MISO Independent Load Forecast

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EXECUTIVE SUMMARY

Executive Summary

The State Utility Forecasting Group (SUFG) has been retained by MISO to perform a series of three independent MISO regional 10-year load forecasts. These forecasts will project annual MISO regional energy demand for the nine MISO local resource zones (LRZs), regional winter and summer seasonal peak loads and MISO system-wide annual energy and peak demands. The report is the first 10-year load forecast for years 2015 to 2024. 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 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 with the MISO system peak. MISO system level projections were developed from the LRZ forecasts. For the seasonal MISO peak demands, coincidence factors were used. Energy efficiency (EE) adjustments were made based on existing state standards. Results with and without the energy efficiency adjustments are provided.

The state econometric drivers were developed using publicly available information for electricity sales, prices for electricity and natural gas, personal income, population, employment, gross state product, and cooling and heating degree days. Economic, price, and population projections acquired from IHS Global Insight 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 on a gross (prior to the energy efficiency adjustment) and net basis (after the energy efficiency adjustment). There are no adjustments made in states without energy efficiency standards.

Table ES-1. State Retail Sales Growth Rates (2015-2024)

State	Gross CAGR (without EE adjustment)	Net CAGR (with EE adjustment)
Arkansas	1.70	1.23
Illinois	0.82	-0.25
Indiana	1.64	1.67
Iowa	1.66	0.86
Kentucky	0.75	0.75
Louisiana	0.47	0.47
Michigan	1.62	0.77
Minnesota	1.83	0.52
Mississippi	1.97	1.97
Missouri	0.96	0.20
Montana	2.09	2.09
North Dakota	0.75	0.75
South Dakota	2.06	2.06
Texas	2.47	2.09
Wisconsin	2.04	1.51

LRZ level energy forecasts were developed by allocating the state energy forecasts to the individual LRZs on a proportional basis. Additionally, losses associated with the distribution system were added to produce a

forecast at the metered load level. Table ES-2 provides the compound average growth rates for the LRZ energy forecasts on a gross and net basis.

Table ES-2. LRZ Metered Load Growth Rates (2015-2024)

LRZ	Gross CAGR (without EE adjustment)	Net CAGR (with EE adjustment)
1	1.81	0.79
2	2.00	1.46
3	1.63	0.81
4	0.66	-0.41
5	0.75	0.00
6	1.25	1.26
7	1.62	0.77
8	1.69	1.23
9	1.11	1.04

LRZ summer and winter non-coincident peak demand projections were developed using conversion factors that are based on normal weather conditions 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. Since these conversion factors are held constant for the forecast period, the LRZ peak demand projections have the same growth rates as the energy projections in Table ES-2.[1]

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. Separate 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-3 provides the compound average growth rates for the MISO energy and peak demand forecasts on a gross and net basis.[2]

Table ES-3. MISO Energy and Seasonal Peak Demand Growth Rates (2015-2024)

MISO-System	Gross CAGR (without EE adjustment)	Net CAGR (with EE adjustment)
Energy	1.42	0.87
Summer Peak Demand	1.42	0.86
Winter Peak Demand	1.41	0.86

[1] 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.

[2] Due to the variations in the coincidence factors, MISO system energy and seasonal peak demand projections may have slightly different growth rates.

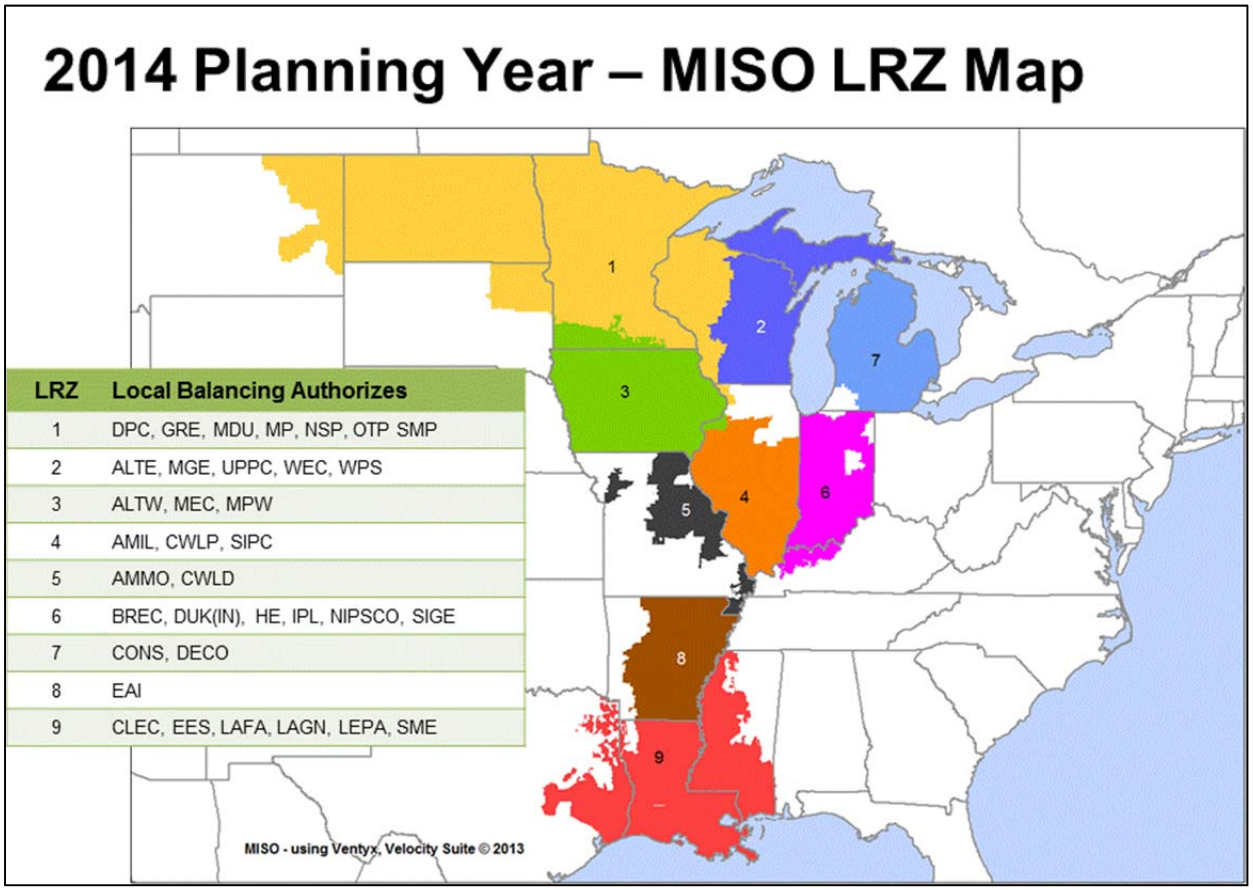
1 Introduction

The State Utility Forecasting Group (SUFG) has been retained by MISO to perform a series of three independent MISO regional 10-year load forecasts. These forecasts will provide annual MISO regional energy demand for the 9 MISO local resource zones (LRZs), regional winter and summer seasonal peak loads and MISO system-wide annual energy and peak demands. The report is the first 10-year load forecast for years 2015 to 2024. 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

MISO's market footprint consists of a number of individual Local Balancing Authorities (LBAs) within MISO. MISO's market footprint covers all or parts of 15 states and is divided into 9 LRZs. Figure 1 displays MISO's market footprint at the LRZ level.

Figure 1: MISO LRZ Map



Source: MISO, 2014

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 conversion factors, which translate annual energy into peak demand based on historical observations and assuming normal weather conditions. The LRZ peak demand forecasts are on a non-coincident basis with the MISO system peak. MISO system level projections were developed from the LRZ forecasts. For the seasonal MISO peak demands, coincidence factors were used. Energy efficiency (EE) adjustments were made based on existing state standards. Results with and without the energy efficiency adjustments are provided.

1.2 REPORT STRUCTURE

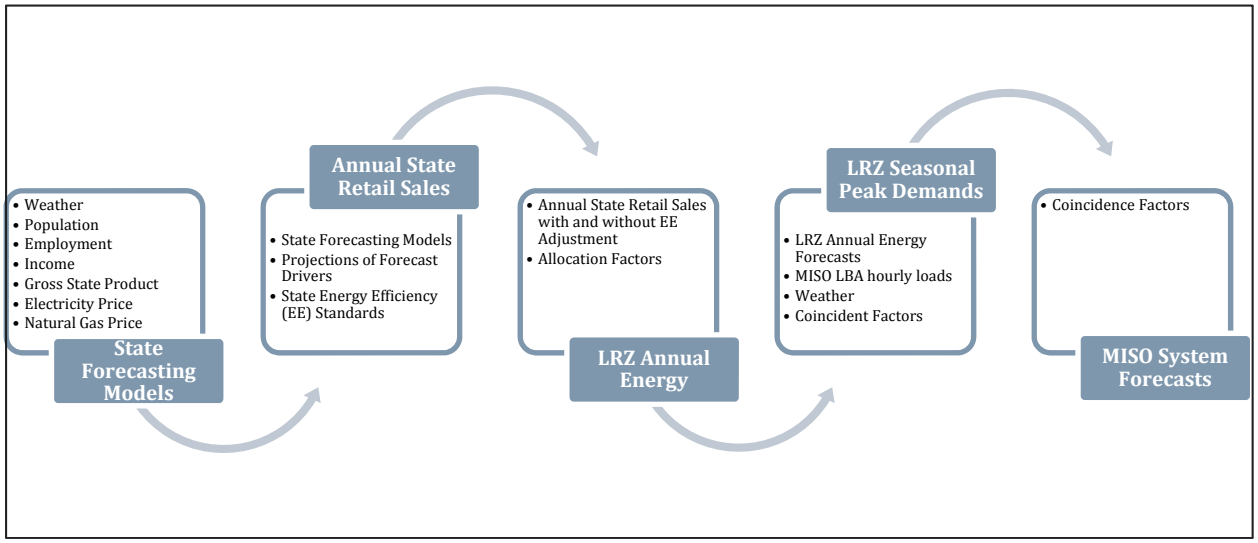
In this report, Chapter 2 explains the forecasting methodology at a high level and provides the data sources. Chapter 3 covers the econometric forecasting models developed for each state, the resulting forecasts of annual statewide retail sales, and the energy efficiency adjustments. Chapter 4 explains the process for allocating the state energy forecasts to LRZ-level forecasts and provides those forecasts. 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 and alternate higher and lower projections.

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. 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 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: 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 overall growth in the state (such as population, employment, or GSP). The model formulations for each state are provided in APPENDIX A.

In addition, adjustments to the state energy forecasts are provided based on each state's energy efficiency (EE) requirements, if any. Both adjusted and non-adjusted projections are provided at all levels of the forecast.

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 EIA. The LRZ-level forecasts are at the metered level (in essence, loads at the substations where the transmission network

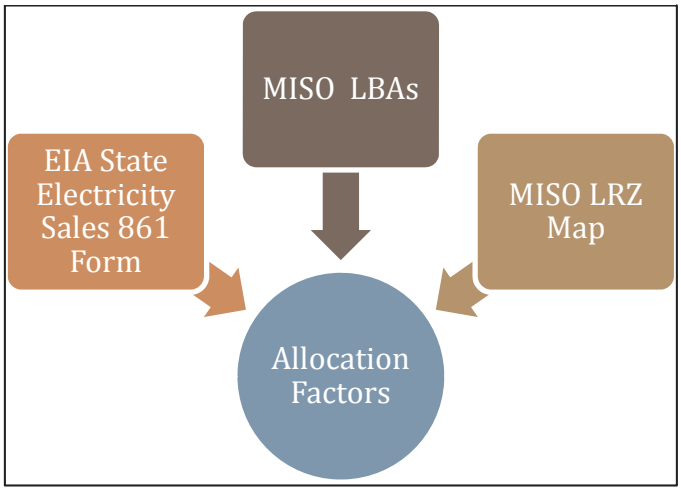
operated by MISO connects to the local distribution systems). The difference between the two is caused by losses between the substations and customers.[3] Thus, an adjustment was made to convert retail sales forecasts to metered loads. This was accomplished by comparing historical EIA sales data for the utilities in an LRZ to historical metered data at the LBA level provided by MISO. For LRZs 8 and 9, LBA data was not available for an entire year, so Federal Energy Regulatory Commission (FERC) Form 714 data was used instead. Since not all utilities file with FERC (many not-for-profits do not), the data used did not represent the entirety of those LRZs but is believed to be fairly representative.

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,[4] 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 because SUFG has not acquired access to the necessary data for LRZs 8 and 9. Thus, the MISO system-wide projections are at the metered load 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 local BAs within each LRZ (Figure 4). 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 meter-level load and retail sales was made to estimate the distribution losses. The MISO system-wide energy forecast was obtained by summing the LRZ annual energy forecasts.

Figure 3: Structure and Logic Diagram for Allocation Factors

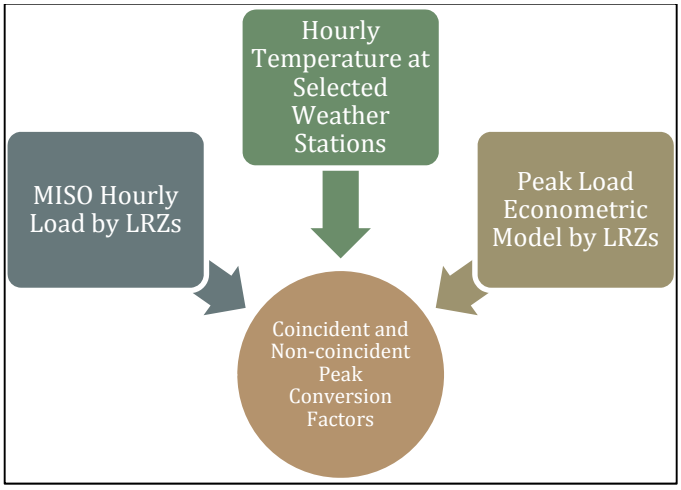


[3] These losses occur mainly in the distribution system of the load serving entities and may include some low voltage transmission lines that are not under MISO operation. They are referred to as distribution losses herein.

[4] 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 the historical 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 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 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 adjusted 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 the U.S. Department of Energy's Energy Information Administration (EIA). Historical population data for each state were obtained from IHS Global Insight. Historical macroeconomic data such as personal income and gross domestic product) are available on a state-by-state basis from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). The state-level historical employment data were obtained from U.S. Bureau of Labor Statistics (BLS). Actual heating and cooling degree days on a 65 degree Fahrenheit basis for all 15 states were acquired monthly and annually from the National Oceanic and Atmospheric Administration's (NOAA) National Climate Data Center (NCDC). Table 1 summarizes the sources of data used in this study. Annual weather data for cooling and heating purposes was used based on weather stations that were near the population center of each state. Table 2 lists the weather station used for each state.

FORECASTING METHODOLOGY

Table 1: Data sources

Data	Content	Source for historical data	Data used in projection
Electricity sales	GWh, annual retail electricity sales by state, 1990-2012	EIA	N/A
Electricity prices	Cents/KWh in 2005 dollars	EIA*	IHS Global Insight/EIA Annual Energy Outlook
Natural gas prices	Dollars/Mcf in 2005 dollars	EIA*	IHS Global Insight/EIA Annual Energy Outlook
Real personal income	Thousands of 2005 dollars, 1970-2013	BEA*	IHS Global Insight
Population	Number of people, population by state, 1990-2013	IHS	IHS Global Insight
Manufacturing employment	Number of jobs, 1990-2013	BLS	IHS Global Insight
Non-manufacturing employment	Number of jobs, 1990-2013	BLS	IHS Global Insight
Non-farm employment	Number of jobs, 1990-2013	BLS	IHS Global Insight
Gross state product	Millions of chained 2005 dollars, 1990-2013	BEA	IHS Global Insight
Cooling degree days	Summations of monthly cooling degree days base 65°F, 1970-2013	NOAA	NOAA 30-year normal
Heating degree days	Summations of monthly heating degree days base 65°F, 1970-2013	NOAA	NOAA 30-year normal

** Original data was in nominal dollars. SUFG converted it to real 2005 dollars using state level CPI from IHS Global Insight.*

Table 2: Weather Stations for State Econometric Models

State	City	Station Code	Airport
AR	Little Rock	LIT	Little Rock Airport Adams Field
IA	Des Moines	DSM	Des Moines International Airport
IL	Springfield	SPI	Springfield Abraham Lincoln Capital Airport
IN	Indianapolis	IND	Indianapolis International Airport
KY	Lexington	LEX	Lexington Bluegrass Airport
LA	Baton Rouge	BTR	Baton Rouge Ryan Airport
MI	Lansing	LAN	Lansing Capital City Airport
MN	Minneapolis-St. Paul	MSP	Minneapolis-St. Paul Airport
MO	Columbia	COU	Columbia Regional Airport
MS	Jackson	JAN	Jackson International Airport
MT	Helena	HLN	Helena Regional Airport
ND	Bismarck	BIS	Bismarck Municipal Airport
SD	Sioux Falls	FSD	Sioux Falls Foss Field
TX	San Antonio	SAT	San Antonio International Airport
WI	Madison	MSN	Madison Dane Co. Regional Airport

2.8 FORECAST BANDS

The base forecast of electric energy is generated from the state level econometric models using base forecasts of the numerous economic variables and under the assumption of normal weather. The source of the forecasts of these numerous economic variables is IHS Global Insight. If alternative high and low values for these economic variables were available, they could be run through the econometric models to produce high and low energy forecasts. IHS Global Insight does not, however, have bands around the economic variables available and therefore another method of constructing forecast bands must be used.

SUFG used the standard errors of the regression from the state level econometric models used to produce the base forecast to generate the high and low energy forecasts. The bands are based on a 90% confidence interval which equates to approximately +/-1.64 standard deviations. The 90% level was chosen by MISO and these statistical bands are symmetric by design. These calculations were used to adjust the base forecast up or down thus providing high and low bands around the base forecast.

It should be noted that the energy bands were calculated before the energy efficiency (EE) adjustments were applied. This is because in many states the EE adjustment is based on a percentage of sales. The same method for determining EE adjustments that were applied to the base forecasts were applied to the high and low forecasts. The high and low energy forecasts, adjusted for EE, were then run through the same process as the base forecast to allocate them to the LRZ level, adjust to metered level, and finally converted to peaks.

It should also be noted that since these bands do not take into account the uncertainty around the projections for the economic drivers themselves, they may understate the uncertainty in the forecast. Furthermore, the potential for correlation among state forecasts is not captured, which could cause the uncertainty to be either overstated or understated, depending on the correlation. SUFG intends to explore advanced regression techniques in Year 2 to try to identify the correlation in uncertainty among the state models.

See APPENDIX B for the high and low forecast band results.

3 Statewide Annual Energy Forecasts

3.1 STATE-LEVEL ENERGY FORECASTS

SUFG developed 15 econometric models of annual retail electricity sales for each of the MISO states. 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 3.

Table 3: Dependent and Explanatory Variables

Variables	Eviews Name	Data Source
Dependent variable:		
Electricity sales	ELECTRICITY_SALES	EIA
Explanatory variables:		
Electricity prices	REAL_ELECTRICITY_PRICE	EIA*
Natural gas prices	REAL_NATURAL_GAS_PRICE	EIA*
Real personal income	REAL_INCOME	BEA*
Population	POPULATION	IHS Global Insight
Manufacturing employment	MANUFACTURING_EMP	BLS
Non-manufacturing employment	NON_MANUFACTURING_EMP	BLS
Non-farm employment	NON_FARM_EMP	BLS
Gross state product	REAL_GSP	BEA
Cooling degree days	CDD	NOAA
Heating degree days	HDD	NOAA

** Original data was in nominal dollars. SUFG converted it to real 2005 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 average growth rates for the explanatory variables over the forecast period (2015-2024). Cooling degree days and heating degree days are held constant at their 30-year normal values per NOAA. The projections provided in Table 4 are from a macroeconomic forecast by IHS Global Insight.

Table 4: Explanatory Variable Compound Annual Growth Rates for the 2015-2024 Period (%)

Variables	AR	IL	IN	IA	KY	LA	MI	MN	MS	MO	MT	ND	SD	TX	WI
REAL_ELECTRICITY_PRICE	0.75	0.33	0.99	1.09	0.84	0.92	1.05	1.21	0.96	1.20	0.76	1.16	1.25	0.69	0.90
REAL_NATURAL_GAS_PRICE	-0.72		-0.43		-0.03			-0.59			-0.62	-0.40	-0.44		-0.58
REAL_INCOME								2.68							
POPULATION					0.52					0.51			0.84		
REAL_INCOME/ POPULATION		2.11		2.21		2.10	1.93		2.36		2.56			2.18	2.40
REAL_GSP	2.51		2.40	2.58			2.08		2.37					3.61	2.19
NON_MANUFACTURING_EMP		0.70								0.88		0.79			
MANUFACTURING_EMP						-0.10					0.32				

Source: Annual state-level growth rates were calculated by SUFG using IHS Global Insight data.

Table 5 provides the gross state-level forecasts (prior to the EE adjustment). The retail sales for the year 2013 are not actual observed values since EIA has not published those numbers yet. Therefore, the state econometric models were used to "forecast" those values (as well as the 2014 numbers) to provide continuity between the historical data and the forecast period (2015 to 2024). SUFG will incorporate the 2013 actual values in the econometric model formulations for next year's process.

Stakeholder comments have indicated that the projected sales in Louisiana are unusually low in light of recent developments in the state. A number of very large new industrial projects have been announced in the state recently, which would seem to indicate a high level of sales growth as opposed to the low growth of 0.47% resulting from the SUFG modeling.

In investigating this, SUFG discovered that the lower forecast results from the extremely high level of industrial self-generation (over 20% of all electricity used in the state is self-generated by industrial customers). Furthermore, the historical growth in self-generation has vastly exceeded the growth in retail sales, with industrial CHP growing at double the rate of all retail sales and approximately 4 times the rate of retail sales to industrial customers. This creates a disconnect between industrial output and retail sales, which prevented SUFG from developing an econometric model that used an output measure like GSP. All attempts to develop such a model failed. Thus, a formulation based on employment was used, which shows a weaker relationship between industrial output and sales.

This brings up a significant question: is it reasonable to believe that the significant future industrial growth in Louisiana will occur in the form of retail sales, or will the trend of self-generation continue?

SUFG has looked into an alternative model that projects retail sales plus industrial combined heat and power (CHP). In theory, this model could be used to produce a forecast of sales plus CHP, from which expected CHP could be subtracted to produce a sales forecast. Using this formulation, SUFG was able to develop a model that uses GSP as a driver, which is preferable to manufacturing employment. The combined growth rate for sales plus CHP in the model is 1.70%. Since this model has not been vetted through the stakeholder process and since an appropriate projection for the amount of CHP to be used to find the retail sales forecast has not been determined, this formulation has not been used. It does indicate that the question of how much of the new load will be self-generated is one that can have a significant effect on retail sales in the future.

STATEWIDE ANNUAL ENERGY FORECASTS

Table 5: Gross State Energy Forecasts (Annual Retail Sales in GWh)[5]

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	78,722	105,781	68,792
2009	43,173	136,688	99,312	43,641	88,809	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	47,079	144,226	107,729	46,882	89,795	87,173	105,023	70,366
2014	47,756	143,803	107,984	46,245	89,967	87,793	105,737	67,953
2015	48,567	146,518	109,943	47,021	90,870	87,090	107,784	69,277
2016	49,476	149,060	112,188	47,856	91,811	87,712	110,176	71,044
2017	50,480	150,957	114,501	48,791	92,576	88,234	112,255	72,694
2018	51,392	152,220	116,382	49,597	93,250	88,943	113,947	74,111
2019	52,266	153,336	118,175	50,377	93,863	89,860	115,982	75,315
2020	53,064	154,395	119,982	51,129	94,545	90,395	118,033	76,586
2021	53,672	155,045	121,833	51,676	95,274	90,031	119,698	77,747
2022	54,591	155,877	123,587	52,538	95,962	89,876	121,251	78,949
2023	55,526	156,782	125,322	53,488	96,593	90,044	122,535	80,271
2024	56,500	157,669	127,229	54,525	97,210	90,826	124,606	81,588
Compound Annual Growth Rates (%)								
1990-2012	2.48	1.15	1.61	2.02	1.73	1.30	1.10	1.68
2013-2024	1.67	0.81	1.52	1.38	0.72	0.37	1.57	1.35
2015-2024	1.70	0.82	1.64	1.66	0.75	0.47	1.62	1.83

[5] The gross forecast is prior to adjustments for state energy efficiency requirements.

Table 5. 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	74,270	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	347,059	70,122
2009	46,049	79,687	14,326	12,649	11,010	345,296	66,286
2010	49,687	86,085	13,423	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	49,875	84,157	13,705	16,132	12,415	387,714	70,691
2014	49,819	83,842	13,428	16,622	12,652	393,127	70,290
2015	50,750	84,920	13,444	17,135	13,061	404,807	71,748
2016	51,996	86,168	13,741	17,573	13,413	417,968	73,596
2017	53,231	87,288	14,230	17,918	13,737	430,427	75,623
2018	54,335	88,347	14,632	18,228	14,035	440,995	77,378
2019	55,476	89,252	15,032	18,351	14,324	451,739	78,961
2020	56,509	90,170	15,260	18,364	14,618	462,467	80,305
2021	57,322	90,766	15,084	18,268	14,911	472,386	81,341
2022	58,207	91,340	15,406	18,232	15,184	482,438	82,838
2023	59,226	91,943	15,770	18,280	15,439	492,806	84,416
2024	60,477	92,532	16,191	18,325	15,686	503,999	86,022
Compound Annual Growth Rates (%)							
1990-2012	1.88	1.95	0.25	3.43	2.84	1.98	1.54
2013-2024	1.77	0.87	1.53	1.17	2.15	2.41	1.80
2015-2024	1.97	0.96	2.09	0.75	2.06	2.47	2.04

3.2 IMPACT OF ENERGY EFFICIENCY STANDARDS

The gross forecast results do not specifically account for future energy efficiency and demand-side management. While the econometric models will project continued energy efficiency gains at levels that have occurred in the past, they will not account for more aggressive improvements. Since SUFG does not have access to individual LSE Demand-side Management (DSM) plans (and since those plans generally do not go out for the full time period of the forecast), adjustments have been made to reflect individual state energy efficiency requirements. Please refer to Table 6 for the energy efficiency adjustments for states that have requirements. The energy efficiency reductions are per the levels indicated in the Database of State Incentives for Renewables & Efficiency (DSIRE),[6] supplemented with contact at state regulatory commissions where appropriate. For states that have mandates that are yet to be specified for some future year, the most recent required efficiency savings level was assumed.

For some states, the state has established a goal or benchmark for EE rather than a specific requirement. Also, some states' requirements are subject to being cost effective. In response to stakeholder comments, SUFG contacted state officials in those states to determine whether the goals were likely to be met. This process resulted in adjustments to the DSIRE levels. Illinois has an aggressive state goal which reaches 2.0% of annual sales. SUFG adjusted the EE levels based on the levels of actual savings that have been achieved so far under the state goal. Missouri has an aggressive benchmark that reaches 1.9% per year in 2020 and beyond. This benchmark is one of the factors that are used to set an annual goal, which may or may not be met. SUFG utilized the annual potential savings (0.8%) for Missouri that were identified by the American Council for an Energy-Efficient Economy (ACEEE) [7].

The EE adjustments for Minnesota and Texas have also been changed from the draft results presented in the September workshop in response to stakeholder feedback. These changes are due to the earlier version not capturing all utilities that are subject to the state requirements, thus the adjustments used here are larger.

The handling of EE within a long-term forecast can be problematic. An econometric formulation, such as is used here, is based on historical usage, which in turn is affected by energy efficiency gains that have occurred in the past. The projections coming from the econometric model will include similar efficiency gains in the future. This may not be true, especially when specific actions are taken that drive efficiency decisions, such as in utility DSM programs or through government codes and standards. If efficiency is likely to improve at a faster rate in the future, the econometric model will tend to forecast electricity demand too high. Similarly, if efficiency improvements occur at a lower rate in the future, the model will forecast too low. The relatively short time period for EE plans complicates matters, since DSM plans and future codes and standards are usually not known five to ten years into the future. Even if the amount of efficiency savings is known in the future, the amount that is already captured by the econometric model is not known. Thus, it is relatively easy to make an adjustment that is either too large or too small. It should be noted that similar issues can exist with customer-owned generation and with demand response programs.

Since the amount of efficiency that is imbedded in the historical data is unknown, and since the future plans of individual LSEs for DSM programs are unknown, this study includes forecasts under both gross (no EE adjustment) and net (with EE adjustment) bases. SUFG acknowledges that there is considerable uncertainty surrounding the EE adjustment (as there would be with any adjustment that would be made).

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[6] http://www.dsireusa.org/

[7] "Missouri Demand-side Market Potential Report" Missouri Public Service Commission, EW-2015-0078, September 24, 2014.

Table 6: State Energy Efficiency Standard Requirements

State	Applies to:	Savings
Arkansas	Investor-owned utilities	0.75% (2013 and 2014), 0.9% (2015 and beyond) of 2010 demand
Illinois	Investor-owned utilities	0.63% (2013*), 0.88% (2014), 1.13% (2015), 1.26% (2016 and beyond)
Indiana	Investor-owned utilities	0.9% (2013) and 1.1% (2014) of preceding three year average
Iowa	Mid-American Energy and Interstate Power & Light	420 GWh (2014, 2015), 416 GWh (2016), 422 GWh (2017), 427 GWh (2018 and beyond)
Michigan	Investor-owned utilities	1.0% annually
Minnesota	Investor-owned utilities, municipals, and cooperatives	1.5% of three year average annually
Missouri	Utilities	0.5% (2013), 0.7% (2014), 0.8 (2015 and beyond)
Texas	Investor-owned utilities and retail marketers	30% of incremental load growth each year
Wisconsin	Utilities	Savings goal set by PSC on a 4-year basis; most recent averaged 454 GWh/year, which was assumed constant throughout

** The program year for Illinois follows a planning year (June through May) rather than a calendar year.*

Table 7 provides the net (after the EE adjustment) state-level forecasts. The shaded areas represent historical data. Figures 5 to 19 illustrate the projections for each state with and without the EE adjustment.

STATEWIDE ANNUAL ENERGY FORECASTS

Table 7: Net 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	78,722	105,781	68,792
2009	43,173	136,688	99,312	43,641	88,809	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	46,862	143,233	106,778	46,462	89,795	87,173	104,090	69,345
2014	47,322	141,498	105,867	45,405	89,967	87,793	103,870	65,902
2015	47,873	142,693	107,827	45,761	90,870	87,090	104,975	66,210
2016	48,522	143,634	110,071	46,180	91,811	87,712	106,408	66,969
2017	49,266	143,921	112,384	46,693	92,576	88,234	107,507	67,624
2018	49,917	143,570	114,266	47,072	93,250	88,943	108,199	68,038
2019	50,531	143,076	116,059	47,425	93,863	89,860	109,220	68,228
2020	51,069	142,531	117,866	47,750	94,545	90,395	110,240	68,480
2021	51,417	141,582	119,717	47,870	95,274	90,031	110,854	68,617
2022	52,076	140,827	121,471	48,305	95,962	89,876	111,341	68,793
2023	52,750	140,152	123,206	48,828	96,593	90,044	111,546	69,084
2024	53,464	139,468	125,113	49,438	97,210	90,826	112,527	69,369
Compound Annual Growth Rates (%)								
1990-2012	2.48	1.15	1.61	2.02	1.73	1.30	1.10	1.68
2013-2024	1.21	-0.24	1.45	0.57	0.72	0.37	0.71	0.00
2015-2024	1.23	-0.25	1.67	0.86	0.75	0.47	0.77	0.52

[8] The net forecast is after the adjustments for state energy efficiency requirements.

Table 7. Net 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	74,270	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	347,059	70,122
2009	46,049	79,687	14,326	12,649	11,010	345,296	66,286
2010	49,687	86,085	13,423	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	49,875	83,745	13,705	16,132	12,415	382,763	70,237
2014	49,819	82,843	13,428	16,622	12,652	384,309	69,382
2015	50,750	83,259	13,444	17,135	13,061	395,650	70,386
2016	51,996	83,841	13,741	17,573	13,413	406,327	71,780
2017	53,231	84,290	14,230	17,918	13,737	416,447	73,353
2018	54,335	84,675	14,632	18,228	14,035	424,799	74,654
2019	55,476	84,902	15,032	18,351	14,324	433,714	75,783
2020	56,509	85,141	15,260	18,364	14,618	442,490	76,673
2021	57,322	85,056	15,084	18,268	14,911	450,487	77,255
2022	58,207	84,949	15,406	18,232	15,184	458,787	78,298
2023	59,226	84,873	15,770	18,280	15,439	467,337	79,422
2024	60,477	84,783	16,191	18,325	15,686	476,659	80,574
Compound Annual Growth Rates (%)							
1990-2012	1.88	1.95	0.25	3.43	2.84	1.98	1.54
2013-2024	1.77	0.11	1.53	1.17	2.15	2.01	1.26
2015-2024	1.97	0.20	2.09	0.75	2.06	2.09	1.51

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

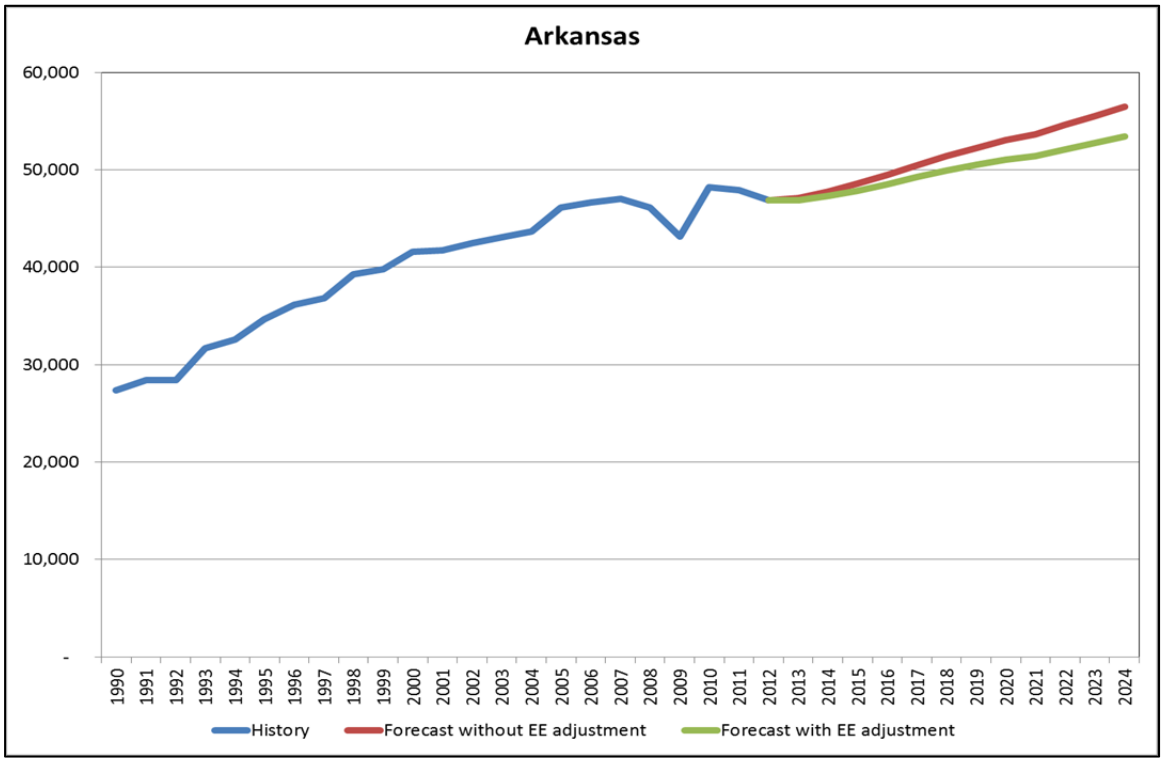


Figure 6: Net and Gross Illinois Energy Forecast (Annual Retail Sales in GWh)

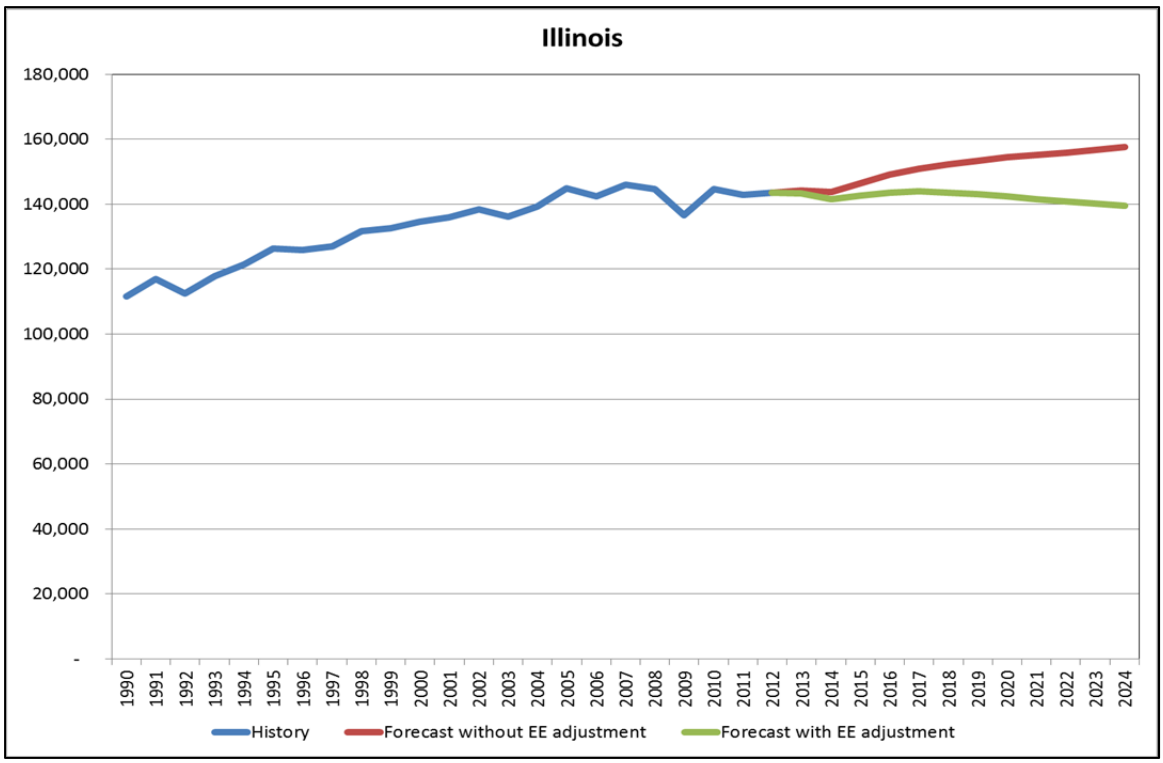


Figure 7: Net and Gross Indiana Energy Forecast (Annual Retail Sales in GWh)

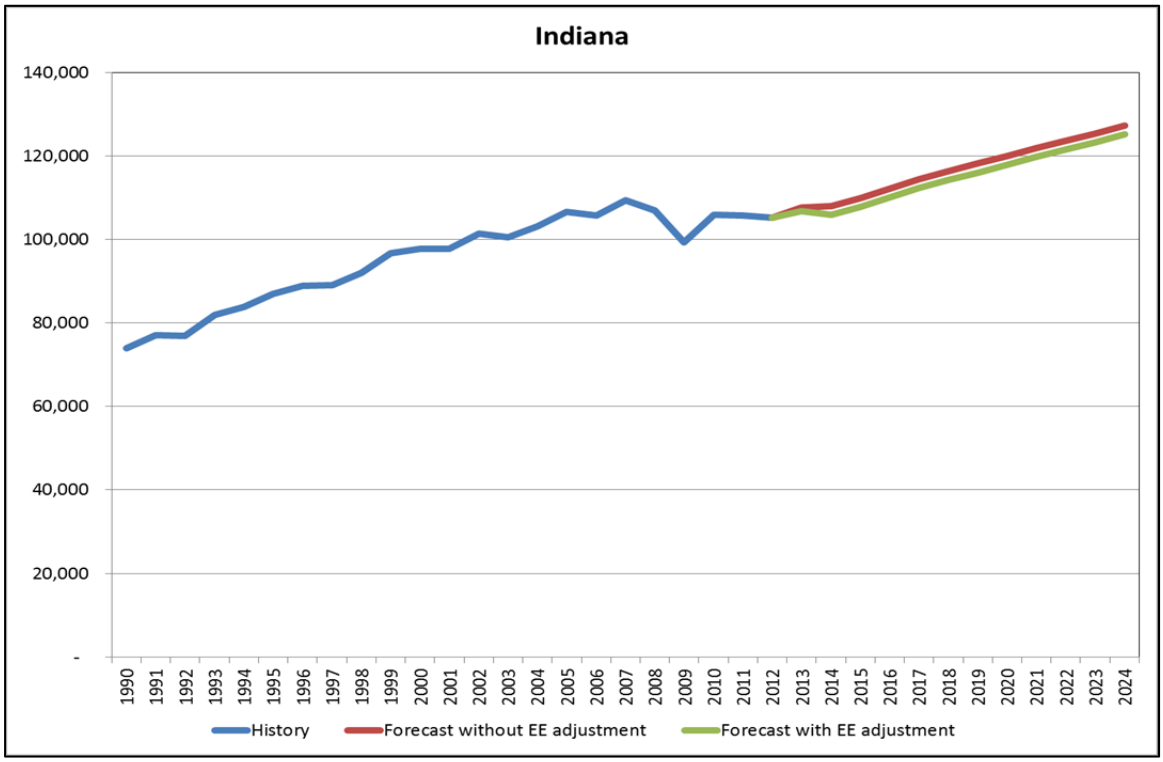


Figure 8: Net and Gross Iowa Energy Forecast (Annual Retail Sales in GWh)

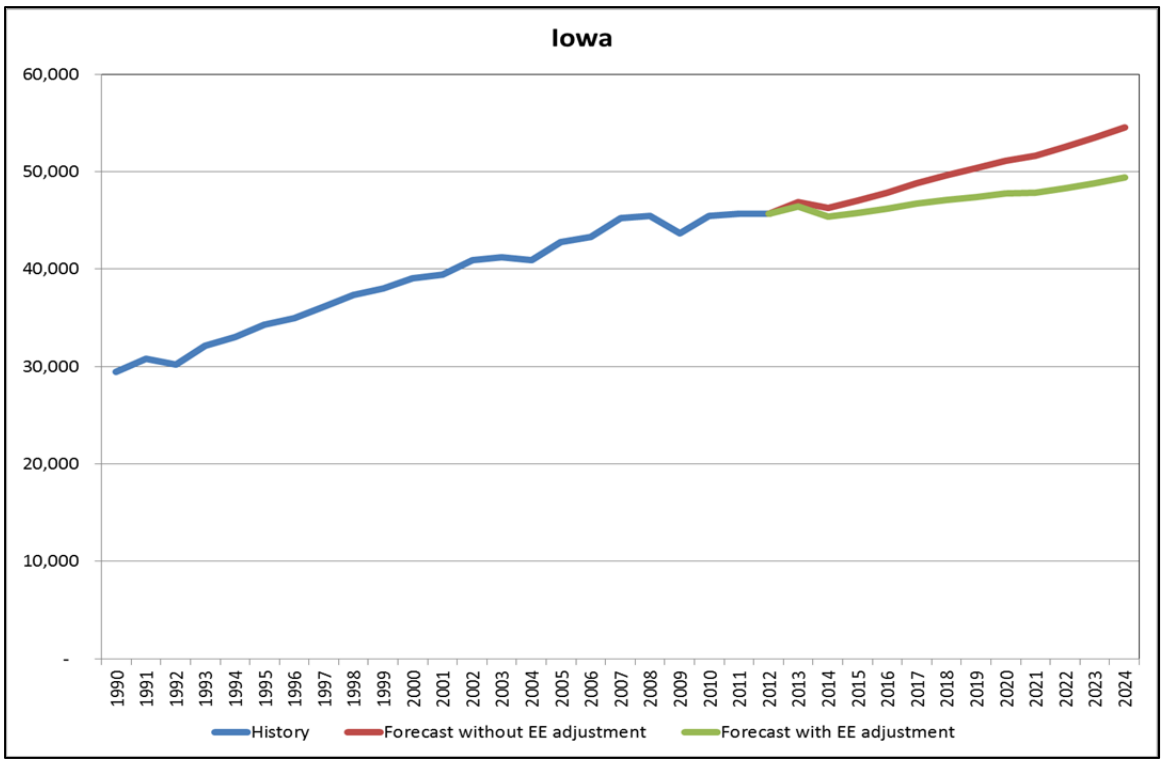


Figure 9: Net and Gross Kentucky Energy Forecast (Annual Retail Sales in GWh)

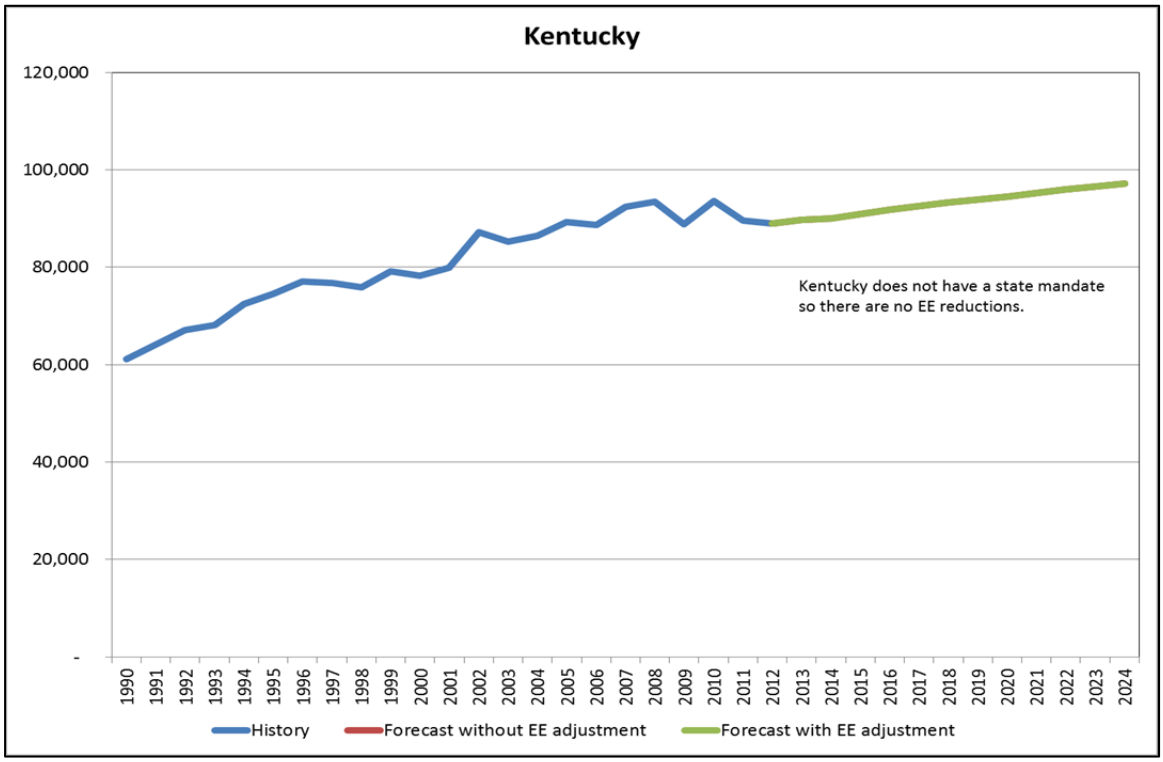


Figure 10: Net and Gross Louisiana Energy Forecast (Annual Retail Sales in GWh)

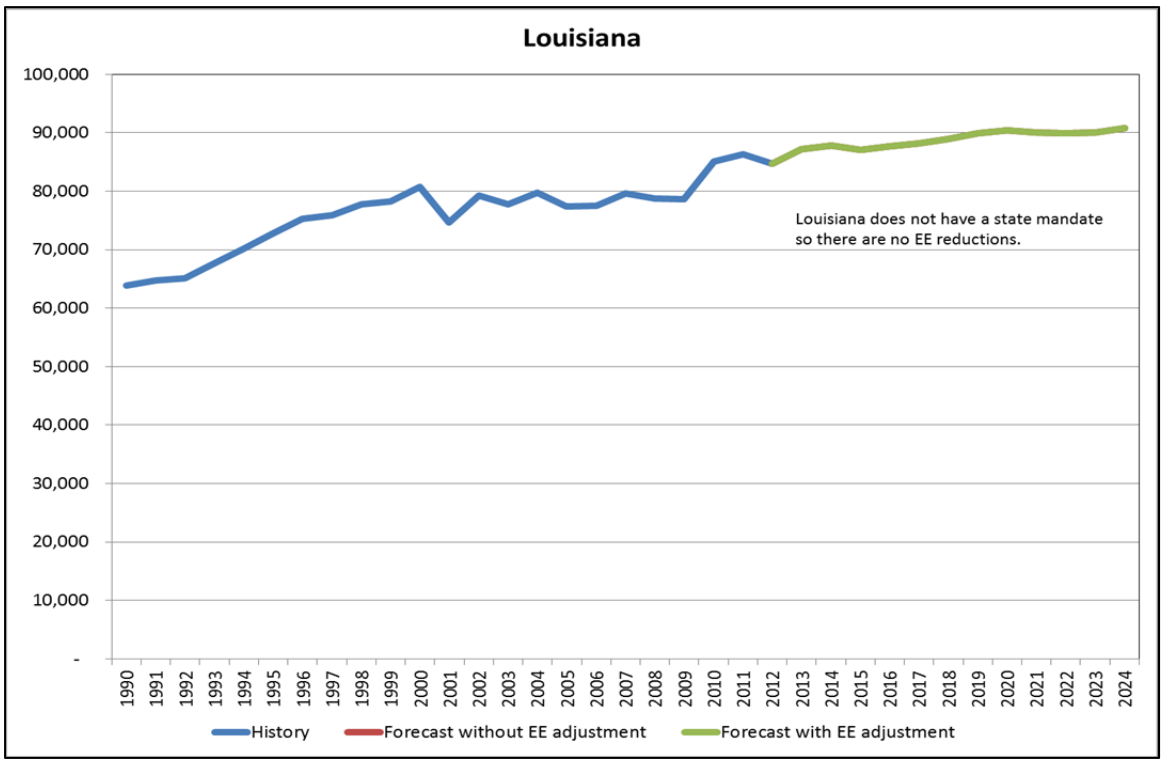


Figure 11: Net and Gross Michigan Energy Forecast (Annual Retail Sales in GWh)

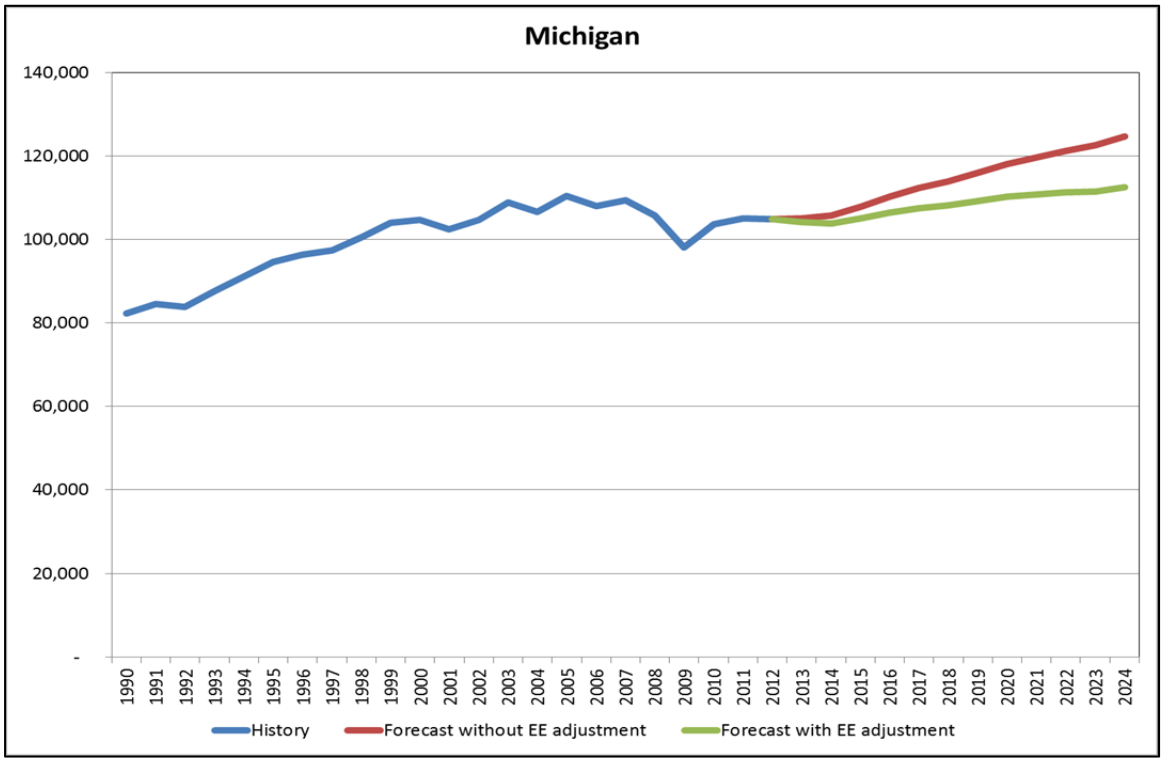


Figure 12: Net and Gross Minnesota Energy Forecast (Annual Retail Sales in GWh)

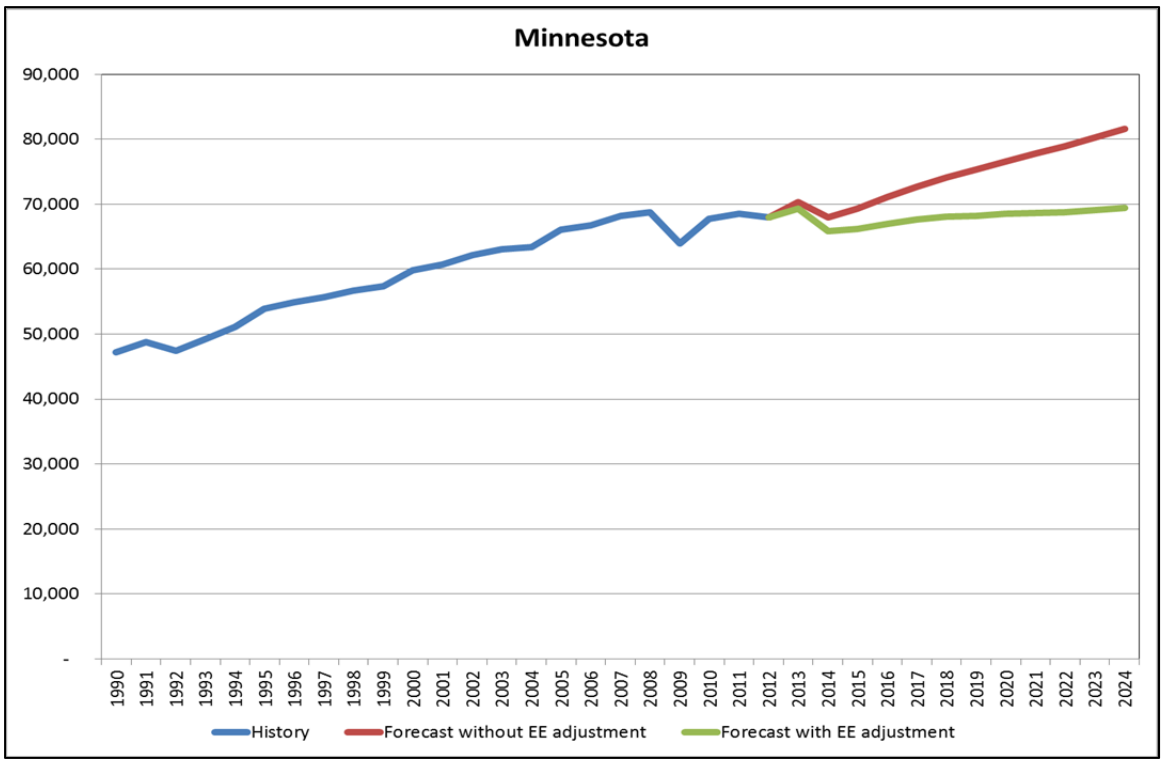


Figure 13: Net and Gross Mississippi Energy Forecast (Annual Retail Sales in GWh)

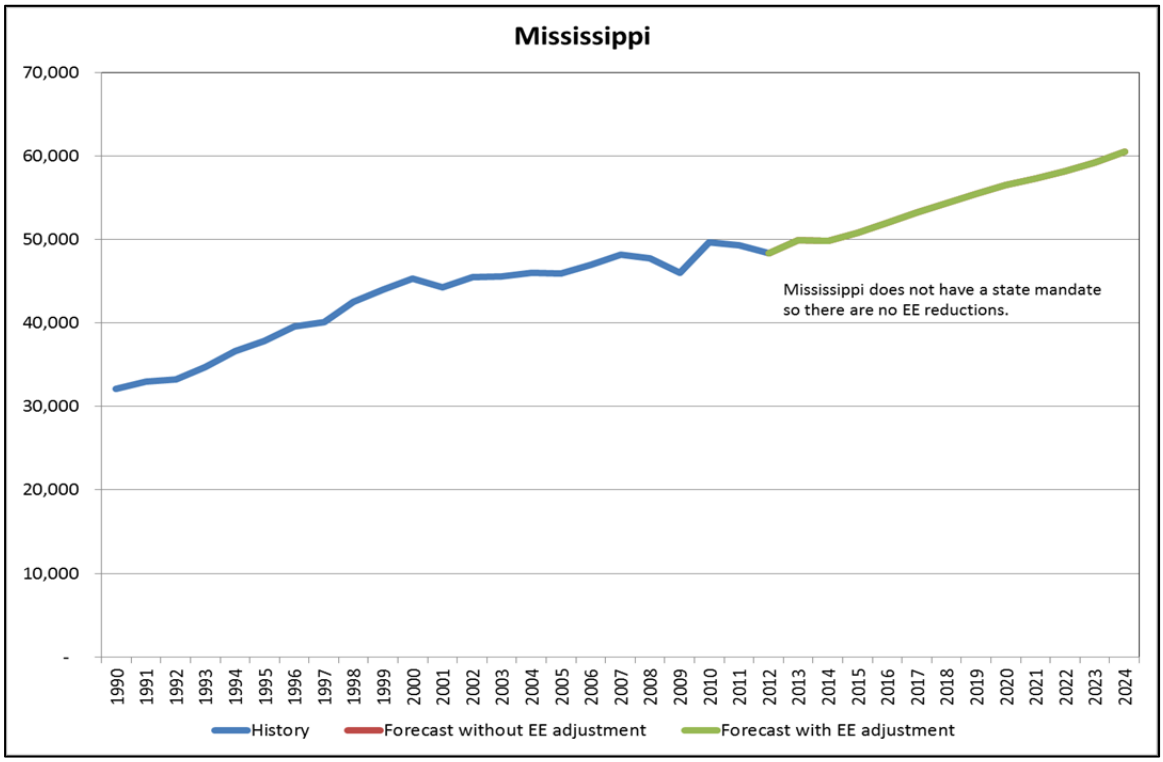


Figure 14: Net and Gross Missouri Energy Forecast (Annual Retail Sales in GWh)

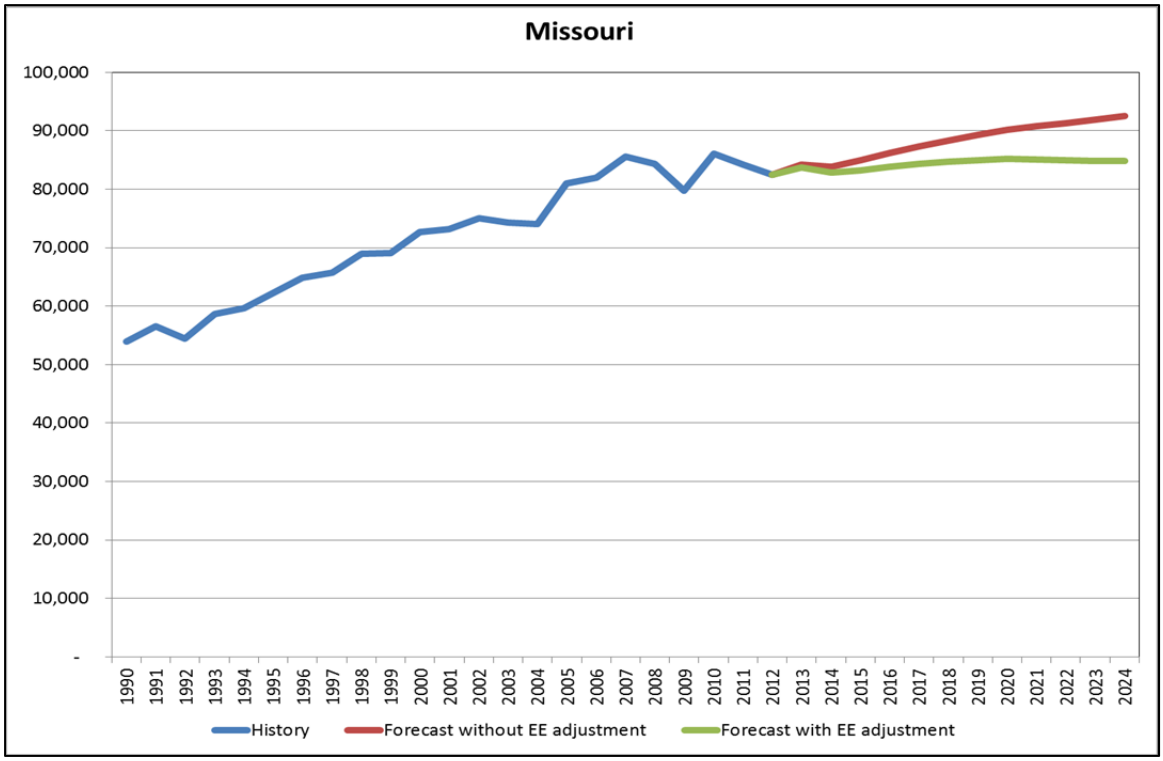


Figure 15: Net and Gross Montana Energy Forecast (Annual Retail Sales in GWh)

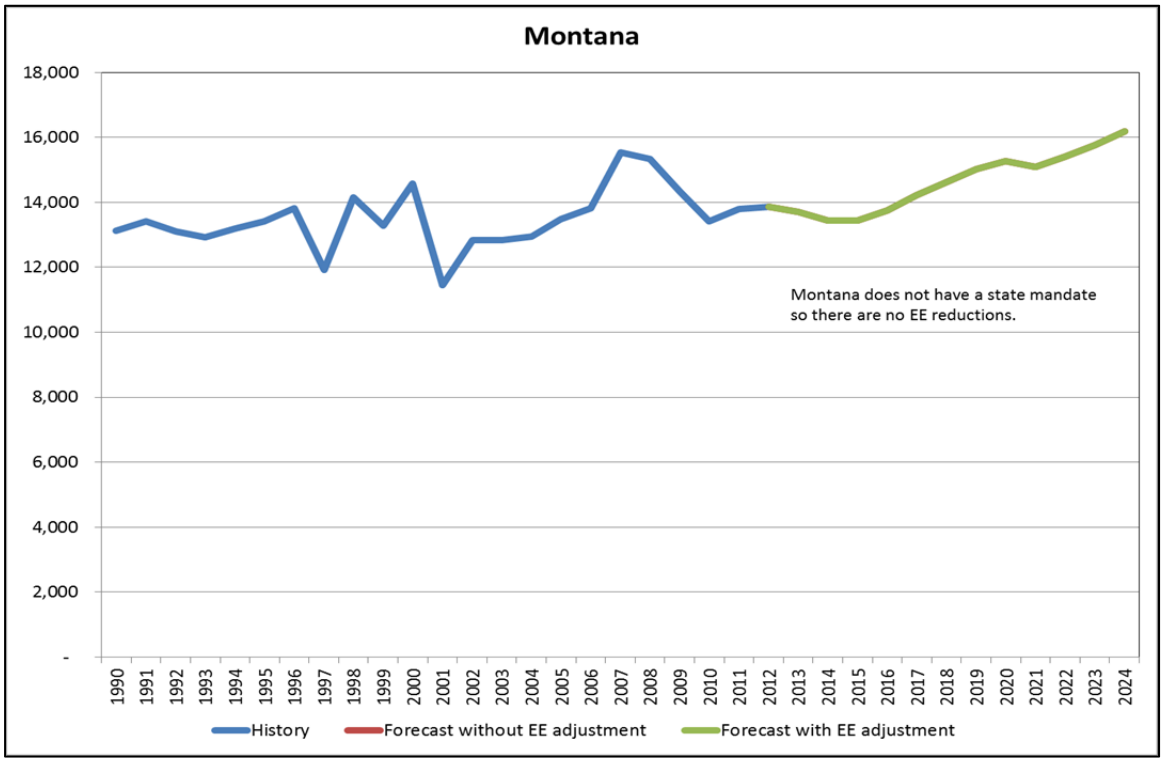


Figure 16: Net and Gross North Dakota Energy Forecast (Annual Retail Sales in GWh)

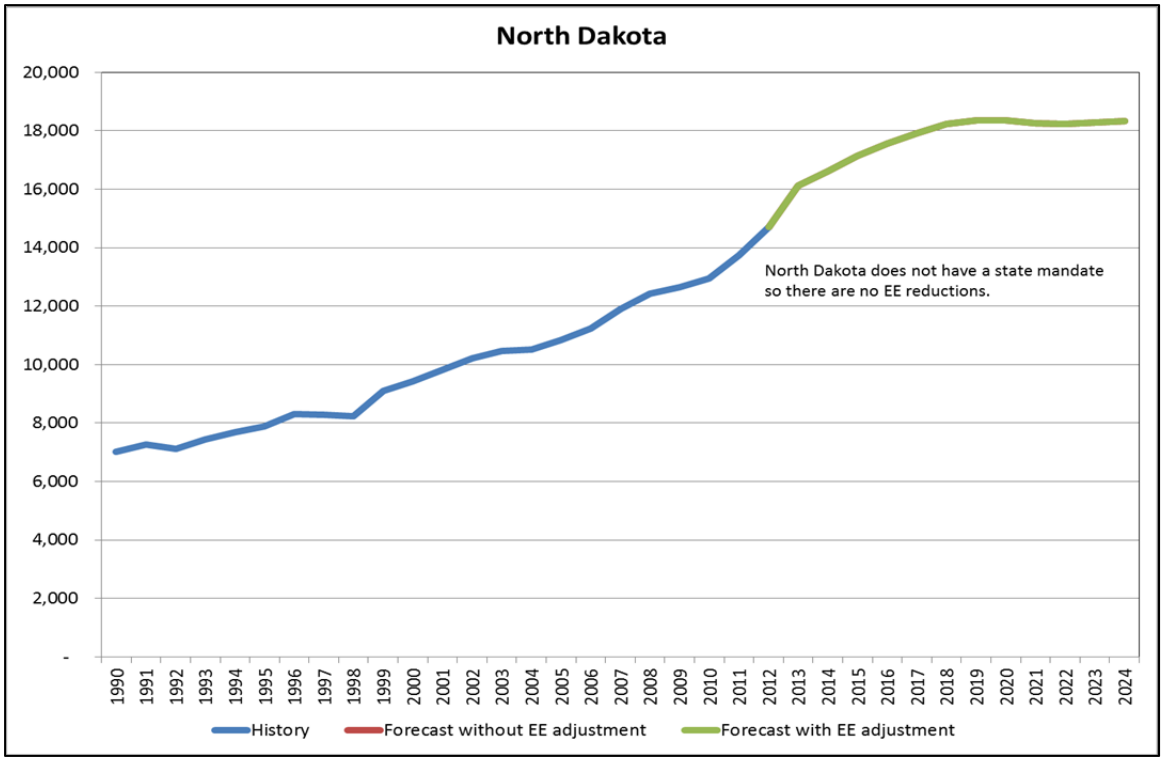


Figure 17: Net and Gross South Dakota Energy Forecast (Annual Retail Sales in GWh)

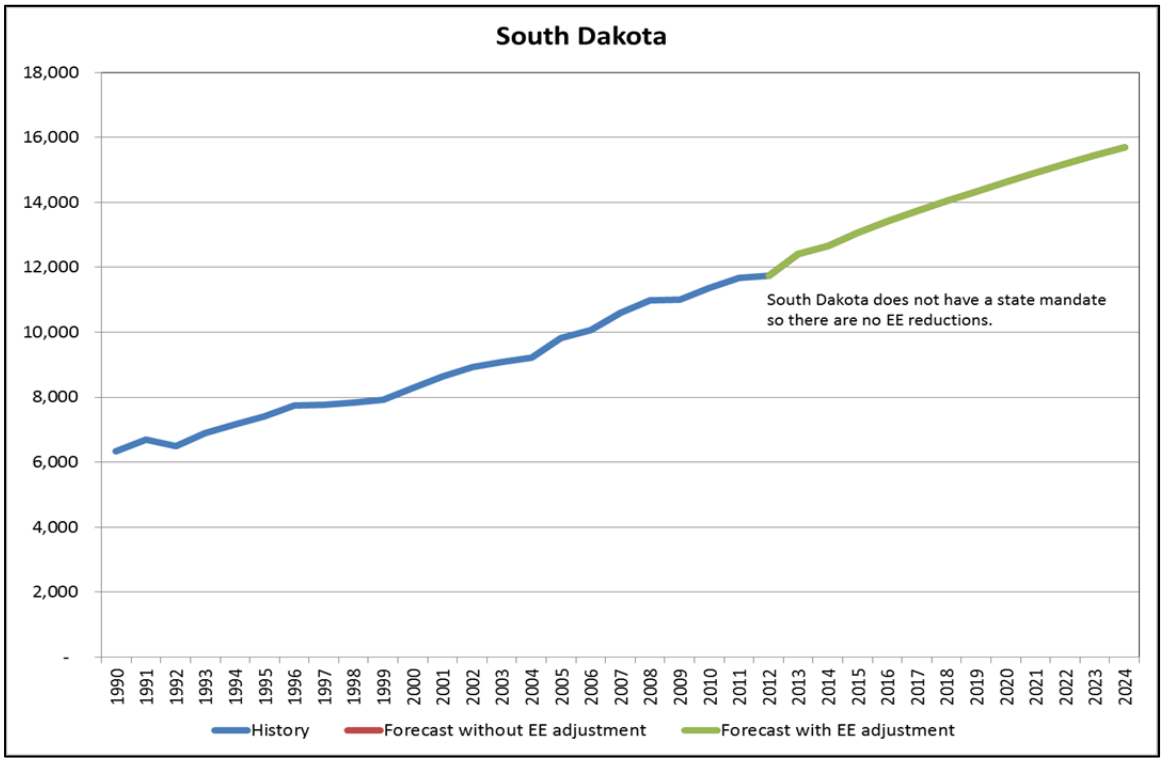


Figure 18: Net and Gross Texas Energy Forecast (Annual Retail Sales in GWh)

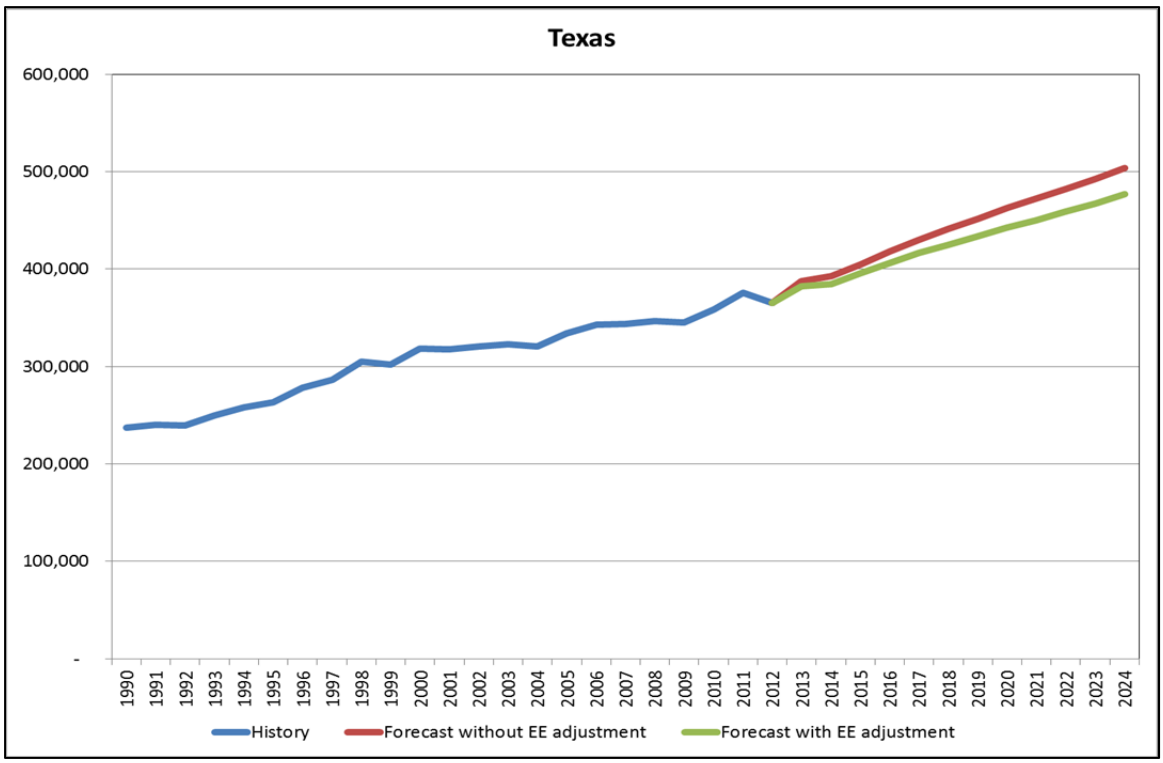
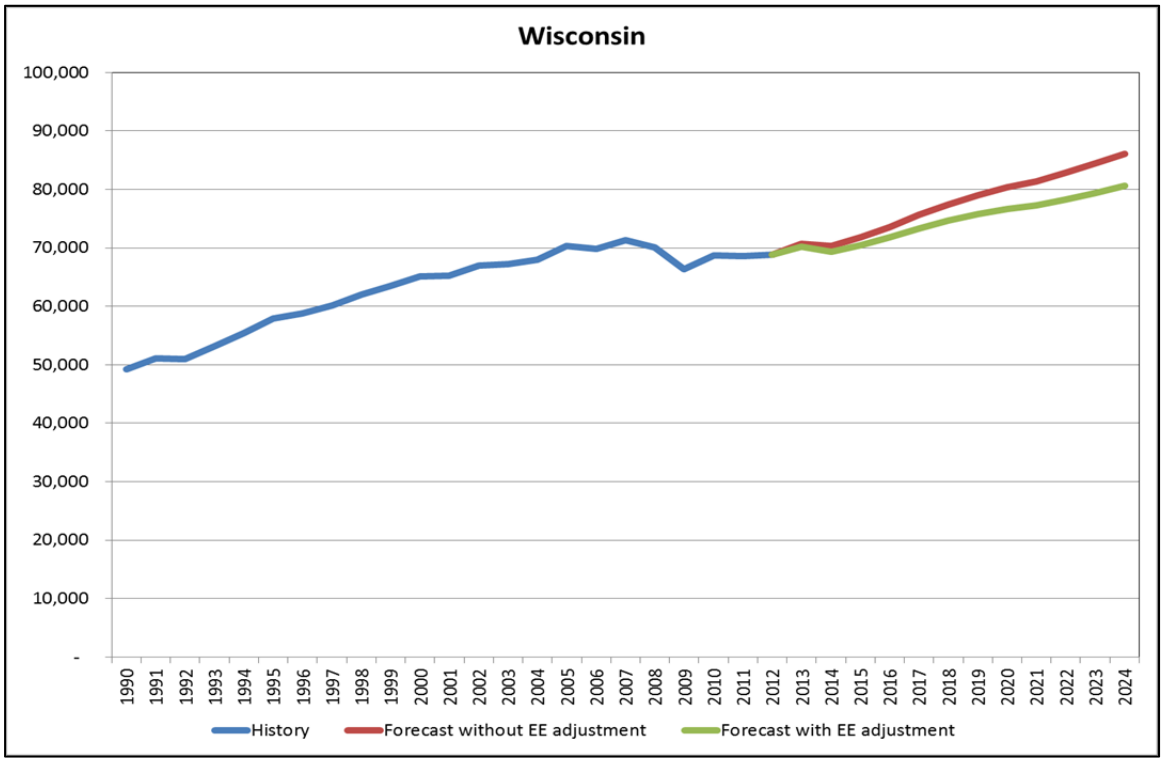


Figure 19: Net and Gross Wisconsin Energy Forecast (Annual Retail Sales in GWh)



4 MISO Regional Energy Forecasts

4.1 ALLOCATION FACTORS

Allocation factors were used to develop annual electricity sales forecasts at the MISO LRZ level from the state level econometric forecasts. The shares of electricity sales within the MISO market footprint were calculated from sales of the LBAs. Historical annual electricity sales data for 2009 to 2012 from EIA form 861 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

MISO's market footprint covers all or parts of 15 states and is divided into 9 LRZs. Figure 1 in Chapter 1 displays MISO's market footprint at the LRZ level and lists the local BAs for each LRZ in abbreviations.

For some LBAs, the name recorded in EIA's 861 database is somewhat different from the name listed in MISO's market footprint. Therefore, the utility name mapping in Table 8 was developed in order to capture all MISO sales from EIA's 861 database. This table was used to extract MISO electricity sales from EIA's 861 database and calculate allocation factors for each MISO LRZ. Sales from those utilities listed in Table 7 were considered MISO sales. For utilities that are not listed in this table but use MISO LBAs as their local balancing authority, their sales were included.

The balancing authority listing in EIA-861 for a small number of utilities is either specified as "Other" or not provided. In these cases, the utility loads were excluded unless information was obtained that indicated that they should be included.

Table 9 summarizes the historical MISO load fractions at the state level for 2009 to 2012. The category "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 states of Indiana and Kentucky are combined (IN+KY). Similarly, North Dakota and Montana have been combined (ND+MT).

Table 8: MISO Local Balancing Authorities, 2014

BA Acronym	Local Balancing Authority (MISO)	Local Utility /Balancing Authority (EIA)	LRZ
DPC	Dairy Land Power Cooperative	Dairyland Power Cooperative	1
GRE	Great River Energy	Great River Energy	1
MDU	Montana-Dakota Utilities	Montana-Dakota Utilities Co	1
MP	Minnesota Power	Minnesota Power Inc	1
NSP	Northern States Power (Xcel Energy)	Northern States Power Co	1
OTP	Otter Tail Power	Otter Tail Power Co	1
SMP	Southern Minnesota Municipal Association	Southern Minnesota Mun P Agny	1
ALTE	Alliant Energy – East[9]	Wisconsin Power & Light Co	2
MGE	Madison Gas & Electric	Madison Gas & Electric Co	2
UPPC	Upper Peninsula Power Company	Upper Peninsula Power Co	2
WEC	Wisconsin Electric Power Company	Wisconsin Electric Power Co	2
WPS	Wisconsin Public Service	Wisconsin Public Service Corp	2
ALTW	Alliant Energy - West[10]	Interstate Power and Light Co	3
MEC	MidAmerican Electric Company	MidAmerican Energy Co	3
MPW	Muscatine Power & Water	Board of Water Electric & Communications	3
AMIL	Ameren - Illinois	Ameren Illinois Company	4
CWLP	City Water Light & Power	City of Springfield - (IL)	4
SIPC	Southern Illinois Power Cooperative	Southern Illinois Power Coop	4
AMMO	Ameren - Missouri[11]	Union Electric Co - (MO)	5
CWLD	Columbia Water & Light District	City of Columbia - (MO)	5
BREC	Big Rivers Electric Cooperative	Big Rivers Electric Corp	6
DUK(IN)	Duke Energy - Indiana	Duke Energy Indiana Inc.	6
HE	Hoosier Energy	Hoosier Energy R E C, Inc.	6
IPL	Indianapolis Power & Light	Indianapolis Power & Light Co	6
NIPSCO	Northern Indiana Public Service Company	Northern Indiana Pub Serv Co	6
SIGE	Southern Indian Gas & Electric	Southern Indiana Gas & Elec Co	6
CONS	Consumers Energy	Consumers Energy	7
DECO	Detroit Edison (DTE Energy)	Detroit Edison (DTE Energy)	7
EAI	Entergy – Arkansas	Entergy Arkansas Inc.	8
CLEC	Cleco	Cleco Power LLC	9
EES	Entergy - MS, LA, TX	Entergy Mississippi Inc.	9
EES	Entergy - MS, LA, TX	Entergy Louisiana Inc.	9
EES	Entergy - MS, LA, TX	Entergy Texas Inc.	9
LAFA	Lafayette Utilities	City of Lafayette	9
LAGN	Louisiana Generation (NRG)	Louisiana Generating, LLC	9
LEPA	Louisiana Energy & Power Authority	Louisiana Energy & Power Authority	9
SME	South Mississippi Electric Power Association	South Mississippi Electric Power Association	9

Source: MISO, 2014; Electric power sales, revenue, and energy efficiency 861 detailed data files, U.S. Energy Information Administration, summarized by SUFG

[9] It is listed as Wisconsin Power & Light Co in EIA 861 database. It is an Alliant Energy's subsidiary that provides services in southern and central Wisconsin.

[10] It is listed as Interstate Power and Light Co in EIA 861 database. It is an Alliant Energy's subsidiary and provides services in Iowa and southern Minnesota.

[11] Union Electric and CIPSCO, Inc merged to create Ameren Corporation in 1997. Source: www.ameren.com

Table 9: MISO Load Fraction at State Level, 2012 (MWh)

State	MISO Sales	Non-MISO Sales	Total Sales	MISO State Level Load Fraction				
				2009	2010	2011	2012	Average
AR	32,728,449	14,131,118	46,859,567	69.4%	70.0%	69.7%	69.8%	69.7%
IA	42,599,044	3,110,056	45,709,100	92.0%	92.9%	93.0%	93.2%	92.8%
IL	48,655,718	94,884,286	143,540,004	33.9%	34.5%	34.8%	33.9%	34.3%
IN+KY	94,756,837	99,465,078	194,221,915	47.5%	47.5%	48.7%	49.0%	48.2%
LA	77,955,289	6,775,454	84,730,743	91.8%	91.8%	91.7%	92.0%	91.8%
MI	100,059,073	4,759,118	104,818,191	94.5%	95.7%	95.4%	95.5%	95.3%
MN	66,186,072	1,802,463	67,988,535	97.5%	97.4%	97.3%	97.3%	97.4%
MO	41,489,813	40,945,546	82,435,359	48.9%	49.7%	49.5%	50.3%	49.6%
MS	20,871,963	27,515,712	48,387,675	43.9%	44.2%	43.6%	43.1%	43.7%
ND+MT	9,510,284	19,070,055	28,580,339	33.0%	34.4%	34.5%	33.3%	33.8%
SD	3,073,575	8,660,635	11,734,210	26.6%	27.0%	26.2%	26.2%	26.5%
TX	19,359,398	345,744,733	365,104,131	5.3%	5.4%	5.4%	5.3%	5.4%
WI	68,695,399	124,691	68,820,090	99.8%	99.8%	99.8%	99.8%	99.8%

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 2009 to 2012. The numbers above the bars represent the four-year average MISO load fraction at the state level. For most of the states, the MISO load fractions changed slowly during the period of 2009 to 2012, except for ND+MT. To understand the sharp drop in MISO's load fraction in ND+MT that occurred in 2012, SUFG researched EIA's Form 861 annual electricity sales and found the drop could be attributed to unusually high growth experienced during 2012 by 7 non-MISO utilities in the region where the development of the Bakken shale formation occurred as shown in Table 10. At the same time, MISO utilities in the remainder of ND+MT exhibited relatively normal growth which resulted in an overall drop in the MISO load fraction.

Figure 20: State-Level MISO Load Fraction, 2009 to 2012

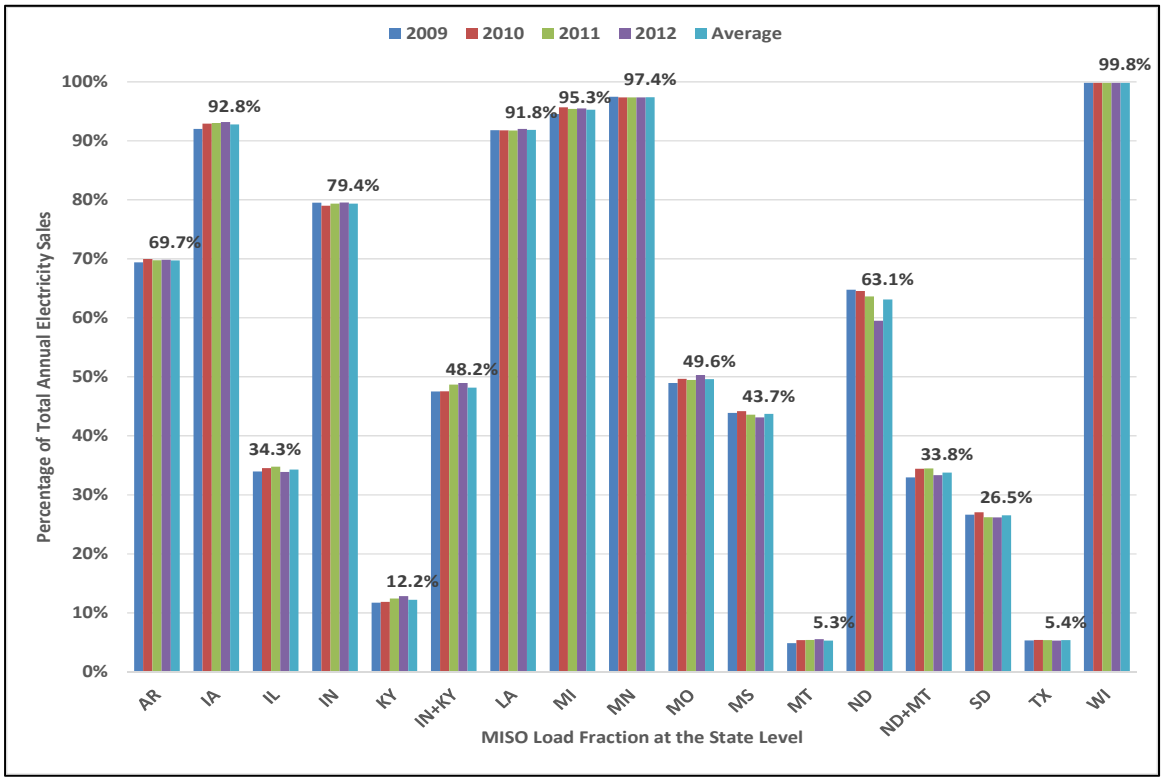


Table 10: Non-MISO Utilities in the Bakken Region Experienced Tremendous Growth in 2012 (MWh)

Utility Name	2011	2012	Annual Change%	Service Territory (County)
Burke-Divide Electric Coop Inc.	85,504	116,170	36%	Burke, Divide, Mountrail, Renville, Ward, Williams
Lower Yellowstone R E A, Inc.	20,611	31,658	54%	McKenzie, Williams
McKenzie Electric Coop Inc.	512,506	867,976	69%	Billings, Dunn, Golden Valley, McKenzie, Mercer
Mountrail-Williams Elec. Coop	682,017	1,007,191	48%	Burke, Divide, McLean, Mountrail, Ward, Williams
Roughrider Electric Cooperative	520,158	595,786	15%	Billings, Dunn, Golden Valley, Hettinger, Mercer, Oliver, Slope, Stark
Sheridan Electric Coop, Inc.	5,848	7,848	34%	Divide, Williams
Slope Electric Coop Inc.	360,021	411,736	14%	Adams, Bowman, Hettinger, Slope

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

Table 11 shows the average percentage of annual electricity sales at the state level that was located in each MISO LRZ. Color scales are used to highlight those states with higher MISO load fraction; the darker the color, the higher the MISO load fraction. The last row "Non-MISO" lists the average percentage of electricity sales from non-MISO utilities at the state level.

Table 11: MISO Load Fraction Formula at LRZ Level (Average Percentage of State-Level Electricity Sales from 2009 to 2012)

MISO LRZ	AR[12]	IA[13]	IL	IN+KY	LA	MI[14]	MN	MO[15]	MS	ND+MT	SD	TX	WI[16]
1		1.8%	0.0002%			0.1%	96.1%			33.7%	24.7%		14.9%
2						4.9%							84.9%
3		91.0%	1.4%				1.3%				1.8%		
4			32.9%										
5								49.3%					
6				48.1%									
7						90.2%							
8	69.7%							0.3%					
9					91.8%				43.7%			5.4%	
Non-MISO	**30.3%**	**7.2%**	**65.7%**	**51.8%**	**8.2%**	**4.7%**	**2.6%**	**50.4%**	**56.3%**	**66.2%**	**73.5%**	**94.6%**	**0.2%**

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

Table 12 summarizes the percentage of MISO electricity sales in each state for 2009 to 2012 and the four-year average by LRZ. For most states, their percentage of electricity sales from MISO utilities was quite stable during this period. Figures 21 to 29 display MISO state level load fraction by LRZ from 2009 to 2012.

[12] Conway Corporation in Arkansas used Louisiana Generating, LLC (NRG) as its balancing authority. NRG is a MISO LRZ 9 balancing authority. Therefore, the sales from Conway Corporation were classified as MISO sales in LRZ 9 instead of LRZ 8.

[13] 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 Zone 1. Therefore, electricity sales from those utilities are considered MISO sales in LRZ 1.

[14] 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.

[15] 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.

[16] 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 12: State Level MISO Load Fraction by MISO LRZs, 2009 to 2012

MISO LRZ	State	State Level MISO Load Fraction				
		Average	2009	2010	2011	2012
1	IA	1.8%	1.8%	1.8%	1.8%	1.7%
	IL	0.0002%	0.0002%	0.0002%	0.0002%	0.0002%
	MI	0.1%	0.1%	0.1%	0.1%	0.1%
	MN	96.1%	96.2%	96.1%	96.1%	96.1%
	ND+MT	33.7%	32.9%	34.0%	34.5%	33.3%
	SD	24.7%	24.8%	25.1%	24.4%	24.4%
	WI	14.9%	15.1%	14.9%	15.1%	14.5%
2	MI	4.9%	4.3%	5.2%	5.3%	4.9%
	WI	84.9%	84.7%	85.0%	84.7%	85.3%
3	IA	91.0%	90.2%	91.1%	91.3%	91.5%
	IL	1.4%	1.4%	1.4%	1.4%	1.4%
	MN	1.3%	1.3%	1.3%	1.2%	1.2%
	SD	1.8%	1.8%	1.9%	1.8%	1.8%
4	IL	32.9%	32.5%	33.1%	33.3%	32.5%
5	MO	49.3%	48.6%	49.4%	49.2%	50.1%
6	IN+KY	48.1%	47.5%	47.5%	48.7%	48.8%
7	MI	90.2%	90.1%	90.3%	90.0%	90.4%
8	AR	69.7%	69.4%	70.0%	69.7%	69.8%
	MO	0.3%	0.3%	0.3%	0.2%	0.2%
9	LA	91.8%	91.8%	91.8%	91.7%	92.0%
	MS	43.7%	43.9%	44.2%	43.6%	43.1%
	TX	5.4%	5.3%	5.4%	5.4%	5.3%

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

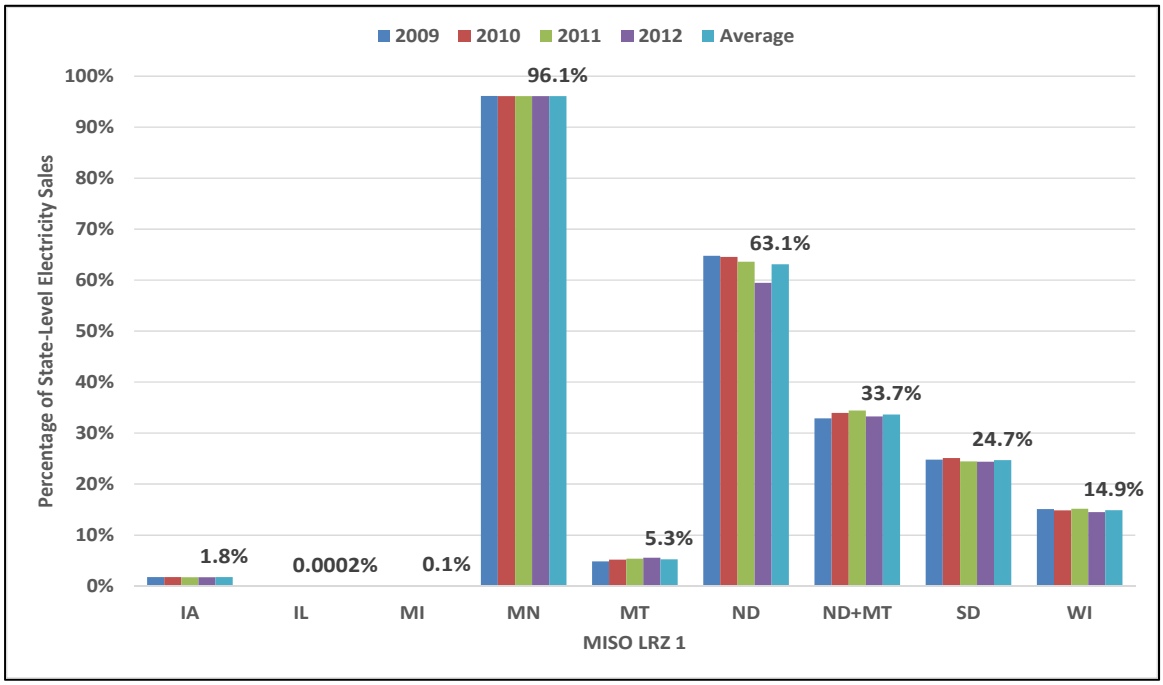


Figure 22: MISO State-Level Load Fractions at LRZ 2

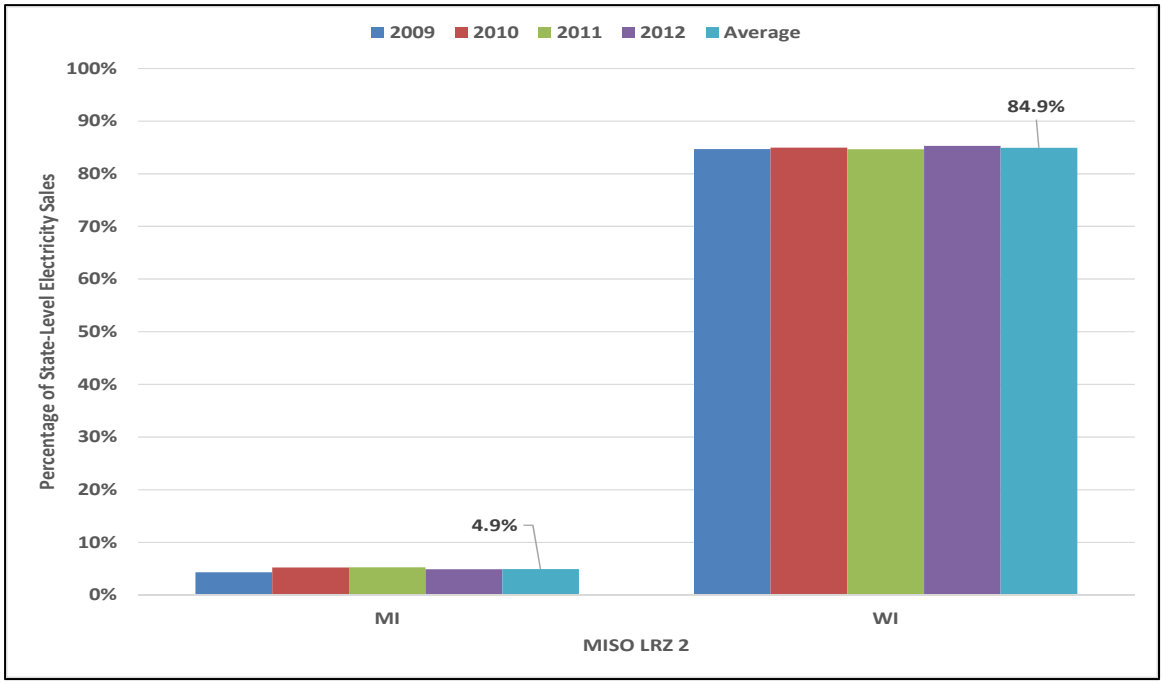


Figure 23: MISO State-Level Load Fractions at LRZ 3

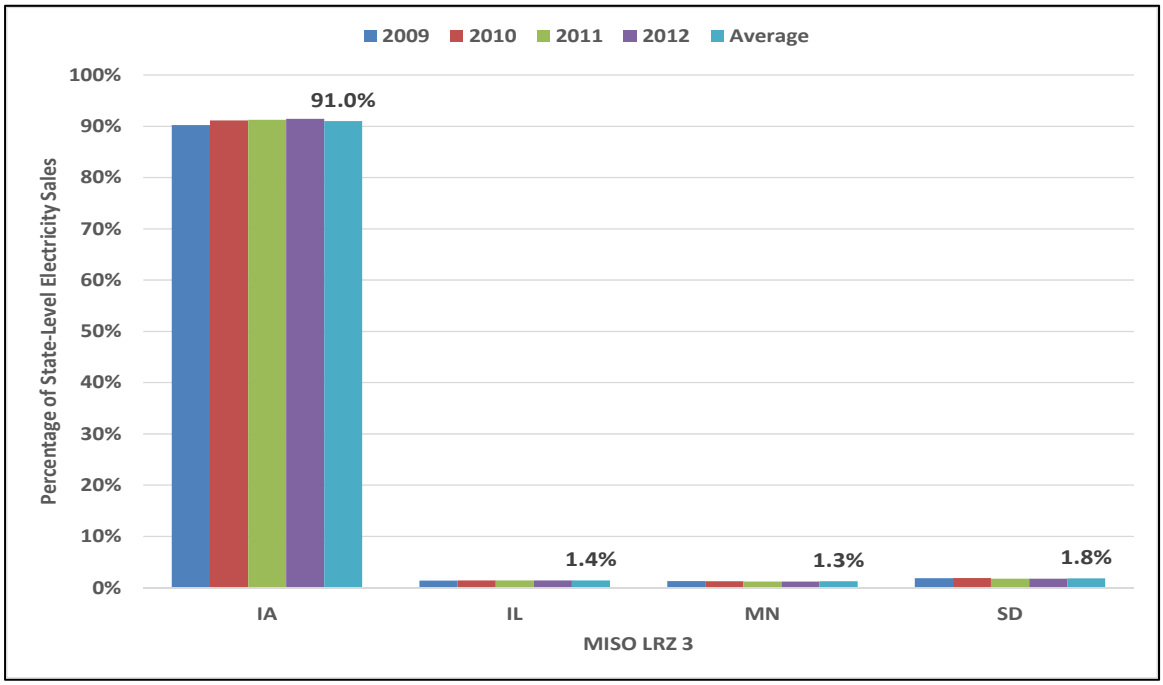


Figure 24: MISO State-Level Load Fractions at LRZ 4

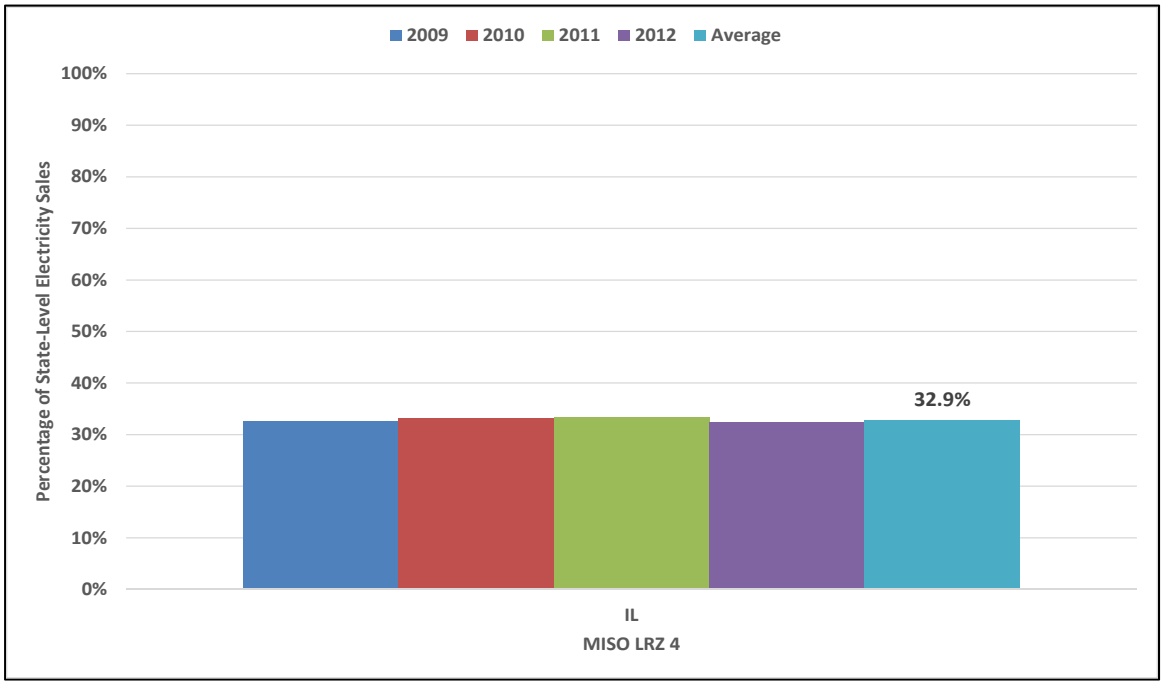


Figure 25: MISO State-Level Load Fractions at LRZ 5

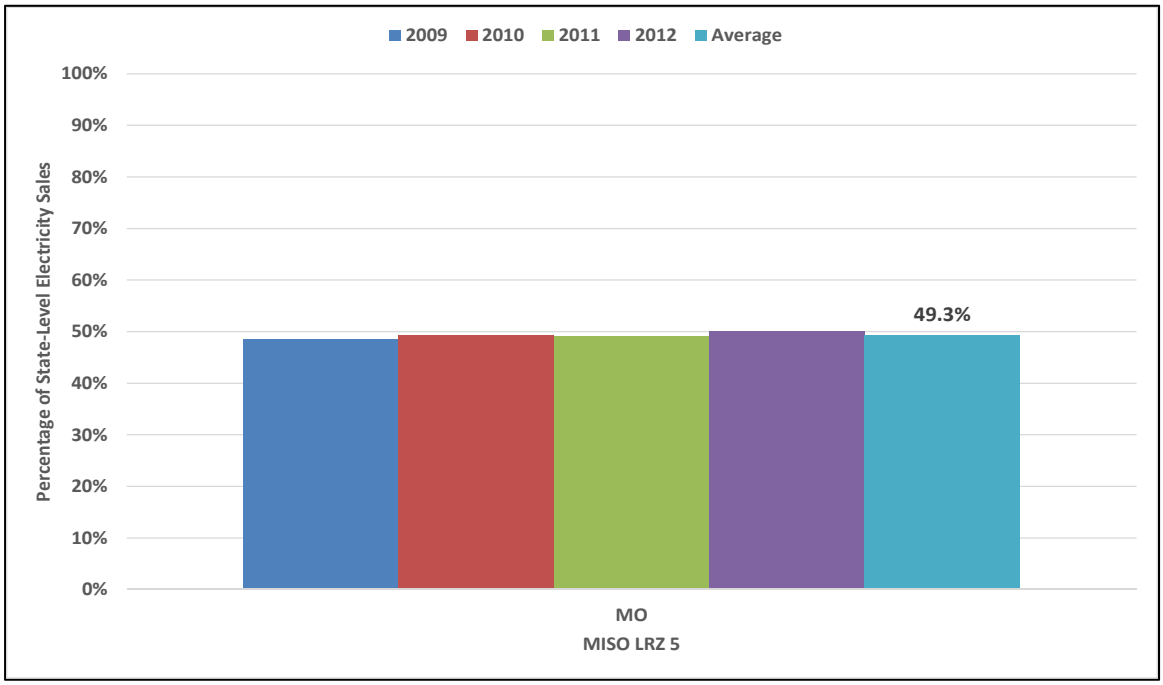


Figure 26: MISO State-Level Load Fractions at LRZ 6

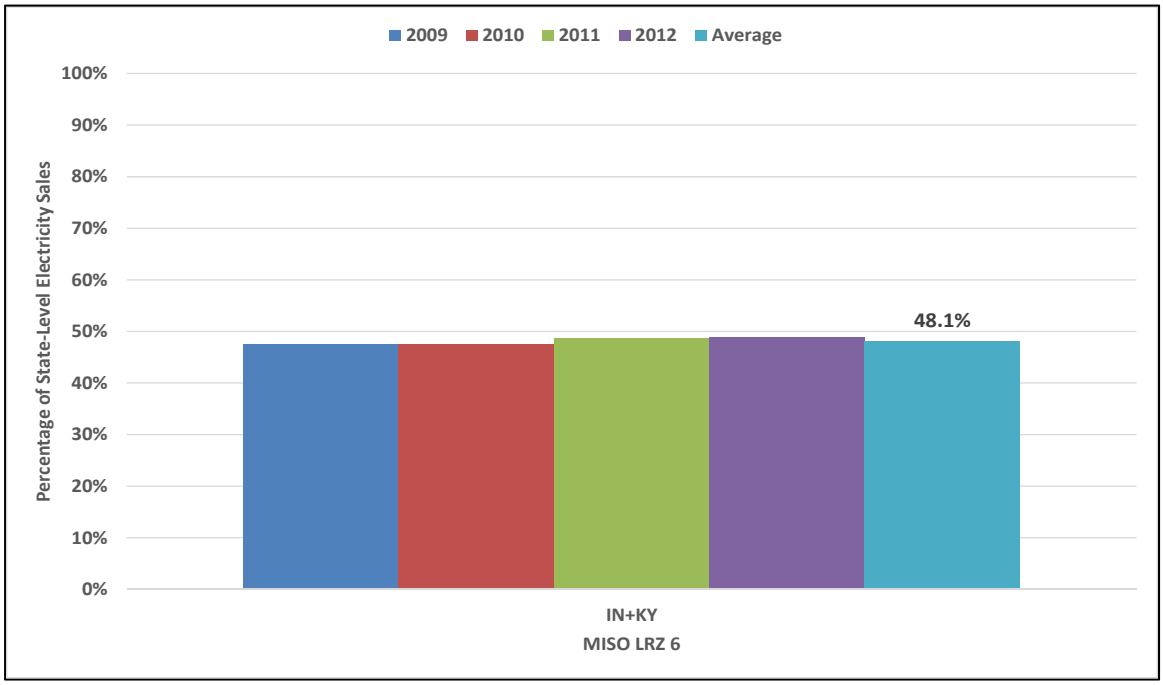


Figure 27: MISO State-Level Load Fractions at LRZ 7

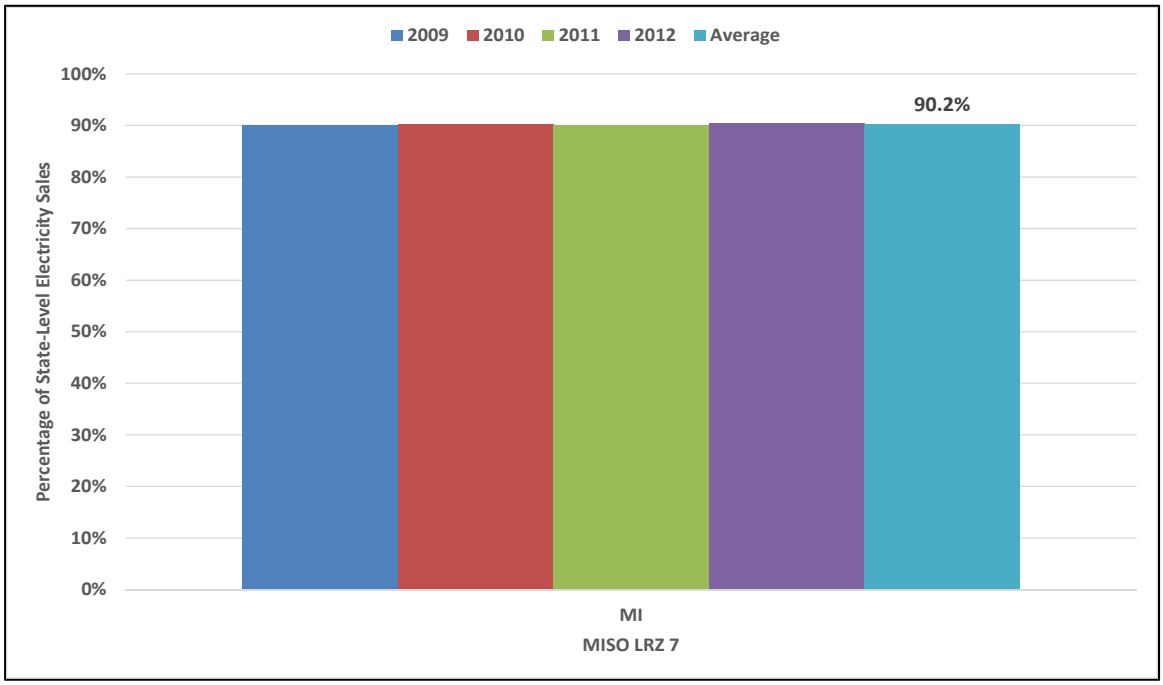


Figure 28: MISO State-Level Load Fractions at LRZ 8

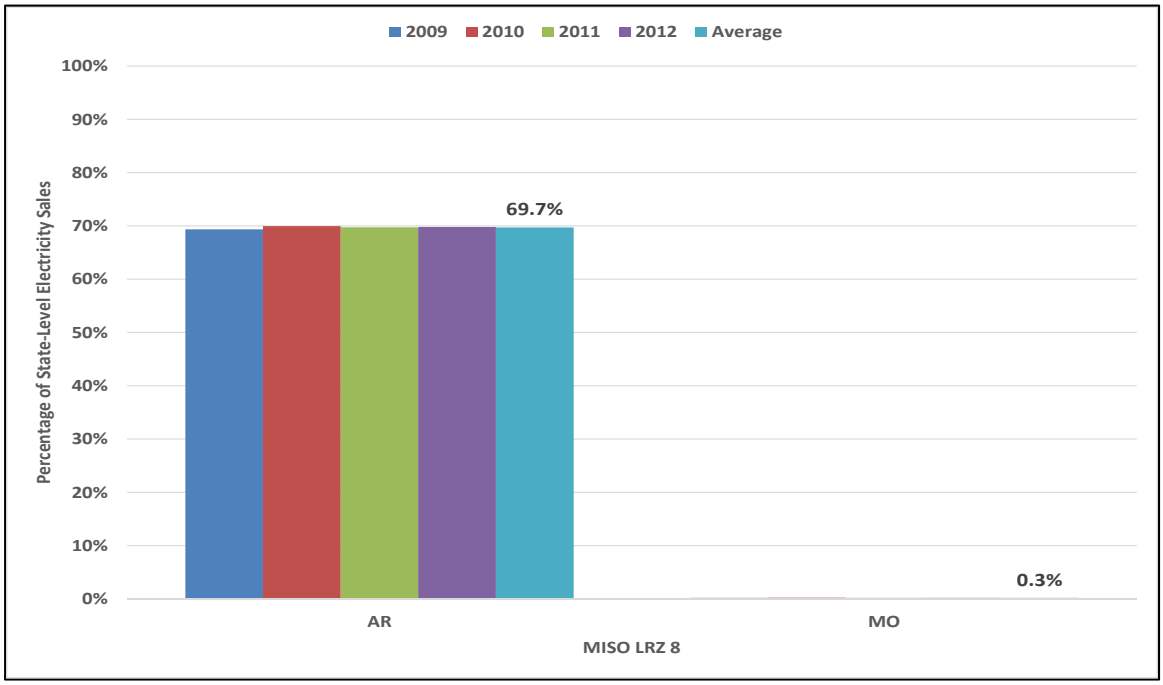
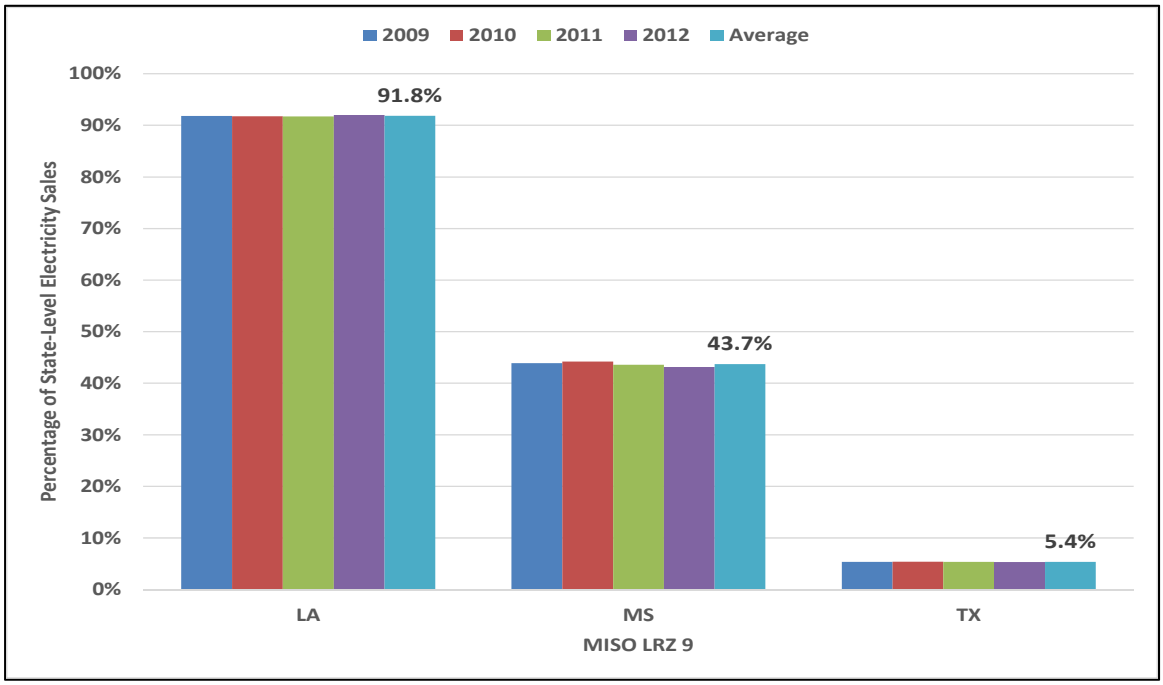


Figure 29: MISO State-Level Load Fractions at LRZ 9



4.1.2 MISO Future Allocation Factors

In determining the future allocation factors, a number of elements were considered. This includes 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 non-MISO portion of Illinois is in or near the Chicago metropolitan area. Since the economic drivers for the Chicago area are stronger than those for the entire state of Illinois, the share of electricity sales in the MISO portion is expected to decrease. A similar analysis was performed in Missouri using the St. Louis metropolitan area. In general future allocation factors are constant at either the average or most recent observed level, assumed to change going forward because of trends in the observed values, or assumed to change based on differences in expected growth for sub-state areas that are indicative of the MISO or non-MISO portion of the state.

Table 13 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 historical estimated distribution losses. Figures 30 to 41 provide historical market shares for various states and the future allocation factors.

Table 13: Allocation Factors to Convert State Sales to LRZ Sales

MISO LRZ	State	Allocation Factor	
		Basis	Result
1	IA	Historical average	Constant at 1.8%
	IL	Historical average	Constant at 0.0002%
	MI	Historical average	Constant at 0.1%
	MN	Historical average	Constant at 96.1%
	ND+MT	Historical trend	Declining from 32.7% to 32.1%
	SD	Historical average	Constant at 24.7%
	WI	Historical average	Constant at 14.9%
2	MI	Last observed	Constant at 4.9%
	WI	Historical average	Constant at 84.9%
3	IA	Last observed	Constant at 91.5%
	IL	Historical average	Constant at 1.4%
	MN	Historical average	Constant at 1.3%
	SD	Historical average	Constant at 1.8%
4	IL	Chicago vs. state growth	Declining from 32.4% to 31.9%
5	MO	St. Louis vs. state growth	Declining from 50.0% to 49.0%
6	IN+KY	Historical trend	Increasing from 48.8% to 49.0%
7	MI	Historical average	Constant at 90.2%
8	AR	Historical average	Constant at 69.7%
	MO	Historical average	Constant at 0.3%
9	LA	Historical average	Constant at 91.8%
	MS	Historical average	Constant at 43.7%
	TX	Historical average	Constant at 5.4%

Figure 30: MISO Allocation Factors—IA

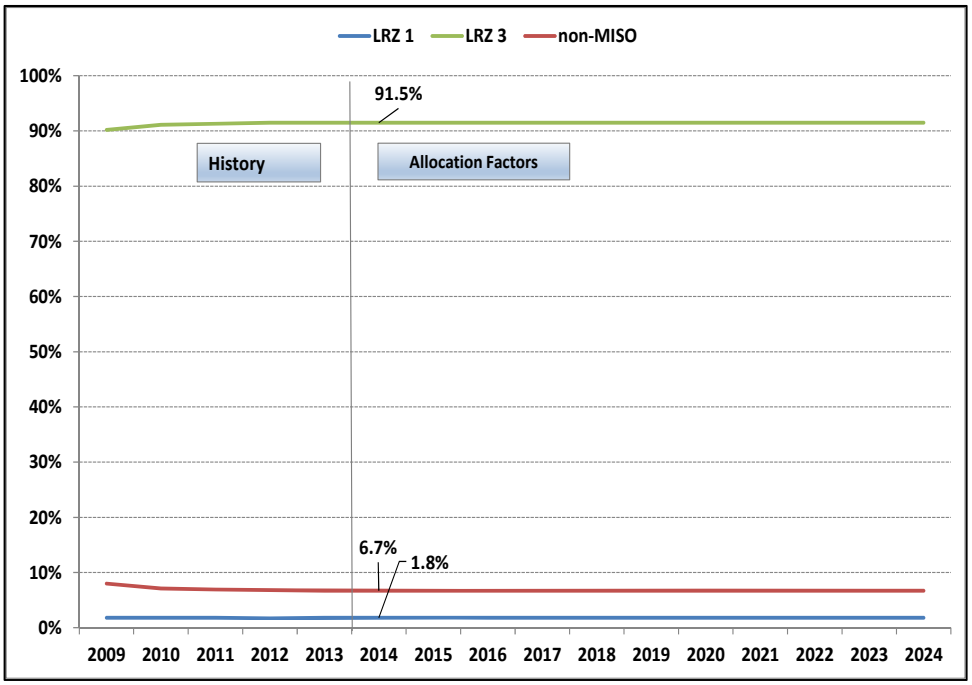


Figure 30 shows the historical MISO market share and future allocation factors for Iowa. Historical values for LRZ 1 are all either 1.7% or 1.8%. The allocation factor is held at the average of the historical values (1.8%). For LRZ 3, the 2009 value (90.2%) is lower than the others, which have little variation. The allocation factor is held at the last observed value (91.5%).

Figure 31: MISO Allocation Factors—IL

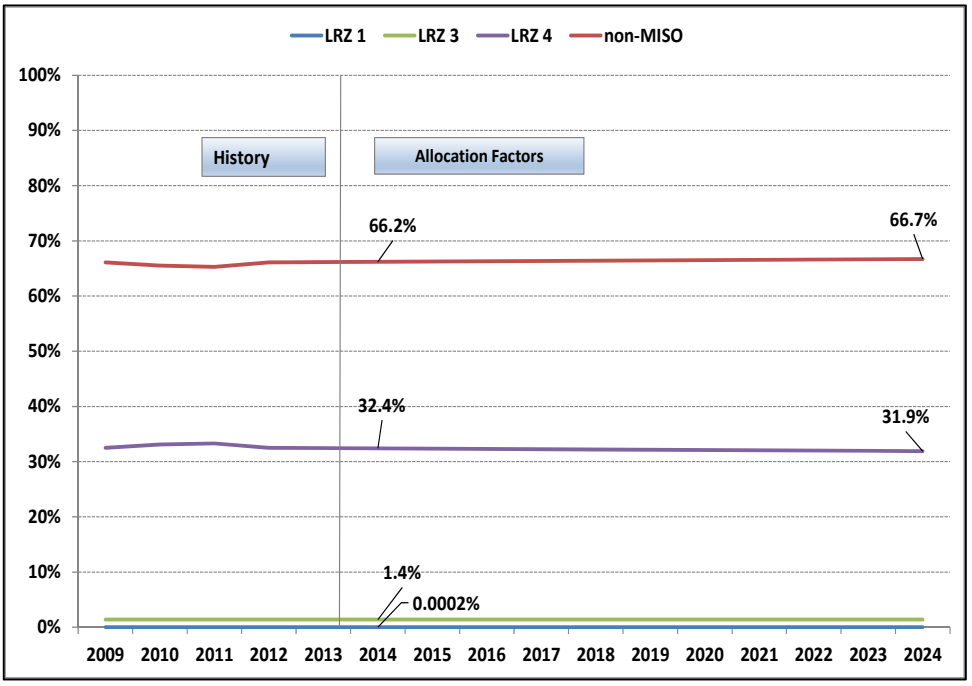


Figure 31 shows the historical MISO market share and future allocation factors for Illinois. Based on the projections of the values for the model drivers for the state of Illinois and for the Chicago metropolitan statistical area, the non-MISO region is projected to grow slightly faster than the MISO region. The allocation factors for LRZ 1 (0.0002%) and LRZ 3 (1.4%) are held constant at their historical values. The allocation factor for LRZ 4 declines from 32.4% to 31.9% over the 10-year period to reflect the declining share of statewide sales in the MISO footprint.

Figure 32: MISO Allocation Factors—IN+KY

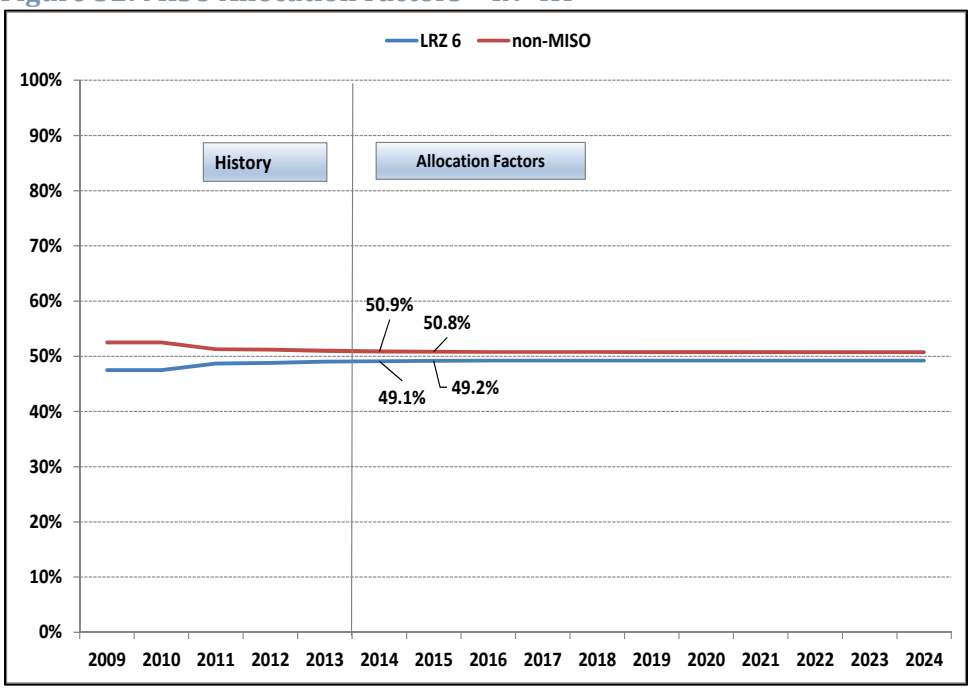


Figure 32 shows the combined historical MISO market share in Indiana and Kentucky and the future allocation factors. The historical share in the MISO footprint has risen throughout the observations (from 47.5% to 48.8%). The allocation factor reflects that growth in the future, growing to 49.2% and then leveling off.

Figure 33: MISO Allocation Factors—LA

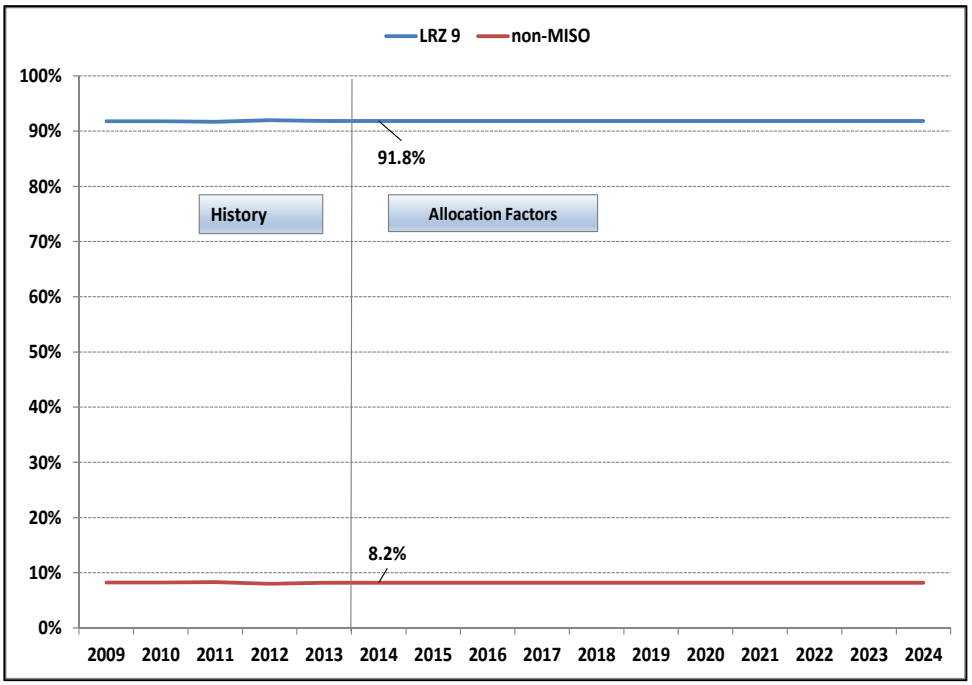


Figure 33 shows the historical MISO market share and future allocation factors for Louisiana. The historical shares have been consistent with a slight increase in 2012. The allocation factor is held at the average of the historical values (91.8%).

Figure 34: MISO Allocation Factors—MI

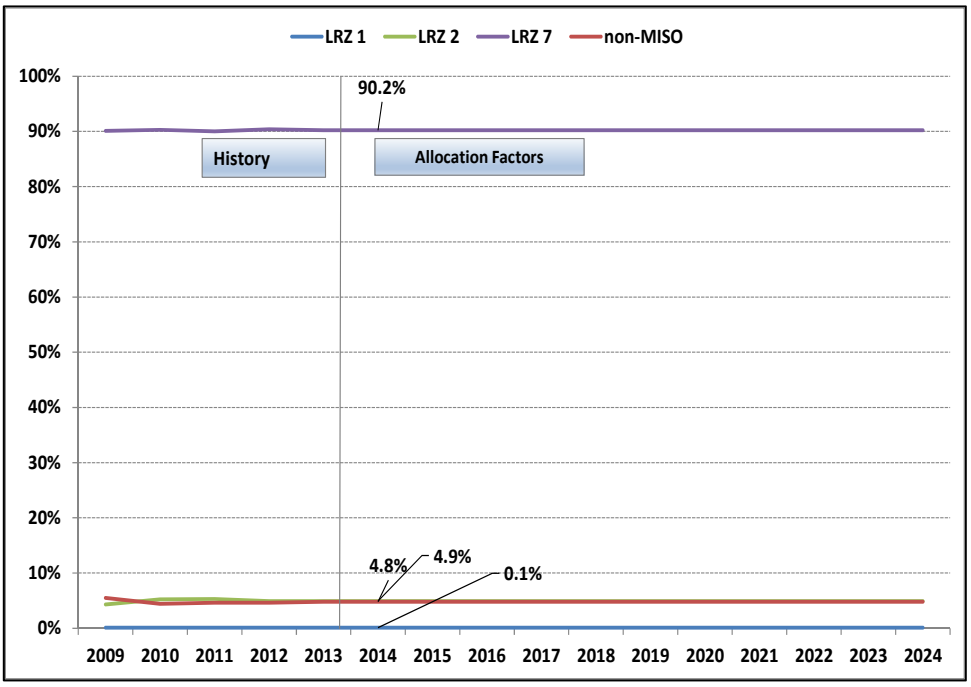


Figure 34 shows the historical MISO market share and future allocation factors for Michigan. LRZ 1 has had a constant share (0.1%) and is held constant at that level. LRZ 2 has been consistent since a lower level in 2009 (4.3%). The allocation factor is held constant at the last historical observation (4.9%). The variation in LRZ 7 has been low (between 90.0% and 90.4%). The allocation factor is held at the average of the historical values (90.2%).

Figure 35: MISO Allocation Factors—MN

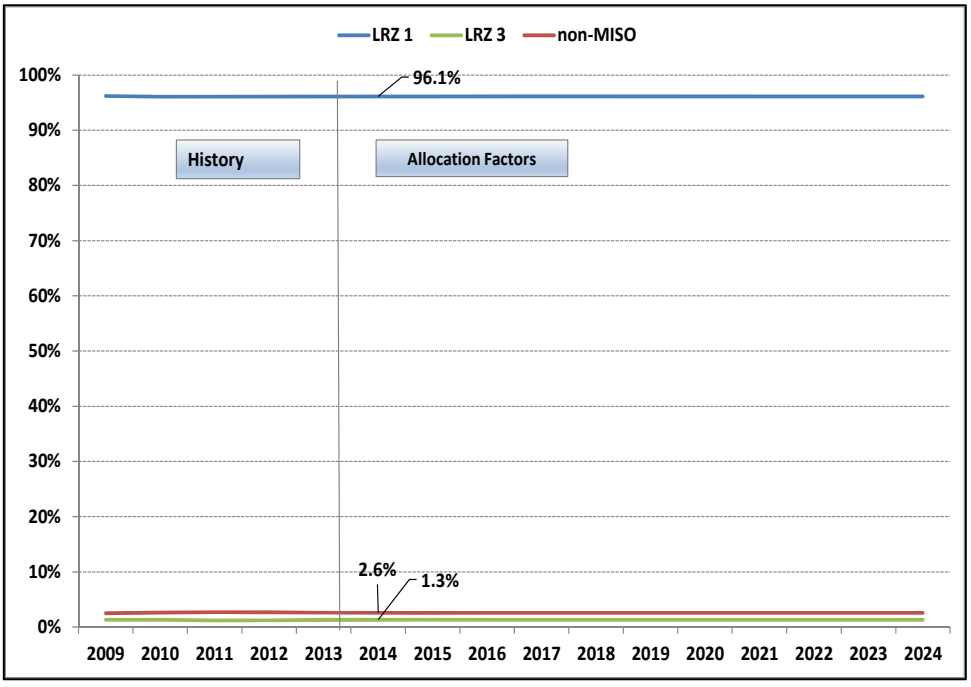


Figure 35 shows the historical MISO market share and future allocation factors for Minnesota. The variation in LRZ 1 has been very low (between 96.1% and 96.2%). The allocation factor is held at the average of the historical values (96.1%). The variation in LRZ 3 has also been low (between 1.2% and 1.3%). The allocation factor is held at the average of the historical values (1.3%).

Figure 36: MISO Allocation Factors—MO

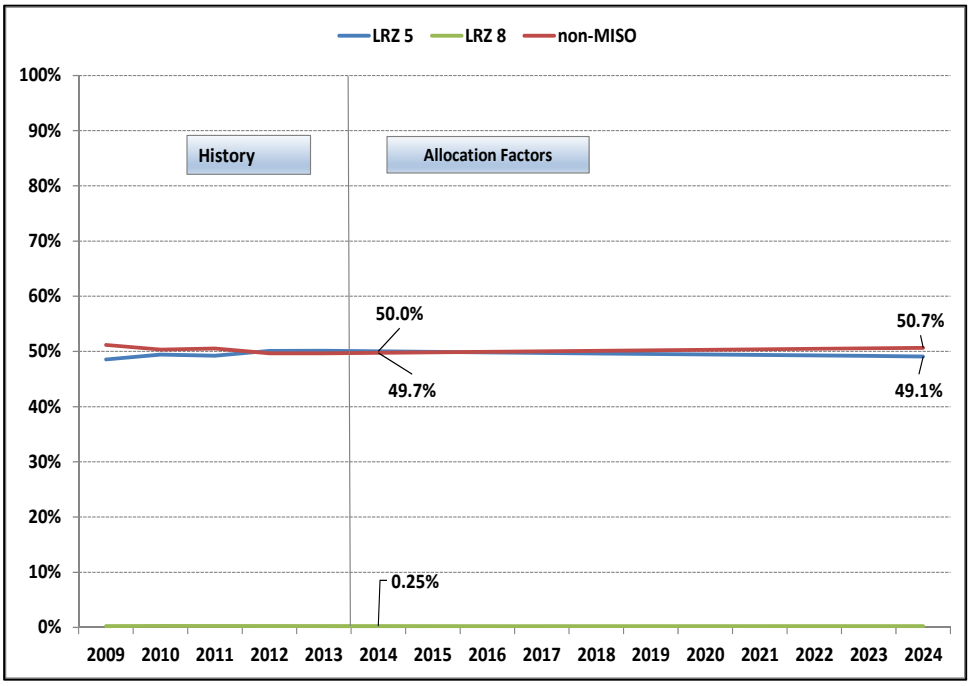


Figure 36 shows the historical MISO market share and future allocation factors for Missouri. Based on the projections of the values for the model drivers for the state of Missouri and for the St. Louis metropolitan statistical area, the non-MISO region is projected to grow faster than the MISO region. The allocation factor for LRZ 5 declines from 50.1% to 49.1% over the 10-year period to reflect the declining share of statewide sales in the MISO footprint. The variation in the historical share of LRZ 8 is low. The allocation factor is held at the average of the historical values (0.25%).

Figure 37: MISO Allocation Factors—MS

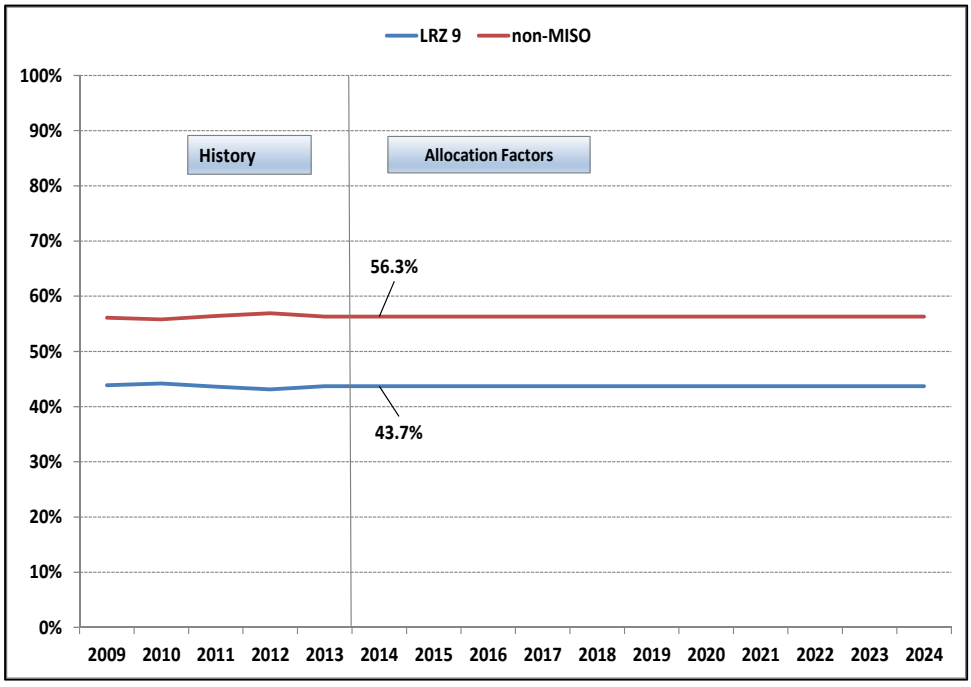


Figure 37 shows the historical MISO market share and future allocation factors for Mississippi. While there is some variation in the historical share (between 43.1% and 44.2%), there is no consistent pattern of growth or shrinkage. The allocation factor is held at the average of the historical values (43.7%).

Figure 38: MISO Allocation Factors—ND+MT

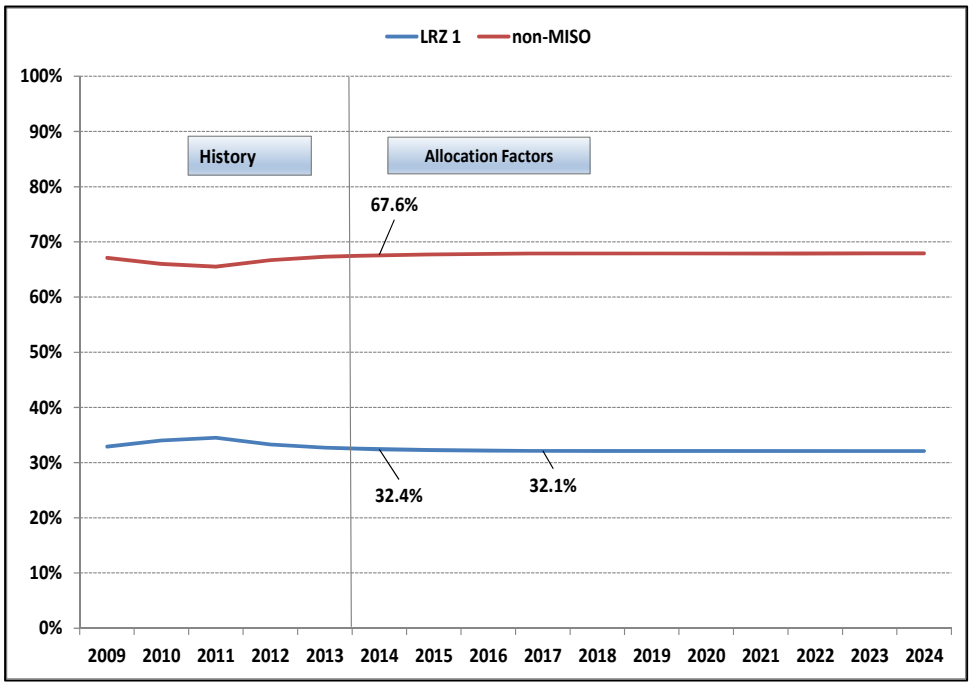


Figure 38 shows the combined historical MISO market share in North Dakota and Montana and the future allocation factors. The share of sales in LRZ 1 dropped significantly in 2012 (from 34.5% to 33.3%) due to very strong growth in non-MISO utilities in the Bakken region. While strong growth is expected to continue in that region, the extreme growth (in excess of 50% in one year for some utilities) is not expected to continue indefinitely. The allocation factor for LRZ 1 drops from the 2012 level to 32.1% before leveling off.

Figure 39: MISO Allocation Factors—SD

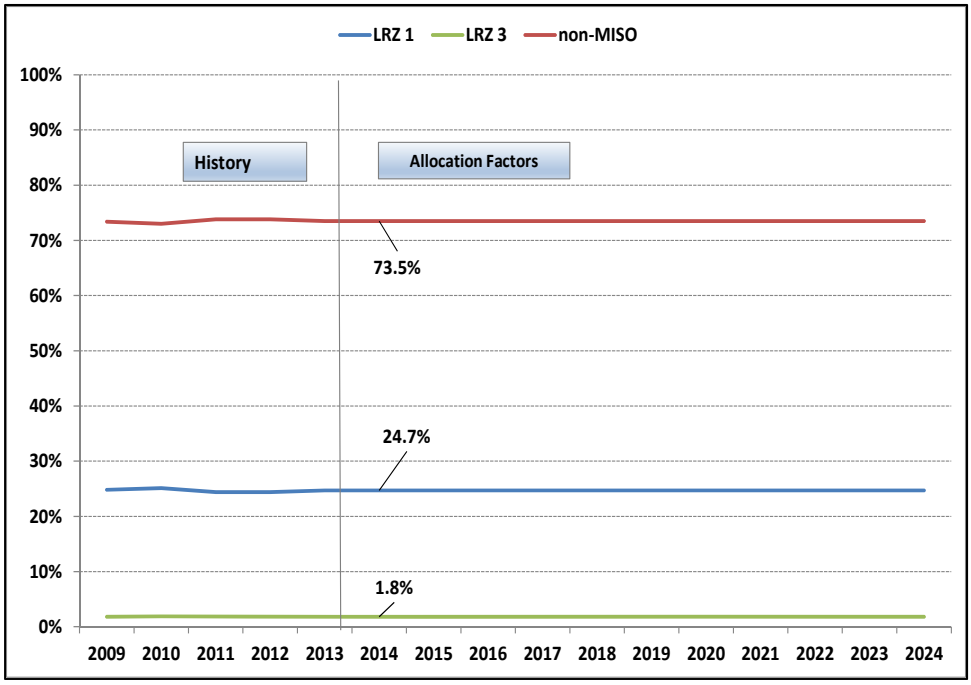


Figure 39 shows the historical MISO market share and future allocation factors for South Dakota. The variation in the historical share of LRZ 1 is moderate (between 24.4% and 25.1%). The allocation factor is held at the average of the historical values (24.7%). The variation in the historical share of LRZ 3 is low (between 1.8% and 1.9%). The allocation factor is held at the average of the historical values (1.8%).

Figure 40: MISO Allocation Factors—TX

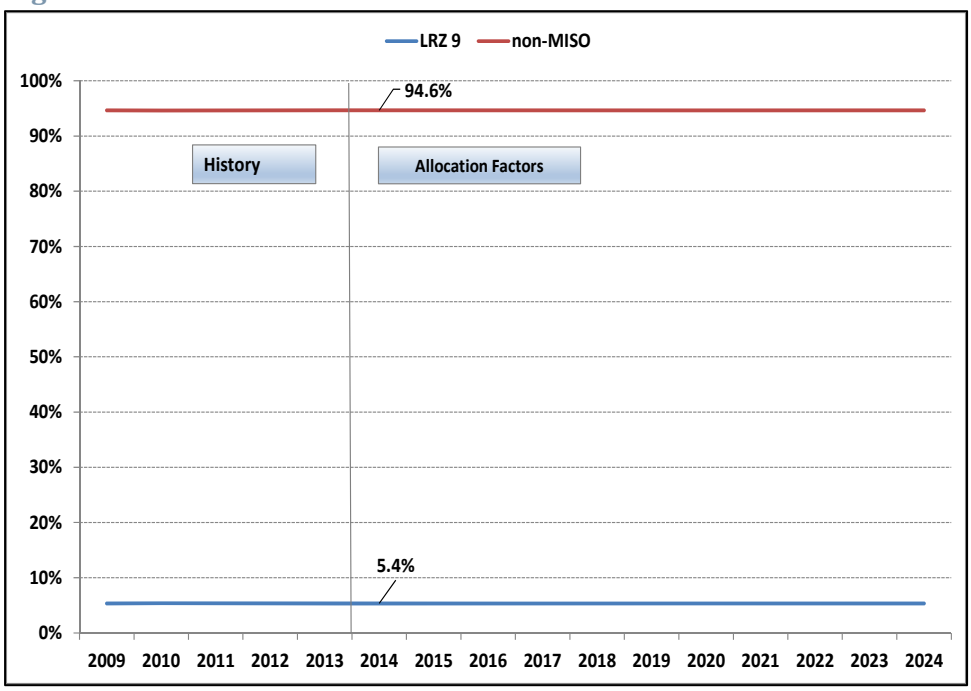


Figure 40 shows the historical MISO market share and future allocation factors for Texas. The variation has been very low (between 5.3% and 5.4%) since a lower level in 2009 (5.3%). The allocation factor is held constant at the average of historical observation (5.4%).

Figure 41: MISO Allocation Factors—WI

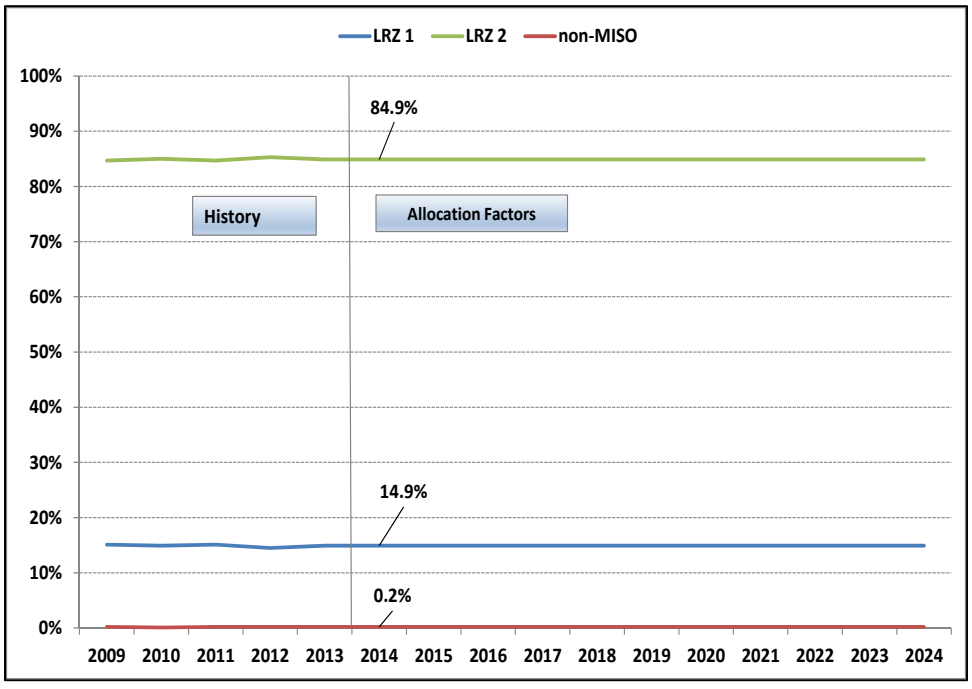


Figure 37 shows the historical MISO market share and future allocation factors for Wisconsin. The variation in the historical share of LRZ 1 is moderate (between 14.5% and 15.1%). The allocation factor is held at the average of the historical values (14.9%). The variation in the historical share of LRZ 2 is also moderate (between 84.7% and 85.3%). The allocation factor is held at the average of the historical values (84.9%).

4.2 ANNUAL ENERGY FORECASTS

Table 14 provides the gross (without the EE adjustment) LRZ annual metered load projections and Table 15 provides the net (with the EE adjustment) LRZ annual metered load projections.

Table 14: Gross LRZ Energy Forecasts (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	100,101	66,632	47,573	49,944	44,254	102,125	101,553	34,223	126,543
2014	97,543	66,319	46,938	49,798	44,088	102,431	102,244	34,711	127,405
2015	99,431	67,687	47,736	50,660	44,566	103,957	104,223	35,300	127,803
2016	101,926	69,412	48,592	51,459	45,130	105,628	106,536	35,960	129,682
2017	104,369	71,276	49,532	52,034	45,625	107,233	108,547	36,688	131,421
2018	106,478	72,884	50,335	52,388	46,086	108,562	110,182	37,349	133,175
2019	108,269	74,360	51,110	52,690	46,464	109,811	112,150	37,983	135,153
2020	109,996	75,631	51,859	52,972	46,847	111,101	114,134	38,561	136,718
2021	111,375	76,613	52,406	53,112	47,062	112,438	115,744	39,002	137,287
2022	113,067	77,991	53,254	53,314	47,263	113,703	117,245	39,668	138,095
2023	114,938	79,425	54,187	53,540	47,479	114,929	118,487	40,344	139,287
2024	116,829	80,923	55,201	53,759	47,686	116,236	120,489	41,049	141,210
Annual Growth Rates (%)									
2013-2014	-2.55	-0.47	-1.33	-0.29	-0.37	0.30	0.68	1.43	0.68
2014-2015	1.94	2.06	1.70	1.73	1.08	1.49	1.94	1.70	0.31
2015-2016	2.51	2.55	1.79	1.58	1.27	1.61	2.22	1.87	1.47
2016-2017	2.40	2.68	1.93	1.12	1.10	1.52	1.89	2.02	1.34
2017-2018	2.02	2.26	1.62	0.68	1.01	1.24	1.51	1.80	1.33
2018-2019	1.68	2.03	1.54	0.58	0.82	1.15	1.79	1.70	1.48
2019-2020	1.59	1.71	1.46	0.53	0.82	1.18	1.77	1.52	1.16
2020-2021	1.25	1.30	1.06	0.26	0.46	1.20	1.41	1.14	0.42
2021-2022	1.52	1.80	1.62	0.38	0.43	1.13	1.30	1.71	0.59
2022-2023	1.65	1.84	1.75	0.42	0.46	1.08	1.06	1.71	0.86
2023-2024	1.65	1.89	1.87	0.41	0.44	1.14	1.69	1.75	1.38
Compound Annual Growth Rates (%)									
2013-2018	1.24	1.81	1.14	0.96	0.81	1.23	1.64	1.76	1.03
2013-2024	1.41	1.78	1.36	0.67	0.68	1.18	1.57	1.67	1.00
2015-2024	1.81	2.00	1.63	0.66	0.75	1.25	1.62	1.69	1.11

Table 15: Net LRZ Energy Forecasts (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	98,949	66,191	47,148	49,601	44,037	101,633	100,651	34,065	126,270
2014	95,231	65,437	46,084	49,000	43,563	101,336	100,438	34,395	126,918
2015	95,973	66,364	46,449	49,337	43,694	102,861	101,507	34,794	127,297
2016	97,331	67,647	46,876	49,586	43,911	104,532	102,893	35,264	129,039
2017	98,649	69,067	47,380	49,608	44,058	106,137	103,955	35,803	130,649
2018	99,624	70,232	47,743	49,411	44,170	107,466	104,624	36,274	132,281
2019	100,272	71,263	48,077	49,165	44,200	108,715	105,612	36,718	134,157
2020	100,849	72,087	48,386	48,901	44,235	110,005	106,597	37,107	135,615
2021	101,073	72,623	48,493	48,500	44,101	111,342	107,192	37,358	136,078
2022	101,608	73,553	48,900	48,167	43,957	112,607	107,663	37,834	136,789
2023	102,318	74,539	49,393	47,861	43,828	113,833	107,861	38,321	137,880
2024	103,046	75,588	49,967	47,553	43,693	115,140	108,809	38,836	139,700
Annual Growth Rates (%)									
2013-2014	-3.76	-1.14	-2.26	-1.21	-1.08	-0.29	-0.21	0.97	0.51
2014-2015	0.78	1.42	0.79	0.69	0.30	1.50	1.06	1.16	0.30
2015-2016	1.42	1.93	0.92	0.50	0.50	1.62	1.36	1.35	1.37
2016-2017	1.35	2.10	1.08	0.04	0.33	1.54	1.03	1.53	1.25
2017-2018	0.99	1.69	0.77	-0.40	0.25	1.25	0.64	1.32	1.25
2018-2019	0.65	1.47	0.70	-0.50	0.07	1.16	0.94	1.22	1.42
2019-2020	0.58	1.16	0.64	-0.54	0.08	1.19	0.93	1.06	1.09
2020-2021	0.22	0.74	0.22	-0.82	-0.30	1.21	0.56	0.68	0.34
2021-2022	0.53	1.28	0.84	-0.69	-0.33	1.14	0.44	1.27	0.52
2022-2023	0.70	1.34	1.01	-0.63	-0.29	1.09	0.18	1.29	0.80
2023-2024	0.71	1.41	1.16	-0.64	-0.31	1.15	0.88	1.35	1.32
Compound Annual Growth Rates (%)									
2013-2018	0.14	1.19	0.25	-0.08	0.06	1.12	0.78	1.26	0.93
2013-2024	0.37	1.21	0.53	-0.38	-0.07	1.14	0.71	1.20	0.92
2015-2024	0.79	1.46	0.81	-0.41	0.00	1.26	0.77	1.23	1.04

5 MISO Regional Non-coincident Peak Demand Forecasts

5.1 PEAK LOAD CONVERSION FACTORS

5.1.1 Introduction

Peak load conversion factors were used to translate annual electricity sales forecasts 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[17] using historical data, (2) estimate the "normal" weather conditions at the time the peak demand occurs, and (3) determine the relationship between peak demand and average demand under normal conditions.

5.1.2 Load Data and Selected Weather Stations

Load data consisted primarily of hourly loads at the LBAs for the period of 2010-2013 that were provided by MISO. These data points represented the MISO footprint at the time the data was collected. Since the MISO footprint has evolved over time, the entire dataset does not cover the current MISO footprint. This is particularly true for the MISO South region (LRZs 8 and 9), which was added in December 2013. Where possible, the MISO load data was supplemented with hourly load data obtained from FERC filings. Since not all utilities make these filings with FERC (many not-for-profit utilities do not), the dataset is incomplete. A necessary assumption is that the partial data is representative of the missing data within a particular LRZ. Due to the availability of data for LRZs 8 and 9, hourly loads for 2009-2012 were used.

For 2005-2013 (2005-2012 for LRZs 8 and 9), the hour at which the LRZ experienced its summer peak was known, but not the actual load level for 2005-2009 (2005-2008 for LRZs 8 and 9). The times of winter peaks were only known for the years when hourly loads were available.

Hourly weather data was obtained dating back to 1997. For most weather stations, there are a handful of missing observations in the course of a year. For most LRZs, data from a second or third weather station were collected to supplement the main station. As described later, the data from these stations were used either for informational purposes or as a replacement for the primary stations under specific unusual circumstances. The primary station was selected to be as centrally located within the loads of the particular LRZ (these may or may not correspond to the weather stations used in the development of the state annual energy models that were done previously). Table 16 lists the primary and secondary weather stations.

[17] 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.

Table 16: Weather Stations

LRZ	Primary	Secondary
1	St. Paul, MN	Bismarck, ND; Fergus Falls, MN
2	Milwaukee, WI	Green Bay, WI; Marquette, MI
3	Des Moines, IA	Davenport, IA
4	Springfield, IL	Carbondale, IL
5	St. Louis, MO	
6	Indianapolis, IN	Evansville, IN; South Bend, IN
7	Lansing, MI	Grand Rapids, MI
8	Little Rock, AR	
9	Alexandria, LA	Houston, TX; Jackson, MS; New Orleans, LA

5.1.3 Relationship between Peak Demand and Temperature

For the four years (2010-2013 for LRZs 1 through 7 and 2009-2012 for LRZs 8 and 9) during which hourly loads were available, the ten highest load hours (with the corresponding temperatures) were selected for the summer and winter. The ratio of annual average hourly load to hourly load for each of these ten hours was calculated[18] for the four years. Using the forty pairs of data points (four years times ten hours/year for load factor and temperature), a linear regression was performed to determine the mathematical relationship between load and temperature during periods of high loads. These calculations were performed for both winter and summer.

A few observations regarding the relationships are worth noting. The statistical fits for the summer are generally better in the northern LRZs and for the winter in the southern LRZs. Furthermore, the factors for northern LRZs are less sensitive to winter temperatures and the factors for southern LRZs are less sensitive to summer temperatures. The summer lines all have negative slopes, indicating that the load factor decreases as temperature increases (or alternatively, demand increases with temperature). The winter lines all have positive slopes, indicating that load factor increases (and demand decreases) with increasing temperature. These results are intuitive in that summer air conditioning load increases with temperature, while winter heating load decreases with temperature.

Table 17 provides the linear relationship for each LRZ. T indicates hourly temperature and LF represents the ratio of average hourly demand for the year to summer or winter peak demand. Figures 42 to 50 provide the scatter plots for the data pairs, along with the estimated linear relationships.

[18] For the absolute peak demand hour for the year, this value represents the load factor for the LRZ. For those hours with less than peak demand, the calculation is identical. While these numbers do not strictly represent the LRZ's load factor, the terminology is used here for sake of explanation.

Table 17: Load Factors vs. Temperature Relationships

LRZ	Summer	Winter
1	LF=0.9969-0.003841*T	LF=0.7804+0.00004095*T
2	LF=0.8692-0.003043*T	LF=0.7846+0.0007954*T
3	LF=0.7989-0.002023*T	LF=0.7815+0.0004810*T
4	LF=0.8957-0.003335*T	LF=0.7521+0.002048*T
5	LF=0.9862-0.004199*T	LF=0.6615+0.004333*T
6	LF=0.8355-0.002040*T	LF=0.7407+0.002103*T
7	LF=1.0940-0.005983*T	LF=0.7867+0.001108*T
8	LF=0.6532-0.0007886*T	LF=0.5924+0.005740*T
9	LF=0.5918-0.0002066*T	LF=0.5140+0.008117*T

Figure 42: Load Factor vs. Temperature for LRZ 1

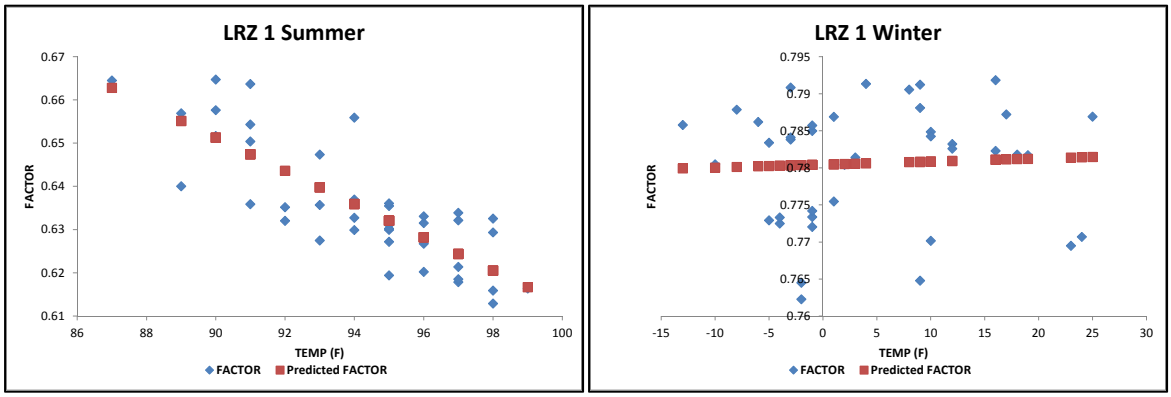


Figure 43: Load Factor vs. Temperature for LRZ 2

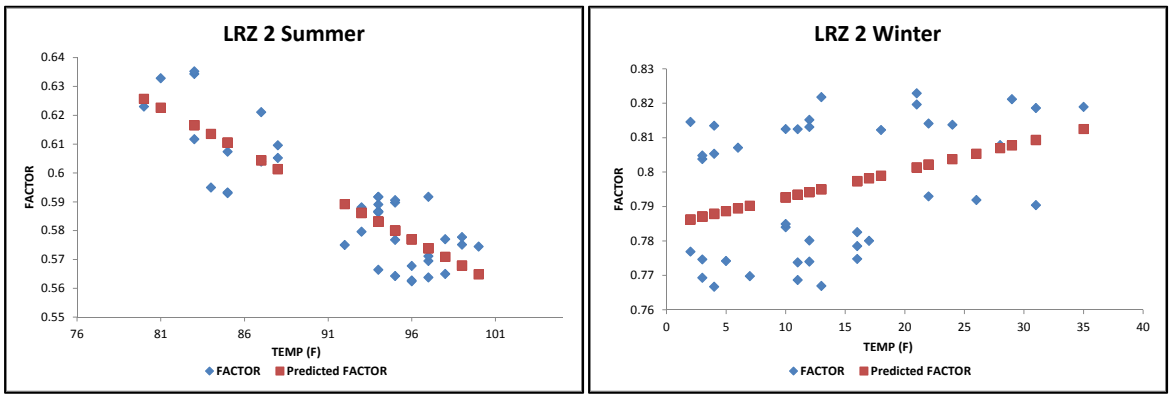


Figure 44: Load Factor vs. Temperature for LRZ 3

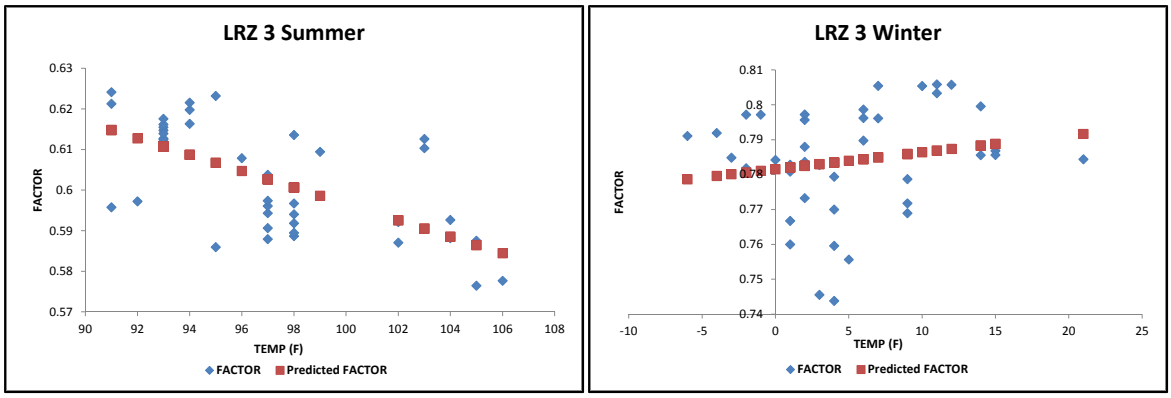


Figure 45: Load Factor vs. Temperature for LRZ 4

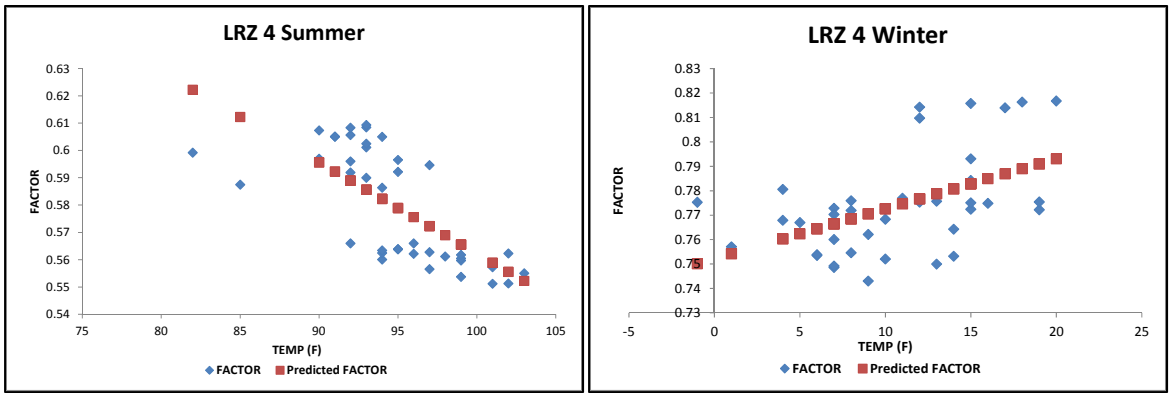


Figure 46: Load Factor vs. Temperature for LRZ 5

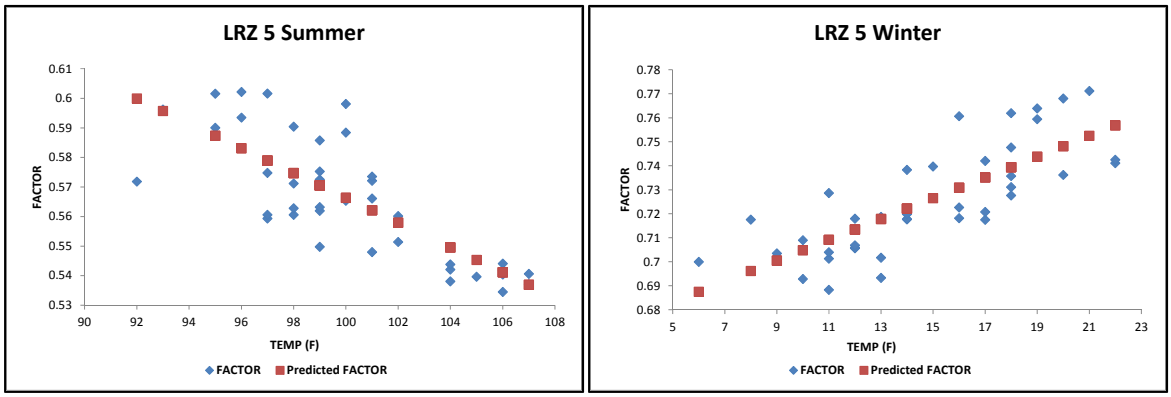


Figure 47: Load Factor vs. Temperature for LRZ 6

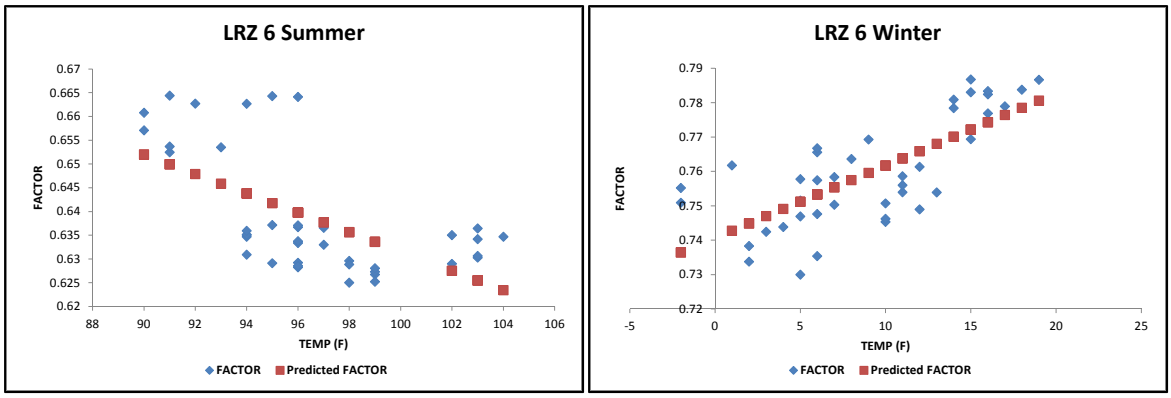


Figure 48: Load Factor vs. Temperature for LRZ 7

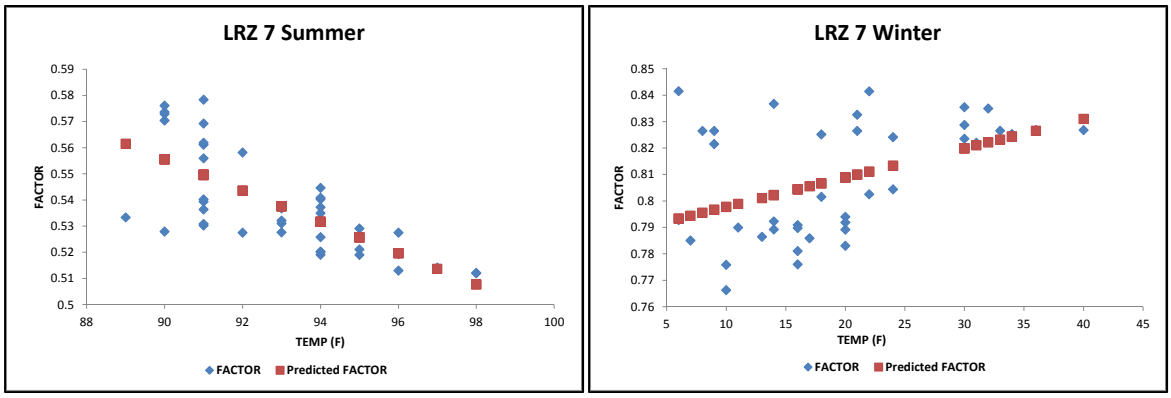


Figure 49: Load Factor vs. Temperature for LRZ 8

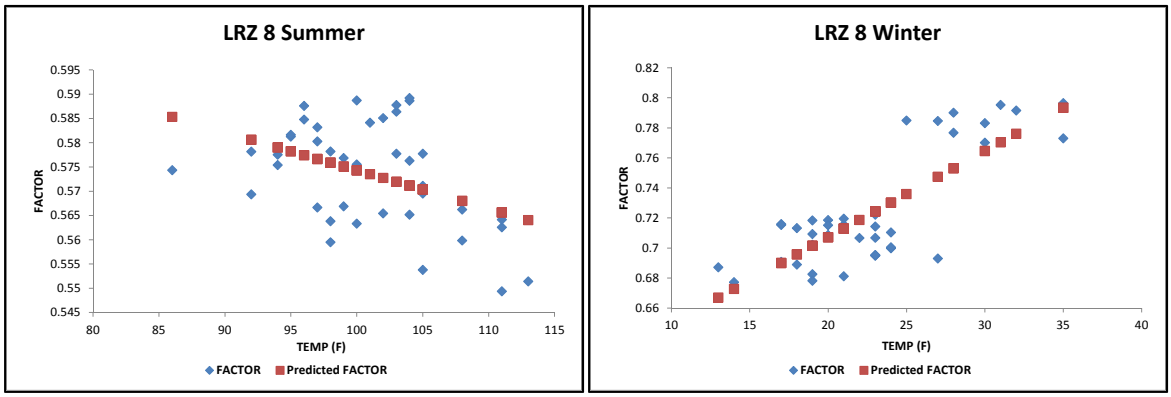
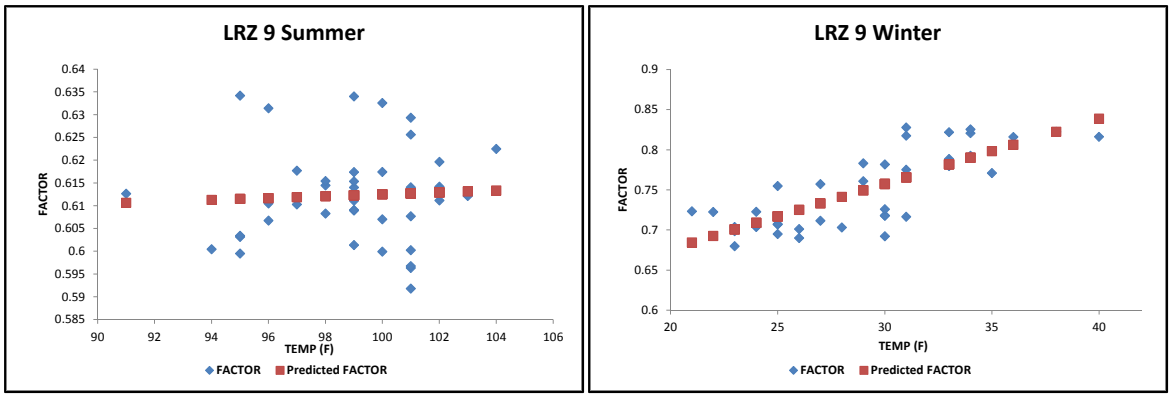


Figure 50: Load Factor vs. Temperature for LRZ 9



5.1.4 Estimating "Normal" Peak Demand Weather Conditions

For summer, nine years' worth of information (eight for LRZs 8 and 9) was available regarding the hour and temperature that corresponded to actual LRZ peak demands. For winter, only four years' worth of information was available. Due to concerns over the insufficiency of the data to accurately reflect typical peak demand weather conditions (especially for winter), weather data was incorporated going back to 1997. Since the actual hour that the peak demand occurred was not known and since peak demand does not always occur on the hottest (coldest) hour of the year for the summer (winter) peak, an estimation of what temperatures were typical at the time of peak demand was undertaken.

Extreme temperatures that occurred during times 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 ten highest load hours during the four years for which hourly loads were available (as described previously). While there is some variation across LRZs, peak hours generally occur in the morning and evening in the winter and the afternoon and evening in the 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.

After eliminating off-peak times, the remaining hours were ranked according to hottest temperatures in summer (and lowest temperatures in winter). For years where the hourly loads were known, the actual temperature on peak was compared to the list of highest (lowest) temperatures. Thus, it was determined whether the summer peak occurred on the hottest hour, the second hottest hour, and so forth. A similar determination was performed for the winter peak. 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.

Next the average of the ranked extreme temperatures was calculated for two separate time periods: 1997-2013 (which included all weather data) and 2005-2013 (the years for which the hour at which the peak

demand occurred was known)[19]. This facilitated a comparison of the extremity of the temperatures over the smaller period to the larger period (which indicated whether the smaller period was generally warmer or colder than the larger 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 1997-2013 period was warmer or colder than the known period. Adjustment tended to be more significant in the winter since the known period was smaller and warmer (at least for extremes) than the total period. A couple of examples of the adjustments are provided:

- In LRZ 5 (the St. Louis weather station), the average summer temperature on peak from 2005 to 2013 was 99.7 degrees. The average extreme temperature for the 1997-2013 period was 1 degree cooler. Therefore, a "normal" peak temperature of 98.7 degrees was assumed.
- In LRZ 2 (the Milwaukee weather station), the average winter temperature on peak from 2010 to 2013 was 5.5 degrees. Since the average extreme temperature for the 1997-2013 period was 0.5 degrees warmer, a "normal" peak temperature of 6.0 degrees was assumed.

A pair of outlier observations was encountered during the analysis. In LRZ 1, the temperature (MSP Airport) at the time of the winter peak was 23 degrees, despite there being several significantly colder hours that year. Further analysis indicated that the temperatures at the secondary weather stations were not particularly cold (Bismarck and Fergus Falls both registered 18 degrees). Therefore, that data point was excluded from the analysis.

In LRZ 3, the temperature (Des Moines) at the hour of the 2009 summer peak was 72 degrees, but the temperature at the secondary station (Davenport) was 94 degrees and the temperature in Des Moines the hour prior to the peak was 95 degrees. Since it was apparent that a front was moving through the LRZ at the time of the peak (and since temperatures are recorded during the middle of an hour rather than on the hour), the Davenport temperature was used in the analysis as more indicative of the LRZ.

Table 18 lists the summer and winter temperatures used as normal peak temperatures for each LRZ.

Table 18: Summer and Winter Peak Normal Hourly Temperatures (Fahrenheit)

LRZ	Summer	Winter
1	93.5	-4.0
2	89.1	6.0
3	93.2	5.9
4	93.9	7.6
5	98.7	11.6
6	91.6	2.6
7	91.3	15
8	99.0	20.2
9	96.8	27.1

[19] For the winter analysis, the second period covered 2010-2013. For LRZs 8 and 9, the known periods ended at 2012.

5.1.5 Peak Demand Conversion Factors

The peak demand conversion factors were then determined by inserting the normal peak temperature to the mathematical relationships developed previously. The factors determined by the process represent the ratio of annual average hourly load over summer (or winter) peak demand under normal weather. Since the desired conversion factor is actually the inverse of this ratio, these numbers were inverted to achieve the results in Table 19. To find the peak demand, multiply the average hourly load for a given year of the forecast by the conversion factor. An example of that 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.

$$11{,}416\ MW * 1.568 = 17{,}900\ MW\ (summer)$$

$$11{,}416\ MW * 1.282 = 14{,}635\ MW\ (winter)$$

Table 19: Peak Demand Conversion Factors

LRZ	Summer	Winter
1	1.568	1.282
2	1.672	1.267
3	1.638	1.275
4	1.717	1.303
5	1.749	1.405
6	1.542	1.340
7	1.826	1.245
8	1.739	1.412
9	1.634	1.363

5.2 NON-COINCIDENT PEAK DEMANDS

The LRZ-level non-coincident summer and winter peak demands were calculated by applying the energy-to-peak conversion factors developed earlier to the LRZ annual energy projections. These values represent the projected peak demands for the summer and winter season 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. Tables 20 to 23 provide the gross and net non-coincident peak demand projections for summer and winter. Figures 51 to 59 provide the same information graphically.

MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Table 20: Summer Non-coincident Peak Demand Using Gross Forecast (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	17,916	12,720	8,898	9,787	8,835	17,971	21,165	6,793	23,610
2014	17,458	12,660	8,779	9,758	8,802	18,025	21,309	6,890	23,771
2015	17,796	12,922	8,928	9,927	8,898	18,293	21,721	7,007	23,845
2016	18,243	13,251	9,088	10,084	9,010	18,587	22,203	7,138	24,196
2017	18,680	13,607	9,264	10,196	9,109	18,870	22,622	7,283	24,520
2018	19,057	13,914	9,414	10,266	9,201	19,104	22,963	7,414	24,848
2019	19,378	14,195	9,559	10,325	9,277	19,324	23,373	7,540	25,217
2020	19,687	14,438	9,699	10,380	9,353	19,551	23,787	7,655	25,509
2021	19,934	14,625	9,802	10,408	9,396	19,786	24,122	7,742	25,615
2022	20,236	14,888	9,960	10,447	9,436	20,008	24,435	7,874	25,766
2023	20,571	15,162	10,135	10,491	9,479	20,224	24,694	8,008	25,988
2024	20,910	15,448	10,325	10,534	9,521	20,454	25,111	8,148	26,347
Annual Growth Rates (%)									
2013-2014	-2.55	-0.47	-1.33	-0.29	-0.37	0.30	0.68	1.43	0.68
2014-2015	1.94	2.06	1.70	1.73	1.08	1.49	1.94	1.70	0.31
2015-2016	2.51	2.55	1.79	1.58	1.27	1.61	2.22	1.87	1.47
2016-2017	2.40	2.68	1.93	1.12	1.10	1.52	1.89	2.02	1.34
2017-2018	2.02	2.26	1.62	0.68	1.01	1.24	1.51	1.80	1.33
2018-2019	1.68	2.03	1.54	0.58	0.82	1.15	1.79	1.70	1.48
2019-2020	1.59	1.71	1.46	0.53	0.82	1.18	1.77	1.52	1.16
2020-2021	1.25	1.30	1.06	0.26	0.46	1.20	1.41	1.14	0.42
2021-2022	1.52	1.80	1.62	0.38	0.43	1.13	1.30	1.71	0.59
2022-2023	1.65	1.84	1.75	0.42	0.46	1.08	1.06	1.71	0.86
2023-2024	1.65	1.89	1.87	0.41	0.44	1.14	1.69	1.75	1.38
Compound Annual Growth Rates (%)									
2013-2018	1.24	1.81	1.14	0.96	0.81	1.23	1.64	1.76	1.03
2013-2024	1.41	1.78	1.36	0.67	0.68	1.18	1.57	1.67	1.00
2015-2024	1.81	2.00	1.63	0.66	0.75	1.25	1.62	1.69	1.11

MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Table 21: Winter Non-coincident Peak Demand Using Gross Forecast (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,645	9,636	6,924	7,427	7,098	15,625	14,431	5,515	19,683
2014	14,271	9,590	6,831	7,405	7,071	15,672	14,530	5,594	19,817
2015	14,547	9,788	6,947	7,533	7,148	15,905	14,811	5,689	19,879
2016	14,912	10,038	7,072	7,652	7,239	16,161	15,139	5,795	20,171
2017	15,269	10,307	7,209	7,738	7,318	16,406	15,425	5,913	20,441
2018	15,578	10,540	7,326	7,790	7,392	16,610	15,658	6,019	20,714
2019	15,840	10,753	7,438	7,835	7,453	16,801	15,937	6,121	21,022
2020	16,093	10,937	7,547	7,877	7,514	16,998	16,219	6,215	21,265
2021	16,294	11,079	7,627	7,898	7,548	17,203	16,448	6,286	21,354
2022	16,542	11,278	7,750	7,928	7,581	17,396	16,661	6,393	21,479
2023	16,816	11,486	7,886	7,962	7,615	17,584	16,838	6,502	21,665
2024	17,092	11,702	8,034	7,994	7,649	17,784	17,122	6,616	21,964
Annual Growth Rates (%)									
2013-2014	-2.55	-0.47	-1.33	-0.29	-0.37	0.30	0.68	1.43	0.68
2014-2015	1.94	2.06	1.70	1.73	1.08	1.49	1.94	1.70	0.31
2015-2016	2.51	2.55	1.79	1.58	1.27	1.61	2.22	1.87	1.47
2016-2017	2.40	2.68	1.93	1.12	1.10	1.52	1.89	2.02	1.34
2017-2018	2.02	2.26	1.62	0.68	1.01	1.24	1.51	1.80	1.33
2018-2019	1.68	2.03	1.54	0.58	0.82	1.15	1.79	1.70	1.48
2019-2020	1.59	1.71	1.46	0.53	0.82	1.18	1.77	1.52	1.16
2020-2021	1.25	1.30	1.06	0.26	0.46	1.20	1.41	1.14	0.42
2021-2022	1.52	1.80	1.62	0.38	0.43	1.13	1.30	1.71	0.59
2022-2023	1.65	1.84	1.75	0.42	0.46	1.08	1.06	1.71	0.86
2023-2024	1.65	1.89	1.87	0.41	0.44	1.14	1.69	1.75	1.38
Compound Annual Growth Rates (%)									
2013-2018	1.24	1.81	1.14	0.96	0.81	1.23	1.64	1.76	1.03
2013-2024	1.41	1.78	1.36	0.67	0.68	1.18	1.57	1.67	1.00
2015-2024	1.81	2.00	1.63	0.66	0.75	1.25	1.62	1.69	1.11

MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Table 22: Summer Non-coincident Peak Demand Using Net Forecast (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	17,710	12,636	8,818	9,719	8,792	17,885	20,977	6,762	23,559
2014	17,044	12,492	8,619	9,602	8,697	17,832	20,932	6,828	23,680
2015	17,177	12,669	8,688	9,668	8,724	18,101	21,155	6,907	23,751
2016	17,420	12,914	8,767	9,717	8,767	18,395	21,444	7,000	24,076
2017	17,656	13,185	8,862	9,721	8,796	18,677	21,665	7,107	24,376
2018	17,830	13,407	8,930	9,682	8,819	18,911	21,805	7,201	24,681
2019	17,946	13,604	8,992	9,634	8,825	19,131	22,011	7,289	25,031
2020	18,050	13,761	9,050	9,582	8,832	19,358	22,216	7,366	25,303
2021	18,090	13,864	9,070	9,504	8,805	19,593	22,340	7,416	25,389
2022	18,186	14,041	9,146	9,438	8,776	19,816	22,438	7,510	25,522
2023	18,313	14,230	9,238	9,379	8,750	20,031	22,479	7,607	25,725
2024	18,443	14,430	9,346	9,318	8,723	20,261	22,677	7,709	26,065
Annual Growth Rates (%)									
2013-2014	-3.76	-1.14	-2.26	-1.21	-1.08	-0.29	-0.21	0.97	0.51
2014-2015	0.78	1.42	0.79	0.69	0.30	1.50	1.06	1.16	0.30
2015-2016	1.42	1.93	0.92	0.50	0.50	1.62	1.36	1.35	1.37
2016-2017	1.35	2.10	1.08	0.04	0.33	1.54	1.03	1.53	1.25
2017-2018	0.99	1.69	0.77	-0.40	0.25	1.25	0.64	1.32	1.25
2018-2019	0.65	1.47	0.70	-0.50	0.07	1.16	0.94	1.22	1.42
2019-2020	0.58	1.16	0.64	-0.54	0.08	1.19	0.93	1.06	1.09
2020-2021	0.22	0.74	0.22	-0.82	-0.30	1.21	0.56	0.68	0.34
2021-2022	0.53	1.28	0.84	-0.69	-0.33	1.14	0.44	1.27	0.52
2022-2023	0.70	1.34	1.01	-0.63	-0.29	1.09	0.18	1.29	0.80
2023-2024	0.71	1.41	1.16	-0.64	-0.31	1.15	0.88	1.35	1.32
Compound Annual Growth Rates (%)									
2013-2018	0.14	1.19	0.25	-0.08	0.06	1.12	0.78	1.26	0.93
2013-2024	0.37	1.21	0.53	-0.38	-0.07	1.14	0.71	1.20	0.92
2015-2024	0.79	1.46	0.81	-0.41	0.00	1.26	0.77	1.23	1.04

MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Table 23: Winter Non-coincident Peak Demand Using Net Forecast (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,476	9,572	6,862	7,376	7,063	15,550	14,303	5,490	19,640
2014	13,932	9,463	6,707	7,286	6,987	15,504	14,273	5,543	19,741
2015	14,041	9,597	6,760	7,337	7,008	15,738	14,425	5,607	19,800
2016	14,240	9,782	6,822	7,374	7,043	15,993	14,622	5,683	20,071
2017	14,433	9,988	6,895	7,377	7,067	16,239	14,773	5,770	20,321
2018	14,575	10,156	6,948	7,348	7,085	16,442	14,868	5,846	20,575
2019	14,670	10,305	6,997	7,311	7,089	16,633	15,008	5,918	20,867
2020	14,754	10,424	7,042	7,272	7,095	16,831	15,148	5,980	21,094
2021	14,787	10,502	7,057	7,212	7,074	17,035	15,233	6,021	21,166
2022	14,865	10,636	7,117	7,162	7,050	17,229	15,300	6,097	21,276
2023	14,969	10,779	7,188	7,117	7,030	17,416	15,328	6,176	21,446
2024	15,076	10,931	7,272	7,071	7,008	17,616	15,462	6,259	21,729
Annual Growth Rates (%)									
2013-2014	-3.76	-1.14	-2.26	-1.21	-1.08	-0.29	-0.21	0.97	0.51
2014-2015	0.78	1.42	0.79	0.69	0.30	1.50	1.06	1.16	0.30
2015-2016	1.42	1.93	0.92	0.50	0.50	1.62	1.36	1.35	1.37
2016-2017	1.35	2.10	1.08	0.04	0.33	1.54	1.03	1.53	1.25
2017-2018	0.99	1.69	0.77	-0.40	0.25	1.25	0.64	1.32	1.25
2018-2019	0.65	1.47	0.70	-0.50	0.07	1.16	0.94	1.22	1.42
2019-2020	0.58	1.16	0.64	-0.54	0.08	1.19	0.93	1.06	1.09
2020-2021	0.22	0.74	0.22	-0.82	-0.30	1.21	0.56	0.68	0.34
2021-2022	0.53	1.28	0.84	-0.69	-0.33	1.14	0.44	1.27	0.52
2022-2023	0.70	1.34	1.01	-0.63	-0.29	1.09	0.18	1.29	0.80
2023-2024	0.71	1.41	1.16	-0.64	-0.31	1.15	0.88	1.35	1.32
Compound Annual Growth Rates (%)									
2013-2018	0.14	1.19	0.25	-0.08	0.06	1.12	0.78	1.26	0.93
2013-2024	0.37	1.21	0.53	-0.38	-0.07	1.14	0.71	1.20	0.92
2015-2024	0.79	1.46	0.81	-0.41	0.00	1.26	0.77	1.23	1.04

MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Figure 51: Net and Gross LRZ 1 Summer and Winter Non-coincident Peak Demand (MW)

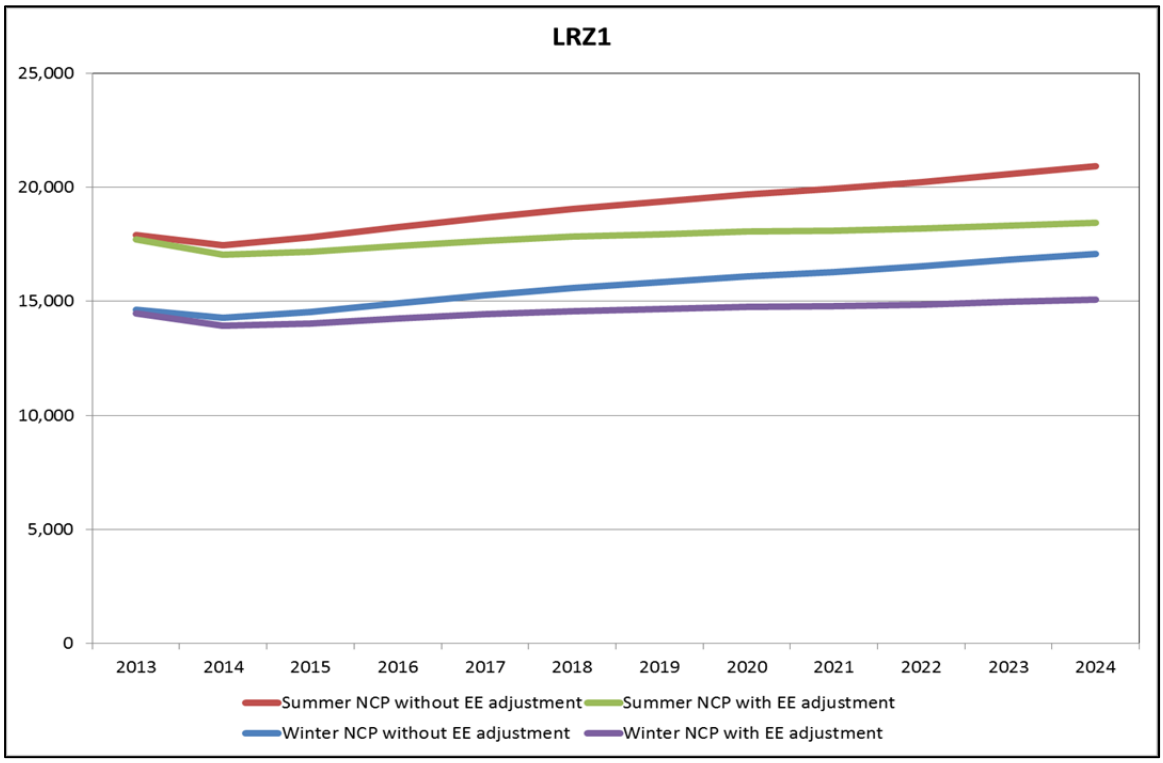
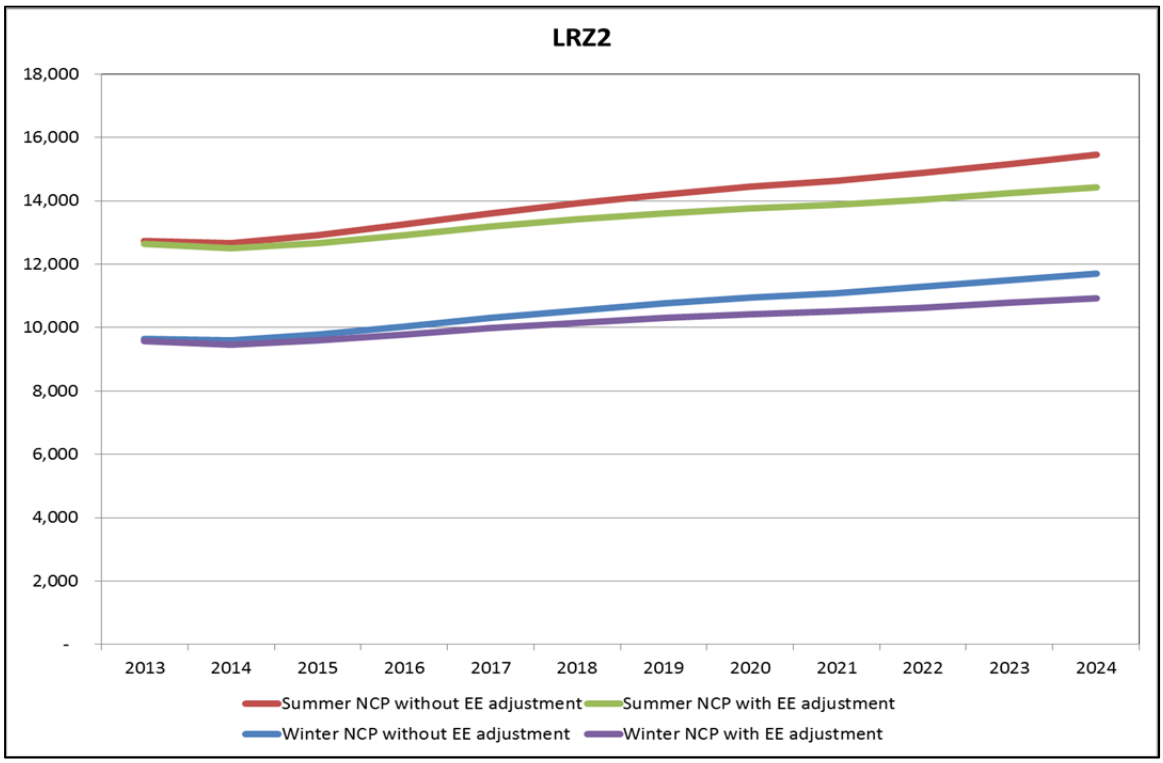


Figure 52: Net and Gross LRZ 2 Summer and Winter Non-coincident Peak Demand (MW)



MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Figure 53: Net and Gross LRZ 3 Summer and Winter Non-coincident Peak Demand (MW)

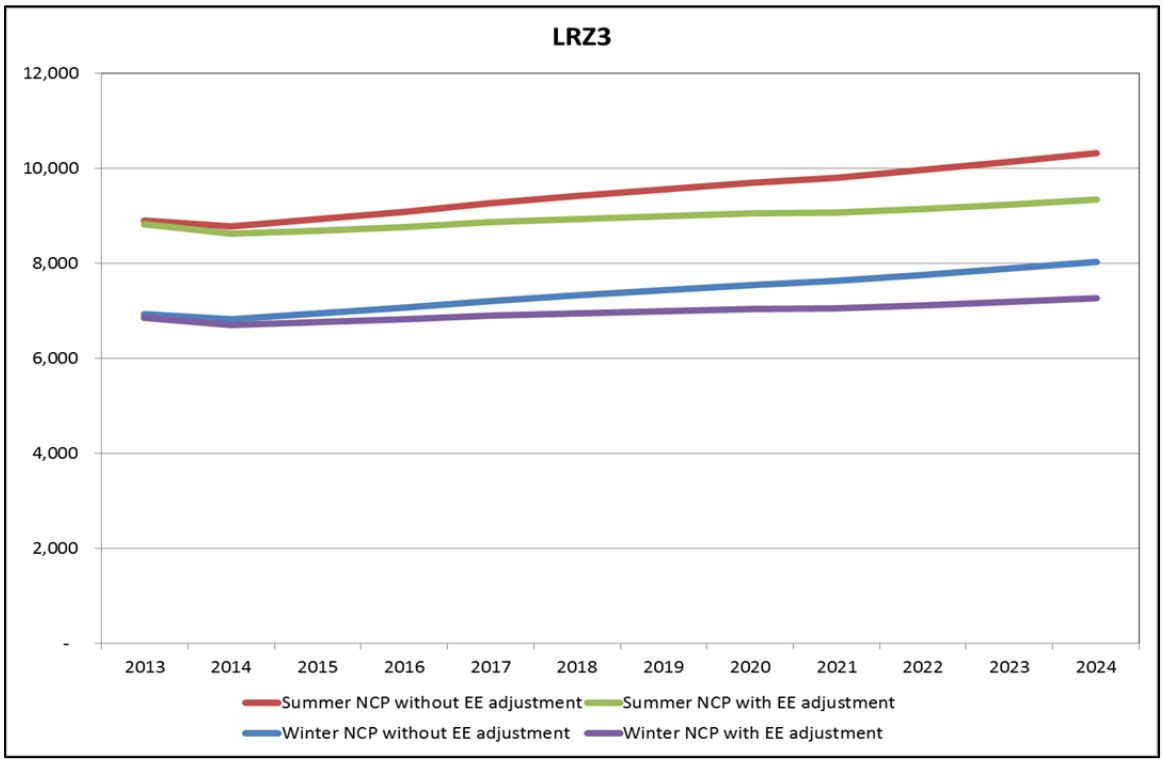


Figure 54: Net and Gross LRZ 4 Summer and Winter Non-coincident Peak Demand (MW)

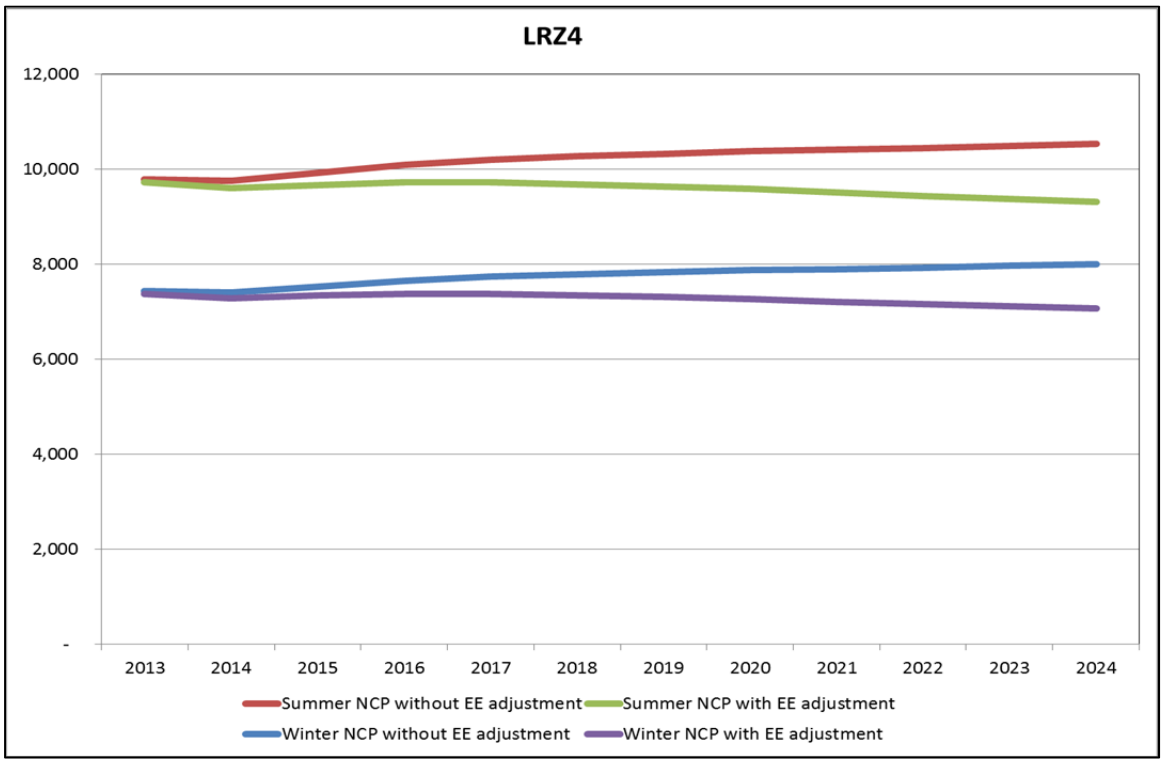


Figure 55: Net and Gross LRZ 5 Summer and Winter Non-coincident Peak Demand (MW)

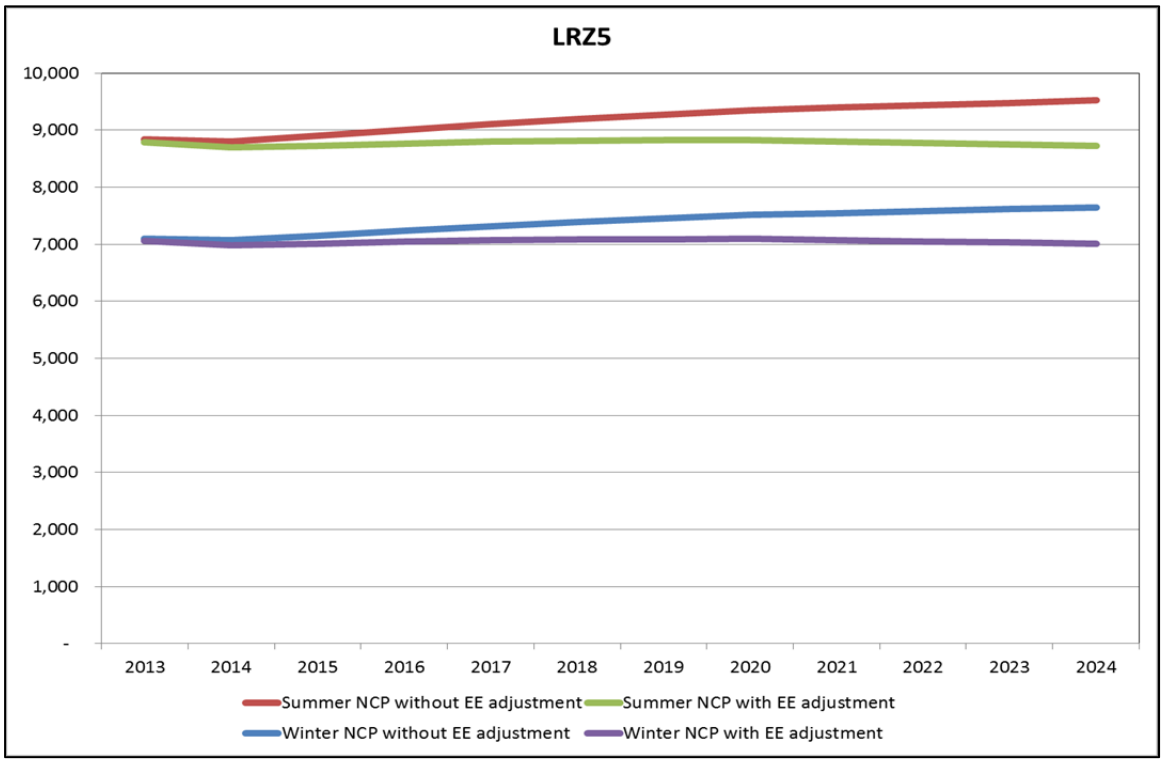
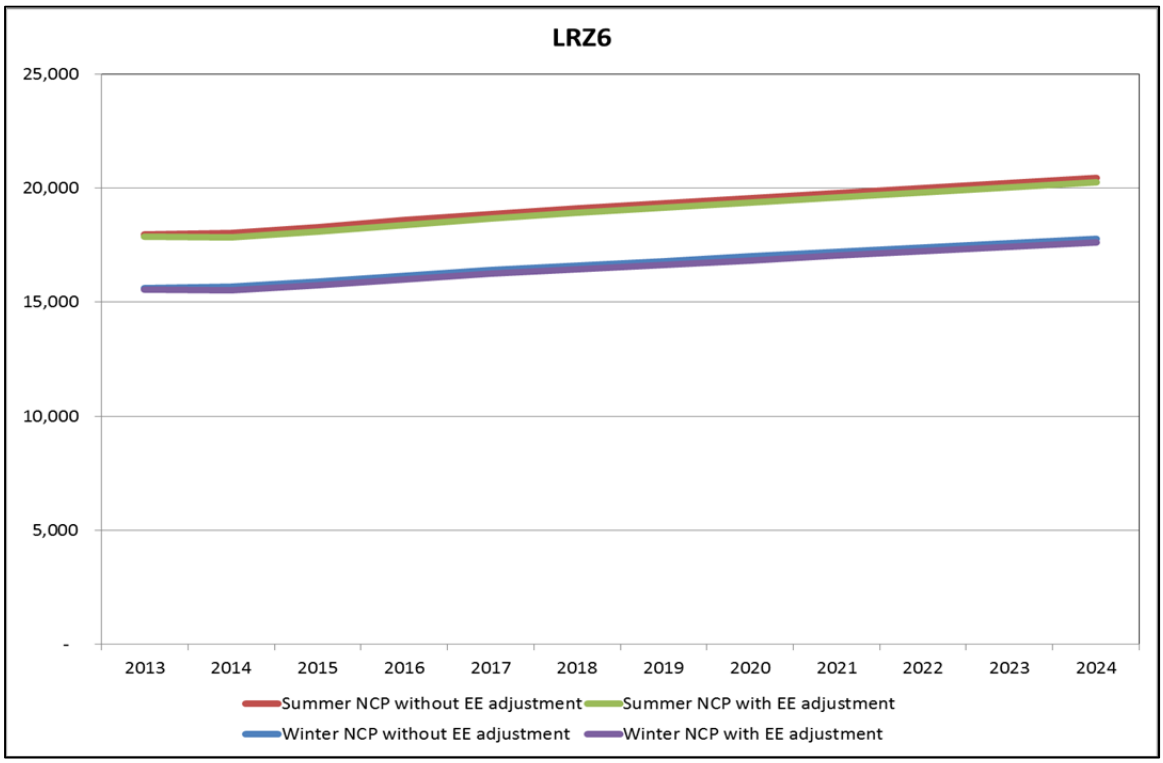


Figure 56: Net and Gross LRZ 6 Summer and Winter Non-coincident Peak Demand (MW)



MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Figure 57: Net and Gross LRZ 7 Summer and Winter Non-coincident Peak Demand (MW)

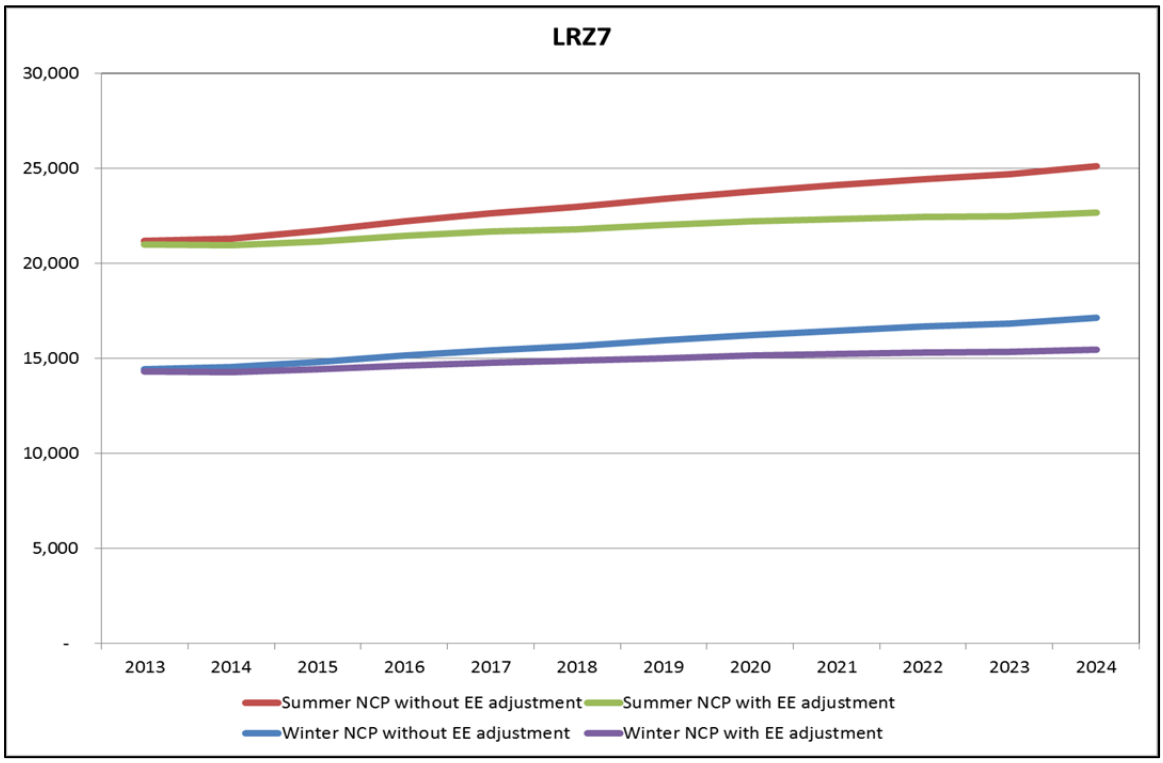
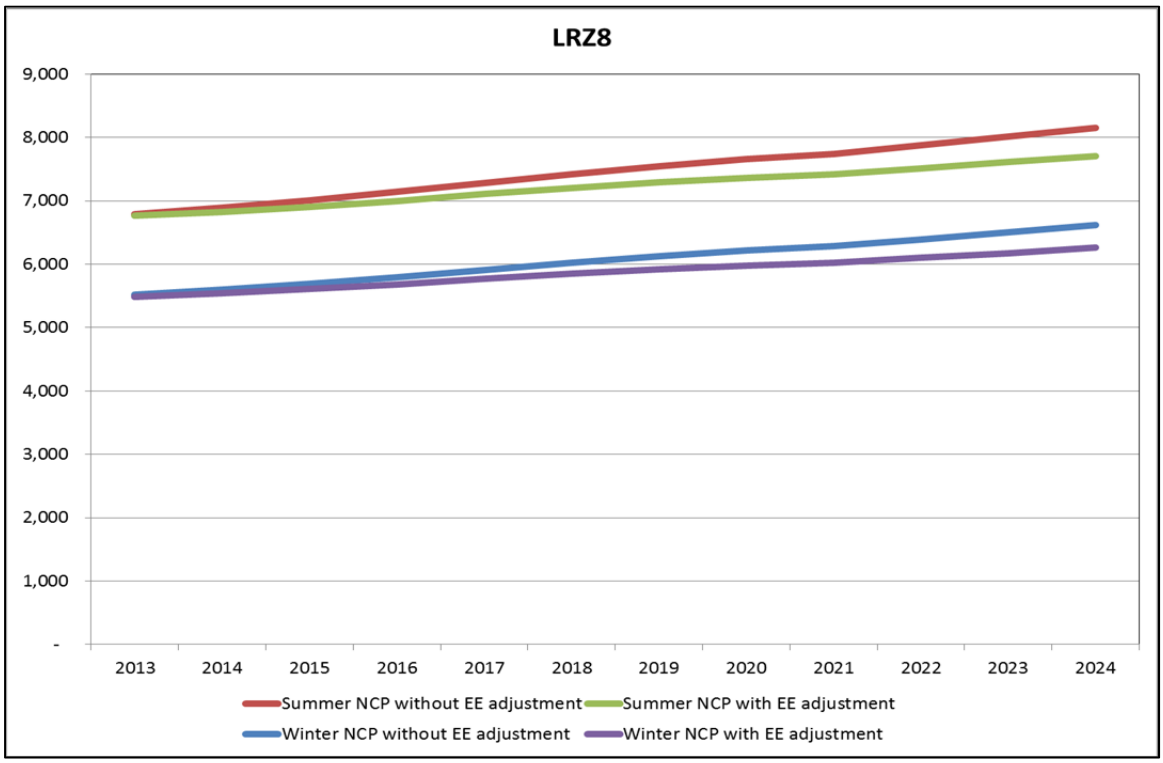
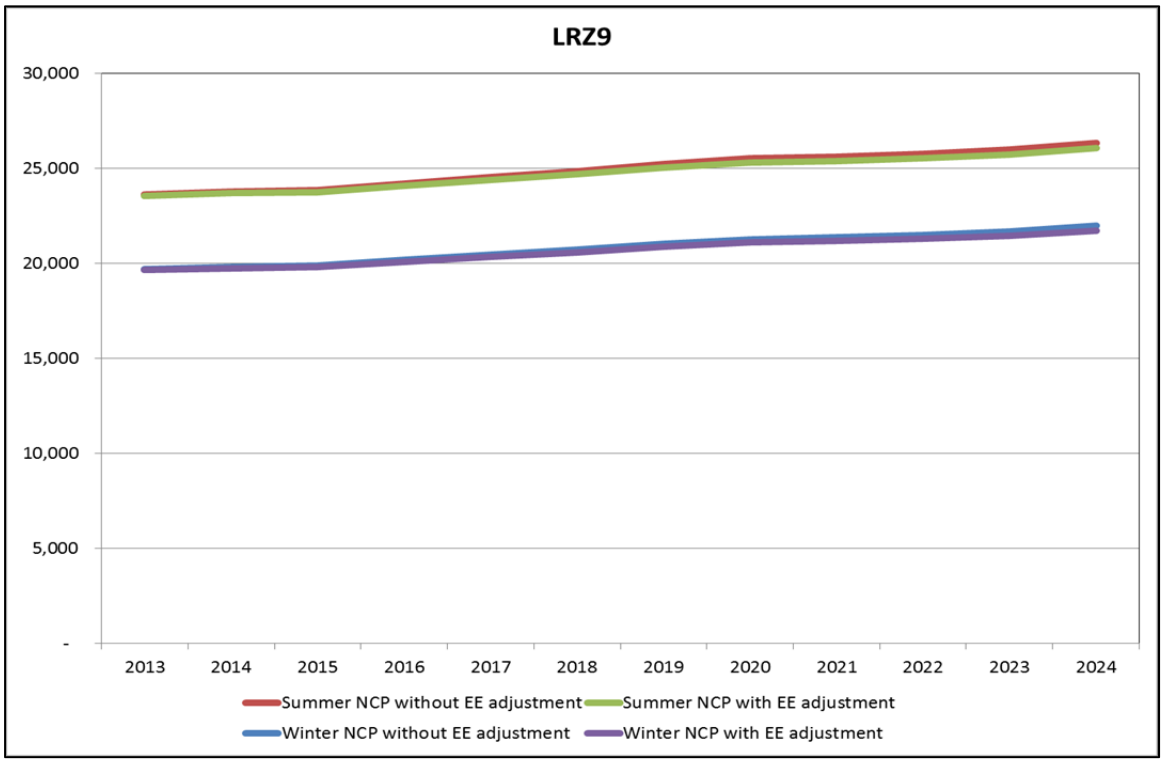


Figure 58: Net and Gross LRZ 8 Summer and Winter Non-coincident Peak Demand (MW)



MISO REGIONAL NON-COINCIDENT PEAK DEMAND FORECASTS

Figure 59: Net and Gross LRZ 9 Summer and Winter Non-coincident Peak Demand (MW)



6 MISO System-wide Forecasts

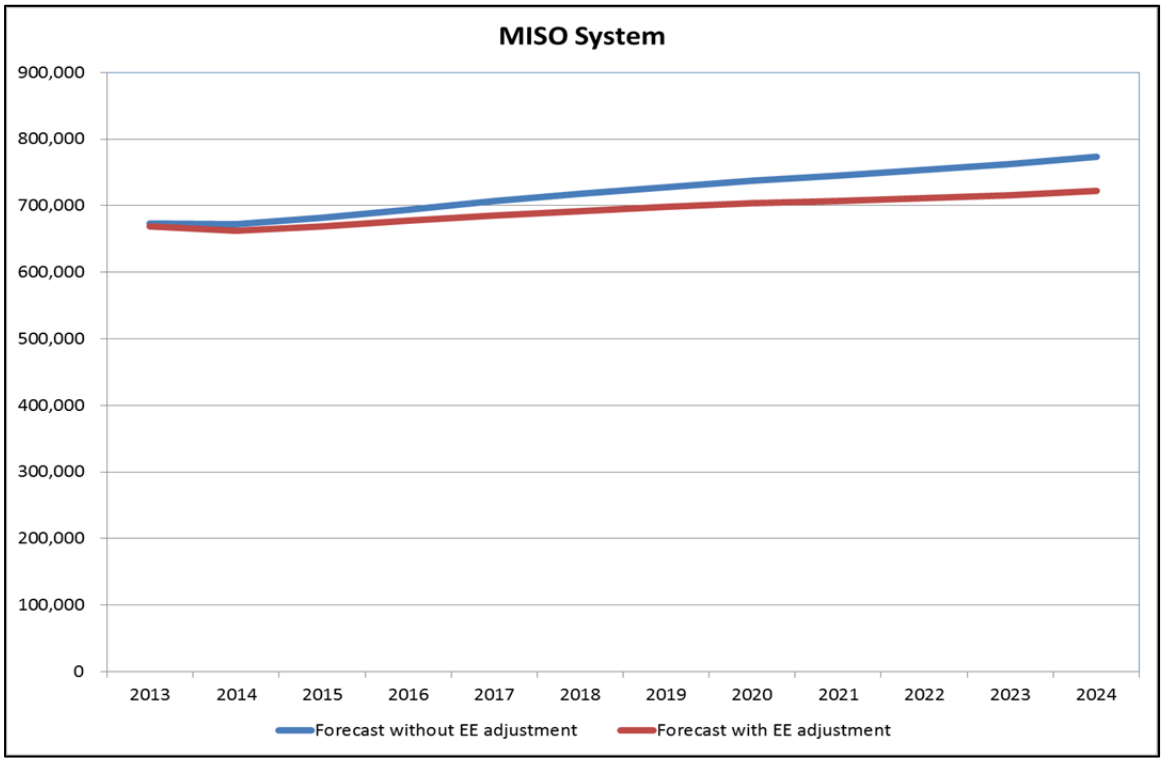
6.1 MISO SYSTEM ENERGY FORECAST

The MISO system energy forecast is found by summing the individual LRZ energy forecasts. Table 24 and Figure 60 provide the MISO-level energy forecast. Note: the forecasts are for the specified calendar year, not the MISO planning year.

Table 24: Net and Gross MISO System Energy (Annual Metered Load in GWh)

Year	MISO energy without EE adjustment	MISO energy with EE adjustment
2013	672,947	668,544
2014	671,478	662,403
2015	681,362	668,277
2016	694,326	677,080
2017	706,724	685,307
2018	717,440	691,826
2019	727,990	698,179
2020	737,819	703,782
2021	745,039	706,760
2022	753,600	711,077
2023	762,615	715,834
2024	773,382	722,332
Annual Growth Rates (%)		
2013-2014	-0.22	-0.92
2014-2015	1.47	0.89
2015-2016	1.90	1.32
2016-2017	1.79	1.22
2017-2018	1.52	0.95
2018-2019	1.47	0.92
2019-2020	1.35	0.80
2020-2021	0.98	0.42
2021-2022	1.15	0.61
2022-2023	1.20	0.67
2023-2024	1.41	0.91
Compound Annual Growth Rates (%)		
2013-2018	1.29	0.69
2013-2024	1.27	0.71
2015-2024	1.42	0.87

Figure 60: Net and Gross 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. Summer coincidence factors were provided by MISO and are based on information from 2005 through 2012. Winter coincidence factors were calculated from hourly loads over the 2010-2012 timeframe. Table 25 lists the summer and winter coincidence factors. Note that the winter coincidence factor of 1.000 for LRZ 4 occurs because the winter peak for that zone coincided with the MISO system peak in all years examined. Table 26 and Figure 61 provide the projected coincident peak demands for the MISO system.

Table 25: Summer and Winter Coincidence Factors

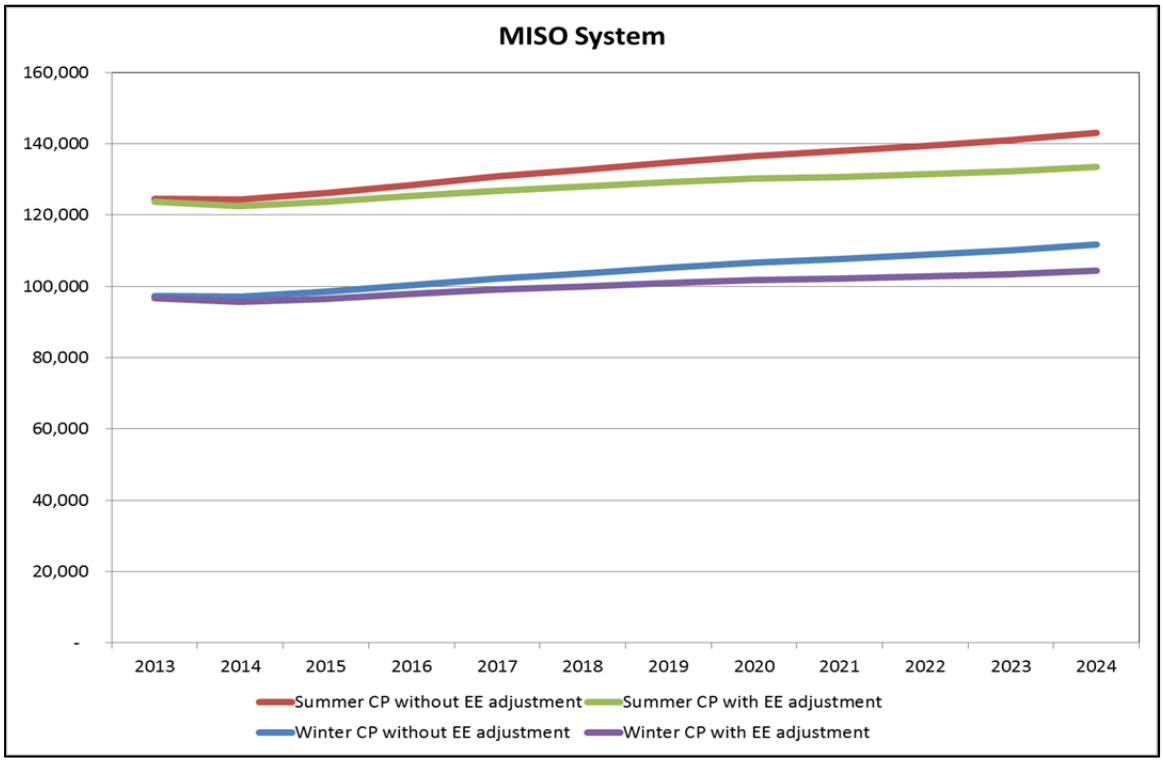
LRZ	Summer	Winter
1	0.972	0.983
2	0.983	0.977
3	0.982	0.989
4	0.980	1.000
5	0.976	0.987
6	0.995	0.986
7	0.965	0.961
8	0.966	0.920
9	0.964	0.905

MISO SYSTEM-WIDE FORECASTS

Table 26: Net and Gross MISO System Coincident Peak Demand (Metered Load in MW)

Year	MISO Summer CP without EE adjustment	MISO Summer CP with EE adjustment	MISO Winter CP without EE adjustment	MISO Winter CP with EE adjustment
2013	124,498	123,681	97,258	96,624
2014	124,258	122,575	97,041	95,732
2015	126,098	123,662	98,468	96,582
2016	128,499	125,282	100,333	97,848
2017	130,791	126,791	102,116	99,031
2018	132,769	127,981	103,657	99,968
2019	134,723	129,147	105,169	100,876
2020	136,545	130,176	106,579	101,678
2021	137,884	130,717	107,617	102,106
2022	139,467	131,502	108,847	102,726
2023	141,126	132,362	110,143	103,411
2024	143,118	133,551	111,684	104,338
Annual Growth Rates (%)				
2013-2014	-0.19	-0.89	-0.22	-0.92
2014-2015	1.48	0.89	1.47	0.89
2015-2016	1.90	1.31	1.89	1.31
2016-2017	1.78	1.20	1.78	1.21
2017-2018	1.51	0.94	1.51	0.95
2018-2019	1.47	0.91	1.46	0.91
2019-2020	1.35	0.80	1.34	0.80
2020-2021	0.98	0.42	0.97	0.42
2021-2022	1.15	0.60	1.14	0.61
2022-2023	1.19	0.65	1.19	0.67
2023-2024	1.41	0.90	1.40	0.90
Compound Annual Growth Rates (%)				
2013-2018	1.29	0.69	1.28	0.68
2013-2024	1.28	0.70	1.27	0.70
2015-2024	1.42	0.86	1.41	0.86

Figure 61: Net and Gross MISO System Coincident Peak Demand (Metered Load in MW)



APPENDIX A State Electric Energy Forecasting Models

Arkansas

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	10153.62	3412.086	2.975781	0.0085	
REAL_ELECTRICITY_PRICE	-1510.663	197.1103	-7.664052	0.0000	-0.207429
REAL_NATURAL_GAS_PRICE	260.0201	97.02004	2.680066	0.0158	0.037032
REAL_GSP	0.349524	0.026244	13.31848	0.0000	0.699647
CDD	3.666795	0.502172	7.301868	0.0000	0.204896
HDD	1.190954	0.441476	2.697663	0.0152	0.085959

R-squared	0.995397	Mean dependent var	40001.16
Adjusted R-squared	0.994044	S.D. dependent var	6727.353
S.E. of regression	519.1934	Durbin-Watson stat	2.165387
F-statistic	735.3249		
Prob(F-statistic)	0.000000		

Illinois

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at Means)
C	57313.69	23795.24	2.408619	0.0276	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-2960.353	732.7669	-4.039966	0.0009	-0.166134
REAL_INCOME/POPULATION	1117.896	381.7323	2.928482	0.0094	0.307317
NON_MANUFACTURING_EMP	0.007250	0.003488	2.078529	0.0531	0.260972
CDD	11.39225	1.531595	7.438161	0.0000	0.099273
HDD	2.500394	0.855162	2.923883	0.0095	0.099790

R-squared	0.988629	Mean dependent var	132802.6
Adjusted R-squared	0.985284	S.D. dependent var	10924.26
S.E. of regression	1325.211	Durbin-Watson stat	2.015528
F-statistic	295.5968		
Prob(F-statistic)	0.000000		

STATE ELECTRIC ENERGY FORECASTING MODELS

Indiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	27160.42	6276.360	4.327416	0.0005	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1985.668	422.2641	-4.702432	0.0002	-0.134034
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	653.4294	162.4422	4.022536	0.0009	0.039664
REAL_GSP	0.289142	0.012665	22.83091	0.0000	0.702235
CDD	5.243999	0.996895	5.260334	0.0001	0.062199
HDD	1.667886	0.574212	2.904653	0.0099	0.090906

R-squared	0.994476	Mean dependent var	95347.45
Adjusted R-squared	0.992851	S.D. dependent var	10954.77
S.E. of regression	926.2677	Durbin-Watson stat	1.874429
F-statistic	612.0405		
Prob(F-statistic)	0.000000		

Iowa

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	15314.01	4720.060	3.244453	0.0048	
REAL_ELECTRICITY_PRICE	-1649.176	354.3460	-4.654139	0.0002	-0.239605
REAL_INCOME/POPULATION	389.9282	159.4461	2.445518	0.0256	0.322735
REAL_GSP	0.152352	0.042107	3.618251	0.0021	0.431059
CDD	2.633157	0.670060	3.929732	0.0011	0.072200
HDD	0.719806	0.272836	2.638235	0.0173	0.113379

R-squared	0.992234	Mean dependent var	38922.22
Adjusted R-squared	0.989950	S.D. dependent var	5428.231
S.E. of regression	544.1910	Durbin-Watson stat	1.790356
F-statistic	434.3908		
Prob(F-statistic)	0.000000		

STATE ELECTRIC ENERGY FORECASTING MODELS

Kentucky

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at Means)
C	-74279.80	9960.544	-7.457404	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-2326.018	474.2090	-4.905047	0.0001	-0.160187
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	994.1832	234.2793	4.243582	0.0005	0.067771
POPULATION	0.035164	0.002071	16.97781	0.0000	1.729506
CDD	3.616164	1.596908	2.264478	0.0369	0.054171
HDD	2.931803	1.002025	2.925877	0.0094	0.164439

R-squared	0.982525	Mean dependent var	80805.80
Adjusted R-squared	0.977385	S.D. dependent var	9725.946
S.E. of regression	1462.621	Durbin-Watson stat	2.424052
F-statistic	191.1598		
Prob(F-statistic)	0.000000		

Louisiana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	54699.27	10064.29	5.434986	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-5194.793	368.1526	-14.11043	0.0000	-0.397645
REAL_INCOME/POPULATION	942.7084	117.7834	8.003746	0.0000	0.375089
MANUFACTURING_EMP	0.060829	0.026634	2.283883	0.0355	0.102087
CDD	5.785006	1.249078	4.631421	0.0002	0.211551
HDD	5.547568	1.016749	5.456184	0.0000	0.113428

R-squared	0.983642	Mean dependent var	76157.68
Adjusted R-squared	0.978830	S.D. dependent var	6267.344
S.E. of regression	911.8835	Durbin-Watson stat	2.292839
F-statistic	204.4457		
Prob(F-statistic)	0.000000		

STATE ELECTRIC ENERGY FORECASTING MODELS

Michigan

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1992 2012
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	9887.556	23906.46	0.413593	0.6850	
REAL_ELECTRICITY_PRICE(-2)	-2009.455	777.2216	-2.585433	0.0207	-0.172984
REAL_INCOME/POPULATION	2260.565	515.8022	4.382621	0.0005	0.712365
REAL_GSP	0.052013	0.023470	2.216160	0.0426	0.173104
CDD	7.472736	2.050467	3.644406	0.0024	0.042552
HDD	2.176611	0.980449	2.220014	0.0422	0.146169

R-squared	0.974284	Mean dependent var	101334.8
Adjusted R-squared	0.965713	S.D. dependent var	7254.844
S.E. of regression	1343.371	Durbin-Watson stat	1.655936
F-statistic	113.6606		
Prob(F-statistic)	0.000000		

Minnesota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	9792.845	4056.166	2.414311	0.0273	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-751.6947	298.6641	-2.516857	0.0222	-0.084335
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	338.9010	131.5096	2.577005	0.0196	0.030419
REAL_INCOME	0.000217	8.69E-06	24.99242	0.0000	0.694308
CDD	5.226810	0.975240	5.359510	0.0001	0.068711
HDD	1.443649	0.310209	4.653789	0.0002	0.180303

R-squared	0.993427	Mean dependent var	59548.41
Adjusted R-squared	0.991494	S.D. dependent var	7398.364
S.E. of regression	682.3407	Durbin-Watson stat	1.818326
F-statistic	513.8751		
Prob(F-statistic)	0.000000		

STATE ELECTRIC ENERGY FORECASTING MODELS

Mississippi

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1991 2012
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	5015.631	3025.089	1.658011	0.1168	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-1513.318	230.6393	-6.561404	0.0000	-0.237037
REAL_INCOME/POPULATION	731.7930	288.4842	2.536683	0.0220	0.431093
REAL_GSP	0.264817	0.095223	2.781019	0.0134	0.472299
CDD	3.534194	0.667244	5.296703	0.0001	0.192359
HDD	1.446693	0.601993	2.403171	0.0287	0.076327

R-squared	0.991021	Mean dependent var	43205.89
Adjusted R-squared	0.988215	S.D. dependent var	5231.762
S.E. of regression	567.9565	Durbin-Watson stat	2.343873
F-statistic	353.1815		
Prob(F-statistic)	0.000000		

Missouri

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1997 2012
Included observations: 16

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	-92323.29	31275.91	-2.951898	0.0145	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-2870.827	1140.149	-2.517939	0.0305	-0.241815
POPULATION	0.018543	0.002333	7.947021	0.0000	1.355780
NON_MANUFACTURING_EMP	0.022565	0.009812	2.299640	0.0443	0.667380
CDD	8.196991	1.312581	6.244939	0.0001	0.141505
HDD	3.520744	0.780072	4.513355	0.0011	0.219506

R-squared	0.986652	Mean dependent var	77392.46
Adjusted R-squared	0.979979	S.D. dependent var	6559.812
S.E. of regression	928.1939	Durbin-Watson stat	2.145002
F-statistic	147.8396		
Prob(F-statistic)	0.000000		

Montana

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1996 2012
Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	-147.2706	4936.305	-0.029834	0.9768	
REAL_ELECTRICITY_PRICE	-2319.576	250.4169	-9.262858	0.0000	-1.179269
@MOVAV(REAL_NATURAL_GAS_PRICE,5)	557.3859	110.0592	5.064417	0.0005	0.325891
REAL_INCOME/POPULATION	472.6714	92.23000	5.124920	0.0004	1.121158
MANUFACTURING_EMP	0.265660	0.074082	3.585997	0.0050	0.337264
CDD	1.303610	0.495909	2.628727	0.0252	0.041810
HDD	0.720867	0.208191	3.462536	0.0061	0.398884

R-squared	0.960434	Mean dependent var	13609.20
Adjusted R-squared	0.936694	S.D. dependent var	1058.139
S.E. of regression	266.2357	Durbin-Watson stat	2.255830
F-statistic	40.45654		
Prob(F-statistic)	0.000002		

North Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1995 2012
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	-6298.058	1168.215	-5.391180	0.0001	
@MOVAV(REAL_ELECTRICITY_PRICE,2)	-832.9679	126.5348	-6.582914	0.0000	-0.360069
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	151.4305	37.61366	4.025945	0.0014	0.050621
NON_MANUFACTURING_EMP	0.056609	0.001436	39.41398	0.0000	1.553223
HDD	0.371532	0.071051	5.229110	0.0002	0.293716

R-squared	0.994687	Mean dependent var	10705.33
Adjusted R-squared	0.993052	S.D. dependent var	2027.470
S.E. of regression	168.9944	Durbin-Watson stat	2.419346
F-statistic	608.4711		
Prob(F-statistic)	0.000000		

South Dakota

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1995 2012
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	-24504.61	1213.219	-20.19801	0.0000	
@MOVAV(REAL_ELECTRICITY_PRICE,3)	-341.9450	89.70761	-3.811772	0.0025	-0.207574
@MOVAV(REAL_NATURAL_GAS_PRICE,3)	105.8534	23.60448	4.484462	0.0007	0.051028
POPULATION	0.043675	0.000848	51.53076	0.0000	3.109470
CDD	0.345942	0.115548	2.993940	0.0112	0.027503
HDD	0.193068	0.037102	5.203737	0.0002	0.153476

R-squared	0.998637	Mean dependent var	9446.345
Adjusted R-squared	0.998069	S.D. dependent var	1490.663
S.E. of regression	65.50321	Durbin-Watson stat	2.071926
F-statistic	1758.412		
Prob(F-statistic)	0.000000		

Texas

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	30527.38	33755.29	0.904373	0.3784	
@MOVAV(REAL_ELECTRICITY_PRICE,5)	-4641.131	1375.351	-3.374506	0.0036	-0.108300
REAL_INCOME/POPULATION	3515.000	1454.605	2.416465	0.0272	0.346215
REAL_GSP	0.145494	0.026098	5.574822	0.0000	0.482663
CDD	16.16171	3.823118	4.227363	0.0006	0.170940
HDD	20.84670	5.074099	4.108454	0.0007	0.094441

R-squared	0.993627	Mean dependent var	307551.8
Adjusted R-squared	0.991752	S.D. dependent var	43037.33
S.E. of regression	3908.547	Durbin-Watson stat	1.629527
F-statistic	530.0731		
Prob(F-statistic)	0.000000		

Wisconsin

Dependent Variable: ELECTRICITY_SALES
Method: Least Squares
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Elasticity at 2012 (weather at means)
C	3338.401	4033.360	0.827697	0.4200	
REAL_ELECTRICITY_PRICE	-1409.155	165.4177	-8.518773	0.0000	-0.181672
REAL_NATURAL_GAS_PRICE	277.8522	92.06560	3.017981	0.0082	0.025929
REAL_INCOME/POPULATION	804.5379	302.7931	2.657055	0.0172	0.424950
REAL_GSP	0.161445	0.037478	4.307672	0.0005	0.528265
CDD	4.065225	0.767690	5.295401	0.0001	0.041011
HDD	1.168013	0.290250	4.024162	0.0010	0.131086

R-squared	0.996163	Mean dependent var	62989.83
Adjusted R-squared	0.994724	S.D. dependent var	7021.303
S.E. of regression	509.9883	Durbin-Watson stat	1.562163
F-statistic	692.3359		
Prob(F-statistic)	0.000000		

APPENDIX B 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	78,722	105,781	68,792
2009	43,173	136,688	99,312	43,641	88,809	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	48,232	146,969	109,973	48,021	92,824	88,885	108,190	71,927
2014	48,946	146,115	110,314	47,366	93,051	89,470	109,393	69,499
2015	49,824	148,907	112,450	48,241	93,965	88,782	112,029	70,929
2016	50,830	151,621	114,870	49,204	94,929	89,505	115,007	72,812
2017	51,967	153,803	117,367	50,243	95,749	90,150	117,895	74,576
2018	53,000	155,400	119,411	51,125	96,498	90,961	120,246	76,103
2019	53,991	156,905	121,360	51,987	97,203	91,962	122,842	77,409
2020	54,877	158,382	123,318	52,861	97,961	92,578	125,382	78,775
2021	55,579	159,416	125,334	53,584	98,745	92,298	127,477	80,020
2022	56,637	160,708	127,258	54,566	99,499	92,248	129,660	81,320
2023	57,701	162,136	129,171	55,634	100,210	92,520	131,827	82,757
2024	58,801	163,582	131,251	56,797	100,916	93,388	134,455	84,189
Compound Annual Growth Rates (%)								
1990-2012	2.48	1.15	1.61	2.02	1.73	1.30	1.10	1.68
2013-2024	1.82	0.98	1.62	1.54	0.76	0.45	2.00	1.44
2015-2024	1.86	1.05	1.73	1.83	0.80	0.56	2.05	1.92

HIGH AND LOW FORECASTS

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

Year	MS	MO	MT	ND	SD	TX	WI
1990	32,127	53,925	13,125	7,014	6,334	237,415	49,198
1991	33,019	56,514	13,407	7,255	6,685	240,352	51,032
1992	33,241	54,411	13,096	7,128	6,494	239,431	50,925
1993	34,749	58,622	12,929	7,432	6,905	250,084	53,156
1994	36,627	59,693	13,184	7,681	7,174	258,180	55,412
1995	37,868	62,259	13,419	7,883	7,414	263,279	57,967
1996	39,622	64,843	13,820	8,314	7,736	278,450	58,744
1997	40,089	65,711	11,917	8,282	7,773	286,704	60,094
1998	42,510	69,010	14,145	8,220	7,824	304,705	62,061
1999	43,980	69,045	13,282	9,112	7,922	301,844	63,547
2000	45,336	72,643	14,580	9,413	8,283	318,263	65,146
2001	44,287	73,213	11,447	9,810	8,627	318,044	65,218
2002	45,452	75,001	12,831	10,219	8,937	320,846	66,999
2003	45,544	74,270	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	347,059	70,122
2009	46,049	79,687	14,326	12,649	11,010	345,296	66,286
2010	49,687	86,085	13,423	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	50,933	86,901	14,375	16,524	12,562	395,777	71,755
2014	50,892	87,219	14,160	17,046	12,814	401,761	71,459
2015	51,885	89,043	14,337	17,605	13,246	413,587	72,929
2016	53,189	91,093	14,824	18,073	13,621	426,875	74,789
2017	54,491	92,966	15,472	18,443	13,969	439,470	76,815
2018	55,645	94,566	16,005	18,768	14,283	450,205	78,573
2019	56,830	95,980	16,547	18,899	14,581	461,174	80,201
2020	57,925	97,387	16,934	18,920	14,889	472,228	81,629
2021	58,825	98,332	16,898	18,844	15,208	482,575	82,736
2022	59,786	99,252	17,339	18,828	15,510	492,964	84,315
2023	60,864	100,249	17,839	18,887	15,789	503,702	85,986
2024	62,161	101,227	18,395	18,940	16,047	515,291	87,686
Compound Annual Growth Rates (%)							
1990-2012	1.88	1.95	0.25	3.43	2.84	1.98	1.54
2013-2024	1.83	1.40	2.27	1.25	2.25	2.43	1.84
2015-2024	2.03	1.44	2.81	0.82	2.15	2.47	2.07

HIGH AND LOW FORECASTS

Net 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	78,722	105,781	68,792
2009	43,173	136,688	99,312	43,641	88,809	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	48,015	145,976	109,022	47,601	92,824	88,885	107,257	70,906
2014	48,512	143,786	108,190	46,526	93,051	89,470	107,498	67,440
2015	49,130	145,032	110,325	46,981	93,965	88,782	109,160	67,839
2016	49,876	146,120	112,745	47,528	94,929	89,505	111,140	68,690
2017	50,752	146,663	115,243	48,145	95,749	90,150	113,005	69,434
2018	51,525	146,615	117,287	48,600	96,498	90,961	114,307	69,932
2019	52,256	146,477	119,236	49,035	97,203	91,962	115,832	70,198
2020	52,882	146,310	121,194	49,482	97,961	92,578	117,279	70,516
2021	53,324	145,704	123,210	49,778	98,745	92,298	118,258	70,707
2022	54,121	145,362	125,133	50,333	99,499	92,248	119,306	70,951
2023	54,925	145,160	127,046	50,974	100,210	92,520	120,320	71,327
2024	55,765	144,979	129,126	51,710	100,916	93,388	121,775	71,694
Compound Annual Growth Rates (%)								
1990-2012	2.48	1.15	1.61	2.02	1.73	1.30	1.10	1.68
2013-2024	1.37	-0.06	1.55	0.76	0.76	0.45	1.16	0.10
2015-2024	1.42	0.00	1.76	1.07	0.80	0.56	1.22	0.62

HIGH AND LOW FORECASTS

Net 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	74,270	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	347,059	70,122
2009	46,049	79,687	14,326	12,649	11,010	345,296	66,286
2010	49,687	86,085	13,423	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	50,933	86,488	14,375	16,524	12,562	389,059	71,301
2014	50,892	86,201	14,160	17,046	12,814	389,798	70,551
2015	51,885	87,335	14,337	17,605	13,246	401,462	71,567
2016	53,189	88,687	14,824	18,073	13,621	412,196	72,973
2017	54,491	89,851	15,472	18,443	13,969	422,439	74,545
2018	55,645	90,732	16,005	18,768	14,283	430,931	75,849
2019	56,830	91,420	16,547	18,899	14,581	440,041	77,023
2020	57,925	92,096	16,934	18,920	14,889	449,100	77,997
2021	58,825	92,304	16,898	18,844	15,208	457,463	78,650
2022	59,786	92,486	17,339	18,828	15,510	466,021	79,775
2023	60,864	92,743	17,839	18,887	15,789	474,884	80,992
2024	62,161	92,978	18,395	18,940	16,047	484,532	82,238
Compound Annual Growth Rates (%)							
1990-2012	1.88	1.95	0.25	3.43	2.84	1.98	1.54
2013-2024	1.83	0.66	2.27	1.25	2.25	2.02	1.31
2015-2024	2.03	0.70	2.81	0.82	2.15	2.11	1.56

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	102,350	67,714	48,713	50,894	45,696	104,851	104,615	35,063	129,089
2014	99,828	67,518	48,055	50,599	45,864	105,233	105,779	35,579	129,955
2015	101,909	68,926	48,949	51,486	46,729	106,856	108,328	36,218	130,405
2016	104,613	70,689	49,931	52,344	47,710	108,631	111,207	36,950	132,412
2017	107,248	72,593	50,974	53,015	48,593	110,360	114,000	37,776	134,306
2018	109,530	74,237	51,857	53,482	49,330	111,812	116,273	38,527	136,188
2019	111,493	75,780	52,716	53,917	49,967	113,190	118,783	39,246	138,277
2020	113,398	77,147	53,588	54,340	50,597	114,598	121,239	39,890	139,965
2021	114,943	78,214	54,309	54,609	50,985	116,049	123,265	40,400	140,677
2022	116,811	79,694	55,278	54,966	51,358	117,436	125,376	41,166	141,638
2023	118,879	81,253	56,332	55,368	51,768	118,795	127,472	41,937	142,974
2024	120,961	82,860	57,476	55,775	52,167	120,238	130,013	42,734	145,021
Annual Growth Rates (%)									
2013-2014	-2.46	-0.29	-1.35	-0.58	0.37	0.36	1.11	1.47	0.67
2014-2015	2.08	2.09	1.86	1.75	1.89	1.54	2.41	1.80	0.35
2015-2016	2.65	2.56	2.01	1.67	2.10	1.66	2.66	2.02	1.54
2016-2017	2.52	2.69	2.09	1.28	1.85	1.59	2.51	2.24	1.43
2017-2018	2.13	2.26	1.73	0.88	1.52	1.32	1.99	1.99	1.40
2018-2019	1.79	2.08	1.66	0.81	1.29	1.23	2.16	1.87	1.53
2019-2020	1.71	1.80	1.65	0.78	1.26	1.24	2.07	1.64	1.22
2020-2021	1.36	1.38	1.35	0.50	0.77	1.27	1.67	1.28	0.51
2021-2022	1.63	1.89	1.79	0.65	0.73	1.20	1.71	1.90	0.68
2022-2023	1.77	1.96	1.91	0.73	0.80	1.16	1.67	1.87	0.94
2023-2024	1.75	1.98	2.03	0.73	0.77	1.21	1.99	1.90	1.43
Compound Annual Growth Rates (%)									
2013-2018	1.37	1.86	1.26	1.00	1.54	1.29	2.14	1.90	1.08
2013-2024	1.53	1.85	1.52	0.84	1.21	1.25	2.00	1.81	1.06
2015-2024	1.92	2.07	1.80	0.89	1.23	1.32	2.05	1.86	1.19

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	101,198	67,273	48,289	50,550	45,480	104,359	103,713	34,905	128,718
2014	97,508	66,634	47,200	49,792	45,329	104,134	103,946	35,264	129,295
2015	98,426	67,600	47,661	50,146	45,833	105,756	105,553	35,713	129,735
2016	99,969	68,919	48,213	50,444	46,450	107,531	107,468	36,255	131,601
2017	101,453	70,377	48,820	50,554	46,965	109,260	109,272	36,891	133,365
2018	102,575	71,575	49,262	50,459	47,330	110,712	110,530	37,452	135,124
2019	103,365	72,670	49,680	50,333	47,593	112,090	112,005	37,981	137,110
2020	104,090	73,588	50,110	50,198	47,848	113,498	113,404	38,435	138,688
2021	104,450	74,205	50,389	49,912	47,859	114,949	114,351	38,755	139,291
2022	105,128	75,234	50,918	49,718	47,856	116,336	115,365	39,331	140,149
2023	106,003	76,341	51,530	49,571	47,892	117,695	116,345	39,912	141,382
2024	106,887	77,496	52,233	49,432	47,916	119,138	117,752	40,519	143,323
Annual Growth Rates (%)									
2013-2014	-3.65	-0.95	-2.25	-1.50	-0.33	-0.22	0.22	1.03	0.45
2014-2015	0.94	1.45	0.98	0.71	1.11	1.56	1.55	1.27	0.34
2015-2016	1.57	1.95	1.16	0.59	1.35	1.68	1.81	1.52	1.44
2016-2017	1.48	2.12	1.26	0.22	1.11	1.61	1.68	1.75	1.34
2017-2018	1.11	1.70	0.90	-0.19	0.78	1.33	1.15	1.52	1.32
2018-2019	0.77	1.53	0.85	-0.25	0.56	1.24	1.33	1.41	1.47
2019-2020	0.70	1.26	0.87	-0.27	0.54	1.26	1.25	1.19	1.15
2020-2021	0.35	0.84	0.56	-0.57	0.02	1.28	0.83	0.83	0.43
2021-2022	0.65	1.39	1.05	-0.39	-0.01	1.21	0.89	1.49	0.62
2022-2023	0.83	1.47	1.20	-0.29	0.07	1.17	0.85	1.48	0.88
2023-2024	0.83	1.51	1.36	-0.28	0.05	1.23	1.21	1.52	1.37
Compound Annual Growth Rates (%)									
2013-2018	0.27	1.25	0.40	-0.04	0.80	1.19	1.28	1.42	0.98
2013-2024	0.50	1.29	0.72	-0.20	0.48	1.21	1.16	1.37	0.98
2015-2024	0.92	1.53	1.02	-0.16	0.50	1.33	1.22	1.41	1.11

HIGH AND LOW FORECASTS

Summer Non-coincident Peak Demand Using Gross Forecast (Metered Load in MW) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	18,318	12,927	9,111	9,973	9,123	18,451	21,803	6,960	24,085
2014	17,867	12,889	8,988	9,915	9,157	18,518	22,045	7,063	24,247
2015	18,239	13,158	9,155	10,089	9,330	18,804	22,577	7,189	24,331
2016	18,723	13,495	9,339	10,257	9,525	19,116	23,177	7,335	24,705
2017	19,195	13,858	9,534	10,388	9,702	19,420	23,759	7,499	25,059
2018	19,603	14,172	9,699	10,480	9,849	19,676	24,233	7,648	25,410
2019	19,955	14,466	9,860	10,565	9,976	19,918	24,756	7,790	25,800
2020	20,296	14,727	10,023	10,648	10,102	20,166	25,268	7,918	26,114
2021	20,572	14,931	10,158	10,701	10,179	20,421	25,690	8,019	26,247
2022	20,906	15,214	10,339	10,771	10,254	20,665	26,130	8,171	26,426
2023	21,277	15,511	10,536	10,850	10,336	20,905	26,566	8,325	26,676
2024	21,649	15,818	10,750	10,929	10,415	21,158	27,096	8,483	27,058
Annual Growth Rates (%)									
2013-2014	-2.46	-0.29	-1.35	-0.58	0.37	0.36	1.11	1.47	0.67
2014-2015	2.08	2.09	1.86	1.75	1.89	1.54	2.41	1.80	0.35
2015-2016	2.65	2.56	2.01	1.67	2.10	1.66	2.66	2.02	1.54
2016-2017	2.52	2.69	2.09	1.28	1.85	1.59	2.51	2.24	1.43
2017-2018	2.13	2.26	1.73	0.88	1.52	1.32	1.99	1.99	1.40
2018-2019	1.79	2.08	1.66	0.81	1.29	1.23	2.16	1.87	1.53
2019-2020	1.71	1.80	1.65	0.78	1.26	1.24	2.07	1.64	1.22
2020-2021	1.36	1.38	1.35	0.50	0.77	1.27	1.67	1.28	0.51
2021-2022	1.63	1.89	1.79	0.65	0.73	1.20	1.71	1.90	0.68
2022-2023	1.77	1.96	1.91	0.73	0.80	1.16	1.67	1.87	0.94
2023-2024	1.75	1.98	2.03	0.73	0.77	1.21	1.99	1.90	1.43
Compound Annual Growth Rates (%)									
2013-2018	1.37	1.86	1.26	1.00	1.54	1.29	2.14	1.90	1.08
2013-2024	1.53	1.85	1.52	0.84	1.21	1.25	2.00	1.81	1.06
2015-2024	1.92	2.07	1.80	0.89	1.23	1.32	2.05	1.86	1.19

HIGH AND LOW FORECASTS

Winter Non-coincident Peak Demand Using Gross Forecast (Metered Load in MW) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,974	9,792	7,090	7,568	7,329	16,042	14,866	5,651	20,079
2014	14,605	9,764	6,994	7,524	7,356	16,101	15,032	5,734	20,213
2015	14,909	9,967	7,124	7,656	7,495	16,349	15,394	5,837	20,283
2016	15,305	10,222	7,267	7,784	7,652	16,620	15,803	5,955	20,595
2017	15,691	10,498	7,419	7,883	7,794	16,885	16,200	6,088	20,890
2018	16,024	10,735	7,547	7,953	7,912	17,107	16,523	6,209	21,183
2019	16,311	10,959	7,672	8,018	8,014	17,318	16,880	6,325	21,508
2020	16,590	11,156	7,799	8,080	8,116	17,533	17,229	6,429	21,770
2021	16,816	11,310	7,904	8,121	8,178	17,755	17,517	6,511	21,881
2022	17,090	11,524	8,045	8,174	8,238	17,968	17,817	6,634	22,030
2023	17,392	11,750	8,198	8,233	8,303	18,175	18,115	6,759	22,238
2024	17,697	11,982	8,365	8,294	8,367	18,396	18,476	6,887	22,557
Annual Growth Rates (%)									
2013-2014	-2.46	-0.29	-1.35	-0.58	0.37	0.36	1.11	1.47	0.67
2014-2015	2.08	2.09	1.86	1.75	1.89	1.54	2.41	1.80	0.35
2015-2016	2.65	2.56	2.01	1.67	2.10	1.66	2.66	2.02	1.54
2016-2017	2.52	2.69	2.09	1.28	1.85	1.59	2.51	2.24	1.43
2017-2018	2.13	2.26	1.73	0.88	1.52	1.32	1.99	1.99	1.40
2018-2019	1.79	2.08	1.66	0.81	1.29	1.23	2.16	1.87	1.53
2019-2020	1.71	1.80	1.65	0.78	1.26	1.24	2.07	1.64	1.22
2020-2021	1.36	1.38	1.35	0.50	0.77	1.27	1.67	1.28	0.51
2021-2022	1.63	1.89	1.79	0.65	0.73	1.20	1.71	1.90	0.68
2022-2023	1.77	1.96	1.91	0.73	0.80	1.16	1.67	1.87	0.94
2023-2024	1.75	1.98	2.03	0.73	0.77	1.21	1.99	1.90	1.43
Compound Annual Growth Rates (%)									
2013-2018	1.37	1.86	1.26	1.00	1.54	1.29	2.14	1.90	1.08
2013-2024	1.53	1.85	1.52	0.84	1.21	1.25	2.00	1.81	1.06
2015-2024	1.92	2.07	1.80	0.89	1.23	1.32	2.05	1.86	1.19

HIGH AND LOW FORECASTS

Summer Non-coincident Peak Demand Using Net Forecast (Metered Load in MW) —High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	18,112	12,843	9,032	9,906	9,080	18,364	21,615	6,929	24,016
2014	17,452	12,721	8,828	9,757	9,050	18,325	21,663	7,000	24,124
2015	17,616	12,905	8,914	9,826	9,151	18,610	21,998	7,089	24,206
2016	17,892	13,157	9,017	9,885	9,274	18,922	22,397	7,197	24,554
2017	18,158	13,435	9,131	9,906	9,377	19,227	22,773	7,323	24,883
2018	18,359	13,664	9,214	9,888	9,449	19,482	23,036	7,434	25,211
2019	18,500	13,873	9,292	9,863	9,502	19,725	23,343	7,539	25,582
2020	18,630	14,048	9,372	9,837	9,553	19,972	23,635	7,629	25,876
2021	18,694	14,166	9,425	9,781	9,555	20,228	23,832	7,693	25,989
2022	18,816	14,362	9,523	9,742	9,555	20,472	24,043	7,807	26,149
2023	18,972	14,574	9,638	9,714	9,562	20,711	24,247	7,923	26,379
2024	19,130	14,794	9,769	9,686	9,566	20,965	24,541	8,043	26,741
Annual Growth Rates (%)									
2013-2014	-3.65	-0.95	-2.25	-1.50	-0.33	-0.22	0.22	1.03	0.45
2014-2015	0.94	1.45	0.98	0.71	1.11	1.56	1.55	1.27	0.34
2015-2016	1.57	1.95	1.16	0.59	1.35	1.68	1.81	1.52	1.44
2016-2017	1.48	2.12	1.26	0.22	1.11	1.61	1.68	1.75	1.34
2017-2018	1.11	1.70	0.90	-0.19	0.78	1.33	1.15	1.52	1.32
2018-2019	0.77	1.53	0.85	-0.25	0.56	1.24	1.33	1.41	1.47
2019-2020	0.70	1.26	0.87	-0.27	0.54	1.26	1.25	1.19	1.15
2020-2021	0.35	0.84	0.56	-0.57	0.02	1.28	0.83	0.83	0.43
2021-2022	0.65	1.39	1.05	-0.39	-0.01	1.21	0.89	1.49	0.62
2022-2023	0.83	1.47	1.20	-0.29	0.07	1.17	0.85	1.48	0.88
2023-2024	0.83	1.51	1.36	-0.28	0.05	1.23	1.21	1.52	1.37
Compound Annual Growth Rates (%)									
2013-2018	0.27	1.25	0.40	-0.04	0.80	1.19	1.28	1.42	0.98
2013-2024	0.50	1.29	0.72	-0.20	0.48	1.21	1.16	1.37	0.98
2015-2024	0.92	1.53	1.02	-0.16	0.50	1.33	1.22	1.41	1.11

HIGH AND LOW FORECASTS

Winter Non-coincident Peak Demand Using Net Forecast (Metered Load in MW)—High

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,805	9,728	7,028	7,517	7,295	15,967	14,738	5,625	20,021
2014	14,266	9,636	6,869	7,404	7,270	15,932	14,771	5,683	20,111
2015	14,400	9,776	6,936	7,457	7,351	16,181	15,000	5,755	20,179
2016	14,626	9,966	7,017	7,501	7,450	16,452	15,272	5,843	20,469
2017	14,843	10,177	7,105	7,517	7,533	16,717	15,528	5,945	20,744
2018	15,007	10,350	7,169	7,503	7,591	16,939	15,707	6,036	21,017
2019	15,122	10,509	7,230	7,485	7,634	17,150	15,917	6,121	21,326
2020	15,228	10,642	7,293	7,465	7,675	17,365	16,116	6,194	21,572
2021	15,281	10,731	7,333	7,422	7,676	17,587	16,250	6,246	21,665
2022	15,380	10,879	7,410	7,393	7,676	17,799	16,394	6,339	21,799
2023	15,508	11,040	7,500	7,371	7,682	18,007	16,533	6,432	21,991
2024	15,638	11,207	7,602	7,351	7,685	18,228	16,733	6,530	22,293
Annual Growth Rates (%)									
2013-2014	-3.65	-0.95	-2.25	-1.50	-0.33	-0.22	0.22	1.03	0.45
2014-2015	0.94	1.45	0.98	0.71	1.11	1.56	1.55	1.27	0.34
2015-2016	1.57	1.95	1.16	0.59	1.35	1.68	1.81	1.52	1.44
2016-2017	1.48	2.12	1.26	0.22	1.11	1.61	1.68	1.75	1.34
2017-2018	1.11	1.70	0.90	-0.19	0.78	1.33	1.15	1.52	1.32
2018-2019	0.77	1.53	0.85	-0.25	0.56	1.24	1.33	1.41	1.47
2019-2020	0.70	1.26	0.87	-0.27	0.54	1.26	1.25	1.19	1.15
2020-2021	0.35	0.84	0.56	-0.57	0.02	1.28	0.83	0.83	0.43
2021-2022	0.65	1.39	1.05	-0.39	-0.01	1.21	0.89	1.49	0.62
2022-2023	0.83	1.47	1.20	-0.29	0.07	1.17	0.85	1.48	0.88
2023-2024	0.83	1.51	1.36	-0.28	0.05	1.23	1.21	1.52	1.37
Compound Annual Growth Rates (%)									
2013-2018	0.27	1.25	0.40	-0.04	0.80	1.19	1.28	1.42	0.98
2013-2024	0.50	1.29	0.72	-0.20	0.48	1.21	1.16	1.37	0.98
2015-2024	0.92	1.53	1.02	-0.16	0.50	1.33	1.22	1.41	1.11

HIGH AND LOW FORECASTS

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

Year	MISO energy without EE adjustment	MISO energy with EE adjustment
2013	688,986	684,486
2014	688,410	679,100
2015	699,806	686,424
2016	714,486	696,849
2017	728,865	706,957
2018	741,237	715,018
2019	753,369	722,827
2020	764,761	729,859
2021	773,450	734,160
2022	783,721	740,034
2023	794,779	746,672
2024	807,246	754,695
Annual Growth Rates (%)		
2013-2014	-0.08	-0.79
2014-2015	1.66	1.08
2015-2016	2.10	1.52
2016-2017	2.01	1.45
2017-2018	1.70	1.14
2018-2019	1.64	1.09
2019-2020	1.51	0.97
2020-2021	1.14	0.59
2021-2022	1.33	0.80
2022-2023	1.41	0.90
2023-2024	1.57	1.07
Compound Annual Growth Rates (%)		
2013-2018	1.47	0.88
2013-2024	1.45	0.89
2015-2024	1.60	1.06

HIGH AND LOW FORECASTS

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

Year	MISO Summer CP without EE adjustment	MISO Summer CP with EE adjustment	MISO Winter CP without EE adjustment	MISO Winter CP with EE adjustment
2013	127,477	126,643	99,581	98,933
2014	127,412	125,686	99,493	98,151
2015	129,542	127,051	101,140	99,211
2016	132,270	128,981	103,255	100,713
2017	134,942	130,850	105,324	102,168
2018	137,237	132,335	107,104	103,328
2019	139,493	133,779	108,844	104,447
2020	141,613	135,079	110,480	105,456
2021	143,229	135,870	111,730	106,074
2022	145,138	136,952	113,206	106,918
2023	147,189	138,172	114,794	107,871
2024	149,503	139,650	116,580	109,019
Annual Growth Rates (%)				
2013-2014	-0.05	-0.76	-0.09	-0.79
2014-2015	1.67	1.09	1.66	1.08
2015-2016	2.11	1.52	2.09	1.51
2016-2017	2.02	1.45	2.00	1.44
2017-2018	1.70	1.13	1.69	1.13
2018-2019	1.64	1.09	1.63	1.08
2019-2020	1.52	0.97	1.50	0.97
2020-2021	1.14	0.59	1.13	0.59
2021-2022	1.33	0.80	1.32	0.80
2022-2023	1.41	0.89	1.40	0.89
2023-2024	1.57	1.07	1.56	1.06
Compound Annual Growth Rates (%)				
2013-2018	1.49	0.88	1.47	0.87
2013-2024	1.46	0.89	1.44	0.89
2015-2024	1.61	1.06	1.59	1.05

HIGH AND LOW FORECASTS

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

Year	AR	IL	IN	IA	KY	LA	MI	MN
1990	27,365	111,577	73,982	29,437	61,097	63,826	82,367	47,167
1991	28,440	116,869	77,034	30,781	64,194	64,704	84,519	48,755
1992	28,451	112,521	76,977	30,208	67,068	65,098	83,840	47,412
1993	31,663	117,786	81,931	32,104	68,149	67,756	87,589	49,211
1994	32,619	121,490	83,808	33,039	72,485	70,132	91,160	51,155
1995	34,671	126,231	87,006	34,301	74,548	72,827	94,701	53,959
1996	36,137	125,990	88,901	34,999	77,019	75,269	96,302	54,942
1997	36,858	126,953	89,147	36,148	76,836	75,886	97,391	55,674
1998	39,315	131,697	92,059	37,318	75,850	77,716	100,506	56,744
1999	39,789	132,682	96,735	38,034	79,098	78,267	103,981	57,399
2000	41,611	134,697	97,775	39,088	78,316	80,690	104,772	59,782
2001	41,732	136,034	97,734	39,444	79,975	74,693	102,409	60,687
2002	42,450	138,447	101,429	40,898	87,267	79,261	104,714	62,162
2003	43,108	136,248	100,468	41,207	85,220	77,769	108,877	63,087
2004	43,672	139,254	103,094	40,903	86,521	79,737	106,606	63,340
2005	46,165	144,986	106,549	42,757	89,351	77,389	110,445	66,019
2006	46,636	142,448	105,664	43,337	88,743	77,468	108,018	66,770
2007	47,055	146,055	109,420	45,270	92,404	79,567	109,297	68,231
2008	46,135	144,620	106,981	45,488	93,428	78,722	105,781	68,792
2009	43,173	136,688	99,312	43,641	88,809	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	45,926	141,484	105,486	45,742	86,766	85,461	101,856	68,805
2014	46,566	141,490	105,653	45,125	86,883	86,115	102,081	66,407
2015	47,310	144,129	107,437	45,800	87,776	85,397	103,539	67,626
2016	48,122	146,498	109,505	46,508	88,693	85,920	105,346	69,276
2017	48,993	148,110	111,634	47,340	89,404	86,317	106,615	70,813
2018	49,784	149,040	113,354	48,068	90,002	86,924	107,647	72,119
2019	50,541	149,767	114,990	48,766	90,524	87,758	109,122	73,221
2020	51,250	150,408	116,646	49,396	91,129	88,212	110,685	74,397
2021	51,765	150,674	118,332	49,768	91,802	87,764	111,920	75,475
2022	52,546	151,047	119,917	50,510	92,424	87,503	112,842	76,578
2023	53,350	151,428	121,474	51,342	92,976	87,569	113,243	77,784
2024	54,199	151,756	123,207	52,253	93,505	88,264	114,757	78,987
Compound Annual Growth Rates (%)								
1990-2012	2.48	1.15	1.61	2.02	1.73	1.30	1.10	1.68
2013-2024	1.52	0.64	1.42	1.22	0.68	0.29	1.09	1.26
2015-2024	1.52	0.57	1.53	1.48	0.70	0.37	1.15	1.74

HIGH AND LOW FORECASTS

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

Year	MS	MO	MT	ND	SD	TX	WI
1990	32,127	53,925	13,125	7,014	6,334	237,415	49,198
1991	33,019	56,514	13,407	7,255	6,685	240,352	51,032
1992	33,241	54,411	13,096	7,128	6,494	239,431	50,925
1993	34,749	58,622	12,929	7,432	6,905	250,084	53,156
1994	36,627	59,693	13,184	7,681	7,174	258,180	55,412
1995	37,868	62,259	13,419	7,883	7,414	263,279	57,967
1996	39,622	64,843	13,820	8,314	7,736	278,450	58,744
1997	40,089	65,711	11,917	8,282	7,773	286,704	60,094
1998	42,510	69,010	14,145	8,220	7,824	304,705	62,061
1999	43,980	69,045	13,282	9,112	7,922	301,844	63,547
2000	45,336	72,643	14,580	9,413	8,283	318,263	65,146
2001	44,287	73,213	11,447	9,810	8,627	318,044	65,218
2002	45,452	75,001	12,831	10,219	8,937	320,846	66,999
2003	45,544	74,270	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	347,059	70,122
2009	46,049	79,687	14,326	12,649	11,010	345,296	66,286
2010	49,687	86,085	13,423	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	48,816	81,413	13,035	15,741	12,268	379,652	69,627
2014	48,747	80,464	12,697	16,199	12,490	384,494	69,120
2015	49,615	80,797	12,551	16,665	12,875	396,028	70,566
2016	50,803	81,243	12,657	17,073	13,204	409,061	72,404
2017	51,971	81,610	12,987	17,394	13,505	421,384	74,431
2018	53,025	82,129	13,259	17,688	13,787	431,786	76,183
2019	54,122	82,524	13,518	17,803	14,067	442,303	77,721
2020	55,093	82,952	13,587	17,807	14,348	452,706	78,982
2021	55,818	83,200	13,270	17,692	14,614	462,197	79,946
2022	56,629	83,427	13,474	17,635	14,858	471,911	81,361
2023	57,588	83,637	13,701	17,673	15,089	481,909	82,846
2024	58,793	83,837	13,988	17,711	15,324	492,708	84,358
Compound Annual Growth Rates (%)							
1990-2012	1.88	1.95	0.25	3.43	2.84	1.98	1.54
2013-2024	1.71	0.27	0.64	1.08	2.04	2.40	1.76
2015-2024	1.90	0.41	1.21	0.68	1.95	2.46	2.00

HIGH AND LOW FORECASTS

Net 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	78,722	105,781	68,792
2009	43,173	136,688	99,312	43,641	88,809	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	45,709	140,491	104,535	45,322	86,766	85,461	100,923	67,784
2014	46,132	139,211	103,545	44,285	86,883	86,115	100,242	64,364
2015	46,616	140,353	105,329	44,540	87,776	85,397	100,791	64,582
2016	47,168	141,149	107,398	44,832	88,693	85,920	101,676	65,248
2017	47,779	141,178	109,526	45,242	89,404	86,317	102,008	65,814
2018	48,309	140,525	111,246	45,543	90,002	86,924	102,092	66,143
2019	48,806	139,676	112,882	45,814	90,524	87,758	102,608	66,259
2020	49,255	138,751	114,539	46,017	91,129	88,212	103,200	66,443
2021	49,510	137,460	116,224	45,962	91,802	87,764	103,450	66,527
2022	50,030	136,292	117,809	46,277	92,424	87,503	103,376	66,634
2023	50,574	135,145	119,366	46,682	92,976	87,569	102,772	66,842
2024	51,163	133,957	121,099	47,166	93,505	88,264	103,278	67,045
Compound Annual Growth Rates (%)								
1990-2012	2.48	1.15	1.61	2.02	1.73	1.30	1.10	1.68
2013-2024	1.03	-0.43	1.35	0.36	0.68	0.29	0.21	-0.10
2015-2024	1.04	-0.52	1.56	0.64	0.70	0.37	0.27	0.42

HIGH AND LOW FORECASTS

Net 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	74,270	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	347,059	70,122
2009	46,049	79,687	14,326	12,649	11,010	345,296	66,286
2010	49,687	86,085	13,423	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	48,816	81,001	13,035	15,741	12,268	376,466	69,173
2014	48,747	79,485	12,697	16,199	12,490	378,819	68,212
2015	49,615	79,182	12,551	16,665	12,875	389,838	69,204
2016	50,803	78,995	12,657	17,073	13,204	400,458	70,588
2017	51,971	78,730	12,987	17,394	13,505	410,456	72,161
2018	53,025	78,619	13,259	17,688	13,787	418,668	73,459
2019	54,122	78,385	13,518	17,803	14,067	427,387	74,543
2020	55,093	78,186	13,587	17,807	14,348	435,881	75,350
2021	55,818	77,808	13,270	17,692	14,614	443,511	75,860
2022	56,629	77,412	13,474	17,635	14,858	451,554	76,821
2023	57,588	77,004	13,701	17,673	15,089	459,791	77,852
2024	58,793	76,588	13,988	17,711	15,324	468,786	78,910
Compound Annual Growth Rates (%)							
1990-2012	1.88	1.95	0.25	3.43	2.84	1.98	1.54
2013-2024	1.71	-0.51	0.64	1.08	2.04	2.01	1.20
2015-2024	1.90	-0.37	1.21	0.68	1.95	2.07	1.47

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	97,851	65,550	46,433	48,995	42,811	99,398	98,491	33,383	123,997
2014	95,259	65,121	45,822	48,997	42,312	99,630	98,709	33,843	124,854
2015	96,953	66,449	46,523	49,834	42,402	101,057	100,118	34,381	125,202
2016	99,240	68,136	47,253	50,575	42,551	102,625	101,865	34,969	126,953
2017	101,491	69,959	48,089	51,053	42,657	104,106	103,093	35,599	128,537
2018	103,425	71,532	48,814	51,294	42,842	105,312	104,091	36,171	130,162
2019	105,046	72,941	49,504	51,464	42,962	106,432	105,517	36,719	132,028
2020	106,594	74,114	50,129	51,604	43,098	107,604	107,028	37,233	133,472
2021	107,807	75,013	50,503	51,615	43,139	108,827	108,223	37,605	133,897
2022	109,324	76,288	51,229	51,662	43,169	109,970	109,114	38,170	134,553
2023	110,997	77,597	52,041	51,712	43,190	111,062	109,501	38,751	135,600
2024	112,697	78,986	52,926	51,743	43,205	112,234	110,965	39,365	137,398
Annual Growth Rates (%)									
2013-2014	-2.65	-0.65	-1.32	0.00	-1.17	0.23	0.22	1.38	0.69
2014-2015	1.78	2.04	1.53	1.71	0.21	1.43	1.43	1.59	0.28
2015-2016	2.36	2.54	1.57	1.49	0.35	1.55	1.75	1.71	1.40
2016-2017	2.27	2.68	1.77	0.94	0.25	1.44	1.21	1.80	1.25
2017-2018	1.91	2.25	1.51	0.47	0.43	1.16	0.97	1.61	1.26
2018-2019	1.57	1.97	1.41	0.33	0.28	1.06	1.37	1.51	1.43
2019-2020	1.47	1.61	1.26	0.27	0.32	1.10	1.43	1.40	1.09
2020-2021	1.14	1.21	0.75	0.02	0.10	1.14	1.12	1.00	0.32
2021-2022	1.41	1.70	1.44	0.09	0.07	1.05	0.82	1.50	0.49
2022-2023	1.53	1.72	1.58	0.10	0.05	0.99	0.35	1.52	0.78
2023-2024	1.53	1.79	1.70	0.06	0.04	1.05	1.34	1.58	1.33
Compound Annual Growth Rates (%)									
2013-2018	1.11	1.76	1.01	0.92	0.01	1.16	1.11	1.62	0.98
2013-2024	1.29	1.71	1.20	0.50	0.08	1.11	1.09	1.51	0.94
2015-2024	1.69	1.94	1.44	0.42	0.21	1.17	1.15	1.52	1.04

HIGH AND LOW FORECASTS

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

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	96,699	65,109	46,008	48,651	42,594	98,907	97,589	33,225	123,821
2014	92,955	64,241	44,968	48,208	41,797	98,539	96,930	33,527	124,541
2015	93,519	65,129	45,237	48,528	41,554	99,966	97,461	33,876	124,860
2016	94,693	66,375	45,539	48,728	41,373	101,533	98,317	34,274	126,478
2017	95,846	67,758	45,940	48,663	41,152	103,014	98,638	34,714	127,934
2018	96,673	68,888	46,225	48,363	41,011	104,220	98,719	35,097	129,438
2019	97,179	69,855	46,475	47,996	40,807	105,340	99,218	35,455	131,204
2020	97,607	70,586	46,661	47,604	40,621	106,513	99,790	35,779	132,542
2021	97,697	71,041	46,596	47,088	40,343	107,735	100,032	35,962	132,865
2022	98,087	71,872	46,883	46,616	40,057	108,878	99,961	36,337	133,428
2023	98,633	72,737	47,256	46,151	39,765	109,970	99,377	36,729	134,378
2024	99,204	73,681	47,702	45,674	39,469	111,142	99,866	37,153	136,077
Annual Growth Rates (%)									
2013-2014	-3.87	-1.33	-2.26	-0.91	-1.87	-0.37	-0.68	0.91	0.58
2014-2015	0.61	1.38	0.60	0.67	-0.58	1.45	0.55	1.04	0.26
2015-2016	1.26	1.91	0.67	0.41	-0.44	1.57	0.88	1.17	1.30
2016-2017	1.22	2.08	0.88	-0.13	-0.54	1.46	0.33	1.29	1.15
2017-2018	0.86	1.67	0.62	-0.62	-0.34	1.17	0.08	1.10	1.18
2018-2019	0.52	1.40	0.54	-0.76	-0.50	1.07	0.51	1.02	1.36
2019-2020	0.44	1.05	0.40	-0.82	-0.45	1.11	0.58	0.91	1.02
2020-2021	0.09	0.64	-0.14	-1.08	-0.68	1.15	0.24	0.51	0.24
2021-2022	0.40	1.17	0.62	-1.00	-0.71	1.06	-0.07	1.04	0.42
2022-2023	0.56	1.20	0.80	-1.00	-0.73	1.00	-0.58	1.08	0.71
2023-2024	0.58	1.30	0.95	-1.03	-0.74	1.07	0.49	1.15	1.26
Compound Annual Growth Rates (%)									
2013-2018	-0.01	1.13	0.09	-0.12	-0.75	1.05	0.23	1.10	0.89
2013-2024	0.23	1.13	0.33	-0.57	-0.69	1.07	0.21	1.02	0.86
2015-2024	0.66	1.38	0.59	-0.67	-0.57	1.18	0.27	1.03	0.96

HIGH AND LOW FORECASTS

Summer Non-coincident Peak Demand Using Gross Forecast (Metered Load in MW) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	17,513	12,514	8,685	9,601	8,547	17,491	20,526	6,627	23,135
2014	17,049	12,432	8,570	9,601	8,448	17,532	20,572	6,718	23,295
2015	17,352	12,685	8,701	9,765	8,466	17,783	20,866	6,825	23,360
2016	17,762	13,007	8,838	9,910	8,495	18,059	21,230	6,941	23,687
2017	18,165	13,355	8,994	10,004	8,517	18,320	21,486	7,066	23,982
2018	18,511	13,655	9,130	10,051	8,554	18,532	21,694	7,180	24,285
2019	18,801	13,924	9,259	10,085	8,577	18,729	21,991	7,289	24,634
2020	19,078	14,148	9,376	10,112	8,604	18,935	22,306	7,391	24,903
2021	19,295	14,320	9,446	10,114	8,613	19,150	22,555	7,465	24,982
2022	19,566	14,563	9,582	10,123	8,619	19,352	22,741	7,577	25,105
2023	19,866	14,813	9,733	10,133	8,623	19,544	22,821	7,692	25,300
2024	20,170	15,078	9,899	10,139	8,626	19,750	23,126	7,814	25,636
Annual Growth Rates (%)									
2013-2014	-2.65	-0.65	-1.32	0.00	-1.17	0.23	0.22	1.38	0.69
2014-2015	1.78	2.04	1.53	1.71	0.21	1.43	1.43	1.59	0.28
2015-2016	2.36	2.54	1.57	1.49	0.35	1.55	1.75	1.71	1.40
2016-2017	2.27	2.68	1.77	0.94	0.25	1.44	1.21	1.80	1.25
2017-2018	1.91	2.25	1.51	0.47	0.43	1.16	0.97	1.61	1.26
2018-2019	1.57	1.97	1.41	0.33	0.28	1.06	1.37	1.51	1.43
2019-2020	1.47	1.61	1.26	0.27	0.32	1.10	1.43	1.40	1.09
2020-2021	1.14	1.21	0.75	0.02	0.10	1.14	1.12	1.00	0.32
2021-2022	1.41	1.70	1.44	0.09	0.07	1.05	0.82	1.50	0.49
2022-2023	1.53	1.72	1.58	0.10	0.05	0.99	0.35	1.52	0.78
2023-2024	1.53	1.79	1.70	0.06	0.04	1.05	1.34	1.58	1.33
Compound Annual Growth Rates (%)									
2013-2018	1.11	1.76	1.01	0.92	0.01	1.16	1.11	1.62	0.98
2013-2024	1.29	1.71	1.20	0.50	0.08	1.11	1.09	1.51	0.94
2015-2024	1.69	1.94	1.44	0.42	0.21	1.17	1.15	1.52	1.04

HIGH AND LOW FORECASTS

Winter Non-coincident Peak Demand Using Gross Forecast (Metered Load in MW) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,316	9,479	6,758	7,286	6,867	15,208	13,996	5,380	19,287
2014	13,936	9,417	6,669	7,286	6,787	15,243	14,027	5,454	19,420
2015	14,184	9,609	6,771	7,410	6,801	15,462	14,227	5,541	19,474
2016	14,519	9,853	6,877	7,521	6,825	15,701	14,476	5,636	19,746
2017	14,848	10,117	6,999	7,592	6,842	15,928	14,650	5,737	19,993
2018	15,131	10,344	7,104	7,627	6,872	16,113	14,792	5,829	20,246
2019	15,368	10,548	7,205	7,653	6,891	16,284	14,995	5,918	20,536
2020	15,595	10,718	7,296	7,674	6,913	16,463	15,209	6,000	20,760
2021	15,772	10,848	7,350	7,675	6,919	16,650	15,379	6,060	20,827
2022	15,994	11,032	7,456	7,682	6,924	16,825	15,506	6,151	20,928
2023	16,239	11,221	7,574	7,690	6,927	16,992	15,561	6,245	21,091
2024	16,488	11,422	7,703	7,694	6,930	17,172	15,769	6,344	21,371
Annual Growth Rates (%)									
2013-2014	-2.65	-0.65	-1.32	0.00	-1.17	0.23	0.22	1.38	0.69
2014-2015	1.78	2.04	1.53	1.71	0.21	1.43	1.43	1.59	0.28
2015-2016	2.36	2.54	1.57	1.49	0.35	1.55	1.75	1.71	1.40
2016-2017	2.27	2.68	1.77	0.94	0.25	1.44	1.21	1.80	1.25
2017-2018	1.91	2.25	1.51	0.47	0.43	1.16	0.97	1.61	1.26
2018-2019	1.57	1.97	1.41	0.33	0.28	1.06	1.37	1.51	1.43
2019-2020	1.47	1.61	1.26	0.27	0.32	1.10	1.43	1.40	1.09
2020-2021	1.14	1.21	0.75	0.02	0.10	1.14	1.12	1.00	0.32
2021-2022	1.41	1.70	1.44	0.09	0.07	1.05	0.82	1.50	0.49
2022-2023	1.53	1.72	1.58	0.10	0.05	0.99	0.35	1.52	0.78
2023-2024	1.53	1.79	1.70	0.06	0.04	1.05	1.34	1.58	1.33
Compound Annual Growth Rates (%)									
2013-2018	1.11	1.76	1.01	0.92	0.01	1.16	1.11	1.62	0.98
2013-2024	1.29	1.71	1.20	0.50	0.08	1.11	1.09	1.51	0.94
2015-2024	1.69	1.94	1.44	0.42	0.21	1.17	1.15	1.52	1.04

HIGH AND LOW FORECASTS

Summer Non-coincident Peak Demand Using Net Forecast (Metered Load in MW) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	17,307	12,429	8,605	9,533	8,504	17,405	20,338	6,595	23,102
2014	16,637	12,264	8,411	9,446	8,345	17,340	20,201	6,655	23,237
2015	16,738	12,433	8,461	9,509	8,296	17,591	20,312	6,724	23,296
2016	16,948	12,671	8,517	9,548	8,260	17,867	20,490	6,803	23,598
2017	17,154	12,935	8,592	9,536	8,216	18,128	20,557	6,891	23,870
2018	17,302	13,151	8,646	9,477	8,188	18,340	20,574	6,967	24,150
2019	17,393	13,335	8,692	9,405	8,147	18,537	20,678	7,038	24,480
2020	17,470	13,475	8,727	9,328	8,110	18,743	20,797	7,102	24,729
2021	17,486	13,562	8,715	9,227	8,055	18,958	20,848	7,139	24,790
2022	17,555	13,720	8,769	9,134	7,997	19,160	20,833	7,213	24,895
2023	17,653	13,886	8,838	9,043	7,939	19,352	20,711	7,291	25,072
2024	17,755	14,066	8,922	8,950	7,880	19,558	20,813	7,375	25,389
Annual Growth Rates (%)									
2013-2014	-3.87	-1.33	-2.26	-0.91	-1.87	-0.37	-0.68	0.91	0.58
2014-2015	0.61	1.38	0.60	0.67	-0.58	1.45	0.55	1.04	0.26
2015-2016	1.26	1.91	0.67	0.41	-0.44	1.57	0.88	1.17	1.30
2016-2017	1.22	2.08	0.88	-0.13	-0.54	1.46	0.33	1.29	1.15
2017-2018	0.86	1.67	0.62	-0.62	-0.34	1.17	0.08	1.10	1.18
2018-2019	0.52	1.40	0.54	-0.76	-0.50	1.07	0.51	1.02	1.36
2019-2020	0.44	1.05	0.40	-0.82	-0.45	1.11	0.58	0.91	1.02
2020-2021	0.09	0.64	-0.14	-1.08	-0.68	1.15	0.24	0.51	0.24
2021-2022	0.40	1.17	0.62	-1.00	-0.71	1.06	-0.07	1.04	0.42
2022-2023	0.56	1.20	0.80	-1.00	-0.73	1.00	-0.58	1.08	0.71
2023-2024	0.58	1.30	0.95	-1.03	-0.74	1.07	0.49	1.15	1.26
Compound Annual Growth Rates (%)									
2013-2018	-0.01	1.13	0.09	-0.12	-0.75	1.05	0.23	1.10	0.89
2013-2024	0.23	1.13	0.33	-0.57	-0.69	1.07	0.21	1.02	0.86
2015-2024	0.66	1.38	0.59	-0.67	-0.57	1.18	0.27	1.03	0.96

HIGH AND LOW FORECASTS

Winter Non-coincident Peak Demand Using Net Forecast (Metered Load in MW) —Low

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,147	9,415	6,696	7,235	6,832	15,133	13,868	5,355	19,259
2014	13,599	9,290	6,545	7,169	6,704	15,076	13,774	5,403	19,371
2015	13,682	9,418	6,584	7,216	6,665	15,295	13,850	5,459	19,421
2016	13,854	9,598	6,628	7,246	6,636	15,534	13,971	5,524	19,673
2017	14,022	9,798	6,686	7,236	6,601	15,761	14,017	5,595	19,899
2018	14,143	9,962	6,727	7,192	6,578	15,946	14,029	5,656	20,133
2019	14,217	10,102	6,764	7,137	6,545	16,117	14,100	5,714	20,408
2020	14,280	10,207	6,791	7,079	6,515	16,296	14,181	5,766	20,616
2021	14,293	10,273	6,781	7,002	6,471	16,483	14,215	5,796	20,666
2022	14,350	10,393	6,823	6,932	6,425	16,658	14,205	5,856	20,754
2023	14,430	10,518	6,877	6,863	6,378	16,825	14,122	5,919	20,901
2024	14,514	10,655	6,942	6,792	6,331	17,005	14,192	5,988	21,166
Annual Growth Rates (%)									
2013-2014	-3.87	-1.33	-2.26	-0.91	-1.87	-0.37	-0.68	0.91	0.58
2014-2015	0.61	1.38	0.60	0.67	-0.58	1.45	0.55	1.04	0.26
2015-2016	1.26	1.91	0.67	0.41	-0.44	1.57	0.88	1.17	1.30
2016-2017	1.22	2.08	0.88	-0.13	-0.54	1.46	0.33	1.29	1.15
2017-2018	0.86	1.67	0.62	-0.62	-0.34	1.17	0.08	1.10	1.18
2018-2019	0.52	1.40	0.54	-0.76	-0.50	1.07	0.51	1.02	1.36
2019-2020	0.44	1.05	0.40	-0.82	-0.45	1.11	0.58	0.91	1.02
2020-2021	0.09	0.64	-0.14	-1.08	-0.68	1.15	0.24	0.51	0.24
2021-2022	0.40	1.17	0.62	-1.00	-0.71	1.06	-0.07	1.04	0.42
2022-2023	0.56	1.20	0.80	-1.00	-0.73	1.00	-0.58	1.08	0.71
2023-2024	0.58	1.30	0.95	-1.03	-0.74	1.07	0.49	1.15	1.26
Compound Annual Growth Rates (%)									
2013-2018	-0.01	1.13	0.09	-0.12	-0.75	1.05	0.23	1.10	0.89
2013-2024	0.23	1.13	0.33	-0.57	-0.69	1.07	0.21	1.02	0.86
2015-2024	0.66	1.38	0.59	-0.67	-0.57	1.18	0.27	1.03	0.96

HIGH AND LOW FORECASTS

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

Year	MISO energy without EE adjustment	MISO energy with EE adjustment
2013	656,909	652,603
2014	654,546	645,705
2015	662,918	650,130
2016	674,166	657,310
2017	684,583	663,657
2018	693,642	668,634
2019	702,611	673,530
2020	710,877	677,706
2021	716,629	679,360
2022	723,478	682,120
2023	730,451	684,996
2024	739,519	689,969
Annual Growth Rates (%)		
2013-2014	-0.36	-1.06
2014-2015	1.28	0.69
2015-2016	1.70	1.10
2016-2017	1.55	0.97
2017-2018	1.32	0.75
2018-2019	1.29	0.73
2019-2020	1.18	0.62
2020-2021	0.81	0.24
2021-2022	0.96	0.41
2022-2023	0.96	0.42
2023-2024	1.24	0.73
Compound Annual Growth Rates (%)		
2013-2018	1.09	0.49
2013-2024	1.08	0.51
2015-2024	1.22	0.66

HIGH AND LOW FORECASTS

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

Year	MISO Summer CP without EE adjustment	MISO Summer CP with EE adjustment	MISO Winter CP without EE adjustment	MISO Winter CP with EE adjustment
2013	121,518	120,719	94,935	94,315
2014	121,104	119,464	94,589	93,313
2015	122,654	120,273	95,796	93,952
2016	124,728	121,584	97,411	94,982
2017	126,639	122,732	98,908	95,893
2018	128,300	123,627	100,210	96,608
2019	129,953	124,515	101,494	97,305
2020	131,478	125,273	102,677	97,901
2021	132,539	125,564	103,503	98,138
2022	133,796	126,053	104,488	98,535
2023	135,064	126,552	105,493	98,950
2024	136,733	127,452	106,789	99,658
Annual Growth Rates (%)				
2013-2014	-0.34	-1.04	-0.37	-1.06
2014-2015	1.28	0.68	1.28	0.68
2015-2016	1.69	1.09	1.69	1.10
2016-2017	1.53	0.94	1.54	0.96
2017-2018	1.31	0.73	1.32	0.75
2018-2019	1.29	0.72	1.28	0.72
2019-2020	1.17	0.61	1.17	0.61
2020-2021	0.81	0.23	0.80	0.24
2021-2022	0.95	0.39	0.95	0.40
2022-2023	0.95	0.40	0.96	0.42
2023-2024	1.24	0.71	1.23	0.72
Compound Annual Growth Rates (%)				
2013-2018	1.09	0.48	1.09	0.48
2013-2024	1.08	0.49	1.08	0.50
2015-2024	1.21	0.65	1.21	0.66