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Weather Normalized Distribution System Throughput Forecast: 2022-2026

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Prepared for:
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1 INTRODUCTION

This report outlines the results of, and methodology used to derive, the 2022 to 2026 weather normal throughput forecast (or "load forecast") prepared for EPCOR Natural Gas Limited Partnership ("ENGLP").

The methodology outlined in this report is virtually unchanged from the methodology used in ENGLP's 2020-24 load forecast update dated April 17, 2020 and 2021-25 load forecast updated dated April 23, 2021. The methodology is largely consistent with the methodology used in ENGLP's 2020 COS application (EB-2018-0336) and the methodology used by Natural Gas Resources Limited ("NRG") in previous rates applications. Parties agreed to the results of the 2020 throughput forecast in settlement and the overall methodology was last approved in EB-2010-0018. Alternate methods were tested but generally found to be inferior to the previously approved methodology.

The regression equations used to normalize and forecast ENGLP's weather sensitive load use monthly heating degree days as measured at Environment Canada's London CS weather station to take into account temperature sensitivity. This location is the closest weather station to ENGLP's service territory with strong historical weather data. ENGLP experiences peak loads in winter months, though certain rate classes are not weather sensitive. Environment Canada defines heating degree days as the difference between the average daily temperature and 18°C for each day. Heating degree days is 0 when the average temperature is above 18°C. New to this forecast, Elenchus considered heating degree day data with alternate temperature thresholds other than 18°C, consistent with changes to the OEB's electricity distributor load forecast filing requirements.

ENGLP serves six rate classes, R1 to R6, one of which (R1) contains three sub-classes: Residential, Commercial, and Industrial. Each R1 sub-class and the R3 class are weather-sensitive. Consumption of the R2, R4, R5, and R6 rate classes are not correlated to heating degree days. Consumption per customer forecasts for the R1 sub-classes use a baseload and excess consumption methodology to examine the impact of temperature on consumption. The R3 class's baseload consumption has fluctuated in historic years so the regression for this uses total consumption with a time trend.

Forecasts for non-weather sensitive classes are derived with average consumption per customer figures in recent years, consistent with previously approved forecasts. The number of years used on the average consumption per customer calculations is reassessed in each load forecast to account for changes in consumption patterns over time. Consumption forecasts for non-weather sensitive classes is further described in Section 6 of this report.

In addition to the weather variables, other variables such as economic variables, time trend variable, number of days and number of working days in each month, number of customers, and month of year variables, have been examined for weather sensitive rate classes. A COVID variable and COVID/weather interaction variables were considered for weather-sensitive classes but found not to be statistically significant. More details on the individual class specifications are provided in the next section.

ENGLP does not have a DSM plan so no adjustments were made to the class forecasts to account for DSM savings.

1.1 SUMMARIZED RESULTS

The following table summarizes the historic and weather normalized consumption.

Normal Forecast

	2019 Actual	2020 Actual	2021 Actual	2021 Normal	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
R1 Residential	18,000,452	16,837,081	17,299,257	18,272,944	18,607,331	19,257,743	19,930,528	20,626,443	21,346,276
R1 Industrial	2,461,420	2,067,358	2,226,121	2,736,619	2,220,366	2,333,411	2,451,644	2,575,289	2,704,581
R1 Commercial	5,890,482	5,028,438	5,306,940	5,648,018	5,876,510	6,078,753	6,287,803	6,503,888	6,727,238
R2 Seasonal	1,279,499	784,724	829,096	829,096	962,031	940,348	919,154	898,437	878,187
R3	1,510,164	1,361,184	1,372,372	1,414,518	1,358,859	1,301,078	1,249,451	1,202,977	1,160,868
R4	1,953,378	1,534,283	1,793,580	1,793,580	1,806,683	1,889,798	1,976,737	2,067,675	2,162,797
R5	927,203	554,438	791,530	791,530	757,724	757,724	757,724	757,724	757,724
R6	62,525,354	59,599,950	60,410,748	60,410,748	61,336,401	61,336,401	61,336,401	61,336,401	61,336,401
Total	**94,547,953**	**87,767,455**	**90,029,645**	**91,897,053**	**92,925,905**	**93,895,256**	**94,909,441**	**95,968,834**	**97,074,072**

Table 1 Consumption Forecast by class

The following table summarizes the historic and forecast customer/connections for 2019-2026:

Customers / Connections

	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
R1 Residential	8657	8839	9070	9353	9644	9945	10,254	10,574
R1 Industrial	73	75	76	79	81	84	87	90
R1 Commercial	536	535	559	575	593	610	628	647
R2 Seasonal	49	48	51	49	48	47	46	45
R3	6	6	6	6	6	6	6	6
R4	37	40	46	48	50	52	54	57
R5	4	4	4	4	4	4	4	4
R6	1	1	1	1	1	1	1	1
Total	**9,363**	**9,548**	**9,812**	**10,115**	**10,427**	**10,750**	**11,081**	**11,424**

Table 2 Customer Forecast for 2019-2026

Forecasts of 2022 consumption by tier, for the classes billed based on volume tiers, is provided below.

2022 Tier Forecast

kW	Period	Tier 1	Tier 2	Tier 3	Total
R1 Residential		18,492,197	115,133		18,607,331
R1 Industrial		520,770	1,699,596		2,220,366
R1 Commercial		2,781,738	3,094,773		5,876,510
Seasonal	Apr-Oct	64,054	535,030	102,213	701,296
Seasonal	Nov-Mar	49,709	197,942	13,084	260,735
R4	Jan-Mar	28,308	5,731		34,039
R4	Apr-Dec	148,280	1,624,364		1,772,644

Table 3 2022 Consumption Forecast by Tier

2 METHODOLOGY

Energy use for R1 Residential, R1 Industrial, R1 Commercial and R3 rate classes are forecast with multivariate regressions. Regressions were not selected for R2 Seasonal, R4, R5 and R6 rate classes as these classes do not exhibit sufficient sensitivity to the explanatory variables available for a statistical regression approach.

2.1 CONSUMPTION OF WEATHER SENSITIVE CLASSES

Consumption of the three R1 rate classes are forecast using a base load and excess consumption method. Average monthly consumption per customer is first calculated for each class. The amounts are then reduced by the base load consumption, which is considered the average consumption in the summer months of July and August. The remaining consumption is considered the weather-sensitive load (or “excess” load). A baseline trend is applied to certain classes that have ongoing increasing consumption per customer that is not related to heating.

The excess load is regressed by the actual heating degree days in each month to determine the impact of cold weather on average consumption. A time-series (Prais-Winsten) regression is used to determine the coefficient, consistent with the methodology used in prior NRG throughput forecasts. A simple Ordinary Least Squares (“OLS”) model is not appropriate as the errors exhibit a high level of autocorrelation (as demonstrated by Durbin-Watson statistics close to, or below, 1).

Alternate heating degree days data were also considered for each weather-sensitive class. Elenchus considered heating degree day figures for a range of reference temperatures from 10°C to 20°C. Using alternate HDD temperatures considers the possibility that classes, on average, begin consuming natural gas for their heating load at temperatures other than 18°C.

Actual heating degree days are then multiplied by the coefficients and base load consumption is added back to determine the average predicted consumption in each month. Predicted total consumption of a class is determined by multiplying this sum by the actual number of customers.

The methodology is similar for the R3 class, but the base load is not removed before the regression. While the calculated base load consumption is generally consistent from year to year for the R1 classes, the base load appears to have declined in historic years. As a consequence of higher base load consumption in earlier years, the calculated base load is higher than consumption in 25 of the 120 sample months and over double the volume of consumption in the most recent summer months.

To forecast 2022-2026 consumption, forecast heating degree days figures, as described in section 4, are used in place of actual heating degree days. Weather normalized consumption in historic years is determined by removing the deviations from average weather from consumption. This is done by multiplying the coefficients by the difference between actual and average heating degree days and applying the difference to actual consumption.

A set of interaction COVID/Weather variables were considered for the weather-sensitive classes but found to be not statistically significant. The values for this variable were set to 0 in all months before March 2020 and set equal to the applicable heating degree day variable for the months of March 2020 to December 2021. This variable was intended to capture potential incremental heating load for the Residential class, and reduced heating load for non-residential classes, resulting from people staying and working from home. This indicates that COVID did not have a material impact on heating load. A COVID variable, equal to 1 from March 2020 to December 2021 and 0 in all other months, was also tested and found not to be statistically significant.

2.2 CONSUMPTION OF NON-WEATHER SENSITIVE CLASSES

Consumption of four rate classes (R2 Seasonal, R4, R5 and R6) are not weather-sensitive and do not exhibit sensitivity to the explanatory variables. Total and monthly volumes fluctuate from year to year, so a rolling average is used to forecast monthly consumption for these classes, with the exception of R4 in which a trend is also applied. The number of years used in the average calculations is explained in Section 6.

2.3 CUSTOMER COUNTS

Annual customer counts for 2022-2026 are forecast by applying the geometric mean annual growth rate from 2010 to 2021 to the 2021 average customer count. Calculations for each class are provided in section 5 and 6 of this report. Monthly customer counts are derived by applying equal percentage increases in each month such that the annual average of monthly forecasts is equal to the annual forecast.

2.4 Consumption Tiers

The R1 classes, R2 Seasonal Class, and R4 classes are billed according to consumption tiers (also known as volume blocks). Historic tiered data from January 2017 to November 2018 was used to derive weather-normal tiered forecasts. The allocation from total class throughput to tiered throughput has not been updated for this forecast.

The R1 classes are billed different rates on consumption above and below a 1,000 m^3 threshold. As these classes are weather-sensitive, the share of energy consumed in each tier is determined by adjusting actual consumption in each month for each individual customer to weather normal consumption. This method allows a class's forecast consumption to be consistent with the weather normalized total volume while maintaining the consumption profile of the rate classes. The weather-normalized consumption split between Tier 1 and Tier 2 in historic years is determined for each month and used to forecast the monthly splits in the forecast months. When two years of data was available, an average of the 2017 and 2018 splits was used. The R2 Seasonal and R4 classes are not weather-sensitive so the average of 2017 and 2018 tier splits were applied to total annual consumption.

3 Class Specific Consumption Regressions

3.1 R1 Residential

For the R1 Residential Class consumption the equation was estimated using 144 observations from 2010:01 to 2021:12. The natural logarithm of heating degree days at 18°C for the months of September to June were used, as measured at the London CS weather station as described in the introduction.

Several other variables were examined and found to not show a statistically significant relationship to energy usage. Those included alternate reference temperatures, economic indicators of full-time employment and GDP, days in each month, workdays in each month, a time trend, a COVID binary variable, and COVID/weather interaction variables.

A baseload trend was used to remove from 31.45m^3 in 2010 to 39.0m^3 in 2021 from the average consumption variable in each month. This amount is added back to the predicted values.

The following table outlines the resulting regression model:

Model 2: Prais-Winsten, using observations 2010:01-2021:12 (T = 144)				
Dependent variable: ExLNResAverageTrend				
rho = 0.206192				
	coefficient	std. error	t-ratio	p-value
const	0.21788	0.0563	3.87	1.7E-04
LNHDDJanuary18	0.83933	0.0140	59.90	4.3E-98
LNHDDFebruary18	0.83459	0.0142	58.62	6.9E-97
LNHDDMarch18	0.83123	0.0147	56.63	5.7E-95
LNHDDApril18	0.79945	0.0158	50.65	8.3E-89
LNHDDMay18	0.77246	0.0184	41.88	1.8E-78
LNHDDJune18	0.54440	0.0255	21.33	9.1E-45
LNHDDSeptember18	0.43137	0.0201	21.44	5.4E-45
LNHDDOctober18	0.73448	0.0166	44.20	2.2E-81
LNHDDNovember18	0.80291	0.0151	53.06	2.3E-91
LNHDDDecember18	0.83510	0.0144	57.91	3.2E-96
Statistics based on the rho-differenced data				
Mean dependent var	3.74373	S.D. dependent var	2.022	
Sum squared resid	8.12044	S.E. of regression	0.24710	
R-squared	0.98611	Adjusted R-squared	0.98506	
F(10, 121)	672.43688	P-value(F)	0.00000	
rho	-0.00261	Durbin-Watson	2.00340	

Table 4 R1 Residential Regression Model

In the above table, and all regression results tables in the section, LN denotes natural logarithm, HDD denotes heating degree days, the month name denotes a dummy variable representing 1 in the labeled month and 0 in all other months, and the ‘18’ denotes the reference HDD temperature of 18°C. The values within the LNHDDJanuary variable, for example, includes the natural logarithm of the number of heating degree days for each January, and 0 in all other months. The label for the dependent variable includes “Ex” denoting the values of this variable are the excess consumption above the class's base load.

Using the above model coefficients, we derive the following:

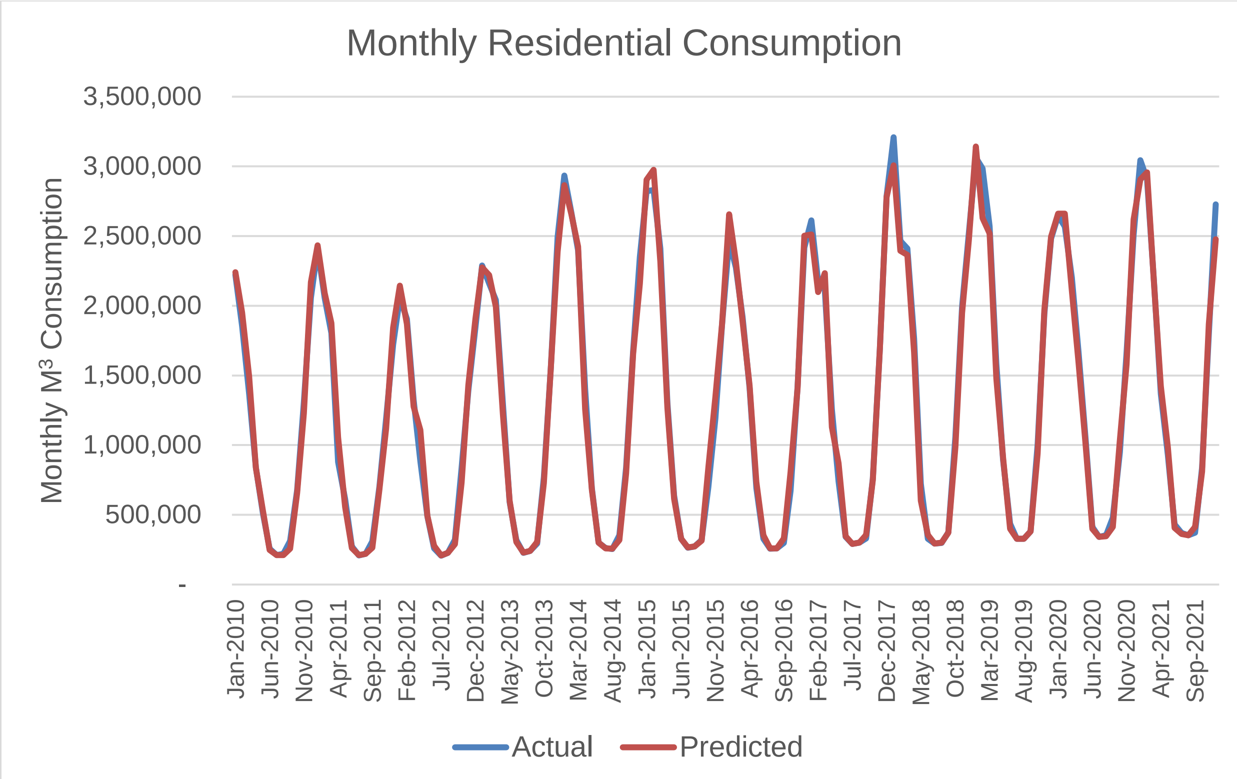

Figure 1 R1 Residential Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 2.1%. The MAPE calculated monthly over the period is 4.5%.

Year	Residential Actual	Predicted	Absolute Error (%)
2011	12,393,486	12,611,688	1.8%
2012	11,751,822	11,963,989	1.8%
2013	14,287,143	14,077,166	1.5%
2014	16,127,158	15,631,550	3.1%
2015	14,948,329	15,321,787	2.5%
2016	14,417,053	14,950,349	3.7%
2017	15,400,135	15,358,194	0.3%
2018	17,442,260	16,758,461	3.9%
2019	18,000,452	17,519,555	2.7%
2020	16,837,081	16,758,636	0.5%
2021	17,299,257	17,115,095	1.1%
Total	**168,904,177**	**168,066,469**	**0.5%**

Mean Absolute Percentage Error (Annual)	2.1%
Mean Absolute Percentage Error (Monthly)	4.5%

Table 5 R1 Residential model error

3.2 R1 INDUSTRIAL

For the R1 Industrial Class consumption the equation was estimated using 144 observations from 2010:01 to 2021:12. The natural logarithm of heating degree days at 16°C for the months from August to June were used, as measured at the London CS weather station.

Several other variables were examined and found to not show a statistically significant relationship to energy usage. Those included alternate reference temperatures, economic indicators of full-time employment and GDP, days in each month, workdays in each month, and a time trend.

A baseload trend was used to remove from 373.20m^3 in 2010 to 768.83m^3 in 2021 from the average consumption variable in each month. This amount is added back to the predicted values.

The following table outlines the resulting regression model:

Model 3: Prais-Winsten, using observations 2010:01-2021:12 (T = 144)				
Dependent variable: ExLNR1AverageTrend				
rho = 0.224137				
	coefficient	std. error	t-ratio	p-value
const	0.57718	0.2734	2.11	3.7E-02
LNHDDJanuary16	1.10713	0.0666	16.64	3.4E-34
LNHDDFebruary16	1.09883	0.0676	16.24	2.8E-33
LNHDDMarch16	1.12297	0.0701	16.02	9.7E-33
LNHDDApril16	1.15177	0.0763	15.09	1.6E-30
LNHDDMay16	1.15874	0.0930	12.45	5.0E-24
LNHDDJune16	0.27230	0.1639	1.66	9.9E-02
LNHDDAugust16	1.89409	0.4713	4.02	9.8E-05
LNHDDSeptember16	1.21571	0.1137	10.69	1.3E-19
LNHDDOctober16	1.44145	0.0819	17.60	1.9E-36
LNHDDNovember16	1.32167	0.0726	18.19	8.8E-38
LNHDDDecember16	1.16255	0.0687	16.92	7.5E-35
Statistics based on the rho-differenced data				
Mean dependent var	5.64798	S.D. dependent var	3.101	
Sum squared resid	167.63238	S.E. of regression	1.12692	
R-squared	0.87806	Adjusted R-squared	0.86790	
F(11, 120)	61.31425	P-value(F)	0.00000	
rho	-0.02046	Durbin-Watson	2.04069	

Table 6 R1 Industrial Regression Model

Using the above model coefficients we derive the following:

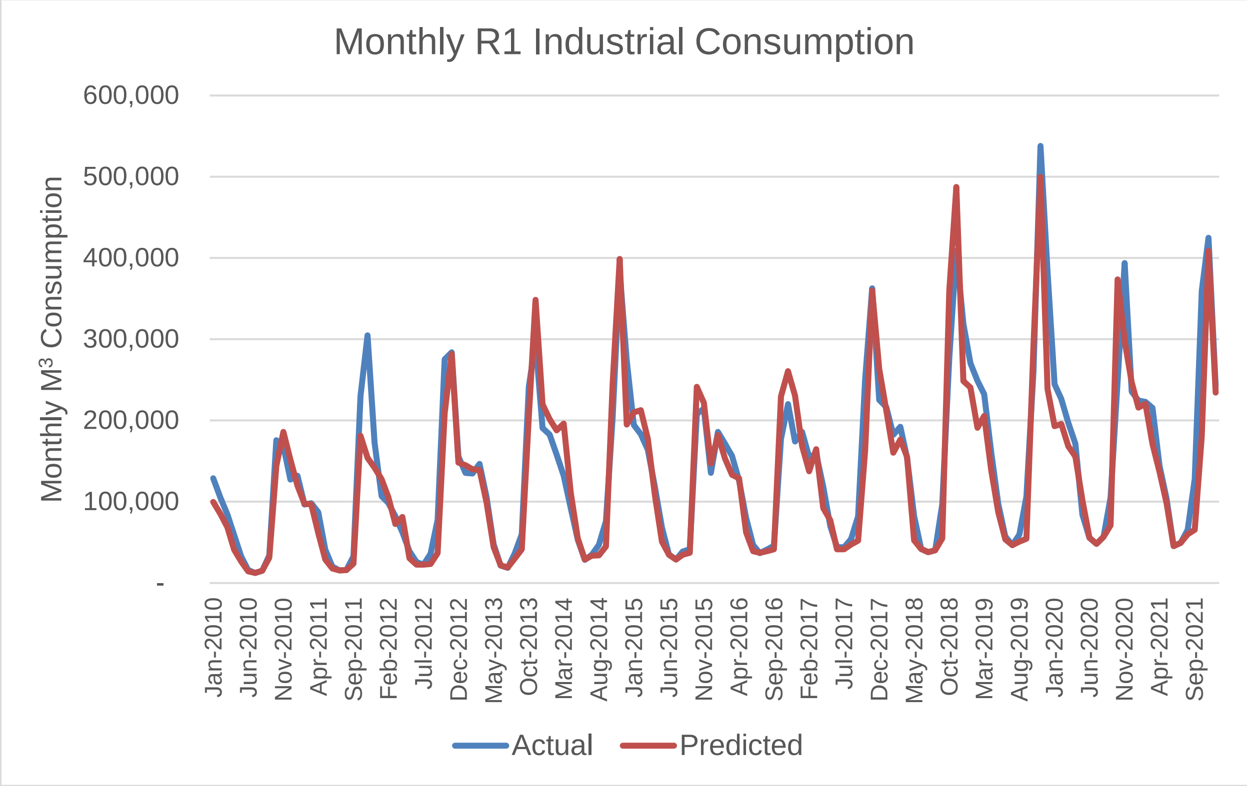

Figure 2 R1 Industrial Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 8.3%. The MAPE calculated monthly over the period is 18.5%.

	R1 Industrial		Absolute
Year	Actual	Predicted	Error (%)
2011	1,247,376.0	955,074.6	23.4%
2012	1,265,913.0	1,162,815.3	8.1%
2013	1,436,592.0	1,452,758.9	1.1%
2014	1,666,209.0	1,732,930.6	4.0%
2015	1,430,900.0	1,505,370.4	5.2%
2016	1,462,707.0	1,538,068.7	5.2%
2017	1,752,123.4	1,610,215.4	8.1%
2018	2,050,371.1	2,028,673.3	1.1%
2019	2,461,420.1	2,099,488.3	14.7%
2020	2,067,357.8	1,965,416.0	4.9%
2021	2,226,121.1	1,887,126.8	15.2%
Total	19,067,090	17,937,938	5.9%
Mean Absolute Percentage Error (Annual)			8.3%
Mean Absolute Percentage Error (Monthly)			18.5%

Table 7 R1 Industrial model error

3.3 R1 COMMERCIAL

For the R1 Commercial Class consumption the equation was estimated using 144 observations from 2010:01 to 2021:12. The natural logarithm of heating degree days at 18°C for the months from September to June were used, as measured at the London CS weather station.

Several other variables were examined and found to not show a statistically significant relationship to energy usage. Those included alternate reference temperatures, economic indicators of full-time employment and GDP, days in each month, workdays in each month, and a time trend.

A baseload trend was used to remove from 180.64m^3 in 2010 to 228.08m^3 in 2021 from the average consumption variable in each month. This amount is added back to the predicted values.

The following table outlines the resulting regression model:

Model 4: Prais-Winsten, using observations 2010:01-2021:12 (T = 144)				
Dependent variable: ExLNComAverageTrend				
rho = 0.178664				
	coefficient	std. error	t-ratio	p-value
const	1.24666	0.1713	7.28	2.7E-11
LNHDDJanuary18	0.92918	0.0430	21.63	2.2E-45
LNHDDFebruary18	0.92735	0.0436	21.25	1.4E-44
LNHDDMarch18	0.92035	0.0450	20.45	6.9E-43
LNHDDApril18	0.89198	0.0484	18.41	2.1E-38
LNHDDMay18	0.86237	0.0568	15.19	7.7E-31
LNHDDJune18	0.58732	0.0794	7.40	1.4E-11
LNHDDSeptember18	0.59899	0.0626	9.57	7.8E-17
LNHDDOctober18	0.82413	0.0512	16.11	4.7E-33
LNHDDNovember18	0.89180	0.0464	19.20	3.6E-40
LNHDDDecember18	0.92162	0.0442	20.84	1.0E-43
Statistics based on the rho-differenced data				
Mean dependent var	5.20105	S.D. dependent var	2.322	
Sum squared resid	77.78975	S.E. of regression	0.76478	
R-squared	0.89915	Adjusted R-squared	0.89157	
F(10, 121)	88.62763	P-value(F)	0.00000	
rho	-0.03268	Durbin-Watson	2.06511	

Table 8 R1 Commercial Regression Model

Using the above model coefficients we derive the following:

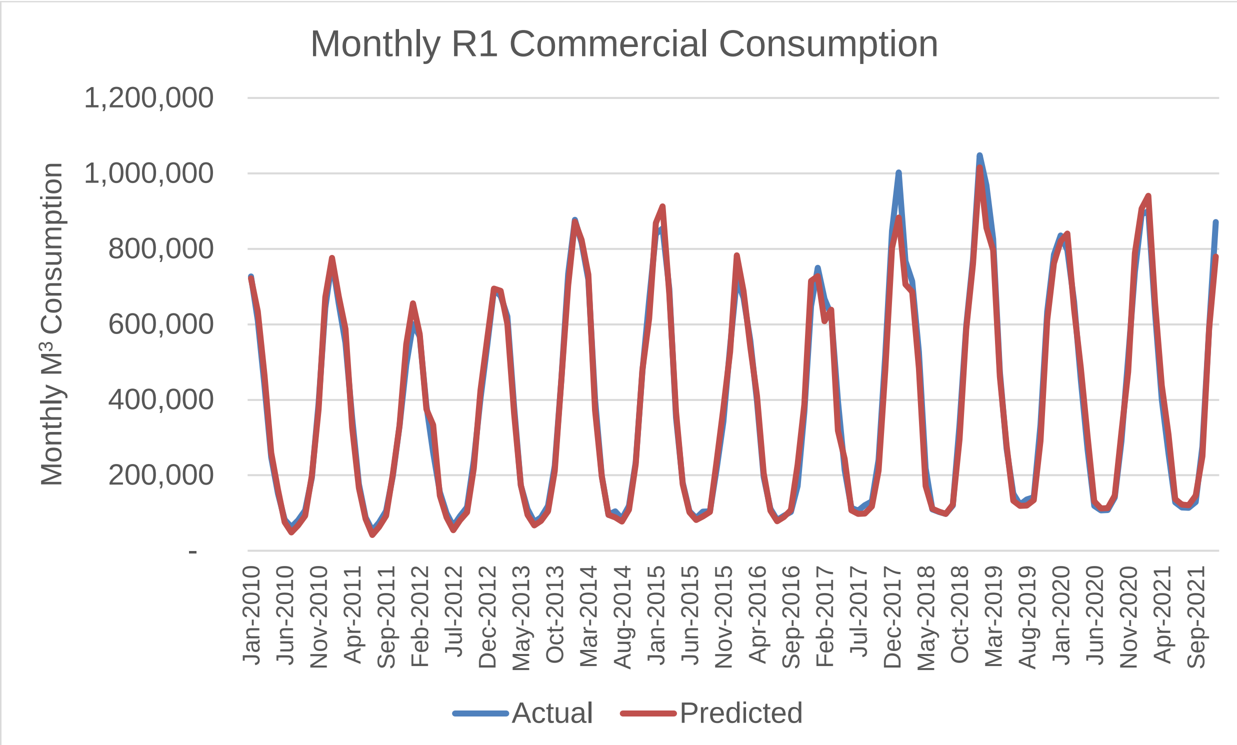

Figure 3 R1 Commercial Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 3.2%. The MAPE calculated monthly over the period is 7.2%.

	R1 Commercial		Absolute
Year	Actual	Predicted	Error (%)
2011	3,846,511.0	3,895,980.2	1.3%
2012	3,526,397.0	3,615,432.8	2.5%
2013	4,352,319.0	4,238,513.0	2.6%
2014	4,788,282.0	4,690,033.3	2.1%
2015	4,420,443.0	4,524,717.2	2.4%
2016	4,117,374.0	4,341,403.3	5.4%
2017	4,734,212.7	4,451,277.5	6.0%
2018	5,363,287.7	5,008,229.0	6.6%
2019	5,890,482.0	5,579,567.8	5.3%
2020	5,028,437.6	5,167,836.6	2.8%
2021	5,306,939.8	5,395,213.8	1.7%
Total	51,374,686	50,908,204	0.9%
Mean Absolute Percentage Error (Annual)			3.2%
Mean Absolute Percentage Error (Monthly)			7.2%

Table 9 R1 Commercial model error

3.4 R3

For the R3 Class consumption the equation was estimated using 144 observations from 2010:01 to 2021:12. The natural logarithm of heating degree days at 20°C for the months from September to May were used, as measured at the London CS weather station. A natural log of a time trend is also included, beginning at ln(10) in January 2010 (increasing to ln(153) in December 2021) is used as this class exhibits declining average consumption over time.

The R3 class's customer count declined from 6 to 4 from October 2009 to June 2010, which had a clear impact on average consumption per customer, as shown on the below chart. A dummy variable is used for this period (denoted d2009), set at 1 for the months October 2009 to May 2010 and 0.5 in June 2010, the month the customer count fell to 4. A dummy variable for June was included as consumption in June was typically greater than what was expected based on the weather in that month. A dummy variable for the shoulder months of March, April, May, September, October, and November was also used to reflect lower consumption in those months than could be explained by heating degree days.

Several other variables were examined and found to not show a statistically significant relationship to energy usage. Those included alternate weather variables, economic indicators of full-time employment and GDP, days in each month, and work days in each month.

The following table outlines the resulting regression model:

Model 7: Prais-Winsten, using observations 2010:01-2021:12 (T = 144)				
Dependent variable: LNContractR3Average				
rho = 0.652409				
	coefficient	std. error	t-ratio	p-value
const	11.76531	0.3636	32.36	4.7E-64
LNHDDJanuary20	0.26195	0.0154	17.01	7.4E-35
LNHDDFebruary20	0.25241	0.0157	16.08	1.1E-32
LNHDDMarch20	0.63527	0.1194	5.32	4.4E-07
LNHDDApril20	0.61279	0.1273	4.81	4.0E-06
LNHDDMay20	0.61182	0.1457	4.20	5.0E-05
LNHDDSeptember20	0.06558	0.0144	4.56	1.2E-05
LNHDDOctober20	0.58752	0.1345	4.37	2.5E-05
LNHDDNovember20	0.61803	0.1233	5.01	1.7E-06
LNHDDDecember20	0.24057	0.0153	15.68	9.3E-32
lnTrend	-0.59848	0.0839	-7.13	6.1E-11
d2009	-1.07601	0.2400	-4.48	1.6E-05
Shoulder	-2.50196	0.7631	-3.28	1.3E-03
June	0.20433	0.0681	3.00	3.2E-03
Statistics based on the rho-differenced data				
Mean dependent var	10.12214	S.D. dependent var	0.779	
Sum squared resid	6.08624	S.E. of regression	0.21637	
R-squared	0.92992	Adjusted R-squared	0.92291	
F(13, 118)	69.16274	P-value(F)	0.00000	
rho	0.02113	Durbin-Watson	1.94448	

Table 10 R3 Regression Model

Using the above model coefficients we derive the following:

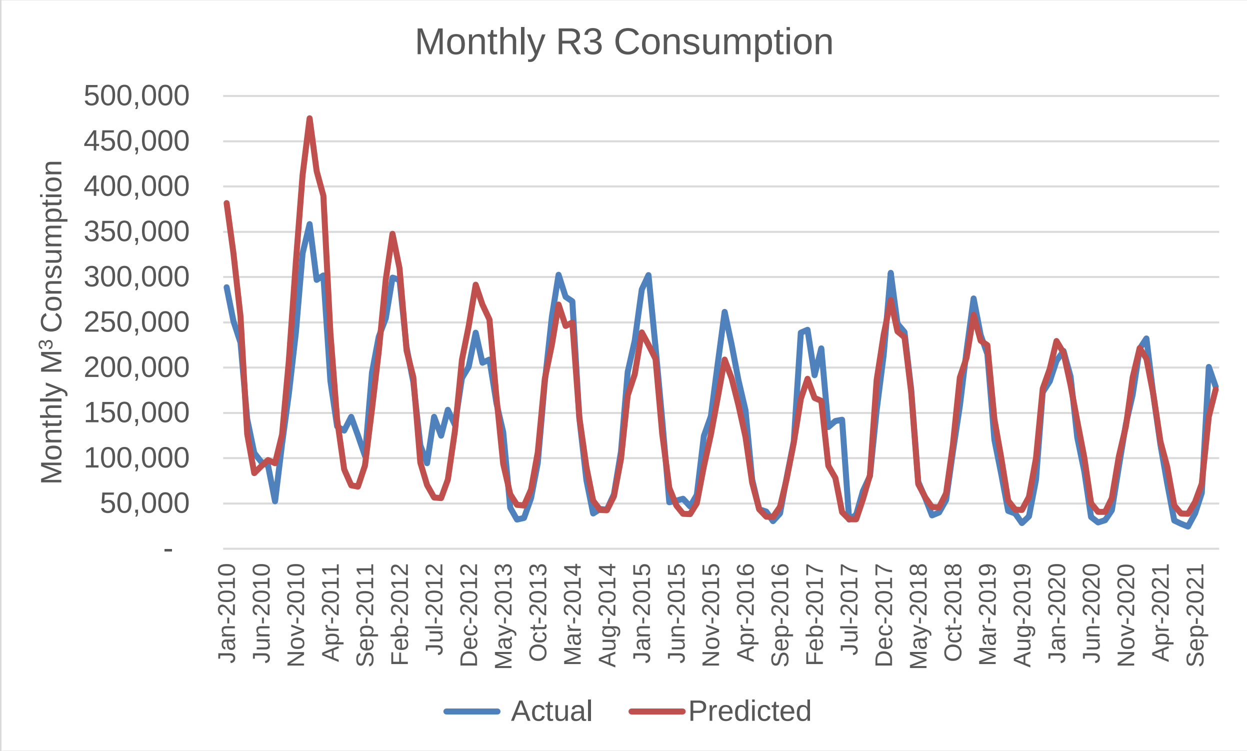

Figure 4 R3 Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 9.0%. The MAPE calculated monthly over the period is 21.6%. The MAPEs are relatively high for this class but more variance can be expected in a class with only 4 to 6 customers.

	R3		Absolute
Year	Actual	Predicted	Error (%)
2011	2,464,687.0	2,650,359.3	7.5%
2012	2,161,705.0	2,004,057.8	7.3%
2013	1,644,742.0	1,816,443.4	10.4%
2014	1,792,006.0	1,656,867.0	7.5%
2015	1,692,328.0	1,425,517.7	15.8%
2016	1,492,346.0	1,272,777.2	14.7%
2017	1,653,466.4	1,351,372.1	18.3%
2018	1,711,012.7	1,715,883.6	0.3%
2019	1,510,163.8	1,629,201.7	7.9%
2020	1,361,183.7	1,481,391.9	8.8%
2021	1,372,372.2	1,381,119.4	0.6%
Total	18,856,013	18,384,991	2.5%
Mean Absolute Percentage Error (Annual)			9.0%
Mean Absolute Percentage Error (Monthly)			21.6%

Table 11 R3 model error

4 WEATHER NORMALIZATION

It is not possible to accurately forecast weather for months or years in advance. Therefore, one can only base future weather expectations on what has happened in the past. Individual years may experience unusual spells of weather (unusually cold winter, unusually warm summer, etc.). However, over time, these unusual spells “average” out. While there may be trends over several years (e.g., warmer winters for example), using several years of data rather than one particular year filters out the extremes of any particular year. While there are several different approaches to determining an appropriate weather normal, ENGLP has adopted the 10-year trend of 10-year monthly degree day averages.

Various methods were analysed to determine the most appropriate methodology to forecast monthly heating degree days from 2022 to 2026. A 5-year average, 10-year average, 20-year trend, 5-year weighted average, 10-year trend of 5 year averages, 10-year trend of 10-year averages, and the midpoint of the 10-year average and 20-year trend were considered.

Data from 1982 to 2021 was used to evaluate each method's predicted heating degree days against the actual heating degree days for each month since January 2001. Data from Environment Canada's London Airport weather station was used for the period from 1982 to 2002. London Airport's temperature data is only provided until 2002, which is approximately when temperature data for London CS begins. Data from the London A weather station (another London Airport weather station with temperature data as of March 2012) is used in place of London CS when data from that station is unavailable.

Each method was ranked according to the magnitude of the deviations between predicted and actual heating degree days, with 1 being the closest predicted value and 7 being the furthest. The rankings were done on monthly and annual bases. The following table shows the annual rankings, average annual and monthly rankings, and variance of the deviations on monthly and annual bases.

Year	5-Year Average	10-Year Average	20-Year Trend	Weighted 5-Year Average	10-Year Trend (5MA)	10-Year Trend (10MA)	10-Yr Avg & 20-Yr Trend Midpoint
2002	2	5	1	4	7	6	3
2003	7	2	5	6	4	1	3
2004	6	2	5	4	7	1	3
2005	4	3	6	2	7	1	5
2006	6	2	4	7	1	5	3
2007	2	4	6	3	7	1	5
2008	1	4	6	3	7	2	5
2009	1	2	6	3	4	7	5
2010	3	5	2	7	6	1	4
2011	1	6	5	4	7	2	3
2012	5	6	1	4	7	3	2
2013	4	3	7	6	1	2	5
2014	4	2	7	6	3	1	5
2015	4	2	5	1	7	6	3
2016	6	3	5	7	1	2	4
2017	2	4	6	7	1	3	5
2018	1	5	2	7	6	3	4
2019	1	6	4	7	2	3	5
2020	1	3	5	6	7	2	4
2021	1	5	3	2	7	6	4
Average Rank							
Monthly	3.98	3.90	4.14	4.19	4.02	3.85	3.93
Annual	3.10	3.70	4.55	4.80	4.95	2.90	4.00
Variance between Predicted and Actual							
Monthly	4,072	3,650	4,100	4,402	3,971	3,605	3,835
Annual	67,711	59,711	69,038	77,181	67,488	54,182	63,406

Table 12 HDD Rankings and Variance

The rankings and variance analysis reveals that the 10-year trend of the 10-year average is the best methodology for predicting future heating degree days. On a monthly and annual basis, the predicted heating degree days using this methodology is closest to actual heating degree days and the deviations from actual weather have the lowest variance among the methods analysed.

For clarity, the 10-year trend of the 10-year moving average is the annualized trend of one 10-year period to the next 10-year period. For example, the 2002 predicted value uses the trend from the average heating degree days from 1982 and 1991 to the average from 1992 and 2001.

This method is the best predictive method as it accounts for trends in heating degree days over time without being over-reliant on data of any one year. Simple averages do not consider weather trends over time and typical trend forecasts can be significantly impacted by single data points.

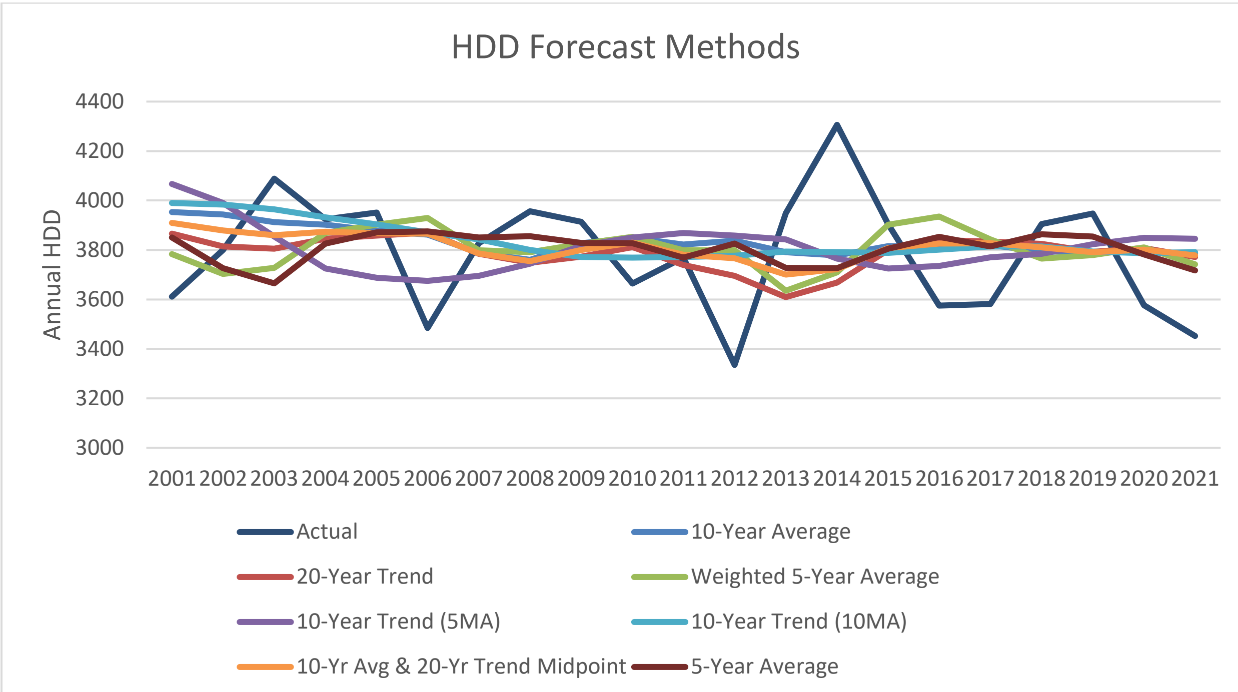

Figure 5 Weather Forecast for Various Methods

The monthly predicted and forecast heating degree days are detailed in the following tables for heating degree days at 18°C.

18°C	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	**Total**	**Actual**
2012	722	651	549	311	162	33	6	11	67	257	404	633	**3,806**	**3,335**
2013	721	655	545	310	157	32	6	11	69	254	408	632	**3,799**	**3,949**
2014	719	661	546	312	153	30	6	10	71	251	415	630	**3,806**	**4,306**
2015	721	671	549	314	147	29	7	11	73	250	420	620	**3,812**	**3,904**
2016	725	676	548	318	142	29	7	11	73	248	422	614	**3,813**	**3,575**
2017	726	672	547	318	137	30	7	11	73	245	422	612	**3,801**	**3,582**
2018	730	666	547	324	131	30	7	11	73	243	425	608	**3,796**	**3,905**
2019	732	661	549	330	128	29	6	11	72	241	431	605	**3,796**	**3,947**
2020	729	656	551	338	129	29	6	10	71	241	434	598	**3,792**	**3,577**
2021	722	652	549	343	134	29	5	10	69	239	438	592	**3,783**	**3,452**
2022	721	649	551	352	131	29	5	10	67	236	445	583	**3,777**	
2023	721	647	552	357	129	28	4	9	66	234	448	579	**3,774**	
2024	720	645	552	361	128	28	4	9	66	233	451	574	**3,771**	
2025	720	643	553	366	126	28	4	9	65	231	454	570	**3,768**	
2026	719	641	554	370	125	28	4	9	64	229	458	565	**3,765**	

Table 13 Forecast HDD 18°C

5 WEATHER-NORMALIZED CLASS FORECASTS

5.1 R1 RESIDENTIAL

Incorporating the normalized and forecast heating degree days the following weather corrected consumption and forecast values are calculated:

R1 Residential						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	6,609	1,876	12,400,852	12,393,486	1,885	12,460,549
2012	6,896	1,705	11,756,626	11,751,822	1,893	13,041,075
2013	7,181	1,990	14,289,175	14,287,143	1,954	14,021,948
2014	7,470	2,162	16,150,603	16,127,158	2,002	14,949,679
2015	7,726	1,938	14,974,492	14,948,329	1,900	14,671,276
2016	7,956	1,813	14,425,323	14,417,053	1,886	14,995,391
2017	8,110	1,892	15,347,218	15,400,135	1,977	16,078,869
2018	8,400	2,075	17,426,321	17,442,260	2,050	17,235,055
2019	8,657	2,083	18,035,211	18,000,452	2,033	17,562,537
2020	8,839	1,904	16,828,057	16,837,081	1,992	17,616,719
2021	9,070	1,907	17,299,680	17,299,257	2,015	18,272,944
2022	9,353				1,994	18,607,331
2023	9,644				2,001	19,257,743
2024	9,945				2,009	19,930,528
2025	10,254				2,016	20,626,443
2026	10,574				2,023	21,346,276

Table 14 Actual vs Normalized R1 Residential

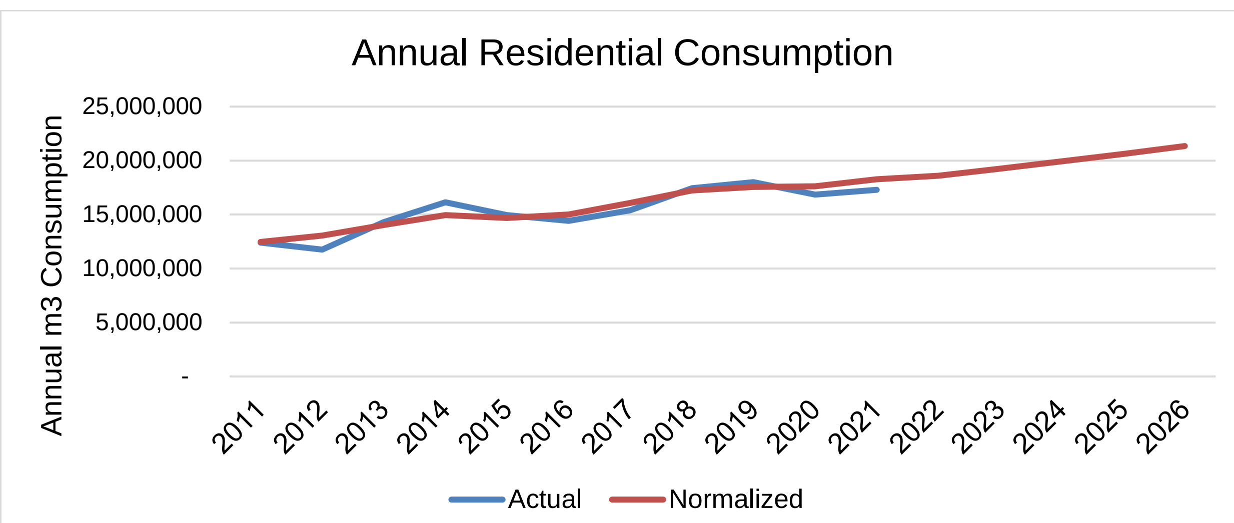

Figure 6 Actual vs Normalized R1 Residential

A tiered forecast was produced using actual individual customer data adjusted to weather-normal consumption.

	R1 Residential		
	Tier 1	**Tier 2**	**Total**
2020	16,736,013	101,069	16,837,081
2021	17,190,340	108,917	17,299,257
2022	18,492,197	115,133	18,607,331
2023	19,138,839	118,905	19,257,743
2024	19,807,729	122,799	19,930,528
2025	20,499,624	126,819	20,626,443
2026	21,215,305	130,971	21,346,276

Table 15 Forecasted R1 Residential Tiered Consumption

The Geometric mean of the annual growth from 2010 to 2021 was used to forecast the growth rate from 2022 to 2026.

Year	Residential Customers	Percent of Prior Year
2010	6,472	
2011	6,609	102.1%
2012	6,896	104.3%
2013	7,181	104.1%
2014	7,470	104.0%
2015	7,726	103.4%
2016	7,956	103.0%
2017	8,110	101.9%
2018	8,400	103.6%
2019	8,657	103.1%
2020	8,839	102.1%
2021	9,070	102.6%
2022	9,353	103.1%
2023	9,644	103.1%
2024	9,944	103.1%
2025	10,254	103.1%
2026	10,574	103.1%

Table 16 Forecasted R1 Residential Customer Count

5.2 R1 INDUSTRIAL

Incorporating the normalized and forecast heating degree days the following weather corrected consumption and forecast values are calculated:

R1 Industrial						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	43	28,608	1,225,376	1,247,376	31,232	1,372,395
2012	51	24,350	1,252,019	1,265,913	26,371	1,369,217
2013	58	24,752	1,429,444	1,436,592	24,071	1,396,675
2014	63	26,306	1,659,456	1,666,209	24,071	1,525,376
2015	62	23,186	1,439,435	1,430,900	24,316	1,496,325
2016	65	22,433	1,461,881	1,462,707	24,586	1,604,009
2017	66	26,620	1,752,499	1,752,123	29,539	1,944,061
2018	68	29,425	2,005,771	2,050,371	28,133	1,956,516
2019	73	33,281	2,440,611	2,461,420	33,204	2,449,929
2020	75	27,629	2,067,592	2,067,358	29,813	2,231,524
2021	76	29,179	2,220,030	2,226,121	35,858	2,736,619
2022	79				28,170	2,220,366
2023	81				28,618	2,333,411
2024	84				29,067	2,451,644
2025	87				29,516	2,575,289
2026	90				29,966	2,704,581

Table 17 Actual vs Normalized R1 Industrial

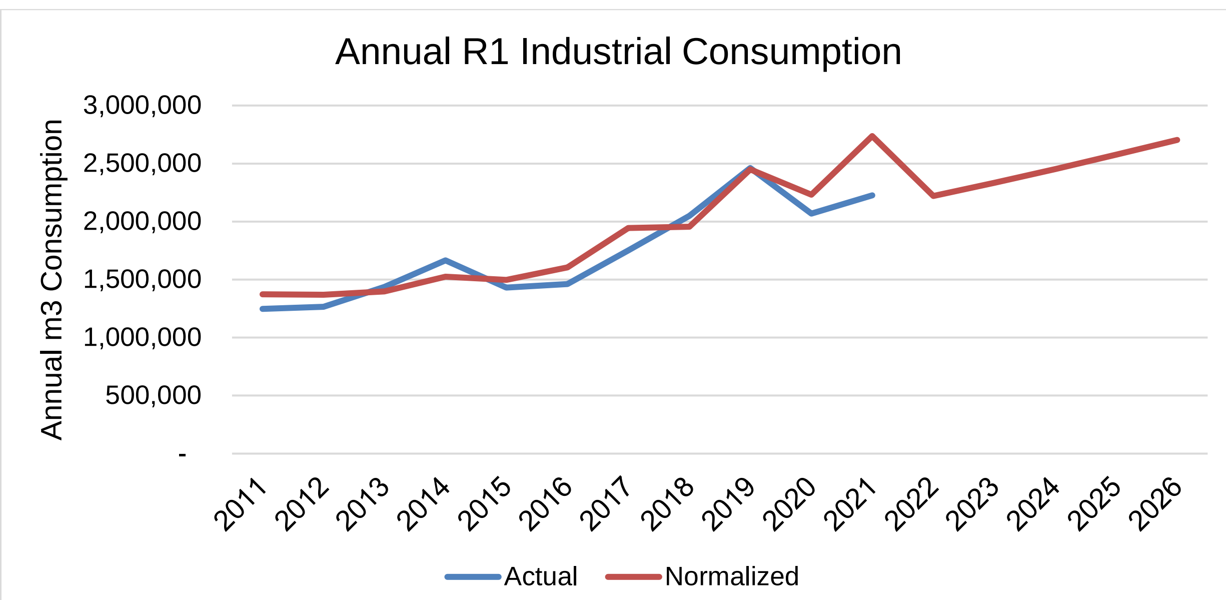

Figure 7 Actual vs Normalized R1 Industrial

A tiered forecast was produced using actual individual customer data adjusted to weather-normal consumption.

	R1 Industrial		
	Tier 1	**Tier 2**	**Total**
2020	486,972	1,580,386	2,067,358
2021	513,443	1,712,679	2,226,121
2022	520,770	1,699,596	2,220,366
2023	549,743	1,783,668	2,333,411
2024	580,101	1,871,542	2,451,644
2025	611,905	1,963,384	2,575,289
2026	645,219	2,059,362	2,704,581

Table 18 Forecasted R1 Industrial Tiered Consumption

The Geometric mean of the annual growth from 2016 to 2021 was used to forecast the growth rate from 2022 to 2026. The number of customers in this class grew significantly from 2009 to 2016 so the growth rates from these years was excluded as they do not reflect the current customer growth trend.

The following table includes the customer Actual / Forecast customer count on this basis:

Year	R1 Industrial Customers	Percent of Prior Year
2010	43	
2011	43	99.8%
2012	51	120.0%
2013	58	112.3%
2014	63	109.2%
2015	62	98.4%
2016	65	105.0%
2017	66	101.0%
2018	68	103.5%
2019	73	107.6%
2020	75	102.0%
2021	76	101.7%
2022	79	103.4%
2023	81	103.4%
2024	84	103.4%
2025	87	103.4%
2026	90	103.4%

Table 19 Forecasted R1 Industrial Customer Count

5.3 R1 COMMERCIAL

Incorporating the normalized and forecast heating degree days the following weather corrected consumption and forecast values are calculated:

R1 Commercial						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	405	9,477	3,833,380	3,846,511	9,522	3,863,954
2012	415	8,515	3,533,844	3,526,397	9,528	3,943,192
2013	424	10,227	4,336,095	4,352,319	10,012	4,260,086
2014	437	10,964	4,795,706	4,788,282	10,077	4,402,353
2015	445	9,935	4,421,983	4,420,443	9,711	4,323,556
2016	453	9,065	4,102,131	4,117,374	9,448	4,290,469
2017	462	10,219	4,716,893	4,734,213	10,733	4,968,796
2018	487	10,958	5,332,657	5,363,288	10,824	5,295,344
2019	536	10,970	5,880,685	5,890,482	10,691	5,741,454
2020	535	9,378	5,017,149	5,028,438	9,960	5,341,100
2021	559	9,469	5,292,354	5,306,940	10,078	5,648,018
2022	575				10,234	5,876,510
2023	593				10,282	6,078,753
2024	610				10,330	6,287,803
2025	628				10,377	6,503,888
2026	647				10,425	6,727,238

Table 20 Actual vs Normalized R1 Commercial

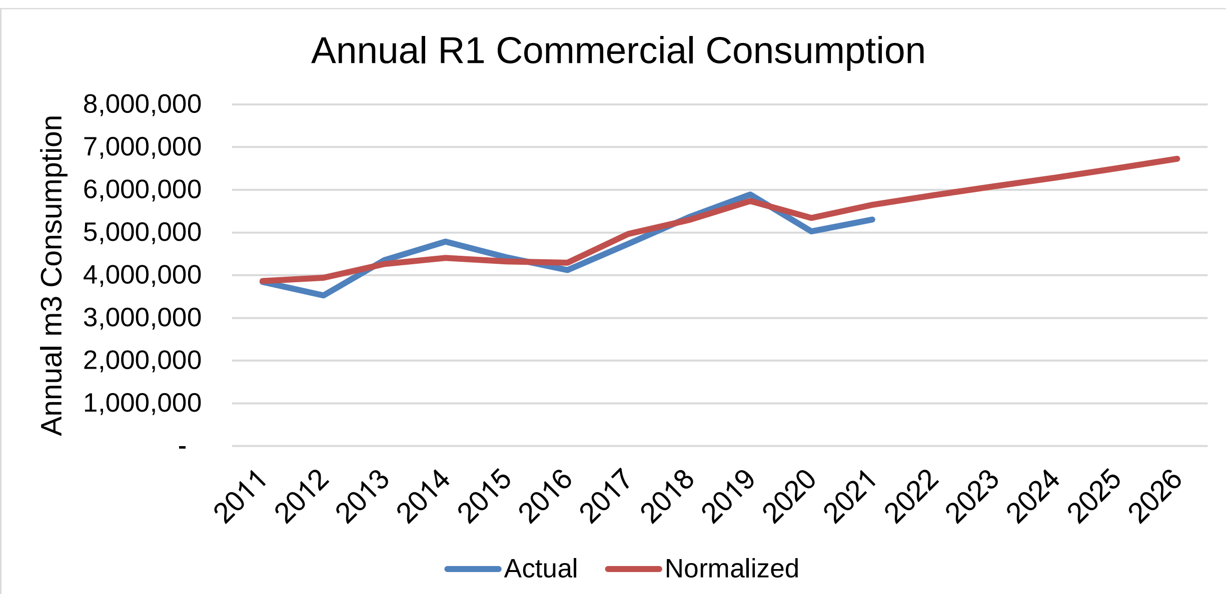

Figure 8 Actual vs Normalized R1 Commercial

A tiered forecast was produced using actual individual customer data adjusted to weather-normal consumption.

	R1 Commercial		
	Tier 1	**Tier 2**	**Total**
2020	2,391,122	2,637,316	5,028,438
2021	2,503,888	2,803,052	5,306,940
2022	2,781,738	3,094,773	5,876,510
2023	2,879,860	3,198,893	6,078,753
2024	2,981,345	3,306,458	6,287,803
2025	3,086,307	3,417,581	6,503,888
2026	3,194,861	3,532,377	6,727,238

Table 21 Forecasted R1 Commercial Tiered Consumption

The Geometric mean of the annual growth from 2010 to 2021 was used to forecast the growth rate from 2022 to 2026.The following table includes the customer Actual / Forecast customer count on this basis:

Year	R1 Commercial Customers	Percent of Prior Year
2010	405	
2011	405	99.8%
2012	415	102.6%
2013	424	102.2%
2014	437	103.2%
2015	445	101.8%
2016	453	101.7%
2017	462	102.0%
2018	487	105.4%
2019	536	110.2%
2020	535	99.8%
2021	559	104.5%
2022	575	103.0%
2023	593	103.0%
2024	610	103.0%
2025	628	103.0%
2026	647	103.0%

Table 22 Forecasted R1 Commercial Customer Count

5.4 R3

Incorporating the normalized and forecast heating degree days, continuing time trend and calendar dummy variables, the following weather corrected consumption and forecast values are calculated:

R3						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	4	616,172	2,464,687	2,464,687	621,678	2,486,712
2012	4	540,426	2,161,705	2,161,705	570,119	2,280,477
2013	4	411,186	1,644,742	1,644,742	407,454	1,629,818
2014	4	448,002	1,792,006	1,792,006	427,015	1,708,062
2015	4	423,082	1,692,328	1,692,328	420,923	1,683,691
2016	4	373,087	1,492,346	1,492,346	380,354	1,521,417
2017	5	375,566	1,690,049	1,653,466	380,399	1,671,154
2018	6	285,169	1,711,013	1,711,013	280,148	1,680,888
2019	6	251,694	1,510,164	1,510,164	244,504	1,467,022
2020	6	226,864	1,361,184	1,361,184	230,461	1,382,767
2021	6	228,729	1,372,372	1,372,372	235,753	1,414,518
2022	6				226,476	1,358,859
2023	6				216,846	1,301,078
2024	6				208,242	1,249,451
2025	6				200,496	1,202,977
2026	6				193,478	1,160,868

Table 23 Actual vs Normalized R3

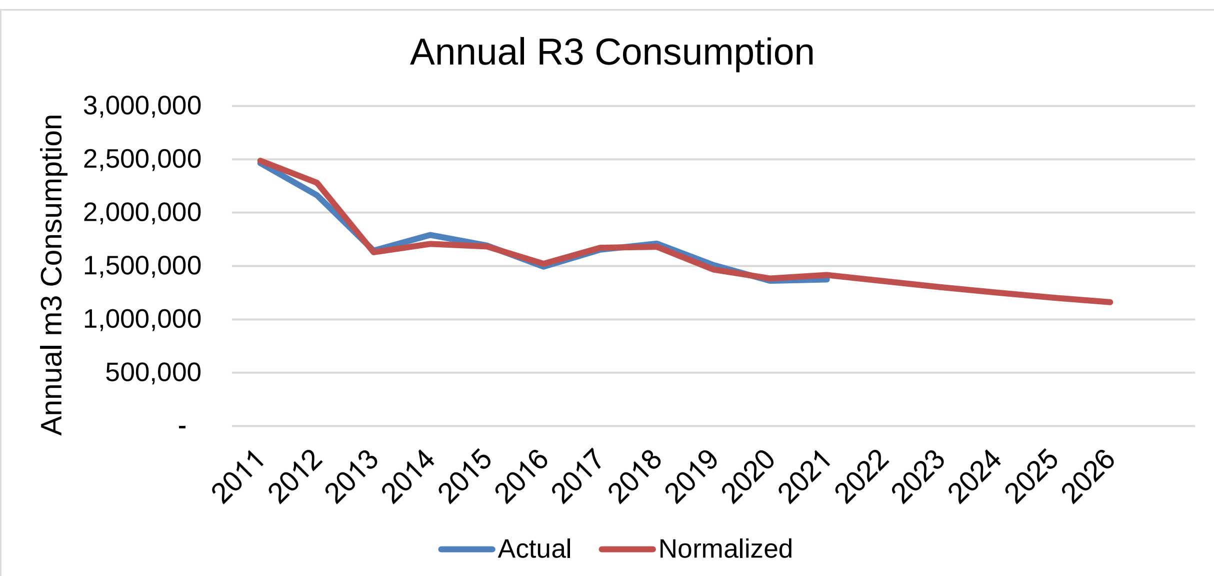

Figure 9 Actual vs Normalized R3

The R3 class has fluctuated between 4 and 6 customers since 2009. The current count of 6 customers is expected to continue through 2022-2026.

6 NON-WEATHER SENSITIVE CLASS FORECASTS

6.1 R2 SEASONAL

Monthly consumption is forecast using a three-year average of consumption per customer in each month. The sum of monthly forecast values per customer are used to calculate annual total consumption as follows:

R2 Seasonal						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	65	27,387	1,768,757	1,849,679		
2012	66	28,174	1,868,851	1,885,826		
2013	64	28,302	1,820,741	1,844,495		
2014	65	30,594	1,980,940	1,988,124		
2015	63	20,017	1,256,038	1,242,867		
2016	59	23,524	1,382,013	1,394,132		
2017	55	26,211	1,435,062	1,410,653		
2018	54	28,488	1,526,500	1,520,647		
2019	49	25,819	1,267,264	1,279,499		
2020	48	16,202	781,723	784,724		
2021	51	16,595	839,456	829,096		
2022	49				19,539	962,031
2023	48				19,539	940,348
2024	47				19,539	919,154
2025	46				19,539	898,437
2026	45				19,539	878,187

Table 24 Actual vs Normalized R2 Seasonal

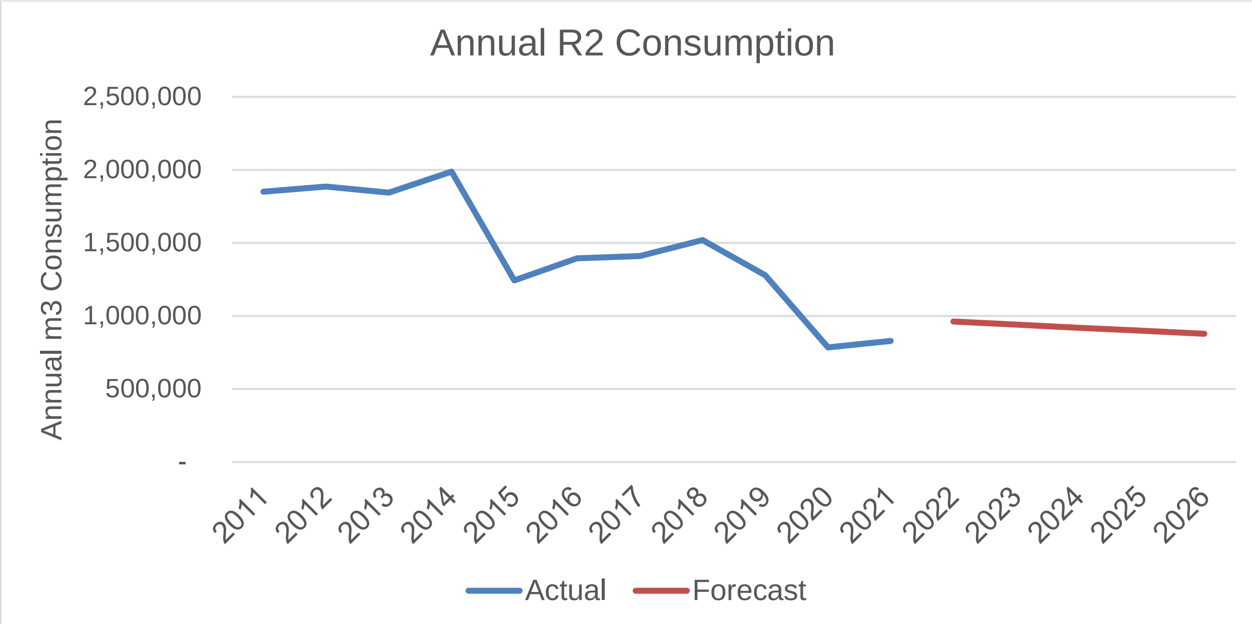

Figure 10 Actual vs Normalized R2 Seasonal

An average of tiered consumption shares in 2017 and 2018 was used to forecast tiered consumption in future years. The R2 seasonal class has three tiers with different rates in April to October and November to March. Tier 1 consumption is consumption up to 1,000 m^3, tier 2 applies to consumption between 1,000 m^3 and 25,000 m^3, and all consumption above 25,000 m^3 is considered Tier 3.

R2 Seasonal							
	April 1 to Oct 31			Nov 1 to Mar 31			
	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3	Total
2020	52,248	436,421	83,374	40,547	161,461	10,672	784,724
2021	55,203	461,098	88,089	42,840	170,590	11,276	829,096
2022	64,054	535,030	102,213	49,709	197,942	13,084	962,031
2023	62,610	522,971	99,909	48,588	193,481	12,789	940,348
2024	61,199	511,184	97,657	47,493	189,120	12,500	919,154
2025	59,819	499,662	95,456	46,423	184,858	12,219	898,437
2026	58,471	488,400	93,304	45,377	180,691	11,943	878,187

Table 25 Forecasted R2 Seasonal Tiered Consumption

The Geometric mean of the annual growth from 2010 to 2021 was used to forecast the growth rate from 2022 to 2026. The following table includes the customer Actual / Forecast customer count on this basis:

Year	R2 Seasonal Customers	Percent of Prior Year
2010	65	
2011	65	99.4%
2012	66	102.7%
2013	64	97.0%
2014	65	100.6%
2015	63	96.9%
2016	59	93.6%
2017	55	93.2%
2018	54	97.9%
2019	49	91.6%
2020	48	98.3%
2021	51	104.8%
2022	49	97.7%
2023	48	97.7%
2024	47	97.7%
2025	46	97.7%
2026	45	97.7%

Table 26 Forecasted R2 Seasonal Customer Count

6.2 R4

Consumption per R4 customer is not consistent over time and the 5-year average does not accurately reflect current consumption for the class. Consumption per customer has been consistent in 2020 and 2021 so the 2022 forecast is based on a 2-year average.

R4						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	23	21,688	487,988	477,633		
2012	25	23,036	575,898	678,458		
2013	32	26,175	831,059	861,111		
2014	33	39,661	1,318,721	1,345,169		
2015	34	29,232	996,339	994,710		
2016	35	25,140	888,266	904,160		
2017	36	31,238	1,119,348	1,124,029		
2018	37	35,029	1,278,561	1,327,953		
2019	37	50,232	1,841,844	1,953,378		
2020	40	37,145	1,501,271	1,534,283		
2021	46	37,805	1,720,128	1,793,580		
2022	48				37,475	1,806,683
2023	50				37,475	1,889,798
2024	52				37,475	1,976,737
2025	54				37,475	2,067,675
2026	57				37,475	2,162,797

Table 27 Actual vs Forecast R4

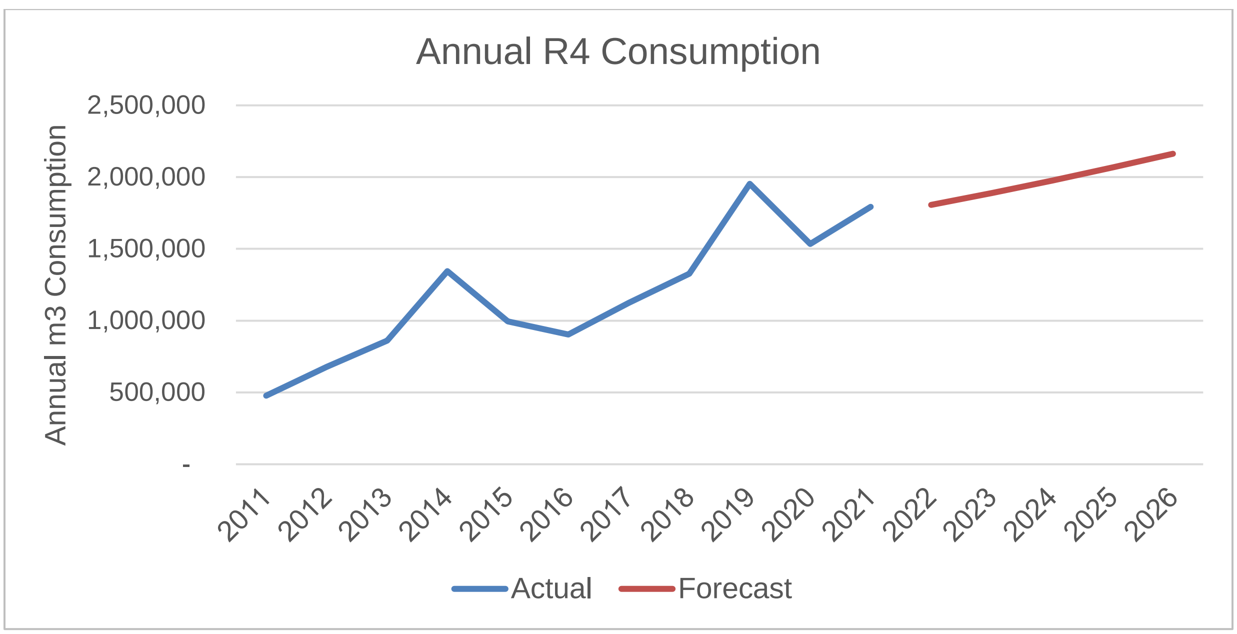

Figure 11 Actual vs Normalized R4

An average of tiered consumption shares in 2017 and 2018 was used to forecast tiered consumption in future years. The R4 class has two tiers with different rates in January to

March and April to December. Tier 1 consumption is consumption up to 1,000 m^3 and all consumption above 1,000 m^3 is considered tier 2.

	R4				
	Jan 1 to Mar 31		Apr 1 to Dec 31		
	Tier 1	Tier 2	Tier 1	Tier 2	Total
2020	24,040	4,867	125,923	1,379,453	1,534,283
2021	28,103	5,689	147,205	1,612,584	1,793,580
2022	28,308	5,731	148,280	1,624,364	1,806,683
2023	29,610	5,995	155,102	1,699,092	1,889,798
2024	30,973	6,270	162,237	1,777,257	1,976,737
2025	32,397	6,559	169,700	1,859,019	2,067,675
2026	33,888	6,861	177,507	1,944,541	2,162,797

Table 28 Forecasted R4 Tiered Consumption

The Geometric mean of the annual growth from 2014 to 2021 was used to forecast the growth rate from 2022 to 2026. The number of customers in this class grew significantly from 2010 to 2013 so the growth rates from these years was excluded as they do not reflect the current customer growth trend.

The following table includes the customer Actual / Forecast customer count on this basis:

Year	R4 Customers	Percent of Prior Year
2010	23	
2011	23	96.8%
2012	25	111.1%
2013	32	127.0%
2014	33	104.7%
2015	34	102.5%
2016	35	103.7%
2017	36	101.4%
2018	37	101.9%
2019	37	100.5%
2020	40	110.2%
2021	46	112.6%
2022	48	104.6%
2023	50	104.6%
2024	52	104.6%
2025	54	104.6%
2026	57	104.6%

Table 29 Forecasted R4 Customer Count

6.3 R5

Consumption per R5 customer has fluctuated considerably since 2011. The 2022-2026 forecast is based on a 3-year average from 2019 to 2021, which is in line with average consumption per customer per year since 2012.

R5						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	5	222,975	1,114,874	1,114,874		
2012	5	177,350	886,748	886,748		
2013	5	203,326	1,016,630	1,016,630		
2014	5	225,771	1,147,669	1,128,958		
2015	5	134,524	672,622	672,622		
2016	5	112,572	562,860	562,860		
2017	5	186,530	870,472	753,900		
2018	4	149,492	610,424	624,337		
2019	4	231,801	927,203	927,203		
2020	4	138,609	554,438	554,438		
2021	4	197,882	791,530	791,530		
2022	4				189,431	757,724
2023	4				189,431	757,724
2024	4				189,431	757,724
2025	4				189,431	757,724
2026	4				189,431	757,724

Table 30 Actual vs Forecast R5

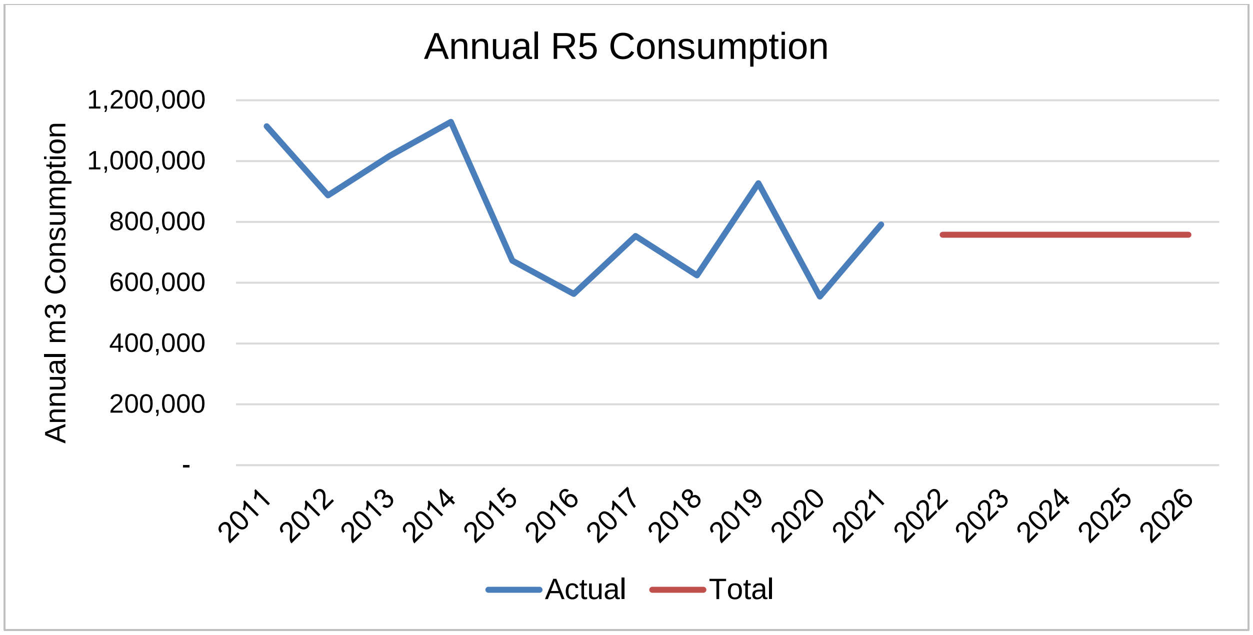

Figure 12 Actual vs Normalized Large Use R5

The R5 class had 5 customers from 2009 to 2017 and had 4 customers from 2018 to 2021. It is expected to maintain 4 customers through 2022 to 2026.

6.4 R6

R6 consumption increased significantly in 2019 over historic volumes. The 2022-2026 forecast uses average 2019-2021 consumption as forecast consumption in each year. Volumes in February and October 2021 were anomalously high and low, respectively, so these months are excluded from the average calculation.

R6						
Year	Customers	Consumption		Actual	Normalized	
		Per Customer	Total		Per Customer	Total
2011	1	30,758,504	30,758,504	30,758,504		
2012	1	31,628,262	31,628,262	31,628,262		
2013	1	31,582,423	31,582,423	31,582,423		
2014	1	31,735,774	31,735,774	31,735,774		
2015	1	34,710,609	34,710,609	34,710,609		
2016	1	40,074,176	40,074,176	40,074,176		
2017	1	36,485,139	36,485,139	36,485,139		
2018	1	40,205,243	40,205,243	40,205,243		
2019	1	62,525,354	62,525,354	62,525,354		
2020	1	59,599,950	59,599,950	59,599,950		
2021	1	60,410,748	60,410,748	60,410,748		
2022	1				61,336,401	61,336,401
2023	1				61,336,401	61,336,401
2024	1				61,336,401	61,336,401
2025	1				61,336,401	61,336,401
2026	1				61,336,401	61,336,401

Table 31 Actual vs Forecast R6

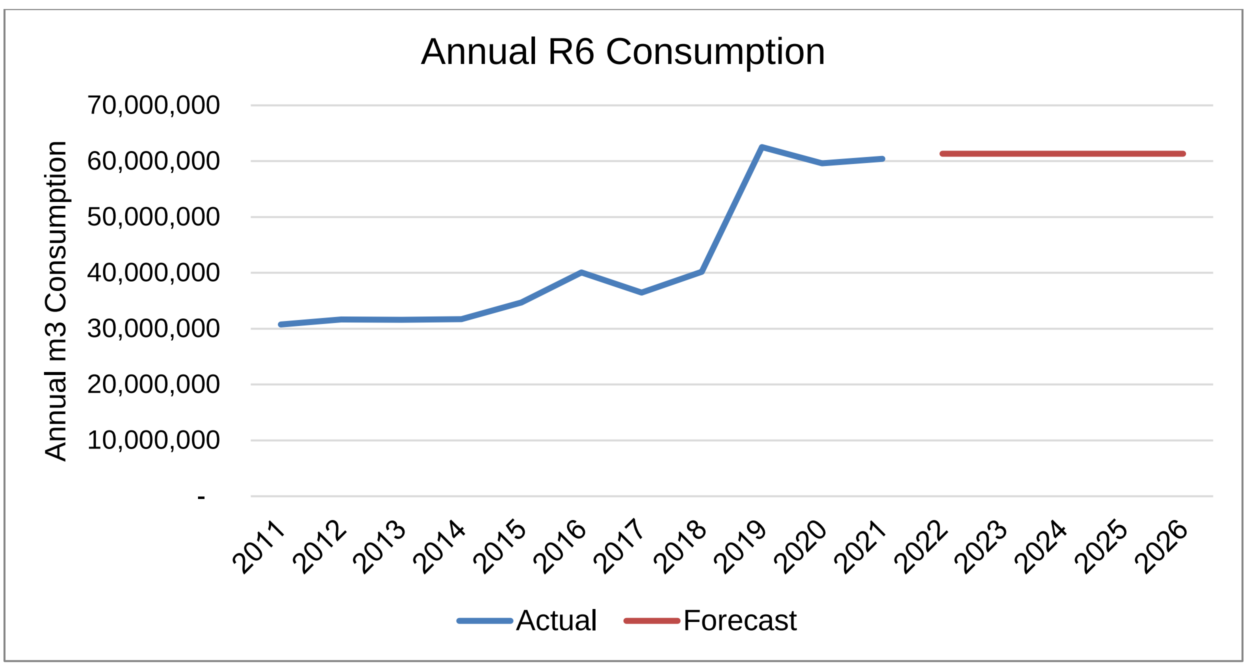

Figure 13 Actual vs Normalized R6

The R6 class has one customer and is expected to persist with one customer through 2026.

7 WEATHER SENSITIVITY

This section provides alternate low forecasts for scenarios with mild winters and high forecasts for cold winters. The low forecast uses the warmest winter in the past 10 years, which was 3,335 HDD (at 18°C) in 2012. The high forecast uses the coldest winter in the past 10 years, 4,306 HDD in 2014. The derived 18°C HDD forecast temperatures from 2022 to 2026 are provided with the normal forecast for reference. Forecast and actual HDDs from 2012 to 2021 are provided in Table 13.

Low Forecast	HDD	3,335.0	3,335.0	3,335.0	3,335.0	3,335.0
	2021 Actual	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
R1 Residential	17,299,257	17,235,043	17,850,374	18,487,317	19,146,622	19,829,065
R1 Industrial	2,226,121	1,989,872	2,095,208	2,205,441	2,320,785	2,441,460
R1 Commercial	5,306,940	5,417,303	5,608,423	5,806,112	6,010,592	6,222,091
R2 Seasonal	829,096	962,031	940,348	919,154	898,437	878,187
R3	1,372,372	1,304,387	1,248,677	1,198,904	1,154,101	1,113,509
R4	1,793,580	1,806,683	1,889,798	1,976,737	2,067,675	2,162,797
R5	791,530	757,724	757,724	757,724	757,724	757,724
R6	60,410,748	61,336,401	61,336,401	61,336,401	61,336,401	61,336,401
Total	**90,029,645**	**90,809,443**	**91,726,953**	**92,687,789**	**93,692,337**	**94,741,234**

Table 32 Low HDD Forecast

Normal Forecast	HDD	3,782.8	3,776.9	3,773.9	3,771.0	3,768.0
	2021 Actual	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
R1 Residential	17,299,257	18,607,331	19,257,743	19,930,528	20,626,443	21,346,276
R1 Industrial	2,226,121	2,220,366	2,333,411	2,451,644	2,575,289	2,704,581
R1 Commercial	5,306,940	5,876,510	6,078,753	6,287,803	6,503,888	6,727,238
R2 Seasonal	829,096	962,031	940,348	919,154	898,437	878,187
R3	1,372,372	1,358,859	1,301,078	1,249,451	1,202,977	1,160,868
R4	1,793,580	1,806,683	1,889,798	1,976,737	2,067,675	2,162,797
R5	791,530	757,724	757,724	757,724	757,724	757,724
R6	60,410,748	61,336,401	61,336,401	61,336,401	61,336,401	61,336,401
Total	**90,029,645**	**92,925,905**	**93,895,256**	**94,909,441**	**95,968,834**	**97,074,072**

Table 33 Normal HDD Forecast

High Forecast	HDD	4,306.0	4,306.0	4,306.0	4,306.0	4,306.0
	2021 Actual	**2022 Forecast**	**2023 Forecast**	**2024 Forecast**	**2025 Forecast**	**2026 Forecast**
R1 Residential	17,299,257	20,203,895	20,911,727	21,644,054	22,401,715	23,185,577
R1 Industrial	2,226,121	2,504,341	2,627,412	2,755,992	2,890,314	3,030,623
R1 Commercial	5,306,940	6,413,188	6,633,806	6,861,867	7,097,618	7,341,315
R2 Seasonal	829,096	962,031	940,348	919,154	898,437	878,187
R3	1,372,372	1,426,955	1,366,013	1,311,563	1,262,552	1,218,146
R4	1,793,580	1,806,683	1,889,798	1,976,737	2,067,675	2,162,797
R5	791,530	757,724	757,724	757,724	757,724	757,724
R6	60,410,748	61,336,401	61,336,401	61,336,401	61,336,401	61,336,401
Total	**90,029,645**	**95,411,218**	**96,463,228**	**97,563,491**	**98,712,435**	**99,910,770**

Table 34 High HDD Forecast

The graph below displays total forecast consumption for the three scenarios. The majority of consumption is not weather-sensitive so the range does not vary considerably on a total consumption basis.

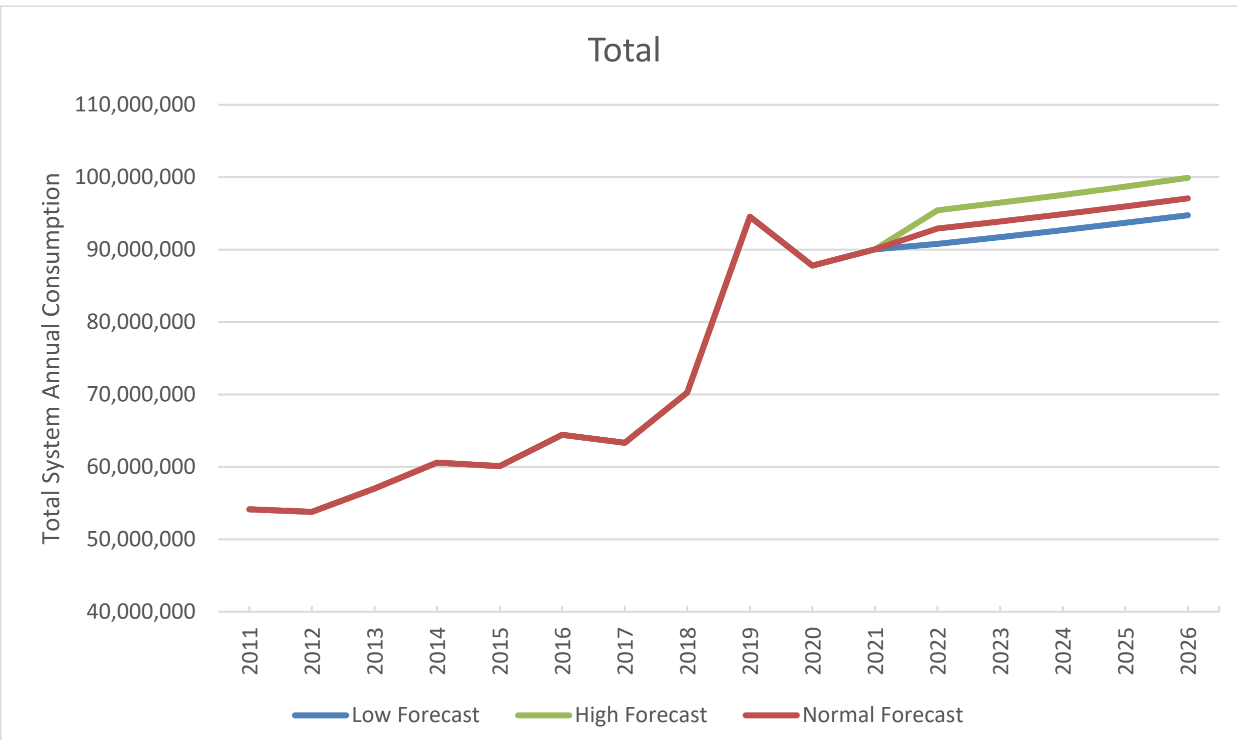

Figure 14 Weather Sensitivity – Total Consumption

Consumption forecasts for only largest weather-sensitive class, R1 Residential, are displayed in the following graph. Note the y-intercept is non-zero in each graph.

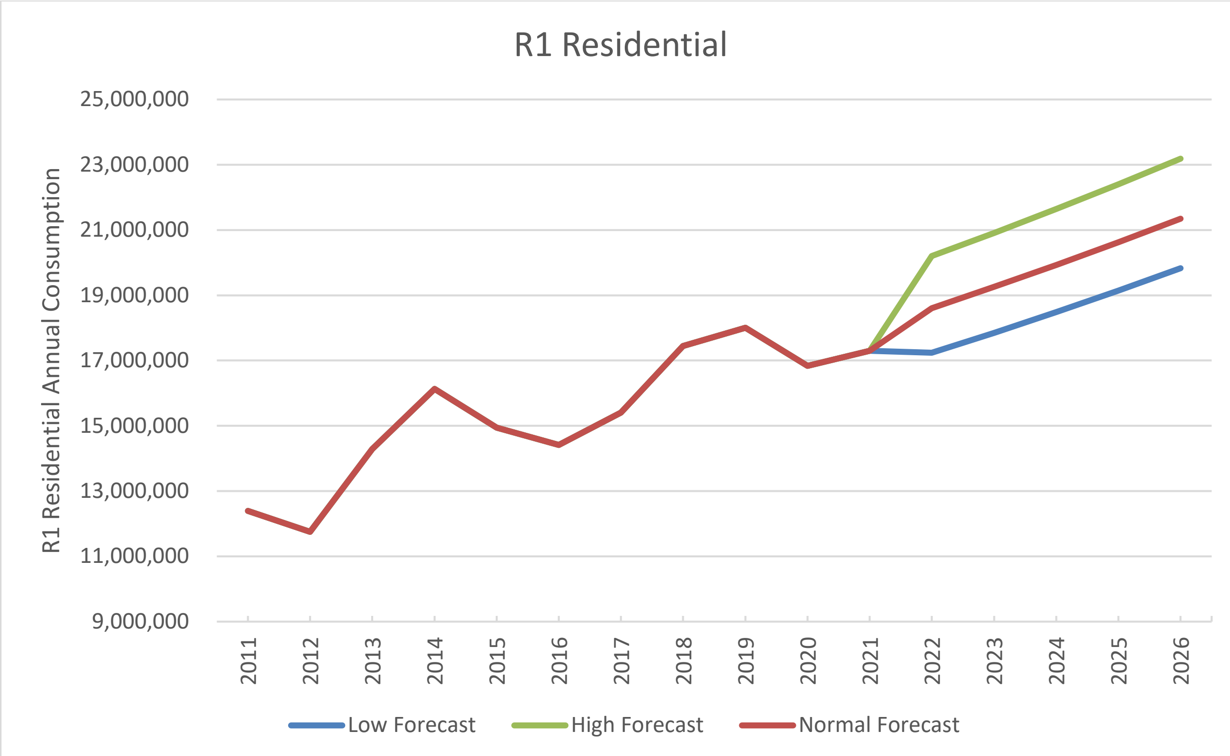

Figure 15 Weather Sensitivity – R1 Residential