,322,241	42,160		0		75,596	85,046
2016	377,330,064	43,074		0		77,024	86,652
2017	384,606,172	43,905		0		78,694	88,531
2018	391,597,067	44,703		0		80,161	90,181
2019	398,301,224	45,468		0		81,622	91,825
2020	404,587,586	46,186		0		82,871	93,230
2021	411,162,342	46,936		0		84,363	94,908
2022	417,594,564	47,671		0		85,681	96,391
2023	423,892,847	48,390		0		87,015	97,892
2024	430,373,659	49,129		0		88,180	99,203
2025	436,287,512	49,805		0		89,883	101,118
		Average Load				Peak	Peak + Reserve
Increase from 2006 to 2025		14,924				27,544	30,987

TABLE 8.2-1 (Sheet 2 of 2)
ERCOT DEMAND FORECAST 2002 – 2025

Average Load – Peak Load – Forecast Accuracy – Capacity Needed to Meet Forecast

Year	Forecast Energy MWh	Forecast Energy Average Load	Actual MW	Act Ave Load	Forecast Accuracy	Forecast Energy Peak Load	Peak +12.5% Reserve Margin

(ERCOT 2007a)

TABLE 8.2-2
HISTORICAL AND FORECAST YEARLY COINCIDENT PEAK DEMANDS BY WEATHER ZONES (MW)

YEAR	NORTH	NORTH CENTRAL	EAST	FAR WEST	WEST	SOUTH CENTRAL	COAST	SOUTH	SYSTEM PEAK LOAD
2002	1904	20,527	2175	1830	1595	9492	14,578	3985	56,086
2003	2070	22,303	2319	1805	1675	10,016	15,823	4025	60,037
2004	2047	20,749	2265	1658	1562	9619	16,611	3996	58,506
2005	2080	21,975	2351	1661	1542	10,162	16,282	4159	60,214
2006	2361	22,687	2432	1598	1612	10,718	16,739	4191	62,339
2007	2086	23,782	2251	1412	1638	11,329	17,174	4123	63,794
2008	2117	24,059	2363	1415	1683	11,708	17,631	4158	65,135
2009	2145	24,472	2323	1429	1725	12,075	18,112	4227	66,508
2010	2183	24,914	2353	1435	1770	12,475	18,554	4271	67,955
2011	2229	25,365	2382	1441	1820	12,901	19,002	4317	69,456
2012	2263	25,743	2402	1442	1863	13,292	19,377	4351	70,733
2013	2325	26,267	2517	1448	1914	13,725	19,794	4405	72,394
2014	2377	26,788	2462	1509	1964	14,111	20,312	4474	73,998
2015	2447	27,360	2484	1461	2022	14,570	20,727	4525	75,596

(ERCOT 2007a)

8.3 POWER SUPPLY

This section presents an Electric Reliability Council of Texas (ERCOT) regional supply assessment, based on the ERCOT reports, assessments, and analyses, including those reported to the North American Electric Reliability Corporation (NERC). As discussed in previous sections and summarized in Section 8.4, ERCOT prepares regional need-for-power evaluations that are (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecast uncertainty.

Installed generation capacity in the ERCOT region is updated continuously as reflected in the Capacity, Demand and Reserves (CDR) in the ERCOT Region report. This report is summarized and published in May, with a mid-year update published in December. As of May 2007, there was an approximately 72,048 megawatt (MW) capacity expected to be available to the system in 2008 to address the summer peaks. The December update shows the amount as 72,416 MW available in 2008, and a total projection of 76,885 MW capacity available in 2013. These values do not include the potential impact of plant aging and potential plant retirement. These are shown on ERCOT Figure 8.3-8 and result in a potential replacement generation capacity of between 63 and 85 thousand MW by 2027, depending on whether 30, 40, or 50 year old plants are being retired. (ERCOT 2007b)

8.3.1 EXISTING GENERATING CAPACITY

Installed generation capacity in the ERCOT region is approximately 76,000 MW, which does not include approximately 5000 MW of “mothballed” natural gas-fired generation capacity; that is, units that have suspended operations from the grid for more than six months (refer to Subsection 8.4.1). This information is discussed in ERCOT’s Report on Existing and Potential Electric System Constraints and Needs, December 2007, and is based on 2006 and 2007 data (ERCOT 2007a). In addition, the December 2007 update to the ERCOT 2007 CDR report provides a summary of the resources expected to be available each summer from 2008 – 2013 and is shown in Table 8.3-1. The focus is on the summer because the loads in ERCOT are substantially higher in the summer than the winter (ERCOT 2007).

As shown in Figure 8.3-1, 68 percent of installed generating capacity in ERCOT is fueled by natural gas, followed by 19 percent by coal, 6 percent by nuclear, and 5.8 percent by wind. It is important to note that nearly all new generation capacity added in the ERCOT system since 2000 is fueled by natural gas. A small portion is fueled by wind and other resources. Figure 8.3-2 shows the actual generation by fuel type. It is also important to note that the baseload units (coal and nuclear) provide more than twice their capacities share of total production, and the variable (wind) and peaking units (gas) only provide half their capacity. (ERCOT 2007a).

The existing ERCOT generation capacity by county, as shown in Figure 8.3-4, is based on information from the generating companies. This information includes switchable capacity (i.e., capacity capable of serving either ERCOT or another regional council), direct current (DC) ties to other regions, private network generation, and distributed generation that has registered with ERCOT (ERCOT 2007a). In addition, Table 8.3-1 shows that the majority of the supply comes from installed capacity. In the 2013 forecast, installed capacity is approximately 80.3 percent, private networks approximately 8.3 percent, and wind 0.6 percent, for a total of about 90 percent of the projected resources. The remaining 10 percent is principally switchable units and planned units with a signed interconnection agreement and air permit (approximately 9 percent) and, finally, 50 percent of the nonsynchronous ties (0.7 percent) and planned wind with a signed interconnection agreement (0.2 percent). (ERCOT 2007)

Since 1999, a total of 107 units (5099 MW) have been decommissioned (Figure 8.3-3). Given the current level of generation capacity, load growth, and economic factors, ERCOT expects more units to be decommissioned. Economics or environmental restrictions require ERCOT to undertake a careful assessment of the reliability needs before decommissioning older plants. According to Public Utility Commission of Texas (PUC) rules, ERCOT may maintain certain necessary units under Reliability Must-Run (RMR) contracts, which provide voltage support and stability, or management of localized transmission constraints under first contingency criteria, and maintain the option for any transmission alternatives to these RMR sources (ERCOT 2007a).

Figure 8.3-5 shows the 114 units, approximately 8700 MW of generation, within ERCOT that are currently over 40 years old. Age is one indication of the efficiency and maintenance costs of a generating unit, which are major factors in the decommissioning of units. Most of the capacity greater than 50 years old is around Dallas-Fort Worth. Other areas with high concentrations of older plants are Central Texas and the Rio Grande border. Figures 8.3-7 and 8.3-8 show an analysis of the age of plants and the demand projections. This analysis gives an indication of how much additional generation capacity may be needed in the long term. The values range from 7423 MW in 2012 to 85,181 in 2027 (ERCOT 2007).

A total of 820 MW of DC tie transfer capability exists between ERCOT and Southwest Power Pool (SPP) and 286 MW of capability between ERCOT and Mexico's federal electricity commission, Comisión Federal de Electricidad (CFE). Entities in ERCOT anticipate importing 191 MW of firm purchases via the SPP DC ties, and entities in SPP own about 200 MW of capacity in ERCOT. These purchases and sales have little impact on ERCOT's ability to meet demand requirements (NERC 2007).

8.3.2 ERCOT FUTURE GENERATION

ERCOT, as shown in Table 8.3-1, includes a limited amount of planned generation capacity in its capacity and reserve calculation. This is not the extent of the proposed future generation that is being evaluated by ERCOT. Some of that additional capacity is reflected in Figure 8.3-6. ERCOT is currently analyzing the interconnection of about 61,000 MW of proposed generation capacity as shown in Table 8.3-2. This table shows the proposed capacity by fuel type that ERCOT staff is currently tracking and separates them in three categories: Screening Studies, Interconnection Studies, and Interconnection Agreements. Only a portion of the interconnection agreements are included in ERCOT’s capacity and reserve calculation. This is because there is no firm commitment of the owner of the proposed plants until an interconnection agreement is signed. The first two categories are only studies and require minimal expense and commitment on the part of the owner of the proposed capacity. Additional information regarding future generation is provided in ERCOT’s Existing and Potential Electric System Constraints and Needs report (ERCOT 2007a).

Through project-specific interconnection agreements, and through the system-wide Regional Planning Group process, ERCOT works with transmission owners and stakeholders to design transmission improvements to ensure the system meets all applicable reliability requirements and cost-effectively minimizes system operational costs. Robust load growth, a vibrant wholesale market, and renewal of the Production Tax Credit continue to attract merchant plant developers to the Texas market (NERC 2007).

ERCOT develops a 5-Year Plan for the ERCOT area that is based on studies of system performance against ERCOT and NERC reliability standards performed by both ERCOT and individual transmission owners. The results of this analysis are documented in the Annual ERCOT Report on Constraints and Needs. ERCOT also develops a long-term system assessment (LTSA) in even-numbered years that investigates the long lead-time transmission system improvements that are needed to meet ERCOT reliability standards through the 10th year of the planning horizon. ERCOT performs studies in the odd-numbered years to validate that the projects that are included in the LTSA allow the ERCOT system to meet applicable standards (ERCOT 2007a).

Summary

To meet the forecasted demand, ERCOT shows that, in 2013, over 76,000 MW of capacity has been forecasted to meet the summer peak load. (Table 8.3-1) In addition, ERCOT is evaluating over 61,000 MW of proposed capacity to the system as shown in Table 8.3-2. This includes the coal-fueled, gas-fueled, nuclear-fueled generation as well as a significant wind capacity. However, of this 61,000 MW, only 3,900 MW have signed interconnection agreements. ERCOT also provides a caution with the use of Table 8.3-2, that the numbers may be counted multiple times, that they may reflect alternative sites, and that, based on the fact that many of the estimates are for preliminary interconnect studies, it is possible that much of this capacity will not be built. (ERCOT 2007a)

Finally, the aging of plants in the ERCOT system, i.e., plants 30, 40 or 50 years old, suggests the potential for capacity additions between now and 2027 that range from 7423 MW in 2012 to 85,181 MW in 2027 to replace maturing plants. (Figures 8.3-7 and 8.3-8) (ERCOT 2007)

8.3.3 REFERENCES

(ERCOT 2007a) Electric Reliability Council of Texas. Report on Existing and Potential Electric System Constraints and Needs. http://www.ercot.com/news/presentations/2008/35171_ERCOT_2007_Transmission_Constraints_Needs_Report.pdf. December 2007. Accessed June 2008.

(ERCOT 2007) Electric Reliability Council of Texas. Report on the Capacity, Demand, and Reserves in the ERCOT Region. http://www.ercot.com/news/presentations/2007/07CDR05172007-final.xls. May 2007. Accessed November 2007.

(ERCOT 2007b) Electric Reliability Council of Texas. Report on the Capacity, Demand, and Reserves in the ERCOT Region. http://www.ercot.com/news/presentations/2007/ERCOT_2007_CDR_December_Update_FINAL.xls. December 2007. Accessed June 2008.

(NERC 2007) North American Electric Reliability Corporation. 2007. Long-Term Reliability Assessment. http://www.nerc.com/~filez/rasreports.html. Accessed November 2007.

TABLE 8.3-1
2007 REPORT ON THE CAPACITY AND RESERVES IN THE ERCOT REGION

Summer Summary – December Update

Load Forecast:	2008	2009	2010	2011	2012	2013
Total Summer Peak Demand, MW	65,135	66,508	67,955	69,456	70,733	72,160
less LAARs Serving as Responsive Reserve, MW	1125	1125	1125	1125	1125	1125
less LAARs Serving as Non-Spinning Reserve, MW	0	0	0	0	0	0
less BULs, MW	0	0	0	0	0	0
Firm Load Forecast, MW	64,010	65,383	66,830	68,331	69,608	71,035
Resources:	2008	2009	2010	2011	2012	2013
Installed Capacity, MW	61,722	61,722	61,722	61,722	61,722	61,722
Capacity from Private Networks, MW	6405	6405	6405	6405	6405	6405
Effective Load-Carrying Capability (ELCC) of Wind Generation, MW	497	497	497	497	497	497
RMR Units under Contract, MW	169	169	169	0	0	0
Operational Generation, MW	68,793	68,793	68,793	68,624	68,624	68,624
50% of Non-Synchronous Ties, MW	553	553	553	553	553	553
Switchable Units, MW	2877	2877	2877	2877	2877	2877
Available Mothballed Generation, MW	510	419	594	558	522	522
Planned Units (not wind) with Signed IA and Air Permit, MW	0	836	3296	3296	4221	4221
ELCC of Planned Wind Units with Signed IA, MW	0	148	153	153	153	153
Total Resources, MW	72,733	73,625	76,266	76,061	76,950	76,950
less Switchable Units Unavailable to ERCOT, MW	317	317	0	0	0	0
less Retiring Units, MW	0	0	65	65	65	65
Resources, MW	72,416	73,308	76,201	75,996	76,885	76,885
Reserve Margin	13.1%	12.1%	14.0%	11.2%	10.5%	8.2%
(Resources - Firm Load Forecast)/Firm Load Forecast						

(ERCOT 2007)

TABLE 8.3-2
POTENTIAL NEW GENERATION

GENERATION INTERCONNECTION REQUEST ACTIVITY IN 2007

Fuel	Screening Studies Requested		Interconnection Studies Requested		Interconnection Agreements Signed	
	Number	MW	Number	MW	Number	MW
Coal	6	2008	4	383	1	581
Natural Gas	40	23,613	17	5292	1	255
Nuclear	2	6400	3	9100	0	0
Other	0	0	1	45	0	0
Wind	79	29,478	45	13,076	17	3,064
Total	127	61,499	70	27,896	19	3900

Projects may appear in more than one category.

(ERCOT 2007a)

8.4 ASSESSMENT OF NEED FOR POWER

This section assesses the need for power within the Electric Reliability Council of Texas (ERCOT) region. The summer peak demand and demand forecasts used in this assessment are discussed in more detail in Section 8.2. Installed capacity and planned additional capacity are discussed in Section 8.3. As discussed in this section, ERCOT prepares regional need-for-power evaluations that are systematic, comprehensive, subject to confirmation, and responsive to forecast uncertainty. As such, the evaluations provide sufficient data and analysis to serve as the basis for a need-for-power assessment and conclusion.

The preliminary report of the ERCOT annual demand forecast indicates the reserve margin is expected to be slightly above the 12.5 percent ERCOT target for 2008, but the margin declines below 12.5 percent by 2013 based on committed resources, as shown in Figure 8.4-2 (ERCOT 2007d).

8.4.1 RESERVE MARGIN CRITERION

The reserve margin is the percent by which the available generating capacity in the area exceeds the peak demand. In determining the need for power, ERCOT considers the reserve margin needed to ensure reliable system operation and supply of power. The reserve margin helps ensure that there are sufficient generating resources available to meet the load while providing allowance for generating facilities that may be unavailable due to planned or forced outages.

Figure 8.4-1 provides the ERCOT generation capacity by type and peak demand for 1997 – 2007. Figure 8.4-2 shows the ERCOT reserve margin significantly dropping below the 12.5 percent margin in 2013. (ERCOT 2007d) Figure 8.4-3 demonstrates a steady divergence between demand and capacity for the period 2012 – 2027. Figure 8.4-4 provides the potential ERCOT generation capacity needed from 2012 – 2027 (ERCOT 2007). Through 2007, the reserve margins remained above the 12.5 percent criterion set by ERCOT. From 1999 to 2004, a different methodology was used to calculate ERCOT's reserve margins. Variation in reserve margin for this period is due to variation in peak loads and not to the changes associated with these methodologies (Figure 8.4-2). The methodology approved by the ERCOT Board of Directors in 2005 considered switchable capacity, mothballed capacity, and wind capacity as they apply to the ERCOT competitive electric market. The methodology was directed to the generating capacity that would be capable of producing needed power during the summer peak load. The reserve margins, reported in the report on the Capacity, Demand, and Reserves (CDR) in the ERCOT region for 2008 – 2013, were calculated using this methodology (ERCOT 2007a).

The reserve margin is defined as (ERCOT 2007b):

$$\text{Reserve Margin} = \frac{\text{(Resources Available – Firm Load Forecast)}}{\text{(Firm Load Forecast)}}$$

The current generation reserve margin requirement for the ERCOT region is 12.5%, as approved by the ERCOT Board in August 2002. The following is a brief summary of the methodology for the reserve margin calculation (Comstock 2007). The terms used here are defined below.

Firm Load Forecast equals

Long-Term Forecast Model total summer peak demand

- minus loads acting as resources (LaaRs) serving as responsive reserve
- minus LaaRs serving as non-spinning reserve
- minus balancing up loads (BULs)

Available Resources equals

Installed capacity using the Summer Net Dependable Capability (SNDC) pursuant to ERCOT testing requirements (excluding wind generation)

- plus capacity from private networks
- plus Effective Load Carrying Capability (ELCC) of wind generation (i. e., 8.7% of name plate generation)
- plus reliability must run (RMR) units under contract
- plus 50% of non-synchronous ties
- plus SNDC of available switchable capacity as reported by the owners
- plus available mothballed generation
- plus planned generation with a signed generation interconnection agreement (SGIA) and a TCEQ air permit, if required
- plus ELCC of planned wind generation with SGIA
- minus switchable capacity unavailable to ERCOT
- minus retiring units

Loads acting as resources (LaaRs) are capable of reducing or increasing the need for electrical energy or providing ancillary services such as responsive reserve service or non-spinning reserve service. LaaRs must be registered and qualified by ERCOT, and will be scheduled by a qualified scheduling entity (ERCOT 2007f).

- Responsive reserve service is provided by operating reserves that ERCOT maintains to restore the frequency of the ERCOT system within the first few minutes of an event that causes a significant deviation from the standard frequency. These unloaded generation resources are online, capable of controllably reducing or increasing consumption under dispatch control and that immediately respond proportionally to frequency changes. The amount of capacity from unloaded generation resources or DC tie response is limited to the amount that can be deployed within 15 seconds.

- Non-spinning reserve service is provided by LaaRs that are capable of being interrupted within 30 minutes and that are capable of running or being interrupted at a specified output level for at least 1 hour.

Balancing up Loads (BULs) are also capable of reducing the need for electrical energy when providing balancing up load energy service, but are not considered resources as defined by the ERCOT Protocols (ERCOT 2007f). Refer to Subsection 8.4.2.

Summer Net Dependable Capability is the maximum sustainable capability of a generation resource as demonstrated by a performance test lasting 168 hours (ERCOT 2007a).

A private network is an electric network connected to the ERCOT transmission grid that contains loads that are not directly metered by ERCOT (i. e., loads that are typically netted with internal generation) (ERCOT 2007a).

Effective Load Carrying Capability – ERCOT selected Global Energy Decisions, Inc. (GED) to complete a new target reserve margin study. GED used their unit commitment and dispatch software (MarketSym) to analyze the impact of load volatility, wind generation, unit maintenance, and unit forced outages on expected unserved energy, loss of load probability, and loss of load events. GED ran the model with the base set of generating units and a generic thermal generator (550 MW) and determined the expected unserved energy. GED removed the generic thermal generator and added new wind generation until the same expected unserved energy was achieved. The amount of new wind generation will have the same effective loadcarrying capability as the 550 MW thermal generator. It was found that 6,300 MW of wind had the same load carrying capacity as 550 MW of thermal generation. Thus, the effective load carrying capacity (ELCC) of wind is 8.7% (Lasher 2007).

Reliability must run (RMR) service is provided under agreements for capacity and energy from resources which otherwise would not operate and which are necessary to provide voltage support, stability or management of localized transmission constraints under first contingency criteria (ERCOT 2007f)

Switchable capacity is defined as a generating unit that can operate in either the ERCOT market or the Southwest Power Pool (SPP) market, but not simultaneously. These switchable generating units are situated in close proximity to the transmission facilities of both ERCOT and SPP, which allows them to switch from one market to the other when it is economically appropriate.

Mothballed capacity includes generation resources for which generation entities have submitted a Notification of Suspension of Operations and for which ERCOT has declined to execute an RMR agreement. Available mothballed generation is the probability that a mothballed unit will return to service provided by the owner multiplied by the capacity of the unit. Return probabilities are considered protected information under the ERCOT Protocols (ERCOT 2007a).

Planned generation capacity is based on the interconnection study phase. A generation developer must go through a set procedure to connect new generation to the ERCOT grid. The first step is a high-level screening study to determine the effects on the transmission system of adding the new generation. The second step is the full interconnection study, which is a detailed study done by transmission owners to determine the effects of the new generation (ERCOT 2007a). The full interconnection study for CPNPP 3 and 4 is in the multi-tear review and approval process by ERCOT and the PUCT.

> There is uncertainty associated with a number of the inputs to the ERCOT reserve margin calculation. The methodology considers these uncertainties to the extent possible in a formulaic approach while attempting to produce an equation to calculate an ERCOT reserve margin forecast that produces a reasonable estimate of such reserve margins and while not being overly cumbersome or complex. It is not possible to create an equation that can capture all of the impacts of market prices on capacity reserves. However, ERCOT believes that the approved methodology represents an accurate calculation of reserve margin (Comstock 2007).

ERCOT has set a minimum planning reserve margin target of 12.5 percent that equates to a capacity margin of 11 percent. This result was based on a reliability study that concluded that the margin should provide about a one-day-in-ten-years loss-of-load expectation. This reserve margin should be sufficient to cover, among other uncertainties, the potentially 5.4 percent higher peak demand associated with 90th percentile temperatures. Table 8.4-1 presents the reserve margins reported in the 2007 CDR (ERCOT 2007a) calculated using the methodology described above. As shown, ERCOT's reserve margin remains above the 12.5% requirement set by the ERCOT Board of Directors through 2008. However, ERCOT predicts that by 2009, the reserve margin will fall below 12.5%.

Generation owners are required to provide ERCOT at least 90 days notice of extended planned shutdowns of generation so ERCOT can enter into Reliability Must-Run (RMR) contracts for those units to keep them available if needed for system reliability. ERCOT has contracts with one remaining plant totaling 169 MW of RMR capacity in the Laredo area that is needed to provide local voltage support and keep facility loadings below transmission limits. ERCOT has exit strategies to improve the transmission system so this RMR capacity can be phased out by the summer of 2011 (NERC 2007).

ERCOT has committed resources of approximately 2100 MW of fossil-fueled generating capacity with existing signed interconnection agreements expected to come online between 2007 and 2012. Almost 2000 MW of new wind generation is also expected between 2007 and 2012. The North American Electric Reliability Corporation (NERC) 2007 Long-Term Reliability Assessment reported 672 MW of fossil-fueled generating capacity and 950 MW of wind generation between 2006 and 2011, all with signed interconnection agreements (NERC 2007).

Based on the CDR, the generation reserve margin is expected to drop below the recommended level in a few years. This drop is attributable to the mothballing and retirement of older, less efficient generation facilities and to a robust state economy. ERCOT emphasized the need for additional generation or demand resources and called for additional diversity in the fuel mix to reduce the system's vulnerability to supply disruption and volatile pricing due to a heavy reliance on natural gas, approximately 71 percent of installed capacity (ERCOT 2006a). As shown in

Table 8.4-1 and Figure 8.4-2, in 2013, ERCOT's reserve margin is projected to fall significantly below the 12.5 percent criterion set by the ERCOT Board of Directors.

The NERC 2007 Long Term Reliability Assessment indicates the capacity margin is expected to be slightly above the 12.5 percent target for 2008 at 12.6 percent, but declines below the minimum planning reserve margin target beginning in 2009 based on committed resources. Uncommitted resources in ERCOT include mothballed generation capacity (approximately 5000 MW) and planned generation. By 2016, the uncommitted planned generation is approximately 11,500 MW of nonwind generation, approximately 14,000 MW of nameplate capacity wind generation, and 6176 MW of nuclear generation (NERC 2007). ERCOT updates this forecast on a monthly basis as plants are added or mothballed, and the forecast is adjusted accordingly. By 2013, the amount below the reserve margin is dependent on how many 30, 40, and 50 year old plants are included in the assessment (ERCOT 2007a).

ERCOT cannot order new capacity to be installed to keep the reserve margin from falling below the required 12.5%, but publication of the various ERCOT reports and continuous collaboration between ERCOT and the market participants ensure that they are aware of the demand and capacity situation. If the PGCs do not voluntarily react to market economic forces and add generation capacity, the reserve margin could fall below the required minimum in the very near future.

8.4.2 LOAD PARTICIPATION PROGRAMS

The ERCOT Demand Side Working Group (DSWG) was created in 2001 as a task force by a directive of the Public Utility Commission of Texas (PUC) and was converted to a permanent working group in 2002. A broad range of commercial and industrial consumers, load serving entities and retail electric providers (REPs), transmission and distribution (T&D) service providers, and power generation companies (PGCs) participate in the DSWG meetings and initiatives. Their mission is to identify and promote opportunities for demand-side resources to participate in ERCOT markets and to recommend adoption of protocols and protocol revisions that foster optimum load participation in all markets. The ERCOT market rules allow demand-side participation under three general classes of service: (1) voluntary load response, (2) qualified balancing up load (BUL), and (3) load acting as a resource (ERCOT 2007c).

Voluntary load response refers to a customer's independent decision to reduce consumption from its scheduled or anticipated level in response to a price signal. This applies to situations in which the customer has not formally offered this response to the market. The practice has also been known as "passive load response" and sometimes as "self-directed load response." Voluntary loads gain financially from the ERCOT markets by reducing consumption when prices are high, but a load's ability to receive extra financial compensation depends entirely on its contractual relationship with its REP and qualified scheduling entity (QSE). Any advanced metering, communication, or curtailment infrastructure required for load participation is a contractual matter between the load and its REP and does not involve ERCOT. The QSE and REP are reimbursed by ERCOT only for the energy imbalance and do not receive capacity payments. Because the load is not recognized by ERCOT as a resource, it is not subject to being curtailed involuntarily during emergency situations (ERCOT 2007c).

BULs refer to loads that contract with a QSE to formally submit offers to ERCOT to provide balancing energy by reducing their energy use. BULs are paid only if they actually deploy (reduce energy use) in response to selection by ERCOT. If deployed, BULs receive two separate forms of compensation: (1) a payment for actual load reduction based on prevailing market clearing price for energy and (2) a capacity payment based on the market clearing price for capacity in the nonspinning reserves market. This compensation is an additional reward for the BULs submitting bids into the balancing energy market even though the BULs are not actually providing nonspinning reserves. Payments are made to a BUL's QSE, who may pass the value on to its REP, who may in turn pass the value along to the BUL. Many variations in products offered by REPs are available, and the load customer has choices on how to receive value for its interruptible load (ERCOT 2007c).

Customers with interruptible loads that can meet certain performance requirements may be qualified to provide operating reserves under the Load Acting as a Resource (LaaR) program. In eligible ancillary services (AS) markets, the value of the LaaR load reduction is equal to that of an increase in generation by a generating plant. In addition, any provider of operating reserves selected through an ERCOT AS market is eligible for a capacity payment, regardless of whether the demand-side resource is actually curtailed. To participate in the ERCOT market as a LaaR, a customer must register each individual LaaR asset and also register with ERCOT as a resource entity (ERCOT 2007c).

8.4.3 ADEQUACY OF ERCOT ASSESSMENTS PER NUREG-1555 CRITERIA

ERCOT performs the functions of an independent organization under Public Utility Regulatory Act (PURA) 39.151 to ensure the following:

- Access to the T&D systems for all buyers and sellers of electricity on nondiscriminatory terms.
- Reliability and adequacy of the regional electrical network. Information relating to a customer's choice of REP is conveyed in a timely manner to the persons who need that information.
- Electricity production and delivery are accurately accounted for among the generators and wholesale buyers and sellers in the region (PUC 2007).

PUC Chapter 25, Substantive Rules Applicable to Electric Service Providers, establishes a comprehensive system to (1) accomplish the mission of the PUC with respect to electric service and (2) establish the rights and responsibilities of the electric utilities, including T&D utilities, nonutility wholesale and retail market participants, and electric customers (PUC 2007).

NUREG-1555, Standard Review Plans for Environmental Reviews for Nuclear Power Plants (ESRP) 8.4 states in part:

> Affected States and/or regions, NERC reliability councils, and regional transmission organizations may prepare need-for-power evaluations for proposed generation and transmission facilities. The NRC plans to review the evaluation of the proposed facility and determine if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and

> (4) responsive to forecasting uncertainty. If the need-for-power evaluation is found acceptable, no additional independent review by NRC is needed, and the analysis can be the basis for ESRPs 8.2 through 8.4.

and further, states:

> If a need-for-power analysis conducted by or for one or more relevant regions affected by the proposed plant concludes there is a need for new generating capacity, that finding should be given great weight provided that the analysis was systematic, comprehensive, subject to confirmation, and responsive to forecast uncertainty.

Sections 8.2, 8.3, and 8.4 describe several ERCOT studies and reports on which ERCOT has relied for the need-for-power evaluation. The tables and figures used in these sections have been taken from the ERCOT studies and reports. These studies and reports, taken collectively, and the conclusions drawn from them, are considered to be systematic, comprehensive, subject to confirmation, and responsive to forecasting uncertainty in accordance with the NUREG-1555 criteria, as discussed below.

<u>Criterion 1 – Systematic</u>

ERCOT is required by the PUC to provide extensive studies, issue reports, and make recommendations for transmission system needs and resource adequacy. ERCOT develops a 5-Year Plan for the ERCOT area that is based on studies of system performance compared to ERCOT and NERC reliability standards set by both ERCOT and individual transmission owners. The results of this analysis are documented in the annual ERCOT report on constraints and needs. ERCOT also develops a long-term system assessment (LTSA) in even-numbered years that investigates the long lead-time transmission system improvements that are needed to meet ERCOT reliability standards through the 10th year of the planning horizon. ERCOT performs studies in the odd-numbered years to validate that the projects included in the LTSA allow the ERCOT system to meet applicable standards. The development of these reports is subject to a rigorous stakeholder input process (NERC 2007).

<u>Criterion 2 – Comprehensive</u>

ERCOT conducts transmission system planning and exercises comprehensive authority over the planning of bulk transmission projects that affect the capability of the ERCOT transmission system. ERCOT also supervises and coordinates the planning activities of transmission service providers (TSPs) (PUC 2007).

- ERCOT evaluates and makes recommendations to the PUC on the need for any transmission facility over which it has comprehensive transmission planning authority.
- A TSP coordinates its transmission planning efforts with those of other TSPs, insofar as its transmission plans affect other TSPs. This activity is monitored by ERCOT to ensure high transmission system reliability.

- ERCOT submits to the PUC any revisions or additions to its planning guidelines and procedures prior to adoption. ERCOT may seek input from the PUC on the content and implementation of its guidelines and procedures as it deems necessary.

Criterion 3 – Subject to Confirmation

The analyses and reports benefit from extensive stakeholder input as provided for in the ERCOT process, as well as review by the PUC, which has the responsibility for market oversight in ERCOT. Both the long-term hourly peak demand and energy forecast study (ERCOT 2007) and the CDR look at historical information as a check on past forecasting performance (ERCOT 2007a). Each TSP and transmission service customer in the ERCOT region provides historical information concerning peak loads and resources connected to the TSP's system. ERCOT periodically files with the PUC reports concerning its governance, operations and budget, the reliability of the ERCOT electrical network, and ERCOT's transmission planning efforts, including a list of any transmission projects that it recommends (PUC 2007).

TSPs and transmission service customers provide such information as may be required by ERCOT to carry out the functions prescribed by PUC Chapter 25 and the ERCOT protocols. ERCOT maintains the confidentiality of competitively sensitive information and other protected information, as specified in PUC Chapter 25, Section 25.362, relating to ERCOT governance. Providers of transmission and AS are expected to also maintain the confidentiality of competitively sensitive information entrusted to them by ERCOT or a transmission service customer (PUC 2007).

Criterion 4 – Responsive to Forecasting Uncertainty

Forecasting electrical demand and energy is one of the most significant factors in determining the future infrastructure needs of the ERCOT power system. To develop the most reasonable load projections for the system, ERCOT load forecasters consider a wide range of variables such as population, weather, land usage, general business economy, governmental policy, and societal trends in terms of both historical actual and the best predicted future indicators available.

ERCOT develops peak demand and energy forecasts that reflect the outcome of differing economic and weather outlooks and uncertainties and, in cooperation with TSPs, selects a most probable scenario for planning purposes (ERCOT 2007d).

The long-term forecasting model resolves one measure of the uncertainty associated with extreme weather impacts on peak demands by using a more extreme weather profile to obtain the forecasts. It then uses a 90th and 10th percentile confidence band to bound contingencies. From 1999 to 2006, the ERCOT peak demand and energy consumption forecasts have been within +5 percent of the actual demand and consumption (ERCOT 2007).

8.4.4 CONCLUSIONS

As discussed above, taken collectively, the studies and reports performed or utilized by ERCOT and referenced in this chapter regarding power supply, demand, and projections satisfy the four criteria in NUREG-1555 and provide sufficient data and analysis to serve as the basis for a need-for-power assessment and conclusion. ERCOT has concluded that a significant amount of new generation is needed to meet the demand projected for 2016, along with maintaining the 12.5 percent reserve margin that is needed to maintain system reliability, regardless of which load scenario is under consideration (ERCOT 2006b).

In its 2006 Long-Term Reliability Assessment, NERC identified four key findings that could critically impact long-term reliability unless prompt actions are taken: (1) declining capacity margins, (2) lagging transmission construction, (3) fuel supply and delivery issues (focusing on natural gas), and (4) the aging industry workforce (NERC 2007). NERC concluded while some progress has been made, efforts to date have yet to substantially mitigate the risk of these issues to future reliability. Each of these four issues is highlighted again in the 2007 report as a key finding (NERC 2007). In summary, the ERCOT generation capacity and demand projections demonstrate a need for power based on a shrinking reserve margin that is expected to fall below the ERCOT system reliability goals by 2009.

8.4.5 ERCOT UPDATE

Chapter 8 of the Environmental Report was developed using 2007 ERCOT data. ERCOT demand and supply data is routinely updated and Luminant continues to monitor the updated ERCOT data. The 2008 ERCOT reports incorporate new projections for power supply (additional intermittent wind supply and efficiency projections) and slightly lower projections for demand (impacts of the economy). The effect of these changes reduced demand approximately 1% in the near-term (10-year look-ahead) and 14% over the long-term projection (20-year look-ahead). However, even with the changes in demand and supply forecast and only excluding plants over 50 years old, ERCOT still showed a need for over 15,000 MWe of supply in the short term and over 48,000 MWe by 2028. This would equate to the addition of over 30 plants the size of the planned units. The overall conclusion regarding the future need for baseload generation in the ERCOT market has not changed.

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TABLE 8.4-1
ERCOT DEMAND, SUPPLY, AND RESERVE MARGIN

Load Forcast:	2008	2009	2010	2011	2012	2013
Total Summer Peak Demand, MW	65.135	66,508	67,955	69,456	70,733	72,160
less LAARs Serving as Responsive Reserve, MW	1,125	1,125	1,125	1,125	1,125	1,125
less LAARs Serving as Non-Spinning Reserve, MW	0	0	0	0	0	0
less BULs, MW	0	0	0	0	0	0
Firm Load Forcast, MW	64,010	65,383	66,830	68,331	69,608	71,035
Resources:	2008	2009	2010	2011	2012	2013
Installed Capacity, MW	61,722	61,722	61,722	61,722	61,722	61,722
Capacity from Private Networks, MW	6405	6405	6405	6405	6405	6405
Effective Load-Carrying Capability (ELCC) of Wind Generation, MW	497	497	497	497	497	497
RMR Units under Contract, MW	169	169	169	0	0	0
Operational Generation, MW	68,793	68,793	68,793	68,624	68,624	68,624
50% of Non-Synchronous Ties, MW	553	553	553	553	553	553
Switchable Units, MW	2877	2877	2877	2877	2877	2877
Available Mothballed Generation, MW	510	419	594	558	522	522
Planned Units (not wind) with Signed IA and Air Permit, MW	0	836	3296	3296	4221	4221
ELCC of Planned Wind Units with Signed IA, MW	0	148	153	153	153	153
Total Resources, MW	72,733	73,625	76,266	76,061	76,950	76,950
less Switchable Units Unavailable to ERCOT, MW	317	317	0	0	0	0
less Retiring Units, MW	0	0	65	65	65	65
Resources, MW	72,416	73,308	76,201	75,996	76,885	76,885
Reserve Margin	13.1%	12.1%	14.0%	11.2%	10.5%	8.2%
(Resources - Firm Load Forecast)/Firm Load Forecast						

(ERCOT 2007a)