

State Electricity Price Forecasting Model Summary

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SUFG State Electricity Price Forecasting Models

SUFG attempted to construct a series of statewide electricity price forecasting models for each of the 15 states in the MISO market footprint. The resultant forecasts would then be used as inputs to the statewide electric energy models. In the construction of these models, a number of issues arose that potentially affect SUFG's confidence in the reasonability of the models. For that reason, SUFG intends to use electricity prices from IHS Global Insight¹ instead of the price that from these models. This document summarizes the forecasts from both the SUFG models and IHS Global Insight.²

The SUFG models are based on econometric formulations using EIA's census region price projections as the primary driver. Other drivers that were considered include the fraction of generation in the state that comes from different sources and the price of different fuels. In some cases, dummy variables were included to account for structural changes, such as retail competition or regulatory/statutory restrictions on retail prices.

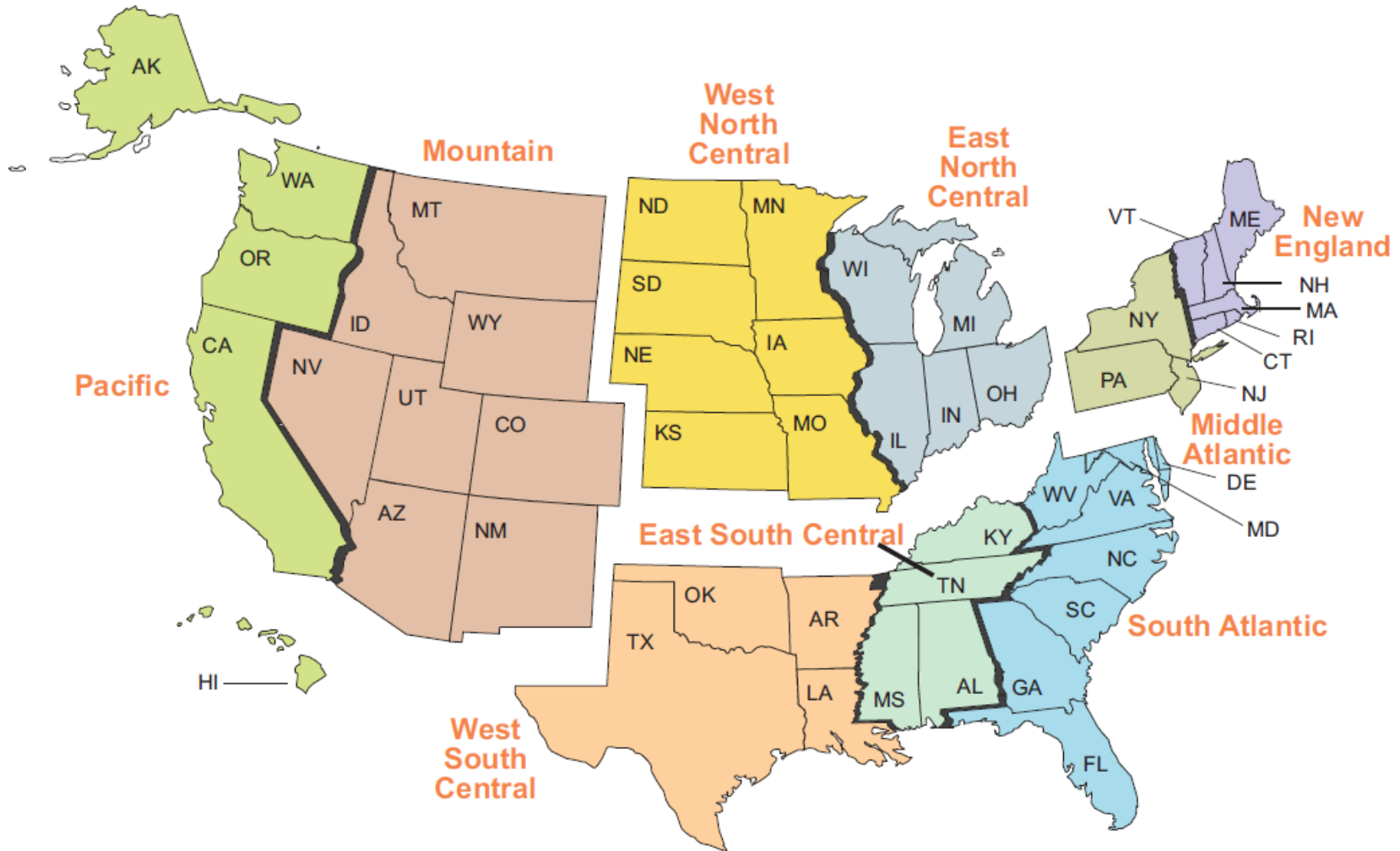
SUFG has opted to use the IHS Global Insight projections for a number of reasons:

- The limitation of the SUFG models to accurately capture the impact of excess capacity on past prices and to project reserves in the future.
- Uncertainty over the fraction of generation from different sources in the future, which requires numerous assumptions that affect the results.
- Model results that are counterintuitive in certain cases, especially in the face of future environmental regulations.
- The IHS Global Insight projections provide consistency of assumptions with the projections of other drivers.

¹ The descriptions of the IHS Global Insight projections apply to their most recent set of projections as of April 2014. SUFG intends to use the most recent projections available when SUFG runs the energy models.

² Due to the proprietary nature of the projections from IHS Global Insight, actual projected values are not provided here. Instead, verbal descriptions and growth rates are provided.

United States Census Regional Division Map



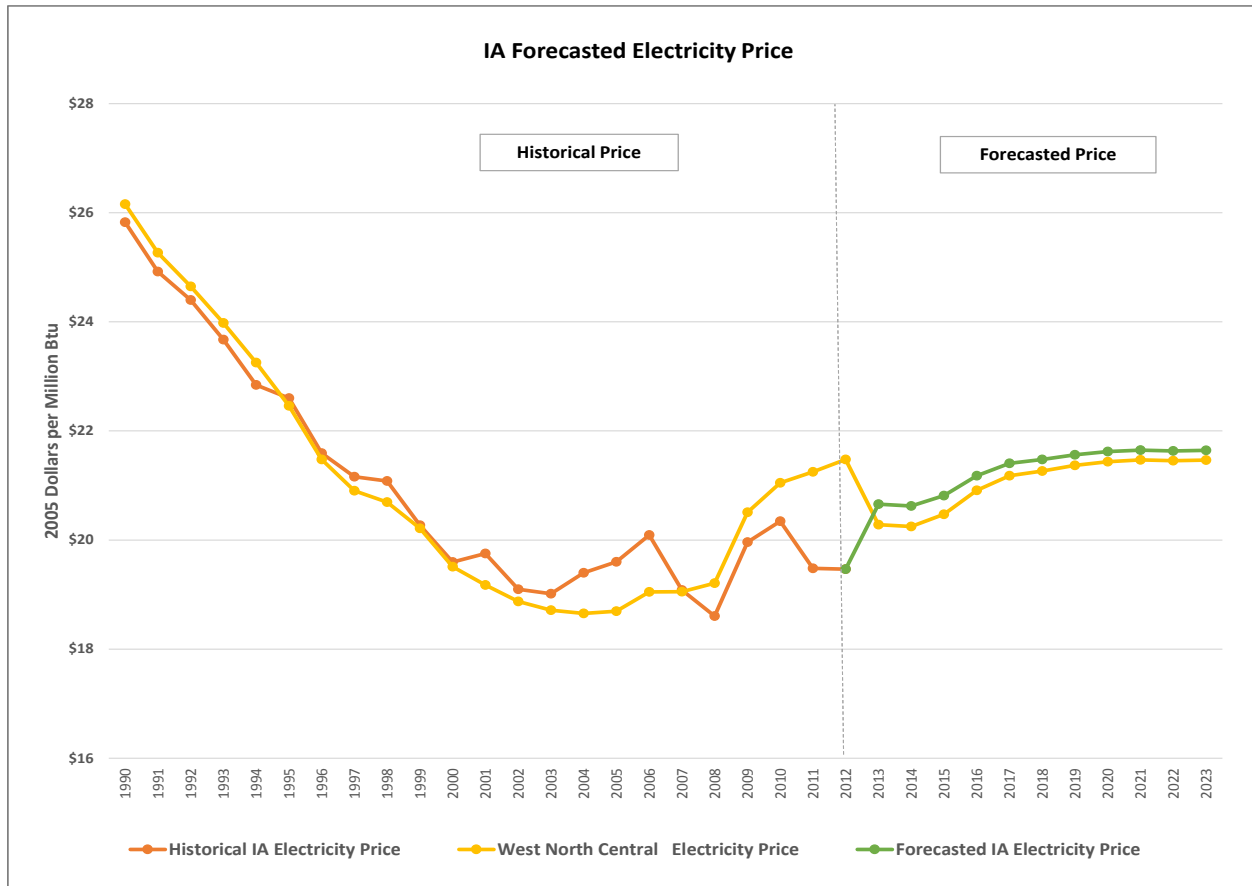
Source: Annual Energy Outlook 2014, Appendix F, Regional Maps, U.S. Energy Information Administration, Office of Energy Analysis

Forecasting Results Comparison (Annual Compound Growth Rate), 2013-2023

Census Region	States	EIA Forecasted Regional Price Growth	Global Insight Forecast	Forecasting Model	Difference between Global Insight Forecast and Forecasting Model
East South Central	Kentucky	-0.2%	1.0%	-0.1%	1.1%
	Mississippi		1.0%	0.2%	0.8%
West South Central	Arkansas	1.6%	0.8%	1.5%	-0.7%
	Louisiana		0.8%	1.3%	-0.4%
	Texas		0.9%	2.0%	-1.1%
East North Central	Indiana	0.7%	1.0%	0.7%	0.3%
	Illinois		0.8%	1.0%	-0.2%
	Michigan		1.1%	0.7%	0.3%
	Wisconsin		1.0%	0.7%	0.3%
West North Central	Iowa	0.6%	1.2%	0.5%	0.7%
	Minnesota		1.2%	1.2%	0.1%
	Missouri		1.1%	0.1%	1.0%
	North Dakota		1.8%	1.2%	0.6%
	South Dakota		1.2%	0.3%	1.0%
Mountain	Montana	0.2%	0.9%	1.0%	-0.1%

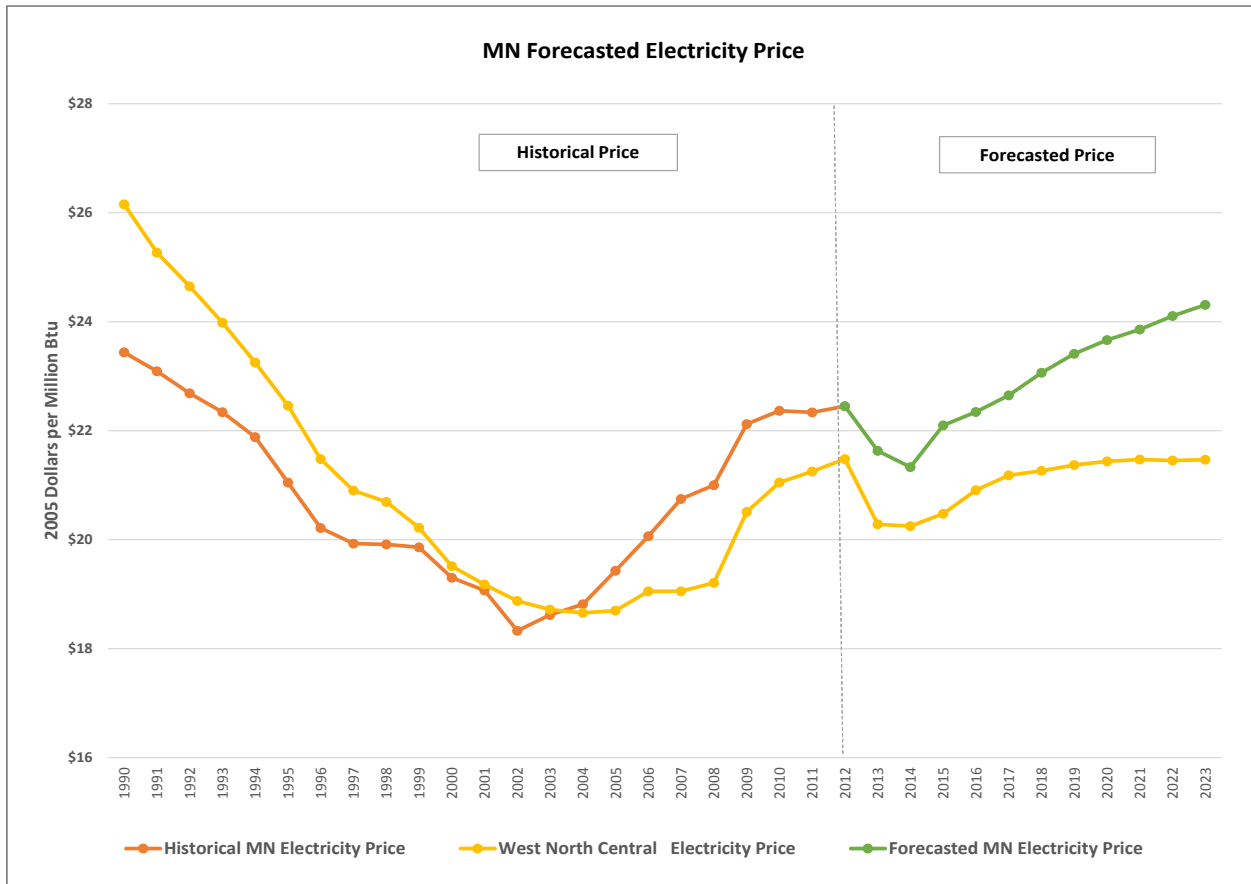
West North Central Region

Iowa



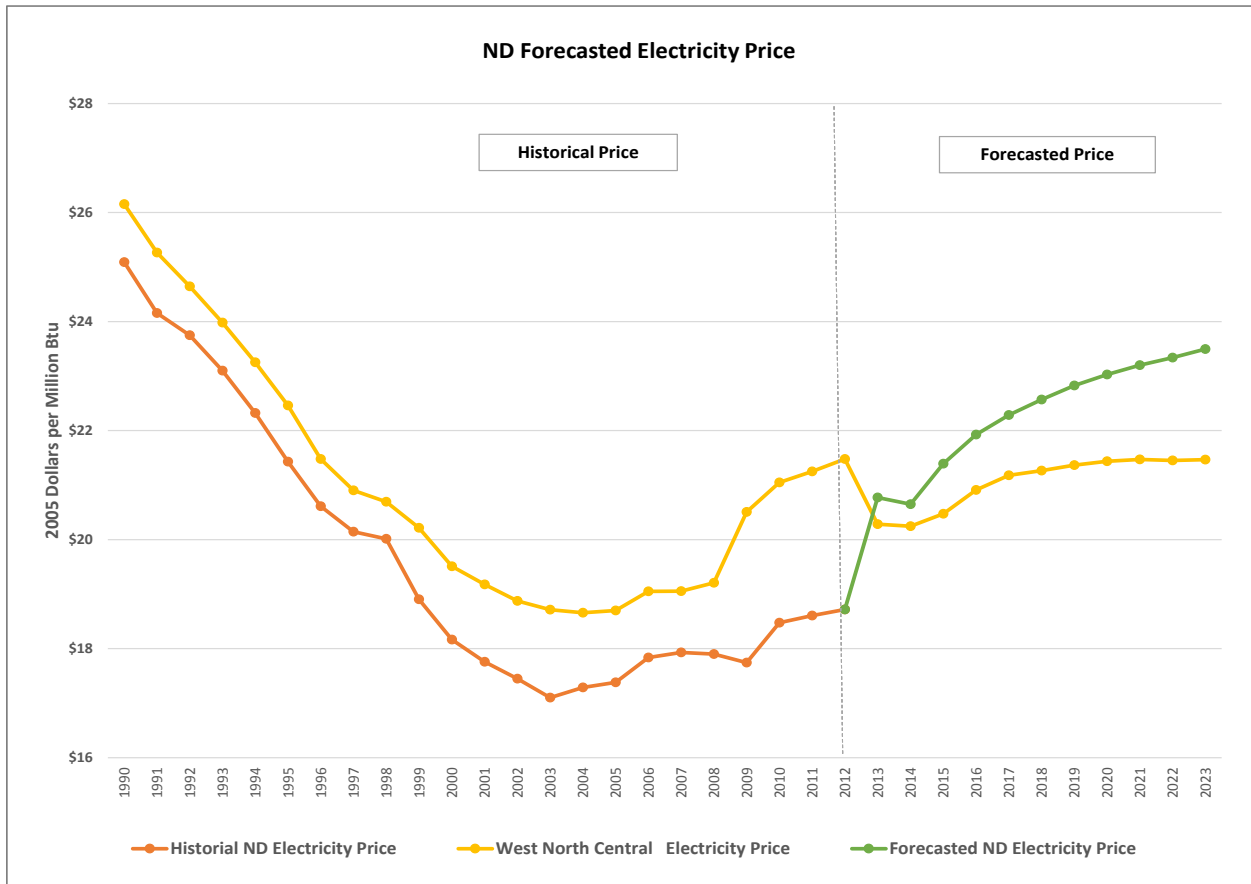
The IHS Global Insight projection is similar to the projection produced by the SUFG model but has higher prices in the later years, resulting in an overall higher annual growth rate (1.2% vs. 0.5%).

Minnesota



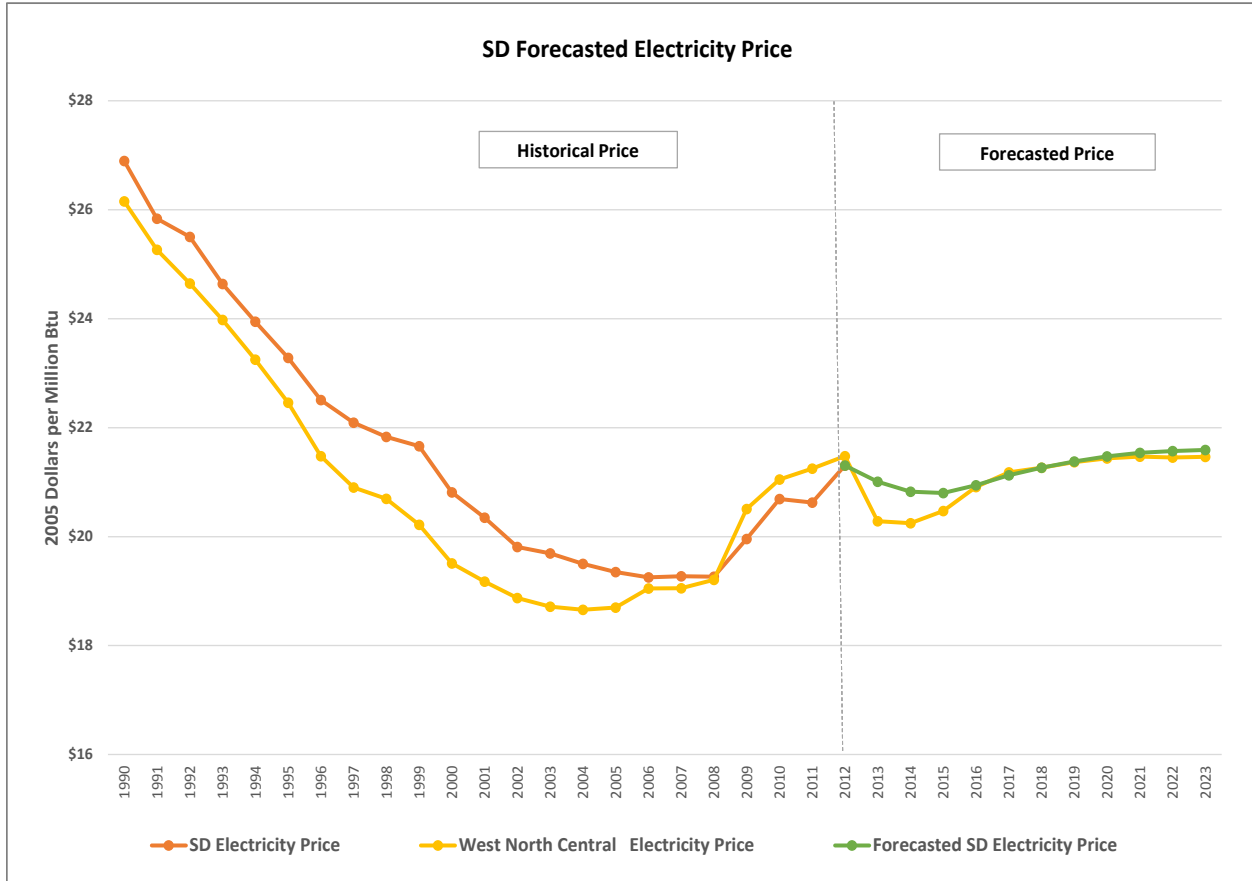
The IHS Global Insight projection exhibits more steady growth than the projection from the SUFG model, with both models having the same overall growth rate over the 2013-2023 period (1.2%).

North Dakota



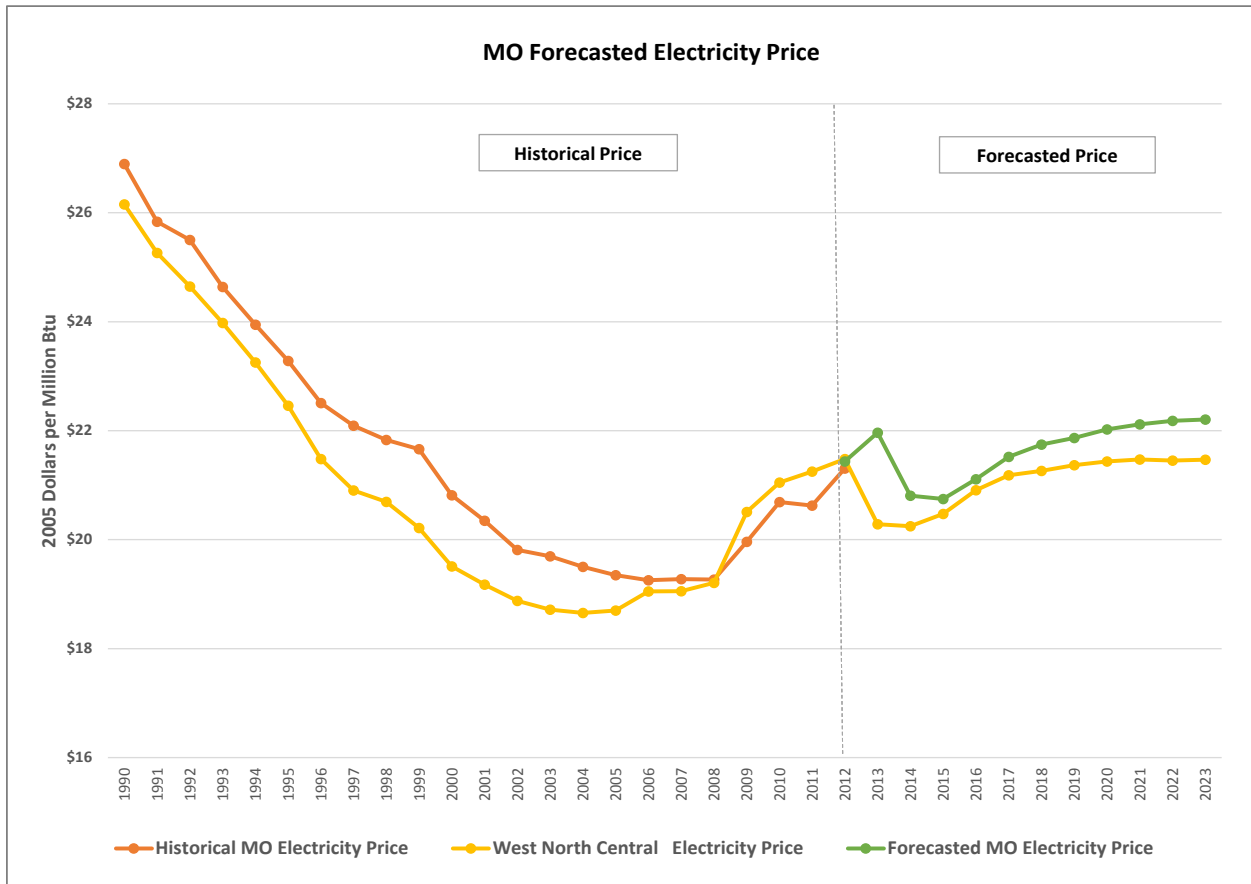
The IHS Global Insight projection has higher growth in the early years and similar growth in the later years to the SUFG model, with a higher overall growth rate (1.8% vs. 1.2%).

South Dakota



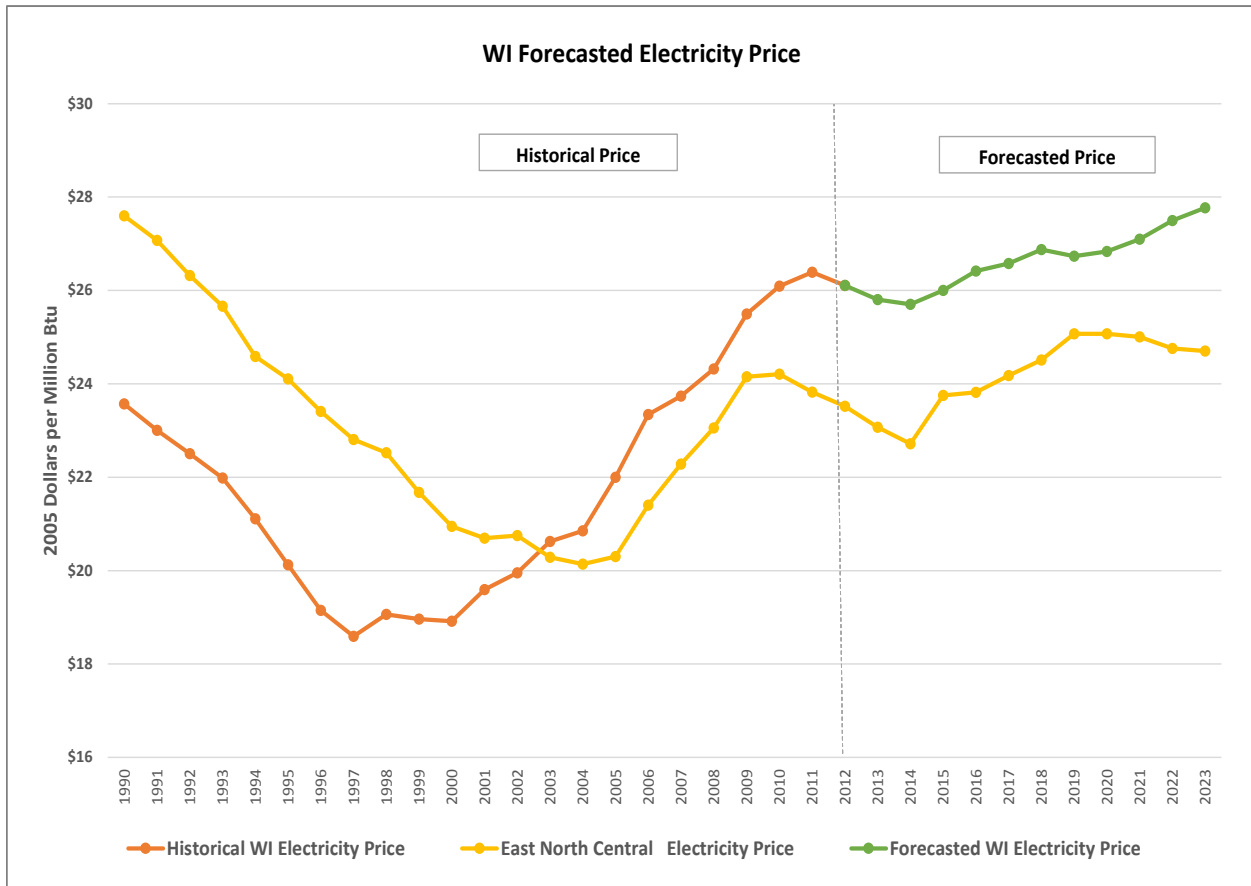
The IHS Global Insight projection exhibits a fairly consistent increase over the entire period, with a higher overall growth rate than the SUFG model (1.2% vs. 0.3%).

Missouri



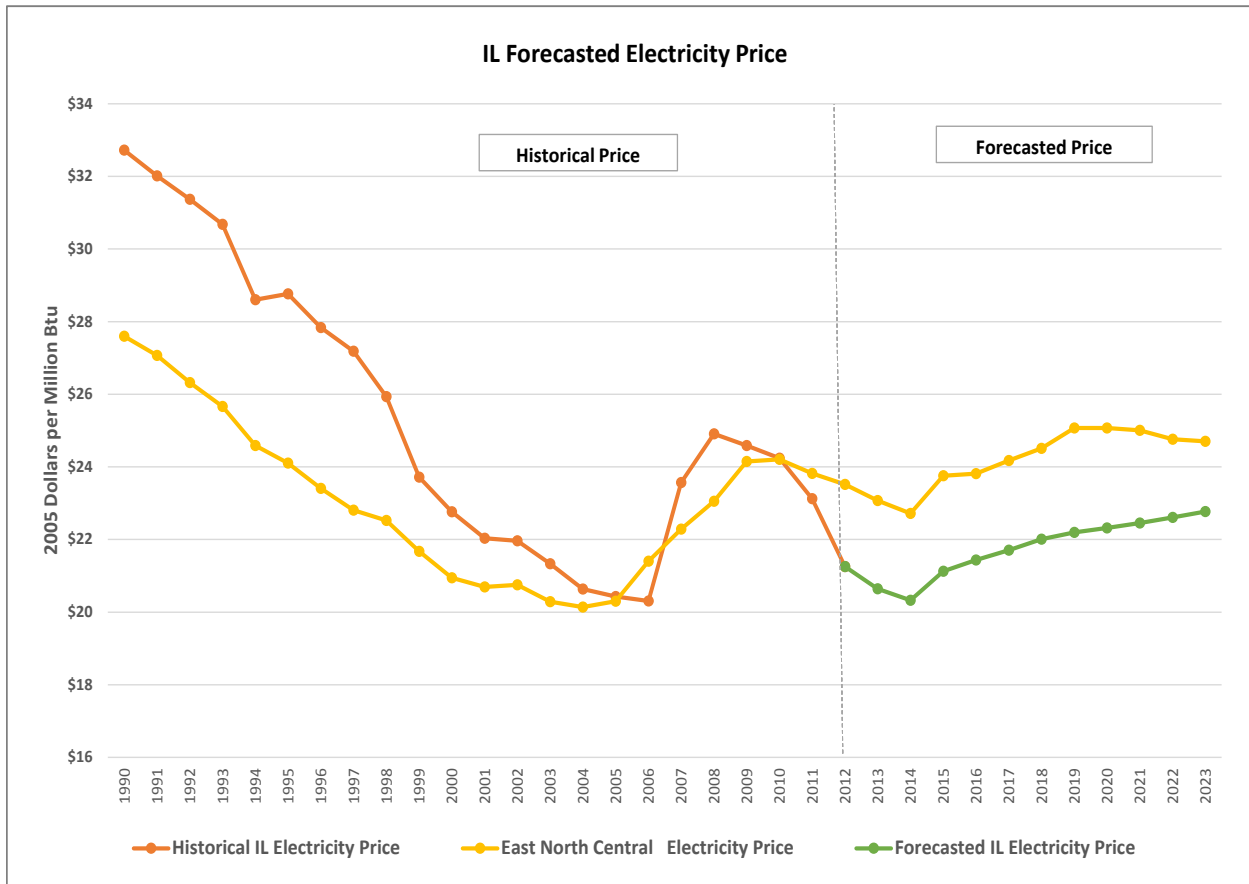
The IHS Global Insight projection is similar to the projection produced by the SUFG model but has a smaller drop in the beginning and higher prices in the later years, resulting in an overall higher growth rate (1.1% vs. 0.1%).

East North Central Region
Wisconsin



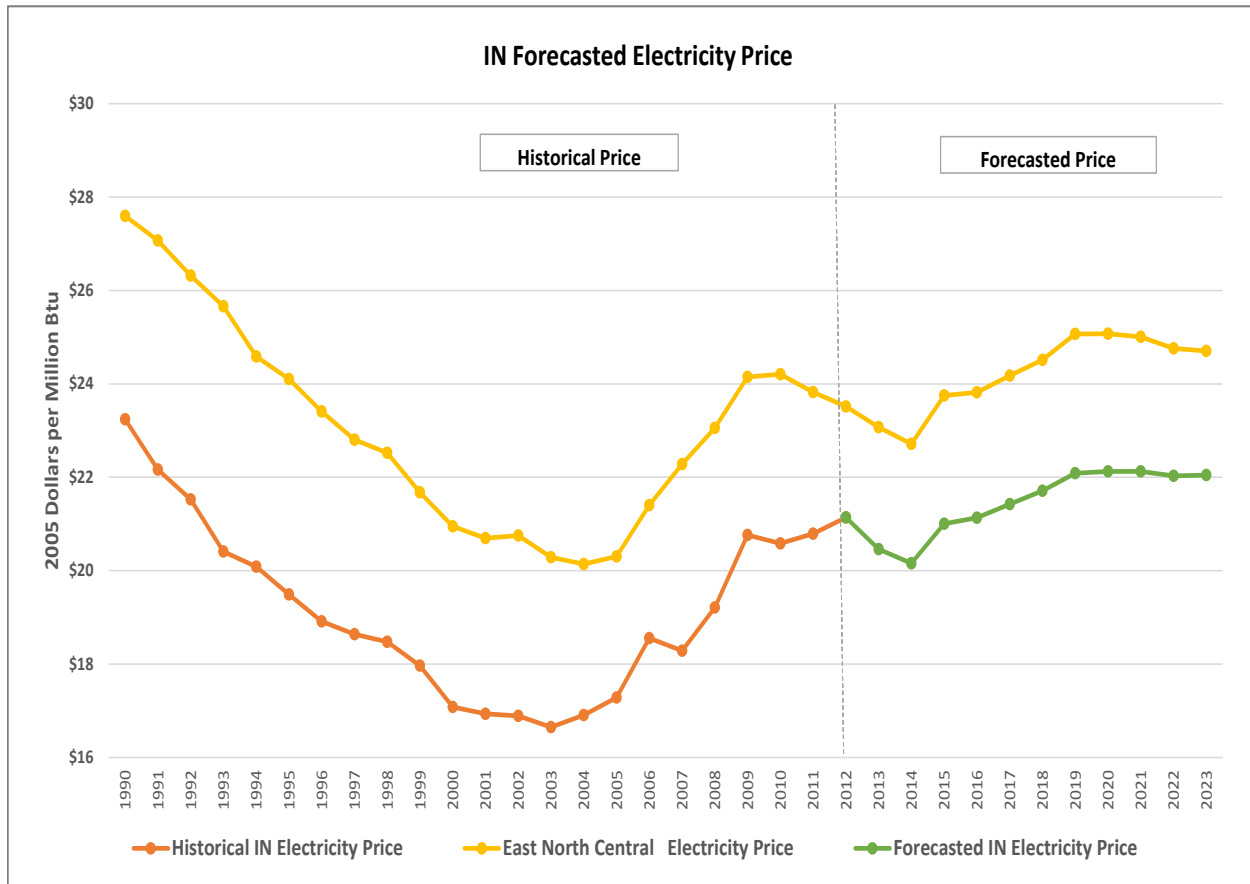
The IHS Global Insight projection is similar to the projection produced by the SUFG model but has higher prices in the later years, resulting in a slightly overall higher growth rate (1.0% vs. 0.7%).

Illinois



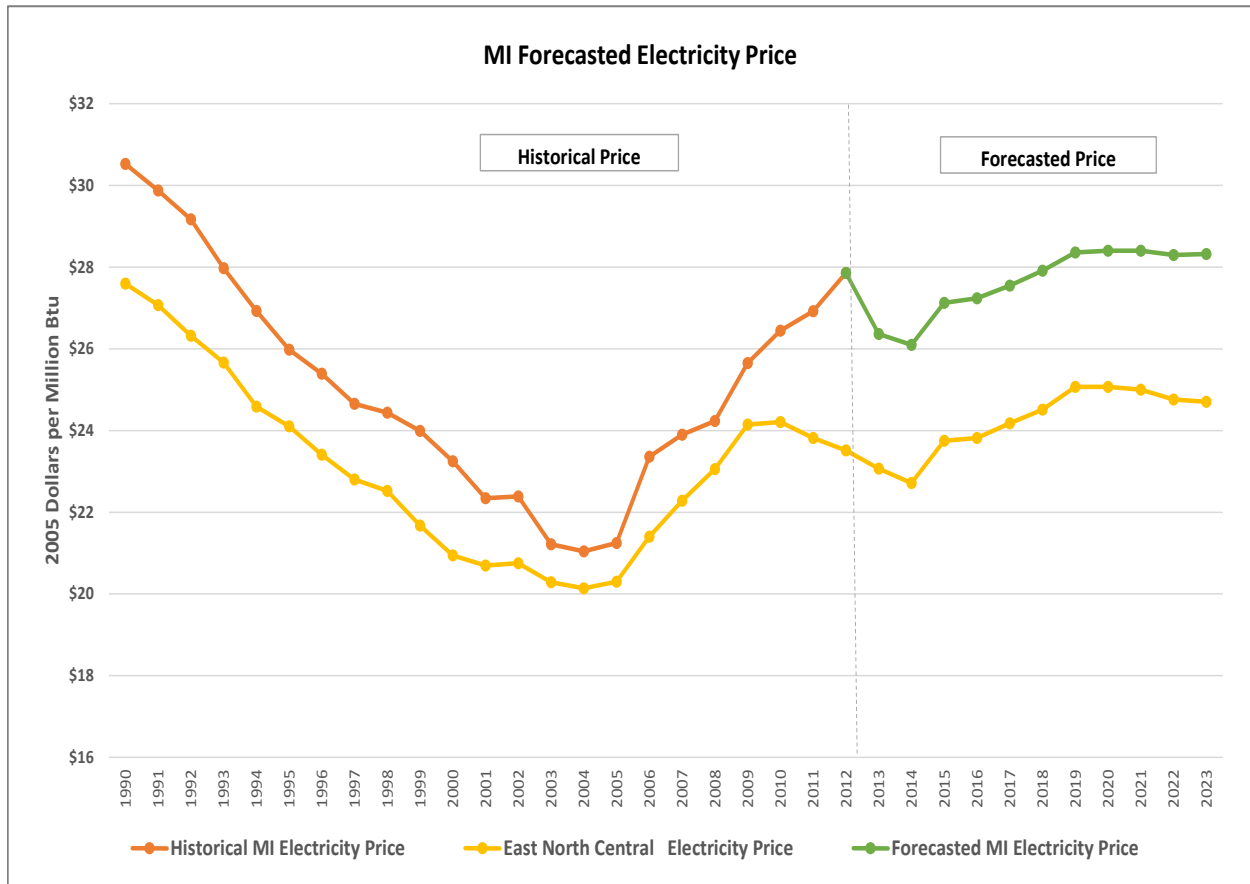
The IHS Global Insight projection has a fairly consistent increase over the entire period, with a slightly lower overall growth rate than the SUFG model (0.8% vs. 1.0%).

Indiana



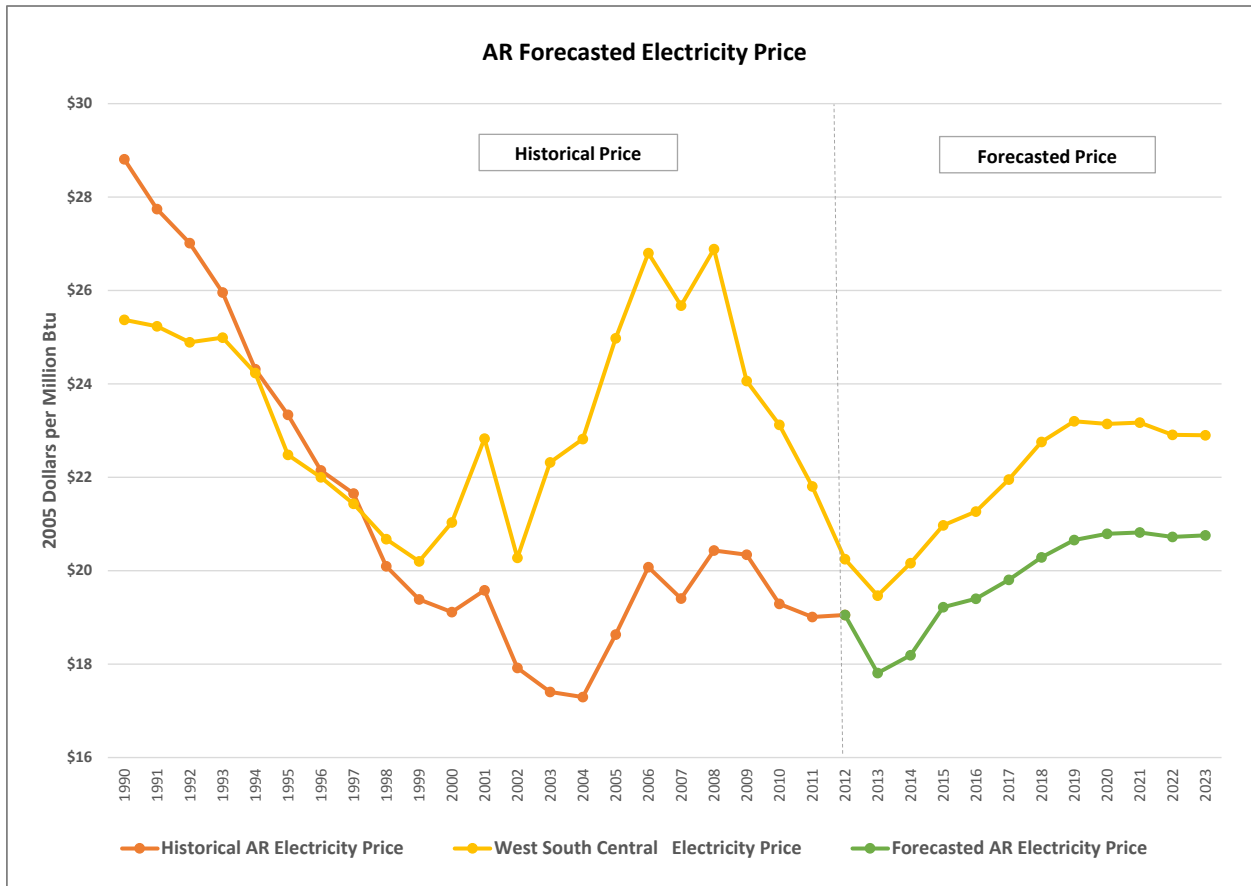
The IHS Global Insight projection has a fairly consistent increase over the entire period, with a slightly higher overall growth rate than the SUFG model (1.0% vs. 0.7%).

Michigan

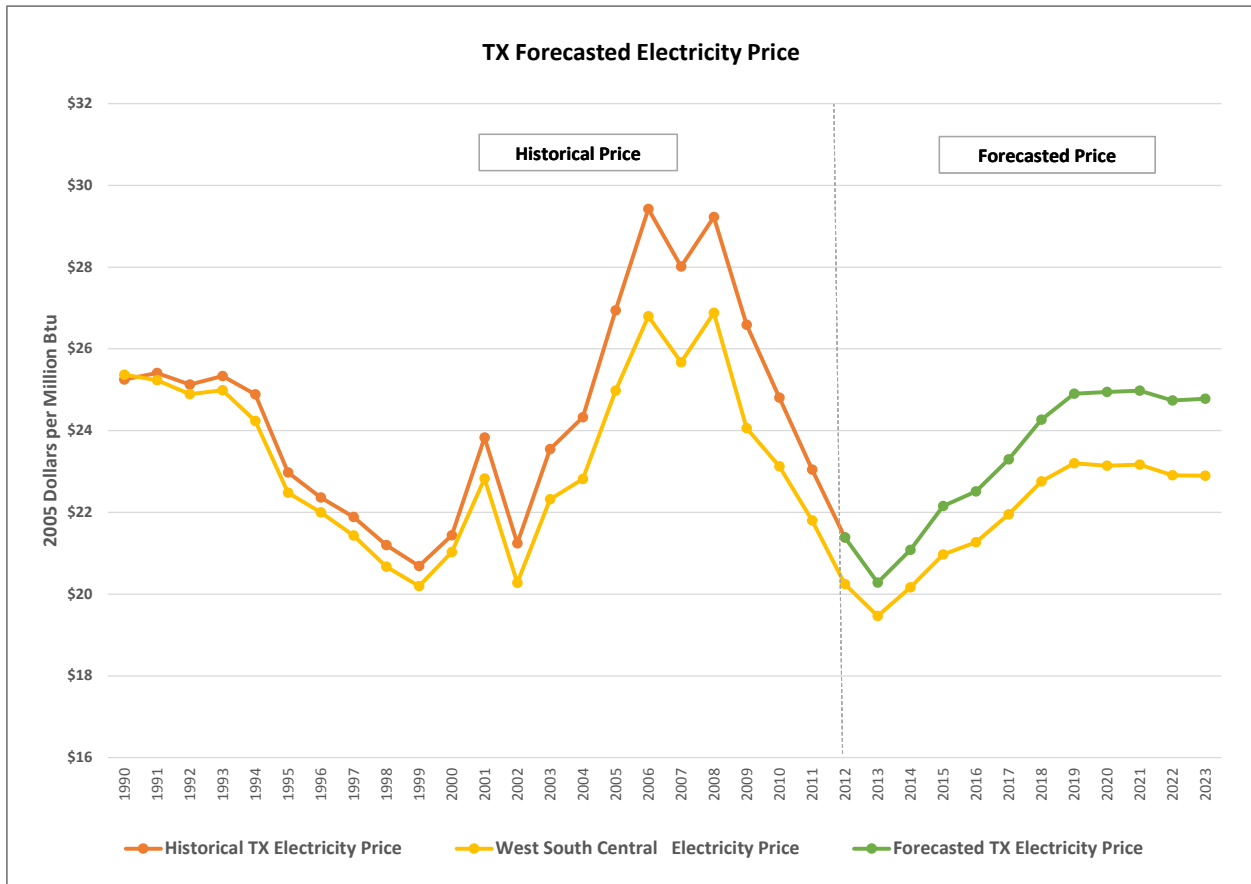


The IHS Global Insight projection has a general increase over the entire period, with a larger increase in the later years. This produces a higher overall growth rate than the SUFG model (1.1% vs. 0.7%).

West South Central Region
Arkansas

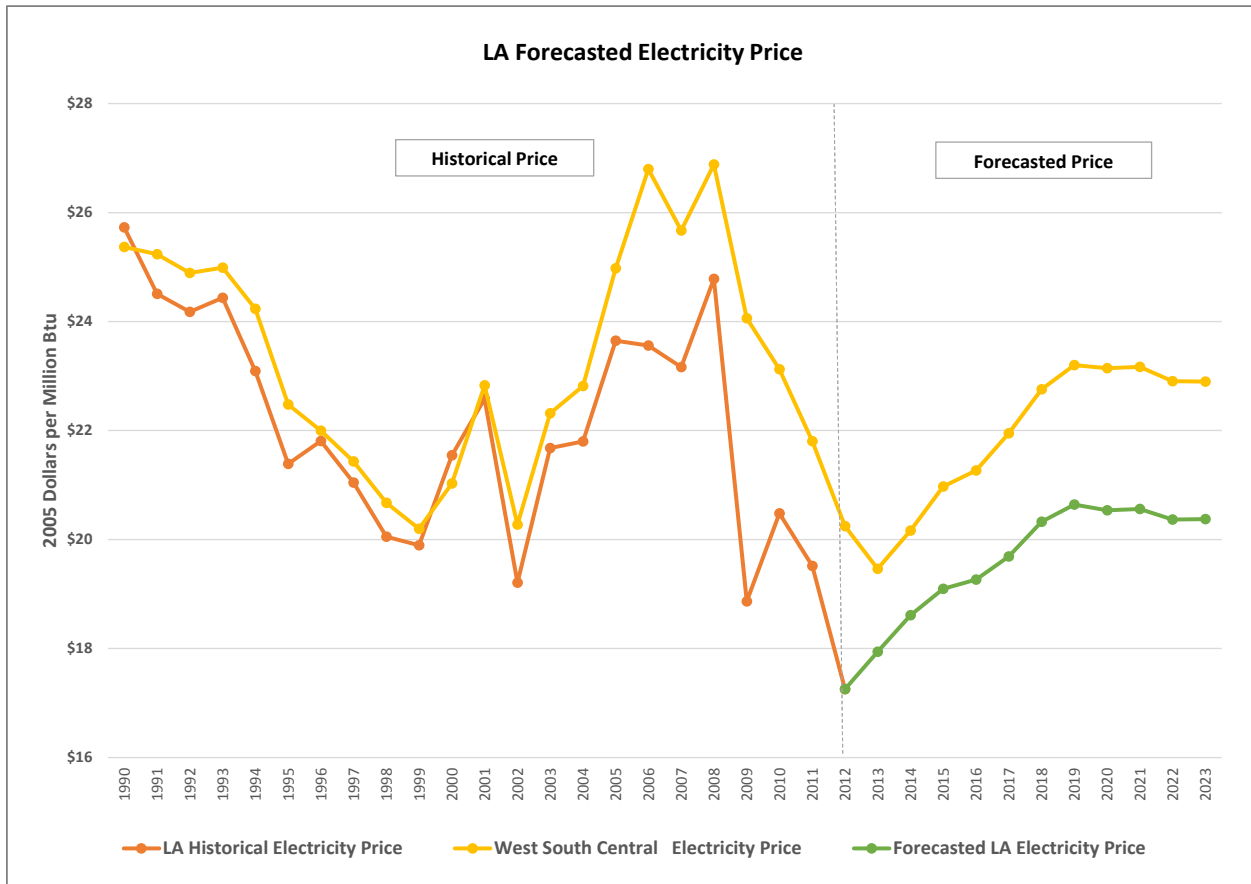


The IHS Global Insight projection has periods of higher growth early and late in the forecast period, with relatively unchanged prices in the middle. The overall growth rate is lower than the projections from the SUFG model (0.8% vs. 1.5%).



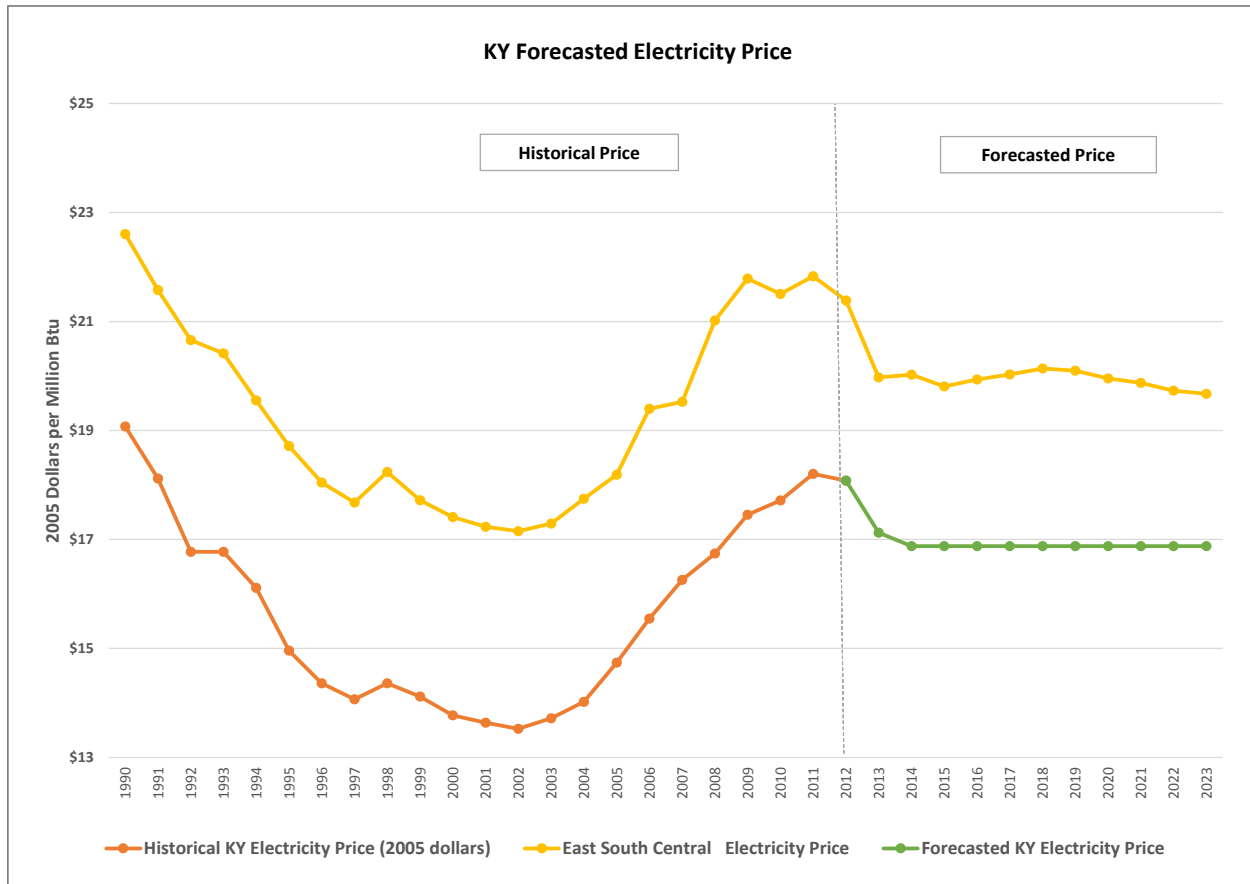
The IHS Global Insight projection has periods of higher growth early and late in the forecast period, with relatively unchanged prices in the middle. The overall growth rate is lower than the projections from the SUFG model (0.9% vs. 2.0%).

Louisiana



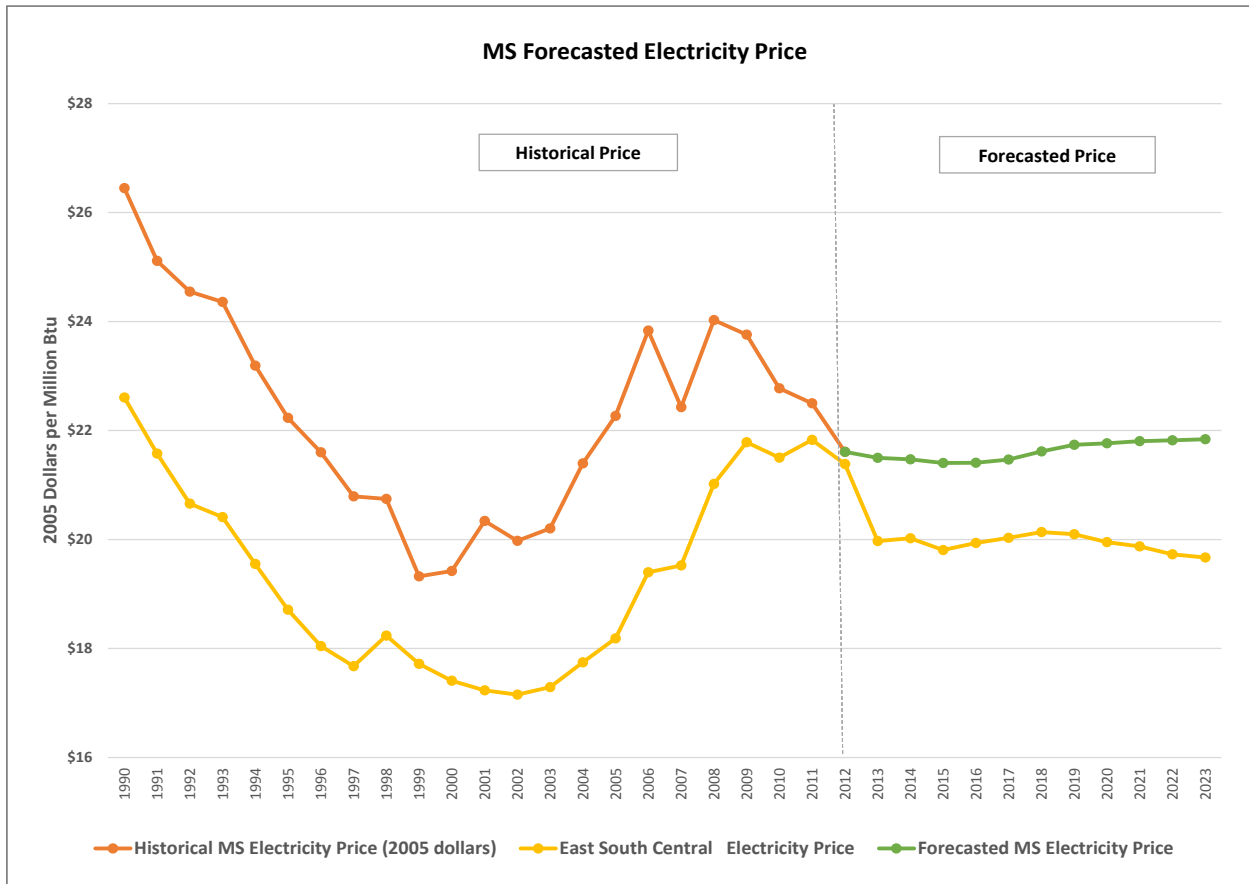
The IHS Global Insight projection has the highest growth late in the forecast period, with overall lower growth than the projections from the SUFG model (0.8% vs. 1.3%).

East South Central Region
 Kentucky



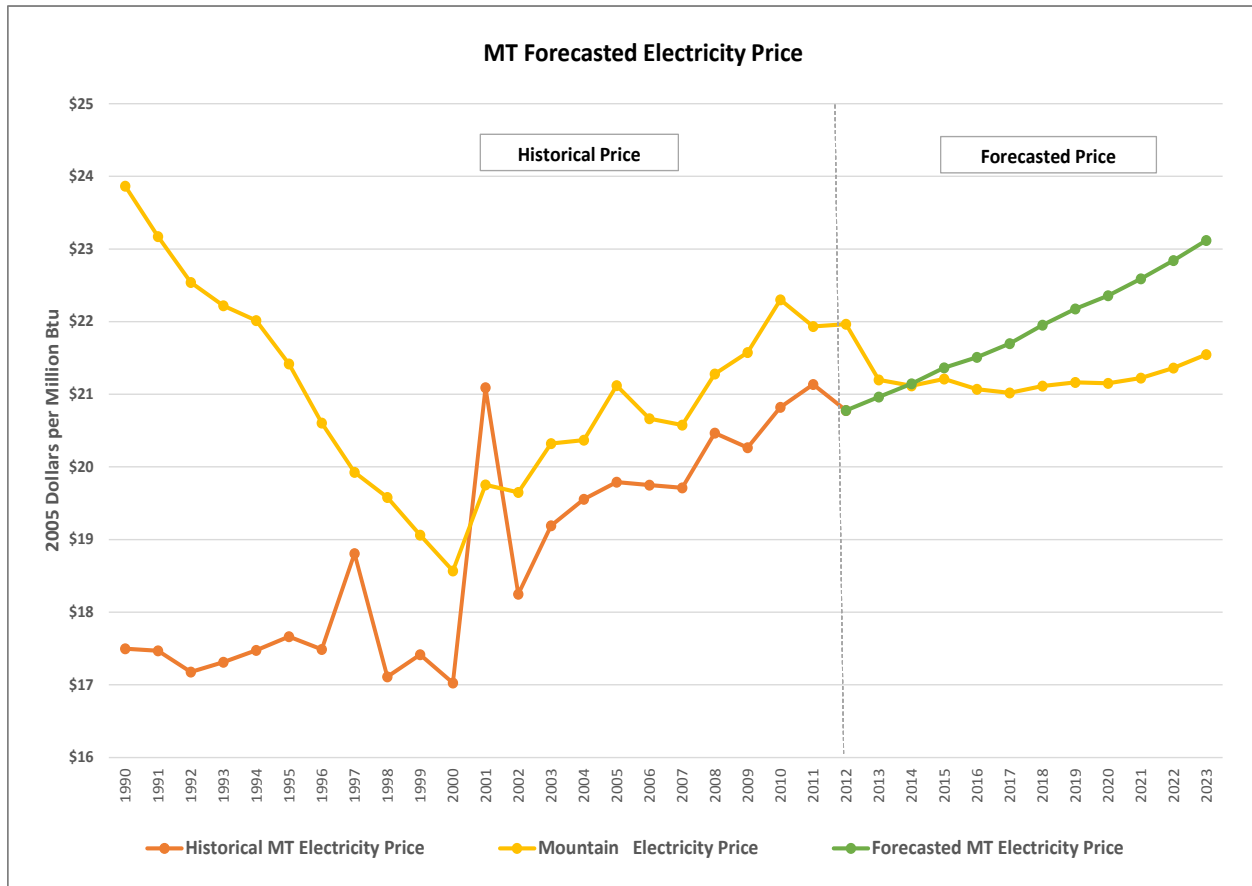
The IHS Global Insight projection has periods of higher growth early and late in the forecast period, with relatively unchanged prices in the middle. The overall growth rate is higher than the projections from the SUFG model (1.0% vs. -0.1%).

Mississippi



The IHS Global Insight projection has the highest growth rate in the forecast period, with overall higher growth than the projections from the SUFG model (1.0% vs. 0.2%).

Mountain Region
Montana



The IHS Global Insight projection has periods of higher growth early and late in the forecast period, with relatively unchanged prices in the middle. The overall growth rate is similar to the projections from the SUFG model (0.9% vs. 1.0%).

Appendix

Historical Regional Electricity Prices

EIA provides forecasted regional electricity prices from 2012 year 2040. However, it does not provide historical regional electricity prices. In order to do regression analysis using historical energy prices from 1990 to 2012, the SUFG team calculated historical regional electricity prices for each census region where there was a state in the MISO footprint. The average price was calculated by weighting each state's average electricity price based on its consumption of electricity relative to the consumption of the other states in the same census region. Annual average state electricity prices and consumption were obtained from U.S. Energy Information Administration State Profiles and Energy Estimates.

Data for the following states was collected:

Census Region	States
East South Central	Alabama
	Kentucky
	Mississippi
	Tennessee
West South Central	Arkansas
	Louisiana
	Oklahoma
	Texas
East North Central	Ohio
	Indiana
	Illinois
	Michigan
	Wisconsin
West North Central	Iowa
	Kansas
	Minnesota
	Missouri
	North Dakota
	South Dakota
	Nebraska
Mountain	Arizona
	Colorado
	Idaho
	Montana
	New Mexico
	Nevada
	Utah
	Wyoming