Independent Load Forecast Results

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Previous Deliverables

Previous status reports provided the details surrounding the 15 state econometric forecasting models and the sources used for the historical data, the allocation factors to be used to convert the state-level forecasts to LRZ-level forecasts, and the conversion factors used to translate the LRZ energy forecasts to summer and peak demand forecasts. This report builds on the work described in those reports but does not repeat the content. The previous reports are posted in the meeting materials for the Independent Load Forecast Workshops on April 30th and July 28th. A final report that encompasses all of the steps in the process will be released by November 1st.

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 the customers[1]. 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 use generator level numbers. The difference between metered data and generation data is the losses associated with the transmission system between the generators and the substations[2]. No attempt has been made here to convert the peak demand projections from the metered level to the generation level, since SUFG lacks the appropriate data. This conversion will be included in the final report if the transmission loss estimates are available.

State-level Energy Forecasts

At the beginning of the process for developing an independent load forecast, the State Utility Forecasting Group (SUFG) developed 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 1. The model formulations were provided previously.

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[1] 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. For these purposes, they may be referred to as distribution losses.

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

Table 1: 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 2 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 average values per NOAA. The projections provided in Table 2 are from a macroeconomic forecast by IHS Global Insight.

Table 2: Explanatory Variable Compound Annual Growth Rates (%)

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.

The resulting forecast does 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 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. The energy efficiency reductions are per the levels indicated in the Database of

State Incentives for Renewables & Efficiency (DSIRE)[3], 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 was assumed. Table 3 summarizes the energy efficiency requirements that form the basis of the adjustments.

Table 3: State Energy Efficiency 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	1.0% (2013), 1.4% (2014), 1.8% (2015),2.0% (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	1.5% of three year average annually
Missouri	Utilities	0.5% (2013), increasing by 0.2% each year until reaching 1.9% (2020 and beyond)
Texas	Investor-owned Utilities	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

Table 4 provides the gross state-level forecasts (prior to the EE adjustment) and Table 5 shows the net state-level forecasts. The shaded areas represent historical data. Figures 1 to 15 illustrate the projections. 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.

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

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

Year	AR	IL	IN	IA	KY	LA	MI	MN
1990	27,365	111,577	73,982	29,437	61,097	63,826	82,367	47,167
1991	28,440	116,869	77,034	30,781	64,194	64,704	84,519	48,755
1992	28,451	112,521	76,977	30,208	67,068	65,098	83,840	47,412
1993	31,663	117,786	81,931	32,104	68,149	67,756	87,589	49,211
1994	32,619	121,490	83,808	33,039	72,485	70,132	91,160	51,155
1995	34,671	126,231	87,006	34,301	74,548	72,827	94,701	53,959
1996	36,137	125,990	88,901	34,999	77,019	75,269	96,302	54,942
1997	36,858	126,953	89,147	36,148	76,836	75,886	97,391	55,674
1998	39,315	131,697	92,059	37,318	75,850	77,716	100,506	56,744
1999	39,789	132,682	96,735	38,034	79,098	78,267	103,981	57,399
2000	41,611	134,697	97,775	39,088	78,316	80,690	104,772	59,782
2001	41,732	136,034	97,734	39,444	79,975	74,693	102,409	60,687
2002	42,450	138,447	101,429	40,898	87,267	79,261	104,714	62,162
2003	43,108	136,248	100,468	41,207	85,220	77,769	108,877	63,087
2004	43,672	139,254	103,094	40,903	86,521	79,737	106,606	63,340
2005	46,165	144,986	106,549	42,757	89,351	77,389	110,445	66,019
2006	46,636	142,448	105,664	43,337	88,743	77,468	108,018	66,770
2007	47,055	146,055	109,420	45,270	92,404	79,567	109,297	68,231
2008	46,135	144,620	106,981	45,488	93,428	78,722	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 (%)								
2013-2018	1.77	1.08	1.56	1.13	0.76	0.40	1.64	1.04
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

Table 4. Gross State Energy Forecasts (Annual Retail Sales in GWh) - continued

Year	MS	MO	MT	ND	SD	TX	WI
1990	32,127	53,925	13,125	7,014	6,334	237,415	49,198
1991	33,019	56,514	13,407	7,255	6,685	240,352	51,032
1992	33,241	54,411	13,096	7,128	6,494	239,431	50,925
1993	34,749	58,622	12,929	7,432	6,905	250,084	53,156
1994	36,627	59,693	13,184	7,681	7,174	258,180	55,412
1995	37,868	62,259	13,419	7,883	7,414	263,279	57,967
1996	39,622	64,843	13,820	8,314	7,736	278,450	58,744
1997	40,089	65,711	11,917	8,282	7,773	286,704	60,094
1998	42,510	69,010	14,145	8,220	7,824	304,705	62,061
1999	43,980	69,045	13,282	9,112	7,922	301,844	63,547
2000	45,336	72,643	14,580	9,413	8,283	318,263	65,146
2001	44,287	73,213	11,447	9,810	8,627	318,044	65,218
2002	45,452	75,001	12,831	10,219	8,937	320,846	66,999
2003	45,544	74,270	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 (%)							
2013-2018	1.73	0.98	1.32	2.47	2.48	2.61	1.82
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

Table 5: Net State Energy Forecasts (Annual Retail Sales in GWh)[4]

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	142,949	106,778	46,462	89,795	87,173	104,090	69,713
2014	47,322	140,744	105,867	45,405	89,967	87,793	103,870	66,639
2015	47,873	141,204	107,827	45,761	90,870	87,090	104,975	67,310
2016	48,522	141,233	110,071	46,180	91,811	87,712	106,408	68,424
2017	49,266	140,616	112,384	46,693	92,576	88,234	107,507	69,427
2018	49,917	139,376	114,266	47,072	93,250	88,943	108,199	70,188
2019	50,531	138,012	116,059	47,425	93,863	89,860	109,220	70,726
2020	51,069	136,614	117,866	47,750	94,545	90,395	110,240	71,324
2021	51,417	134,832	119,717	47,870	95,274	90,031	110,854	71,806
2022	52,076	133,264	121,471	48,305	95,962	89,876	111,341	72,323
2023	52,750	131,797	123,206	48,828	96,593	90,044	111,546	72,955
2024	53,464	130,338	125,113	49,438	97,210	90,826	112,527	73,578
Compound Annual Growth Rates (%)								
2013-2018	1.27	-0.50	1.36	0.26	0.76	0.40	0.78	0.14
2013-2024	1.21	-0.84	1.45	0.57	0.72	0.37	0.71	0.49
2015-2024	1.23	-0.89	1.67	0.86	0.75	0.47	0.77	0.99

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

Table 5. 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	386,832	70,237
2014	49,819	82,843	13,428	16,622	12,652	391,398	69,382
2015	50,750	83,176	13,444	17,135	13,061	402,900	70,386
2016	51,996	83,509	13,741	17,573	13,413	415,612	71,780
2017	53,231	83,544	14,230	17,918	13,737	427,575	73,353
2018	54,335	83,350	14,632	18,228	14,035	437,677	74,654
2019	55,476	82,837	15,032	18,351	14,324	448,027	75,783
2020	56,509	82,181	15,260	18,364	14,618	458,352	76,673
2021	57,322	81,216	15,084	18,268	14,911	467,867	77,255
2022	58,207	80,246	15,406	18,232	15,184	477,548	78,298
2023	59,226	79,325	15,770	18,280	15,439	487,538	79,422
2024	60,477	78,407	16,191	18,325	15,686	498,343	80,574
Compound Annual Growth Rates (%)							
2013-2018	1.73	-0.09	1.32	2.47	2.48	2.50	1.23
2013-2024	1.77	-0.60	1.53	1.17	2.15	2.33	1.26
2015-2024	1.97	-0.65	2.09	0.75	2.06	2.39	1.51

Figure 1: Net and Gross Arkansas Energy Forecast (Annual Retail Sales in GWh)

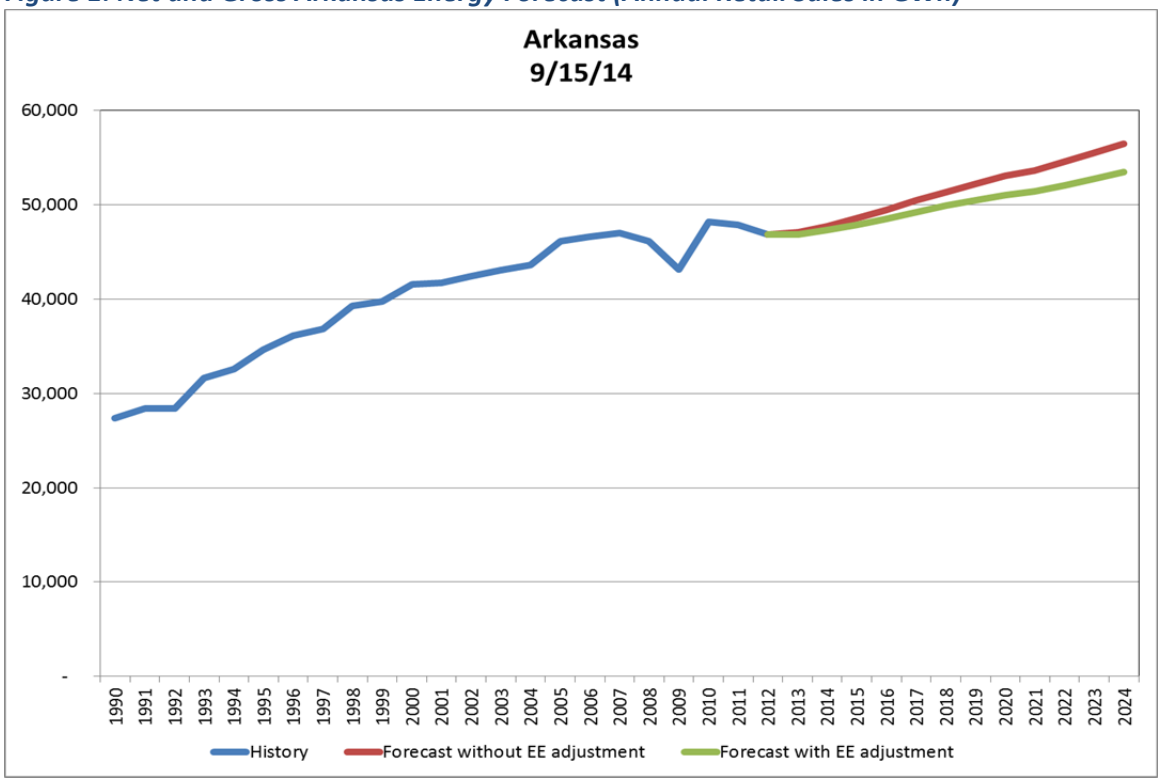


Figure 2: Net and Gross Illinois Energy Forecast (Annual Retail Sales in GWh)

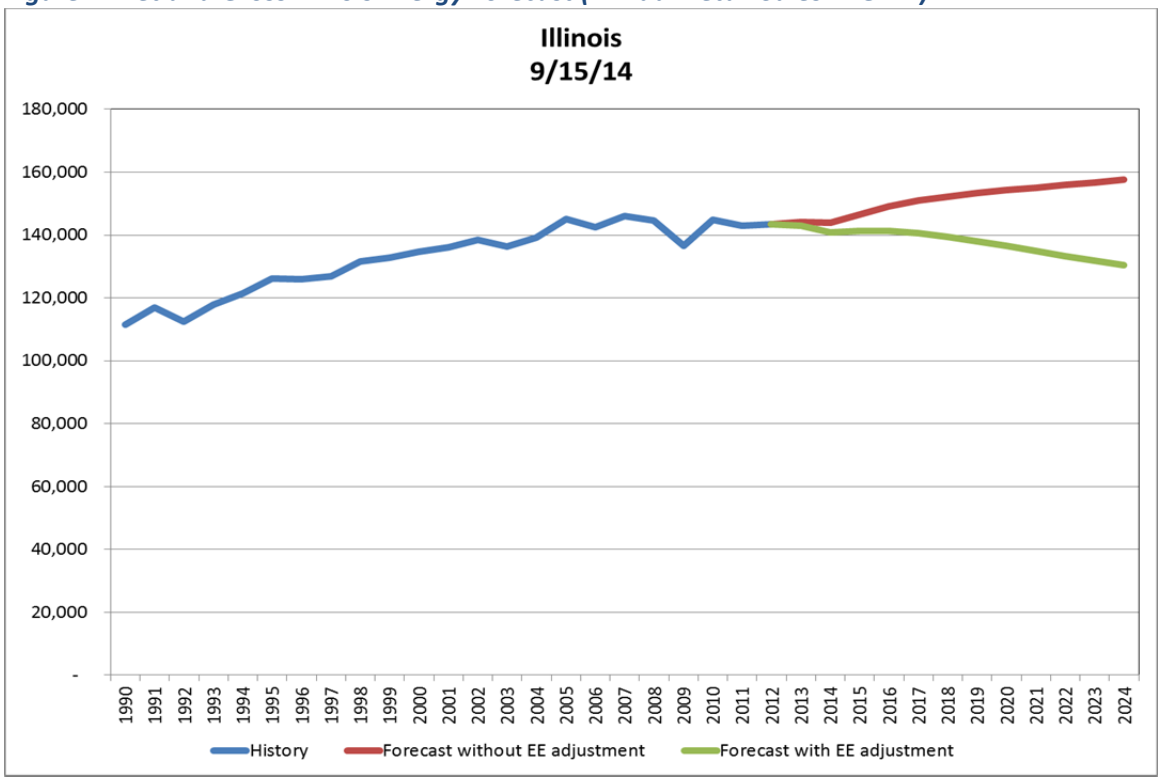


Figure 3: Net and Gross Indiana Energy Forecast (Annual Retail Sales in GWh)

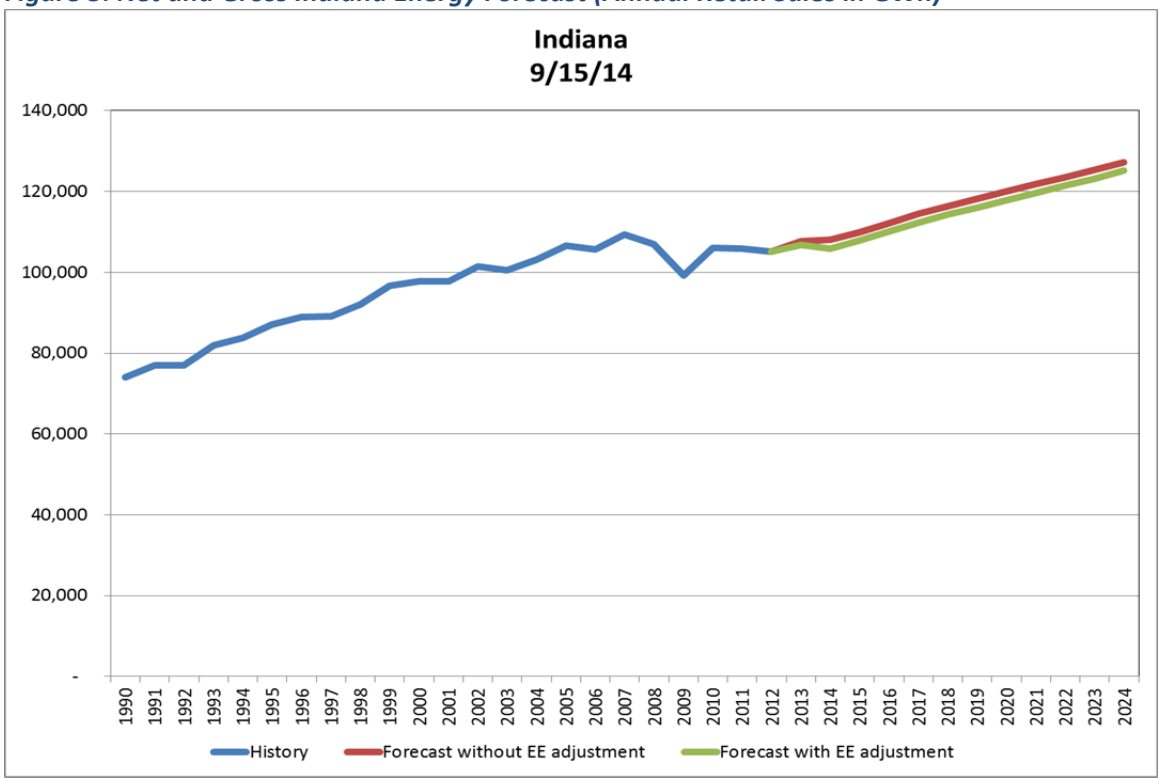


Figure 4: Net and Gross Iowa Energy Forecast (Annual Retail Sales in GWh)

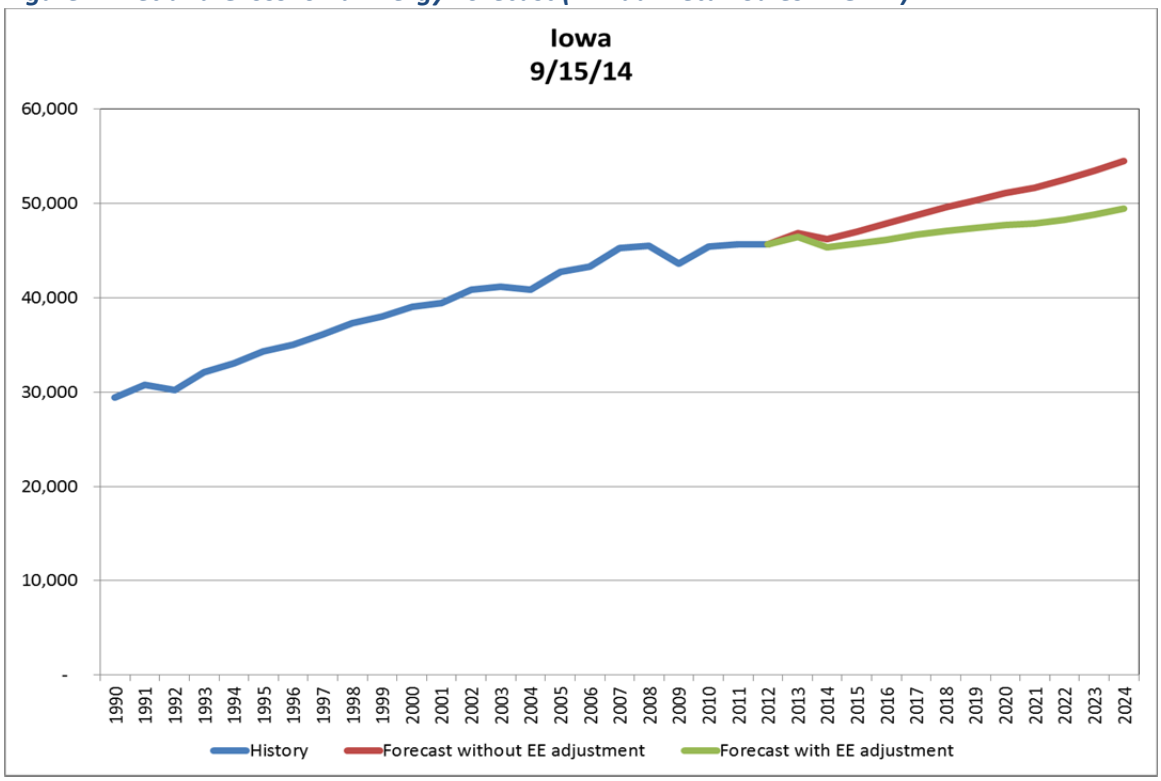


Figure 5: Net and Gross Kentucky Energy Forecast (Annual Retail Sales in GWh)

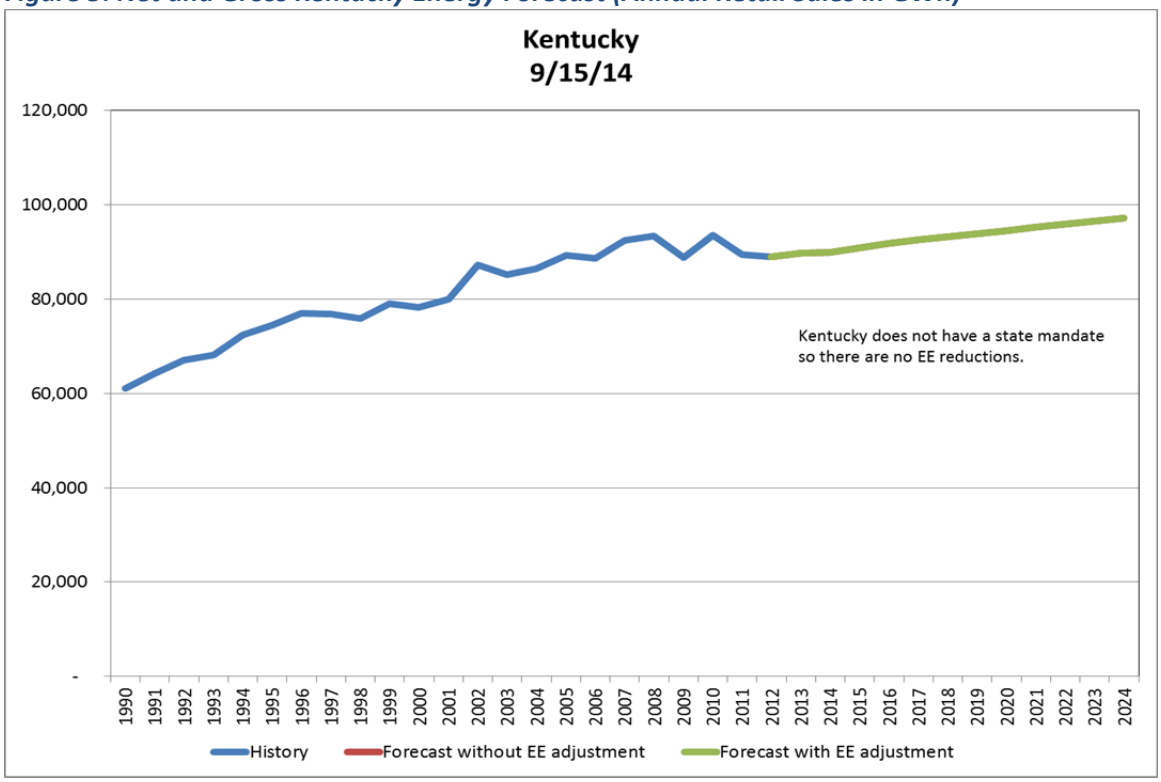


Figure 6: Net and Gross Louisiana Energy Forecast (Annual Retail Sales in GWh)

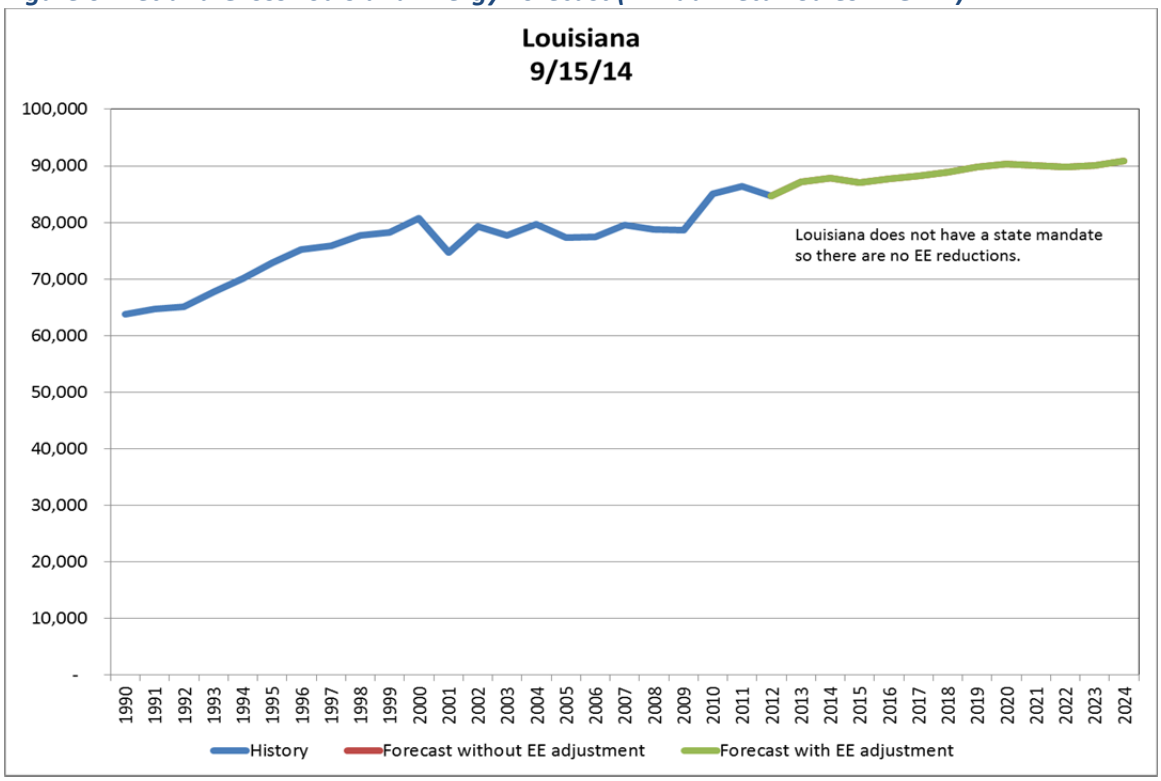


Figure 7: Net and Gross Michigan Energy Forecast (Annual Retail Sales in GWh)

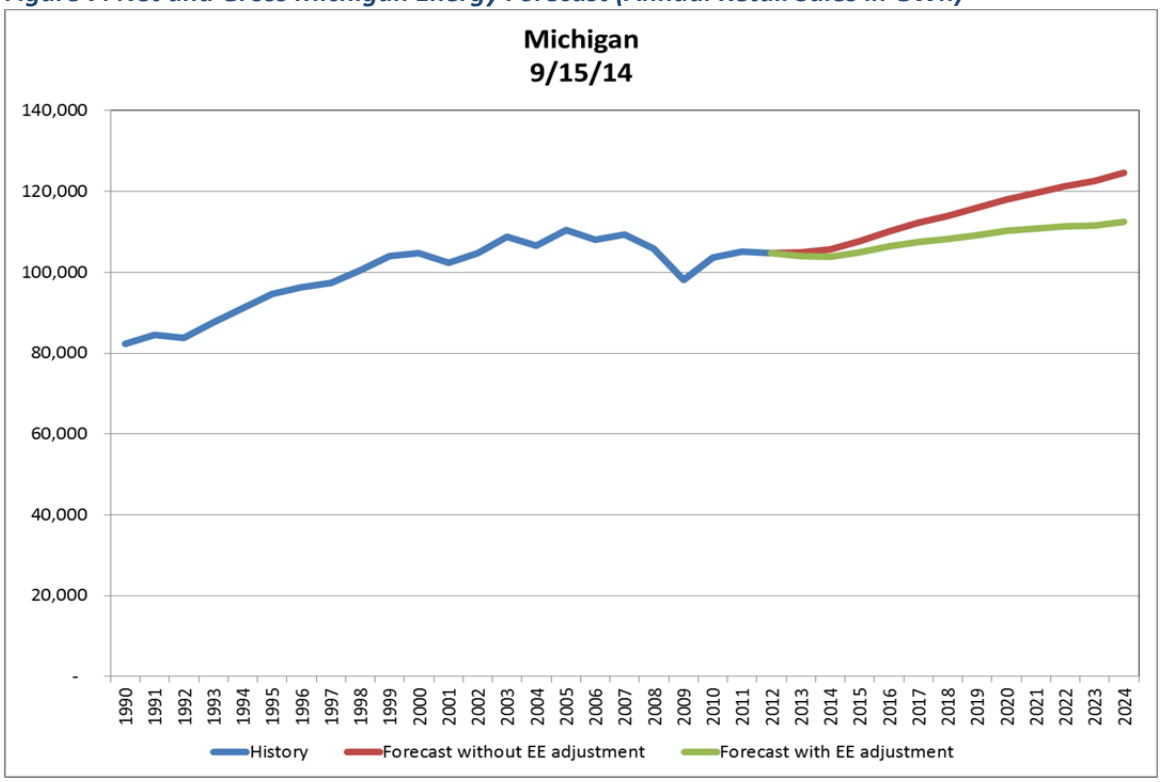


Figure 8: Net and Gross Minnesota Energy Forecast (Annual Retail Sales in GWh)

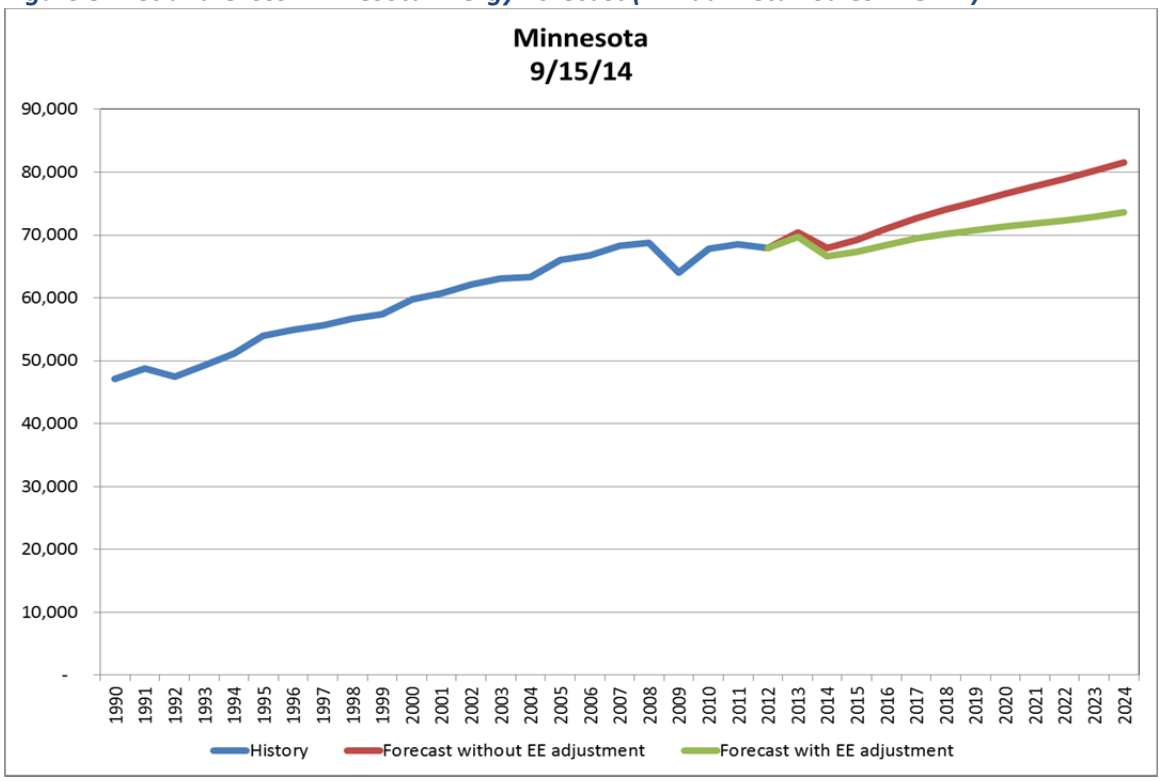


Figure 9: Net and Gross Mississippi Energy Forecast (Annual Retail Sales in GWh)

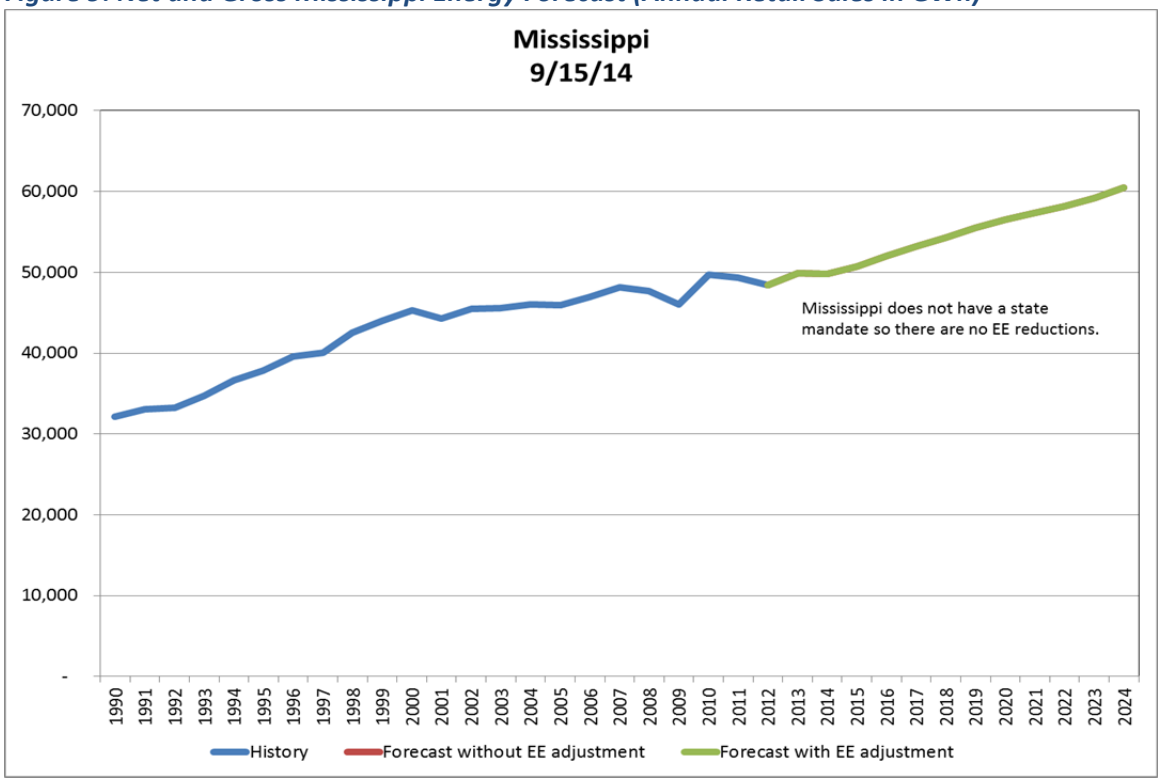


Figure 10: Net and Gross Missouri Energy Forecast (Annual Retail Sales in GWh)

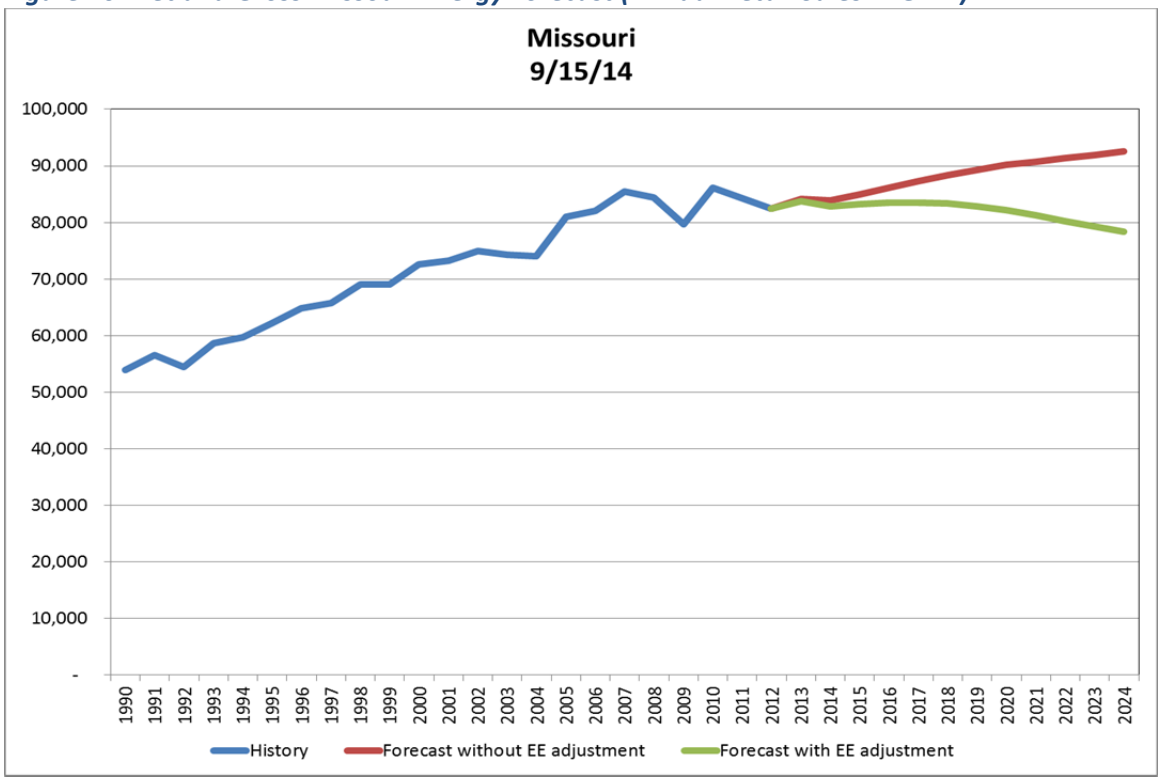


Figure 11: Net and Gross Montana Energy Forecast (Annual Retail Sales in GWh)

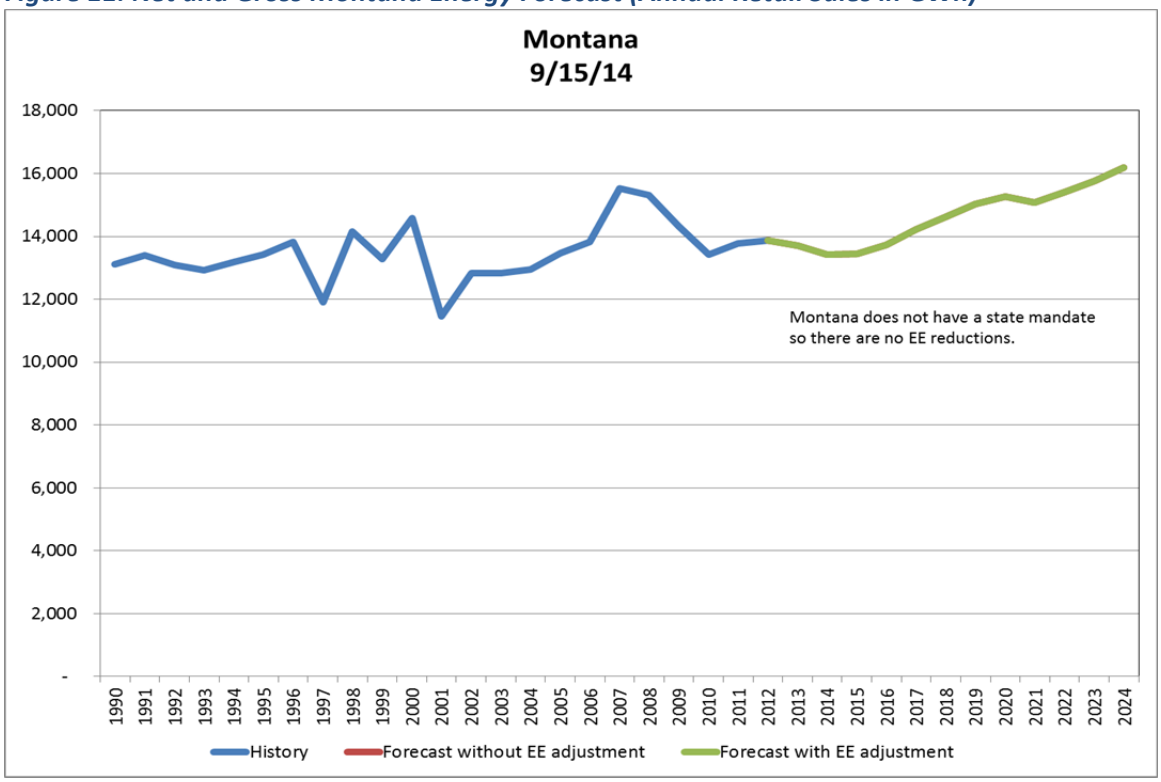


Figure 12: Net and Gross North Dakota Energy Forecast (Annual Retail Sales in GWh)

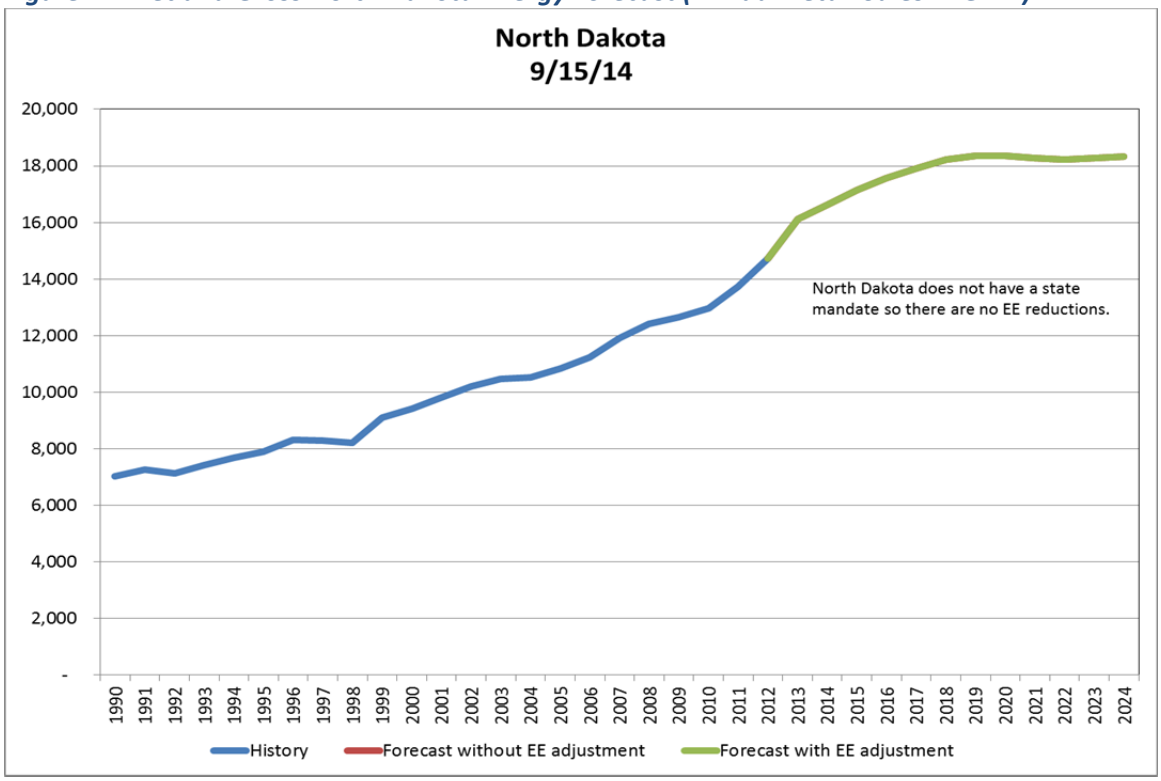


Figure 13: Net and Gross South Dakota Energy Forecast (Annual Retail Sales in GWh)

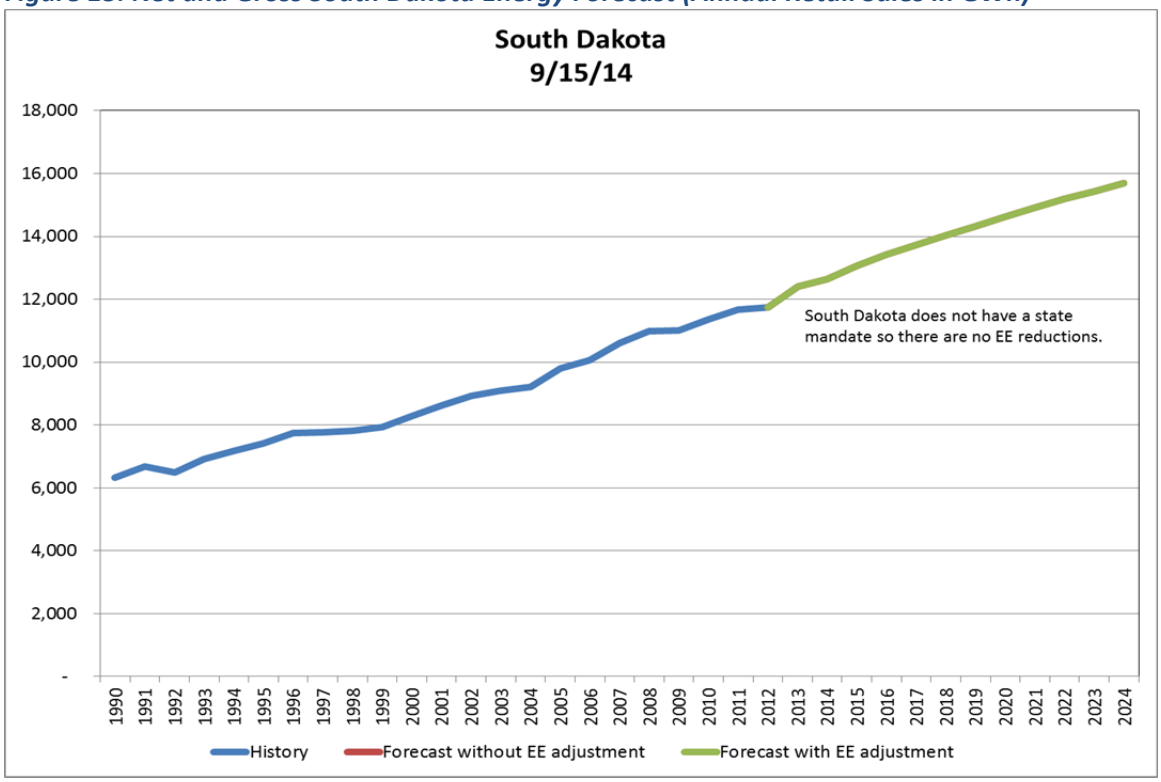


Figure 14: Net and Gross Texas Energy Forecast (Annual Retail Sales in GWh)

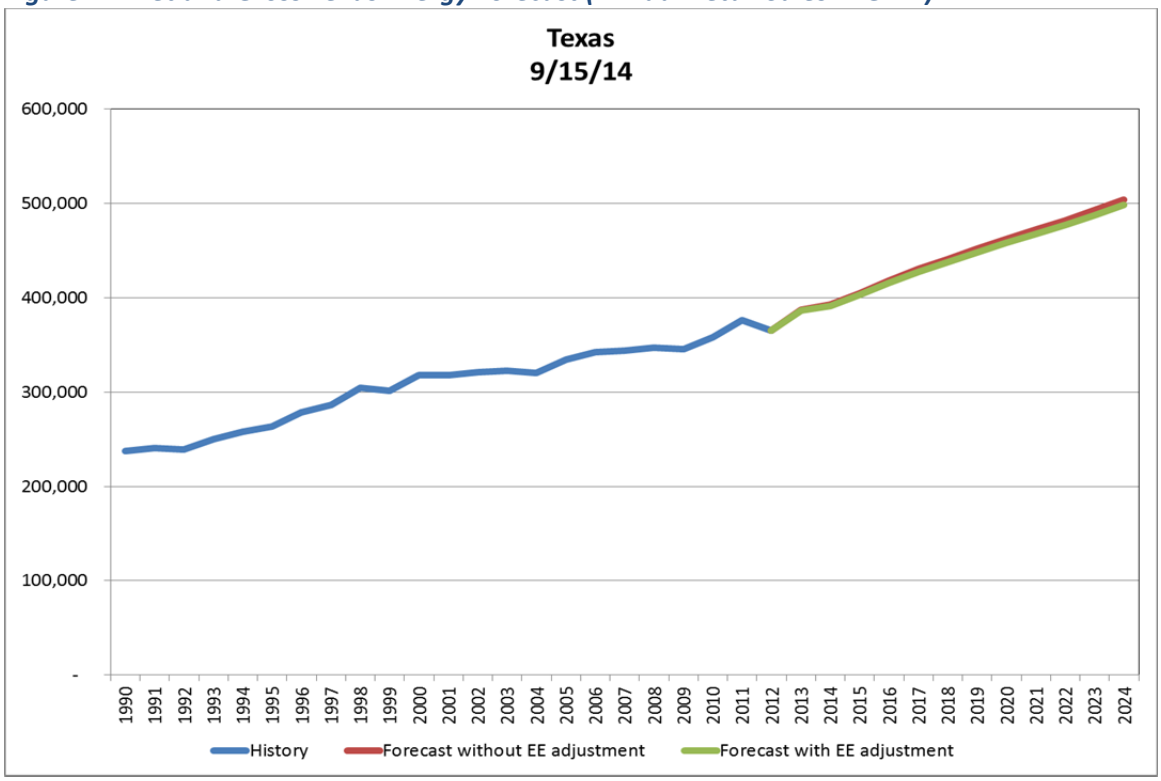
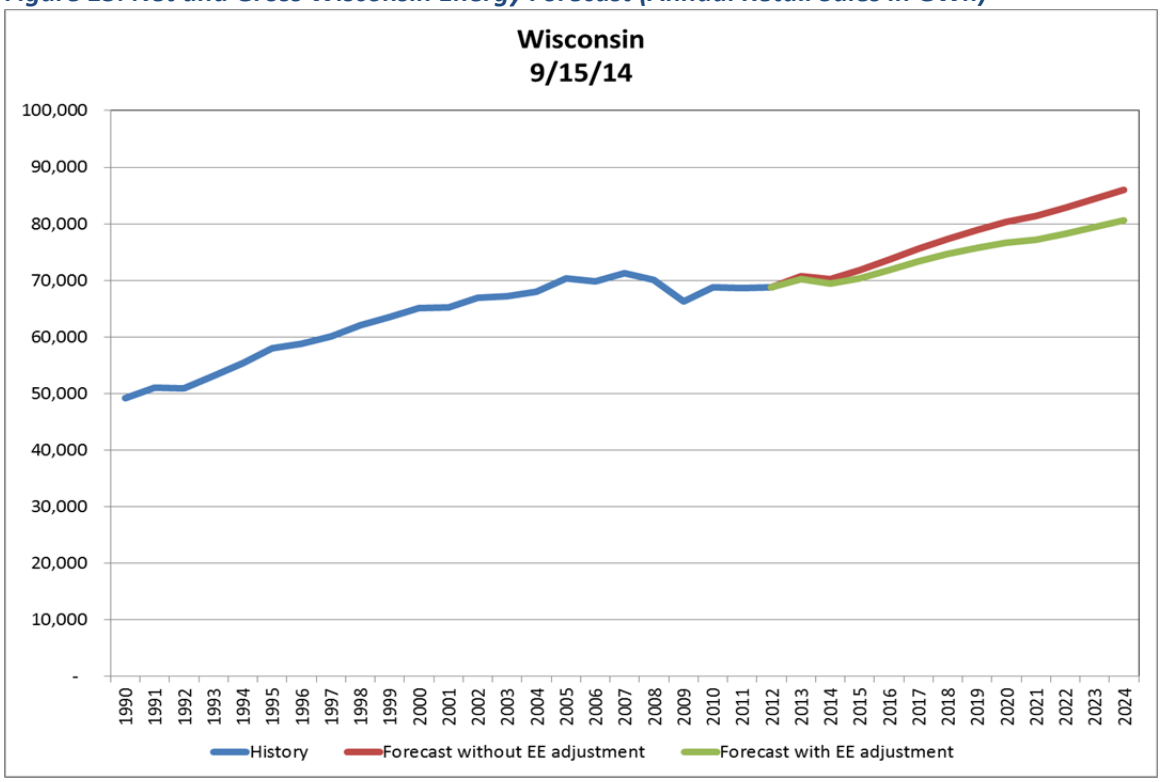


Figure 15: Net and Gross Wisconsin Energy Forecast (Annual Retail Sales in GWh)



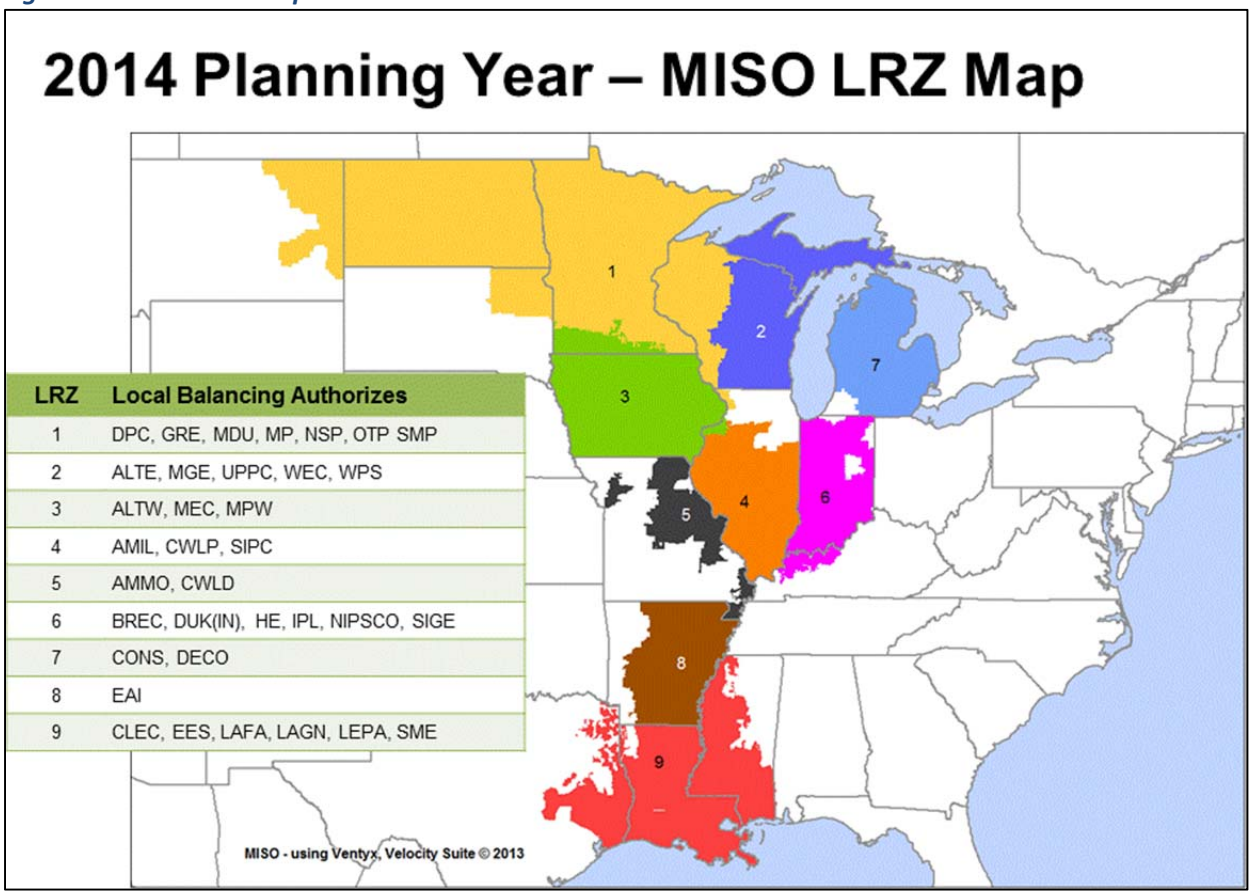
LRZ-level Energy Forecasts

At the July workshop, SUFG asked for assistance from stakeholders as to whether certain utilities should be classified as being in or out of the MISO footprint. As a result, some slight changes have been made to the allocation factors presented previously. Table 6 provides the updated allocation factors and Figure 16 shows the approximate locations covered by each LRZ.

Table 6: 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 16: MISO LRZ Map



Source: MISO, 2014

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. Table 7 provides the gross (without the EE adjustment) LRZ annual metered load projections and Table 8 provides the net (with the EE adjustment) LRZ annual metered load projections.

Table 7: 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
Compound 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
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 8: Net LRZ Energy Forecasts (Annual Metered Load in GWh)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	99,334	66,191	47,149	49,502	44,037	101,633	100,651	34,065	126,495
2014	96,003	65,437	46,083	48,739	43,563	101,336	100,438	34,395	127,309
2015	97,123	66,364	46,441	48,823	43,650	102,861	101,507	34,794	127,698
2016	98,854	67,647	46,859	48,757	43,738	104,532	102,893	35,263	129,552
2017	100,536	69,067	47,355	48,469	43,668	106,137	103,955	35,801	131,264
2018	101,874	70,232	47,710	47,968	43,479	107,466	104,624	36,271	132,992
2019	102,885	71,263	48,036	47,424	43,125	108,715	105,612	36,713	134,948
2020	103,824	72,087	48,336	46,871	42,697	110,005	106,597	37,099	136,491
2021	104,409	72,623	48,435	46,188	42,110	111,342	107,192	37,348	137,038
2022	105,302	73,553	48,835	45,580	41,523	112,607	107,663	37,822	137,825
2023	106,368	74,539	49,321	45,008	40,963	113,833	107,861	38,306	138,996
2024	107,449	75,588	49,888	44,440	40,407	115,140	108,809	38,820	140,897
Compound Annual Growth Rates (%)									
2013-2014	-3.35	-1.14	-2.26	-1.54	-1.08	-0.29	-0.21	0.97	0.64
2014-2015	1.17	1.42	0.78	0.17	0.20	1.50	1.06	1.16	0.31
2015-2016	1.78	1.93	0.90	-0.13	0.20	1.62	1.36	1.35	1.45
2016-2017	1.70	2.10	1.06	-0.59	-0.16	1.54	1.03	1.52	1.32
2017-2018	1.33	1.69	0.75	-1.03	-0.43	1.25	0.64	1.31	1.32
2018-2019	0.99	1.47	0.68	-1.13	-0.81	1.16	0.94	1.22	1.47
2019-2020	0.91	1.16	0.63	-1.17	-0.99	1.19	0.93	1.05	1.14
2020-2021	0.56	0.74	0.21	-1.46	-1.37	1.21	0.56	0.67	0.40
2021-2022	0.86	1.28	0.83	-1.32	-1.39	1.14	0.44	1.27	0.57
2022-2023	1.01	1.34	0.99	-1.26	-1.35	1.09	0.18	1.28	0.85
2023-2024	1.02	1.41	1.15	-1.26	-1.36	1.15	0.88	1.34	1.37
2013-2018	0.51	1.19	0.24	-0.63	-0.25	1.12	0.78	1.26	1.01
2013-2024	0.72	1.21	0.51	-0.98	-0.78	1.14	0.71	1.19	0.99
2015-2024	1.13	1.46	0.80	-1.04	-0.85	1.26	0.77	1.22	1.10

LRZ-level Non-coincident Summer and Winter Peaks

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 provided above. These values represent the projected peak demands for the summer and winter season under normal weather conditions. They do not occur non-coincident (do not occur at the same time) with the MISO peak. Tables 9 to 12 provide the gross and net non-coincident peak demand projections for summer and winter. Figures 17 to 25 provide the same information graphically.

Table 9: 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
Compound 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
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 10: 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
Compound 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
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 11: Summer Non-coincident Peak Demand using Net Forecast (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	17,778	12,636	8,818	9,700	8,792	17,885	20,977	6,762	23,601
2014	17,182	12,492	8,619	9,551	8,697	17,832	20,932	6,828	23,753
2015	17,383	12,669	8,686	9,567	8,715	18,101	21,155	6,907	23,826
2016	17,693	12,914	8,764	9,554	8,732	18,395	21,444	7,000	24,172
2017	17,994	13,185	8,857	9,498	8,718	18,677	21,665	7,107	24,491
2018	18,233	13,407	8,923	9,399	8,681	18,911	21,805	7,200	24,813
2019	18,414	13,604	8,984	9,293	8,610	19,131	22,011	7,288	25,178
2020	18,582	13,761	9,040	9,185	8,525	19,358	22,216	7,364	25,466
2021	18,687	13,864	9,059	9,051	8,407	19,593	22,340	7,414	25,568
2022	18,847	14,041	9,134	8,932	8,290	19,816	22,438	7,508	25,715
2023	19,038	14,230	9,225	8,819	8,178	20,031	22,479	7,604	25,934
2024	19,231	14,430	9,331	8,708	8,067	20,261	22,677	7,706	26,288
Compound Annual Growth Rates (%)									
2013-2014	-3.35	-1.14	-2.26	-1.54	-1.08	-0.29	-0.21	0.97	0.64
2014-2015	1.17	1.42	0.78	0.17	0.20	1.50	1.06	1.16	0.31
2015-2016	1.78	1.93	0.90	-0.13	0.20	1.62	1.36	1.35	1.45
2016-2017	1.70	2.10	1.06	-0.59	-0.16	1.54	1.03	1.52	1.32
2017-2018	1.33	1.69	0.75	-1.03	-0.43	1.25	0.64	1.31	1.32
2018-2019	0.99	1.47	0.68	-1.13	-0.81	1.16	0.94	1.22	1.47
2019-2020	0.91	1.16	0.63	-1.17	-0.99	1.19	0.93	1.05	1.14
2020-2021	0.56	0.74	0.21	-1.46	-1.37	1.21	0.56	0.67	0.40
2021-2022	0.86	1.28	0.83	-1.32	-1.39	1.14	0.44	1.27	0.57
2022-2023	1.01	1.34	0.99	-1.26	-1.35	1.09	0.18	1.28	0.85
2023-2024	1.02	1.41	1.15	-1.26	-1.36	1.15	0.88	1.34	1.37
2013-2018	0.51	1.19	0.24	-0.63	-0.25	1.12	0.78	1.26	1.01
2013-2024	0.72	1.21	0.51	-0.98	-0.78	1.14	0.71	1.19	0.99
2015-2024	1.13	1.46	0.80	-1.04	-0.85	1.26	0.77	1.22	1.10

Table 12: Winter Non-coincident Peak Demand using Net Forecast (Metered Load in MW)

Year	LRZ1	LRZ2	LRZ3	LRZ4	LRZ5	LRZ6	LRZ7	LRZ8	LRZ9
2013	14,533	9,572	6,862	7,361	7,063	15,550	14,303	5,490	19,675
2014	14,045	9,463	6,707	7,248	6,987	15,504	14,273	5,543	19,802
2015	14,209	9,597	6,759	7,260	7,001	15,738	14,425	5,607	19,862
2016	14,462	9,782	6,820	7,250	7,015	15,993	14,622	5,683	20,151
2017	14,708	9,988	6,892	7,207	7,004	16,239	14,773	5,770	20,417
2018	14,904	10,156	6,943	7,133	6,974	16,442	14,868	5,845	20,686
2019	15,052	10,305	6,991	7,052	6,917	16,633	15,008	5,917	20,990
2020	15,190	10,424	7,035	6,970	6,848	16,831	15,148	5,979	21,230
2021	15,275	10,502	7,049	6,868	6,754	17,035	15,233	6,019	21,315
2022	15,406	10,636	7,107	6,778	6,660	17,229	15,300	6,095	21,437
2023	15,562	10,779	7,178	6,693	6,570	17,416	15,328	6,173	21,620
2024	15,720	10,931	7,261	6,608	6,481	17,616	15,462	6,256	21,915
Compound Annual Growth Rates (%)									
2013-2014	-3.35	-1.14	-2.26	-1.54	-1.08	-0.29	-0.21	0.97	0.64
2014-2015	1.17	1.42	0.78	0.17	0.20	1.50	1.06	1.16	0.31
2015-2016	1.78	1.93	0.90	-0.13	0.20	1.62	1.36	1.35	1.45
2016-2017	1.70	2.10	1.06	-0.59	-0.16	1.54	1.03	1.52	1.32
2017-2018	1.33	1.69	0.75	-1.03	-0.43	1.25	0.64	1.31	1.32
2018-2019	0.99	1.47	0.68	-1.13	-0.81	1.16	0.94	1.22	1.47
2019-2020	0.91	1.16	0.63	-1.17	-0.99	1.19	0.93	1.05	1.14
2020-2021	0.56	0.74	0.21	-1.46	-1.37	1.21	0.56	0.67	0.40
2021-2022	0.86	1.28	0.83	-1.32	-1.39	1.14	0.44	1.27	0.57
2022-2023	1.01	1.34	0.99	-1.26	-1.35	1.09	0.18	1.28	0.85
2023-2024	1.02	1.41	1.15	-1.26	-1.36	1.15	0.88	1.34	1.37
2013-2018	0.51	1.19	0.24	-0.63	-0.25	1.12	0.78	1.26	1.01
2013-2024	0.72	1.21	0.51	-0.98	-0.78	1.14	0.71	1.19	0.99
2015-2024	1.13	1.46	0.80	-1.04	-0.85	1.26	0.77	1.22	1.10

Figure 17: Net and Gross LRZ 1 Summer and Winter Non-coincident Peak Demand (MW)

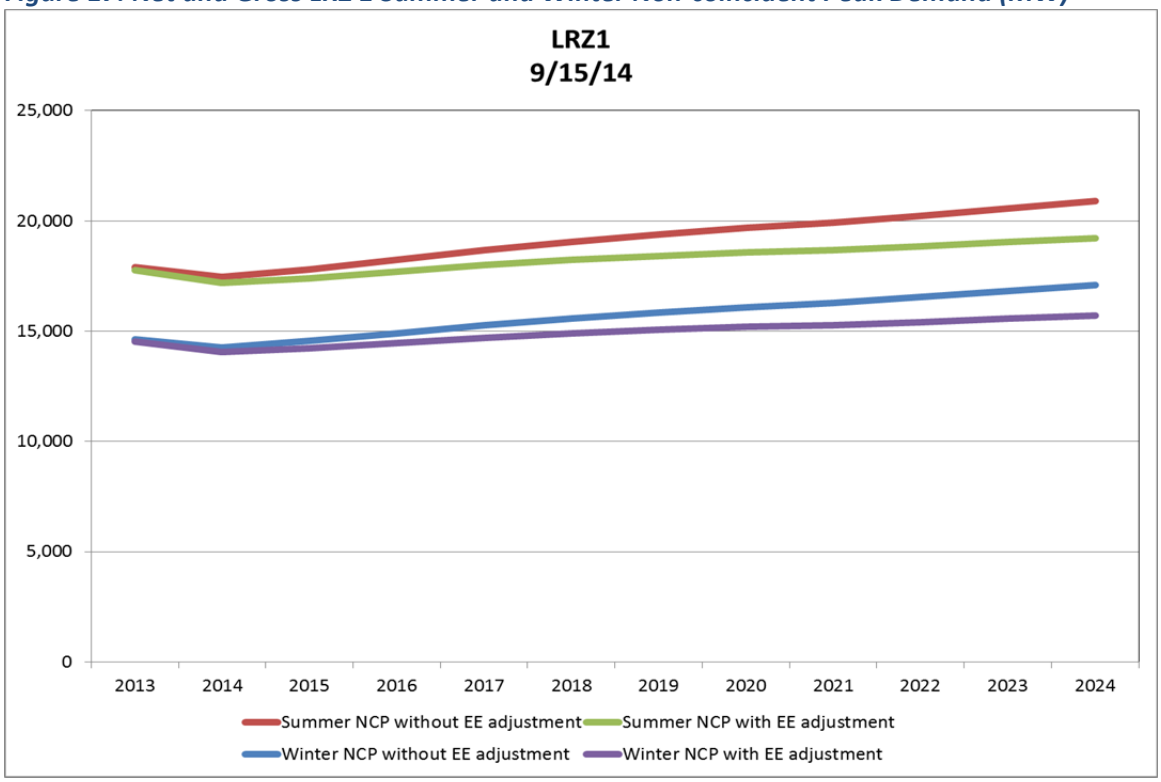


Figure 18: Net and Gross LRZ 2 Summer and Winter Non-coincident Peak Demand (MW)

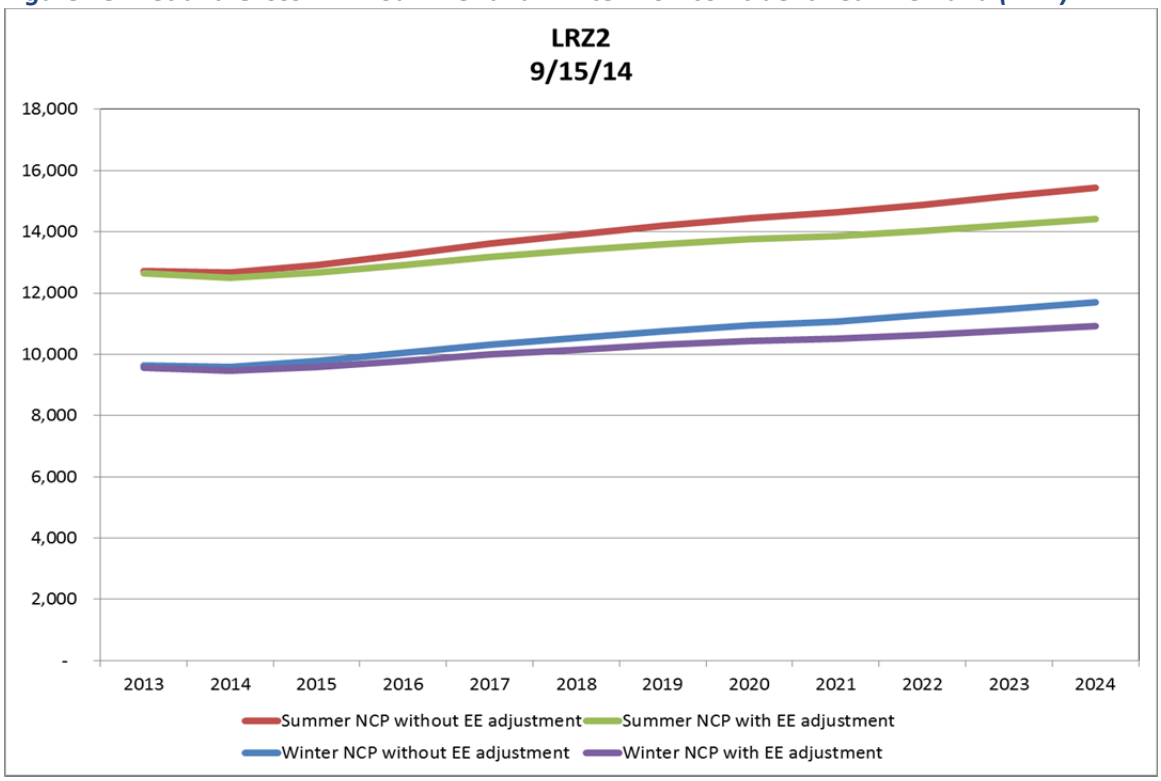


Figure 19: Net and Gross LRZ 3 Summer and Winter Non-coincident Peak Demand (MW)

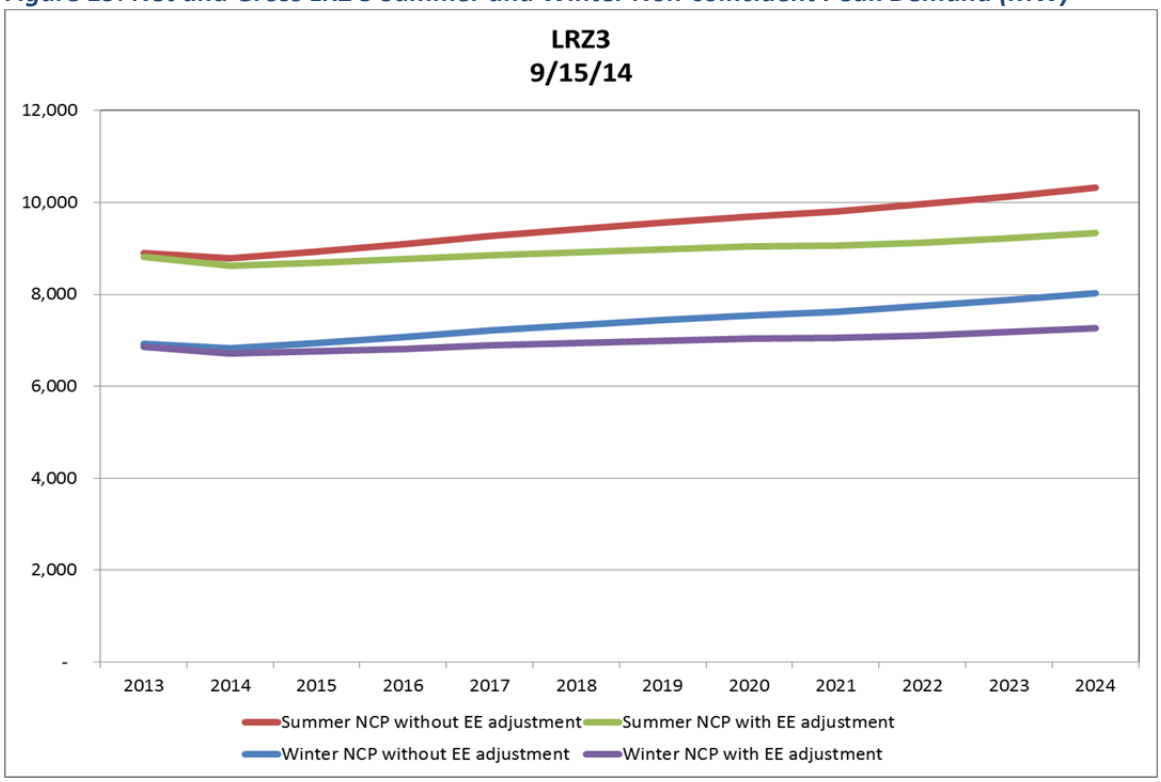


Figure 20: Net and Gross LRZ 4 Summer and Winter Non-coincident Peak Demand (MW)

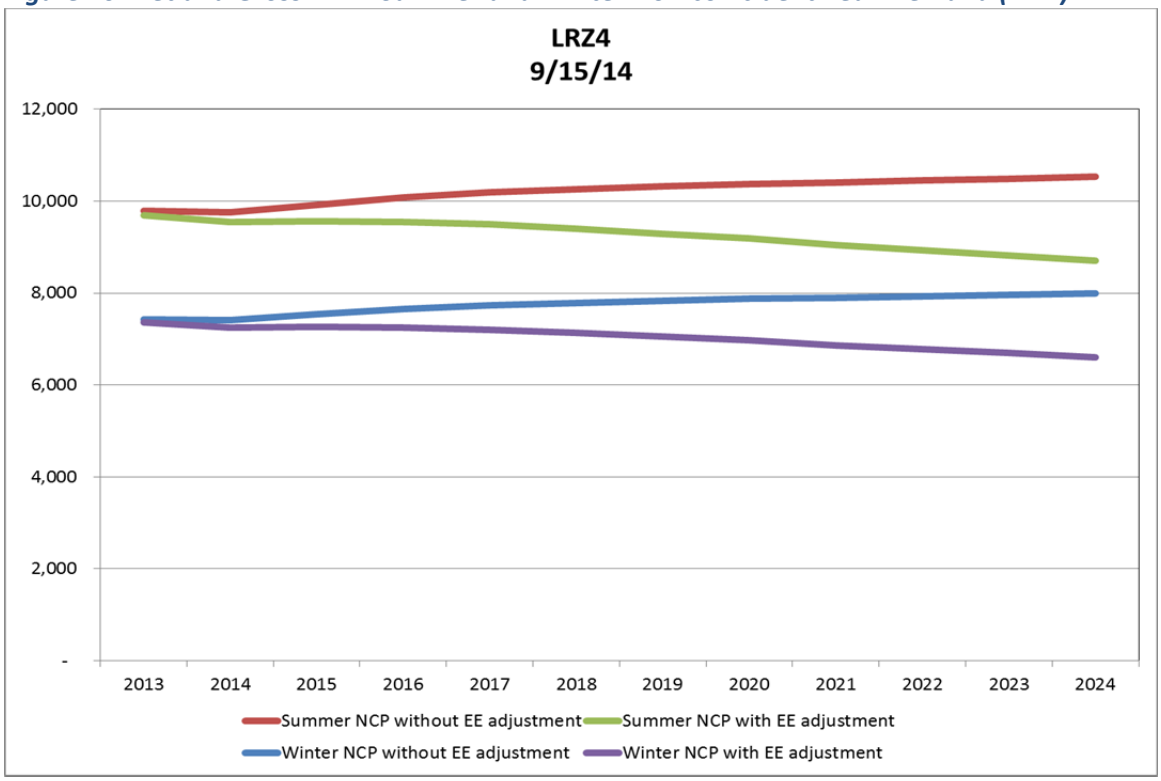


Figure 21: Net and Gross LRZ 5 Summer and Winter Non-coincident Peak Demand (MW)

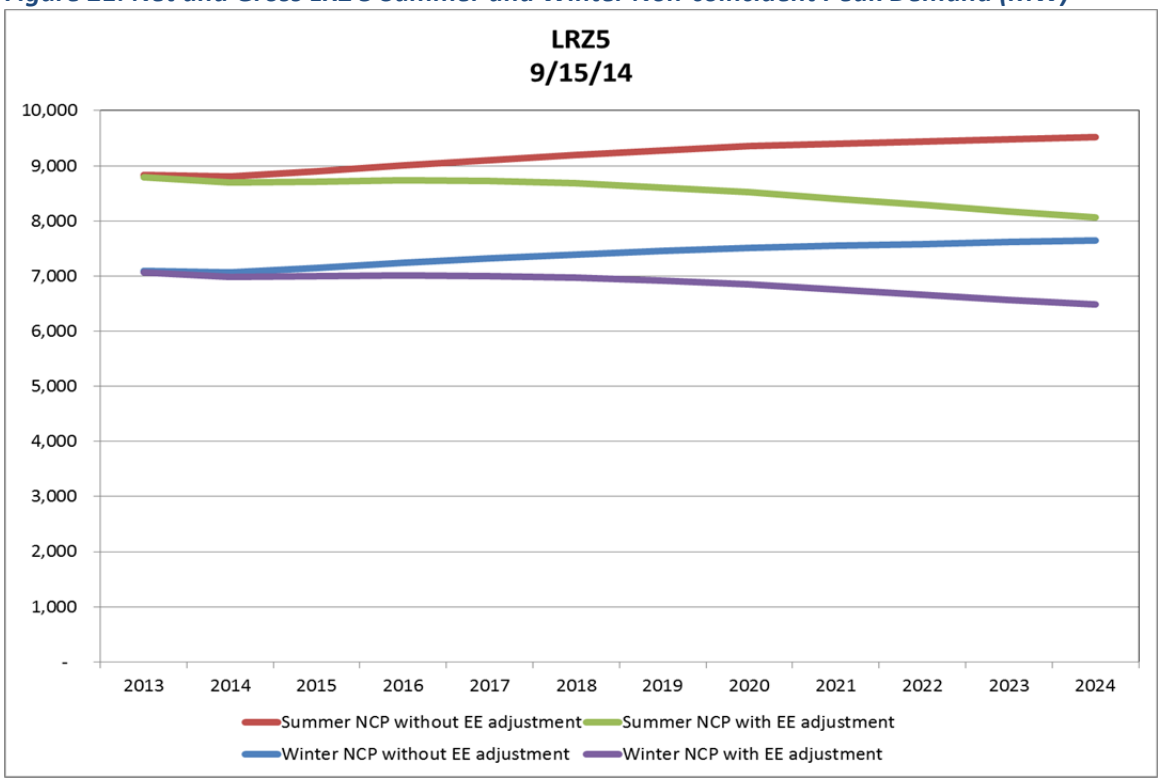


Figure 22: Net and Gross LRZ 6 Summer and Winter Non-coincident Peak Demand (MW)

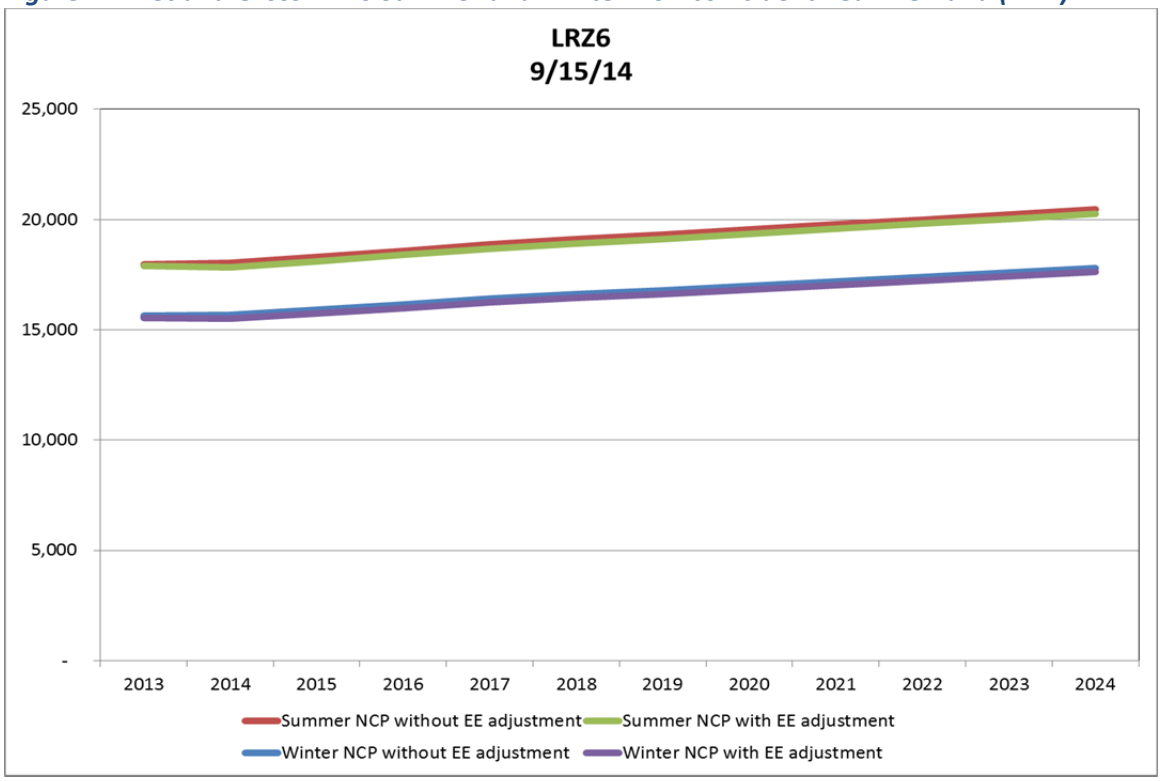


Figure 23: Net and Gross LRZ 7 Summer and Winter Non-coincident Peak Demand (MW)

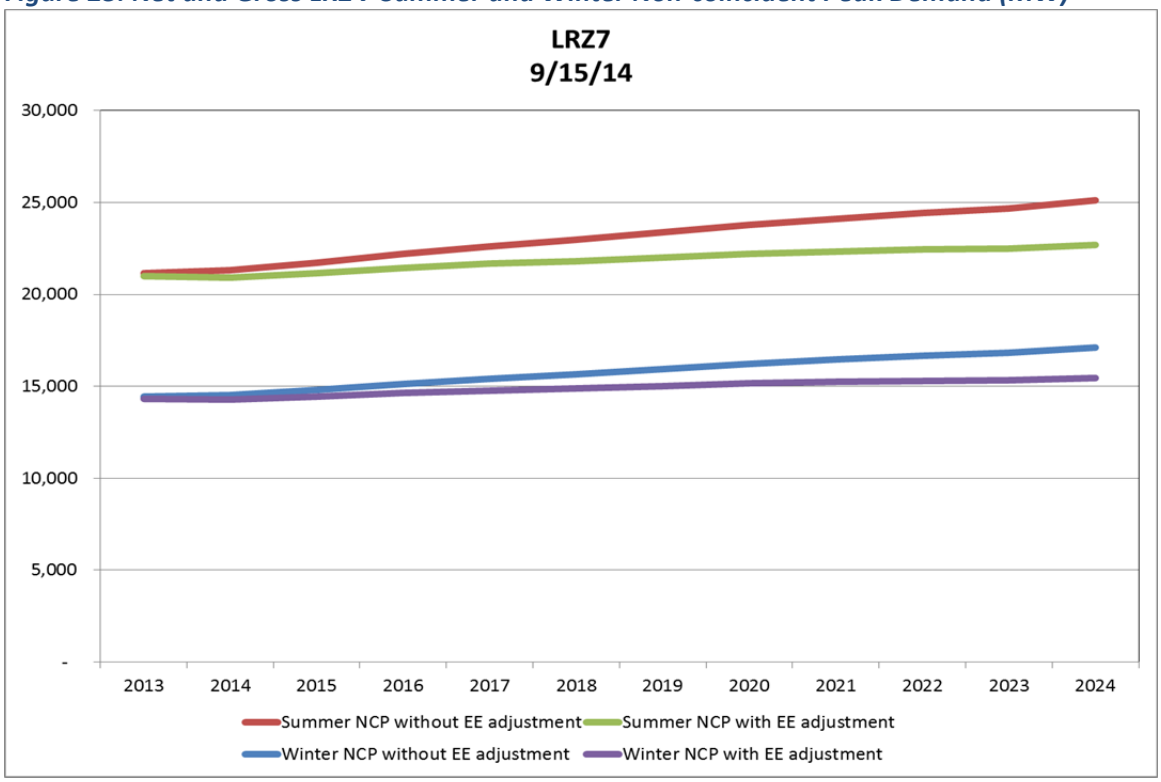


Figure 24: Net and Gross LRZ 8 Summer and Winter Non-coincident Peak Demand (MW)

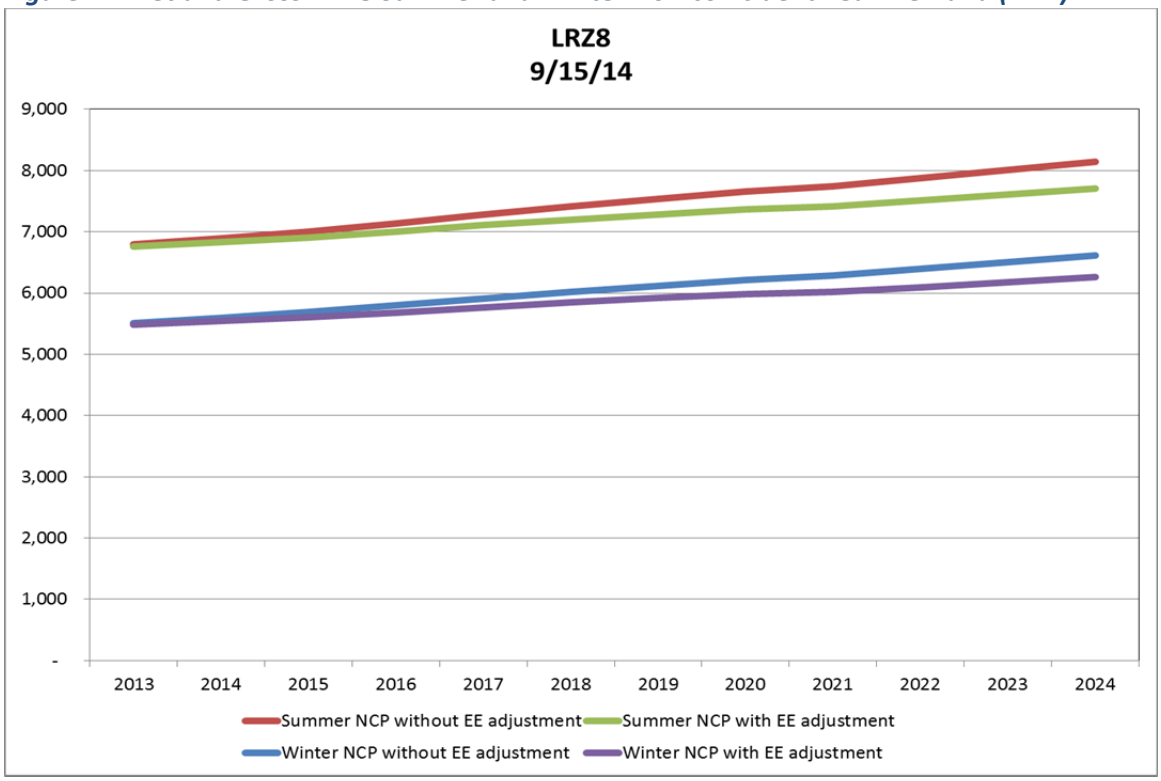
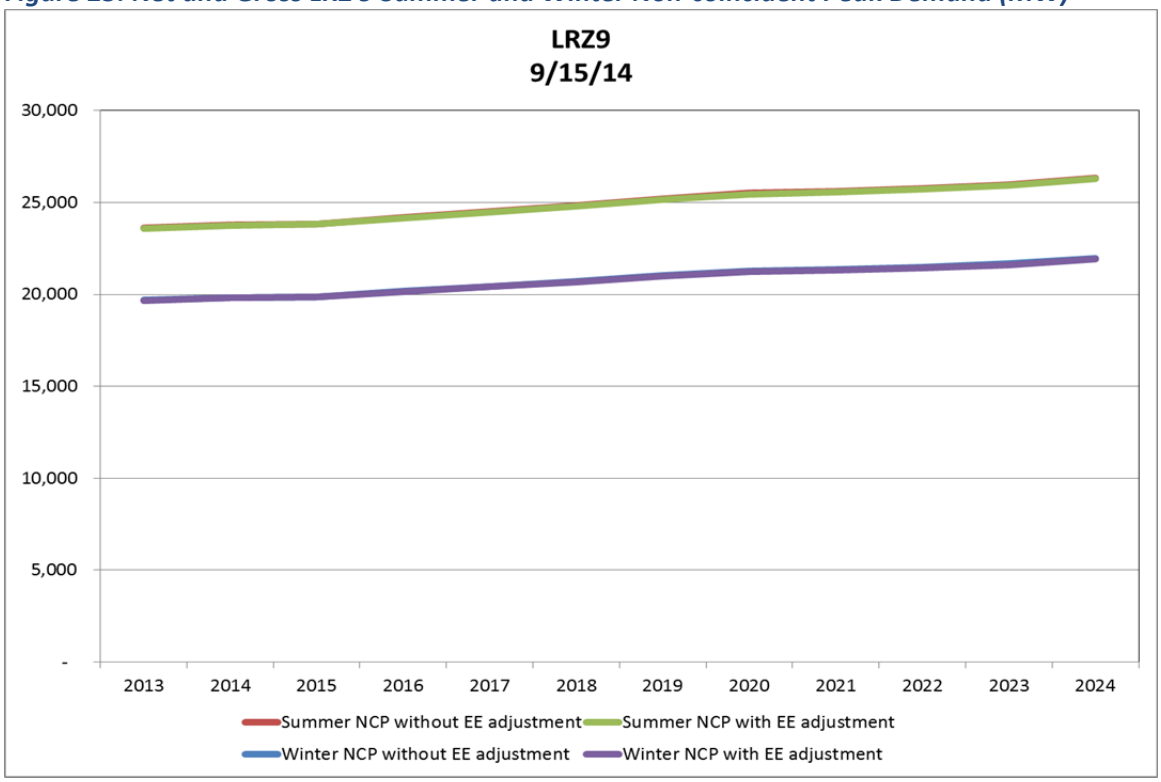


Figure 25: Net and Gross LRZ 9 Summer and Winter Non-coincident Peak Demand (MW)



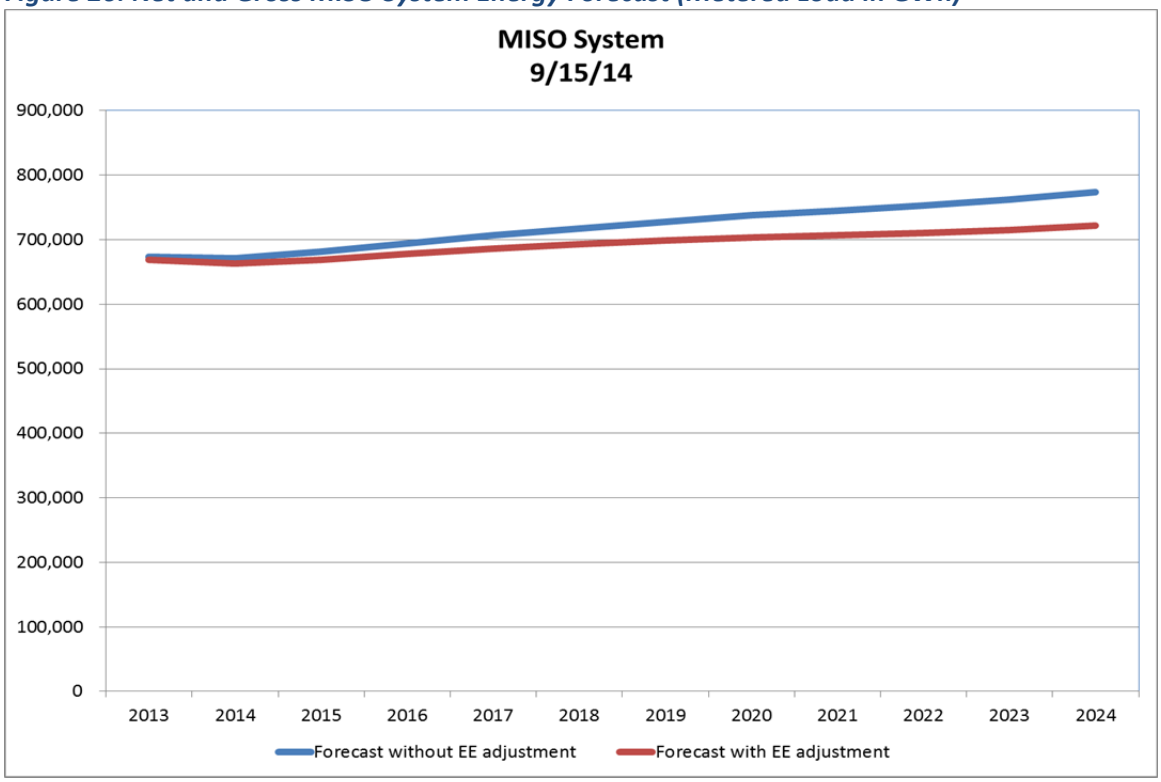
MISO-level Energy and Peak Demand Forecasts

The MISO system energy forecast is found by summing the individual LRZ energy forecasts. Table 13 and Figure 26 provide the MISO-level energy forecast. Note: the forecasts are for the specified calendar year, not the MISO planning year.

Table 13: 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	669,056
2014	671,478	663,303
2015	681,362	669,262
2016	694,326	678,095
2017	706,724	686,252
2018	717,440	692,615
2019	727,990	698,720
2020	737,819	704,009
2021	745,039	706,685
2022	753,600	710,710
2023	762,615	715,195
2024	773,382	721,439
	Compound Annual Growth Rates (%)	
2013-2014	-0.22	-0.86
2014-2015	1.47	0.90
2015-2016	1.90	1.32
2016-2017	1.79	1.20
2017-2018	1.52	0.93
2018-2019	1.47	0.88
2019-2020	1.35	0.76
2020-2021	0.98	0.38
2021-2022	1.15	0.57
2022-2023	1.20	0.63
2023-2024	1.41	0.87
2013-2018	1.29	0.69
2013-2024	1.27	0.69
2015-2024	1.42	0.84

Figure 26: Net and Gross MISO System Energy Forecast (Metered Load in GWh)



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 14 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 15 and Figure 27 provide the projected coincident peak demands for the MISO system. It should be noted that these represent loading at the metered level, not the generation level. To convert these to generation level, one would need to add in an estimate of the transmission losses.

Table 14: 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

Table 15: 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	123,770	97,258	96,697
2014	124,258	122,729	97,041	95,859
2015	126,098	123,825	98,468	96,719
2016	128,499	125,443	100,333	97,985
2017	130,791	126,930	102,116	99,153
2018	132,769	128,082	103,657	100,062
2019	134,723	129,191	105,169	100,927
2020	136,545	130,151	106,579	101,676
2021	137,884	130,625	107,617	102,052
2022	139,467	131,346	108,847	102,622
2023	141,126	132,145	110,143	103,260
2024	143,118	133,277	111,684	104,143
Compound Annual Growth Rates (%)				
2013-2014	-0.19	-0.84	-0.22	-0.87
2014-2015	1.48	0.89	1.47	0.90
2015-2016	1.90	1.31	1.89	1.31
2016-2017	1.78	1.19	1.78	1.19
2017-2018	1.51	0.91	1.51	0.92
2018-2019	1.47	0.87	1.46	0.86
2019-2020	1.35	0.74	1.34	0.74
2020-2021	0.98	0.36	0.97	0.37
2021-2022	1.15	0.55	1.14	0.56
2022-2023	1.19	0.61	1.19	0.62
2023-2024	1.41	0.86	1.40	0.86
2013-2018	1.29	0.69	1.28	0.69
2013-2024	1.28	0.68	1.27	0.68
2015-2024	1.42	0.82	1.41	0.83

Figure 27: Net and Gross MISO System Coincident Peak Demand (Metered Load in MW)