2019 MISO Energy and Peak Demand Forecasting for System Planning

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Executive Summary

This report provides the sixth 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).

Previous forecast reports included projections on both gross (prior to adjustments for utility energy efficiency programs) and net (after those adjustments) bases. The energy efficiency (EE) adjustments were provided by MISO and were developed in the process of developing the annual MISO Transmission Expansion Plan (MTEP). With the temporary suspension of the MTEP process this year, no EE adjustments are available. Thus, all projections in this report are on a gross basis.

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 (2020-2039) (%)

STATE	AR	IL	IN	IA	KY	LA	MI	MN	MS	MO	MT	ND	SD	TX	WI
CAGR	1.00	0.62	1.09	1.75	0.91	0.59	0.87	0.82	1.41	0.95	1.68	1.54	1.68	1.67	1.01

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] This is the first forecast that includes monthly peak load projections (previous forecasts were done on a summer and winter seasonal basis). 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 (2020-2039) (%)

LRZ	1	2	3	4	5	6	7	8	9	10
CAGR	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

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 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 (2020-2039) (%)

MISO-System	CAGR
Energy	0.97
July Peak Demand	0.96

[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.

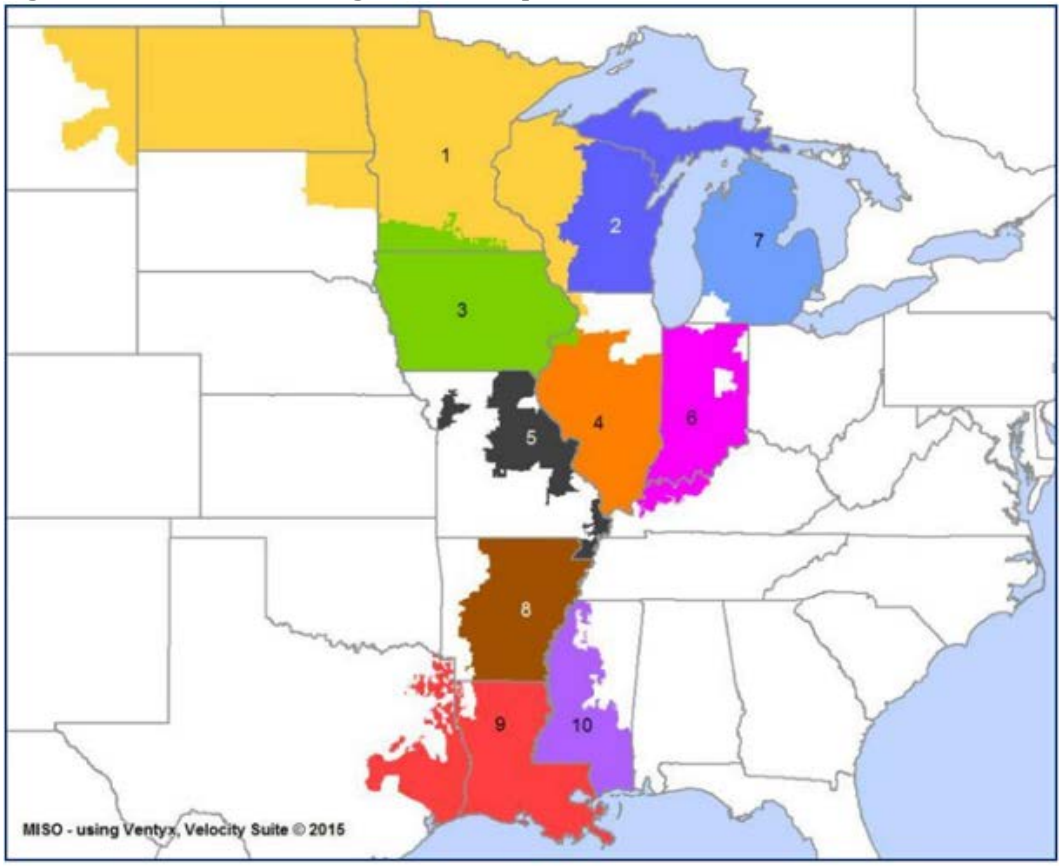
1 Introduction

This report represents the sixth 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).

1.1 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 first 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.

Econometric models were developed for each state to project annual retail sales of electricity.[6] 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 forecast for the year 2018 and the weather-normalized LRZ metered load for the year 2018. 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,[7] 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.

1.2 REPORT STRUCTURE

In this report, Chapter 2 explains the forecasting methodology and provides the 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] Econometric models were not updated this year. They were built in 2018.

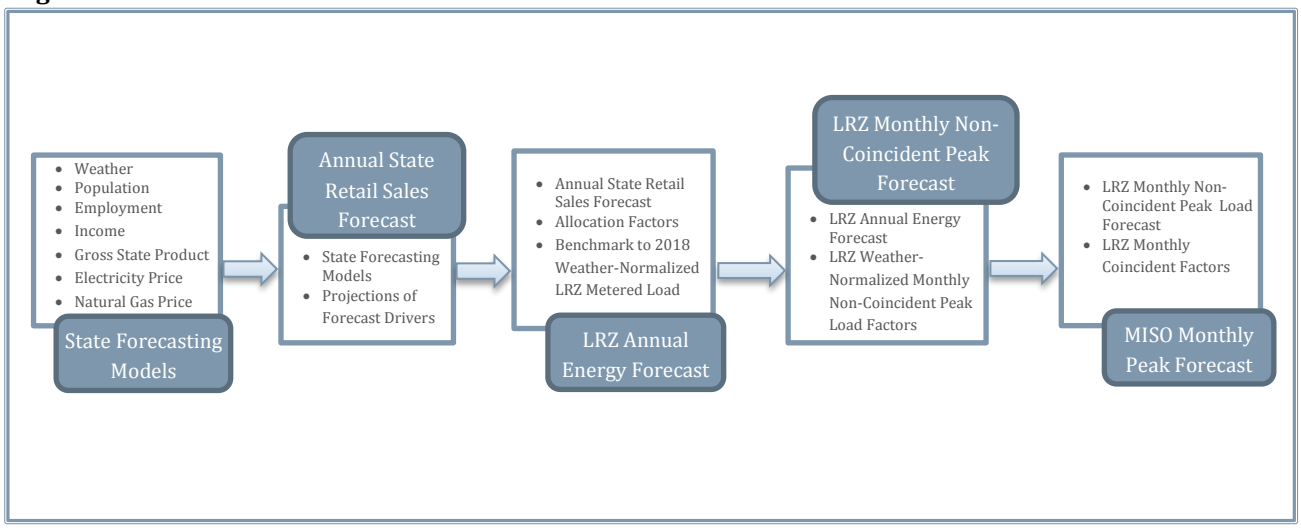
[7] Throughout this report, coincidence is stated in reference to the overall MISO system. Thus, the LRZ peak demand forecasts are for the highest level of demand for that particular LRZ, which would be coincident at the LRZ level but non-coincident at the MISO system level.

2 Forecasting Methodology

2.1 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 2020 to 2039. The statewide energy forecasts were then used to construct annual energy forecasts at the LRZ level based on the 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 coincident 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



2.2 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 models that had a good fit (significant t-statistics, high R-squared values, and a significant F-statistic), passed the statistical tests (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 GSP). The model formulations by state are provided in Appendix A.

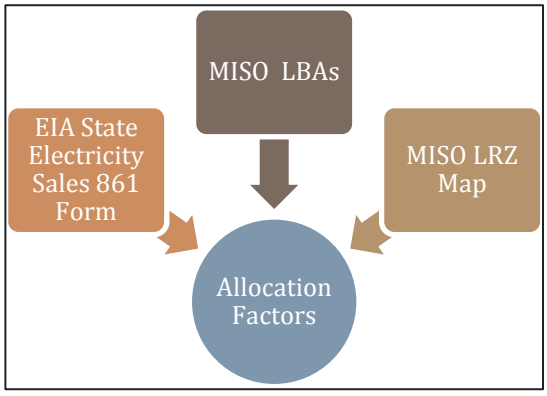
2.3 CONVERSION OF RETAIL SALES TO METERED LOAD AND BENCHMARKING TO 2018 LEVELS

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 2018 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 two is caused by losses between the substations and customers.[8] Since the historical metered loads at the LRZ-level are known for 2018 (they are 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 2018.

2.4 LRZ ENERGY FORECASTS

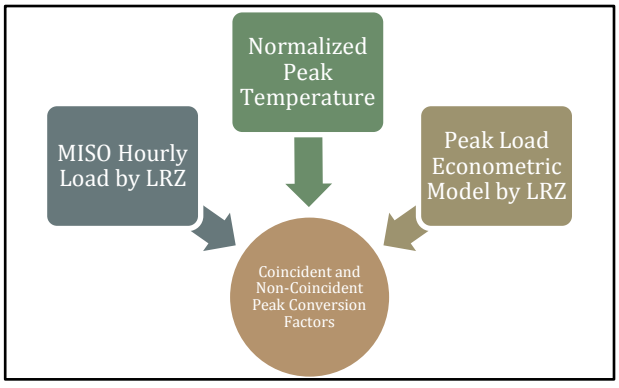
Figure 3: Structure and Logic Diagram for Allocation Factors



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, the 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.

2.5 LRZ NON-COINCIDENT MONTHLY PEAK DEMAND FORECASTS

Figure 4: Structure and Logic Diagram for Peak Conversion Factors



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 illustrates the resources employed in estimating the monthly peak conversion factors. Peak load conversion factors were used to translate annual electricity sales 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.

[8] 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.

2.6 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 forecast was obtained by summing the LRZ 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.

2.7 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); 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 degree 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 Midwest Regional Climate Center (MRCC). Table 1 summarizes the sources of data used in this study. Please note that state econometric models were not updated in 2019.

Table 1: Data Sources

Data	Content	Historical Data Source	Data Used in Projection
Electricity sales	GWhs, annual retail electricity sales by state, 1990-2017	EIA	N/A
Electricity prices	Cents/KWh, 2009$, 1990-2017	EIA*	SUFG projection based on EIA data
Natural gas prices	$/Mcf (thousand cubic feet), 2009$, 1990-2017	EIA*	SUFG projection based on EIA data
Real personal income	Thousands, 2009$, 1990-2016	BEA*	IHS Markit
Population	Number of people, population by state, 1990-2016	Census Bureau	IHS Markit
Manufacturing & non-manufacturing employment	Number of jobs, 1990-2016	BLS	IHS Markit
Non-farm employment	Number of jobs, 1990-2016	BLS	IHS Markit
Gross state product	Millions, 2009$, 1990-2016	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, 1997-2018	MRCC	Normal peak temperatures

** Original data was in nominal dollars. SUFG converted it to real 2009 dollars using CPI data obtained from BLS.*

2.8 Modeling Enhancements

The overall modeling methodology is similar to the one employed in 2018. Starting with this forecast, peak demand projections are provided on a monthly basis at both the LRZ and MISO system levels. Previously peak demand projections were provided on summer and winter seasonal bases.

3 State-by-State Results

3.1 ARKANSAS

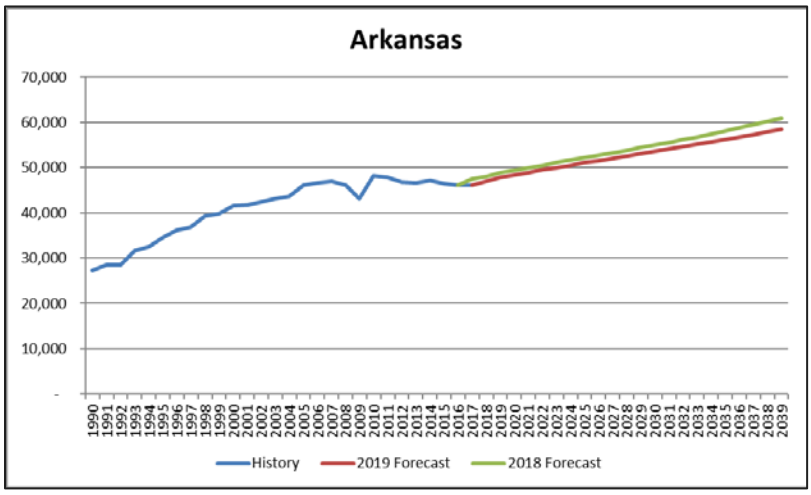
The Arkansas state econometric model uses real GSP, real electricity and natural gas prices, CDDs, and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 2.

Table 2: Arkansas Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
0.42	1.06	1.47

Arkansas annual electricity sales are projected to grow at 1.00% in this forecast, which is close to the 1.10% growth rate projected in the 2018 Forecast. Figure 5 shows Arkansas sales projection for the 2018 and 2019 forecasts.

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



Most of Arkansas' loads are in LRZ 8. A portion of Arkansas annual energy forecast was allocated to LRZ 8 based on the historical average of the load fractions of the period of 2013 to 2017, 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

LRZ 8	Non-MISO
71.89%	28.11%

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 2020-2039 (%)

LRZ	Annual Energy[9]
LRZ8	1.00

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

3.2 ILLINOIS

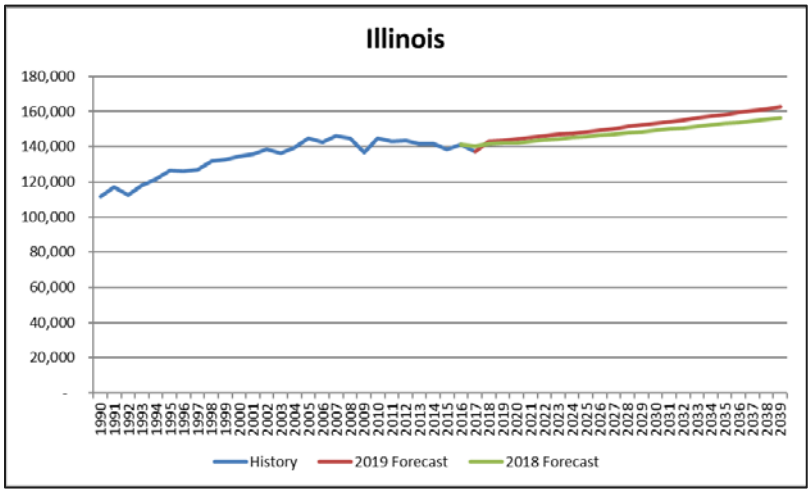
The Illinois state econometric model uses real personal income, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 5.

Table 5: Illinois Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real Income
-0.19	1.05	1.74

Illinois annual electricity sales are projected to grow at 0.62% in this forecast, which is slightly higher than the 0.48% growth rate projected in the 2018 Forecast. Figure 6 shows Illinois sales projection for the 2018 and 2019 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. Illinois annual energy forecast was allocated to the three LRZs based on historical average of load fractions for the period of 2013 to 2017, 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

LRZ 1	LRZ 3	LRZ 4	Non-MISO
0.0002%	1.42%	33.22%	65.37%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ1	0.99
LRZ3	1.69
LRZ4	0.62

3.3 INDIANA

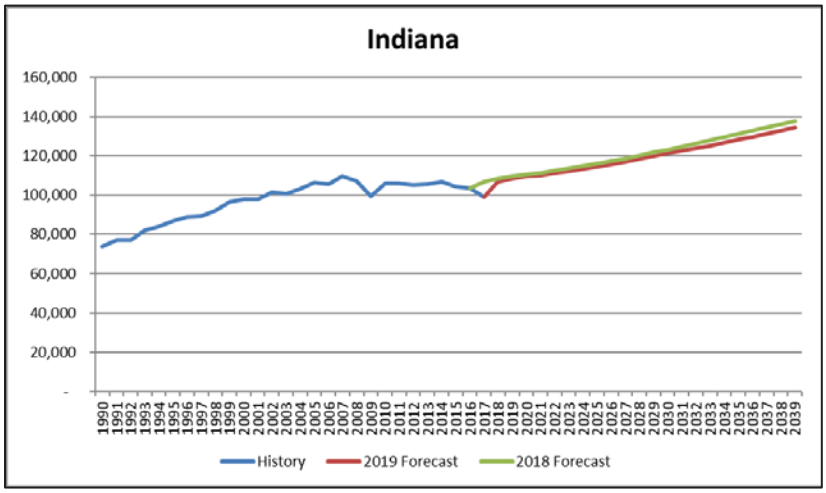
The Indiana state econometric model uses real GSP, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 8.

Table 8: Indiana Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
-0.21	1.04	1.48

Indiana annual electricity sales are projected to grow at 1.09% in this forecast, which is close to the 1.15% growth rate projected in the 2018 Forecast. Figure 7 shows Indiana sales projection for the 2018 and 2019 forecasts.

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 2017, 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 2017 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

LRZ 6	Non-MISO
51.24%	48.76%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ6	1.01

3.4 IOWA

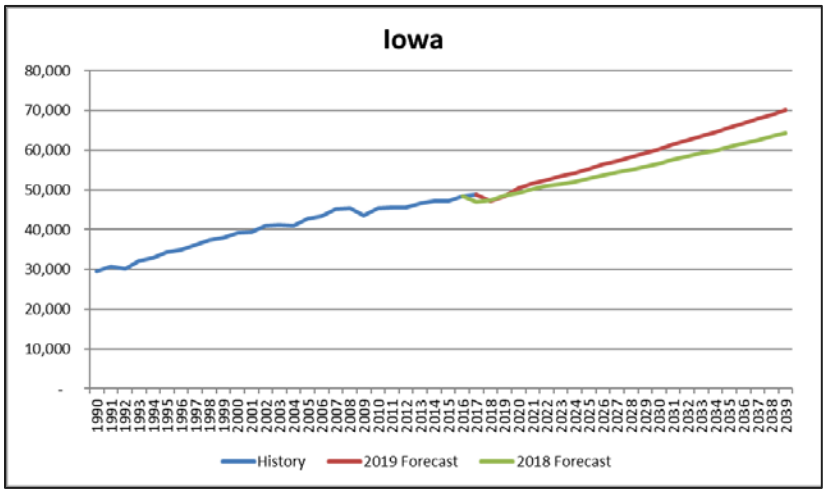
The Iowa state econometric model uses real personal income, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 11.

Table 11: Iowa Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real Personal Income
-0.39	0.96	2.08

Iowa annual electricity sales are projected to grow at 1.75% in this forecast, which is higher than the 1.41% growth rate projected in the 2018 Forecast. Figure 8 shows sales projection for the 2018 and 2019 forecasts.

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



Iowa has loads in LRZ 1 and LRZ 3. Iowa annual energy forecast was allocated to the two LRZs based on the historical average of the load fractions for the period of 2013 to 2017, 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

LRZ 1	LRZ 3	Non-MISO
1.80%	91.08%	7.12%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ 1	0.99
LRZ 3	1.69

3.5 KENTUCKY

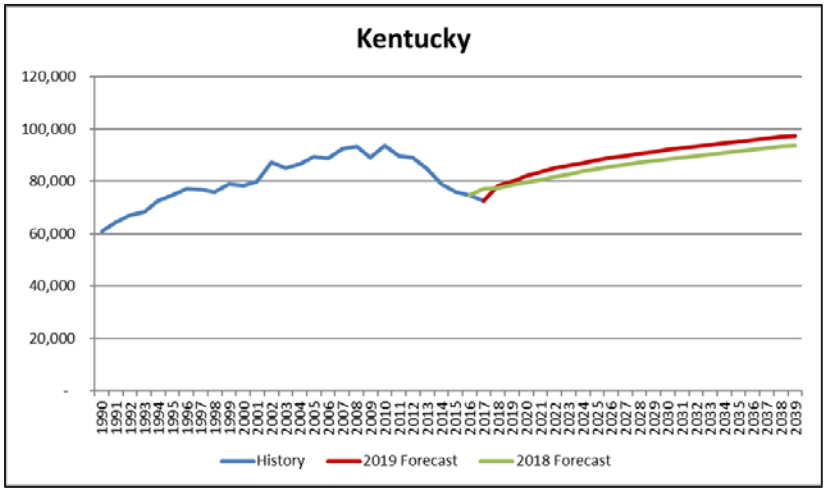
The Kentucky state econometric model uses population, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 14.

Table 14: Kentucky Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Population
-0.18	0.93	0.36

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 0.91% in this forecast, which is very close to the 0.90% growth rate projected in the 2018 Forecast. Figure 9 shows Kentucky sales projection for the 2018 and 2019 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 2017, 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 2017 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

LRZ 6	Non-MISO
51.24%	48.76%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ6	1.01

3.6 LOUISIANA

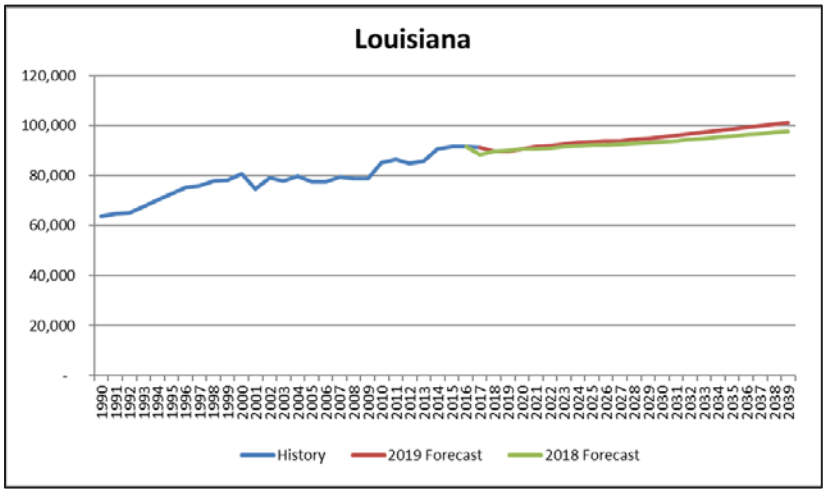
The Louisiana state econometric model uses real personal income, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 17.

Table 17: Louisiana Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real Personal Income
0.42	1.37	1.71

Louisiana annual electricity sales are projected to grow at 0.59% in this forecast, which is higher than the 0.41% growth projected in the 2018 Forecast. Figure 10 shows Louisiana sales projections for the 2018 and 2019 forecasts.

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



Most of Louisiana's loads are in LRZ 9. Louisiana annual energy forecast was allocated to LRZ 9 based on the historical average of the load fractions for the period of 2013 to 2017, 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

LRZ 9	Non-MISO
92.63%	7.37%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ9	0.84

3.7 MICHIGAN

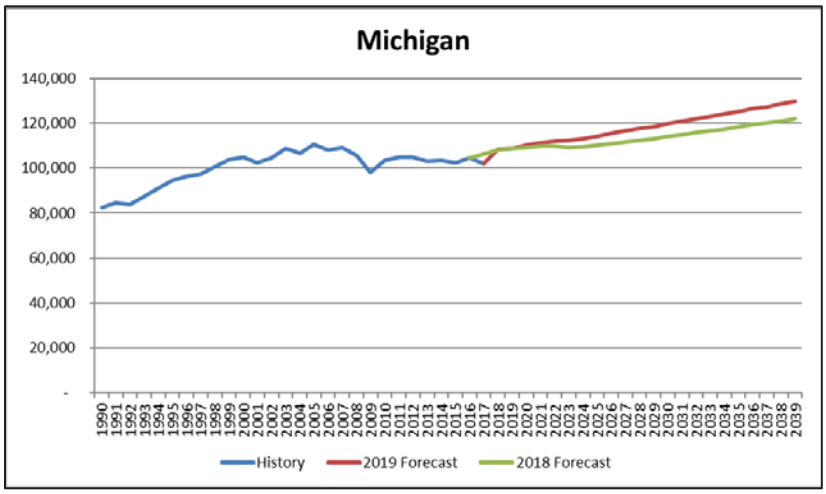
The Michigan state econometric model uses real personal income, real electricity price, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 20.

Table 20: Michigan Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Personal Income
-0.19	1.55

Michigan annual electricity sales are projected to grow at 0.87% in this forecast, which is higher than the 0.57% growth rate projected in the 2018 Forecast. Figure 11 shows sales projection for the 2018 and 2019 forecasts.

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



Michigan has loads in LRZ 1, LRZ 2 and LRZ7. Michigan forecast was allocated to the three LRZs based on the historical average of the load fractions for the period of 2013 to 2017, 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

LRZ 1	LRZ 2	LRZ 7	Non-MISO
0.13%	4.72%	91.25%	3.90%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ1	0.99
LRZ2	1.00
LRZ7	0.87

3.8 MINNESOTA

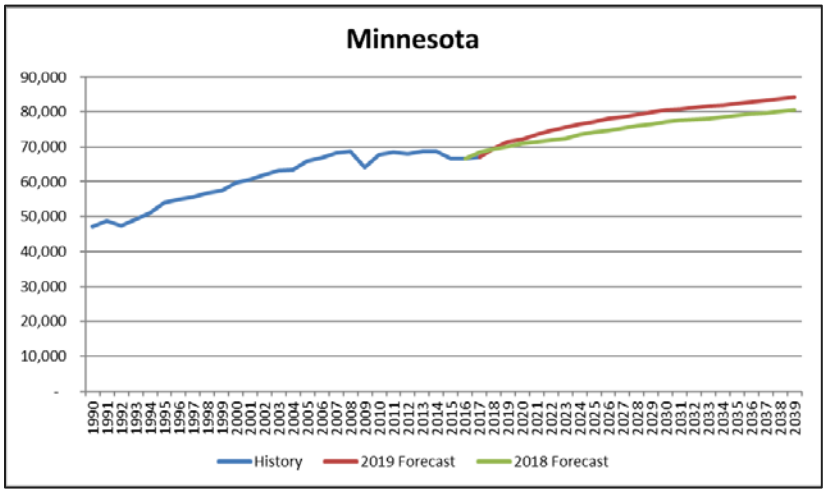
The Minnesota state econometric model uses real electricity price, population, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 23.

Table 23: Minnesota Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Population
-0.41	0.43

Minnesota annual electricity sales are projected to grow at 0.82% in this forecast, which is higher than the 0.71% growth rate` projected in the 2018 Forecast. Figure 12 shows electricity sales projection for the 2018 and 2019 forecasts.

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



Minnesota has loads in LRZ 1 and LRZ 3. Minnesota forecast was allocated to the two LRZs based on the historical average of the load fractions of 2016 and 2017, as shown in Table 24. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 24: Minnesota Allocation Factors

LRZ 1	LRZ 3	Non-MISO
97.79%	0.93%	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 2020-2039 (%)

LRZ	Annual Energy
LRZ1	0.99
LRZ3	1.69

3.9 MISSISSIPPI

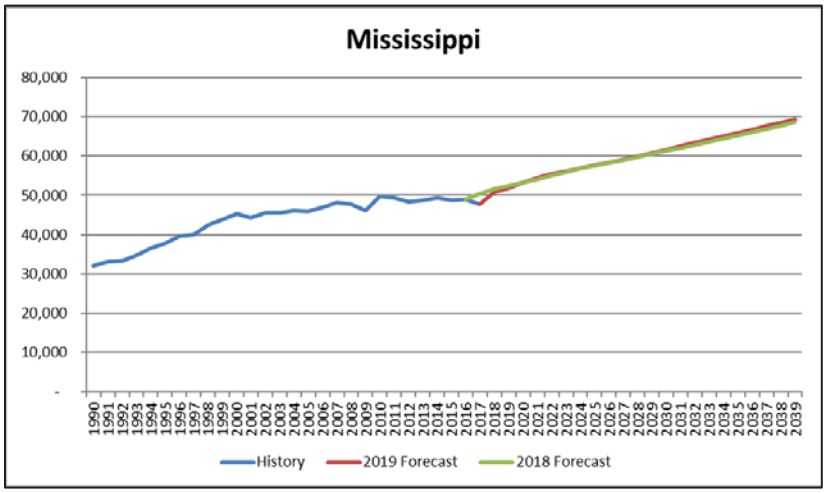
The Mississippi state econometric model uses real electricity price, real personal income, real GSP, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 26.

Table 26: Mississippi Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Personal Income	Real GSP
-0.18	1.78	1.48

Mississippi annual electricity sales are projected to grow at 1.41% in this forecast, which is close to the 1.37% growth rate projected in the 2018 Forecast. Figure 13 shows sales projections for the 2018 and 2019 forecasts.

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 2013 to 2017, 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

LRZ 10	Non-MISO
44.67%	55.33%

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 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 2020-2039 (%)

LRZ	Annual Energy
LRZ10	1.41

3.10 MISSOURI

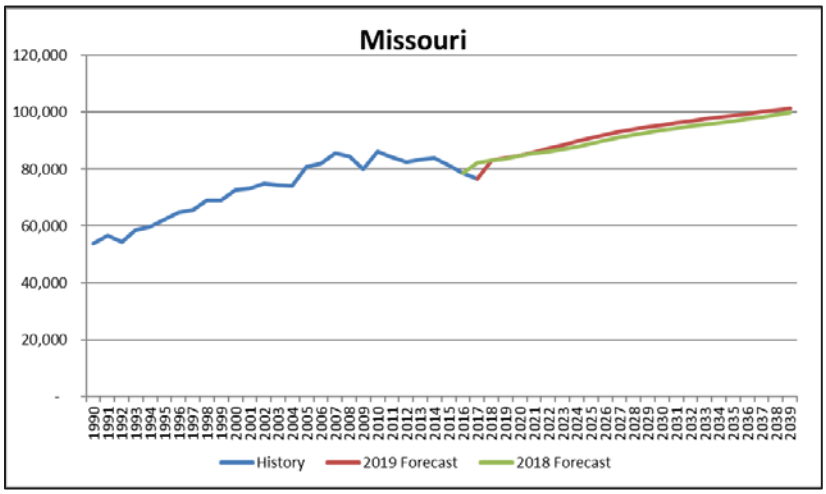
The Missouri state econometric model uses population, manufacturing employment, real electricity price, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 29.

Table 29: Missouri Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Population	Manufacturing Employment
-0.40	0.36	-0.43

Missouri annual electricity sales are projected to grow at 0.95% in this forecast, which is close to the 0.89% growth rate projected in the 2018 Forecast. Figure 14 shows sales projections for the 2018 and 2019 forecasts.

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



Missouri has loads in LRZ 5 and LRZ 8. 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 46.20% in 2018 to 41.26% in 2039. See Appendix B for more information on historical load fractions and the process of developing allocation factors.

Table 30: Missouri Allocation Factors

LRZ 5	LRZ 8	Non-MISO
Reduced from 46.20% in 2018 to 41.26% in 2039	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: LRZ Forecast CAGR for the Period of 2020-2039 (%)

LRZ	Annual Energy
LRZ5	0.41
LRZ8	1.00

3.11 MONTANA

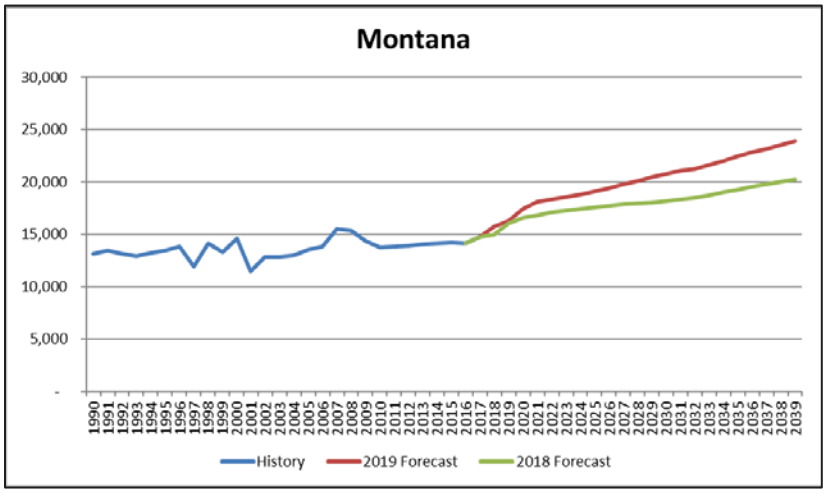
The Montana state econometric model uses real personal income per capita, manufacturing employment, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 32.

Table 32: Montana Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real Income/Population	Manufacturing Employment
-0.05	1.01	1.59	-0.25

Montana annual electricity sales are projected to grow at 1.68% in this forecast, which is higher than the 1.17% growth projected in the 2018 Forecast. Figure 15 shows sales projections for the 2018 and 2019 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, 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

LRZ 1	Non-MISO
32.89%	67.11%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ1	0.99

3.12 NORTH DAKOTA

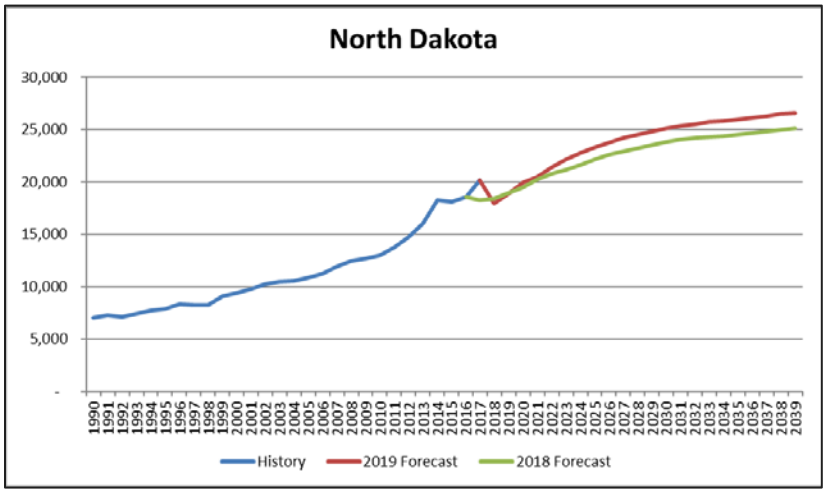
The North Dakota state econometric model uses population, real electricity price, and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 35.

Table 35: North Dakota Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Population
-0.41	0.44

North Dakota annual electricity sales are projected to grow at 1.54% in this forecast, which is slightly higher than the 1.47% growth rate projected in the 2018 Forecast. Figure 16 shows sales projection for the 2018 and 2019 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). MT+ND forecast was allocated to LRZ 1 based on the load fraction of 2017, 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

LRZ 1	Non-MISO
32.89%	67.11%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ1	0.99

3.13 SOUTH DAKOTA

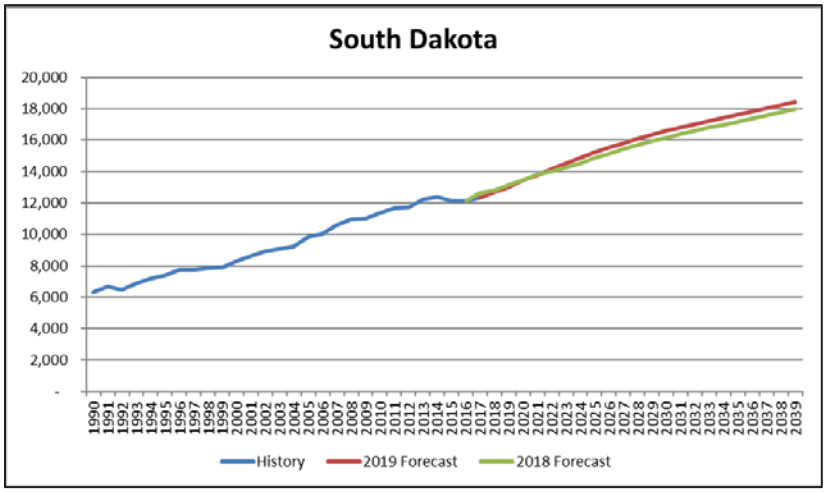
The South Dakota state econometric model uses population, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 38.

Table 38: South Dakota Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Population
-0.41	0.98	0.66

South Dakota electricity sales are projected to grow at 1.68% in this forecast, which is close to the 1.60% growth rate projected in the 2018 Forecast. Figure 17 shows sales projection for the 2018 and 2019 forecasts.

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



South Dakota has loads in LRZ 1 and LRZ 3. South Dakota sales forecast was allocated to the two LRZs based on the historical average of the load fractions of the period of 2013-2017, 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

LRZ 1	LRZ 3	Non-MISO
23.72%	1.81%	74.47%

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 2020-2039 (%)

LRZ	Annual Energy
LRZ1	0.99
LRZ3	1.69

3.14 TEXAS

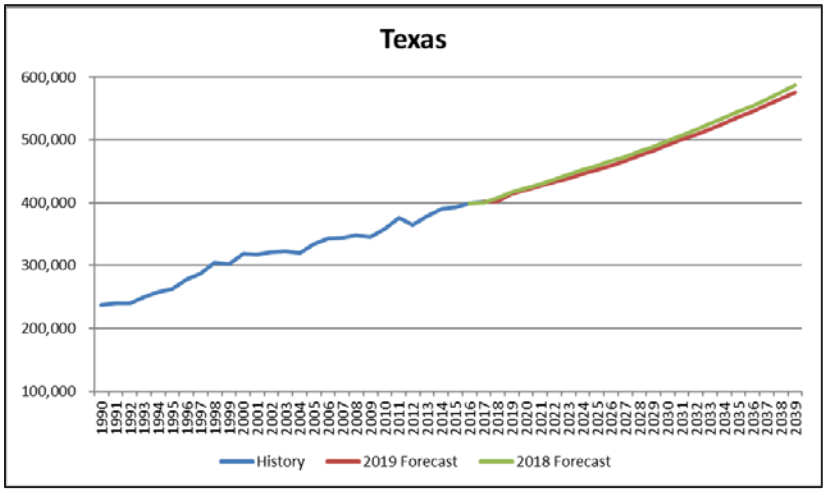
The Texas state econometric model uses real GSP, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 41.

Table 41: Texas Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
0.42	1.24	2.60

Texas annual electricity sales are projected to grow at 1.67% in this forecast, which is close to the 1.72% growth rate projected in the 2018 Forecast. Figure 19 shows sales projection for the 2018 and 2019 forecasts.

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



Texas has loads in LRZ 8 and LRZ 9. Texas sales forecast was allocated to the two LRZs based on the historical average of the load fractions of the period of 2013-2017, 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 (%)

LRZ 8	LRZ 9	Non-MISO
0.0055%	5.52%	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 2020-2039 (%)

LRZ	Annual Energy
LRZ8	1.00
LRZ9	0.84

3.15 WISCONSIN

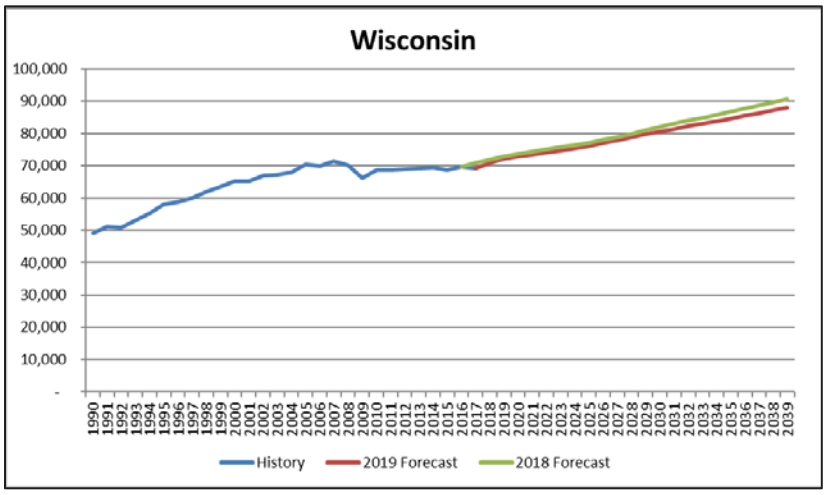
The Wisconsin state econometric model uses real GSP, real electricity and natural gas prices, CDDs and HDDs as explanatory variables. Appendix A provides data sources and the model specification. The growth rates for the drivers are provided in Table 44.

Table 44: Wisconsin Explanatory Variable CAGR for the Period of 2020-2039 (%)

Real Electricity Price	Real Natural Gas Price	Real GSP
-0.20	1.05	1.41

Wisconsin annual electricity sales are projected to grow at 1.01% in this forecast, which is slightly lower than the 1.10% growth rate projected in the 2018 Forecast. Figure 19 shows sales projection for the 2018 and 2019 forecasts.

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. Wisconsin sales forecast was allocated to the two LRZs based on the historical average of the load fractions of the period of 2013-2017, 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

LRZ 1	LRZ 2	Non-MISO
16.95%	83.05%	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 2020-2039 (%)

LRZ	Annual Energy
LRZ 1	0.99
LRZ 2	1.00

4 LRZ Forecasts

4.1 ANNUAL LRZ ENERGY FORECASTS

Table 47 provides LRZ annual metered load. Previous forecast reports included projections on both gross (prior to adjustments for utility EE programs) and net (after those adjustments) bases. The EE adjustments were provided by MISO and were developed in the process of developing the annual MISO Transmission Expansion Plan (MTEP). With the temporary suspension of the MTEP process this year, no EE adjustments are available. Thus, all projections in this report are on a gross basis.

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
2018	93,631	62,519	48,085	47,696	37,163	89,793	97,297	37,767	110,062	21,181
2019	95,952	63,486	49,110	47,804	37,332	91,314	97,647	38,412	110,831	21,622
2020	97,613	64,175	51,104	48,190	37,563	92,917	98,798	38,945	112,045	22,168
2021	99,497	64,684	52,243	48,432	37,866	94,030	99,820	39,374	113,398	22,667
2022	101,256	65,243	53,123	48,705	38,244	95,208	100,282	39,803	114,245	23,127
2023	102,722	65,764	54,014	48,980	38,581	96,165	100,748	40,205	115,200	23,405
2024	104,035	66,328	54,935	49,237	38,968	97,233	101,202	40,623	115,985	23,699
2025	105,317	67,047	55,924	49,533	39,301	98,329	102,367	41,079	116,755	24,016
2026	106,507	67,817	56,935	49,844	39,592	99,391	103,516	41,468	117,429	24,334
2027	107,620	68,597	57,881	50,139	39,812	100,390	104,433	41,826	118,042	24,648
2028	108,708	69,415	58,864	50,443	39,979	101,432	105,349	42,254	118,915	24,975
2029	109,791	70,245	59,867	50,781	40,135	102,468	106,248	42,668	119,960	25,323
2030	110,733	70,974	60,860	51,089	40,255	103,486	107,262	43,082	121,037	25,692
2031	111,469	71,648	61,868	51,420	40,347	104,477	108,230	43,462	122,126	26,040
2032	112,192	72,333	62,848	51,733	40,411	105,449	109,269	43,872	123,145	26,381
2033	112,920	73,031	63,826	52,084	40,439	106,430	110,235	44,294	124,241	26,723
2034	113,669	73,754	64,867	52,425	40,450	107,416	111,334	44,741	125,417	27,071
2035	114,434	74,479	66,007	52,793	40,483	108,404	112,363	45,205	126,573	27,433
2036	115,245	75,206	67,106	53,163	40,505	109,419	113,368	45,648	127,778	27,789
2037	116,035	75,944	68,178	53,496	40,531	110,464	114,248	46,103	128,990	28,161
2038	116,827	76,697	69,241	53,862	40,568	111,519	115,349	46,566	130,142	28,539
2039	117,605	77,487	70,312	54,224	40,600	112,547	116,467	47,051	131,366	28,916
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

4.2 LRZ NON-COINCIDENT PEAK DEMANDS

The LRZ-level monthly non-coincident[10] 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 the MISO reaches system-wide peak. Table 48 shows July non-coincident peak demand projections by LRZ. Monthly peak projections for each one of the twelve months are included in Appendix C.

Table 48: July Non-Coincident Peak Demand without EE Adjustments (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	16,850	11,874	9,109	9,117	7,738	15,709	20,421	7,333	19,834	4,351
2019	17,268	12,058	9,303	9,137	7,773	15,975	20,494	7,458	19,973	4,442
2020	17,567	12,189	9,681	9,211	7,821	16,255	20,736	7,562	20,191	4,554
2021	17,906	12,285	9,897	9,257	7,884	16,450	20,950	7,645	20,435	4,656
2022	18,222	12,392	10,064	9,309	7,963	16,656	21,047	7,728	20,588	4,751
2023	18,486	12,490	10,232	9,362	8,033	16,823	21,145	7,806	20,760	4,808
2024	18,722	12,598	10,407	9,411	8,113	17,010	21,240	7,887	20,901	4,869
2025	18,953	12,734	10,594	9,468	8,183	17,202	21,485	7,976	21,040	4,934
2026	19,167	12,880	10,786	9,527	8,243	17,388	21,726	8,051	21,162	4,999
2027	19,367	13,029	10,965	9,583	8,289	17,562	21,919	8,121	21,272	5,064
2028	19,563	13,184	11,151	9,641	8,324	17,745	22,111	8,204	21,429	5,131
2029	19,758	13,342	11,341	9,706	8,356	17,926	22,299	8,284	21,618	5,202
2030	19,928	13,480	11,529	9,765	8,381	18,104	22,512	8,365	21,812	5,278
2031	20,060	13,608	11,720	9,828	8,401	18,277	22,715	8,439	22,008	5,349
2032	20,190	13,738	11,906	9,888	8,414	18,448	22,933	8,518	22,192	5,420
2033	20,321	13,871	12,091	9,955	8,420	18,619	23,136	8,600	22,389	5,490
2034	20,456	14,008	12,288	10,020	8,422	18,792	23,367	8,687	22,601	5,561
2035	20,594	14,146	12,504	10,091	8,429	18,965	23,583	8,777	22,810	5,636
2036	20,740	14,284	12,713	10,161	8,433	19,142	23,794	8,863	23,027	5,709
2037	20,882	14,424	12,916	10,225	8,439	19,325	23,978	8,951	23,245	5,785
2038	21,024	14,567	13,117	10,295	8,447	19,509	24,210	9,041	23,453	5,863
2039	21,164	14,717	13,320	10,364	8,453	19,689	24,444	9,135	23,673	5,940
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

[10] Non-coincident from the perspective of the MISO system peak load.

4.3 LRZ Forecasts

Each sub-section here provides information regarding the forecast for a specific LRZ. Energy and peak demand projections are on a gross basis (prior to any adjustments for EE programs). Due to the change from seasonal peaks to monthly peaks, a comparison to the previous forecast in terms of peak demand is not possible. Also, rather than provide twelve monthly peak demand charts for each LRZ, a single month (July) is provided. The forecasts for all months are provided in Appendix C.

4.3.1 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 energy is projected to grow at a CAGR of 0.99% for the period of 2020 to 2039, which is slightly higher than the rate in 2018 Forecast (0.88% for the period of 2019-2038). However, the 2019 Forecast lies below the 2018 Forecast due to a lower starting point. Figure 20 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 21 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 20: Gross LRZ 1 Energy (GWh)

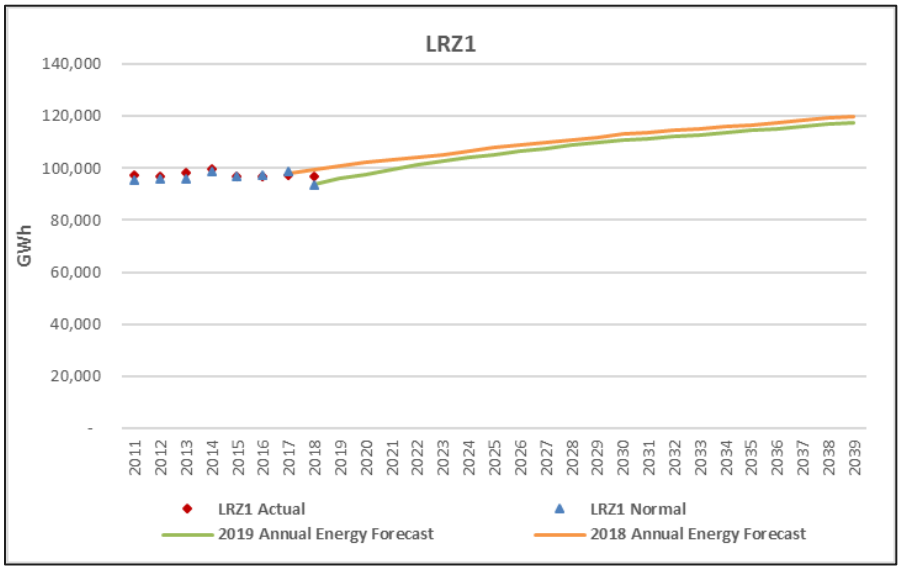
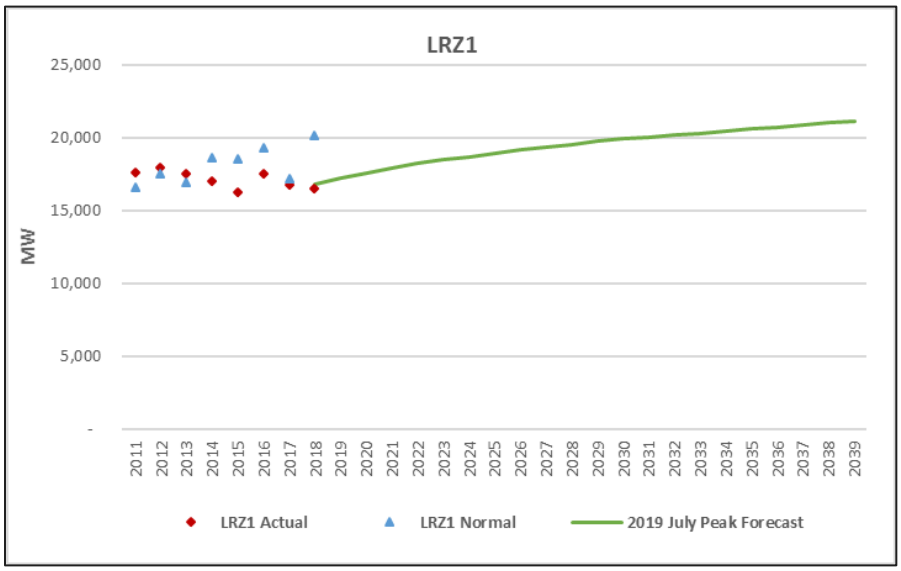


Figure 21: Gross LRZ 1 July Non-Coincident Peak Demand (MW)



4.3.2 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 energy is projected to grow at a CAGR of 1.00% for the period of 2020 to 2039. This is slightly lower than the rate in 2018 Forecast (1.06% for the period of 2019-2038). Figure 22 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 23 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 22: Gross LRZ 2 Energy (GWh)

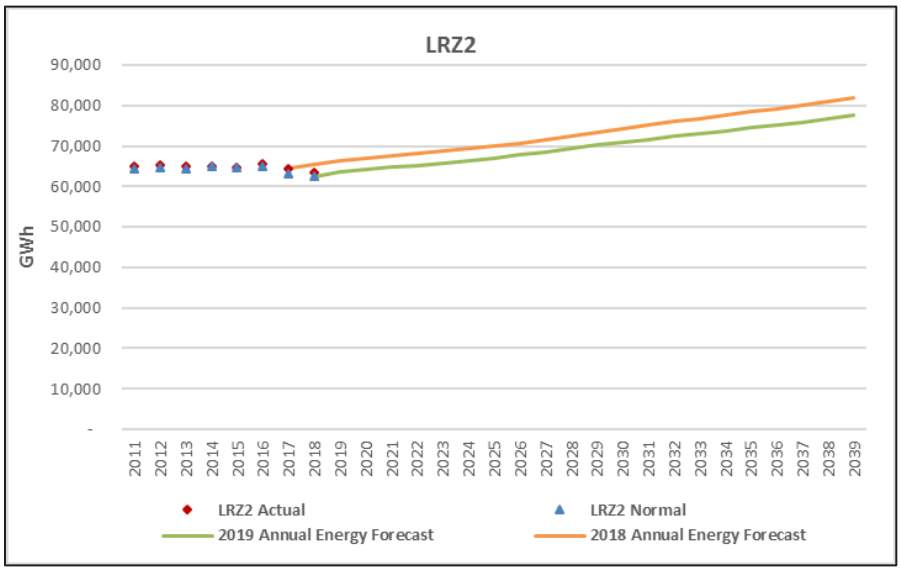
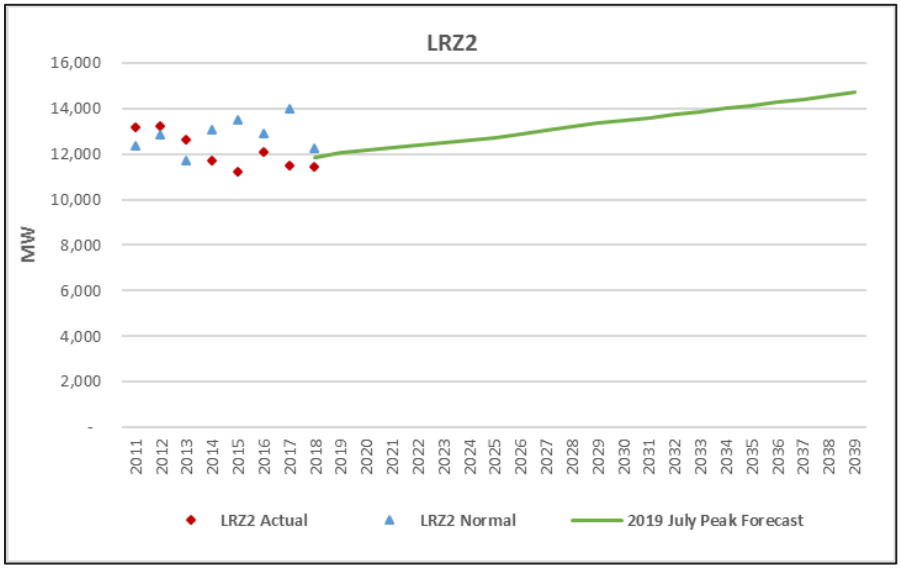


Figure 23: Gross LRZ 2 July Non-Coincident Peak Demand (MW)



4.3.3 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 energy is projected to grow at a CAGR of 1.69% for the period of 2020 to 2039, which is higher than the rate in 2018 Forecast (1.37% for the period of 2019-2038). Figure 24 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 25

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

Figure 24: Gross LRZ 3 Energy (GWh)

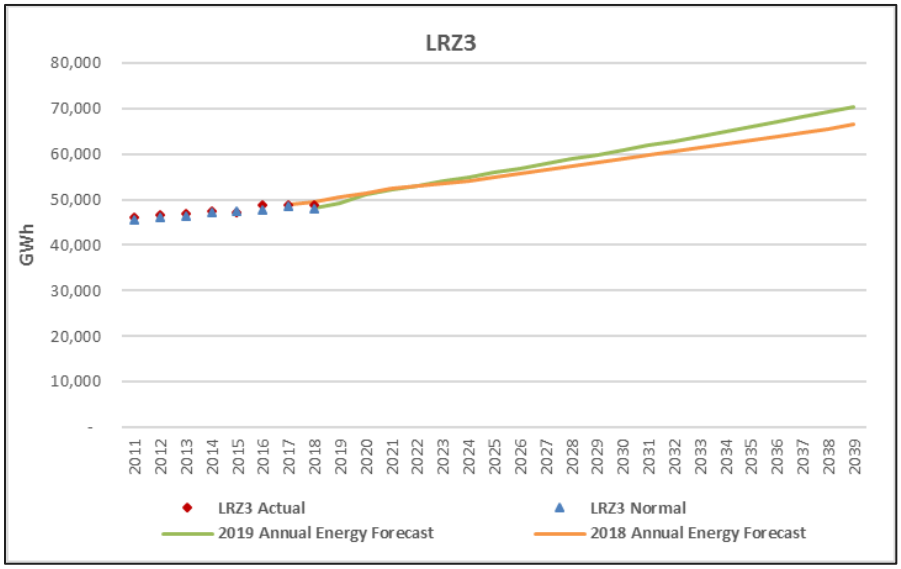
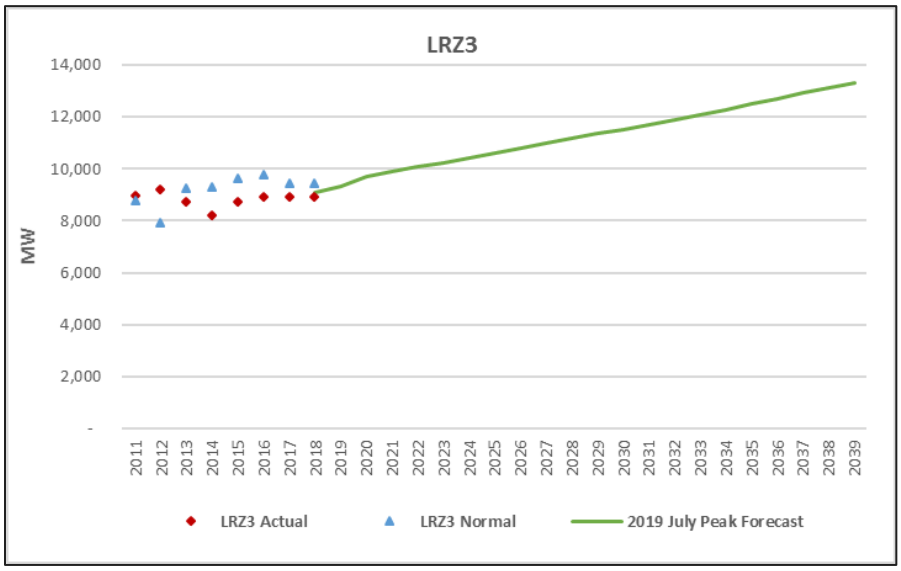


Figure 25: Gross LRZ 3 July Non-Coincident Peak Demand (MW)



4.3.4 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 energy is projected to grow at a CAGR of 0.62% for the period of 2020 to 2039, which is slightly higher than the rate in 2018 Forecast (0.48% for the period of 2019-2038). Figure 26 shows annual energy forecasts

for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 27 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 26: Gross LRZ 4 Energy (GWh)

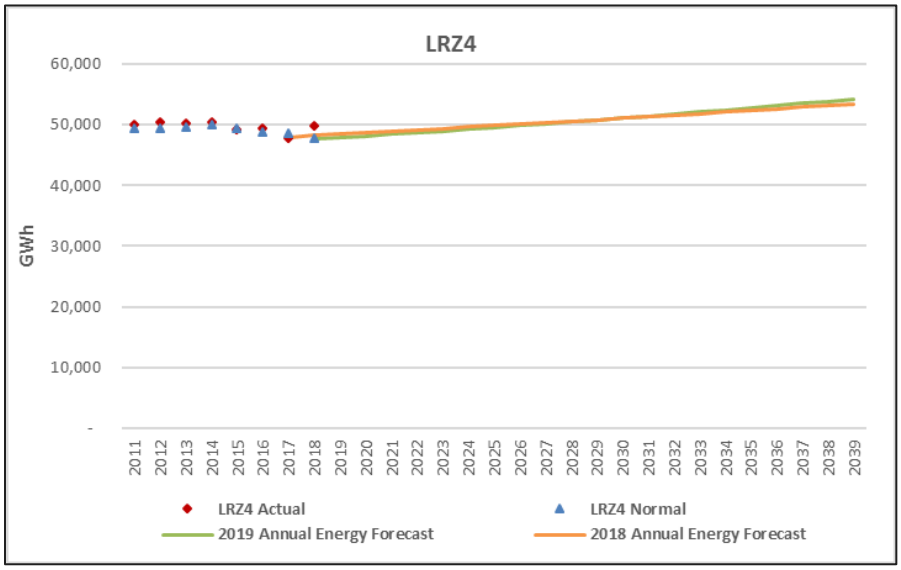
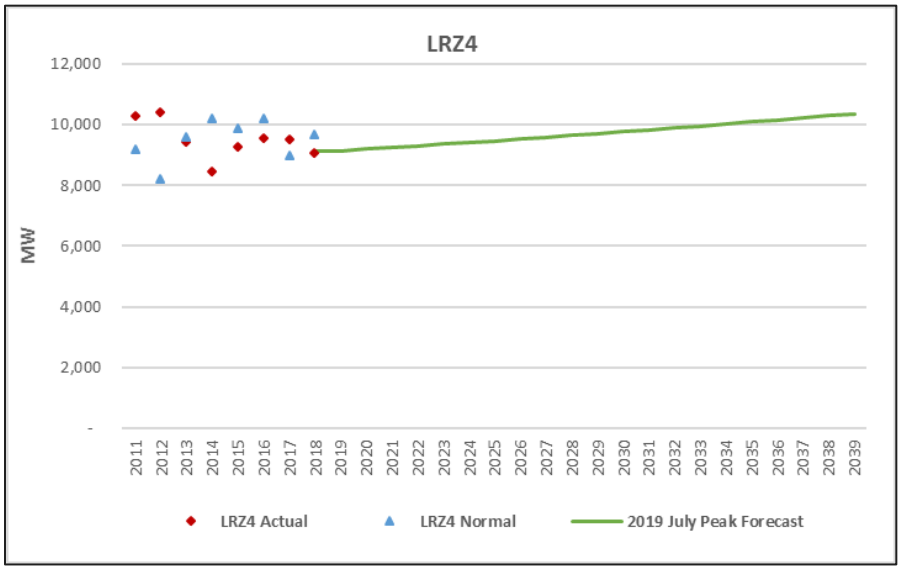


Figure 27: Gross LRZ 4 July Non-Coincident Peak Demand (MW)



4.3.5 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 in economic 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 energy is projected to grow at a CAGR of 0.41% for the period of 2019-2038. This is higher than the rate in 2018 Forecast (0.28% for the period of 2020-2039). However, the 2019 Forecast starts below the 2018 Forecast. Figure 28 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 29 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 28: Gross LRZ 5 Energy (GWh)

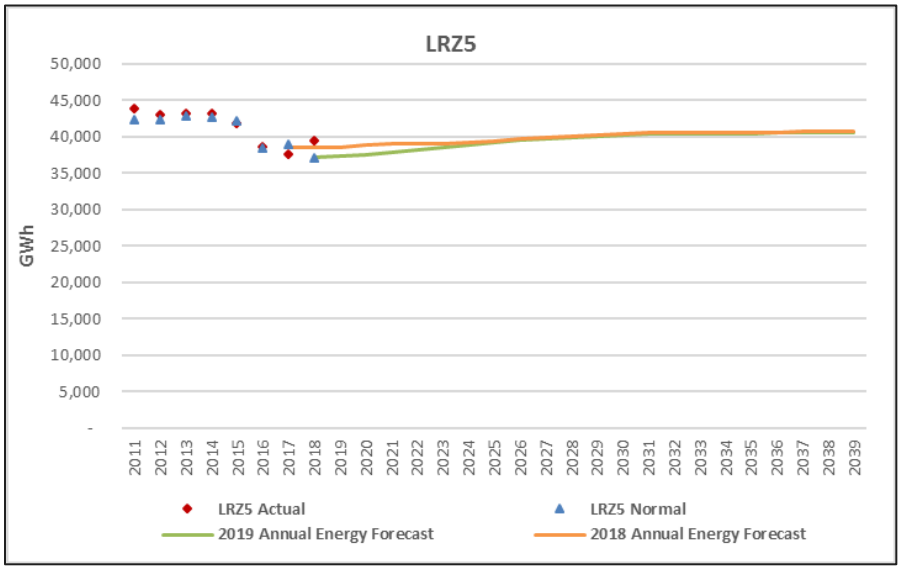
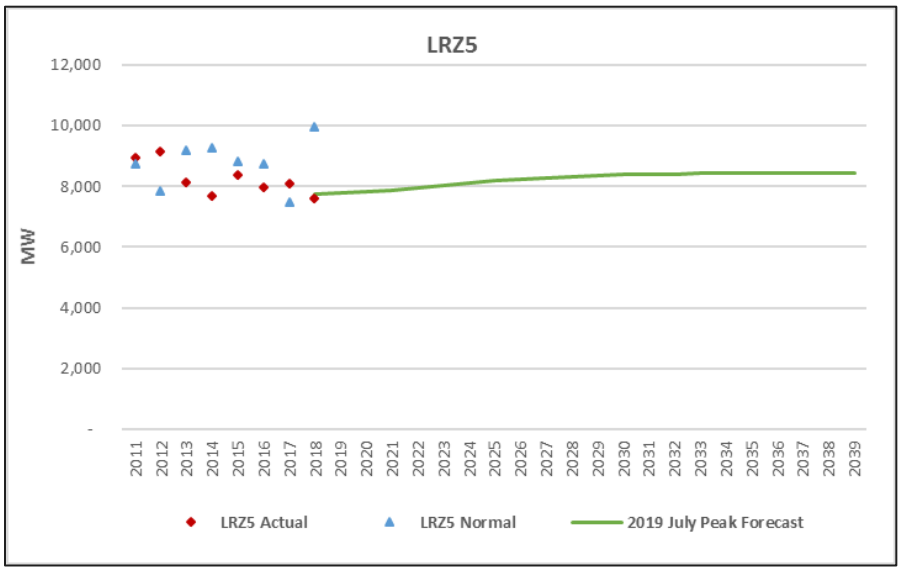


Figure 29: Gross LRZ 5 July Non-Coincident Peak Demand (MW)



4.3.6 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.

Annual energy is projected to grow at a CAGR of 1.01% for the period from 2020 to 2039. This is slightly lower than the rate in the 2018 Forecast (1.05% for the period of 2019-2038). Figure 30 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 31 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 30: Gross LRZ 6 Energy (GWh)

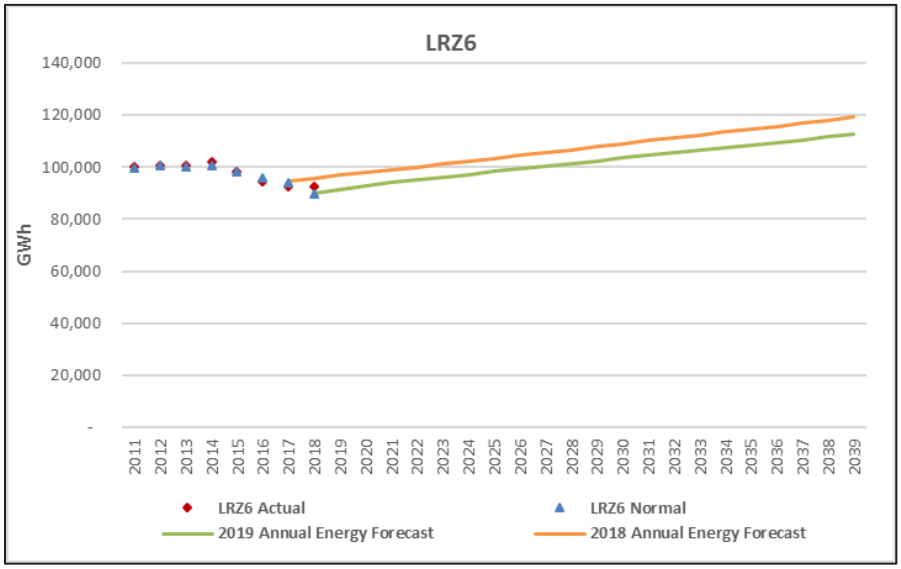
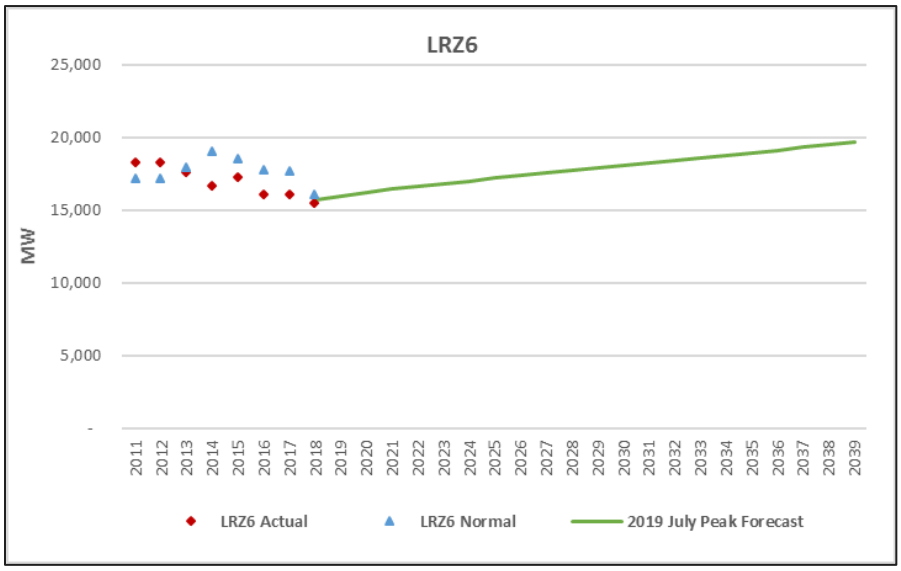


Figure 31: Gross LRZ 6 July Non-Coincident Peak Demand (MW)



4.3.7 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 energy is projected to grow at a CAGR of 0.87% for the period of 2020 to 2039. This is higher than the rate in the 2018 Forecast (0.57% for the period 2019-2038). Figure 32 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 33 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 32: Gross LRZ 7 Energy (GWh)

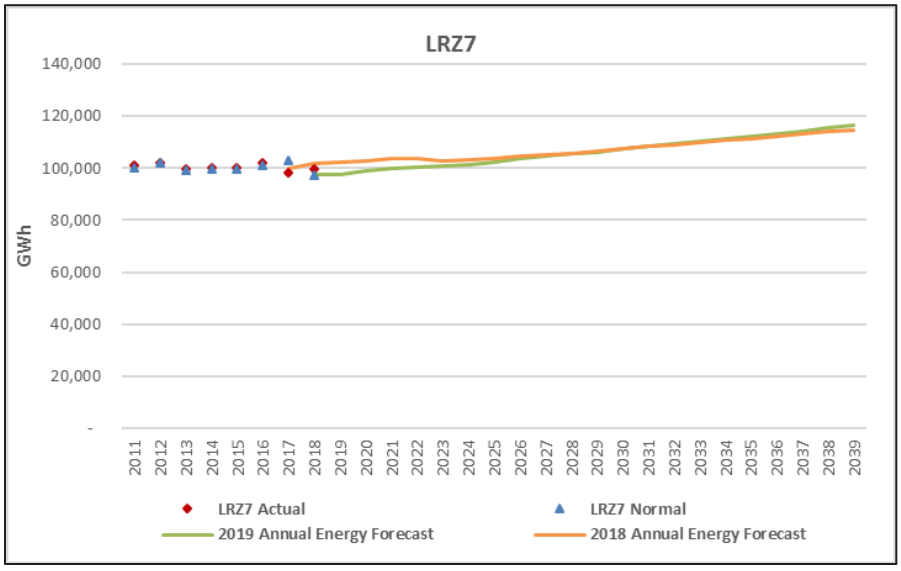
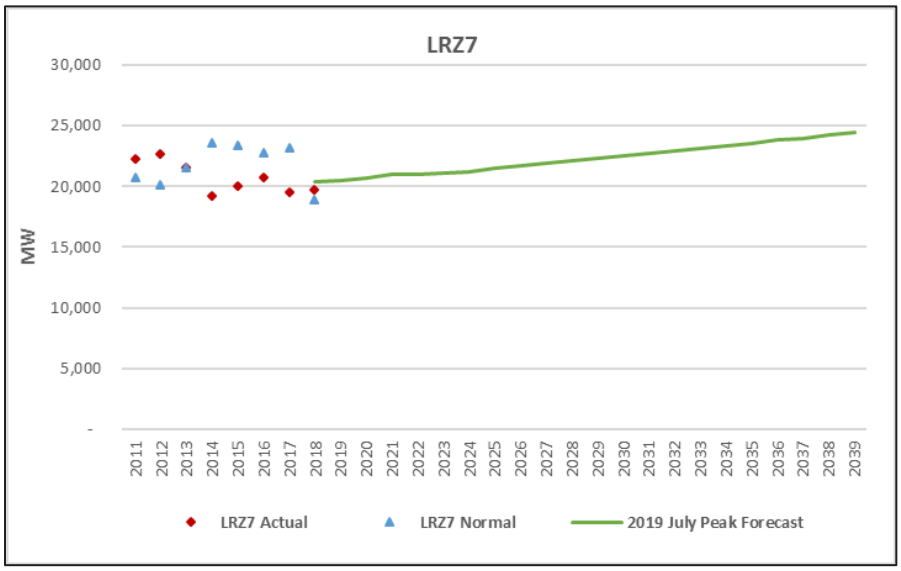


Figure 33: Gross LRZ 7 July Non-Coincident Peak Demand (MW)



4.3.8 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 energy is projected to grow at a CAGR of 1.00% for the period of 2020 to 2039, which is lower than the rate in the 2018 Forecast (1.15% for the period of 2019-2038). Figure 34 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 35 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 34: Gross LRZ 8 Energy (GWh)

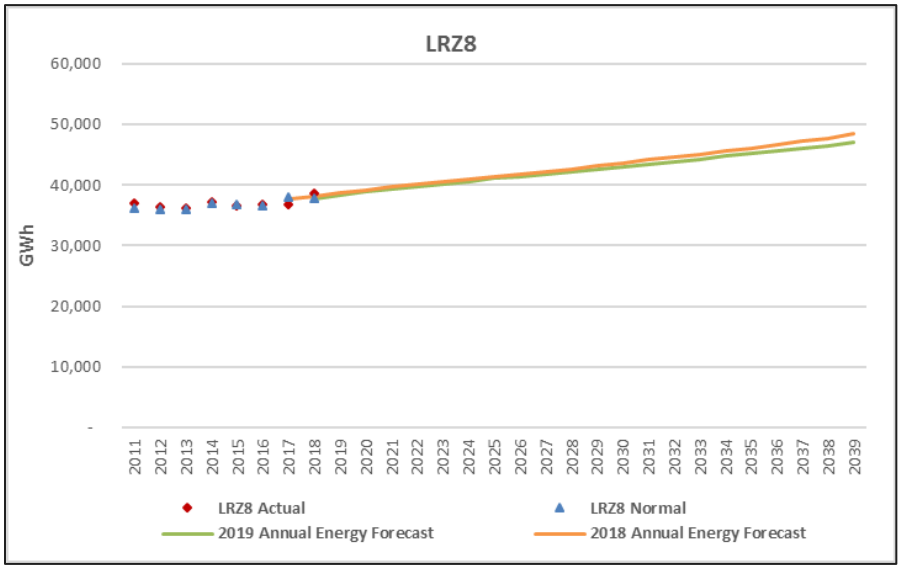
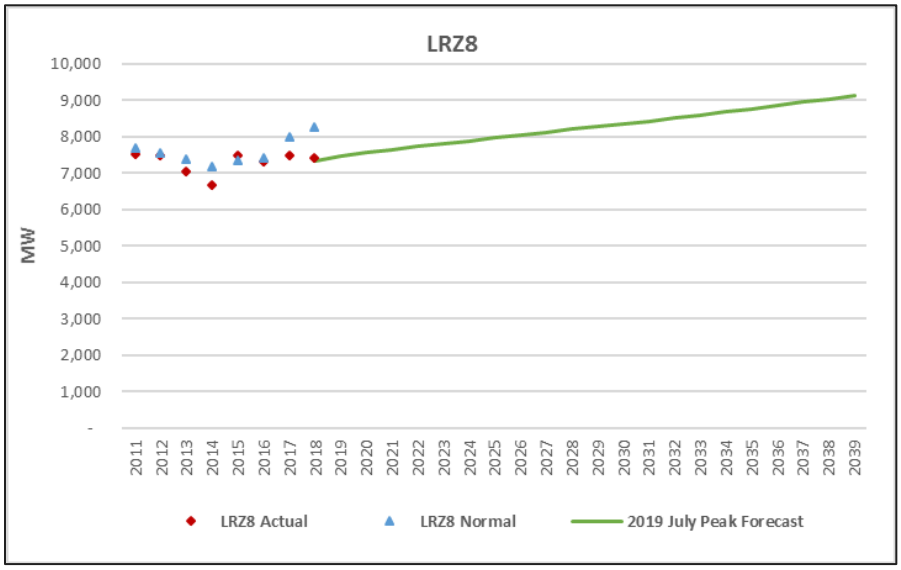


Figure 35: Gross LRZ 8 July Non-Coincident Peak Demand (MW)



4.3.9 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 energy is projected to grow at a CAGR of 0.84% for the period of 2020 to 2039. This rate is higher than the rate in the 2018 Forecast (0.72% for the period of 2019-2038), although the trajectory of 2019 Forecast lies lower than that of the 2018 Forecast due to a lower starting point. Figure 36 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 37 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 36: Gross LRZ 9 Energy (GWh)

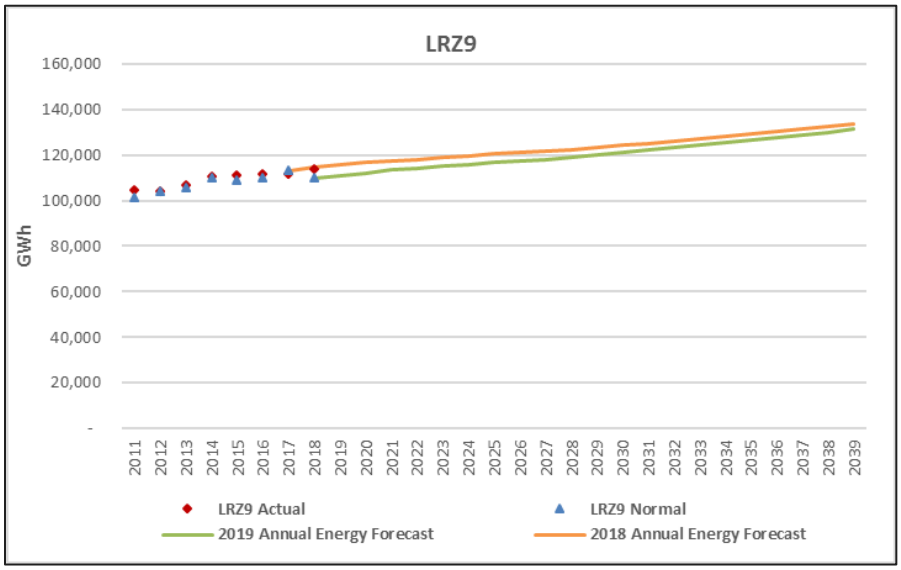
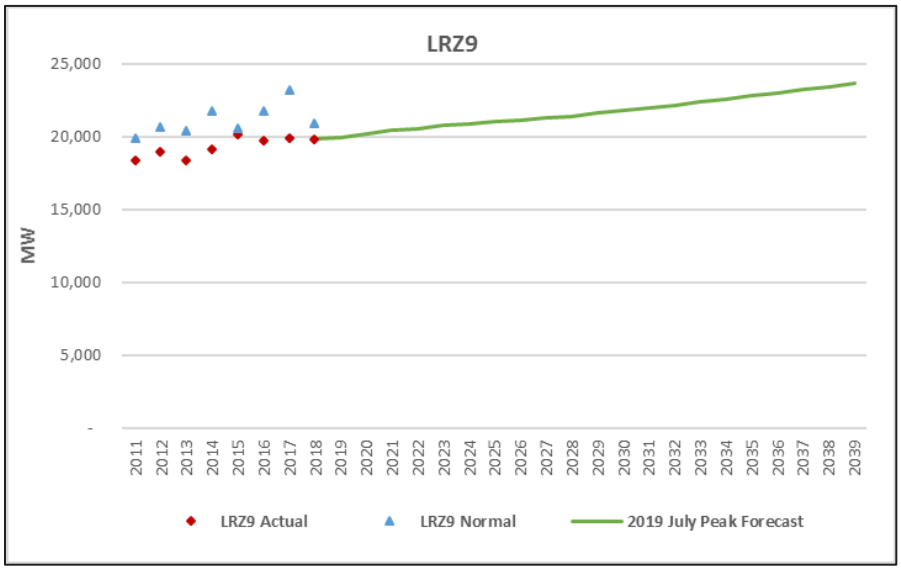


Figure 37: Gross LRZ 9 July Non-Coincident Peak Demand (MW)



4.3.10 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 energy is projected to grow at a CAGR of 1.41% for the period of 2020 to 2039. Although the growth rate is similar to that in the 2018 Forecast (1.37% for the period of 2019-2038), the 2019 Forecast is lower due to a lower starting point. Figure 38 shows annual energy forecasts for the 2019 Forecast and 2018 Forecast along with actual and weather-normalized historical energy levels. Figure 39 provides July non-coincident peak forecast for the 2019 Forecast along with actual and weather-normalized historical July peaks.

Figure 38: Gross LRZ 10 Energy (GWh)

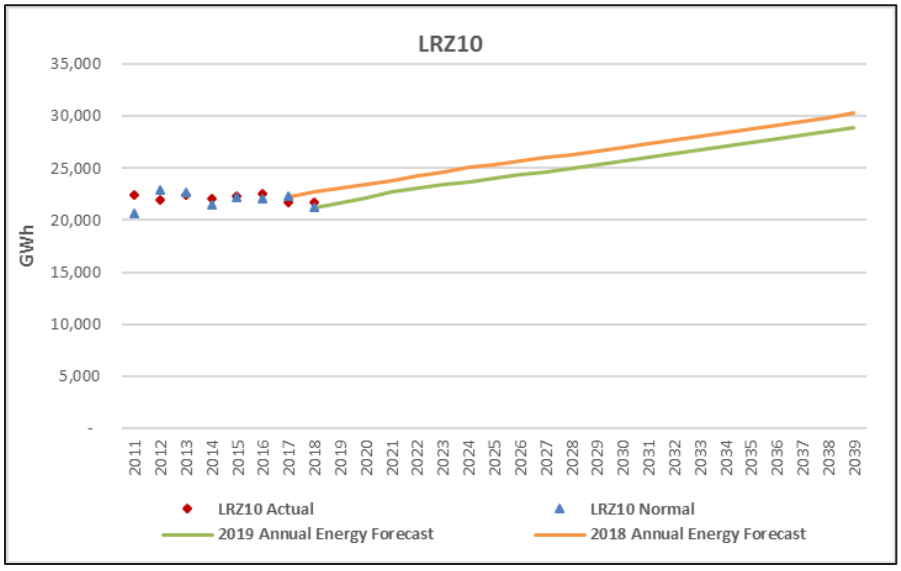
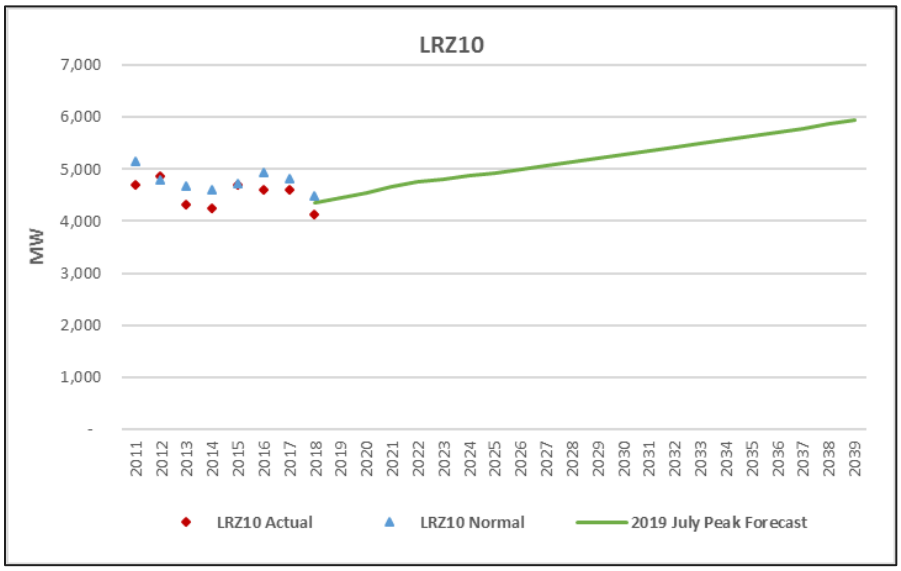


Figure 39: Gross LRZ 10 July Non-Coincident Peak Demand (MW)



5 MISO Forecasts

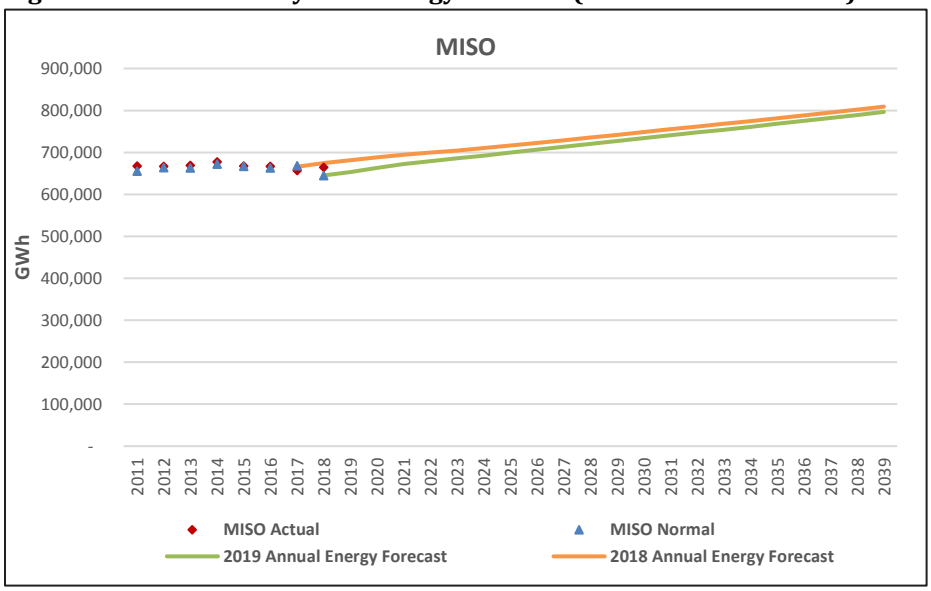
5.1 MISO ANNUAL ENERGY FORECAST

The MISO annual energy forecast is obtained by summing the individual LRZ metered load forecasts. Table 49 and Figure 40 provide the MISO-level energy forecast. Please note the forecasts are for the specified calendar year, not the MISO planning year. Also note that the forecast represents metered load prior to reductions from future EE programs. The compound annual growth rate for the period of 2020-2039 is 0.97%, which is slightly higher than that in the 2018 Forecast (0.86% for the period of 2019-2038). However, the trajectory of the 2019 Forecast lies below that of the 2018 Forecast due to a lower starting point, as shown in Figure 40.

Table 49: Gross MISO System Energy (Annual Metered Load in GWh)

Year	MISO Energy
2018	645,192
2019	653,512
2020	663,519
2021	672,011
2022	679,236
2023	685,783
2024	692,246
2025	699,668
2026	706,833
2027	713,388
2028	720,333
2029	727,483
2030	734,470
2031	741,086
2032	747,635
2033	754,223
2034	761,144
2035	768,174
2036	775,227
2037	782,149
2038	789,312
2039	796,575
Compound Annual Growth Rates (%)	
2020-2024	1.07
2020-2029	1.03
2020-2039	0.97

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



5.2 MISO SYSTEM COINCIDENT PEAK DEMAND FORECAST

Not all LRZs experience their 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. 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 over the 2010 to 2018 timeframe. Table 50 lists the average monthly coincidence factors estimated using the actual zonal monthly coincidence factors from 2010 to 2018. When the coincidence factor equals one, it means the peak for that zone coincides with the MISO system-wide peak. Table 51 and Figure 41 provide the MISO system July peak demand forecast.[11]

Table 50: MISO Monthly Coincident Factors

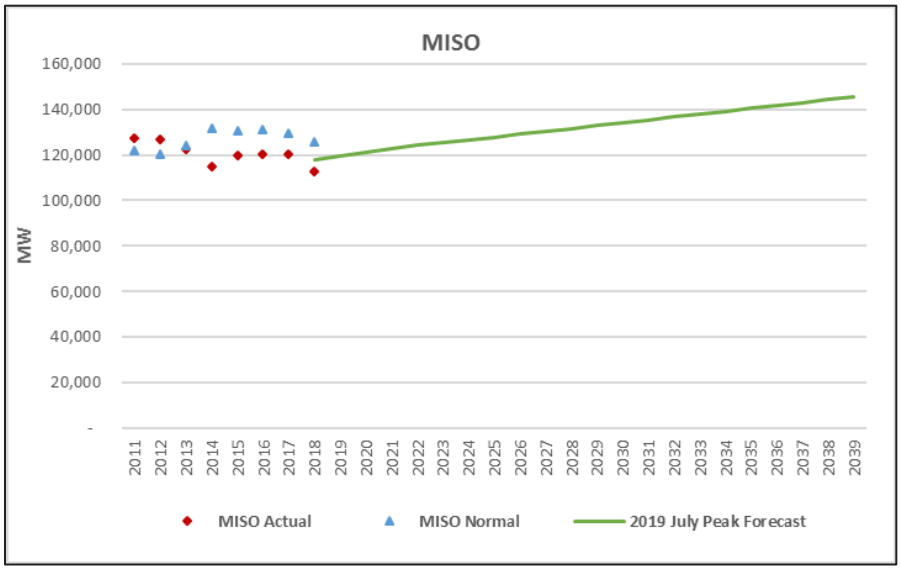
Month / LRZ	Average Monthly Coincident Factor											
	1	2	3	4	5	6	7	8	9	10	11	12
1	0.9732	0.9795	0.9781	0.9597	0.9271	0.9557	0.9413	0.9609	0.9714	0.9395	0.9735	0.9829
2	0.9582	0.9835	0.9802	0.9736	0.9460	0.9884	0.9897	0.9700	0.9947	0.9644	0.9684	0.9815
3	0.9800	0.9793	0.9975	0.9518	0.9415	0.9577	0.9642	0.9798	0.9781	0.9763	0.9717	0.9847
4	0.9859	0.9865	1.0068	0.9695	0.9740	0.9757	0.9833	0.9719	0.9765	0.9921	0.9781	0.9769
5	0.9908	0.9737	0.9923	0.9375	0.9577	0.9704	0.9907	0.9628	0.9691	0.9783	0.9745	0.9751
6	0.9808	0.9753	0.9969	0.9604	0.9722	0.9863	0.9830	0.9649	0.9785	0.9780	0.9671	0.9797
7	0.9456	0.9711	0.9911	0.9552	0.9294	0.9807	0.9574	0.9667	0.9752	0.9656	0.9703	0.9669
8	0.9765	0.9772	0.9245	0.9479	0.9345	0.9597	0.9569	0.9308	0.9699	0.9599	0.9661	0.9695
9	0.9414	0.9362	0.9073	0.9253	0.9639	0.9423	0.9565	0.9391	0.9384	0.9464	0.9473	0.9359
10	0.9770	0.9530	0.9409	0.9378	0.9732	0.9406	0.9341	0.9242	0.9596	0.9613	0.9650	0.9337

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

Table 51: Gross MISO System July Coincident Peak Demand (Metered Load in MW)

Year	MISO CP
2018	118,071
2019	119,557
2020	121,372
2021	122,909
2022	124,211
2023	125,392
2024	126,561
2025	127,919
2026	129,232
2027	130,429
2028	131,694
2029	132,995
2030	134,268
2031	135,475
2032	136,671
2033	137,871
2034	139,133
2035	140,415
2036	141,698
2037	142,956
2038	144,263
2039	145,588
Compound Annual Growth Rates (%)	
2020-2024	1.05
2020-2029	1.02
2020-2039	0.96

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



5.3 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 52 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.

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

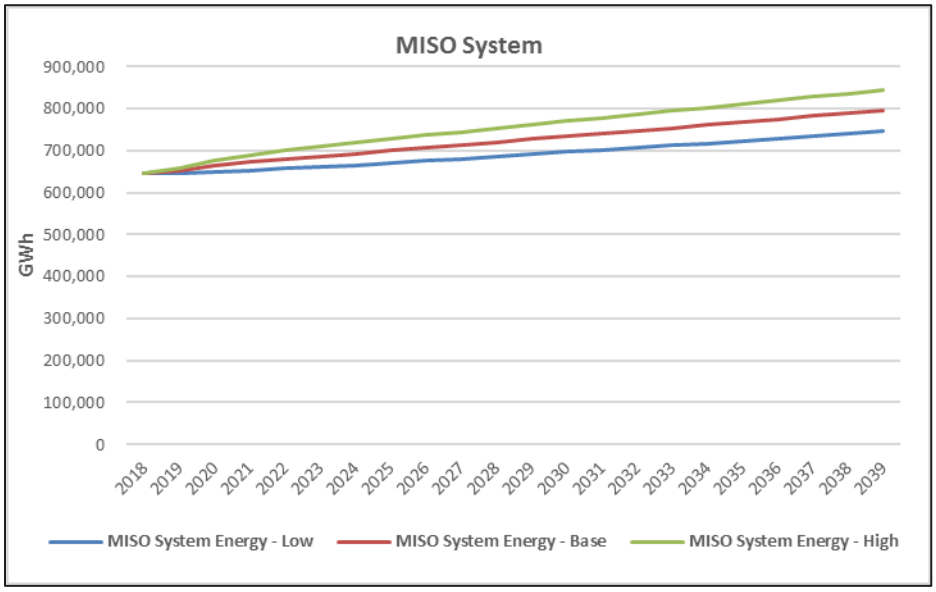


Table 52: Gross MISO System CAGR for Alternate Forecasts (2020-2039)

	BASE	HIGH	LOW
Energy	0.97	1.17	0.73
July Peak	0.96	1.17	0.72

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).[12] The candidate variables and their data sources are provided in Table 53.

Table 53: 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*	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 was in nominal dollars. SUFG converted it to real 2009 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 54 provides compound annual growth rates for explanatory variables over the forecast period (2020-2039). 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 54 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.

[12] State econometric models are updated every other year. Thus, the formulation of the econometric models in this forecast are the same as in the previous forecast. New econometric models will be produced for the 2020 Forecast.

Table 54: Explanatory Variable CAGR for the Period of 2020-2039 (%)

Variables	AR	IL	IN	IA	KY	LA	MI	MN	MS	MO	MT	ND	SD	TX	WI
REAL_ELECTRICITY_PRICE	0.42	-0.19	-0.21	-0.39	-0.18	0.42	-0.19	-0.41	-0.18	-0.40	-0.05	-0.41	-0.41	0.42	-0.20
REAL_NATURAL_GAS_PRICE	1.06	1.05	1.04	0.96	0.93	1.37					1.01		0.98	1.24	1.05
REAL_INCOME		1.74		2.08		1.71	1.55		1.78						
POPULATION					0.36			0.43		0.36		0.44	0.66		
REAL_INCOME/POPULATION											1.59				
REAL_GSP	1.47		1.48						1.48					2.60	1.41
MANUFACTURING_EMP										-0.43	-0.25				

Table 55 provides state-level forecasts. The retail sales by state for the year 2018 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" 2018 values (as well as 2019 values) to provide continuity between the historical data and the forecast period (2020 to 2039).

Table 55: 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	46,987	143,030	106,717	47,312	78,285	89,527	108,570	69,714
2019	47,789	143,352	108,215	48,362	79,922	89,670	108,961	71,336
2020	48,453	144,511	109,403	50,421	82,037	90,522	110,245	72,045
2021	48,986	145,237	110,214	51,587	83,519	91,539	111,386	73,393
2022	49,519	146,056	111,125	52,477	85,035	92,060	111,901	74,595
2023	50,019	146,881	112,112	53,383	86,018	92,672	112,421	75,562
2024	50,539	147,651	113,286	54,323	87,046	93,087	112,928	76,431
2025	51,107	148,539	114,566	55,333	88,024	93,476	114,227	77,266
2026	51,590	149,471	115,847	56,366	88,932	93,758	115,510	77,978
2027	52,035	150,355	117,098	57,334	89,737	93,946	116,534	78,646
2028	52,567	151,266	118,460	58,339	90,523	94,357	117,556	79,302
2029	53,081	152,281	119,855	59,365	91,262	94,936	118,558	79,950
2030	53,596	153,205	121,213	60,383	92,003	95,549	119,690	80,489
2031	54,069	154,196	122,550	61,418	92,706	96,176	120,770	80,871
2032	54,579	155,135	123,875	62,425	93,385	96,726	121,930	81,296
2033	55,104	156,187	125,273	63,427	94,007	97,347	123,007	81,678
2034	55,659	157,210	126,725	64,497	94,588	98,001	124,234	82,061
2035	56,236	158,315	128,199	65,669	95,148	98,640	125,382	82,446
2036	56,787	159,423	129,712	66,798	95,726	99,320	126,503	82,895
2037	57,353	160,422	131,272	67,900	96,320	99,990	127,485	83,326
2038	57,930	161,521	132,868	68,990	96,897	100,579	128,714	83,752
2039	58,532	162,606	134,517	70,090	97,367	101,211	129,961	84,163
Compound Annual Growth Rates (%)								
2020-2024	1.06	0.54	0.88	1.88	1.49	0.70	0.60	1.49
2020-2029	1.02	0.58	1.02	1.83	1.19	0.53	0.81	1.16
2020-2039	1.00	0.62	1.09	1.75	0.91	0.59	0.87	0.82

Table 55: 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	50,844	82,930	15,706	17,948	12,675	402,736	70,847
2019	51,904	83,786	16,260	18,878	12,968	413,665	72,016
2020	53,214	84,759	17,411	19,905	13,431	420,380	72,791
2021	54,411	85,876	18,064	20,496	13,735	426,716	73,354
2022	55,516	87,158	18,344	21,397	14,142	432,647	74,013
2023	56,183	88,398	18,583	22,167	14,534	438,918	74,625
2024	56,889	89,718	18,814	22,771	14,880	445,531	75,291
2025	57,651	90,929	19,056	23,295	15,204	452,345	76,103
2026	58,414	92,058	19,399	23,776	15,520	459,271	76,979
2027	59,167	93,052	19,742	24,166	15,802	466,735	77,882
2028	59,951	93,944	20,072	24,511	16,070	474,951	78,831
2029	60,787	94,776	20,424	24,833	16,333	483,319	79,796
2030	61,674	95,540	20,756	25,139	16,590	491,672	80,631
2031	62,508	96,276	21,034	25,375	16,823	500,029	81,399
2032	63,328	96,950	21,253	25,523	17,022	508,430	82,178
2033	64,149	97,569	21,580	25,691	17,231	516,966	82,976
2034	64,984	98,177	21,981	25,838	17,429	526,364	83,797
2035	65,852	98,803	22,424	25,982	17,625	535,667	84,625
2036	66,707	99,430	22,818	26,123	17,820	545,105	85,457
2037	67,599	100,080	23,154	26,296	18,027	554,845	86,309
2038	68,508	100,768	23,531	26,451	18,230	564,904	87,168
2039	69,412	101,458	23,895	26,598	18,428	575,491	88,070
Compound Annual Growth Rates (%)							
2020-2024	1.68	1.43	1.96	3.42	2.59	1.46	0.85
2020-2029	1.49	1.25	1.79	2.49	2.20	1.56	1.03
2020-2039	1.41	0.95	1.68	1.54	1.68	1.67	1.01

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 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	7997.335	5232.202	1.528483	0.1472	
@MOVAV(REAL_ELECTRICITY_PRICE,4)	-974.2413	408.3832	-2.385606	0.0307	-0.1537
REAL_NATURAL_GAS_PRICE	284.4885	92.17246	3.086481	0.0075	0.0397
REAL_GSP	0.278789	0.018192	15.32509	0.0000	0.6560
CDD	4.495245	0.613019	7.332961	0.0000	0.1885
HDD	1.708262	0.442772	3.858106	0.0015	0.1342

R-squared	0.981704	Mean dependent var	43963.51
Adjusted R-squared	0.975605	S.D. dependent var	3616.722
S.E. of regression	564.8931	Durbin-Watson stat	1.933566
F-statistic	160.9675		
Prob(F-statistic)	0.000000		

Illinois

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	79267.68	14669.54	5.403556	0.0001	
REAL_ELECTRICITY_PRICE	-1779.53	733.1073	-2.42738	0.0283	-0.1058
REAL_NATURAL_GAS_PRICE(-1)	1047.483	252.692	4.145297	0.0009	0.0477
REAL INCOME	0.0000633	0.0000164	3.852153	0.0016	0.2661
CDD	13.73561	3.059202	4.489932	0.0004	0.0981
HDD	3.192515	1.236322	2.582268	0.0208	0.1354

R-squared	0.901057	Mean dependent var	138619.1
Adjusted R-squared	0.868076	S.D. dependent var	5752.518
S.E. of regression	2089.391	Durbin-Watson stat	1.722164
F-statistic	27.32052		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Indiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1994 2016
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	34040.67	6275.603	5.424286	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-2618.308	621.0073	-4.216227	0.0006	-0.2069
@MOVAV(REAL_NATURAL_GAS_PRICE,2)	455.9379	203.4126	2.241444	0.0386	0.0258
REAL_GSP	0.231176	0.009514	24.29745	0.0000	0.6701
CDD	7.249942	1.442948	5.024397	0.0001	0.0777
HDD	2.415416	0.668004	3.615869	0.0021	0.1322

R-squared	0.982869	Mean dependent var	100161.6
Adjusted R-squared	0.977831	S.D. dependent var	7351.366
S.E. of regression	1094.564	Durbin-Watson stat	1.314745
F-statistic	195.0753		
Prob(F-statistic)	0.000000		

Iowa

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	16870.64	3790.158	4.451172	0.0005	
REAL_ELECTRICITY_PRICE(-2)	-1565.046	329.4068	-4.751104	0.0003	-0.2387
REAL_NATURAL_GAS_PRICE(-2)	229.7269	61.64316	3.726722	0.0020	0.0356
REAL INCOME	0.000272	1.13E-05	24.03273	0.0000	0.7239
CDD	2.808754	0.707035	3.972579	0.0012	0.0622
HDD	0.479795	0.192745	2.489266	0.025	0.0737

R-squared	0.992251	Mean dependent var	42610.76
Adjusted R-squared	0.989668	S.D. dependent var	3969.136
S.E. of regression	403.4541	Durbin-Watson stat	1.871969
F-statistic	384.1362		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Kentucky

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	-90813.08	17071.65	-5.319525	0.0001	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-3318.914	1255.891	-2.642678	0.0185	-0.2837
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	734.9339	268.2416	2.739821	0.0152	0.0522
POPULATION	0.039214	0.00551	7.116283	0.0000	2.0024
CDD	4.367273	1.849944	2.360759	0.0322	0.0681
HDD	4.54976	1.125907	4.040974	0.0011	0.2324

R-squared	0.951876	Mean dependent var	86166.14
Adjusted R-squared	0.935835	S.D. dependent var	5847.143
S.E. of regression	1481.128	Durbin-Watson stat	1.850402
F-statistic	59.33933		
Prob(F-statistic)	0.000000		

Louisiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	48245.37	8036.353	6.003391	0.0000	
REAL_ELECTRICITY_PRICE(-2)	-2194.594	538.3219	-4.076732	0.0010	-0.1759
REAL_NATURAL_GAS_PRICE	-655.6612	178.5169	-3.672823	0.0023	-0.0222
REAL INCOME	0.000169	0.0000225	7.504014	0.0000	0.3271
CDD	6.745231	2.033971	3.316287	0.0047	0.2515
HDD	5.341063	1.810201	2.950536	0.0099	0.0970

R-squared	0.932414	Mean dependent var	81278.67
Adjusted R-squared	0.909886	S.D. dependent var	5325.338
S.E. of regression	1598.615	Durbin-Watson stat	1.834548
F-statistic	41.38809		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Michigan

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1993 2016
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	67219.66	10491.11	6.407296	0.0000	
REAL_ELECTRICITY_PRICE(-3)	-3324.069	320.5015	-10.37146	0.0000	-0.3285
REAL INCOME	0.000132	0.0000158	8.332633	0.0000	0.4962
CDD	8.232416	2.163918	3.804404	0.0012	0.0656
HDD	2.132905	0.873304	2.442339	0.0245	0.1301

R-squared	0.947101	Mean dependent var	102395.4
Adjusted R-squared	0.935965	S.D. dependent var	5662.765
S.E. of regression	1432.974	Durbin-Watson stat	1.57512
F-statistic	85.04424		
Prob(F-statistic)	0		

Minnesota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	-34578.4	7716.765	-4.480945	0.0004	
REAL_ELECTRICITY_PRICE(-1)	-2761.373	723.8497	-3.814843	0.0015	-0.3579
POPULATION	0.02001	0.001837	10.89174	0.0000	1.6598
CDD	8.319551	2.554485	3.256841	0.0049	0.0896
HDD	1.414425	0.495638	2.853745	0.0115	0.1732

R-squared	0.941528	Mean dependent var	63926.05
Adjusted R-squared	0.92691	S.D. dependent var	4697.838
S.E. of regression	1270.067	Durbin-Watson stat	1.647825
F-statistic	64.40897		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Mississippi

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	12032.65	3440.877	3.496973	0.0032	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1963.547	378.8537	-5.182863	0.0001	-0.3346
REAL_INCOME(-1)	0.000193	6.18E-05	3.118957	0.0070	0.3701
REAL_GSP	0.23046	0.083751	2.751723	0.0148	0.4477
CDD	3.731709	0.729032	5.11872	0.0001	0.1846
HDD	2.137433	0.562375	3.800728	0.0017	0.1124

R-squared	0.969146	Mean dependent var	46236.11
Adjusted R-squared	0.958862	S.D. dependent var	2910.506
S.E. of regression	590.3248	Durbin-Watson stat	1.985191
F-statistic	94.23326		
Prob(F-statistic)	0.000000		

Missouri

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	-138083.9	38891.12	-3.550525	0.0029	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-3995.924	435.2837	-9.180046	0.0000	-0.4249
POPULATION	0.033884	0.005302	6.390526	0.0000	2.6261
MANUFACTURING_EMP	0.062171	0.023889	2.602543	0.0200	0.2078
CDD	7.942293	1.457584	5.448944	0.0001	0.1540
HDD	3.991143	0.749111	5.327837	0.0001	0.2376

R-squared	0.978589	Mean dependent var	77652.88
Adjusted R-squared	0.971452	S.D. dependent var	6705.843
S.E. of regression	1133.022	Durbin-Watson stat	1.788196
F-statistic	137.1168		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Montana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	-3986.463	3346.745	-1.191146	0.2534	
REAL_ELECTRICITY_PRICE	-1727.114	208.8767	-8.268579	0.0000	-0.9679
@MOVAV(REAL_NATURAL_GAS_PRICE,5)	375.663	60.92514	6.165976	0.0000	0.1884
REAL_INCOME/POPULATION	414.8955	40.5622	10.22863	0.0000	1.1296
MANUFACTURING_EMP	0.314856	0.063094	4.990295	0.0002	0.4358
CDD	1.918328	0.652252	2.941085	0.0107	0.0649
HDD	0.913984	0.224622	4.068984	0.0011	0.4748

R-squared	0.937697	Mean dependent var	13723.19
Adjusted R-squared	0.910995	S.D. dependent var	967.1413
S.E. of regression	288.5336	Durbin-Watson stat	2.251128
F-statistic	35.11788		
Prob(F-statistic)	0.000000		

North Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1998 2016
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	-34911.8	2650.76	-13.17049	0.0000	
REAL_ELECTRICITY_PRICE(-2)	-1618.518	247.9155	-6.528505	0.0000	-0.6660
POPULATION	0.083248	0.002592	32.11803	0.0000	3.4070
HDD	0.314905	0.164743	1.911488	0.0752	0.2111

R-squared	0.98647	Mean dependent var	12586.33
Adjusted R-squared	0.983764	S.D. dependent var	3200.938
S.E. of regression	407.864	Durbin-Watson stat	1.9333
F-statistic	364.5515		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

South Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1995 2016
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	-18186.06	1188.603	-15.30037	0.0000	
REAL_ELECTRICITY_PRICE(-2)	-572.4136	61.44786	-9.315436	0.0000	-0.3870
REAL_NATURAL_GAS_PRICE(-1)	43.5981	19.76565	2.20575	0.0424	0.0192
POPULATION	0.037678	0.000742	50.79983	0.0000	2.6884
CDD	0.624101	0.148579	4.200459	0.0007	0.0451
HDD	0.285388	0.042487	6.717077	0.0000	0.2110

R-squared	0.997548	Mean dependent var	9946.814
Adjusted R-squared	0.996782	S.D. dependent var	1726.755
S.E. of regression	97.95609	Durbin-Watson stat	1.861101
F-statistic	1301.912		
Prob(F-statistic)	0.000000		

Texas

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	93337.17	19510.45	4.783957	0.0002	
REAL_ELECTRICITY_PRICE(-2)	-4078.944	1838.177	-2.219015	0.0423	-0.0829
REAL_NATURAL_GAS_PRICE(-2)	2486.691	980.431	2.536324	0.0228	0.0318
REAL_GSP	0.146545	0.004998	29.31819	0.0000	0.5510
CDD	25.13267	5.448175	4.613043	0.0003	0.2266
HDD	15.80796	5.301451	2.981817	0.0093	0.0852

R-squared	0.988974	Mean dependent var	340249.8
Adjusted R-squared	0.985299	S.D. dependent var	34566.54
S.E. of regression	4191.165	Durbin-Watson stat	2.101659
F-statistic	269.0836		
Prob(F-statistic)	0.000000		

APPENDIX A STATE MODELS

Wisconsin

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2016 (weather at means)
C	24875.42	2683.658	9.269223	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-986.0362	252.5938	-3.903644	0.0014	-0.1361
REAL_NATURAL_GAS_PRICE	367.7294	76.09553	4.83247	0.0002	0.0300
REAL_GSP	0.164874	0.011086	14.8726	0.0000	0.6458
CDD	4.403688	1.034685	4.256067	0.0007	0.0390
HDD	0.646072	0.301474	2.143042	0.0489	0.0681

R-squared	0.984625	Mean dependent var	67053.89
Adjusted R-squared	0.979501	S.D. dependent var	3447.182
S.E. of regression	493.5537	Durbin-Watson stat	2.069814
F-statistic	192.128		
Prob(F-statistic)	0.000000		

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 56. EIA Form 861's historical annual electricity sales data from 2009 to 2017 were used to estimate the annual MISO load fraction at the state level.

The MISO market footprint covers all or parts of 17 states and is divided into 10 LRZs.[13] Figure 1 in Chapter 1 displays the MISO market footprint at the LRZ level.

Table 56: 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

[13] 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 57 summarizes the historical MISO load fractions at the state level for the period of 2009-2017. 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 57: MISO Load Fraction at State Level (MWh), 2009-2017

State	MISO Sales (MWhs)	Non-MISO Sales (MWhs)	2009	2010	2011	2012	2013	2014	2015	2016	2017
AR	33,421,047	12,664,904	70.03%	70.57%	70.39%	70.52%	70.45%	72.23%	72.30%	71.94%	72.52%
IA	45,338,365	3,583,632	92.03%	92.92%	93.04%	93.22%	92.92%	93.05%	92.92%	92.85%	92.67%
IL	47,277,268	89,919,042	33.95%	34.55%	34.80%	33.91%	34.59%	34.84%	34.83%	34.45%	34.46%
IN+KY	86,295,896	85,304,459	47.37%	47.49%	48.49%	48.78%	49.94%	51.95%	51.86%	50.89%	50.29%
LA	84,716,611	6,489,324	91.82%	91.77%	91.74%	92.06%	92.20%	92.67%	92.66%	92.75%	92.88%
MI	97,942,700	3,956,393	95.28%	96.01%	96.16%	96.21%	96.10%	96.08%	96.09%	96.11%	96.12%
MN	66,297,408	855,172	98.66%	98.73%	98.73%	98.84%	98.75%	98.77%	98.76%	98.72%	98.73%
MO	35,661,864	40,799,555	48.83%	49.55%	49.35%	50.22%	49.38%	49.06%	48.98%	46.98%	46.64%
MS	21,188,533	26,640,254	45.58%	45.89%	45.24%	44.78%	44.73%	44.56%	45.06%	44.71%	44.30%
ND+MT	11,462,172	23,387,910	36.03%	37.35%	37.90%	36.76%	37.46%	36.30%	35.14%	34.48%	32.89%
SD	3,156,555	9,157,120	26.48%	26.87%	26.07%	26.02%	25.32%	25.26%	25.57%	25.85%	25.63%
TX	21,520,498	380,359,876	5.53%	5.66%	5.46%	5.99%	5.74%	5.60%	5.47%	5.45%	5.35%
WI	69,079,109	0	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 58 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 58: MISO Load Fraction (Average % of State-Level Electricity Sales from 2009 to 2017)

LRZ	AR	IA	IL	IN+KY	LA	MI	MN	MO	MS	ND+MT	SD	TX	WI
1		1.8%	0.0002%			0.1%	97.0%			36.0%	24.1%		16.8%
2						4.8%							83.2%
3		91.1%	1.4%				1.7%				1.8%		
4			33.1%										
5								48.7%					
6				49.6%									
7						91.1%							
8	71.2%							0.02%				0.01%	
9					92.3%							5.6%	
10									45.0%				
Non-MISO	**28.8%**	**7.2%**	**65.5%**	**50.4%**	**7.7%**	**4.0%**	**1.3%**	**51.3%**	**55.0%**	**64.0%**	**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 59 summarizes the percentage of MISO electricity sales in each state for the period of 2009-2017 and the eight-year average by LRZ. For most states, the percentage of electricity sales from MISO utilities was quite stable during this period.

Table 59: 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
1	IA	1.78%	1.78%	1.77%	1.76%	1.73%	1.78%	1.83%	1.84%	1.81%	1.74%
	IL	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%
	MI	0.14%	0.14%	0.14%	0.14%	0.13%	0.14%	0.14%	0.13%	0.13%	0.13%
	MN	97.05%	96.60%	96.73%	96.76%	96.93%	96.89%	96.76%	97.20%	97.78%	97.80%
	ND+MT	36.70%	35.99%	37.35%	37.90%	36.76%	37.46%	36.30%	35.14%	34.48%	32.89%
	SD	24.08%	24.64%	24.97%	24.28%	24.24%	23.51%	23.51%	23.78%	24.05%	23.72%
	WI	16.82%	16.84%	16.59%	16.94%	16.23%	17.02%	17.05%	16.90%	16.68%	17.12%
2	MI	4.81%	4.32%	5.22%	5.28%	4.89%	4.94%	5.14%	4.83%	4.53%	4.14%
	WI	83.18%	83.16%	83.41%	83.06%	83.77%	82.98%	82.95%	83.10%	83.32%	82.88%
3	IA	91.06%	90.25%	91.14%	91.28%	91.48%	91.15%	91.22%	91.07%	91.05%	90.93%
	IL	1.42%	1.40%	1.42%	1.45%	1.42%	1.42%	1.40%	1.41%	1.42%	1.43%
	MN[14]	1.69%	2.06%	2.00%	1.97%	1.91%	1.86%	2.01%	1.56%	0.94%	0.93%
	SD	1.82%	1.84%	1.90%	1.79%	1.77%	1.80%	1.75%	1.79%	1.80%	1.91%
4	IL	33.07%	32.55%	33.12%	33.35%	32.49%	33.17%	33.44%	33.42%	33.03%	33.03%
5	MO	48.68%	48.56%	49.41%	49.22%	50.08%	49.26%	49.04%	48.96%	46.96%	46.62%
6	IN+KY	49.65%	47.35%	47.49%	48.49%	48.60%	49.94%	51.95%	51.86%	50.89%	50.29%
7	MI	91.07%	90.82%	90.65%	90.75%	91.19%	91.02%	90.80%	91.13%	91.45%	91.84%
8	AR	71.22%	70.03%	70.57%	70.39%	70.52%	70.45%	72.23%	72.30%	71.94%	72.52%
	MO	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.020%
	TX	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
9	LA	92.28%	91.82%	91.77%	91.74%	92.06%	92.20%	92.67%	92.66%	92.75%	92.88%
	TX	5.58%	5.52%	5.65%	5.46%	5.98%	5.73%	5.59%	5.47%	5.45%	5.35%
10	MS	44.98%	45.58%	45.89%	45.24%	44.78%	44.73%	44.56%	45.06%	44.71%	44.30%

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 the 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 the 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 60 provides the 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 metered load forecasts.

[14] Customers of Interstate Power and Light located in Minnesota were transferred to rural electric cooperatives in 2016. Some of the cooperatives are in LRZ 1 while Interstate Power and Light is in LRZ 3. Thus, some loads switched from LRZ 3 to LRZ 1 at that time. Thus, the percentage of Minnesota electricity sales in LRZ 3 dropped from 1.56% to 0.94%, and the share in LRZ 1 increased.

APPENDIX B ALLOCATION FACTORS

Table 60: Allocation Factors to Convert State Sales to LRZ Metered Load

MISO LRZ	State	Allocation Factor	
		Basis	Forecasting Period
1	IA	Historical average (2013-2017)	Constant at 1.80%
	IL	Historical average (2013-2017)	Constant at 0.0002%
	MI	Historical average (2013-2017)	Constant at 0.13%
	MN	Historical average (2016-2017)	Constant at 97.79%
	ND+MT	2017 value	Constant at 32.89%
	SD	Historical average (2013-2017)	Constant at 23.72%
	WI	Historical average (2013-2017)	Constant at 16.95%
2	MI	Historical average (2013-2017)	Constant at 4.72%
	WI	Historical average (2013-2017)	Constant at 83.05%
3	IA	Historical average (2013-2017)	Constant at 91.08%
	IL	Historical average (2013-2017)	Constant at 1.42%
	MN	Historical average (2016-2017)	Constant at 0.93%[15]
	SD	Historical average (2013-2017)	Constant at 1.81%
4	IL	Historical average (2013-2017)	Constant at 33.22%
5	MO	St. Louis vs. state growth Decrease over time	Reduced from 46.20% in 2018 to 41.26% in 2039[16]
6	IN+KY	Historical average (2014-2017)	Constant at 51.24%[17]
7	MI	Historical average (2013-2017)	Constant at 91.25%
8	AR	Historical average (2013-2017)	Constant at 71.89%
	MO	Historical average (2013-2017)	Constant at 0.02%
	TX	Historical average (2013-2017)	Constant at 0.0055%
9	LA	Historical average (2013-2017)	Constant at 92.63%
	TX	Historical average (2013-2017)	Constant at 5.52%
10	MS	Historical average (2013-2017)	Constant at 44.67%

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

[16] 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 46.20% in 2018 to 41.26% in 2039.

[17] Because the 2014, 2015, 2016 and 2017values reflect the MISO shares in LRZ 6 after the complete shutdown of the Paducah Gaseous Diffusion Plant in Kentucky, the future allocation factor is held constant at the average of 2014-2017 values (51.24%).

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 eight years' of hourly load observations of LRZ-level loads from January 1, 2010 to December 31, 2018. Actual hourly weather data from 1997 to 2018 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 61 lists the selected weather station by LRZ.

Table 61: Selected Weather Stations for LRZs, 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 nine years of zonal hourly load records from 2010 to 2018. 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.

Other than the current hourly temperature, the average 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.

APPENDIX C PEAK DEMAND

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 2018, Table 62 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 62: Normalized July Peak Load Factors and Weather Conditions (Fahrenheit)

LRZ	Normal LF	Temp	AVGT-L1	AVGT_L2	Hour
LRZ1	0.6343	92.7	85.0	81.6	16
LRZ2	0.6010	89.8	82.6	83.3	16
LRZ3	0.6026	95.0	87.2	84.5	16
LRZ4	0.5972	92.7	83.4	80.0	16
LRZ5	0.5483	96.7	89.8	87.9	16
LRZ6	0.6525	92.9	85.0	83.3	16
LRZ7	0.5439	92.1	81.3	80.0	16
LRZ8	0.5879	97.1	89.2	87.7	16
LRZ9	0.6335	96.0	87.0	85.9	16
LRZ10	0.5557	93.8	86.3	85.9	16

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

$$fitted\ monthly\ peak\ load\ factor_{mij} = C + Temp_{mijt} + Temp_{mijt}^2 + h_t * Temp_{mijt} + h_t + average\ daily\ temp_{mij-1} + average\ daily\ temp_{mij-2}$$

where m represents month, i indicates zone, j is a given year and t represents the hour. The variable $Temp_{mijt}$ is the hourly temperature when the peak occurs, h_t is the hour when the peak occurs. The $average\ daily\ temp_{mij-1}$ is the average daily temperature of the day which is one day before the day when monthly peak occurs, and $average\ daily\ temp_{mij-2}$ is the average daily temperature of the day which is two days before the day when monthly peak occurs. By fitting the actual temperature records and the time when peak occurred, we can obtain the fitted monthly peak load factor via the regression model.

Given the actual hourly LRZ load records from 2010 to 2017 and historical hourly temperature records, we estimate the most likely hourly temperature and the hour that monthly peak may occur. The fitted normal monthly peak load factor is derived by fitting the most likely peak weather condition inputs into the equation .

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:

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

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

APPENDIX C PEAK DEMAND

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

Table 63: Gross January Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	13,951	9,162	7,287	7,527	6,254	14,170	13,918	6,454	17,371	3,643
2019	14,297	9,304	7,442	7,544	6,283	14,410	13,968	6,565	17,493	3,719
2020	14,544	9,405	7,744	7,605	6,322	14,663	14,133	6,656	17,684	3,813
2021	14,825	9,480	7,917	7,643	6,373	14,839	14,279	6,729	17,898	3,898
2022	15,087	9,562	8,050	7,686	6,436	15,025	14,345	6,802	18,031	3,978
2023	15,306	9,638	8,185	7,730	6,493	15,176	14,412	6,871	18,182	4,025
2024	15,501	9,721	8,325	7,770	6,558	15,344	14,477	6,943	18,306	4,076
2025	15,692	9,826	8,475	7,817	6,614	15,517	14,644	7,021	18,428	4,130
2026	15,870	9,939	8,628	7,866	6,663	15,685	14,808	7,087	18,534	4,185
2027	16,035	10,053	8,771	7,913	6,700	15,842	14,939	7,148	18,631	4,239
2028	16,198	10,173	8,920	7,960	6,728	16,007	15,070	7,221	18,768	4,295
2029	16,359	10,295	9,072	8,014	6,754	16,170	15,199	7,292	18,933	4,355
2030	16,499	10,401	9,223	8,063	6,775	16,331	15,344	7,363	19,103	4,419
2031	16,609	10,500	9,376	8,115	6,790	16,487	15,482	7,428	19,275	4,479
2032	16,717	10,601	9,524	8,164	6,801	16,641	15,631	7,498	19,436	4,537
2033	16,825	10,703	9,672	8,219	6,806	16,796	15,769	7,570	19,609	4,596
2034	16,937	10,809	9,830	8,273	6,807	16,951	15,926	7,646	19,795	4,656
2035	17,051	10,915	10,003	8,331	6,813	17,107	16,073	7,726	19,977	4,718
2036	17,172	11,022	10,169	8,390	6,817	17,267	16,217	7,801	20,167	4,779
2037	17,289	11,130	10,332	8,442	6,821	17,432	16,343	7,879	20,359	4,843
2038	17,407	11,240	10,493	8,500	6,827	17,599	16,501	7,958	20,540	4,908
2039	17,523	11,356	10,655	8,557	6,833	17,761	16,661	8,041	20,734	4,973
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

Table 64: Gross February Non-Coincident Peak Demand (Metered Load in MW)

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	13,492	8,850	6,758	7,068	6,083	13,755	13,695	5,850	15,585	3,196
2019	13,827	8,987	6,902	7,083	6,111	13,988	13,744	5,950	15,694	3,262
2020	14,066	9,084	7,182	7,141	6,149	14,233	13,906	6,033	15,866	3,345
2021	14,338	9,156	7,342	7,177	6,198	14,404	14,050	6,099	16,058	3,420
2022	14,591	9,235	7,466	7,217	6,260	14,584	14,115	6,165	16,178	3,489
2023	14,802	9,309	7,591	7,258	6,315	14,731	14,181	6,228	16,313	3,531
2024	14,991	9,389	7,720	7,296	6,379	14,895	14,245	6,293	16,424	3,576
2025	15,176	9,491	7,859	7,340	6,433	15,062	14,408	6,363	16,533	3,624
2026	15,348	9,600	8,001	7,386	6,481	15,225	14,570	6,423	16,628	3,672
2027	15,508	9,710	8,134	7,429	6,517	15,378	14,699	6,479	16,715	3,719
2028	15,665	9,826	8,272	7,474	6,544	15,538	14,828	6,545	16,839	3,768
2029	15,821	9,944	8,413	7,525	6,570	15,696	14,955	6,609	16,987	3,821
2030	15,957	10,047	8,553	7,570	6,589	15,852	15,098	6,673	17,139	3,876
2031	16,063	10,142	8,695	7,619	6,604	16,004	15,234	6,732	17,294	3,929
2032	16,167	10,239	8,832	7,666	6,615	16,153	15,380	6,796	17,438	3,980
2033	16,272	10,338	8,970	7,718	6,620	16,303	15,516	6,861	17,593	4,032
2034	16,380	10,440	9,116	7,768	6,621	16,454	15,671	6,930	17,760	4,084
2035	16,490	10,543	9,276	7,823	6,627	16,606	15,815	7,002	17,923	4,139
2036	16,607	10,646	9,431	7,878	6,630	16,761	15,957	7,071	18,094	4,193
2037	16,721	10,750	9,582	7,927	6,635	16,921	16,081	7,141	18,266	4,249
2038	16,835	10,857	9,731	7,981	6,641	17,083	16,236	7,213	18,429	4,306
2039	16,947	10,969	9,881	8,035	6,646	17,240	16,393	7,288	18,602	4,363
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	12,969	8,295	6,457	6,458	5,378	12,377	12,625	5,090	14,988	2,897
2019	13,291	8,423	6,595	6,472	5,402	12,587	12,670	5,177	15,093	2,958
2020	13,521	8,514	6,862	6,525	5,435	12,808	12,819	5,248	15,259	3,032
2021	13,782	8,582	7,015	6,557	5,479	12,961	12,952	5,306	15,443	3,101
2022	14,025	8,656	7,134	6,594	5,534	13,123	13,012	5,364	15,558	3,164
2023	14,228	8,725	7,253	6,632	5,583	13,255	13,072	5,418	15,688	3,202
2024	14,410	8,800	7,377	6,666	5,639	13,403	13,131	5,474	15,795	3,242
2025	14,588	8,895	7,510	6,707	5,687	13,554	13,282	5,536	15,900	3,285
2026	14,753	8,997	7,646	6,749	5,729	13,700	13,432	5,588	15,992	3,329
2027	14,907	9,101	7,773	6,788	5,761	13,838	13,551	5,637	16,075	3,372
2028	15,058	9,209	7,904	6,830	5,785	13,981	13,669	5,694	16,194	3,416
2029	15,208	9,320	8,039	6,875	5,808	14,124	13,786	5,750	16,336	3,464
2030	15,338	9,416	8,173	6,917	5,825	14,264	13,918	5,806	16,483	3,515
2031	15,440	9,506	8,308	6,962	5,838	14,401	14,043	5,857	16,631	3,562
2032	15,540	9,597	8,440	7,004	5,848	14,535	14,178	5,912	16,770	3,609
2033	15,641	9,689	8,571	7,052	5,852	14,670	14,303	5,969	16,919	3,656
2034	15,745	9,785	8,711	7,098	5,853	14,806	14,446	6,029	17,080	3,703
2035	15,851	9,881	8,864	7,148	5,858	14,942	14,579	6,092	17,237	3,753
2036	15,963	9,978	9,011	7,198	5,861	15,082	14,710	6,152	17,401	3,801
2037	16,073	10,076	9,155	7,243	5,865	15,226	14,824	6,213	17,566	3,852
2038	16,182	10,176	9,298	7,293	5,870	15,372	14,967	6,275	17,723	3,904
2039	16,290	10,280	9,442	7,342	5,875	15,513	15,112	6,341	17,890	3,956
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	11,509	7,781	6,041	5,501	4,795	11,024	12,140	4,672	14,804	2,908
2019	11,794	7,901	6,169	5,514	4,817	11,211	12,184	4,752	14,908	2,969
2020	11,998	7,987	6,420	5,558	4,846	11,408	12,328	4,818	15,071	3,044
2021	12,230	8,050	6,563	5,586	4,886	11,545	12,455	4,871	15,253	3,112
2022	12,446	8,120	6,673	5,618	4,934	11,689	12,513	4,924	15,367	3,176
2023	12,626	8,185	6,785	5,649	4,978	11,807	12,571	4,974	15,495	3,214
2024	12,788	8,255	6,901	5,679	5,028	11,938	12,628	5,025	15,601	3,254
2025	12,945	8,345	7,025	5,713	5,071	12,072	12,773	5,082	15,704	3,298
2026	13,092	8,440	7,152	5,749	5,108	12,203	12,916	5,130	15,795	3,341
2027	13,228	8,537	7,271	5,783	5,137	12,325	13,031	5,174	15,877	3,385
2028	13,362	8,639	7,395	5,818	5,158	12,453	13,145	5,227	15,995	3,429
2029	13,495	8,743	7,521	5,857	5,178	12,581	13,257	5,278	16,135	3,477
2030	13,611	8,833	7,645	5,893	5,194	12,706	13,384	5,329	16,280	3,528
2031	13,702	8,917	7,772	5,931	5,206	12,827	13,504	5,377	16,427	3,576
2032	13,790	9,002	7,895	5,967	5,214	12,947	13,634	5,427	16,564	3,623
2033	13,880	9,089	8,018	6,007	5,218	13,067	13,755	5,479	16,711	3,670
2034	13,972	9,179	8,149	6,047	5,219	13,188	13,892	5,535	16,869	3,717
2035	14,066	9,270	8,292	6,089	5,223	13,309	14,020	5,592	17,025	3,767
2036	14,166	9,360	8,430	6,132	5,226	13,434	14,146	5,647	17,187	3,816
2037	14,263	9,452	8,565	6,170	5,230	13,562	14,255	5,703	17,350	3,867
2038	14,360	9,546	8,698	6,213	5,234	13,692	14,393	5,761	17,505	3,919
2039	14,456	9,644	8,833	6,254	5,238	13,818	14,532	5,821	17,670	3,971
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	12,811	9,053	7,179	7,094	5,696	13,560	15,507	5,870	18,197	3,684
2019	13,129	9,193	7,332	7,110	5,722	13,790	15,563	5,970	18,324	3,760
2020	13,356	9,293	7,630	7,168	5,757	14,032	15,746	6,053	18,525	3,855
2021	13,614	9,367	7,800	7,204	5,804	14,200	15,909	6,120	18,748	3,942
2022	13,855	9,448	7,931	7,244	5,861	14,378	15,983	6,186	18,889	4,022
2023	14,055	9,523	8,064	7,285	5,913	14,522	16,057	6,249	19,046	4,070
2024	14,235	9,605	8,202	7,324	5,972	14,684	16,130	6,314	19,176	4,122
2025	14,410	9,709	8,349	7,368	6,024	14,849	16,315	6,385	19,304	4,177
2026	14,573	9,820	8,500	7,414	6,068	15,010	16,498	6,445	19,415	4,232
2027	14,725	9,933	8,641	7,458	6,102	15,160	16,645	6,501	19,516	4,287
2028	14,874	10,052	8,788	7,503	6,127	15,318	16,791	6,567	19,661	4,343
2029	15,022	10,172	8,938	7,553	6,151	15,474	16,934	6,632	19,833	4,404
2030	15,151	10,278	9,086	7,599	6,170	15,628	17,095	6,696	20,011	4,468
2031	15,252	10,375	9,237	7,648	6,184	15,778	17,250	6,755	20,192	4,529
2032	15,351	10,474	9,383	7,695	6,194	15,924	17,415	6,819	20,360	4,588
2033	15,451	10,575	9,529	7,747	6,198	16,073	17,569	6,885	20,541	4,648
2034	15,553	10,680	9,684	7,798	6,200	16,222	17,744	6,954	20,736	4,708
2035	15,658	10,785	9,855	7,852	6,205	16,371	17,908	7,026	20,927	4,771
2036	15,769	10,890	10,019	7,907	6,208	16,524	18,069	7,095	21,126	4,833
2037	15,877	10,997	10,179	7,957	6,212	16,682	18,209	7,166	21,326	4,898
2038	15,985	11,106	10,337	8,012	6,218	16,841	18,384	7,238	21,517	4,963
2039	16,092	11,221	10,497	8,065	6,223	16,996	18,562	7,313	21,719	5,029
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	14,908	10,529	8,189	8,688	7,219	14,955	18,808	7,240	19,460	4,219
2019	15,278	10,692	8,364	8,708	7,252	15,208	18,876	7,364	19,596	4,307
2020	15,543	10,808	8,703	8,778	7,297	15,475	19,099	7,466	19,811	4,416
2021	15,843	10,894	8,897	8,822	7,355	15,661	19,296	7,548	20,050	4,515
2022	16,123	10,988	9,047	8,872	7,429	15,857	19,385	7,630	20,200	4,607
2023	16,356	11,076	9,199	8,922	7,494	16,016	19,476	7,707	20,369	4,662
2024	16,565	11,171	9,356	8,969	7,569	16,194	19,563	7,787	20,508	4,721
2025	16,769	11,292	9,524	9,023	7,634	16,377	19,789	7,875	20,644	4,784
2026	16,959	11,422	9,696	9,079	7,691	16,554	20,011	7,949	20,763	4,848
2027	17,136	11,553	9,857	9,133	7,733	16,720	20,188	8,018	20,871	4,910
2028	17,309	11,691	10,025	9,188	7,766	16,893	20,365	8,100	21,026	4,975
2029	17,482	11,831	10,196	9,250	7,796	17,066	20,539	8,179	21,210	5,045
2030	17,632	11,953	10,365	9,306	7,820	17,236	20,735	8,259	21,401	5,118
2031	17,749	12,067	10,536	9,366	7,837	17,401	20,922	8,332	21,594	5,187
2032	17,864	12,182	10,703	9,423	7,850	17,562	21,123	8,410	21,774	5,255
2033	17,980	12,300	10,870	9,487	7,855	17,726	21,310	8,491	21,967	5,324
2034	18,099	12,422	11,047	9,549	7,857	17,890	21,522	8,577	22,175	5,393
2035	18,221	12,544	11,241	9,617	7,864	18,055	21,721	8,666	22,380	5,465
2036	18,350	12,666	11,428	9,684	7,868	18,224	21,915	8,751	22,593	5,536
2037	18,476	12,790	11,611	9,745	7,873	18,398	22,085	8,838	22,807	5,610
2038	18,602	12,917	11,792	9,811	7,880	18,573	22,298	8,927	23,011	5,685
2039	18,726	13,050	11,974	9,877	7,887	18,745	22,514	9,020	23,227	5,760
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	16,850	11,874	9,109	9,117	7,738	15,709	20,421	7,333	19,834	4,351
2019	17,268	12,058	9,303	9,137	7,773	15,975	20,494	7,458	19,973	4,442
2020	17,567	12,189	9,681	9,211	7,821	16,255	20,736	7,562	20,191	4,554
2021	17,906	12,285	9,897	9,257	7,884	16,450	20,950	7,645	20,435	4,656
2022	18,222	12,392	10,064	9,309	7,963	16,656	21,047	7,728	20,588	4,751
2023	18,486	12,490	10,232	9,362	8,033	16,823	21,145	7,806	20,760	4,808
2024	18,722	12,598	10,407	9,411	8,113	17,010	21,240	7,887	20,901	4,869
2025	18,953	12,734	10,594	9,468	8,183	17,202	21,485	7,976	21,040	4,934
2026	19,167	12,880	10,786	9,527	8,243	17,388	21,726	8,051	21,162	4,999
2027	19,367	13,029	10,965	9,583	8,289	17,562	21,919	8,121	21,272	5,064
2028	19,563	13,184	11,151	9,641	8,324	17,745	22,111	8,204	21,429	5,131
2029	19,758	13,342	11,341	9,706	8,356	17,926	22,299	8,284	21,618	5,202
2030	19,928	13,480	11,529	9,765	8,381	18,104	22,512	8,365	21,812	5,278
2031	20,060	13,608	11,720	9,828	8,401	18,277	22,715	8,439	22,008	5,349
2032	20,190	13,738	11,906	9,888	8,414	18,448	22,933	8,518	22,192	5,420
2033	20,321	13,871	12,091	9,955	8,420	18,619	23,136	8,600	22,389	5,490
2034	20,456	14,008	12,288	10,020	8,422	18,792	23,367	8,687	22,601	5,561
2035	20,594	14,146	12,504	10,091	8,429	18,965	23,583	8,777	22,810	5,636
2036	20,740	14,284	12,713	10,161	8,433	19,142	23,794	8,863	23,027	5,709
2037	20,882	14,424	12,916	10,225	8,439	19,325	23,978	8,951	23,245	5,785
2038	21,024	14,567	13,117	10,295	8,447	19,509	24,210	9,041	23,453	5,863
2039	21,164	14,717	13,320	10,364	8,453	19,689	24,444	9,135	23,673	5,940
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	16,253	11,386	8,443	8,804	7,424	15,385	19,440	7,596	20,045	4,475
2019	16,656	11,562	8,624	8,824	7,457	15,646	19,510	7,726	20,185	4,569
2020	16,945	11,688	8,974	8,896	7,503	15,921	19,740	7,833	20,406	4,684
2021	17,272	11,781	9,174	8,940	7,564	16,112	19,944	7,920	20,653	4,789
2022	17,577	11,882	9,328	8,991	7,639	16,313	20,036	8,006	20,807	4,887
2023	17,831	11,977	9,485	9,042	7,707	16,477	20,129	8,087	20,981	4,945
2024	18,059	12,080	9,646	9,089	7,784	16,660	20,220	8,171	21,124	5,007
2025	18,282	12,211	9,820	9,144	7,851	16,848	20,453	8,262	21,264	5,074
2026	18,488	12,351	9,998	9,201	7,909	17,030	20,682	8,341	21,387	5,142
2027	18,682	12,493	10,164	9,255	7,953	17,201	20,866	8,413	21,498	5,208
2028	18,871	12,642	10,336	9,311	7,986	17,380	21,049	8,499	21,657	5,277
2029	19,059	12,793	10,512	9,374	8,017	17,557	21,228	8,582	21,848	5,350
2030	19,222	12,926	10,687	9,431	8,041	17,732	21,431	8,665	22,044	5,429
2031	19,350	13,049	10,864	9,492	8,060	17,902	21,624	8,742	22,242	5,502
2032	19,475	13,174	11,036	9,550	8,072	18,068	21,832	8,824	22,428	5,574
2033	19,602	13,301	11,208	9,614	8,078	18,236	22,025	8,909	22,627	5,646
2034	19,732	13,432	11,390	9,677	8,080	18,405	22,245	8,999	22,842	5,720
2035	19,865	13,565	11,591	9,745	8,087	18,574	22,450	9,092	23,052	5,796
2036	20,005	13,697	11,784	9,814	8,091	18,748	22,651	9,181	23,272	5,871
2037	20,142	13,831	11,972	9,875	8,096	18,927	22,827	9,273	23,492	5,950
2038	20,280	13,968	12,158	9,943	8,104	19,108	23,047	9,366	23,702	6,030
2039	20,415	14,112	12,346	10,010	8,110	19,284	23,270	9,464	23,925	6,110
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	14,320	10,520	8,339	8,699	7,198	15,497	18,765	6,724	18,969	4,142
2019	14,675	10,683	8,517	8,718	7,231	15,760	18,833	6,839	19,102	4,229
2020	14,930	10,799	8,863	8,789	7,276	16,037	19,055	6,934	19,311	4,336
2021	15,218	10,884	9,060	8,833	7,334	16,229	19,252	7,010	19,544	4,433
2022	15,487	10,978	9,213	8,883	7,408	16,432	19,341	7,087	19,690	4,523
2023	15,711	11,066	9,367	8,933	7,473	16,597	19,431	7,158	19,855	4,577
2024	15,912	11,161	9,527	8,980	7,548	16,781	19,518	7,233	19,990	4,635
2025	16,108	11,282	9,699	9,034	7,613	16,970	19,743	7,314	20,123	4,697
2026	16,290	11,412	9,874	9,090	7,669	17,154	19,965	7,383	20,239	4,759
2027	16,460	11,543	10,038	9,144	7,711	17,326	20,141	7,447	20,344	4,821
2028	16,627	11,680	10,208	9,199	7,744	17,506	20,318	7,523	20,495	4,885
2029	16,792	11,820	10,382	9,261	7,774	17,685	20,491	7,597	20,675	4,953
2030	16,936	11,943	10,555	9,317	7,797	17,861	20,687	7,670	20,861	5,025
2031	17,049	12,056	10,729	9,378	7,815	18,032	20,874	7,738	21,048	5,093
2032	17,159	12,172	10,899	9,435	7,828	18,199	21,074	7,811	21,224	5,160
2033	17,271	12,289	11,069	9,499	7,833	18,369	21,260	7,886	21,413	5,227
2034	17,385	12,411	11,249	9,561	7,835	18,539	21,472	7,966	21,616	5,295
2035	17,502	12,533	11,447	9,628	7,841	18,709	21,671	8,048	21,815	5,365
2036	17,626	12,655	11,638	9,695	7,846	18,884	21,865	8,127	22,022	5,435
2037	17,747	12,779	11,824	9,756	7,851	19,065	22,034	8,208	22,231	5,508
2038	17,868	12,906	12,008	9,823	7,858	19,247	22,247	8,291	22,430	5,582
2039	17,987	13,039	12,194	9,889	7,864	19,424	22,462	8,377	22,641	5,655
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	11,761	8,370	6,230	6,452	5,080	11,537	12,799	5,442	15,872	3,240
2019	12,052	8,500	6,363	6,467	5,103	11,732	12,845	5,535	15,983	3,308
2020	12,261	8,592	6,621	6,519	5,135	11,938	12,996	5,612	16,158	3,391
2021	12,498	8,660	6,769	6,552	5,176	12,081	13,131	5,673	16,353	3,467
2022	12,719	8,735	6,883	6,589	5,228	12,233	13,192	5,735	16,475	3,538
2023	12,903	8,804	6,998	6,626	5,274	12,356	13,253	5,793	16,613	3,580
2024	13,068	8,880	7,118	6,661	5,327	12,493	13,313	5,853	16,726	3,625
2025	13,229	8,976	7,246	6,701	5,372	12,634	13,466	5,919	16,837	3,674
2026	13,378	9,079	7,377	6,743	5,412	12,770	13,617	5,975	16,934	3,722
2027	13,518	9,184	7,499	6,783	5,442	12,899	13,738	6,027	17,023	3,770
2028	13,655	9,293	7,627	6,824	5,465	13,032	13,858	6,088	17,149	3,820
2029	13,791	9,404	7,757	6,870	5,486	13,166	13,976	6,148	17,299	3,874
2030	13,909	9,502	7,885	6,911	5,503	13,296	14,110	6,208	17,455	3,930
2031	14,001	9,592	8,016	6,956	5,515	13,424	14,237	6,262	17,612	3,983
2032	14,092	9,684	8,143	6,999	5,524	13,549	14,374	6,322	17,759	4,036
2033	14,184	9,777	8,270	7,046	5,528	13,675	14,501	6,382	17,917	4,088
2034	14,278	9,874	8,404	7,092	5,529	13,801	14,646	6,447	18,086	4,141
2035	14,374	9,971	8,552	7,142	5,534	13,928	14,781	6,513	18,253	4,196
2036	14,476	10,069	8,695	7,192	5,537	14,059	14,913	6,577	18,427	4,251
2037	14,575	10,167	8,833	7,237	5,540	14,193	15,029	6,643	18,602	4,308
2038	14,674	10,268	8,971	7,287	5,545	14,328	15,174	6,710	18,768	4,366
2039	14,772	10,374	9,110	7,336	5,550	14,461	15,321	6,780	18,944	4,423
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	13,085	8,527	6,632	6,377	5,100	11,934	13,086	5,185	15,231	2,946
2019	13,410	8,659	6,773	6,392	5,123	12,136	13,133	5,274	15,338	3,007
2020	13,642	8,753	7,048	6,443	5,155	12,349	13,288	5,347	15,506	3,083
2021	13,905	8,823	7,205	6,476	5,196	12,497	13,426	5,406	15,693	3,153
2022	14,151	8,899	7,327	6,512	5,248	12,653	13,488	5,465	15,810	3,217
2023	14,356	8,970	7,450	6,549	5,295	12,780	13,550	5,520	15,942	3,255
2024	14,539	9,047	7,577	6,583	5,348	12,923	13,611	5,577	16,051	3,296
2025	14,718	9,145	7,713	6,623	5,393	13,068	13,768	5,640	16,157	3,340
2026	14,885	9,250	7,853	6,665	5,433	13,209	13,923	5,693	16,250	3,385
2027	15,040	9,356	7,983	6,704	5,464	13,342	14,046	5,743	16,335	3,428
2028	15,192	9,468	8,119	6,745	5,486	13,481	14,169	5,801	16,456	3,474
2029	15,344	9,581	8,257	6,790	5,508	13,618	14,290	5,858	16,601	3,522
2030	15,475	9,681	8,394	6,831	5,524	13,754	14,426	5,915	16,750	3,574
2031	15,578	9,773	8,533	6,875	5,537	13,885	14,557	5,967	16,901	3,622
2032	15,679	9,866	8,668	6,917	5,546	14,014	14,696	6,024	17,042	3,669
2033	15,781	9,961	8,803	6,964	5,550	14,145	14,826	6,082	17,193	3,717
2034	15,886	10,060	8,946	7,010	5,551	14,276	14,974	6,143	17,356	3,765
2035	15,993	10,159	9,104	7,059	5,556	14,407	15,112	6,207	17,516	3,816
2036	16,106	10,258	9,255	7,108	5,559	14,542	15,248	6,267	17,683	3,865
2037	16,216	10,359	9,403	7,153	5,562	14,681	15,366	6,330	17,850	3,917
2038	16,327	10,461	9,550	7,202	5,567	14,821	15,514	6,393	18,010	3,970
2039	16,436	10,569	9,697	7,250	5,572	14,958	15,664	6,460	18,179	4,022
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	13,973	8,947	6,964	6,961	5,817	12,898	13,794	5,854	15,770	3,222
2019	14,320	9,085	7,113	6,977	5,844	13,117	13,843	5,954	15,881	3,290
2020	14,568	9,183	7,401	7,033	5,880	13,347	14,006	6,037	16,055	3,373
2021	14,849	9,256	7,566	7,069	5,927	13,507	14,151	6,103	16,248	3,448
2022	15,111	9,336	7,694	7,108	5,986	13,676	14,217	6,170	16,370	3,518
2023	15,330	9,411	7,823	7,149	6,039	13,814	14,283	6,232	16,507	3,561
2024	15,526	9,492	7,956	7,186	6,100	13,967	14,347	6,297	16,619	3,606
2025	15,717	9,594	8,099	7,229	6,152	14,125	14,512	6,368	16,730	3,654
2026	15,895	9,705	8,246	7,275	6,197	14,277	14,675	6,428	16,826	3,702
2027	16,061	9,816	8,383	7,318	6,232	14,421	14,805	6,484	16,914	3,750
2028	16,224	9,933	8,525	7,362	6,258	14,570	14,935	6,550	17,039	3,800
2029	16,385	10,052	8,670	7,411	6,282	14,719	15,063	6,614	17,189	3,853
2030	16,526	10,156	8,814	7,456	6,301	14,866	15,206	6,678	17,343	3,909
2031	16,636	10,253	8,960	7,505	6,316	15,008	15,344	6,737	17,499	3,962
2032	16,743	10,351	9,102	7,550	6,326	15,148	15,491	6,801	17,645	4,014
2033	16,852	10,451	9,244	7,601	6,330	15,288	15,628	6,866	17,802	4,066
2034	16,964	10,554	9,395	7,651	6,332	15,430	15,784	6,935	17,971	4,119
2035	17,078	10,658	9,560	7,705	6,337	15,572	15,930	7,007	18,136	4,174
2036	17,199	10,762	9,719	7,759	6,340	15,718	16,072	7,076	18,309	4,228
2037	17,317	10,868	9,874	7,808	6,344	15,868	16,197	7,146	18,483	4,284
2038	17,435	10,975	10,028	7,861	6,350	16,019	16,353	7,218	18,648	4,342
2039	17,551	11,088	10,183	7,914	6,355	16,167	16,511	7,294	18,823	4,399
Compound Annual Growth Rates (%)										
2020-2024	1.61	0.83	1.82	0.54	0.92	1.14	0.60	1.06	0.87	1.68
2020-2029	1.31	1.01	1.77	0.58	0.74	1.09	0.81	1.02	0.76	1.49
2020-2039	0.99	1.00	1.69	0.62	0.41	1.01	0.87	1.00	0.84	1.41

APPENDIX C PEAK DEMAND

Table 75: 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
2018	96,390	91,500	84,976	77,239	93,771	110,431	118,071	114,309	109,763	83,576	85,170	91,262
2019	97,639	92,685	86,079	78,234	94,949	111,810	119,557	115,753	111,136	84,637	86,275	92,450
2020	99,136	94,100	87,402	79,433	96,393	113,499	121,372	117,510	112,826	85,924	87,599	93,869
2021	100,405	95,299	88,521	80,453	97,619	114,931	122,909	119,002	114,251	87,016	88,725	95,074
2022	101,494	96,329	89,480	81,319	98,654	116,142	124,211	120,267	115,458	87,944	89,684	96,105
2023	102,478	97,259	90,347	82,103	99,593	117,240	125,392	121,412	116,552	88,785	90,552	97,037
2024	103,452	98,180	91,205	82,877	100,520	118,327	126,561	122,544	117,636	89,615	91,409	97,959
2025	104,558	99,233	92,186	83,765	101,588	119,591	127,919	123,857	118,897	90,569	92,391	99,012
2026	105,624	100,249	93,133	84,622	102,618	120,811	129,232	125,125	120,116	91,490	93,339	100,029
2027	106,600	101,178	94,000	85,406	103,559	121,923	130,429	126,282	121,227	92,332	94,206	100,959
2028	107,635	102,160	94,915	86,238	104,561	123,101	131,694	127,506	122,402	93,227	95,124	101,943
2029	108,701	103,170	95,855	87,096	105,596	124,313	132,995	128,765	123,611	94,150	96,070	102,954
2030	109,741	104,154	96,773	87,934	106,611	125,501	134,268	129,999	124,797	95,054	96,993	103,940
2031	110,727	105,086	97,641	88,728	107,576	126,629	135,475	131,167	125,923	95,912	97,866	104,872
2032	111,701	106,008	98,499	89,514	108,531	127,747	136,671	132,325	127,038	96,760	98,730	105,795
2033	112,683	106,935	99,363	90,305	109,492	128,869	137,871	133,488	128,158	97,615	99,600	106,722
2034	113,711	107,908	100,268	91,136	110,502	130,050	139,133	134,711	129,336	98,513	100,513	107,696
2035	114,758	108,896	101,189	91,979	111,527	131,247	140,415	135,953	130,531	99,425	101,441	108,687
2036	115,808	109,888	102,113	92,826	112,556	132,447	141,698	137,197	131,729	100,339	102,372	109,680
2037	116,841	110,862	103,020	93,657	113,566	133,623	142,956	138,416	132,902	101,237	103,286	110,655
2038	117,907	111,870	103,958	94,516	114,610	134,845	144,263	139,682	134,121	102,166	104,231	111,664
2039	118,988	112,891	104,908	95,388	115,670	136,084	145,588	140,966	135,357	103,109	105,190	112,686
Compound Annual Growth Rates (%)												
2020-2024	1.07	1.07	1.07	1.07	1.05	1.05	1.05	1.05	1.05	1.06	1.07	1.07
2020-2029	1.03	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.03
2020-2039	0.97	0.96	0.97	0.97	0.96	0.96	0.96	0.96	0.96	0.96	0.97	0.97

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	48,581	145,558	110,611	48,559	79,702	92,210	110,681	69,942
2019	49,829	148,596	113,864	49,923	82,441	92,682	111,530	72,546
2020	50,908	150,230	116,218	53,181	85,745	96,094	113,242	73,536
2021	51,813	151,422	117,826	54,657	87,559	97,370	116,642	75,102
2022	52,609	152,501	119,420	55,774	89,377	98,072	117,966	76,508
2023	53,336	153,599	121,138	56,886	90,592	98,884	119,060	77,625
2024	54,069	154,627	122,916	58,013	91,835	99,489	120,173	78,678
2025	54,855	155,716	124,866	59,200	92,996	99,935	121,995	79,664
2026	55,525	156,833	126,609	60,429	94,076	100,468	123,844	80,505
2027	56,162	157,877	128,469	61,568	95,043	100,724	125,319	81,326
2028	56,878	158,936	130,372	62,768	95,979	101,338	126,911	82,099
2029	57,576	160,127	132,466	63,914	96,865	102,030	128,198	82,883
2030	58,255	161,255	134,196	65,099	97,752	102,869	129,727	83,552
2031	58,900	162,373	136,141	66,295	98,596	103,546	131,269	84,041
2032	59,580	163,474	137,921	67,508	99,446	104,288	132,880	84,579
2033	60,271	164,730	139,851	68,653	100,204	104,964	134,319	85,091
2034	60,987	165,909	141,744	69,873	100,958	105,803	136,066	85,565
2035	61,733	167,156	143,851	71,213	101,656	106,527	137,547	86,058
2036	62,449	168,451	145,891	72,506	102,352	107,345	139,006	86,585
2037	63,158	169,655	147,906	73,764	103,088	108,152	140,240	87,130
2038	63,897	170,908	150,006	74,965	103,798	108,897	141,886	87,621
2039	64,676	172,129	152,113	76,303	104,405	109,658	143,437	88,134
Compound Annual Growth Rates (%)								
2020-2024	1.52	0.72	1.41	2.20	1.73	0.87	1.50	1.70
2020-2029	1.38	0.71	1.46	2.06	1.36	0.67	1.39	1.34
2020-2039	1.27	0.72	1.43	1.92	1.04	0.70	1.25	0.96

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	51,982	84,864	18,113	18,938	12,823	409,132	72,586
2019	54,061	86,489	19,178	20,127	13,237	421,798	74,079
2020	56,177	88,240	20,774	21,946	13,930	439,159	75,127
2021	57,731	90,192	21,825	22,872	14,300	447,064	75,955
2022	59,161	92,284	22,453	24,138	14,751	454,570	76,839
2023	60,109	94,028	22,877	25,198	15,183	462,045	77,557
2024	61,052	95,796	23,274	26,147	15,563	469,943	78,332
2025	62,066	97,454	23,581	26,955	15,930	477,822	79,260
2026	62,977	98,920	24,073	27,723	16,282	485,790	80,223
2027	63,907	100,204	24,552	28,394	16,598	494,396	81,234
2028	64,830	101,404	24,994	28,986	16,896	503,938	82,231
2029	65,828	102,562	25,501	29,583	17,188	513,111	83,291
2030	66,863	103,596	25,933	30,138	17,483	522,701	84,191
2031	67,842	104,540	26,303	30,671	17,755	532,319	85,017
2032	68,774	105,461	26,663	31,063	17,983	541,959	85,865
2033	69,705	106,289	27,063	31,501	18,225	551,563	86,687
2034	70,644	107,105	27,573	31,902	18,458	562,182	87,580
2035	71,630	107,988	28,139	32,304	18,687	572,772	88,438
2036	72,591	108,764	28,613	32,659	18,924	583,298	89,303
2037	73,603	109,654	29,028	33,104	19,161	594,589	90,203
2038	74,605	110,549	29,497	33,512	19,392	605,893	91,085
2039	75,590	111,488	29,913	33,918	19,627	617,963	92,045
Compound Annual Growth Rates (%)							
2020-2024	2.10	2.08	2.88	4.48	2.81	1.71	1.05
2020-2029	1.78	1.69	2.30	3.37	2.36	1.74	1.15
2020-2039	1.57	1.24	1.94	2.32	1.82	1.81	1.07

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
2018	93,631	62,519	48,085	47,696	37,163	89,793	97,297	37,767	110,062	21,181
2019	97,170	63,741	49,428	48,691	37,658	92,619	98,042	38,737	111,220	22,028
2020	99,579	64,648	52,498	49,227	38,214	95,289	99,547	39,576	115,418	22,890
2021	101,937	65,458	53,908	49,618	38,863	96,903	102,536	40,280	117,067	23,523
2022	104,135	66,218	54,982	49,971	39,570	98,513	103,700	40,899	118,152	24,106
2023	105,898	66,836	56,049	50,331	40,103	99,897	104,662	41,464	119,338	24,492
2024	107,555	67,501	57,127	50,668	40,659	101,322	105,640	42,035	120,354	24,876
2025	109,100	68,319	58,261	51,025	41,162	102,790	107,242	42,645	121,218	25,289
2026	110,556	69,166	59,432	51,390	41,574	104,122	108,868	43,166	122,169	25,660
2027	111,956	70,033	60,518	51,733	41,895	105,456	110,164	43,662	122,895	26,040
2028	113,269	70,895	61,660	52,080	42,170	106,796	111,564	44,219	124,011	26,416
2029	114,623	71,793	62,754	52,470	42,442	108,202	112,695	44,762	125,180	26,822
2030	115,806	72,576	63,883	52,840	42,655	109,436	114,039	45,290	126,512	27,244
2031	116,775	73,300	65,019	53,206	42,812	110,752	115,395	45,791	127,691	27,643
2032	117,735	74,044	66,171	53,567	42,957	111,993	116,811	46,320	128,933	28,023
2033	118,697	74,761	67,261	53,978	43,050	113,261	118,076	46,858	130,112	28,402
2034	119,657	75,547	68,419	54,365	43,123	114,511	119,612	47,414	131,501	28,784
2035	120,649	76,294	69,690	54,773	43,238	115,833	120,914	47,994	132,780	29,186
2036	121,630	77,045	70,919	55,198	43,298	117,124	122,196	48,551	134,144	29,578
2037	122,642	77,814	72,114	55,592	43,397	118,422	123,281	49,103	135,541	29,990
2038	123,605	78,588	73,256	56,003	43,492	119,748	124,727	49,678	136,880	30,398
2039	124,587	79,419	74,525	56,403	43,597	121,029	126,092	50,283	138,277	30,800
Compound Annual Growth Rates (%)										
2020-2024	1.94	1.09	2.13	0.72	1.56	1.55	1.50	1.52	1.05	2.10
2020-2029	1.58	1.17	2.00	0.71	1.17	1.42	1.39	1.38	0.91	1.78
2020-2039	1.19	1.09	1.86	0.72	0.70	1.27	1.25	1.27	0.96	1.57

APPENDIX D HIGH AND LOW FORECASTS

Gross Summer[18] Non-Coincident Peak Demand (Metered Load in MW) —High

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	16,850	11,874	9,109	9,117	7,738	15,709	20,421	7,596	20,045	4,475
2019	17,487	12,106	9,364	9,307	7,841	16,203	20,577	7,791	20,256	4,654
2020	17,920	12,279	9,945	9,409	7,957	16,670	20,893	7,960	21,020	4,836
2021	18,345	12,432	10,212	9,484	8,092	16,953	21,520	8,102	21,321	4,970
2022	18,740	12,577	10,416	9,551	8,239	17,234	21,765	8,226	21,518	5,093
2023	19,058	12,694	10,618	9,620	8,350	17,476	21,966	8,340	21,734	5,175
2024	19,356	12,820	10,822	9,685	8,466	17,726	22,172	8,455	21,919	5,256
2025	19,634	12,976	11,037	9,753	8,570	17,982	22,508	8,577	22,077	5,343
2026	19,896	13,137	11,259	9,823	8,656	18,215	22,849	8,682	22,250	5,422
2027	20,148	13,301	11,465	9,888	8,723	18,449	23,121	8,782	22,382	5,502
2028	20,384	13,465	11,681	9,954	8,780	18,683	23,415	8,894	22,586	5,581
2029	20,628	13,636	11,888	10,029	8,837	18,929	23,652	9,003	22,798	5,667
2030	20,841	13,784	12,102	10,100	8,881	19,145	23,935	9,109	23,041	5,756
2031	21,015	13,922	12,317	10,170	8,914	19,375	24,219	9,210	23,256	5,841
2032	21,188	14,063	12,535	10,239	8,944	19,592	24,516	9,317	23,482	5,921
2033	21,361	14,199	12,742	10,317	8,963	19,814	24,782	9,425	23,697	6,001
2034	21,534	14,349	12,961	10,391	8,979	20,033	25,104	9,537	23,950	6,082
2035	21,712	14,490	13,202	10,469	9,002	20,264	25,377	9,653	24,183	6,167
2036	21,889	14,633	13,435	10,550	9,015	20,490	25,646	9,765	24,431	6,249
2037	22,071	14,779	13,661	10,626	9,036	20,717	25,874	9,876	24,685	6,337
2038	22,244	14,926	13,878	10,704	9,055	20,949	26,178	9,992	24,929	6,423
2039	22,421	15,084	14,118	10,781	9,077	21,173	26,464	10,114	25,184	6,508
Compound Annual Growth Rates (%)										
2020-2024	1.94	1.09	2.13	0.72	1.56	1.55	1.50	1.52	1.05	2.10
2020-2029	1.58	1.17	2.00	0.71	1.17	1.42	1.39	1.38	0.91	1.78
2020-2039	1.19	1.09	1.86	0.72	0.70	1.27	1.25	1.27	0.96	1.57

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

APPENDIX D HIGH AND LOW FORECASTS

Gross Winter[19] Non-Coincident Peak Demand (Metered Load in MW) —High

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	13,973	9,162	7,287	7,527	6,254	14,170	13,918	6,454	17,371	3,643
2019	14,502	9,341	7,490	7,684	6,338	14,616	14,025	6,620	17,554	3,788
2020	14,861	9,474	7,956	7,769	6,431	15,037	14,240	6,764	18,216	3,937
2021	15,213	9,593	8,169	7,830	6,540	15,292	14,668	6,884	18,477	4,046
2022	15,541	9,704	8,332	7,886	6,659	15,546	14,834	6,990	18,648	4,146
2023	15,804	9,795	8,494	7,943	6,749	15,765	14,972	7,086	18,835	4,212
2024	16,051	9,892	8,657	7,996	6,843	15,989	15,112	7,184	18,995	4,278
2025	16,282	10,012	8,829	8,052	6,927	16,221	15,341	7,288	19,132	4,349
2026	16,499	10,136	9,007	8,110	6,997	16,431	15,573	7,377	19,282	4,413
2027	16,708	10,264	9,171	8,164	7,051	16,642	15,759	7,462	19,397	4,478
2028	16,904	10,390	9,344	8,219	7,097	16,853	15,959	7,557	19,573	4,543
2029	17,106	10,522	9,510	8,280	7,143	17,075	16,121	7,650	19,757	4,613
2030	17,283	10,636	9,681	8,339	7,179	17,270	16,313	7,740	19,967	4,686
2031	17,427	10,742	9,853	8,397	7,205	17,478	16,507	7,826	20,154	4,754
2032	17,571	10,851	10,028	8,454	7,229	17,673	16,710	7,916	20,350	4,820
2033	17,714	10,956	10,193	8,518	7,245	17,873	16,891	8,008	20,536	4,885
2034	17,857	11,072	10,368	8,579	7,257	18,071	17,110	8,103	20,755	4,951
2035	18,005	11,181	10,561	8,644	7,277	18,279	17,297	8,202	20,957	5,020
2036	18,152	11,291	10,747	8,711	7,287	18,483	17,480	8,297	21,172	5,087
2037	18,303	11,404	10,928	8,773	7,303	18,688	17,635	8,392	21,393	5,158
2038	18,447	11,517	11,101	8,838	7,319	18,897	17,842	8,490	21,604	5,228
2039	18,593	11,639	11,294	8,901	7,337	19,099	18,037	8,594	21,824	5,297
Compound Annual Growth Rates (%)										
2020-2024	1.94	1.09	2.13	0.72	1.56	1.55	1.50	1.52	1.05	2.10
2020-2029	1.58	1.17	2.00	0.71	1.17	1.42	1.39	1.38	0.91	1.78
2020-2039	1.19	1.09	1.86	0.72	0.70	1.27	1.25	1.27	0.96	1.57

[19] The winter peak is picked from monthly peak, 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
2018	645,192
2019	659,335
2020	676,887
2021	690,092
2022	700,246
2023	709,072
2024	717,737
2025	727,050
2026	736,104
2027	744,353
2028	753,080
2029	761,743
2030	770,280
2031	778,384
2032	786,554
2033	794,455
2034	802,934
2035	811,352
2036	819,683
2037	827,896
2038	836,375
2039	845,011
Compound Annual Growth Rates (%)	
2020-2024	1.48
2020-2029	1.32
2020-2039	1.17

APPENDIX D HIGH AND LOW FORECASTS

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

	MISO Summer[20] CP	MISO Winter[21] CP
2018	118,071	96,390
2019	120,613	98,526
2020	123,774	101,160
2021	126,205	103,117
2022	128,053	104,644
2023	129,656	105,970
2024	131,232	107,272
2025	132,942	108,663
2026	134,603	110,009
2027	136,112	111,238
2028	137,707	112,538
2029	139,284	113,832
2030	140,842	115,104
2031	142,322	116,311
2032	143,816	117,526
2033	145,257	118,703
2034	146,807	119,962
2035	148,343	121,218
2036	149,860	122,459
2037	151,352	123,685
2038	152,901	124,947
2039	154,477	126,233
Compound Annual Growth Rates (%)		
2020-2024	1.47	1.48
2020-2029	1.32	1.32
2020-2039	1.17	1.17

[20] 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.

[21] 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	45,394	140,517	102,820	46,118	76,878	86,835	106,515	69,488
2019	45,749	138,095	102,623	46,883	77,404	86,646	106,418	70,109
2020	45,998	138,705	102,663	47,751	78,317	84,991	107,242	70,556
2021	46,161	139,027	102,707	48,586	79,467	85,629	106,154	71,706
2022	46,432	139,592	102,906	49,208	80,709	86,023	105,910	72,710
2023	46,701	140,109	103,129	49,960	81,455	86,450	105,799	73,505
2024	46,982	140,794	103,758	50,714	82,265	86,789	105,714	74,207
2025	47,354	141,408	104,256	51,536	83,050	87,031	106,426	74,864
2026	47,656	142,048	105,122	52,328	83,792	87,138	107,177	75,444
2027	47,908	142,842	105,832	53,196	84,406	87,186	107,772	75,970
2028	48,259	143,612	106,625	54,018	85,037	87,501	108,216	76,469
2029	48,588	144,447	107,379	54,900	85,605	87,850	108,841	76,993
2030	48,925	145,127	108,287	55,742	86,180	88,290	109,570	77,418
2031	49,213	146,007	109,174	56,640	86,739	88,830	110,216	77,673
2032	49,562	146,815	109,864	57,453	87,255	89,316	110,961	77,987
2033	49,934	147,724	110,776	58,290	87,755	89,731	111,531	78,263
2034	50,333	148,482	111,766	59,234	88,182	90,239	112,424	78,525
2035	50,753	149,482	112,688	60,225	88,632	90,663	113,258	78,801
2036	51,135	150,449	113,794	61,203	89,059	91,187	114,078	79,148
2037	51,537	151,227	114,805	62,150	89,506	91,746	114,570	79,496
2038	51,952	152,166	115,832	63,112	89,938	92,235	115,409	79,821
2039	52,397	153,109	117,031	64,013	90,255	92,755	116,428	80,148
Compound Annual Growth Rates (%)								
2020-2024	0.53	0.37	0.27	1.52	1.24	0.52	-0.36	1.27
2020-2029	0.61	0.45	0.50	1.56	0.99	0.37	0.16	0.97
2020-2039	0.69	0.52	0.69	1.55	0.75	0.46	0.43	0.67

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	49,730	80,996	13,277	16,966	12,526	396,324	69,131
2019	49,787	81,076	13,337	17,615	12,701	405,643	69,944
2020	50,300	81,267	14,083	17,856	12,926	401,634	70,457
2021	51,144	81,591	14,373	18,097	13,169	406,131	70,796
2022	51,940	82,041	14,220	18,654	13,533	410,646	71,219
2023	52,322	82,795	14,332	19,100	13,882	415,728	71,724
2024	52,767	83,698	14,377	19,383	14,191	420,952	72,248
2025	53,333	84,508	14,469	19,623	14,483	426,651	72,951
2026	53,897	85,281	14,697	19,835	14,766	432,608	73,712
2027	54,475	85,954	14,908	19,938	15,009	438,954	74,529
2028	55,060	86,537	15,107	19,991	15,246	445,931	75,412
2029	55,749	87,045	15,366	20,091	15,490	453,350	76,279
2030	56,512	87,529	15,569	20,136	15,708	460,707	77,105
2031	57,180	88,022	15,760	20,107	15,901	467,767	77,793
2032	57,876	88,444	15,857	20,056	16,067	474,987	78,529
2033	58,591	88,807	16,069	19,917	16,250	482,361	79,272
2034	59,302	89,193	16,345	19,810	16,415	490,355	80,018
2035	60,089	89,598	16,704	19,713	16,574	498,533	80,822
2036	60,847	90,038	16,987	19,617	16,735	506,238	81,636
2037	61,633	90,480	17,261	19,526	16,908	514,929	82,427
2038	62,458	90,960	17,559	19,485	17,067	523,579	83,238
2039	63,252	91,454	17,857	19,391	17,224	533,099	84,103
Compound Annual Growth Rates (%)							
2020-2024	1.20	0.74	0.52	2.07	2.36	1.18	0.63
2020-2029	1.15	0.77	0.97	1.32	2.03	1.35	0.89
2020-2039	1.21	0.62	1.26	0.44	1.52	1.50	0.94

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
2018	93,631	62,519	48,085	47,696	37,163	89,793	97,297	37,767	110,062	21,181
2019	94,665	63,190	48,804	46,874	36,987	89,957	97,208	38,062	110,427	21,205
2020	95,584	63,656	49,670	47,081	36,875	90,433	97,961	38,269	108,540	21,423
2021	97,013	63,886	50,506	47,190	36,836	91,029	96,967	38,405	109,442	21,783
2022	98,297	64,227	51,139	47,382	36,858	91,750	96,744	38,630	110,103	22,122
2023	99,440	64,641	51,896	47,558	36,999	92,234	96,643	38,854	110,830	22,284
2024	100,411	65,073	52,654	47,790	37,221	92,953	96,565	39,089	111,478	22,474
2025	101,368	65,692	53,479	47,998	37,398	93,594	97,215	39,399	112,058	22,715
2026	102,292	66,360	54,272	48,216	37,554	94,398	97,901	39,650	112,518	22,955
2027	103,123	67,068	55,142	48,485	37,653	95,059	98,444	39,860	112,942	23,202
2028	103,916	67,823	55,966	48,747	37,706	95,771	98,850	40,152	113,670	23,451
2029	104,768	68,573	56,849	49,030	37,741	96,432	99,421	40,426	114,458	23,744
2030	105,474	69,294	57,690	49,261	37,760	97,173	100,087	40,706	115,333	24,069
2031	105,956	69,897	58,586	49,560	37,769	97,895	100,677	40,947	116,291	24,354
2032	106,459	70,544	59,399	49,834	37,746	98,498	101,358	41,237	117,203	24,650
2033	106,938	71,189	60,235	50,142	37,687	99,203	101,878	41,546	118,054	24,955
2034	107,434	71,851	61,174	50,400	37,626	99,911	102,694	41,879	119,035	25,257
2035	107,984	72,560	62,163	50,739	37,588	100,597	103,456	42,229	119,943	25,593
2036	108,579	73,276	63,138	51,067	37,555	101,363	104,205	42,546	120,922	25,916
2037	109,174	73,957	64,081	51,331	37,518	102,091	104,655	42,882	121,995	26,250
2038	109,770	74,670	65,041	51,650	37,494	102,820	105,421	43,227	122,996	26,601
2039	110,359	75,437	65,941	51,970	37,470	103,578	106,352	43,597	124,079	26,940
Compound Annual Growth Rates (%)										
2020-2024	1.24	0.55	1.47	0.37	0.23	0.69	-0.36	0.53	0.67	1.20
2020-2029	1.02	0.83	1.51	0.45	0.26	0.72	0.16	0.61	0.59	1.15
2020-2039	0.76	0.90	1.50	0.52	0.08	0.72	0.43	0.69	0.71	1.21

APPENDIX D HIGH AND LOW FORECASTS

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

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	16,850	11,874	9,109	9,117	7,738	15,709	20,421	7,596	20,045	4,475
2019	17,036	12,002	9,245	8,959	7,701	15,737	20,402	7,656	20,112	4,480
2020	17,201	12,090	9,409	8,999	7,678	15,821	20,560	7,697	19,768	4,527
2021	17,458	12,134	9,568	9,020	7,669	15,925	20,351	7,725	19,932	4,602
2022	17,690	12,199	9,688	9,057	7,674	16,051	20,305	7,770	20,052	4,674
2023	17,895	12,277	9,831	9,090	7,703	16,136	20,283	7,815	20,185	4,708
2024	18,070	12,359	9,975	9,135	7,750	16,262	20,267	7,862	20,303	4,749
2025	18,242	12,477	10,131	9,174	7,787	16,374	20,403	7,924	20,408	4,799
2026	18,409	12,604	10,281	9,216	7,819	16,514	20,547	7,975	20,492	4,850
2027	18,558	12,738	10,446	9,267	7,840	16,630	20,661	8,017	20,570	4,902
2028	18,701	12,881	10,602	9,317	7,851	16,754	20,747	8,076	20,702	4,955
2029	18,854	13,024	10,769	9,371	7,858	16,870	20,867	8,131	20,846	5,017
2030	18,981	13,161	10,929	9,416	7,862	17,000	21,006	8,187	21,005	5,086
2031	19,068	13,275	11,099	9,473	7,864	17,126	21,130	8,236	21,179	5,146
2032	19,158	13,398	11,252	9,525	7,859	17,231	21,273	8,294	21,346	5,208
2033	19,245	13,521	11,411	9,584	7,847	17,355	21,382	8,356	21,501	5,273
2034	19,334	13,647	11,589	9,633	7,834	17,479	21,553	8,423	21,679	5,337
2035	19,433	13,781	11,776	9,698	7,826	17,599	21,713	8,494	21,845	5,407
2036	19,540	13,917	11,961	9,761	7,819	17,733	21,871	8,558	22,023	5,476
2037	19,647	14,047	12,140	9,811	7,812	17,860	21,965	8,625	22,218	5,546
2038	19,754	14,182	12,321	9,872	7,807	17,988	22,126	8,694	22,401	5,621
2039	19,860	14,328	12,492	9,933	7,802	18,120	22,321	8,769	22,598	5,692
Compound Annual Growth Rates (%)										
2020-2024	1.24	0.55	1.47	0.37	0.23	0.69	-0.36	0.53	0.67	1.20
2020-2029	1.02	0.83	1.51	0.45	0.26	0.72	0.16	0.61	0.59	1.15
2020-2039	0.76	0.90	1.50	0.52	0.08	0.72	0.43	0.69	0.71	1.21

APPENDIX D HIGH AND LOW FORECASTS

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

	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2018	13,973	9,162	7,287	7,527	6,254	14,170	13,918	6,454	17,371	3,643
2019	14,128	9,261	7,396	7,397	6,225	14,196	13,906	6,505	17,429	3,647
2020	14,265	9,329	7,527	7,430	6,206	14,271	14,013	6,540	17,131	3,685
2021	14,478	9,363	7,654	7,447	6,199	14,365	13,871	6,563	17,273	3,746
2022	14,670	9,413	7,750	7,477	6,203	14,479	13,839	6,602	17,378	3,805
2023	14,840	9,473	7,864	7,505	6,227	14,555	13,825	6,640	17,492	3,833
2024	14,985	9,537	7,979	7,542	6,264	14,669	13,814	6,680	17,595	3,865
2025	15,128	9,627	8,104	7,575	6,294	14,770	13,907	6,733	17,686	3,907
2026	15,266	9,725	8,225	7,609	6,320	14,897	14,005	6,776	17,759	3,948
2027	15,390	9,829	8,356	7,652	6,337	15,001	14,082	6,812	17,826	3,990
2028	15,508	9,940	8,481	7,693	6,346	15,113	14,141	6,862	17,941	4,033
2029	15,636	10,050	8,615	7,738	6,352	15,218	14,222	6,909	18,065	4,084
2030	15,741	10,155	8,742	7,774	6,355	15,335	14,317	6,957	18,203	4,140
2031	15,813	10,244	8,878	7,821	6,356	15,449	14,402	6,998	18,354	4,189
2032	15,888	10,338	9,001	7,864	6,352	15,544	14,499	7,048	18,498	4,240
2033	15,959	10,433	9,128	7,913	6,342	15,655	14,574	7,100	18,633	4,292
2034	16,033	10,530	9,270	7,954	6,332	15,767	14,690	7,157	18,787	4,344
2035	16,115	10,634	9,420	8,007	6,326	15,875	14,799	7,217	18,931	4,402
2036	16,204	10,739	9,568	8,059	6,320	15,996	14,906	7,271	19,085	4,457
2037	16,293	10,839	9,711	8,101	6,314	16,111	14,971	7,329	19,255	4,515
2038	16,382	10,943	9,856	8,151	6,310	16,226	15,080	7,388	19,413	4,575
2039	16,470	11,056	9,993	8,202	6,306	16,345	15,214	7,451	19,584	4,633
Compound Annual Growth Rates (%)										
2020-2024	1.24	0.55	1.47	0.37	0.23	0.69	-0.36	0.53	0.67	1.20
2020-2029	1.02	0.83	1.51	0.45	0.26	0.72	0.16	0.61	0.59	1.15
2020-2039	0.76	0.90	1.50	0.52	0.08	0.72	0.43	0.69	0.71	1.21

APPENDIX D HIGH AND LOW FORECASTS

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

Year	MISO Energy
2018	645,192
2019	647,379
2020	649,492
2021	653,057
2022	657,252
2023	661,379
2024	665,708
2025	670,915
2026	676,116
2027	680,978
2028	686,051
2029	691,442
2030	696,848
2031	701,931
2032	706,928
2033	711,828
2034	717,262
2035	722,850
2036	728,567
2037	733,934
2038	739,690
2039	745,723
Compound Annual Growth Rates (%)	
2020-2024	0.62
2020-2029	0.70
2020-2039	0.73

APPENDIX D HIGH AND LOW FORECASTS

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

	MISO Summer CP	MISO Winter CP
2018	118,071	96,390
2019	118,445	96,705
2020	118,851	97,012
2021	119,454	97,561
2022	120,192	98,197
2023	120,924	98,818
2024	121,698	99,473
2025	122,647	100,249
2026	123,595	101,022
2027	124,481	101,745
2028	125,400	102,502
2029	126,378	103,303
2030	127,361	104,107
2031	128,285	104,865
2032	129,195	105,607
2033	130,085	106,338
2034	131,075	107,145
2035	132,095	107,976
2036	133,135	108,826
2037	134,105	109,628
2038	135,154	110,484
2039	136,255	111,380
Compound Annual Growth Rates (%)		
2020-2024	0.59	0.63
2020-2029	0.68	0.70
2020-2039	0.72	0.73