2020-2029 Electric Customer and Sales Forecasts

Prepared by Regulated Pricing

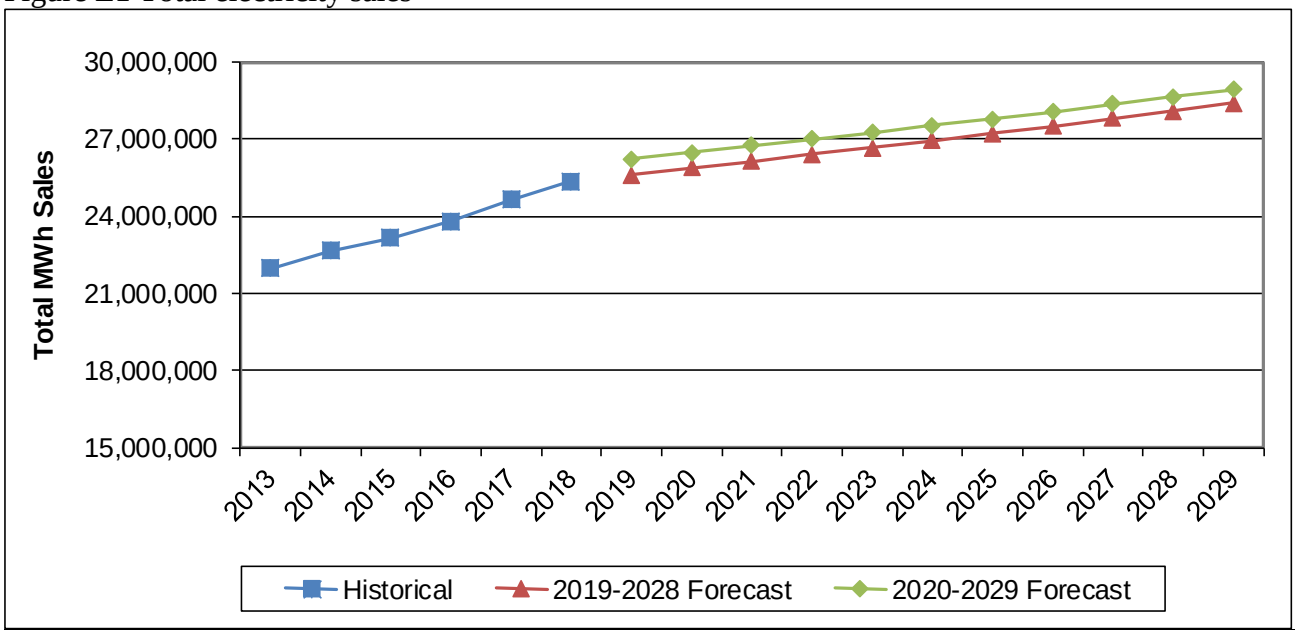
EXECUTIVE SUMMARY

The population and economic growth of Iowa has been considered as a proxy for the electric customer and sales growth in these forecasts due to the fact that the majority of retail customers reside in Iowa. While the customer growth is primarily driven by population and household formation, the electric sales are more correlated with the general economy of the state. According to the Census Bureau and IHS Markit, Inc., the Iowa population grew by 0.40% in 2018 versus 0.50% during the last five years and is expected to grow by 0.39% in 2019 and 0.49% in the next five years. The economy, as measured by real gross state product, grew by 0.5% in 2018 and grew by an average of 2.1% in the last five years. It is expected to grow by 1.6% in 2019 and increase by an annual average of 1.8% in the next five years. The economic forecast underlying the electric sales and customer forecast was made in February 2019.

The residential electric customer count is expected to increase 0.86% annually for the next ten years, which is less than the growth rate of 0.98% during the last five years. The customer numbers in the industrial and public authority classes will experience the annual growth of 0.75% and -0.09%, respectively. For the commercial class, the forecasted customer growth rate is 0.78% annually.

The current forecast projects total electric sales to grow by 1.22% annually for the next ten years, less than last year's projection of 1.03%. In last five years, the weather normalized electric sales grew 2.90%.

Figure E1 Total electricity sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	2.90%	3.10%	2.97%			
2020-2029 Forecast				3.45%	1.78%	1.22%
2019-2028 Forecast				0.99%	1.00%	1.03%

Energy Efficiency Impacts

Energy efficiency impacts as promoted through company demand-side management (DSM) programs have been accounted for in the electric sales forecast. National level DSM is also implicitly included in MEC's electric MWh sales results. The regression models have incorporated the impacts of energy efficiency program MWh savings since 2000. No out-of-model adjustments were made to the forecast due to energy efficiency impacts.

The concept behind embedded energy efficiency savings is that as DSM programs mature, the impact and momentum of past programs is already captured in the observed historical kWh sales series.

Customer forecasts

As compared to the 2019-2028 forecasts, the 2020-2029 customer forecasts decreased the ten year annual growth rates in the industrial class while increasing it in the residential, commercial and public authority classes. The fastest customer growth is projected to occur in the residential class at 0.86% while the slowest customer growth is expected in the public authority class at -0.09%. Figure E2 shows the comparison of historical, 2020-2029 forecast and 2019-2028 forecast average annual customers for the residential, commercial, industrial and public authority classes. The tables associated with these figures compare the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

In the residential class, the 2020-2029 forecast increased the ten year growth rate to 0.86% from 0.79% in the 2019-2028 forecast. This is less than the last five year's historical growth rate of 0.98%. In this class, South Dakota is projected to be the fastest growing jurisdiction at 2.49% while Illinois is the slowest growing at 0.0%. Iowa is growing at 0.95%.

In the commercial class, the 2020-2029 forecast increased the ten year growth rate to 0.78% from 0.76% in the 2019-2028 forecast. The current growth rate is less than the historical five year growth rate of 1.75%. In this class, South Dakota is projected to be the fastest growing jurisdiction at 1.46% while Illinois is the slowest growing at 0.97%. Iowa is growing at 0.75%.

In the industrial class, the 2020-2029 forecast increased the ten year growth rate to 0.75% from 0.73% in the 2019-2028 forecast. The growth rate during the last five years was 2.61%. In this class, Illinois is projected to be the fastest growing jurisdiction at 0.89% while South Dakota increases at a 0.52% rate. Iowa is projected to grow at 0.75%.

In the public authority class, the 2020-2029 forecast decreased the ten year growth rate to -0.09% from -0.05% in the 2019-2028 forecast. The historical five year growth rate was 0.32% for this class. In this class, South Dakota is projected to be the fastest growing jurisdiction at 0.43% while Iowa shows shows a decline at -0.12%.

In the street lighting class, the current forecast assumed that the customer numbers, using the most recent monthly data, are to remain constant, as has been done in past forecasts.

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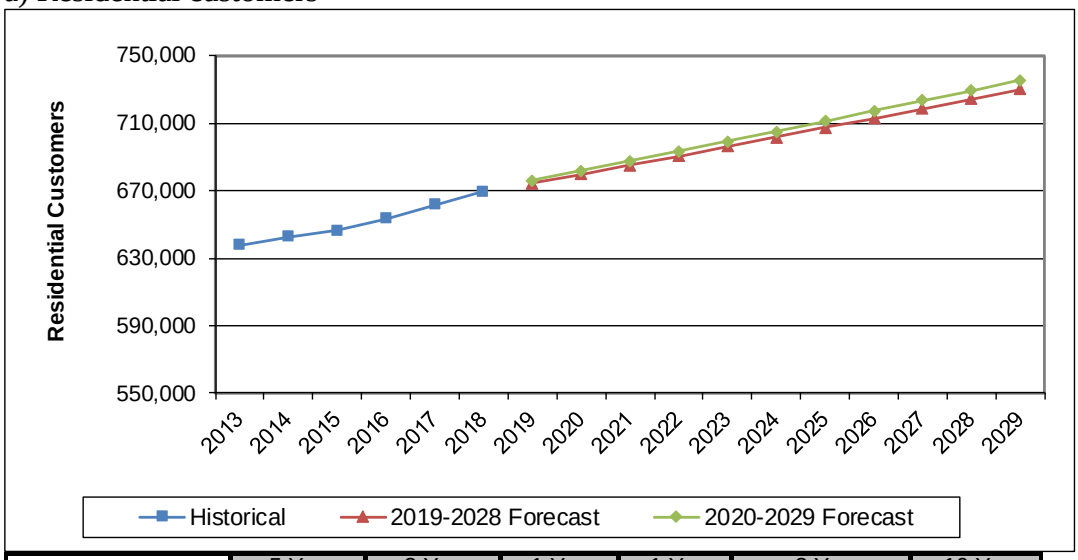
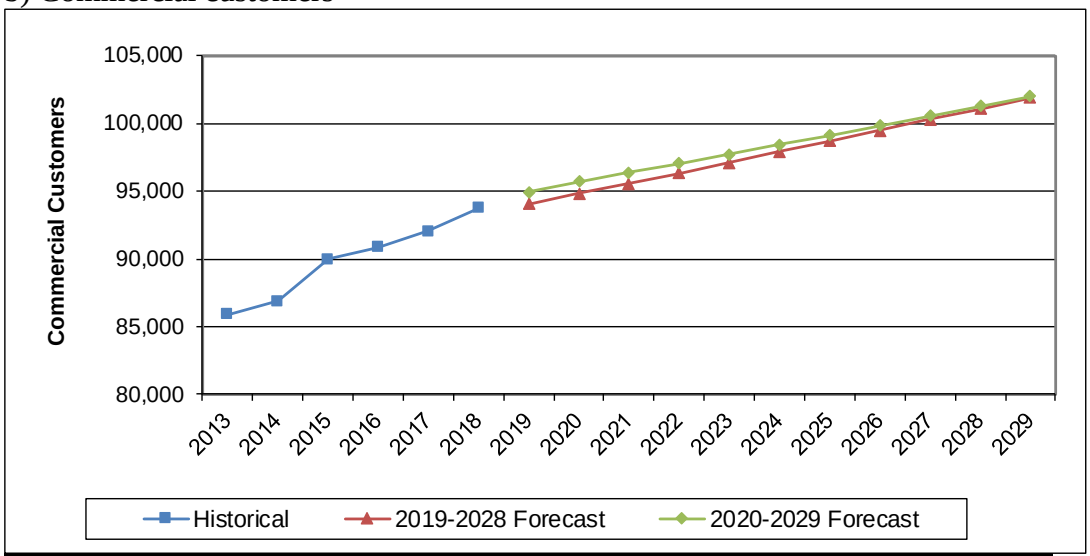
Figure E2 Customer forecasts for a) residential, b) commercial, c) industrial and d) public authority classes. Each graph shows the historical, 2020-2029 forecast and 2020-2029 forecast average customers. The tables compare the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

a) Residential customers



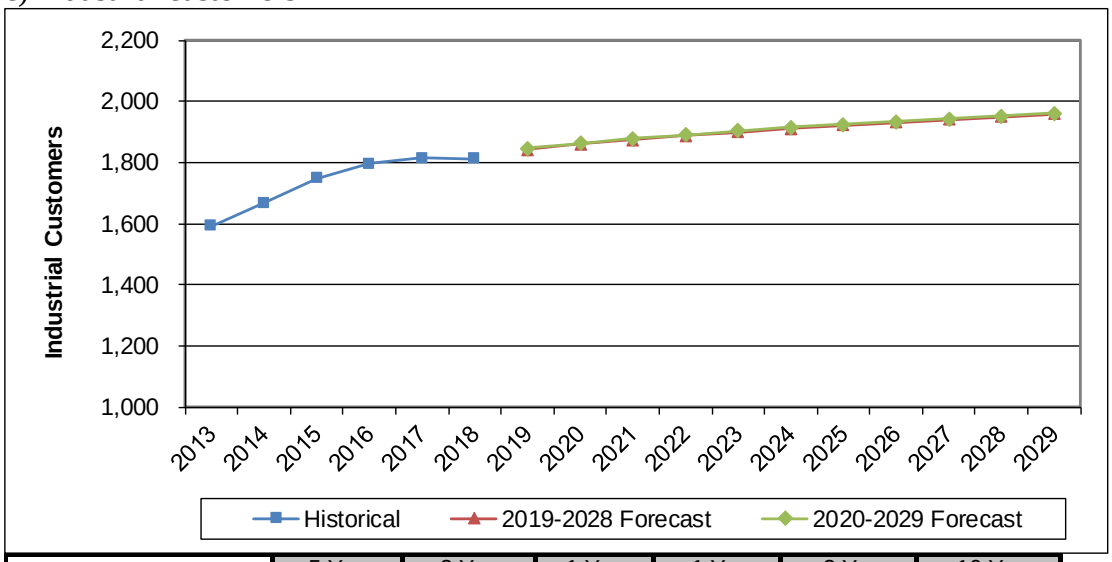
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.98%	1.18%	1.18%			
2020-2029 Forecast				0.99%	0.90%	0.86%
2019-2028 Forecast				0.72%	0.77%	0.79%

b) Commercial customers



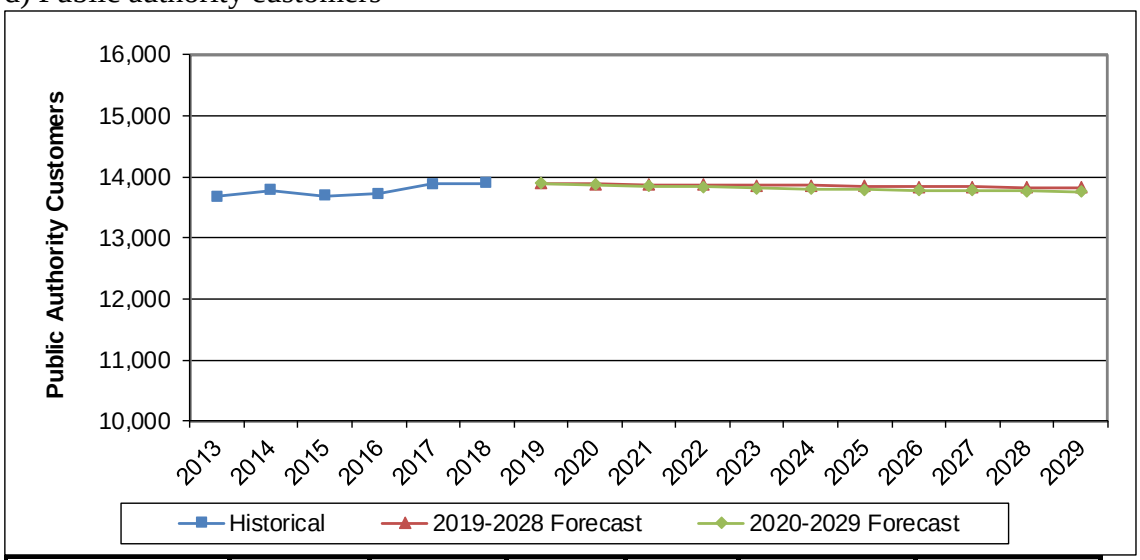
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	1.75%	1.38%	1.82%			
2020-2029 Forecast				1.30%	0.93%	0.78%
2019-2028 Forecast				0.36%	0.65%	0.76%

c) Industrial customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	2.61%	1.23%	-0.17%			
2020-2029 Forecast				1.85%	1.19%	0.75%
2019-2028 Forecast				1.68%	1.14%	0.73%

d) Public authority customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.32%	0.49%	0.05%			
2020-2029 Forecast				-0.04%	-0.11%	-0.09%
2019-2028 Forecast				-0.03%	-0.04%	-0.05%

Sales forecasts

The 2020-2029 electric sales forecasts decreased the ten year annual growth rates in the residential and commercial classes, while increasing it in the industrial class. The industrial class is the fastest growing class at 1.91% annually over the next ten years. The slowest growing class is forecasted to be the street lighting class at -2.17%. Figure E3 shows the comparison of historical, 2019-2028 forecast and 2020-2029 sales forecasts for the residential, commercial, industrial and public authority classes. The tables associated with these figures compare the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

In the residential class, the 2020-2029 forecast decreased the ten year sales growth rate to 0.45% from 0.68% in the 2019-2028 forecast. This new ten year growth rate number is lower than the last five year growth rate of 0.51%. In this class, the fastest growth is expected to be in South Dakota, while the slowest growth is projected to be in Illinois.

In the commercial class, the 2020-2029 forecast decreased the ten year sales growth rate to 0.48% from 0.68% in the 2019-2028 forecast. The historical five year growth rate is 0.46%. The fastest growth in this class is expected to be in South Dakota, while the slowest growth is projected to be in Iowa.

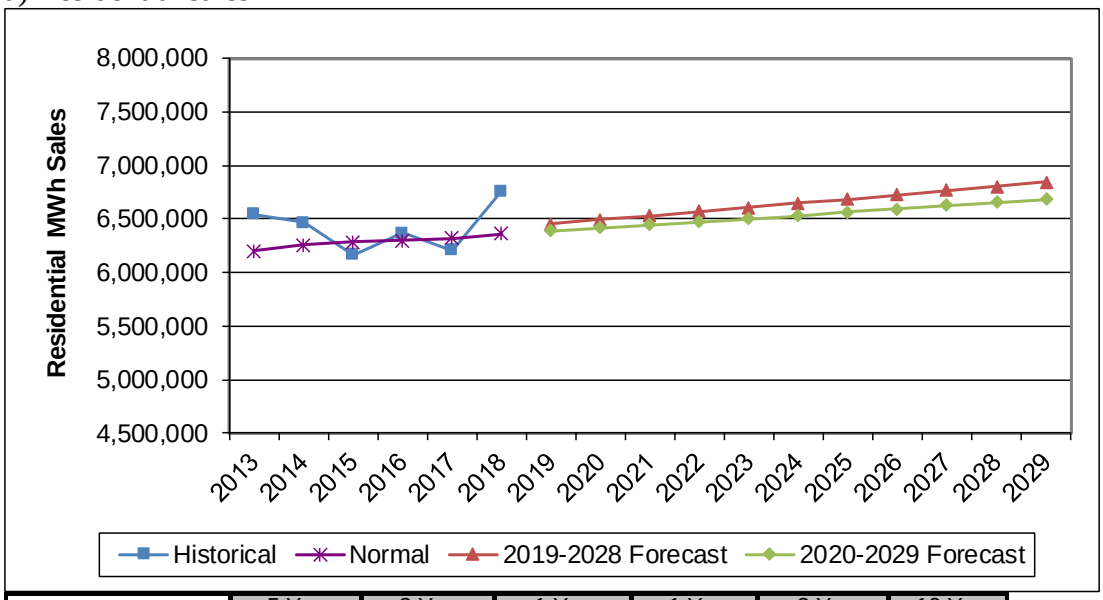
In the industrial class, the 2020-2029 forecast decreased the ten year sales growth rate to 1.91% from 1.42% in the 2019-2028 forecast. The growth rate over the last five years is 5.41%. In this class, the fastest growth is expected to be in Iowa with 1.96%, while South Dakota is growing at a rate of 1.12%.

In the public authority class, the 2020-2029 forecast increased the ten year sales growth rate to -0.23% from -0.26% in the 2019-2028 forecast. The growth rate over the last five years was -0.04%. The fastest growth in this class is expected to be in South Dakota, while the slowest growth is projected to be in Illinois.

Street lighting sales are decreasing over the forecast period due to the implementation of the LED lighting replacement program in the state of Iowa.

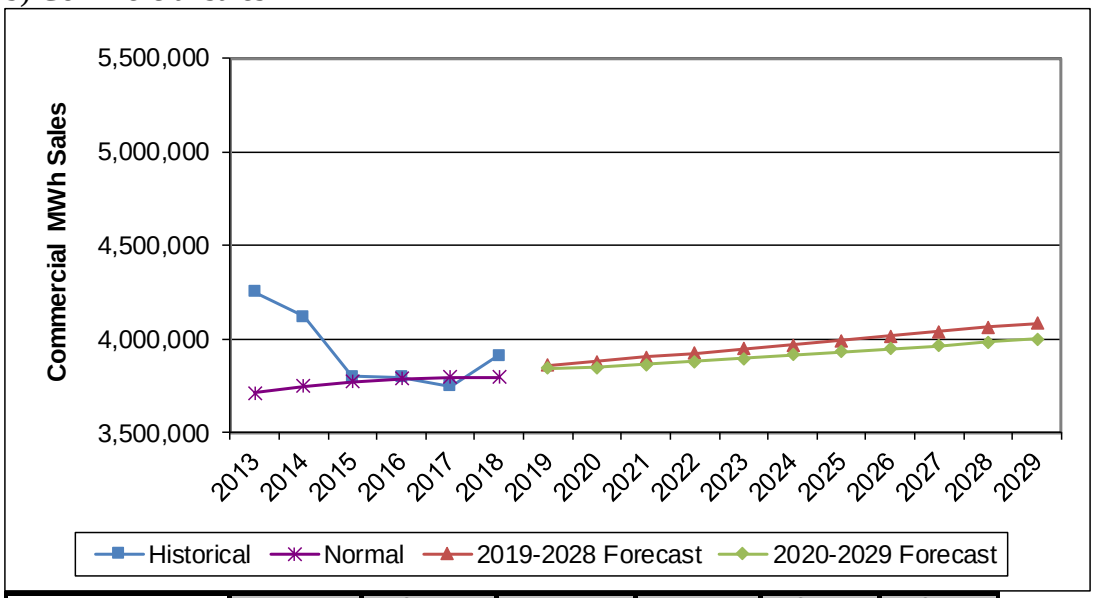
Figure E3 Billed sales forecasts for a) residential, b) commercial, c) industrial and d) public authority classes. Each graph shows the historical, 2019-2028 forecast and 2020-2029 forecast annual sales. The tables compare the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

a) Residential sales



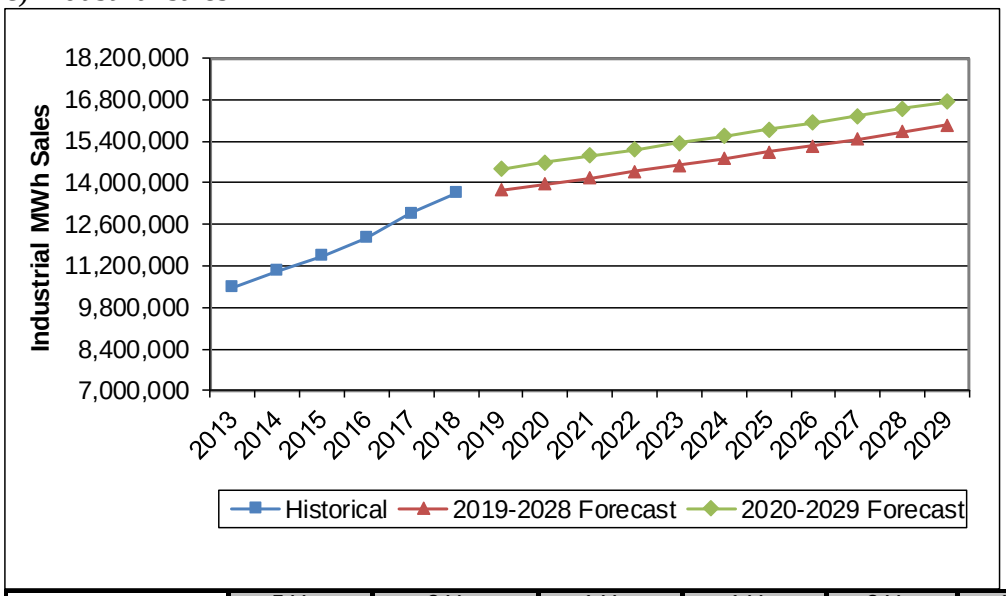
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.64%	3.09%	8.93%			
2020-2029 Forecast	0.51%	0.39%	0.62%	0.53%	0.46%	0.45%
2019-2028 Forecast				1.52%	0.89%	0.68%

b) Commercial sales



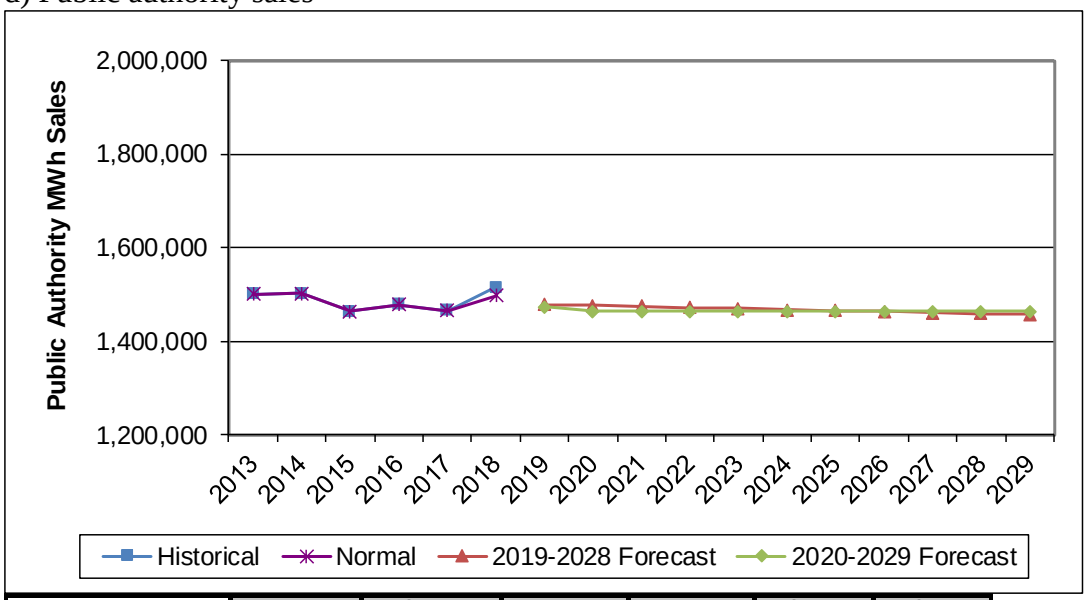
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-1.66%	0.98%	4.37%			
2020-2029 Forecast	0.46%	0.23%	0.00%	1.23%	0.59%	0.48%
2019-2028 Forecast				1.66%	0.92%	0.68%

c) Industrial sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	5.41%	5.77%	5.19%			
2020-2029 Forecast				6.02%	2.99%	1.91%
2019-2028 Forecast				0.78%	1.25%	1.42%

d) Public authority sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.20%	1.15%	3.44%			
2020-2029 Forecast	-0.04%	0.77%	2.25%	-1.60%	-0.76%	-0.23%
2019-2028 Forecast				-1.27%	-0.52%	-0.26%

I. METHODOLOGY

The 2020-2029 electric customer and sales forecasts were produced using econometric models on a monthly basis and are carried out in three steps using a bottom-up approach:

Step 1: The customer numbers were forecasted directly by state, by revenue class:

- Residential
- Commercial
- Industrial
- Public authority.

Industrial kWh sales were forecast directly, by state, to arrive at a total industrial class kWh sales forecast. The industrial sales were forecast in two groups: Non-ICR customers and ICR customers. Iowa is the only state that currently has customers on the ICR rate. The street lighting forecasts were forecast using trending. In this class, as in prior forecasts, the current customer numbers were assumed to remain constant throughout the forecast period. An LED lighting replacement program currently being implemented in Iowa caused the street lighting MWh sales forecast to decline over the forecast period.

Step 2: For residential, commercial and public authority, econometric models were built to forecast kWh per customer. This was done for each state: Iowa, Illinois and South Dakota. The resulting kWh per customer forecasts were multiplied by the appropriate customer forecasts to arrive at a kWh sales forecast. For industrial, the kWh per customer values for each revenue class was calculated using customer and sales forecasts, and employed to check the presence of any discontinuity between the historical and forecasted values.

Step 3: The projected customers and sales numbers were modeled using data specific to the area being forecast. Economic data for the state of Iowa, the Des Moines, IA metropolitan statistical area, the Quad Cities' metropolitan statistical area and the appropriate county level data in Iowa and South Dakota were used in building the models for the different regions.

I.1 Economic and demographic variables

Some variables, such as customer numbers, price, sales, revenue class, jurisdiction, etc., were obtained internally from the company database while other data, such as economic, demographic and weather, were received from external sources.

The economic and demographic data for the models were obtained from the IHS Markit, Inc. database. The economic and demographic data forecast was performed by IHS Markit, Inc. in February 2019, the most recent forecast available. The list of variables considered for the electric sales and customer forecasts is shown in Table 1. For MEC's Illinois service territory, economic and demographic variables specific to the Quad Cities metropolitan area were used in the forecasting process. The Quad Cities area encompasses MEC's Illinois service territory. For MEC's Iowa-South service territory, economic and demographic variables specific to the Des Moines metropolitan area were used in the forecasting process. For MEC's Iowa-North and South Dakota service territories, county level data were considered.

Table 1: List of economic and demographic variables considered for the 2020-2029 forecasts

	State of Iowa Data
1	Population (Thous.)
2	Households, Family and Non-Family (Thous.)
3	Housing Starts, Total Private (SAAR)
4	Housing Starts, Private Single-Family (Thousands, SAAR)
5	Housing Starts, Private Multi-Family (Thousands, SAAR)
6	Real Gross State Product (Millions 2005$)
7	Real Per Capita Personal Income (Thous., 2005$)
8	Employment (NAICS), Total Nonfarm (Thous.)
9	Industrial Production Index Total (2007 = 100)
10	Non-Manufacturing Real Gross State Product (Millions 2005$)
11	Real GSP, State and Local Government (Millions 2005$)
12	Employment (NAICS), State & Local Government (Thous.)
	Quad Cities MSA Data
13	Real Gross Metropolitan Product (Millions 2005$)
14	Real Gross Metropolitan Product, Government, State & Local (Millions 2005$)
15	Households, Family and Non-Family (Thous.)
16	Employment (NAICS), Total Nonfarm (Thous.)
17	Employment (NAICS), State & Local Government (Thous.)
	Des Moines MSA Data
18	Real Gross Metropolitan Product (Millions 2005$)
19	Real Gross Metropolitan Product, Government, State & Local (Millions 2005$)
20	Households, Family and Non-Family (Thous.)
21	Employment (NAICS), Total Nonfarm (Thous.)
22	Employment (NAICS), State & Local Government (Thous.)
	County Level Data for Iowa and South Dakota
23	Employment, Total Nonfarm
24	Households, Total
25	Population
26	Real Gross County Product
27	Real Per Capita Personal Income

I.2 Weather variables

The weather variables used in the present forecast are:

Current month and previous month cooling degree days (CDD)
Current month and previous month heating degree days (HDD)

The forecast also contains a variable in which cooling degree days are interacted with a time trend and a variable in which heating degree days are interacted with a time trend. These variables measure the extent to which the relationship between degree days and electric sales changes over time.

The weather data was obtained from the NOAA (National Oceanic and Atmospheric Administration) and are based on 65 degrees Fahrenheit. The values of weather variables were calculated through a weighting scheme based on the readings from five weather stations:

Weather Stations of Interest	
Des Moines	WSFO_AP
Sioux City	WSO_AP
Waterloo	WSO_AP
Moline	WSO_AP
Omaha	Eppley_Field

The present energy forecasts are based on billed data. This means that the sales numbers reflect, in part, the weather conditions from the previous month as well as the weather conditions for the current month, depending on the meter read date. To take this into account, both current month and previous month degree days are used in the modeling process. The forecasts used actual weather values for the historical period and normal weather values for the forecast period. In the 2020-2029 forecast, normal weather was defined as the MEC system load-weighted average monthly degree days from 1989-2018.

To compare the growth rates the historical sales figures were "weather normalized" using average (normal) weather values. The normalization process consists of three steps. First, the historic predicted numbers were obtained from a regression model using the actual weather values. Second, the sales were re-calculated using average weather results.[1] Third, the difference between them, which defines the weather impact, was subtracted from the corresponding actual sales to arrive the normalized sales. In mathematical terms, the weather normalization can be written as follows:

$$Normalized\,Sales = ActualSales - [\Pr edictedSales_{ActualWeather} - \Pr edictedSales_{NormalWeather}]$$

[1] The same equation obtained in the first step was used.

I.3 Modeling

The econometric forecasting method used in this study assumes that the relationship between the dependent and independent variables is linear (additive) and defined as follows[2]:

$$y = r + \alpha X + \beta Y + \gamma Z$$

where X, Y and Z are the variables, α, β and γ are the coefficients and r is the constant.

The forecasts were prepared using MetrixND software, version 4.7, developed by Itron, Inc. The forecasts typically involve finding a mathematical relationship between the dependent and independent variables. The steps taken in this forecast were as follows: The historical numbers since 2000 and the forecast numbers for economic variables until 2048 were obtained. These values were then exported into MetrixND and the analysis was carried out.

The primary criterion in selecting the variables was the relevance to the dependent variable being forecasted. Other considerations were the sign (the direction of change) and impact (the magnitude of elasticity coefficients) of variables on the forecasted dependent variable. Some of the statistical parameters important to the econometric model are:

Adjusted R-Square: It indicates the fraction of total variation explained by the independent variables in the regression. Its value ranges between 0 and 1, 1 being a perfect fit.

$$R^2 = \frac{ExplainedVariation}{TotalVariation}$$

Adjusted R^2 takes into account the number of variables (k) with a constant sample size (n) as this leads to a decrease in the degree of freedom (n-k). Thus, adjusted R^2 is more conservative.

$$\text{Adjusted } R^2 = 1 - (1 - R^2)\left(\frac{n-1}{n-k}\right)$$

F-Statistics (Probability): This is an alternative measure of goodness of the fit. F-statistics number indicates the probability that the estimated regression fit is purely accidental. This number is preferred to be as low as possible as compared to a critical number of 5%.

[2] Appendix 1

Mean Absolute Percentage Error (MAPE): MAPE defines the magnitude of errors in the model. It is the average of absolute values of the residual error percentages measured at each data point. The lower the MAPE number the better the model is considered to be.

Durbin-Watson Statistic: It tests the hypothesis that the errors from a model do not exhibit first order autocorrelation. In the absence of autocorrelation, the statistic has a value of 2. While it varies between 0 and 4, a value above 2 indicates negative autocorrelation, while a value below 2 indicates positive autocorrelation.

Test parameters for statistical significance

The t-statistics and P-values show the statistical significance of independent variables in 95% confidence interval (or 5% significance level). Most of the explanatory variables presented in this document are within the 95% confidence interval based on the t-statistics and P-values[3].

To evaluate the reasonableness of the model, the residual patterns and model fit statistics were studied. The residuals indicate the difference between the predicted and actual values. Any pattern associated with residuals suggests a missing variable(s). The residuals were studied through the autocorrelation factor and partial autocorrelation diagrams.

[3] Appendix 3

II. 2020-2029 FORECASTS

II.1 Customer forecasts

II.1a Methodology

The customer forecasts in general were straight-forward and involved fewer variables. Customers were modeled by state and by class. A sampling of variables included in the state of Iowa customer models is listed below. Information about other states' models is available upon request.

- Residential: weighted variable consisting of number of households and members per household, monthly binary variables, binary variable for August 2014, binary variable for December 2016 and ARMA (Autoregressive-Moving Average) errors
  Commercial: Real per capita personal income multiplied by a time trend, total number of households, monthly binary variables, binary variables for August 2014, December 2014, March 2015, April 2015 and March 2016 and ARMA errors
  Industrials: Non-farm employment, monthly binary variables, binary variables for August 2014, December 2014 and March 2016 and ARMA errors
  Public authority: State and local government employment, monthly binary variables, binary variable for August 2014 and ARMA errors.

II.1b Customer forecast results

The monthly customer numbers were forecasted at an aggregate level for each revenue class. The system and jurisdiction level of forecasts were determined through an allocation. The annual historical data and 10-year forecast values are summarized in Table 3[4].

Table 3: Summary of the historical and forecast average annual customer numbers in different classes

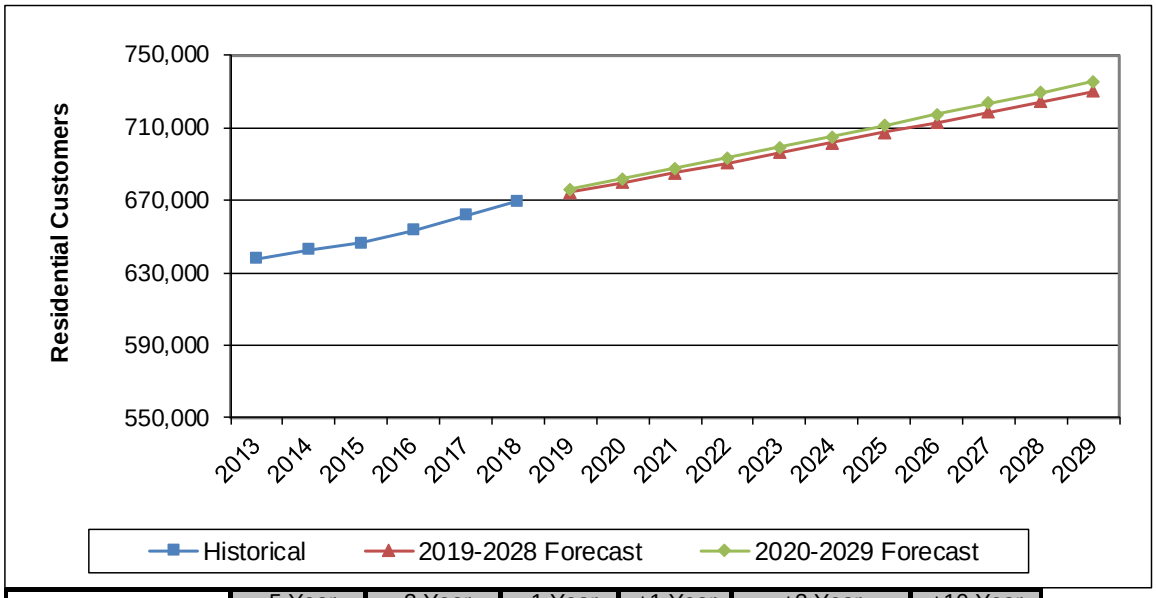
	Residential	Commercial	Industrial	Public Authority	Street Lighting	Total
2013	637,607	85,928	1,594	13,673	491	739,293
2014	642,668	86,875	1,668	13,777	488	745,476
2015	646,431	89,967	1,748	13,692	486	752,324
2016	653,194	90,875	1,797	13,725	486	760,077
2017	661,688	92,055	1,816	13,889	484	769,932
2018	669,499	93,730	1,813	13,895	487	779,425
2019	676,122	94,947	1,846	13,890	487	787,292
2020	681,915	95,692	1,864	13,867	487	793,824
2021	687,718	96,367	1,879	13,850	487	800,301
2022	693,522	97,048	1,892	13,835	487	806,784
2023	699,328	97,738	1,904	13,819	487	813,276
2024	705,144	98,434	1,915	13,804	487	819,784
2025	711,126	99,136	1,925	13,793	487	826,468
2026	717,249	99,843	1,935	13,785	487	833,299
2027	723,370	100,555	1,944	13,776	487	840,132
2028	729,489	101,270	1,953	13,765	487	846,964
2029	735,595	101,990	1,961	13,754	487	853,788

[4] Annual values were calculated as the average of 12-months in a given year.

Residential customer forecasts

Figure 2 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast customer numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 2 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast average residential customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.98%	1.18%	1.18%			
2020-2029 Forecast				0.99%	0.90%	0.86%
2019-2028 Forecast				0.72%	0.77%	0.79%

The aggregate customer numbers shown in Fig. 2 have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of customer numbers in these jurisdictions are summarized in Table 4. See Appendix 3 for the data tables.

Table 4: Growth rates of the residential customers

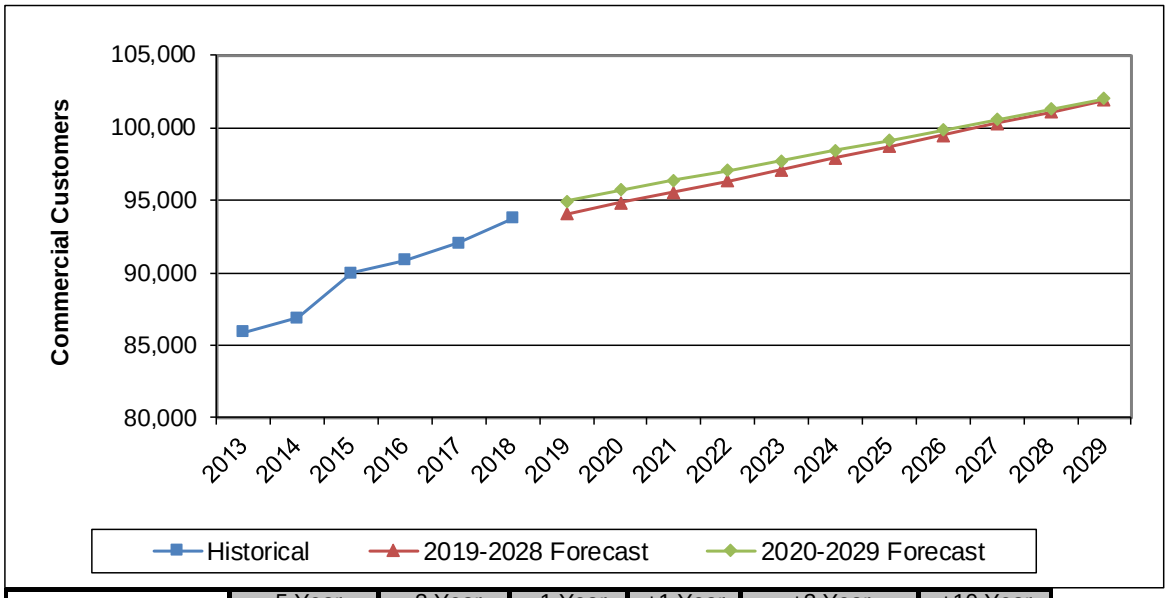
Area	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	1.16%	1.35%	1.37%	1.10%	1.00%	0.95%
IL	-0.49%	-0.23%	-0.30%	0.07%	0.02%	0.00%
SD	2.43%	2.29%	1.49%	1.93%	2.26%	2.49%
MEC	0.98%	1.18%	1.18%	0.99%	0.90%	0.86%

The biggest growth expected in South Dakota, and the smallest growth predicted in Illinois.

Commercial customer forecasts

Figure 3 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast customer numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 3 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast average commercial customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	1.75%	1.38%	1.82%			
2020-2029 Forecast				1.30%	0.93%	0.78%
2019-2028 Forecast				0.36%	0.65%	0.76%

The aggregate customer numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of customer numbers in these jurisdictions are summarized in Table 5. See Appendix 4 for the data tables.

Table 5: Growth rates of the commercial customers

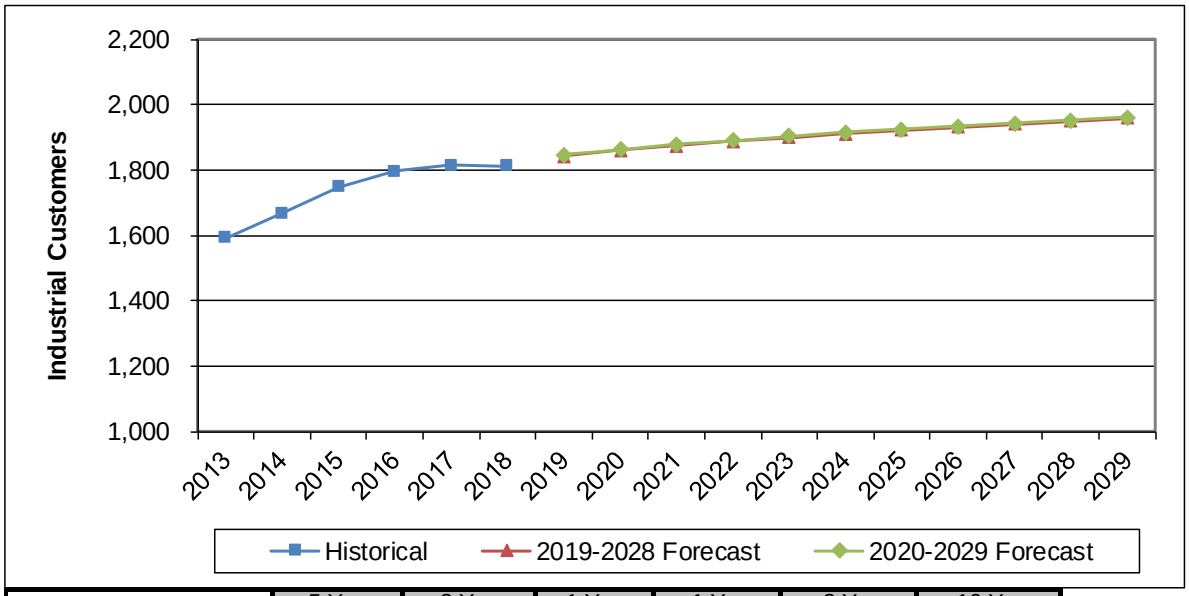
Area	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	1.45%	1.25%	1.69%	1.09%	0.86%	0.75%
IL	4.60%	2.37%	2.68%	3.01%	1.51%	0.97%
SD	2.36%	2.23%	5.06%	2.27%	1.20%	1.46%
MEC	1.75%	1.38%	1.82%	1.30%	0.93%	0.78%

The highest growth expected in South Dakota and the lowest growth predicted in Iowa.

Industrial customer forecasts

Figure 4 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast customer numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 4 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast average industrial customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	2.61%	1.23%	-0.17%			
2020-2029 Forecast				1.85%	1.19%	0.75%
2019-2028 Forecast				1.68%	1.14%	0.73%

The aggregate customer numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of customer numbers in these jurisdictions are summarized in Table 6. See Appendix 5 for the data tables.

Table 6: Growth rates of the industrial customers

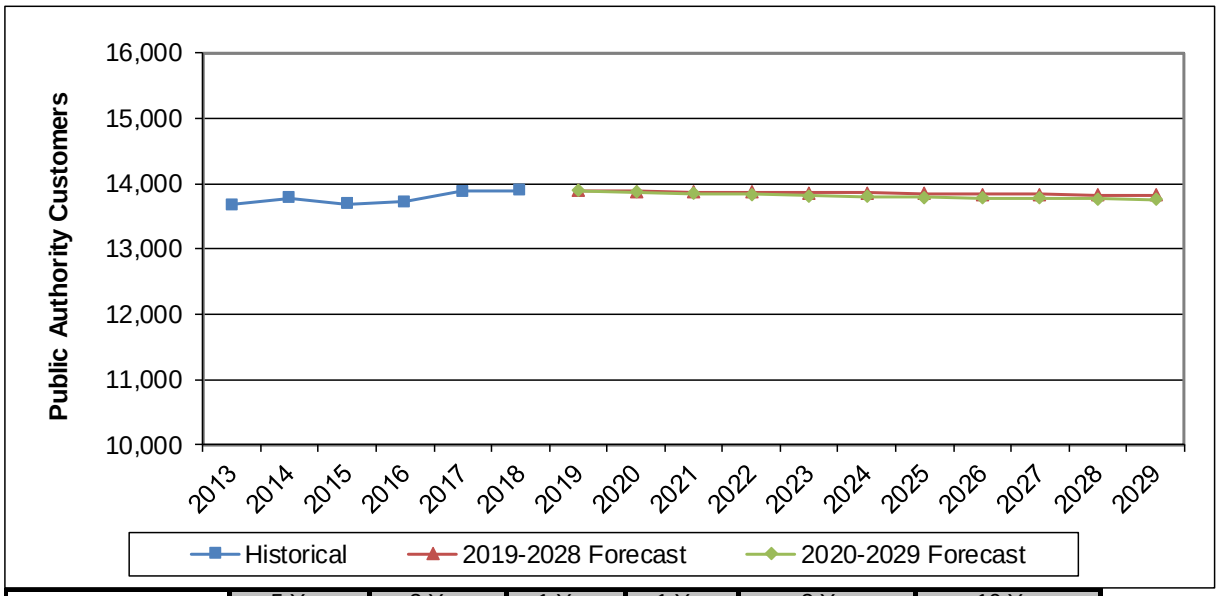
Area	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	3.63%	1.61%	-0.18%	1.89%	1.20%	0.75%
IL	-18.21%	-11.65%	-0.86%	0.44%	1.05%	0.89%
SD	-0.51%	1.15%	1.52%	0.65%	0.38%	0.52%
MEC	2.61%	1.23%	-0.17%	1.85%	1.19%	0.75%

The highest growth is expected in Illinois while South Dakota is growing the least.

Public authority customer forecasts

Figure 5 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast customer numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 5 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast average public authority customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.32%	0.49%	0.05%			
2020-2029 Forecast				-0.04%	-0.11%	-0.09%
2019-2028 Forecast				-0.03%	-0.04%	-0.05%

The aggregate customer numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of customer numbers in these jurisdictions are summarized in Table 7. See Appendix 6 for the data tables.

Table 7: Growth rates of the public authority customers

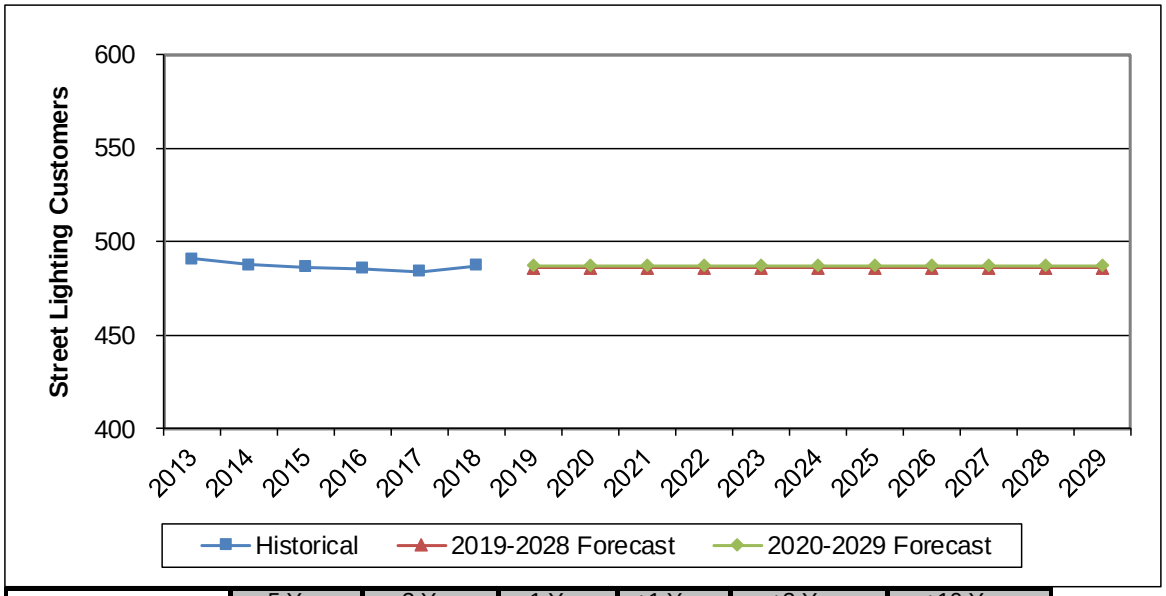
Area	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	0.33%	0.26%	-0.25%	-0.18%	-0.17%	-0.12%
IL	0.30%	2.71%	2.84%	1.08%	0.35%	0.11%
SD	0.33%	-0.75%	-1.19%	1.60%	0.81%	0.43%
MEC	0.32%	0.49%	0.05%	-0.04%	-0.11%	-0.09%

The highest growth is expected in South Dakota while the lowest growth is predicted in Iowa.

Street lighting customer forecasts

As in the 2019-2028 forecasts, the present study assumed no change in the customer numbers of this class. Based on this assumption, Figure 5 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast customer numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates. The plots of customers in different regions are shown in Appendix 14.

Fig. 6 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast average street lighting customers



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-0.14%	0.06%	0.64%			
2020-2029 Forecast				-0.03%	-0.01%	0.00%
2019-2028 Forecast				-0.24%	-0.08%	-0.02%

The aggregate customer numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of customer numbers in these jurisdictions are summarized in Table 8. See Appendix 7 for the data tables.

Table 8: Growth rates of the street lighting customers

Area	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	-0.15%	-0.07%	0.55%	-0.04%	-0.01%	0.00%
IL	0.00%	1.43%	1.54%	0.00%	0.00%	0.00%
SD	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEC	-0.14%	0.06%	0.64%	-0.03%	-0.01%	0.00%

II.2 Sales forecasts

II.2a Methodology

The energy forecasts are more complicated and involve more variables than do the customer forecasts. For residential and commercial, sales are determined by multiplying customers by use per customer. For industrial and public authority, sales are modeled directly. For street lighting, sales are forecast using trending. There is a sampling of variables used in the industrial sales models below:

> Industrial: Weighted variable consisting of real gross state product and total industrial production index, cooling degree days (current month), billing days, trend interacted with heating degree day variable, binary for August 2014, monthly binaries and ARMA errors

Better statistics were obtained for the customer models than sales models. The reason is that there is more uncertainty in the sales forecasts due to the presence of multiple drivers and their possible interactions. For example, a relatively small change in the historical usage pattern of a large industrial customer could have big impact on the total energy usage in this class. Similarly, the changes in billing cycle could have significant effect on the billed sales.

II.2b Sales forecast results

The monthly billed sales numbers were forecasted at an aggregate level for each revenue class. The annual historical data and 10-year forecast values are summarized in Table 10[5].

Table 10: Summary of the historical and forecast annual billed sales of different revenue classes (MWh)

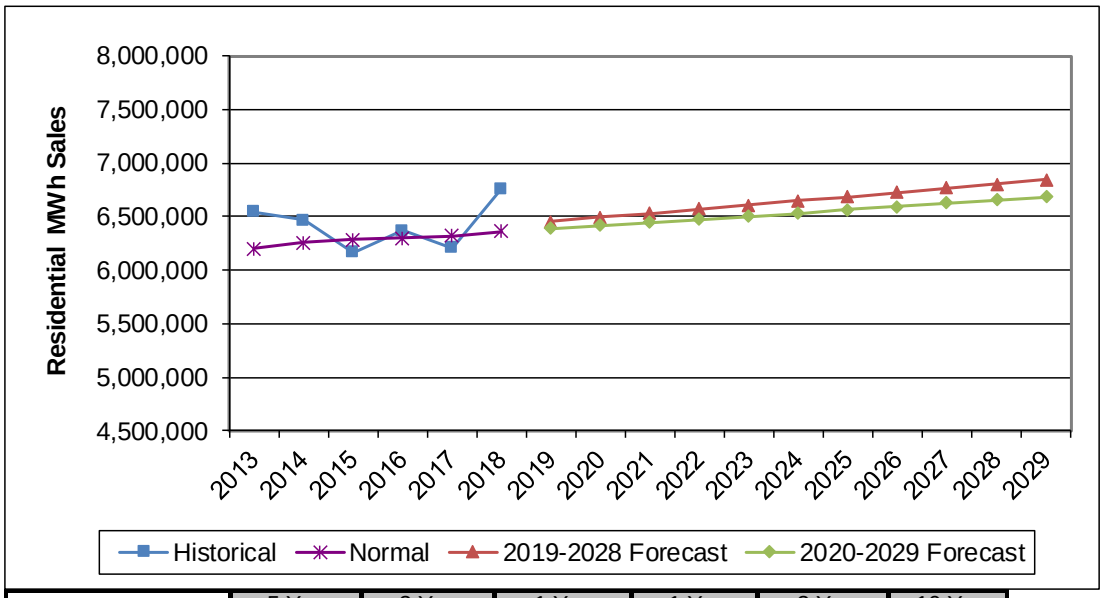
	Residential	Commercial	Industrial	Public Authority	Street Lighting	Total
2013	6,546,600	4,252,513	10,488,000	1,500,622	94,255	22,881,990
2014	6,464,413	4,120,005	11,050,000	1,502,434	97,512	23,234,364
2015	6,168,951	3,798,561	11,537,818	1,464,324	95,491	23,065,144
2016	6,370,934	3,796,125	12,152,000	1,479,072	89,651	23,887,782
2017	6,204,202	3,747,855	12,976,947	1,465,110	80,811	24,474,925
2018	6,758,096	3,911,621	13,651,000	1,515,541	66,802	25,903,060
2019	6,392,833	3,843,730	14,473,057	1,473,996	64,693	26,248,309
2020	6,418,755	3,848,000	14,702,964	1,464,000	63,144	26,496,863
2021	6,447,146	3,864,546	14,912,534	1,464,000	60,691	26,748,918
2022	6,475,758	3,881,164	15,126,092	1,464,000	58,445	27,005,459
2023	6,504,449	3,897,853	15,343,723	1,464,000	56,199	27,266,225
2024	6,532,878	3,914,614	15,565,515	1,464,000	54,162	27,531,168
2025	6,562,913	3,931,447	15,791,556	1,464,000	52,920	27,802,835
2026	6,594,180	3,948,352	16,021,938	1,464,000	53,097	28,081,567
2027	6,624,505	3,965,330	16,256,754	1,464,000	53,275	28,363,864
2028	6,654,222	3,982,381	16,496,099	1,464,000	53,664	28,650,366
2029	6,684,184	3,999,505	16,740,071	1,464,000	53,633	28,941,393

[5] Annual values were calculated as the sum of 12-months in a given year.

Residential sales forecasts

Figure 7 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast sales numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 7 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast annual residential billed sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.64%	3.09%	8.93%			
2020-2029 Forecast	0.51%	0.39%	0.62%	0.53%	0.46%	0.45%
2019-2028 Forecast				1.52%	0.89%	0.68%

The aggregate sales numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates sales numbers in these jurisdictions are summarized in Table 12. See Appendix 8 for the data tables.

Table 12: Growth rates of the residential sales

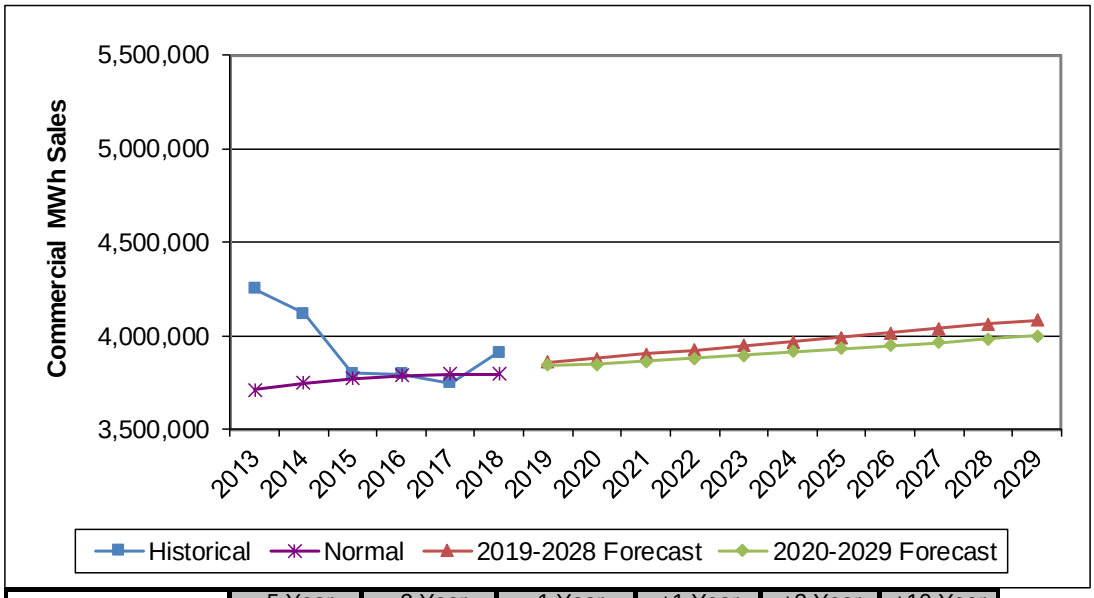
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	0.65%	0.51%	0.59%	0.67%	0.59%	0.55%
IL	-0.83%	-0.80%	1.08%	-0.95%	-0.93%	-0.66%
SD	1.80%	1.82%	-2.25%	3.61%	3.04%	2.74%
MEC_Total	0.51%	0.39%	0.62%	0.53%	0.46%	0.45%

The highest growth is expected in South Dakota while the lowest growth is predicted in Illinois.

Commercial sales forecasts

Figure 8 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast sales numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 8 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast annual commercial billed sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-1.66%	0.98%	4.37%			
2020-2029 Forecast	0.46%	0.23%	0.00%	1.23%	0.59%	0.48%
2019-2028 Forecast				1.66%	0.92%	0.68%

The aggregate sales numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of sales numbers in these jurisdictions are summarized in Table 13. See Appendix 9 for the data tables.

Table 13: Growth rates of the commercial sales

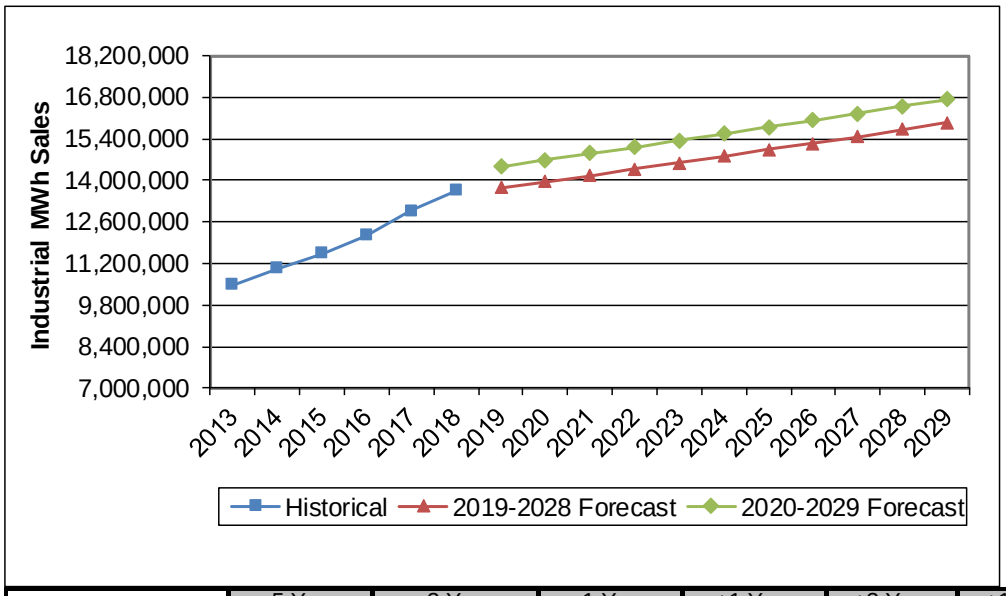
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	-0.02%	0.13%	0.17%	1.38%	0.60%	0.46%
IL	3.70%	0.40%	-1.65%	0.45%	0.56%	0.54%
SD	7.44%	6.89%	5.67%	-1.71%	-0.05%	1.11%
MEC_Total	0.46%	0.23%	0.00%	1.23%	0.59%	0.48%

The highest growth area in this class is South Dakota, while the lowest growth area is Iowa.

Industrial sales forecasts

Figure 9 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast sales numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 9 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast annual industrial billed sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	5.41%	5.77%	5.19%			
2020-2029 Forecast				6.02%	2.99%	1.91%
2019-2028 Forecast				0.78%	1.25%	1.42%

The aggregate sales numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of sales numbers in these jurisdictions are summarized in Table 12. See Appendix 10 for the data tables.

Table 14: Growth rates of the industrial sales

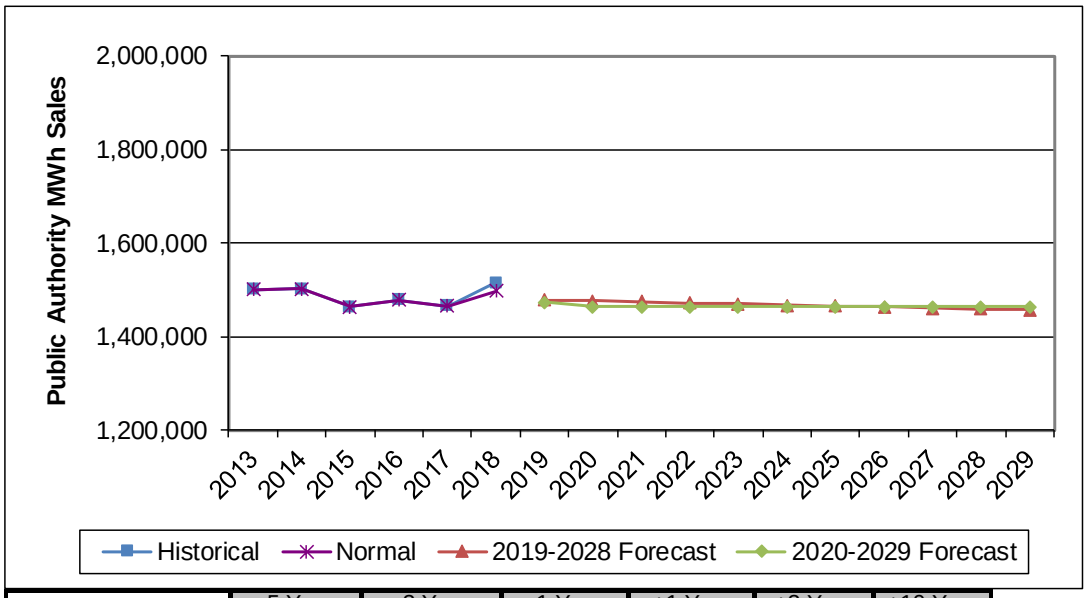
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	5.91%	6.19%	5.65%	6.20%	3.07%	1.96%
IL	-1.81%	-0.82%	-1.83%	3.06%	1.67%	1.03%
SD	0.35%	1.01%	-2.81%	2.82%	1.56%	1.12%
MEC_Total	5.41%	5.77%	5.19%	6.02%	2.99%	1.91%

The biggest growth area is Iowa while the smallest growth area is Illinois.

Public authority sales forecasts

Figure 10 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast sales numbers. Note that these are aggregate numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 10 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast annual public authority billed sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	0.20%	1.15%	3.44%			
2020-2029 Forecast	-0.04%	0.77%	2.25%	-1.60%	-0.76%	-0.23%
2019-2028 Forecast				-1.27%	-0.52%	-0.26%

The aggregate sales numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of sales numbers in these jurisdictions are summarized in Table 15. See Appendix 11 for the data tables.

Table 15: Growth rates of the public authority sales

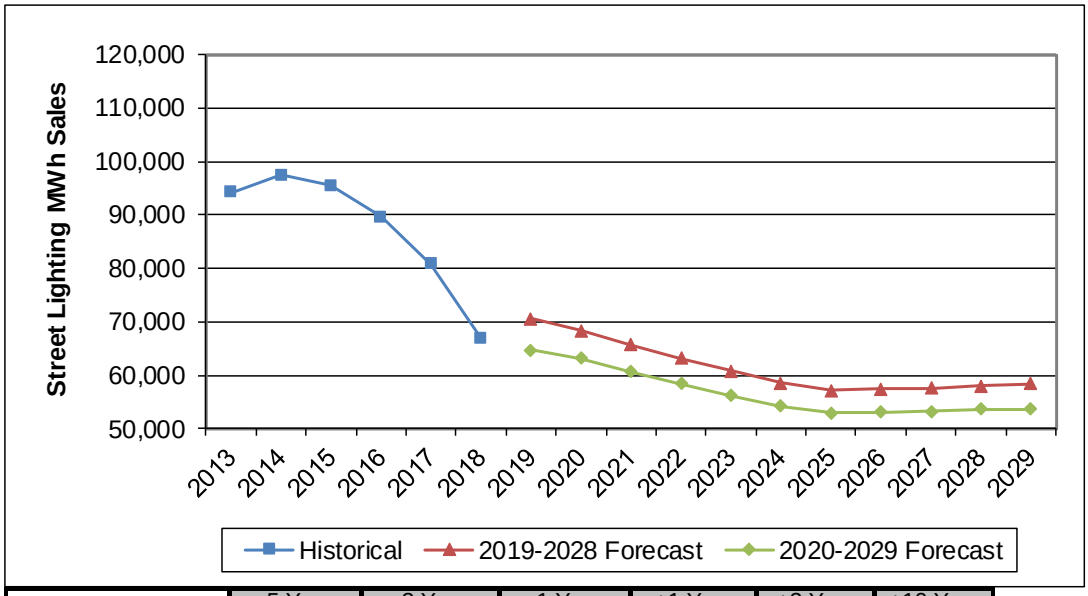
	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	0.21%	0.75%	2.22%	-1.63%	-0.75%	-0.18%
IL	-1.97%	0.80%	2.54%	-1.34%	-0.83%	-0.63%
SD	2.51%	3.48%	2.19%	-2.87%	-1.01%	-0.07%
MEC_Total	-0.04%	0.77%	2.25%	-1.60%	-0.76%	-0.23%

The highest growth area is South Dakota while the smallest growth area is Illinois.

Street lighting sales forecasts

In this class, trending based on historical data was used. Sales will decline throughout the forecast period due to the implementation of an LED replacement program currently underway in the state of Iowa. Figure 11 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast sales numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 11 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast annual street lighting billed sales



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-6.65%	-11.23%	-17.34%			
2020-2029 Forecast				-3.16%	-3.15%	-2.17%
2019-2028 Forecast				5.66%	-0.57%	-1.40%

The aggregate customer numbers have been forecast for the Iowa, Illinois and South Dakota jurisdictions. The growth rates of customer numbers in these jurisdictions are summarized in Table 16. See Appendix 12 for the data tables.

Table 16: Growth rates of the street lighting sales

	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
IA	-7.32%	-13.20%	-20.53%	-1.75%	-3.09%	-2.42%
IL	-2.98%	2.25%	3.25%	-10.48%	-3.56%	-1.01%
SD	-0.11%	-0.11%	0.12%	-0.79%	-0.20%	0.01%
MEC_Total	-6.65%	-11.23%	-17.34%	-3.16%	-3.15%	-2.17%

II.3 Usage per customer (UPC) forecasts

For the residential, commercial and public authority classes, kWh per customer values was forecast using econometric models. For the industrial and street lighting classes, the kWh per customer forecast values were calculated using the forecast sales and customer numbers data.

II.3a State of Iowa UPC forecast model variables:

Residential model – Weighted variable consisting of real per capita personal income and non-farm employment, heating degree days (current and lagged), cooling degree days (current month), hours of light, monthly billing days, monthly binaries, binary for August 2014 and ARMA errors

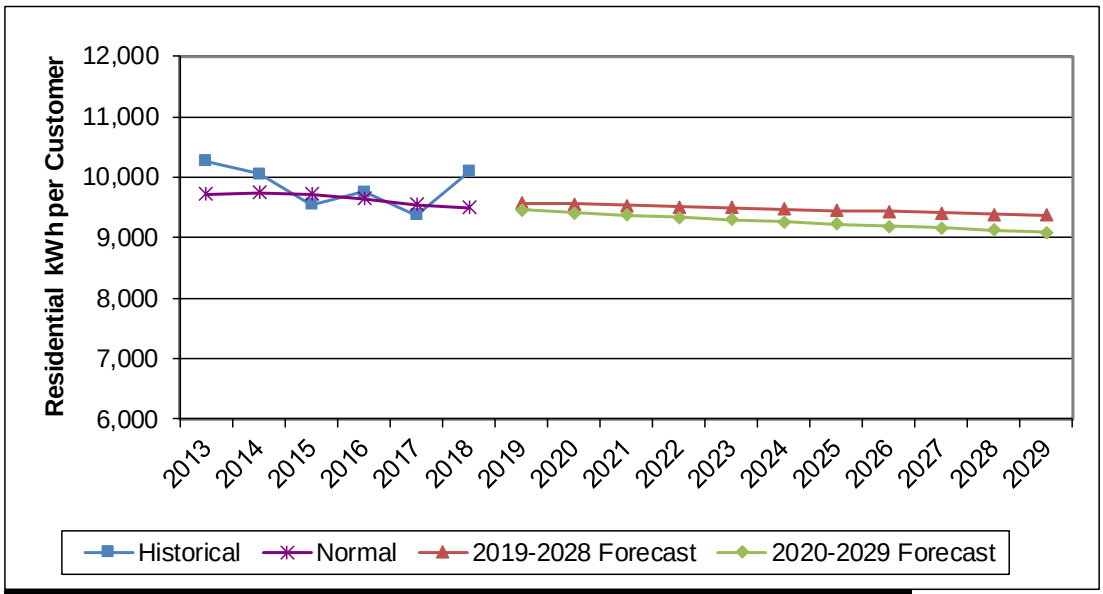
Commercial model – Weighted economic variable made up of members per household and the total industrial production index, monthly billing days, heating degree days (current and lagged), cooling degree days (current month), monthly binaries, binary variable for August 2014, and ARMA errors

Public Authority model – Weighted variable consisting of members per household and state and local government employment, heating degree days (current and lagged), cooling degree days (current month), monthly billing days, hours of light, binary for winter storm in December 2012, monthly binaries, binary variable for August 2014 and ARMA errors

Residential forecast

Figure 12 shows the comparison of historical, normalized, 2019-2028 forecast and 2020-2029 forecast kWh per customer numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 12 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast residential kWh per customer

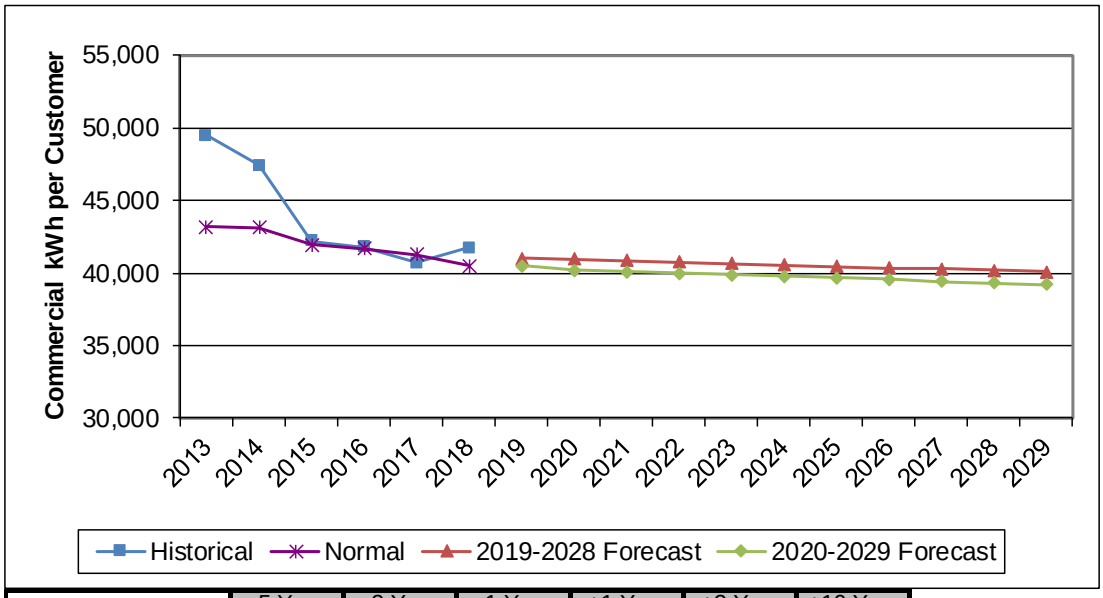


	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-0.34%	1.89%	7.66%			
2020-2029 Forecast	-0.47%	-0.78%	-0.56%	-0.45%	-0.44%	-0.40%
2019-2028 Forecast				0.79%	0.12%	-0.11%

Commercial forecast

Figure 13 shows the comparison of historical, normalized, 2019-2028 forecast and 2020-2029 forecast kWh per customer numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 13 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast commercial kWh per customer

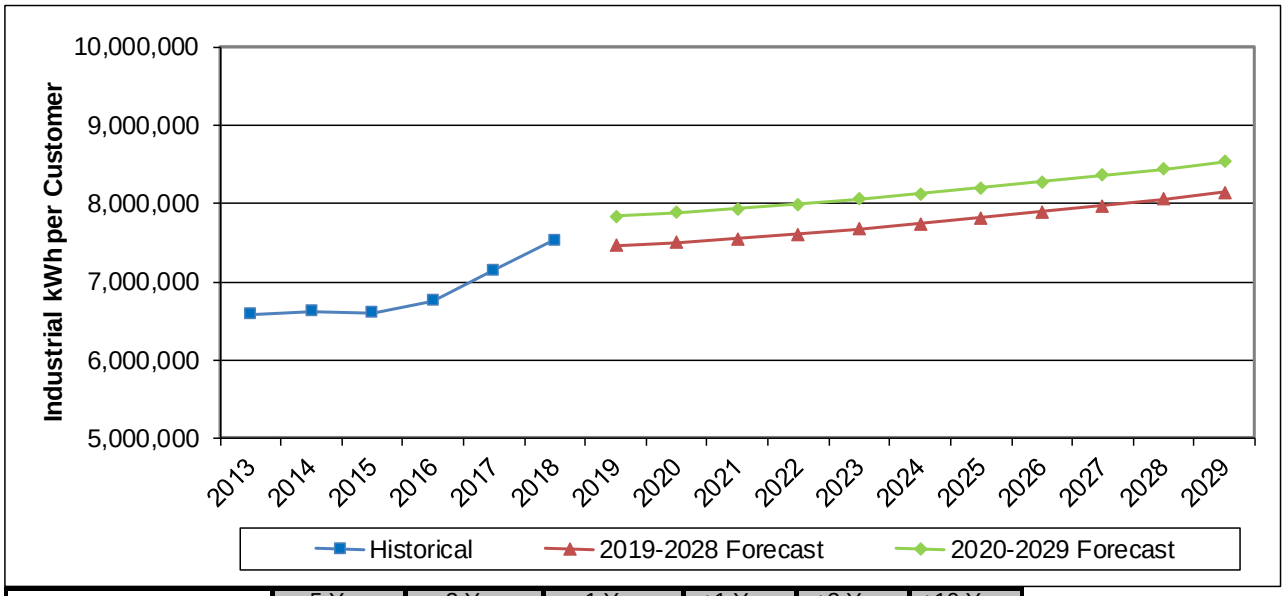


	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-3.35%	-0.39%	2.50%			
2020-2029 Forecast	-1.27%	-1.13%	-1.79%	-0.07%	-0.34%	-0.30%
2019-2028 Forecast				1.30%	0.27%	-0.08%

Industrial forecast

Figure 14 shows the comparison of historical, 2019-2028 forecast and 2020-2029 forecast kWh per customer numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 14 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast industrial kWh per customer

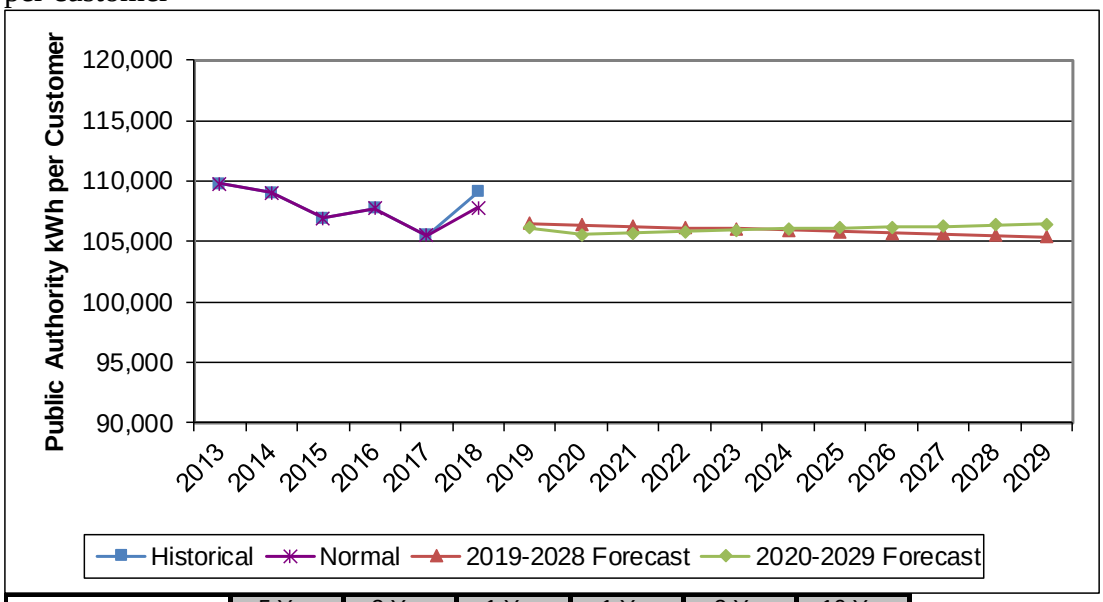


	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	2.73%	4.48%	5.37%			
2020-2029 Forecast				4.10%	1.78%	1.16%
2019-2028 Forecast				-0.89%	0.11%	0.68%

Public authority forecast

Figure 15 shows the comparison of historical, normalized, 2019-2028 forecast and 2020-2029 forecast kWh per customer numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Fig. 15 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast public authority kWh per customer

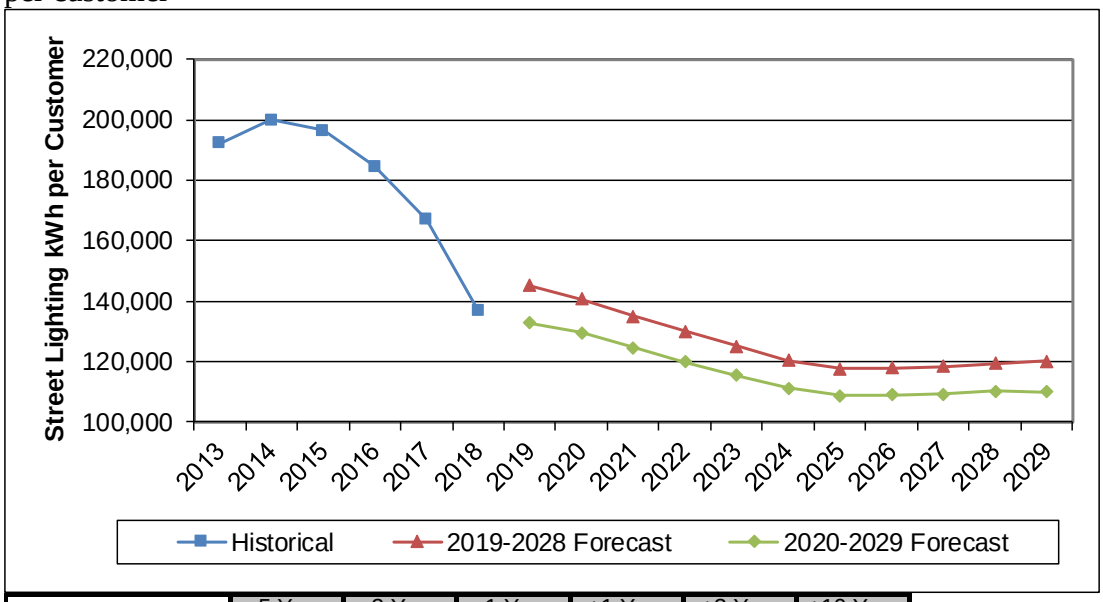


	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-0.12%	0.66%	3.39%			
2020-2029 Forecast	-0.36%	0.28%	2.20%	-1.57%	-0.66%	-0.14%
2019-2028 Forecast				-1.24%	-0.48%	-0.22%

Street lighting forecast

Figure 16 shows the comparison of historical, normalized, 2019-2028 forecast and 2020-2029 forecast kWh per customer numbers. The table associated with this figure compares the -5 year, -3 year, -1 year, +1 year, +3 year and +10 year growth rates.

Figure 16 Comparison of historical, 2019-2028 forecast and 2020-2029 forecast street lighting kWh per customer



	-5 Year	-3 Year	-1 Year	+1 Year	+3 Year	+10 Year
Historical	-6.52%	-11.28%	-17.86%			
2020-2029 Forecast				-3.12%	-3.14%	-2.16%
2019-2028 Forecast				5.91%	-0.49%	-1.38%

APPENDIX
Appendix 1: Additive regression model (linear)

If the relationship between the dependent and independent variables is truly linear[6], the multiple regression equation has the form of:

$$y = r + \alpha X + \beta Y + \gamma Z$$

where X, Y and Z are the variables, α, β and γ are the coefficients and r is the constant.

$$Elasticity = Slope\frac{X}{y} = \alpha\frac{X}{y} = \frac{dy}{dX}\frac{X}{y} = \frac{\%\,Change\text{ in }y}{\%\,Change\text{ in }X}$$

$$Slope = \alpha = \frac{dy}{dX}$$

In this model, the coefficients α, β and γ, are the slopes, not the elasticity values. The slope only shows the change in demand in response to "one-unit" change in a given independent variable, assuming that all others independent variables are held constant. Thus, the elasticity (the ratio of % change in the dependent variable to % change in the independent variable) in this model is calculated as the slope coefficient multiplied by the ratio of independent variable to dependent variable.

[6] Occasionally, it may be necessary to transform the actual data to arrive a linear relationship, as in the case of logarithmic transformation.

Appendix 2: Statistical significance tests

In multiple regressions, the initial assumption (Null Hypothesis) is that the independent variables have zero coefficients. The goal is to prove that this is not the case (Alternative Hypothesis).

Null Hypothesis	H_0: coefficient for a variable = 0
Alternative Hypothesis	H_1: coefficient for a variable $\neq 0$

$$t = \frac{Coefficient - HypothesizedValue}{S\tan dardError} = \frac{\beta - 0}{S\tan dardError}$$

If calculated t value satisfies one of these two conditions,

$$t > t_{Critical} \qquad \text{or}$$

$$t < -t_{Critical}$$

the variable is said to be statistically significant. $t_{critical}$ has a value around ±2 depending of the number of sample used in the analysis.

The P-value (probability) also leads to a similar conclusion regarding the statistical significance of independent variables. Typically, P-values are reported at 5% significance level, i.e., 95% confidence interval. In this case, the P-values are required to be less than 5%. The smaller the P-value, the more confident one becomes about the significance of that variable. The relationships between t, $t_{critical}$ and P-value are shown in figure below.

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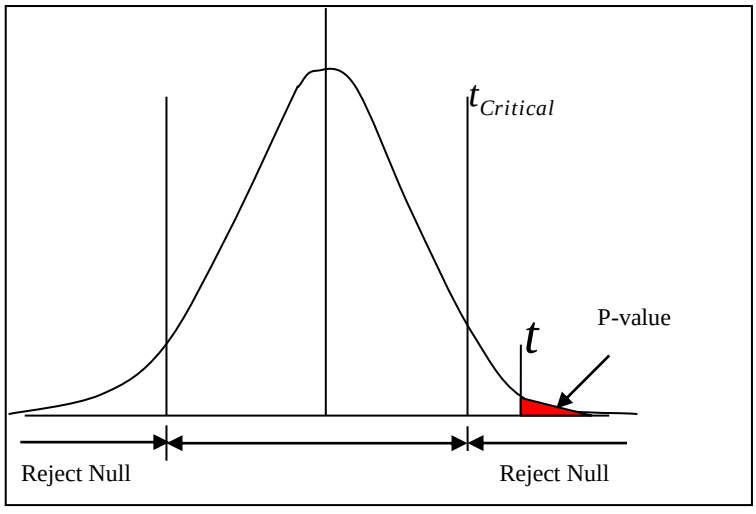

Appendix 3: Tables of residential customers

Figure A3.1 Table of average customers in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	558,202			75,765			3,640		
2014	563,119			75,812			3,737		
2015	568,142			74,455			3,834		
2016	574,953			74,298			3,942		
2017	583,485			74,159			4,044		
2018	591,461			73,933			4,104		
2019		595,557	597,955		74,604	73,984		4,139	4,184
2020		600,321	603,655		75,201	73,976		4,173	4,284
2021		605,124	609,355		75,803	73,975		4,206	4,389
2022		609,965	615,055		76,409	73,971		4,240	4,497
2023		614,844	620,755		77,020	73,964		4,273	4,610
2024		619,763	626,455		77,637	73,958		4,308	4,731
2025		624,721	632,317		78,258	73,948		4,342	4,861
2026		629,719	638,317		78,884	73,936		4,377	4,996
2027		634,757	644,317		79,515	73,930		4,412	5,123
2028		639,835	650,317		80,151	73,925		4,447	5,247
2029		644,954	656,317		80,792	73,913		4,483	5,366

Appendix 4: Tables of commercial customers

Figure A4.1 Table of average customers in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	77,508			7,709			711		
2014	78,379			7,765			731		
2015	80,221			8,998			748		
2016	80,905			9,209			760		
2017	81,894			9,401			760		
2018	83,279			9,653			799		
2019		83,627	84,186		9,642	9,944		795	817
2020		84,313	84,850		9,704	10,021		802	821
2021		85,004	85,444		9,763	10,095		810	828
2022		85,701	86,042		9,822	10,169		821	838
2023		86,404	86,644		9,882	10,244		833	850
2024		87,112	87,250		9,943	10,320		846	864
2025		87,827	87,861		10,003	10,396		859	879
2026		88,547	88,476		10,064	10,472		874	895
2027		89,273	89,096		10,126	10,550		887	909
2028		90,005	89,719		10,188	10,628		899	923
2029		90,743	90,347		10,251	10,708		911	935

Appendix 5: Tables of industrial customers

Figure A5.1 Table of average customers in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	1,466			105			23		
2014	1,548			99			22		
2015	1,671			56			22		
2016	1,728			49			21		
2017	1,755			39			22		
2018	1,752			38			22		
2019		1,784	1,786		38	39		22	22
2020		1,800	1,802		38	39		23	23
2021		1,814	1,816		39	40		23	23
2022		1,827	1,829		39	40		23	23
2023		1,839	1,841		39	40		23	23
2024		1,849	1,851		40	41		23	23
2025		1,859	1,861		40	41		23	23
2026		1,868	1,870		40	41		23	23
2027		1,877	1,879		41	42		23	23
2028		1,886	1,888		41	42		24	24
2029		1,894	1,895		41	42		24	24

Appendix 6: Tables of public authority customers

Figure A6.1 Table of average customers in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	12,155			1,389			129		
2014	12,254			1,392			131		
2015	12,256			1,302			134		
2016	12,301			1,288			136		
2017	12,384			1,371			133		
2018	12,354			1,410			131		
2019		12,355	12,331		1,406	1,426		131	133
2020		12,348	12,308		1,405	1,425		131	134
2021		12,342	12,291		1,404	1,425		131	135
2022		12,336	12,274		1,403	1,425		131	135
2023		12,330	12,258		1,403	1,426		131	135
2024		12,324	12,243		1,402	1,426		131	136
2025		12,318	12,232		1,401	1,426		131	136
2026		12,311	12,223		1,401	1,426		131	136
2027		12,305	12,214		1,400	1,426		131	137
2028		12,299	12,202		1,399	1,426		131	137
2029		12,293	12,191		1,399	1,426		131	138

Appendix 7: Tables of street lighting customers

Figure A7.1 Table of average customers in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	443			44			4		
2014	440			44			4		
2015	440			42			4		
2016	440			42			4		
2017	437			43			4		
2018	439			44			4		
2019		438	439		44	44		4	4
2020		438	439		44	44		4	4
2021		438	439		44	44		4	4
2022		438	439		44	44		4	4
2023		438	439		44	44		4	4
2024		438	439		44	44		4	4
2025		438	439		44	44		4	4
2026		438	439		44	44		4	4
2027		438	439		44	44		4	4
2028		438	439		44	44		4	4
2029		438	439		44	44		4	4

Appendix 8: Tables of residential sales

Figure A8.1 Table of annual billed MWh sales in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	5,499,683			651,142			49,175		
2014	5,555,266			655,434			49,300		
2015	5,594,431			639,637			50,932		
2016	5,608,701			638,937			49,362		
2017	5,647,193			617,812			54,996		
2018	5,680,776			624,464			53,760		
2019		5,772,937	5,718,593		627,216	618,536		55,241	55,703
2020		5,806,318	5,750,021		631,292	611,342		55,600	57,392
2021		5,839,893	5,781,106		635,394	607,228		55,960	58,812
2022		5,873,661	5,811,851		639,523	603,630		56,323	60,277
2023		5,907,625	5,842,257		643,679	600,381		56,689	61,812
2024		5,941,786	5,872,327		647,862	597,099		57,057	63,452
2025		5,976,143	5,903,537		652,072	594,174		57,427	65,203
2026		6,010,700	5,935,725		656,310	591,425		57,799	67,030
2027		6,045,456	5,967,561		660,574	588,178		58,174	68,766
2028		6,080,413	5,999,047		664,867	584,729		58,552	70,446
2029		6,115,573	6,030,186		669,187	581,943		58,932	72,055

Appendix 9: Tables of commercial sales

Figure A9.1 Table of annual billed MWh sales in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	3,294,785			386,917			29,298		
2014	3,318,759			395,923			32,318		
2015	3,278,098			458,556			34,346		
2016	3,284,739			465,786			36,475		
2017	3,285,480			471,828			39,693		
2018	3,291,019			464,039			41,942		
2019		3,361,259	3,336,376		460,402	466,128		38,331	41,225
2020		3,380,688	3,336,903		462,256	469,471		38,574	41,626
2021		3,400,230	3,350,716		463,975	471,947		38,894	41,884
2022		3,419,884	3,364,417		465,667	474,401		39,293	42,346
2023		3,439,652	3,377,951		467,402	476,909		39,767	42,993
2024		3,459,534	3,391,461		469,135	479,416		40,291	43,737
2025		3,480,229	3,404,942		470,972	481,926		40,863	44,579
2026		3,501,048	3,418,417		472,817	484,455		41,451	45,480
2027		3,521,991	3,432,048		474,683	487,005		41,982	46,277
2028		3,543,059	3,445,978		476,572	489,584		42,460	46,819
2029		3,564,254	3,460,041		478,469	492,194		42,943	47,270

Appendix 10: Tables of industrial sales

Figure A10.1 Table of annual billed MWh sales in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	9,676,304			686,082			125,614		
2014	10,243,783			681,658			124,559		
2015	10,771,839			641,935			124,043		
2016	11,392,005			634,925			125,070		
2017	12,207,415			637,991			131,541		
2018	12,896,819			626,337			127,844		
2019		12,964,390	13,696,075		662,190	645,528		130,884	131,455
2020		13,158,750	13,917,222		669,856	652,705		133,049	133,037
2021		13,356,752	14,120,309		815,647	658,301		134,010	133,924
2022		13,558,475	14,327,225		876,062	663,949		135,088	134,918
2023		13,763,994	14,538,885		884,268	668,795		136,306	136,043
2024		13,973,392	14,754,234		892,495	674,129		137,508	137,153
2025		14,183,381	14,974,503		900,124	678,694		138,815	138,358
2026		14,397,363	15,198,954		907,253	683,259		140,296	139,725
2027		14,615,424	15,427,016		914,435	688,498		141,936	141,240
2028		14,837,650	15,659,341		922,343	693,869		143,723	142,889
2029		15,063,255	15,896,231		930,320	699,218		145,533	144,622

Appendix 11: Tables of public authority sales

Figure A11.1 Table of annual billed MWh sales in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	1,309,030			185,223			6,747		
2014	1,318,367			177,044			6,589		
2015	1,293,398			163,711			6,891		
2016	1,302,724			169,394			6,883		
2017	1,294,025			163,501			7,473		
2018	1,322,712			167,652			7,637		
2019		1,302,202	1,301,175		169,832	165,404		6,992	7,417
2020		1,300,249	1,292,188		169,563	164,400		6,982	7,412
2021		1,298,299	1,293,065		169,295	163,526		6,971	7,408
2022		1,296,353	1,293,925		169,028	162,656		6,961	7,419
2023		1,294,409	1,294,778		168,761	161,776		6,950	7,446
2024		1,292,468	1,295,629		168,494	160,894		6,940	7,477
2025		1,290,530	1,296,474		168,228	160,010		6,930	7,517
2026		1,288,595	1,297,304		167,962	159,132		6,919	7,564
2027		1,286,662	1,298,132		167,696	158,268		6,909	7,600
2028		1,284,733	1,299,004		167,431	157,411		6,898	7,584
2029		1,282,807	1,299,889		167,166	156,553		6,888	7,558

Appendix 12: Tables of street lighting sales

Figure A12.1 Table of annual billed MWh sales in Iowa, Illinois and South Dakota

	Iowa			Illinois			South Dakota		
	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst	Historical	2019-2028 Fcst	2020-2029 Fcst
2013	81,235			12,599			420		
2014	84,498			12,595			419		
2015	84,943			10,129			419		
2016	79,280			9,949			422		
2017	69,906			10,487			417		
2018	55,555			10,829			418		
2019		60,216	54,584		9,944	9,694		422	415
2020		57,974	53,025		9,954	9,704		423	415
2021		55,281	50,562		9,964	9,713		425	415
2022		52,815	48,306		9,974	9,723		426	416
2023		50,348	46,050		9,984	9,733		428	416
2024		48,110	44,003		9,994	9,743		429	417
2025		46,740	42,750		10,004	9,752		431	417
2026		46,924	42,918		10,014	9,762		432	417
2027		47,107	43,086		10,024	9,772		434	418
2028		47,521	43,464		10,034	9,782		435	418
2029		47,938	43,423		10,044	9,791		437	419