2020 MISO Energy and Peak Demand Forecasting for System Planning

Prepared by:

Liwei Lu
Fang Wu
Douglas J. Gotham
David G. Nderitu
Timothy A. Phillips
Paul V. Preckel
Marco A. Velástegui

State Utility Forecasting Group
Discovery Park
Purdue University
West Lafayette, Indiana

November 2020

Prepared for:

Midcontinent Independent System Operator, Inc.

PURDUE UNIVERSITY | State Utility Forecasting Group

CONTENTS

Contents

Executive Summary 1

Introduction 3

OVERVIEW 3

REPORT STRUCTURE 4

Forecasting Methodology 5

OVERVIEW 5

STATEWIDE ANNUAL ELECTRIC ENERGY FORECASTS 5

CONVERSION OF RETAIL SALES TO METERED LOAD AND BENCHMARKING TO 2019 LEVELS 5

LRZ ENERGY FORECASTS 6

LRZ NON-COINCIDENT MONTHLY PEAK DEMAND FORECASTS 6

MISO-LEVEL FORECASTS 7

DATA SOURCES 7

COVID-19 8

State-by-State Results 9

ARKANSAS 9

ILLINOIS 10

INDIANA 11

IOWA 12

KENTUCKY 13

LOUISIANA 15

MICHIGAN 16

MINNESOTA 17

MISSISSIPPI 18

MISSOURI 19

MONTANA 20

NORTH DAKOTA 21

SOUTH DAKOTA 22

TEXAS 23

WISCONSIN 24

LRZ Forecasts 25

ANNUAL LRZ ENERGY FORECASTS 25

LRZ NON-COINCIDENT PEAK DEMANDS 27

LRZ FORECASTS 29

CONTENTS

LRZ 1 ____ 29
LRZ 2 ____ 30
LRZ 3 ____ 31
LRZ 4 ____ 32
LRZ 5 ____ 33
LRZ 6 ____ 34
LRZ 7 ____ 36
LRZ 8 ____ 37
LRZ 9 ____ 38
LRZ 10 ____ 39
MISO Forecasts ____ 41
MISO ANNUAL ENERGY FORECAST ____ 41
MISO SYSTEM COINCIDENT PEAK DEMAND FORECAST ____ 42
MISO SYSTEM HIGH AND LOW FORECASTS ____ 44
APPENDIX A State Electric Energy Forecasting Models ____ 45
APPENDIX B Allocation Factors ____ 57
APPENDIX C Peak Demand Models and Forecast Results ____ 61
APPENDIX D High and Low Forecasts ____ 76

TABLES

Tables

Table ES-1: State Retail Sales CAGR (2021-2040) (%) 1
Table ES-2: LRZ Metered Load CAGR (2021-2040) (%) 2
Table ES-3: MISO Annual Energy and July Coincident Peak Demand CAGR (2021-2040) (%) 2
Table 1: Data Sources 7
Table 2: Arkansas Explanatory Variable CAGR for the Period of 2021-2040 (%) 9
Table 3: Arkansas Allocation Factors 9
Table 4: Arkansas LRZ Forecast CAGR for the Period of 2021-2040 (%) 9
Table 5: Illinois Explanatory Variable CAGR for the Period of 2021-2040 (%) 10
Table 6: Illinois Allocation Factors 10
Table 7: Illinois LRZ Forecast CAGR for the Period of 2021-2040 (%) 10
Table 8: Indiana Explanatory Variable CAGR for the Period of 2021-2040 (%) 11
Table 9: Indiana and Kentucky Allocation Factors 11
Table 10: Indiana and Kentucky LRZ Forecast CAGR for the Period of 2021-2040 (%) 11
Table 11: Iowa Explanatory Variable CAGR for the Period of 2021-2040 (%) 12
Table 12: Iowa Allocation Factors 12
Table 13: Iowa LRZ Forecast CAGR for the Period of 2021-2040 (%) 12
Table 14: Kentucky Explanatory Variable CAGR for the Period of 2021-2040 (%) 13
Table 15: Indiana and Kentucky Allocation Factors 13
Table 16: Indiana and Kentucky LRZ Forecast CAGR for the Period of 2021-2040 (%) 14
Table 17: Louisiana Explanatory Variable CAGR for the Period of 2021-2040 (%) 15
Table 18: Louisiana Allocation Factors 15
Table 19: Louisiana LRZ Forecast CAGR for the Period of 2021-2040 (%) 15
Table 20: Michigan Explanatory Variable CAGR for the Period of 2021-2040 (%) 16
Table 21: Michigan Allocation Factors 16
Table 22: Michigan LRZ Forecast CAGR for the Period of 2021-2040 (%) 16
Table 23: Minnesota Explanatory Variable CAGR for the Period of 2021-2040 (%) 17
Table 24: Minnesota Allocation Factors 17
Table 25: Minnesota LRZ Forecast CAGR for the Period of 2021-2040 (%) 17
Table 26: Mississippi Explanatory Variable CAGR for the Period of 2021-2040 (%) 18
Table 27: Mississippi Allocation Factors 18
Table 28: Mississippi LRZ Forecast CAGR for the Period of 2021-2040 (%) 18
Table 29: Missouri Explanatory Variable CAGR for the Period of 2021-2040 (%) 19
Table 30: Missouri Allocation Factors 19
Table 31: Missouri LRZ Forecast CAGR for the Period of 2021-2040 (%) 19

TABLES

Table 32: Montana Explanatory Variable CAGR for the Period of 2021-2040 (%) 20
Table 33: Montana and North Dakota Allocation Factors 20
Table 34: Montana and North Dakota LRZ Forecast CAGR for the Period of 2021-2040 (%) 20
Table 35: North Dakota Explanatory Variable CAGR for the Period of 2021-2040 (%) 21
Table 36: Montana and North Dakota Allocation Factors 21
Table 37: Montana and North Dakota LRZ Forecast CAGR for the Period of 2021-2040 (%) 21
Table 38: South Dakota Explanatory Variable CAGR for the Period of 2021-2040 (%) 22
Table 39: South Dakota Allocation Factors 22
Table 40: South Dakota LRZ Forecast CAGR for the Period of 2021-2040 (%) 22
Table 41: Texas Explanatory Variable CAGR for the Period of 2021-2040 (%) 23
Table 42: Texas Allocation Factors (%) 23
Table 43: Texas LRZ Forecast CAGR for the Period of 2021-2040 (%) 23
Table 44: Wisconsin Explanatory Variable CAGR for the Period of 2021-2040 (%) 24
Table 45: Wisconsin Allocation Factors 24
Table 46: Wisconsin LRZ Forecast CAGR for the Period of 2021-2040 (%) 24
Table 47: Gross LRZ Energy Forecasts without EE Adjustments (Annual Metered Load in GWh) 25
Table 48: Net LRZ Energy Forecasts with EE Adjustments (Annual Metered Load in GWh) 26
Table 49: July Non-Coincident Peak Demand without EE Adjustments (Metered Load in MW) 27
Table 50: July Non-Coincident Peak Demand with EE Adjustments (Metered Load in MW) 28
Table 51: Gross and Net MISO System Energy (Annual Metered Load in GWh) 41
Table 52: MISO Monthly Coincidence Factors 42
Table 53: Gross and Net MISO System July Coincident Peak Demand (Metered Load in MW) 43
Table 54: Gross MISO System CAGRs for Alternate Forecasts (2021-2040) 44
Table 55: Dependent and Explanatory Variables 45
Table 56: Explanatory Variable CAGR for the Period of 2021-2040 (%) 46
Table 57: Gross State Energy Forecasts (Annual Retail Sales in GWh) 47
Table 58: MISO Local Balancing Authorities, 2018 57
Table 59: MISO Load Fraction at State Level (MWh), 2009-2018 58
Table 60: MISO Load Fraction (Average % of State-Level Electricity Sales from 2009 to 2018) 58
Table 61: State Level MISO Load Fraction by MISO LRZs 59
Table 62: Allocation Factors to Convert State Sales to LRZ Energy Sales 60
Table 63: Selected Weather Stations by LRZ, Midwest Regional Climate Center 61
Table 64: Normalized July Peak Load Factors and Weather Conditions (Fahrenheit) 62
Table 65: Gross January Non-Coincident Peak Demand (Metered Load in MW) 63
Table 66: Gross February Non-Coincident Peak Demand (Metered Load in MW) 64

TABLES

Table 67: Gross March Non-Coincident Peak Demand (Metered Load in MW) 65
Table 68: Gross April Non-Coincident Peak Demand (Metered Load in MW) 66
Table 69: Gross May Non-Coincident Peak Demand (Metered Load in MW) 67
Table 70: Gross June Non-Coincident Peak Demand (Metered Load in MW) 68
Table 71: Gross July Non-Coincident Peak Demand (Metered Load in MW) 69
Table 72: Gross August Non-Coincident Peak Demand (Metered Load in MW) 70
Table 73: Gross September Non-Coincident Peak Demand (Metered Load in MW) 71
Table 74: Gross October Non-Coincident Peak Demand (Metered Load in MW) 72
Table 75: Gross November Non-Coincident Peak Demand (Metered Load in MW) 73
Table 76: Gross December Non-Coincident Peak Demand (Metered Load in MW) 74
Table 77: Gross MISO System Coincident Peak Demand by Month (Metered Load in MW) 75

FIGURES

Figures

Figure 1: MISO 2018 Planning Year LRZ Map 3
Figure 2: Process Flow Chart 5
Figure 3: Structure and Logic Diagram for Allocation Factors 6
Figure 4: Structure and Logic Diagram for Peak Conversion Factors 6
Figure 5: Arkansas Energy Forecast (Annual Retail Sales in GWh) 9
Figure 6: Illinois Energy Forecasts (Annual Retail Sales in GWh) 10
Figure 7: Indiana Energy Forecasts (Annual Retail Sales in GWh) 11
Figure 8: Iowa Energy Forecasts (Annual Retail Sales in GWh) 12
Figure 9: Kentucky Energy Forecasts (Annual Retail Sales in GWh) 13
Figure 10: Louisiana Energy Forecasts (Annual Retail Sales in GWh) 15
Figure 11: Michigan Energy Forecasts (Annual Retail Sales in GWh) 16
Figure 12: Minnesota Energy Forecasts (Annual Retail Sales in GWh) 17
Figure 13: Mississippi Energy Forecasts (Annual Retail Sales in GWh) 18
Figure 14: Missouri Energy Forecasts (Annual Retail Sales in GWh) 19
Figure 15: Montana Energy Forecasts (Annual Retail Sales in GWh) 20
Figure 16: North Dakota Energy Forecasts (Annual Retail Sales in GWh) 21
Figure 17: South Dakota Energy Forecasts (Annual Retail Sales in GWh) 22
Figure 18: Texas Energy Forecasts (Annual Retail Sales in GWh) 23
Figure 19: Wisconsin Energy Forecasts (Annual Retail Sales in GWh) 24
Figure 20: Gross and Net LRZ 1 Energy (GWh) 29
Figure 21: Gross and Net LRZ 1 July Non-Coincident Peak Demand (MW) 30
Figure 22: Gross and Net LRZ 2 Energy (GWh) 31
Figure 23: Gross and Net LRZ 2 July Non-Coincident Peak Demand (MW) 31
Figure 24: Gross and Net LRZ 3 Energy (GWh) 32
Figure 25: Gross and Net LRZ 3 July Non-Coincident Peak Demand (MW) 32
Figure 26: Gross and Net LRZ 4 Energy (GWh) 33
Figure 27: Gross and Net LRZ 4 July Non-Coincident Peak Demand (MW) 33
Figure 28: Gross and Net LRZ 5 Energy (GWh) 34
Figure 29: Gross and Net LRZ 5 July Non-Coincident Peak Demand (MW) 34
Figure 30: Gross and Net LRZ 6 Energy (GWh) 35
Figure 31: Gross and Net LRZ 6 July Non-Coincident Peak Demand (MW) 35
Figure 32: Gross and Net LRZ 7 Energy (GWh) 36
Figure 33: Gross and Net LRZ 7 July Non-Coincident Peak Demand (MW) 36

FIGURES

Figure 34: Gross and Net LRZ 8 Energy (GWh) 37
Figure 35: Gross and Net LRZ 8 July Non-Coincident Peak Demand (MW) 38
Figure 36: Gross and Net LRZ 9 Energy (GWh) 39
Figure 37: Gross and Net LRZ 9 July Non-Coincident Peak Demand (MW) 39
Figure 38: Gross and Net LRZ 10 Energy (GWh) 40
Figure 39: Gross and Net LRZ 10 July Non-Coincident Peak Demand (MW) 40
Figure 40: Gross and Net MISO System Energy Forecast (Metered Load in GWh) 42
Figure 41: Gross and Net MISO System July Coincident Peak Demand (Metered Load in MW) 43
Figure 42: Gross MISO System Energy for Alternate Forecasts (Annual Metered Load in GWh) 44

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report provides the seventh load forecast the State Utility Forecasting Group (SUFG) has prepared for the Midcontinent Independent System Operator Inc. (MISO). These forecasts project annual energy demand for the ten MISO local resource zones (LRZs) and the MISO system as a whole. Monthly peak loads[1] are also forecast at the LRZ and MISO system-wide levels. This forecast does not attempt to replicate the forecasts that are produced by MISO's load-serving entities (LSEs).

Forecast reports before 2019 included projections on both gross (prior to adjustments for utility energy efficiency and demand response programs) and net (after those adjustments) bases. The energy efficiency/demand response (EE) adjustments were provided by MISO and were developed in the process of developing the annual MISO Transmission Expansion Plan (MTEP). Due to the temporary suspension of the MTEP process last year, no EE adjustments were available. Thus, all projections in the 2019 report were on a gross basis. This year's report includes both gross and net forecasts.

Econometric models were developed for each state to project annual retail sales of electricity. Forecasts of metered load at the LRZ level were developed by allocating the portion of each state's sales to the appropriate LRZ and adjusting for distribution system losses, weather and existing EE programs. LRZ monthly peak demand projections were developed using normalized monthly peak conversion factors, which translated annual energy into monthly peak demand based on historical observations assuming normal peak weather conditions. The LRZ monthly peak demand forecasts are on a non-coincident basis.[2] MISO system level monthly peak projections were developed from the LRZ monthly peak forecasts using monthly coincidence factors by LRZ.

The state econometric models were developed using publicly available economic data, namely annual electricity sales, prices for electricity and natural gas, personal income, population, employment, gross state product (GSP), and annual cooling and heating degree days. Economic and population projections acquired from IHS Markit (formerly IHS Global Insight) and price projections developed by SUFG were used to produce projections of future retail sales. Weather variables were held constant at their 30-year normal values. Table ES-1 provides the compound annual growth rate (CAGR) for each state energy forecast.

Table ES-1. State Retail Sales CAGR (2021-2040) (%)

STATE	AR	IL	IN	IA	KY	LA	MI	MN	MS	MO	MT	ND	SD	TX	WI
CAGR	1.36	0.59	1.30	1.52	1.84	0.74	0.77	0.78	1.44	0.80	1.72	0.92	2.21	1.98	1.02

LRZ level annual energy forecasts were developed by allocating the state energy forecasts to the individual LRZs on a proportional basis. Additionally, adjustments for distribution losses, normal weather and existing EE programs were made to produce a forecast at the metered load level. Table ES-2 provides the CAGR for each LRZ energy forecast.

[1] Due to the voluminous nature of including twelve monthly 20-year forecasts for ten LRZs and the MISO system, only a representative month (July) is included in the main body of this report. The monthly forecasts are available in Appendix C.

[2] Throughout this report, coincidence is stated in reference to the overall MISO system. Thus, the LRZ peak demand forecasts are for the highest level of demand for that particular LRZ, which would be coincident at the LRZ level but non-coincident at the MISO system level.

Table ES-2. LRZ Metered Load CAGR (2021-2040) (%)

LRZ	1	2	3	4	5	6	7	8	9	10
Gross	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44
Net	0.37	0.86	1.37	0.57	0.23	1.38	0.47	1.28	1.01	1.43

LRZ monthly non-coincident peak demand projections were developed using peak conversion factors that are determined from historical relationships between average hourly load for the year, monthly peak levels for the year, and weather conditions at the time of the peak demand. Since these conversion factors are held constant for the forecast period, the gross LRZ monthly peak demand projections have the same growth rates as the energy projections in Table ES-2.[3]

MISO system-wide energy and peak demand projections were developed from the LRZ-level projections. Since each LRZ does not experience its peak demand at the same time as the others (or as the entire MISO system), the MISO monthly coincident peak demand is less than the arithmetic sum of the individual LRZ monthly non-coincident peak demands. The MISO system monthly coincident peak demand is determined by applying monthly coincidence factors to the individual LRZ monthly non-coincident peak demands and summing across LRZs. These monthly coincidence factors represent the ratio of the LRZ's load at the time of the overall MISO system monthly peak to the LRZ's monthly non-coincident peak. Since coincidence is not an issue for annual energy, the MISO energy projections are found from the simple sum of the individual LRZs' energy projections. Table ES-3 provides the compound annual growth rates for the MISO annual energy and July peak demand forecasts.

Table ES-3. MISO Annual Energy and July Coincident Peak Demand CAGR (2021-2040) (%)

MISO-System	Gross (without EE Adjustments)	Net (with EE Adjustments)
Energy	1.04	0.86
July Peak Demand	1.03	0.76

[3] It should be noted that if customer sectors grow at different rates, the assumption that energy and peak demand will grow at the same rate is unlikely to hold true. However, there has been very little long-term change in the relationship between energy and peak demand in the MISO region, with weather variations having a much larger impact.

INTRODUCTION

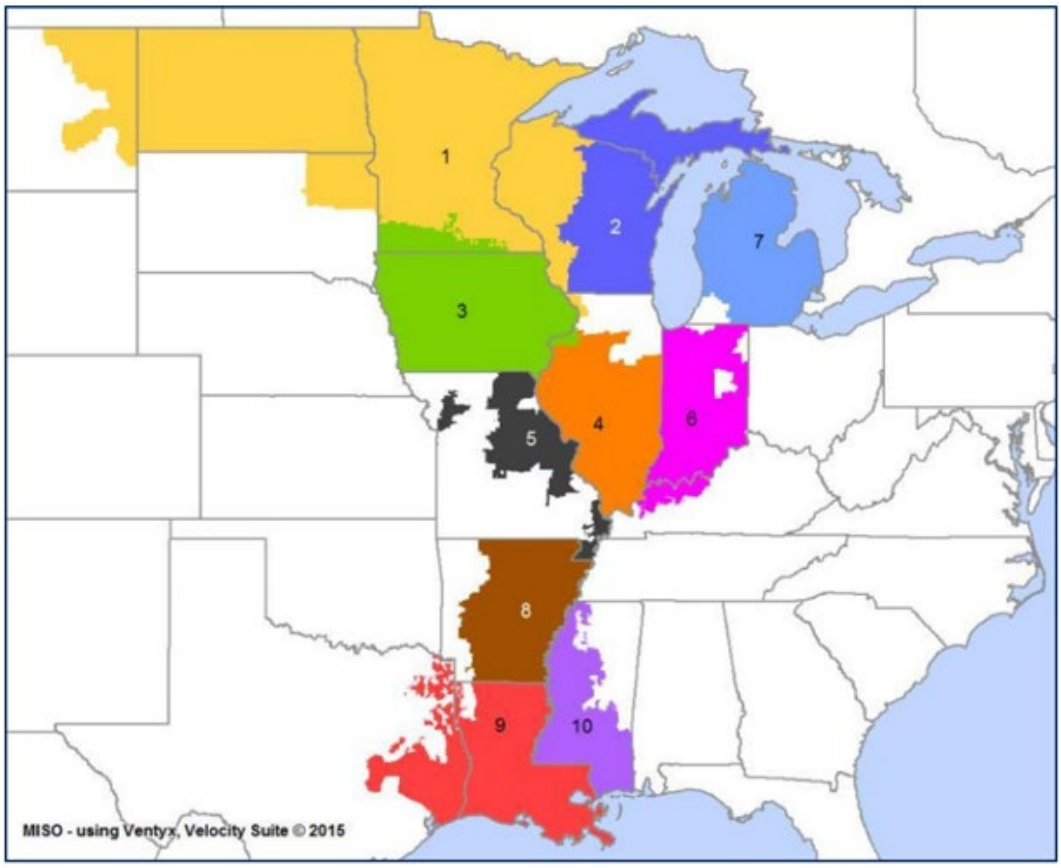
INTRODUCTION

This report represents the seventh load forecast the State Utility Forecasting Group (SUFG) has prepared for the Midcontinent Independent System Operator Inc. (MISO). These forecasts project annual energy and monthly peak[4] demand for the ten MISO local resource zones (LRZs) and the MISO system as a whole. This forecast does not attempt to replicate the forecasts that are produced by MISO's load-serving entities (LSEs).

OVERVIEW

The MISO market footprint consists of a number of individual Local Balancing Authorities (LBAs). It covers all or parts of 15 states and is divided into 10 LRZs.[5] Figure 1 displays the MISO market footprint at the LRZ level.

Figure 1: MISO 2018 Planning Year LRZ Map



Source: MISO, 2018

[4] This is the second forecast that includes monthly projections (previous forecasts were done on summer and winter seasonal bases). Due to the voluminous nature of including twelve monthly 20-year forecasts for ten LRZs and the MISO system, only a representative month (July) is included in the body of this report. The monthly forecasts are available in the Appendices.

[5] A very small amount of load in Oklahoma and Tennessee is served by MISO LBAs in LRZ 8. Rather than developing individual state econometric models for those states, it is assumed that these loads grow at the rate of the rest of LRZ 8.

INTRODUCTION

Econometric models were developed for each state to project annual retail sales of electricity. Forecasts of metered load at the LRZ level were developed by allocating the portion of each state's sales to the appropriate LRZ and adjusting for distribution system losses, weather, and existing energy efficiency (EE) programs based on the difference between the estimate of LRZ retail sales from state sales forecasts for the year 2019 and the weather-normalized LRZ metered load for the year 2019. LRZ monthly peak demand projections were developed using normalized monthly peak load conversion factors, which translated annual energy into monthly peak demand based on historical observations assuming normal peak weather conditions. The LRZ peak demand forecasts are on a non-coincident basis,[6] which means each zone may reach its zonal peak at a different time. MISO system level projections were developed from the LRZ forecasts. For the MISO-wide peak demands, coincidence factors were used.

REPORT STRUCTURE

In this report, Chapter 2 explains the forecasting methodology and provides data sources. Chapter 3 summarizes state energy projection profiles including descriptions of the state econometric models and the resulting energy forecasts. Chapter 4 covers forecast results by LRZ. Chapter 5 provides MISO system level results. The report contains four appendices. Appendix A provides details of the state energy forecasting models and methodology. Appendix B explains the calculation of allocation factors and the process of allocating the state energy forecasts to LRZ-level forecasts. Appendix C provides the methodology for determining monthly peak demand forecasts and forecast results of monthly peak by LRZ and at the MISO level. Appendix D lists high and low forecasts of energy and peak demand at state, LRZ and MISO levels.

[6] Throughout this report, coincidence is stated in reference to the overall MISO system. Thus, the LRZ peak demand forecasts are for the highest level of demand for that particular LRZ, which would be coincident at the LRZ level but non-coincident at the MISO system level.

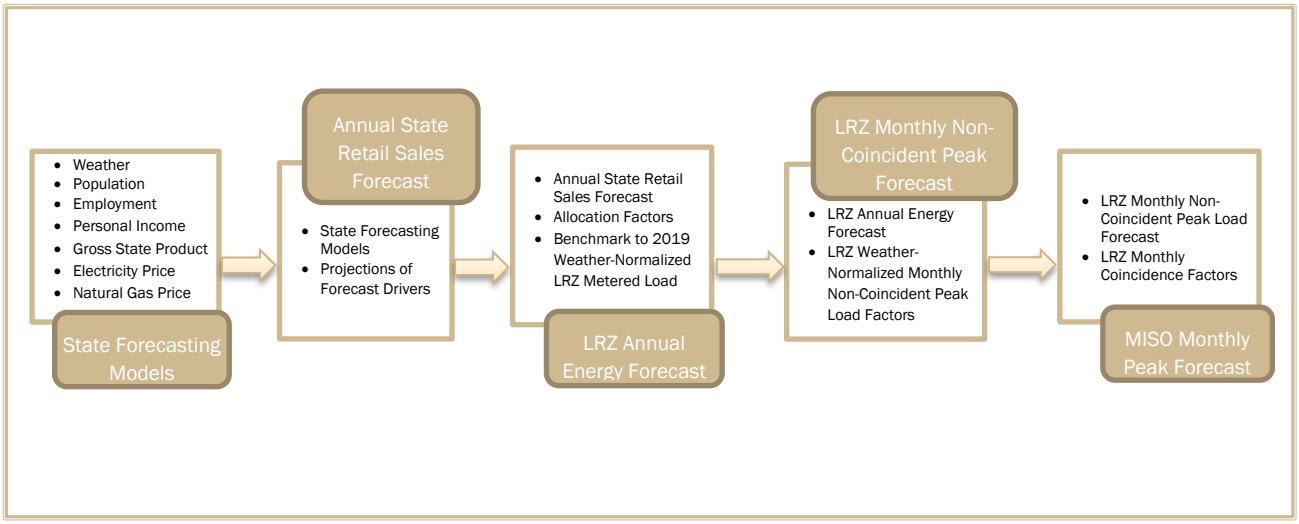
FORECASTING METHODOLOGY

FORECASTING METHODOLOGY

OVERVIEW

This study employed a multi-step approach to forecast annual energy and monthly peak demand at the MISO LRZ and system-wide levels. Econometric models were built for each state to forecast retail sales for a 20-year period, namely 2021 to 2040. The statewide energy forecasts were then used to construct annual energy forecasts at the LRZ level based on allocation factors. The LRZ annual energy forecasts were used, in turn, to develop monthly non-coincident peak demand projections by LRZ. The LRZ monthly coincident peak projections were estimated from LRZ monthly non-coincident peak demand projections by applying the zonal monthly coincidence factors. MISO system-wide energy and peak forecasts were aggregated from LRZ energy forecast and LRZ coincident peak forecast, respectively. The overall process flow chart is illustrated in Figure 2 below. It shows the five major steps in the process and the key inputs at each step.

Figure 2: Process Flow Chart



STATEWIDE ANNUAL ELECTRIC ENERGY FORECASTS

Econometric models of retail electricity sales were developed for each state using statewide historical data to determine the appropriate drivers of electricity consumption and the statistical relationship between those drivers and energy consumption. SUFG developed numerous possible model specifications for each state and selected the model that had a good fit (significant t-statistics, high R-squared values, and a significant F-statistic), passed the statistical tests (for heteroskedasticity and serial correlation), and had a set of drivers that included at least one driver that was tied to the overall growth in the state (such as employment, population or gross state product). The model formulations by state are provided in Appendix A.

CONVERSION OF RETAIL SALES TO METERED LOAD AND BENCHMARKING TO 2019 LEVELS

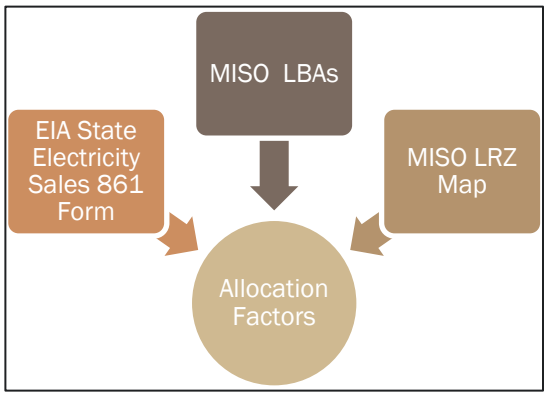
The state-level forecasts represent annual (calendar year) retail sales (electricity usage at the customer locations). This is driven by data availability, since statewide historical sales are available from the U.S. Department of Energy's Energy Information Administration (EIA). Since 2019 state electricity sales data were not available at the time this report was prepared, the state sales numbers for that year represent a forecast value that is not adjusted for EE programs. The LRZ-level forecasts are at the metered level (in essence, loads at the substations where the transmission network operated by MISO connects to the distribution systems). The

difference between the metered load and the retail sale is caused by losses between the substations and customers.[7] Since the historical metered loads at the LRZ-level are known for 2019 (they were provided by MISO), SUFG benchmarked the LRZ-level forecasts to the weather-normalized metered load levels for that year. This benchmarking accomplishes two objectives: it converts the forecast from the retail sales level to the metered load level and it captures savings from EE programs for 2019.

LRZ ENERGY FORECASTS

The LRZ annual energy forecasts were produced after the individual state annual forecasts were developed. This was done by allocating the fraction of each state's load to the appropriate LBA within that state (herein referred to as the load fraction) and summing across the various LBAs within each LRZ (see Figure 3). Since not all regions within a state experience load growth at the same rate, the load fraction of each state may change over time. The historical load fractions of each state were calculated and used to determine the future allocation factors. Additional adjustments have also been made to account for LBAs that operate in more than one state. In these cases, the market share of the LBA's load in each state within its service territory has been calculated in order to determine its load fraction for that state. In addition, distribution losses of each LRZ were incorporated (please refer to section 2.3). After LRZ annual energy forecasts were estimated, the MISO system-wide energy forecast was obtained by summing the LRZ energy forecasts. See Appendix B for additional details on the allocation process.

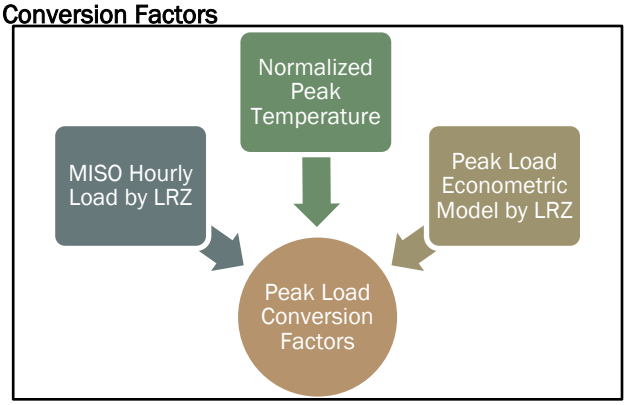
Figure 3: Structure and Logic Diagram for Allocation Factors



LRZ NON-COINCIDENT MONTHLY PEAK DEMAND FORECASTS

The LRZ non-coincident monthly peak demand forecasts were estimated based on load factors calculated using historical hourly load data of each LRZ provided by MISO. The structure and logic diagram in Figure 4 illustrate the resources employed in estimating the monthly peak conversion factors. Peak load conversion factors were used to translate annual metered load electricity forecasts at the LRZ level to monthly non-coincident peak demands. These conversion factors were determined from historical relationships between average hourly load for the year, monthly peak levels for the year, and weather conditions at the time of the peak demand. See Appendix C for additional information on the peak demand forecast methodology.

Figure 4: Structure and Logic Diagram for Peak Conversion Factors



[7] These losses occur mainly in the distribution system of the load serving entities and may include some low voltage transmission lines that are not under MISO operation.

FORECASTING METHODOLOGY

MISO-LEVEL FORECASTS

The LRZ monthly non-coincident peak demand projections were converted to MISO-level monthly coincident peak demands using historical average coincidence factors. The coincidence factor for each LRZ is determined at the time of the MISO system-wide peak demand using the ratio of the LRZ's demand at the time of the MISO-wide (coincident) peak demand divided by the LRZ's demand at the time of the LRZ's individual (non-coincident) peak demand. The MISO system-wide monthly peak demand forecasts were obtained by summing the LRZ monthly coincident peak demands. Since coincidence is not an issue with annual energy, the MISO system-wide annual energy forecast is the arithmetic sum of the LRZ annual energy forecasts.

DATA SOURCES

Historical annual energy sales data and electricity and natural gas prices by state were obtained from EIA. Historical population data by state were obtained from the Census Bureau. Historical macroeconomic data, such as personal income, were obtained from the Bureau of Economic Analysis (BEA); gross state product (GSP) data were obtained from IHS Markit (formerly IHS Global Insight) to avoid inconsistency in BEA data due to a change in industry classification systems; and employment data were obtained from the Bureau of Labor Statistics (BLS). Projections of macroeconomic data and population were retrieved from IHS Markit. Electricity and natural gas price projections were developed by SUFG. Actual monthly heating and cooling degree days on a 65°Fahrenheit basis for all 15 states were obtained from the National Oceanic and Atmospheric Administration (NOAA), and were aggregated to annual data by state. Normal weather by state used in projections were obtained from NOAA. Zonal hourly temperature records were acquired from the Midwest Regional Climate Center (MRCC). Table 1 summarizes data sources used in this study.

Table 1: Data Sources

Data	Content	Historical Data Source	Data Used in Projection
Electricity sales	GWhs, annual retail electricity sales by state, 1990-2018	EIA	N/A
Electricity prices	Cents/KWh, 2012$, 1990-2018	EIA*	SUFG projection based on EIA data
Natural gas prices	Dollars/Mcf, 2012$, 1990-2018	EIA*	SUFG projection based on EIA data
Real personal income	Thousands, 2012$, 1990-2018	BEA*	IHS Markit
Population	Number of people, 1990-2018	Census Bureau	IHS Markit
Manufacturing & non-manufacturing employment	Number of jobs, 1990-2018	BLS	IHS Markit
Non-farm employment	Number of jobs, 1990-2018	BLS	IHS Markit
Gross state product	Millions, 2012$, 1990-2018	IHS Markit	IHS Markit
Cooling degree days (CDDs)	Summations of monthly cooling degree days, base 65°F, 1970-2018	NOAA	NOAA 30-year normal
Heating degree days (HDDs)	Summations of monthly heating degree days, base 65°F, 1970-2018	NOAA	NOAA 30-year normal
Hourly Temperature	Historical hourly temperature of selected weather stations, 1997-2019	MRCC	Normal peak temperatures

** Original data were in nominal dollars. SUFG converted them to real 2012 dollars using CPI data obtained from BLS.*

FORECASTING METHODOLOGY

COVID-19

There is considerable uncertainty surrounding the impacts of the COVID-19 pandemic on the demand for electricity, especially in the short term. While this is a long-term forecast, SUFG believes that it is important that the forecast reflect both the near- and long-term impacts. Therefore, SUFG revisited the construction of some of the state econometric models to try to fit explanatory variables that better reflect the short-term impacts. Some variables, such as population and personal income, may be a reasonable driver of long-term usage but perform poorly in reflecting the impact of the pandemic and economic shutdowns. Other variables, such as various types of employment, tend to overstate the pandemic's impact. Thus, GSP was the first economic variable that was considered during model construction. In some cases, it was not possible to use GSP due to statistical problems, such as serial correlation. In those cases, alternate drivers were used.

In order to best capture the expected long-term impacts, SUFG used the most recent set of economic projections from IHS Markit, while still being able to produce the forecast in a timely manner. The economic projections were collected in June. In general, they project the economy to return to pre-pandemic levels in 2022, with the long-term economic outlook slightly below previous projections, due to economic scarring associated with obsolete capital stock and labor force reductions.

It should be further noted that due to the lower starting point, many of the projections in this report may show higher compound annual growth rates than were reported in the 2019 forecast, despite the forecast levels being lower throughout the forecast period.

STATE-BY-STATE RESULTS

ARKANSAS

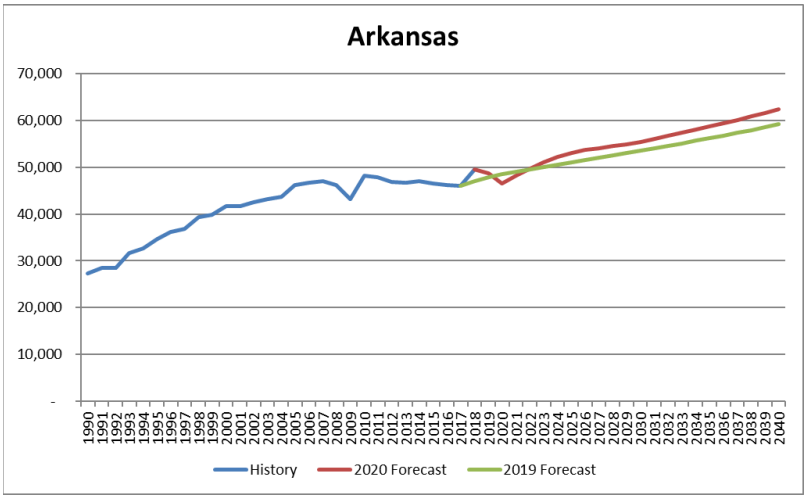
The Arkansas state econometric model uses real electricity and natural gas prices, real GSP, CDDs, and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 2.

Table 2: Arkansas Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
0.28	1.15	1.99

Arkansas annual electricity sales are projected to grow at 1.36% in this forecast, which is higher than the 1.00% growth rate projected in the 2019 Forecast. Figure 5 shows Arkansas sales projection for the 2019 and 2020 forecasts.

Figure 5: Arkansas Energy Forecast (Annual Retail Sales in GWh)



Most of Arkansas's loads are in LRZ 8. A portion of the Arkansas annual energy forecast was allocated to LRZ 8 based on the historical average of the load fractions of the period of 2014 to 2018, as shown in Table 3. See Appendix B for more information on the historical load fractions and the process of developing allocation factors.

Table 3: Arkansas Allocation Factors

LRZ8	Non-MISO
72.40%	27.60%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate for Arkansas's LRZ is shown in Table 4. Chapter 4 contains more information on LRZ forecasts.

Table 4: Arkansas LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy[8]
LRZ8	1.36

[8] The compound annual growth rates for LRZ-level energy forecast and non-coincident peak load forecast are the same.

STATE BY STATE RESULTS

ILLINOIS

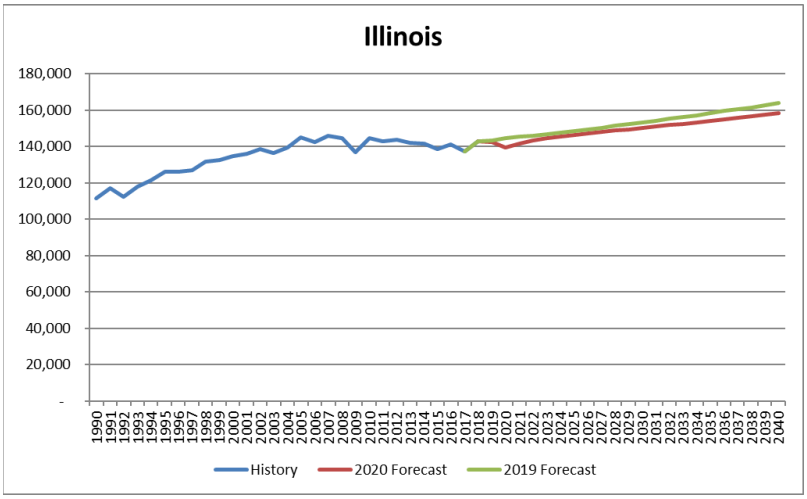
The Illinois state econometric model uses real electricity and natural gas prices, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 5.

Table 5: Illinois Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
-0.34	0.68	1.65

Illinois annual electricity sales are projected to grow at 0.59% in this forecast, which is slightly lower than the 0.62% growth rate projected in the 2019 Forecast. Figure 6 shows Illinois sales projection for the 2019 and 2020 forecasts.

Figure 6: Illinois Energy Forecasts (Annual Retail Sales in GWh)



Illinois has loads in LRZ 1, LRZ 3 and LRZ 4, with roughly 2/3 of the state's loads located outside MISO. The Illinois annual energy forecast was allocated to the three LRZs based on historical average of load fractions for the period of 2014 to 2018, as show in Table 6. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 6: Illinois Allocation Factors

LRZ1	LRZ3	LRZ4	Non-MISO
0.0002%	1.41%	33.26%	65.33%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Illinois related LRZs are shown in Table 7. Chapter 4 contains more information on LRZ forecasts.

Table 7: Illinois LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93
LRZ3	1.48
LRZ4	0.59

STATE BY STATE RESULTS

INDIANA

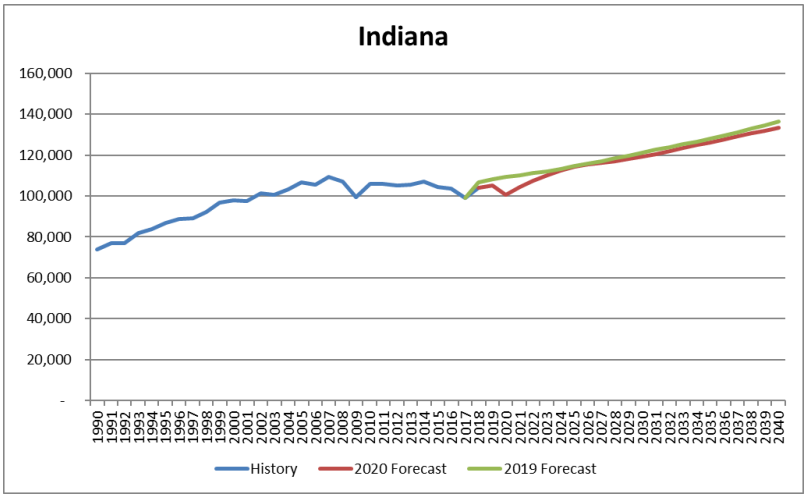
The Indiana state econometric model uses real electricity price, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 8.

Table 8: Indiana Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real GSP
-0.34	1.89

Indiana annual electricity sales are projected to grow at 1.30% in this forecast, which is higher than the 1.09% growth rate projected in the 2019 Forecast. Figure 7 shows Indiana sales projections for the 2019 and 2020 forecasts. The 2020 forecast lies slightly below the 2019 forecast due to a lower forecast value for the year 2020 caused by the COVID-19 pandemic.

Figure 7: Indiana Energy Forecasts (Annual Retail Sales in GWh)



Most of Indiana's loads are in LRZ 6. Per the request of MISO staff and due to concerns over providing utility-specific information in states that only have a single MISO utility, the load fraction of Indiana and Kentucky are combined (IN+KY). IN+KY forecasts are allocated to LRZ 6 based on the historical average of the load fractions for the period of 2014 to 2018, as shown in Table 9. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

The shutdown of the Paducah Gaseous Diffusion Plant (PGDP) in Kentucky in 2013 caused a significant shift in the historical MISO share in IN+KY. Because the 2014 to 2018 values reflect the MISO shares in LRZ 6 after the complete shutdown of the plant, the future allocation factor is held constant at the average of those values.

Table 9: Indiana and Kentucky Allocation Factors

LRZ6	Non-MISO
51.08%	48.92%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate of LRZ 6 is shown in Table 10. Chapter 4 contains more information on LRZ forecasts.

Table 10: Indiana and Kentucky LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ6	1.54

IOWA

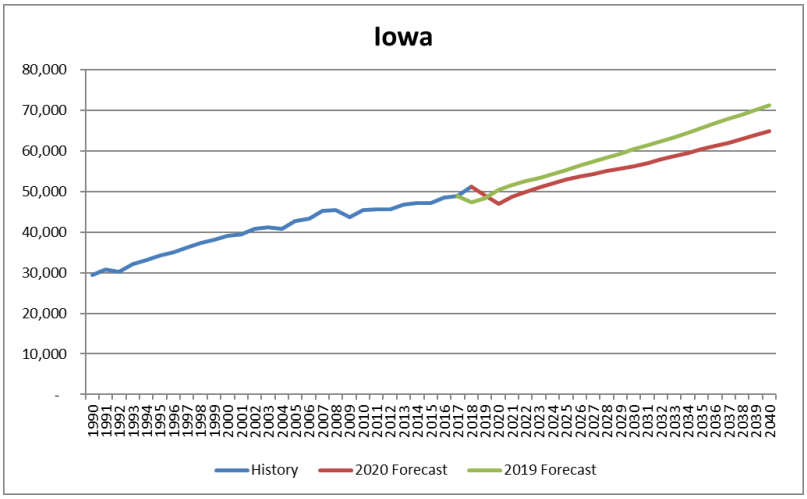
The Iowa state econometric model uses real electricity price, real GSP, and CDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 11.

Table 11: Iowa Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real GSP
-0.46	2.06

Iowa annual electricity sales are projected to grow at 1.52% in this forecast, which is lower than the 1.75% growth rate projected in the 2019 Forecast. Figure 8 shows sales projection for the 2019 and 2020 forecasts.

Figure 8: Iowa Energy Forecasts (Annual Retail Sales in GWh)



Iowa has loads in LRZ 1 and LRZ 3. The Iowa annual energy forecast was allocated to the two LRZs based on the historical average of the load fractions for the period of 2014 to 2018, as shown in Table 12. See Appendix B for more information on the historical load fractions and the process of developing allocation factors.

Table 12: Iowa Allocation Factors

LRZ1	LRZ3	Non-MISO
1.80%	91.04%	7.16%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Iowa's LRZs are shown in Table 13. Chapter 4 contains more information on LRZ forecasts.

Table 13: Iowa LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93
LRZ3	1.48

STATE BY STATE RESULTS

KENTUCKY

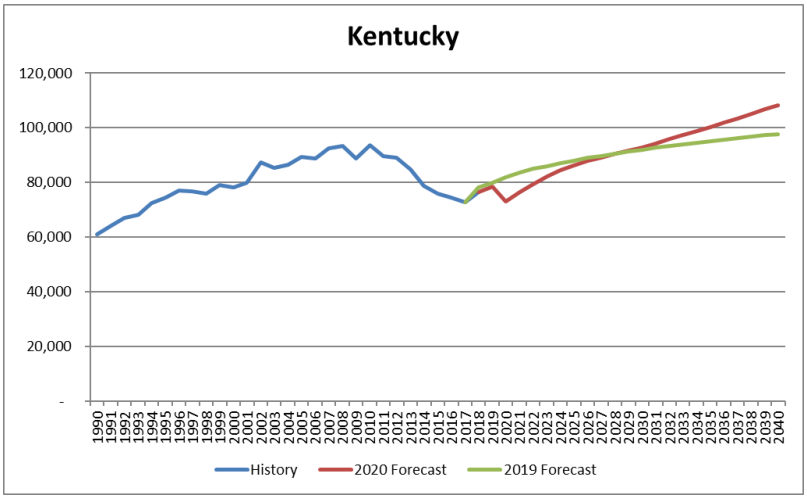
The Kentucky state econometric model uses real electricity and natural gas prices, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 14.

Table 14: Kentucky Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
-0.36	0.77	1.91

For the state of Kentucky, SUFG observed a dramatic drop in electricity sales occurred starting in 2013. This was caused by the closure of the PGDP in mid-2013, which represented a 3 GW load on the Tennessee Valley Authority system and accounted for more than 10% of the state's retail sales. With this large drop in load, SUFG could not fit an econometric model for the state. Therefore, the 2013 and subsequent years historical load were adjusted up to what it would have been if the PGDP had operated at its full capacity. SUFG then developed the econometric model with the adjusted electricity load and used the model to produce a load forecast for the state of Kentucky. The PGDP load was then subtracted from the forecast load derived from the econometric model to serve as the final state load forecast for Kentucky. Kentucky electricity sales are projected to grow at 1.84% in this forecast, which is higher than the 0.91% growth rate projected in the 2019 Forecast. Figure 9 shows Kentucky sales projection for the 2019 and 2020 forecasts.

Figure 9: Kentucky Energy Forecasts (Annual Retail Sales in GWh)



Only a small portion of Kentucky's loads are in LRZ 6, with most of the loads occurring outside of MISO. Per the request of MISO staff and due to concerns over providing utility-specific information in states that only have a single MISO utility, the load fraction of Indiana and Kentucky are combined (IN+KY). IN+KY forecasts were allocated to LRZ 6 based on the historical average of the load fractions for the period of 2014 to 2018, as shown in Table 15. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

The shutdown of the PGDP in Kentucky in 2013 caused a significant shift in the historical MISO share in IN+KY. Because the 2014 to 2018 values reflect the MISO shares in LRZ 6 after the complete shutdown of the plant, the future allocation factor is held constant at the average of those values.

Table 15: Indiana and Kentucky Allocation Factors

LRZ6	Non-MISO
51.08%	48.92%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate for Indiana and Kentucky's LRZ is shown in Table 16. Chapter 4 contains more information on LRZ forecasts.

Table 16: Indiana and Kentucky LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ6	1.54

LOUISIANA

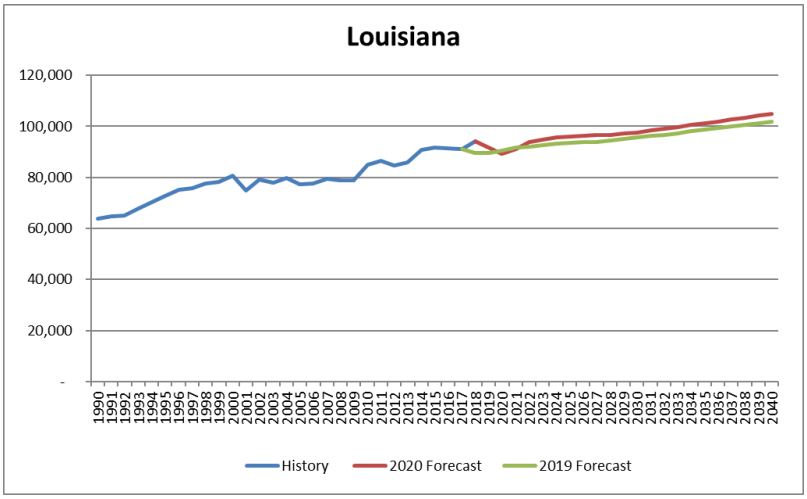
The Louisiana state econometric model uses real electricity and natural gas prices, real GSP excluding the mining sector, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 17.

Table 17: Louisiana Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP Excluding Mining Sector
0.28	1.47	1.77

Louisiana annual electricity sales are projected to grow at 0.74% in this forecast, which is higher than the 0.59% growth rate projected in the 2019 Forecast. Figure 10 shows Louisiana sales projections for the 2019 and 2020 forecasts.

Figure 10: Louisiana Energy Forecasts (Annual Retail Sales in GWh)



Most of Louisiana's loads are in LRZ 9. The Louisiana annual energy forecast was allocated to LRZ 9 based on the historical average of the load fractions for the period of 2014 to 2018, as shown in Table 18. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 18: Louisiana Allocation Factors

LRZ9	Non-MISO
92.74%	7.26%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate for Louisiana's LRZ is shown in Table 19. Chapter 4 contains more information on LRZ forecasts.

Table 19: Louisiana LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ9	1.03

STATE BY STATE RESULTS

MICHIGAN

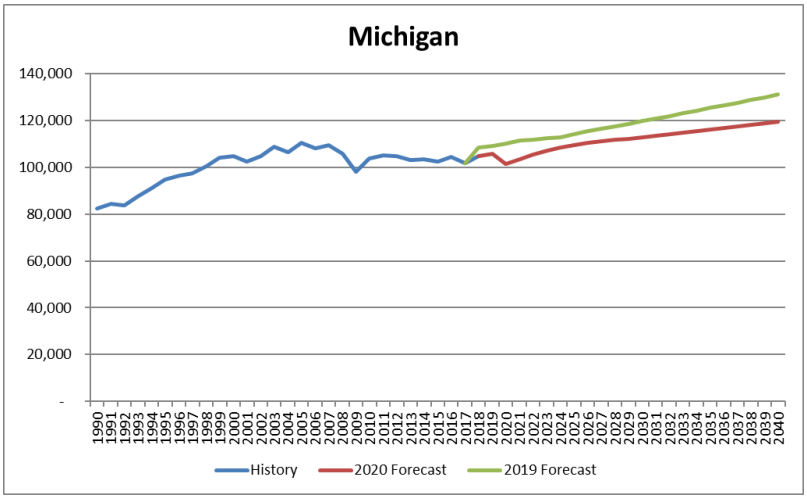
The Michigan state econometric model uses real electricity and natural gas prices, real GSP, and CDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 20.

Table 20: Michigan Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
-0.34	0.67	1.64

Michigan annual electricity sales are projected to grow at 0.77% in this forecast, which is slightly lower than the 0.87% growth rate projected in the 2019 Forecast. Figure 11 shows sales projections for the 2019 and 2020 forecasts.

Figure 11: Michigan Energy Forecasts (Annual Retail Sales in GWh)



Michigan has loads in LRZ 1, LRZ 2 and LRZ 7. The Michigan forecast was allocated to the three LRZs based on the historical average of the load fractions for the period of 2014 to 2018, as shown in Table 21. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 21: Michigan Allocation Factors

LRZ1	LRZ2	LRZ7	Non-MISO
0.13%	4.55%	91.42%	3.89%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Michigan's LRZs are shown in Table 22. Chapter 4 contains more information on LRZ forecasts.

Table 22: Michigan LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93
LRZ2	1.00
LRZ7	0.77

STATE BY STATE RESULTS

MINNESOTA

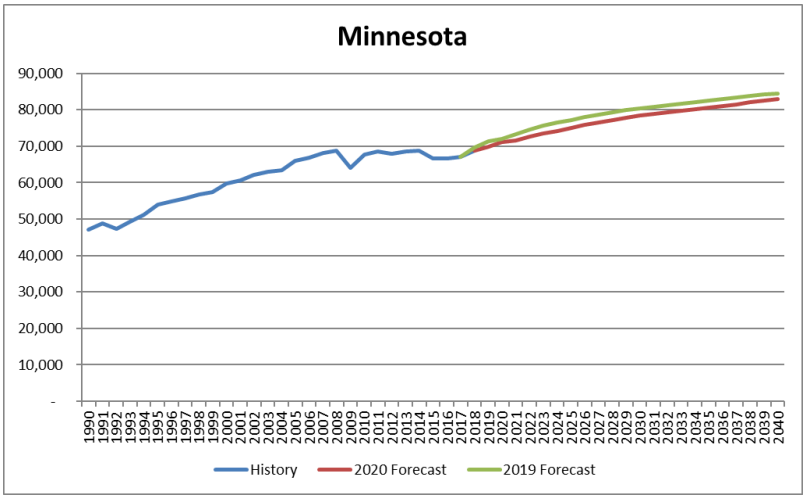
The Minnesota state econometric model uses real electricity price, population, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 23.

Table 23: Minnesota Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Population
-0.48	0.39

Minnesota annual electricity sales are projected to grow at 0.78% in this forecast, which is slightly lower than the 0.82% growth rate projected in the 2019 Forecast. Figure 12 shows electricity sales projection for the 2019 and 2020 forecasts.

Figure 12: Minnesota Energy Forecasts (Annual Retail Sales in GWh)



Minnesota has loads in LRZ 1 and LRZ 3. The Minnesota forecast was allocated to the two LRZs based on the historical average of the load fractions of 2016 to 2018, as shown in Table 24. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Minnesota's allocation factor in LRZ3 dropped dramatically from previous years in 2016 because the Interstate Power and Light Co stopped selling power to Minnesota beginning in 2016. Therefore, the future allocation factor is held constant at the average of the load fractions of 2016 to 2018 to reflect the recent situation.

Table 24: Minnesota Allocation Factors

LRZ1	LRZ3	Non-MISO
97.79%	0.92%	1.28%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Minnesota's LRZs are shown in Table 25. Chapter 4 contains more information on LRZ forecasts.

Table 25: Minnesota LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93
LRZ3	1.48

MISSISSIPPI

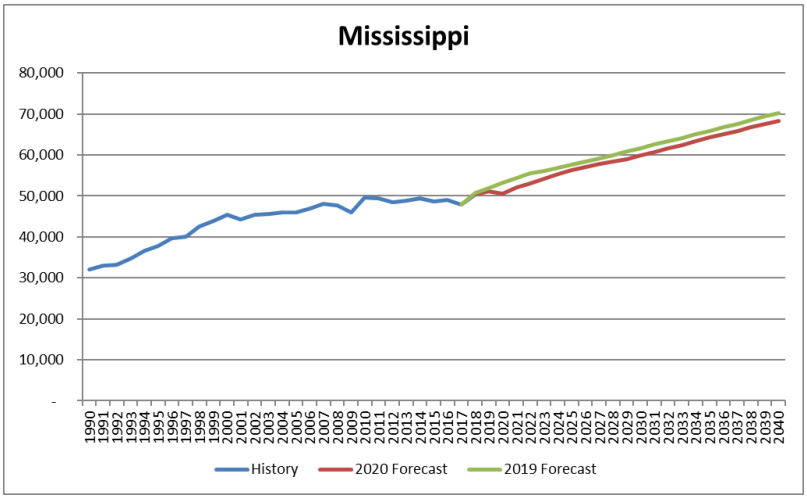
The Mississippi state econometric model uses real electricity price, real personal income, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 26.

Table 26: Mississippi Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Personal Income	Real GSP
-0.36	1.75	1.94

Mississippi annual electricity sales are projected to grow at 1.44% in this forecast, which is very close to the 1.41% growth rate projected in the 2019 Forecast. Figure 13 shows sales projections for the 2019 and 2020 forecasts. The 2020 Forecast lies slightly below the 2019 Forecast due to a lower starting point.

Figure 13: Mississippi Energy Forecasts (Annual Retail Sales in GWh)



Almost half of Mississippi's load is in LRZ 10. The Mississippi forecast was allocated to LRZ 10 based on the historical average of the load fractions of the period of 2014 to 2018, as shown in Table 27. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 27: Mississippi Allocation Factors

LRZ10	Non-MISO
44.61%	55.39%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate for Mississippi's LRZ is shown in Table 28. Chapter 4 contains more information on LRZ forecasts.

Table 28: Mississippi LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ10	1.44

STATE BY STATE RESULTS

MISSOURI

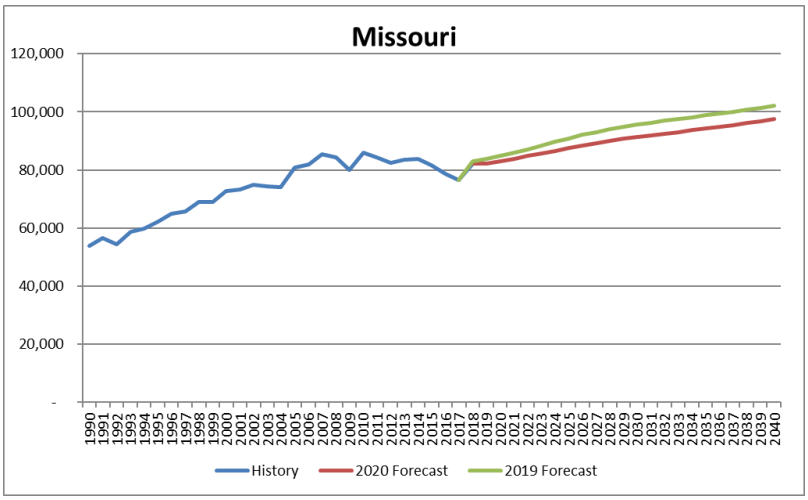
The Missouri state econometric model uses real electricity price, population, and CDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 29.

Table 29: Missouri Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Population
-0.48	0.25

Missouri annual electricity sales are projected to grow at 0.80% in this forecast, which is lower than the 0.95% growth rate projected in the 2019 Forecast. Figure 14 shows sales projections for the 2019 and 2020 forecasts.

Figure 14: Missouri Energy Forecasts (Annual Retail Sales in GWh)



Missouri has loads in LRZ 5 and LRZ 8. The Missouri forecast was allocated to the two LRZs based on the trend of historical load fractions, as shown in Table 30. Based on the projections of the values from the model drivers for the state of Missouri and for the St. Louis metropolitan statistical area from IHS Markit, the non-MISO region is projected to grow faster than the MISO region. Therefore, the allocation factor for LRZ 5 is reduced from 45.97% in 2019 to 41.01% in 2040. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 30: Missouri Allocation Factors

LRZ5	LRZ8	Non-MISO
Reduced from 45.97% in 2019 to 41.01% in 2040	0.02%	Change accordingly

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Missouri's LRZs are shown in Table 31. Chapter 4 contains more information on LRZ forecasts.

Table 31: Missouri LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ5	0.26
LRZ8	1.36

MONTANA

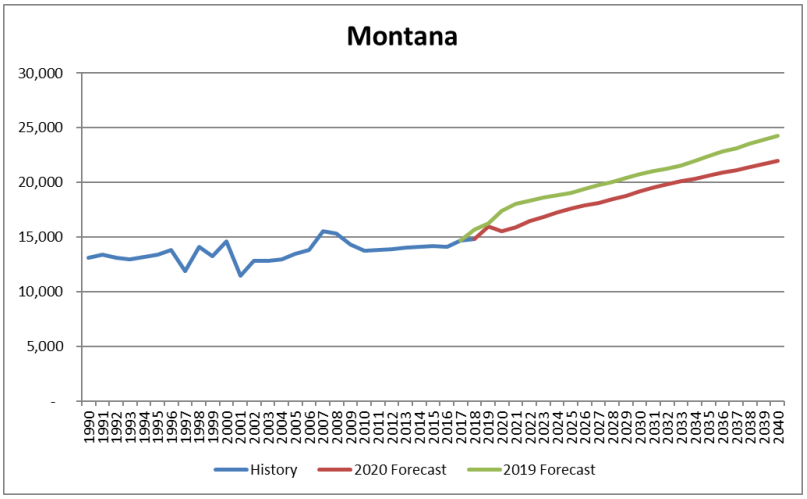
The Montana state econometric model uses real electricity and natural gas prices, real personal income per capita, manufacturing employment, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 32.

Table 32: Montana Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real Income/Population	Manufacturing Employment
0.004	1.17	1.80	0.31

Montana annual electricity sales are projected to grow at 1.72% in this forecast, which is slightly higher than the 1.68% growth rate projected in the 2019 Forecast. However, the 2020 Forecast is generally lower than the 2019 Forecast due to a lower forecast value for the year 2020. Figure 15 shows sales projections for the 2019 and 2020 forecasts.

Figure 15: Montana Energy Forecasts (Annual Retail Sales in GWh)



A small portion of Montana's loads is located in LRZ 1, with the remainder outside MISO. Per the request of MISO staff and due to concerns over providing utility-specific information in states that only have a single MISO utility, the load fractions of Montana and North Dakota are combined (MT+ND). The MT+ND forecasts were allocated to LRZ 1 based on the load fraction of 2017 and 2018, as shown in Table 33. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 33: Montana and North Dakota Allocation Factors

LRZ1	Non-MISO
33.03%	66.97%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate for Montana's LRZ is shown in Table 34. Chapter 4 contains more information on LRZ forecasts.

Table 34: Montana and North Dakota LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93

STATE BY STATE RESULTS

NORTH DAKOTA

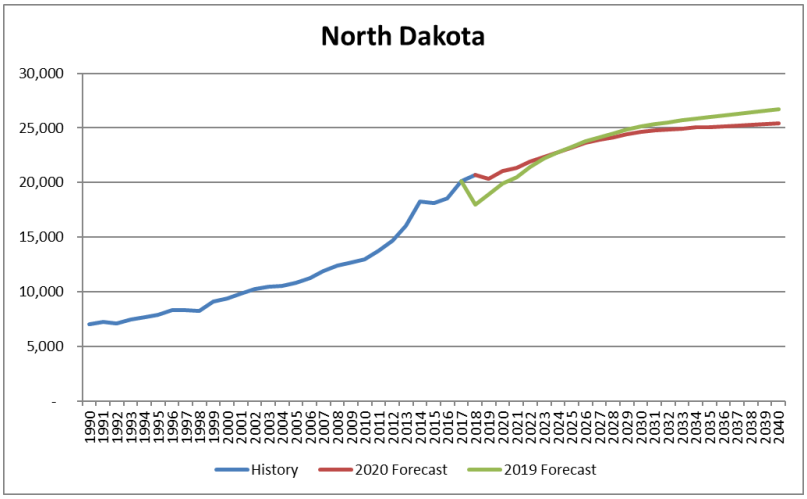
The North Dakota state econometric model uses real electricity price, population, and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 35.

Table 35: North Dakota Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Population
-0.49	0.20

North Dakota annual electricity sales are projected to grow at 0.92% in this forecast, which is lower than the 1.54% growth rate projected in the 2019 Forecast. Figure 16 shows sales projection for the 2019 and 2020 forecasts.

Figure 16: North Dakota Energy Forecasts (Annual Retail Sales in GWh)



North Dakota has loads located in LRZ 1. Per the request of MISO staff and due to concerns over providing utility-specific information in states that only have a single MISO utility, the load fraction of Montana and North Dakota are combined (MT+ND). The MT+ND forecast was allocated to LRZ 1 based on the load fraction of 2017 and 2018, as shown in Table 36. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 36: Montana and North Dakota Allocation Factors

LRZ1	Non-MISO
33.03%	66.97%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rate for North Dakota's LRZ is shown in Table 37. Chapter 4 contains more information on LRZ forecasts.

Table 37: Montana and North Dakota LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93

STATE BY STATE RESULTS

SOUTH DAKOTA

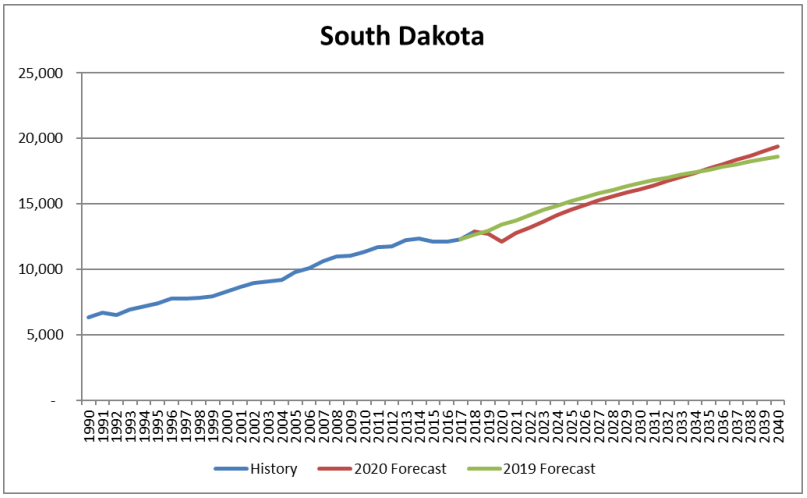
The South Dakota state econometric model uses real electricity price, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 38.

Table 38: South Dakota Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real GSP
-0.48	2.07

South Dakota electricity sales are projected to grow at 2.21% in this forecast, which is higher than the 1.68% growth rate projected in the 2019 Forecast. Figure 17 shows the sales projections for the 2019 and 2020 forecasts.

Figure 17: South Dakota Energy Forecasts (Annual Retail Sales in GWh)



South Dakota has loads in LRZ 1 and LRZ 3. The South Dakota sales forecast was allocated to the two LRZs based on the historical average of the load fractions of the period of 2014-2018, as shown in Table 39. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 39: South Dakota Allocation Factors

LRZ1	LRZ3	Non-MISO
23.74%	1.82%	74.44%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for South Dakota's LRZs are shown in Table 40. Chapter 4 contains more information on LRZ forecasts.

Table 40: South Dakota LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93
LRZ3	1.48

STATE BY STATE RESULTS

TEXAS

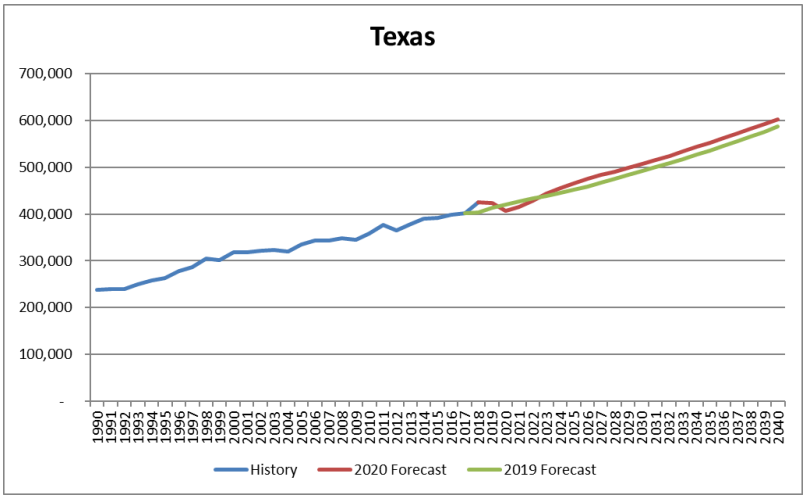
The Texas state econometric model uses real electricity price, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 41.

Table 41: Texas Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real GSP
0.27	3.10

Texas annual electricity sales are projected to grow at 1.98% in this forecast, which is higher than the 1.67% growth rate projected in the 2019 Forecast. Figure 18 shows sales projections for the 2019 and 2020 forecasts.

Figure 18: Texas Energy Forecasts (Annual Retail Sales in GWh)



Texas has loads in LRZ 8 and LRZ 9. The Texas sales forecast was allocated to the two LRZs based on the historical average of the load fractions of the period of 2014-2018, as shown in Table 42. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 42: Texas Allocation Factors (%)

LRZ8	LRZ9	Non-MISO
0.0054%	5.51%	94.48%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Texas's LRZs are shown in Table 43. Chapter 4 contains more information on LRZ forecasts.

Table 43: Texas LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ8	1.36
LRZ9	1.03

WISCONSIN

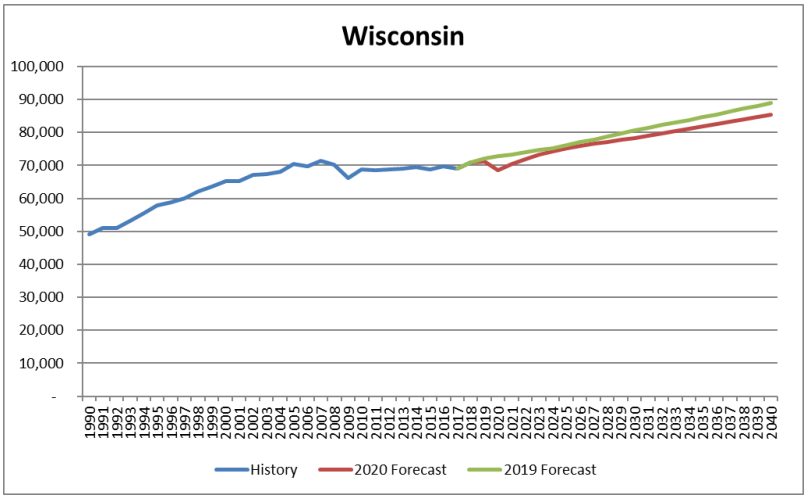
The Wisconsin state econometric model uses real electricity and natural gas prices, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 44.

Table 44: Wisconsin Explanatory Variable CAGR for the Period of 2021-2040 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
-0.35	0.70	1.77

Wisconsin annual electricity sales are projected to grow at 1.02% in this forecast, which is very close to the 1.01% growth rate projected in the 2019 Forecast. Figure 19 shows sales projections for the 2019 and 2020 forecasts. Despite having nearly identical growth rates, the 2020 Forecast is noticeably lower than the 2019 Forecast due to having a lower starting point because of COVID-19.

Figure 19: Wisconsin Energy Forecasts (Annual Retail Sales in GWh)



Wisconsin has loads in LRZ 1 and LRZ 2. Unlike other MISO states, Wisconsin has no non-MISO loads. The Wisconsin sales forecast was allocated to the two LRZs based on the historical average of the load fractions of the period of 2014-2018, as shown in the Table 45. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 45: Wisconsin Allocation Factors

LRZ1	LRZ2	Non-MISO
17.01%	82.99%	0.00%

Annual energy for the LRZs is determined by summing the allocated portions of the appropriate state sales forecasts and benchmarking to the most recent weather normalized metered load energy (as described in Chapter 2). The resulting forecast growth rates for Wisconsin's LRZs are shown in Table 46. Chapter 4 contains more information on LRZ forecasts.

Table 46: Wisconsin LRZ Forecast CAGR for the Period of 2021-2040 (%)

LRZ	Annual Energy
LRZ1	0.93
LRZ2	1.00

LRZ FORECASTS

LRZ FORECASTS

ANNUAL LRZ ENERGY FORECASTS

Table 47 and Table 48 provide LRZ annual metered load forecasts on both gross and net bases. The EE adjustments were provided by MISO and were developed in the process of developing the annual MISO Transmission Expansion Plan (MTEP).

Table 47: Gross LRZ Energy Forecasts without EE Adjustments (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	93,090	62,167	48,003	50,237	36,786	90,459	96,110	37,313	110,420	21,033
2020	93,761	59,952	45,993	49,227	36,953	85,452	92,233	35,718	107,050	20,745
2021	94,919	61,574	47,625	49,926	37,061	89,125	94,122	37,010	109,372	21,421
2022	96,664	62,857	48,737	50,517	37,327	91,969	95,865	38,147	112,625	21,775
2023	98,074	63,965	49,875	50,979	37,498	94,796	97,511	39,146	114,405	22,302
2024	99,299	64,878	50,881	51,346	37,673	96,918	98,695	39,989	115,777	22,772
2025	100,546	65,650	51,708	51,629	37,909	98,810	99,638	40,653	116,782	23,171
2026	101,765	66,281	52,406	51,907	38,098	100,157	100,454	41,153	117,543	23,481
2027	102,743	66,877	53,051	52,212	38,216	101,199	101,144	41,519	118,223	23,747
2028	103,711	67,397	53,654	52,482	38,341	102,204	101,688	41,849	118,853	23,987
2029	104,659	67,872	54,224	52,722	38,507	103,256	102,111	42,161	119,587	24,269
2030	105,666	68,362	54,857	52,955	38,618	104,425	102,514	42,512	120,526	24,588
2031	106,465	68,941	55,642	53,242	38,619	105,774	103,129	42,947	121,694	24,925
2032	107,173	69,579	56,441	53,515	38,625	107,238	103,775	43,452	122,905	25,305
2033	107,943	70,185	57,168	53,787	38,673	108,743	104,421	43,961	124,124	25,675
2034	108,740	70,816	57,972	54,074	38,699	110,181	105,054	44,485	125,335	26,038
2035	109,441	71,419	58,790	54,374	38,717	111,583	105,674	45,023	126,539	26,393
2036	110,162	72,008	59,578	54,664	38,747	113,006	106,274	45,549	127,698	26,731
2037	110,914	72,623	60,388	54,942	38,790	114,533	106,912	46,094	128,949	27,078
2038	111,679	73,228	61,236	55,238	38,843	116,068	107,536	46,658	130,253	27,420
2039	112,473	73,829	62,074	55,532	38,894	117,535	108,151	47,220	131,509	27,766
2040	113,249	74,440	62,960	55,825	38,931	119,073	108,802	47,811	132,869	28,117
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

LRZ FORECASTS

Table 48: Net LRZ Energy Forecasts with EE Adjustments (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	93,090	62,167	48,003	50,237	36,786	90,459	96,110	37,313	110,420	21,033
2020	92,982	59,820	45,900	49,211	36,940	85,187	91,720	35,682	107,017	20,734
2021	93,360	61,309	47,440	49,892	37,031	88,554	93,052	36,939	109,309	21,401
2022	94,326	62,457	48,453	50,466	37,274	91,117	94,230	38,039	112,534	21,746
2023	94,955	63,432	49,494	50,911	37,425	93,660	95,386	39,002	114,286	22,266
2024	95,378	64,212	50,404	51,262	37,582	95,501	96,098	39,808	115,630	22,729
2025	95,868	64,852	51,136	51,529	37,800	97,124	96,585	40,436	116,607	23,121
2026	96,307	65,349	51,742	51,791	37,974	98,213	96,912	40,899	117,341	23,426
2027	96,483	65,818	52,298	52,082	38,078	99,013	97,234	41,228	117,994	23,685
2028	96,621	66,210	52,813	52,337	38,190	99,790	97,447	41,521	118,597	23,920
2029	96,830	66,554	53,299	52,562	38,344	100,628	97,492	41,795	119,303	24,197
2030	97,049	66,915	53,849	52,782	38,445	101,594	97,553	42,109	120,215	24,510
2031	97,088	67,371	54,556	53,055	38,436	102,751	97,889	42,506	121,354	24,843
2032	97,043	67,892	55,280	53,314	38,433	104,035	98,270	42,973	122,538	25,219
2033	97,076	68,387	55,938	53,574	38,472	105,368	98,663	43,443	123,728	25,584
2034	97,164	68,912	56,675	53,848	38,490	106,646	99,057	43,928	124,911	25,943
2035	97,517	69,416	57,430	54,136	38,500	107,896	99,449	44,427	126,086	26,294
2036	97,899	69,909	58,158	54,414	38,523	109,175	99,834	44,913	127,216	26,628
2037	98,355	70,434	58,912	54,679	38,558	110,567	100,267	45,418	128,439	26,972
2038	98,787	70,953	59,705	54,964	38,604	111,975	100,696	45,942	129,714	27,310
2039	99,300	71,472	60,492	55,247	38,649	113,321	101,126	46,463	130,940	27,653
2040	100,075	72,083	61,379	55,540	38,686	114,859	101,777	47,054	132,300	28,004
Compound Annual Growth Rates (%)										
2021-2025	0.66	1.41	1.89	0.81	0.52	2.34	0.94	2.29	1.63	1.95
2021-2030	0.43	0.98	1.42	0.63	0.42	1.54	0.53	1.47	1.06	1.52
2021-2040	0.37	0.86	1.37	0.57	0.23	1.38	0.47	1.28	1.01	1.43

LRZ FORECASTS

LRZ NON-COINCIDENT PEAK DEMANDS

The LRZ-level monthly non-coincident[9] peak demands were calculated by applying the monthly energy-to-peak conversion factors to the LRZ annual metered load projections. These values represent the projected monthly peak demands under normal weather conditions. Usually, the non-coincident peak of each LRZ does not occur at the same time when MISO reaches system-wide peak. Table 49 and Table 50 show July non-coincident peak demand projections by LRZ without and with EE adjustments. Monthly peak projections for each one of the twelve months are included in Appendix C.

Table 49: July Non-Coincident Peak Demand without EE Adjustments (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	16,560	11,649	9,083	9,947	7,547	15,909	20,239	7,267	19,613	4,408
2020	16,679	11,234	8,703	9,747	7,581	15,028	19,423	6,957	19,014	4,347
2021	16,885	11,538	9,011	9,885	7,603	15,674	19,821	7,208	19,427	4,489
2022	17,196	11,779	9,222	10,002	7,658	16,175	20,188	7,430	20,005	4,563
2023	17,447	11,986	9,437	10,094	7,693	16,672	20,534	7,624	20,321	4,674
2024	17,665	12,157	9,627	10,166	7,729	17,045	20,784	7,788	20,564	4,772
2025	17,886	12,302	9,784	10,222	7,777	17,378	20,982	7,918	20,743	4,856
2026	18,103	12,420	9,916	10,277	7,816	17,615	21,154	8,015	20,878	4,921
2027	18,277	12,532	10,038	10,338	7,840	17,798	21,299	8,086	20,999	4,976
2028	18,449	12,629	10,152	10,391	7,866	17,975	21,414	8,151	21,111	5,027
2029	18,618	12,718	10,260	10,439	7,900	18,160	21,503	8,211	21,241	5,086
2030	18,797	12,810	10,380	10,485	7,923	18,365	21,588	8,280	21,408	5,153
2031	18,939	12,919	10,528	10,542	7,923	18,603	21,717	8,365	21,615	5,223
2032	19,065	13,038	10,679	10,596	7,924	18,860	21,853	8,463	21,831	5,303
2033	19,202	13,152	10,817	10,650	7,934	19,125	21,989	8,562	22,047	5,381
2034	19,344	13,270	10,969	10,706	7,939	19,377	22,123	8,664	22,262	5,457
2035	19,469	13,383	11,124	10,766	7,943	19,624	22,253	8,769	22,476	5,531
2036	19,597	13,493	11,273	10,823	7,949	19,874	22,380	8,871	22,682	5,602
2037	19,731	13,609	11,426	10,878	7,958	20,143	22,514	8,978	22,904	5,675
2038	19,867	13,722	11,587	10,937	7,969	20,413	22,645	9,087	23,136	5,746
2039	20,008	13,834	11,745	10,995	7,979	20,671	22,775	9,197	23,359	5,819
2040	20,146	13,949	11,913	11,053	7,987	20,941	22,912	9,312	23,600	5,892
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

[9] Non-coincidence is from the perspective of the MISO system peak load.

LRZ FORECASTS

Table 50: July Non-Coincident Peak Demand with EE Adjustments (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	16,560	11,649	9,083	9,947	7,547	15,909	20,239	7,267	19,613	4,408
2020	16,487	11,199	8,678	9,742	7,579	14,961	19,250	6,946	19,004	4,346
2021	16,501	11,468	8,963	9,876	7,598	15,529	19,389	7,187	19,407	4,486
2022	16,618	11,672	9,147	9,989	7,649	15,957	19,480	7,397	19,976	4,558
2023	16,676	11,845	9,337	10,075	7,681	16,380	19,583	7,581	20,283	4,668
2024	16,707	11,983	9,503	10,144	7,715	16,685	19,627	7,734	20,518	4,765
2025	16,728	12,090	9,633	10,196	7,760	16,943	19,610	7,852	20,687	4,847
2026	16,751	12,172	9,741	10,246	7,796	17,113	19,567	7,938	20,814	4,912
2027	16,734	12,252	9,840	10,303	7,818	17,237	19,540	7,998	20,926	4,966
2028	16,723	12,320	9,934	10,353	7,842	17,363	19,503	8,052	21,030	5,016
2029	16,686	12,370	10,016	10,396	7,874	17,483	19,390	8,099	21,150	5,074
2030	16,670	12,427	10,114	10,439	7,895	17,636	19,299	8,156	21,308	5,140
2031	16,621	12,502	10,242	10,492	7,894	17,823	19,348	8,228	21,506	5,210
2032	16,564	12,591	10,373	10,542	7,894	18,038	19,418	8,315	21,713	5,289
2033	16,521	12,676	10,493	10,593	7,902	18,257	19,481	8,402	21,920	5,365
2034	16,487	12,766	10,628	10,646	7,906	18,468	19,546	8,492	22,126	5,441
2035	16,530	12,853	10,766	10,702	7,909	18,676	19,613	8,584	22,330	5,515
2036	16,585	12,940	10,900	10,757	7,914	18,893	19,686	8,675	22,527	5,585
2037	16,634	13,027	11,036	10,808	7,921	19,120	19,750	8,766	22,739	5,657
2038	16,706	13,121	11,184	10,864	7,931	19,363	19,839	8,865	22,962	5,728
2039	16,776	13,211	11,329	10,919	7,940	19,588	19,913	8,961	23,175	5,800
2040	16,914	13,325	11,497	10,977	7,948	19,859	20,050	9,076	23,417	5,873
Compound Annual Growth Rates (%)										
2021-2025	0.34	1.33	1.82	0.80	0.53	2.20	0.28	2.24	1.61	1.96
2021-2030	0.11	0.90	1.35	0.62	0.43	1.42	-0.05	1.42	1.04	1.52
2021-2040	0.13	0.79	1.32	0.56	0.24	1.30	0.18	1.24	0.99	1.43

LRZ FORECASTS

LRZ Forecasts

Each sub-section here provides information regarding the forecast for a specific LRZ. Energy and peak demand projections are on a gross and net bases (without and with any adjustments for EE programs). Rather than providing twelve monthly peak demand charts for each LRZ, a single month (July) is provided. Forecasts for all months are displayed in Appendix C.

LRZ 1

LRZ 1 consists of most of the state of Minnesota, parts of Montana, North Dakota, South Dakota, and Wisconsin, and small portions of Iowa, Illinois, and Michigan. The annual energy forecast for the LRZ is determined from those states' forecasts using the allocation method described in Appendix B. Monthly non-coincident peak demands are determined using weather information for Minneapolis-St. Paul, MN according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 0.93% for the period of 2021-2040, which is slightly lower than the rate projected in the 2019 Forecast (0.99% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 0.37%. Figure 20 shows annual gross and net energy forecasts for the 2020 Forecast and gross forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 21 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 20: Gross and Net LRZ 1 Energy (GWh)

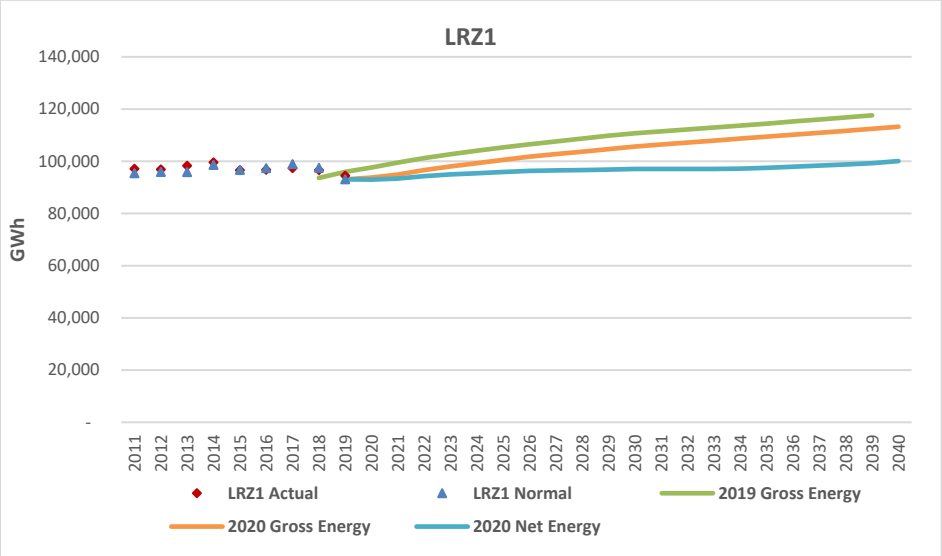
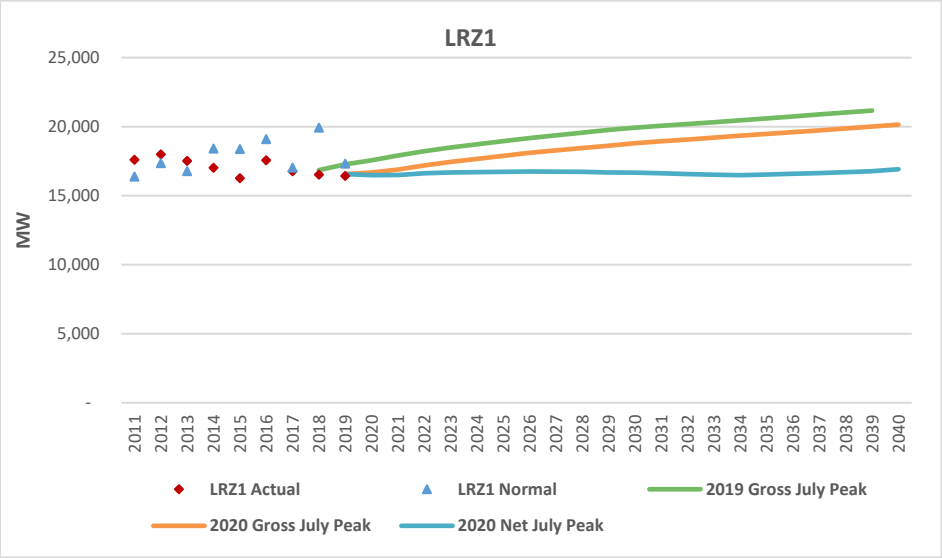


Figure 21: Gross and Net LRZ 1 July Non-Coincident Peak Demand (MW)



LRZ 2

LRZ 2 is made up of most of the state of Wisconsin and a very small portion of Michigan. The annual energy forecast for the LRZ is determined from those states' forecasts using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Milwaukee, WI according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 1.00% for the period of 2021-2040. This is the same as the rate projected in the 2019 Forecast (1.00% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 0.86%. Figure 22 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Despite having identical growth rates for the gross forecasts, the 2020 Forecast is noticeably lower than the 2019 Forecast due to having a lower starting point because of COVID-19. Figure 23 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 22: Gross and Net LRZ 2 Energy (GWh)

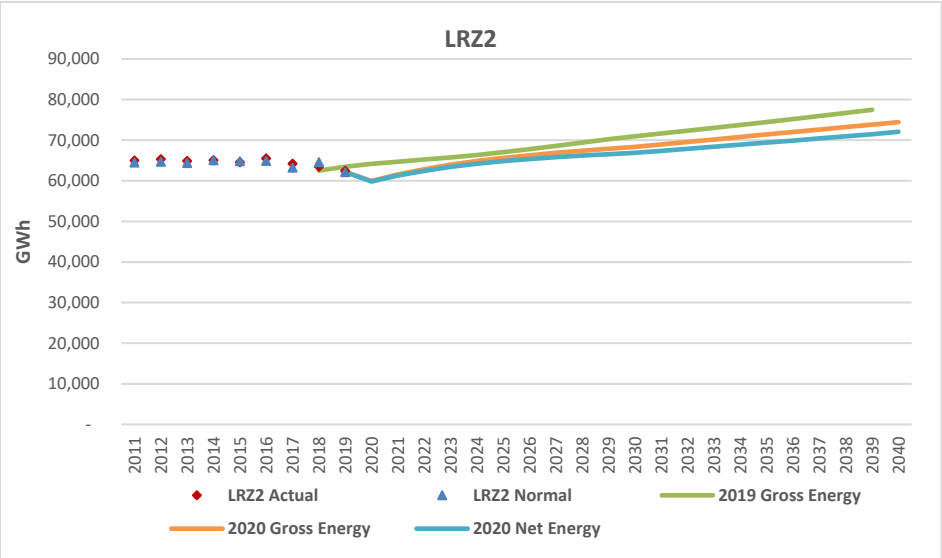
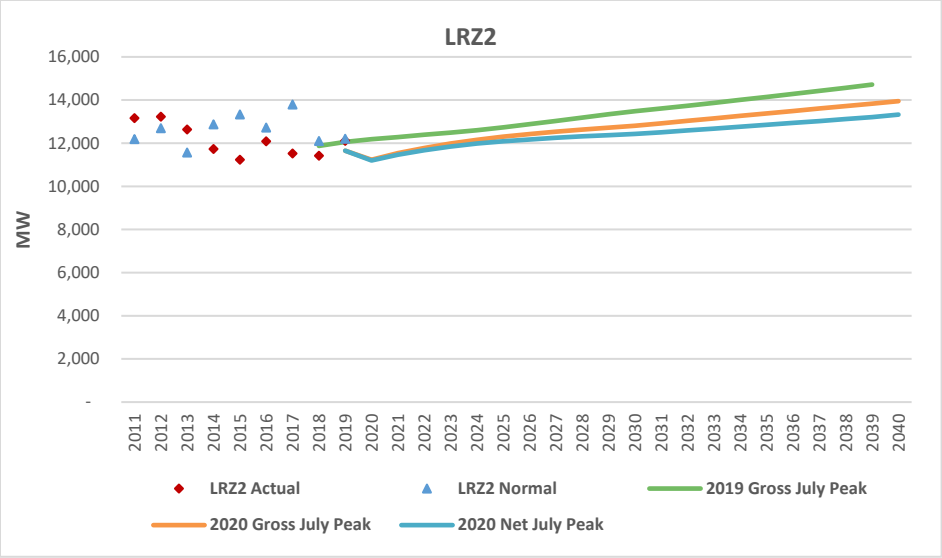


Figure 23: Gross and Net LRZ 2 July Non-Coincident Peak Demand (MW)



LRZ 3

LRZ 3 consists of most of the state of Iowa and small portions of Illinois, Minnesota, and South Dakota. The annual energy forecast for the LRZ is determined from those states' forecasts using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Des Moines, IA according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 1.48% for the period of 2021- 2040, which is lower than the rate projected in the 2019 Forecast (1.69% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 1.37%. Figure 24 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 25 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 24: Gross and Net LRZ 3 Energy (GWh)

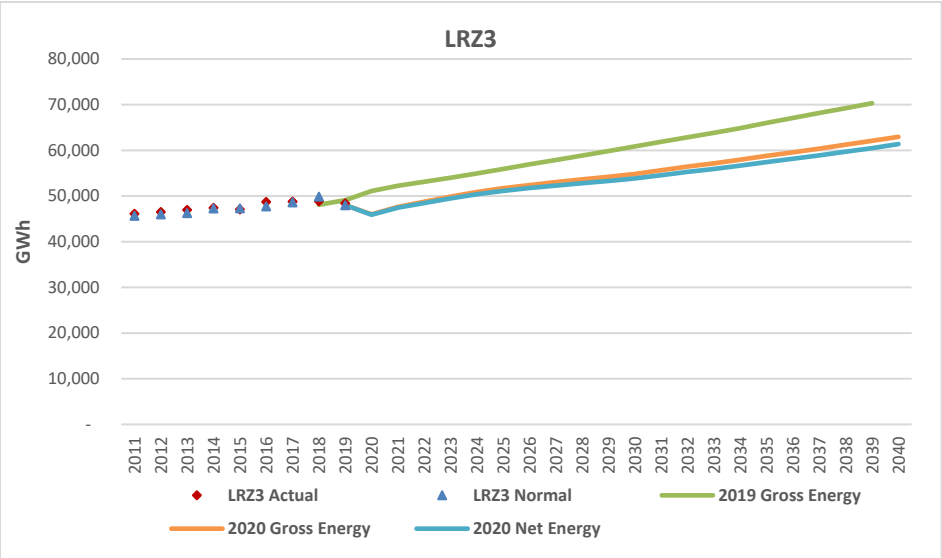
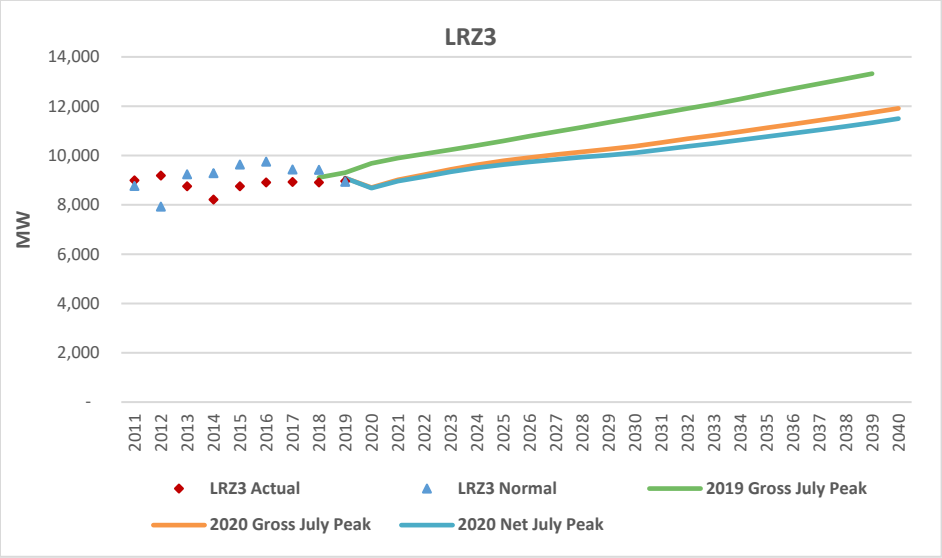


Figure 25: Gross and Net LRZ 3 July Non-Coincident Peak Demand (MW)



LRZ 4

LRZ 4 consists of about 1/3 of the state of Illinois. The annual energy forecast for the LRZ is determined from that state's forecast using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Springfield, IL according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 0.59% for the period of 2021-2040, which is slightly lower than the rate projected in the 2019 Forecast (0.62% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 0.57%. However, the gross energy forecast for the 2020 Forecast lies above that of the 2019 Forecast because it starts at a higher point. Figure 26 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 27 provides gross and net July non-coincident peak forecasts for the 2020

Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 26: Gross and Net LRZ 4 Energy (GWh)

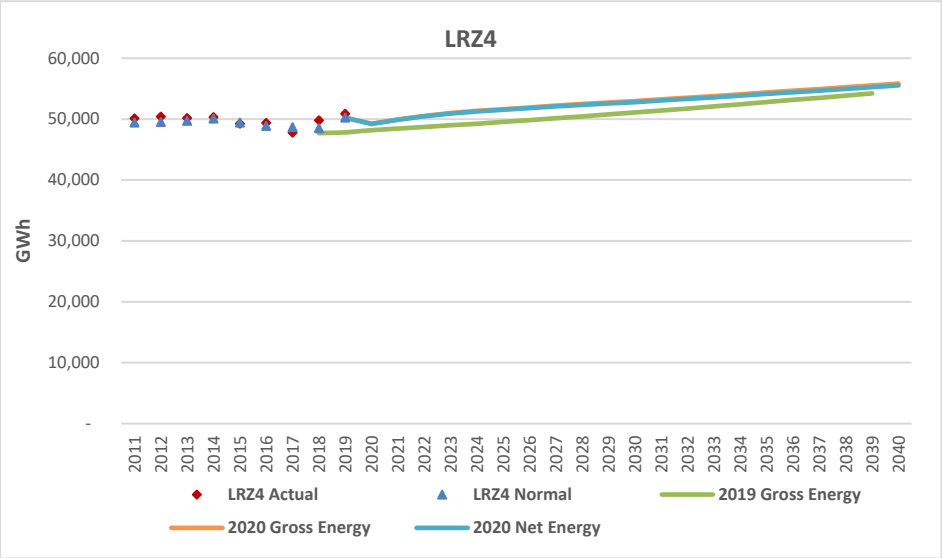
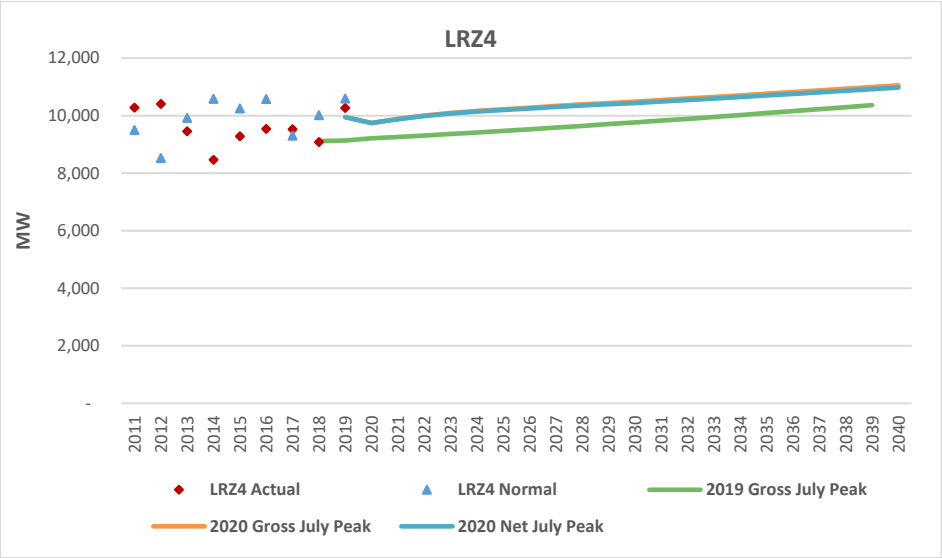


Figure 27: Gross and Net LRZ 4 July Non-Coincident Peak Demand (MW)



LRZ 5

LRZ 5 consists of about half of the state of Missouri. The annual energy forecast for the LRZ is determined from that state's forecast using the allocation method described in Appendix B. Due to differences of growth rate in population projections between the state and the St. Louis Metropolitan Statistical Area, the allocation factor declines over time. Non-coincident monthly peak demands are determined using weather information for St. Louis, MO according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 0.26% for the period of 2021-2040. This is lower than the rate projected in the 2019 Forecast (0.41% for the period of 2020-2039). Annual net energy is projected to grow

at a CAGR of 0.23%. Figure 28 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross energy forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 29 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 28: Gross and Net LRZ 5 Energy (GWh)

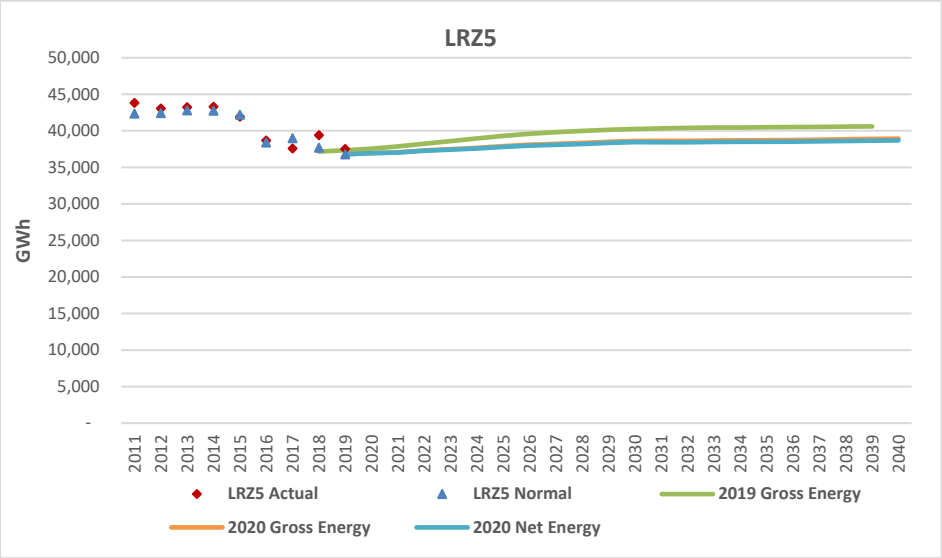
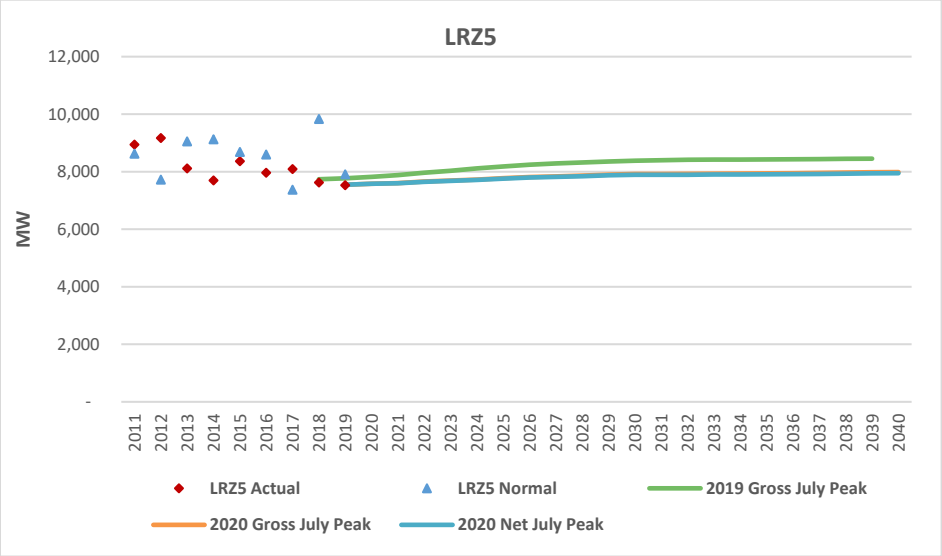


Figure 29: Gross and Net LRZ 5 July Non-Coincident Peak Demand (MW)



LRZ 6

LRZ 6 is made up of portions of the states of Indiana and Kentucky. The annual energy forecast for the LRZ is determined from those states' forecasts using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Indianapolis, IN according to the methodology described in Appendix C.

LRZ FORECASTS

Annual gross energy is projected to grow at a CAGR of 1.54% for the period of 2021-2040. This is higher than the rate projected in the 2019 Forecast (1.01% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 1.38%. Figure 30 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross energy forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 31 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 30: Gross and Net LRZ 6 Energy (GWh)

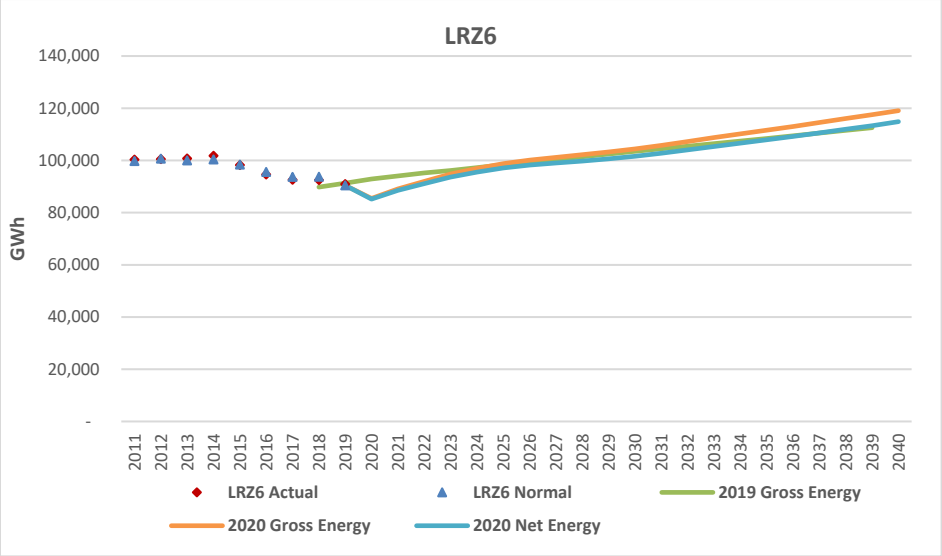
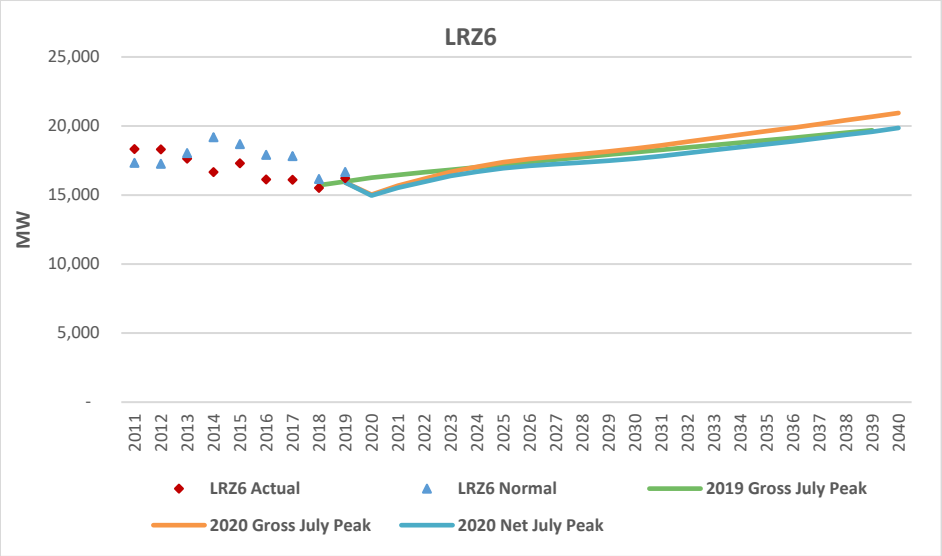


Figure 31: Gross and Net LRZ 6 July Non-Coincident Peak Demand (MW)



LRZ 7

LRZ 7 consists of most of the state of Michigan. The annual energy forecast for the LRZ is determined from that state's forecast using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Lansing, MI according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 0.77% for the period of 2021-2040. This is lower than the rate projected in the 2019 Forecast (0.87% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 0.47%. Figure 32 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross energy forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 33 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 32: Gross and Net LRZ 7 Energy (GWh)

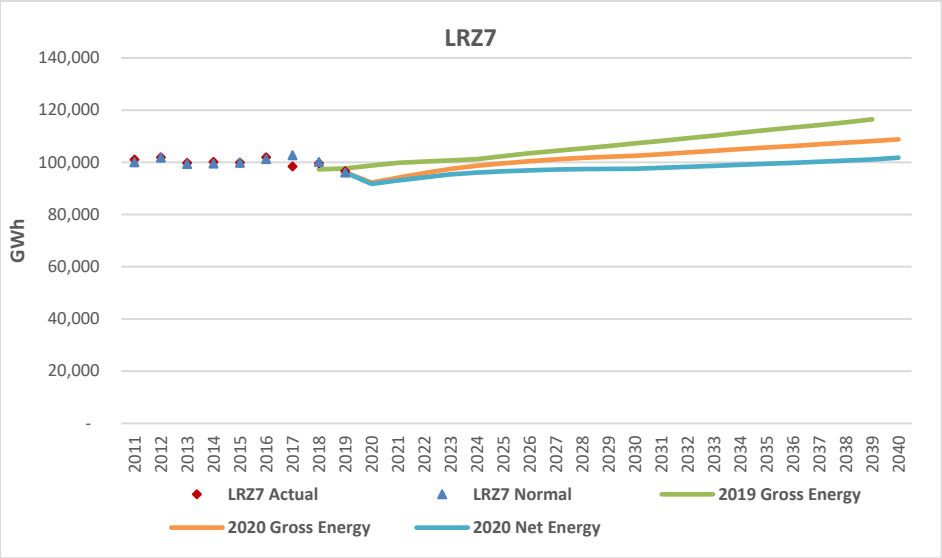
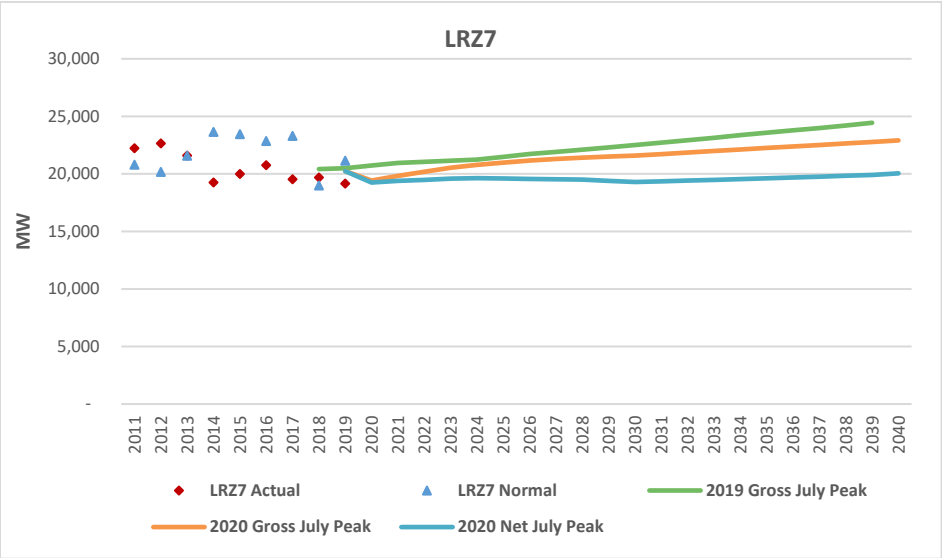


Figure 33: Gross and Net LRZ 7 July Non-Coincident Peak Demand (MW)



LRZ 8

LRZ 8 consists of most of the state of Arkansas and very small portions of Missouri and Texas. The annual energy forecast for the LRZ is determined from those states' forecasts using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Little Rock, AR according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 1.36% for the period of 2021-2040, which is higher than the rate projected in the 2019 Forecast (1.00% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 1.28%. Figure 34 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross energy forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 35 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 34: Gross and Net LRZ 8 Energy (GWh)

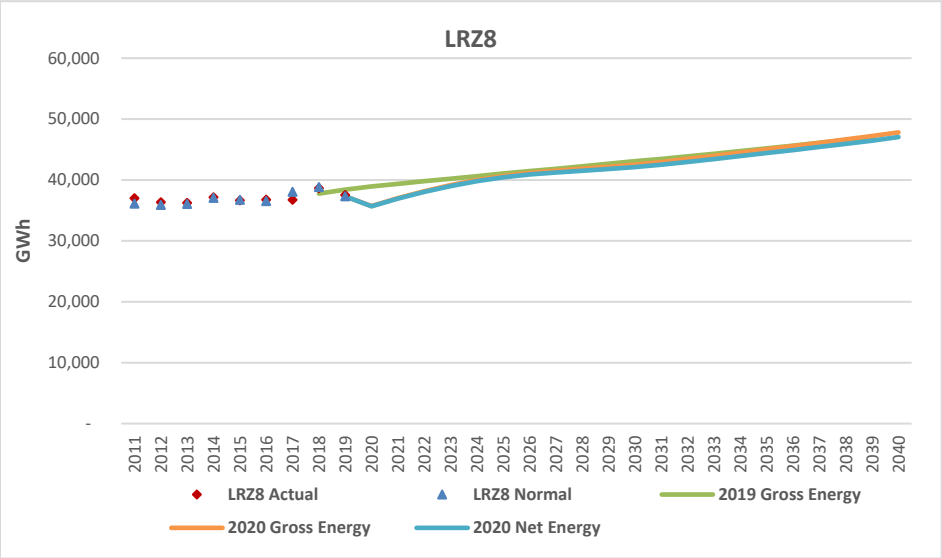
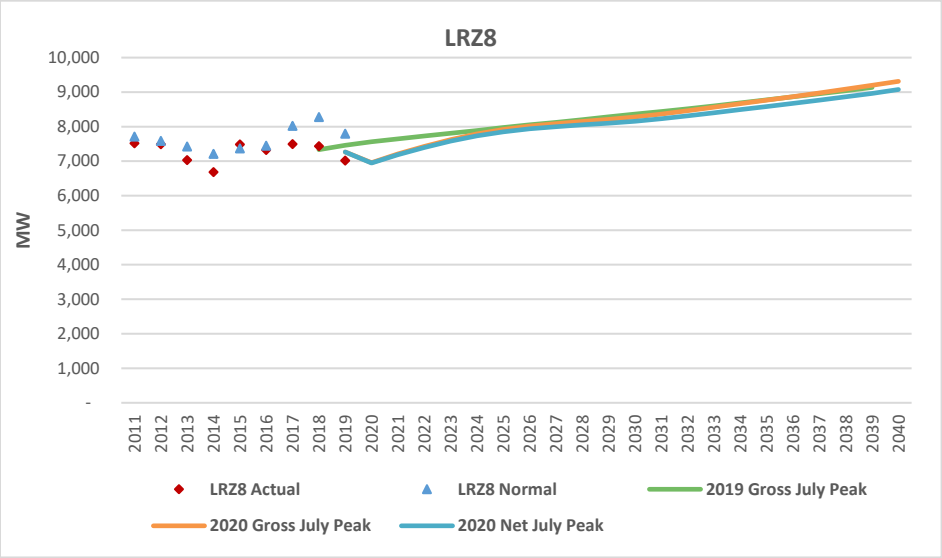


Figure 35: Gross and Net LRZ 8 July Non-Coincident Peak Demand (MW)



LRZ 9

LRZ 9 consists of most of the state of Louisiana and a small portion of Texas. The annual energy forecast for the LRZ is determined from those states' forecasts using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Lake Charles, LA according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 1.03% for the period of 2021-2040. This rate is higher than the rate projected in the 2019 Forecast (0.84% for the period of 2020-2039). Annual net energy is projected to grow at a CAGR of 1.01%. Figure 36 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross energy forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 37 provides gross and net July non-coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 36: Gross and Net LRZ 9 Energy (GWh)

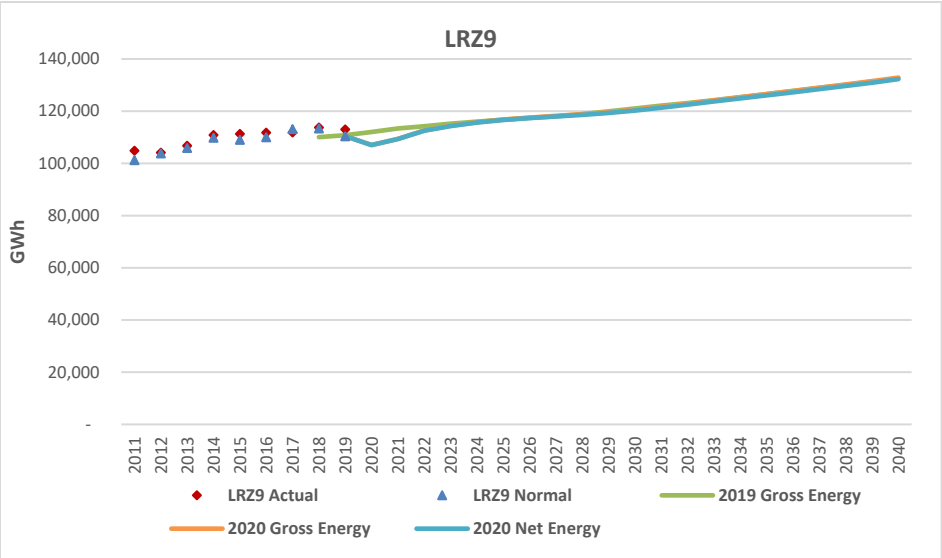
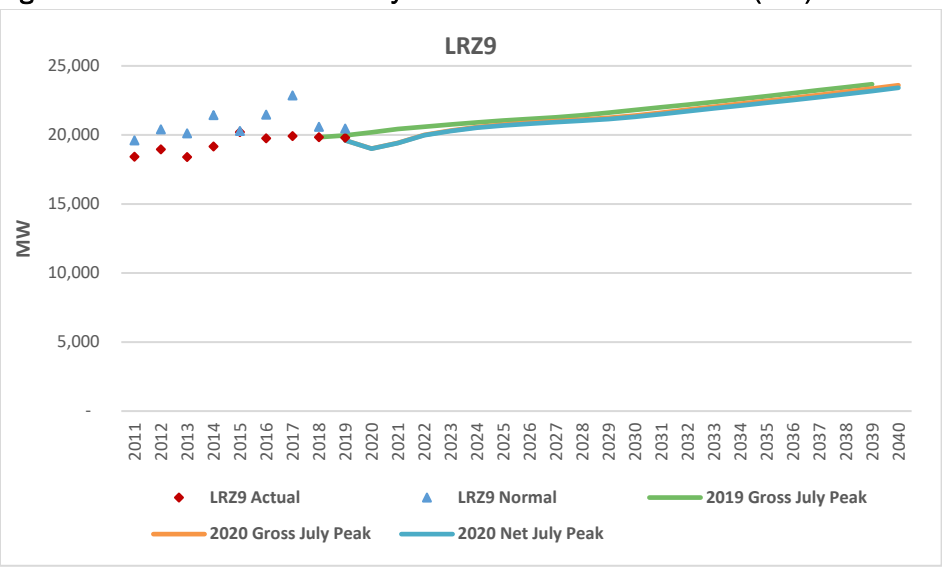


Figure 37: Gross and Net LRZ 9 July Non-Coincident Peak Demand (MW)



LRZ 10

LRZ 10 consists of almost half of the state of Mississippi. The annual energy forecast for the LRZ is determined from that state's forecast using the allocation method described in Appendix B. Non-coincident monthly peak demands are determined using weather information for Jackson, MS according to the methodology described in Appendix C.

Annual gross energy is projected to grow at a CAGR of 1.44% for the period of 2021-2040. Although the growth rate is very similar to that in the 2019 Forecast (1.41% for the period of 2020-2039), the 2020 Forecast is lower due to a lower starting point. Annual net energy is projected to grow at a CAGR of 1.43%. Figure 38 shows annual gross and net energy forecasts for the 2020 Forecast and annual gross energy forecast for the 2019 Forecast along with actual and weather-normalized historical energy levels. Figure 39 provides gross and net July non-

coincident peak forecasts for the 2020 Forecast and gross July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 38: Gross and Net LRZ 10 Energy (GWh)

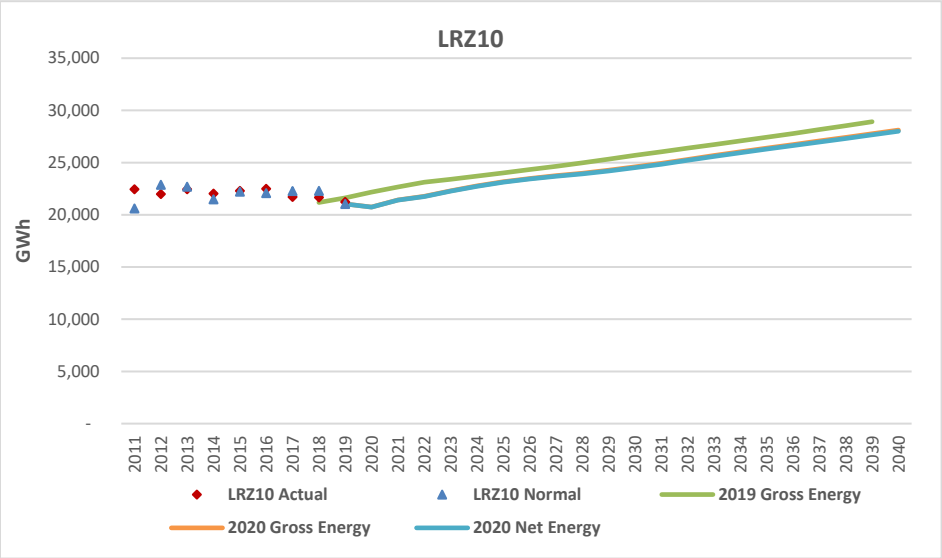
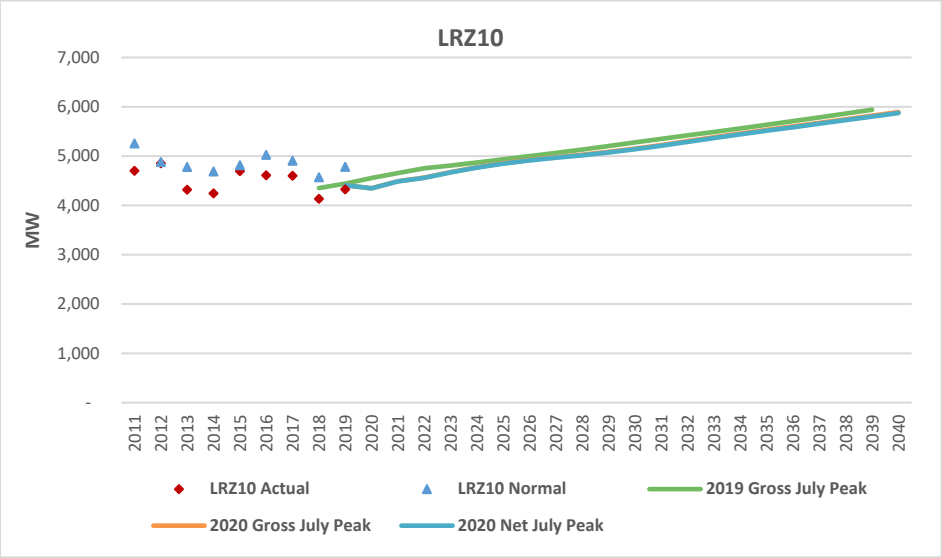


Figure 39: Gross and Net LRZ 10 July Non-Coincident Peak Demand (MW)



MISO FORECASTS

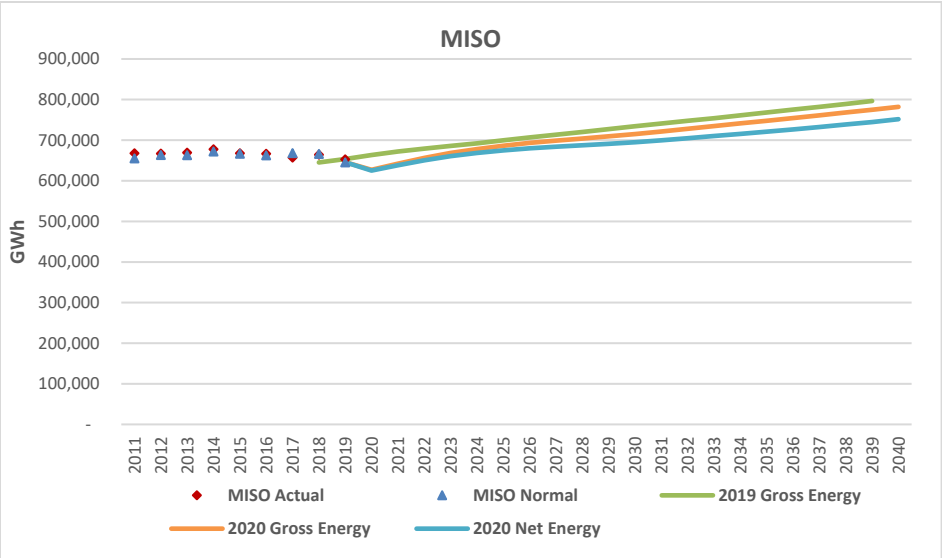
MISO ANNUAL ENERGY FORECAST

The MISO annual energy forecast is obtained by summing the individual LRZ metered load forecasts. Table 51 and Figure 40 provide the MISO-level energy forecast. Please note the forecasts are for the specified calendar year, not the MISO planning year. The compound annual growth rate for the period of 2021-2040 is 1.04% for the gross forecast, which is slightly higher than that in the 2019 Forecast (0.97% for the period of 2020-2039). However, the trajectory of the gross forecast for the 2020 Forecast lies below that of the 2019 Forecast due to a lower starting point, as shown in Figure 40. The net energy forecast has a CAGR of 0.86% for the period of 2021-2040.

Table 51: Gross and Net MISO System Energy (Annual Metered Load in GWh)

Year	MISO Energy without EE Adjustments	MISO Energy with EE Adjustments
2019	645,618	645,618
2020	627,084	625,194
2021	642,156	638,285
2022	656,484	650,642
2023	668,549	660,816
2024	678,229	668,604
2025	686,495	675,058
2026	693,244	679,953
2027	698,931	683,912
2028	704,166	687,445
2029	709,367	691,003
2030	715,023	695,020
2031	721,379	699,848
2032	728,009	704,997
2033	734,681	710,233
2034	741,396	715,575
2035	747,953	721,149
2036	754,418	726,669
2037	761,224	732,601
2038	768,160	738,649
2039	774,983	744,662
2040	782,077	751,756
Compound Annual Growth Rates (%)		
2021-2025	1.68	1.41
2021-2030	1.20	0.95
2021-2040	1.04	0.86

Figure 40: Gross and Net MISO System Energy Forecast (Metered Load in GWh)



MISO SYSTEM COINCIDENT PEAK DEMAND FORECAST

Not all LRZs experience peak demands at the same time. This load diversity means that the MISO system peak demand level is less than the arithmetic sum of the LRZ non-coincident peak demands. The MISO system coincident peak demand is determined by applying coincidence factors to individual LRZ non-coincident peak demands and summing across LRZs. These coincidence factors represent the ratio of the LRZ's load at the time of the overall MISO system peak to the LRZ's non-coincident peak. Coincidence factors were calculated from hourly loads by LRZ over the 2010 to 2019 timeframe. Table 52 lists the average monthly coincidence factors estimated using the actual zonal monthly coincidence factors from 2010 to 2019. When the coincidence factor equals one, it means the peak for the zone coincides with the MISO system-wide peak. Table 53 and Figure 41 provide the MISO system July peak demand forecast.[10]

Table 52: MISO Monthly Coincidence Factors

Month / LRZ	Average Monthly Coincidence Factor											
	1	2	3	4	5	6	7	8	9	10	11	12
1	0.9731	0.9792	0.9757	0.9599	0.9358	0.9500	0.9425	0.9627	0.9495	0.9307	0.9685	0.9793
2	0.9610	0.9833	0.9766	0.9717	0.9524	0.9862	0.9907	0.9730	0.9907	0.9649	0.9671	0.9769
3	0.9820	0.9814	0.9937	0.9538	0.9529	0.9573	0.9671	0.9809	0.9783	0.9780	0.9684	0.9789
4	0.9857	0.9853	0.9912	0.9696	0.9690	0.9703	0.9849	0.9666	0.9658	0.9929	0.9755	0.9792
5	0.9899	0.9739	0.9833	0.9438	0.9566	0.9710	0.9912	0.9558	0.9701	0.9804	0.9768	0.9732
6	0.9820	0.9771	0.9908	0.9633	0.9745	0.9876	0.9847	0.9650	0.9768	0.9798	0.9688	0.9803
7	0.9503	0.9680	0.9909	0.9595	0.9462	0.9814	0.9588	0.9700	0.9723	0.9673	0.9691	0.9657
8	0.9691	0.9780	0.9108	0.9531	0.9333	0.9595	0.9547	0.9280	0.9677	0.9639	0.9678	0.9718
9	0.9345	0.9352	0.8991	0.9229	0.9578	0.9451	0.9539	0.9360	0.9384	0.9516	0.9514	0.9422
10	0.9683	0.9501	0.9350	0.9357	0.9709	0.9304	0.9340	0.9193	0.9596	0.9640	0.9664	0.9403

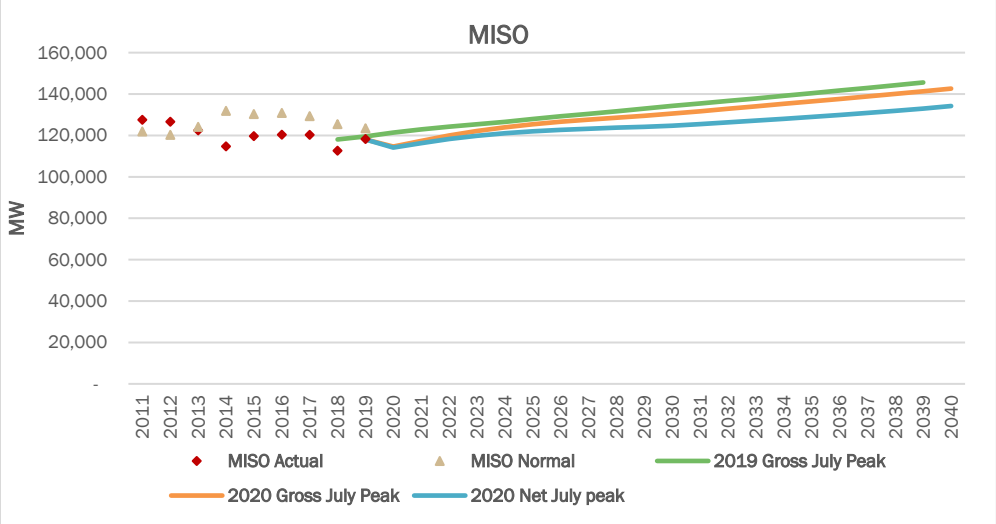
[10] MISO system monthly peak demand forecasts for each one of the twelve months are displayed in Appendix C.

MISO FORECASTS

Table 53: Gross and Net MISO System July Coincident Peak Demand (Metered Load in MW)

Year	MISO July CP without EE Adjustments	MISO July CP with EE Adjustments
2019	118,045	118,045
2020	114,642	114,142
2021	117,378	116,284
2022	119,957	118,258
2023	122,145	119,870
2024	123,899	121,103
2025	125,395	122,037
2026	126,618	122,719
2027	127,649	123,267
2028	128,595	123,773
2029	129,533	124,167
2030	130,547	124,695
2031	131,691	125,452
2032	132,886	126,295
2033	134,088	127,142
2034	135,298	128,009
2035	136,481	128,946
2036	137,646	129,897
2037	138,872	130,861
2038	140,120	131,926
2039	141,349	132,941
2040	142,626	134,218
Compound Annual Growth Rates (%)		
2021-2025	1.67	1.21
2021-2030	1.19	0.78
2021-2040	1.03	0.76

Figure 41: Gross and Net MISO System July Coincident Peak Demand (Metered Load in MW)



MISO SYSTEM HIGH AND LOW FORECASTS

Alternate 90/10 (High/Low) forecasts were developed. Figure 42 shows the MISO system energy forecasts for the Low, Base and High scenarios and Table 54 provides the growth rates for energy and July peaks. Appendix D contains more information on the high and low forecasts. Appendix D provides data tables for these alternate forecasts. Net forecasts are not provided here since they would use the same adjustments used in the base forecast.

Figure 42: Gross MISO System Energy for Alternate Forecasts (Annual Metered Load in GWh)

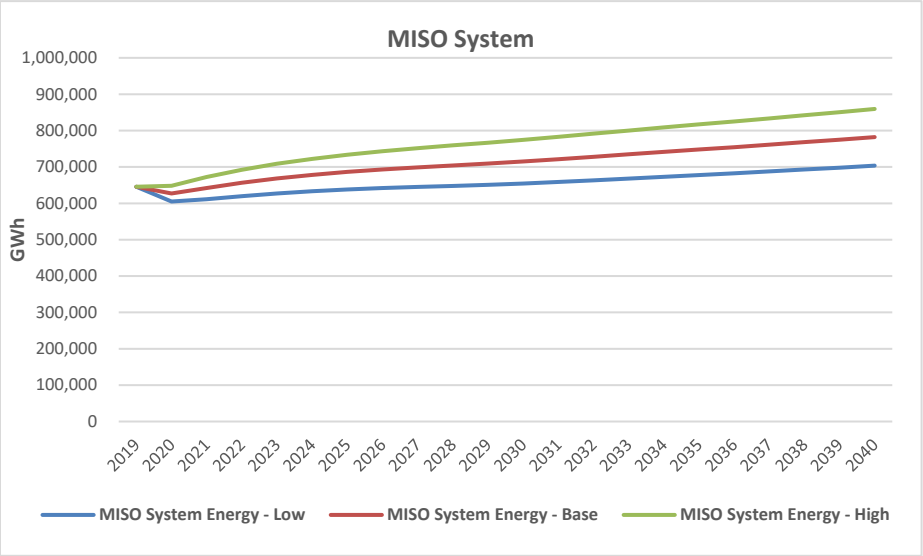


Table 54: Gross MISO System CAGRs for Alternate Forecasts (2021-2040)

	BASE	HIGH	LOW
Energy	1.04	1.30	0.75
July Peak	1.03	1.29	0.73

APPENDIX A STATE MODELS

APPENDIX A STATE ELECTRIC ENERGY FORECASTING MODELS

SUFG developed econometric models of annual retail electricity sales for each of 15 MISO states using Eviews, a statistical analysis program. The econometric models are based on historical values for a variety of explanatory variables (or drivers). The candidate variables and their data sources are provided in Table 55.

Table 55: Dependent and Explanatory Variables

Variables	Eviews Name	Historical Data Source	Projected Data Source
Dependent variable:			
Electricity sales	ELECTRICITY_SALES	U.S. Energy Information Administration (EIA)	N/A
Explanatory variables:			
Electricity prices	REAL_ELECTRICITY_PRICE	EIA*	SUFG projection based on EIA data
Natural gas prices	REAL_NATURAL_GAS_PRICE	EIA*	SUFG projection based on EIA data
Real personal income	REAL_INCOME	U.S. Bureau of Economic Analysis (BEA)*	IHS Markit
Population	POPULATION	Census Bureau	IHS Markit
Manufacturing employment	MANUFACTURING_EMP	U.S. Bureau of Labor Statistics (BLS)	IHS Markit
Non-manufacturing employment	NON_MANUFACTURING_EMP	BLS	IHS Markit
Non-farm employment	NON_FARM_EMP	BLS	IHS Markit
Gross state product	REAL_GSP	IHS Markit	IHS Markit
Cooling degree days	CDD	National Oceanic and Atmospheric Administration (NOAA)	NOAA
Heating degree days	HDD	NOAA	NOAA

** Original data were in nominal dollars. SUFG converted them to real 2012 dollars using CPI data obtained from BLS.*

Each state's electricity sales forecast was determined using projections of values for the applicable drivers for that state. Table 56 provides compound annual growth rates for explanatory variables over the forecast period (2021-2040). Cells with no entry indicate that the corresponding variables are not included in that state's model. CDDs and HDDs are held constant at their 30-year normal values from NOAA for the projections. The projections provided in Table 56 are from a macroeconomic forecast by IHS Markit, except the electricity price forecast and the natural gas price forecast. Those were developed by SUFG using a similar method adopted in the 2015 forecast, with details being provided in the 2015 report.

Table 56: Explanatory Variable CAGR for the Period of 2021-2040 (%)

Variables	AR	IL	IN	IA	KY	LA	MI	MN	MS	MO	MT	ND	SD	TX	WI
REAL_ELECTRICITY_PRICE	0.28	-0.34	-0.34	-0.46	-0.36	0.28	-0.34	-0.48	-0.36	-0.48	0.00	-0.49	-0.48	0.27	-0.35
REAL_NATURAL_GAS_PRICE	1.15	0.68			0.77	1.47	0.67				1.17				0.70
REAL_INCOME									1.75						
POPULATION								0.39		0.25		0.20			
REAL_INCOME/POPULATION											1.80				
REAL_GSP	1.99	1.65	1.89	2.06	1.91	1.77%*	1.64		1.94				2.07	3.10	1.77
MANUFACTURING_EMP											0.31				

** For LA, real GSP excluding the mining sector was used.*

Table 57 provides state-level forecasts. The retail sales by state for the year 2019 are not actual observed values since EIA had not published the final release of that year's data at the time the forecast was prepared. Therefore, the state econometric models were used to "forecast" 2019 values (as well as 2020 values) to provide continuity between the historical data and the forecast period (2021 to 2040).

APPENDIX A STATE MODELS

Table 57: Gross State Energy Forecasts (Annual Retail Sales in GWh)

Year	AR	IL	IN	IA	KY	LA	MI	MN
1990	27,365	111,577	73,982	29,437	61,097	63,826	82,367	47,167
1991	28,440	116,869	77,034	30,781	64,194	64,704	84,519	48,755
1992	28,451	112,521	76,977	30,208	67,068	65,098	83,840	47,412
1993	31,663	117,786	81,931	32,104	68,149	67,756	87,589	49,211
1994	32,619	121,490	83,808	33,039	72,485	70,132	91,160	51,155
1995	34,671	126,231	87,006	34,301	74,548	72,827	94,701	53,959
1996	36,137	125,990	88,901	34,999	77,019	75,269	96,302	54,942
1997	36,858	126,953	89,147	36,148	76,836	75,886	97,391	55,674
1998	39,315	131,697	92,059	37,318	75,850	77,716	100,506	56,744
1999	39,789	132,682	96,735	38,034	79,098	78,267	103,981	57,399
2000	41,611	134,697	97,775	39,088	78,316	80,690	104,772	59,782
2001	41,732	136,034	97,734	39,444	79,975	74,693	102,409	60,687
2002	42,450	138,447	101,429	40,898	87,267	79,261	104,714	62,162
2003	43,108	136,248	100,468	41,207	85,220	77,769	108,877	63,087
2004	43,672	139,254	103,094	40,903	86,521	79,737	106,606	63,340
2005	46,165	144,986	106,549	42,757	89,351	77,389	110,445	66,019
2006	46,636	142,448	105,664	43,337	88,743	77,468	108,018	66,770
2007	47,055	146,055	109,420	45,270	92,404	79,567	109,297	68,231
2008	46,135	144,620	106,981	45,488	93,428	78,726	105,781	68,794
2009	43,173	136,688	99,312	43,641	88,897	78,670	98,121	64,004
2010	48,194	144,761	105,994	45,445	93,569	85,080	103,649	67,800
2011	47,928	142,886	105,818	45,655	89,538	86,369	105,054	68,533
2012	46,860	143,540	105,173	45,709	89,048	84,731	104,818	67,989
2013	46,683	141,805	105,487	46,705	84,764	85,808	103,038	68,644
2014	47,080	141,540	106,943	47,202	78,839	90,628	103,314	68,719
2015	46,465	138,620	104,515	47,147	76,039	91,676	102,480	66,579
2016	46,188	141,050	103,705	48,431	74,554	91,453	104,468	66,546
2017	46,086	137,196	98,966	48,922	72,634	91,206	101,899	67,153
2018	49,603	142,655	104,217	51,214	76,611	94,186	104,869	68,729
2019	48,635	142,382	105,329	49,049	78,359	91,783	105,621	69,833
2020	46,555	139,520	100,460	46,906	73,061	89,255	101,360	71,093
2021	48,240	141,500	104,364	48,633	76,616	91,181	103,436	71,572
2022	49,722	143,175	107,498	49,797	79,257	93,850	105,352	72,646
2023	51,025	144,483	110,214	50,996	82,281	94,870	107,160	73,507
2024	52,123	145,524	112,339	52,059	84,465	95,577	108,462	74,201
2025	52,988	146,326	114,296	52,930	86,349	96,014	109,498	74,988
2026	53,640	147,113	115,519	53,661	87,862	96,287	110,394	75,813
2027	54,117	147,979	116,314	54,337	89,183	96,522	111,153	76,440
2028	54,547	148,743	117,160	54,967	90,378	96,719	111,750	77,065
2029	54,953	149,423	118,122	55,566	91,553	97,052	112,215	77,716
2030	55,411	150,085	119,256	56,231	92,792	97,588	112,659	78,396
2031	55,978	150,898	120,558	57,062	94,230	98,308	113,334	78,870
2032	56,636	151,671	121,954	57,908	95,807	99,036	114,045	79,255
2033	57,299	152,443	123,512	58,677	97,303	99,774	114,754	79,734
2034	57,982	153,257	124,907	59,528	98,829	100,488	115,450	80,238
2035	58,683	154,108	126,238	60,393	100,344	101,195	116,131	80,653
2036	59,369	154,929	127,584	61,227	101,888	101,850	116,790	81,087
2037	60,078	155,716	129,079	62,085	103,494	102,590	117,492	81,560
2038	60,814	156,555	130,570	62,982	105,121	103,384	118,178	82,041
2039	61,547	157,388	131,981	63,869	106,688	104,121	118,854	82,540
2040	62,317	158,219	133,420	64,808	108,372	104,937	119,569	83,024
Compound Annual Growth Rates (%)								
2021-2025	2.37	0.84	2.30	2.14	3.04	1.30	1.43	1.17
2021-2030	1.55	0.66	1.49	1.63	2.15	0.76	0.95	1.02
2021-2040	1.36	0.59	1.30	1.52	1.84	0.74	0.77	0.78

Table 57: Gross State Energy Forecasts (Annual Retail Sales in GWh) – continued

Year	MS	MO	MT	ND	SD	TX	WI
1990	32,127	53,925	13,125	7,014	6,334	237,415	49,198
1991	33,019	56,514	13,407	7,255	6,685	240,352	51,032
1992	33,241	54,411	13,096	7,128	6,494	239,431	50,925
1993	34,749	58,622	12,929	7,432	6,905	250,084	53,156
1994	36,627	59,693	13,184	7,681	7,174	258,180	55,412
1995	37,868	62,259	13,419	7,883	7,414	263,279	57,967
1996	39,622	64,843	13,820	8,314	7,736	278,450	58,744
1997	40,089	65,711	11,917	8,282	7,773	286,704	60,094
1998	42,510	69,010	14,145	8,220	7,824	304,705	62,061
1999	43,980	69,045	13,282	9,112	7,922	301,844	63,547
2000	45,336	72,643	14,580	9,413	8,283	318,263	65,146
2001	44,287	73,213	11,447	9,810	8,627	318,044	65,218
2002	45,452	75,001	12,831	10,219	8,937	320,846	66,999
2003	45,544	74,240	12,825	10,461	9,080	322,686	67,241
2004	46,033	74,054	12,957	10,516	9,214	320,615	67,976
2005	45,901	80,940	13,479	10,840	9,811	334,258	70,336
2006	46,936	82,015	13,815	11,245	10,056	342,724	69,821
2007	48,153	85,533	15,532	11,906	10,603	343,829	71,301
2008	47,721	84,382	15,326	12,416	10,974	347,815	70,122
2009	46,049	79,897	14,354	12,649	11,010	345,351	66,286
2010	49,687	86,085	13,771	12,956	11,356	358,458	68,752
2011	49,338	84,255	13,788	13,737	11,680	376,065	68,612
2012	48,388	82,435	13,863	14,717	11,734	365,104	68,820
2013	48,782	83,407	14,045	16,033	12,210	378,817	69,124
2014	49,409	83,878	14,102	18,240	12,355	389,670	69,495
2015	48,692	81,504	14,207	18,129	12,102	392,337	68,699
2016	49,050	78,618	14,101	18,520	12,130	398,662	69,736
2017	47,829	76,461	14,710	20,140	12,314	401,880	69,079
2018	50,390	82,058	14,839	20,670	12,866	424,528	70,965
2019	51,172	82,198	15,968	20,344	12,729	423,632	71,056
2020	50,472	83,079	15,517	21,052	12,090	406,102	68,551
2021	52,116	83,776	15,886	21,320	12,784	415,088	70,442
2022	52,978	84,828	16,473	21,890	13,202	428,166	71,924
2023	54,259	85,733	16,796	22,365	13,686	442,709	73,194
2024	55,404	86,577	17,257	22,774	14,119	455,264	74,251
2025	56,373	87,531	17,591	23,201	14,543	465,817	75,148
2026	57,129	88,393	17,875	23,613	14,915	474,782	75,879
2027	57,775	89,124	18,152	23,897	15,259	482,957	76,575
2028	58,360	89,884	18,505	24,154	15,571	490,872	77,185
2029	59,046	90,709	18,792	24,398	15,840	498,338	77,745
2030	59,822	91,423	19,161	24,636	16,113	506,060	78,327
2031	60,643	91,925	19,522	24,760	16,422	514,763	79,006
2032	61,567	92,440	19,865	24,830	16,742	524,096	79,756
2033	62,467	93,070	20,132	24,933	17,046	533,400	80,466
2034	63,350	93,674	20,368	25,039	17,371	542,978	81,207
2035	64,213	94,232	20,626	25,097	17,700	552,526	81,916
2036	65,035	94,838	20,909	25,155	18,021	562,157	82,608
2037	65,881	95,486	21,142	25,225	18,350	572,016	83,330
2038	66,711	96,167	21,393	25,288	18,689	581,907	84,040
2039	67,553	96,858	21,690	25,347	19,023	591,886	84,745
2040	68,407	97,518	21,972	25,388	19,375	602,386	85,461
Compound Annual Growth Rates (%)							
2021-2025	1.98	1.10	2.58	2.14	3.27	2.92	1.63
2021-2030	1.54	0.98	2.10	1.62	2.60	2.23	1.19
2021-2040	1.44	0.80	1.72	0.92	2.21	1.98	1.02

APPENDIX A STATE MODELS

The state energy forecasting models and associated modeling statistics follow. The EViews software package is used for linear regression modeling.

Arkansas

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2018
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	9175.428232	5885.5369	1.558979	0.1374	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-949.2965449	411.82454	-2.3051	0.0340	-0.1463
REAL_NATURAL_GAS_PRICE	210.5495199	93.057682	2.26257	0.0370	0.0317
REAL_GSP	0.263127085	0.0189523	13.883627	0.0000	0.6222
CDD	4.361568075	0.5482492	7.9554481	0.0000	0.1810
HDD	1.745671254	0.3763663	4.6382245	0.0002	0.1353

R-squared	0.981724	Mean dependent var	44300.97
Adjusted R-squared	0.976349	S.D. dependent var	3663.702
S.E. of regression	563.4357	Durbin-Watson stat	2.030339
F-statistic	182.6391		
Prob(F-statistic)	0.000000		

Illinois

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1994 2018
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	87958.12937	14436.8593	6.092608339	7.38E-06	
REAL_ELECTRICITY_PRICE	-1782.222325	754.6265794	-2.36172747	0.02901973	-0.1097
REAL_NATURAL_GAS_PRICE(-1)	975.5932126	236.3759751	4.127294292	0.000572909	0.0492
REAL_GSP	0.053691924	0.011369178	4.722586062	0.000148176	0.2897
CDD	8.801855213	2.690340819	3.271650621	0.004013494	0.0647
HDD	2.168136225	1.141015711	1.900180869	0.072693393	0.0927

R-squared	0.911954	Mean dependent var	137542.9
Adjusted R-squared	0.888784	S.D. dependent var	6764.046
S.E. of regression	2255.745	Durbin-Watson stat	1.604195
F-statistic	39.3593		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Indiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2018
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	58063.5	6409.484	9.058997	0.0000	
REAL_ELECTRICITY_PRICE(-2)	-3708.585	511.4302	-7.251401	0.0000	-0.3103
REAL_GSP	0.193515	0.013522	14.31101	0.0000	0.6045
CDD	6.531537	1.892264	3.451705	0.0028	0.0695
HDD	1.85289	0.828924	2.235296	0.0383	0.0993

R-squared	0.942613	Mean dependent var	101785.1
Adjusted R-squared	0.92986	S.D. dependent var	5739.765
S.E. of regression	1520.117	Durbin-Watson stat	1.000275
F-statistic	73.91463		
Prob(F-statistic)	0.000000		

Iowa

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1992 2018
Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	19536.74	4412.336	4.427753	0.0002	
REAL_ELECTRICITY_PRICE(-2)	-814.9002	354.1533	-2.300982	0.0308	-0.1301
REAL_GSP	0.193978	0.011956	16.22485	0.0000	0.6517
CDD	2.678881	1.126979	2.377046	0.0262	0.0596

R-squared	0.979548	Mean dependent var	41652.37
Adjusted R-squared	0.97688	S.D. dependent var	5646.7
S.E. of regression	858.5948	Durbin-Watson stat	1.163298
F-statistic	367.1898		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Kentucky

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1993 2018
Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	-5632.235	7616.205	-0.739507	0.4682	
REAL_ELECTRICITY_PRICE(-2)	-1129.374	591.3995	-1.909664	0.0706	-0.1023
@MOVAV(REAL_NATURAL_GAS_PRICE,4)	1015.258	237.9197	4.267229	0.0004	0.0702
REAL_GSP	0.378484	0.028365	13.34344	0.0000	0.7966
CDD	3.43803	1.921725	1.789034	0.0888	0.0552
HDD	5.20034	1.167146	4.455602	0.0002	0.2702

R-squared	0.950737	Mean dependent var	84561.27
Adjusted R-squared	0.938421	S.D. dependent var	7135.08
S.E. of regression	1770.584	Durbin-Watson stat	1.269981
F-statistic	77.19604		
Prob(F-statistic)	0.000000		

Louisiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2018
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	60201.91	8685.56	6.931263	0.0000	
REAL_ELECTRICITY_PRICE(-2)	-3123.384	438.7459	-7.118889	0.0000	-0.2367
REAL_NATURAL_GAS_PRICE	-1281.255	230.0796	-5.568745	0.0000	-0.0491
REAL_GSP_EXCLUDING_MINING	0.184557	0.027165	6.793913	0.0000	0.4347
CDD	4.270529	2.235425	1.910389	0.0686	0.1604
HDD	3.281614	1.824638	1.798501	0.0852	0.0611

R-squared	0.951646	Mean dependent var	79192.67
Adjusted R-squared	0.941135	S.D. dependent var	8293.298
S.E. of regression	2012.136	Durbin-Watson stat	1.826739
F-statistic	90.5323		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Michigan

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2018
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	66586.61	9172.828	7.259114	0.0000	
REAL_ELECTRICITY_PRICE	-1262.884	457.7407	-2.758951	0.0129	-0.1255
REAL_NATURAL_GAS_PRICE	780.4264	159.8892	4.881045	0.0001	0.0490
REAL_GSP	0.090931	0.015129	6.010244	0.0000	0.4080
CDD	5.00789	1.994776	2.510502	0.0218	0.0399

R-squared	0.852911	Mean dependent var	103948.2
Adjusted R-squared	0.820224	S.D. dependent var	3591.473
S.E. of regression	1522.784	Durbin-Watson stat	1.430725
F-statistic	26.09364		
Prob(F-statistic)	0		

Minnesota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2018
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	-28548.55	7763.656	-3.677205	0.0017	
REAL_ELECTRICITY_PRICE(-1)	-3005.205	689.5553	-4.358179	0.0004	-0.4206
POPULATION	0.020031	0.001963	10.20654	0.0000	1.6354
CDD	6.92102	2.480399	2.790284	0.0121	0.0750
HDD	1.188752	0.499778	2.378561	0.0287	0.1447

R-squared	0.927908	Mean dependent var	64275.17
Adjusted R-squared	0.911887	S.D. dependent var	4632.262
S.E. of regression	1375.031	Durbin-Watson stat	1.461719
F-statistic	57.92007		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Mississippi

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1997 2018
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	13087.33	3247.546	4.029914	0.0010	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1515.821	413.5917	-3.665017	0.0021	-0.2533
REAL_INCOME(-1)	0.00019	4.91E-05	3.876198	0.0013	0.3841
REAL_GSP	0.173925	0.074457	2.335906	0.0328	0.3550
CDD	3.459462	0.701872	4.928909	0.0002	0.1703
HDD	2.065104	0.514654	4.012606	0.0010	0.1055

R-squared	0.954639	Mean dependent var	46797.94
Adjusted R-squared	0.940463	S.D. dependent var	2568.369
S.E. of regression	626.6869	Durbin-Watson stat	1.427198
F-statistic	67.34448		
Prob(F-statistic)	0.000000		

Missouri

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 2001 2018
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	-75842.12	23668.94	-3.204288	0.0064	
@MOVAV(REAL_ELECTRICITY_PRICE,2)	-5106.725	1010.415	-5.054089	0.0002	-0.5748
POPULATION	0.031931	0.004961	6.435893	0.0000	2.3840
CDD	5.50729	2.376036	2.317848	0.0361	0.1070

R-squared	0.788332	Mean dependent var	80443.21
Adjusted R-squared	0.742974	S.D. dependent var	4197.05
S.E. of regression	2127.807	Durbin-Watson stat	1.368756
F-statistic	17.38042		
Prob(F-statistic)	0.000054		

APPENDIX A STATE MODELS

Montana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2018
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	3009.955	3121.303	0.964326	0.3492	
REAL_ELECTRICITY_PRICE	-1580.638	218.236	-7.24279	0.0000	-0.8610
@MOVAV(REAL_NATURAL_GAS_PRICE,4)	351.7457	51.94441	6.77158	0.0000	0.1583
REAL_INCOME/POPULATION	300.4576	26.31436	11.41801	0.0000	0.8801
MANUFACTURING_EMPLOYMENT	0.198096	0.063467	3.121268	0.0066	0.2737
CDD	1.680454	0.70104	2.397088	0.0291	0.0567
HDD	0.657676	0.2138	3.076127	0.0072	0.3402

R-squared	0.915473	Mean dependent var	13814.58
Adjusted R-squared	0.883776	S.D. dependent var	970.776
S.E. of regression	330.9535	Durbin-Watson stat	2.363533
F-statistic	28.8816		
Prob(F-statistic)	0.000000		

North Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1998 2018
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	-43888.98	3214.933	-13.6516	0.0000	
REAL_ELECTRICITY_PRICE(-1)	-1515.244	425.9569	-3.557271	0.0024	-0.6029
POPULATION	0.096435	0.00497	19.40152	0.0000	3.5462
HDD	0.349212	0.242099	1.442431	0.1674	0.2213

R-squared	0.978008	Mean dependent var	13330.96
Adjusted R-squared	0.974127	S.D. dependent var	3841.785
S.E. of regression	617.9512	Akaike info criterion	15.86034
F-statistic	252.0048	Durbin-Watson stat	1.581511
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

South Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 2002 2018
Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	-1721.57	977.6485	-1.760929	0.1037	
REAL_ELECTRICITY_PRICE(-2)	-189.9656	93.23572	-2.037477	0.0643	-0.1388
REAL_GSP	0.289755	0.011068	26.18055	0.0000	1.0470
CDD	0.442588	0.261426	1.692979	0.1162	0.0295
HDD	0.316424	0.080945	3.909139	0.0021	0.2077

R-squared	0.988149	Mean dependent var	11084.17
Adjusted R-squared	0.984198	S.D. dependent var	1264.877
S.E. of regression	159.002	Durbin-Watson stat	2.081119
F-statistic	250.1343		
Prob(F-statistic)	0.000000		

Texas

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1998 2018
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	94213.14	14889.61	6.327443	0.0000	
REAL_ELECTRICITY_PRICE(-3)	-1931.279	760.4655	-2.539601	0.0219	-0.0383
REAL_GSP	0.138842	0.003558	39.02543	0.0000	0.5602
CDD	22.25848	4.210426	5.286514	0.0001	0.1958
HDD	16.75234	3.715117	4.509236	0.0004	0.0851

R-squared	0.99207	Mean dependent var	352690.5
Adjusted R-squared	0.990088	S.D. dependent var	35257.23
S.E. of regression	3510.253	Durbin-Watson stat	2.108497
F-statistic	500.417		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Wisconsin

Dependent Variable: ELECTRICITY_SALES

Method: Least Squares

Sample: 1997 2018

Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2018 (weather at means)
C	28630.96	2515.176	11.38328	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-607.648	247.0299	-2.459816	0.0257	-0.0867
REAL_NATURAL_GAS_PRICE	442.9261	62.36026	7.102699	0.0000	0.0367
REAL_GSP	0.119904	0.010168	11.79178	0.0000	0.5096
CDD	5.084512	1.03838	4.896583	0.0002	0.0458
HDD	0.891959	0.304309	2.931095	0.0098	0.0921

R-squared	0.975427	Mean dependent var	67701.49
Adjusted R-squared	0.967749	S.D. dependent var	2917.732
S.E. of regression	523.9864	Durbin-Watson stat	2.298585
F-statistic	127.0267		
Prob(F-statistic)	0.000000		

APPENDIX B ALLOCATION FACTORS

APPENDIX B ALLOCATION FACTORS

Allocation factors were used to convert annual electricity sales forecasts at the state level to the MISO LRZ level energy forecasts. The shares of electricity sales within the MISO market footprint were calculated from sales of the LBAs within the MISO market footprint. The correspondence between LBAs and LRZs within MISO is displayed in Table 58. EIA Form 861's historical annual electricity sales data from 2009 to 2018 were used to estimate annual MISO load fractions at the state level.

The MISO market footprint covers all or parts of 17 states and is divided into 10 LRZs.[11] Figure 1 in Chapter 1 displays the MISO market footprint at the LRZ level.

Table 58: MISO Local Balancing Authorities, 2018

LBA	Local Balancing Authority (MISO)	LRZ	LBA	Local Balancing Authority (MISO)	LRZ
DPC	Dairy Land Power Cooperative	1	AMMO	Ameren - Missouri	5
GRE	Great River Energy	1	CWLD	Columbia Water & Light District	5
MDU	Montana-Dakota Utilities	1	BREC	Big Rivers Electric Cooperative	6
MP	Minnesota Power, Inc.	1	CIN	Cinergy	6
NSP	Northern States Power	1	HE	Hoosier Energy	6
OTP	Otter Tail Power Company	1	IPL	Indianapolis Power and Light	6
SMP	Southern Minnesota Municipal Power Association	1	NIPS	Northern Indiana Public Service Company	6
ALTE	Alliant East	2	SIGE	Southern Indiana Gas and Electric	6
MGE	Madison Gas and Electric	2	CONS	Consumers	7
MIUP	Michigan Upper Peninsula	2	DECO	Detroit Edison	7
UPPC	Upper Peninsula Power Company	2	EAI	Entergy Arkansas, Inc.	8
WEC	Wisconsin Electric Power Company	2	CLEC	Central Louisiana Electric Company	9
WPS	Wisconsin Public Service Company	2	EES	Entergy Electric System	9
ALTW	Alliant West	3	LAFA	Lafayette Utilities	9
MEC	MidAmerican Electric Company	3	LAGN	Louisiana Generating Company	9
MPW	Muscatine Power & Water	3	LEPA	Louisiana Energy and Power Authority	9
AMIL	Ameren - Illinois	4	EES	Entergy Electric System	10
CWPLP	City Water Light & Power	4	SME	South Mississippi Electric Power Association	10
SIPC	Southern Illinois Power Cooperative	4			

Source: MAP of MEP Local Resource Zone Boundaries, MISO, March 1, 2018

[11] A very small amount of load in Oklahoma and Tennessee is served by MISO LBAs in LRZ 8. Rather than developing individual state econometric models for those states, it is assumed that these loads grow at the rate of the rest of LRZ 8.

APPENDIX B ALLOCATION FACTORS

Table 59 summarizes the historical MISO load fractions at the state level for the period of 2009-2018. The category named "MISO Sales" includes all electricity sales from either MISO utilities or utilities listing a MISO LBA as the local balancing authority. At the request of MISO staff and due to concerns over providing utility-specific information in states that only have a single MISO utility, the annual electricity sales of Indiana and Kentucky are combined (IN+KY). Similarly, North Dakota and Montana have been combined (ND+MT).

Table 59: MISO Load Fraction at State Level (MWh), 2009-2018

State	MISO Sales (MWhs)	Non-MISO Sales (MWhs)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AR	36,207,187	13,395,521	70.03%	70.57%	70.39%	70.52%	70.45%	72.23%	72.30%	71.94%	72.52%	72.99%
IA	47,465,445	3,745,210	92.03%	92.92%	93.04%	93.22%	92.92%	93.05%	92.92%	92.85%	92.67%	92.69%
IL	49,639,435	93,015,373	33.95%	34.55%	34.80%	33.91%	34.59%	34.84%	34.83%	34.45%	34.46%	34.80%
IN+KY	91,182,936	89,622,076	47.37%	47.49%	48.49%	48.78%	49.94%	51.95%	51.86%	50.89%	50.29%	50.43%
LA	87,334,223	6,851,849	91.82%	91.77%	91.74%	92.06%	92.20%	92.67%	92.66%	92.75%	92.88%	92.73%
MI	100,806,408	4,063,088	95.28%	96.01%	96.16%	96.21%	96.10%	96.08%	96.09%	96.11%	96.12%	96.13%
MN	67,818,842	889,540	98.66%	98.73%	98.73%	98.84%	98.75%	98.77%	98.76%	98.72%	98.73%	98.71%
MO	37,956,986	44,098,849	48.83%	49.55%	49.35%	50.22%	49.38%	49.06%	48.98%	46.98%	46.64%	46.26%
MS	22,374,690	28,015,378	45.58%	45.89%	45.24%	44.78%	44.73%	44.56%	45.06%	44.71%	44.30%	44.40%
ND+MT	11,775,007	23,733,344	36.03%	37.35%	37.90%	36.76%	37.46%	36.30%	35.14%	34.48%	32.89%	33.16%
SD	3,277,170	9,579,768	26.48%	26.87%	26.07%	26.02%	25.32%	25.26%	25.57%	25.85%	25.63%	25.49%
TX	22,990,915	401,427,713	5.53%	5.66%	5.46%	5.99%	5.74%	5.60%	5.47%	5.45%	5.35%	5.42%
WI	70,959,549	0	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Electric power sales, revenue, and energy efficiency Form 861 detailed data files, U.S. Energy Information Administration, calculated by SUFG.

Table 60 shows the average percentage of annual electricity sales at the state level that was located in each MISO LRZ. The last row named "Non-MISO" lists the average percentage of electricity sales from non-MISO utilities at the state level.

Table 60: MISO Load Fraction (Average % of State-Level Electricity Sales from 2009 to 2018)

LRZ	AR	IA	IL	IN+KY	LA	MI	MN	MO	MS	ND+MT	SD	TX	WI
1		1.8%	0.0002%			0.1%	97.1%			35.7%	24.0%		16.9%
2						4.7%							83.1%
3		91.0%	1.4%				1.6%				1.8%		
4			33.1%										
5								48.4%					
6				49.7%									
7						91.2%							
8	71.4%							0.02%				0.01%	
9					92.3%							5.6%	
10									44.9%				
Non-MISO	**28.6%**	**7.2%**	**65.5%**	**50.3%**	**7.7%**	**4.0%**	**1.3%**	**51.5%**	**55.1%**	**64.3%**	**74.1%**	**94.4%**	**0.0%**

Source: Electric power sales, revenue, and energy efficiency Form 861 detailed data files, U.S. Energy Information Administration, calculated by SUFG.

APPENDIX B ALLOCATION FACTORS

Table 61 summarizes the percentage of MISO electricity sales in each state for the period of 2009-2018 and the ten-year average by LRZ. For most states, the percentage of electricity sales from MISO utilities was quite stable during this period.

Table 61: State Level MISO Load Fraction by MISO LRZs

MISO LRZ	State	State Level MISO Load Fraction										
		Average	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	IA	1.78%	1.78%	1.77%	1.76%	1.73%	1.78%	1.83%	1.84%	1.81%	1.74%	1.77%
	IL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	MI	0.14%	0.14%	0.14%	0.14%	0.13%	0.14%	0.14%	0.13%	0.13%	0.13%	0.13%
	MN	97.12%	96.60%	96.73%	96.76%	96.93%	96.89%	96.76%	97.20%	97.78%	97.80%	97.80%
	ND+MT	35.74%	35.99%	37.35%	37.90%	36.76%	37.46%	36.30%	35.14%	34.48%	32.89%	33.16%
	SD	24.04%	24.64%	24.97%	24.28%	24.24%	23.51%	23.51%	23.78%	24.05%	23.72%	23.65%
	WI	16.87%	16.84%	16.59%	16.94%	16.23%	17.02%	17.05%	16.90%	16.68%	17.12%	17.29%
2	MI	4.74%	4.32%	5.22%	5.28%	4.89%	4.94%	5.14%	4.83%	4.53%	4.14%	4.10%
	WI	83.13%	83.16%	83.41%	83.06%	83.77%	82.98%	82.95%	83.10%	83.32%	82.88%	82.71%
3	IA	91.05%	90.25%	91.14%	91.28%	91.48%	91.15%	91.22%	91.07%	91.05%	90.93%	90.92%
	IL	1.42%	1.40%	1.42%	1.45%	1.42%	1.42%	1.40%	1.41%	1.42%	1.43%	1.42%
	MN	1.62%	2.06%	2.00%	1.97%	1.91%	1.86%	2.01%	1.56%	0.94%	0.93%	0.91%
	SD	1.82%	1.84%	1.90%	1.79%	1.77%	1.80%	1.75%	1.79%	1.80%	1.91%	1.84%
4	IL	33.10%	32.55%	33.12%	33.35%	32.49%	33.17%	33.44%	33.42%	33.03%	33.03%	33.38%
5	MO	48.44%	48.56%	49.41%	49.22%	50.08%	49.26%	49.04%	48.96%	46.96%	46.62%	46.23%
6	IN+KY	49.73%	47.35%	47.49%	48.49%	48.60%	49.94%	51.95%	51.86%	50.89%	50.29%	50.43%
7	MI	91.16%	90.82%	90.65%	90.75%	91.19%	91.02%	90.80%	91.13%	91.45%	91.84%	91.89%
8	AR	71.40%	70.03%	70.57%	70.39%	70.52%	70.45%	72.23%	72.30%	71.94%	72.52%	72.99%
	MO	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
	TX	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
9	LA	92.33%	91.82%	91.77%	91.74%	92.06%	92.20%	92.67%	92.66%	92.75%	92.88%	92.73%
	TX	5.59%	5.52%	5.65%	5.46%	5.98%	5.73%	5.59%	5.46%	5.45%	5.35%	5.72%
10	MS	44.92%	45.58%	45.89%	45.24%	44.78%	44.73%	44.56%	45.06%	44.71%	44.30%	44.40%

Source: Electric power sales, revenue, and energy efficiency Form 861 detailed data files, U.S. Energy Information Administration, calculated by SUFG.

In determining the future allocation factors, a number of elements were considered. These include the stability of the historical market shares, any distinct upward or downward trend in historical market shares, and information regarding expected growth for sub-state areas where those areas are particularly indicative of either the MISO or the non-MISO portion of the state. For example, most of the MISO portion of Missouri is in or near the St. Louis metropolitan area. Since economic drivers for the St. Louis area grow slower than the entire state of Missouri, the share of electricity sales in the MISO portion is reduced over time. A similar analysis was performed for Illinois using the Chicago metropolitan area, but did not indicate that an adjustment is warranted. Table 62 provides allocation factors for each LRZ. The allocation factors were then applied to the state load forecasts to obtain LRZ-level forecasts of annual calendar-year energy sales. These were then converted to LRZ metered load forecasts.

APPENDIX B ALLOCATION FACTORS

Table 62: Allocation Factors to Convert State Sales to LRZ Energy Sales

MISO LRZ	State	Allocation Factor	
		Basis	Forecasting Period
1	IA	Historical average (2014-2018)	Constant at 1.80%
	IL	Historical average (2014-2018)	Constant at 0.0002%
	MI	Historical average (2014-2018)	Constant at 0.13%
	MN	Historical average (2016-2018)	Constant at 97.79%
	ND+MT	Historical average (2017-2018)	Constant at 33.03%
	SD	Historical average (2014-2018)	Constant at 23.74%
	WI	Historical average (2014-2018)	Constant at 17.01%
2	MI	Historical average (2014-2018)	Constant at 4.55%
	WI	Historical average (2014-2018)	Constant at 82.99%
3	IA	Historical average (2014-2018)	Constant at 91.04%
	IL	Historical average (2014-2018)	Constant at 1.41%
	MN	Historical average (2016-2018)	Constant at 0.92%[12]
	SD	Historical average (2014-2018)	Constant at 1.82%
4	IL	Historical average (2014-2018)	Constant at 33.26%
5	MO	St. Louis vs. state growth Decrease over time	Reduced from 45.97% in 2019 to 41.01% in 2040[13]
6	IN+KY	Historical average (2014-2018)	Constant at 51.08%
7	MI	Historical average (2014-2018)	Constant at 91.42%
8	AR	Historical average (2014-2018)	Constant at 72.40%
	MO	Historical average (2014-2018)	Constant at 0.02%
	TX	Historical average (2014-2018)	Constant at 0.0054%
9	LA	Historical average (2014-2018)	Constant at 92.74%
	TX	Historical average (2014-2018)	Constant at 5.51%
10	MS	Historical average (2014-2018)	Constant at 44.61%

[12] Minnesota's allocation factor in LRZ3 for 2016 dropped from previous years because of the transfer of Interstate Power and Light customers in 2016.

[13] Based on the projections of the values for the model drivers for the state of Missouri and for the St. Louis metropolitan statistical area from IHS Markit, the non-MISO region is projected to grow faster than the MISO region. Therefore, the allocation factor for LRZ5 is reduced from 45.97% in 2019 to 41.01% in 2040.

APPENDIX C PEAK DEMAND

APPENDIX C PEAK DEMAND MODELS AND FORECAST RESULTS

Peak load conversion factors were used to translate annual metered load at the MISO LRZ level to monthly non-coincident peak demands. These conversion factors are based on normal weather conditions at the time of peak demand and are determined from historical relationships between hourly load factors, monthly peak levels, and weather conditions at the time of the peak demand.

The process involves three steps: (1) determine the relationship between the monthly peak demand (relative to the average demand level for the year) and temperature using historical data, (2) estimate the "normal" weather conditions when peak demand occurs, and (3) calculate the monthly peak hourly demand given the monthly peak load factor under normal weather conditions.

The zonal hourly load data were obtained from MISO and contain ten years' of hourly load observations of LRZ-level loads from January 1, 2010 to December 31, 2019. Actual hourly weather data from 1997 to 2019 were obtained from the Midwest Regional Climate Center. For each LRZ, one weather station was selected to be centrally located within the load center of a particular LRZ. Table 63 lists the selected weather stations by LRZ.

Table 63: Selected Weather Stations by LRZ, Midwest Regional Climate Center

LRZ	City	Station WBAN ID	Station Call Sign
1	Minneapolis-St. Paul, MN	14922	KMSP
2	Milwaukee, WI	14839	KMKE
3	Des Moines, IA	14933	KDSM
4	Springfield, IL	93822	KSPI
5	St. Louis, MO	13994	KSTL
6	Indianapolis, IN	93819	KIND
7	Lansing, MI	14836	KLAN
8	Little Rock, AR	13963	KLIT
9	Lake Charles, LA	03937	KLCH
10	Jackson, MS	03940	KJAN

Multiple linear regression (MLR) analysis was employed to estimate the relationship of peak load factor and temperature quantitatively. In this study, several MLR models were developed such as classical models with seasonal dummy variables, autoregressive models and models with moving average of hourly temperatures, etc. There are an extremely large number of possible models for peak load factor forecasting using various techniques and methodologies. Multiple statistics such as R squared values, Akaike information criterion (AIC) and mean absolute percentage error (MAPE) are used to measure the advantages of one model over another.

MISO provided ten years of zonal hourly load records from 2010 to 2019. Preliminary data screening and sample selection are necessary for peak load factor modeling. Since monthly peaks are unlikely to occur on weekends and national holidays, SUFG decided to only select work-day hourly records for regression analysis.

The multiple linear regression model used to estimate hourly load factors given specific hourly temperature conditions is constructed as follows.

$$Houly\ load\ factor_{mij} = C_{0mi} + C_{1mi} * Temp_{mij} + C_{2mi} * Temp_{mij}^2 + C_{3mi} * Average\ daily\ temp_{mij-1} + C_{4mi} * Average\ daily\ temp_{mij-2} + \sum_{t=0}^{23} C_{5mit} * h_{mij} + \sum_{t=0}^{23} C_{6mit} * h_{mij} * Temp_{mij}$$

where m represents month, which equals to 1, 2, 3, …12;

i represents zone, which equals to 1, 2, 3, …10;

j is the index of each hourly load record for month *m*, and zone *i;*

t represents the hour of the day when the hourly load *j* occurs, which equals to 0,1,2, …23;

$Hourly\ load\ factor_{mij}$ is the hourly load factor for record *j* of month *m*, and zone *i;*

$Temp_{mij}$ is the temperature when the hourly load *j* occurs for month *m*, and zone *i*;

$Average\ daily\ temp_{mij-1}$ is the average daily temperature of the day which is one day before the day when the hourly load *j* occurs for month *m*, and zone *i*;

$Average\ daily\ temp_{mij-2}$ is the average daily temperature of the day which is two days before the day when the hourly load *j* occurs for month *m*, and zone *i*;

h_{mij} is a binary variable, which equals 1 when the hourly load *j* occurs for month *m*, and zone *i; otherwise, it is 0.*

By fitting the actual temperature records and the time when peak occurred, the fitted monthly peak load factor can be obtained via the regression model.

Other than the current hourly temperature, the averages of daily temperatures of previous day and the day before yesterday are used as weather-related variables. Other than weather related variables, hourly dummy variables indicate load change during the 24-hour cycle. The hourly load factor is used as the dependent variable for the peak demand model.

The historical average of actual observed peak weather conditions is used as the most likely monthly peak weather condition. Given the historical hourly zonal load data from 2010 to 2019, Table 64 summarizes the normalized July peak load factors and most likely weather conditions when the monthly peaks occur. The temp column lists the most likely hourly temperature when normal peak occurs. The AVGT-L1 indicates the average daily temperature of the day which is one day ahead of the day when peak occurs. The AVGT-L2 represents the average daily temperature of the day which are two days ahead of the peak day. The Hour column represents the most likely hour when the July peak may occur. Based on historical records, most July peaks occur in late afternoon around 4 PM.

Table 64: Normalized July Peak Load Factors and Weather Conditions (Fahrenheit)

LRZ	Normal LF	Temp	AVGT-L1	AVGT_L2	Hour
LRZ1	0.6417	92.1	84.5	80.9	16
LRZ2	0.6092	89.1	82.5	78.1	16
LRZ3	0.6033	95.0	86.9	83.6	16
LRZ4	0.5766	94.0	84.5	81.4	16
LRZ5	0.5564	96.4	89.2	88.3	16
LRZ6	0.6491	93.0	85.2	82.6	14
LRZ7	0.5421	91.0	82.9	81.4	15
LRZ8	0.5861	96.5	88.9	88.0	14
LRZ9	0.6427	95.7	87.0	87.0	16
LRZ10	0.5447	92.6	86.4	86.2	16

APPENDIX C PEAK DEMAND

Historical monthly normalized peak demand is estimated by using the relationship between peak demand and load factor. Assuming the total annual energy is fixed, the normalized peak demand is calculated using the following formula:

$$Historical\ NormalizedMPD_{miy} = \frac{Actual\ monthly\ peak\ demand_{miy} * fitted\ monthly\ peak\ load\ factor_{miy}}{fitted\ normalized\ monthly\ peak\ load\ factor_{mi}}$$

where $Historical\ NormalizedMPD_{miy}$ is normalized monthly peak demand for month m, zone i and year y.

The following tables display monthly non-coincident peak forecasts by LRZ for each month.

Table 65: Gross January Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	14,016	9,329	7,180	7,978	6,346	14,395	13,798	6,362	17,450	3,595
2020	14,117	8,997	6,879	7,817	6,375	13,598	13,242	6,090	16,918	3,546
2021	14,292	9,240	7,123	7,928	6,393	14,183	13,513	6,310	17,285	3,662
2022	14,554	9,433	7,289	8,022	6,439	14,635	13,763	6,504	17,799	3,722
2023	14,767	9,599	7,460	8,095	6,469	15,085	14,000	6,674	18,080	3,812
2024	14,951	9,736	7,610	8,154	6,499	15,423	14,170	6,818	18,297	3,893
2025	15,139	9,852	7,734	8,198	6,540	15,724	14,305	6,931	18,456	3,961
2026	15,323	9,946	7,838	8,243	6,572	15,938	14,422	7,017	18,576	4,014
2027	15,470	10,036	7,935	8,291	6,593	16,104	14,521	7,079	18,683	4,059
2028	15,615	10,114	8,025	8,334	6,614	16,264	14,599	7,135	18,783	4,100
2029	15,758	10,185	8,110	8,372	6,643	16,432	14,660	7,188	18,899	4,149
2030	15,910	10,259	8,205	8,409	6,662	16,618	14,718	7,248	19,047	4,203
2031	16,030	10,345	8,322	8,455	6,662	16,832	14,806	7,323	19,232	4,261
2032	16,137	10,441	8,442	8,498	6,663	17,065	14,899	7,409	19,423	4,326
2033	16,253	10,532	8,550	8,541	6,671	17,305	14,992	7,495	19,616	4,389
2034	16,373	10,627	8,671	8,587	6,676	17,534	15,083	7,585	19,807	4,451
2035	16,478	10,717	8,793	8,634	6,679	17,757	15,171	7,677	19,998	4,512
2036	16,587	10,806	8,911	8,681	6,684	17,983	15,258	7,766	20,181	4,569
2037	16,700	10,898	9,032	8,725	6,692	18,226	15,349	7,859	20,379	4,629
2038	16,815	10,989	9,159	8,772	6,701	18,471	15,439	7,955	20,585	4,687
2039	16,935	11,079	9,284	8,818	6,710	18,704	15,527	8,051	20,783	4,746
2040	17,052	11,171	9,417	8,865	6,716	18,949	15,621	8,152	20,998	4,806
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 66: Gross February Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	13,641	8,788	6,750	7,410	6,121	13,806	13,569	5,726	15,618	3,173
2020	13,739	8,475	6,467	7,261	6,149	13,041	13,021	5,482	15,141	3,129
2021	13,909	8,705	6,697	7,364	6,167	13,602	13,288	5,680	15,470	3,231
2022	14,165	8,886	6,853	7,451	6,211	14,036	13,534	5,854	15,930	3,285
2023	14,371	9,043	7,013	7,519	6,240	14,467	13,766	6,008	16,181	3,364
2024	14,551	9,172	7,154	7,573	6,269	14,791	13,934	6,137	16,375	3,435
2025	14,734	9,281	7,271	7,615	6,308	15,080	14,067	6,239	16,518	3,495
2026	14,912	9,370	7,369	7,656	6,339	15,286	14,182	6,316	16,625	3,542
2027	15,056	9,454	7,460	7,701	6,359	15,445	14,279	6,372	16,721	3,582
2028	15,197	9,528	7,544	7,741	6,380	15,598	14,356	6,422	16,811	3,618
2029	15,336	9,595	7,625	7,776	6,407	15,759	14,416	6,470	16,914	3,661
2030	15,484	9,664	7,713	7,811	6,426	15,937	14,473	6,524	17,047	3,709
2031	15,601	9,746	7,824	7,853	6,426	16,143	14,559	6,591	17,212	3,760
2032	15,705	9,836	7,936	7,893	6,427	16,366	14,651	6,669	17,384	3,817
2033	15,818	9,922	8,038	7,933	6,435	16,596	14,742	6,747	17,556	3,873
2034	15,934	10,011	8,152	7,976	6,439	16,815	14,831	6,827	17,727	3,928
2035	16,037	10,096	8,267	8,020	6,442	17,029	14,919	6,910	17,898	3,981
2036	16,143	10,180	8,377	8,063	6,447	17,247	15,003	6,990	18,062	4,032
2037	16,253	10,267	8,491	8,104	6,454	17,480	15,094	7,074	18,239	4,084
2038	16,365	10,352	8,610	8,147	6,463	17,714	15,182	7,160	18,423	4,136
2039	16,481	10,437	8,728	8,191	6,472	17,938	15,269	7,247	18,601	4,188
2040	16,595	10,523	8,853	8,234	6,478	18,173	15,360	7,337	18,793	4,241
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 67: Gross March Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	12,938	8,369	6,591	6,973	5,234	12,960	12,915	4,964	14,858	2,829
2020	13,031	8,071	6,315	6,833	5,258	12,243	12,394	4,752	14,404	2,790
2021	13,192	8,290	6,539	6,930	5,273	12,769	12,648	4,924	14,717	2,881
2022	13,435	8,462	6,692	7,012	5,311	13,176	12,883	5,075	15,155	2,929
2023	13,631	8,611	6,848	7,076	5,335	13,581	13,104	5,208	15,394	3,000
2024	13,801	8,734	6,987	7,127	5,360	13,885	13,263	5,320	15,579	3,063
2025	13,974	8,838	7,100	7,167	5,394	14,156	13,390	5,408	15,714	3,116
2026	14,144	8,923	7,196	7,205	5,421	14,349	13,499	5,475	15,816	3,158
2027	14,280	9,004	7,285	7,248	5,437	14,499	13,592	5,523	15,908	3,194
2028	14,414	9,074	7,367	7,285	5,455	14,643	13,665	5,567	15,993	3,226
2029	14,546	9,137	7,446	7,318	5,479	14,793	13,722	5,609	16,091	3,264
2030	14,686	9,203	7,532	7,351	5,495	14,961	13,776	5,655	16,218	3,307
2031	14,797	9,281	7,640	7,391	5,495	15,154	13,859	5,713	16,375	3,352
2032	14,895	9,367	7,750	7,428	5,496	15,364	13,946	5,781	16,538	3,404
2033	15,003	9,449	7,850	7,466	5,502	15,579	14,032	5,848	16,702	3,453
2034	15,113	9,534	7,960	7,506	5,506	15,785	14,117	5,918	16,865	3,502
2035	15,211	9,615	8,073	7,548	5,509	15,986	14,201	5,990	17,027	3,550
2036	15,311	9,694	8,181	7,588	5,513	16,190	14,281	6,059	17,183	3,595
2037	15,416	9,777	8,292	7,627	5,519	16,409	14,367	6,132	17,351	3,642
2038	15,522	9,859	8,408	7,668	5,527	16,629	14,451	6,207	17,527	3,688
2039	15,632	9,939	8,523	7,708	5,534	16,839	14,534	6,282	17,696	3,735
2040	15,740	10,022	8,645	7,749	5,539	17,059	14,621	6,360	17,879	3,782
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 68: Gross April Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	11,351	7,766	6,005	5,969	4,710	11,599	11,951	4,627	14,846	2,880
2020	11,433	7,489	5,753	5,849	4,731	10,957	11,469	4,429	14,393	2,840
2021	11,574	7,692	5,958	5,932	4,745	11,428	11,704	4,590	14,705	2,933
2022	11,786	7,852	6,097	6,002	4,779	11,792	11,920	4,731	15,143	2,981
2023	11,958	7,990	6,239	6,057	4,801	12,155	12,125	4,854	15,382	3,054
2024	12,108	8,104	6,365	6,101	4,824	12,427	12,272	4,959	15,567	3,118
2025	12,260	8,201	6,468	6,134	4,854	12,670	12,390	5,041	15,702	3,173
2026	12,408	8,280	6,556	6,167	4,878	12,842	12,491	5,103	15,804	3,215
2027	12,528	8,354	6,636	6,203	4,893	12,976	12,577	5,149	15,895	3,251
2028	12,646	8,419	6,712	6,235	4,909	13,105	12,645	5,190	15,980	3,284
2029	12,761	8,478	6,783	6,264	4,930	13,240	12,697	5,228	16,079	3,323
2030	12,884	8,540	6,862	6,292	4,945	13,390	12,747	5,272	16,205	3,367
2031	12,982	8,612	6,960	6,326	4,945	13,563	12,824	5,326	16,362	3,413
2032	13,068	8,692	7,060	6,358	4,945	13,750	12,904	5,388	16,525	3,465
2033	13,162	8,767	7,151	6,391	4,952	13,943	12,984	5,451	16,689	3,515
2034	13,259	8,846	7,252	6,425	4,955	14,128	13,063	5,517	16,852	3,565
2035	13,344	8,921	7,354	6,460	4,957	14,307	13,140	5,583	17,014	3,614
2036	13,432	8,995	7,453	6,495	4,961	14,490	13,215	5,648	17,169	3,660
2037	13,524	9,072	7,554	6,528	4,967	14,686	13,294	5,716	17,338	3,708
2038	13,617	9,147	7,660	6,563	4,973	14,882	13,372	5,786	17,513	3,754
2039	13,714	9,222	7,765	6,598	4,980	15,070	13,448	5,856	17,682	3,802
2040	13,809	9,299	7,876	6,633	4,985	15,268	13,529	5,929	17,865	3,850
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 69: Gross May Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	13,069	8,958	7,157	7,491	5,654	13,591	15,073	5,797	18,204	3,659
2020	13,163	8,639	6,857	7,340	5,679	12,839	14,465	5,550	17,649	3,609
2021	13,325	8,873	7,101	7,444	5,696	13,391	14,761	5,750	18,031	3,726
2022	13,570	9,058	7,266	7,532	5,737	13,818	15,034	5,927	18,568	3,788
2023	13,768	9,217	7,436	7,601	5,763	14,243	15,293	6,082	18,861	3,879
2024	13,940	9,349	7,586	7,656	5,790	14,562	15,478	6,213	19,087	3,961
2025	14,115	9,460	7,709	7,698	5,826	14,846	15,626	6,316	19,253	4,031
2026	14,287	9,551	7,813	7,740	5,855	15,048	15,754	6,394	19,379	4,085
2027	14,424	9,637	7,910	7,785	5,873	15,205	15,862	6,451	19,491	4,131
2028	14,560	9,712	7,999	7,825	5,892	15,356	15,948	6,502	19,595	4,173
2029	14,693	9,780	8,085	7,861	5,918	15,514	16,014	6,551	19,716	4,222
2030	14,834	9,851	8,179	7,896	5,935	15,690	16,077	6,605	19,870	4,277
2031	14,946	9,934	8,296	7,939	5,935	15,892	16,174	6,673	20,063	4,336
2032	15,046	10,026	8,415	7,979	5,936	16,112	16,275	6,751	20,263	4,402
2033	15,154	10,114	8,523	8,020	5,943	16,338	16,376	6,830	20,463	4,466
2034	15,266	10,205	8,643	8,063	5,948	16,555	16,476	6,912	20,663	4,529
2035	15,364	10,292	8,765	8,108	5,950	16,765	16,573	6,995	20,862	4,591
2036	15,465	10,377	8,883	8,151	5,955	16,979	16,667	7,077	21,053	4,650
2037	15,571	10,465	9,004	8,192	5,961	17,208	16,767	7,162	21,259	4,710
2038	15,678	10,552	9,130	8,236	5,970	17,439	16,865	7,249	21,474	4,770
2039	15,790	10,639	9,255	8,280	5,977	17,659	16,961	7,337	21,681	4,830
2040	15,899	10,727	9,387	8,324	5,983	17,891	17,063	7,428	21,905	4,891
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 70: Gross June Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	14,784	10,427	8,223	9,243	7,004	15,807	17,709	7,081	19,630	4,241
2020	14,890	10,056	7,879	9,057	7,036	14,932	16,995	6,779	19,031	4,183
2021	15,074	10,328	8,159	9,186	7,057	15,574	17,343	7,024	19,444	4,319
2022	15,351	10,543	8,349	9,295	7,107	16,071	17,664	7,240	20,022	4,390
2023	15,575	10,729	8,544	9,380	7,140	16,565	17,967	7,429	20,339	4,497
2024	15,770	10,882	8,716	9,447	7,173	16,936	18,186	7,589	20,583	4,592
2025	15,968	11,011	8,858	9,499	7,218	17,266	18,359	7,715	20,761	4,672
2026	16,161	11,117	8,978	9,550	7,254	17,502	18,510	7,810	20,897	4,735
2027	16,317	11,217	9,088	9,606	7,276	17,684	18,637	7,879	21,018	4,788
2028	16,470	11,304	9,191	9,656	7,300	17,859	18,737	7,942	21,130	4,837
2029	16,621	11,384	9,289	9,700	7,332	18,043	18,815	8,001	21,260	4,893
2030	16,781	11,466	9,397	9,743	7,353	18,248	18,889	8,068	21,427	4,958
2031	16,908	11,563	9,532	9,796	7,353	18,483	19,003	8,150	21,635	5,026
2032	17,020	11,670	9,669	9,846	7,354	18,739	19,122	8,246	21,850	5,102
2033	17,142	11,772	9,793	9,896	7,364	19,002	19,241	8,343	22,067	5,177
2034	17,269	11,878	9,931	9,949	7,369	19,253	19,357	8,442	22,282	5,250
2035	17,380	11,979	10,071	10,004	7,372	19,498	19,471	8,544	22,496	5,322
2036	17,495	12,078	10,206	10,058	7,378	19,747	19,582	8,644	22,702	5,390
2037	17,614	12,181	10,345	10,109	7,386	20,014	19,700	8,748	22,925	5,460
2038	17,736	12,282	10,490	10,163	7,396	20,282	19,815	8,855	23,156	5,529
2039	17,862	12,383	10,634	10,217	7,406	20,538	19,928	8,961	23,380	5,598
2040	17,985	12,486	10,786	10,271	7,413	20,807	20,048	9,074	23,621	5,669
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 71: Gross July Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	16,560	11,649	9,083	9,947	7,547	15,909	20,239	7,267	19,613	4,408
2020	16,679	11,234	8,703	9,747	7,581	15,028	19,423	6,957	19,014	4,347
2021	16,885	11,538	9,011	9,885	7,603	15,674	19,821	7,208	19,427	4,489
2022	17,196	11,779	9,222	10,002	7,658	16,175	20,188	7,430	20,005	4,563
2023	17,447	11,986	9,437	10,094	7,693	16,672	20,534	7,624	20,321	4,674
2024	17,665	12,157	9,627	10,166	7,729	17,045	20,784	7,788	20,564	4,772
2025	17,886	12,302	9,784	10,222	7,777	17,378	20,982	7,918	20,743	4,856
2026	18,103	12,420	9,916	10,277	7,816	17,615	21,154	8,015	20,878	4,921
2027	18,277	12,532	10,038	10,338	7,840	17,798	21,299	8,086	20,999	4,976
2028	18,449	12,629	10,152	10,391	7,866	17,975	21,414	8,151	21,111	5,027
2029	18,618	12,718	10,260	10,439	7,900	18,160	21,503	8,211	21,241	5,086
2030	18,797	12,810	10,380	10,485	7,923	18,365	21,588	8,280	21,408	5,153
2031	18,939	12,919	10,528	10,542	7,923	18,603	21,717	8,365	21,615	5,223
2032	19,065	13,038	10,679	10,596	7,924	18,860	21,853	8,463	21,831	5,303
2033	19,202	13,152	10,817	10,650	7,934	19,125	21,989	8,562	22,047	5,381
2034	19,344	13,270	10,969	10,706	7,939	19,377	22,123	8,664	22,262	5,457
2035	19,469	13,383	11,124	10,766	7,943	19,624	22,253	8,769	22,476	5,531
2036	19,597	13,493	11,273	10,823	7,949	19,874	22,380	8,871	22,682	5,602
2037	19,731	13,609	11,426	10,878	7,958	20,143	22,514	8,978	22,904	5,675
2038	19,867	13,722	11,587	10,937	7,969	20,413	22,645	9,087	23,136	5,746
2039	20,008	13,834	11,745	10,995	7,979	20,671	22,775	9,197	23,359	5,819
2040	20,146	13,949	11,913	11,053	7,987	20,941	22,912	9,312	23,600	5,892
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 72: Gross August Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	15,585	11,326	8,452	9,419	7,328	15,427	18,589	7,442	20,010	4,493
2020	15,698	10,923	8,098	9,230	7,361	14,574	17,839	7,123	19,399	4,431
2021	15,892	11,218	8,386	9,361	7,383	15,200	18,204	7,381	19,820	4,576
2022	16,184	11,452	8,581	9,472	7,436	15,685	18,542	7,608	20,410	4,651
2023	16,420	11,654	8,782	9,558	7,470	16,167	18,860	7,807	20,732	4,764
2024	16,625	11,820	8,959	9,627	7,505	16,529	19,089	7,975	20,981	4,865
2025	16,834	11,961	9,104	9,680	7,552	16,852	19,271	8,108	21,163	4,950
2026	17,038	12,076	9,227	9,732	7,590	17,081	19,429	8,207	21,301	5,016
2027	17,202	12,185	9,341	9,789	7,613	17,259	19,563	8,280	21,424	5,073
2028	17,364	12,279	9,447	9,840	7,638	17,431	19,668	8,346	21,538	5,124
2029	17,522	12,366	9,547	9,885	7,671	17,610	19,750	8,408	21,671	5,184
2030	17,691	12,455	9,659	9,929	7,693	17,809	19,828	8,478	21,841	5,252
2031	17,825	12,561	9,797	9,983	7,693	18,040	19,947	8,565	22,053	5,324
2032	17,943	12,677	9,938	10,034	7,695	18,289	20,072	8,666	22,273	5,406
2033	18,072	12,787	10,066	10,085	7,704	18,546	20,197	8,767	22,493	5,485
2034	18,206	12,902	10,207	10,139	7,709	18,791	20,319	8,872	22,713	5,562
2035	18,323	13,012	10,351	10,195	7,713	19,030	20,439	8,979	22,931	5,638
2036	18,444	13,119	10,490	10,249	7,719	19,273	20,555	9,084	23,141	5,710
2037	18,570	13,231	10,633	10,301	7,727	19,533	20,678	9,193	23,368	5,784
2038	18,698	13,342	10,782	10,357	7,738	19,795	20,799	9,305	23,604	5,857
2039	18,831	13,451	10,930	10,412	7,748	20,045	20,918	9,417	23,832	5,931
2040	18,960	13,562	11,086	10,467	7,756	20,308	21,044	9,535	24,078	6,006
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 73: Gross September Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	14,220	10,410	8,204	8,888	6,806	15,604	17,906	6,555	19,128	4,098
2020	14,322	10,039	7,860	8,709	6,836	14,740	17,184	6,275	18,544	4,042
2021	14,499	10,311	8,139	8,833	6,856	15,374	17,536	6,502	18,947	4,174
2022	14,765	10,526	8,330	8,937	6,906	15,864	17,860	6,701	19,510	4,243
2023	14,981	10,711	8,524	9,019	6,937	16,352	18,167	6,877	19,818	4,345
2024	15,168	10,864	8,696	9,084	6,970	16,718	18,388	7,025	20,056	4,437
2025	15,358	10,994	8,837	9,134	7,013	17,044	18,563	7,142	20,230	4,514
2026	15,545	11,099	8,956	9,183	7,048	17,277	18,715	7,229	20,362	4,575
2027	15,694	11,199	9,067	9,237	7,070	17,456	18,844	7,294	20,480	4,627
2028	15,842	11,286	9,170	9,285	7,093	17,630	18,945	7,352	20,589	4,674
2029	15,987	11,366	9,267	9,327	7,124	17,811	19,024	7,406	20,716	4,728
2030	16,141	11,448	9,375	9,368	7,144	18,013	19,099	7,468	20,879	4,791
2031	16,263	11,545	9,510	9,419	7,145	18,246	19,214	7,545	21,081	4,856
2032	16,371	11,652	9,646	9,467	7,146	18,498	19,334	7,633	21,291	4,930
2033	16,488	11,753	9,770	9,516	7,155	18,758	19,455	7,723	21,502	5,002
2034	16,610	11,859	9,908	9,566	7,160	19,006	19,573	7,815	21,712	5,073
2035	16,717	11,960	10,048	9,619	7,163	19,248	19,688	7,909	21,920	5,142
2036	16,827	12,058	10,182	9,671	7,168	19,493	19,800	8,002	22,121	5,208
2037	16,942	12,161	10,321	9,720	7,176	19,756	19,919	8,097	22,338	5,276
2038	17,059	12,263	10,466	9,772	7,186	20,021	20,035	8,197	22,564	5,342
2039	17,180	12,363	10,609	9,824	7,196	20,274	20,150	8,295	22,781	5,410
2040	17,299	12,465	10,760	9,876	7,202	20,540	20,271	8,399	23,017	5,478
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 74: Gross October Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	11,959	8,421	6,268	6,857	4,850	11,541	12,499	5,364	15,841	3,206
2020	12,045	8,121	6,006	6,719	4,872	10,903	11,995	5,135	15,357	3,163
2021	12,194	8,341	6,219	6,814	4,887	11,371	12,240	5,321	15,691	3,266
2022	12,418	8,514	6,364	6,895	4,922	11,734	12,467	5,484	16,157	3,320
2023	12,599	8,664	6,513	6,958	4,944	12,095	12,681	5,628	16,413	3,400
2024	12,757	8,788	6,644	7,008	4,967	12,366	12,835	5,749	16,609	3,472
2025	12,917	8,893	6,752	7,047	4,998	12,607	12,958	5,844	16,754	3,532
2026	13,073	8,978	6,843	7,085	5,023	12,779	13,064	5,916	16,863	3,580
2027	13,199	9,059	6,927	7,126	5,039	12,912	13,153	5,969	16,960	3,620
2028	13,323	9,129	7,006	7,163	5,055	13,040	13,224	6,016	17,051	3,657
2029	13,445	9,194	7,081	7,196	5,077	13,174	13,279	6,061	17,156	3,700
2030	13,574	9,260	7,163	7,228	5,092	13,323	13,332	6,112	17,291	3,748
2031	13,677	9,338	7,266	7,267	5,092	13,495	13,412	6,174	17,458	3,800
2032	13,768	9,425	7,370	7,304	5,093	13,682	13,496	6,247	17,632	3,858
2033	13,867	9,507	7,465	7,341	5,099	13,874	13,580	6,320	17,807	3,914
2034	13,969	9,592	7,570	7,381	5,103	14,058	13,662	6,395	17,981	3,969
2035	14,059	9,674	7,677	7,422	5,105	14,237	13,742	6,473	18,153	4,023
2036	14,152	9,754	7,780	7,461	5,109	14,418	13,821	6,548	18,320	4,075
2037	14,249	9,837	7,886	7,499	5,115	14,613	13,904	6,627	18,499	4,128
2038	14,347	9,919	7,996	7,539	5,122	14,809	13,985	6,708	18,686	4,180
2039	14,449	10,001	8,106	7,580	5,128	14,996	14,065	6,789	18,867	4,233
2040	14,549	10,083	8,221	7,620	5,133	15,192	14,149	6,873	19,062	4,286
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 75: Gross November Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	12,887	8,569	6,768	6,692	5,224	12,142	12,921	5,039	15,446	2,909
2020	12,980	8,263	6,484	6,557	5,248	11,470	12,400	4,824	14,975	2,870
2021	13,140	8,487	6,714	6,650	5,263	11,963	12,654	4,998	15,300	2,963
2022	13,382	8,664	6,871	6,729	5,301	12,345	12,888	5,152	15,755	3,012
2023	13,577	8,816	7,031	6,791	5,325	12,724	13,110	5,287	16,004	3,085
2024	13,746	8,942	7,173	6,840	5,350	13,009	13,269	5,400	16,196	3,150
2025	13,919	9,049	7,290	6,877	5,383	13,263	13,396	5,490	16,336	3,205
2026	14,088	9,135	7,388	6,914	5,410	13,444	13,505	5,558	16,443	3,248
2027	14,223	9,218	7,479	6,955	5,427	13,584	13,598	5,607	16,538	3,285
2028	14,357	9,289	7,564	6,991	5,445	13,719	13,671	5,652	16,626	3,318
2029	14,488	9,355	7,645	7,023	5,468	13,860	13,728	5,694	16,729	3,357
2030	14,628	9,422	7,734	7,054	5,484	14,017	13,782	5,741	16,860	3,401
2031	14,738	9,502	7,845	7,092	5,484	14,198	13,865	5,800	17,024	3,448
2032	14,836	9,590	7,957	7,129	5,485	14,394	13,952	5,868	17,193	3,500
2033	14,943	9,674	8,060	7,165	5,492	14,596	14,039	5,937	17,364	3,551
2034	15,053	9,761	8,173	7,203	5,496	14,789	14,124	6,008	17,533	3,602
2035	15,150	9,844	8,288	7,243	5,498	14,977	14,207	6,080	17,701	3,651
2036	15,250	9,925	8,399	7,282	5,502	15,168	14,288	6,151	17,863	3,697
2037	15,354	10,010	8,514	7,319	5,508	15,373	14,374	6,225	18,039	3,746
2038	15,460	10,093	8,633	7,358	5,516	15,580	14,457	6,301	18,221	3,793
2039	15,570	10,176	8,751	7,397	5,523	15,776	14,540	6,377	18,397	3,841
2040	15,677	10,260	8,876	7,436	5,529	15,983	14,628	6,457	18,587	3,889
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 76: Gross December Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	13,915	8,976	6,967	7,331	5,769	12,864	13,480	5,837	15,785	3,179
2020	14,016	8,657	6,675	7,183	5,795	12,152	12,936	5,588	15,303	3,136
2021	14,189	8,891	6,912	7,285	5,812	12,674	13,201	5,790	15,635	3,238
2022	14,450	9,076	7,074	7,371	5,854	13,079	13,445	5,968	16,100	3,291
2023	14,660	9,236	7,239	7,439	5,881	13,481	13,676	6,124	16,355	3,371
2024	14,844	9,368	7,385	7,492	5,908	13,782	13,842	6,256	16,551	3,442
2025	15,030	9,479	7,505	7,534	5,945	14,051	13,974	6,360	16,695	3,502
2026	15,212	9,570	7,606	7,574	5,975	14,243	14,089	6,438	16,803	3,549
2027	15,358	9,657	7,700	7,619	5,993	14,391	14,186	6,495	16,901	3,590
2028	15,503	9,732	7,787	7,658	6,013	14,534	14,262	6,547	16,991	3,626
2029	15,645	9,800	7,870	7,693	6,039	14,684	14,321	6,596	17,096	3,668
2030	15,795	9,871	7,962	7,727	6,057	14,850	14,378	6,651	17,230	3,717
2031	15,915	9,954	8,076	7,769	6,057	15,042	14,464	6,719	17,397	3,768
2032	16,021	10,047	8,192	7,809	6,058	15,250	14,555	6,798	17,570	3,825
2033	16,136	10,134	8,297	7,849	6,065	15,464	14,645	6,877	17,744	3,881
2034	16,255	10,225	8,414	7,890	6,069	15,669	14,734	6,959	17,917	3,936
2035	16,360	10,312	8,533	7,934	6,072	15,868	14,821	7,044	18,089	3,990
2036	16,467	10,397	8,647	7,977	6,077	16,070	14,905	7,126	18,255	4,041
2037	16,580	10,486	8,765	8,017	6,084	16,287	14,995	7,211	18,434	4,093
2038	16,694	10,574	8,888	8,060	6,092	16,506	15,082	7,299	18,621	4,145
2039	16,813	10,660	9,009	8,103	6,100	16,714	15,168	7,387	18,800	4,197
2040	16,929	10,748	9,138	8,146	6,106	16,933	15,260	7,480	18,994	4,250
Compound Annual Growth Rates (%)										
2021-2025	1.45	1.62	2.08	0.84	0.57	2.61	1.43	2.37	1.65	1.98
2021-2030	1.20	1.17	1.58	0.66	0.46	1.78	0.95	1.55	1.08	1.54
2021-2040	0.93	1.00	1.48	0.59	0.26	1.54	0.77	1.36	1.03	1.44

APPENDIX C PEAK DEMAND

Table 77: Gross MISO System Coincident Peak Demand by Month (Metered Load in MW)

Year\Month	1	2	3	4	5	6	7	8	9	10	11	12
2019	97,003	91,727	85,569	77,849	94,154	110,256	118,045	113,110	107,904	83,683	85,622	91,172
2020	94,237	89,116	83,114	75,598	91,410	107,036	114,642	109,852	104,736	81,265	83,183	88,593
2021	96,508	91,256	85,114	77,425	93,620	109,619	117,378	112,480	107,269	83,225	85,175	90,713
2022	98,659	93,281	87,001	79,161	95,721	112,058	119,957	114,966	109,653	85,086	87,071	92,726
2023	100,475	94,996	88,604	80,622	97,485	114,120	122,145	117,066	111,673	86,649	88,667	94,426
2024	101,935	96,373	89,889	81,793	98,898	115,771	123,899	118,752	113,291	87,903	89,948	95,792
2025	103,183	97,553	90,990	82,793	100,100	117,178	125,395	120,189	114,669	88,970	91,043	96,962
2026	104,199	98,516	91,890	83,607	101,077	118,323	126,618	121,361	115,790	89,839	91,938	97,918
2027	105,053	99,324	92,647	84,293	101,901	119,287	127,649	122,350	116,735	90,573	92,692	98,722
2028	105,840	100,070	93,345	84,925	102,658	120,172	128,595	123,258	117,603	91,248	93,386	99,464
2029	106,626	100,811	94,038	85,554	103,413	121,051	129,533	124,158	118,464	91,919	94,077	100,200
2030	107,480	101,615	94,789	86,238	104,237	122,007	130,547	125,135	119,399	92,651	94,827	101,000
2031	108,436	102,514	95,630	87,008	105,168	123,086	131,691	126,237	120,457	93,477	95,669	101,894
2032	109,435	103,452	96,507	87,813	106,141	124,215	132,886	127,388	121,564	94,340	96,547	102,827
2033	110,441	104,398	97,389	88,622	107,120	125,352	134,088	128,546	122,678	95,208	97,431	103,766
2034	111,453	105,348	98,277	89,436	108,104	126,494	135,298	129,712	123,797	96,082	98,320	104,711
2035	112,442	106,277	99,144	90,231	109,066	127,611	136,481	130,851	124,892	96,936	99,188	105,634
2036	113,417	107,193	99,999	91,015	110,014	128,712	137,646	131,973	125,970	97,777	100,044	106,545
2037	114,444	108,157	100,900	91,840	111,012	129,871	138,872	133,154	127,106	98,663	100,946	107,503
2038	115,491	109,140	101,817	92,681	112,030	131,052	140,120	134,357	128,262	99,565	101,864	108,480
2039	116,520	110,107	102,719	93,508	113,030	132,213	141,349	135,541	129,400	100,453	102,768	109,441
2040	117,590	111,111	103,656	94,368	114,071	133,421	142,626	136,772	130,583	101,377	103,708	110,440
Compound Annual Growth Rates (%)												
2021-2025	1.69	1.68	1.68	1.69	1.69	1.68	1.67	1.67	1.68	1.68	1.68	1.68
2021-2030	1.20	1.20	1.20	1.20	1.20	1.20	1.19	1.19	1.20	1.20	1.20	1.20
2021-2040	1.05	1.04	1.04	1.05	1.05	1.04	1.03	1.03	1.04	1.04	1.04	1.04

APPENDIX D HIGH AND LOW FORECASTS

APPENDIX D HIGH AND LOW FORECASTS

Gross State Energy Forecasts (Annual Retail Sales in GWh)—High

Year	AR	IL	IN	IA	KY	LA	MI	MN
1990	27,365	111,577	73,982	29,437	61,097	63,826	82,367	47,167
1991	28,440	116,869	77,034	30,781	64,194	64,704	84,519	48,755
1992	28,451	112,521	76,977	30,208	67,068	65,098	83,840	47,412
1993	31,663	117,786	81,931	32,104	68,149	67,756	87,589	49,211
1994	32,619	121,490	83,808	33,039	72,485	70,132	91,160	51,155
1995	34,671	126,231	87,006	34,301	74,548	72,827	94,701	53,959
1996	36,137	125,990	88,901	34,999	77,019	75,269	96,302	54,942
1997	36,858	126,953	89,147	36,148	76,836	75,886	97,391	55,674
1998	39,315	131,697	92,059	37,318	75,850	77,716	100,506	56,744
1999	39,789	132,682	96,735	38,034	79,098	78,267	103,981	57,399
2000	41,611	134,697	97,775	39,088	78,316	80,690	104,772	59,782
2001	41,732	136,034	97,734	39,444	79,975	74,693	102,409	60,687
2002	42,450	138,447	101,429	40,898	87,267	79,261	104,714	62,162
2003	43,108	136,248	100,468	41,207	85,220	77,769	108,877	63,087
2004	43,672	139,254	103,094	40,903	86,521	79,737	106,606	63,340
2005	46,165	144,986	106,549	42,757	89,351	77,389	110,445	66,019
2006	46,636	142,448	105,664	43,337	88,743	77,468	108,018	66,770
2007	47,055	146,055	109,420	45,270	92,404	79,567	109,297	68,231
2008	46,135	144,620	106,981	45,488	93,428	78,726	105,781	68,794
2009	43,173	136,688	99,312	43,641	88,897	78,670	98,121	64,004
2010	48,194	144,761	105,994	45,445	93,569	85,080	103,649	67,800
2011	47,928	142,886	105,818	45,655	89,538	86,369	105,054	68,533
2012	46,860	143,540	105,173	45,709	89,048	84,731	104,818	67,989
2013	46,683	141,805	105,487	46,705	84,764	85,808	103,038	68,644
2014	47,080	141,540	106,943	47,202	78,839	90,628	103,314	68,719
2015	46,465	138,620	104,515	47,147	76,039	91,676	102,480	66,579
2016	46,188	141,050	103,705	48,431	74,554	91,453	104,468	66,546
2017	46,086	137,196	98,966	48,922	72,634	91,206	101,899	67,153
2018	49,603	142,655	104,217	51,214	76,611	94,186	104,869	68,729
2019	49,585	144,005	107,262	49,940	80,305	95,193	108,590	70,023
2020	47,904	143,449	103,223	48,186	76,135	93,983	105,557	72,123
2021	49,892	146,492	108,933	50,420	81,048	99,708	108,582	72,982
2022	51,621	148,893	113,108	51,903	84,745	104,047	111,316	74,348
2023	53,149	150,805	116,723	53,377	88,316	106,323	113,859	75,461
2024	54,379	152,356	119,629	54,676	90,868	107,958	115,813	76,374
2025	55,344	153,554	122,330	55,782	93,046	109,157	117,467	77,367
2026	56,067	154,697	124,238	56,729	94,784	110,063	118,947	78,377
2027	56,612	155,902	125,664	57,605	96,278	110,842	120,253	79,180
2028	57,090	156,961	127,136	58,438	97,631	111,560	121,380	79,979
2029	57,543	157,897	128,706	59,221	98,934	112,290	122,335	80,765
2030	58,047	158,842	130,456	60,077	100,295	113,255	123,245	81,607
2031	58,643	159,877	132,329	61,085	101,832	114,310	124,404	82,217
2032	59,331	160,850	134,291	62,125	103,506	115,370	125,569	82,749
2033	60,026	161,790	136,360	63,066	105,084	116,496	126,725	83,351
2034	60,734	162,823	138,315	64,107	106,678	117,557	127,837	83,974
2035	61,451	163,867	140,207	65,151	108,271	118,566	128,924	84,517
2036	62,152	164,833	142,076	66,151	109,887	119,516	129,997	85,069
2037	62,876	165,779	144,080	67,212	111,539	120,555	131,064	85,669
2038	63,627	166,751	146,084	68,312	113,239	121,668	132,171	86,274
2039	64,369	167,721	148,000	69,387	114,884	122,686	133,268	86,892
2040	65,158	168,672	149,986	70,506	116,652	123,747	134,327	87,494
Compound Annual Growth Rates (%)								
2021-2025	2.63	1.18	2.94	2.56	3.51	2.29	1.99	1.47
2021-2030	1.70	0.90	2.02	1.97	2.40	1.43	1.42	1.25
2021-2040	1.41	0.74	1.70	1.78	1.94	1.14	1.13	0.96

APPENDIX D HIGH AND LOW FORECASTS

Gross State Energy Forecasts (Annual Retail Sales in GWh)—High - continued

Year	MS	MO	MT	ND	SD	TX	WI
1990	32,127	53,925	13,125	7,014	6,334	237,415	49,198
1991	33,019	56,514	13,407	7,255	6,685	240,352	51,032
1992	33,241	54,411	13,096	7,128	6,494	239,431	50,925
1993	34,749	58,622	12,929	7,432	6,905	250,084	53,156
1994	36,627	59,693	13,184	7,681	7,174	258,180	55,412
1995	37,868	62,259	13,419	7,883	7,414	263,279	57,967
1996	39,622	64,843	13,820	8,314	7,736	278,450	58,744
1997	40,089	65,711	11,917	8,282	7,773	286,704	60,094
1998	42,510	69,010	14,145	8,220	7,824	304,705	62,061
1999	43,980	69,045	13,282	9,112	7,922	301,844	63,547
2000	45,336	72,643	14,580	9,413	8,283	318,263	65,146
2001	44,287	73,213	11,447	9,810	8,627	318,044	65,218
2002	45,452	75,001	12,831	10,219	8,937	320,846	66,999
2003	45,544	74,240	12,825	10,461	9,080	322,686	67,241
2004	46,033	74,054	12,957	10,516	9,214	320,615	67,976
2005	45,901	80,940	13,479	10,840	9,811	334,258	70,336
2006	46,936	82,015	13,815	11,245	10,056	342,724	69,821
2007	48,153	85,533	15,532	11,906	10,603	343,829	71,301
2008	47,721	84,382	15,326	12,416	10,974	347,815	70,122
2009	46,049	79,897	14,354	12,649	11,010	345,351	66,286
2010	49,687	86,085	13,771	12,956	11,356	358,458	68,752
2011	49,338	84,255	13,788	13,737	11,680	376,065	68,612
2012	48,388	82,435	13,863	14,717	11,734	365,104	68,820
2013	48,782	83,407	14,045	16,033	12,210	378,817	69,124
2014	49,409	83,878	14,102	18,240	12,355	389,670	69,495
2015	48,692	81,504	14,207	18,129	12,102	392,337	68,699
2016	49,050	78,618	14,101	18,520	12,130	398,662	69,736
2017	47,829	76,461	14,710	20,140	12,314	401,880	69,079
2018	50,390	82,058	14,839	20,670	12,866	424,528	70,965
2019	51,807	83,362	17,578	21,213	13,020	428,023	72,431
2020	51,870	85,513	17,773	22,693	12,487	412,416	70,512
2021	54,155	86,900	18,676	23,417	13,303	422,948	72,851
2022	55,409	88,503	19,767	24,361	13,792	439,000	74,700
2023	57,006	89,877	20,427	25,161	14,332	455,492	76,311
2024	58,423	91,156	21,164	25,869	14,815	469,728	77,646
2025	59,617	92,498	21,740	26,569	15,270	481,839	78,798
2026	60,576	93,717	22,243	27,223	15,672	492,392	79,751
2027	61,399	94,783	22,719	27,762	16,046	501,962	80,641
2028	62,148	95,862	23,257	28,241	16,389	511,273	81,437
2029	62,987	96,995	23,718	28,705	16,670	520,005	82,157
2030	63,897	98,010	24,242	29,155	16,960	529,077	82,918
2031	64,849	98,797	24,756	29,467	17,286	539,218	83,722
2032	65,895	99,572	25,250	29,746	17,625	549,781	84,611
2033	66,905	100,447	25,661	30,041	17,937	560,349	85,448
2034	67,899	101,317	26,034	30,326	18,278	571,309	86,312
2035	68,864	102,130	26,409	30,565	18,618	582,162	87,132
2036	69,788	102,966	26,827	30,795	18,951	593,131	87,930
2037	70,736	103,861	27,177	31,034	19,290	604,383	88,748
2038	71,655	104,765	27,545	31,272	19,638	615,586	89,556
2039	72,590	105,675	27,947	31,514	19,983	626,919	90,375
2040	73,525	106,573	28,333	31,942	20,344	638,739	91,179
Compound Annual Growth Rates (%)							
2021-2025	2.43	1.57	3.87	3.21	3.51	3.31	1.98
2021-2030	1.86	1.35	2.94	2.46	2.74	2.52	1.45
2021-2040	1.62	1.08	2.22	1.65	2.26	2.19	1.19

APPENDIX D HIGH AND LOW FORECASTS

Gross LRZ Energy Forecasts (Annual Metered Load in GWh) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	93,090	62,167	48,003	50,237	36,786	90,459	96,110	37,313	110,420	21,033
2020	96,417	61,724	47,242	50,614	38,036	88,327	96,052	36,753	111,867	21,319
2021	98,361	63,751	49,362	51,688	38,443	93,558	98,805	38,277	117,863	22,259
2022	100,744	65,368	50,781	52,535	38,944	97,435	101,293	39,604	122,860	22,774
2023	102,678	66,784	52,184	53,209	39,311	100,974	103,606	40,775	125,934	23,431
2024	104,356	67,951	53,417	53,757	39,666	103,662	105,385	41,719	128,277	24,013
2025	106,015	68,956	54,469	54,179	40,060	106,064	106,890	42,460	130,088	24,504
2026	107,604	69,793	55,372	54,582	40,393	107,859	108,236	43,015	131,535	24,898
2027	108,935	70,570	56,209	55,008	40,642	109,298	109,425	43,433	132,808	25,236
2028	110,239	71,265	57,003	55,381	40,891	110,689	110,451	43,801	134,008	25,544
2029	111,474	71,889	57,749	55,711	41,176	112,104	111,319	44,148	135,188	25,889
2030	112,787	72,545	58,562	56,045	41,401	113,636	112,148	44,535	136,608	26,263
2031	113,852	73,247	59,516	56,410	41,506	115,315	113,202	44,992	138,173	26,654
2032	114,844	74,018	60,497	56,753	41,605	117,106	114,263	45,520	139,766	27,084
2033	115,865	74,747	61,386	57,085	41,738	118,901	115,314	46,054	141,422	27,499
2034	116,901	75,495	62,370	57,450	41,857	120,650	116,326	46,597	143,039	27,908
2035	117,842	76,206	63,356	57,818	41,963	122,365	117,315	47,148	144,600	28,304
2036	118,797	76,899	64,300	58,159	42,069	124,081	118,291	47,686	146,112	28,684
2037	119,783	77,609	65,300	58,493	42,192	125,882	119,262	48,241	147,725	29,074
2038	120,780	78,311	66,337	58,836	42,316	127,706	120,270	48,818	149,404	29,452
2039	121,803	79,022	67,352	59,178	42,435	129,460	121,268	49,387	151,002	29,836
2040	122,867	79,720	68,406	59,513	42,546	131,308	122,231	49,993	152,667	30,220
Compound Annual Growth Rates (%)										
2021-2025	1.89	1.98	2.49	1.18	1.04	3.19	1.99	2.63	2.50	2.43
2021-2030	1.53	1.45	1.92	0.90	0.83	2.18	1.42	1.70	1.65	1.86
2021-2040	1.18	1.18	1.73	0.74	0.54	1.80	1.13	1.42	1.37	1.62

APPENDIX D HIGH AND LOW FORECASTS

Gross Summer[14] Non-Coincident Peak Demand (Metered Load in MW) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	16,560	11,649	9,083	9,947	7,547	15,909	20,239	7,442	20,010	4,493
2020	17,152	11,566	8,939	10,021	7,803	15,534	20,227	7,330	20,272	4,554
2021	17,498	11,946	9,340	10,234	7,887	16,454	20,807	7,634	21,359	4,755
2022	17,922	12,249	9,609	10,402	7,990	17,136	21,331	7,898	22,264	4,865
2023	18,266	12,514	9,874	10,535	8,065	17,758	21,818	8,132	22,822	5,005
2024	18,564	12,733	10,107	10,644	8,138	18,231	22,192	8,320	23,246	5,130
2025	18,859	12,921	10,306	10,727	8,218	18,653	22,509	8,468	23,574	5,234
2026	19,142	13,078	10,477	10,807	8,287	18,969	22,793	8,579	23,836	5,319
2027	19,379	13,224	10,636	10,891	8,338	19,222	23,043	8,662	24,067	5,391
2028	19,611	13,354	10,786	10,965	8,389	19,467	23,259	8,735	24,285	5,457
2029	19,830	13,471	10,927	11,031	8,447	19,716	23,442	8,805	24,498	5,530
2030	20,064	13,594	11,081	11,097	8,493	19,985	23,617	8,882	24,756	5,610
2031	20,253	13,725	11,261	11,169	8,515	20,280	23,839	8,973	25,039	5,694
2032	20,430	13,870	11,447	11,237	8,535	20,595	24,062	9,078	25,328	5,786
2033	20,612	14,006	11,615	11,303	8,563	20,911	24,283	9,185	25,628	5,874
2034	20,796	14,147	11,801	11,375	8,587	21,219	24,496	9,293	25,921	5,962
2035	20,963	14,280	11,988	11,448	8,609	21,520	24,705	9,403	26,204	6,046
2036	21,133	14,410	12,167	11,515	8,630	21,822	24,910	9,510	26,478	6,127
2037	21,308	14,543	12,356	11,581	8,656	22,139	25,115	9,621	26,770	6,211
2038	21,486	14,674	12,552	11,649	8,681	22,460	25,327	9,736	27,075	6,291
2039	21,668	14,808	12,744	11,717	8,706	22,768	25,537	9,850	27,364	6,373
2040	21,857	14,938	12,943	11,783	8,728	23,093	25,740	9,970	27,666	6,456
Compound Annual Growth Rates (%)										
2021-2025	1.89	1.98	2.49	1.18	1.04	3.19	1.99	2.63	2.50	2.43
2021-2030	1.53	1.45	1.92	0.90	0.83	2.18	1.42	1.70	1.65	1.86
2021-2040	1.18	1.18	1.73	0.74	0.54	1.80	1.13	1.42	1.37	1.62

[14] The summer peak is picked from monthly peaks, which is the highest value of monthly peaks of May through October for each LRZ.

APPENDIX D HIGH AND LOW FORECASTS

Gross Winter[15] Non-Coincident Peak Demand (Metered Load in MW) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	14,016	9,329	7,180	7,978	6,346	14,395	13,798	6,362	17,450	3,595
2020	14,517	9,263	7,066	8,037	6,562	14,056	13,790	6,266	17,679	3,644
2021	14,810	9,567	7,383	8,208	6,632	14,888	14,185	6,526	18,627	3,805
2022	15,169	9,809	7,595	8,342	6,718	15,505	14,542	6,753	19,416	3,893
2023	15,460	10,022	7,805	8,449	6,781	16,068	14,875	6,952	19,902	4,005
2024	15,713	10,197	7,989	8,536	6,843	16,496	15,130	7,113	20,272	4,105
2025	15,962	10,348	8,147	8,603	6,911	16,878	15,346	7,239	20,559	4,189
2026	16,202	10,473	8,282	8,667	6,968	17,164	15,539	7,334	20,787	4,256
2027	16,402	10,590	8,407	8,735	7,011	17,393	15,710	7,405	20,988	4,314
2028	16,598	10,694	8,526	8,794	7,054	17,614	15,857	7,468	21,178	4,367
2029	16,784	10,788	8,637	8,847	7,103	17,840	15,982	7,527	21,365	4,426
2030	16,982	10,886	8,759	8,900	7,142	18,083	16,101	7,593	21,589	4,489
2031	17,142	10,992	8,902	8,958	7,160	18,351	16,252	7,671	21,836	4,556
2032	17,292	11,107	9,048	9,012	7,177	18,636	16,405	7,761	22,088	4,630
2033	17,445	11,217	9,181	9,065	7,200	18,921	16,556	7,852	22,350	4,701
2034	17,602	11,329	9,328	9,123	7,221	19,200	16,701	7,945	22,605	4,771
2035	17,743	11,436	9,476	9,181	7,239	19,473	16,843	8,039	22,852	4,838
2036	17,887	11,540	9,617	9,235	7,257	19,746	16,983	8,131	23,091	4,903
2037	18,035	11,646	9,767	9,288	7,279	20,032	17,122	8,225	23,346	4,970
2038	18,186	11,752	9,922	9,343	7,300	20,323	17,267	8,324	23,611	5,035
2039	18,339	11,858	10,074	9,397	7,320	20,602	17,410	8,421	23,864	5,100
2040	18,500	11,963	10,231	9,450	7,340	20,896	17,549	8,524	24,127	5,166
Compound Annual Growth Rates (%)										
2021-2025	1.89	1.98	2.49	1.18	1.04	3.19	1.99	2.63	2.50	2.43
2021-2030	1.53	1.45	1.92	0.90	0.83	2.18	1.42	1.70	1.65	1.86
2021-2040	1.18	1.18	1.73	0.74	0.54	1.80	1.13	1.42	1.37	1.62

[15] The winter peak is picked from monthly peaks, which is the highest value of monthly peaks of November through April for each LRZ.

APPENDIX D HIGH AND LOW FORECASTS

Gross MISO System Energy (Annual Metered Load in GWh) —High

Year	MISO Energy
2019	645,618
2020	648,351
2021	672,366
2022	692,337
2023	708,886
2024	722,202
2025	733,684
2026	743,287
2027	751,565
2028	759,271
2029	766,648
2030	774,530
2031	782,866
2032	791,456
2033	800,012
2034	808,592
2035	816,919
2036	825,078
2037	833,561
2038	842,230
2039	850,742
2040	859,472
Compound Annual Growth Rates (%)	
2021-2025	2.21
2021-2030	1.58
2021-2040	1.30

APPENDIX D HIGH AND LOW FORECASTS

Gross MISO System Coincident Peak Demand (Metered Load in MW) —High

Year	MISO Summer[16] CP	MISO Winter[17] CP
2019	118,045	97,003
2020	118,525	97,415
2021	122,852	101,027
2022	126,447	104,023
2023	129,444	106,510
2024	131,858	108,513
2025	133,938	110,240
2026	135,680	111,681
2027	137,183	112,921
2028	138,579	114,076
2029	139,913	115,185
2030	141,333	116,370
2031	142,839	117,620
2032	144,392	118,910
2033	145,937	120,195
2034	147,487	121,484
2035	148,992	122,735
2036	150,466	123,962
2037	151,997	125,237
2038	153,562	126,540
2039	155,099	127,819
2040	156,672	129,132
Compound Annual Growth Rates (%)		
2021-2025	2.18	2.21
2021-2030	1.57	1.58
2021-2040	1.29	1.30

[16] The MISO summer peak is picked from MISO monthly coincident peaks, which is the highest value of MISO monthly coincident peaks of May through October.

[17] The MISO winter peak is picked from MISO monthly coincident peaks, which is the highest value of MISO monthly coincident peaks of November through April.

APPENDIX D HIGH AND LOW FORECASTS

Gross State Energy Forecasts (Annual Retail Sales in GWh) —Low

Year	AR	IL	IN	IA	KY	LA	MI	MN
1990	27,365	111,577	73,982	29,437	61,097	63,826	82,367	47,167
1991	28,440	116,869	77,034	30,781	64,194	64,704	84,519	48,755
1992	28,451	112,521	76,977	30,208	67,068	65,098	83,840	47,412
1993	31,663	117,786	81,931	32,104	68,149	67,756	87,589	49,211
1994	32,619	121,490	83,808	33,039	72,485	70,132	91,160	51,155
1995	34,671	126,231	87,006	34,301	74,548	72,827	94,701	53,959
1996	36,137	125,990	88,901	34,999	77,019	75,269	96,302	54,942
1997	36,858	126,953	89,147	36,148	76,836	75,886	97,391	55,674
1998	39,315	131,697	92,059	37,318	75,850	77,716	100,506	56,744
1999	39,789	132,682	96,735	38,034	79,098	78,267	103,981	57,399
2000	41,611	134,697	97,775	39,088	78,316	80,690	104,772	59,782
2001	41,732	136,034	97,734	39,444	79,975	74,693	102,409	60,687
2002	42,450	138,447	101,429	40,898	87,267	79,261	104,714	62,162
2003	43,108	136,248	100,468	41,207	85,220	77,769	108,877	63,087
2004	43,672	139,254	103,094	40,903	86,521	79,737	106,606	63,340
2005	46,165	144,986	106,549	42,757	89,351	77,389	110,445	66,019
2006	46,636	142,448	105,664	43,337	88,743	77,468	108,018	66,770
2007	47,055	146,055	109,420	45,270	92,404	79,567	109,297	68,231
2008	46,135	144,620	106,981	45,488	93,428	78,726	105,781	68,794
2009	43,173	136,688	99,312	43,641	88,897	78,670	98,121	64,004
2010	48,194	144,761	105,994	45,445	93,569	85,080	103,649	67,800
2011	47,928	142,886	105,818	45,655	89,538	86,369	105,054	68,533
2012	46,860	143,540	105,173	45,709	89,048	84,731	104,818	67,989
2013	46,683	141,805	105,487	46,705	84,764	85,808	103,038	68,644
2014	47,080	141,540	106,943	47,202	78,839	90,628	103,314	68,719
2015	46,465	138,620	104,515	47,147	76,039	91,676	102,480	66,579
2016	46,188	141,050	103,705	48,431	74,554	91,453	104,468	66,546
2017	46,086	137,196	98,966	48,922	72,634	91,206	101,899	67,153
2018	49,603	142,655	104,217	51,214	76,611	94,186	104,869	68,729
2019	47,684	140,759	103,394	48,156	76,411	87,507	102,657	69,642
2020	45,213	135,928	97,698	45,639	69,972	83,324	97,150	70,063
2021	46,592	137,018	99,810	46,847	72,190	81,215	98,290	70,164
2022	47,815	138,045	101,879	47,687	73,738	81,998	99,395	70,953
2023	48,901	138,848	103,696	48,602	76,243	81,739	100,462	71,552
2024	49,867	139,451	105,040	49,420	78,044	81,376	101,105	72,023
2025	50,634	139,871	106,266	50,068	79,655	81,002	101,521	72,608
2026	51,214	140,368	106,830	50,580	80,968	80,534	101,831	73,239
2027	51,625	140,979	106,958	51,049	82,075	80,157	102,039	73,701
2028	52,002	141,487	107,190	51,486	83,124	79,805	102,123	74,147
2029	52,362	141,932	107,527	51,898	84,143	79,619	102,093	74,650
2030	52,786	142,399	108,097	52,381	85,259	79,739	102,047	75,192
2031	53,315	143,042	108,771	53,029	86,610	80,026	102,243	75,513
2032	53,946	143,649	109,628	53,687	88,108	80,402	102,504	75,768
2033	54,582	144,275	110,596	54,273	89,528	80,686	102,774	76,110
2034	55,237	144,946	111,467	54,936	90,976	81,098	103,057	76,480
2035	55,918	145,632	112,241	55,608	92,409	81,483	103,327	76,785
2036	56,588	146,324	113,085	56,258	93,886	81,792	103,581	77,089
2037	57,280	146,968	114,093	56,954	95,436	82,248	103,870	77,444
2038	57,995	147,678	115,084	57,658	96,978	82,751	104,176	77,798
2039	58,709	148,421	115,940	58,371	98,495	83,256	104,500	78,173
2040	59,468	149,137	116,863	59,117	100,125	83,805	104,795	78,552
Compound Annual Growth Rates (%)								
2021-2025	2.10	0.52	1.58	1.68	2.49	-0.07	0.81	0.86
2021-2030	1.40	0.43	0.89	1.25	1.87	-0.20	0.42	0.77
2021-2040	1.29	0.45	0.83	1.23	1.74	0.17	0.34	0.60

APPENDIX D HIGH AND LOW FORECASTS

Gross State Energy Forecasts (Annual Retail Sales in GWh) —Low – continued

Year	MS	MO	MT	ND	SD	TX	WI
1990	32,127	53,925	13,125	7,014	6,334	237,415	49,198
1991	33,019	56,514	13,407	7,255	6,685	240,352	51,032
1992	33,241	54,411	13,096	7,128	6,494	239,431	50,925
1993	34,749	58,622	12,929	7,432	6,905	250,084	53,156
1994	36,627	59,693	13,184	7,681	7,174	258,180	55,412
1995	37,868	62,259	13,419	7,883	7,414	263,279	57,967
1996	39,622	64,843	13,820	8,314	7,736	278,450	58,744
1997	40,089	65,711	11,917	8,282	7,773	286,704	60,094
1998	42,510	69,010	14,145	8,220	7,824	304,705	62,061
1999	43,980	69,045	13,282	9,112	7,922	301,844	63,547
2000	45,336	72,643	14,580	9,413	8,283	318,263	65,146
2001	44,287	73,213	11,447	9,810	8,627	318,044	65,218
2002	45,452	75,001	12,831	10,219	8,937	320,846	66,999
2003	45,544	74,240	12,825	10,461	9,080	322,686	67,241
2004	46,033	74,054	12,957	10,516	9,214	320,615	67,976
2005	45,901	80,940	13,479	10,840	9,811	334,258	70,336
2006	46,936	82,015	13,815	11,245	10,056	342,724	69,821
2007	48,153	85,533	15,532	11,906	10,603	343,829	71,301
2008	47,721	84,382	15,326	12,416	10,974	347,815	70,122
2009	46,049	79,897	14,354	12,649	11,010	345,351	66,286
2010	49,687	86,085	13,771	12,956	11,356	358,458	68,752
2011	49,338	84,255	13,788	13,737	11,680	376,065	68,612
2012	48,388	82,435	13,863	14,717	11,734	365,104	68,820
2013	48,782	83,407	14,045	16,033	12,210	378,817	69,124
2014	49,409	83,878	14,102	18,240	12,355	389,670	69,495
2015	48,692	81,504	14,207	18,129	12,102	392,337	68,699
2016	49,050	78,618	14,101	18,520	12,130	398,662	69,736
2017	47,829	76,461	14,710	20,140	12,314	401,880	69,079
2018	50,390	82,058	14,839	20,670	12,866	424,528	70,965
2019	50,472	81,036	14,358	19,475	12,438	419,250	69,819
2020	49,008	80,647	13,256	19,408	11,694	399,759	66,794
2021	50,012	80,642	13,092	19,218	12,270	407,223	68,288
2022	50,482	81,138	13,175	19,416	12,611	417,256	69,413
2023	51,444	81,565	13,156	19,576	13,039	429,927	70,373
2024	52,325	81,981	13,339	19,685	13,423	440,763	71,182
2025	53,056	82,551	13,438	19,836	13,812	449,700	71,855
2026	53,610	83,068	13,493	19,994	14,153	457,146	72,385
2027	54,073	83,461	13,579	20,039	14,472	463,911	72,903
2028	54,483	83,892	13,746	20,024	14,762	470,390	73,365
2029	55,011	84,410	13,865	20,100	15,012	476,462	73,784
2030	55,658	84,839	14,077	20,129	15,266	482,831	74,216
2031	56,351	85,054	14,278	20,051	15,553	490,230	74,775
2032	57,156	85,311	14,476	19,911	15,862	498,242	75,408
2033	57,947	85,683	14,602	19,828	16,153	506,230	76,006
2034	58,717	86,033	14,699	19,752	16,463	514,550	76,637
2035	59,464	86,348	14,829	19,638	16,783	522,750	77,239
2036	60,177	86,705	14,989	19,522	17,090	531,103	77,837
2037	60,933	87,120	15,109	19,399	17,407	539,442	78,465
2038	61,668	87,571	15,248	19,293	17,738	548,047	79,097
2039	62,429	88,033	15,423	19,188	18,061	556,681	79,694
2040	63,190	88,476	15,604	19,074	18,409	565,741	80,356
Compound Annual Growth Rates (%)							
2021-2025	1.49	0.59	0.65	0.80	3.00	2.51	1.28
2021-2030	1.20	0.57	0.81	0.52	2.46	1.91	0.93
2021-2040	1.24	0.49	0.93	-0.04	2.16	1.75	0.86

APPENDIX D HIGH AND LOW FORECASTS

Gross LRZ Energy Forecasts (Annual Metered Load in GWh) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	93,090	62,167	48,003	50,237	36,786	90,459	96,110	37,313	110,420	21,033
2020	91,137	58,344	44,760	47,960	35,871	82,571	88,402	34,689	101,095	20,143
2021	91,519	59,603	45,897	48,345	35,675	84,703	89,440	35,746	99,522	20,556
2022	92,632	60,562	46,698	48,707	35,703	86,485	90,445	36,684	100,825	20,749
2023	93,516	61,386	47,564	48,990	35,675	88,613	91,416	37,517	101,291	21,145
2024	94,290	62,070	48,336	49,203	35,673	90,162	92,001	38,258	101,556	21,507
2025	95,133	62,632	48,950	49,351	35,752	91,559	92,380	38,846	101,705	21,807
2026	95,972	63,075	49,439	49,527	35,803	92,483	92,662	39,291	101,681	22,035
2027	96,617	63,503	49,890	49,742	35,787	93,092	92,851	39,607	101,704	22,225
2028	97,236	63,880	50,308	49,921	35,785	93,722	92,927	39,896	101,736	22,394
2029	97,906	64,218	50,703	50,079	35,833	94,390	92,900	40,172	101,901	22,611
2030	98,632	64,565	51,163	50,243	35,837	95,220	92,858	40,498	102,372	22,877
2031	99,144	65,027	51,776	50,470	35,732	96,218	93,037	40,904	103,058	23,161
2032	99,589	65,550	52,398	50,684	35,646	97,377	93,274	41,388	103,863	23,492
2033	100,101	66,046	52,954	50,905	35,603	98,553	93,520	41,876	104,579	23,817
2034	100,643	66,569	53,582	51,142	35,543	99,695	93,777	42,378	105,435	24,134
2035	101,122	67,068	54,217	51,384	35,478	100,782	94,023	42,901	106,259	24,441
2036	101,602	67,563	54,833	51,628	35,425	101,925	94,254	43,415	107,019	24,734
2037	102,125	68,084	55,491	51,855	35,391	103,185	94,517	43,945	107,918	25,045
2038	102,662	68,609	56,158	52,106	35,371	104,432	94,796	44,494	108,875	25,347
2039	103,223	69,106	56,834	52,368	35,350	105,601	95,091	45,041	109,837	25,659
2040	103,805	69,655	57,539	52,621	35,321	106,858	95,359	45,624	110,863	25,972
Compound Annual Growth Rates (%)										
2021-2025	0.97	1.25	1.62	0.52	0.05	1.96	0.81	2.10	0.54	1.49
2021-2030	0.84	0.89	1.21	0.43	0.05	1.31	0.42	1.40	0.31	1.20
2021-2040	0.67	0.82	1.20	0.45	-0.05	1.23	0.34	1.29	0.57	1.24

APPENDIX D HIGH AND LOW FORECASTS

Gross Summer Non-Coincident Peak Demand (Metered Load in MW) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	16,560	11,649	9,083	9,947	7,547	15,909	20,239	7,442	20,010	4,493
2020	16,213	10,933	8,469	9,496	7,359	14,522	18,616	6,918	18,320	4,303
2021	16,281	11,169	8,684	9,572	7,319	14,897	18,835	7,129	18,035	4,391
2022	16,479	11,348	8,836	9,644	7,325	15,210	19,046	7,316	18,271	4,432
2023	16,636	11,503	9,000	9,700	7,319	15,584	19,251	7,482	18,356	4,517
2024	16,773	11,631	9,146	9,742	7,319	15,857	19,374	7,630	18,404	4,594
2025	16,924	11,736	9,262	9,771	7,335	16,102	19,454	7,747	18,431	4,658
2026	17,073	11,819	9,355	9,806	7,345	16,265	19,513	7,836	18,426	4,707
2027	17,187	11,899	9,440	9,849	7,342	16,372	19,553	7,899	18,431	4,748
2028	17,298	11,970	9,519	9,884	7,341	16,483	19,569	7,957	18,436	4,784
2029	17,417	12,034	9,594	9,915	7,351	16,600	19,563	8,012	18,466	4,830
2030	17,546	12,099	9,681	9,948	7,352	16,746	19,554	8,077	18,552	4,887
2031	17,637	12,185	9,797	9,993	7,331	16,922	19,592	8,158	18,676	4,948
2032	17,716	12,283	9,914	10,035	7,313	17,126	19,642	8,254	18,822	5,018
2033	17,807	12,376	10,020	10,079	7,304	17,332	19,694	8,352	18,952	5,088
2034	17,904	12,474	10,138	10,126	7,292	17,533	19,748	8,452	19,107	5,155
2035	17,989	12,568	10,259	10,174	7,278	17,725	19,800	8,556	19,256	5,221
2036	18,074	12,660	10,375	10,222	7,267	17,926	19,848	8,658	19,394	5,284
2037	18,167	12,758	10,500	10,267	7,261	18,147	19,904	8,764	19,557	5,350
2038	18,263	12,856	10,626	10,317	7,256	18,366	19,963	8,874	19,730	5,415
2039	18,363	12,949	10,754	10,369	7,252	18,572	20,025	8,983	19,904	5,481
2040	18,466	13,052	10,887	10,419	7,246	18,793	20,081	9,099	20,090	5,548
Compound Annual Growth Rates (%)										
2021-2025	0.97	1.25	1.62	0.52	0.05	1.96	0.81	2.10	0.54	1.49
2021-2030	0.84	0.89	1.21	0.43	0.05	1.31	0.42	1.40	0.31	1.20
2021-2040	0.67	0.82	1.20	0.45	-0.05	1.23	0.34	1.29	0.57	1.24

APPENDIX D HIGH AND LOW FORECASTS

Gross Winter Non-Coincident Peak Demand (Metered Load in MW) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2019	14,016	9,329	7,180	7,978	6,346	14,395	13,798	6,362	17,450	3,595
2020	13,722	8,755	6,695	7,616	6,188	13,140	12,692	5,915	15,977	3,443
2021	13,780	8,944	6,865	7,677	6,154	13,479	12,841	6,095	15,728	3,514
2022	13,947	9,088	6,984	7,735	6,159	13,763	12,985	6,255	15,934	3,547
2023	14,080	9,212	7,114	7,780	6,154	14,101	13,125	6,397	16,008	3,614
2024	14,197	9,314	7,229	7,813	6,154	14,348	13,209	6,523	16,050	3,676
2025	14,324	9,399	7,321	7,837	6,168	14,570	13,263	6,623	16,073	3,728
2026	14,450	9,465	7,394	7,865	6,176	14,717	13,303	6,699	16,069	3,767
2027	14,547	9,529	7,462	7,899	6,174	14,814	13,331	6,753	16,073	3,799
2028	14,641	9,586	7,524	7,927	6,173	14,914	13,341	6,802	16,078	3,828
2029	14,741	9,637	7,583	7,952	6,182	15,021	13,338	6,850	16,104	3,865
2030	14,851	9,689	7,652	7,978	6,182	15,153	13,331	6,905	16,178	3,911
2031	14,928	9,758	7,744	8,014	6,164	15,312	13,357	6,974	16,287	3,959
2032	14,995	9,837	7,837	8,048	6,149	15,496	13,391	7,057	16,414	4,016
2033	15,072	9,911	7,920	8,084	6,142	15,683	13,427	7,140	16,527	4,071
2034	15,154	9,989	8,014	8,121	6,131	15,865	13,463	7,226	16,662	4,125
2035	15,226	10,064	8,109	8,160	6,120	16,038	13,499	7,315	16,793	4,178
2036	15,298	10,139	8,201	8,198	6,111	16,220	13,532	7,402	16,913	4,228
2037	15,377	10,217	8,300	8,234	6,105	16,420	13,570	7,493	17,055	4,281
2038	15,458	10,296	8,399	8,274	6,102	16,619	13,610	7,586	17,206	4,333
2039	15,542	10,370	8,500	8,316	6,098	16,805	13,652	7,680	17,358	4,386
2040	15,630	10,453	8,606	8,356	6,093	17,005	13,691	7,779	17,520	4,440
Compound Annual Growth Rates (%)										
2021-2025	0.97	1.25	1.62	0.52	0.05	1.96	0.81	2.10	0.54	1.49
2021-2030	0.84	0.89	1.21	0.43	0.05	1.31	0.42	1.40	0.31	1.20
2021-2040	0.67	0.82	1.20	0.45	-0.05	1.23	0.34	1.29	0.57	1.24

APPENDIX D HIGH AND LOW FORECASTS

Gross MISO System Energy (Annual Metered Load in GWh)—Low

Year	MISO Energy
2019	645,618
2020	604,972
2021	611,005
2022	619,489
2023	627,113
2024	633,056
2025	638,115
2026	641,967
2027	645,017
2028	647,805
2029	650,713
2030	654,265
2031	658,527
2032	663,262
2033	667,955
2034	672,897
2035	677,674
2036	682,398
2037	687,557
2038	692,850
2039	698,110
2040	703,618
Compound Annual Growth Rates (%)	
2021-2025	1.09
2021-2030	0.76
2021-2040	0.75

APPENDIX D HIGH AND LOW FORECASTS

Gross MISO System Coincident Peak Demand (Metered Load in MW) —Low

Year	MISO Summer CP	MISO Winter CP
2019	118,045	97,003
2020	110,620	90,934
2021	111,750	91,851
2022	113,282	93,126
2023	114,668	94,279
2024	115,747	95,180
2025	116,662	95,951
2026	117,359	96,536
2027	117,911	96,997
2028	118,413	97,421
2029	118,932	97,865
2030	119,563	98,407
2031	120,326	99,052
2032	121,176	99,770
2033	122,019	100,483
2034	122,906	101,232
2035	123,764	101,957
2036	124,612	102,674
2037	125,537	103,457
2038	126,487	104,260
2039	127,432	105,057
2040	128,419	105,893
Compound Annual Growth Rates (%)		
2021-2025	1.08	1.10
2021-2030	0.75	0.77
2021-2040	0.73	0.75