Exhibit GMP-ER-RB-5

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Green Mountain Power
FY 2022 Budget Forecast Report
October 2021 Update

Prepared for:

Green Mountain Power

Prepared by:

Itron, Inc.
20 Park Plaza
Boston, MA 02116-4399
617-423-7660

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2022 FISCAL YEAR UPDATED BUDGET FORECAST: SUMMARY

The FY2022 update forecast includes monthly customer, sales, and revenue projections through 2041. The baseline forecast is derived from a set of monthly sales and customer regression models. Models are estimated for residential, small commercial & industrial (C&I), and large C&I revenue classes and are based on billed sales and customer counts from January 2011 through September 2021. Once estimated models are used to forecast sales for projected household and economic growth, end-use energy trends, energy efficiency program savings, and trended temperature projections. The model-based forecast is referred to as the *baseline* sales forecast.

Expected sales impact from large customer expansion (and contractions) and new technologies are layered on the baseline forecast. The baseline forecast is adjusted for:

- Tier 3 customer electrification activity
- Behind the meter solar (BTM)
- Heat pump incentive program
- Electric vehicle projections

Tier 3 customer electrification projects and behind the meter (BTM) solar capacity projections are provided by GMP. The heat-pump and electric vehicle (EV) forecasts were developed as part of the recent VELCO long-term state energy and demand forecast. The heat-pump forecast is based on unit projections derived by Vermont Public Utilities Commission staff working with Vermont Energy Investment Corporation (VEIC). VEIC also developed the state EV forecast.

Revenue Forecast. Sales forecasts are generated at the customer class level for residential, small C&I, large C&I, and street lighting. Class-level sales forecasts are allocated to rate schedules and then to billing determinants based on historical rate-schedule allocation trends, on and off-peak sales and billing demand trends. Revenue is then calculated as the product of rate class billing determinants and current tariffs.

Not surprisingly, COVID-19 had a significant impact on 2020 and 2021 rate class sales and revenues. There has been a significant increase in residential sales and decline in commercial sales as work shifted from the office to the home. While there are large impacts on residential and C&I class sales the combined impact is relatively small with estimated 2021 sales just 0.2% lower than pre-COVID 2019 sales. We expect COVID will likely result in some structural shift

as many businesses transition to a hybrid work model in which employees split time between the office and working at home. Our expectation is that we get close to pre COVID-19 business and personal activity by the end of 2022, with average impact across all sectors less than 10% of the height of the COVID impact which occurred April 2020.

We expect total FY 2022 sales (October 2021 to September 2022) to be flat at 4,094,024 MWh. Residential sales are expected to show a sharp decline with C&I sales showing a strong increase as we transition back to something closer to the pre COVID-19 economy. There is an 8.7% drop in Large C&I sales in 2027 as a result of loss of GlobalFoundries as an all-requirements customer. The forecast assumes that GlobalFoundries' pending petition to become a Self-Managed Utility (SMU) is approved and GlobalFoundries takes limited distribution service on a portion of their campus starting in FY 2027. Revenues are priced at current tariffs with residential contributing nearly all the revenue growth over the next five years; electric vehicle adoption and the state heat pump incentive program are expected to more than compensate for the sales loss associated with solar generation.

Table 1 and Table 2 show expected annual sales and revenue through 2041.

Table 1: Fiscal Year Booked Sales Forecast (MWh)

Year	Residential	Chg	Small C&I	Chg	Large C&I	Chg	Other	Chg	Total	Chg
2021	1,572,658		1,409,215		1,111,423		3,792		4,097,088	
2022	1,489,677	-5.3%	1,450,162	2.9%	1,150,404	3.5%	3,781	-0.3%	4,094,024	-0.1%
2023	1,486,229	-0.2%	1,463,385	0.9%	1,155,880	0.5%	3,781	0.0%	4,109,276	0.4%
2024	1,502,364	1.1%	1,465,880	0.2%	1,161,400	0.5%	3,781	0.0%	4,133,426	0.6%
2025	1,525,639	1.5%	1,466,016	0.0%	1,163,381	0.2%	3,781	0.0%	4,158,818	0.6%
2026	1,552,511	1.8%	1,464,290	-0.1%	1,166,125	0.2%	3,781	0.0%	4,186,708	0.7%
2027	1,585,284	2.1%	1,460,211	-0.3%	772,545	-33.8%	3,781	0.0%	3,821,822	-8.7%
2028	1,622,882	2.4%	1,457,155	-0.2%	770,367	-0.3%	3,781	0.0%	3,854,185	0.8%
2029	1,667,704	2.8%	1,454,817	-0.2%	768,345	-0.3%	3,781	0.0%	3,894,647	1.0%
2030	1,716,140	2.9%	1,452,814	-0.1%	766,054	-0.3%	3,781	0.0%	3,938,790	1.1%
2031	1,766,541	2.9%	1,447,693	-0.4%	762,547	-0.5%	3,781	0.0%	3,980,562	1.1%
2032	1,818,532	2.9%	1,443,495	-0.3%	758,565	-0.5%	3,781	0.0%	4,024,373	1.1%
2033	1,872,480	3.0%	1,438,661	-0.3%	754,807	-0.5%	3,781	0.0%	4,069,730	1.1%
2034	1,924,602	2.8%	1,434,359	-0.3%	751,037	-0.5%	3,781	0.0%	4,113,779	1.1%
2035	1,974,695	2.6%	1,429,764	-0.3%	746,987	-0.5%	3,781	0.0%	4,155,227	1.0%
2036	2,019,633	2.3%	1,427,209	-0.2%	742,830	-0.6%	3,781	0.0%	4,193,453	0.9%
2037	2,058,521	1.9%	1,423,795	-0.2%	738,420	-0.6%	3,781	0.0%	4,224,518	0.7%
2038	2,088,778	1.5%	1,420,761	-0.2%	733,986	-0.6%	3,781	0.0%	4,247,305	0.5%
2039	2,111,399	1.1%	1,417,122	-0.3%	729,577	-0.6%	3,781	0.0%	4,261,879	0.3%
2040	2,126,316	0.7%	1,412,045	-0.4%	725,273	-0.6%	3,781	0.0%	4,267,416	0.1%
2041	2,139,489	0.6%	1,406,922	-0.4%	721,093	-0.6%	3,781	0.0%	4,271,286	0.1%
21-26		-0.2%		0.8%		1.0%		-0.1%		0.4%
26-31		2.6%		-0.2%		-7.0%		0.0%		-0.9%
31-41		1.9%		-0.3%		-0.6%		0.0%		0.7%

Table 2: Fiscal Year Booked Revenue Forecast ($)

Year	Residential	Chg	Small C&I	Chg	Large C&I	Chg	Other	Chg	Total	Chg
2021	302,361,312		235,146,362		122,836,936		2,710,167		663,054,778	
2022	302,071,899	-0.1%	250,705,639	6.6%	129,507,776	5.4%	2,702,820	-0.3%	684,988,134	3.3%
2023	301,535,333	-0.2%	253,086,503	0.9%	113,280,941	-12.5%	2,702,820	0.0%	670,605,597	-2.1%
2024	304,590,123	1.0%	253,610,981	0.2%	113,885,865	0.5%	2,702,820	0.0%	674,789,788	0.6%
2025	308,641,204	1.3%	254,014,847	0.2%	115,128,564	1.1%	2,702,820	0.0%	680,487,435	0.8%
2026	313,437,104	1.6%	253,988,053	0.0%	116,234,289	1.0%	2,702,820	0.0%	686,362,266	0.9%
2027	319,236,204	1.9%	253,581,442	-0.2%	95,479,996	-17.9%	2,702,820	0.0%	671,000,462	-2.2%
2028	325,980,720	2.1%	253,215,398	-0.1%	95,131,238	-0.4%	2,702,820	0.0%	677,030,176	0.9%
2029	333,724,612	2.4%	253,216,092	0.0%	94,962,983	-0.2%	2,702,820	0.0%	684,606,507	1.1%
2030	342,210,958	2.5%	253,145,992	0.0%	94,680,727	-0.3%	2,702,820	0.0%	692,740,497	1.2%
2031	351,024,652	2.6%	252,571,018	-0.2%	94,247,520	-0.5%	2,702,820	0.0%	700,546,010	1.1%
2032	360,224,190	2.6%	252,026,997	-0.2%	93,676,830	-0.6%	2,702,820	0.0%	708,630,837	1.2%
2033	369,498,732	2.6%	251,618,331	-0.2%	93,293,091	-0.4%	2,702,820	0.0%	717,112,973	1.2%
2034	378,554,048	2.5%	251,176,333	-0.2%	92,827,951	-0.5%	2,702,820	0.0%	725,261,152	1.1%
2035	387,250,431	2.3%	250,687,844	-0.2%	92,328,437	-0.5%	2,702,820	0.0%	732,969,533	1.1%
2036	395,176,102	2.0%	250,417,783	-0.1%	91,737,951	-0.6%	2,702,820	0.0%	740,034,656	1.0%
2037	401,787,633	1.7%	250,234,678	-0.1%	91,271,600	-0.5%	2,702,820	0.0%	745,996,730	0.8%
2038	407,009,728	1.3%	250,000,382	-0.1%	90,724,700	-0.6%	2,702,820	0.0%	750,437,630	0.6%
2039	410,899,835	1.0%	249,668,145	-0.1%	90,180,960	-0.6%	2,702,820	0.0%	753,451,760	0.4%
2040	413,573,735	0.7%	248,994,585	-0.3%	89,574,522	-0.7%	2,702,820	0.0%	754,845,662	0.2%
2041	415,687,369	0.5%	248,527,693	-0.2%	89,134,755	-0.5%	2,702,820	0.0%	756,052,637	0.2%
21-26		0.7%		1.6%		-0.9%		-0.1%		0.7%
26-31		2.3%		-0.1%		-3.8%		0.0%		0.4%
31-41		1.7%		-0.2%		-0.6%		0.0%		0.8%

The strong long-term residential sales growth is largely driven by heat pump adoption and EV market penetration.

I. Forecast Summary

Baseline Sales Forecast. Class sales and customer forecasts are derived from linear regression models that relate monthly sales to household projections, economic activity as measured by real GDP, employment, household income, expected weather, price, and changes in end-use energy ownership and efficiency (both standards and state efficiency programs). Models are estimated with monthly billed sales and customer data from January 2011 to September 2021. The forecast is extended through 2041 and is used developing the long-term system energy and demand forecast.

Sales Trend. Residential and Small C&I sales have been declining since 2014. Increase in customers and business activity have been countered by efficiency improvements (both market and program driven) and strong solar market penetration. The 2020 uptick in residential sales and decline in C&I sales is largely due to the impact of COVID-19 on businesses and residences. Large C&I sales have largely been flat with a slight decline starting in 2019 and continuing

this trend into 2020 because of COVID-19. Figure 1 shows class sales trends over the last decade.

Figure 1: Sales Trend (12-month moving sum)

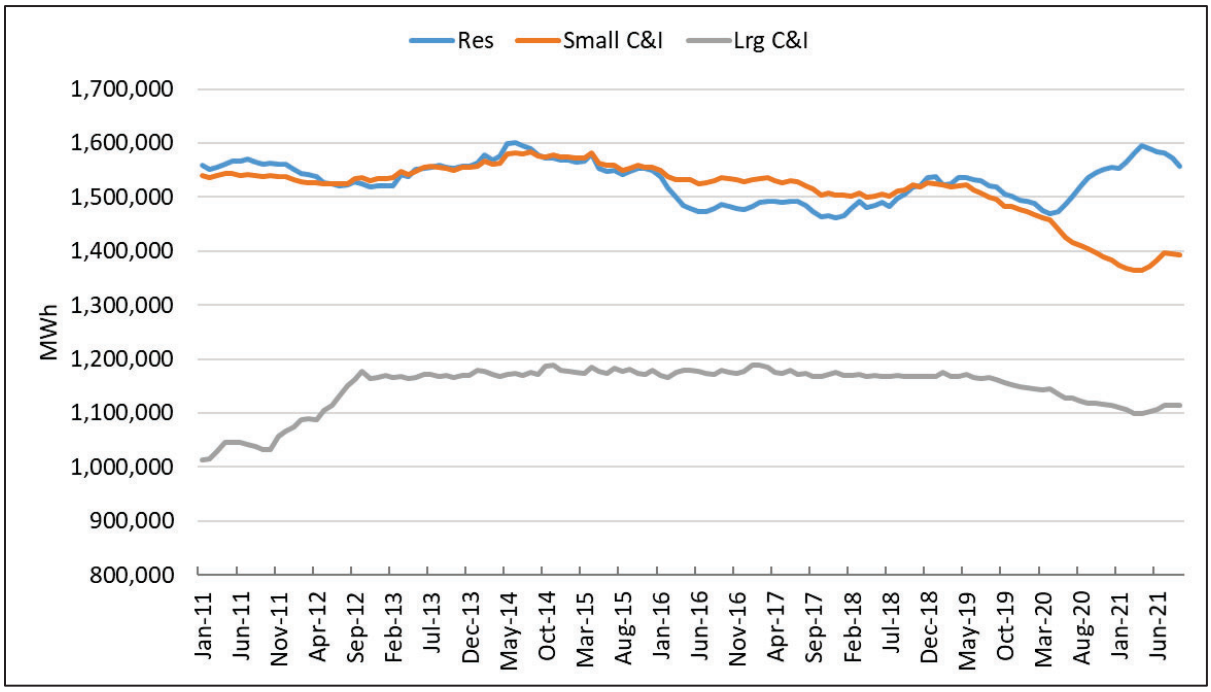
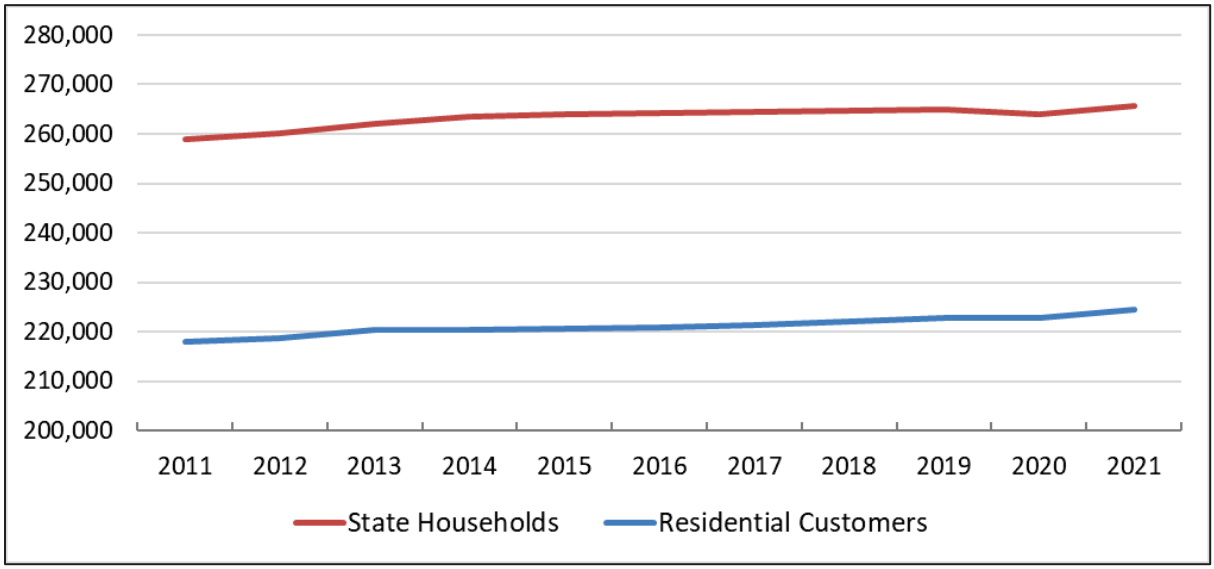


Figure 2 shows historical residential customers and number of state households.

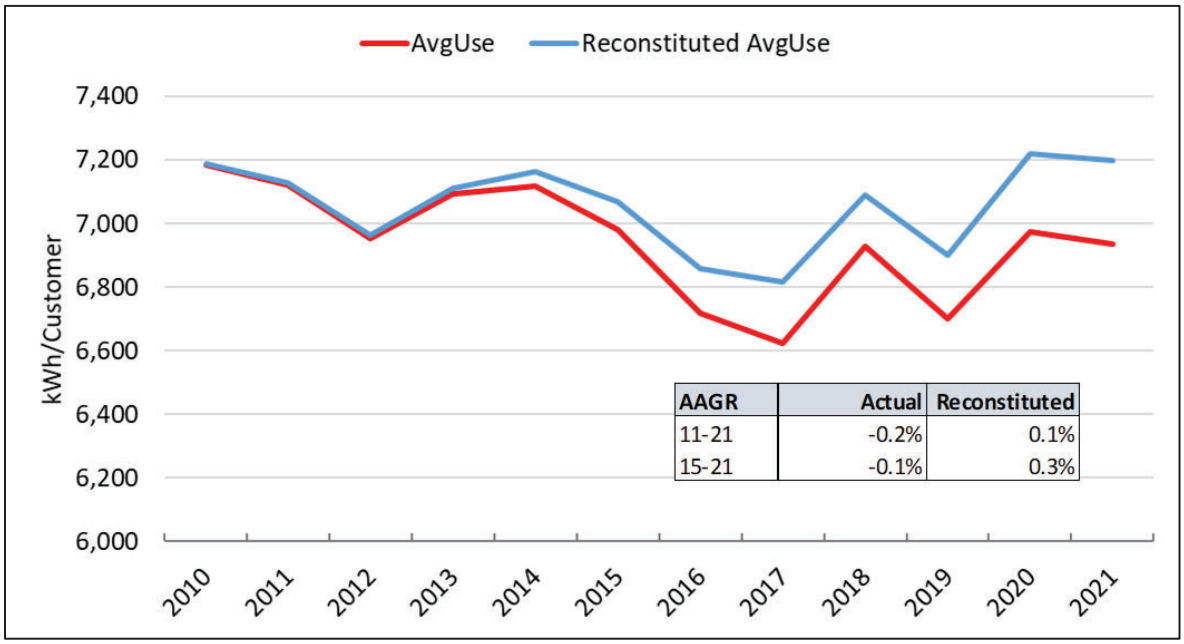
Figure 2: Residential Customers and State Households



Customer growth has been relatively slow. Since 2011, GMP has added roughly 5,000 customers. Customer growth has tracked state household growth with both customers and number of households averaging 0.3% annual growth through 2021. GMP accounts for approximately 84% of state households.

Behind the meter (BTM) solar has had significant impact on customer usage. Figure 3 compares measured residential average use against reconstituted average use (average use with own-use solar generation added back).

Figure 3: Residential Solar Load Impact

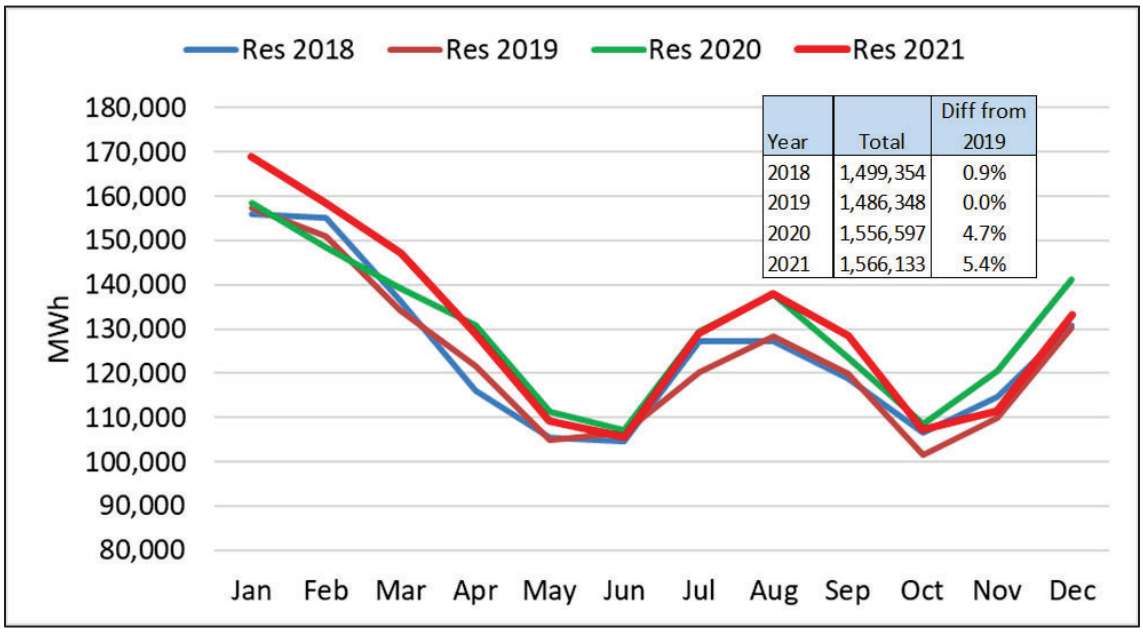


The chart shows relatively small decline in residential use. That, however, is largely a result of the large increase in 2020 and 2021 sales resulting from COVID-19 work at home mandate. Adjusting for COVID's impact average use has been declining close to 0.9% percent per year. The decline is roughly split between efficiency gains and solar adoption.

BTM solar penetration has had a meaningful impact starting 2014. By end of 2021, Solar's cumulative impact will reach roughly 260 kWh per customer with a total sales impact of over 59,000 MWh; this represents a little over 3.5% reduction in residential sales. While BTM solar also impacts small C&I usage, very little is reflected in the billed sales data; most of the solar usage is treated as a power purchase cost and registers on the C&I customer bill as a dollar credit.

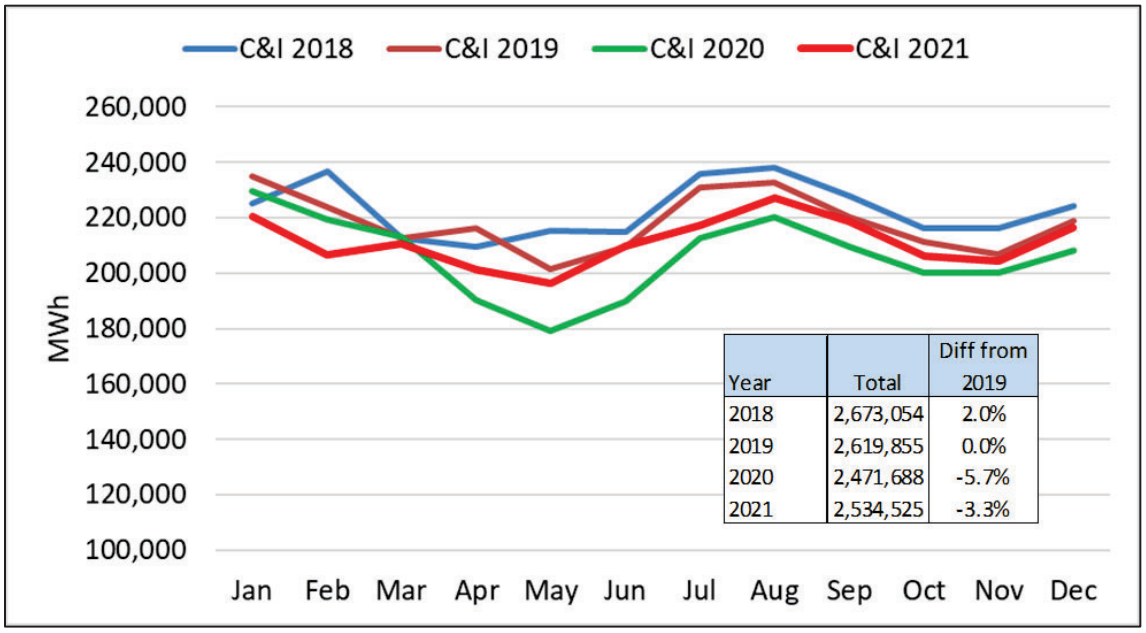
COVID-19 added a new twist to this year's forecast contributing to a large increase in residential sales and decline in C&I sales. Figure 4 and Figure 5 show COVID sales impact.

Figure 4: Residential COVID Sales Impact



Year	Total	Diff from 2019
2018	1,499,354	0.9%
2019	1,486,348	0.0%
2020	1,556,597	4.7%
2021	1,566,133	5.4%

Figure 5: COVID Impact on C&I Sales



Year	Total	Diff from 2019
2018	2,673,054	2.0%
2019	2,619,855	0.0%
2020	2,471,688	-5.7%
2021	2,534,525	-3.3%

For 2021, residential sales are expected to be 5.4% higher than 2019 sales and C&I sales are 3.3% lower than 2019 sales. The net impact (residential plus C&I)

is relatively small with total sales roughly 0.2% (10,000 MWh) lower than 2019 sales. With vaccinations beginning to slow COVID-19 spread, we expect to get close to the pre-pandemic residential and C&I sales mix by the start of Fiscal Year 2023.

The baseline forecast incorporates Moody's Analytics September 2021 state economic forecast and the Energy Information Administration (EIA) 2020 end-use energy intensity projections for New England. End-use intensity projections are adjusted to reflect end-use saturations for Vermont and VEIC's energy efficiency (EE) program savings projections.

Baseline Forecast Adjustments. The baseline forecast is adjusted for factors not captured in historical sales data. This includes adjustments for:

- New solar capacity and generation projections.
- Expected Tier 3 electrification impacts (heat pumps and custom projects).
- Electric vehicle sales.

1.1 Residential Sales Forecast

Since 2010, residential average use has declined from 7,200 kWh per customer to 6,700 kWh in 2019, a 0.8% average annual decline. Solar adoption has accounted for approximately half the decline with improvements in end-use efficiency from standards and state-sponsored energy efficiency programs the other half.

Average use in 2020 was up 4% over 2019 as a result of COVID work at home mandate. We expect most of the COVID impact to phase out by 2023.

Over the few years, solar adoption, natural occurring efficiency, and EE programs savings will continue to contribute to declining average use. By 2024, average use begins to turn positive with increase in electric sales from state heat pump program and beginning of measurable impact from electric vehicle adoption.

The residential sales forecast is derived by combining average use forecast with customer forecast. The customer forecast is based on state-level household projections. Table 3 shows the forecast results.

Table 3: Residential Sales Forecast

Year	Average Use (kWh)	Chg	Customers	Chg	Sales (MWh)	Chg
2021	7,019		224,067		1,572,658	
2022	6,625	-5.6%	224,869	0.4%	1,489,677	-5.3%
2023	6,593	-0.5%	225,425	0.2%	1,486,229	-0.2%
2024	6,643	0.8%	226,174	0.3%	1,502,364	1.1%
2025	6,723	1.2%	226,932	0.3%	1,525,639	1.5%
2026	6,818	1.4%	227,694	0.3%	1,552,511	1.8%
2027	6,942	1.8%	228,356	0.3%	1,585,284	2.1%
2028	7,088	2.1%	228,950	0.3%	1,622,882	2.4%
2029	7,267	2.5%	229,503	0.2%	1,667,704	2.8%
2030	7,461	2.7%	230,024	0.2%	1,716,140	2.9%
2031	7,665	2.7%	230,474	0.2%	1,766,541	2.9%
2032	7,877	2.8%	230,852	0.2%	1,818,532	2.9%
2033	8,101	2.8%	231,140	0.1%	1,872,480	3.0%
2034	8,321	2.7%	231,285	0.1%	1,924,602	2.8%
2035	8,534	2.6%	231,391	0.0%	1,974,695	2.6%
2036	8,725	2.2%	231,487	0.0%	2,019,633	2.3%
2037	8,893	1.9%	231,484	0.0%	2,058,521	1.9%
2038	9,027	1.5%	231,385	0.0%	2,088,778	1.5%
2039	9,131	1.1%	231,235	-0.1%	2,111,399	1.1%
2040	9,203	0.8%	231,057	-0.1%	2,126,316	0.7%
2041	9,269	0.7%	230,819	-0.1%	2,139,489	0.6%
21-26		-0.5%		0.3%		-0.2%
26-31		2.4%		0.2%		2.6%
31-41		1.9%		0.0%		1.9%

Table 4 shows the cumulative forecast adjustments. Energy efficiency and own-use solar impacts are part of the baseline forecast as both efficiency and solar are embedded in the historical data. Tier 3 projections are state-level heat pump projections adjusted for GMP's share of state electricity sales (approximately 84%). Similarly, EV sales are derived by applying GMP's share of state electric sales to state-level EV forecast.

Table 4: Residential Sales Forecast Disaggregation (MWh)

Year	NoEE(1)	EE(2)	Solar(3)	Tier3(4)	EV(5)	TtlAdj	Forecast
2022	1,497,042	-11,010	-10,142	9,131	4,656	-7,365	1,489,677
2023	1,496,614	-26,746	-17,585	23,451	10,495	-10,385	1,486,229
2024	1,510,768	-39,633	-25,208	38,866	17,572	-8,404	1,502,364
2025	1,529,743	-54,121	-32,236	55,375	26,878	-4,104	1,525,639
2026	1,545,593	-66,553	-38,553	72,983	39,041	6,918	1,552,511
2027	1,563,436	-79,896	-44,806	91,753	54,798	21,849	1,585,284
2028	1,579,709	-90,775	-51,285	110,253	74,980	43,172	1,622,882
2029	1,597,607	-100,862	-57,310	127,816	100,452	70,097	1,667,704
2030	1,613,546	-110,352	-63,562	144,505	132,004	102,594	1,716,140
2031	1,629,892	-120,006	-67,888	160,350	164,193	136,648	1,766,541
2032	1,644,544	-128,348	-71,382	175,397	198,322	173,988	1,818,532
2033	1,659,685	-136,930	-74,334	189,690	234,368	212,794	1,872,480
2034	1,673,190	-144,772	-77,557	203,268	270,473	251,412	1,924,602
2035	1,687,094	-152,210	-80,779	216,164	304,427	287,601	1,974,695
2036	1,700,259	-158,814	-84,300	228,410	334,079	319,374	2,019,633
2037	1,713,419	-165,537	-87,225	240,073	357,791	345,102	2,058,521
2038	1,725,549	-172,264	-90,447	251,173	374,766	363,228	2,088,778
2039	1,737,477	-179,224	-93,670	261,722	385,094	373,922	2,111,399
2040	1,748,756	-186,514	-97,218	271,748	389,544	377,560	2,126,316
2041	1,759,788	-194,033	-100,116	281,268	392,582	379,701	2,139,489

1. No EE forecast assumes no efficiency improvements after 2021.
2. Efficiency includes impacts of new standards, naturally occurring, and EE program-based efficiency improvements.
3. Solar is derived from GMP solar capacity forecast and is allocated to classes.
4. Tier 3 heat pump forecast is derived by adjusting VEIC projections for Vermont for the share of GMP sales.
5. VEIC EV forecast adjusted for GMP state share of electricity sales.

Starting in 2026 sales gain from heat pumps and electric vehicles are expected to outweigh sale losses from BTM solar and energy efficiency.

1.2 C&I Sales Forecast

Separate forecast models are estimated for the small and large commercial and industrial (C&I) customer classes. The Large C&I model excludes GlobalFoundries which is forecasted separately. Over the long-term, C&I sales are expected to continue to decline approximately 0.4% per year. GlobalFoundries remains a retail customer at a negotiated price per MWh starting in October 2022 and is removed from the forecast altogether beginning in October 2026. Baseline C&I sales forecasts are derived using linear regression models that relate monthly billed sales to state GDP, population,

employment, small C&I end-use intensity trends, state DSM savings projections, and weather conditions (heating and cooling degree-days). The modeled-base or baseline forecasts are adjusted for solar own-use (excess generation is treated as power purchase cost), Tier 3 electrification projects, and large load additions (and losses) associated with specific customer activity that would not be captured in the baseline models. Table 5 shows the C&I sales forecast.

Table 5: C&I Sales Forecast

Year	Small C&I (MWh)	Chg	Large C&I (MWh)	Chg	Other (MWh)	Chg	Total (MWh)	Chg
2021	1,409,215		1,111,423		3,792		2,524,430	
2022	1,450,162	2.9%	1,150,404	3.5%	3,781	-0.3%	2,604,348	3.2%
2023	1,463,385	0.9%	1,155,880	0.5%	3,781	0.0%	2,623,047	0.7%
2024	1,465,880	0.2%	1,161,400	0.5%	3,781	0.0%	2,631,061	0.3%
2025	1,466,016	0.0%	1,163,381	0.2%	3,781	0.0%	2,633,178	0.1%
2026	1,464,290	-0.1%	1,166,125	0.2%	3,781	0.0%	2,634,196	0.0%
2027	1,460,211	-0.3%	772,545	-33.8%	3,781	0.0%	2,236,537	-15.1%
2028	1,457,155	-0.2%	770,367	-0.3%	3,781	0.0%	2,231,303	-0.2%
2029	1,454,817	-0.2%	768,345	-0.3%	3,781	0.0%	2,226,943	-0.2%
2030	1,452,814	-0.1%	766,054	-0.3%	3,781	0.0%	2,222,650	-0.2%
2031	1,447,693	-0.4%	762,547	-0.5%	3,781	0.0%	2,214,022	-0.4%
2032	1,443,495	-0.3%	758,565	-0.5%	3,781	0.0%	2,205,841	-0.4%
2033	1,438,661	-0.3%	754,807	-0.5%	3,781	0.0%	2,197,250	-0.4%
2034	1,434,359	-0.3%	751,037	-0.5%	3,781	0.0%	2,189,177	-0.4%
2035	1,429,764	-0.3%	746,987	-0.5%	3,781	0.0%	2,180,532	-0.4%
2036	1,427,209	-0.2%	742,830	-0.6%	3,781	0.0%	2,173,820	-0.3%
2037	1,423,795	-0.2%	738,420	-0.6%	3,781	0.0%	2,165,996	-0.4%
2038	1,420,761	-0.2%	733,986	-0.6%	3,781	0.0%	2,158,528	-0.3%
2039	1,417,122	-0.3%	729,577	-0.6%	3,781	0.0%	2,150,480	-0.4%
2040	1,412,045	-0.4%	725,273	-0.6%	3,781	0.0%	2,141,100	-0.4%
2041	1,406,922	-0.4%	721,093	-0.6%	3,781	0.0%	2,131,797	-0.4%
21-26		0.8%		1.0%		-0.1%		0.9%
26-31		-0.2%		-7.0%		0.0%		-3.2%
31-41		-0.3%		-0.6%		0.0%		-0.4%

Table 6 shows the C&I sales disaggregation. As with residential sector, historical efficiency savings are embedded in the billing data and as a result are part of the baseline forecast. Own-use solar is only partially embedded in billed sales as the larger share of own-use sales is received as a bill credit. The larger part of solar load impact flows through as a reduction in system energy

requirements. Tier 3 projections include customer-specific activity not captured in the historical data.

Table 6: C&I Sales Forecast Disaggregation (MWh)

Year	NoEE(1)	EE(2)	Solar(3)	Tier3(4)	TtlAdj	Forecast
2022	2,614,704	-13,816	74	3,386	-10,356	2,604,348
2023	2,644,744	-27,977	185	6,095	-21,697	2,623,047
2024	2,663,923	-41,967	301	8,804	-32,861	2,631,062
2025	2,680,169	-58,911	407	11,513	-46,991	2,633,178
2026	2,694,743	-75,266	497	14,222	-60,546	2,634,196
2027	2,311,817	-92,801	590	16,931	-75,280	2,236,537
2028	2,319,994	-109,027	696	19,640	-88,691	2,231,303
2029	2,328,941	-125,124	777	22,349	-101,997	2,226,943
2030	2,336,623	-139,902	871	25,058	-113,973	2,222,650
2031	2,344,138	-156,780	928	25,736	-130,117	2,214,022
2032	2,350,934	-171,821	993	25,736	-145,092	2,205,841
2033	2,358,248	-187,757	1,024	25,736	-160,998	2,197,250
2034	2,364,801	-202,432	1,072	25,736	-175,624	2,189,177
2035	2,371,015	-217,339	1,121	25,736	-190,483	2,180,532
2036	2,376,704	-229,808	1,189	25,736	-202,884	2,173,820
2037	2,381,775	-242,731	1,217	25,736	-215,779	2,165,996
2038	2,386,224	-254,697	1,265	25,736	-227,696	2,158,528
2039	2,390,635	-267,203	1,313	25,736	-240,154	2,150,480
2040	2,394,948	-280,969	1,385	25,736	-253,848	2,141,100
2041	2,399,390	-294,738	1,410	25,736	-267,593	2,131,797

1. No EE forecast assumes no efficiency improvements after 2021.
2. Efficiency includes impacts of new standards, naturally occurring, and program-based efficiency improvements.
3. Solar is derived from GMP solar capacity forecast and is allocated to classes.
4. Electrification is based on expected gains from class-specific Tier 3 electrification projects.

The "No EE" forecast shows a significant drop in 2027 reflecting the loss of GlobalFoundries.

Table 7 shows the breakdown of total sales forecast.

Table 7: Forecast Disaggregation (MWh)

Year	NoEE(1)	EE(2)	Solar(3)	Tier3(4)	EV(5)	TtlAdj	Forecast
2022	4,111,746	-24,826	-10,068	12,517	4,656	-17,722	4,094,024
2023	4,141,358	-54,722	-17,400	29,546	10,495	-32,082	4,109,276
2024	4,174,691	-81,600	-24,907	47,670	17,572	-41,265	4,133,426
2025	4,209,912	-113,032	-31,829	66,888	26,878	-51,094	4,158,818
2026	4,240,336	-141,819	-38,056	87,206	39,041	-53,628	4,186,708
2027	3,875,253	-172,698	-44,215	108,685	54,798	-53,431	3,821,822
2028	3,899,703	-199,802	-50,590	129,893	74,980	-45,518	3,854,185
2029	3,926,548	-225,986	-56,532	150,165	100,452	-31,901	3,894,648
2030	3,950,169	-250,254	-62,692	169,563	132,004	-11,379	3,938,790
2031	3,974,030	-276,786	-66,961	186,086	164,193	6,532	3,980,562
2032	3,995,477	-300,169	-70,389	201,132	198,322	28,896	4,024,373
2033	4,017,933	-324,687	-73,310	215,426	234,368	51,797	4,069,730
2034	4,037,991	-347,204	-76,484	229,004	270,473	75,788	4,113,779
2035	4,058,109	-369,549	-79,659	241,899	304,427	97,118	4,155,227
2036	4,076,962	-388,622	-83,111	254,145	334,079	116,491	4,193,453
2037	4,095,194	-408,268	-86,008	265,808	357,791	129,323	4,224,518
2038	4,111,773	-426,960	-89,182	276,908	374,766	135,532	4,247,306
2039	4,128,111	-446,427	-92,357	287,458	385,094	133,768	4,261,879
2040	4,143,704	-467,482	-95,833	297,483	389,544	123,712	4,267,416
2041	4,159,178	-488,771	-98,706	307,003	392,582	112,108	4,271,286

Across all classes, it is not until 2031 that sales gain from electrification and heat pumps outweigh sales loss due to efficiency gains and solar adoption.

II. Forecast Drivers

Sales forecast is tied to household and economic projections, expected efficiency gains, increasing average temperature, BTM solar capacity installation, state electrification activity, and EV market penetration. Model inputs include:

- Moody Analytics September 2021 Vermont economic forecast.
- AEO 2020 end-use efficiency estimates for the New England Census Division (modified for Vermont end-use information).
- VEIC current energy efficiency savings projections, cold-climate heat pumps forecast, electric vehicle forecast.
- GMP's updated solar capacity forecast.
- GMP adjustments for C&I Tier 3 electrification efforts that would not be reflected in the historical billing data.
- Updated trended normal HDD and CDD with data through 2020.
- State response to COVID-19

2.1 Economic Forecast

The FY22 forecast is based on Moody's September 2021 state economic projections. The primary economic drivers include number of state households, state real personal income, employment, and real state economic output (GDP). Table 8 shows historical and projected economic outlook.

Table 8: State Economic Projections

Year	Households (Thou)	Chg	RPI (Mil $)	Chg	GDP (Mil $)	Chg	Emp (Thou)	Chg
2011	258.9		27,890		28,694		300.9	
2012	260.2	0.5%	28,336	1.6%	28,951	0.9%	304.5	1.2%
2013	262.1	0.7%	28,431	0.3%	28,345	-2.1%	306.7	0.7%
2014	263.4	0.5%	29,011	2.0%	28,480	0.5%	309.6	0.9%
2015	264.1	0.3%	29,924	3.1%	28,913	1.5%	312.1	0.8%
2016	264.2	0.1%	30,194	0.9%	29,164	0.9%	313.3	0.4%
2017	264.5	0.1%	30,410	0.7%	29,320	0.5%	315.0	0.5%
2018	264.7	0.1%	30,878	1.5%	29,584	0.9%	316.1	0.3%
2019	265.0	0.1%	31,413	1.7%	29,670	0.3%	315.3	-0.3%
2020	263.9	-0.4%	33,138	5.5%	28,398	-4.3%	289.1	-8.3%
2021	265.8	0.7%	33,297	0.5%	29,707	4.6%	296.5	2.6%
2022	267.4	0.6%	32,470	-2.5%	30,842	3.8%	310.5	4.7%
2023	269.0	0.6%	33,201	2.3%	31,547	2.3%	315.3	1.5%
2024	270.2	0.5%	34,042	2.5%	32,352	2.6%	317.4	0.7%
2025	271.3	0.4%	34,806	2.2%	33,104	2.3%	318.3	0.3%
2026	272.4	0.4%	35,555	2.2%	33,785	2.1%	318.8	0.2%
2027	273.2	0.3%	36,350	2.2%	34,394	1.8%	319.2	0.1%
2028	274.0	0.3%	37,222	2.4%	35,016	1.8%	319.6	0.1%
2029	274.8	0.3%	38,102	2.4%	35,639	1.8%	320.0	0.1%
2030	275.5	0.3%	38,942	2.2%	36,237	1.7%	320.3	0.1%
2031	276.1	0.2%	39,719	2.0%	36,837	1.7%	320.5	0.1%
2032	276.6	0.2%	40,469	1.9%	37,463	1.7%	320.5	0.0%
2033	276.9	0.1%	41,198	1.8%	38,108	1.7%	320.7	0.1%
2034	277.1	0.1%	41,891	1.7%	38,755	1.7%	320.7	0.0%
2035	277.2	0.1%	42,565	1.6%	39,400	1.7%	320.7	0.0%
2036	277.3	0.0%	43,218	1.5%	40,040	1.6%	320.5	-0.1%
2037	277.3	0.0%	43,866	1.5%	40,670	1.6%	320.2	-0.1%
2038	277.1	-0.1%	44,490	1.4%	41,293	1.5%	320.0	-0.1%
2039	276.9	-0.1%	45,085	1.3%	41,916	1.5%	319.7	-0.1%
2040	276.6	-0.1%	45,660	1.3%	42,542	1.5%	319.5	-0.1%
2041	276.3	-0.1%	46,216	1.2%	43,172	1.5%	319.4	0.0%
11-20		0.2%		1.9%		-0.1%		-0.4%
21-31		0.4%		1.8%		2.2%		0.8%
31-41		0.0%		1.5%		1.6%		0.0%

In 2020, state output (GDP) dropped 4.3% and employment declined 8.3% while personal income increased 5.5%. The large increase in real income is a result of government financial stimulus designed to counter the COVID employment impact. Moody's projects economic recovery to pre-pandemic levels by 2023 with strong economic growth coming out of the COVID-driven recession.

Long-term, number of state households is expected to increase 0.4%; number of households drives residential customer forecast which historically and through the forecast period increases at a slightly lower rate. Economic growth recovers from the COVID-induced recession quickly with GDP jumping 4.6% in 2021 and 3.8% in 2022.

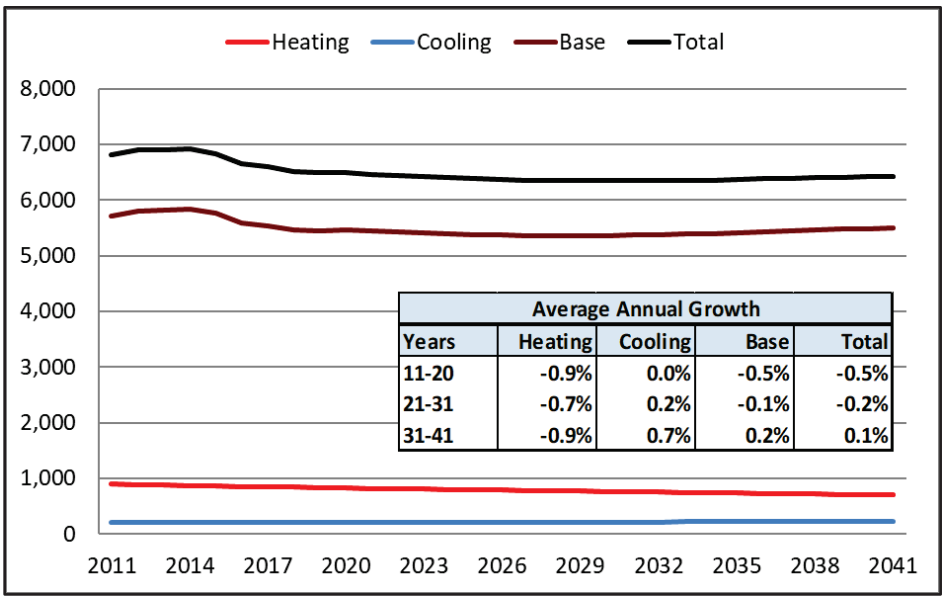
2.2 Energy Efficiency Impact

Efficiency gains continue to counter sales growth from customer and economic growth. Efficiency gains are captured two ways – through (1) end-use energy intensity projections and (2) expected state-sponsored EE program savings. By 2031, EE savings are expected to reduce total sales by 7.0% (roughly 277 thousand MWh) from current sales levels. EE savings reduces average annual sales growth by 0.4% over this period.

End-Use Model Intensities. End-use intensities are derived for ten residential and nine small C&I end-uses. End-use intensities reflect both increase in appliance ownership (saturation) and change in stock efficiency. In the residential sector, intensities are measured on a kWh per household basis and in the small C&I sector on a kWh per square-foot basis. End-use intensities are based on EIA 2020 Annual Energy Outlook for New England. Residential end-use saturations are calibrated to Vermont-specific end-use saturations where this data is available.

For most end-uses, increasing efficiency outweighs increase in saturation contributing to declining customer average use. The exception is residential cooling where saturations continue to trend positive at a rate slightly faster than air conditioning stock efficiency. Incentivized heat-pumps are also expected to contribute to additional cooling-related sales. While cooling intensity is increasing, aggregate cooling consumption is still relatively small given the temperate summer weather conditions. Figure 6 shows residential end-use intensities aggregated into heating, cooling, base, and total intensity.

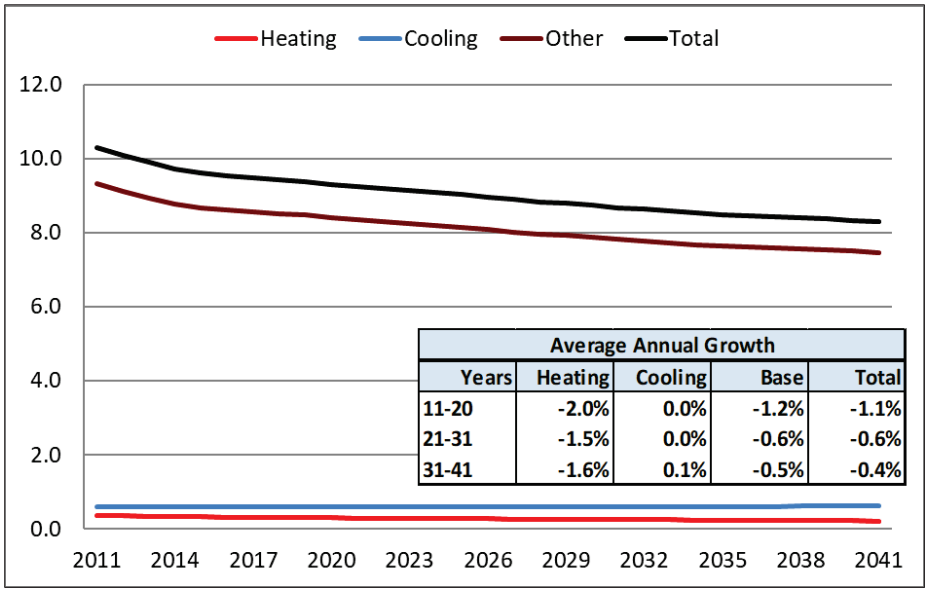
Figure 6: Residential End-Use Indices (kWh per Household)



Average Annual Growth				
Years	Heating	Cooling	Base	Total
11-20	-0.9%	0.0%	-0.5%	-0.5%
21-31	-0.7%	0.2%	-0.1%	-0.2%
31-41	-0.9%	0.7%	0.2%	0.1%

Figure 7 shows small C&I heating, cooling, and other use intensity trends. Intensities are expressed on a kWh per square foot basis. Heating and cooling intensities are relatively small. The non-weather sensitive use (Base) is composed of seven end-uses where the largest end-uses include ventilation, lighting, refrigeration, and miscellaneous use.

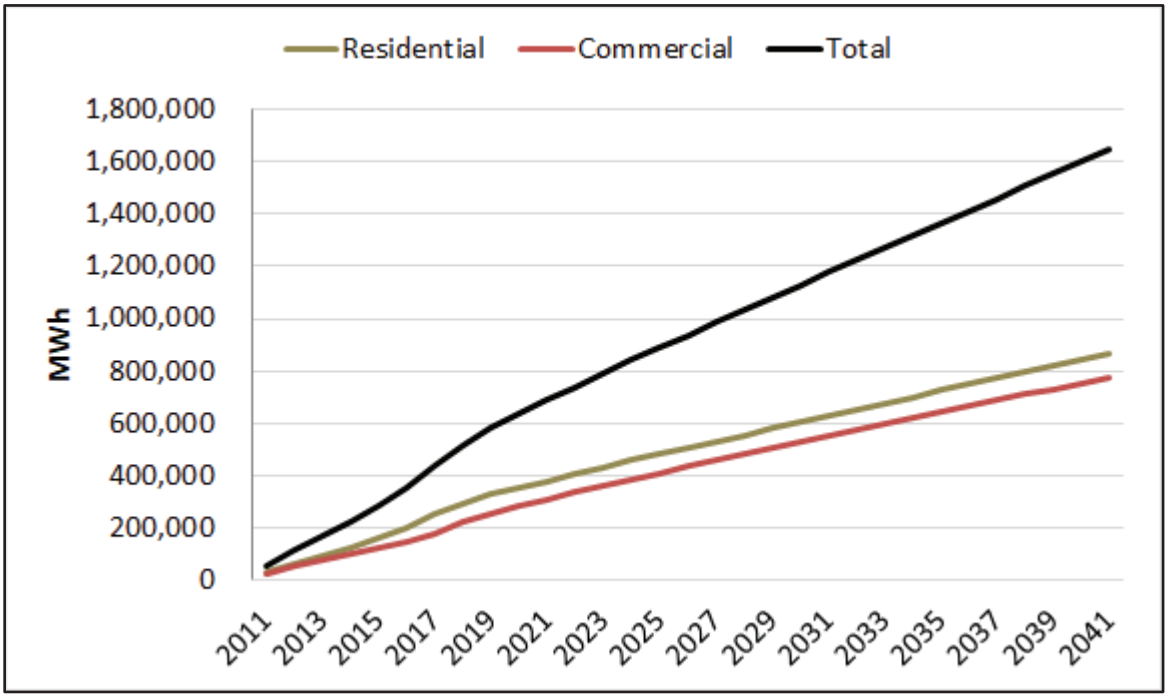
Figure 7: Small C&I End-Use Intensities (kWh/sqft)



Average Annual Growth				
Years	Heating	Cooling	Base	Total
11-20	-2.0%	0.0%	-1.2%	-1.1%
21-31	-1.5%	0.0%	-0.6%	-0.6%
31-41	-1.6%	0.1%	-0.5%	-0.4%

Energy Efficiency Program Savings. EIA captures the impact of regional (New England) energy efficiency (EE) programs through the National End-Use Modeling System (NEMS) by incentivizing the adoption of more efficient technologies in the end-use choice models. Additional savings from Vermont EE program activity are captured by incorporating historical and projected DSM savings as model variables. The DSM variables are constructed by cumulating EE savings over the historical and into the forecast period. Historical program savings are derived from Efficiency Vermont's *Savings Claim Summary* reports, and future savings provided by Efficiency Vermont reflect the state's most recently approved efficiency program budget. Historical and forecasted savings are scaled to reflect GMP's share of state electric sales. Figure 8 shows the DSM model inputs.

Figure 8: Cumulative EE Savings

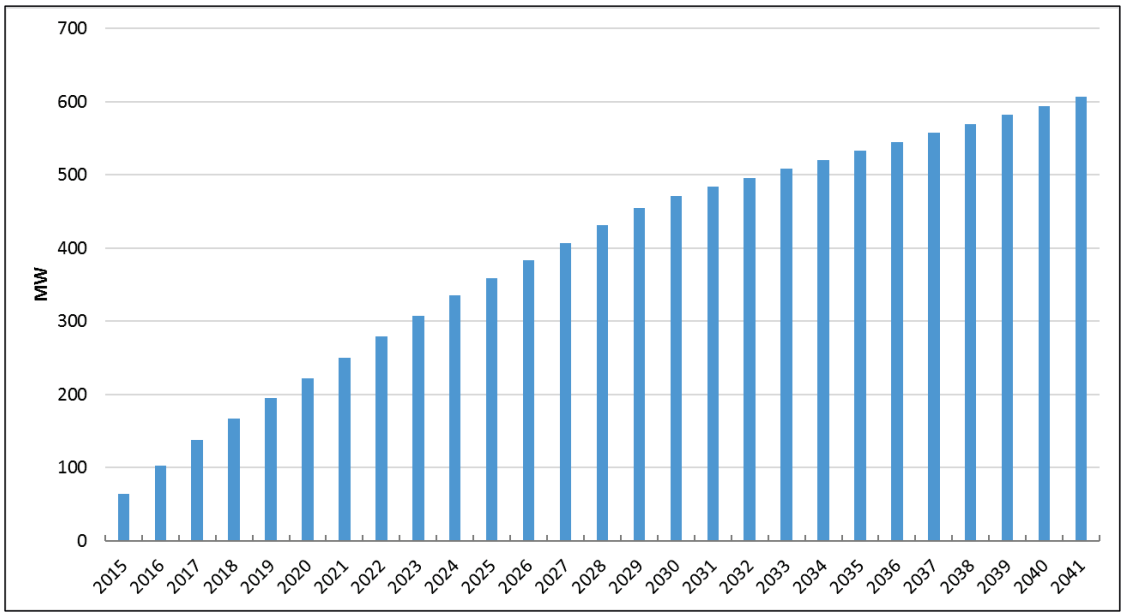


2.3 Solar Load Impact

Solar Capacity Forecast. The behind the meter (BTM) solar capacity forecast is developed by GMP. By September of 2021, an estimated 240 MW of BTM solar has been installed; this includes traditional, customer owned or leased roof-top systems, and larger community/group-based systems. GMP expects BTM solar to continue to increase at a strong pace adding 24 MW per year through 2030. Capacity growth slows after 2030 increasing at half the rate at 12 MW per year.

By 2041 GMP projects over 600 MW of BTM solar capacity. Figure 9 shows the year-end (calendar year) capacity forecast.

Figure 9: Year-End Solar Capacity Forecast



Capacity Class Allocation. The capacity forecast is allocated to the residential, small C&I, and large C&I classes based on the previous 12 months of billed solar generation data. Table 9 shows the allocation factors.

Table 9: Capacity Allocation Factors

Class	Previous 12 Mnth Generation (MWh)	Share of Total
Residential	88,590	31.7%
Commerical	159,078	56.9%
Industrial	32,093	11.5%

Solar Generation. Solar output is derived by applying monthly solar load factors to the capacity forecast; load factors are based on typical solar generation patterns developed by GMP. Table 10 shows the solar generation load factors.

Table 10: Solar Load Factors

Month	Load Factor
Jan	7.7%
Feb	10.8%
Mar	14.1%
Apr	18.8%
May	19.5%
Jun	20.6%
Jul	20.3%
Aug	19.5%
Sep	15.7%
Oct	12.5%
Nov	8.4%
Dec	5.7%

Solar Own-Use. Solar generation is either consumed onsite (*own-use*) or returned to the connected power-grid (*excess*); own-use reduces billed revenues, while excess is treated as power purchase cost. Solar billing data are used to determine the own-use and excess allocations. The split between own-use and excess varies by revenue class and month; own-use share is typically smaller in the summer months with a larger percentage of the generation sent to the grid. Figure 10 shows total, own use, and excess solar generation. Excess is significantly higher than own use. One reason is that most of small C&I solar generation are purchases from large offsite solar installations that do not directly impact the customer's usage.

Figure 10: BTM Solar Generation

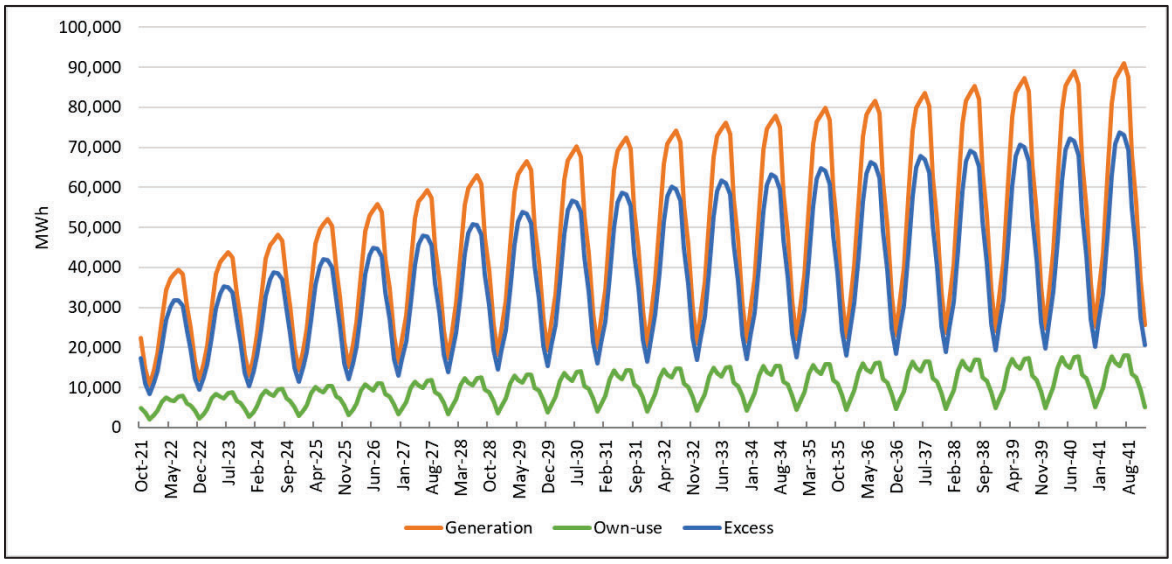


Table 11 shows the forecasted capacity and solar generation by rate case.

Table 11: Solar Generation

		Total			Residential			Commercial & Industrial		
Year	Year End Capacity (MW)	MWh Generation	MWh Excess	MWh Own Use	MWh Generation	MWh Excess	MWh Own Use	MWh Generation	MWh Excess	MWh Own Use
2021	250.5	282,570	225,025	57,545	90,249	31,947	58,302	192,321	193,078	-757
2022	278.9	330,753	263,895	66,858	104,737	36,657	68,080	226,016	227,239	-1,222
2023	307.3	366,688	292,573	74,115	116,116	40,641	75,475	250,572	251,931	-1,360
2024	335.7	403,540	321,991	81,549	127,786	44,718	83,068	275,754	277,274	-1,519
2025	359.5	436,889	348,607	88,282	138,346	48,431	89,915	298,542	300,176	-1,633
2026	383.3	467,121	372,734	94,387	147,920	51,784	96,135	319,202	320,950	-1,749
2027	407.1	497,360	396,867	100,493	157,495	55,138	102,357	339,865	341,729	-1,864
2028	431.0	528,658	421,854	106,803	167,406	58,594	108,812	361,252	363,260	-2,008
2029	454.8	557,828	445,124	112,705	176,643	61,844	114,800	381,185	383,280	-2,095
2030	471.5	587,500	468,812	118,688	186,039	65,147	120,892	401,461	403,665	-2,204
2031	483.7	606,538	484,026	122,512	192,068	67,266	124,801	414,470	416,759	-2,289
2032	496.0	623,386	497,484	125,902	197,403	69,118	128,285	425,983	428,366	-2,383
2033	508.3	637,708	508,901	128,807	201,938	70,723	131,215	435,770	438,178	-2,408
2034	520.6	653,293	521,339	131,954	206,873	72,451	134,422	446,420	448,887	-2,468
2035	532.8	668,878	533,776	135,101	211,808	74,180	137,629	457,069	459,597	-2,527
2036	545.1	685,854	547,338	138,516	217,184	76,044	141,140	468,670	471,294	-2,624
2037	557.4	700,048	558,652	141,396	221,679	77,636	144,042	478,369	481,015	-2,646
2038	569.7	715,633	571,089	144,543	226,614	79,365	147,249	489,019	491,724	-2,706
2039	582.0	731,217	583,527	147,691	231,549	81,093	150,456	499,669	502,434	-2,765
2040	594.2	748,321	597,191	151,130	236,965	82,970	153,995	511,356	514,222	-2,866
2041	606.5	762,387	608,402	153,985	241,419	84,550	156,869	520,968	523,852	-2,884

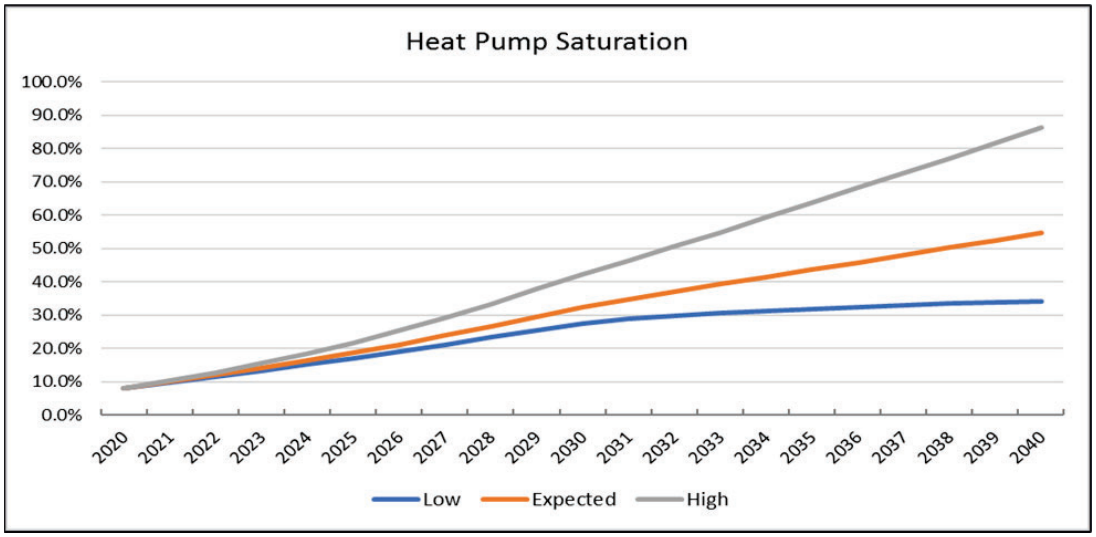
The sales forecast is adjusted for solar load impacts by subtracting cumulative new solar own-use generation from the appropriate class sales forecasts. By 2030, solar generation reduces residential sales by an additional 120,892 MWh, which represents a reduction of 528 kWh per customer. C&I solar impacts are relatively small as most of the C&I solar generation is treated as excess generation that shows up as a reduction in system energy requirements.

2.4 Tier 3 Electrification Impacts

State Tier 3 objectives are designed to reduce greenhouse gases with a large part of that effort through statewide electrification programs. The largest program is an incentive program promoting adoption of cold-climate heat pumps.

The heat pump forecast is based on the state-level forecast developed by Vermont Efficiency Investment Corporation (VEIC) and Department of Public Service (DPS) staff. VEIC and DPS developed low, medium, and high case projections; these forecasts are incorporated in the 2020 Vermont Electric Power Company (VELCO) IRP forecast. Figure 11 show saturation projections.

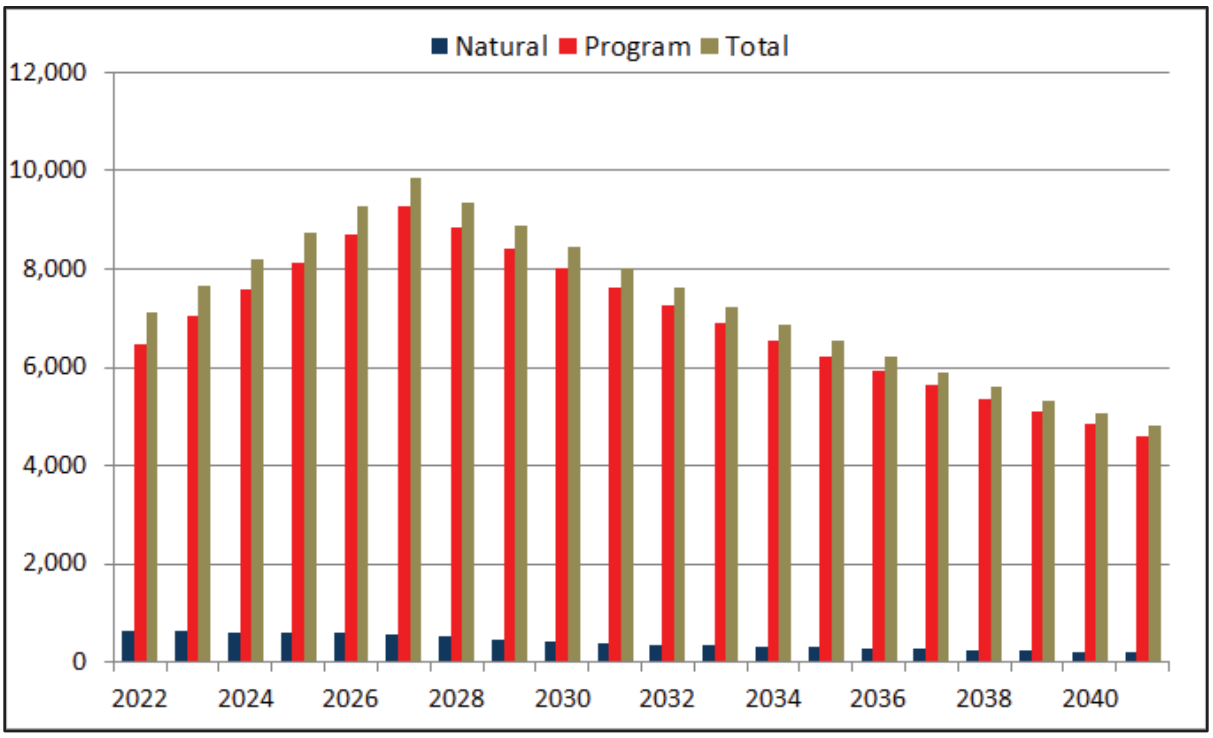
Figure 11: Heat Pump Program Forecast



The GMP forecast is based on the *expected* case. In the expected case, 30% of residential customers have heat pumps by 2030 and 50% of households by 2040 have either whole-house or auxiliary heat-pump units.

A small share of the heat pump program forecast is already captured in the end-use model. To avoid double counting, units sold through the heat-pump program are reduced by the number of units captured in the forecast model. Figure 12 shows net unit heat pump adoptions.

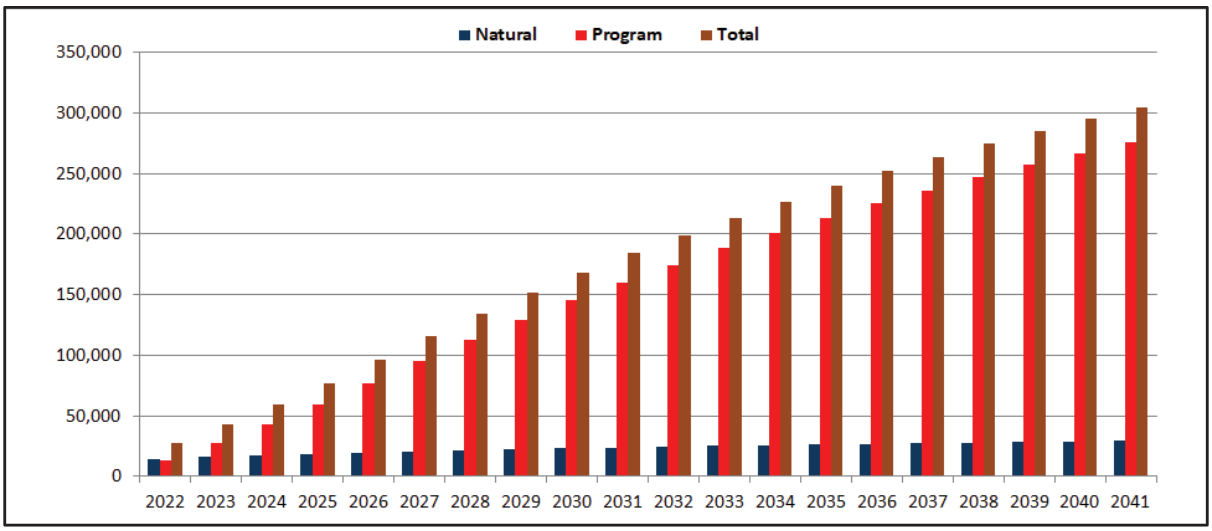
Figure 12: Cold-Climate Heat Pump Net Unit Adoption (units)



Net units decline in the out years, as by this point some heat pump unit sales are replacing older, less efficient heat pumps.

Annual heat pump energy projections are based on the GMP input based in turn on 2017 Cadmus heat pump study for Vermont. Cadmus estimated heat pumps on average use 2,085 kWh per year for heating and 146 kWh per year for cooling. Heat pump use declines over the forecast period with improvements in heat pump efficiency. Heat pump electricity sales are derived by multiplying the net heat pump unit forecast with the winter and summer heat-pump annual usage. Electricity use from market-driven heat pump adoption are captured in the baseline forecast models. Figure 13 shows projected heat pump sales.

Figure 13: Heat Pump Sales (MWh)



Based on unit projections and heat pump annual average use, the heat pump program is expected to add 150,000 MWh in sales by 2030 and over 270,000 MWh by 2040.

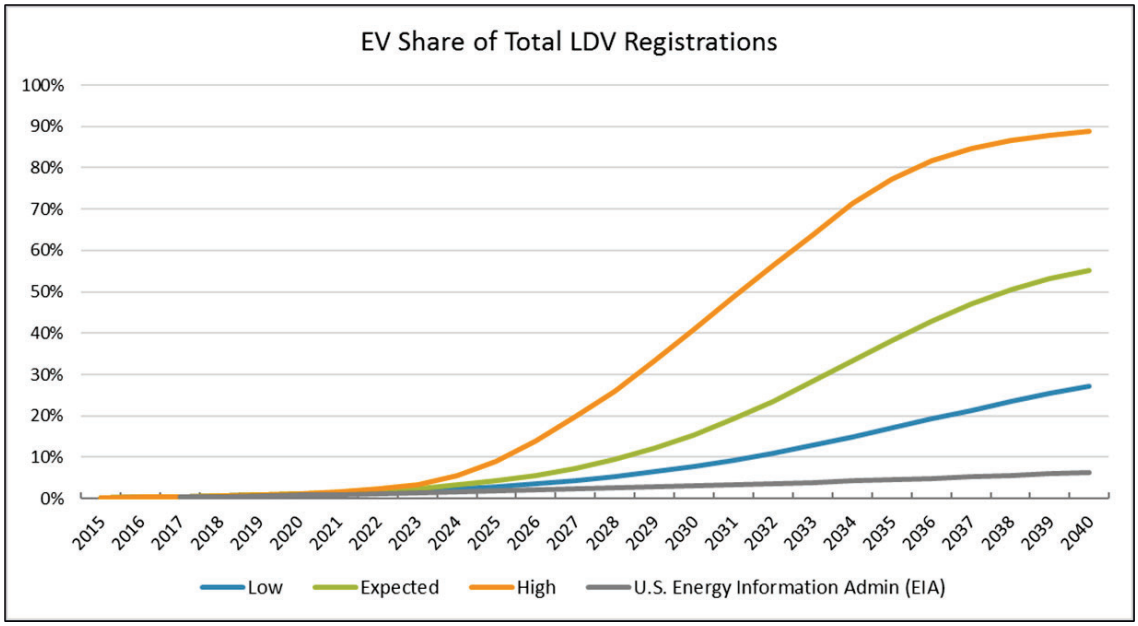
The C&I Tier 3 sales are relatively small. Total Tier 3 sales reach 25,736 MWh by 2030 and is kept at the same level through 2041. Tier 3 C&I sales include a small amount of program-related heat-pump sales and several customer-specific electrification projects.

2.5 Electric Vehicle Forecast

As of Jan 2021, Vermont had approximately 4,360 registered plug-in hybrid (PHEV) and all battery electric (BEV) vehicles. While still relatively low percent of new car sales, demand is expected to significantly increase over the next five years with declining vehicle costs, longer lasting batteries, improving infrastructure, and new vehicle models. EV investment commitments from GM, Volkswagen, Ford, and other major vehicle manufacturers along with new federal policy promoting electric vehicles all but guarantee strong growth in electric vehicle sales. There are dozens of new models coming into the market including this year's Ford Mustang, GMC Hummer, and Volkswagen's new ID.4 SUV.

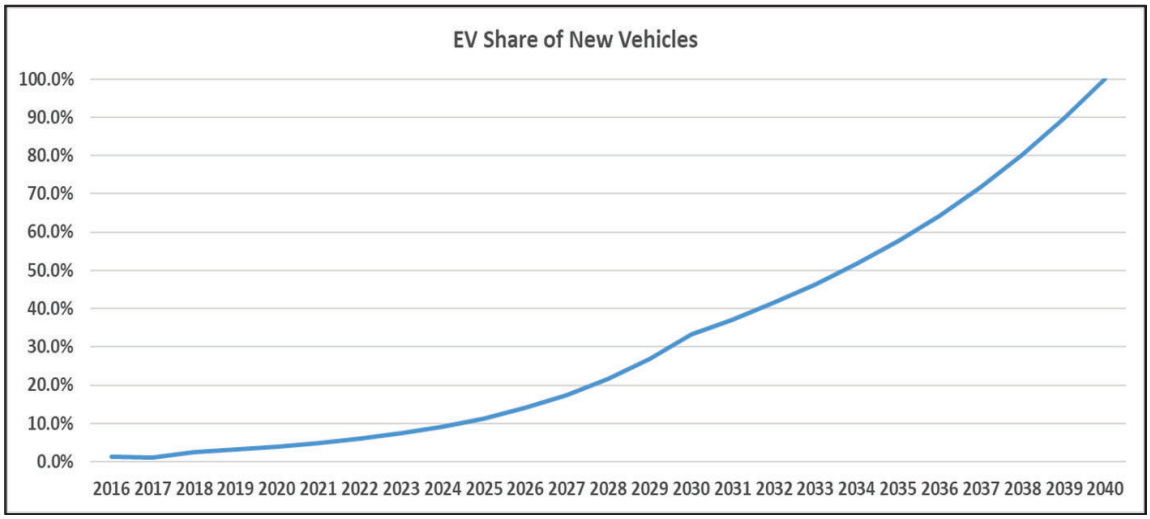
The EV sales forecast is based on VEICs EV projections that were developed as part of the 2020 long-term VELCO energy and demand forecast. Figure 14 shows EV share of total vehicle stock.

Figure 14: EV Saturation Forecast



Projections show low, expected, and high saturation scenarios and in addition, EIA's saturation projections. EIA's current projection is significantly more conservative than nearly all other EV projections. The GMP forecast is based on VEIC's expected saturation path. Figure 15 shows how the saturation projection translates into share of new purchases.

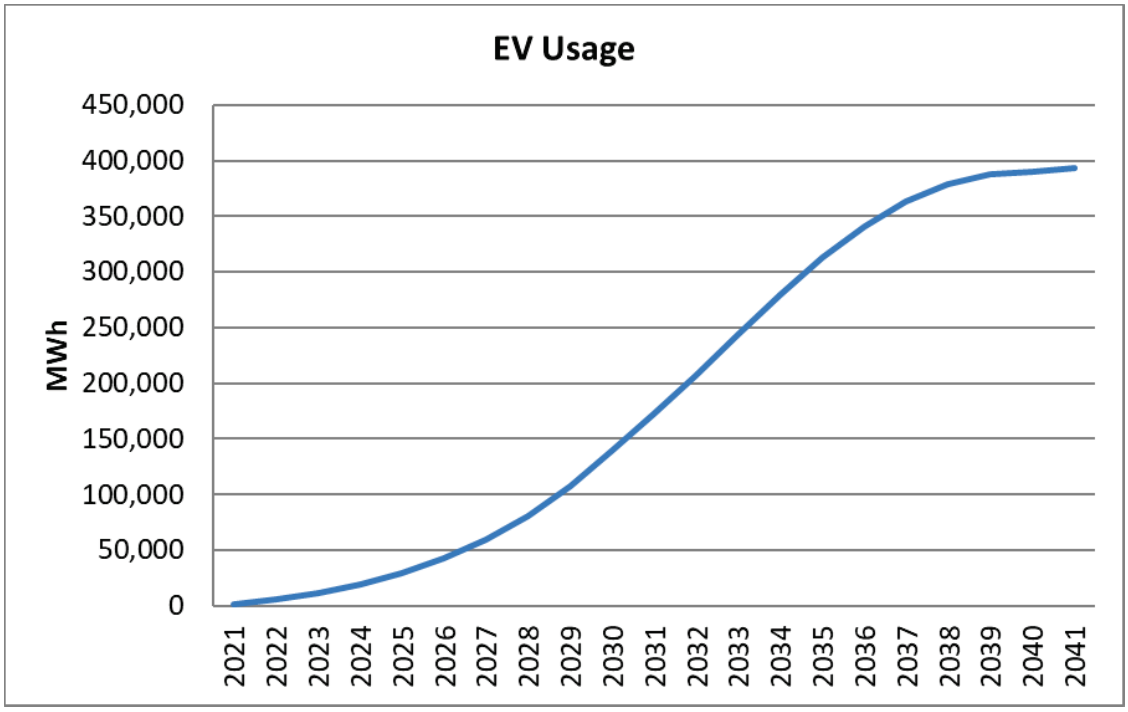
Figure 15: New Vehicle Purchases



By 2030, one in three vehicle purchases are expected to be electric. This is consistent with the most recent BloombergNEF forecast. By 2041, nearly all new vehicle purchases are electric.

Figure 16 shows the GMP electric vehicle sales forecast. Inputs include number of EVs, average annual miles driven, and miles per kWh.

Figure 16: Electric Vehicle Sales



2.6 Customer Specific Load Adjustments

The largest load adjustment is for the loss of GlobalFoundries as a retail customer; their sales are a third of Large C&I class sales. GlobalFoundries is dropped from the retail sales forecast beginning October 2026.

III. Baseline Forecast Models

Baseline sales forecasts are derived from estimated linear regression models that relate monthly historical sales to economic conditions, price, weather conditions, end-use energy intensity trends, and EE program savings.

Separate forecast models are estimated for the primary revenue classes. Models are estimated for the following:

- Residential
- Small C&I
- Large C&I
- Other

Residential and small C&I models are constructed using an SAE modeling framework. This approach entails constructing generalized end-use variables (Heating, Cooling, and Other Use) that incorporate expected end-use saturation and efficiency projections as well as price, economic drivers, and weather. The SAE specification allows us to directly capture the impact of improving end-use efficiency and end-use saturation trends on class sales.

3.1 Residential Sales Model

The residential forecast is generated using separate average use and customer forecast models. The average use model is estimated using an SAE specification where monthly average use is estimated as a function of a heating variable (*XHeat*), cooling variable (*XCool*) and other use variable (*XOther*) as shown below:

$$AvgUse_m = a + b_1 \times XHeat_m + b_2 \times XCool_m + b_3 \times XOther_m + b_4 \times DSM + \varepsilon_m$$

XHeat is calculated as a product of a variable that captures changes in heating end-use saturation and efficiency (HeatIndex), economic and other factors that impact stock utilization (HDD, household size, household income, and price). *XHeat* is calculated as:

$$XHeat_{y,m} = HeatIndex_y \times HeatUse_{y,m}$$

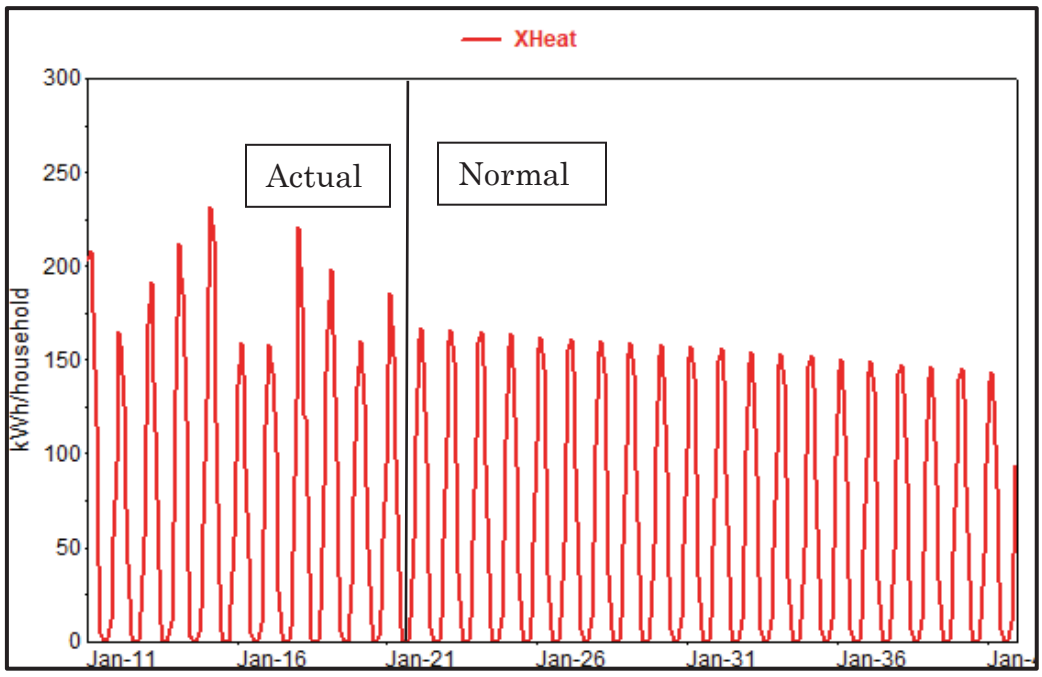
Where:

$$HeatUse_{y,m} = \left(\frac{HDD_{y,m}}{HDD_{15}}\right) \times \left(\frac{HHSize_y}{HHSize_{15}}\right)^{0.20} \times \left(\frac{Income_y}{Income_{15}}\right)^{0.20} \times \left(\frac{Price_{y,m}}{Price_{15}}\right)^{-0.10}$$

The heat index is a variable that captures heating end-use efficiency and saturation trends, thermal shell improvement trends, and housing square footage trends. The index is constructed from the EIA's annual end-use residential forecast for the New England census division. The economic and price drivers are incorporated into the HeatUse variable. By construction, the $HeatUse_{y,m}$ variable sums close to 1.0 in the base year (2015). This index value changes through time and across months in response to changes in weather conditions, prices, household size, and household income.

The heat index (*HeatIndex*) and heat use variable (*HeatUse*) are combined to generate the monthly heating variable XHeat. Figure 17 shows the calculated XHeat variable.

Figure 17: XHeat Variable



The strong decline in the XHeat is largely driven by decline in resistance heat and improvements in heat pump efficiency. Program-related heat pump electricity sales are added to the baseline forecast.

Similar variables are constructed for cooling (*XCool*) and other end-uses (*XOther*).

Figure 18 and Figure 19 show XCool and XOther.

Figure 18: XCool Variable

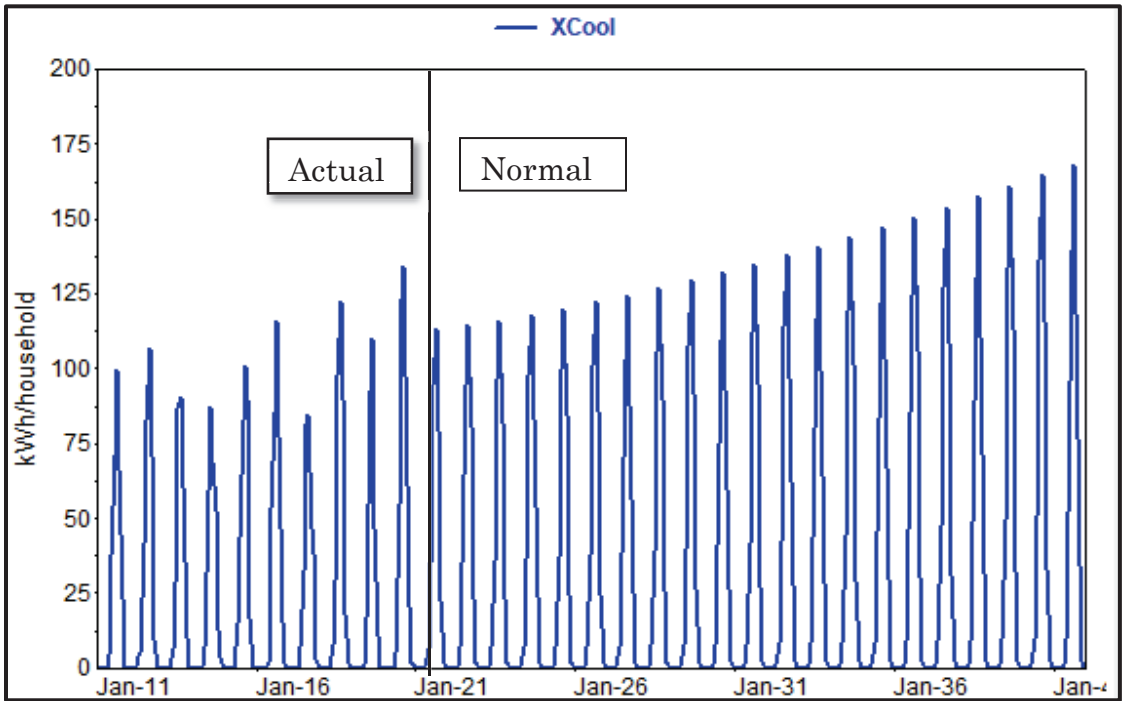
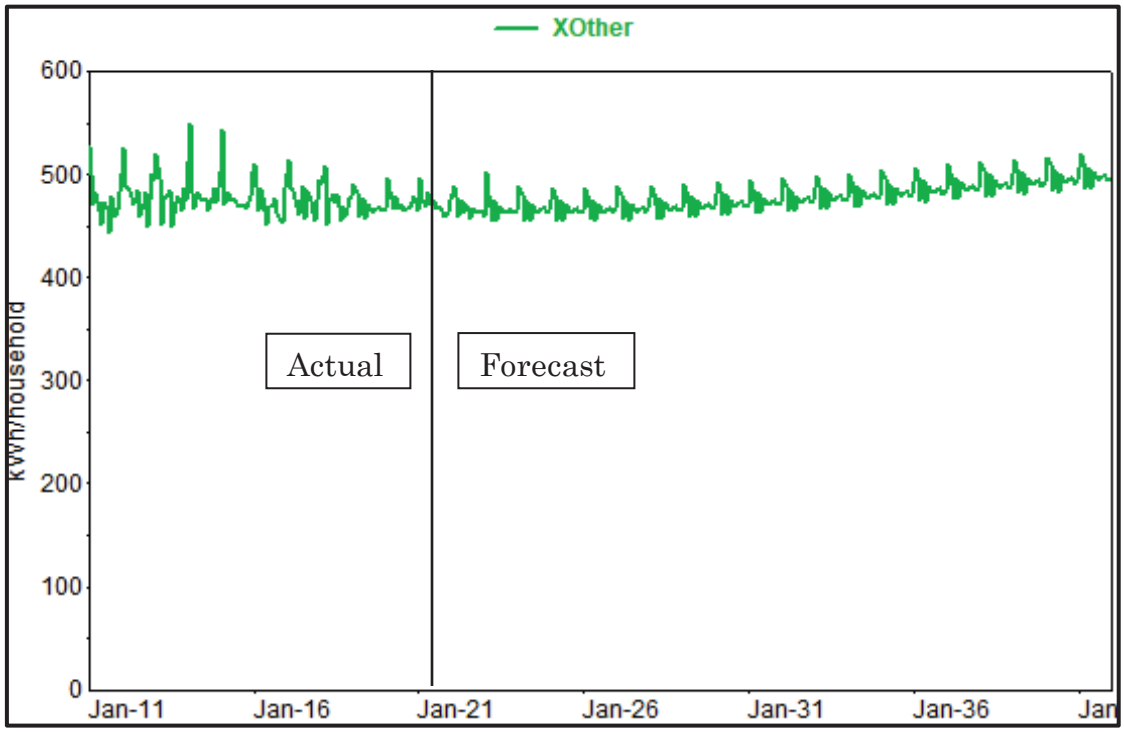


Figure 19: XOther Variable

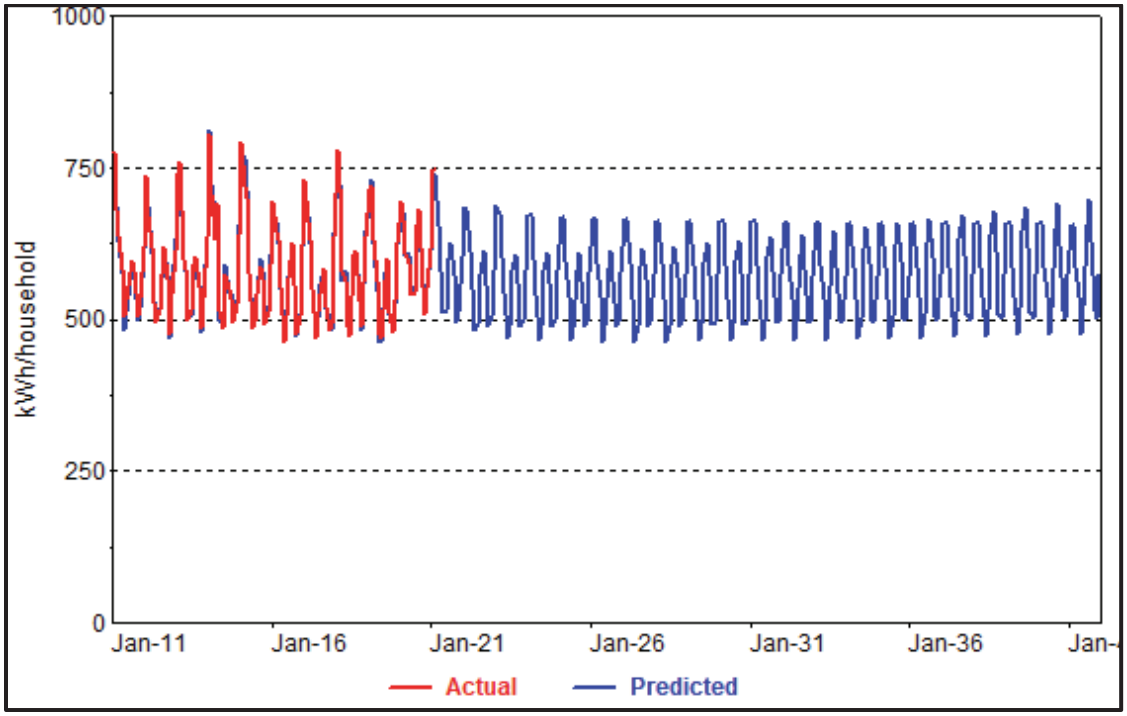


While cooling intensity is relatively small, cooling per household increases over the forecast period largely as a result of increasing air conditioning and heat pump saturation.

XOther (non-weather sensitive use) declines over the forecast period. The monthly variation in XOther reflects variation in the number of monthly billing days, lighting requirements, and monthly variation in water heater and refrigerator use. End-use intensities across non-weather sensitive end-uses are declining and, as a result, XOther also declines driving total average use downwards.

The end-use variables are used to estimate the residential average use model. Figure 20 shows actual and predicted residential average use.

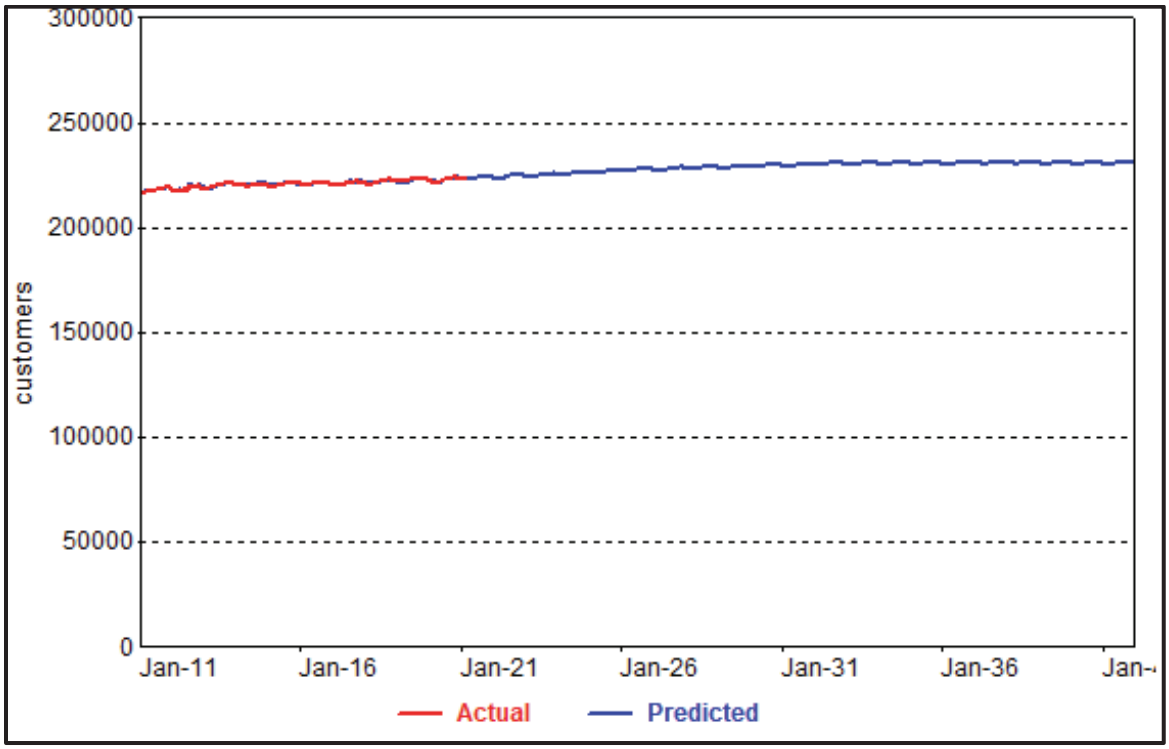
Figure 20: Residential Average Use



The model explains historical monthly sales variation well with an Adjusted R-Squared of 0.98 and a MAPE of 1.6%.

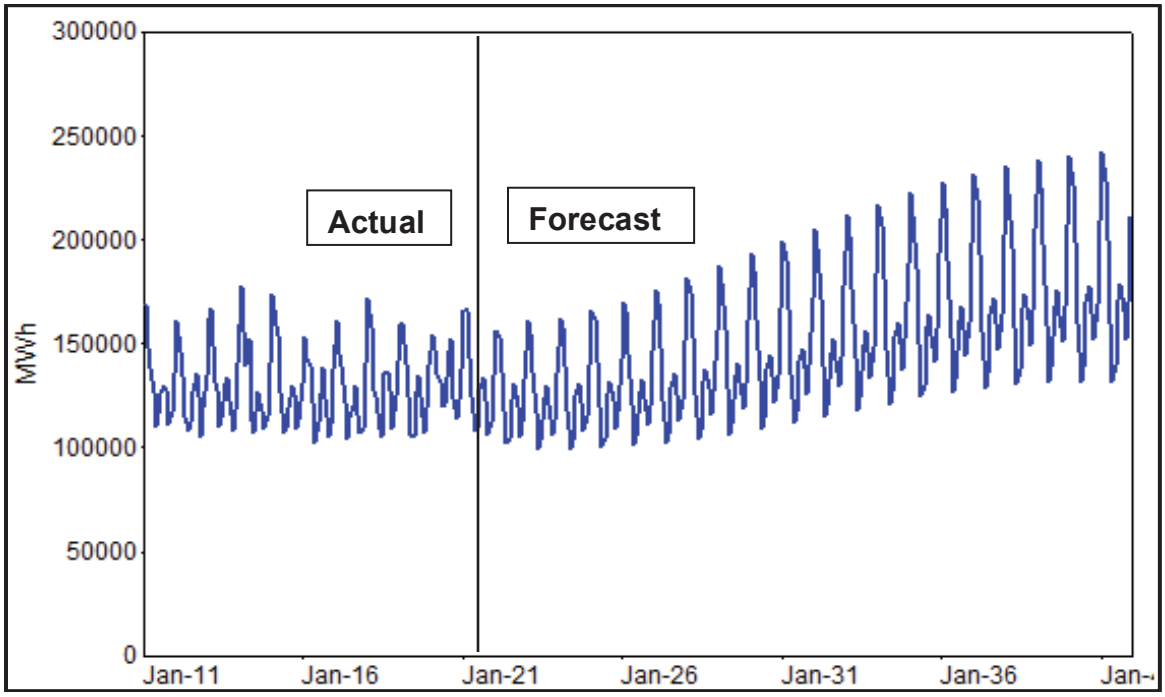
Residential customer projections are based on state household projections. The models explain historical customer growth well with an Adjusted R-Squared of 0.95 and MAPE of 0.1%. Figure 21 shows actual and predicted customers for GMP.

Figure 21: Residential Customer Forecast



Customer and average use forecasts are combined to generate monthly billed sales forecast. Figure 22 shows the monthly residential sales forecast.

Figure 22: Residential Sales Forecast



The strong increase in sales after 2023 is first driven by expected increase in cold climate heat pump sales and later by electric vehicle market growth.

3.2 Small C&I Model

The small C&I model is also based on SAE specification.

The SAE small C&I model captures the impact of changing end-use intensity as well as economic conditions, price, and weather in the constructed model variables. As in the residential model, end-use variables XHeat, XCool, and XOther are constructed from end-use saturation and efficiency trends, regional output, price, and weather conditions. The small C&I SAE model is defined as:

$$ComSales_m = a + b_1 \times XHeat_m + b_2 \times XCool_m + b_3 \times XOther_m + b_4 \times DSM + \varepsilon_m$$

The SAE model variables are constructed similarly to that of the residential model, the primary difference is that the end-use intensities are measured on a kWh per square foot basis (vs. kWh per household in the residential model), and output and employment are used to capture economic activity (vs. household income and population in the residential model).

The GMP small C&I class is forecasted using a total sales model where XCool is defined as:

$$XCool_{y,m} = CoolEI_y \times CoolUse_{y,m}$$

Where:

$$CoolUse_{y,m} = \left(\frac{CDD_{y,m}}{CDD_{15}}\right) \times \left(\frac{ComVar_y}{ComVar_{15}}\right) \times \left(\frac{Price_{y,m}}{Price_{15}}\right)^{-0.10}$$

.

And

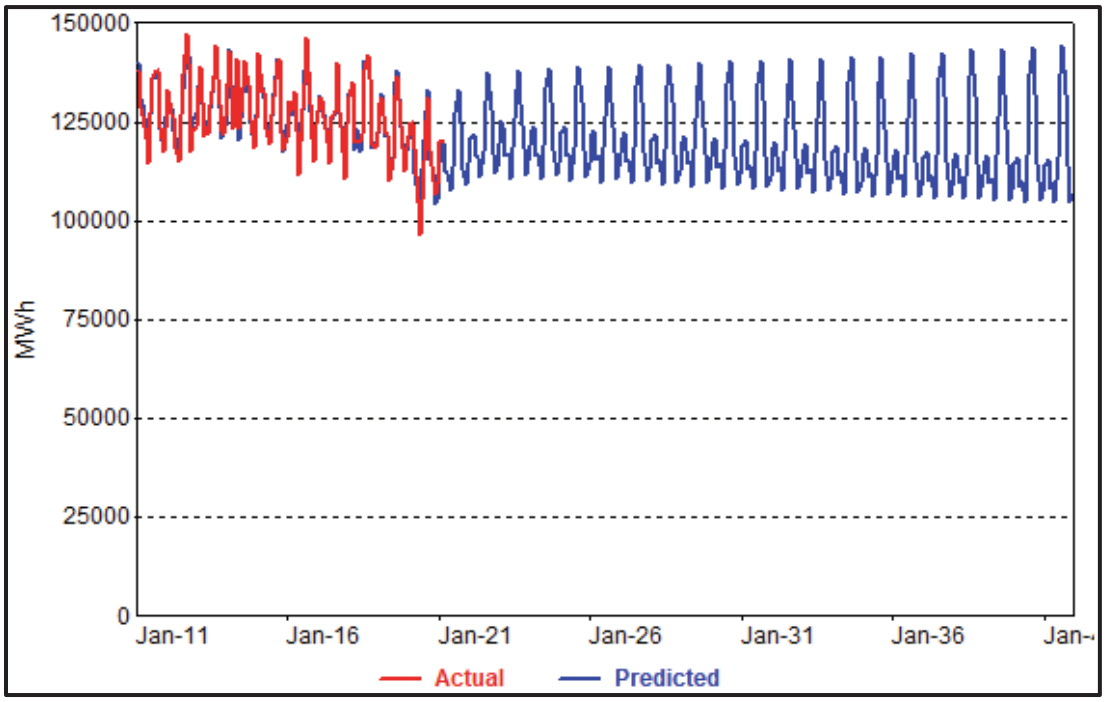
$$ComVar_{y,m} = \left(\frac{Emp_{y,m}}{Emp_{15}}\right)^{0.25} \times \left(\frac{GDP_{y,m}}{GDP_{15}}\right)^{0.25} \times \left(\frac{HHs_{y,m}}{HHs_{15}}\right)^{0.50}$$

In the constructed economic variable output and employment are weighted equally reflecting the relationship between economy and sales in the last five years.

A monthly variable is constructed for heating (XHeat) and other use (XOther) similarly to XCool. The model variables are used to drive total sales through an

estimated monthly regression model. Figure 23 shows the small C&I sales model results.

Figure 23: Small C&I Sales Forecast



This model fits small C&I data well with an Adjusted R-Squared of 0.93 and model MAPE of 1.5%. Model statistics can be found in the Appendix A.

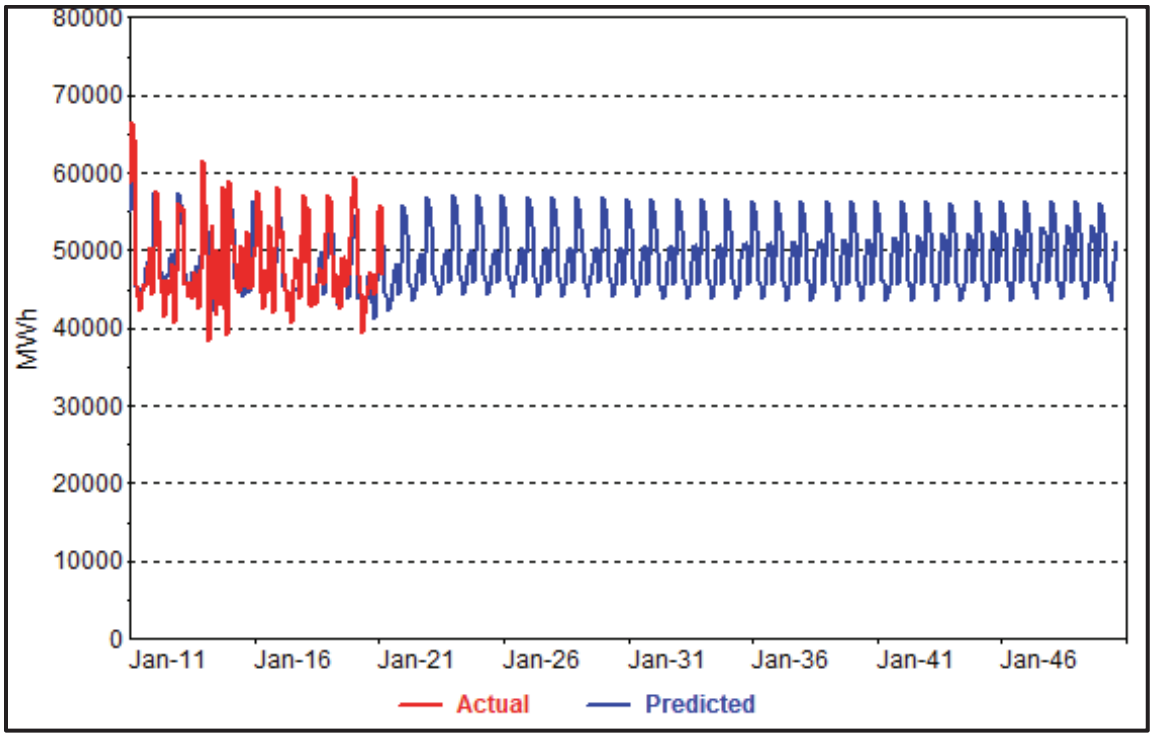
3.3 Large C&I Model

Large C&I sales are estimated using a generalized (vs. SAE model) model specification that is driven by economic projections. The economic variable includes both manufacturing employment projections and state GDP where 60% of the weight is on manufacturing employment. The constructed economic variable is summarized below:

$$IndVar_{y,m} = \left(\frac{ManEmp_{y,m}}{ManEmp_{15}}\right)^{0.60} \times \left(\frac{GDP_{y,m}}{GDP_{15}}\right)^{0.40}$$

Seasonal load variation is captured through a set of monthly binary variables. The large C&I model excludes GlobalFoundries and OMYA sales as GMP provides an independent forecast for these customers based on their input. Figure 24 shows actual and predicted large C&I sales.

Figure 24: Large C&I Sales Forecast

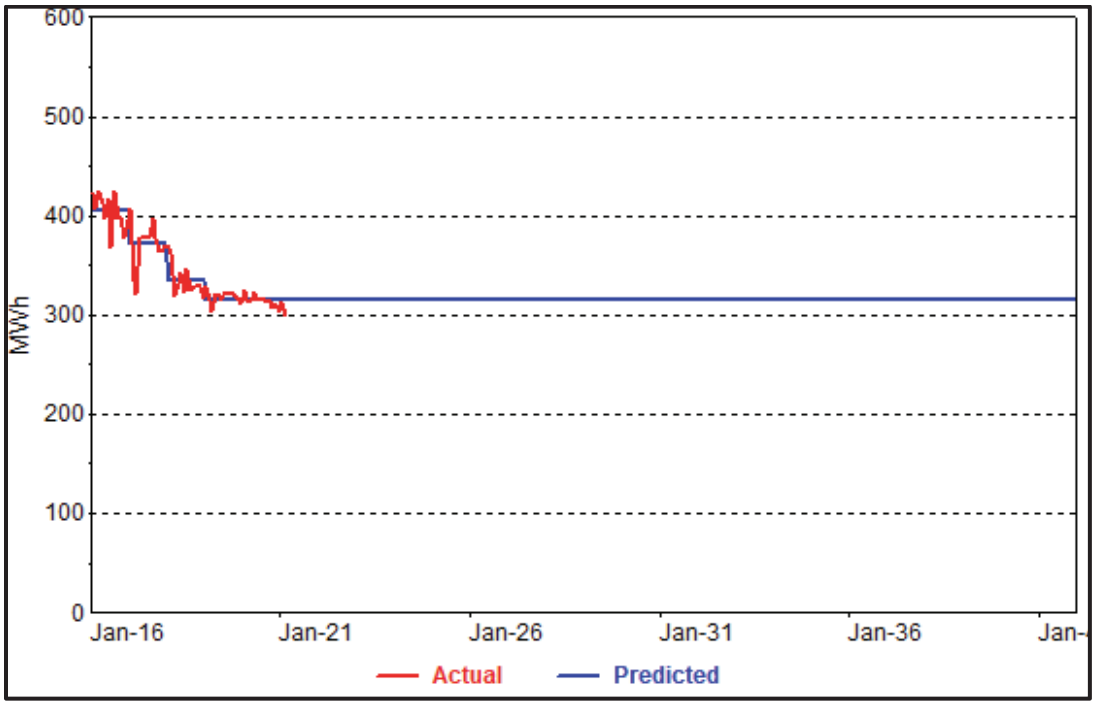


This model Adjusted R-Squared is 0.74 and the MAPE is 4.0%. The lower, relative to other models, Adjusted R-Squared is due to the large variation in monthly billed sales data. There is significant month-to-month variation driven by customer-specific activity and billing adjustments that cannot be totally accounted for by economic drivers and weather conditions.

3.4 Other Use

Other Use sales are estimated using a simple regression model constructed to capture seasonal effects and shifts in the data. This class is dominated by street lighting, but also includes a small amount of other public authority sales. GMP has seen a significant drop in street lighting sales as existing lamps were replaced with high efficiency lamps. We project flat sales after the savings adjustments. Figure 25 shows actual and forecasted sales for this revenue class.

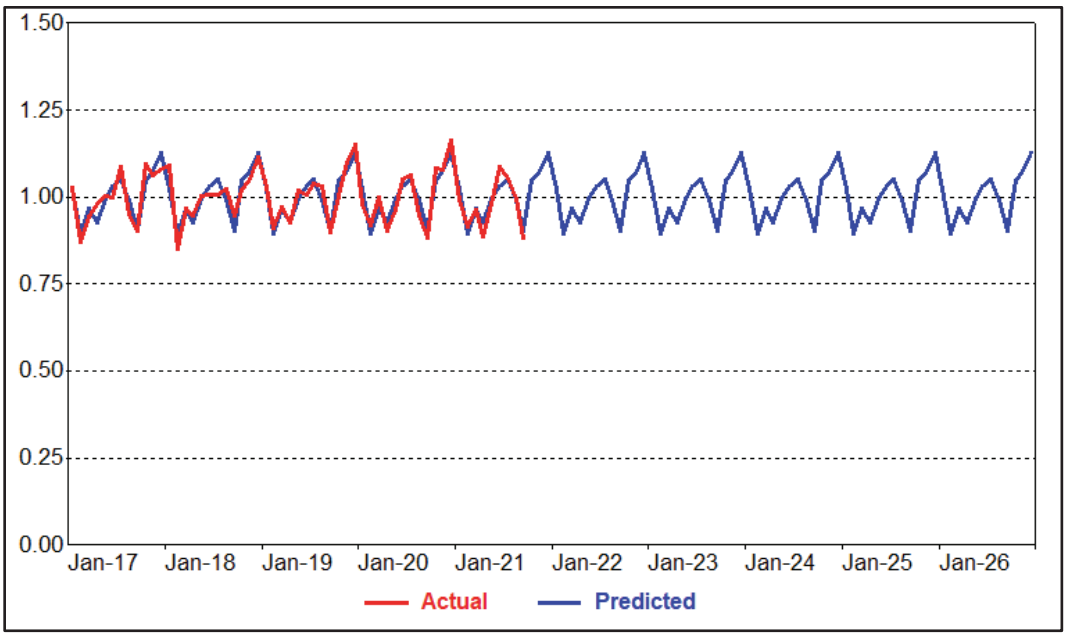
Figure 25: Other Sales Forecast (MWh)



3.5 Calendarize class sales forecast

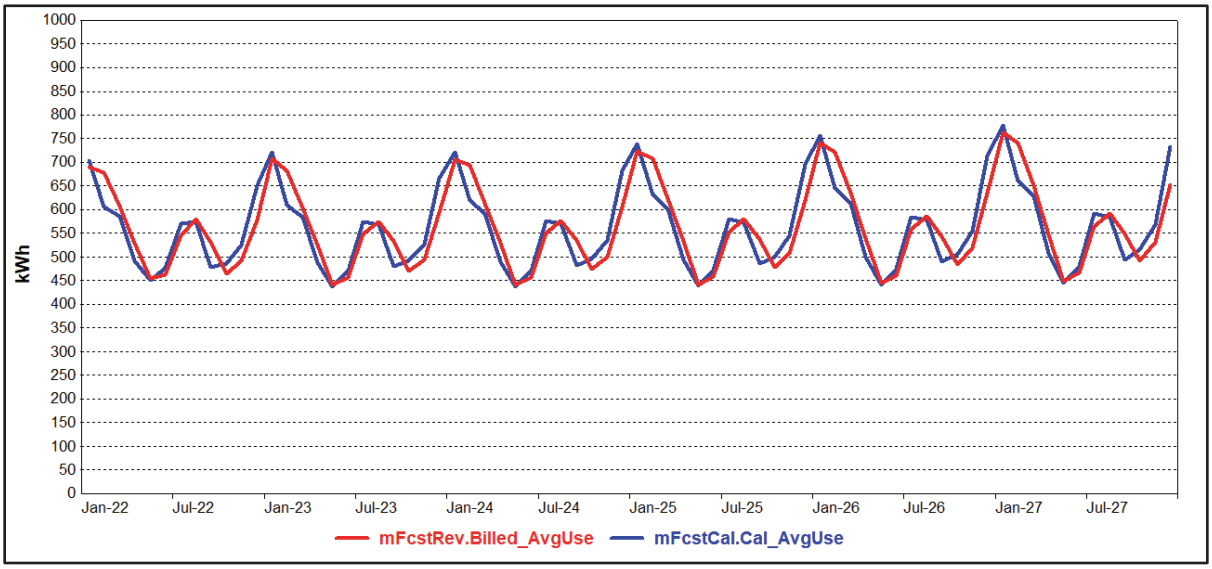
The estimated models are based on monthly billed sales data. AMI data is used to convert the billed-sales forecast to calendar month. Daily AMI reads are aggregated over the calendar month. The monthly AMI data series is then used to calculate a calendar-to-billed sales monthly ratio. A simple model with monthly binaries is then used to calculate the average monthly ratio and extend this ratio out through time. Figure 26 shows the residential ratio calculation.

Figure 26: Residential Calendar to Billed Sales Ratio



The calendar-month average use forecast (total sales in Small C&I, Large C&I, and Other rate classes) is derived by multiplying the calendar-to-billed sales ratio with the billed sales average use forecast. Figure 27 shows forecasted billed sales average use and resulting calendar-month average use.

Figure 27: Comparison of Residential Billed and Calendar-Month Average Use

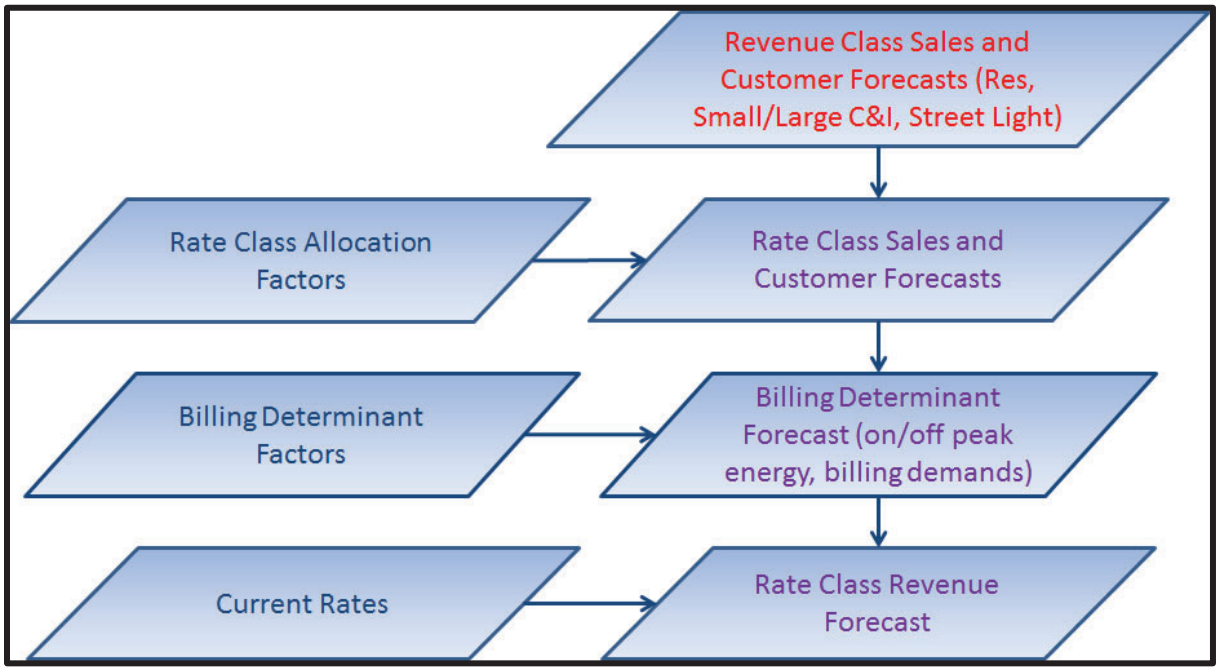


As depicted above, calendar month average use series (blue) leads the billed sales average use (red) as billed sales include sales in the current and prior calendar months.

IV. Revenue Forecast

The revenue forecast is derived at the rate schedule level. Class sales forecasts are allocated to rate schedules and within rate schedules to billing determinants (i.e., customer, on and off-peak use, and billing demands). Revenues are then generated by multiplying rate schedule billing determinants by the current tariff rates. Figure 28 provides an overview of the revenue model.

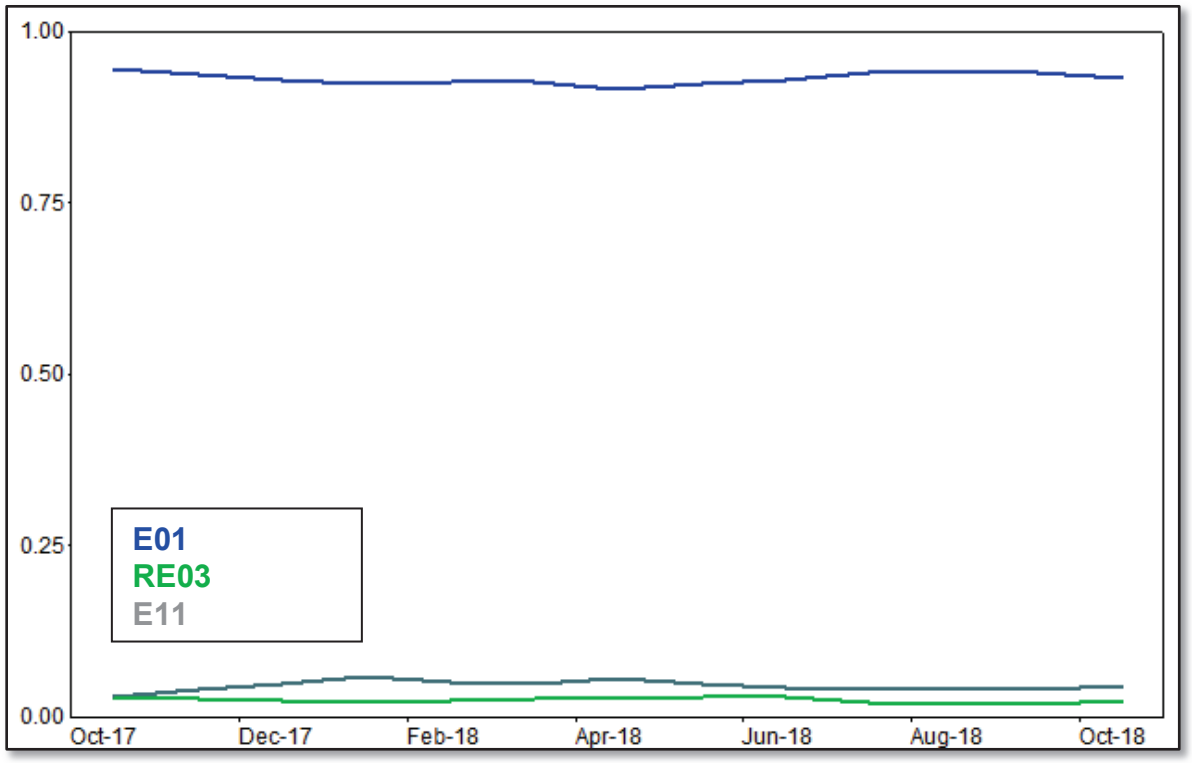
Figure 28: Revenue Model



4.1 Derive Rate Class Monthly Sales Forecast

Revenue class sales and customer forecasts are allocated to the underlying rate schedules based on projected monthly allocation factors. The allocation factors are derived from historical billing data and simple regression models that capture any share trends and seasonal variation. Residential class sales, for example, are allocated to rate schedules - E01, RE03, and E11 rate classes. Figure 29 shows historical and forecasted residential rate class sales shares.

Figure 29: Residential Rate Class Share Forecast



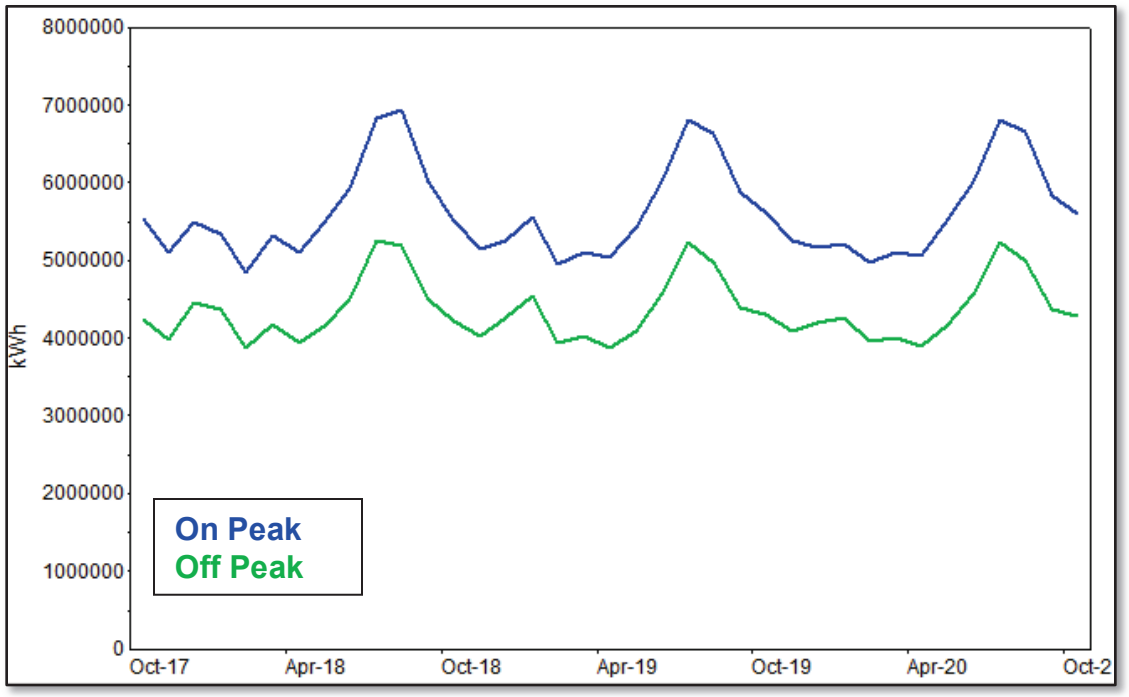
Approximately 95% of residential sales are billed under rate E01. The percentage is slightly lower in the winter months as the electric time-of-use rate (E11) is higher in these months.

4.2 Estimate monthly billing determinants

In the next step, rate class sales (and customers counts for some rates) are allocated to billing blocks, time-of-use billing periods, and on and off-peak billing demand blocks. Billing block and demand factors are derived from historical billing data. For example, residential rate E11 has on-peak and off-peak energy billing periods that are priced differently. Rate E11 monthly sales are allocated to TOU periods based on historical on-peak and off-peak sales data.

Some of the rates are complex. The small C&I rate E65, for example, includes non-demand and demand billed sales and customers, load factor kWh blocks (for demand customers), and different demand charges for demand for on/off peak, which are scheduled to replace block rates within the next two years. Figure 30 shows the resulting sales block forecasts for rate E65 Demand Customers.

Figure 30: Rate E65 Demand Customer - Sales Billing Block Forecast

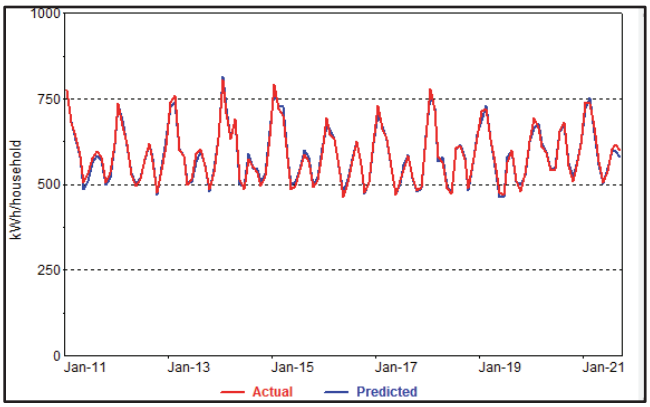


4.3 Calculate Rate Schedule and Revenue Class Revenues

Once the billing determinants are derived, revenues are generated by multiplying the forecasted billing determinants by the current customer, energy, and demand charges. Revenues are aggregated by rate schedule and month. Rate schedule revenues are then aggregated to revenue classes: residential, small C&I, large C&I, and street lighting.

APPENDIX A: MODEL STATISTICS AND COEFFICIENTS

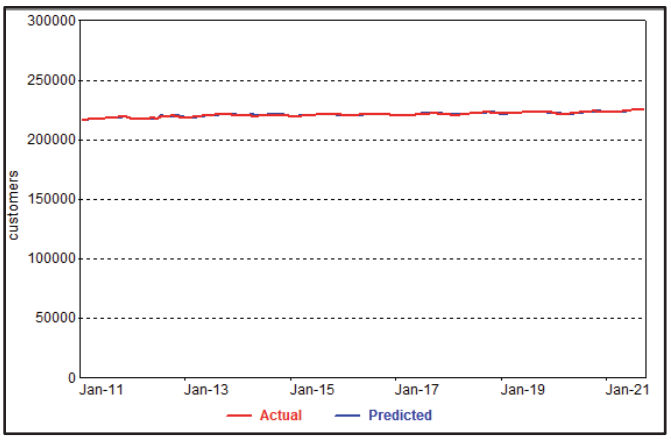
Figure 31: Residential Average Use Model



Variable	Coefficient	StdErr	T-Stat	P-Value
mStructRevRes.XHeat	1.487	0.037	40.635	0.00%
mStructRevRes.XCool	2.403	0.088	27.211	0.00%
mStructRevRes.XOther	0.976	0.011	91.547	0.00%
mDSM.ResSavings_PC	-0.124	0.038	-3.264	0.15%
Covid.ResIndex	37.313	4.257	8.764	0.00%
mBin.Mar	-22.54	4.435	-5.082	0.00%
mBin.Apr	-28.954	4.607	-6.284	0.00%
mBin.May	-17.366	4.902	-3.543	0.06%
mBin.Jun	-17.484	4.498	-3.887	0.02%
mBin.Nov	-10.44	4.326	-2.413	1.74%
mBin.FebMar11	-51.635	10.2	-5.062	0.00%
mBin.Apr14	94.703	13.031	7.267	0.00%
mBin.Mar14	-41.567	13.182	-3.153	0.21%
mBin.Feb15	-39.289	12.696	-3.095	0.25%
mBin.Oct17	-25.48	12.357	-2.062	4.15%
AR(1)	0.192	0.098	1.967	5.16%

Model Statistics	
Iterations	13
Adjusted Observations	128
Deg. of Freedom for Error	112
R-Squared	0.979
Adjusted R-Squared	0.976
AIC	5.156
BIC	5.512
Log-Likelihood	-495.61
Model Sum of Squares	805,610.53
Sum of Squared Errors	17,292.05
Mean Squared Error	154.39
Std. Error of Regression	12.43
Mean Abs. Dev. (MAD)	9.21
Mean Abs. % Err. (MAPE)	1.56%
Durbin-Watson Statistic	2.009

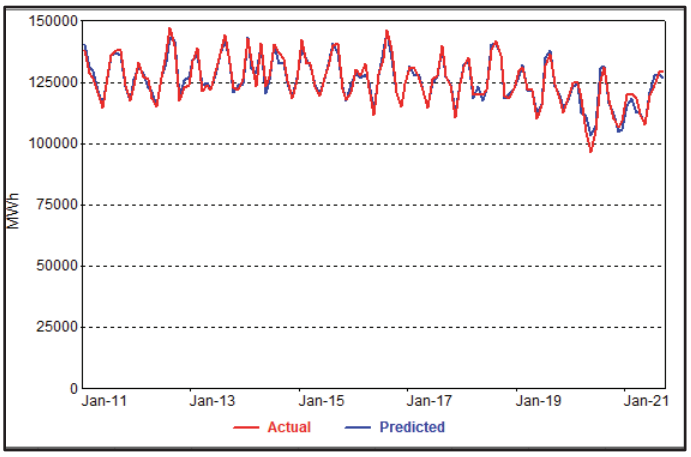
Figure 32: Residential Customer Model



Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	28360.504	61702.7	0.46	64.66%
Economics.HHs	733.882	233.656	3.141	0.21%
mBin.Jan	-855.217	156.478	-5.465	0.00%
mBin.Feb	-937.944	168.455	-5.568	0.00%
mBin.Mar	-859.043	167.341	-5.133	0.00%
mBin.Apr	-960.905	152.776	-6.29	0.00%
mBin.May	-487.342	119.844	-4.066	0.01%
mBin.Dec	-437.694	121.836	-3.592	0.05%
mBin.Jun12	-2052.844	350.163	-5.863	0.00%
mBin.Jul12	1056.929	343.343	3.078	0.26%
AR(1)	0.917	0.041	22.451	0.00%

Model Statistics	
Iterations	18
Adjusted Observations	128
Deg. of Freedom for Error	117
R-Squared	0.955
Adjusted R-Squared	0.951
AIC	12.075
BIC	12.32
F-Statistic	248.147
Prob (F-Statistic)	0
Log-Likelihood	-943.43
Model Sum of Squares	401,072,238.44
Sum of Squared Errors	18,910,328.18
Mean Squared Error	161,626.74
Std. Error of Regression	402.03
Mean Abs. Dev. (MAD)	295.18
Mean Abs. % Err. (MAPE)	0.13%
Durbin-Watson Statistic	2.213

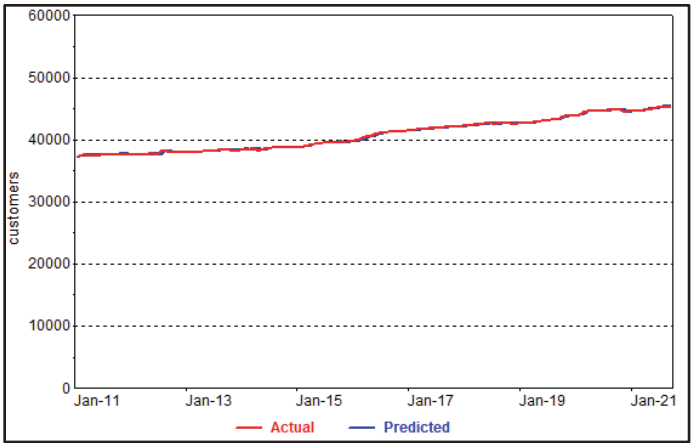
Figure 33: Small C&I Sales Model



Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	17522.822	7170.509	2.444	1.60%
mStructRevCom.XHeat	260464.648	17801.22	14.632	0.00%
mStructRevCom.XCool	135312.83	5947.111	22.753	0.00%
mStructRevCom.XOther	10723.977	782.747	13.7	0.00%
DSM.Com	-0.199	0.069	-2.881	0.47%
Covid.NResIndex	-3814.453	1026.646	-3.715	0.03%
mBin.Sep12Plus	6108.107	1122.739	5.44	0.00%
mBin.Feb	1563.34	703.011	2.224	2.81%
mBin.Oct	2811.027	726.055	3.872	0.02%
mBin.Apr14	17149.452	2243.196	7.645	0.00%
mBin.Jul17	-5714.239	2184.998	-2.615	1.01%
mBin.Jun20	-6475.591	2139.969	-3.026	0.31%
MA(1)	0.505	0.086	5.845	0.00%

Model Statistics	
Iterations	13
Adjusted Observations	129
Deg. of Freedom for Error	116
R-Squared	0.941
Adjusted R-Squared	0.934
AIC	15.706
BIC	15.994
F-Statistic	153.114
Prob (F-Statistic)	0
Log-Likelihood	-1,183.09
Model Sum of Squares	11,063,692,390.56
Sum of Squared Errors	698,492,411.99
Mean Squared Error	6,021,486.31
Std. Error of Regression	2,453.87
Mean Abs. Dev. (MAD)	1,808.03
Mean Abs. % Err. (MAPE)	1.46%
Durbin-Watson Statistic	1.905

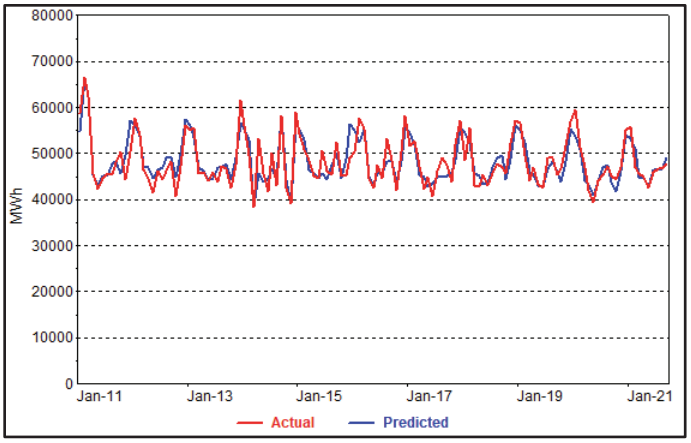
Figure 34: Small C&I Customer Model



Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	4995590.741	2.1E+09	0.002	99.81%
Economics.NManEmp	-13.038	14.083	-0.93	35.63%
AR(1)	1	0.006	170.8	0.00%

Model Statistics	
Iterations	99
Adjusted Observations	128
Deg. of Freedom for Error	125
R-Squared	0.996
Adjusted R-Squared	0.996
AIC	10.244
BIC	10.311
F-Statistic	15354.371
Prob (F-Statistic)	0
Log-Likelihood	-834.22
Model Sum of Squares	843,353,025.69
Sum of Squared Errors	3,432,870.19
Mean Squared Error	27,462.96
Std. Error of Regression	165.72
Mean Abs. Dev. (MAD)	113.66
Mean Abs. % Err. (MAPE)	0.28%
Durbin-Watson Statistic	2.696

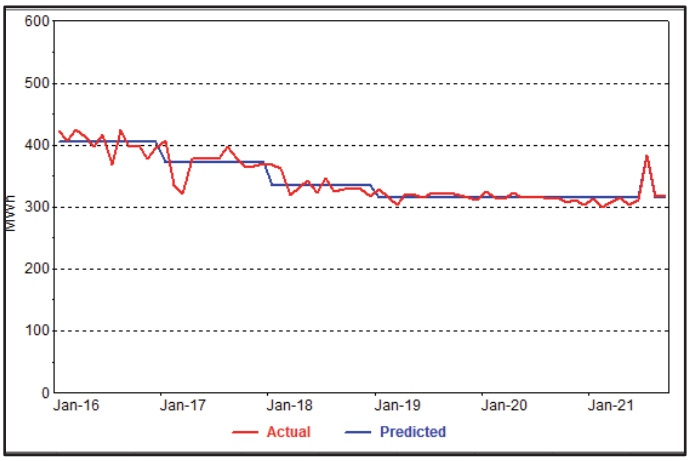
Figure 35: Large C&I Sales Model



Variable	Coefficient	StdErr	T-Stat	P-Value
mEcon.IndVar	46358.607	978.767	47.364	0.00%
mWthrRev.CDD60	30.94	8.836	3.502	0.07%
mBin.Jan	9040.676	1273.069	7.101	0.00%
mBin.Feb	6607.074	1299.562	5.084	0.00%
mBin.Apr	-569.924	1273.481	-0.448	65.54%
mBin.May	-3123.199	1286.658	-2.427	1.68%
mBin.Jun	-4835.341	1678.52	-2.881	0.48%
mBin.Jul	-8120.854	2735.919	-2.968	0.37%
mBin.Aug	-8421.283	3099.084	-2.717	0.76%
mBin.Sep	-4762.89	2307.503	-2.064	4.14%
mBin.Oct	-3184.151	1393.44	-2.285	2.42%
mBin.Nov	2718.877	1331.339	2.042	4.35%
mBin.Dec	10253.056	1299.672	7.889	0.00%
mBin.Feb11	13903.845	2876.557	4.834	0.00%
mBin.Mar11	16532.629	2909.276	5.683	0.00%
mBin.Mar14	-7947.746	2911.471	-2.73	0.74%
mBin.Sep14	11467.248	2907.758	3.944	0.01%
mBin.Nov14	-10209.385	2892.226	-3.53	0.06%
mBin.Mar16	9415.927	2908.418	3.237	0.16%

Model Statistics	
Iterations	1
Adjusted Observations	129
Deg. of Freedom for Error	110
R-Squared	0.779
Adjusted R-Squared	0.743
AIC	15.969
BIC	16.39
Log-Likelihood	-1,194.02
Model Sum of Squares	2,920,457,084.06
Sum of Squared Errors	827,457,528.98
Mean Squared Error	7,522,341.17
Std. Error of Regression	2,742.69
Mean Abs. Dev. (MAD)	1,945.21
Mean Abs. % Err. (MAPE)	4.00%
Durbin-Watson Statistic	1.929

Figure 36: Other Sales Model



Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	404.329	4.311	93.798	0.00%
mBin.Yr2017Plus	-33.228	6.096	-5.451	0.00%
mBin.Yr2018Plus	-35.859	6.096	-5.882	0.00%
mBin.Yr2019Plus	-20.403	5.055	-4.037	0.01%
mBin.Jul21	68.334	15.164	4.506	0.00%

Model Statistics	
Iterations	1
Adjusted Observations	69
Deg. of Freedom for Error	64
R-Squared	0.852
Adjusted R-Squared	0.843
AIC	5.477
BIC	5.639
F-Statistic	92.071
Prob (F-Statistic)	0
Log-Likelihood	-281.86
Model Sum of Squares	82,119.58
Sum of Squared Errors	14,270.67
Mean Squared Error	222.98
Std. Error of Regression	14.93
Mean Abs. Dev. (MAD)	10.03
Mean Abs. % Err. (MAPE)	2.84%
Durbin-Watson Statistic	1.995