2016 MISO Independent Load Forecast

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November 2016

Prepared for:

Midcontinent Independent System Operator

Contents

Tables

Figures

INTRODUCTION

Executive Summary

This report represents the third in a series of independent 10-year load forecasts the State Utility Forecasting Group (SUFG) has prepared for the Midcontinent Independent System Operator (MISO). These forecasts project annual MISO regional energy demand for the ten MISO local resource zones (LRZs), zonal summer and winter seasonal peak loads and MISO system-wide annual energy and peak demands. This forecast does not attempt to replicate the forecasts that are produced by MISO's load-serving entities (LSEs). It would not be appropriate to infer a load forecast for an individual LSE from this forecast.

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 estimated distribution system losses. LRZ seasonal peak demand projections were developed using peak conversion factors, which translated annual energy into peak demand based on historical observations assuming normal weather conditions. The LRZ peak demand forecasts are on a non-coincident basis.[1] MISO system level seasonal peak projections were developed from the LRZ forecasts by using coincidence factors. Energy efficiency, demand response, and distributed generation (EE/DR/DG) adjustments were made at the LRZ level and the MISO system-wide level based on a study of those factors performed by Applied Energy Group for MISO. Results are provided without and with the adjustments.

The state econometric models were developed using publicly available information for electricity sales, prices for electricity and natural gas, personal income, population, employment, gross state product, and annual cooling and heating degree days. Economic and population projections acquired from IHS Global Insight (IHS) 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 rates (CAGR) for the state energy forecasts.

LRZ level energy forecasts were developed by allocating the state energy forecasts to the individual LRZs on a proportional basis. The EE/DR/DG adjustments were made at the LRZ level. Additionally, losses associated with the distribution system were added to produce a forecast at the metered load level. Table ES-2 provides the growth rates for the LRZ energy forecasts without and with the EE/DR/DG adjustments.

LRZ summer and winter non-coincident peak demand projections were developed using peak conversion factors that are based on normal weather conditions and are determined from historical relationships between average hourly load for the year, summer and winter 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 peak demand projections without the EE/DR/DG adjustments have the same growth rates as the energy projections in Table ES-2.[2] The compound annual growth rates of the LRZ non-coincident peak demand projections with the EE/DR/DG adjustments are shown in Table ES-3.

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[1] 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] 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.

Table ES-1 State Retail Sales (without EE/DR/DG Adjustments) Annual Growth Rates (2017-2026)

State	CAGR
Arkansas	1.07
Illinois	0.64
Indiana	1.41
Iowa	1.70
Kentucky	1.20
Louisiana	0.62
Michigan	0.98
Minnesota	1.68
Mississippi	1.63
Missouri	1.25
Montana	1.90
North Dakota	1.55
South Dakota	2.17
Texas	2.00
Wisconsin	1.53

Table ES-2 LRZ Metered Load Annual Growth Rates (2017-2026)

LRZ	CAGR (without EE/DR/DG Adjustments)	CAGR (with EE/DR/DG Adjustments)
1	1.68	1.59
2	1.49	1.49
3	1.66	1.32
4	0.64	0.45
5	1.25	1.10
6	1.32	1.25
7	0.98	0.87
8	1.07	1.06
9	0.94	0.90
10	1.63	1.63

Table ES-3 LRZ Non-Coincident Summer and Winter Peak Demand (with EE/DR/DG Adjustments) Compound Annual Growth Rates (2017-2026)

LRZ	CAGR (with EE/DR/DG Adjustments on Non-Coincident Peak)	CAGR (with EE/DR/DG Adjustments on Non-Coincident Peak)
	Summer	Winter
1	1.41	1.35
2	1.36	1.32
3	1.17	1.04
4	0.44	0.39
5	1.12	1.10
6	1.20	1.19
7	0.81	0.73
8	0.97	0.95
9	0.84	0.82
10	1.63	1.63

INTRODUCTION

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 coincident peak demand is less than the arithmetic sum of the individual LSE non-coincident peak demands. The MISO system coincident peak demand is determined by applying coincidence factors to the 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 developed for the summer and winter peaks. Since coincidence is not a factor for annual energy, the MISO energy projections are found from the simple sum of the individual LSEs. Table ES-4 provides the compound annual growth rates for the MISO energy and peak demand forecasts on a gross and net basis.

Table ES-4. MISO Energy and Seasonal Peak Demand Growth Rates (2017-2026)

MISO-System	Gross CAGR (without EE/DR/DG Adjustments)	Net CAGR (with EE/DR/DG Adjustments)
Energy	1.25	1.15
Summer Peak Demand	1.24	1.06
Winter Peak Demand	1.25	1.02

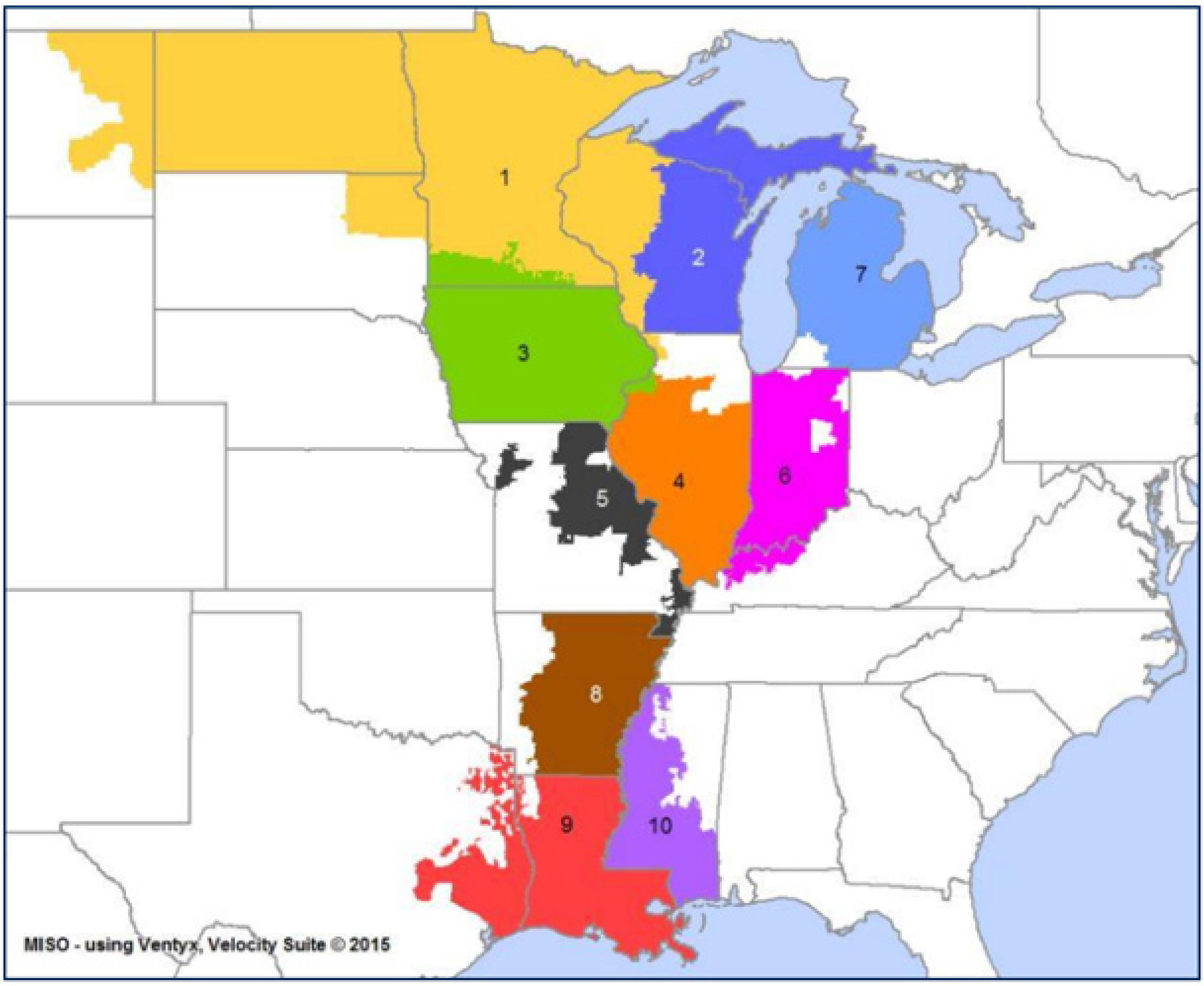
1 Introduction

This report represents the third in a series of independent 10-year load forecasts the State Utility Forecasting Group (SUFG) has prepared for the Midcontinent Independent System Operator (MISO). These forecasts project annual MISO regional energy demand for the ten MISO local resource zones (LRZs), regional winter and summer seasonal peak loads and MISO system-wide annual energy and peak demands. This forecast does not attempt to replicate the forecasts that are produced by MISO's load-serving entities (LSEs). It would not be appropriate to infer a load forecast for an individual LSE from this forecast.

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. Figure 1 displays the MISO market footprint at LRZ level.

Figure 1: MISO 2015 Planning Year LRZ Map



Source: MISO, 2015

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 estimated distribution losses. LRZ seasonal peak demand projections were developed using conversion factors, which translated annual energy into peak demand based on historical observations assuming normal weather conditions. The LRZ peak demand forecasts are on a non-coincident basis.[3] MISO system level projections were developed from the LRZ forecasts. For the seasonal MISO peak demands, coincidence factors were used. Energy efficiency, demand response, and distributed generation (EE/DR/DG) adjustments were made at the LRZ level and the MISO system-wide level based on a study of those factors performed by Applied Energy Group for MISO. Zonal energy and peak forecast results are provided without and with the EE/DR/DG adjustments for the period of 2017 to 2026.

1.2 REPORT STRUCTURE

In this report, Chapter 2 explains the forecasting methodology and provides the data sources. Chapter 3 covers the econometric forecasting models developed for each state and the resulting forecasts of annual statewide retail sales. Chapter 4 explains the process for allocating the state energy forecasts to LRZ-level forecasts and provides those forecasts without and with the EE/DR/DG adjustments. The methodology and results for determining LRZ-level seasonal peak demands are in Chapter 5. The MISO system-wide results are incorporated in Chapter 6. Appendices are provided that include the state econometric models, peak demand models and alternate higher and lower projections.

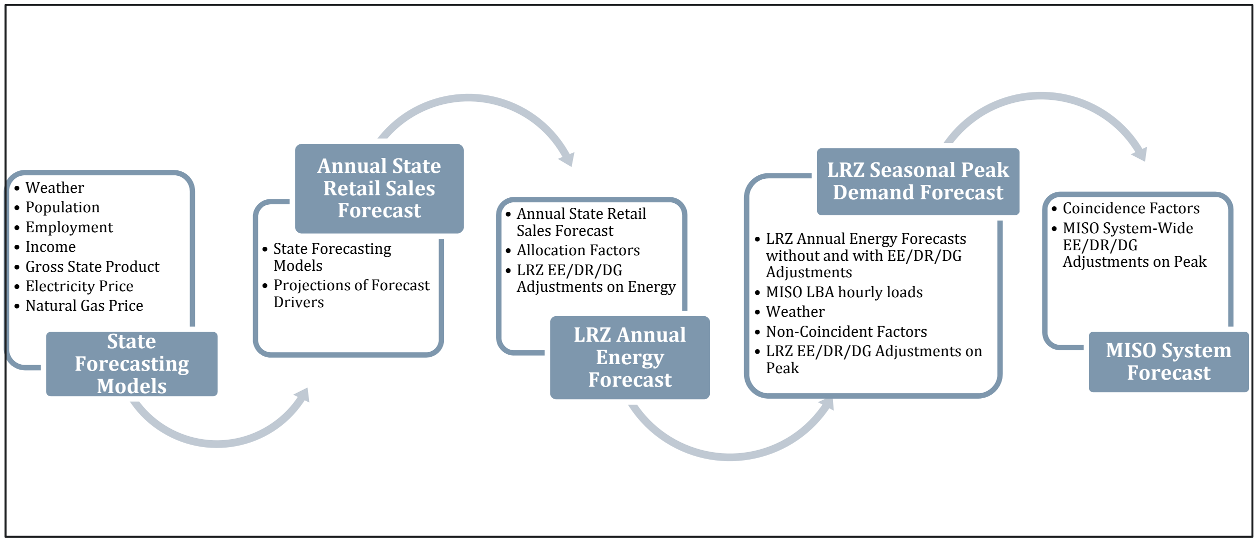
[3] Throughout this report, coincidence is stated in reference to the overall MISO system. Thus, the LRZ peak demand forecasts are for the highest level of demand for that particular LRZ, which would be coincident at the LRZ level but non-coincident at the MISO system level.

2 Forecasting Methodology

2.1 OVERVIEW

This study employed a multi-step approach to forecast annual energy and seasonal peak demand at the MISO LRZ and system-wide levels. Econometric models were built for each state to forecast retail sales for a 10-year period, namely 2017 to 2026. These statewide energy forecasts were used to construct annual energy forecasts at the LRZ level, while accounting for the fraction of statewide load that is a part of each LRZ. The LRZ annual energy forecasts were used, in turn, to develop seasonal non-coincident peak demand projections for each LRZ. The LRZ coincident peak projections estimated from non-coincident peak demand projections were used to create the MISO system-wide peak demand projections. 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, and a significant F-statistic), that 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 and GSP). The model formulations by state are provided in APPENDIX A.

2.3 RETAIL SALES VS. METERED LOAD VS. RESOURCE NEEDS

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). 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 local distribution systems). The historical metered loads at the LRZ-level are confidential and were provided by

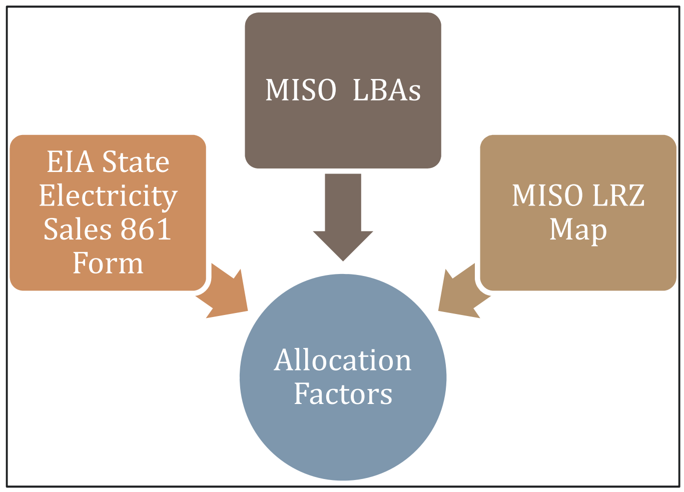
MISO. The difference between the two is caused by losses between the substations and customers.[4] Thus, an adjustment was made to convert retail sales forecasts to metered loads. This was accomplished by comparing historical EIA sales data for the utilities to historical metered data at the LBA level for each LRZ.

While the LRZ and MISO system projections (both energy and peak demand) are at the metered level, when determining resource needs from the peak demand projections, it may be more appropriate to include the losses associated with the transmission system between the generators and the substations,[5] since sufficient resources will be needed to provide for loads and all system losses. The annual energy forecasts at the state-level are for retail sales. For the LRZ-level forecasts, metered loads are provided. The MISO system-wide coincident peak demands have not been converted to the resource need level.

2.4 LRZ ENERGY FORECASTS

The LRZ annual energy forecasts were produced after the individual state annual forecasts were developed. This was done by allocating the fraction of each state's load to the appropriate LBA within that state (herein referred to as the load fraction) and summing across the various LBAs within each LRZ (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 estimate the future allocation factors. Additional adjustments also have 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. A comparison between the MISO annual metered loads and retail sales was made to estimate the distribution losses by LRZ. The MISO system-wide energy forecast was obtained by summing the LRZ annual energy forecasts.

Figure 3: Structure and Logic Diagram for Allocation Factors



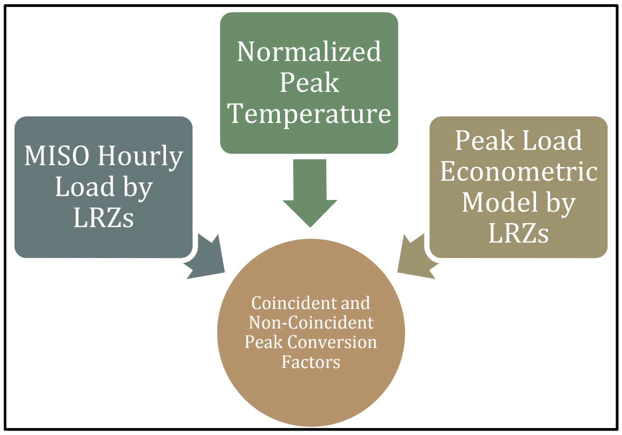
In addition, the EE/DR/DG adjustments to the LRZ energy forecasts were made based on a study of those factors performed by Applied Energy Group for MISO. Both non-adjusted and adjusted projections are provided at the LRZ level.

[4] 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. They are referred to as distribution losses herein.

[5] These are referred to here as transmission losses, even though they exclude those low voltage transmission losses that are included in distribution losses (see previous footnote).

2.5 LRZ NON-COINCIDENT PEAK DEMAND FORECASTS

Figure 4: Structure and Logic Diagram for Peak Conversion Factors



The non-coincident 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 peak conversion factors. Peak load conversion factors were used to translate annual electricity sales forecasts at the LRZ level to summer and winter non-coincident peak demands. These conversion factors were determined from historical relationships between average hourly load for the year, summer/winter peak levels for the year, and weather conditions at the time of the peak demand.

2.6 MISO-LEVEL FORECASTS

The non-coincident LRZ peak demand projections were converted to MISO-level 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 LRZ's demand at the time of the MISO-wide (coincident) peak demand and at the time of the LRZ's individual (non-coincident) peak demand. The coincidence factor is generally a number slightly less than 1. The MISO system-wide peak demand forecast was obtained by summing the coincident LRZ 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 by state are available from EIA. Historical electricity and natural gas price are available by state from EIA. Price projections were developed by the SUFG after IHS Global Insight stopped providing them in 2015. Historical population data by state were obtained from the Census Bureau. Historical macroeconomic data, such as real personal income and gross state product, were obtained from the Bureau of Economic Analysis (BEA); employment data were obtained from the Bureau of Labor Statistics (BLS). Projections of macroeconomic data and population were provided by IHS Global Insight. Actual heating and cooling degree days on a 65 degree Fahrenheit basis for all 15 states were acquired monthly from the National Oceanic and Atmospheric Administration (NOAA), add were aggregated to annual data by state. Normal weather by state used in projections were obtained from NOAA. Hourly temperature records were acquired from Midwest Regional Climate Center (MRCC). Table 1 summarizes the sources of data used in this study.

Table 1: Data sources

Data	Content	Historical Data Source	Data Used in Projection
Electricity sales	GWhs, annual retail electricity sales by state, 1990-2014	EIA	N/A
Electricity prices	Cents/KWh, 2009$, 1990-2014	EIA*	SUFG projection based on EIA data
Natural gas prices	$/Mcf (thousand cubic feet), 2009$, 1990-2014	EIA*	SUFG projection based on EIA data
Real personal income	Thousands, 2009$, 1990-2014	BEA	IHS Global Insight
Population	Number of people, population by state, 1990-2015	Census Bureau	IHS Global Insight
Manufacturing employment	Number of jobs, 1990-2014	BLS	IHS Global Insight
Non-manufacturing employment	Number of jobs, 1990-2014	BLS	IHS Global Insight
Non-farm employment	Number of jobs, 1990-2014	BLS	IHS Global Insight
Gross state product	Millions, 2009$, 1990-2014	BEA	IHS Global Insight
Cooling degree days (CDD)	Summations of monthly cooling degree days, base 65°F, 1970-2015	NOAA	NOAA 30-year normal
Heating degree days (HDD)	Summations of monthly heating degree days, base 65°F, 1970-2015	NOAA	NOAA 30-year normal
Hourly Temperature	Historical hourly temperature of selected weather stations, 1997-2015	MRCC	Normalized Temperature for Seasonal Peak Analysis

** Original data was in nominal dollars. SUFG converted it to real 2009 dollars using state level CPI from IHS Global Insight.*

2.8 Modeling Refinements

In year 2, SUFG undertook a number of model refinements, which were chosen by MISO stakeholders. These include improving the modeling of EE/DR/DG, incorporating multiple weather stations in the state econometric models, developing confidence intervals that capture uncertainty around the macroeconomic variables, incorporating more information in the conversion of annual energy forecasts to peak demand forecasts, and incorporating a new LRZ (LRZ 10).[6] These improvements were used this year, with a further refinement to the energy to peak demand conversion methodology, which is explained in Chapter 5.

[6] Please see the year 2 report for an explanation of the modeling refinements.

3 Statewide Annual Energy Forecasts

SUFG developed 15 econometric models of annual retail electricity sales for each of the MISO states.[7] The models are based on historical values for a variety of explanatory variables (or drivers), using Eviews, a statistical analysis program. The candidate variables and their data sources are provided in Table 2.

Table 2: Dependent and Explanatory Variables

Variables	Eviews Name	Historical Data Source	Projected Data Source
Dependent variable:			
Electricity sales	ELECTRICITY_SALES	EIA	EIA
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	BEA	IHS Global Insight
Population	POPULATION	Census Bureau	IHS Global Insight
Manufacturing employment	MANUFACTURING_EMP	BLS	IHS Global Insight
Non-manufacturing employment	NON_MANUFACTURING_EMP	BLS	IHS Global Insight
Non-farm employment	NON_FARM_EMP	BLS	IHS Global Insight
Gross state product	REAL_GSP	BEA	IHS Global Insight
Cooling degree days	CDD	NOAA	NOAA
Heating degree days	HDD	NOAA	NOAA

** Original data was in nominal dollars. SUFG converted it to real 2009 dollars using state level CPI from IHS Global Insight.*

Each state's electricity sales forecast was determined using projections of values for the applicable drivers for that state. Table 3 provides compound annual growth rates for the explanatory variables over the forecast period (2017-2026). Cells with no entry indicate that the corresponding variables are not included in that state's model. Cooling degree days and heating degree days are held constant at their 30-year normal values from NOAA. The projections provided in Table 3 are from a macroeconomic forecast by IHS Global Insight, except the electricity price forecast and the natural gas price forecast. They were developed by the SUFG using a similar method adopted in the 2015 Independent Load Forecast, with details being provided in last year's report.

[7] The Kentucky econometric model used a load adjustment for the removal of a large load. The process is described subsequently.

STATEWIDE ANNUAL ENERGY FORECASTS

Table 3: Explanatory Variable Compound Annual Growth Rates for the 2017-2026 Period (%)

Variables	AR	IL	IN	IA	KY	LA	MI	MN	MS	MO	MT	ND	SD	TX	WI
REAL_ELECTRICITY_PRICE	2.14	1.13	1.16	-0.37	0.04	2.14	1.13	-0.38	0.07	-0.38	-0.02	-0.38	-0.39	2.13	1.14
REAL_NATURAL_GAS_PRICE			2.68	3.48	3.34			3.25			2.37	3.46	3.56	4.84	2.60
REAL_INCOME				2.25				2.48	2.24						
POPULATION					0.48					0.48			0.79		
REAL_INCOME/POPULATION							1.79				1.74				
REAL_GSP	2.15	1.81	1.98			2.11	1.61		1.88					3.23	2.03
NON_MANUFACTURING_EMP										0.66		0.88			
MANUFACTURING_EMP											0.24				

For the state of Kentucky, SUFG observed a dramatic drop of the electricity load in 2013. This was caused by the closure of the Paducah Gaseous Diffusion Plant (PGDP) in mid-2013, which represented a 3 GW load on the Tennessee Valley Authority (TVA) 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 2014 historical load were adjusted up to what it would have been with the PGDP 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 subtracted from the forecast load derived from the econometric model to serve as the final state load forecast for Kentucky.

Table 4 and Figure 5 through Figure 19 provide the gross (or prior to any EE/DR/DG adjustments) state-level forecasts. The retail sales by state for the year 2015 are not actual observed values since EIA had not published the data at the time of model construction. Therefore, the state econometric models were used to "forecast" 2015 values (as well as 2016 values) to provide continuity between the historical data and the forecast period (2017 to 2026).

STATEWIDE ANNUAL ENERGY FORECASTS

Table 4: Gross State Energy Forecasts (Annual Retail Sales in GWh)[8]

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	48,484	143,289	105,880	45,912	77,408	85,815	105,313	68,785
2016	49,929	144,914	107,371	47,563	78,233	85,764	107,565	70,530
2017	51,305	146,253	109,634	48,179	78,827	88,703	109,053	71,822
2018	52,341	147,224	111,805	48,954	79,469	90,569	111,145	73,032
2019	52,979	148,543	113,516	49,902	80,683	91,022	112,751	74,386
2020	53,358	149,763	115,103	50,834	81,904	91,327	113,732	75,775
2021	53,682	150,564	116,600	51,639	83,132	91,252	114,225	77,115
2022	54,104	151,307	118,086	52,455	84,173	91,428	115,009	78,425
2023	54,642	152,076	119,640	53,317	85,061	91,994	115,814	79,654
2024	55,230	153,021	121,220	54,207	85,943	92,796	116,976	80,845
2025	55,837	153,894	122,735	55,132	86,881	93,201	118,062	82,157
2026	56,472	154,878	124,356	56,093	87,752	93,812	119,066	83,472
Compound Annual Growth Rates (%)								
1990-2014	2.29	1.00	1.55	1.99	1.07	1.47	0.95	1.58
2015-2026	1.40	0.71	1.47	1.84	1.15	0.81	1.12	1.77
2017-2026	1.07	0.64	1.41	1.70	1.20	0.62	0.98	1.68

[8] The gross forecast is prior to the EE/DR/DG adjustments.

Table 4: 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	49,061	83,412	14,947	16,986	12,256	398,998	69,762
2016	50,061	85,047	15,284	16,875	12,742	400,468	71,401
2017	51,202	86,273	15,405	17,114	12,995	407,683	73,183
2018	51,925	87,507	15,581	17,513	13,286	417,086	74,892
2019	52,840	88,608	15,648	17,892	13,640	426,912	76,213
2020	53,771	89,756	16,033	18,263	13,966	436,159	77,267
2021	54,768	90,781	16,526	18,526	14,250	444,081	78,231
2022	55,702	91,845	16,969	18,788	14,549	452,832	79,381
2023	56,557	93,004	17,307	19,056	14,864	461,551	80,577
2024	57,412	94,236	17,651	19,294	15,182	470,287	81,724
2025	58,307	95,417	17,914	19,487	15,485	478,539	82,774
2026	59,222	96,520	18,246	19,649	15,765	487,358	83,920
Compound Annual Growth Rates (%)							
1990-2014	1.81	1.86	0.30	4.06	2.82	2.09	1.45
2015-2026	1.73	1.34	1.83	1.33	2.31	1.84	1.69
2017-2026	1.63	1.25	1.90	1.55	2.17	2.00	1.53

STATEWIDE ANNUAL ENERGY FORECASTS

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

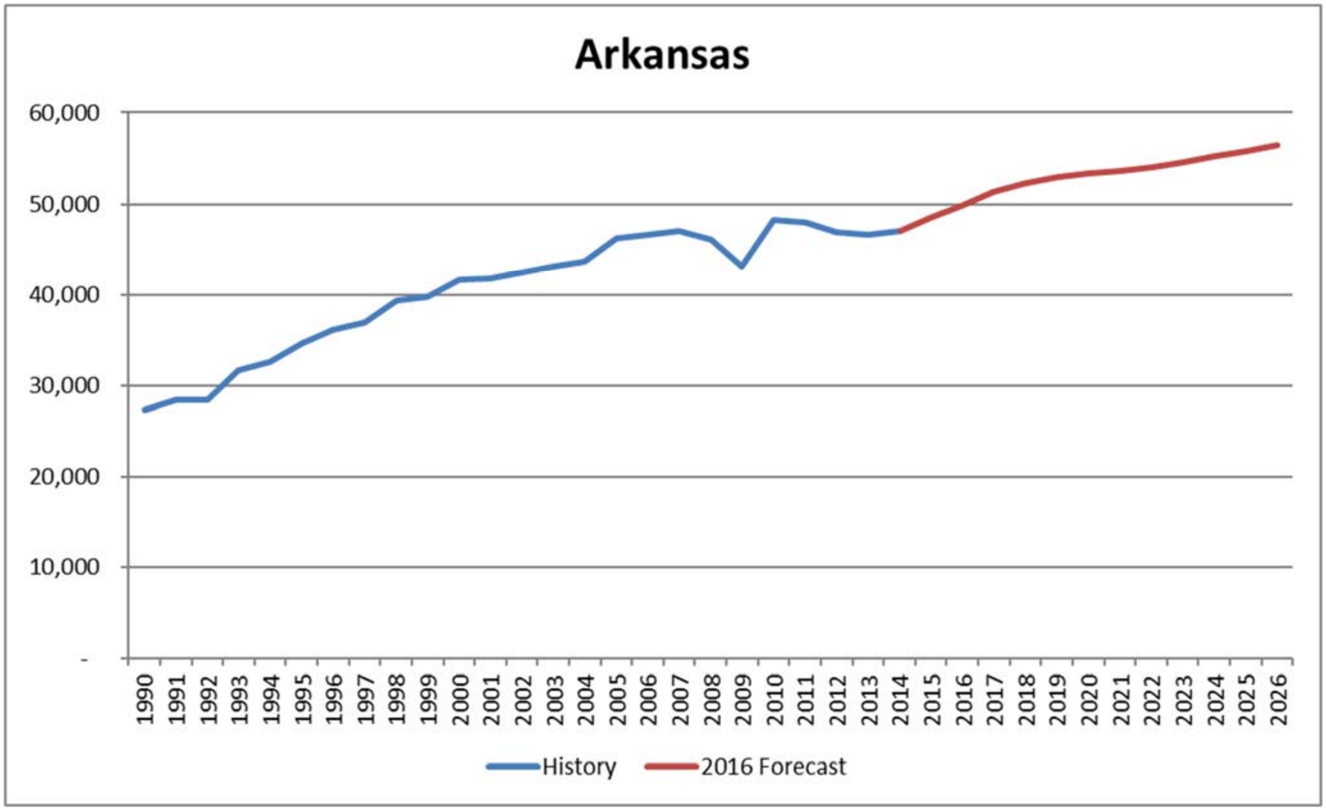
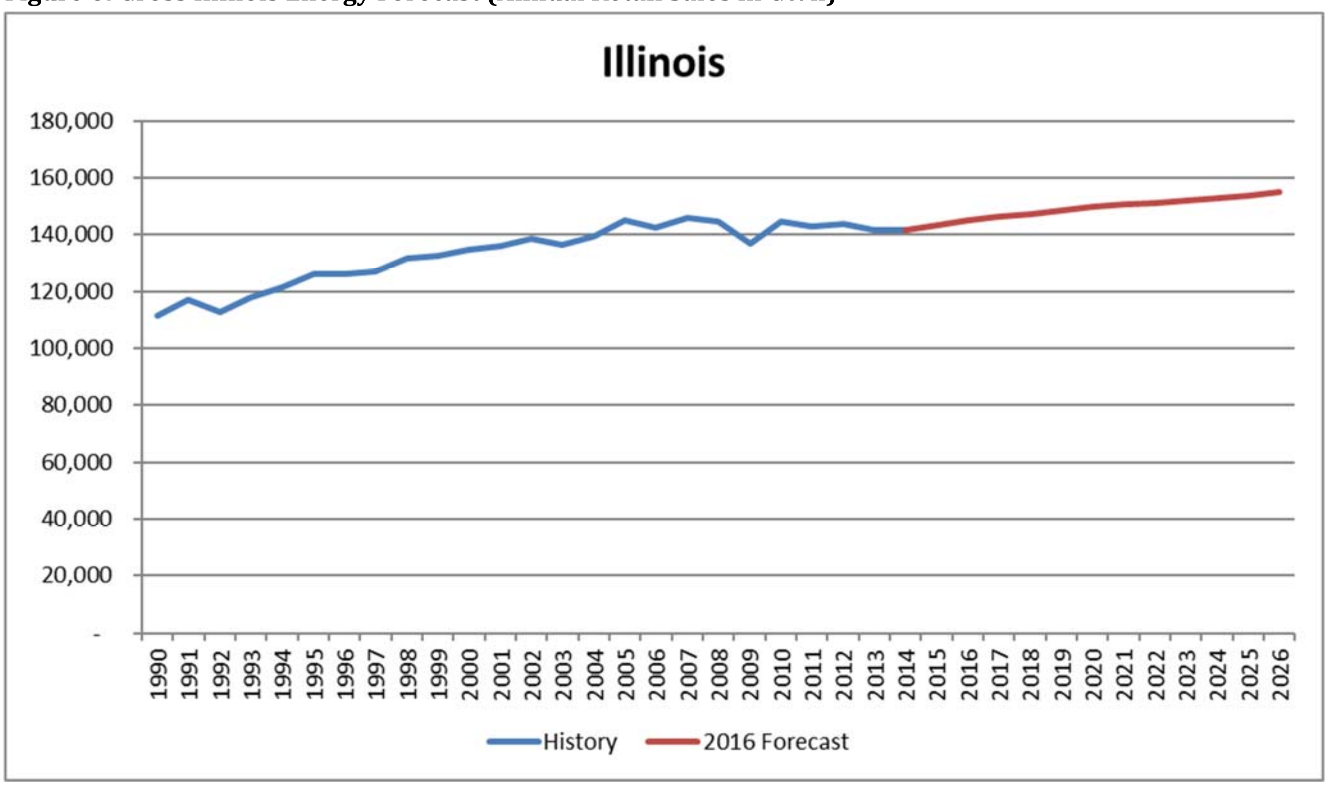


Figure 6: Gross Illinois Energy Forecast (Annual Retail Sales in GWh)



STATEWIDE ANNUAL ENERGY FORECASTS

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

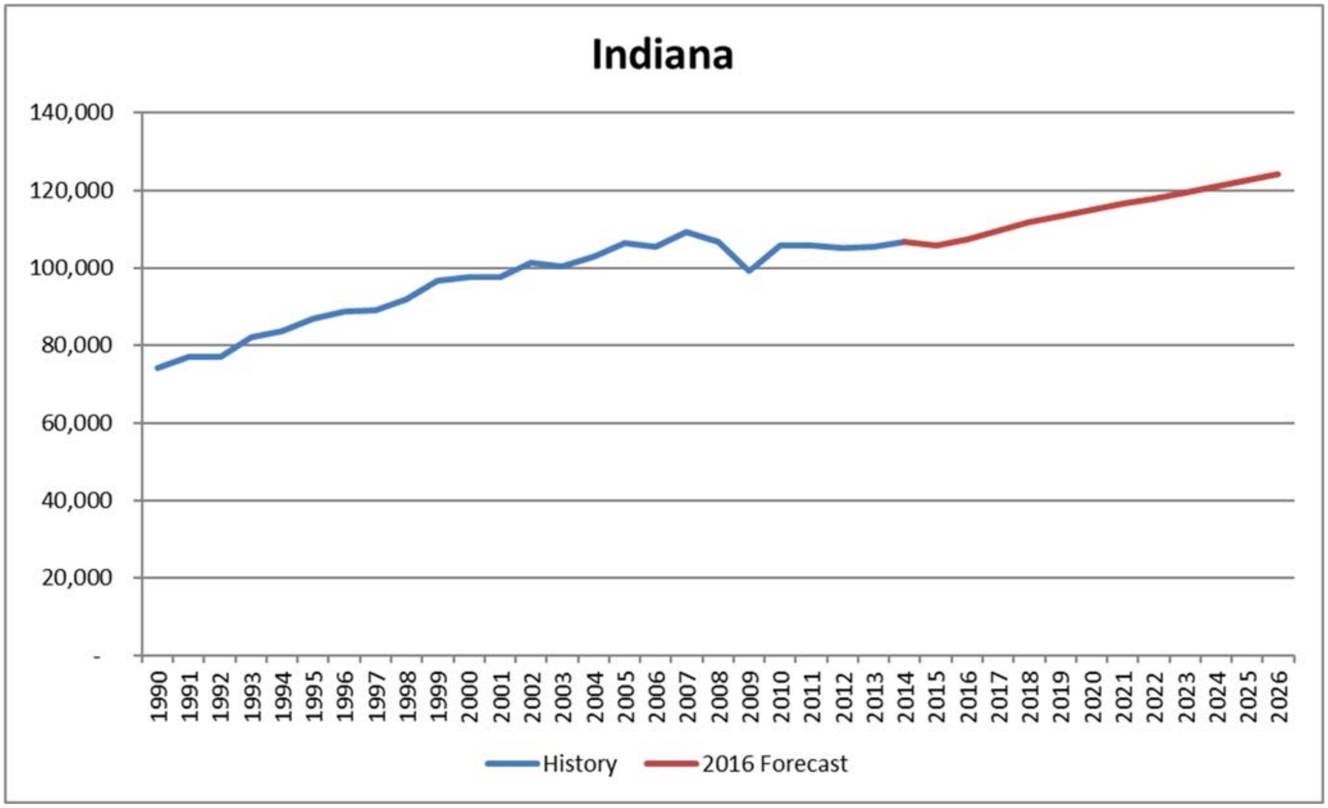


Figure 8: Gross Iowa Energy Forecast (Annual Retail Sales in GWh)

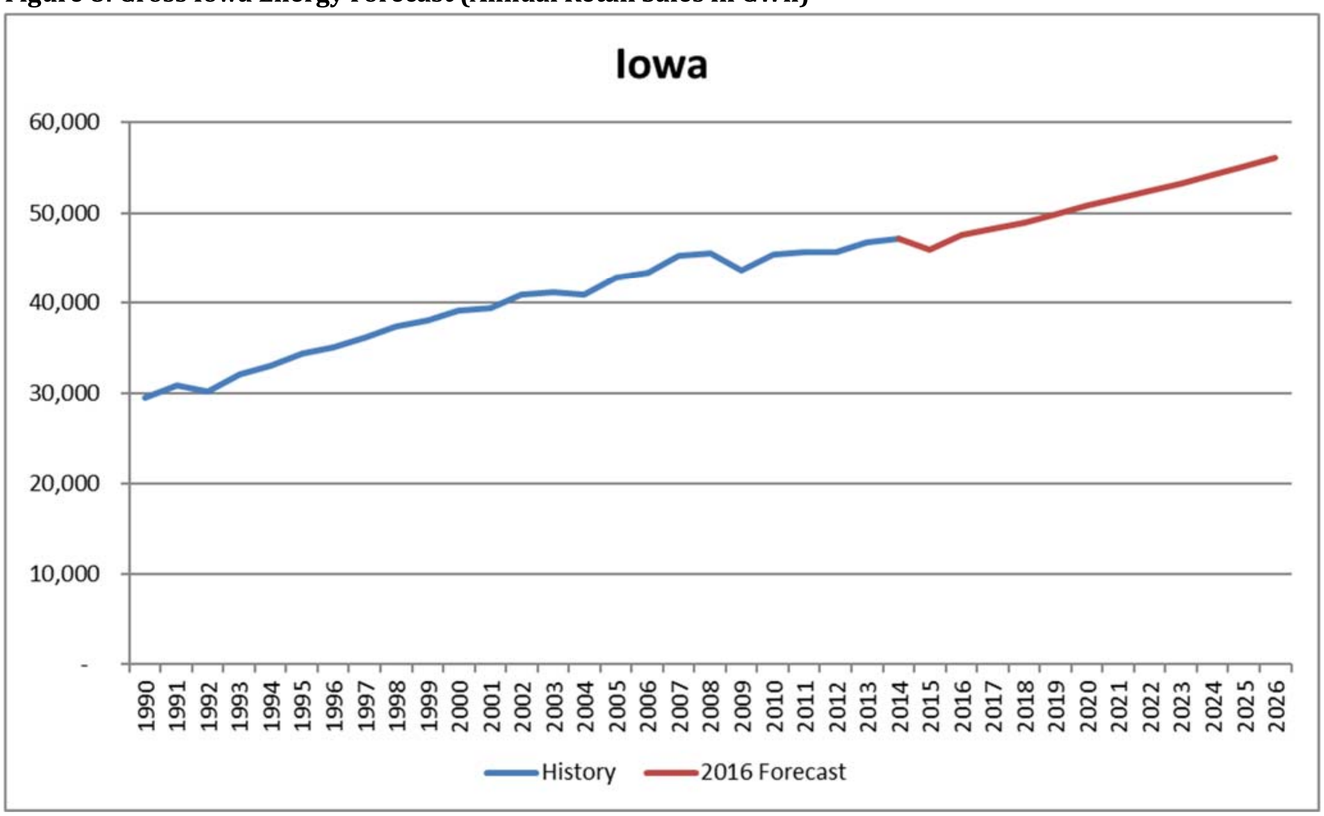


Figure 9: Gross Kentucky Energy Forecast (Annual Retail Sales in GWh)

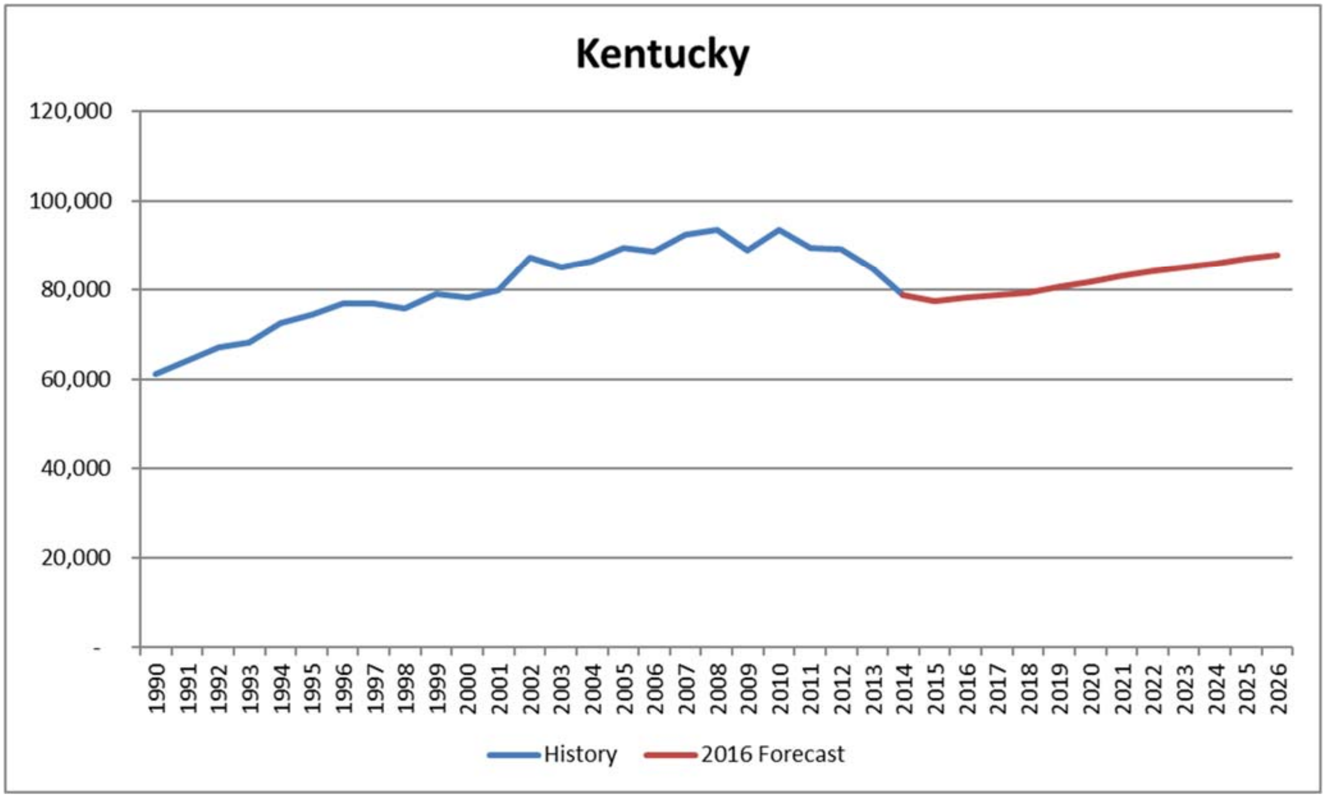
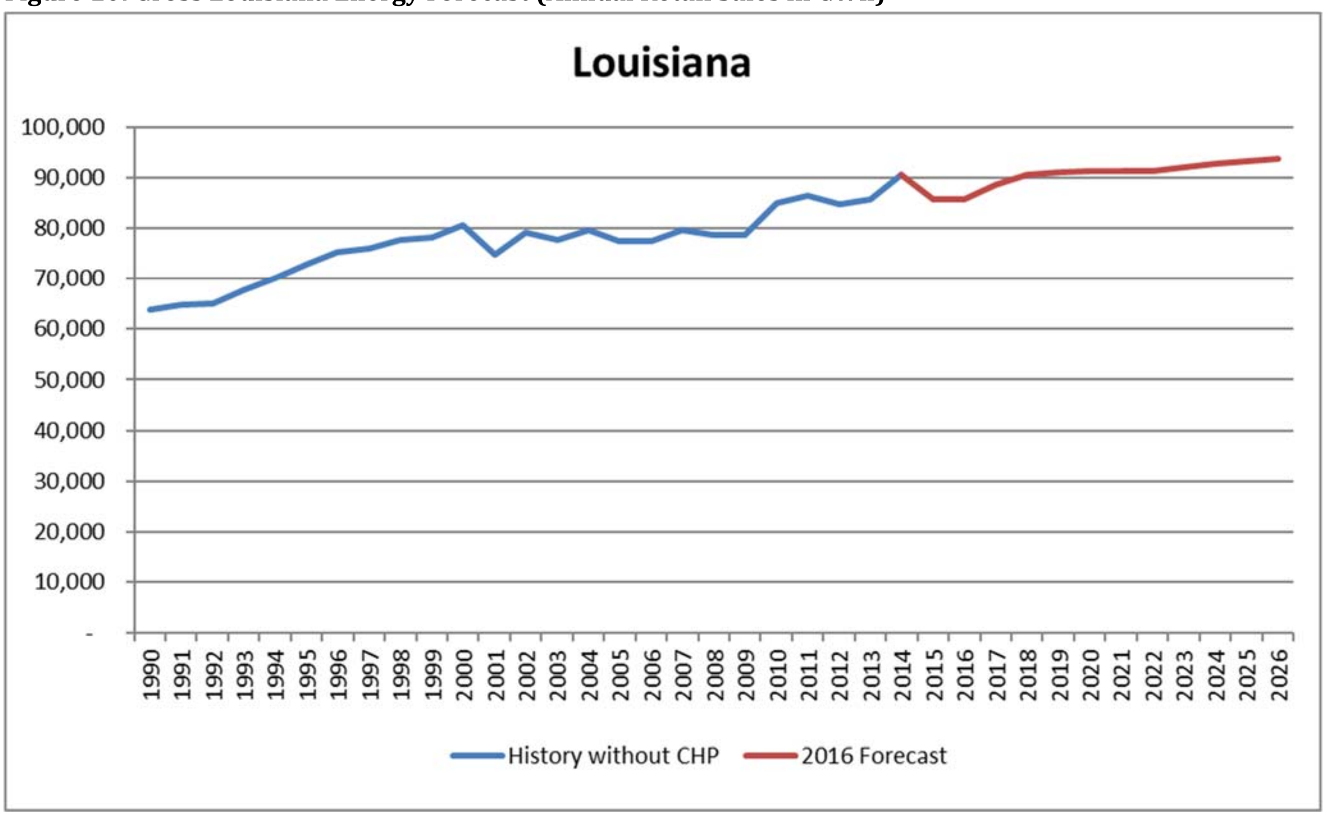


Figure 10: Gross Louisiana Energy Forecast (Annual Retail Sales in GWh)



STATEWIDE ANNUAL ENERGY FORECASTS

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

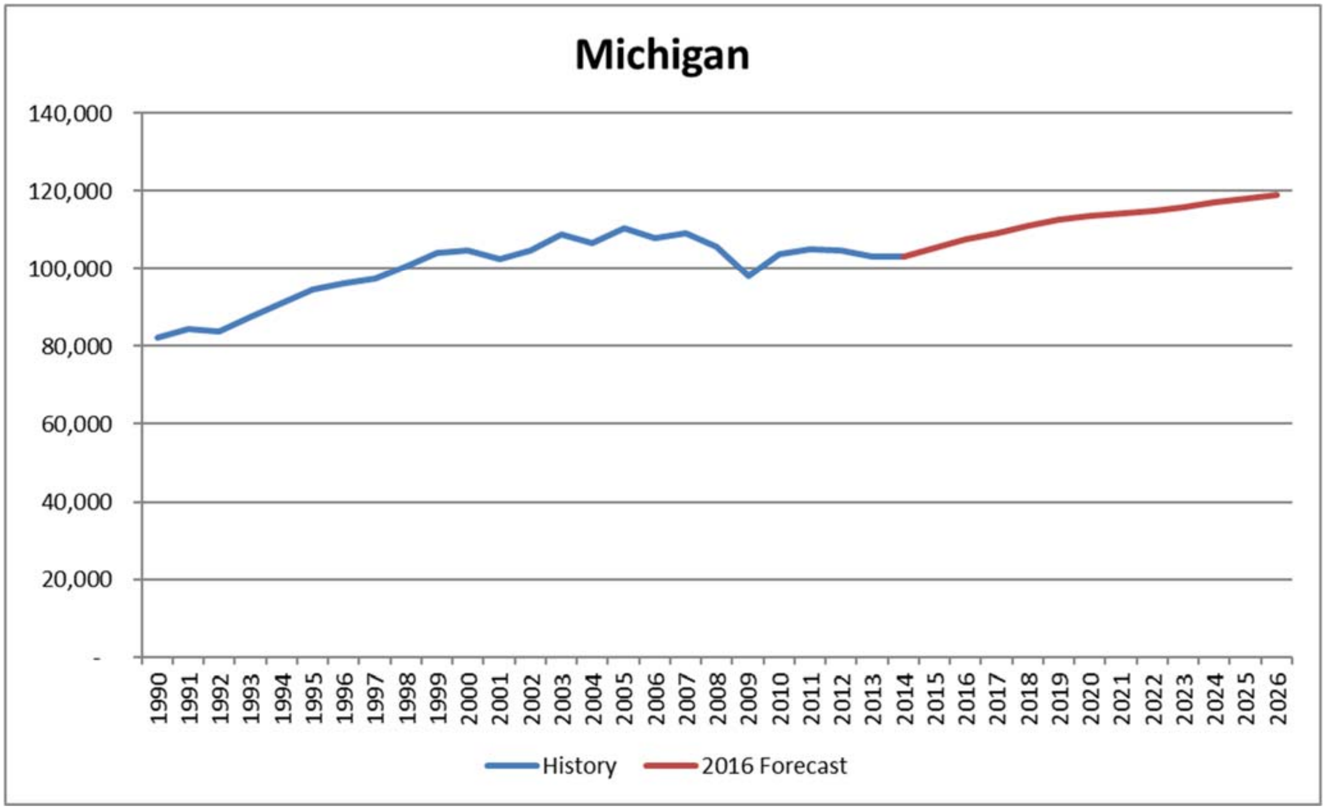


Figure 12: Gross Minnesota Energy Forecast (Annual Retail Sales in GWh)

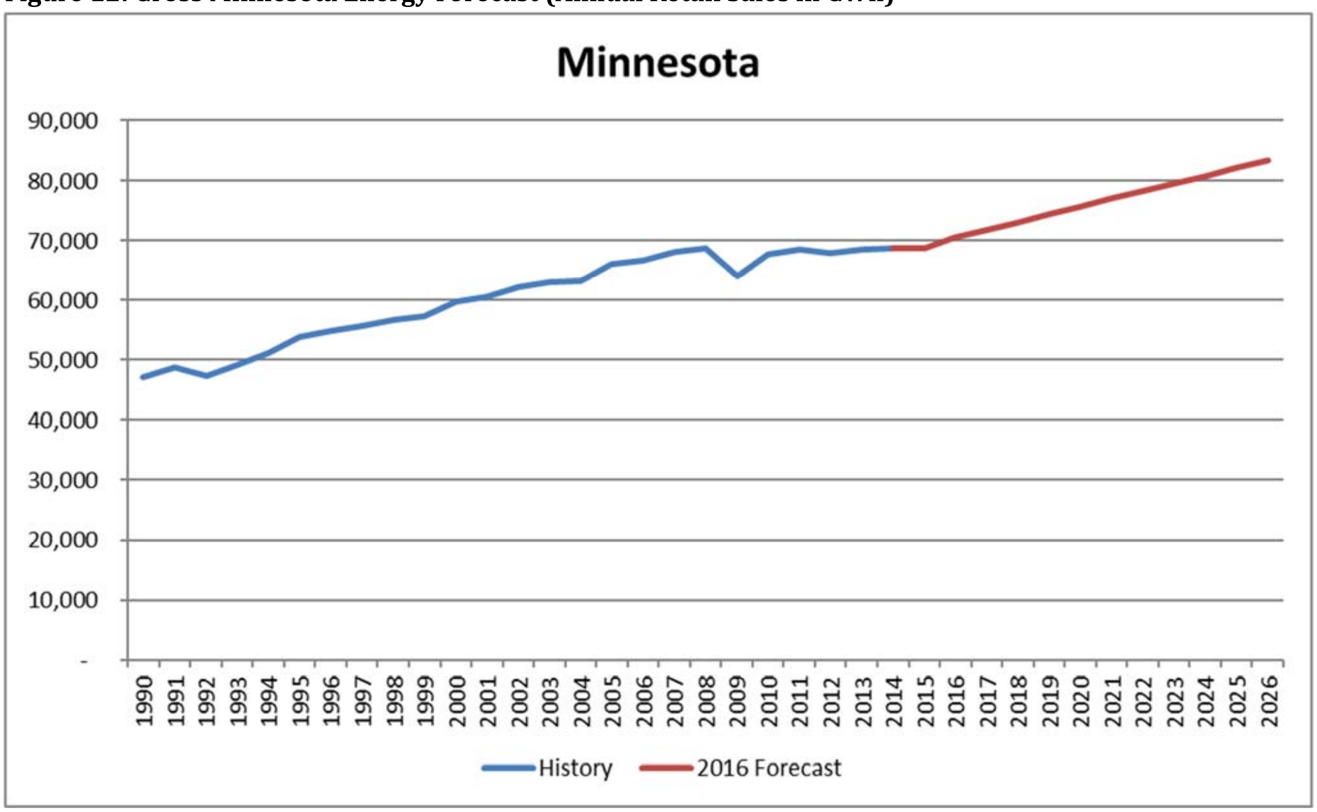


Figure 13: Gross Mississippi Energy Forecast (Annual Retail Sales in GWh)

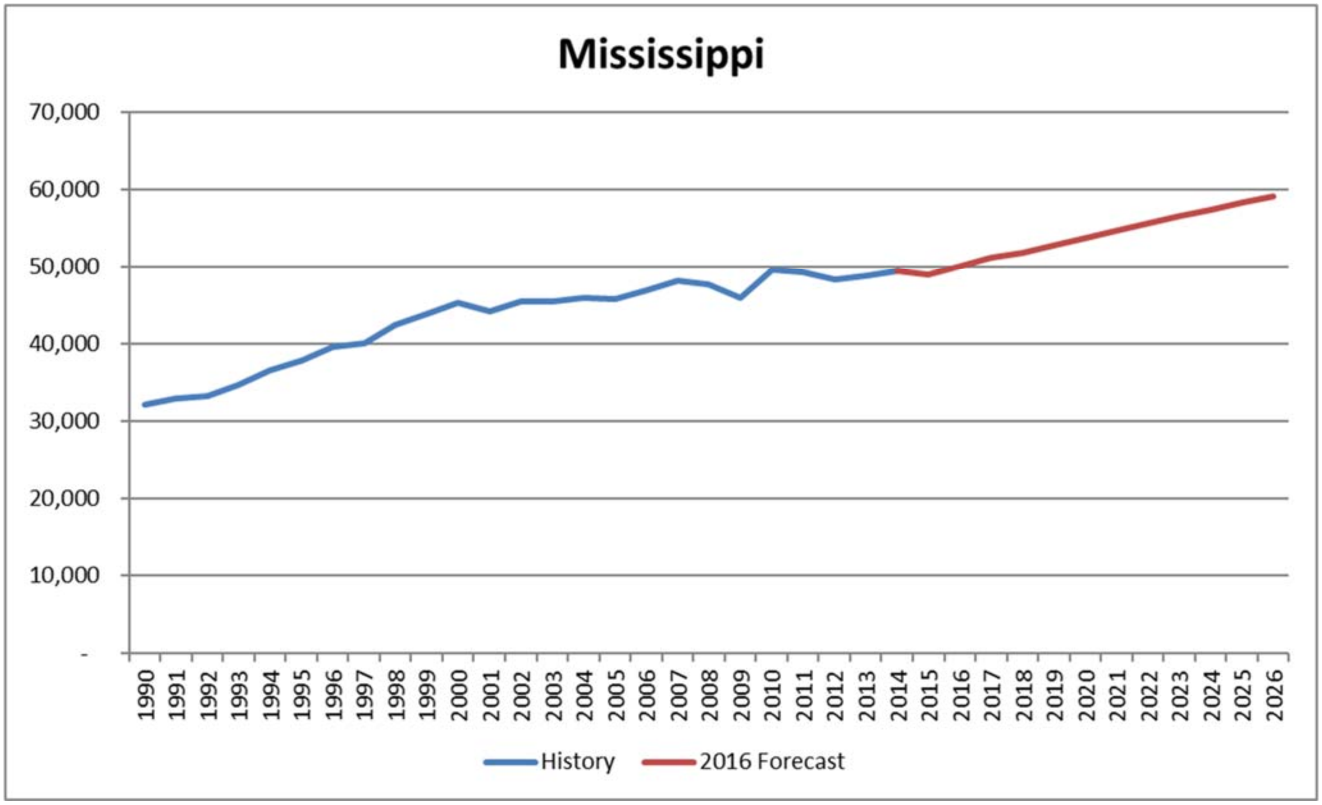


Figure 14: Gross Missouri Energy Forecast (Annual Retail Sales in GWh)

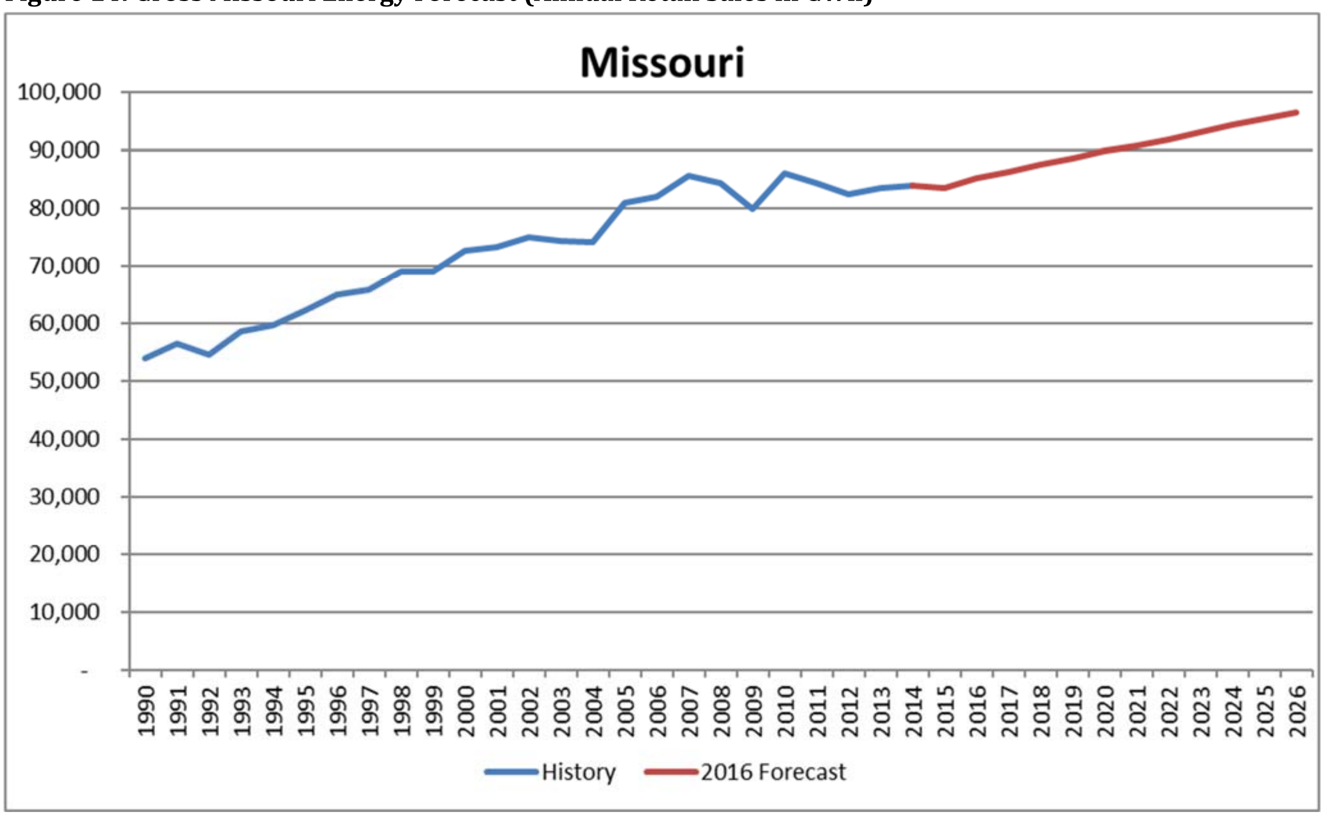


Figure 15: Gross Montana Energy Forecast (Annual Retail Sales in GWh)

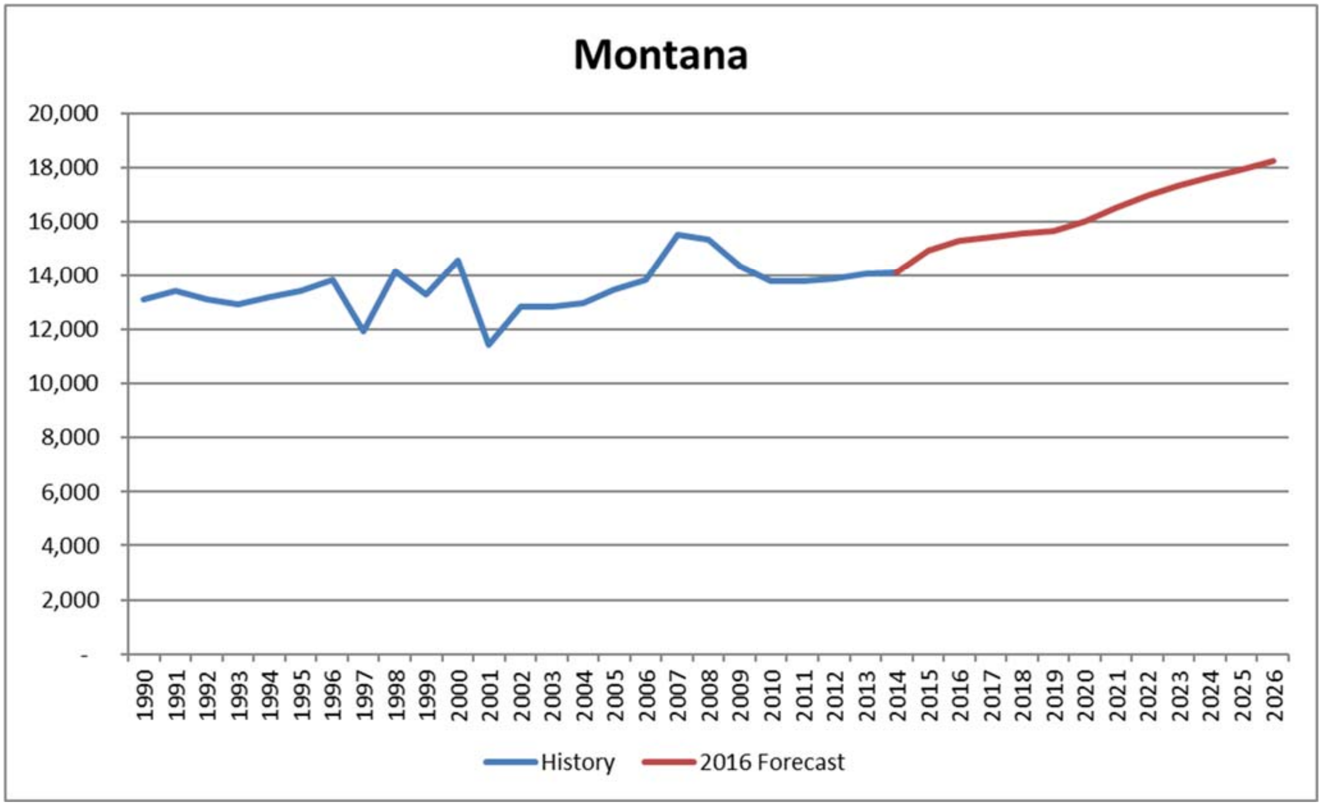
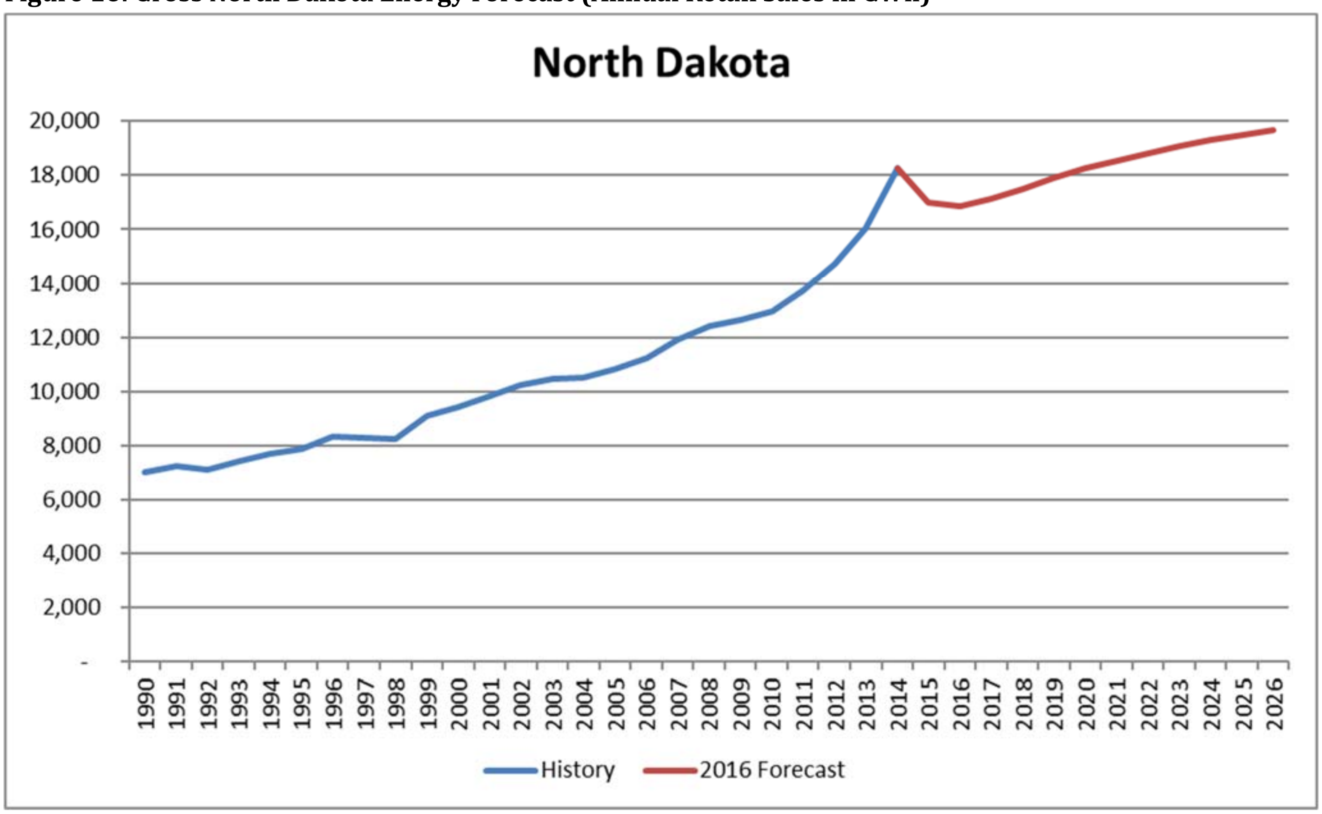


Figure 16: Gross North Dakota Energy Forecast (Annual Retail Sales in GWh)



STATEWIDE ANNUAL ENERGY FORECASTS

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

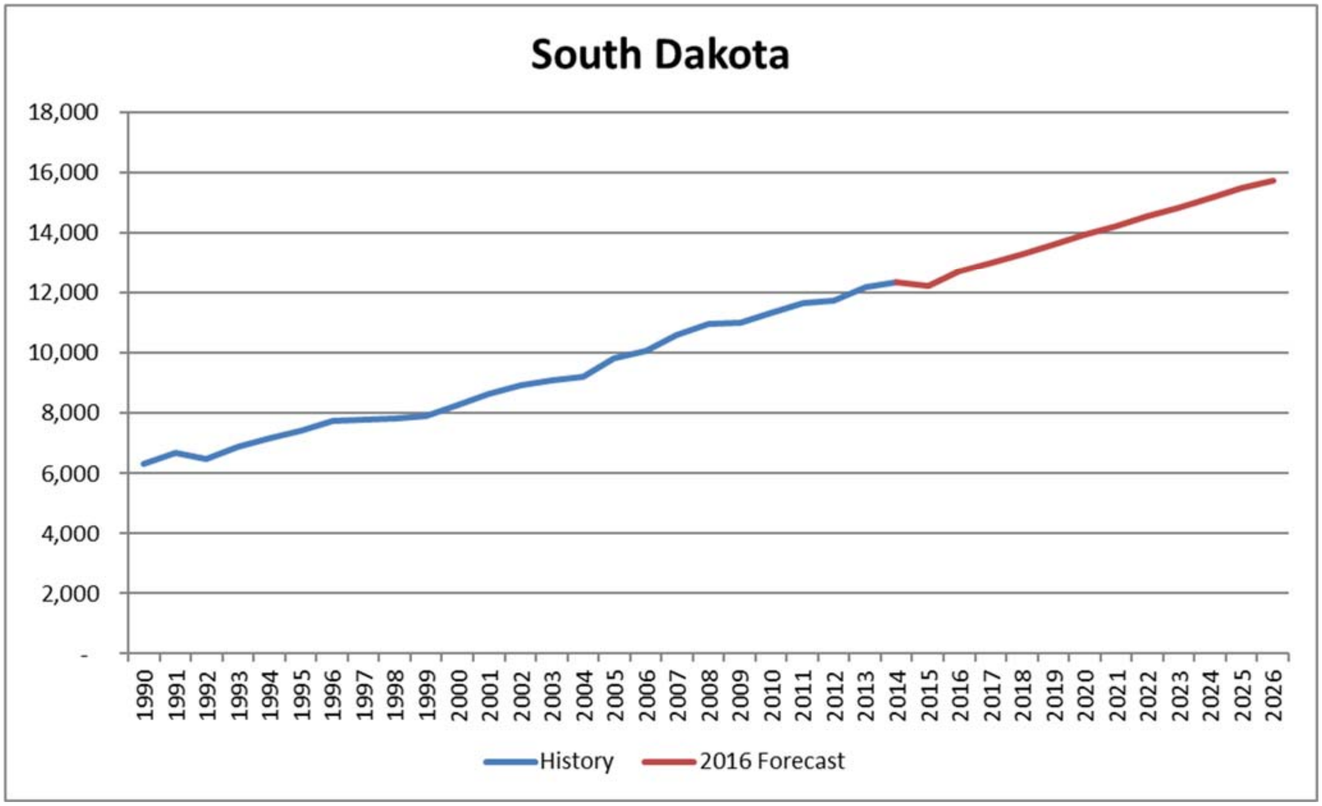
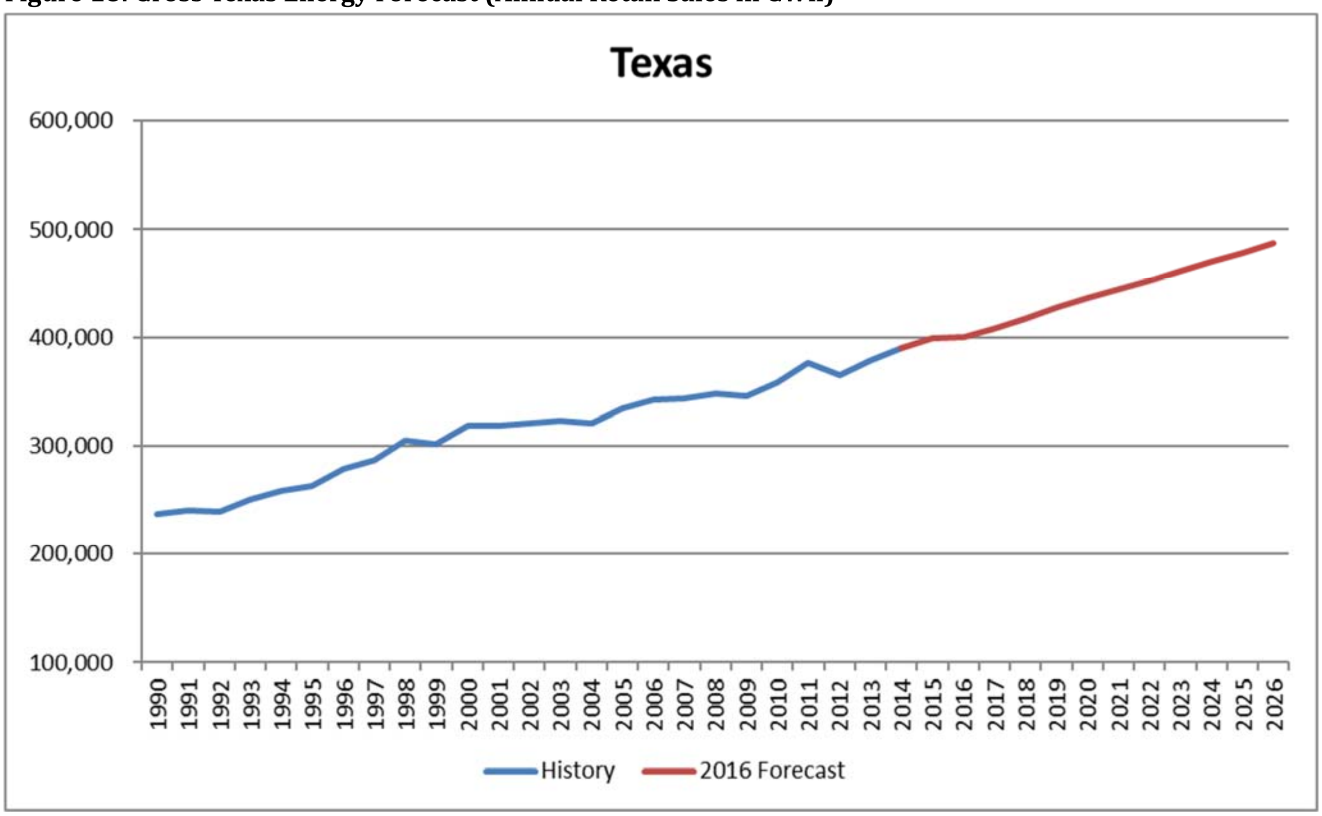
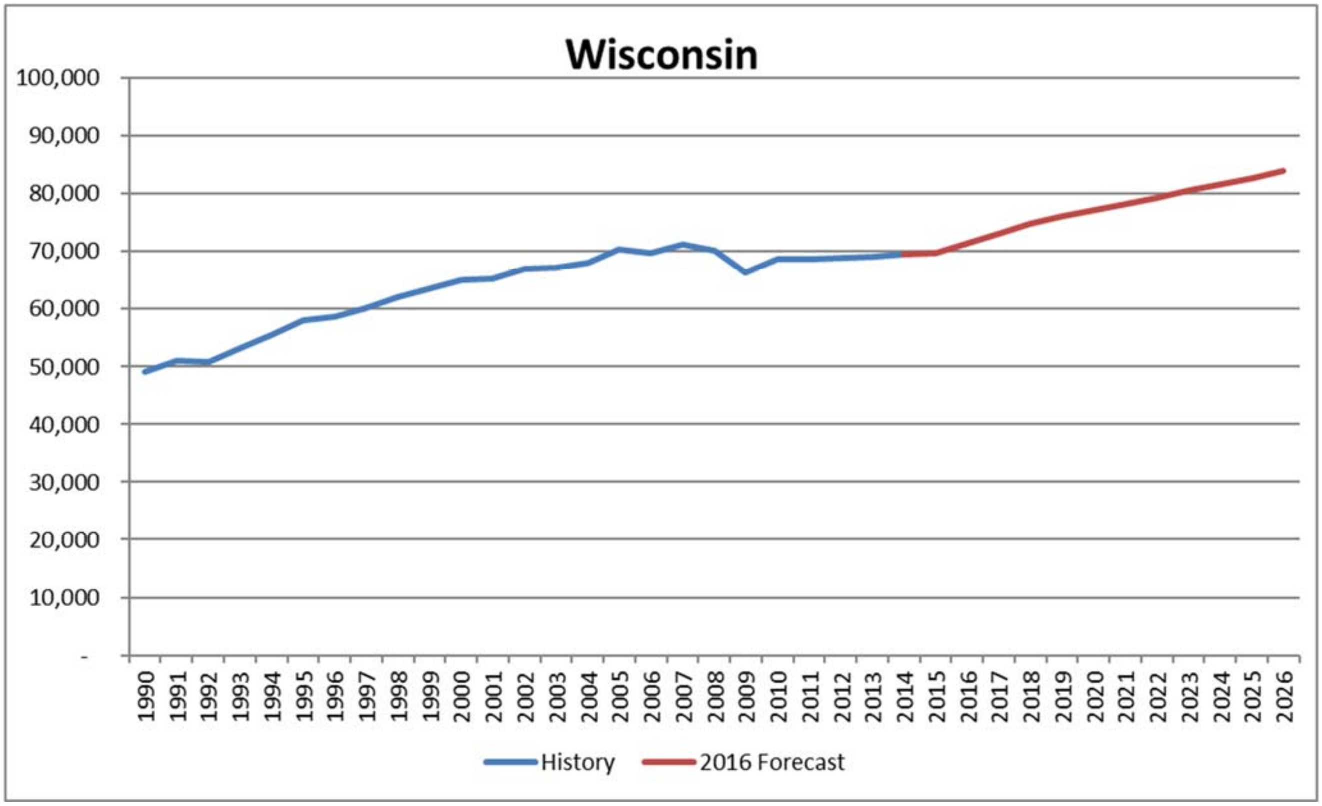


Figure 18: Gross Texas Energy Forecast (Annual Retail Sales in GWh)



STATEWIDE ANNUAL ENERGY FORECASTS

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



4 MISO Regional Energy Forecasts

4.1 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. EIA form 861's historical annual electricity sales data from 2010 to 2014 were used to estimate the annual MISO load fraction at the state level. For most states, the MISO load fraction at either the state or the LRZ level showed the same pattern with less than a 1% absolute change annually.

4.1.1 MISO Local Resource Zone

The MISO market footprint covers all or parts of 17 states and is divided into 10 LRZs.[9] Figure 1 in Chapter 1 displays the MISO market footprint at the LRZ level. Table 6 lists MISO local balancing authorities' names and acronyms for each LRZ.

[9] A very small amount of load in Oklahoma and Tennessee is served by MISO LBAs in LRZ 8. Rather than develop individual state econometric models for those states, these loads grow at the rate of LRZ8.

Table 5: MISO Local Balancing Authorities, 2015

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

Source: MAP of Local Resource Zone Boundaries, MISO, November 21, 2015

Table 6 summarizes the historical MISO load fractions at the state level for the period of 2010-2014. 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).

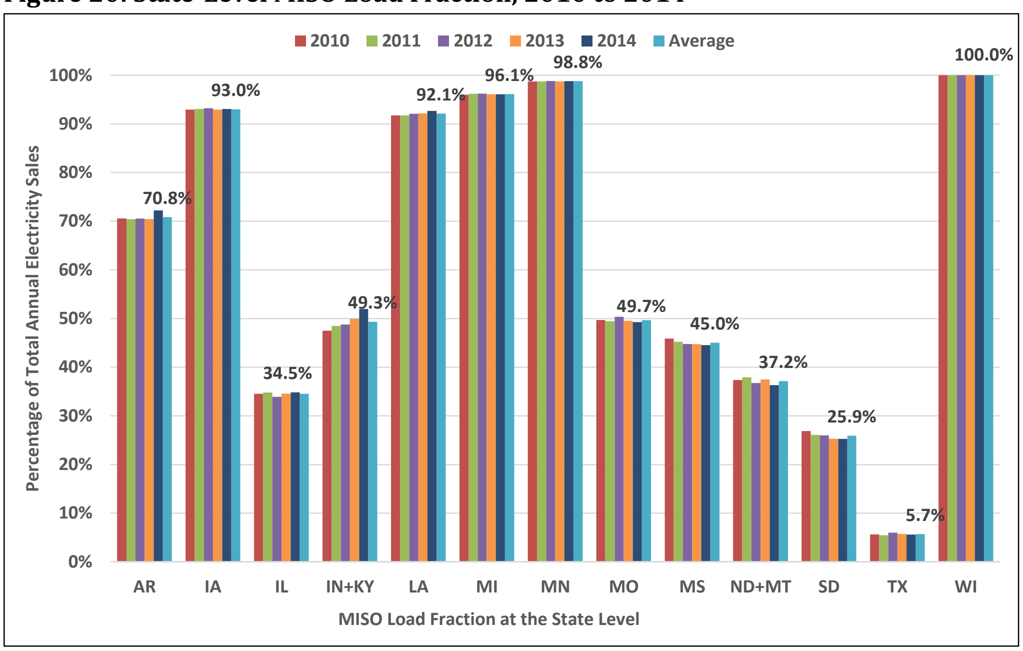
Table 6: MISO Load Fraction at State Level (MWh)

State	MISO Sales	Non-MISO Sales	MISO State Level Load Fraction					
			2010	2011	2012	2013	2014	Average
AR	34,008,348	13,071,953	70.57%	70.39%	70.52%	70.45%	72.23%	70.83%
IA	43,920,136	3,281,717	92.92%	93.04%	93.22%	92.92%	93.05%	93.03%
IL	49,309,489	92,230,798	34.55%	34.80%	33.91%	34.59%	34.84%	34.54%
IN+KY	96,504,879	89,276,549	47.49%	48.49%	48.78%	49.94%	51.95%	49.33%
LA	83,987,702	6,640,614	91.77%	91.74%	92.06%	92.20%	92.67%	92.09%
MI	99,263,860	4,050,238	96.01%	96.16%	96.21%	96.10%	96.08%	96.11%
MN	67,870,999	848,368	98.73%	98.73%	98.84%	98.75%	98.77%	98.76%
MO	41,332,442	42,545,955	49.67%	49.47%	50.33%	49.52%	49.28%	49.65%
MS	22,014,990	27,393,641	45.89%	45.24%	44.78%	44.73%	44.56%	45.04%
ND+MT	11,739,180	20,602,944	37.35%	37.90%	36.76%	37.46%	36.30%	37.15%
SD	3,120,871	9,233,855	26.87%	26.07%	26.02%	25.32%	25.26%	25.91%
TX	21,815,593	367,854,227	5.66%	5.46%	5.99%	5.74%	5.60%	5.69%
WI	69,494,755	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

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

Figure 20 illustrates the percentage of total electricity sales from MISO associated utilities at the state level for the period of 2010-2014. The numbers above the bars represent the five-year average MISO load fraction at the state level.

Figure 20: State-Level MISO Load Fraction, 2010 to 2014



MISO REGIONAL ENERGY FORECASTS

Table 7 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 7: MISO Load Fraction at LRZ Level (Average Percentage of State-Level Electricity Sales from 2010 to 2014)

LRZ	AR	IA[10]	IL	IN+KY	LA	MI[11]	MN	MO[12]	MS	ND+MT	SD	TX[13]	WI[14]
1		1.8%	0.0002%			0.1%	96.8%			37.2%	24.1%		16.8%
2						5.1%							83.2%
3		91.3%	1.4%				2.0%				1.8%		
4			33.1%										
5								49.4%					
6				49.3%									
7						90.9%							
8	70.8%							0.2%				0.01%	
9					92.1%							5.7%	
10									45.0%				
Non-MISO	29.2%	7.0%	65.5%	50.7%	7.9%	3.9%	1.2%	50.3%	55.0%	62.8%	74.1%	94.3%	0.0%

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

Table 8 summarizes the percentage of MISO electricity sales in each state for the period of 2010-2014 and the five-year average by LRZ. For most states, their percentage of electricity sales from MISO utilities was quite stable during this period. Figure 21 to Figure 30 display MISO state level load fraction by LRZ from 2010 to 2014.

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10 Part of utilities in Iowa such as Heartland Power Coop, Hawkeye Tri-County EL Coop Inc. etc. used Dairy Land Power Cooperative as their balancing authority. Dairy Land Power Cooperative is a local balancing authority in MISO market footprint LRZ 1. Therefore, electricity sales from those utilities are considered MISO sales in LRZ 1.

11 Northern States Power Company provides electricity to customers in the Upper Peninsula of Michigan. As it is categorized as MISO LRZ 1 utility, its sales to Michigan are considered MISO sales in LRZ 1.

12 Some utilities in Missouri adjacent to Arkansas used Entergy as their balancing authority, such as City of West Plains and Clay County Electric Coop Corp. Therefore, those sales were classified as MISO sales in LRZ 8 instead of LRZ 5.

13 Southwest Arkansas ECC sells electricity to Texas using Entergy as its balancing agency. Since it is located in Arkansas, it is grouped with LRZ 8 utilities. Therefore, its sales in Texas are also treated as zone 8 sales.

14 Northern States Power Company and Dairy Land Power Cooperative provide electricity to customers in western Wisconsin. Therefore, their sales are considered MISO sales in LRZ 1.

Table 8: State Level MISO Load Fraction by MISO LRZs

MISO LRZ	State	State Level MISO Load Fraction					
		Average	2010	2011	2012	2013	2014
1	IA	1.77%	1.77%	1.76%	1.73%	1.78%	1.83%
	IL	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%
	MI	0.14%	0.14%	0.14%	0.13%	0.14%	0.14%
	MN	96.81%	96.73%	96.76%	96.93%	96.89%	96.76%
	ND+MT	37.15%	37.35%	37.90%	36.76%	37.46%	36.30%
	SD	24.10%	24.97%	24.28%	24.24%	23.51%	23.51%
	WI	16.77%	16.59%	16.94%	16.23%	17.02%	17.05%
2	MI	5.09%	5.22%	5.28%	4.89%	4.94%	5.14%
	WI	83.23%	83.41%	83.06%	83.77%	82.98%	82.95%
3	IA	91.25%	91.14%	91.28%	91.48%	91.15%	91.22%
	IL	1.42%	1.42%	1.45%	1.42%	1.42%	1.40%
	MN	1.95%	2.00%	1.97%	1.91%	1.86%	2.01%
	SD	1.81%	1.90%	1.79%	1.77%	1.80%	1.75%
4	IL	33.11%	33.12%	33.35%	32.49%	33.17%	33.44%
5	MO	49.41%	49.41%	49.22%	50.09%	49.28%	49.06%
6	IN+KY	49.29%	47.49%	48.49%	48.60%	49.94%	51.95%
7	MI	90.88%	90.65%	90.75%	91.19%	91.02%	90.80%
8	AR	70.83%	70.57%	70.39%	70.52%	70.45%	72.23%
	MO	0.24%	0.26%	0.25%	0.24%	0.23%	0.22%
	TX	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
9	LA	92.09%	91.77%	91.74%	92.06%	92.20%	92.67%
	TX	5.68%	5.65%	5.46%	5.98%	5.73%	5.59%
10	MS	45.04%	45.89%	45.24%	44.78%	44.73%	44.56%

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

Figure 21: MISO State-Level Load Fractions at LRZ 1

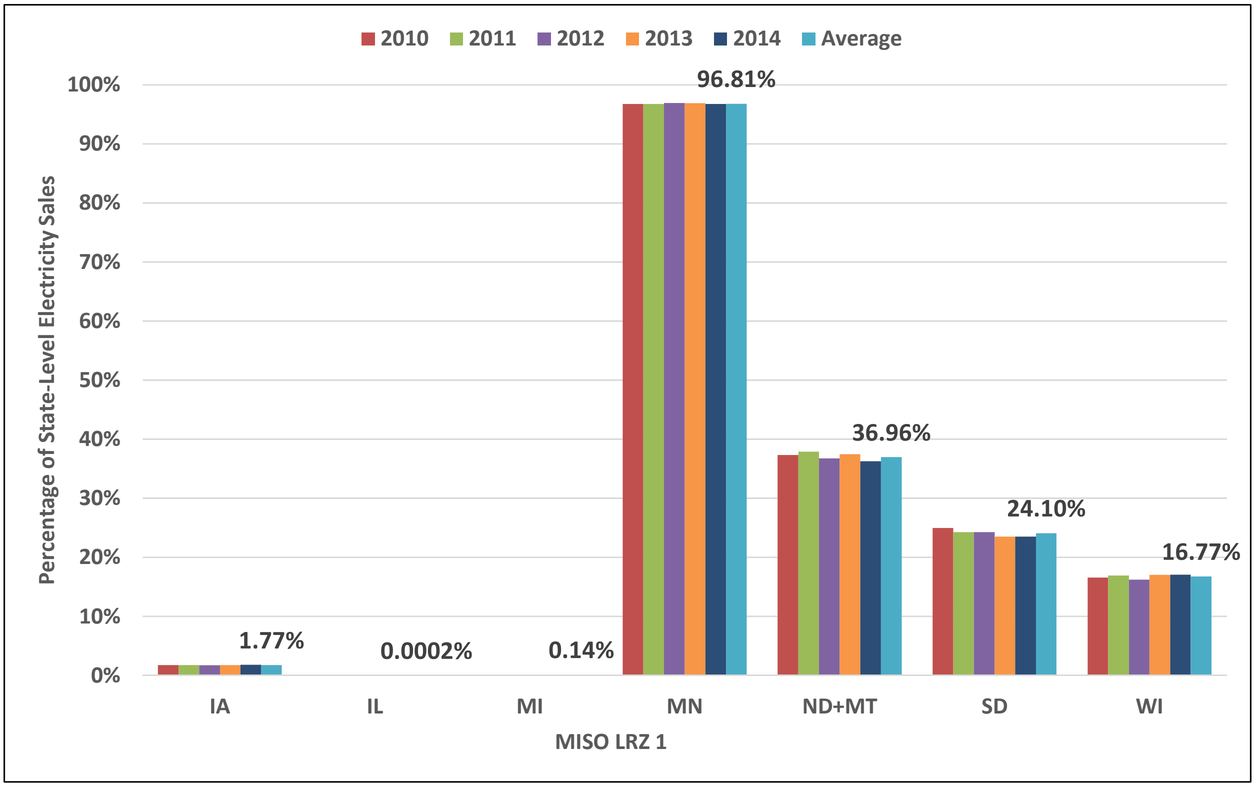


Figure 22: MISO State-Level Load Fractions at LRZ 2

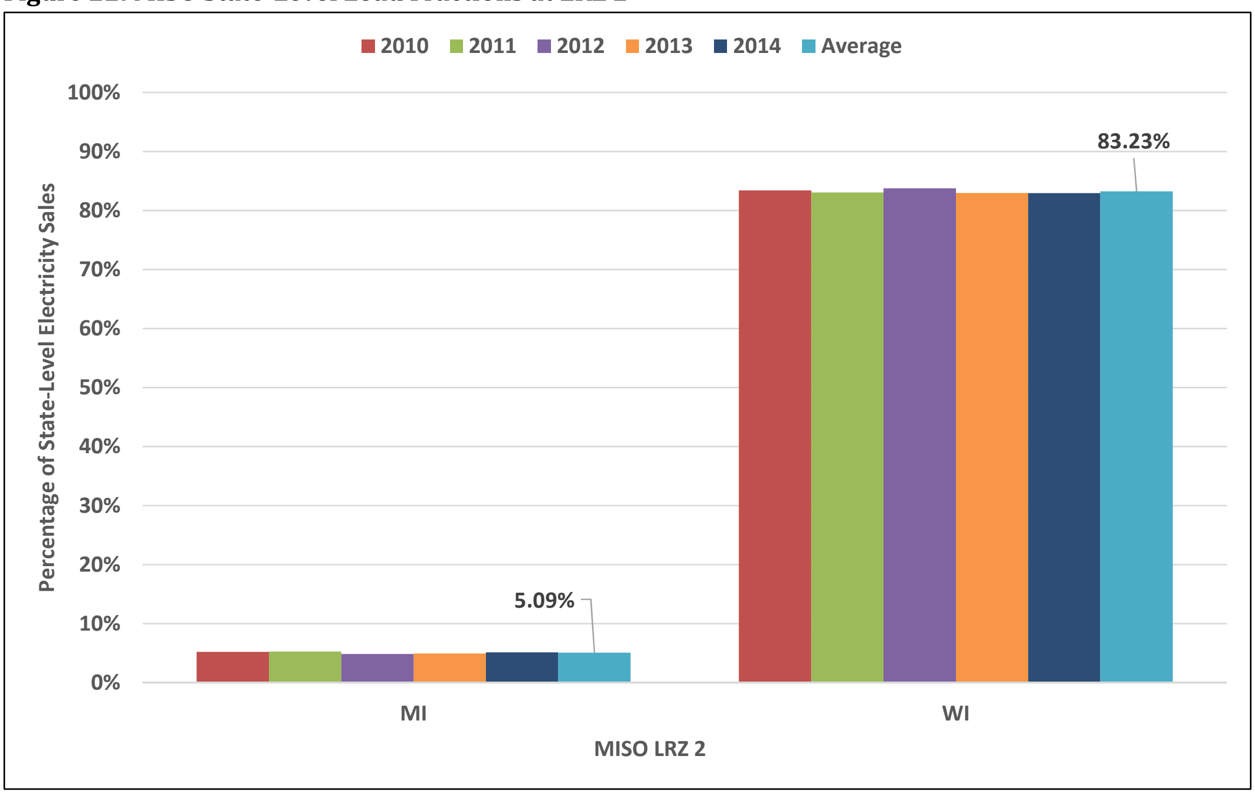


Figure 23: MISO State-Level Load Fractions at LRZ 3

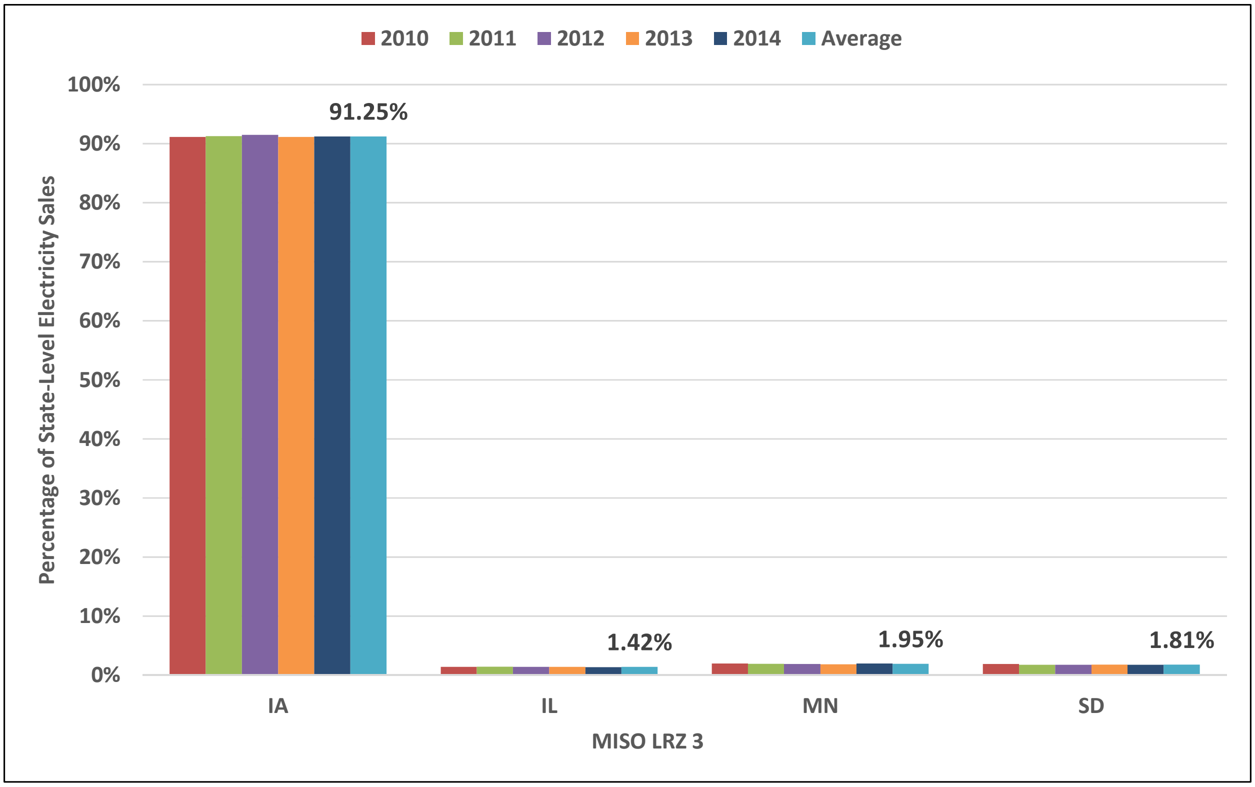


Figure 24: MISO State-Level Load Fractions at LRZ 4

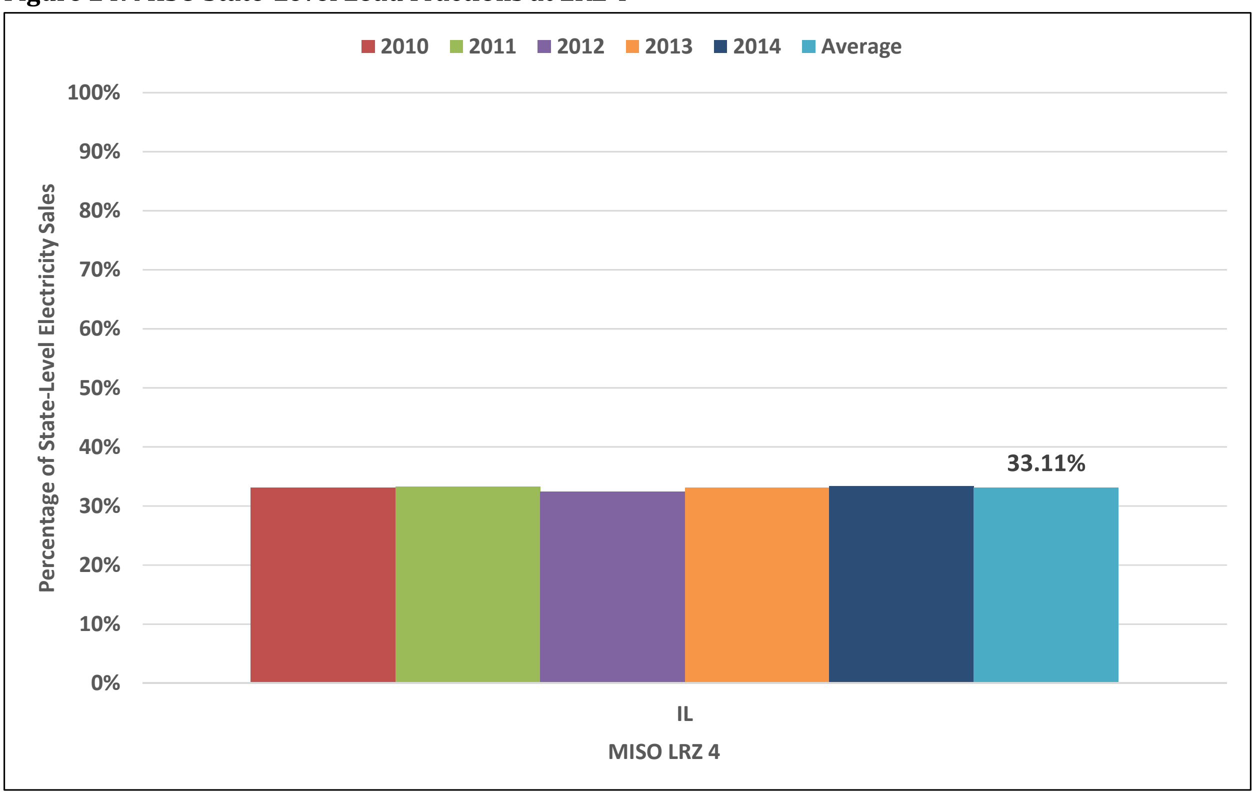


Figure 25: MISO State-Level Load Fractions at LRZ 5

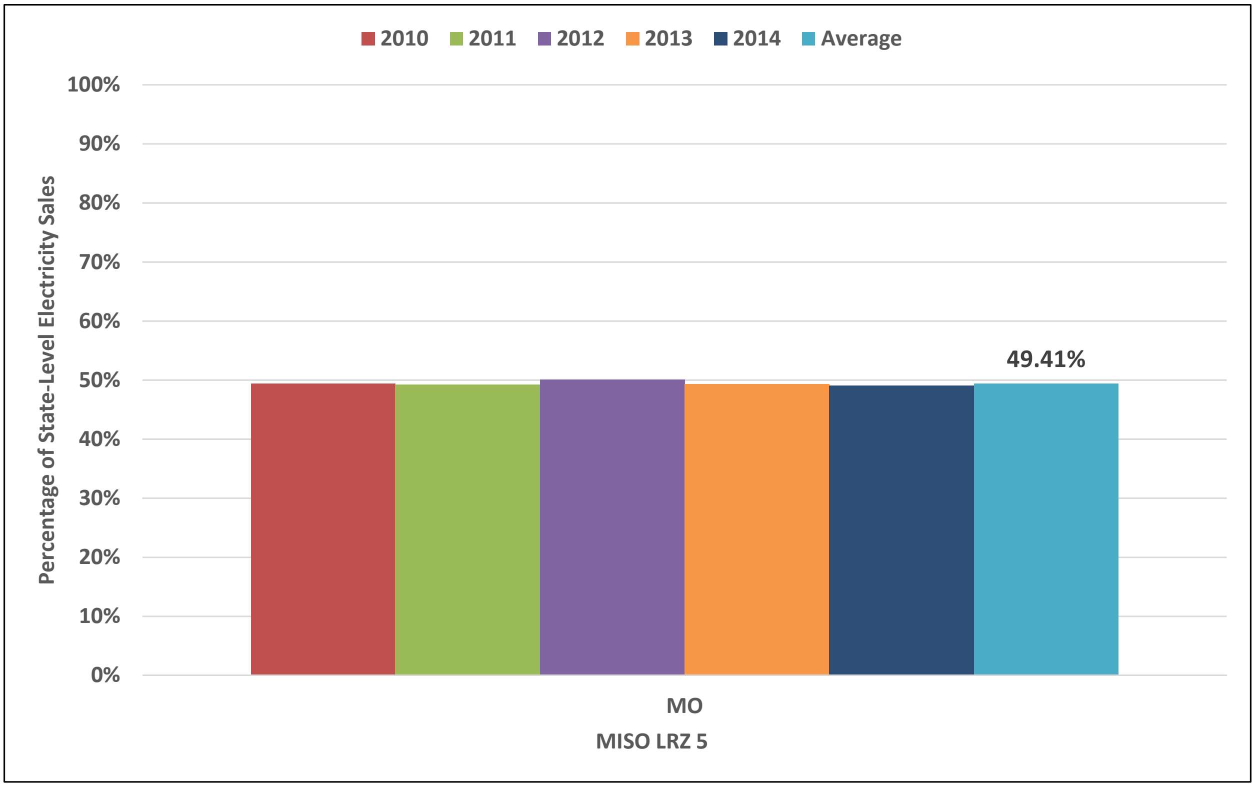


Figure 26: MISO State-Level Load Fractions at LRZ 6

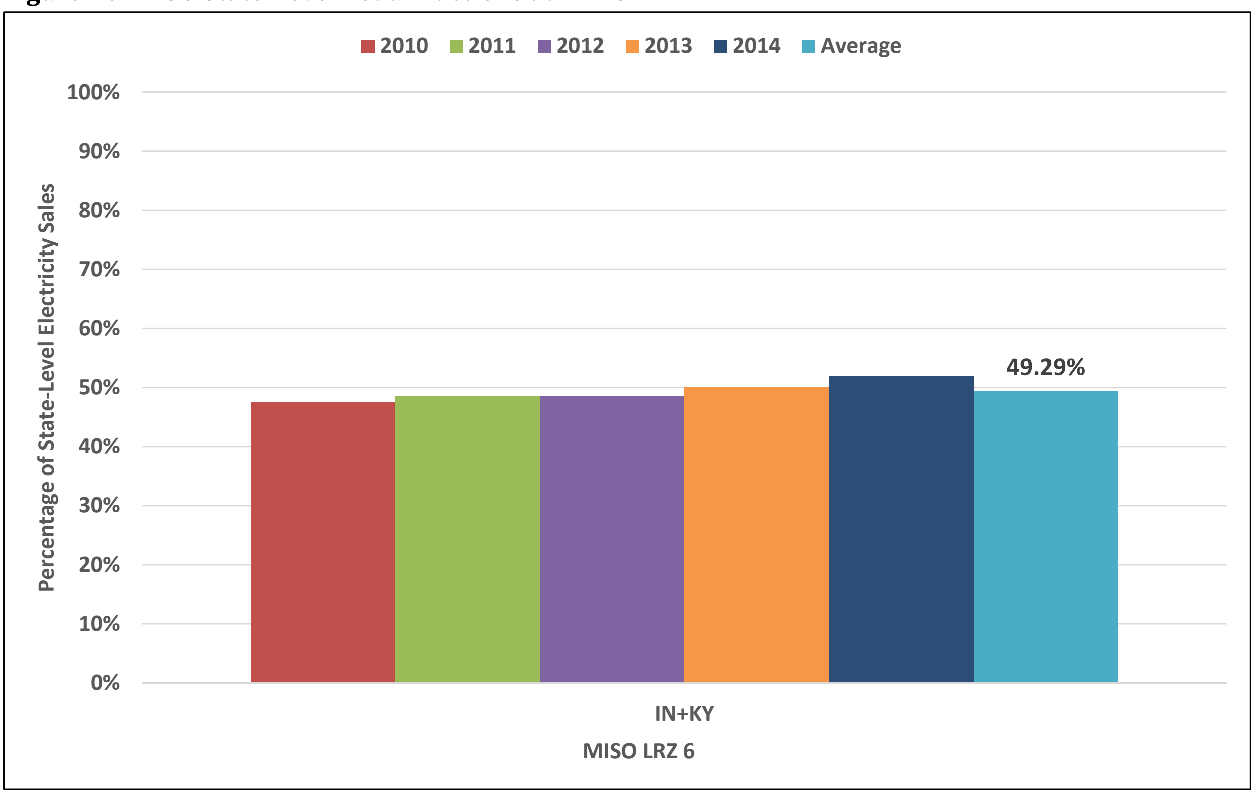


Figure 27: MISO State-Level Load Fractions at LRZ 7

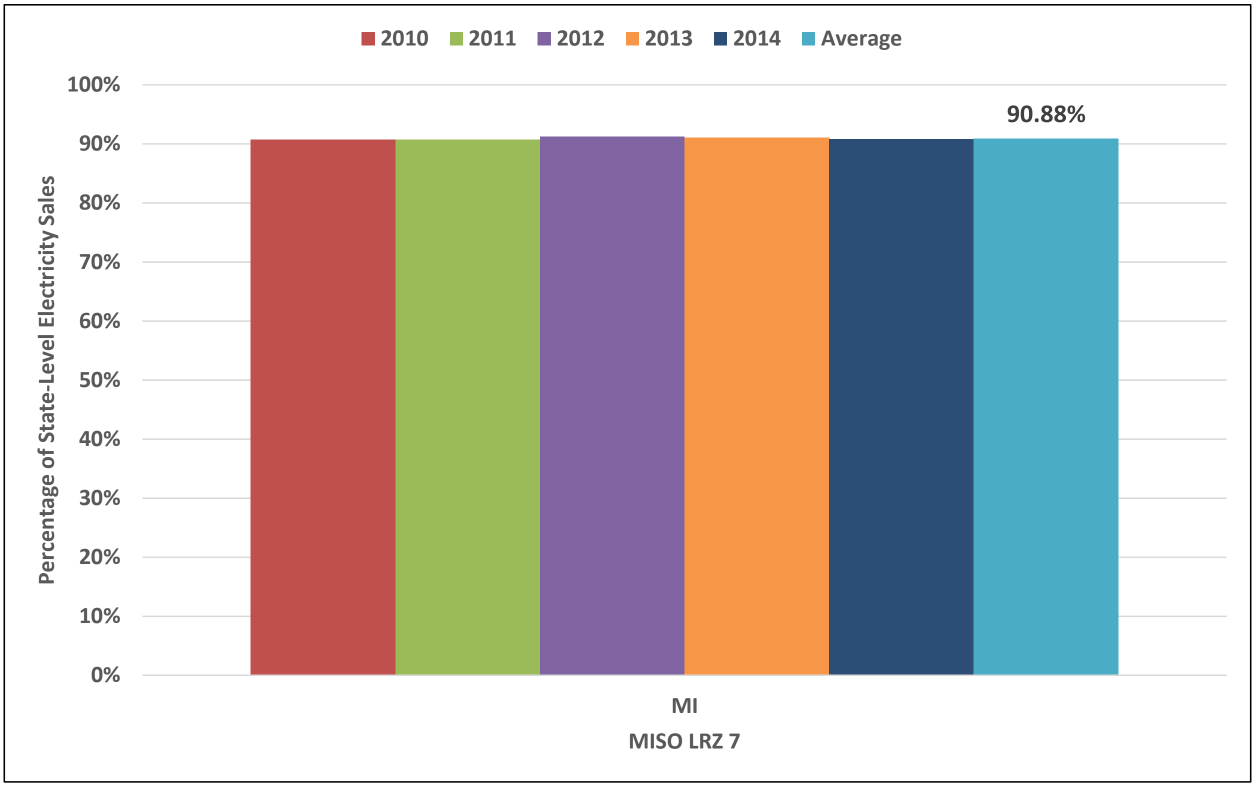


Figure 28: MISO State-Level Load Fractions at LRZ 8

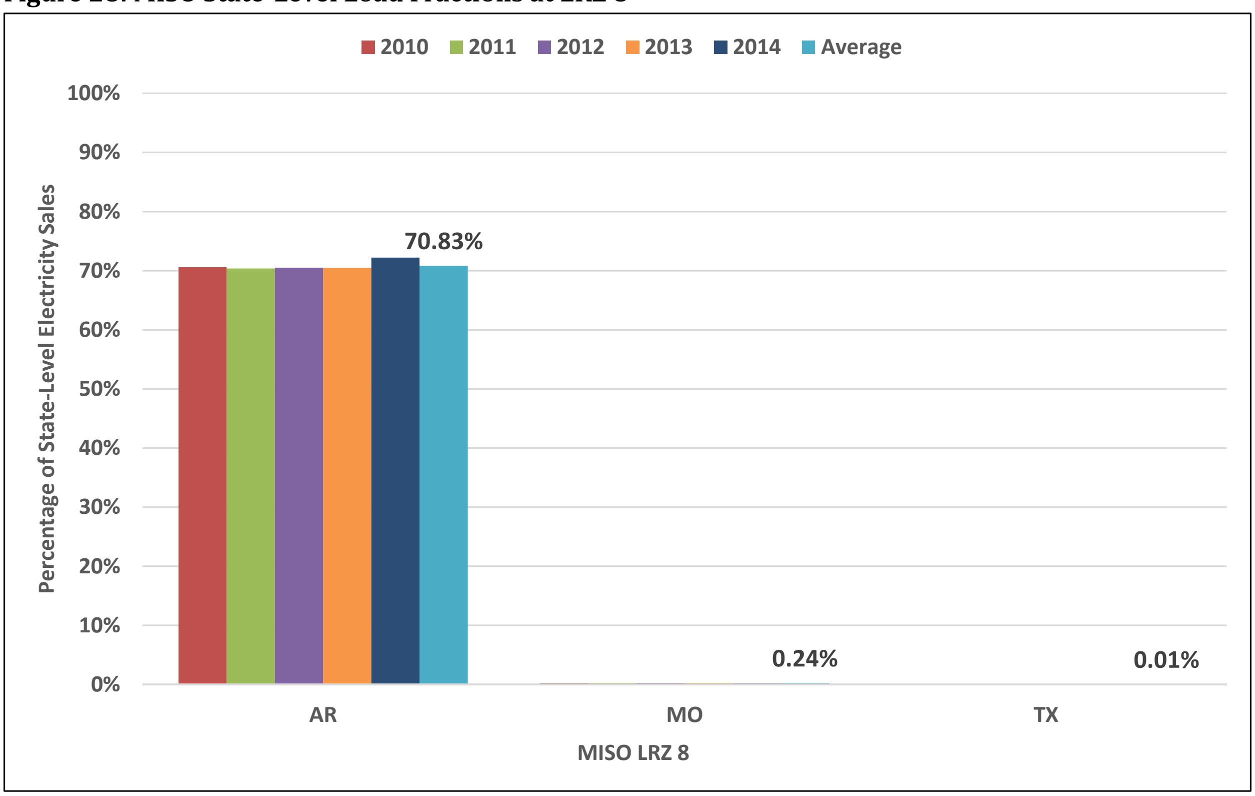


Figure 29: MISO State-Level Load Fractions at LRZ 9

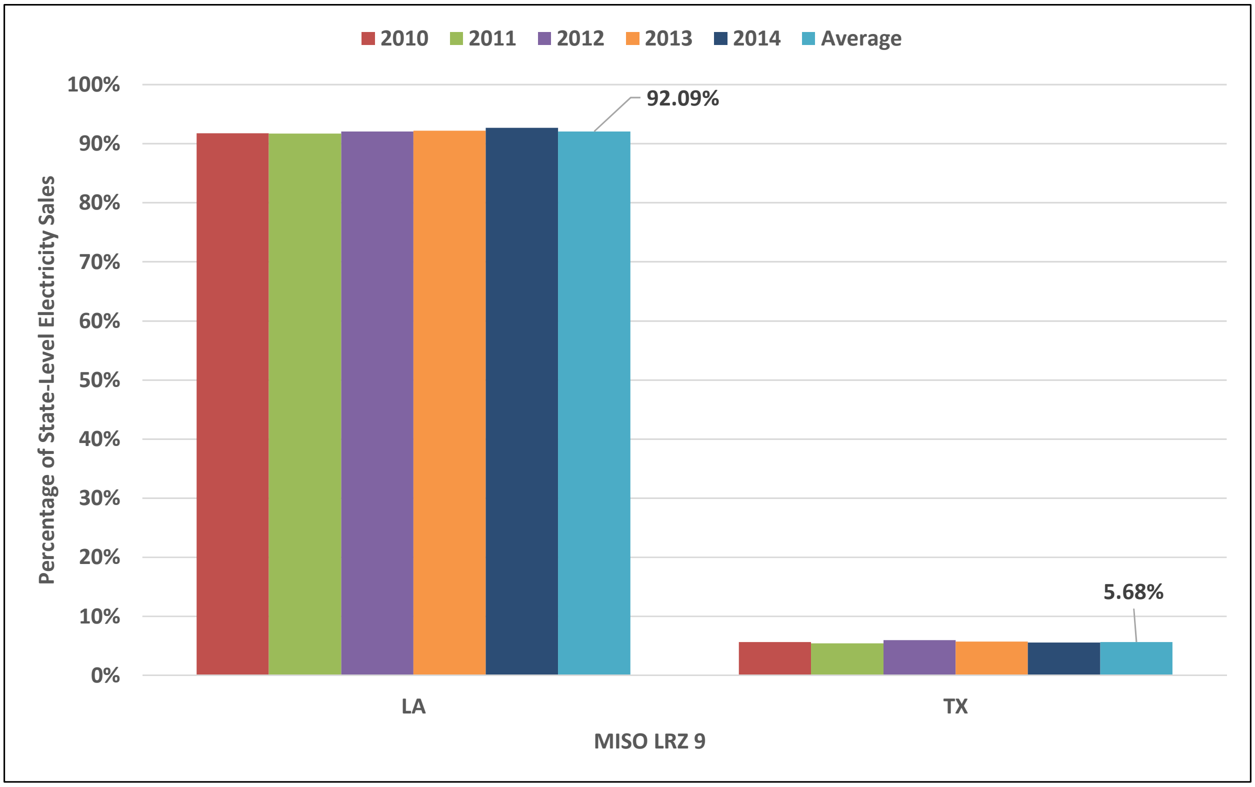
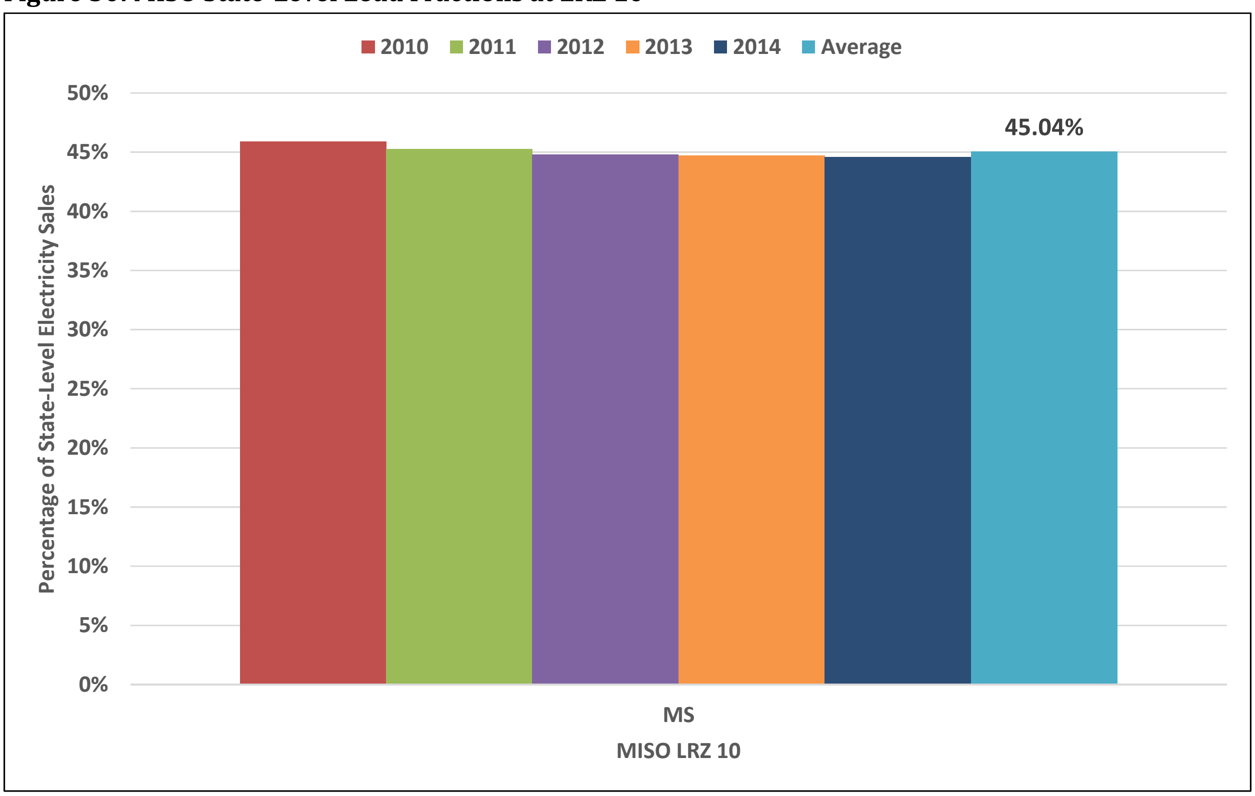


Figure 30: MISO State-Level Load Fractions at LRZ 10



4.1.2 MISO Future Allocation Factors

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 are close to those for the entire state of Missouri, the share of electricity sales in the MISO portion is held constant into the future. A similar analysis was performed for Illinois using the Chicago metropolitan area. Table 9 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 by applying the estimated historical distribution losses. Figure 31 to Figure 43 provide historical market shares and future allocation factors for the 15 states within the MISO market footprint.

Table 9: Allocation Factors to Convert State Sales to LRZ Sales

MISO LRZ	State	Allocation Factor	
		Basis	Forecasting Period
1	IA	Historical average (2010-2014)	Constant at 1.77%
	IL	Historical average (2010-2014)	Constant at 0.0002%
	MI	Historical average (2010-2014)	Constant at 0.14%
	MN	Historical average (2010-2014)	Constant at 96.81%
	ND+MT	Historical average (2010-2013)	Constant at 37.37%
	SD	Historical average (2010-2014)	Constant at 24.10%
	WI	Historical average (2010-2014)	Constant at 16.77%
2	MI	Historical average (2010-2014)	Constant at 5.09%
	WI	Historical average (2010-2014)	Constant at 83.23%
3	IA	Historical average (2010-2014)	Constant at 91.25%
	IL	Historical average (2010-2014)	Constant at 1.42%
	MN	Historical average (2010-2014)	Constant at 1.95%
	SD	Historical average (2010-2014)	Constant at 1.81%
4	IL	Chicago vs. state growth Historical average (2010-2014)	Constant at 33.11%
5	MO	St. Louis vs. state growth Historical average (2010-2014)	Constant at 49.41%
6	IN+KY	2014 value	Constant at 51.95%
7	MI	Historical average (2010-2014)	Constant at 90.88%
8	AR	Historical average (2010-2014)	Constant at 70.83%
	MO	Historical average (2010-2014)	Constant at 0.24%
	TX	Historical average (2010-2014)	Constant at 0.0060%
9	LA	Historical average (2010-2014)	Constant at 92.09%
	TX	Historical average (2010-2014)	Constant at 5.68%
10	MS	Historical average (2010-2014)	Constant at 45.04%

Figure 31: MISO Allocation Factors—AR

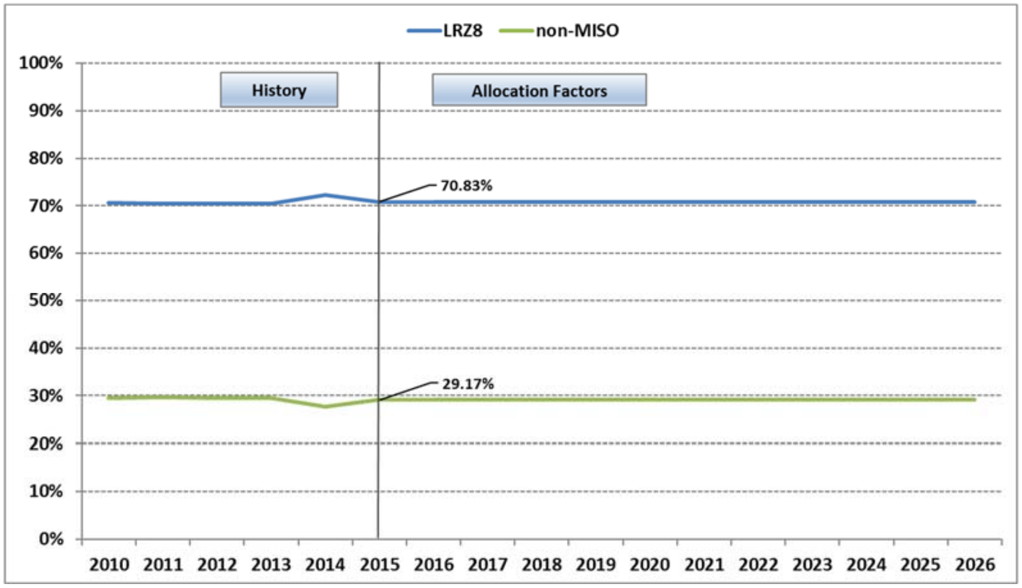


Figure 31 shows the historical MISO market share and future allocation factor for the state of Arkansas. Historical values for LRZ 8 are in the range of 70.39% to 72.23%. The allocation factor is held constant at the average of the historical values (70.83%).

Figure 32 : MISO Allocation Factors—IA

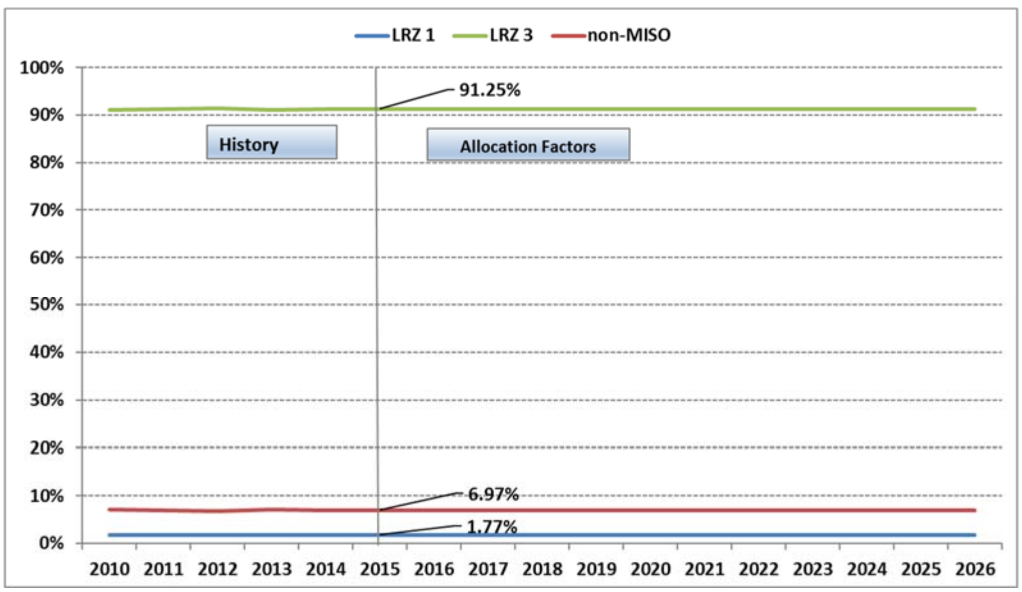


Figure 32 shows the historical MISO market share and future allocation factor for Iowa. Historical values for LRZ 1 are in the range of 1.73% to 1.83%. The allocation factor is held constant at the average of the historical values (1.77%). For LRZ 3, historical values have little variation, which range from 91.14% to 91.48%. The allocation factor is held constant at the average of the historical values (91.25%).

Figure 33: MISO Allocation Factors—IL

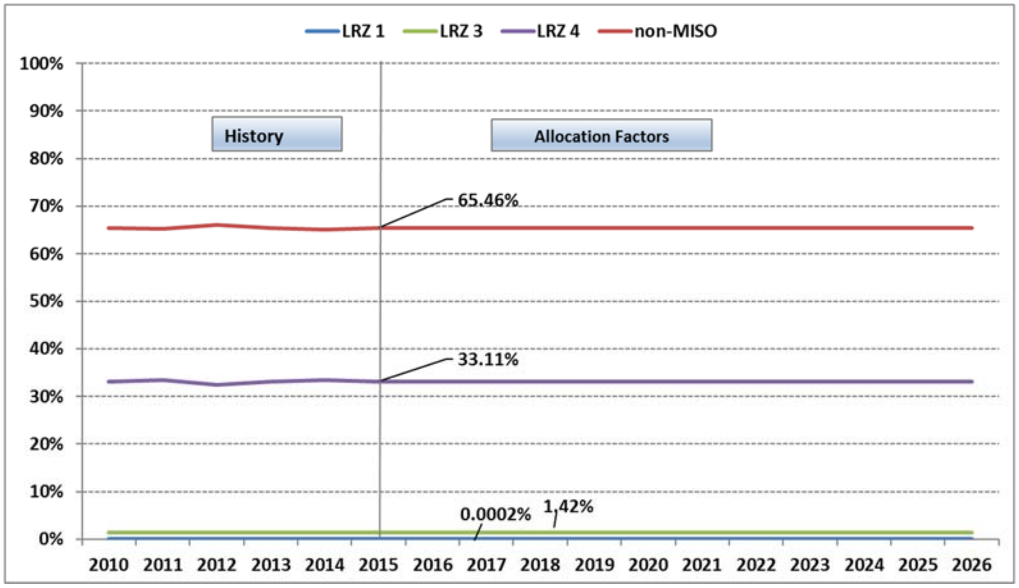


Figure 33 shows the historical MISO market share and future allocation factor for Illinois. Based on the projections of the values for the model drivers for the state of Illinois and for the Chicago metropolitan statistical area, the non-MISO region is projected to grow at a similar rate to the MISO region. The allocation factors for LRZ 4 are held constant at the average of the historical values (33.11%). For LRZ 1 and LRZ 3, very small variations are observed in their historical values. They are held constant at the averages of their historical values (0.0002% and 1.42% respectively).

Figure 34: MISO Allocation Factors—IN+KY

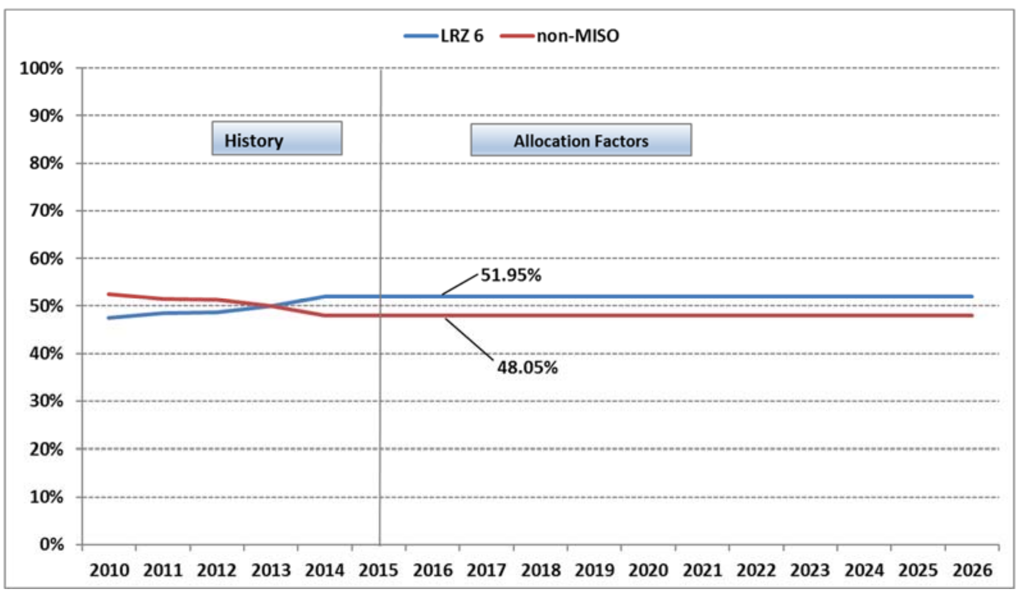


Figure 34 shows the combined historical MISO market share for Indiana and Kentucky and the future allocation factor. The historical share in the MISO footprint has risen throughout the observations (from 47.49% to 51.95% as shown in the graph). Because the 2014 value reflects the MISO share in LRZ 6 after the complete shutdown of the PGDP in Kentucky, the future allocation factor is held constant at the 2014 value (51.95%).

Figure 35: MISO Allocation Factors—LA

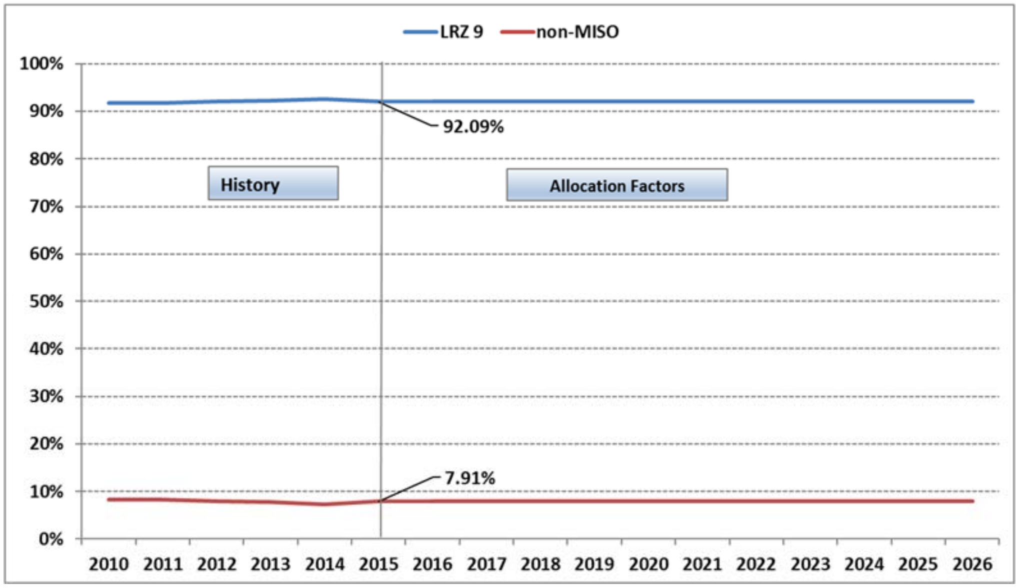


Figure 35 shows the historical MISO market share and future allocation factor for Louisiana. Very small variations are observed in the historical shares, which are in the range of 91.74% to 92.67%. The allocation factor is held constant at the average of the historical values (92.09%).

Figure 36: MISO Allocation Factors—MI

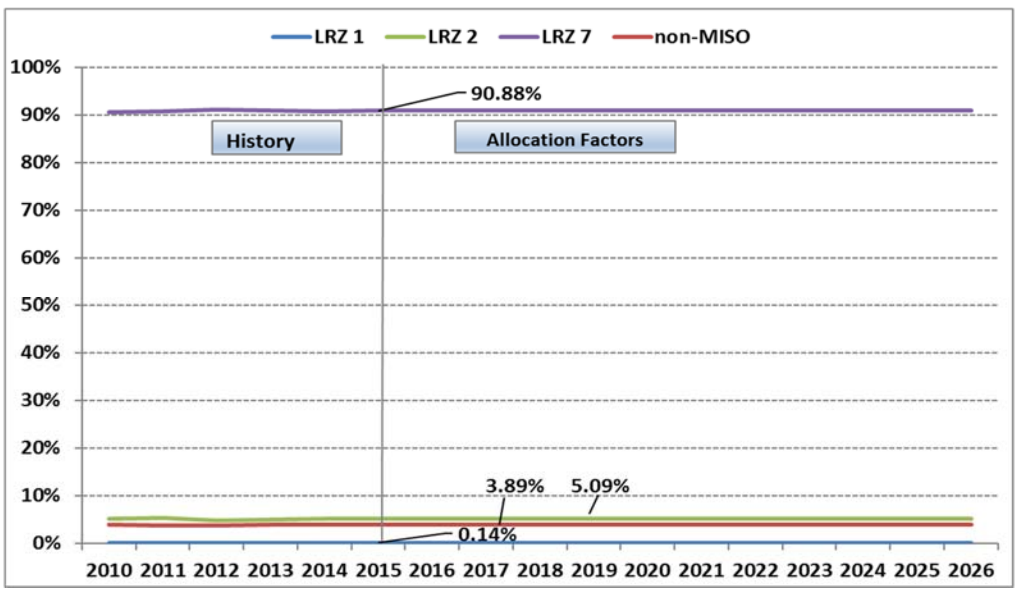


Figure 36 shows the historical MISO market share and future allocation factor for Michigan. LRZ 1 has very little variation in historical shares and is held constant at the average of the historical values (0.14%). LRZ 2 has historical shares ranging from 4.94% to 5.28%. The allocation factor is held constant at the historical average (5.09%). The variation in LRZ 7 has been low (between 90.65% and 91.19%). The allocation factor is held constant at the average of the historical values (90.88%).

Figure 37: MISO Allocation Factors—MN

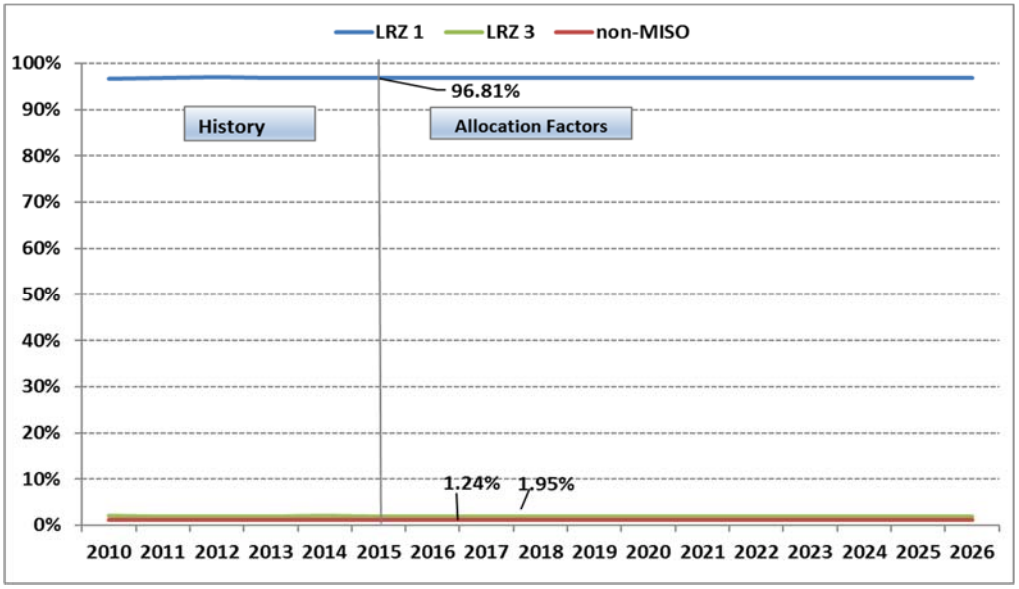


Figure 37 shows the historical MISO market share and future allocation factor for Minnesota. The variation in LRZ 1 has been very low (between 96.73% and 96.93%). The allocation factor is held constant at the average of the historical values (96.81%). The variation in LRZ 3 has also been low (between 1.86% and 2.01%). The allocation factor is held constant at the average of the historical values (1.95%).

Figure 38: MISO Allocation Factors—MO

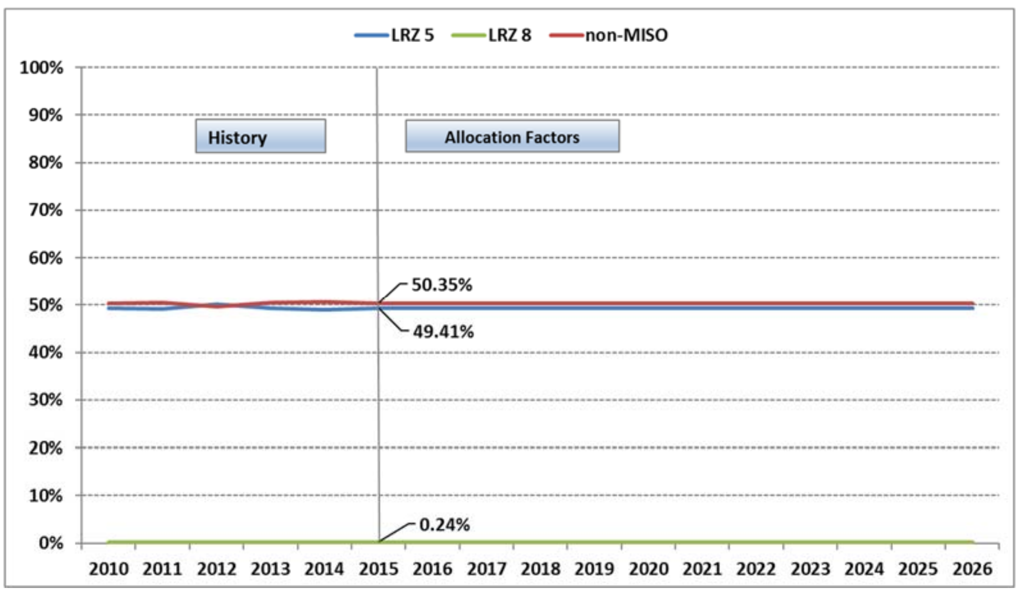


Figure 38 shows the historical MISO market share and future allocation factor for Missouri. Based on the projections of the values for the model drivers for the state of Missouri and for the St. Louis metropolitan statistical area, the non-MISO region is projected to grow at a rate similar to the MISO region. The allocation factor for LRZ 5 is held constant at the historical values (49.41%). The variation in the historical share of LRZ 8 is low. The allocation factor is held constant at the average of the historical values (0.24%).

Figure 39: MISO Allocation Factors—MS

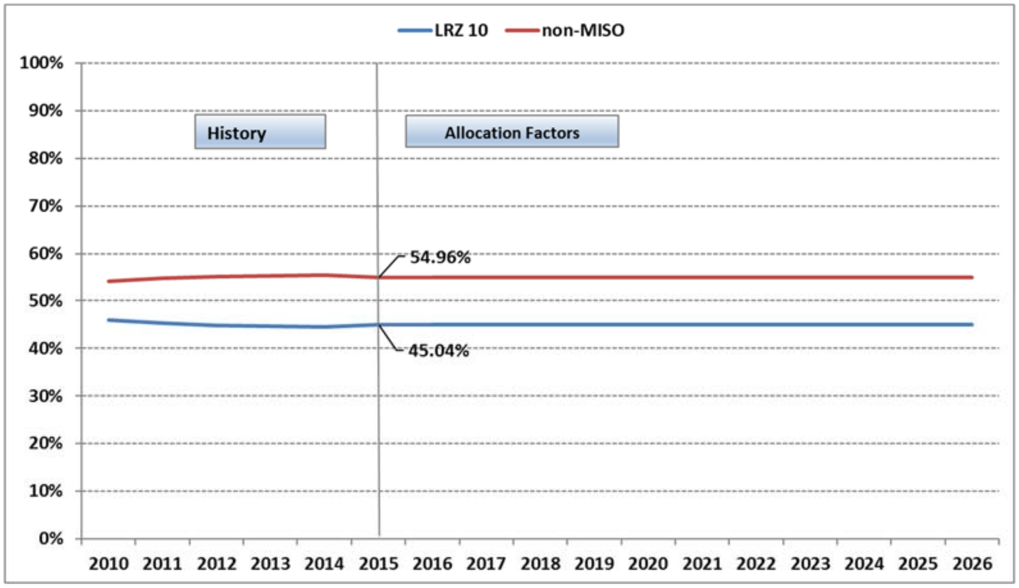


Figure 39 shows the historical MISO market share and future allocation factors for Mississippi. While there is some variation in the historical share (between 44.73% and 45.89%), there is no consistent pattern of growth or shrinkage. The allocation factor is held constant at the average of the historical values (45.04%).

Figure 40: MISO Allocation Factors—ND+MT

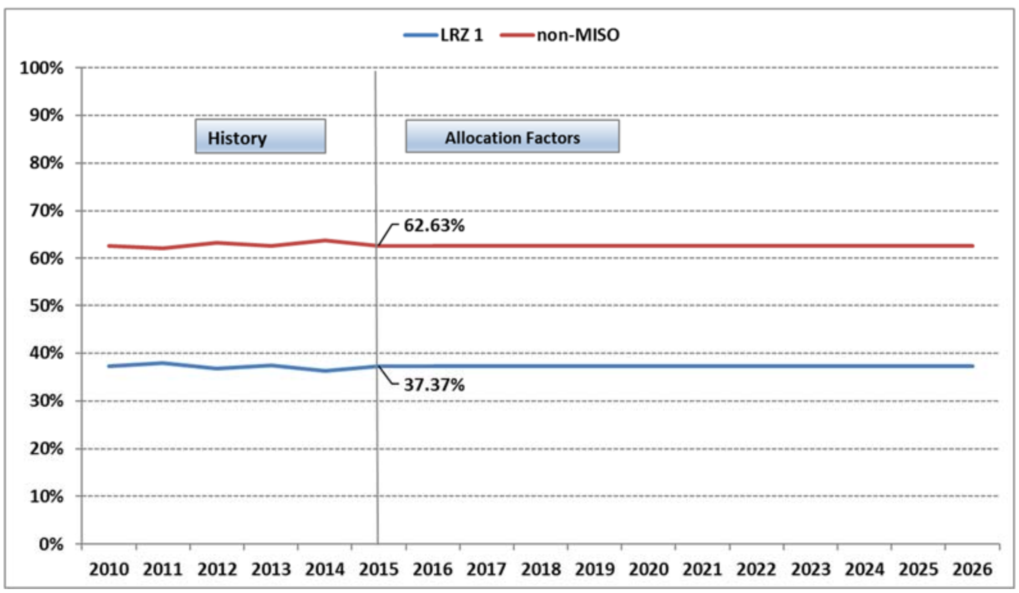


Figure 40 shows the combined historical MISO market share in North Dakota and Montana and the future allocation factor. The historical shares range from 36.30% to 37.90%, without a clear trend of growing or shrinking. The allocation factor is held constant at the average of the historical values of the period of 2010-2013 (37.37%). The 2014 value is excluded in the calculation because it coincides with the peak of the shale gas boom. The shale boom is especially significant because the majority of the growth in retail sales occurred in the non-MISO portion of the region. While the Bakken region continues to produce, it is at a lower level due to lower oil prices. Thus, the 2010-2013 period, which had some production, is considered to be more indicative of the current economic conditions in ND.

Figure 41: MISO Allocation Factors—SD

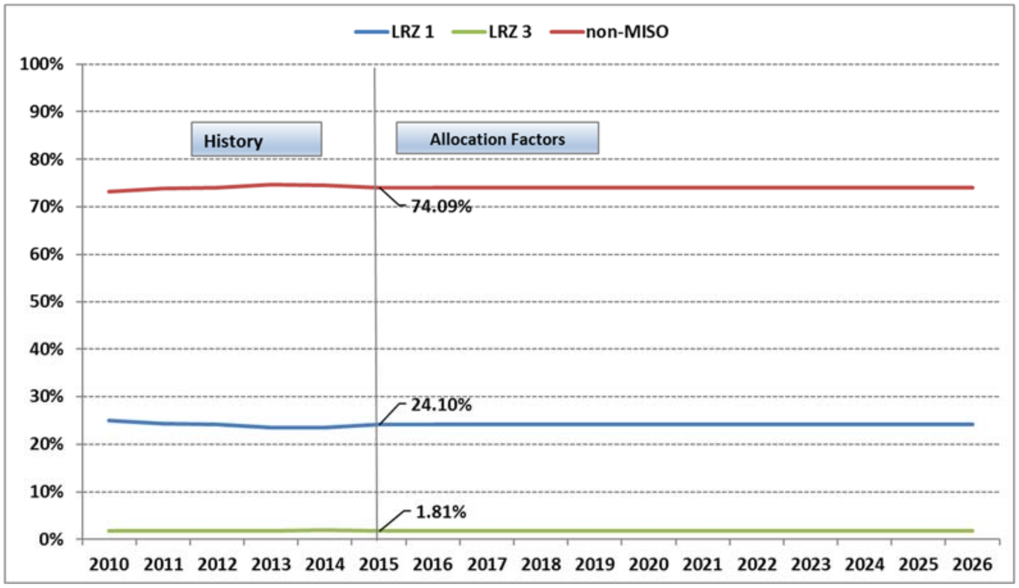


Figure 41 shows the historical MISO market share and future allocation factor for South Dakota. The variation in the historical share of LRZ 1 is moderate (between 23.51% and 24.97%). The allocation factor is held constant at the average of the historical values (24.10%). The variation in the historical share of LRZ 3 is low (between 1.75% and 1.90%). The allocation factor is held constant at the average of the historical values (1.81%).

Figure 42: MISO Allocation Factors—TX

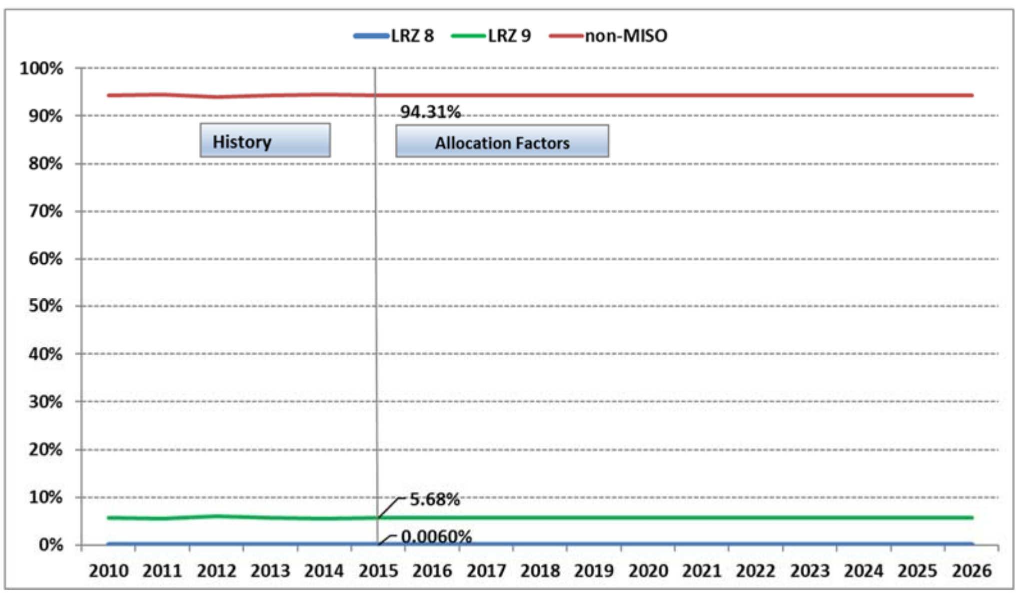


Figure 42 shows the historical MISO market share and future allocation factor for Texas. The variation has been very low for LRZ 8 (between 0.0057% and 0.0065%). The allocation factor is held constant at the average of historical values (0.0060%). For LRZ 9, historical shares fluctuated in the range of 5.46% to 5.98%. The allocation factor is held constant at its historical average (5.68%).

Figure 43: MISO Allocation Factors—WI

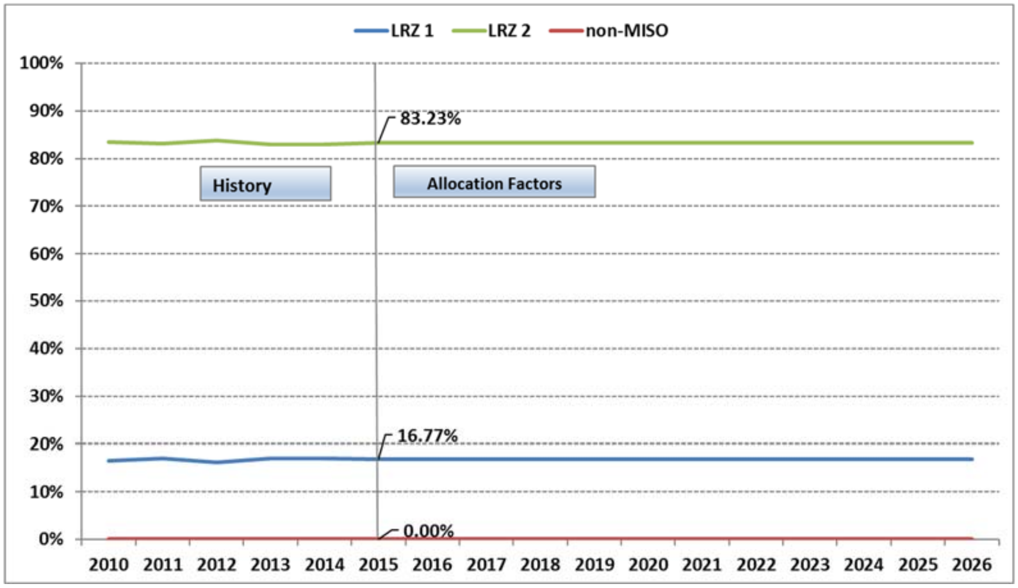


Figure 43 shows the historical MISO market share and future allocation factor for Wisconsin. The variation in the historical share of LRZ 1 is moderate (between 16.23% and 17.05%). The allocation factor is held constant at the average of the historical values (16.77%). The variation in the historical share of LRZ 2 is also moderate (between 82.95% and 83.77%). The allocation factor is held constant at the average of the historical values (83.23%).

4.2 ANNUAL ENERGY FORECASTS

Table 10 provides the gross LRZ annual metered load projections (without the EE/DR/DG adjustments) and Table 11 provides the net LRZ annual metered load projections (with the EE/DR/DG adjustments). Please note that 2015 data shown in the following tables are actual loads from data provided by MISO. Thus, they are the same on both the gross and net basis. Also, there is no EE/DR/DG adjustment for LRZ 10 because none was indicated from the EGEAS results provided by MISO.

Table 10: Gross LRZ Energy Forecasts without EE/DR/DG Adjustments (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	96,613	64,572	47,074	49,243	41,938	98,266	99,885	36,631	111,306	22,294
2016	101,800	67,413	48,003	51,128	44,164	102,187	104,059	38,822	106,783	22,842
2017	103,657	69,032	48,626	51,601	44,801	103,760	105,499	39,889	110,054	23,363
2018	105,517	70,620	49,391	51,943	45,442	105,309	107,523	40,693	112,418	23,693
2019	107,422	71,847	50,326	52,409	46,013	106,920	109,076	41,189	113,442	24,110
2020	109,430	72,810	51,244	52,839	46,609	108,465	110,025	41,486	114,289	24,535
2021	111,359	73,670	52,036	53,122	47,142	109,966	110,503	41,740	114,689	24,990
2022	113,274	74,705	52,838	53,384	47,694	111,357	111,260	42,069	115,380	25,416
2023	115,080	75,782	53,682	53,655	48,296	112,701	112,040	42,488	116,447	25,806
2024	116,830	76,834	54,553	53,989	48,936	114,057	113,164	42,946	117,744	26,196
2025	118,635	77,799	55,458	54,297	49,549	115,408	114,214	43,419	118,627	26,604
2026	120,469	78,843	56,398	54,644	50,122	116,780	115,186	43,913	119,744	27,022
Annual Growth Rates (%)										
2015-2016	5.37	4.40	1.97	3.83	5.31	3.99	4.18	5.98	-4.06	2.46
2016-2017	1.82	2.40	1.30	0.92	1.44	1.54	1.38	2.75	3.06	2.28
2017-2018	1.79	2.30	1.57	0.66	1.43	1.49	1.92	2.02	2.15	1.41
2018-2019	1.81	1.74	1.89	0.90	1.26	1.53	1.44	1.22	0.91	1.76
2019-2020	1.87	1.34	1.83	0.82	1.29	1.45	0.87	0.72	0.75	1.76
2020-2021	1.76	1.18	1.55	0.53	1.14	1.38	0.43	0.61	0.35	1.85
2021-2022	1.72	1.41	1.54	0.49	1.17	1.26	0.69	0.79	0.60	1.71
2022-2023	1.59	1.44	1.60	0.51	1.26	1.21	0.70	1.00	0.92	1.53
2023-2024	1.52	1.39	1.62	0.62	1.32	1.20	1.00	1.08	1.11	1.51
2024-2025	1.54	1.26	1.66	0.57	1.25	1.18	0.93	1.10	0.75	1.56
2025-2026	1.55	1.34	1.70	0.64	1.16	1.19	0.85	1.14	0.94	1.57
Compound Annual Growth Rates (%)										
2015-2020	2.52	2.43	1.71	1.42	2.13	1.99	1.95	2.52	0.53	1.93
2015-2026	2.03	1.83	1.66	0.95	1.63	1.58	1.30	1.66	0.67	1.76
2017-2026	1.68	1.49	1.66	0.64	1.25	1.32	0.98	1.07	0.94	1.63

Table 11: Net LRZ Energy Forecasts with EE/DR/DG Adjustments (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	96,613	64,572	47,074	49,243	41,938	98,266	99,885	36,631	111,306	22,294
2016	101,599	67,318	47,763	50,970	44,084	102,071	103,761	38,780	106,747	22,842
2017	103,376	68,933	48,204	51,350	44,650	103,581	105,089	39,843	109,988	23,363
2018	105,149	70,519	48,786	51,596	45,219	105,063	106,998	40,644	112,320	23,693
2019	106,961	71,742	49,536	51,964	45,717	106,602	108,432	41,136	113,306	24,110
2020	108,867	72,702	50,268	52,294	46,237	108,071	109,257	41,428	114,109	24,535
2021	110,682	73,560	50,871	52,474	46,693	109,491	109,606	41,678	114,460	24,990
2022	112,481	74,592	51,483	52,632	47,167	110,796	110,232	42,003	115,097	25,416
2023	114,163	75,666	52,133	52,797	47,690	112,050	110,874	42,417	116,104	25,806
2024	115,783	76,716	52,808	53,021	48,248	113,310	111,858	42,870	117,336	26,196
2025	117,449	77,677	53,513	53,218	48,778	114,559	112,762	43,338	118,148	26,604
2026	119,138	78,718	54,249	53,453	49,267	115,824	113,584	43,827	119,188	27,022
Annual Growth Rates (%)										
2015-2016	5.16	4.25	1.46	3.51	5.12	3.87	3.88	5.87	-4.10	2.46
2016-2017	1.75	2.40	0.92	0.74	1.28	1.48	1.28	2.74	3.04	2.28
2017-2018	1.72	2.30	1.21	0.48	1.27	1.43	1.82	2.01	2.12	1.41
2018-2019	1.72	1.74	1.54	0.71	1.10	1.46	1.34	1.21	0.88	1.76
2019-2020	1.78	1.34	1.48	0.64	1.14	1.38	0.76	0.71	0.71	1.76
2020-2021	1.67	1.18	1.20	0.34	0.99	1.31	0.32	0.60	0.31	1.85
2021-2022	1.62	1.40	1.20	0.30	1.02	1.19	0.57	0.78	0.56	1.71
2022-2023	1.50	1.44	1.26	0.31	1.11	1.13	0.58	0.99	0.88	1.53
2023-2024	1.42	1.39	1.29	0.43	1.17	1.12	0.89	1.07	1.06	1.51
2024-2025	1.44	1.25	1.33	0.37	1.10	1.10	0.81	1.09	0.69	1.56
2025-2026	1.44	1.34	1.38	0.44	1.00	1.10	0.73	1.13	0.88	1.57
Compound Annual Growth Rates (%)										
2015-2020	2.42	2.40	1.32	1.21	1.97	1.92	1.81	2.49	0.50	1.93
2015-2026	1.92	1.82	1.30	0.75	1.48	1.51	1.18	1.64	0.62	1.76
2017-2026	1.59	1.49	1.32	0.45	1.10	1.25	0.87	1.06	0.90	1.63

5 MISO Regional Non-Coincident Peak Demand Forecasts

5.1 PEAK LOAD CONVERSION FACTORS

Peak load conversion factors were used to translate annual metered load at the MISO LRZ level to summer and winter 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 average hourly load for the year, summer/winter peak levels for the year, and weather conditions at the time of the peak demand.

The process involves three steps: (1) determine the relationship between the peak demand (normalized to the average demand level for the year) and temperature[15] using historical data, (2) estimate the "normal" weather conditions at the time of the peak demand, and (3) determine the relationship between peak demand and average demand under normal weather conditions.

5.1.1 Load Data and Selected Weather Stations

The zonal hourly load data was obtained from MISO and contains 52,584 hourly observations of LRZ-level loads from January 1, 2010 to December 31, 2015. These data points represent the MISO footprint at the time the data was collected. In 2014, the MISO market footprint was divided into 9 zones. In 2015, MISO split Mississippi from LRZ 9 and assigned it as LRZ 10.

Actual hourly weather data from 1997 to 2015 was obtained from the Midwest Regional Climate Center. For each LRZ, one weather station was selected to be as centrally located within the load center of the particular LRZ. Table 12 lists the selected weather stations for each LRZ.

Table 12: Selected Weather Stations for LRZs

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	53841	KFFT
8	Little Rock, AR	13963	KLIT
9	Lake Charles, LA	03937	KLCH
10	Jackson, MS	03940	KJAN

5.1.2 Relationship between Peak Demand and Temperature

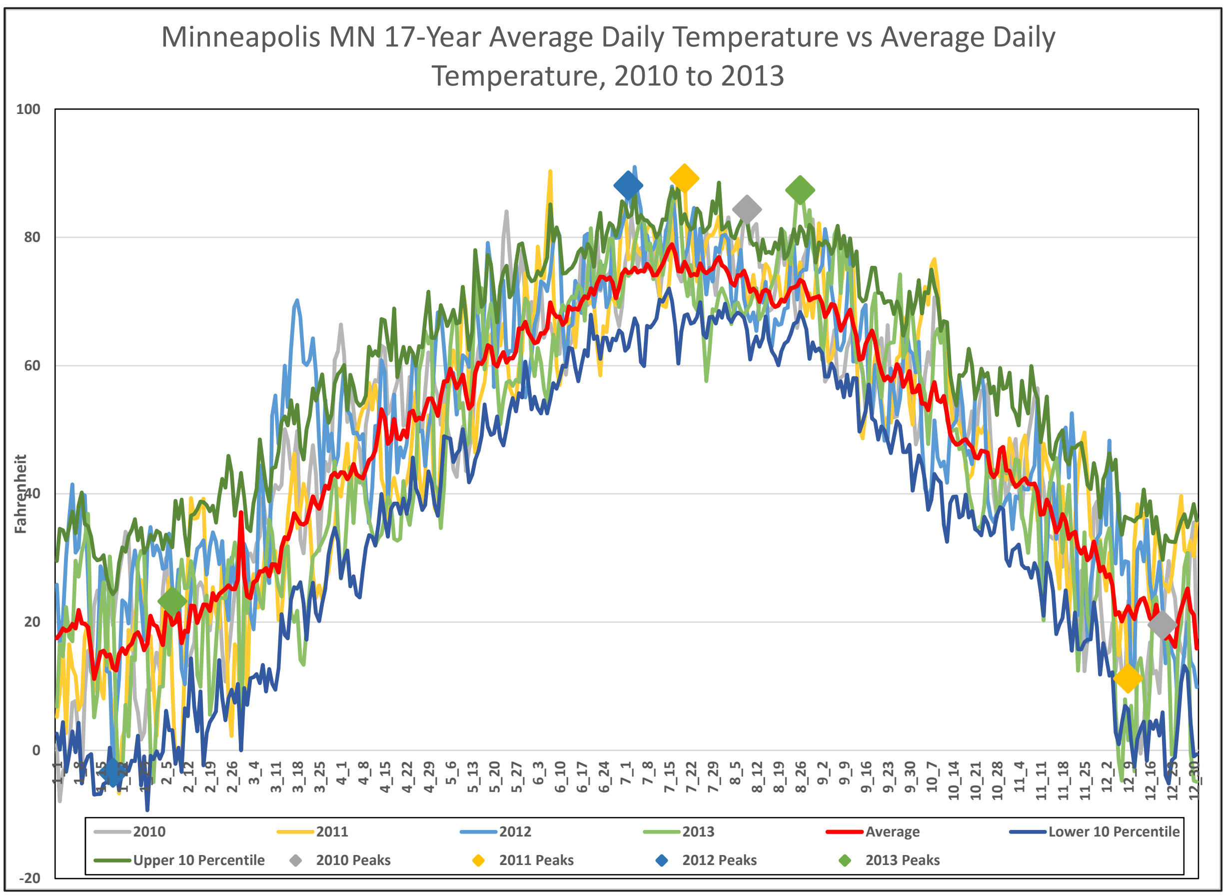
There are a number of factors affecting hourly load demand, such as humidity, wind speed, and temperature, etc. Of all the weather related factors, temperature is the most important one to determine the timing and

[15] While heat index was considered as a substitute for temperature for summer peaks, it was found to be less indicative of peak demand occurrences than ambient temperature was.

magnitude of the peak. A closer look at the historical relationships between hourly loads and hourly temperatures shows that temperature has an enormous impact on annual electricity demand, zonal peak winter and summer hourly loads and when seasonal peaks occur.

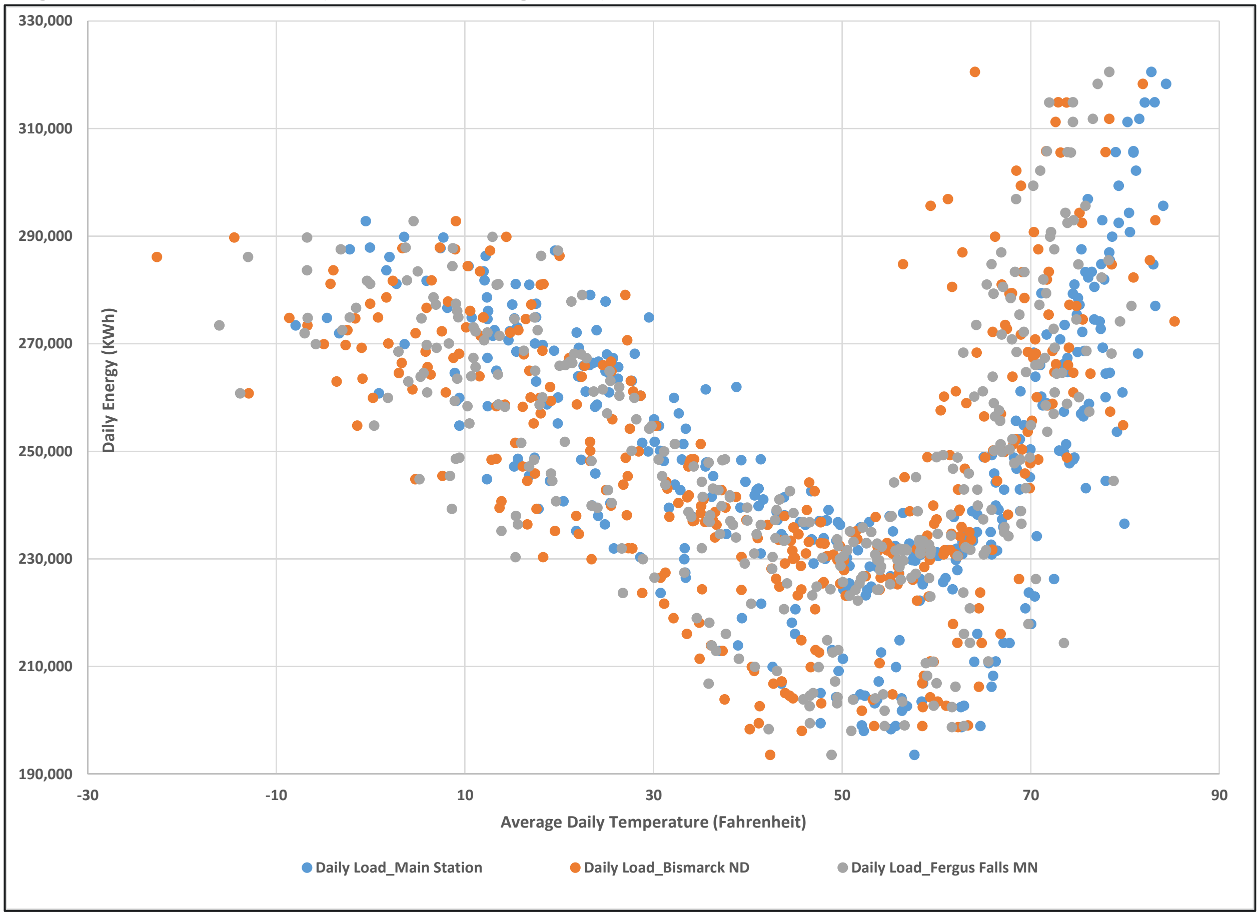
The likelihood of a peak occurrence increases as the weather gets colder in the winter or hotter in the summer. While the peak may or may not occur at the hour when the temperature is coldest or hottest, it often occurs on the day when the average daily temperature is the year's coldest or hottest. Using Minnesota as an example, Figure 44 shows the historical relationships between hourly peaks and average daily temperatures. The red line represents the average of historical average daily temperature values across years using the 17 years of hourly temperature records of Minneapolis, MN from 1997 to 2013. The dark blue line represents the average daily temperature at the lower 10th percentile and the dark green line represents the upper 10th percentile. The other four lines represent average daily temperature for each year from 2010 to 2013. The diamonds represent actual summer and winter peaks recorded in 2010 to 2013. The curves in the chart show the volatility of weather over years. Summer peaks usually occur when the average daily temperature is above the 10th percentile value of the hottest days of a year. Winter peaks are less consistent. The chart indicates that the peaks usually happen at extreme temperatures instead of normal temperature, especially for summer peaks.

Figure 44: Average Daily Temperature and Peaks (Fahrenheit)



An investigation of historical MISO zonal load data and zonal weather patterns shows that the relationship between temperature and electricity usage is nonlinear. Figure 45 illustrates the daily electricity load of LRZ 1 vs. the average daily temperature. The dots represent the daily electricity load of LRZ 1 versus the average daily temperature of selected weather stations. For days with colder temperatures (generally below 50 degrees), load increases as temperature decreases. For warmer days (above 65 degrees), load increases as temperature increases. When the average daily temperature falls around 40 to 50 Fahrenheit degrees, the daily load is relatively insensitive to temperature since the need for space heating or air conditioning is less than in winter or summer. In addition, the load is more sensitive to temperature in the summer than winter as the slope is steeper in summer than winter. It can also be observed that when the temperature is extremely cold or hot, the daily load is less responsive to temperature changes because the heating/cooling end uses are already being nearly fully utilized.

Figure 45: Daily Electricity Load vs. Average Daily Temperature, 2010



During the period of 2010-2015, the peaks of 10 LRZs all occurred on weekdays. Summer peaks usually happened in the late afternoon to early evening while winter peaks occurred either in the morning or in the evening.

5.1.3 Multiple Linear Regression

Multiple linear regression (MLR) analyses were used to estimate the relationship of peak load 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. After comparing the fitted results with actual peaks and other statistics (significant t-statistics, high R-squared, a significant F-statistic and no heteroscedasticity), a model that could provide best peak prediction was selected for each LRZ respectively.

5.1.4 Sample Selection

There are 52,584 hourly load records for each zone from 2010 to 2015. More than half of those records either are insensitive to the changes of temperature or occur at the time when peak demand is unlikely to occur, namely weekend and holiday loads, spring and fall loads, and hourly loads between 9 pm and 6 am. Thus, SUFG decided to only select those records that are sensitive to temperature changes for regression analysis. For each LRZ, the winter and summer weekday daily peak hourly loads were selected. The loads occurred in January, February, November and December were categorized as winter loads while the loads occurred from June to September were grouped as summer loads. The loads that occur outside of the summer and winter seasons were removed since they were not sensitive to changes of hourly temperature. The remaining loads and corresponding temperature information were then used in the regression analysis for each LRZ.

5.1.5 Variables and Models

The regression models capture the impact of weather on peak demand through a load factor approach, which compares the level of average hourly demand to the level of seasonal peak demand. Load factor is found through dividing the average hourly load over a given period of time (usually one calendar year) by the highest level of demand during that time period. For purposes of this study, SUFG used a slightly modified version of the traditional load factor, which is referred to herein as the Daily Peak Load Factor. It is the ratio of the annual average hourly load over the whole period to the peak demand for a particular day in the period. This modification can exclude the effect of economic development on peak energy demand and be used to capture the impact of hourly and daily temperature on energy demand relative to the normal levels of demand. The Daily Peak Load Factor is used as the dependent variable for the peak demand model.

Numerous possible model specifications for each zone were developed, with final models selected based on key statistics and the ability to predict peaks in comparison with actual values. Appendix B provides the regression models for each LRZ. There are slight variations in model specifications across LRZs.

As Figure 44 showed earlier, peak demand often occurs at temperature extremes that are outside of the average for a given time of year. Thus, it is necessary to investigate what typical weather conditions are when the peak demand occurs instead of the average conditions for a given day or month. However, determining the typical conditions can be problematic, especially when there is limited amount of peak observations. These data limitations can cause one or two unusual years to bias the results. Examples include the mild summers of 2013 and 2014, as well as the Polar Vortex of January 2014.

Table 13 presents the historical zonal peak load factors and associated temperatures from 2010 to 2015.[16] "Temp" represents the actual temperature when peak occurred, "Avg Temp" is the average daily temperature on the day when seasonal peak occurred, "T Max" is the highest daily temperature of the day when seasonal peak occurred and "MAVGT3" represents the moving average of the temperature of the previous two hours plus the peak hour itself when the peak occurred. For summer peaks, the impact of the mild summers on peak loads can be observed in 2013 and 2014. Multiple summer peaks occurred in September. For winter peaks, it is noted that the 2014 zonal load factors are lower than other years. The recorded hourly temperature when the peak

[16] MISO provided a new revised historical hourly zonal load records for the period of 2010- 2015. The new dataset closely matches the previous data used for SUFG's 2014 and 2015 study. However, there are some slight discrepancies between the new dataset and previous hourly load records. Therefore, the actual seasonal peak load factors and time when peak occurred from 2010 to 2014 listed in this report are slightly different from the records released in the 2014 and 2015 Independent Load Forecast.

occurred is generally much colder than previous years. Using just these observations would bias the normal peak conditions calculations to be cooler in both summer and winter. It is worth noting that MAVGT3 is either higher or the same as the peak hour temperature for most of LRZs in summer. It indicates summer peaks tend to occur when the temperature of the past two hours of the peak hour is at least as high as the peak temperature. For winter peaks, the peak usually occurs when the temperature of the past two hours is colder than or as cold as the peak temperature. The regression analysis also shows the coldest daily hourly temperature is not statistically significant on determining the daily peak load factor while Avg Temp and MAVGT3 play more significant roles in determining the level of the daily peak hourly load.

Table 13: Historical Summer and Winter Peak Load Factors and Temperatures, 2010-2015 (Fahrenheit)

LRZ	Year	Summer Peak						Winter Peak					
		Peak Time	Temp	Avg Temp	T Max	MAVG T3	Load Factor	Peak Time	Temp	Avg Temp	T Max	MAVG T3	Load Factor
1	2010	8/9/2010 15:00	93	84	94	93	65%	12/20/2010 18:00	23	20	26	22	76%
	2011	7/20/2011 16:00	95	89	96	95	63%	2/7/2011 19:00	3	11	24	3	78%
	2012	7/2/2012 14:00	98	88	99	97	61%	1/19/2012 8:00	-10	-3	6	-11	78%
	2013	8/26/2013 14:00	96	87	96	94	63%	12/9/2013 19:00	-2	4	12	-2	76%
	2014	7/21/2014 15:00	91	82	91	91	67%	1/22/2014 19:00	-3	2	7	-3	75%
	2015	8/14/2015 15:00	91	82	93	92	65%	1/8/2015 19:00	7	6	15	9	73%
2	2010	8/12/2010 15:00	87	81	88	88	60%	12/13/2010 18:00	11	12	16	12	77%
	2011	7/20/2011 16:00	97	87	98	97	56%	2/9/2011 19:00	4	6	13	7	81%
	2012	7/16/2012 15:00	96	87	97	96	56%	1/19/2012 19:00	3	9	25	3	80%
	2013	8/27/2013 15:00	94	84	94	94	59%	12/11/2013 18:00	4	10	17	5	77%
	2014	7/22/2014 16:00	87	79	89	87	63%	1/6/2014 18:00	-12	-11	-6	-11	74%
	2015	8/14/2015 15:00	93	79	93	93	64%	1/7/2015 18:00	-2	0	5	-2	75%
3	2010	8/12/2010 15:00	93	86	94	94	61%	12/13/2010 18:00	9	8	15	10	77%
	2011	7/19/2011 17:00	95	89	98	97	59%	2/8/2011 19:00	2	-1	13	2	77%
	2012	7/25/2012 16:00	105	91	106	105	58%	1/12/2012 19:00	14	14	18	15	79%
	2013	9/9/2013 16:00	97	86	101	99	60%	12/11/2013 18:00	4	9	24	5	74%
	2014	9/4/2014 16:00	91	84	93	92	65%	1/6/2014 19:00	-4	-7	-1	-4	74%
	2015	7/17/2015 16:00	94	85	95	95	61%	1/7/2015 19:00	-6	-2	7	-4	74%
4	2010	8/3/2010 16:00	94	85	95	95	59%	12/13/2010 19:00	9	9	16	10	74%
	2011	7/21/2011 16:00	97	88	98	97	56%	2/10/2011 8:00	5	12	24	0	77%
	2012	7/25/2012 16:00	101	91	103	102	55%	1/12/2012 19:00	15	19	32	15	77%
	2013	8/30/2013 15:00	93	83	94	94	60%	12/11/2013 20:00	7	18	27	9	76%
	2014	8/25/2014 15:00	96	85	96	95	60%	1/6/2014 18:00	-10	-9	-4	-8	70%
	2015	7/13/2015 16:00	91	84	93	92	61%	1/7/2015 19:00	-1	4	16	0	69%
5	2010	8/3/2010 16:00	100	92	102	101	57%	1/7/2010 19:00	11	15	26	12	69%
	2011	8/2/2011 16:00	101	92	102	102	55%	2/10/2011 8:00	13	21	32	10	70%
	2012	7/25/2012 16:00	106	96	107	106	53%	1/12/2012 19:00	17	21	35	16	72%
	2013	8/30/2013 15:00	99	90	100	100	59%	2/1/2013 8:00	13	20	30	11	72%
	2014	8/25/2014 16:00	95	89	98	96	58%	1/6/2014 19:00	-3	-3	1	-2	64%
	2015	7/13/2015 16:00	97	90	98	98	57%	1/8/2015 8:00	8	17	32	6	64%
6	2010	8/10/2010 16:00	96	87	96	96	65%	12/15/2010 7:00	5	14	23	4	74%
	2011	7/20/2011 14:00	98	88	98	96	63%	2/10/2011 7:00	8	12	22	5	73%
	2012	7/25/2012 16:00	99	88	102	101	63%	1/13/2012 10:00	16	17	19	15	78%
	2013	7/18/2013 15:00	91	84	93	91	65%	12/12/2013 7:00	2	12	20	3	74%
	2014	9/5/2014 15:00	88	79	89	88	68%	1/24/2014 8:00	-4	8	22	-5	69%
	2015	7/29/2015 14:00	88	81	90	89	65%	1/7/2015 19:00	-2	3	12	0	67%

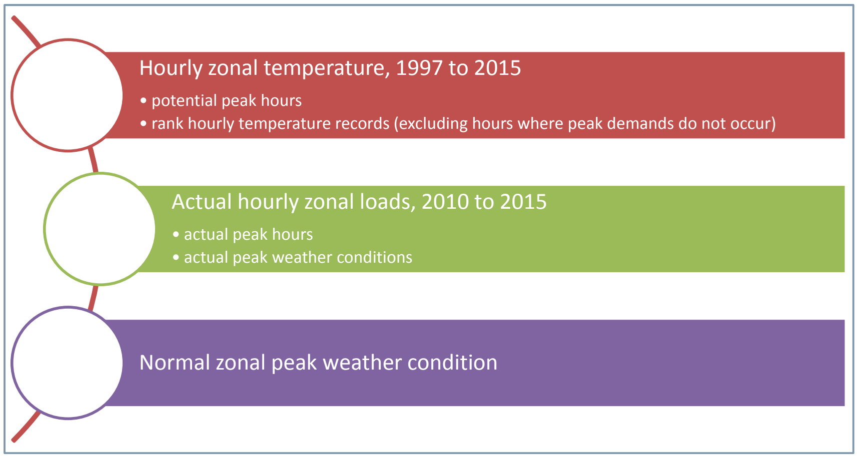
LRZ PEAK DEMAND FORECASTS

LRZ	Year	Summer Peak						Winter Peak					
		Peak Time	Temp	Avg Temp	T Max	MAVG T3	Load Factor	Peak Time	Temp	Avg Temp	T Max	MAVG T3	Load Factor
7	2010	7/7/2010 15:00	91	82	92	91	56%	12/13/2010 18:00	10	12	15	11	77%
	2011	7/21/2011 14:00	95	85	96	94	52%	12/8/2011 18:00	31	30	35	32	82%
	2012	7/17/2012 15:00	98	87	98	97	51%	1/19/2012 18:00	9	17	27	10	82%
	2013	7/17/2013 14:00	92	84	93	91	53%	12/12/2013 18:00	16	13	21	15	78%
	2014	9/5/2014 15:00	86	77	88	87	59%	1/28/2014 18:00	2	-1	7	4	77%
	2015	7/28/2015 15:00	77	79	91	85	57%	1/8/2015 18:00	20	11	27	19	76%
8	2010	8/2/2010 15:00	103	89	104	103	58%	1/8/2010 7:00	13	20	26	13	67%
	2011	8/3/2011 14:00	111	96	113	112	53%	1/13/2011 7:00	17	23	31	17	69%
	2012	7/30/2012 14:00	111	95	111	109	55%	1/12/2012 20:00	30	35	48	31	76%
	2013	7/9/2013 16:00	96	87	96	96	59%	1/15/2013 7:00	26	29	32	25	72%
	2014	8/25/2014 13:00	96	85	96	95	60%	1/24/2014 8:00	17	25	38	14	62%
	2015	7/29/2015 15:00	98	90	101	99	56%	1/8/2015 8:00	15	23	33	13	61%
9	2010	8/2/2010 16:00	95	88	104	97	63%	1/11/2010 8:00	33	36	51	27	67%
	2011	8/31/2011 16:00	94	85	99	95	63%	1/13/2011 8:00	31	35	42	28	69%
	2012	6/26/2012 16:00	96	88	103	98	62%	1/13/2012 8:00	41	42	49	35	78%
	2013	8/7/2013 16:00	91	86	97	93	62%	12/16/2013 7:00	34	43	61	32	75%
	2014	8/22/2014 16:00	90	84	93	91	66%	1/7/2014 7:00	22	29	38	21	65%
	2015	8/10/2015 15:00	99	88	100	99	60%	1/8/2015 7:00	25	31	36	25	68%
10	2010	8/2/2010 14:00	104	89	104	104	56%	1/11/2010 8:00	27	31	47	21	66%
	2011	8/3/2011 14:00	87	89	98	90	52%	1/13/2011 8:00	27	27	39	23	66%
	2012	7/30/2012 16:00	90	89	98	93	52%	1/13/2012 8:00	35	35	46	30	72%
	2013	8/8/2013 16:00	96	87	97	96	55%	1/22/2013 8:00	38	42	50	36	71%
	2014	8/6/2014 16:00	94	83	95	95	58%	1/7/2014 8:00	18	21	31	16	59%
	2015	8/10/2015 15:00	86	86	101	93	54%	1/8/2015 7:00	15	23	35	14	61%

To estimate typical temperature conditions on peak, historical weather data were used going back to 1997. Extreme hourly temperatures that occurred during hours when demand does not historically peak were excluded from the analysis. These include weekends, holidays and off-peak hours. The potential peak hours were determined using the highest load hours during the years for which hourly loads were available. While there is some variation across LRZs, peak hours generally occur in the morning and evening in winter and the afternoon and evening in summer. The elimination of off-peak hours was especially important for the winter analysis, since many of the coldest temperatures occurred in the middle of the night when the demand for energy is low.

After eliminating off-peak hours, the remaining hours were ranked in descending order within the calendar year. Therefore, a list of temperatures ranked in descending order is available for each year from 1997 to 2015. For years where the hourly loads were known, the rank of the peak temperature and its actual value on peak was compared to the temperatures of the same ranking for the period of 2010 and 2015. Thus, it was determined the most likely ranking of peak temperature in summer or winter according to the six year peak records. More often than not, the peak demand did not occur on the hour with the most extreme temperature and occasionally, the peak occurred on an hour which ranked outside of the top ten or twenty extreme hours.

Figure 46: Peak Weather Normalization



Next, the average of the ranked extreme temperatures was calculated for two separate time periods: 1997-2015 (which included all weather data) and 2010-2015 (the years for which the hour at which the peak demand occurred was known). This facilitated a comparison of the extremity of the temperatures over the smaller period to the larger period which indicated whether the shorter period was generally warmer or colder than the longer period. The next step was to calculate the average of the actual temperatures at the time of peak for the years that these were known. Finally, this average was adjusted if the 1997-2015 period was warmer or colder than the known period 2010-2015. Figure 46 illustrates the strategic and logic diagram to derive the normalized peak weather condition. Table 14 lists the summer and winter temperatures used as normal peak temperatures for each LRZ.

Table 14: Typical Peak Weather Temperatures (Fahrenheit)

LRZ	Winter					Summer				
	Hourly Temp	Average Daily Temp	Daily Max Temp	Moving Average Temp	Selected Hours	Hourly Temp	Average Daily Temp	Daily Max Temp	Moving Average Temp	Selected Hours
LRZ 1	3.9	7.9	19.5	4.2	11,18,19	93.7	84.8	94.7	93.6	13,14,15,16,17,20
LRZ 2	2.8	3.9	11.2	3.2	17-20	91.3	81.4	92.1	91.6	11-17
LRZ 3	3.2	2.3	12.4	4.0	8,9,10,11,18,19,20	93.6	86.2	96.3	95.0	13,14,15,16,17,18
LRZ 4	3.0	9.5	18.8	3.5	8,9,11,12,18,19,20	93.6	84.9	94.6	93.8	13,14,15,16,17
LRZ 5	9.5	14.6	27.9	8.7	7,8, 10, 11, 12,18,19,20	98.3	90.4	99.7	98.8	13,14,15,16,17
LRZ 6	4.0	11.6	21.1	3.8	7,8,9,10,12,18,19,20	91.2	83.0	92.1	91.2	12,13,14,15,16,17
LRZ 7	13.5	13.1	21.6	14.2	10,17,18,19	88.8	80.7	92.3	90.2	12,13,14,15,16,17
LRZ 8	19.9	26.3	36.6	18.9	7,8,9,11,18,19,20,21	100.9	88.9	101.9	100.7	13,14,15,16,17
LRZ 9	31.9	37.3	50.1	28.8	7,8,9,10,12,18,19,20,21	93.9	86.1	98.5	95.2	14,15,16,17
LRZ 10	27.2	31.0	43.2	22.9	7,8,9,19,20,21	93.7	86.3	98.6	95.6	13,14,15,16

5.1.6 Regression Results

Table 15 lists the adjusted seasonal peak load factors under typical peak weather conditions. For each zone, the load factor in the winter is higher than that in the summer. It means the winter peak load is less than the summer peak load. By plugging in actual observed peak weather conditions into the finalized peak conversion models, a series of fitted peak load factors for each zone was obtained for the period of 2010- 2015. Appendix B provides a comparison among the historical and fitted peak load factors and the normalized seasonal peak load factors.

Table 15: Adjusted Peak Load Factors under Typical Peak Temperatures

LRZ	Adjusted Peak Load Factors under Typical Weather	
	Summer	Winter
1	0.63803	0.76396
2	0.60994	0.77340
3	0.61000	0.75481
4	0.59594	0.73795
5	0.57363	0.68207
6	0.65497	0.72549
7	0.56128	0.78621
8	0.56981	0.68425
9	0.63384	0.71290
10	0.54722	0.63749

These load factors are the ratios of annual average hourly load over summer (or winter) peak demand under normal peak weather conditions. The reciprocals of the peak load factors are the peak demand conversion factors in Table 16. For comparison purpose, the conversion factors in the 2014 and 2015 Independent Load Forecast are also included in the table. The study period of each version is listed in the parentheses. In general, the 2016 summer peak conversion factors are relatively higher than the 2015 version and less than the 2014 version. The 2016 winter peak conversion factors are slightly higher than the 2014 and 2015 versions. There are multiple factors that may contribute to the changes among different versions, such as a new dataset for the 2016 study, methodology change and normalized peak weather conditions. Also, the addition of the mild summer and extremely cold winter in 2014 affect the results.

Multiplying the average hourly load for a given year of the forecast by the conversion factor would yield the peak hourly demand. An example of the calculation follows:

Suppose the forecast annual energy for a given year in LRZ 1 is 100 million MWh. The average hourly load is found by dividing the annual energy by the number of hours in the year.

$$\frac{100{,}000{,}000\ MWh}{8{,}760\ hr} = 11{,}416\ MW$$

The summer and winter peak demands are found by multiplying the average hourly load by the appropriate conversion factor.

$$11{,}416\ MW * 1.567 = 17{,}889\ MW\ (summer)$$

$$11{,}416\ MW * 1.309 = 15{,}944\ MW\ (winter)$$

Table 16: Peak Demand Conversion Factors

LRZ	2016 Version (2010-2015)		2015 Version (2010-2014)		2014 Version (2010-2013)	
	Summer	Winter	Summer	Winter	Summer	Winter
1	1.567	1.309	1.541	1.329	1.568	1.282
2	1.639	1.293	1.695	1.336	1.672	1.267
3	1.639	1.325	1.635	1.323	1.638	1.275
4	1.678	1.355	1.707	1.348	1.717	1.303
5	1.743	1.466	1.741	1.451	1.749	1.405
6	1.527	1.378	1.508	1.372	1.542	1.340
7	1.782	1.272	1.792	1.286	1.826	1.245
8	1.755	1.461	1.726	1.448	1.739	1.412
9	1.578	1.403	1.536	1.388	1.634	1.363
10	1.827	1.569	1.831	1.489		

5.2 NON-COINCIDENT PEAK DEMANDS

The LRZ-level non-coincident[17] summer and winter peak demands were calculated by applying the energy-to-peak conversion factors to the LRZ annual metered load projections. These values represent the projected peak demands for the summer and winter 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. The EE/DR/DG adjustments were made directly on non-coincident peak projections. Table 17 to Table 20 provide gross and net (without and with EE/DR/DG adjustments) non-coincident peak demand projections for summer and winter. Please note that 2015 data are historical. They are the same for the cases without and with the EE/DR/DG Adjustments. Figure 47 to Figure 56 provide the same information graphically.

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

Table 17: Summer Non-Coincident Peak Demand without EE/DR/DG Adjustments (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	16,935	11,604	8,751	9,280	8,361	17,297	19,994	7,486	21,071	4,755
2016	18,214	12,617	8,983	9,794	8,789	17,810	21,164	7,778	19,232	4,765
2017	18,546	12,920	9,100	9,884	8,916	18,084	21,457	7,991	19,821	4,874
2018	18,879	13,217	9,243	9,950	9,043	18,354	21,868	8,152	20,247	4,943
2019	19,220	13,447	9,418	10,039	9,157	18,635	22,184	8,252	20,431	5,030
2020	19,579	13,627	9,590	10,122	9,275	18,904	22,377	8,311	20,583	5,118
2021	19,924	13,788	9,738	10,176	9,381	19,166	22,474	8,362	20,656	5,213
2022	20,267	13,982	9,888	10,226	9,491	19,408	22,629	8,428	20,780	5,302
2023	20,590	14,183	10,046	10,278	9,611	19,643	22,787	8,512	20,972	5,383
2024	20,903	14,380	10,209	10,342	9,739	19,879	23,016	8,604	21,206	5,465
2025	21,226	14,561	10,378	10,401	9,860	20,115	23,229	8,699	21,365	5,550
2026	21,554	14,756	10,554	10,467	9,975	20,354	23,427	8,797	21,566	5,637
Annual Growth Rates (%)										
2015-2016	7.55	8.73	2.65	5.53	5.12	2.97	5.85	3.90	-8.73	0.22
2016-2017	1.82	2.40	1.30	0.92	1.44	1.54	1.38	2.75	3.06	2.28
2017-2018	1.79	2.30	1.57	0.66	1.43	1.49	1.92	2.02	2.15	1.41
2018-2019	1.81	1.74	1.89	0.90	1.26	1.53	1.44	1.22	0.91	1.76
2019-2020	1.87	1.34	1.83	0.82	1.29	1.45	0.87	0.72	0.75	1.76
2020-2021	1.76	1.18	1.55	0.53	1.14	1.38	0.43	0.61	0.35	1.85
2021-2022	1.72	1.41	1.54	0.49	1.17	1.26	0.69	0.79	0.60	1.71
2022-2023	1.59	1.44	1.60	0.51	1.26	1.21	0.70	1.00	0.92	1.53
2023-2024	1.52	1.39	1.62	0.62	1.32	1.20	1.00	1.08	1.11	1.51
2024-2025	1.54	1.26	1.66	0.57	1.25	1.18	0.93	1.10	0.75	1.56
2025-2026	1.55	1.34	1.70	0.64	1.16	1.19	0.85	1.14	0.94	1.57
Compound Annual Growth Rates (%)										
2015-2020	2.94	3.27	1.85	1.75	2.10	1.79	2.28	2.11	-0.47	1.48
2015-2026	2.22	2.21	1.72	1.10	1.62	1.49	1.45	1.48	0.21	1.56
2017-2026	1.68	1.49	1.66	0.64	1.25	1.32	0.98	1.07	0.94	1.63

Table 18: Winter Non-Coincident Peak Demand without EE/DR/DG Adjustments (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	15,109	9,773	7,274	8,168	7,431	16,768	14,958	6,880	18,698	4,200
2016	15,212	9,950	7,260	7,909	7,392	16,079	15,109	6,477	17,099	4,090
2017	15,489	10,189	7,354	7,982	7,498	16,327	15,318	6,655	17,623	4,184
2018	15,767	10,424	7,470	8,035	7,605	16,570	15,612	6,789	18,001	4,243
2019	16,052	10,605	7,611	8,107	7,701	16,824	15,838	6,872	18,165	4,317
2020	16,352	10,747	7,750	8,174	7,801	17,067	15,975	6,921	18,301	4,393
2021	16,640	10,874	7,870	8,218	7,890	17,303	16,045	6,964	18,365	4,475
2022	16,926	11,027	7,991	8,258	7,982	17,522	16,155	7,018	18,476	4,551
2023	17,196	11,186	8,119	8,300	8,083	17,733	16,268	7,088	18,646	4,621
2024	17,457	11,341	8,251	8,352	8,190	17,947	16,431	7,165	18,854	4,691
2025	17,727	11,483	8,387	8,399	8,293	18,159	16,583	7,244	18,996	4,764
2026	18,001	11,637	8,529	8,453	8,389	18,375	16,725	7,326	19,174	4,839
Annual Growth Rates (%)										
2015-2016[18]	0.68	1.81	-0.19	-3.17	-0.54	-4.11	1.01	-5.86	-8.55	-2.62
2016-2017	1.82	2.40	1.30	0.92	1.44	1.54	1.38	2.75	3.06	2.28
2017-2018	1.79	2.30	1.57	0.66	1.43	1.49	1.92	2.02	2.15	1.41
2018-2019	1.81	1.74	1.89	0.90	1.26	1.53	1.44	1.22	0.91	1.76
2019-2020	1.87	1.34	1.83	0.82	1.29	1.45	0.87	0.72	0.75	1.76
2020-2021	1.76	1.18	1.55	0.53	1.14	1.38	0.43	0.61	0.35	1.85
2021-2022	1.72	1.41	1.54	0.49	1.17	1.26	0.69	0.79	0.60	1.71
2022-2023	1.59	1.44	1.60	0.51	1.26	1.21	0.70	1.00	0.92	1.53
2023-2024	1.52	1.39	1.62	0.62	1.32	1.20	1.00	1.08	1.11	1.51
2024-2025	1.54	1.26	1.66	0.57	1.25	1.18	0.93	1.10	0.75	1.56
2025-2026	1.55	1.34	1.70	0.64	1.16	1.19	0.85	1.14	0.94	1.57
Compound Annual Growth Rates (%)										
2015-2020	1.59	1.92	1.28	0.02	0.98	0.35	1.33	0.12	-0.43	0.90
2015-2026	1.60	1.60	1.46	0.31	1.11	0.84	1.02	0.57	0.23	1.29
2017-2026	1.68	1.49	1.66	0.64	1.25	1.32	0.98	1.07	0.94	1.63

[18] The negative growth rates for the period of 2015-2016 for most of the LRZs are due to a higher actual 2015 value compared with the forecasted 2015 value. The 2015 winter actual peak temperature is colder than the normalized winter peak weather condition for most LRZs.

LRZ PEAK DEMAND FORECASTS

Table 19: Summer Non-Coincident Peak Demand with EE/DR/DG Adjustments (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	16,935	11,604	8,751	9,280	8,361	17,297	19,994	7,486	21,071	4,755
2016	16,807	11,399	8,444	9,622	8,775	17,332	19,800	7,291	18,986	4,765
2017	17,062	11,656	8,507	9,693	8,890	17,581	20,047	7,488	19,548	4,874
2018	17,322	11,918	8,594	9,739	9,006	17,825	20,413	7,635	19,951	4,943
2019	17,589	12,112	8,713	9,807	9,107	18,079	20,681	7,721	20,111	5,030
2020	17,869	12,256	8,829	9,869	9,213	18,320	20,824	7,767	20,237	5,118
2021	18,125	12,380	8,920	9,902	9,306	18,552	20,871	7,804	20,279	5,213
2022	18,390	12,537	9,014	9,931	9,403	18,764	20,973	7,857	20,382	5,302
2023	18,635	12,702	9,114	9,961	9,510	18,967	21,079	7,927	20,552	5,383
2024	18,868	12,862	9,218	10,002	9,623	19,171	21,254	8,004	20,762	5,465
2025	19,110	13,005	9,329	10,039	9,732	19,373	21,413	8,085	20,896	5,550
2026	19,355	13,162	9,444	10,082	9,832	19,578	21,556	8,169	21,070	5,637
Annual Growth Rates (%)										
2015-2016	-0.76	-1.76	-3.51	3.68	4.95	0.20	-0.97	-2.60	-9.89	0.22
2016-2017	1.52	2.25	0.74	0.74	1.31	1.43	1.25	2.70	2.96	2.28
2017-2018	1.52	2.24	1.03	0.47	1.30	1.39	1.82	1.96	2.07	1.41
2018-2019	1.54	1.63	1.38	0.71	1.13	1.42	1.31	1.12	0.80	1.76
2019-2020	1.60	1.19	1.33	0.63	1.16	1.33	0.69	0.60	0.62	1.76
2020-2021	1.43	1.02	1.04	0.33	1.01	1.27	0.22	0.48	0.21	1.85
2021-2022	1.46	1.27	1.05	0.29	1.04	1.15	0.49	0.67	0.51	1.71
2022-2023	1.33	1.32	1.11	0.30	1.13	1.08	0.51	0.89	0.83	1.53
2023-2024	1.25	1.26	1.15	0.42	1.20	1.08	0.83	0.98	1.02	1.51
2024-2025	1.28	1.11	1.19	0.36	1.12	1.05	0.75	1.00	0.65	1.56
2025-2026	1.29	1.21	1.24	0.43	1.03	1.06	0.66	1.04	0.84	1.57
Compound Annual Growth Rates (%)										
2015-2020	1.08	1.10	0.18	1.24	1.96	1.16	0.82	0.74	-0.80	1.48
2015-2026	1.22	1.15	0.69	0.76	1.48	1.13	0.69	0.80	0.00	1.56
2017-2026	1.41	1.36	1.17	0.44	1.12	1.20	0.81	0.97	0.84	1.63

Table 20: Winter Non-Coincident Peak Demand with EE/DR/DG Adjustments (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	15,109	9,773	7,274	8,168	7,431	16,768	14,958	6,880	18,698	4,200
2016	13,805	8,733	6,721	7,737	7,378	15,601	13,745	5,990	16,854	4,090
2017	14,005	8,926	6,761	7,791	7,473	15,823	13,908	6,152	17,350	4,184
2018	14,210	9,124	6,821	7,824	7,568	16,041	14,156	6,272	17,706	4,243
2019	14,421	9,270	6,906	7,875	7,652	16,267	14,334	6,340	17,846	4,317
2020	14,642	9,376	6,989	7,921	7,739	16,482	14,422	6,377	17,954	4,393
2021	14,841	9,466	7,052	7,944	7,815	16,689	14,441	6,406	17,988	4,475
2022	15,049	9,582	7,117	7,963	7,894	16,878	14,499	6,447	18,078	4,551
2023	15,241	9,704	7,186	7,983	7,982	17,058	14,560	6,503	18,226	4,621
2024	15,422	9,822	7,260	8,012	8,075	17,239	14,670	6,565	18,410	4,691
2025	15,611	9,927	7,337	8,037	8,164	17,418	14,768	6,630	18,526	4,764
2026	15,802	10,043	7,419	8,068	8,246	17,600	14,853	6,698	18,679	4,839
Annual Growth Rates (%)										
2015-2016	-8.63	-10.65	-7.61	-5.27	-0.72	-6.96	-8.10	-12.93	-9.86	-2.62
2016-2017	1.45	2.21	0.60	0.69	1.29	1.42	1.19	2.69	2.94	2.28
2017-2018	1.46	2.22	0.89	0.42	1.27	1.38	1.78	1.95	2.06	1.41
2018-2019	1.48	1.59	1.25	0.66	1.10	1.41	1.25	1.10	0.79	1.76
2019-2020	1.53	1.14	1.20	0.58	1.14	1.32	0.62	0.57	0.61	1.76
2020-2021	1.36	0.96	0.91	0.28	0.99	1.26	0.13	0.45	0.19	1.85
2021-2022	1.41	1.22	0.91	0.24	1.02	1.13	0.40	0.64	0.50	1.71
2022-2023	1.27	1.28	0.98	0.25	1.11	1.07	0.42	0.87	0.82	1.53
2023-2024	1.19	1.22	1.02	0.37	1.17	1.06	0.75	0.96	1.01	1.51
2024-2025	1.22	1.07	1.07	0.31	1.10	1.04	0.67	0.98	0.63	1.56
2025-2026	1.23	1.17	1.12	0.38	1.00	1.04	0.58	1.02	0.82	1.57
Compound Annual Growth Rates (%)										
2015-2020	-0.63	-0.83	-0.80	-0.61	0.81	-0.34	-0.73	-1.51	-0.81	0.90
2015-2026	0.41	0.25	0.18	-0.11	0.95	0.44	-0.06	-0.24	-0.01	1.29
2017-2026	1.35	1.32	1.04	0.39	1.10	1.19	0.73	0.95	0.82	1.63

LRZ PEAK DEMAND FORECASTS

Figure 47: Net and Gross LRZ 1 Summer and Winter Non-Coincident Peak Demand (MW)

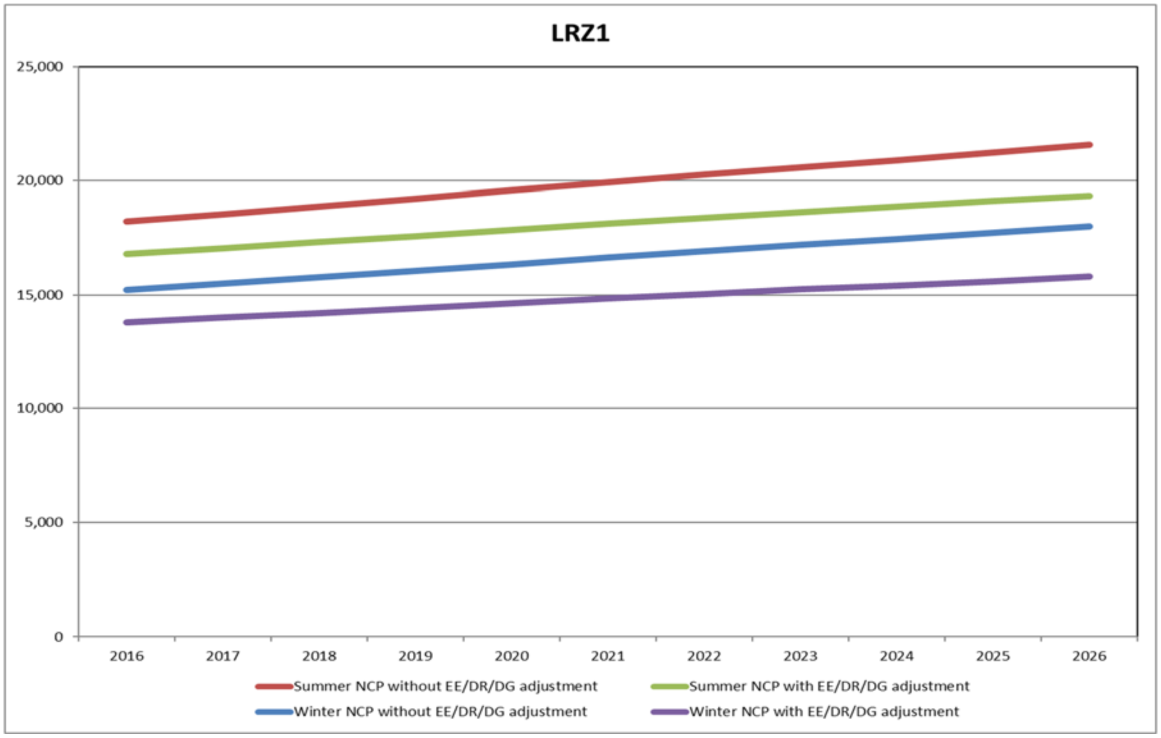
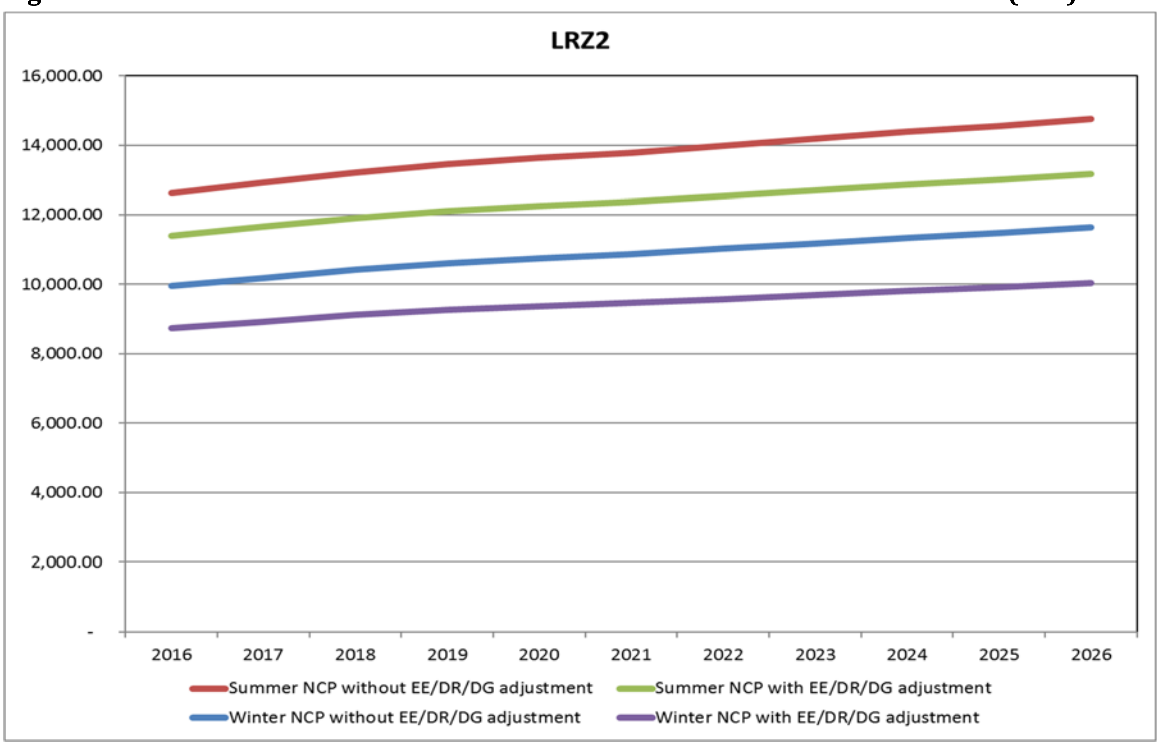


Figure 48: Net and Gross LRZ 2 Summer and Winter Non-Coincident Peak Demand (MW)



LRZ PEAK DEMAND FORECASTS

Figure 49: Net and Gross LRZ 3 Summer and Winter Non-Coincident Peak Demand (MW)

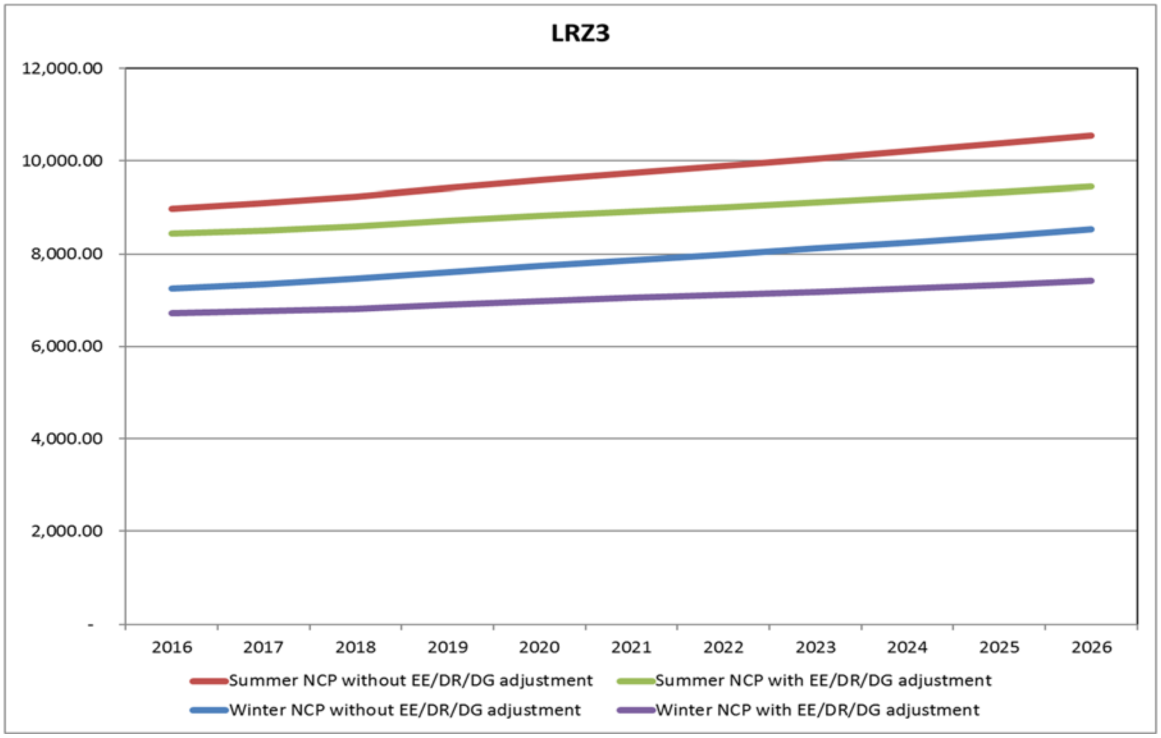
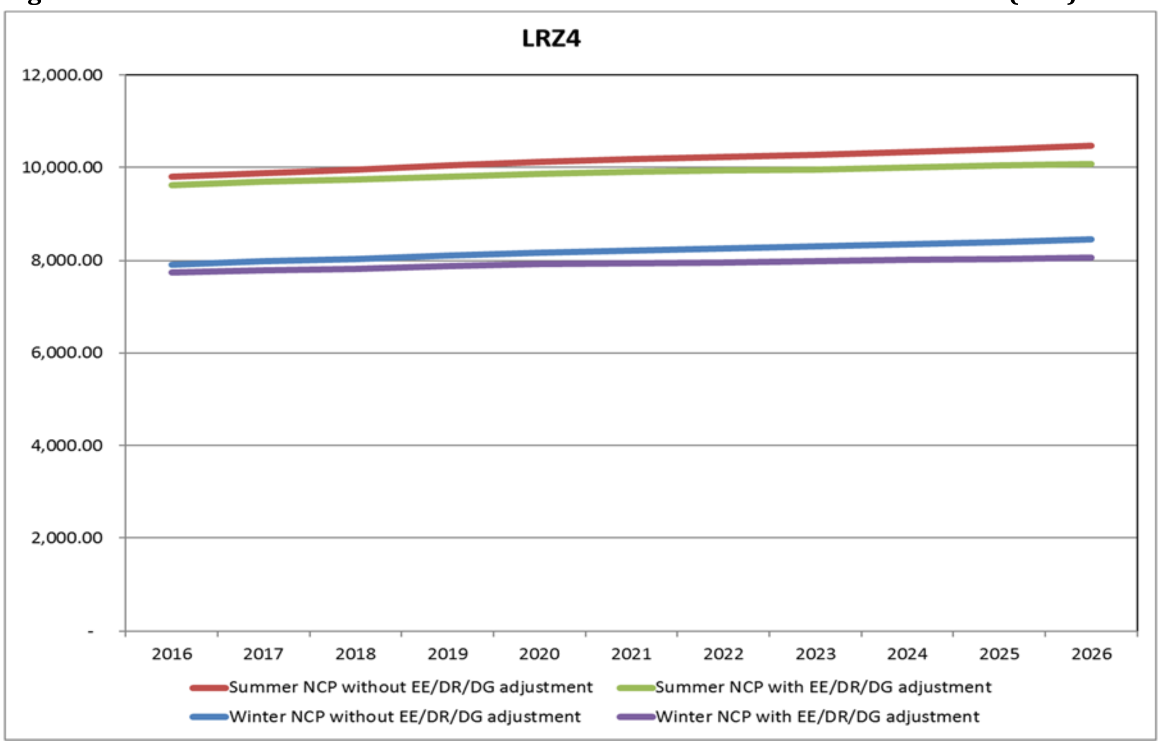


Figure 50: Net and Gross LRZ 4 Summer and Winter Non-Coincident Peak Demand (MW)



LRZ PEAK DEMAND FORECASTS

Figure 51: Net and Gross LRZ 5 Summer and Winter Non-Coincident Peak Demand (MW)

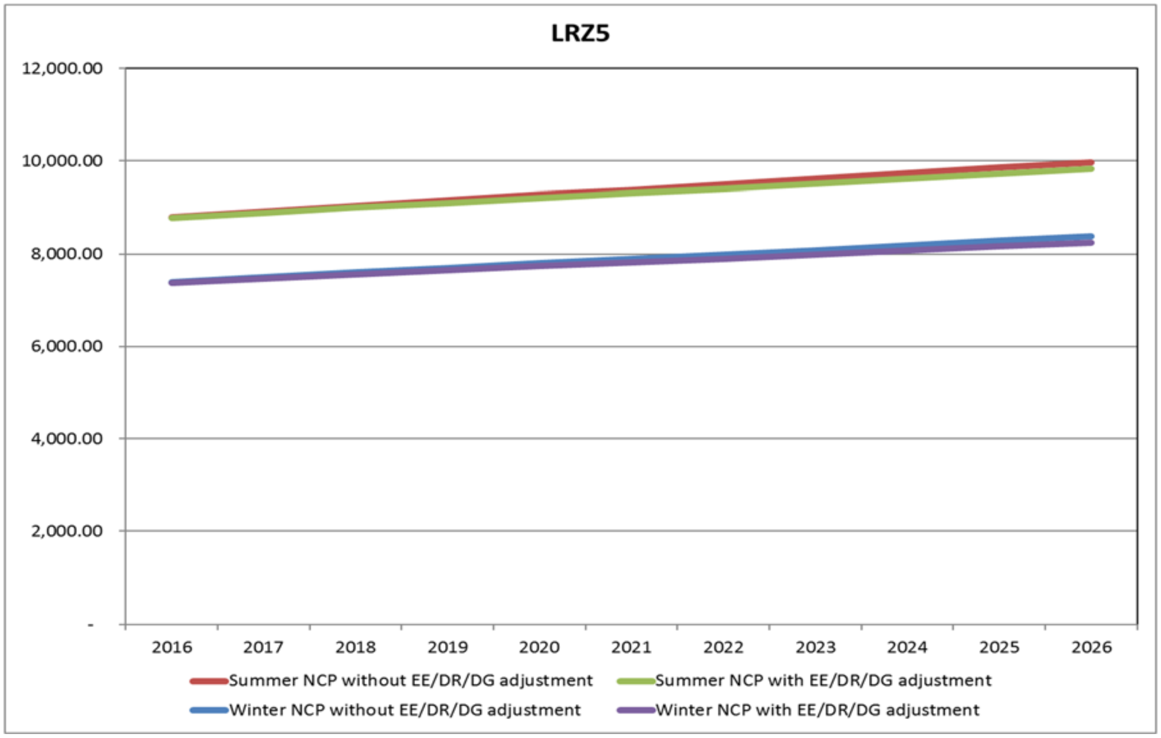
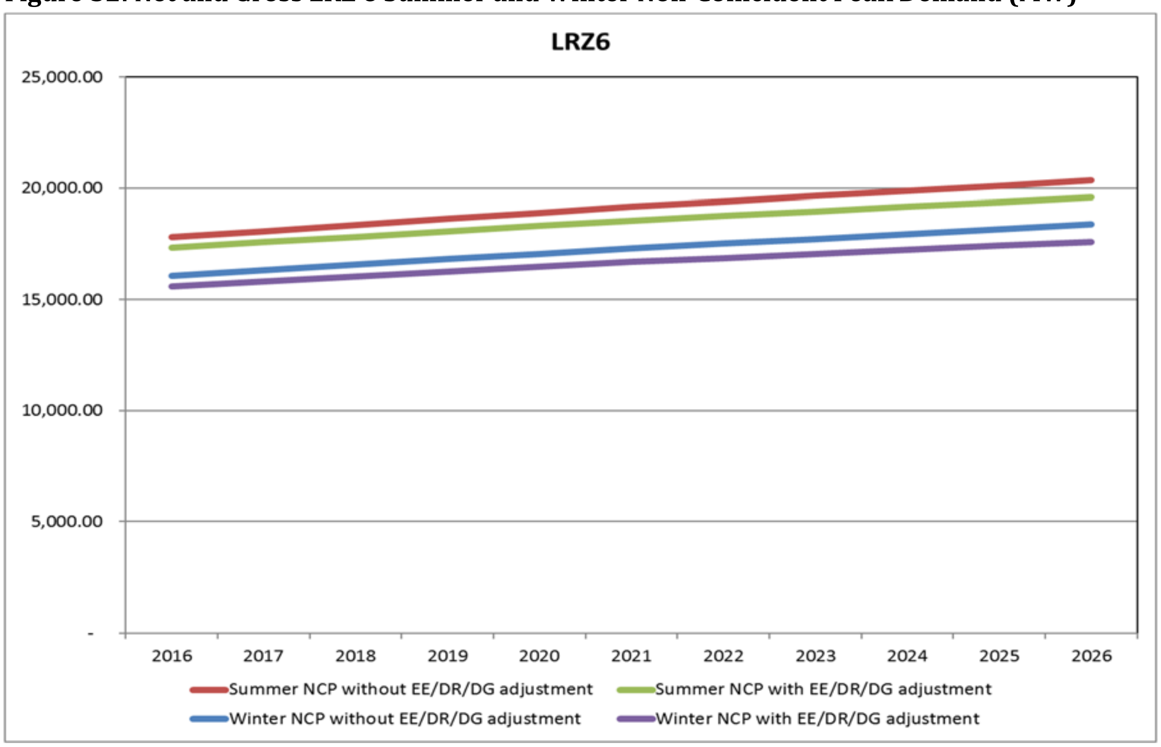


Figure 52: Net and Gross LRZ 6 Summer and Winter Non-Coincident Peak Demand (MW)



LRZ PEAK DEMAND FORECASTS

Figure 53: Net and Gross LRZ 7 Summer and Winter Non-Coincident Peak Demand (MW)

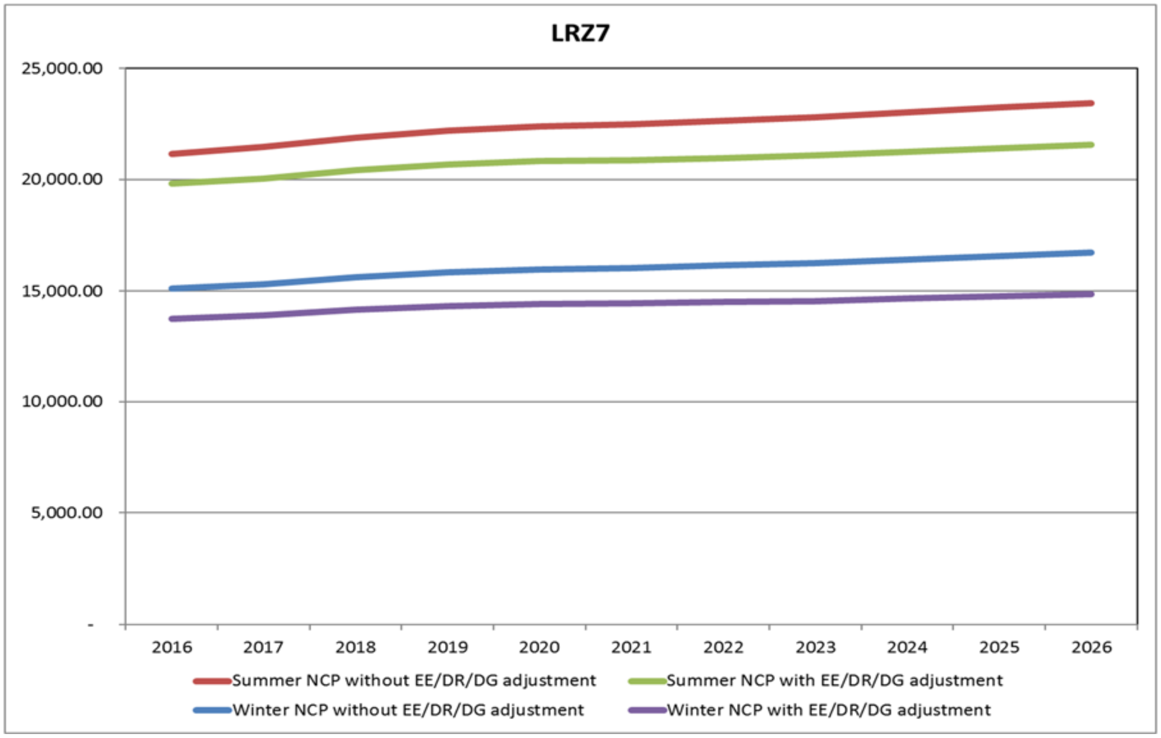


Figure 54: Net and Gross LRZ 8 Summer and Winter Non-Coincident Peak Demand (MW)

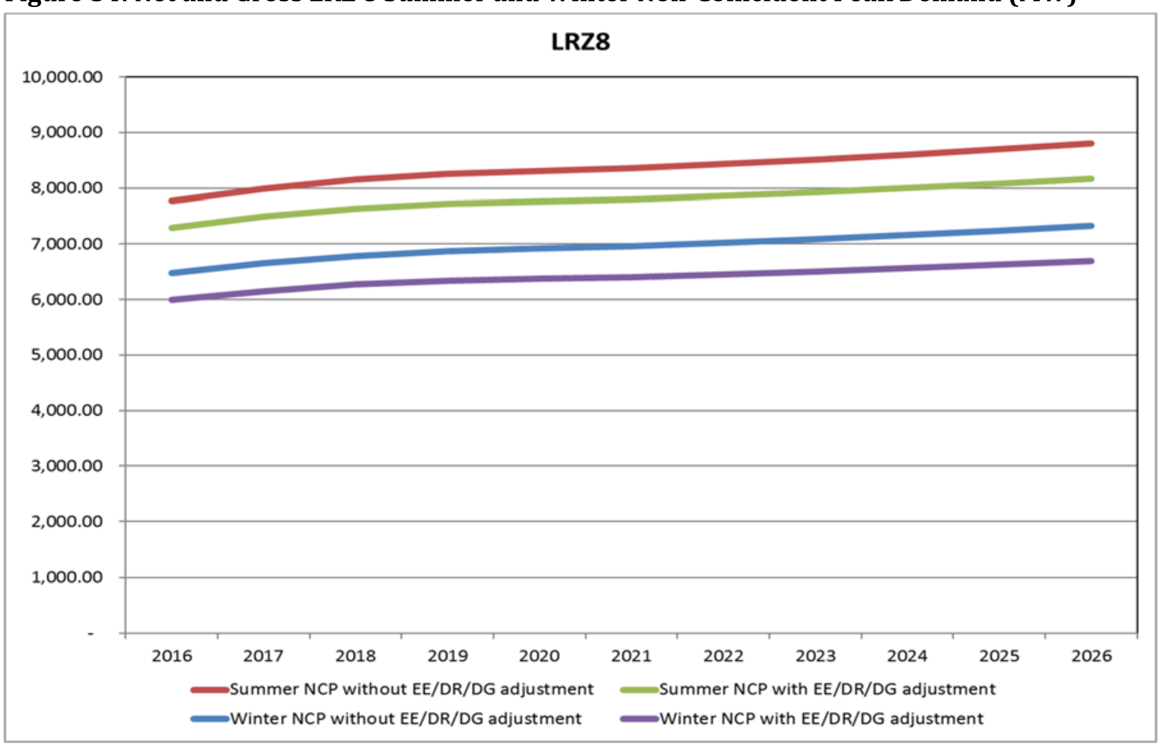


Figure 55: Net and Gross LRZ 9 Summer and Winter Non-Coincident Peak Demand (MW)

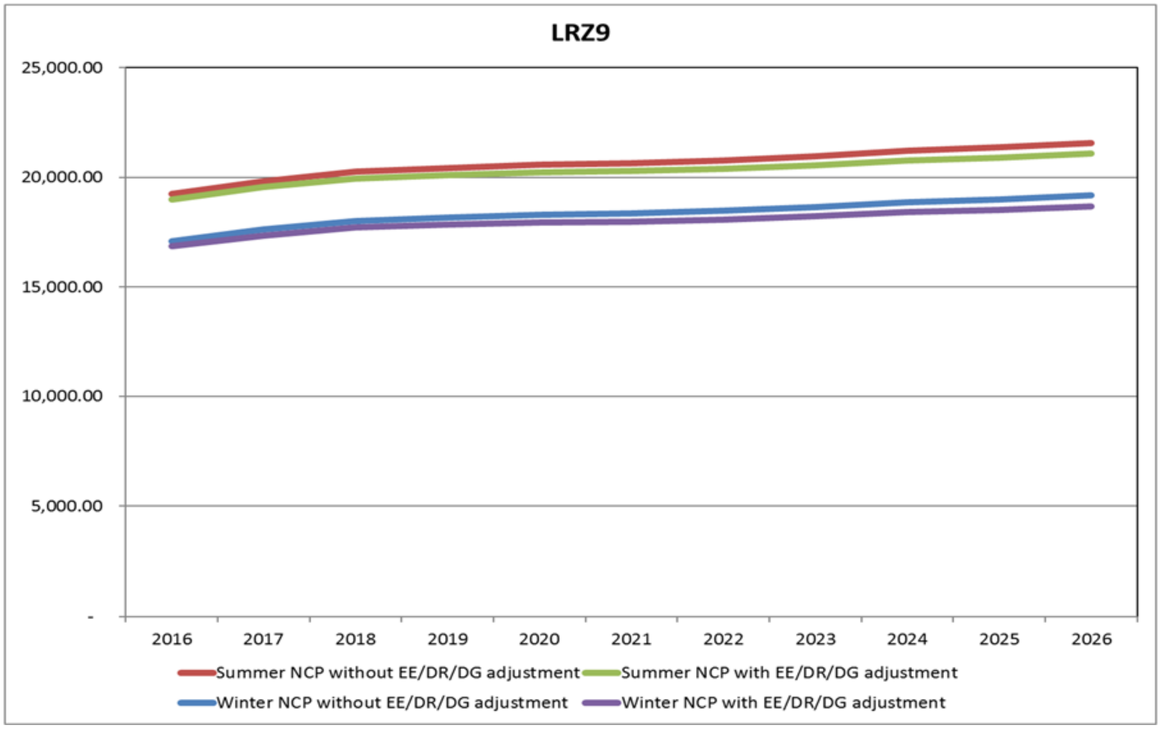
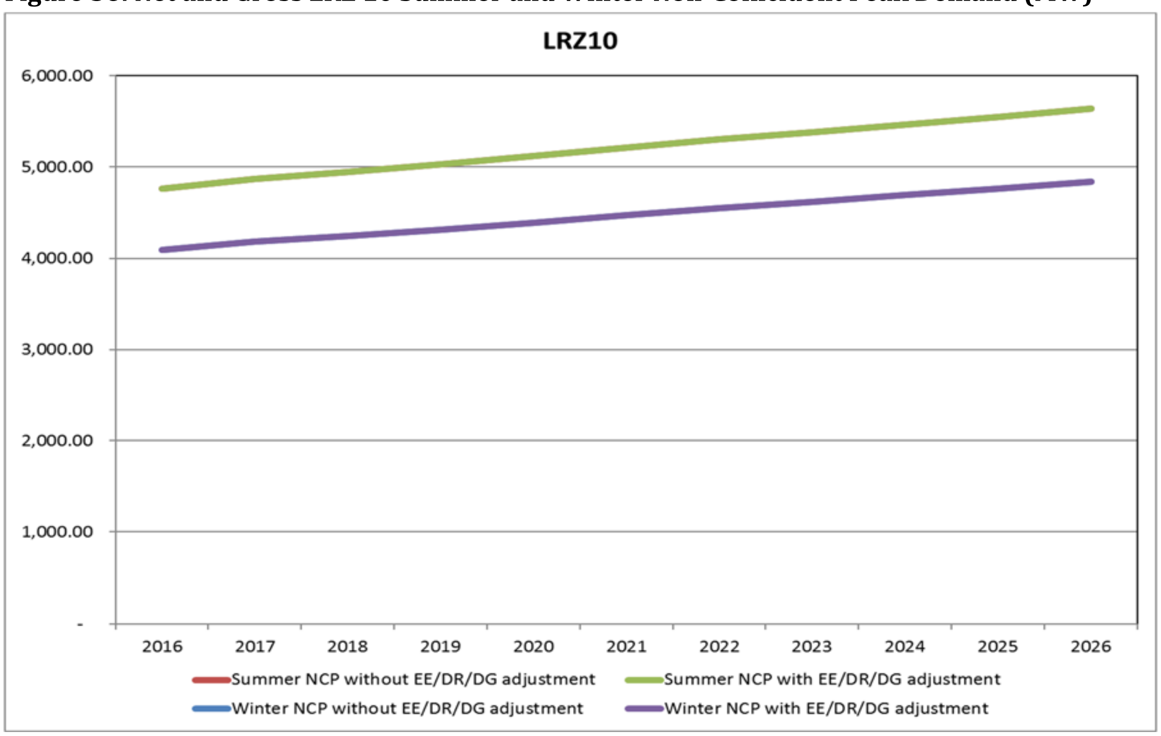


Figure 56: Net and Gross LRZ 10 Summer and Winter Non-Coincident Peak Demand (MW)[19]



[19] The EE/DR/DG adjustments for LRZ 10 is zero. Thus, the gross value overlaps the net value.

6 MISO System-Wide Forecasts

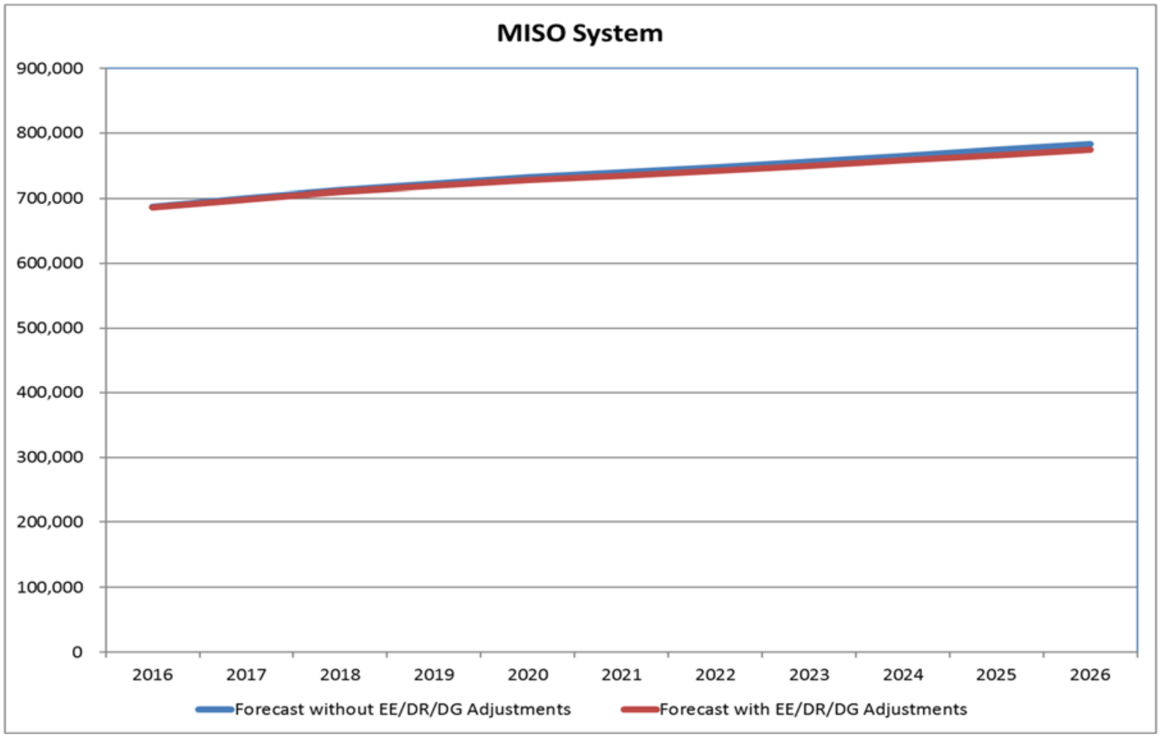
6.1 MISO SYSTEM ENERGY FORECAST

The MISO system energy forecast is found by summing the individual LRZ metered load forecasts. Table 21 and Figure 57 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 adjustments to annual energy for EE/DR/DG are smaller this year than in past years.

Table 21: Gross and Net MISO System Energy (Annual Metered Load in GWh)

Year	MISO Energy without EE/DR/DG Adjustments	MISO Energy with EE/DR/DG Adjustments
2015	667,822	667,822
2016	687,202	685,935
2017	700,281	698,377
2018	712,549	709,986
2019	722,754	719,505
2020	731,733	727,768
2021	739,215	734,504
2022	747,377	741,898
2023	755,977	749,700
2024	765,250	758,146
2025	774,010	766,048
2026	783,121	774,270
Annual Growth Rates (%)		
2015-2016	2.90	2.71
2016-2017	1.90	1.81
2017-2018	1.75	1.66
2018-2019	1.43	1.34
2019-2020	1.24	1.15
2020-2021	1.02	0.93
2021-2022	1.10	1.01
2022-2023	1.15	1.05
2023-2024	1.23	1.13
2024-2025	1.14	1.04
2025-2026	1.18	1.07
Compound Annual Growth Rates (%)		
2015-2020	1.84	1.73
2015-2026	1.46	1.35
2017-2026	1.25	1.15

Figure 57: Gross and Net MISO System Energy Forecast (Metered Load in GWh)



6.2 MISO SYSTEM COINCIDENT PEAK DEMAND FORECAST

Not all LRZs experience their peak demand levels 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 the 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 2015 timeframe. Table 22 and Table 23 list the summer and winter coincidence factors. When the coincidence factor equals 1, it means the peak for that zone coincides with the MISO system peak. Unlike in the 2015 Independent Load Forecast, the net MISO coincident peak is calculated by subtracting the EE/DR/DG coincident load impact at the MISO level directly from MISO coincident peak without the EE/DR/DG adjustments.

Table 22: MISO Coincident Factors—Winter

LRZ	Winter Coincident Factors						
	Average	2010	2011	2012	2013	2014	2015
1	0.984	0.990	0.994	0.962	1.000	0.994	0.962
2	0.976	0.993	0.976	0.963	0.990	0.989	0.944
3	0.986	0.996	0.971	1.000	0.979	1.000	0.970
4	0.988	1.000	1.000	1.000	0.980	0.992	0.957
5	0.988	0.962	1.000	1.000	0.964	1.000	1.000
6	0.979	0.983	0.993	0.992	0.928	0.988	0.988
7	0.954	0.988	0.958	0.938	0.959	0.944	0.936
8	0.958	0.889	0.929	0.995	0.954	0.981	1.000
9	0.921	0.832	0.950	0.895	0.887	0.977	0.984
10	0.935	0.924	0.892	0.936	0.858	0.998	0.999

Table 23: MISO Coincident Factors—Summer

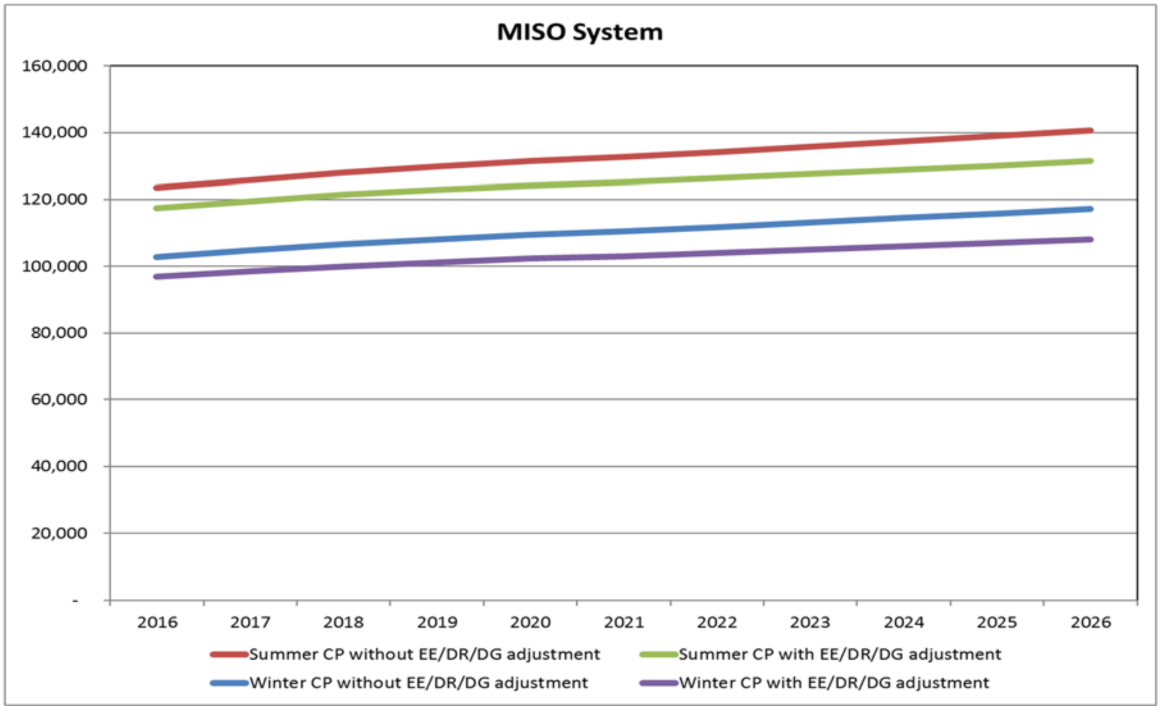
LRZ	Summer Coincident Factors						
	Average	2010	2011	2012	2013	2014	2015
1	0.946	0.968	1.000	0.945	0.973	0.896	0.891
2	0.978	0.948	1.000	0.969	0.999	1.000	0.950
3	0.953	0.952	0.986	0.974	0.969	0.992	0.848
4	0.964	1.000	0.988	0.945	0.988	0.885	0.976
5	0.965	1.000	0.971	0.949	0.963	0.907	0.999
6	0.983	0.968	0.991	0.973	1.000	0.970	0.995
7	0.979	0.913	0.961	1.000	0.999	0.998	1.000
8	0.932	0.964	0.936	0.929	0.936	0.875	0.950
9	0.921	0.982	0.917	0.912	0.860	0.920	0.937
10	0.893	0.960	0.901	0.894	0.791	0.844	0.968

Table 24: Gross and Net MISO System Coincident Peak Demand (Metered Load in MW)

Year	MISO Summer CP without EE/DR/DG Adjustments	MISO Summer CP with EE/DR/DG Adjustments	MISO Winter CP without EE/DR/DG Adjustments	MISO Winter CP with EE/DR/DG Adjustments
2015	119,609	119,609	106,100	106,100
2016	123,475	117,553	102,864	96,942
2017	125,801	119,554	104,822	98,575
2018	128,001	121,449	106,648	100,095
2019	129,836	122,972	108,173	101,309
2020	131,438	124,252	109,521	102,335
2021	132,768	125,243	110,650	103,125
2022	134,224	126,376	111,877	104,029
2023	135,756	127,580	113,169	104,992
2024	137,414	128,902	114,558	106,047
2025	138,983	130,130	115,873	107,020
2026	140,610	131,407	117,241	108,038
Annual Growth Rates (%)				
2015-2016	3.23	-1.72	-3.05	-8.63
2016-2017	1.88	1.70	1.90	1.68
2017-2018	1.75	1.58	1.74	1.54
2018-2019	1.43	1.25	1.43	1.21
2019-2020	1.23	1.04	1.25	1.01
2020-2021	1.01	0.80	1.03	0.77
2021-2022	1.10	0.91	1.11	0.88
2022-2023	1.14	0.95	1.15	0.93
2023-2024	1.22	1.04	1.23	1.00
2024-2025	1.14	0.95	1.15	0.92
2025-2026	1.17	0.98	1.18	0.95
Compound Annual Growth Rates (%)				
2015-2020	1.90	0.76	0.64	-0.72
2015-2026	1.48	0.86	0.91	0.16
2017-2026	1.24	1.06	1.25	1.02

MISO SYSTEM-WIDE FORECASTS

Figure 58: Gross and Net MISO System Coincident Peak Demand (Metered Load in MW)



6.3 MISO SYSTEM HIGH AND LOW FORECASTS

Alternate 90/10 (High/Low) forecasts were developed. Figure 59 shows the MISO system net energy forecasts for the Low, Base and High scenarios and Table 29 provides the growth rates for net energy and seasonal peaks. Appendix C contains more information on the high and low forecasts.

Figure 59: Net MISO System Energy for Alternate Forecasts (Annual Metered Load in GWh)

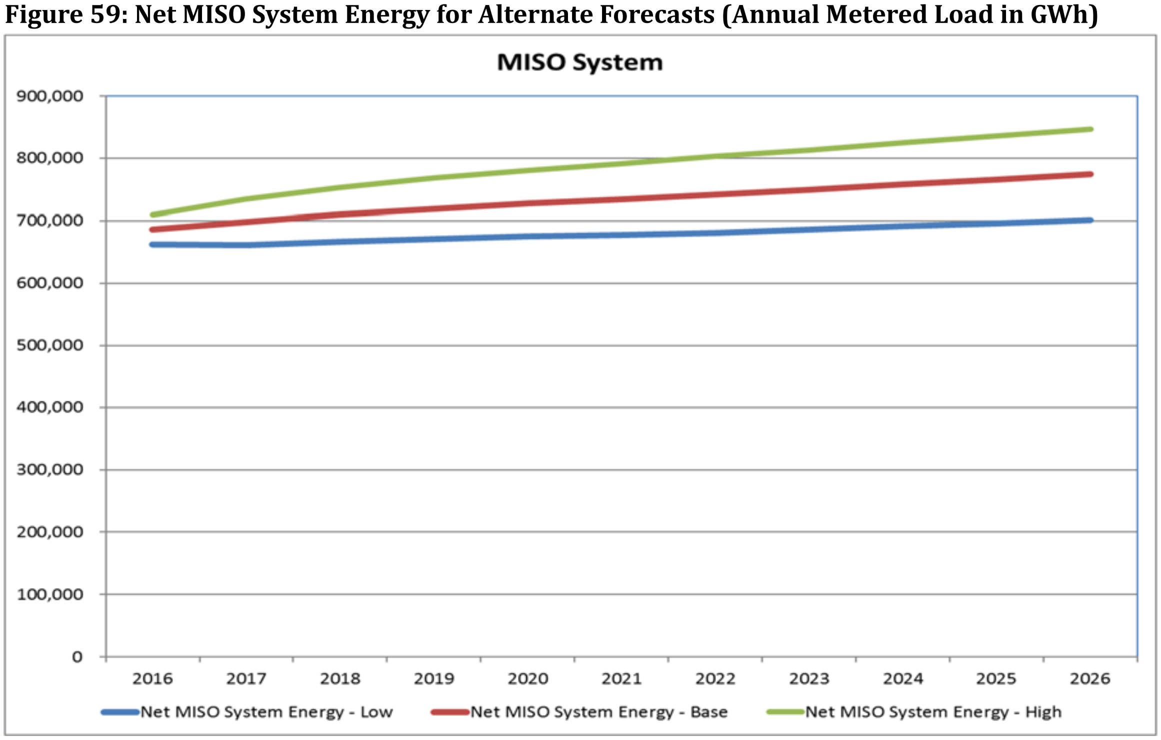


Table 25: Net MISO System Compound Annual Growth Rates for Alternate Forecasts (2017-2026)

	BASE	HIGH	LOW
Energy	1.15	1.58	0.65
Summer Peak	1.06	1.51	0.52
Winter Peak	1.02	1.48	0.49

APPENDIX A State Electric Energy Forecasting Models

Arkansas

Dependent Variable:
ELECTRICITY_SALES

Method: Least Squares

Sample: 1990 2014

Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	18922.77	3202.394	5.908946	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,4)	-1644.084	176.6988	-9.304444	0.0000	-0.2484
GSP	0.278528	0.016122	17.27614	0.0000	0.6491
CDD	3.56418	0.488213	7.300467	0.0000	0.1590
HDD	1.082386	0.358589	3.018457	0.0068	0.0928
R-squared	0.994928	Mean dependent var	40551.61		
Adjusted R-squared	0.993914	S.D. dependent var	6716.979		
S.E. of regression	524.0147	Durbin-Watson stat	1.575739		
F-statistic	980.8533				
Prob(F-statistic)	0.000000				

Illinois

Dependent Variable: ELECTRICITY_SALES

Method: Least Squares

Sample: 1990 2014

Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	88116.68	14962.59	5.889134	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-2367.163	612.858	-3.862499	0.0010	-0.1419
GSP	0.082279	0.014402	5.712963	0.0000	0.3891
CDD	10.70239	1.338207	7.997555	0.0000	0.0778
HDD	1.510145	0.570358	2.647716	0.0154	0.0670
R-squared	0.99072	Mean dependent var	133512.2		
Adjusted R-squared	0.988864	S.D. dependent var	10743.76		
S.E. of regression	1133.768	Durbin-Watson stat	1.978099		
F-statistic	533.7845				
Prob(F-statistic)	0.000000				

Indiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2014
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	23938.99	3441.989	6.954987	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1225.3	227.6832	-5.381601	0.0000	-0.0944
@MOVAV(REAL_NATURAL_GAS_PRICE,2)	363.4235	103.8457	3.499648	0.0024	0.0246
REAL_GSP	0.252658	0.004863	51.95145	0.0000	0.6810
CDD	6.156419	0.764461	8.053285	0.0000	0.0674
HDD	1.813066	0.381139	4.756967	0.0001	0.1033
R-squared	0.996911	Mean dependent var	96216.86		
Adjusted R-squared	0.996098	S.D. dependent var	10913.56		
S.E. of regression	681.7222	Durbin-Watson stat	2.007218		
F-statistic	1226.353				
Prob(F-statistic)	0.000000				

Iowa

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1993 2014
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	16948.22	3105.043	5.458289	0.0001	
REAL_ELECTRICITY_PRICE(-2)	-1286.671	282.2488	-4.558639	0.0003	-0.2024
REAL_NATURAL_GAS_PRICE(-2)	188.075	60.33242	3.117313	0.0066	0.0297
REAL INCOME	0.000214	0.0000106	20.1258	0.0000	0.6498
CDD	2.933447	0.694937	4.221169	0.0006	0.0664
HDD	0.664417	0.212405	3.128059	0.0065	0.1084
R-squared	0.994364	Mean dependent var	40849.62		
Adjusted R-squared	0.992603	S.D. dependent var	4697.763		
S.E. of regression	404.0402	Durbin-Watson stat	1.351322		
F-statistic	564.583				
Prob(F-statistic)	0.000000				

Kentucky

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1993 2014
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	-83509.28	10478.3	-7.969739	0.0000	
@MOVAV(EL_PRICE_KY,3)	-2373.248	738.2586	-3.214657	0.0054	-0.190776
@MOVAV(NG_PRICE_KY,3)	786.6778	217.4875	3.617118	0.0023	0.059757
POPULATION_KY	0.037176	0.002669	13.93053	0.0000	1.799768
CDD_KY	4.107741	1.891501	2.171683	0.0453	0.0646
HDD_KY	3.550747	1.175732	3.020031	0.0081	0.1882

R-squared	0.969562	Mean dependent var	84063.79
Adjusted R-squared	0.96005	S.D. dependent var	7646.604
S.E. of regression	1528.368	Durbin-Watson stat	2.047813
F-statistic	101.931		
Prob(F-statistic)	0.000000		

Louisiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2004 2006 2014
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	43231.93	9063.392	4.769951	0.0001	
REAL_ELECTRICITY_PRICE(-2)	-2880.37	494.0632	-5.829963	0.0000	-0.2313
REAL_GSP	0.182654	0.028914	6.317075	0.0000	0.4319
CDD	4.680232	2.400735	1.9495	0.0662	0.1765
HDD	6.425083	1.936429	3.318006	0.0036	0.1269

R-squared	0.942101	Mean dependent var	77111.55
Adjusted R-squared	0.929912	S.D. dependent var	7050.546
S.E. of regression	1866.571	Durbin-Watson stat	1.716599
F-statistic	77.28978		
Prob(F-statistic)	0.000000		

Michigan

Dependent Variable: MI_EL_SALES
Method: Least Squares
Sample: 1990 2014
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	55168.01	8066.145	6.839452	0.0000	
EL_PRICE_MI(-2)	-2483.754	402.4724	-6.171241	0.0000	-0.240701
PI_MI/POPULATION_MI	919.3478	156.8794	5.860222	0.0000	0.354329
GSP_MI	0.061895	0.017859	3.46581	0.0026	0.248093
CDD_MI	5.449304	1.364307	3.994192	0.0008	0.0436
HDD_MI	1.197745	0.559924	2.139122	0.0456	0.0743
R-squared	0.986385	Mean dependent var	100050.7		
Adjusted R-squared	0.982802	S.D. dependent var	8318.694		
S.E. of regression	1090.925	Durbin-Watson stat	1.940867		
F-statistic	275.3014				
Prob(F-statistic)	0.000000				

Minnesota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1991 2014
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	20842.71	3265.525	6.382653	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-785.6936	286.9386	-2.738194	0.0135	-0.0981
@MOVAV(REAL_NATURAL_GAS_PRICE,4)	465.4847	120.0009	3.87901	0.0011	0.0503
REAL_INCOME	0.000154	5.56E-06	27.74229	0.0000	0.5647
CDD	6.109774	1.119473	5.457725	0.0000	0.0650
HDD	1.012256	0.279173	3.625913	0.0019	0.1328
R-squared	0.992912	Mean dependent var	60825.52		
Adjusted R-squared	0.990943	S.D. dependent var	7158.567		
S.E. of regression	681.2834	Durbin-Watson stat	1.444467		
F-statistic	504.2722				
Prob(F-statistic)	0.000000				

Mississippi

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1993 2014
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	13364.2	4658.947	2.868501	0.0111	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1736.159	243.0253	-7.143943	0.0000	-0.3049
REAL_INCOME(-1)	0.000136	5.15E-05	2.643591	0.0177	0.3000
REAL_GSP	0.256937	0.090669	2.833794	0.0120	0.4921
CDD	3.047907	0.687354	4.434262	0.0004	0.1529
HDD	1.709259	0.615461	2.777203	0.0135	0.0952

R-squared	0.98633	Mean dependent var	44657.31
Adjusted R-squared	0.982059	S.D. dependent var	4336.682
S.E. of regression	580.879	Durbin-Watson stat	2.072365
F-statistic	230.8954		
Prob(F-statistic)	0.000000		

Missouri

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1998 2014
Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	-105234.8	11590.11	-9.079702	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-2284.499	426.4347	-5.357206	0.0002	-0.2249
POPULATION	0.017045	0.00162	10.5187	0.0000	1.2327
NON_MANUFACTURING_EMP	0.0321	0.005897	5.443887	0.0002	0.9482
CDD	8.24986	0.93112	8.860149	0.0000	0.1597
HDD	2.472161	0.53897	4.586823	0.0008	0.1446

R-squared	0.990307	Mean dependent var	78825.52
Adjusted R-squared	0.985901	S.D. dependent var	5881.856
S.E. of regression	698.4027	Durbin-Watson stat	1.904002
F-statistic	224.7692		
Prob(F-statistic)	0.000000		

Montana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2014
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	-524.7233	3615.793	-0.14512	0.8870	
REAL_ELECTRICITY_PRICE	-1857.406	230.4096	-8.061322	0.0000	-1.0301
@MOVAV(REAL_NATURAL_GAS_PRICE,5)	497.9886	76.74329	6.489018	0.0000	0.2770
REAL_INCOME/POPULATION	299.0434	45.60662	6.557017	0.0000	0.8229
MANUFACTURING_EMP	0.288485	0.072824	3.961422	0.0019	0.3873
CDD	2.261957	0.774918	2.918963	0.0129	0.0768
HDD	0.962943	0.241059	3.994629	0.0018	0.5059

R-squared	0.938059	Mean dependent var	13677.86
Adjusted R-squared	0.907089	S.D. dependent var	1008.073
S.E. of regression	307.2734	Durbin-Watson stat	2.010131
F-statistic	30.28902		
Prob(F-statistic)	0.000001		

North Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1994 2014
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	-9908.14	2012.282	-4.923834	0.0002	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-373.9147	179.1613	-2.087029	0.0532	-0.1467
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	164.4758	62.95955	2.612404	0.0189	0.0530
NON_MANUFACTURING_EMP	0.059875	0.00196	30.5538	0.0000	1.4298
HDD	0.335733	0.123958	2.708439	0.0155	0.2612

R-squared	0.988901	Mean dependent var	11173.86
Adjusted R-squared	0.986126	S.D. dependent var	2824.577
S.E. of regression	332.6993	Durbin-Watson stat	1.562303
F-statistic	356.3902		
Prob(F-statistic)	0.000000		

South Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1995 2014
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	-19621.55	1128.682	-17.38448	0.0000	
REAL_ELECTRICITY_PRICE(-2)	-461.3775	77.83107	-5.927934	0.0000	-0.3033
REAL_NATURAL_GAS_PRICE(-2)	56.99736	21.45578	2.656504	0.0188	0.0310
POPULATION	0.039219	0.000887	44.19976	0.0000	2.7102
CDD	0.484225	0.155823	3.10753	0.0077	0.0358
HDD	0.19127	0.0551	3.471316	0.0037	0.1460

R-squared	0.997687	Mean dependent var	9729.92
Adjusted R-squared	0.996861	S.D. dependent var	1658.558
S.E. of regression	92.91854	Durbin-Watson stat	1.833796
F-statistic	1207.911		
Prob(F-statistic)	0.000000		

Texas

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2014
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	86745.8	17633.71	4.919318	0.0003	
REAL_ELECTRICITY_PRICE(-2)	-3684.416	1674.161	-2.200754	0.0464	-0.0757
REAL_NATURAL_GAS_PRICE(-2)	2497.617	894.5251	2.792115	0.0153	0.0333
REAL_GSP	0.146033	0.005283	27.64047	0.0000	0.5461
CDD	25.49181	4.828415	5.27954	0.0001	0.2328
HDD	16.33358	4.96877	3.287248	0.0059	0.0906

R-squared	0.989578	Mean dependent var	334434
Adjusted R-squared	0.98557	S.D. dependent var	30848.37
S.E. of regression	3705.698	Durbin-Watson stat	2.04072
F-statistic	246.875		
Prob(F-statistic)	0.000000		

Wisconsin

Dependent Variable: ELECTRICITY_SALES

Method: Least Squares

Sample: 1990 2014

Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2014 (weather at means)
C	20597.33	2190.601	9.402594	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1299.039	114.4711	-11.34818	0.0000	-0.1789
REAL_NATURAL_GAS_PRICE	257.5846	71.14299	3.62066	0.0018	0.0308
REAL_GSP	0.200844	0.003783	53.09825	0.0000	0.7673
CDD	3.974989	0.738156	5.385027	0.0000	0.0376
HDD	0.569158	0.251927	2.259222	0.0358	0.0637

R-squared	0.99579	Mean dependent var	63495.47
Adjusted R-squared	0.994682	S.D. dependent var	6946.586
S.E. of regression	506.5929	Durbin-Watson stat	1.494082
F-statistic	898.7386		
Prob(F-statistic)	0.000000		

APPENDIX B Peak Demand Models

Regression Models

LRZ	Model Specification (Summer Peak Load Factors)
1	$C + Avg\ Temp + Avg\ Temp^2 + Avg\ Temp^3 + SP + MAVGT3 + T\ Max + Temp$
2	$C + Avg\ Temp + Avg\ Temp^2 + Avg\ Temp^3 + SP + MAVGT3 + T\ Max + Temp$
3	$C + Avg\ Temp + Avg\ Temp^2 + Avg\ Temp^3 + SP + T\ Max + Temp + Temp^2$
4	$C + Avg\ Temp + T\ Max + T\ Max^2 + SP$
5	$C + Avg\ Temp + SP + MVGT3 + Temp + Temp^2$
6	$C + Avg\ Temp + Avg\ Temp^2 + T\ Max + T\ Max^2 + SP$
7	$C + Avg\ Temp + Avg\ Temp^2 + SP + MAVGT3$
8	$C + Avg\ Temp + Avg\ Temp^2 + SP + Temp + T\ Max$
9	$C + Avg\ Temp + Temp + T\ Max + SP$
10	$C + Avg\ Temp + Avg\ Temp^2 + Avg\ Temp^3 + SP + T\ Max + Temp + MAVGT3$
LRZ	**Model Specification (Winter Peak Load Factors)**
1	$C + Avg\ Temp^2 + Avg\ Temp^3 + WP + MAVGT3 + T\ Max + Temp$
2	$C + Avg\ Temp + Avg\ Temp^2 + WP$
3	$C + Avg\ Temp + Temp + WP$
4	$C + Avg\ Temp + Temp + WP$
5	$C + Avg\ Temp + (T\ Max - Temp) + (T\ Max - Temp)^2 + WP + MAVGT3$
6	$C + Avg\ Temp + MAVGT3 + MAVGT3^2 + WP$
7	$C + Avg\ Temp + Avg\ Temp^2 + WP + MAVGT3$
8	$C + Avg\ Temp + Avg\ Temp^2 + WP + MAVGT3$
9	$C + Avg\ Temp + Avg\ Temp^2 + Avg\ Temp^3 + WP + MAVGT3 + MAVGT3^2$
10	$C + Avg\ Temp + Avg\ Temp^2 + Avg\ Temp^3 + WP + MAVGT3 + MAVGT^2$

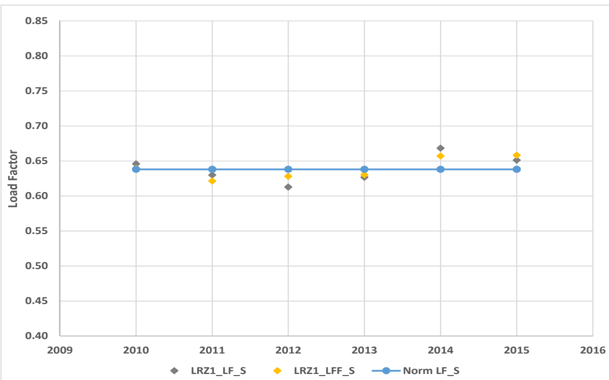
The followings are variable names and definitions:

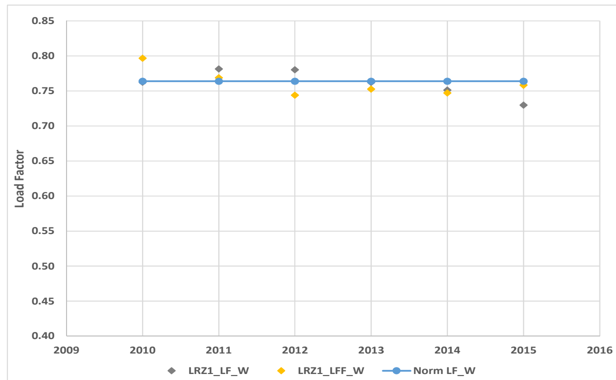
- SP: binary variable, the value is 1 for summer peak load factor, otherwise it is 0;
- WP: binary variable, the value is 1 for winter peak load factor, otherwise it is 0;

- Temp: hourly temperature observed;
- Avg Temp: average daily temperature in respect to the daily peak load factor;
- T Max: highest daily temperature in respect to the daily peak load factor;
- MAVGT3: Moving average temperature of the previous two hours and the hour when the daily peak occurred;
- Daily Peak Load Factor: dependent variable, the ratio of annual average hourly load over daily peak load.

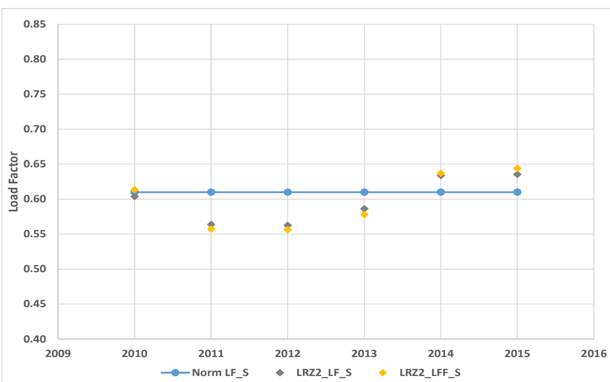
The following figures show the comparison of historical peak load factors, fitted peak load factors and normalized peak load factors. The grey diamonds represent actual peak load factors, the yellow diamonds indicate the fitted peak load factors from the model under actual peak weather conditions, and the blue line shows the normalized peak load factors under normalized seasonal peak weather conditions.

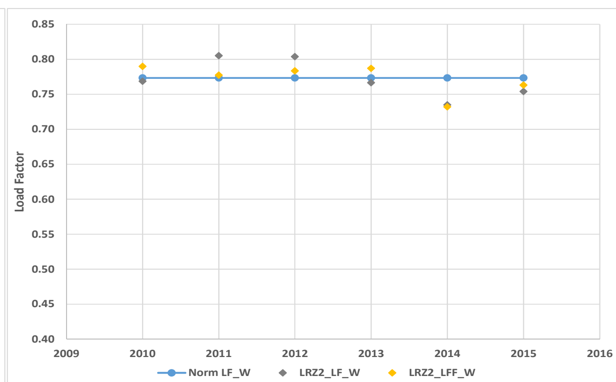
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 1



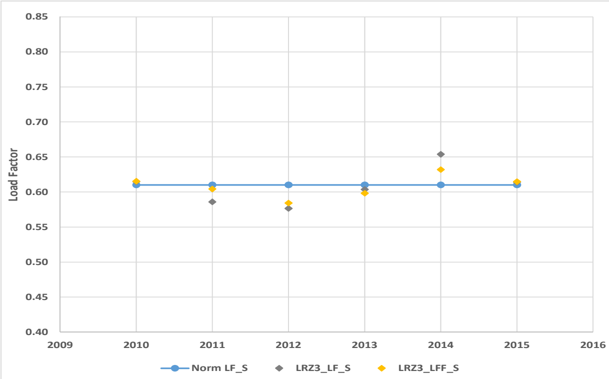


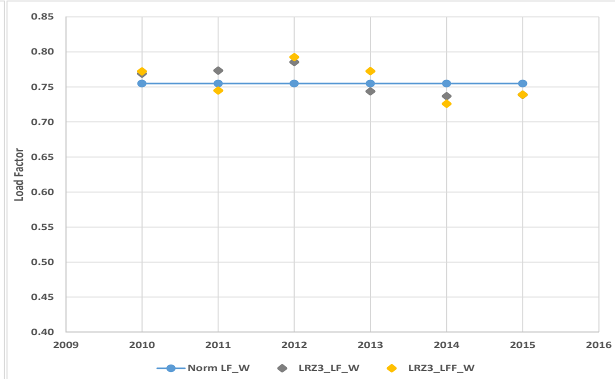
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 2



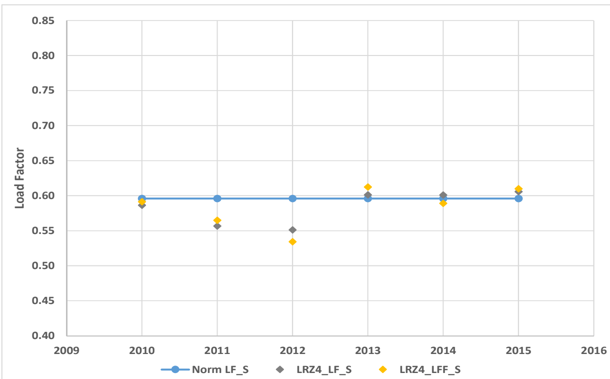


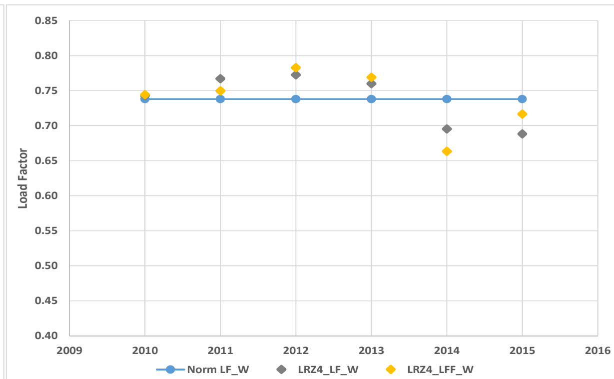
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 3



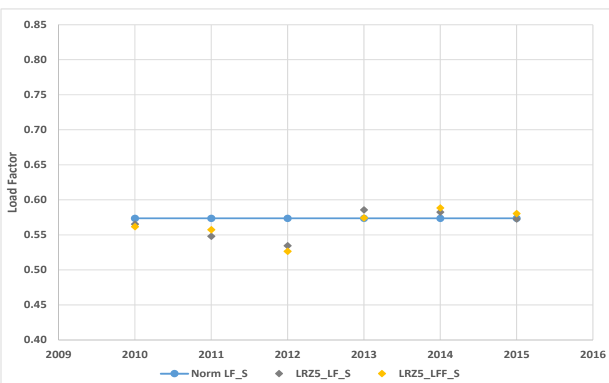


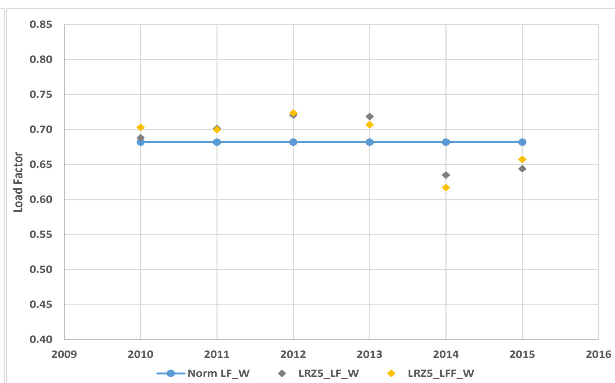
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 4



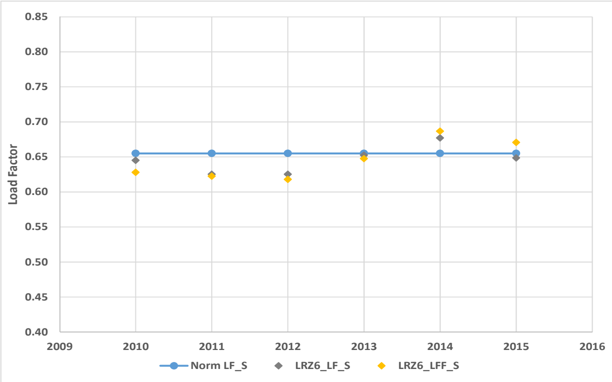


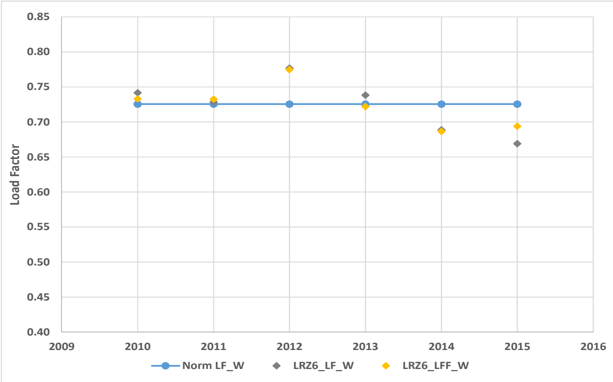
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 5



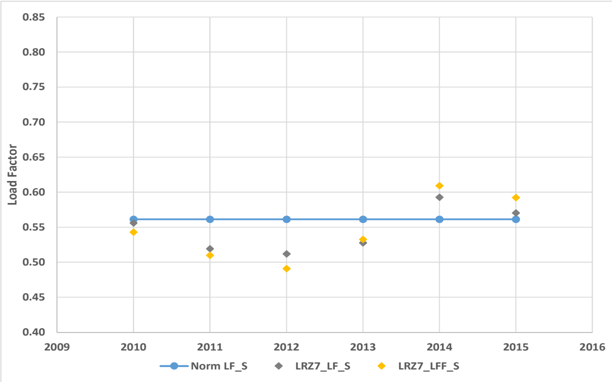


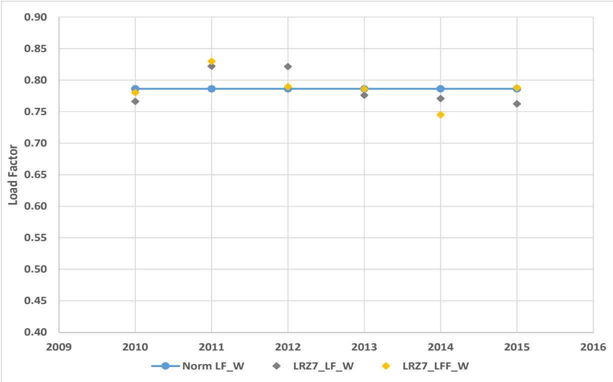
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 6



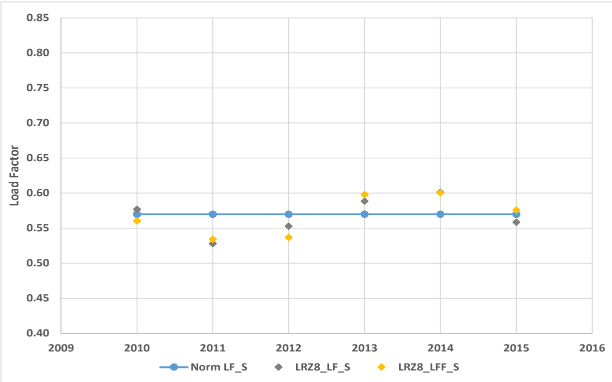


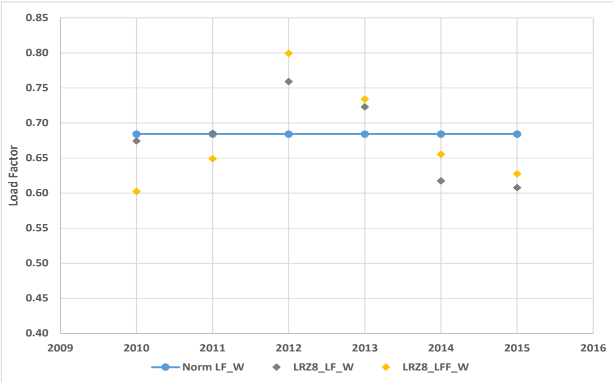
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 7



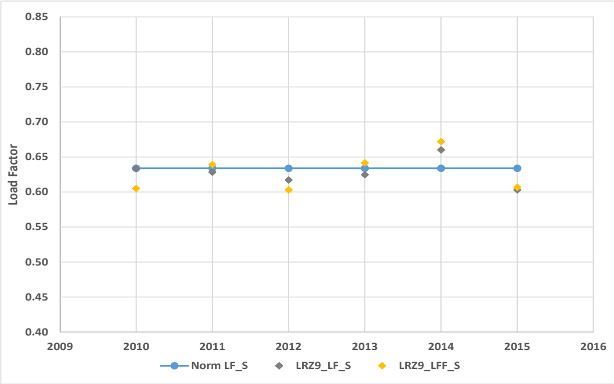


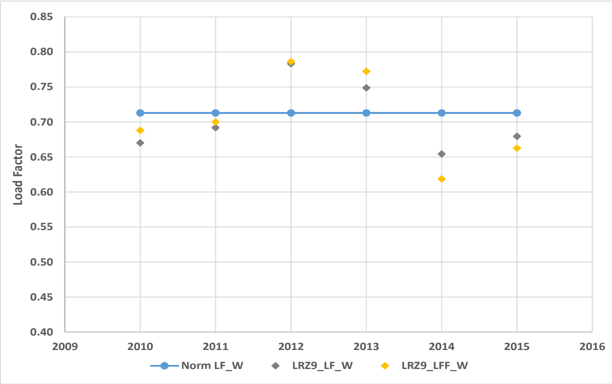
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 8



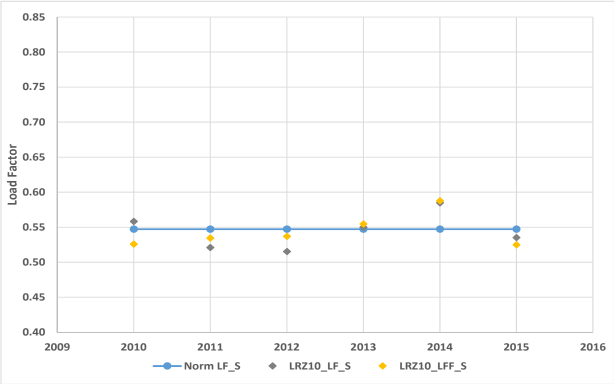


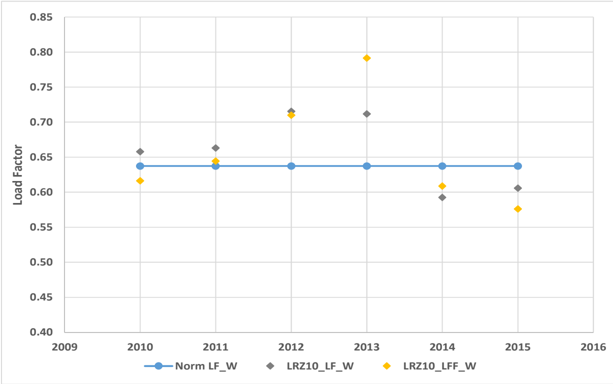
Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 9





Actual Peak Load Factors vs. Fitted Peak Load Factors for LRZ 10





APPENDIX C 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	49,378	145,124	109,517	46,962	78,684	87,612	107,860	70,325
2016	51,411	147,688	113,041	49,075	80,781	88,311	111,183	72,976
2017	53,383	149,875	116,716	50,816	82,750	94,803	114,776	75,191
2018	54,886	151,632	119,962	52,165	83,946	97,682	118,106	77,327
2019	55,792	153,708	122,591	53,581	85,543	98,730	120,761	79,428
2020	56,295	155,239	124,991	54,910	87,066	99,530	122,655	81,450
2021	56,657	156,317	127,346	56,079	88,546	99,874	123,986	83,379
2022	57,216	157,294	129,555	57,213	89,799	101,129	125,552	85,236
2023	57,860	158,244	131,795	58,394	90,883	101,317	127,110	86,969
2024	58,530	159,321	133,931	59,587	91,967	102,413	128,992	88,649
2025	59,217	160,309	136,128	60,787	93,081	103,112	130,725	90,442
2026	59,909	161,378	138,335	62,007	94,126	104,060	132,378	92,228
Compound Annual Growth Rates (%)								
1990-2014	2.29	1.00	1.55	1.99	1.07	1.47	0.95	1.58
2015-2026	1.77	0.97	2.15	2.56	1.64	1.58	1.88	2.50
2017-2026	1.29	0.83	1.91	2.24	1.44	1.04	1.60	2.30

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	50,562	85,163	17,385	17,688	12,364	404,590	71,546
2016	52,274	87,518	18,550	18,021	12,897	408,449	74,008
2017	54,257	89,294	19,299	18,693	13,421	427,615	76,482
2018	55,433	91,037	20,767	19,379	13,803	440,316	78,652
2019	56,829	92,635	20,636	20,023	14,217	452,321	80,334
2020	57,935	94,110	21,259	20,653	14,592	463,315	81,694
2021	59,173	95,409	21,934	21,186	14,917	472,816	82,919
2022	60,319	96,701	22,544	21,735	15,256	483,085	84,318
2023	61,404	98,075	23,047	22,314	15,608	493,345	85,709
2024	62,488	99,496	23,532	22,882	15,963	503,519	87,068
2025	63,557	100,871	23,920	23,429	16,306	513,296	88,283
2026	64,652	102,134	24,387	23,971	16,626	523,554	89,583
Compound Annual Growth Rates (%)							
1990-2014	1.81	1.86	0.30	4.06	2.82	2.09	1.45
2015-2026	2.26	1.67	3.12	2.80	2.73	2.37	2.06
2017-2026	1.97	1.50	2.63	2.80	2.41	2.27	1.77

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
2015	96,613	64,572	47,074	49,243	41,938	98,266	99,885	36,631	111,306	22,294
2016	106,579	69,858	49,502	52,107	45,447	106,712	107,559	39,974	109,721	23,852
2017	110,016	72,186	51,207	52,879	46,370	109,819	111,035	41,503	117,139	24,757
2018	113,564	74,239	52,538	53,499	47,275	112,265	114,257	42,670	120,679	25,293
2019	116,349	75,833	53,935	54,231	48,104	114,591	116,825	43,375	122,408	25,930
2020	119,277	77,109	55,241	54,771	48,871	116,752	118,657	43,768	123,837	26,435
2021	122,051	78,238	56,389	55,152	49,545	118,863	119,945	44,052	124,736	27,000
2022	124,766	79,530	57,501	55,496	50,216	120,769	121,460	44,488	126,561	27,523
2023	127,327	80,816	58,655	55,832	50,930	122,599	122,967	44,989	127,356	28,018
2024	129,817	82,089	59,821	56,211	51,667	124,372	124,788	45,512	129,021	28,512
2025	132,349	83,232	60,995	56,560	52,381	126,194	126,465	46,047	130,281	29,000
2026	134,912	84,443	62,186	56,937	53,037	127,985	128,063	46,585	131,808	29,500
Annual Growth Rates (%)										
2015-2016	10.32	8.19	5.16	5.82	8.37	8.60	7.68	9.13	-1.42	6.99
2016-2017	3.22	3.33	3.45	1.48	2.03	2.91	3.23	3.83	6.76	3.79
2017-2018	3.23	2.84	2.60	1.17	1.95	2.23	2.90	2.81	3.02	2.17
2018-2019	2.45	2.15	2.66	1.37	1.76	2.07	2.25	1.65	1.43	2.52
2019-2020	2.52	1.68	2.42	1.00	1.59	1.89	1.57	0.91	1.17	1.95
2020-2021	2.33	1.46	2.08	0.69	1.38	1.81	1.09	0.65	0.73	2.14
2021-2022	2.22	1.65	1.97	0.62	1.35	1.60	1.26	0.99	1.46	1.94
2022-2023	2.05	1.62	2.01	0.60	1.42	1.52	1.24	1.13	0.63	1.80
2023-2024	1.96	1.58	1.99	0.68	1.45	1.45	1.48	1.16	1.31	1.77
2024-2025	1.95	1.39	1.96	0.62	1.38	1.47	1.34	1.18	0.98	1.71
2025-2026	1.94	1.46	1.95	0.67	1.25	1.42	1.26	1.17	1.17	1.72
Compound Annual Growth Rates (%)										
2015-2020	4.30	3.61	3.25	2.15	3.11	3.51	3.50	3.62	2.16	3.47
2015-2026	3.08	2.47	2.56	1.33	2.16	2.43	2.28	2.21	1.55	2.58
2017-2026	2.29	1.76	2.18	0.83	1.50	1.72	1.60	1.29	1.32	1.97

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	96,613	64,572	47,074	49,243	41,938	98,266	99,885	36,631	111,306	22,294
2016	106,378	69,762	49,262	51,949	45,367	106,596	107,261	39,932	109,685	23,852
2017	109,734	72,088	50,786	52,628	46,219	109,640	110,625	41,457	117,073	24,757
2018	113,196	74,137	51,933	53,152	47,052	112,019	113,732	42,620	120,581	25,293
2019	115,888	75,728	53,145	53,786	47,808	114,274	116,180	43,321	122,272	25,930
2020	118,713	77,001	54,265	54,226	48,499	116,358	117,889	43,711	123,658	26,435
2021	121,374	78,128	55,224	54,504	49,096	118,388	119,049	43,989	124,507	27,000
2022	123,973	79,417	56,146	54,744	49,689	120,208	120,431	44,421	126,278	27,523
2023	126,410	80,700	57,106	54,973	50,323	121,947	121,802	44,918	127,013	28,018
2024	128,770	81,971	58,076	55,244	50,979	123,624	123,482	45,436	128,613	28,512
2025	131,164	83,110	59,049	55,482	51,611	125,346	125,013	45,966	129,801	29,000
2026	133,580	84,318	60,037	55,746	52,182	127,029	126,461	46,500	131,252	29,500
Annual Growth Rates (%)										
2015-2016	10.11	8.04	4.65	5.50	8.18	8.48	7.38	9.01	-1.46	6.99
2016-2017	3.15	3.33	3.09	1.31	1.88	2.86	3.14	3.82	6.74	3.79
2017-2018	3.15	2.84	2.26	1.00	1.80	2.17	2.81	2.80	3.00	2.17
2018-2019	2.38	2.15	2.33	1.19	1.61	2.01	2.15	1.64	1.40	2.52
2019-2020	2.44	1.68	2.11	0.82	1.45	1.82	1.47	0.90	1.13	1.95
2020-2021	2.24	1.46	1.77	0.51	1.23	1.74	0.98	0.64	0.69	2.14
2021-2022	2.14	1.65	1.67	0.44	1.21	1.54	1.16	0.98	1.42	1.94
2022-2023	1.97	1.62	1.71	0.42	1.28	1.45	1.14	1.12	0.58	1.80
2023-2024	1.87	1.57	1.70	0.49	1.30	1.37	1.38	1.15	1.26	1.77
2024-2025	1.86	1.39	1.68	0.43	1.24	1.39	1.24	1.17	0.92	1.71
2025-2026	1.84	1.45	1.67	0.48	1.11	1.34	1.16	1.16	1.12	1.72
Compound Annual Growth Rates (%)										
2015-2020	4.21	3.58	2.88	1.95	2.95	3.44	3.37	3.60	2.13	3.47
2015-2026	2.99	2.46	2.24	1.13	2.01	2.36	2.17	2.19	1.51	2.58
2017-2026	2.21	1.76	1.88	0.64	1.36	1.65	1.50	1.28	1.28	1.97

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	16,935	11,604	8,751	9,280	8,361	17,297	19,994	7,486	21,071	4,755
2016	19,069	13,074	9,264	9,981	9,044	18,599	21,876	8,008	19,761	4,976
2017	19,684	13,510	9,583	10,129	9,228	19,140	22,583	8,315	21,097	5,164
2018	20,319	13,894	9,832	10,248	9,408	19,567	23,238	8,548	21,734	5,276
2019	20,817	14,193	10,093	10,388	9,573	19,972	23,760	8,690	22,046	5,409
2020	21,341	14,432	10,338	10,492	9,726	20,349	24,133	8,769	22,303	5,515
2021	21,837	14,643	10,553	10,565	9,860	20,717	24,395	8,825	22,465	5,632
2022	22,323	14,885	10,761	10,631	9,993	21,049	24,703	8,913	22,794	5,741
2023	22,781	15,125	10,977	10,695	10,135	21,368	25,010	9,013	22,937	5,845
2024	23,227	15,364	11,195	10,768	10,282	21,677	25,380	9,118	23,237	5,948
2025	23,680	15,577	11,415	10,834	10,424	21,995	25,721	9,225	23,464	6,050
2026	24,138	15,804	11,638	10,907	10,555	22,307	26,046	9,333	23,739	6,154
Annual Growth Rates (%)										
2015-2016	12.60	12.67	5.85	7.55	8.17	7.53	9.41	6.98	-6.22	4.65
2016-2017	3.22	3.33	3.45	1.48	2.03	2.91	3.23	3.83	6.76	3.79
2017-2018	3.23	2.84	2.60	1.17	1.95	2.23	2.90	2.81	3.02	2.17
2018-2019	2.45	2.15	2.66	1.37	1.76	2.07	2.25	1.65	1.43	2.52
2019-2020	2.52	1.68	2.42	1.00	1.59	1.89	1.57	0.91	1.17	1.95
2020-2021	2.33	1.46	2.08	0.69	1.38	1.81	1.09	0.65	0.73	2.14
2021-2022	2.22	1.65	1.97	0.62	1.35	1.60	1.26	0.99	1.46	1.94
2022-2023	2.05	1.62	2.01	0.60	1.42	1.52	1.24	1.13	0.63	1.80
2023-2024	1.96	1.58	1.99	0.68	1.45	1.45	1.48	1.16	1.31	1.77
2024-2025	1.95	1.39	1.96	0.62	1.38	1.47	1.34	1.18	0.98	1.71
2025-2026	1.94	1.46	1.95	0.67	1.25	1.42	1.26	1.17	1.17	1.72
Compound Annual Growth Rates (%)										
2015-2020	4.73	4.46	3.39	2.48	3.07	3.30	3.83	3.21	1.14	3.01
2015-2026	3.27	2.85	2.62	1.48	2.14	2.34	2.43	2.02	1.09	2.37
2017-2026	2.29	1.76	2.18	0.83	1.50	1.72	1.60	1.29	1.32	1.97

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	15,109	9,773	7,274	8,168	7,431	16,768	14,958	6,880	18,698	4,200
2016	15,926	10,311	7,486	8,061	7,606	16,791	15,617	6,669	17,569	4,271
2017	16,439	10,655	7,744	8,180	7,761	17,280	16,122	6,924	18,757	4,433
2018	16,969	10,958	7,946	8,276	7,912	17,665	16,590	7,119	19,324	4,529
2019	17,386	11,193	8,157	8,389	8,051	18,031	16,963	7,236	19,601	4,643
2020	17,823	11,381	8,355	8,473	8,179	18,371	17,229	7,302	19,830	4,734
2021	18,238	11,548	8,528	8,532	8,292	18,703	17,416	7,349	19,974	4,835
2022	18,643	11,739	8,696	8,585	8,404	19,003	17,636	7,422	20,266	4,928
2023	19,026	11,929	8,871	8,637	8,524	19,291	17,854	7,506	20,393	5,017
2024	19,398	12,117	9,047	8,695	8,647	19,570	18,119	7,593	20,660	5,106
2025	19,776	12,285	9,225	8,749	8,767	19,857	18,362	7,682	20,862	5,193
2026	20,159	12,464	9,405	8,808	8,877	20,138	18,594	7,772	21,106	5,283
Annual Growth Rates (%)										
2015-2016	5.41	5.50	2.92	-1.31	2.35	0.14	4.41	-3.06	-6.04	1.68
2016-2017	3.22	3.33	3.45	1.48	2.03	2.91	3.23	3.83	6.76	3.79
2017-2018	3.23	2.84	2.60	1.17	1.95	2.23	2.90	2.81	3.02	2.17
2018-2019	2.45	2.15	2.66	1.37	1.76	2.07	2.25	1.65	1.43	2.52
2019-2020	2.52	1.68	2.42	1.00	1.59	1.89	1.57	0.91	1.17	1.95
2020-2021	2.33	1.46	2.08	0.69	1.38	1.81	1.09	0.65	0.73	2.14
2021-2022	2.22	1.65	1.97	0.62	1.35	1.60	1.26	0.99	1.46	1.94
2022-2023	2.05	1.62	2.01	0.60	1.42	1.52	1.24	1.13	0.63	1.80
2023-2024	1.96	1.58	1.99	0.68	1.45	1.45	1.48	1.16	1.31	1.77
2024-2025	1.95	1.39	1.96	0.62	1.38	1.47	1.34	1.18	0.98	1.71
2025-2026	1.94	1.46	1.95	0.67	1.25	1.42	1.26	1.17	1.17	1.72
Compound Annual Growth Rates (%)										
2015-2020	3.36	3.09	2.81	0.74	1.94	1.84	2.87	1.20	1.18	2.42
2015-2026	2.66	2.24	2.36	0.69	1.63	1.68	2.00	1.11	1.11	2.11
2017-2026	2.29	1.76	2.18	0.83	1.50	1.72	1.60	1.29	1.32	1.97

Net Summer Non-Coincident Peak Demand (Metered Load in MW) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	16,935	11,604	8,751	9,280	8,361	17,297	19,994	7,486	21,071	4,755
2016	17,662	11,857	8,725	9,810	9,031	18,121	20,512	7,522	19,516	4,976
2017	18,200	12,247	8,990	9,938	9,203	18,637	21,173	7,812	20,824	5,164
2018	18,761	12,595	9,183	10,036	9,371	19,037	21,782	8,031	21,439	5,276
2019	19,186	12,858	9,389	10,156	9,523	19,416	22,257	8,158	21,726	5,409
2020	19,631	13,060	9,577	10,239	9,663	19,764	22,580	8,224	21,956	5,515
2021	20,038	13,235	9,735	10,291	9,785	20,103	22,791	8,267	22,088	5,632
2022	20,446	13,440	9,886	10,335	9,905	20,405	23,047	8,341	22,396	5,741
2023	20,826	13,644	10,044	10,378	10,034	20,693	23,301	8,428	22,517	5,845
2024	21,191	13,845	10,204	10,428	10,167	20,969	23,618	8,518	22,793	5,948
2025	21,563	14,022	10,365	10,472	10,295	21,253	23,905	8,611	22,995	6,050
2026	21,939	14,210	10,527	10,522	10,412	21,531	24,175	8,704	23,243	6,154
Annual Growth Rates (%)										
2015-2016	4.29	2.18	-0.31	5.70	8.01	4.76	2.59	0.48	-7.38	4.65
2016-2017	3.04	3.29	3.04	1.31	1.90	2.85	3.22	3.85	6.70	3.79
2017-2018	3.09	2.84	2.15	0.99	1.83	2.15	2.88	2.81	2.96	2.17
2018-2019	2.26	2.09	2.24	1.19	1.63	1.99	2.18	1.58	1.34	2.52
2019-2020	2.32	1.58	2.00	0.81	1.47	1.79	1.45	0.81	1.06	1.95
2020-2021	2.07	1.34	1.65	0.51	1.26	1.71	0.94	0.53	0.60	2.14
2021-2022	2.04	1.55	1.56	0.43	1.23	1.50	1.12	0.89	1.39	1.94
2022-2023	1.86	1.52	1.60	0.41	1.30	1.41	1.10	1.04	0.54	1.80
2023-2024	1.75	1.47	1.59	0.49	1.33	1.34	1.36	1.07	1.23	1.77
2024-2025	1.76	1.27	1.57	0.42	1.26	1.36	1.21	1.09	0.88	1.71
2025-2026	1.74	1.34	1.57	0.47	1.13	1.31	1.13	1.08	1.08	1.72
Compound Annual Growth Rates (%)										
2015-2020	3.00	2.39	1.82	1.99	2.94	2.70	2.46	1.90	0.83	3.01
2015-2026	2.38	1.86	1.69	1.15	2.01	2.01	1.74	1.38	0.90	2.37
2017-2026	2.10	1.67	1.77	0.64	1.38	1.62	1.48	1.21	1.23	1.97

HIGH AND LOW FORECASTS

Net Winter Non-Coincident Peak Demand (Metered Load in MW)—High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	15,109	9,773	7,274	8,168	7,431	16,768	14,958	6,880	18,698	4,200
2016	14,519	9,093	6,947	7,889	7,593	16,313	14,254	6,182	17,324	4,271
2017	14,955	9,391	7,151	7,989	7,736	16,776	14,712	6,421	18,484	4,433
2018	15,412	9,658	7,297	8,064	7,875	17,135	15,134	6,601	19,029	4,529
2019	15,755	9,858	7,452	8,157	8,001	17,474	15,459	6,705	19,281	4,643
2020	16,113	10,010	7,593	8,220	8,117	17,786	15,675	6,758	19,483	4,734
2021	16,438	10,140	7,710	8,258	8,217	18,089	15,812	6,791	19,597	4,835
2022	16,767	10,294	7,822	8,290	8,316	18,359	15,980	6,851	19,868	4,928
2023	17,071	10,447	7,939	8,320	8,422	18,616	16,146	6,920	19,973	5,017
2024	17,363	10,598	8,056	8,356	8,532	18,862	16,357	6,993	20,216	5,106
2025	17,660	10,729	8,175	8,387	8,638	19,116	16,546	7,068	20,392	5,193
2026	17,960	10,870	8,295	8,423	8,734	19,363	16,723	7,143	20,611	5,283
Annual Growth Rates (%)										
2015-2016	-3.91	-6.95	-4.49	-3.41	2.17	-2.71	-4.71	-10.13	-7.35	1.68
2016-2017	3.00	3.27	2.94	1.27	1.88	2.84	3.22	3.86	6.70	3.79
2017-2018	3.06	2.84	2.03	0.95	1.80	2.14	2.87	2.81	2.95	2.17
2018-2019	2.22	2.07	2.13	1.15	1.61	1.98	2.15	1.57	1.33	2.52
2019-2020	2.28	1.54	1.90	0.77	1.45	1.78	1.40	0.78	1.05	1.95
2020-2021	2.02	1.30	1.54	0.46	1.23	1.70	0.87	0.50	0.59	2.14
2021-2022	2.00	1.52	1.45	0.39	1.21	1.49	1.06	0.87	1.38	1.94
2022-2023	1.81	1.49	1.49	0.36	1.28	1.40	1.04	1.02	0.53	1.80
2023-2024	1.71	1.44	1.48	0.44	1.30	1.32	1.31	1.05	1.22	1.77
2024-2025	1.71	1.24	1.47	0.37	1.24	1.34	1.16	1.07	0.87	1.71
2025-2026	1.70	1.31	1.47	0.42	1.11	1.29	1.07	1.07	1.07	1.72
Compound Annual Growth Rates (%)										
2015-2020	1.30	0.48	0.86	0.13	1.78	1.19	0.94	-0.36	0.83	2.42
2015-2026	1.58	0.97	1.20	0.28	1.48	1.32	1.02	0.34	0.89	2.11
2017-2026	2.06	1.64	1.66	0.59	1.36	1.61	1.43	1.19	1.22	1.97

HIGH AND LOW FORECASTS

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

Year	MISO Energy without EE/DR/DG Adjustments	MISO Energy with EE/DR/DG Adjustments
2015	667,822	667,822
2016	711,311	710,044
2017	736,910	735,006
2018	756,277	753,714
2019	771,582	768,333
2020	784,718	780,754
2021	795,970	791,259
2022	808,310	802,831
2023	819,488	813,211
2024	831,811	824,707
2025	843,503	835,542
2026	855,457	846,605
Annual Growth Rates (%)		
2015-2016	6.51	6.32
2016-2017	3.60	3.52
2017-2018	2.63	2.55
2018-2019	2.02	1.94
2019-2020	1.70	1.62
2020-2021	1.43	1.35
2021-2022	1.55	1.46
2022-2023	1.38	1.29
2023-2024	1.50	1.41
2024-2025	1.41	1.31
2025-2026	1.42	1.32
Compound Annual Growth Rates (%)		
2015-2020	3.28	3.17
2015-2026	2.28	2.18
2017-2026	1.67	1.58

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

Year	MISO Summer CP without EE/DR/DG Adjustments	MISO Summer CP with EE/DR/DG Adjustments	MISO Winter CP without EE/DR/DG Adjustments	MISO Winter CP with EE/DR/DG Adjustments
2015	119,609	119,609	106,100	106,100
2016	127,788	121,866	106,472	100,550
2017	132,328	126,081	110,286	104,039
2018	135,795	129,243	113,167	106,615
2019	138,548	131,685	115,452	108,588
2020	140,896	133,710	117,414	110,228
2021	142,902	135,376	119,101	111,576
2022	145,098	137,251	120,946	113,098
2023	147,103	138,927	122,619	114,443
2024	149,309	140,797	124,460	115,948
2025	151,403	142,550	126,208	117,355
2026	153,538	144,336	127,995	118,793
Annual Growth Rates (%)				
2015-2016	6.84	1.89	0.35	-5.23
2016-2017	3.55	3.46	3.58	3.47
2017-2018	2.62	2.51	2.61	2.48
2018-2019	2.03	1.89	2.02	1.85
2019-2020	1.69	1.54	1.70	1.51
2020-2021	1.42	1.25	1.44	1.22
2021-2022	1.54	1.38	1.55	1.36
2022-2023	1.38	1.22	1.38	1.19
2023-2024	1.50	1.35	1.50	1.31
2024-2025	1.40	1.24	1.41	1.21
2025-2026	1.41	1.25	1.42	1.22
Compound Annual Growth Rates (%)				
2015-2020	3.33	2.25	2.05	0.77
2015-2026	2.30	1.72	1.72	1.03
2017-2026	1.67	1.51	1.67	1.48

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	47,593	141,564	102,242	44,831	76,137	84,016	102,765	67,126
2016	48,515	142,255	101,704	46,018	75,681	83,203	103,955	67,922
2017	49,411	142,062	102,562	45,500	74,905	82,587	103,330	68,271
2018	49,985	142,936	103,648	45,701	74,989	83,454	104,179	68,545
2019	50,353	143,494	104,432	46,195	75,827	83,316	104,751	69,146
2020	50,537	144,296	105,232	46,723	76,753	83,163	104,805	69,884
2021	50,706	144,796	105,987	47,169	77,732	82,668	104,451	70,652
2022	51,002	145,319	106,736	47,631	78,285	82,497	104,468	71,413
2023	51,422	145,919	107,599	48,179	78,957	82,678	104,537	72,115
2024	51,934	146,717	108,260	48,788	79,638	83,205	104,973	72,787
2025	52,459	147,486	109,100	49,418	80,662	83,256	105,388	73,601
2026	53,024	148,362	110,386	50,081	81,356	83,561	105,752	74,435
Compound Annual Growth Rates (%)								
1990-2014	2.29	1.00	1.55	1.99	1.07	1.47	0.95	1.58
2015-2026	0.99	0.43	0.70	1.01	0.60	-0.05	0.26	0.94
2017-2026	0.79	0.48	0.82	1.07	0.92	0.13	0.26	0.97

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	48,290	81,651	12,509	16,284	12,150	393,389	67,974
2016	48,495	82,584	12,007	15,729	12,587	392,461	68,795
2017	48,952	83,250	11,506	15,531	12,568	387,767	69,886
2018	49,205	83,974	11,132	15,646	12,769	393,908	71,137
2019	49,755	84,563	10,685	15,763	13,064	401,625	72,111
2020	50,366	85,387	10,799	15,869	13,343	409,044	72,845
2021	51,066	86,151	11,110	15,332	13,586	415,268	73,528
2022	51,727	86,986	11,395	15,247	13,846	422,436	74,436
2023	52,376	87,925	11,584	15,805	14,123	429,790	75,429
2024	53,070	88,967	11,766	15,711	14,405	437,032	76,399
2025	53,784	89,968	11,891	15,537	14,667	443,728	77,273
2026	54,542	90,908	12,072	15,306	14,908	451,002	78,264
Compound Annual Growth Rates (%)							
1990-2014	1.81	1.86	0.30	4.06	2.82	2.09	1.45
2015-2026	1.11	0.98	-0.32	-0.56	1.88	1.25	1.29
2017-2026	1.21	0.98	0.54	-0.16	1.91	1.69	1.27

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
2015	96,613	64,572	47,074	49,243	41,938	98,266	99,885	36,631	111,306	22,294
2016	96,849	64,969	46,471	50,190	42,885	97,662	100,567	37,723	103,830	22,127
2017	97,108	65,880	45,993	50,122	43,231	97,707	99,962	38,417	102,955	22,336
2018	97,564	67,005	46,202	50,431	43,607	98,351	100,783	38,862	104,159	22,451
2019	98,306	67,878	46,687	50,627	43,913	99,245	101,337	39,149	104,486	22,703
2020	99,359	68,515	47,210	50,910	44,341	100,194	101,389	39,293	104,780	22,981
2021	100,246	69,087	47,652	51,087	44,737	101,149	101,046	39,426	104,673	23,300
2022	101,339	69,872	48,110	51,271	45,171	101,866	101,063	39,657	104,935	23,602
2023	102,610	70,735	48,648	51,483	45,659	102,711	101,130	39,985	105,549	23,898
2024	103,588	71,596	49,244	51,764	46,200	103,450	101,552	40,384	106,490	24,215
2025	104,635	72,373	49,862	52,036	46,719	104,477	101,953	40,793	106,939	24,541
2026	105,719	73,249	50,513	52,345	47,208	105,567	102,305	41,232	107,668	24,887
Annual Growth Rates (%)										
2015-2016	0.24	0.62	-1.28	1.92	2.26	-0.61	0.68	2.98	-6.72	-0.75
2016-2017	0.27	1.40	-1.03	-0.14	0.81	0.05	-0.60	1.84	-0.84	0.94
2017-2018	0.47	1.71	0.45	0.62	0.87	0.66	0.82	1.16	1.17	0.52
2018-2019	0.76	1.30	1.05	0.39	0.70	0.91	0.55	0.74	0.31	1.12
2019-2020	1.07	0.94	1.12	0.56	0.97	0.96	0.05	0.37	0.28	1.23
2020-2021	0.89	0.83	0.94	0.35	0.89	0.95	-0.34	0.34	-0.10	1.39
2021-2022	1.09	1.14	0.96	0.36	0.97	0.71	0.02	0.59	0.25	1.29
2022-2023	1.25	1.23	1.12	0.41	1.08	0.83	0.07	0.83	0.58	1.26
2023-2024	0.95	1.22	1.23	0.55	1.19	0.72	0.42	1.00	0.89	1.32
2024-2025	1.01	1.09	1.26	0.52	1.12	0.99	0.40	1.01	0.42	1.35
2025-2026	1.04	1.21	1.31	0.59	1.04	1.04	0.35	1.08	0.68	1.41
Compound Annual Growth Rates (%)										
2015-2020	0.56	1.19	0.06	0.67	1.12	0.39	0.30	1.41	-1.20	0.61
2015-2026	0.82	1.15	0.64	0.56	1.08	0.65	0.22	1.08	-0.30	1.01
2017-2026	0.95	1.19	1.05	0.48	0.98	0.86	0.26	0.79	0.50	1.21

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	96,613	64,572	47,074	49,243	41,938	98,266	99,885	36,631	111,306	22,294
2016	96,648	64,874	46,232	50,032	42,804	97,546	100,269	37,681	103,794	22,127
2017	96,827	65,781	45,572	49,871	43,080	97,528	99,552	38,371	102,889	22,336
2018	97,196	66,904	45,597	50,084	43,384	98,105	100,258	38,813	104,061	22,451
2019	97,845	67,773	45,897	50,183	43,616	98,927	100,693	39,095	104,350	22,703
2020	98,796	68,408	46,234	50,365	43,969	99,801	100,620	39,236	104,601	22,981
2021	99,569	68,977	46,487	50,439	44,288	100,675	100,150	39,364	104,444	23,300
2022	100,546	69,759	46,754	50,519	44,644	101,306	100,034	39,591	104,652	23,602
2023	101,693	70,619	47,099	50,624	45,052	102,060	99,965	39,914	105,206	23,898
2024	102,541	71,478	47,499	50,797	45,512	102,703	100,245	40,308	106,082	24,215
2025	103,450	72,252	47,917	50,957	45,949	103,628	100,501	40,712	106,459	24,541
2026	104,387	73,125	48,364	51,153	46,353	104,611	100,703	41,146	107,111	24,887
Annual Growth Rates (%)										
2015-2016	0.04	0.47	-1.79	1.60	2.07	-0.73	0.38	2.86	-6.75	-0.75
2016-2017	0.19	1.40	-1.43	-0.32	0.64	-0.02	-0.71	1.83	-0.87	0.94
2017-2018	0.38	1.71	0.06	0.43	0.71	0.59	0.71	1.15	1.14	0.52
2018-2019	0.67	1.30	0.66	0.20	0.53	0.84	0.43	0.73	0.28	1.12
2019-2020	0.97	0.94	0.73	0.36	0.81	0.88	-0.07	0.36	0.24	1.23
2020-2021	0.78	0.83	0.55	0.15	0.73	0.88	-0.47	0.33	-0.15	1.39
2021-2022	0.98	1.13	0.57	0.16	0.80	0.63	-0.12	0.58	0.20	1.29
2022-2023	1.14	1.23	0.74	0.21	0.91	0.74	-0.07	0.82	0.53	1.26
2023-2024	0.83	1.22	0.85	0.34	1.02	0.63	0.28	0.99	0.83	1.32
2024-2025	0.89	1.08	0.88	0.32	0.96	0.90	0.26	1.00	0.36	1.35
2025-2026	0.91	1.21	0.93	0.38	0.88	0.95	0.20	1.07	0.61	1.41
Compound Annual Growth Rates (%)										
2015-2020	0.45	1.16	-0.36	0.45	0.95	0.31	0.15	1.38	-1.24	0.61
2015-2026	0.71	1.14	0.25	0.35	0.91	0.57	0.07	1.06	-0.35	1.01
2017-2026	0.84	1.18	0.66	0.28	0.82	0.78	0.13	0.78	0.45	1.21

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	16,935	11,604	8,751	9,280	8,361	17,297	19,994	7,486	21,071	4,755
2016	17,328	12,160	8,697	9,614	8,534	17,022	20,454	7,557	18,700	4,616
2017	17,374	12,330	8,607	9,601	8,603	17,029	20,331	7,696	18,542	4,660
2018	17,456	12,541	8,646	9,660	8,678	17,142	20,498	7,786	18,759	4,684
2019	17,589	12,704	8,737	9,698	8,739	17,297	20,610	7,843	18,818	4,736
2020	17,777	12,823	8,835	9,752	8,824	17,463	20,621	7,872	18,871	4,794
2021	17,936	12,930	8,918	9,786	8,903	17,629	20,551	7,899	18,852	4,861
2022	18,131	13,077	9,003	9,821	8,989	17,754	20,555	7,945	18,899	4,924
2023	18,359	13,239	9,104	9,862	9,086	17,902	20,568	8,011	19,009	4,985
2024	18,534	13,400	9,216	9,916	9,194	18,030	20,654	8,091	19,179	5,051
2025	18,721	13,545	9,331	9,968	9,297	18,209	20,736	8,172	19,260	5,119
2026	18,915	13,709	9,453	10,027	9,395	18,399	20,807	8,260	19,391	5,192
Annual Growth Rates (%)										
2015-2016	2.32	4.79	-0.63	3.60	2.07	-1.59	2.30	0.95	-11.25	-2.92
2016-2017	0.27	1.40	-1.03	-0.14	0.81	0.05	-0.60	1.84	-0.84	0.94
2017-2018	0.47	1.71	0.45	0.62	0.87	0.66	0.82	1.16	1.17	0.52
2018-2019	0.76	1.30	1.05	0.39	0.70	0.91	0.55	0.74	0.31	1.12
2019-2020	1.07	0.94	1.12	0.56	0.97	0.96	0.05	0.37	0.28	1.23
2020-2021	0.89	0.83	0.94	0.35	0.89	0.95	-0.34	0.34	-0.10	1.39
2021-2022	1.09	1.14	0.96	0.36	0.97	0.71	0.02	0.59	0.25	1.29
2022-2023	1.25	1.23	1.12	0.41	1.08	0.83	0.07	0.83	0.58	1.26
2023-2024	0.95	1.22	1.23	0.55	1.19	0.72	0.42	1.00	0.89	1.32
2024-2025	1.01	1.09	1.26	0.52	1.12	0.99	0.40	1.01	0.42	1.35
2025-2026	1.04	1.21	1.31	0.59	1.04	1.04	0.35	1.08	0.68	1.41
Compound Annual Growth Rates (%)										
2015-2020	0.98	2.02	0.19	1.00	1.08	0.19	0.62	1.01	-2.18	0.16
2015-2026	1.01	1.53	0.70	0.71	1.06	0.56	0.36	0.90	-0.75	0.80
2017-2026	0.95	1.19	1.05	0.48	0.98	0.86	0.26	0.79	0.50	1.21

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	15,109	9,773	7,274	8,168	7,431	16,768	14,958	6,880	18,698	4,200
2016	14,472	9,590	7,028	7,764	7,178	15,367	14,602	6,293	16,626	3,962
2017	14,510	9,724	6,956	7,754	7,235	15,374	14,514	6,409	16,486	4,000
2018	14,578	9,890	6,987	7,801	7,298	15,476	14,633	6,484	16,679	4,020
2019	14,689	10,019	7,061	7,832	7,349	15,616	14,714	6,531	16,731	4,065
2020	14,847	10,113	7,140	7,875	7,421	15,766	14,721	6,555	16,778	4,115
2021	14,979	10,197	7,207	7,903	7,487	15,916	14,672	6,578	16,761	4,172
2022	15,143	10,313	7,276	7,931	7,560	16,029	14,674	6,616	16,803	4,226
2023	15,333	10,441	7,357	7,964	7,642	16,162	14,684	6,671	16,901	4,279
2024	15,479	10,568	7,448	8,008	7,732	16,278	14,745	6,737	17,052	4,336
2025	15,635	10,682	7,541	8,050	7,819	16,439	14,803	6,806	17,124	4,395
2026	15,797	10,812	7,640	8,097	7,901	16,611	14,854	6,879	17,241	4,456
Annual Growth Rates (%)										
2015-2016	-4.22	-1.88	-3.38	-4.94	-3.42	-8.36	-2.38	-8.52	-11.08	-5.67
2016-2017	0.27	1.40	-1.03	-0.14	0.81	0.05	-0.60	1.84	-0.84	0.94
2017-2018	0.47	1.71	0.45	0.62	0.87	0.66	0.82	1.16	1.17	0.52
2018-2019	0.76	1.30	1.05	0.39	0.70	0.91	0.55	0.74	0.31	1.12
2019-2020	1.07	0.94	1.12	0.56	0.97	0.96	0.05	0.37	0.28	1.23
2020-2021	0.89	0.83	0.94	0.35	0.89	0.95	-0.34	0.34	-0.10	1.39
2021-2022	1.09	1.14	0.96	0.36	0.97	0.71	0.02	0.59	0.25	1.29
2022-2023	1.25	1.23	1.12	0.41	1.08	0.83	0.07	0.83	0.58	1.26
2023-2024	0.95	1.22	1.23	0.55	1.19	0.72	0.42	1.00	0.89	1.32
2024-2025	1.01	1.09	1.26	0.52	1.12	0.99	0.40	1.01	0.42	1.35
2025-2026	1.04	1.21	1.31	0.59	1.04	1.04	0.35	1.08	0.68	1.41
Compound Annual Growth Rates (%)										
2015-2020	-0.35	0.69	-0.37	-0.73	-0.03	-1.23	-0.32	-0.96	-2.14	-0.41
2015-2026	0.41	0.92	0.45	-0.08	0.56	-0.09	-0.06	0.00	-0.74	0.54
2017-2026	0.95	1.19	1.05	0.48	0.98	0.86	0.26	0.79	0.50	1.21

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	16,935	11,604	8,751	9,280	8,361	17,297	19,994	7,486	21,071	4,755
2016	15,921	10,942	8,157	9,442	8,521	16,544	19,090	7,071	18,455	4,616
2017	15,891	11,066	8,014	9,410	8,578	16,526	18,921	7,193	18,269	4,660
2018	15,899	11,241	7,997	9,449	8,641	16,612	19,042	7,268	18,464	4,684
2019	15,958	11,369	8,032	9,466	8,689	16,741	19,107	7,312	18,498	4,736
2020	16,068	11,452	8,074	9,499	8,762	16,878	19,068	7,328	18,524	4,794
2021	16,137	11,522	8,100	9,512	8,828	17,015	18,947	7,341	18,475	4,861
2022	16,255	11,632	8,129	9,526	8,901	17,110	18,899	7,373	18,501	4,924
2023	16,404	11,757	8,172	9,545	8,985	17,226	18,860	7,425	18,589	4,985
2024	16,499	11,881	8,225	9,576	9,079	17,323	18,892	7,491	18,735	5,051
2025	16,605	11,989	8,281	9,606	9,168	17,468	18,920	7,558	18,791	5,119
2026	16,716	12,115	8,343	9,642	9,251	17,624	18,936	7,632	18,895	5,192
Annual Growth Rates (%)										
2015-2016	-5.99	-5.70	-6.79	1.75	1.91	-4.36	-4.52	-5.55	-12.42	-2.92
2016-2017	-0.19	1.14	-1.76	-0.34	0.67	-0.11	-0.89	1.73	-1.00	0.94
2017-2018	0.05	1.58	-0.21	0.41	0.73	0.52	0.64	1.04	1.07	0.52
2018-2019	0.37	1.14	0.43	0.18	0.56	0.78	0.34	0.60	0.19	1.12
2019-2020	0.69	0.73	0.52	0.35	0.84	0.82	-0.20	0.22	0.14	1.23
2020-2021	0.43	0.62	0.33	0.13	0.75	0.81	-0.63	0.18	-0.27	1.39
2021-2022	0.73	0.96	0.36	0.15	0.83	0.56	-0.26	0.45	0.14	1.29
2022-2023	0.91	1.07	0.53	0.20	0.94	0.68	-0.21	0.70	0.48	1.26
2023-2024	0.58	1.06	0.65	0.33	1.05	0.56	0.17	0.89	0.78	1.32
2024-2025	0.64	0.91	0.69	0.31	0.99	0.84	0.14	0.90	0.30	1.35
2025-2026	0.67	1.05	0.74	0.38	0.91	0.89	0.09	0.97	0.56	1.41
Compound Annual Growth Rates (%)										
2015-2020	-1.05	-0.26	-1.60	0.47	0.94	-0.49	-0.94	-0.43	-2.54	0.16
2015-2026	-0.12	0.39	-0.43	0.35	0.92	0.17	-0.49	0.18	-0.99	0.80
2017-2026	0.56	1.01	0.45	0.27	0.84	0.72	0.01	0.66	0.38	1.21

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9	LRZ10
2015	15,109	9,773	7,274	8,168	7,431	16,768	14,958	6,880	18,698	4,200
2016	13,065	8,372	6,489	7,592	7,164	14,889	13,238	5,807	16,381	3,962
2017	13,027	8,460	6,363	7,562	7,210	14,870	13,104	5,906	16,213	4,000
2018	13,021	8,591	6,339	7,590	7,261	14,946	13,178	5,966	16,384	4,020
2019	13,059	8,684	6,356	7,600	7,300	15,059	13,210	6,000	16,411	4,065
2020	13,137	8,742	6,379	7,623	7,359	15,181	13,168	6,011	16,432	4,115
2021	13,180	8,790	6,389	7,629	7,412	15,302	13,068	6,020	16,384	4,172
2022	13,266	8,869	6,402	7,636	7,472	15,385	13,018	6,045	16,405	4,226
2023	13,377	8,959	6,425	7,647	7,540	15,486	12,976	6,085	16,481	4,279
2024	13,443	9,049	6,457	7,668	7,617	15,570	12,983	6,138	16,608	4,336
2025	13,519	9,126	6,491	7,687	7,690	15,698	12,987	6,192	16,655	4,395
2026	13,598	9,217	6,529	7,712	7,758	15,835	12,983	6,250	16,745	4,456
Annual Growth Rates (%)										
2015-2016	-13.53	-14.34	-10.79	-7.05	-3.60	-11.21	-11.49	-15.59	-12.39	-5.67
2016-2017	-0.29	1.06	-1.94	-0.40	0.64	-0.13	-1.01	1.71	-1.03	0.94
2017-2018	-0.04	1.54	-0.38	0.37	0.71	0.51	0.56	1.02	1.05	0.52
2018-2019	0.29	1.08	0.27	0.13	0.53	0.76	0.25	0.57	0.17	1.12
2019-2020	0.60	0.67	0.36	0.30	0.81	0.80	-0.32	0.18	0.12	1.23
2020-2021	0.33	0.55	0.16	0.08	0.73	0.80	-0.76	0.15	-0.29	1.39
2021-2022	0.65	0.90	0.19	0.09	0.80	0.54	-0.38	0.41	0.13	1.29
2022-2023	0.84	1.02	0.37	0.14	0.91	0.66	-0.33	0.67	0.46	1.26
2023-2024	0.49	1.00	0.49	0.28	1.02	0.54	0.06	0.86	0.77	1.32
2024-2025	0.56	0.85	0.53	0.25	0.96	0.82	0.03	0.88	0.28	1.35
2025-2026	0.59	1.00	0.59	0.32	0.88	0.87	-0.03	0.95	0.54	1.41
Compound Annual Growth Rates (%)										
2015-2020	-2.76	-2.21	-2.59	-1.37	-0.20	-1.97	-2.52	-2.66	-2.55	-0.41
2015-2026	-0.95	-0.53	-0.98	-0.52	0.39	-0.52	-1.28	-0.87	-1.00	0.54
2017-2026	0.48	0.96	0.29	0.22	0.82	0.70	-0.10	0.63	0.36	1.21

HIGH AND LOW FORECASTS

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

Year	MISO Energy without EE/DR/DG Adjustments	MISO Energy with EE/DR/DG Adjustments
2015	667,822	667,822
2016	663,273	662,006
2017	663,711	661,807
2018	669,416	666,853
2019	674,330	671,081
2020	678,974	675,010
2021	682,405	677,694
2022	686,887	681,408
2023	692,407	686,130
2024	698,484	691,380
2025	704,328	696,366
2026	710,692	701,841
Annual Growth Rates（%）		
2015-2016	-0.68	-0.87
2016-2017	0.07	-0.03
2017-2018	0.86	0.76
2018-2019	0.73	0.63
2019-2020	0.69	0.59
2020-2021	0.51	0.40
2021-2022	0.66	0.55
2022-2023	0.80	0.69
2023-2024	0.88	0.77
2024-2025	0.84	0.72
2025-2026	0.90	0.79
Compound Annual Growth Rates (%)		
2015-2020	0.33	0.21
2015-2026	0.57	0.45
2017-2026	0.76	0.65

HIGH AND LOW FORECASTS

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

Year	MISO Summer CP without EE/DR/DG Adjustments	MISO Summer CP with EE/DR/DG Adjustments	MISO Winter CP without EE/DR/DG Adjustments	MISO Winter CP with EE/DR/DG Adjustments
2015	119,609	119,609	106,100	106,100
2016	119,200	113,278	99,290	93,368
2017	119,290	113,043	99,375	93,128
2018	120,317	113,765	100,225	93,673
2019	121,202	114,338	100,963	94,100
2020	122,025	114,839	101,668	94,482
2021	122,629	115,104	102,198	94,672
2022	123,426	115,578	102,879	95,031
2023	124,404	116,227	103,715	95,538
2024	125,489	116,978	104,632	96,120
2025	126,536	117,683	105,517	96,664
2026	127,671	118,468	106,479	97,277
Annual Growth Rates (%)				
2015-2016	-0.34	-5.29	-6.42	-12.00
2016-2017	0.08	-0.21	0.09	-0.26
2017-2018	0.86	0.64	0.86	0.59
2018-2019	0.74	0.50	0.74	0.46
2019-2020	0.68	0.44	0.70	0.41
2020-2021	0.50	0.23	0.52	0.20
2021-2022	0.65	0.41	0.67	0.38
2022-2023	0.79	0.56	0.81	0.53
2023-2024	0.87	0.65	0.88	0.61
2024-2025	0.83	0.60	0.85	0.57
2025-2026	0.90	0.67	0.91	0.63
Compound Annual Growth Rates (%)				
2015-2020	0.40	-0.81	-0.85	-2.29
2015-2026	0.59	-0.09	0.03	-0.79
2017-2026	0.76	0.52	0.77	0.49