System Forecasting for Energy Planning at MISO

ACES 2019 MISO Summit

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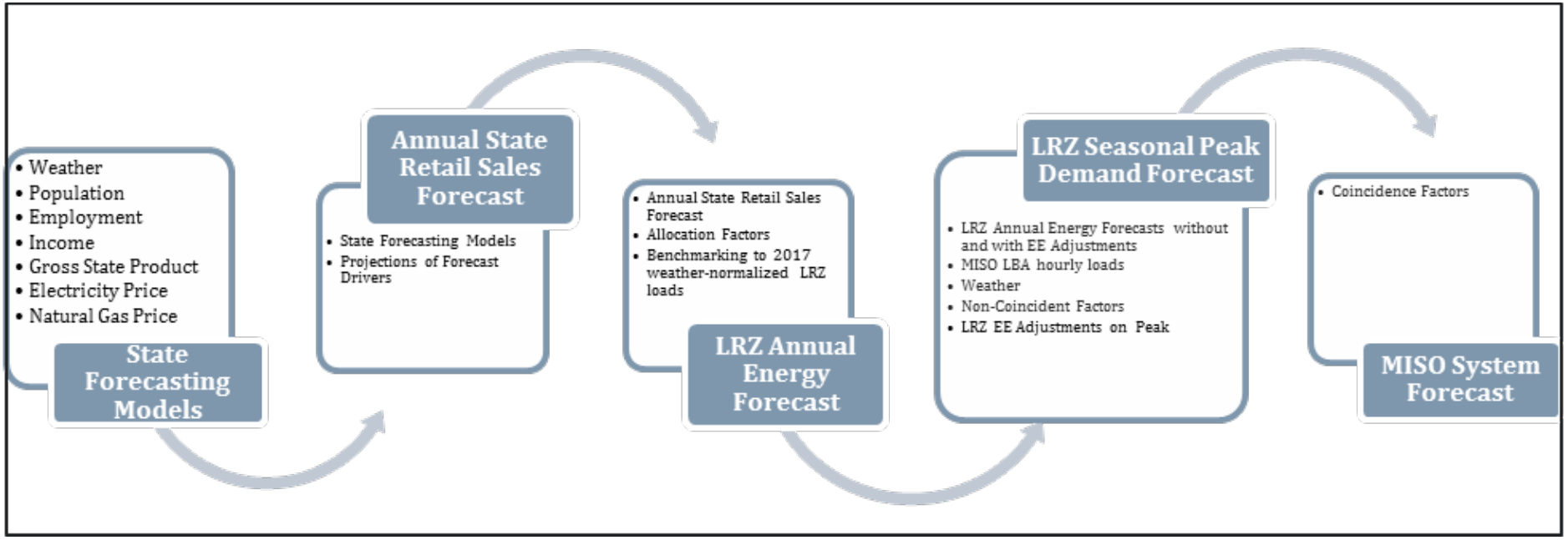
Characteristics

- Independent
- Transparent
- Consistent
- Using public information to the extent possible
- Not an attempt to replicate or replace the Module E forecasts

Process Flow Chart



State Models

- We built econometric models of annual energy sales for each MISO state
  - New versions created every two years
  - Drivers vary from state to state, but generally include an economic measure, electricity and natural gas prices, and weather
- These are used to create 20-year forecasts of annual sales for each state
  - prior to utility energy efficiency programs

Allocation Models

- State energy forecasts are allocated to the Local Resource Zones (or to non-MISO loads) based on historical data
- Allocation factors are held constant throughout the forecast unless we have a reason to expect them to change
  - e.g., The economy in St. Louis may be projected to grow differently than the rest of Missouri in LRZ 5

Average % of State Sales (2009-2016)

LRZ	AR	IA	IL	IN+KY	LA	MI	MN	MO	MS	ND+MT	SD	TX	WI
1		1.8%	0.0002%			0.1%	97.0%			36.4%	24.1%		16.8%
2						4.9%							83.2%
3		91.1%	1.4%				1.8%				1.8%		
4			33.1%										
5								48.9%					
6				49.6%									
7						91.0%							
8	71.1%							0.0%				0.0%	
9					92.2%							5.6%	
10									45.1%				
Non-MISO	**28.9%**	**7.1%**	**65.5%**	**50.4%**	**7.8%**	**4.0%**	**1.3%**	**51.0%**	**54.9%**	**63.6%**	**74.1%**	**94.4%**	**0.0%**

LRZ Peak Demands

- LRZ level peak demands are projected using models that estimate the relationship between demand and average load under typical weather conditions for peak loads
  - polynomial relationship with temperature and average of temperature over previous hours as variables

LRZ Forecasts

- Previously, we provided annual energy and summer and winter peak demand projections
  - we now produce monthly energy and peak forecasts
- We also incorporate utility EE at the LRZ level, based on information provided by MISO staff

Coincidence Factors

- LRZ forecasts are not coincident with the MISO system peak
  - they may not occur at the same time
- Coincidence factors are calculated based on historical observations

$$CF = \frac{LRZ\ demand\ at\ time\ of\ MISO\ peak}{LRZ\ peak\ demand}$$

System Level Forecasts

- MISO system level energy forecasts are the simple sum of the LRZ energy forecasts
- System level peak demand forecasts are the sum of the LRZ peak demands times the coincidence factor

$$Peak_{MISO} = \sum (Peak_{LRZ} * CF_{LRZ})$$

Data Sources (from 2018 report)

Data	Content	Historical Data Source	Data Used in Projection
Electricity sales	GWhs, annual retail electricity sales by state, 1990-2016	EIA	N/A
Electricity prices	Cents/KWh, 2009$, 1990-2016	EIA	SUFG projection based on EIA data
Natural gas prices	$/Mcf (thousand cubic feet), 2009$, 1990-2016	EIA	SUFG projection based on EIA data
Real personal income	Thousands, 2009$, 1990-2016	BEA	IHS Markit
Population	Number of people, population by state, 1990-2016	Census Bureau	IHS Markit
Manufacturing & non-manufacturing employment	Number of jobs, 1990-2016	BLS	IHS Markit
Non-farm employment	Number of jobs, 1990-2016	BLS	IHS Markit
Gross state product	Millions, 2009$, 1990-2016	IHS Markit	IHS Markit
Cooling degree days (CDD)	Summations of monthly cooling degree days, base 65° F, 1970-2017	NOAA	NOAA 30-year normal
Heating degree days (HDD)	Summations of monthly heating degree days, base 65° F, 1970-2017	NOAA	NOAA 30-year normal
Hourly Temperature	Historical hourly temperature of selected weather stations, 1997-2017	MRCC	Normal peak temperatures

Further Information

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