EPCOR Electricity Distribution Ontario Inc.

Cost of Service Application

EB-2022-0028

May 27, 2022

Exhibit 3 – Customer & Load Forecast

PROVIDING MORE

Contents

3.0 Customer and Load Forecast

3.1 Load Forecasts

EPCOR Electricity Distribution Ontario Inc. ("EEDO") engaged Elenchus Research Associates ("Elenchus") to complete the 2023 Test Year load forecast. Elenchus provided forecasts by rate class for: consumption and demand (if applicable); and the number of customers and connections. The sales and energy forecast utilized actual data from January 2012 to December 2021. Forecasts were provided both with and without the impact arising from Conservation and Demand Management ("CDM") programs.

Elenchus used a multivariate regression model to determine the sales and energy forecast for the 2023 Test Year.

3.1.1. Multivariate Regression Model

EEDO's load forecast relies on a multivariate regression methodology for weather-sensitive classes: Residential, GS<50 kW, and GS>50 kW. Monthly consumption, adjusted for CDM as described below, is used as the dependent variable in the multivariate regressions. Independent variables considered for each class model are described in further detail in Section 0 of this Exhibit and are as follows:

- Weather
    - Heating Degree Days ("HDD") and Cooling Degree Days ("CDD")
- Economic
    - Gross Domestic Product ("GDP")
    - Employment levels measured by Full Time Equivalents ("FTEs")
- Time Trend
    - Monthly trend variable incrementing by 1 each month. The value begins at 1 in January 2012 and reaches 144 in December 2023
- Calendar Binary
    - 12 monthly binary variables equal to 1 in the month associated with the observation and 0 in all other months
- Seasonal Binary
    - Spring binary variable equal to 1 in March, April, and May and 0 in all other months

- Fall binary variable equal to 1 in September, October, and November and 0 in all other months
- Shoulder binary variable equal to 1 in the Spring and Fall months and 0 in all other months

- Number of Days
  - The number of days in the month
  - The number of "Peak Days" (non-holiday weekdays) in the month
- Number of Customers
- Other
  - COVID binary and COVID/Degree Day interaction variables
  - Binary 2012 variable covering the first 6 months of 2012

The load forecast approved in EEDO's last Cost of Service application (EB-2012-0116), was based on a methodology which modeled total purchases and allocated forecast purchases to rate classes. EEDO has more detailed consumption data than was available prior to the 2013 Cost of Service so the methodology has evolved to forecast metered consumption separately for each rate class.

EEDO's load forecast methodology consists of a three-step process which explicitly takes into account historical and forecast CDM impacts:

1. Actual historical cumulative CDM impacts are added to the monthly consumption dependent variable to derive a forecast of consumption as if there were no CDM activities;
2. The metered load (gross of CDM) is forecasted based on multifactor regression techniques; and
3. The cumulative forecast CDM impacts are deducted from the gross load forecast to derive the load forecast (net of CDM).

EEDO has developed separate energy forecasts for each rate class. For rate classes whose billing units are monthly peak demand, the forecasted monthly billing demand by class is forecast based on historical relationships between energy and demand.

Streetlight and USL forecasts rely on an average consumption per connection methodology.

3.1.2. Weather and Weather-Normalization Methodology

The regression equations used to normalize and forecast EEDO's weather sensitive load use monthly weather variables: HDD and CDD as measured at Environment Canada's Collingwood Weather Station. This is the only weather station within EEDO's service territory. When temperatures were unavailable from the Colling Weather Station, temperatures from the Borden AWOS Weather Station were used. Environment Canada defines HDD and CDD as the difference between the average daily temperature and a base 18°C for each day (below base 18°C for heating, above base 18°C for cooling). A range of degree day bases beyond 18°C were considered in each rate class regression model. HDD and CDD measures at temperatures other than 18°C were generally found to be more predictive than the default 18°C, though CDD at 18°C is used for one class.

EEDO's proposed consumption forecast relies on the 10-year average weather variables using base degrees as identified in Table 3.1-1 below. Rationale for the use of these HDD and CDD base temperatures is provided in Section 3.1.1.8 of this Exhibit 3.

Table 3.1-1

HDD and CDD by Class

Rate Class	HDD Base Temperature	CDD Base Temperature
Residential	16°C	16°C
General Service < 50 kW	14°C	14°C
General Service > 50 kW	16°C	18°C

Table 3.1-2 below displays the most recent 10-year average (2012 – 2021) of HDD and CDD for a number of temperature thresholds based on temperatures reported by Environment Canada at Collingwood Weather Station. EEDO's proposed load forecast in this Application was based on this 10-year average.

Table 3.1-2

HDD and CDD by Class

	8°C		10°C		12°C		14°C		16°C		18°C		20°C	
	HDD	CDD	HDD	CDD	HDD	CDD	HDD	CDD	HDD	CDD	HDD	CDD	HDD	CDD
January	387	0	439	0	510	0	572	0	634	0	696	0	758	0
February	356	1	402	0	469	0	525	0	582	0	639	0	695	0
March	262	12	305	6	377	3	437	1	498	1	560	0	622	0
April	108	26	151	7	208	6	264	3	323	1	382	0	442	0
May	15	152	35	115	59	72	96	46	140	29	189	16	243	8
June	0	281	0	214	3	164	12	113	30	71	61	42	101	22
July	0	397	0	332	0	273	0	211	1	151	8	96	27	52
August	0	384	0	329	0	260	0	198	2	138	10	84	30	42
September	0	265	1	193	5	150	16	101	37	62	70	34	111	16
October	24	110	42	81	83	45	125	25	174	12	229	5	288	2
November	146	22	198	17	251	6	308	3	366	2	425	1	485	0
December	277	1	321	0	400	0	462	0	524	0	586	0	648	0

3.1.3. Economic Variables

Overall economic activity also impacts energy consumption. There is no known agency that publishes monthly economic accounts on a regional basis for Ontario. However, regional employment levels are available; specifically, the monthly FTE employment levels for Barrie and Ontario, as reported in Statistics Canada's Monthly Labour Force Survey[1]. Overall GDP in Ontario was also considered but is available only on an annual basis.[2]

Forecast GDP and employment in 2023 are based on forecast growth rates from four major Canadian banks: BMO, TD, Scotiabank, and RBC, as of March 31, 2022 and provided in Table 3.1-3 below.

[1] Statistics Canada Table 14-10-0380-01

[2] Statistics Canada Table 36-10-0402-01

Table 3.1-3

Economic Forecasts

	TD	**BMO**	**Scotia**	**RBC**	**Average Used**
Report Date	**17-Mar-22**	**25-Mar-22**	**11-Mar-22**	**10-Mar-22**	
GDP (Real % YoY)					
2022	4.2%	3.4%	4.1%	4.2%	4.1%
2023	3.0%	3.0%	3.2%	2.8%	3.4%
FTE (Employment growth % YoY)					
2022	4.5%	5.1%	4.5%	3.4%	4.4%
2023	1.0%	2.2%	1.4%	1.6%	1.6%

Average forecast growth rates are applied to the most recent GDP and Labour Force Survey monthly data available to estimate future GDP and FTE figures. For example, the 2022 forecast GDP growth rate, 4.1%, is applied to the January 2021 GDP to forecast GDP in January 2022. The January 2023 GDP forecast is then determined by applying 3.4%, the 2023 GDP forecast growth rate, to the January 2022 forecast.

3.1.4. Impact of Conservation and Demand Management

To isolate the impact of CDM, persisting CDM as measured by the IESO is added back to rate class consumption to simulate the rate class consumption had there been no CDM program delivery. This is labeled as “Actual No CDM” throughout the Load Forecast model. The effect is to remove the impact of CDM from any explanatory variables, which may capture a trend, and focus on the external factors. A weather normalized forecast is produced first based on no CDM delivery, and then persisting CDM savings of historic programs are subtracted from the “No CDM” forecast to determine a weather normalized forecast including the impact of CDM.

CDM data for each rate class that is used in the load forecast is from EEDO’s last-approved LRAMVA workform (EB-2021-0020).

3.1.5. Additional Variables

In addition to the weather and economic variables the following variables have been examined for all weather-sensitive classes (Residential, GS<50 kW and GS>50 kW): Only variables which have a strong correlation to consumption are used in the rate class regression equations.

- a time trend variable;
- calendar month binary variable
- seasonal binary variables
- number of days and number of working days in each month; and
- number of customers
- other variables

Details on the variables used in each rate class model are provided by rate class in Section **Error! Reference source not found.** below.

3.1.6. Regression Model

Time-series autoregressive models using the Prais-Winsten estimation for each rate class were used instead of Ordinary least-squares ("OLS") regressions. OLS regressions exhibited errors with a high level of autocorrelation with Durbin-Watson statistics near 1.00[3]. A high level of autocorrelation can distort the models' statistical tests such that independent variables can be inappropriately considered statistically significant when they are not.

3.1.7. Demand Charges

For rate classes with demand charges (GS>50 kW and Street Light), an annual kW to kWh ratio is calculated using actual observations for each historical year and applied to the weather-normalized kWh to derive a weather normalized demand (kW).

[3] The Durbin-Watson statistic value of 2.00 suggests there is no error autocorrelation. Generally, a Durbin-Watson statistic of 1.5 to 2.5 is considered acceptable.

3.1.8. COVID Variables

The impact of COVID-19 had a material impact on consumption of the Residential, General Service < 50 kW and General Service > 50 kW classes. The extent to which to Residential consumption was higher than typical consumption was found to be related to the weather variables in those months. A set of COVID/weather interaction variables were considered to capture the incremental consumption caused by people working from home and more generally staying at home due to lockdowns.

These variables, “COVID HDD” and “COVID CDD” are equal to the relevant HDD and CDD variables from March 2020 to December 2021 and equal to 0 in all other months. The coefficients reflect incremental heating and cooling load from people working from home, public health lockdowns, and people generally staying at home.

COVID flag variables were tested and found to be statistically significant for the General Service < 50 kW and General Service > 50 kW classes. A “COVID” variable equal to 0 in all months prior to March 2020 and 1 in all months since March 2020; a “COVID_AM” variable equal to 0 in all months prior to March 2020, equal to 1 in April and May 2020, and 0.5 in each month from June 2020 to December 2021; and a “COVID2020” variable equal to 0.5 in March 2020, 1 in April and May 2020, 0.5 in June 2020, and 0 each month thereafter, were tested. The “COVID_AM” variable considers the incremental impact in the first few months of the pandemic, with lower impacts after May 2020. The “COVID2020” variable also considers the larger impact in the first few months of the pandemic but the impact ceasing by Summer 2020. The “COVID_AM” variable is used for the General Service < 50 kW class and “COVID2020” is used for the General Service > 50 kW rate class. The purpose of these variables is to account for abnormal consumption patterns caused by COVID so that the coefficients of other variables are not skewed by this unusual consumption.

3.1.9. Load Forecast Methodology by Rate Class

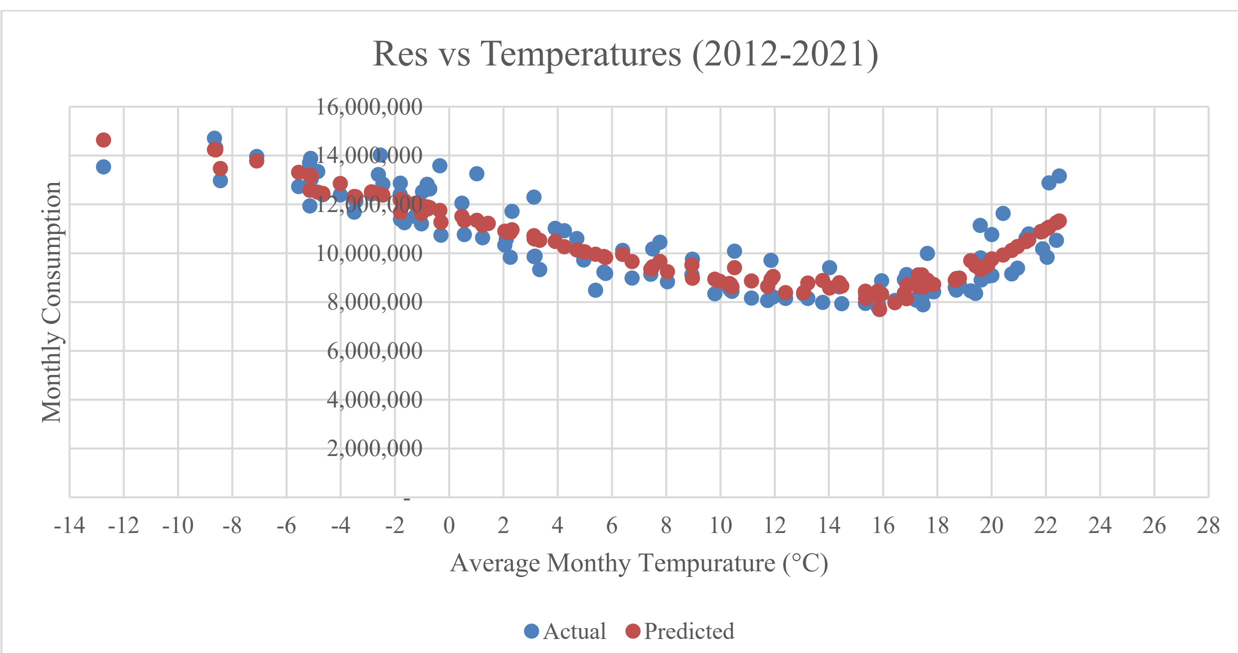
3.1.9.1. Residential

EEDO provides its load forecast methodology for residential consumption and customer counts below.

Residential Consumption (kWh)

The regression equation to estimate Residential kWh consumption relied on 120 observations from January 2012 to December 2021. Multiple HDD and CDD thresholds were considered in the residential regression equation. Consumption generally increases at average monthly temperatures above and below 16°C. HDD and CDD relative to 16°C were found to provide the highest correlation to consumption. HDD and CDD measures near 16°C were also considered but were found to be less predictive of monthly consumption. Figure 3.1-1 below maps monthly consumption against average monthly temperatures, and predicted consumption using only HDD and CDD at 16°C as independent variables.

Figure 3.1-1 – Residential Monthly Consumption vs. Average Temperatures



The number of Residential customers and number of month days were each found to be statistically significant variables. A binary shoulder variable, equal to 1 in the spring months (March, April, and May) and fall months (September, October, and November) and 0 in all other months, is used to account for the observed lower consumption in these months.

Both the COVID HDD variable and COVID CDD variable (both at 16°C) were found to be statistically significant and are used in the statistical model.

Economic variables and time trend variables exhibited a high degree of autocorrelation with customer count (as all are generally increasing over time) so only the variable which exhibited the highest level of statistical significance was selected.

Table 3.1-4 below provides the statistical model results for the Residential Rate Class.

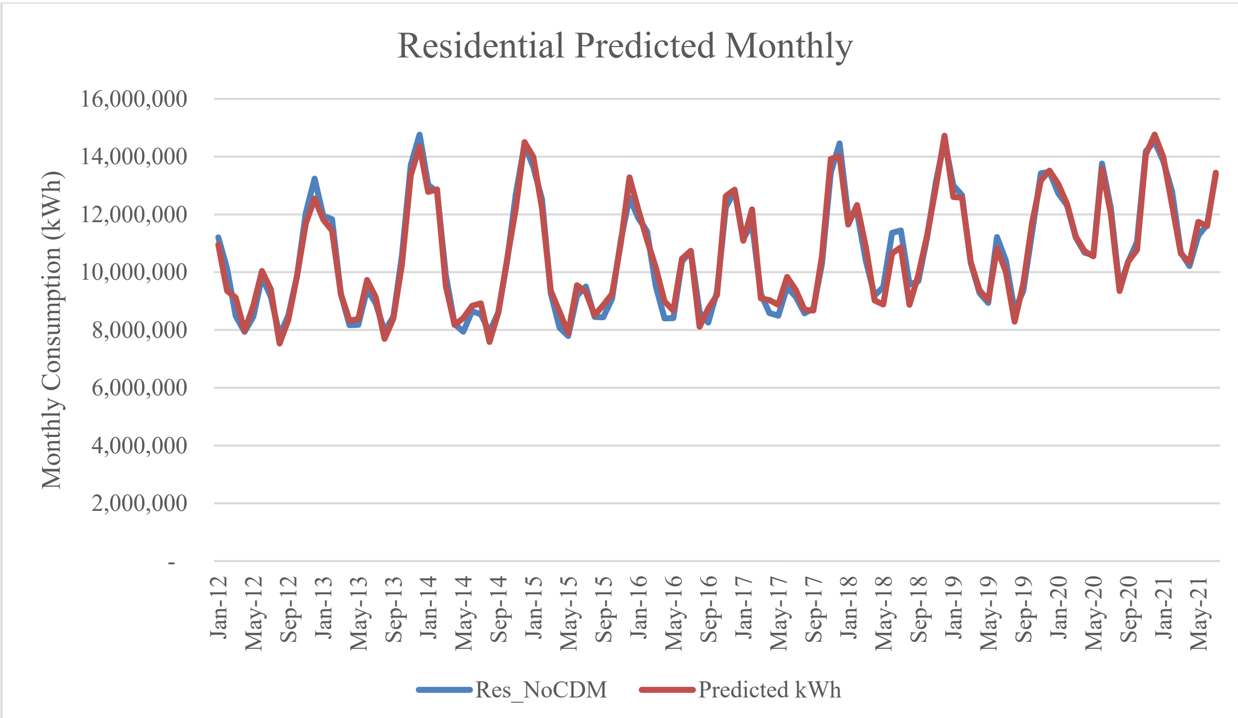
Table 3.1-4

Residential Model Results

Model 2: Prais-Winsten, using observations 2012:01-2021:12 (T = 120) Dependent variable: Res_NoCDM rho = 0.195683				
	coefficient	std. error	t-ratio	p-value
const	(11,221,082)	1433769.80	-7.83	3.06E-12
HDD16	9,098	236.27	38.51	1.98E-66
CDD16	15,301	1121.23	13.65	1.44E-25
MonthDays	291,042	35181.24	8.27	3.04E-13
Shoulder	(615,866)	79730.32	-7.72	5.16E-12
COVIDHDD16	1,423	367.07	3.88	1.79E-04
COVIDCDD16	9,229	1359.77	6.79	5.71E-10
ResCust	668	64.66	10.33	5.53E-18
Statistics based on the rho-differenced data				
Mean dependent var	10,654,588	S.D. dependent var		1,945,115
Sum squared resid	1.214E+13	S.E. of regression		329,204
R-squared	0.97310	Adjusted R-squared		0.97141
F(7, 112)	455	P-value(F)		4.08E-79
rho	-0.00893	Durbin-Watson		1.99203

Using the model coefficients identified in Table 3.1-4 above, Figure 3.1-2 below identifies the predicted monthly consumption as compared to actual monthly consumption.

Figure 3.1-2 – Predicted Residential Monthly Consumption



Annual volumes predicted with the statistical model results are compared to actual volumes from 2012 to 2021 in Table 3.1-5 below. The mean absolute percentage error ("MAPE") for annual predicted values for the period (the average of Absolute Error %) is 1.1%. The average monthly MAPE over the period is 2.6%. The annual and monthly MAPE values are low, which indicates the model is strongly predictive of actual consumption.

Table 3.1-5

Residential Model Summary

Residential			
Year	**Actual Data (CDM Added Back)**	**Predicted Data**	**Absolute Error (%)**
2012	116,259,186	115,390,871	0.7%
2013	121,667,910	120,357,277	1.1%
2014	123,418,602	122,681,849	0.6%
2015	121,502,966	123,086,503	1.3%
2016	121,752,963	124,293,297	2.1%
2017	121,679,900	124,202,240	2.1%
2018	133,945,647	131,253,423	2.0%
2019	133,206,960	132,269,277	0.7%
2020	142,034,261	141,614,381	0.3%
2021	143,082,138	143,558,104	0.3%
Total	**1,278,550,533**	**1,278,707,222**	**0.0%**
Mean Absolute Percentage Error (Annual)			1.1%
Mean Absolute Percentage Error (Monthly)			2.6%

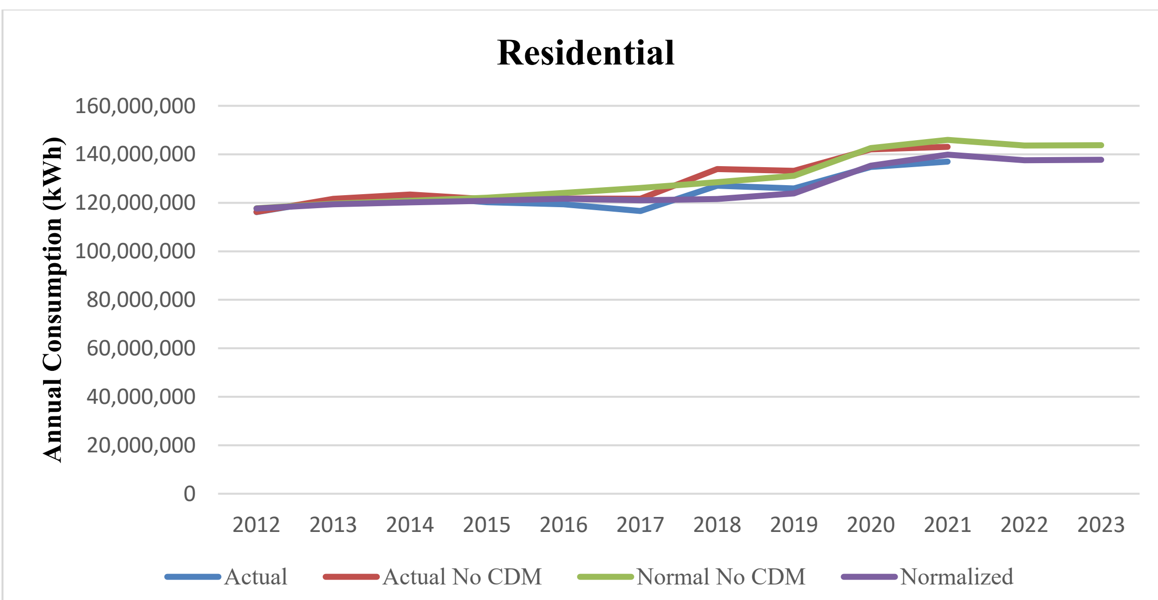
Weather-normalized consumption and forecast values are calculated for the Residential class in Table 3.1-6 below, which incorporates the 10-year weather normal HDD and CDD, month days, customer count, binary shoulder variable, and COVID degree day variables. Forecast COVID-related values are adjusted downward by 50% in 2022 and 75% in 2023 to reflect the gradual declining impacts of COVID. Figure 3.1-3 below compares actual consumption with and without CDM to the weather normalized forecast with and without CDM.

Table 3.1-6

Residential Normalized Annual Summary

Residential kWh						
Year	Actual A	Cumulative Persisting CDM B	Actual No CDM C = A + B	Normal Predicted No CDM D	Cumulative Persisting CDM E = B	Normalized F = D - E
2012	116,167,787	91,399	116,259,186	117,736,700	91,399	117,645,301
2013	121,392,228	275,682	121,667,910	119,675,281	275,682	119,399,599
2014	122,734,566	684,035	123,418,602	120,840,873	684,035	120,156,837
2015	120,270,467	1,232,499	121,502,966	122,067,600	1,232,499	120,835,101
2016	119,372,519	2,380,443	121,752,963	124,063,098	2,380,443	121,682,654
2017	116,589,912	5,089,988	121,679,900	126,135,978	5,089,988	121,045,990
2018	127,042,389	6,903,258	133,945,647	128,491,882	6,903,258	121,588,623
2019	125,937,194	7,269,766	133,206,960	131,176,517	7,269,766	123,906,751
2020	134,775,706	7,258,555	142,034,261	142,562,722	7,258,555	135,304,166
2021	136,991,339	6,090,798	143,082,138	145,956,572	6,090,798	139,865,774
2022				143,635,795	6,066,581	137,569,214
2023				143,771,507	5,984,798	137,786,709

Figure 3.1-3 – Residential Consumption Actuals/Forecasts



Residential Customer Counts

Residential customer counts are forecast using data from January 2012 to December 2021. The geometric mean average growth rate over this time period is applied to the monthly average customer count in 2021 to forecast the 2022 customer count, and the growth rate is applied again to the forecast 2022 customer count to forecast the 2023 customer count. As monthly customer counts are required for the residential consumption forecast, monthly counts are forecast using the monthly equivalent of the geometric mean growth rate from 2012 to 2021 is applied in each month. Table 3.1-7 below identifies the monthly average customer counts from 2012 to 2021.

Table 3.1-7

Residential Customer Counts

Residential		Percent of
Year	Customers	Prior Year
2012	14,009	
2013	14,287	102.0%
2014	14,432	101.0%
2015	14,585	101.1%
2016	14,798	101.5%
2017	15,093	102.0%
2018	15,387	101.9%
2019	15,722	102.2%
2020	16,164	102.8%
2021	16,421	101.6%
2022	16,713.9	101.78%
2023	17,011.6	101.78%

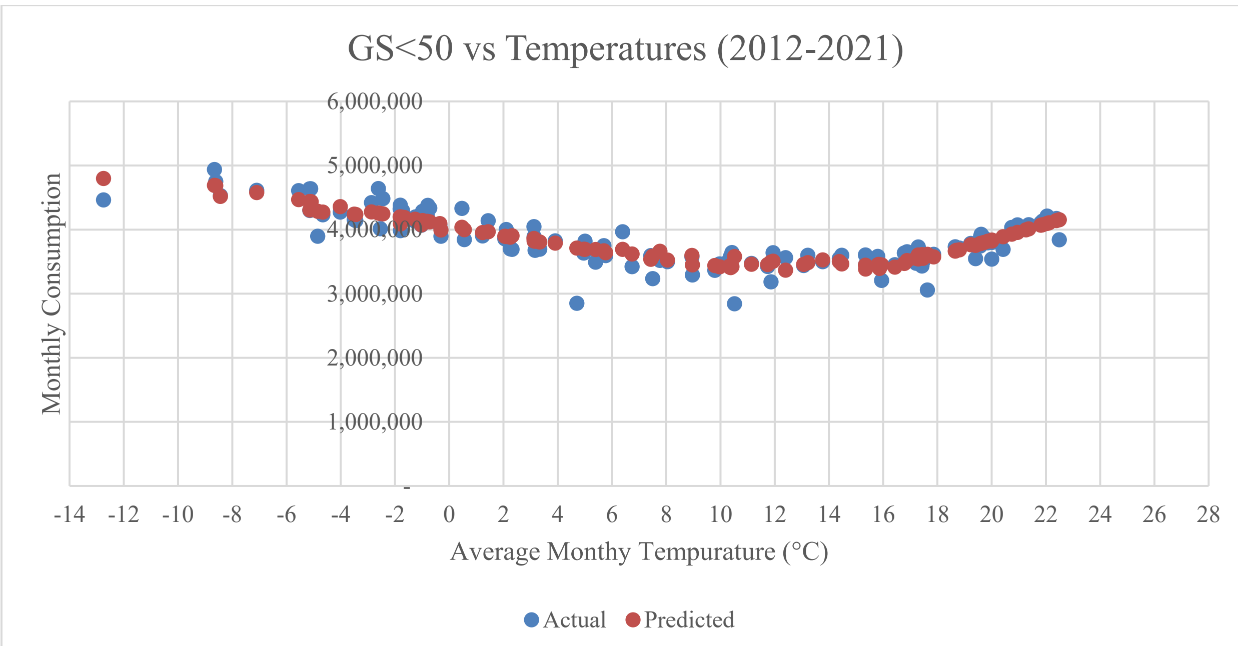
3.1.9.2. General Service < 50 kW

EEDO provides its load forecast methodology for General Service < 50 kW consumption and customer counts below.

General Service < 50 kW Consumption (kWh)

The regression equation to estimate General Service < 50 kW consumption relied on 120 observations from January 2012 to December 2021. Multiple HDD and CDD thresholds were considered in the residential regression equation. Consumption generally increases at average monthly temperatures above and below 14°C. HDD and CDD relative to 14°C were found to provide the highest correlation to consumption. HDD and CDD measures near 14°C were also considered but were found to be less predictive of monthly consumption. Figure 3.1.4 below maps monthly consumption against average monthly temperatures, and predicted consumption using only HDD and CDD at 14°C as independent variables.

Figure 3.1-4 – General Service < 50 kW Monthly Consumption vs. Average Temperatures



The number of month days and a binary shoulder variable, equal to 1 in the spring months (March, April, and May) and fall months (September, October, and November) and 0 in all other months, were each found to be statistically significant variables.

The COVID_AM variable, equal to 0 in all months prior to March 2020, equal to 1 in April and May 2020, and 0.5 in each month from June 2020 to December 2021, is used to account for lower class consumption in 2020 and 2021 attributable to COVID.

Economic variables, a time trend variable, and General Service < 50 kW customer counts were tested separately and each found not to be statistically significant.

Table 3.1-8 below provides the statistical model results for the Residential Rate Class.

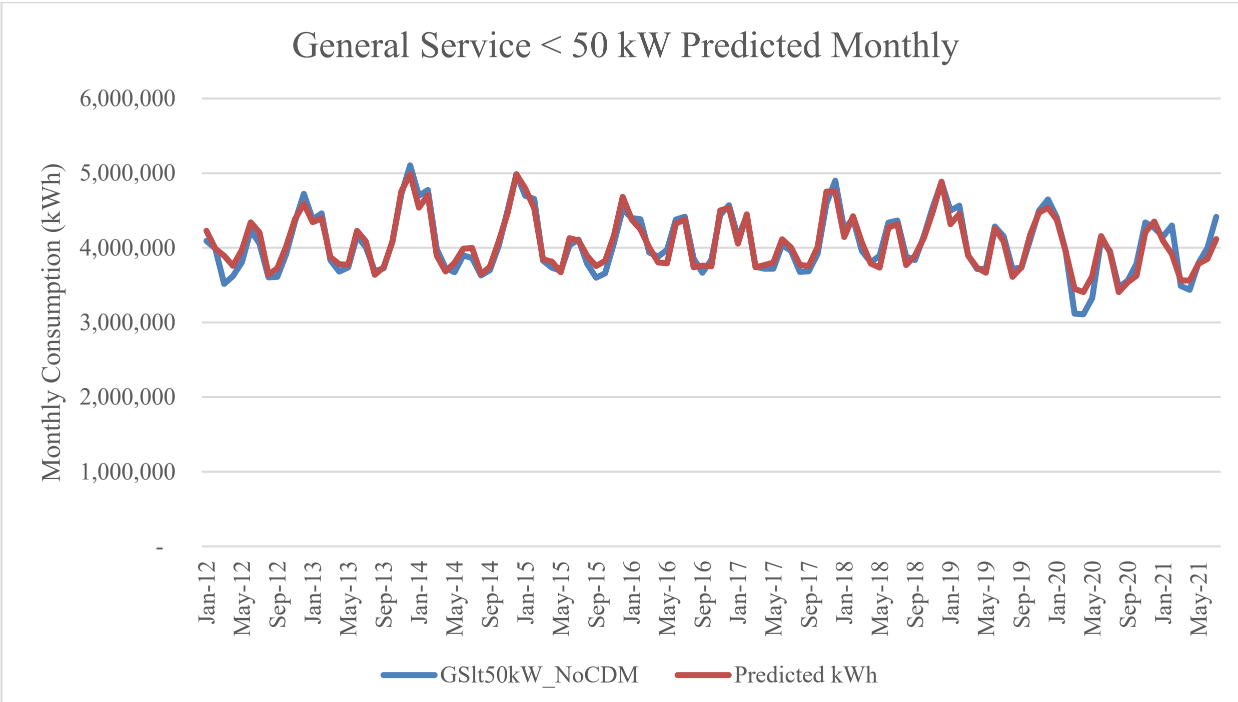
Table 3.1-8

General Service < 50 kW Model Results

Model 3: Prais-Winsten, using observations 2012:01-2021:12 (T = 120)				
Dependent variable: GSlt50kW_NoCDM				
rho = 0.484588				
	coefficient	std. error	t-ratio	p-value
const	492,239	300039.81	1.64	1.04E-01
HDD14	2,122	95.28	22.27	2.49E-43
CDD14	3,386	261.30	12.96	3.74E-24
MonthDays	96,938	10089.13	9.61	2.28E-16
COVID_AM	(465,220)	79994.58	-5.82	5.62E-08
Shoulder	(77,442)	26415.68	-2.93	4.08E-03
Statistics based on the rho-differenced data				
Mean dependent var	4,052,460	S.D. dependent var		398,829
Sum squared resid	1.400E+12	S.E. of regression		110,834
R-squared	0.92678	Adjusted R-squared		0.92357
F(7, 112)	235	P-value(F)		2.58E-58
rho	-0.03240	Durbin-Watson		2.04100

Using the model coefficients identified in Table 3.1-8 above, Figure 3.1-5 below identifies the predicted monthly consumption as compared to actual monthly consumption.

Figure 3.1-5 – Predicted General Service < 50 kW Monthly Consumption



Annual volumes predicted with the statistical model results are compared to actual volumes from 2012 to 2021 in Table 3.1-9 below. The mean absolute percentage error ("MAPE") for annual predicted values for the period (the average of Absolute Error %) is 1.3%. The average monthly MAPE over the period is 2.4%. The annual and monthly MAPE values are low, which indicates the model is strongly predictive of actual consumption.

Table 3.1-9

General Service < 50 kW Model Summary

General Service < 50 kW Consumption			
Year	**Actual Data (CDM Added Back)**	**Predicted Data**	**Absolute Error (%)**
2012	47,300,956	48,734,471	3.0%
2013	49,189,697	49,280,222	0.2%
2014	49,579,268	49,536,087	0.1%
2015	48,835,655	49,495,235	1.4%
2016	49,685,006	49,361,419	0.7%
2017	48,194,435	48,758,428	1.2%
2018	50,320,735	49,786,113	1.1%
2019	49,773,172	49,294,374	1.0%
2020	45,787,968	46,217,769	0.9%
2021	47,628,297	46,039,252	3.3%
Total	**486,295,188**	**486,503,371**	**0.0%**
Mean Absolute Percentage Error (Annual)			1.3%
Mean Absolute Percentage Error (Monthly)			2.4%

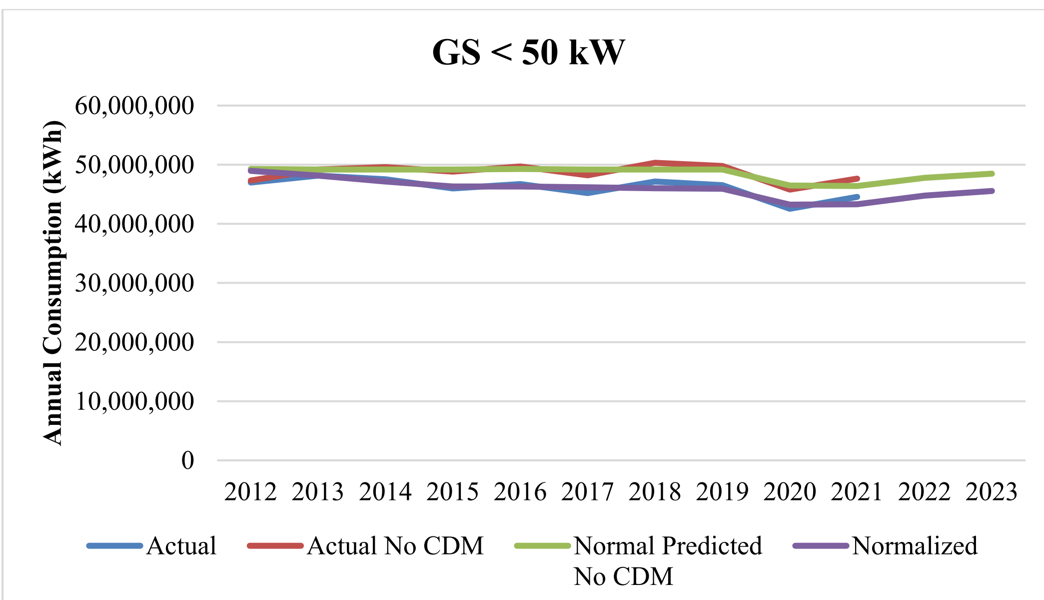
Weather-normalized consumption and forecast values are calculated for the General Service < 50 kW class in Table 3.1-10 below, which incorporates the 10-year weather normal HDD and CDD, month days, binary shoulder variable, and COVID_AM. Forecast COVID-related values are adjusted downward by 50% in 2022 and 75% in 2023 to reflect the gradual declining impacts of COVID. Figure 3.1-6 below compares actual consumption with and without CDM to the weather normalized forecast with and without CDM.

Table 3.1-10

General Service < 50 kW Normalized Annual Summary

General Service < 50 kW (kWh figures)						
Year	Actual A	Cumulative Persisting CDM B	Actual No CDM C = A + B	Normal Predicted No CDM D	Cumulative Persisting CDM E = B	Normalized F = D - E
2012	46,982,248	318,708	47,300,956	49,179,520	1,034,473	48,145,047
2013	48,155,224	1,034,473	49,189,697	49,179,520	2,039,316	47,140,205
2014	47,539,952	2,039,316	49,579,268	49,179,520	2,861,282	46,318,238
2015	45,974,373	2,861,282	48,835,655	49,276,458	2,961,943	46,314,515
2016	46,723,063	2,961,943	49,685,006	49,179,520	2,995,907	46,183,613
2017	45,198,528	2,995,907	48,194,435	49,179,520	3,158,722	46,020,798
2018	47,162,013	3,158,722	50,320,735	49,179,520	3,248,328	45,931,192
2019	46,524,844	3,248,328	49,773,172	46,485,136	3,240,660	43,244,476
2020	42,547,309	3,240,660	45,787,968	46,388,198	3,084,427	43,303,770
2021	44,543,870	3,084,427	47,628,297	47,783,859	3,021,765	44,762,094
2022				48,481,690	2,921,134	45,560,556
2023				49,179,520	1,034,473	48,145,047

Figure 3.1-6 – General Service < 50 kW Consumption Actuals/Forecasts



General Service < 50 kW Customer Counts

General Service < 50 kW customer counts are forecast using data from January 2012 to December 2021. The geometric mean average growth rate over this time period is applied to the monthly average customer count in 2021 to forecast the 2022 customer count, and the growth rate is applied again to the forecast 2022 customer count to forecast the 2023 customer count. Table 3.1-11 below identifies the monthly average customer counts from 2012 to 2021.

Table 3.1-11

General Service < 50 kW Customer Counts

General Service < 50 kW		Percent of Prior Year
Year	Customers	
2012	1,688	
2013	1,697	100.5%
2014	1,706	100.5%
2015	1,714	100.4%
2016	1,738	101.4%
2017	1,741	100.1%
2018	1,751	100.6%
2019	1,761	100.6%
2020	1,779	101.0%
2021	1,806	101.5%
2022	1,819.0	100.75%
2023	1,832.7	100.75%

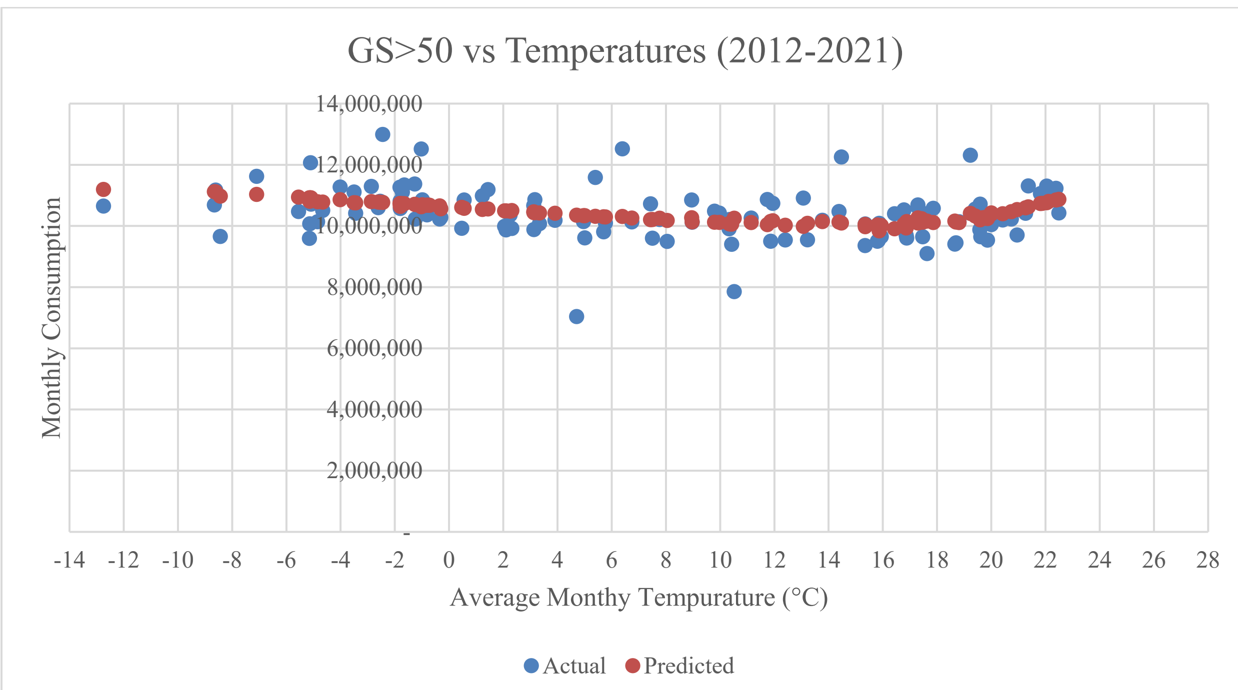
3.1.9.3. General Service > 50 kW

EEDO provides its load forecast methodology for residential consumption and customer counts below.

General Service > 50 kW Consumption (kWh)

The regression equation to estimate General Service > 50 kW consumption relied on 120 observations from January 2012 to December 2021. Multiple HDD and CDD thresholds were considered in the General Service > 50 kW regression equation. Consumption generally increases at average monthly temperatures above 18°C and below 16°C. The impacts are statistically significant, but the weather has a considerably lower impact on General Service > 50 kW consumption than the Residential or General Service < 50 kW classes. HDD relative to 16°C and CDD relative to 18°C were found to provide the highest correlation to consumption. HDD and CDD measures near 16°C and 18°C were also considered but were found to be less predictive of monthly consumption. Figure 3.1-7 below maps monthly consumption against average monthly temperatures, and predicted consumption using only HDD at 18°C and CDD at 16°C as independent variables.

Figure 3.1-7 – General Service > 50 kW Monthly Consumption vs. Average Temperatures



The number of month days was found to be statistically significant. The number of Peak Days (non-holiday weekdays) was also tested and found to be statistically significant, however, the number of month days exhibited a higher degree of statistical significance when tested separately and the Peak Days variable was not statistically significant when both variables were tested jointly.

Ontario GDP is used as an independent variable for the General Service > 50 kW model. Ontario GDP is statistically significant and exhibited a higher degree of statistical significance than Ontario FTEs or a time trend. Barrie FTEs is not statistically significant. The General Service > 50 kW class had materially higher monthly consumption in the first 6 months of 2012 than typical consumption in the remaining 9 and a half years included in the model. These months do not reflect current consumption trends so a dummy variable "D_2012" is used to mitigate the impact that anomalous higher consumption on other variables. Despite an increasing trend in class consumption since 2013 (except 2020), no trend or economic variables were statistically significant without this variable.

A December binary variable is included to account for typically lower December consumption.

The COVID2020 variable is used for the General Service > 50 kW class to account for anomalously low consumption during the first few months of the COVID-19 pandemic.

Table 3.1-12 below provides the statistical model results for the General Service > 50 kW Rate Class.

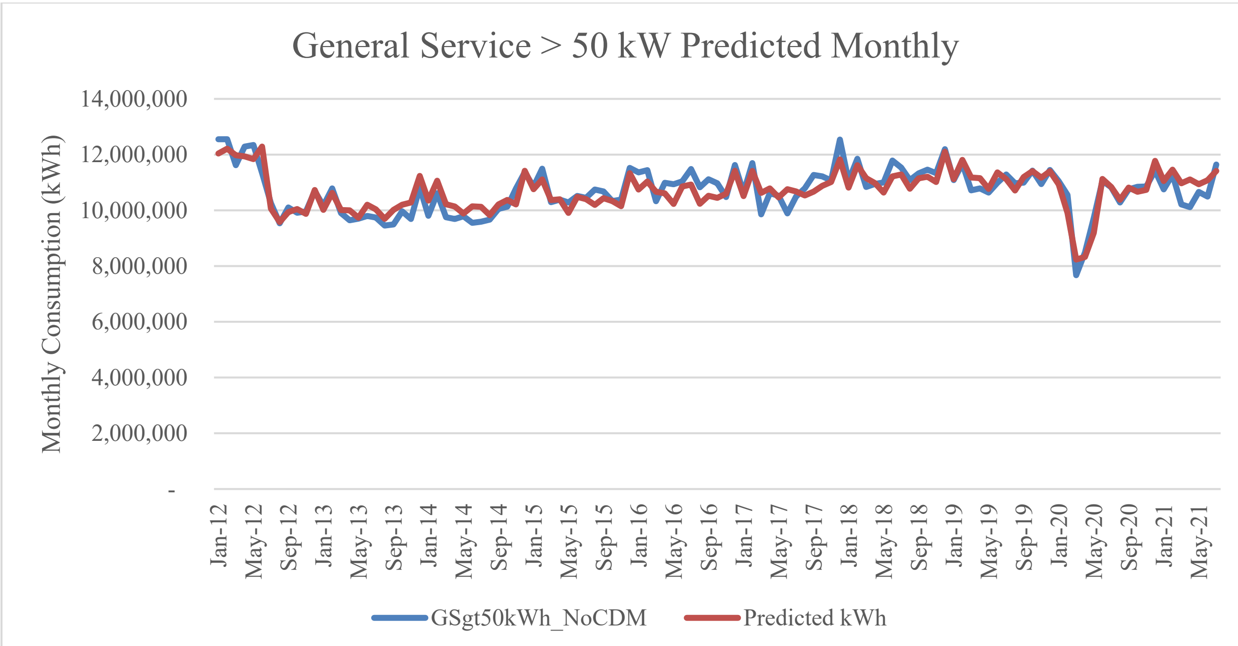
Table 3.1-12

General Service > 50 kW Model Results

Model 1: Prais-Winsten, using observations 2012:01-2021:12 (T = 120)				
Dependent variable: GSgt50kWh_NoCDM				
rho = 0.351288				
	coefficient	std. error	t-ratio	p-value
const	(4,934,593)	1,456,200	-3.39	9.70E-04
HDD16	1,766	230	7.67	6.78E-12
CDD18	5,005	1,341	3.73	3.00E-04
MonthDays	246,381	34,968	7.05	1.59E-10
COVID2020	(2,546,223)	310,953	-8.19	4.71E-13
Dec	(586,242)	115,021	-5.10	1.42E-06
D_2012	2,046,600	215,126	9.51	4.39E-16
OntarioGDP	11	1	7.66	7.35E-12
Statistics based on the rho-differenced data				
Mean dependent var	10,738,490	S.D. dependent var		817,690
Sum squared resid	1.459E+13	S.E. of regression		360,896
R-squared	0.81666	Adjusted R-squared		0.80520
F(7, 112)	69	P-value(F)		1.04E-37
rho	-0.07019	Durbin-Watson		2.13163

Using the model coefficients identified in Table 3.1-12 above, Figure 3.1-8 below identifies the predicted monthly consumption as compared to actual monthly consumption.

Figure 3.1-8 – Predicted General Service > 50 kW Monthly Consumption



Annual volumes predicted with the statistical model results are compared to actual volumes from 2012 to 2021 in Table 3.1-13 below. The mean absolute percentage error ("MAPE") for annual predicted values for the period (the average of Absolute Error %) is 1.8%. The average monthly MAPE over the period is 2.8%. The annual and monthly MAPE values are low, which indicates the model is strongly predictive of actual consumption.

Table 3.1-13

General Service > 50 kW Model Summary

General Service > 50 kW			
Year	**Actual Data (CDM Added Back)**	**Predicted Data**	**Absolute Error (%)**
2012	135,499,674	134,467,922	0.8%
2013	119,060,558	121,559,575	2.1%
2014	120,267,043	123,797,891	2.9%
2015	127,778,037	125,967,019	1.4%
2016	132,504,632	128,208,222	3.2%
2017	129,704,100	129,775,520	0.1%
2018	136,765,173	133,695,697	2.2%
2019	133,722,151	135,115,234	1.0%
2020	123,558,127	122,568,814	0.8%
2021	129,759,281	133,571,894	2.9%
Total	**1,288,618,775**	**1,288,727,788**	**0.0%**
Mean Absolute Percentage Error (Annual)			1.8%
Mean Absolute Percentage Error (Monthly)			2.8%

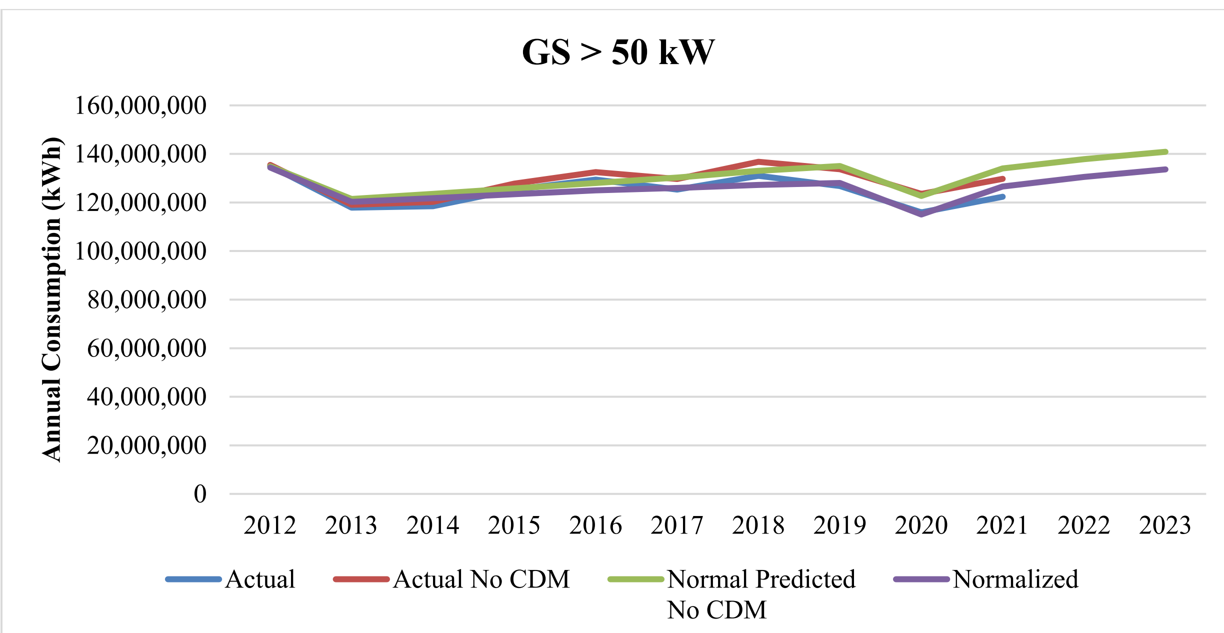
Weather-normalized consumption and forecast values are calculated for the General Service > 50 kW class in Table 3.1-14 below, which incorporates the 10-year weather normal HDD and CDD, month days, Ontario GDP, December binary variable, D_2012 binary variable, and COVID2020 variable. Figure 3.1-9 below compares actual consumption with and without CDM to the weather normalized forecast with and without CDM.

Table 3.1-14

General Service > 50 kW Normalized Annual Summary

General Service > 50 kW kWh						
Year	Actual A	Cumulative Persisting CDM B	Actual No CDM C = A + B	Normal Predicted No CDM D	Cumulative Persisting CDM E = B	Normalized F = D - E
2012	135,049,591	450,082	135,499,674	134,850,965	450,082	134,400,883
2013	117,856,754	1,203,804	119,060,558	121,452,666	1,203,804	120,248,863
2014	118,492,870	1,774,173	120,267,043	123,532,069	1,774,173	121,757,896
2015	125,361,860	2,416,177	127,778,037	125,820,220	2,416,177	123,404,043
2016	129,434,914	3,069,718	132,504,632	128,056,242	3,069,718	124,986,524
2017	125,361,028	4,343,072	129,704,100	130,300,609	4,343,072	125,957,537
2018	130,990,633	5,774,540	136,765,173	133,007,716	5,774,540	127,233,176
2019	126,777,960	6,944,191	133,722,151	134,987,734	6,944,191	128,043,543
2020	115,931,845	7,626,281	123,558,127	122,693,358	7,626,281	115,067,077
2021	122,344,798	7,414,483	129,759,281	134,026,208	7,414,483	126,611,725
2022				137,868,431	7,326,926	130,541,505
2023				140,883,488	7,220,700	133,662,788

Figure 3.1-9 – General Service > 50 kW Consumption Actuals/Forecasts



General Service > 50 kW Customer Counts

General Service > 50 kW customer counts are forecast using data from January 2012 to December 2021. The geometric mean average growth rate over this time period is applied to the monthly average customer count in 2021 to forecast the 2022 customer count, and the growth rate is applied again to the forecast 2022 customer count to forecast the 2023 customer count. Table 3.1-15 below provides the monthly average customer counts from 2012 to 2021.

Table 3.1-15

General Service > 50 kW Customer Counts

General Service > 50 kW		Percent of Prior Year
Year	Customers	
2012	115	
2013	119	104.0%
2014	118	98.6%
2015	124	104.9%
2016	130	104.9%
2017	127	97.9%
2018	128	101.0%
2019	125	97.6%
2020	127	101.4%
2021	124	98.1%
2022	125.5	100.89%
2023	126.7	100.89%

General Service > 50 kW Demand (kW)

In order to normalize and forecast class kW for those classes that bill based on kW billing determinants, the relationship between billed kW and kWh is used. The ten-year average kW/kWh ratio from 2012-2021 was applied to the forecast 2023 kWh consumption to determine kW demand.

Table 3.1-16 below identifies actual consumption and demand, the calculated kW/kWh ratios, forecast consumption, the average kW/kWh ratios, and the resulting demand forecast.

Table 3.1-16

General Service > 50 kW Forecast kW

GS > 50			
	kWh **A**	**kW** **B**	**Ratio** **C = B / A**
2012	135,049,591	325,041	0.002407
2013	117,856,754	295,819	0.002510
2014	118,492,870	296,660	0.002504
2015	125,361,860	308,805	0.002463
2016	129,434,914	317,292	0.002451
2017	125,361,028	308,322	0.002459
2018	130,990,633	320,420	0.002446
2019	126,777,960	305,981	0.002414
2020	115,931,845	289,744	0.002499
2021	122,344,798	296,776	0.002426
	kWh Normalized **D**	**kW Normalized** **E = D * G**	**Avg. Ratio** **F**
2021	126,611,725	311,202	**0.002458**
2022	130,541,505	320,861	**0.002458**
2023	133,662,788	328,533	**0.002458**

3.1.9.4. Street Lighting

EEDO provides its load forecast methodology for Street Lighting consumption, demand, and customer devices below.

Street Lighting Consumption (kWh)

The Street Lighting rate class is not weather-sensitive so forecasted consumption is based on average consumption per connection. Table 3.1-16 below summarizes the historic and forecast annual energy consumption for the Street Light class.

Table 3.1-17

Street Light Forecast

Street Lights				
Year	Actual A	Connections B	Average / Connection C = A / B	Normalized D = C * B
2012	2,183,243	3,018	723	2,183,243
2013	2,179,269	3,065	711	2,179,269
2014	2,180,855	3,069	711	2,180,855
2015	2,184,356	3,018	724	2,184,356
2016	2,060,756	3,065	672	2,060,756
2017	1,230,929	3,069	401	1,230,929
2018	1,204,476	3,130	385	1,204,476
2019	1,202,687	3,251	370	1,202,687
2020	1,224,245	3,261	375	1,224,245
2021	1,221,563	3,261	375	1,221,563
2022		3,289	375	1,232,119
2023		3,318	375	1,242,766

Collingwood, along with the Township of Clearview and Town of the Blue Mountains all undertook LED conversion projects in 2015-2017, resulting in a significant decrease in consumption and demand. Since completion of the LED conversion program, the Street Light class has had generally consistent demand per device. The usage/connection in 2020 and 2021 is expected to continue into 2023 as identified in Figure 3.1-10 below.

Figure 3.1-10 – Street Lighting Average Consumption (kWh) per Connection

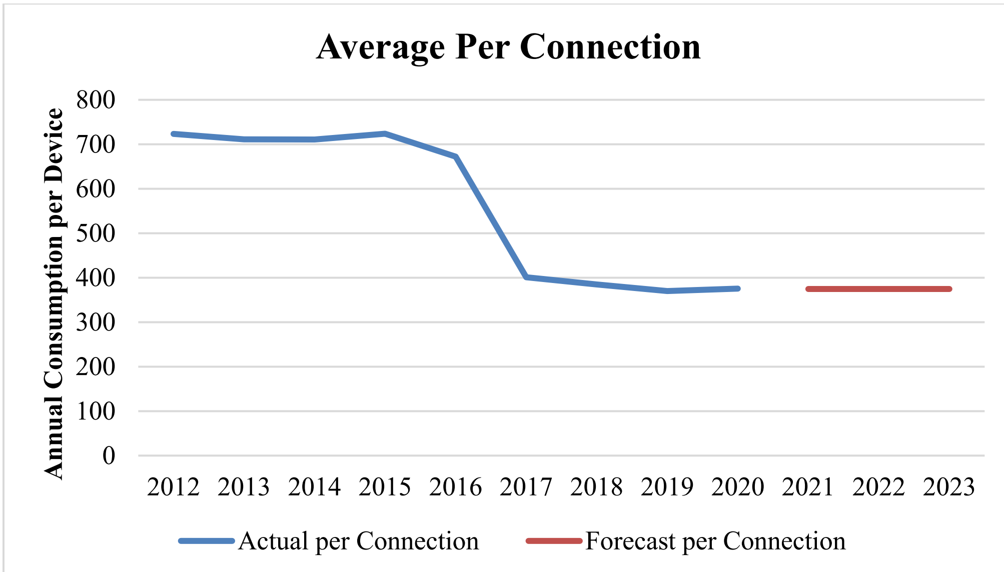
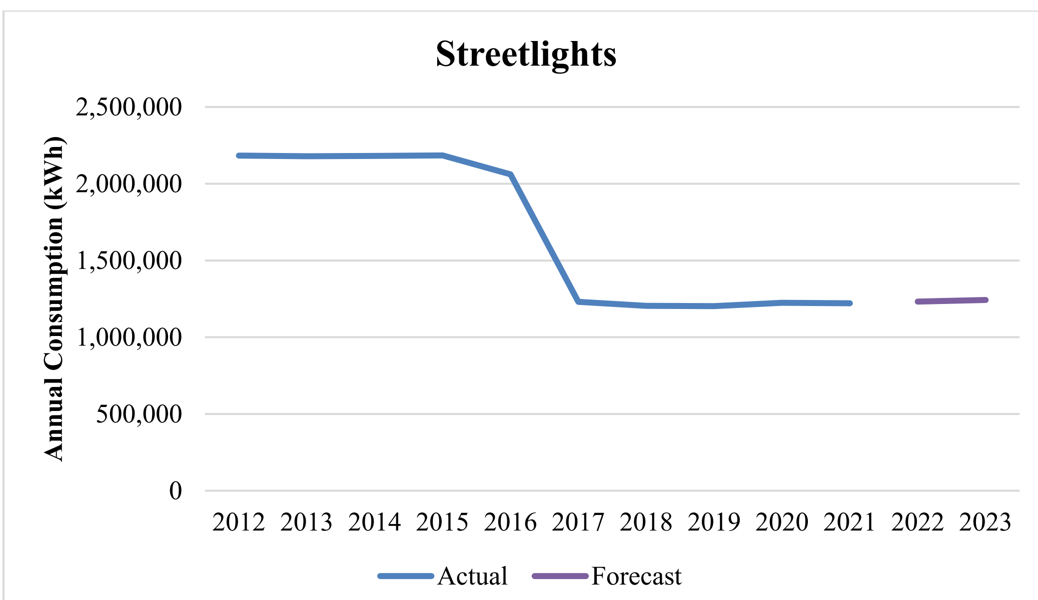


Figure 3.1-11 illustrates total actual and forecast consumption for the Street Light rate class from 2012 to 2023.

Figure 3.1-11 – Street Lighting Annual Consumption



Street Lighting Connection Counts

Street Light connection counts are forecast using data from January 2012 to December 2021. The geometric mean average growth rate over this time period is applied to the monthly average connection count in 2021 to forecast the 2022 connection count, and the growth rate is applied again to the forecast 2022 connection count to forecast the 2023 connection count. Table 3.1-18 below provides the monthly average customer counts from 2012 to 2021.

Table 3.1-18

Street Light Connection Counts

Street Lights		Percent of Prior Year
Year	Customers	
2012	3,018	
2013	3,065	101.5%
2014	3,069	100.1%
2015	3,018	98.3%
2016	3,065	101.5%
2017	3,069	100.1%
2018	3,130	102.0%
2019	3,251	103.8%
2020	3,261	100.3%
2021	3,261	100.0%
2022	3,289.2	100.86%
2023	3,317.6	100.86%

Street Light Demand (kW) Forecast

The relationship between billed kW and kWh is used to forecast Street Light kW demand in the Test Year. The ten-year average kW/kWh ratio from 2012-2021 was applied to forecast 2023 kWh consumption to determine forecast kW demand.

Table 3.1-19 below identifies actual consumption and demand, the calculated kW/kWh ratios, forecast consumption, the average kW/kWh ratios, and the resulting demand forecast.

Table 3.1-19

General Service > 50 kW Forecast kW

GS > 50			
	kWh **A**	**kW** **B**	**Ratio** **C = B / A**
2012	2,183,243	6,094	0.002791
2013	2,179,269	6,104	0.002801
2014	2,180,855	6,128	0.002810
2015	2,184,356	5,686	0.002603
2016	2,060,756	5,825	0.002826
2017	1,230,929	3,778	0.003069
2018	1,204,476	3,394	0.002818
2019	1,202,687	3,373	0.002805
2020	1,224,245	3,430	0.002802
2021	1,221,563	3,430	0.002808
	kWh Normalized **D**	**kW Normalized** **E = D * G**	**Avg. Ratio** **F**
2021	1,221,563	3,437	**0.002813**
2022	1,232,119	3,466	**0.002813**
2023	1,242,766	3,496	**0.002813**

3.1.9.5. Unmetered Scattered Load (“USL”)

EEDO provides its load forecast methodology for USL consumption and customer counts below.

USL Consumption (kWh)

Table 3.1-20 below summarizes historic and forecast annual energy consumption for EEDO’s USL class.

Table 3.1-20

Unmetered Scattered Load Forecast

USL				
Year	Actual A	Connections B	Average / Connection C = A / B	Normalized D = C * B
2012	415,833	30	13,861	415,833
2013	421,514	31	13,671	421,514
2014	418,633	31	13,396	418,633
2015	399,799	31	13,108	399,799
2016	399,176	30	13,306	399,176
2017	400,116	30	13,337	400,116
2018	397,052	30	13,235	397,052
2019	394,005	30	13,133	394,005
2020	396,219	30	13,207	396,219
2021	396,233	30	13,208	396,233
2022		30	13,208	396,233
2023		30	13,208	396,233

Consumption per device was consistent in 2020 and 2021 so 2021 is used as the forecast consumption per connection in 2022 and 2023.

Figure 3.1-12 – USL Consumption per Device

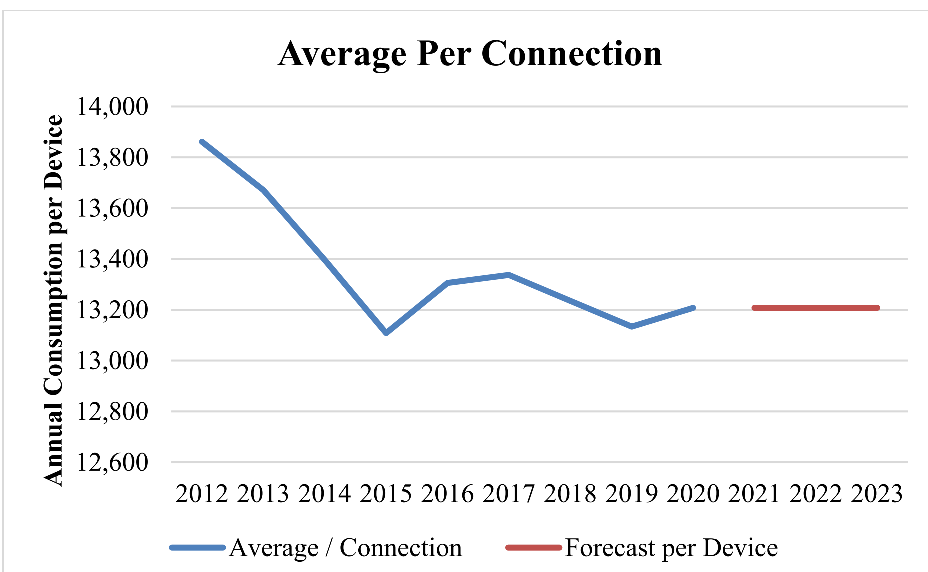
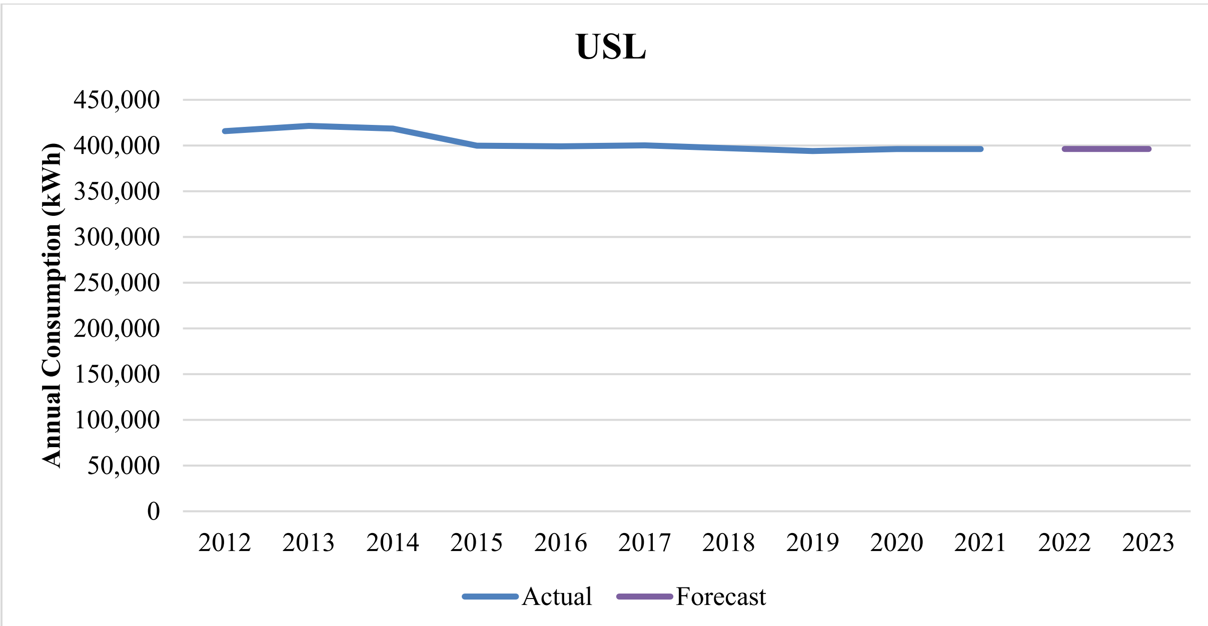


Figure 13 shows total actual and forecast consumption for the class from 2012 to 2023.

Figure 3.1-13 – USL Consumption



USL Connection Counts

USL connection counts are forecast using data from January 2012 to December 2021. The geometric mean average growth rate over this time period is applied to the monthly average connection count in 2021 to forecast the 2022 connection count, and the growth rate is applied again to the forecast 2022 connection count to forecast the 2023 connection count. Table 3.1-21 below provides the monthly average customer counts from 2012 to 2021.

Table 3.1-13
Street Light Connection Counts

Street Lights		Percent of Prior Year
Year	Customers	
2012	30	
2013	31	102.8%
2014	31	101.4%
2015	31	97.6%
2016	30	98.4%
2017	30	100.0%
2018	30	100.0%
2019	30	100.0%
2020	30	100.0%
2021	30	100.0%
2022	30.0	100.00%
2023	30.0	100.00%

3.1.10. CDM Adjustment for the Load Forecast for Distributors

On December 20, 2021, the OEB issued a report Conservation and Demand Management Guidelines for Electricity Distributors which provided updated guidance on the role of CDM for rate-regulated LDCs. Based on these guidelines, Elenchus has derived a manual adjustment to the load forecast. CDM programs undertaken as part of the 2021-2024 Conservation and Demand Management framework will put downward pressure on its billing determinants for the General Service < 50 kW and General Service > 50 kW rate classes.

This CDM adjustment has been made to reflect the impact of CDM activities that are expected to be implemented through from 2021 to 2023. CDM activities have been forecast based on EEDO's share of consumption within the province and the IESO's 2021-2024 Conservation and Demand Management Framework. The table below provides a summary of the 2021-2024 Framework and Collingwood's allocation of savings.

Table 3.1-22

2021-2024 CDM Framework and EEDO Allocation

Program	In year energy savings (GWh)				EEDO Share %	Basis for EEDO %
	2021	2022	2023	2024		
Retrofit	354.3	337.8	217.2	217.2	0.23%	% of provincial kWh
Small Business	40.2	28.5	14.3	15.3	0.23%	% of provincial kWh
Energy Performance Program	21.8	17.3	34.1	35.6	0.23%	% of provincial kWh
Energy Management	16.4	47.3	115.2	115.2	0.23%	% of provincial kWh
Customer Solutions	0	0	325.7	325.7	0.23%	% of provincial kWh
Local Initiatives	52.4	52.4	62.9	62.9	0.00%	
Energy Affordability Program	47.6	50.3	52.3	54	0.14%	% of prov. LIM
First Nations Program	10.3	7.3	7.3	7.3	0.00%	

EEDO's share of kWh is calculated with OEB Yearbook data as a 5-year average of EEDO's Total kWh Supplied divided by the sum of Total kWh Supplied of all Ontario LDCs.

Table 3.1-23

2021-2024 Ontario and EEDO kWh

Year	Province kWh	EEDO kWh	EEDO % Share
2016	135,092,458,977	318,832,369	0.236%
2017	131,507,457,611	309,356,000	0.235%
2018	137,831,974,215	317,405,456	0.230%
2019	135,053,462,090	311,498,208	0.231%
2020	133,510,137,228	308,328,909	0.231%
5-Year Avg.	**135,465,191,178**	**312,410,858**	**0.231%**

EEDO's Energy Affordability Program allocation is based on the number of households in Collingwood within the Low-Income Measure (after tax) as a share of all Ontario households, as per Statistics Canada.

EEDO is not aware of any Local Initiatives programs and as a result, no share of that program is attributed to EEDO.

Total GWh savings figures are then adjusted by the share attributable to EEDO, yearly weighting factors, and converted to kWh savings. Total CDM savings attributable to EEDO is provided in the following table.

Table 3.1-24

2021-2024 EEDO CDM

	In year energy savings (kWh)				**Total CDM**
	2021	**2022**	**2023**	**2024**	
Weighting Factor	*0.5*	*1.0*	*0.5*	*0.0*	
Retrofit	408,545	779,037	250,454	-	1,438,036
Small Business	46,355	65,727	16,489	-	128,571
Energy Performance Program	25,138	39,897	39,321	-	104,356
Energy Management	18,911	109,084	132,838	-	260,832
Customer Solutions	-	-	375,566	-	375,566
Local Initiatives	-	-	-	-	-
Energy Affordability Program	33,388	70,564	36,685	-	140,637
First Nations Program	-	-	-	-	-
Total CDM	**532,336**	**1,064,309**	**851,353**		**2,447,998**

Total CDM savings by program are then allocated to EEDO's rate classes in proportion to historic allocations for those programs. The percentages below reflect the typical share by class used in the LRAMVA workform.

Table 3.1-25

Proposed CDM Adjustments

Program	**Residential**	**GS < 50 kW**	**GS > 50 kW**
Allocation %			
Retrofit		25%	75%
Small Business		90%	10%
Energy Performance Program		0%	100%
Energy Management		0%	100%
Customer Solutions		25%	75%
Local Initiatives			
Energy Affordability Program	100%		
CDM By Class			
Retrofit		359,509	1,078,527
Small Business		115,714	12,857
Energy Performance Program		-	104,356
Energy Management		-	260,832
Customer Solutions		93,891	281,674
Local Initiatives			
Energy Affordability Program	140,637		
Adjustment by Class	**140,637**	**569,114**	**1,738,246**

3.1.11. Summary Tables

Tables 3.1-26 to 3.1-28 below summarize the historic and forecasted kWh, kW and counts/devices respectively for 2017 to 2023. The 2022 Bridge Year and the 2023 Test Year kWh and kW are not CDM Adjusted.

Table 3.1-26
Actual and Forecast kWh Consumption by Class

Normal Forecast

kWh	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast
Residential	116,589,912	127,042,389	125,937,194	134,775,706	139,865,774	137,569,214	137,786,709
GS < 50	45,198,528	47,162,013	46,524,844	42,547,309	43,303,770	44,762,094	45,560,556
GS > 50	125,361,028	130,990,633	126,777,960	115,931,845	126,611,725	130,541,505	133,662,788
Street Light	1,230,929	1,204,476	1,202,687	1,224,245	1,221,563	1,232,119	1,242,766
USL	400,116	397,052	394,005	396,219	396,233	396,233	396,233
Total	**288,780,514**	**306,796,562**	**300,836,689**	**294,875,323**	**311,399,066**	**314,501,164**	**318,649,052**

Table 3.1-27
Actual and Forecast kW Demand by Class

Normal Forecast

kWh	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast
Residential	308,322	320,420	305,981	289,744	311,202	320,861	328,533
GS < 50	3,778	3,394	3,373	3,430	3,437	3,466	3,496
Total	**312,100**	**323,814**	**309,355**	**293,174**	**314,638**	**324,327**	**332,029**

Table 3.1-28
Proposed CDM Adjustments

Normal Forecast

kWh	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast
Residential	116,589,912	127,042,389	125,937,194	134,775,706	139,865,774	137,569,214	137,786,709
GS < 50	45,198,528	47,162,013	46,524,844	42,547,309	43,303,770	44,762,094	45,560,556
GS > 50	125,361,028	130,990,633	126,777,960	115,931,845	126,611,725	130,541,505	133,662,788
Street Light	1,230,929	1,204,476	1,202,687	1,224,245	1,221,563	1,232,119	1,242,766
USL	400,116	397,052	394,005	396,219	396,233	396,233	396,233
Total	**288,780,514**	**306,796,562**	**300,836,689**	**294,875,323**	**311,399,066**	**314,501,164**	**318,649,052**

3.2 Accuracy of Load Forecast and Variance Analyses

EEDO provides a year-over-year variance analysis for consumption and demand below. As described in Section 3.1, customer counts are annual averages of monthly counts and kW figures are forecast by applying a historic kW/kWh ratio to forecast kWh figures.

Table 3.2-1
2013 Board Approved vs. 2013 Actual Billing Determinants

	Customers/Connection			Volumes			
Rate Class	**2013 Approved**	**2013 Actual**	**Diff.**	**2013 Approved**	**2013 Actual**	**kWh / kW**	**Difference**
Residential	14,233	14,287	54	117,956,589	121,392,228	kWh	3,435,639
GS < 50 kW	1,717	1,697	-20	47,173,865	48,155,224	kWh	981,359
GS > 50 kW	117	119	2	342,409	295,819	kW	-46,590
St. Lighting	3,045	3,065	20	6,285	6,104	kW	-181
USL	30	31	1	403,504	421,514	kWh	18,010
Total	**19,142**	**19,199**	**57**	**165,882,652**	**170,270,888**		

Variances between 2013 Actual and 2013 Approved reflect the results of the 2013 Load Forecast model and differences between actual 2013 weather and normalized weather. Heating degree days were 3.8% higher in 2013 than forecast (3,883 HDD normal vs 4,029 HDD in 2013), which is offset by 13.7% lower cooling loads (282 CDD normal vs. 243 CDD in 2013. The 2013 Load Forecast included a material increase in General Service > 50 kW loads in the 2013 Test Year which did not materialize.

Table 3.2-2
2013 Actual vs. 2014 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2013 Actual**	**2014 Actual**	**Diff.**	**2013 Actual**	**2014 Actual**	**kWh / kW**	**Difference**
Residential	14,287	14,432	145	121,392,228	122,734,566	kWh	1,342,338
GS < 50 kW	1,697	1,706	9	48,155,224	47,539,952	kWh	-615,272
GS > 50 kW	119	118	-2	295,819	296,660	kW	841
St. Lighting	3,065	3,069	4	6,104	6,128	kW	24
USL	31	31	0	421,514	418,633	kWh	-2,881
Total	**19,199**	**19,357**	**158**	**170,270,888**	**170,995,939**		

Variances between 2013 and 2014 were minor for each billing determinant. An increase in heating loads (4,029 HDD in 2013 vs. 4,361 HDD in 2014) is offset by a decline in Summer cooling loads (243 CDD in 2013 vs. 168 CDD in 2014). Though the change in cooling degree days was larger, heating loads have a larger impact in Collingwood.

Table 3.2-3
2014 Actual vs. 2015 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2014 Actual**	**2015 Actual**	**Diff.**	**2014 Actual**	**2015 Actual**	**kWh / kW**	**Difference**
Residential	14,432	14,585	153	122,734,566	120,270,467	kWh	-2,464,099
GS < 50 kW	1,706	1,714	8	47,539,952	45,974,373	kWh	-1,565,579
GS > 50 kW	118	124	6	296,660	308,805	kW	12,145
St. Lighting	3,069	3,018	-51	6,128	5,686	kW	-441
USL	31	31	-1	418,633	399,799	kWh	-18,834
Total	**19,357**	**19,471**	**115**	**170,995,939**	**166,959,131**		

Residential and General Service < 50 kW consumption decreased in 2015 as heating loads declined by 7.9% (4,361 HDD in 2014 vs. 4,105 HDD in 2015). This was somewhat offset by an increase in cooling loads and increase in customer counts. Streetlighting demand declined as Streetlight connection counts declined.

Table 3.2-4
2015 Actual vs. 2016 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2015 Actual**	**2016 Actual**	**Diff.**	**2015 Actual**	**2016 Actual**	**kWh / kW**	**Difference**
Residential	14,585	14,798	213	120,270,467	119,372,519	kWh	-897,948
GS < 50 kW	1,714	1,738	24	45,974,373	46,723,063	kWh	748,690
GS > 50 kW	124	130	6	308,805	317,292	kW	8,486
St. Lighting	3,018	3,065	47	5,686	5,825	kW	139
USL	31	30	-1	399,799	399,176	kWh	-623
Total	**19,471**	**19,761**	**289**	**166,959,131**	**166,817,875**		

Collingwood had a mild 2016 winter so Residential heating loads declined from 2015 volumes. General Service > 50 kW demands increased as the number of customers in that class increased in 2016.

Table 3.2-5

2016 Actual vs. 2017 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2016 Actual**	**2017 Actual**	**Diff.**	**2016 Actual**	**2017 Actual**	**kWh / kW**	**Difference**
Residential	14,798	15,093	295	119,372,519	116,589,912	kWh	-2,782,607
GS < 50 kW	1,738	1,741	3	46,723,063	45,198,528	kWh	-1,524,535
GS > 50 kW	130	127	-3	317,292	308,322	kW	-8,969
St. Lighting	3,065	3,069	4	5,825	3,778	kW	-2,047
USL	30	30	0	399,176	400,116	kWh	940
Total	**19,761**	**20,060**	**299**	**166,817,875**	**162,500,656**		

Consumption declined for the Residential, General Service < 50 kW, and General Service > 50 kW rate classes due to a significant decline in cooling loads (361 CDD in 2016 vs. 214 CDD in 2017), with virtually no change in heating loads. Streetlighting demand began to fall in 2017 as EEDO began its transition to LED lights.

Table 3.2-6

2017 Actual vs. 2018 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2017 Actual**	**2018 Actual**	**Diff.**	**2017 Actual**	**2018 Actual**	**kWh / kW**	**Difference**
Residential	15,093	15,387	294	116,589,912	127,042,389	kWh	10,452,476
GS < 50 kW	1,741	1,751	11	45,198,528	47,162,013	kWh	1,963,485
GS > 50 kW	127	128	1	308,322	320,420	kW	12,098
St. Lighting	3,069	3,130	61	3,778	3,394	kW	-384
USL	30	30	0	400,116	397,052	kWh	-3,065
Total	**20,060**	**20,427**	**367**	**162,500,656**	**174,925,267**		

Following a particularly mild 2017 Summer, cooling loads increased by 67% in 2018 (214 CDD in 2017 vs. 357 CDD in 2018), causing increases in consumption and demand for all weather-sensitive classes. Streetlighting demand began to fall in 2018, despite higher connection counts, as EEDO began its transition to LED lights. Streetlighting demand continued to decline due to LED conversions, despite higher connection counts.

Table 3.2-7
2018 Actual vs. 2019 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2018 Actual**	**2019 Actual**	**Diff.**	**2018 Actual**	**2019 Actual**	**kWh / kW**	**Difference**
Residential	15,387	15,722	335	127,042,389	125,937,194	kWh	-1,105,195
GS < 50 kW	1,751	1,761	10	47,162,013	46,524,844	kWh	-637,169
GS > 50 kW	128	125	-3	320,420	305,981	kW	-14,439
St. Lighting	3,130	3,251	120	3,394	3,373	kW	-21
USL	30	30	0	397,052	394,005	kWh	-3,047
Total	**20,427**	**20,888**	**462**	**174,925,267**	**173,165,397**		

Consumption and demand of weather-sensitive classes declined as cooling load declined by 44.7% (357 CDD in 2018 vs. 198 CDD in 2019).

Table 3.2-8
2019 Actual vs. 2020 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2019 Actual**	**2020 Actual**	**Diff.**	**2019 Actual**	**2020 Actual**	**kWh / kW**	**Difference**
Residential	15,722	16,164	443	125,937,194	134,775,706	kWh	8,838,512
GS < 50 kW	1,761	1,779	18	46,524,844	42,547,309	kWh	-3,977,535
GS > 50 kW	125	127	2	305,981	289,744	kW	-16,237
St. Lighting	3,251	3,261	10	3,373	3,430	kW	57
USL	30	30	0	394,005	396,219	kWh	2,214
Total	**20,888**	**21,361**	**473**	**173,165,397**	**178,012,407**		

Variances in 2020 are predominantly caused by the COVID-19 pandemic, in which Collingwood worked from home and generally spent more time at home in response to public health advisories. This cause a 7.0% increase in Residential consumption, 8.5% decline in General Service < 50 kW consumption, and 5.3% decline in General Service > 50 kW demand. In addition to the COVID impacts, cooling loads increased by 59% (198 CDD in 2019 vs. 314 CDD in 2020).

Table 3.2-9

2020 Actual vs. 2021 Actual Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2020 Actual**	**2021 Actual**	**Diff.**	**2020 Actual**	**2021 Actual**	**kWh / kW**	**Difference**
Residential	16,164	16,421	257	134,775,706	136,991,339	kWh	2,215,634
GS < 50 kW	1,779	1,806	26	42,547,309	44,543,870	kWh	1,996,561
GS > 50 kW	127	124	-2	289,744	296,776	kW	7,032
St. Lighting	3,261	3,261	0	3,430	3,430	kW	0
USL	30	30	0	396,219	396,233	kWh	14
Total	**21,361**	**21,642**	**281**	**178,012,407**	**182,231,649**		

General Service < 50 kW and General Service > 50 kW loads increased as the impacts of COVID-19 eased in 2021. Heating loads decreased by 6.8% (3,679 HDD in 2020 vs. 3,428 HDD in 2021) which was somewhat offset be reduced cooling loads (314 CDD in 2020 vs. 327 CDD in 2021).

Table 3.2-10

2021 Actual vs. 2022 Bridge Year Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2021 Actual**	**2022 Bridge**	**Diff.**	**2021 Actual**	**2022 Bridge**	**kWh / kW**	**Difference**
Residential	16,421	16,714	292	136,991,339	137,500,544	kWh	509,204
GS < 50 kW	1,806	1,819	14	44,543,870	44,491,281	kWh	-52,589
GS > 50 kW	124	126	1	296,776	319,079	kW	22,303
St. Lighting	3,261	3,289	28	3,430	3,466	kW	36
USL	30	30	0	396,233	396,233	kWh	0
Total	**21,642**	**21,978**	**335**	**182,231,649**	**182,710,603**		

Variances between 2021 to 2022 reflect the results of the Load Forecast model. Part of the results are caused by the change from actual 2021 weather loads and normalized weather, which is considered average heating and cooling degree days from 2012 to 2021. The change from 2021 actuals to normal weather is a 12.4% increase in heating loads (3,428 DDD in 2021 vs. 3,854 HDD in 2022) and 15% decline in cooling loads (327 CDD in 2021 vs. 278 CDD in 2022).

Table 3.2-11

2022 Bridge Year vs. 2023 Test Year Billing Determinants

	Customers/Connections			Volumes			
Rate Class	**2022 Bridge**	**2023 Test**	**Diff.**	**2022 Bridge**	**2023 Test**	**kWh / kW**	**Difference**
Residential	16,714	17,012	298	137,500,544	137,646,072	kWh	145,528
GS < 50 kW	1,819	1,833	14	44,491,281	44,991,441	kWh	500,160
GS > 50 kW	126	127	1	319,079	325,120	kW	6,041
St. Lighting	3,289	3,318	28	3,466	3,496	kW	30
USL	30	30	0	396,233	396,233	kWh	0
Total	**21,978**	**22,319**	**341**	**182,710,603**	**183,362,362**		

Variances from the 2022 Bridge Year to the 2023 Test Year are modest. Variances reflect continuations of 10-year customer count growth trends, improving economic trends, and continued reduction of the impacts of COVID on consumption and demand patterns.