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# Green Mountain Power
# 2021 Budget Forecast Report

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# Table of Contents

## TABLE OF FIGURES



## TABLE OF TABLES

# 2021 FISCAL YEAR BUDGET FORECAST: SUMMARY

We recently completed the 2021 fiscal-year sales forecast. The forecast includes sales, customers, and revenue projections through 2025. Estimated forecast models are derived from billed sales and customer data through February 2020.

Forecast inputs include:

- Moody Analytics January 2020 Vermont economic forecast
- AEO 2020 end-use efficiency estimates for the New England Census Division
- VEIC most current energy efficiency savings projections, cold-climate heat pumps forecast, electric vehicle forecast
- GMP's updated solar capacity forecast
- GMP adjustments for small commercial Tier 3 electrification efforts and large load adjustments that would not be reflected in the historical billing data
- Updated normal HDD and CDD (2000 to 2019)

Sales forecasts are generated at the customer class level for residential, commercial, industrial, and street lighting. To develop the revenue forecast, 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.

The baseline sales and customer forecasts are estimated from linear regression models that relate monthly customer-class sales (average use in the residential sector) to monthly weather conditions, household growth, economic activity, prices, end-use efficiency improvements, and state-level energy efficiency (EE) program savings. Residential sales are adjusted for embedded behind the meter (BTM) solar.

The baseline forecast is adjusted for factors not reflected in historical sales data. This includes:

- Large load additions and losses from major company expansion and contraction activities
- Solar load growth
- Incentivized cold climate heat pump adoption
- Commercial Tier 3 electrification activity
- State-level electric vehicle forecast projections

Based on Moody's January 2020 economic forecast we expect to see little sales growth over the next couple of years. The actual outlook, however, is much more uncertain as the economy now must recover from a virtual shutdown of the Vermont, U.S. and world economies resulting from the Covid-19 pandemic.

Longer term, we should start to see stronger sales growth, as end-use efficiency improvements and solar adoption begin to level off, heat pumps gain heating and cooling market share, and electric vehicles begin to have a measurable impact on load. Table 1 shows expected annual sales projection. All tables in the report present data on calendar year basis unless otherwise indicated.

**Table 1: Customer Class Billed Sales Forecast (MWh)**

| Year | Residential | Chg | Commercial | Chg | Industrial | Chg | Other | Chg | Total | Chg |
|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 1,456,577 | | 1,471,128 | | 1,131,030 | | 3,822 | | 4,062,557 | |
| 2021 | 1,461,327 | 0.3% | 1,473,920 | 0.2% | 1,123,784 | -0.6% | 3,817 | -0.1% | 4,062,848 | 0.0% |
| 2022 | 1,463,286 | 0.1% | 1,475,956 | 0.1% | 1,123,097 | -0.1% | 3,817 | 0.0% | 4,066,156 | 0.1% |
| 2023 | 1,469,512 | 0.4% | 1,479,180 | 0.2% | 1,122,746 | 0.0% | 3,817 | 0.0% | 4,075,256 | 0.2% |
| 2024 | 1,478,305 | 0.6% | 1,481,387 | 0.1% | 1,123,880 | 0.1% | 3,817 | 0.0% | 4,087,389 | 0.3% |
| 2025 | 1,489,661 | 0.8% | 1,482,774 | 0.1% | 1,124,466 | 0.1% | 3,817 | 0.0% | 4,100,719 | 0.3% |
| 20-25 | | 0.5% | | 0.2% | | -0.1% | | 0.0% | | 0.2% |

## 1. Class Sales Forecast

Monthly customer class sales and customer forecasts are based on 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 intensities resulting from new standards, natural occurring appliance stock replacement, and state energy efficiency programs. Models are estimated with monthly billed sales and customer counts from January 2010 to February 2020.

The forecast incorporates Moody's Analytics January 2020 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.

Estimated forecast models that account for customer growth, economic activity, price, efficiency, and weather trends are used to generate the *Baseline* forecast. The baseline forecast reflects both economic and end-use efficiency improvements through both end-use standards and state efficiency program activity. The forecast is then adjusted for:

- New solar capacity and generation projections
- Expected Tier 3 electrification impacts
- Program-related heat pump sales
- Electric Vehicle sales
- Spot load adjustments for expected large load additions (and losses)

## 1. Residential

Since 2010, residential average use has declined from approximately 7,200 kWh per customer to 6,700 kWh per customer, averaging 0.8% annual usage 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.

Over the next couple of years, solar adoption, natural occurring efficiency, and EE programs savings will continue to contribute to declining average use. By 2023, 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. After 2025, we expect to see even stronger growth in residential electric usage.

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 2 shows the forecast results.

**Table 2: Residential Sales Forecast**

| Year | Average Use (kWh) | Chg | Customers | Chg | Sales (MWh) | Chg |
|---|---|---|---|---|---|---|
| 2020 | 6,533 | | 222,959 | | 1,456,577 | |
| 2021 | 6,529 | -0.1% | 223,831 | 0.4% | 1,461,327 | 0.3% |
| 2022 | 6,512 | -0.2% | 224,691 | 0.4% | 1,463,286 | 0.1% |
| 2023 | 6,517 | 0.1% | 225,494 | 0.4% | 1,469,512 | 0.4% |
| 2024 | 6,535 | 0.3% | 226,219 | 0.3% | 1,478,305 | 0.6% |
| 2025 | 6,565 | 0.5% | 226,918 | 0.3% | 1,489,661 | 0.8% |
| 20-25 | | 0.1% | | 0.4% | | 0.5% |

Table 3 shows the cumulative forecast adjustments and isolates efficiency impacts beginning in 2020. The efficiency embedded in the baseline forecast is disaggregated by holding the model end-use intensities constant through the forecast period. Efficiency savings include the impact of new standards, naturally occurring efficiency, and state efficiency programs.

### Table 3: Residential Sales Forecast Disaggregation

| Year | NoEE(1) | EE(2) | Solar(3) | Ht Pumps(4) | EV(5) | TtlAdj | Forecast |
|---|---|---|---|---|---|---|---|
| 2020 | 1,513,369 | -9,925 | -52,869 | 5,084 | 918 | -56,792 | 1,456,577 |
| 2021 | 1,524,904 | -23,786 | -60,395 | 16,932 | 3,672 | -63,577 | 1,461,327 |
| 2022 | 1,532,147 | -34,319 | -67,555 | 25,930 | 7,083 | -68,862 | 1,463,286 |
| 2023 | 1,541,217 | -44,358 | -74,552 | 35,608 | 11,598 | -71,704 | 1,469,512 |
| 2024 | 1,549,765 | -53,682 | -81,485 | 46,134 | 17,574 | -71,460 | 1,478,305 |
| 2025 | 1,557,475 | -62,613 | -88,064 | 57,423 | 25,440 | -67,814 | 1,489,661 |

1. No EE forecast assumes no efficiency improvements after 2019.
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 forecast adjusted for GMP share.

**Economic Drivers.** The baseline forecast incorporates both household and income growth and expected energy efficiency. Vermont has seen some of the slowest population growth in the U.S. This trend is expected through the forecast period; slow population growth translates into low household formation and low real income growth. Table 4 shows the residential economic drivers.

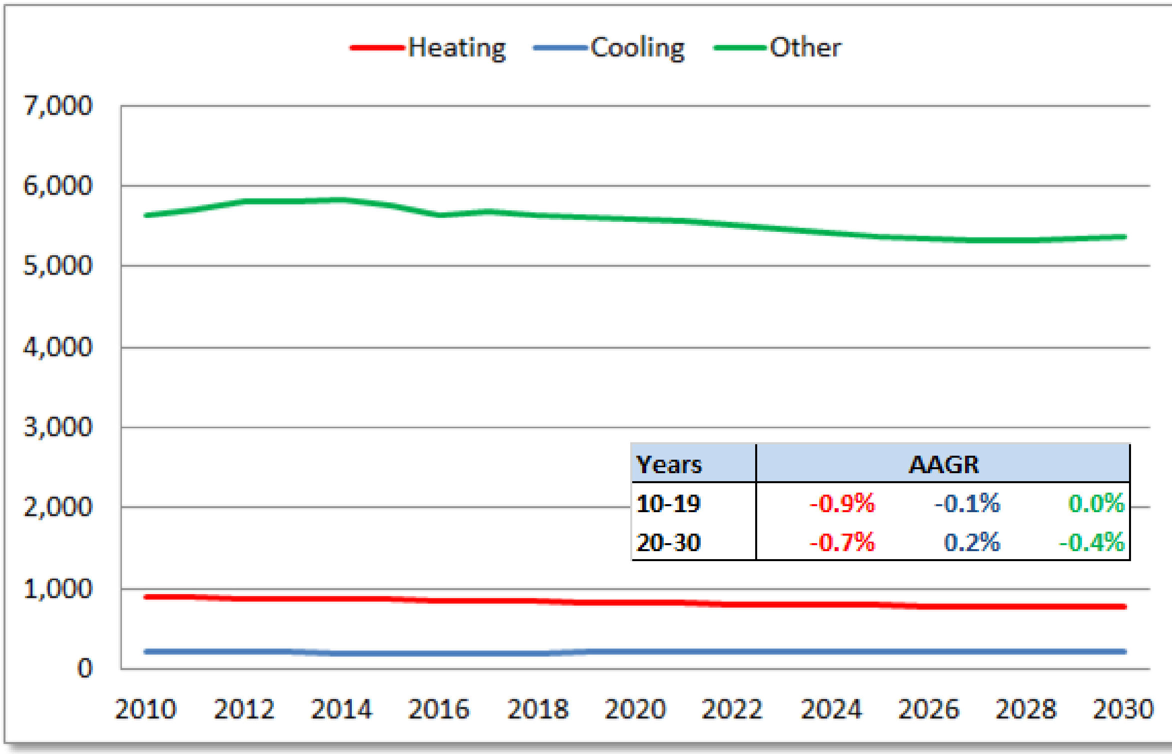
**Table 4: Residential Economic Drivers**

| Year | Population (Thou) | Chg | Households (Thou) | Chg | RPI (Mil $) | Chg |
|---|---|---|---|---|---|---|
| 2010 | 625.9 | | 256.8 | | 27,119 | |
| 2011 | 627.1 | 0.2% | 258.8 | 0.8% | 27,901 | 2.9% |
| 2012 | 626.1 | -0.2% | 260.1 | 0.5% | 28,337 | 1.6% |
| 2013 | 626.2 | 0.0% | 262.0 | 0.7% | 28,434 | 0.3% |
| 2014 | 625.2 | -0.2% | 263.3 | 0.5% | 29,027 | 2.1% |
| 2015 | 625.2 | 0.0% | 264.0 | 0.3% | 30,055 | 3.5% |
| 2016 | 623.7 | -0.2% | 264.1 | 0.0% | 30,434 | 1.3% |
| 2017 | 624.3 | 0.1% | 264.4 | 0.1% | 30,642 | 0.7% |
| 2018 | 624.4 | 0.0% | 265.1 | 0.2% | 31,369 | 2.4% |
| 2019 | 624.0 | -0.1% | 266.1 | 0.4% | 32,186 | 2.6% |
| 2020 | 624.8 | 0.1% | 267.8 | 0.7% | 32,658 | 1.5% |
| 2021 | 625.8 | 0.2% | 269.0 | 0.4% | 33,128 | 1.4% |
| 2022 | 627.0 | 0.2% | 270.5 | 0.6% | 33,779 | 2.0% |
| 2023 | 628.2 | 0.2% | 271.9 | 0.5% | 34,322 | 1.6% |
| 2024 | 629.4 | 0.2% | 273.2 | 0.5% | 34,816 | 1.4% |
| 2025 | 630.4 | 0.2% | 274.5 | 0.5% | 35,259 | 1.3% |
| 2026 | 631.4 | 0.2% | 275.6 | 0.4% | 35,704 | 1.3% |
| 2027 | 632.2 | 0.1% | 276.7 | 0.4% | 36,169 | 1.3% |
| 2028 | 633.0 | 0.1% | 277.6 | 0.3% | 36,669 | 1.4% |
| 2029 | 633.7 | 0.1% | 278.4 | 0.3% | 37,145 | 1.3% |
| 2030 | 634.3 | 0.1% | 279.2 | 0.3% | 37,602 | 1.2% |
| 10-19 | | 0.0% | | 0.4% | | 1.9% |
| 20-30 | | 0.2% | | 0.4% | | 1.4% |

**Energy Efficiency.** Energy efficiency gains will continue to outweigh the positive impact of customer and economic growth translating into lower residential sales. Efficiency gains are captured two ways – through (1) end-use energy intensity projections and (2) expected state-sponsored EE program savings.

End-use intensities are derived for ten residential end-uses and are based on EIA 2020 Annual Energy Outlook for New England. End-use intensities reflect both change in ownership (saturation) and end-use efficiency improvements. Figure 1 shows end-use intensities aggregated into heating, cooling, and other end-uses.

**Figure 1: Residential End-Use Indices (Annual kWh per Household)**




End-use efficiency intensities incorporate new appliance standards, regional building codes, natural occurring gains through purchases of more efficient appliances, and regional efficiency program impacts through EIA modeled technology rebates. Total residential intensity declines on average 0.4% annually as efficiency gains outweigh growth in end-use saturation. Heating intensity (before heat pumps) declines 0.7% per year and other use 0.4% per year. Cooling intensity is largely flat as increase in air condition saturation counters improvements in efficiency. The strong decline in other use is a result of federal appliance efficiency standards.

End-use intensities reflect expected regional (New England) EE program savings resulting from incentives for purchases of more efficient technologies. Additional savings from Vermont specific program activity are captured by incorporating historical and projected DSM savings as model variables.

## 2. Small C&I Sales

Small C&I sales are expected to be largely flat throughout the forecast period. Baseline commercial sales forecast is derived using a total commercial sales model that relates monthly billed sales to state GDP, population, employment, commercial end-use intensity trends, state-specific DSM savings projections, and HDD and CDD. The baseline forecast is then adjusted for solar own-use (excess generation is treated as power purchase cost), Tier 3 electrification projects, and large load additions (and losses) that are not reflected in the baseline forecast model. Table 5 shows the commercial sales forecast.

**Table 5: Commercial Customer Usage Forecast**

| Year | Average Use (kWh) | Chg | Customers | Chg | Sales (MWh) | Chg |
|---|---|---|---|---|---|---|
| 2020 | 32,983 | | 44,603 | | 1,471,128 | |
| 2021 | 32,669 | -1.0% | 45,117 | 1.2% | 1,473,920 | 0.2% |
| 2022 | 32,372 | -0.9% | 45,594 | 1.1% | 1,475,956 | 0.1% |
| 2023 | 32,171 | -0.6% | 45,979 | 0.8% | 1,479,180 | 0.2% |
| 2024 | 31,988 | -0.6% | 46,310 | 0.7% | 1,481,387 | 0.1% |
| 2025 | 31,813 | -0.5% | 46,608 | 0.6% | 1,482,774 | 0.1% |
| 20-25 | | -0.7% | | 0.9% | | 0.2% |

Table 6 shows the forecast disaggregation. Efficiency impacts are derived by holding the model end-use energy intensity inputs constant through the forecast period; efficiency impacts reflect new standards, naturally occurring efficiency gains, as well state-level efficiency program activity.

**Table 6: Commercial Sales Forecast Disaggregation**

| Year | NoEE(1) | EE(2) | Solar(3) | Tier3(4) | Spot(5) | TtlAdj | Forecast |
|---|---|---|---|---|---|---|---|
| 2020 | 1,482,659 | -11,702 | -148 | 1,231 | -912 | -11,531 | 1,471,128 |
| 2021 | 1,497,994 | -27,102 | -608 | 4,730 | -1,094 | -24,074 | 1,473,920 |
| 2022 | 1,507,907 | -38,363 | -1,038 | 8,544 | -1,094 | -31,950 | 1,475,956 |
| 2023 | 1,518,912 | -49,955 | -1,457 | 12,774 | -1,094 | -39,732 | 1,479,180 |
| 2024 | 1,529,250 | -62,063 | -1,866 | 17,160 | -1,094 | -47,863 | 1,481,387 |
| 2025 | 1,538,881 | -74,120 | -2,268 | 21,375 | -1,094 | -56,107 | 1,482,774 |

1. No EE forecast assumes no efficiency improvements after 2019.
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.
5. Spot loads for small C&I are based on projections provided by GMP.

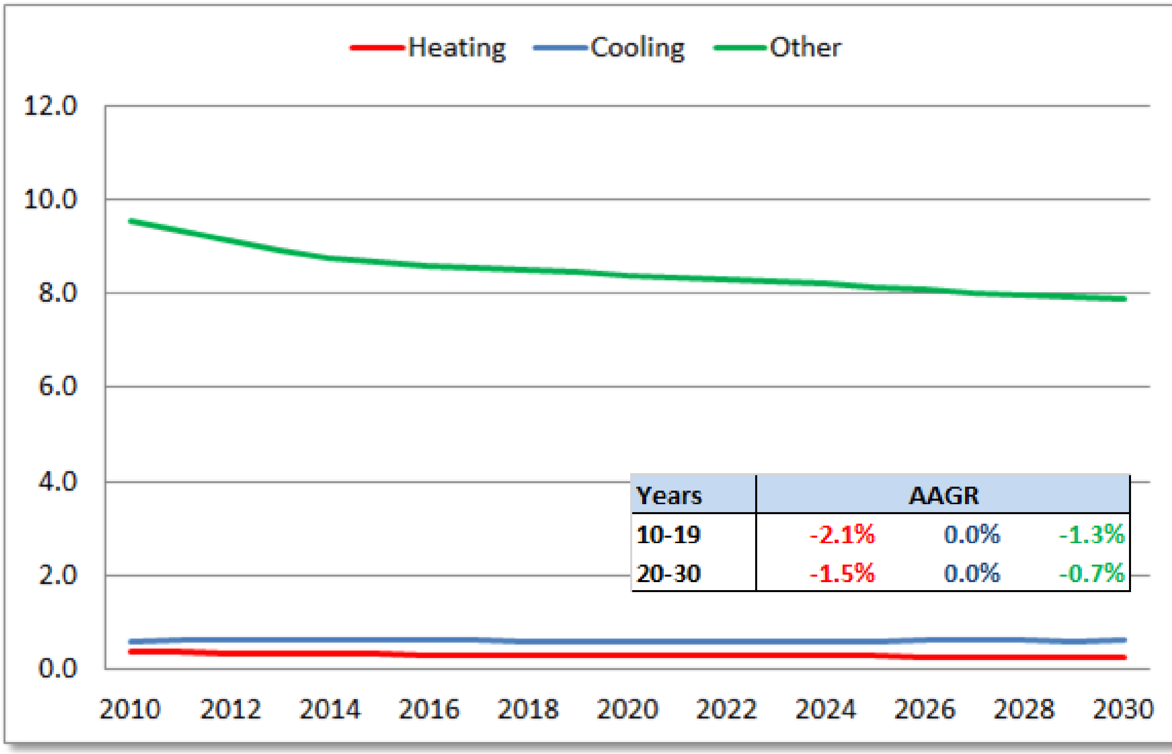
We expect to see largely flat commercial sales as efficiency and solar load largely mitigate sales growth due to economic growth and Tier 3 electrification activity. This forecast, however, is based on Moody's January 2020 economic forecast shown in Table 7. In January, Moody Analytics was forecasting GDP growth averaging 2.0% over the next five years. The virtual shutdown of the Vermont and U.S. economy in March and April 2020 has significantly altered the near-term outlook and the length of recovery in energy sales from this activity is uncertain.

**Table 7: State GDP and Employment Forecast**

| Year | GDP (Mil $) | Chg | Emp (Thou) | Chg | ManEmp (Thou) | Chg | NManEmp (Thou) | Chg |
|---|---|---|---|---|---|---|---|---|
| 2010 | 28,025 | | 297.8 | | 30.6 | | 267.2 | |
| 2011 | 28,693 | 2.4% | 300.8 | 1.0% | 31.1 | 1.5% | 269.7 | 0.9% |
| 2012 | 28,954 | 0.9% | 304.4 | 1.2% | 31.8 | 2.3% | 272.6 | 1.1% |
| 2013 | 28,455 | -1.7% | 306.6 | 0.7% | 31.8 | -0.2% | 274.9 | 0.8% |
| 2014 | 28,498 | 0.1% | 309.5 | 0.9% | 31.2 | -1.7% | 278.3 | 1.3% |
| 2015 | 28,954 | 1.6% | 311.9 | 0.8% | 30.8 | -1.3% | 281.1 | 1.0% |
| 2016 | 29,322 | 1.3% | 313.2 | 0.4% | 30.0 | -2.5% | 283.2 | 0.7% |
| 2017 | 29,414 | 0.3% | 314.9 | 0.5% | 29.6 | -1.4% | 285.3 | 0.7% |
| 2018 | 29,770 | 1.2% | 315.5 | 0.2% | 29.9 | 0.9% | 285.6 | 0.1% |
| 2019 | 30,465 | 2.3% | 317.5 | 0.6% | 30.3 | 1.4% | 287.2 | 0.6% |
| 2020 | 31,038 | 1.9% | 318.2 | 0.2% | 29.8 | -1.8% | 288.4 | 0.4% |
| 2021 | 31,595 | 1.8% | 319.1 | 0.3% | 29.4 | -1.3% | 289.7 | 0.5% |
| 2022 | 32,371 | 2.5% | 320.4 | 0.4% | 29.0 | -1.4% | 291.5 | 0.6% |
| 2023 | 33,022 | 2.0% | 321.5 | 0.3% | 28.5 | -1.5% | 293.0 | 0.5% |
| 2024 | 33,617 | 1.8% | 322.4 | 0.3% | 28.1 | -1.5% | 294.3 | 0.5% |
| 2025 | 34,151 | 1.6% | 323.4 | 0.3% | 27.7 | -1.5% | 295.7 | 0.5% |
| 2026 | 34,689 | 1.6% | 324.4 | 0.3% | 27.3 | -1.4% | 297.1 | 0.5% |
| 2027 | 35,254 | 1.6% | 325.5 | 0.3% | 26.9 | -1.3% | 298.6 | 0.5% |
| 2028 | 35,863 | 1.7% | 326.6 | 0.3% | 26.6 | -1.2% | 300.0 | 0.5% |
| 2029 | 36,446 | 1.6% | 327.6 | 0.3% | 26.3 | -1.3% | 301.4 | 0.4% |
| 2030 | 37,006 | 1.5% | 328.6 | 0.3% | 25.9 | -1.3% | 302.7 | 0.4% |
| 10-19 | | 0.9% | | 0.7% | | -0.1% | | 0.8% |
| 20-30 | | 1.8% | | 0.3% | | -1.4% | | 0.5% |

**Efficiency Projections.** Figure 2 shows projected commercial heating, cooling, and other use intensity trends. Intensities are expressed on a kWh per square foot basis. Commercial heating and cooling intensities are relatively small in New England. Other use is composed of seven end-uses where the largest end-uses include ventilation, lighting, refrigeration, and miscellaneous use.

**Figure 2: Commercial End-Use Intensities (kWh/sqft)**




The EIA captures regional EE program activity through rebates applied to the more efficient technology options; rebates in turn results in a more efficient technology mix and decline in use per square foot. Historical and projected state EE program expenditures are also included as a variable in the commercial sales model. The model variable is statistically significant and reduces the commercial sales forecast even further.

### 3. Large C&I and Other Sales

The Large C&I class includes GMP's largest customers. While this class is dominated by industrial load, it also includes some of GMP's largest commercial customers.

The Large C&I sales forecast model excludes Global Foundries and OMYA; these are two of GMP's largest customers and are forecasted separately. Large C&I baseline sales forecast is derived using a generalized econometric model that relates monthly billed sales to state-level GDP and manufacturing employment. The baseline forecast is effectively flat as a result of strong decline in manufacturing employment mitigates the positive impact from state-level GDP growth. The baseline forecast is adjusted for future state-level energy efficiency activity and spot loads. The solar adjustment is positive as the solar load reduction is accounted for on the other side of the ledger as a power purchase cost.

Other use primarily consists of street lighting sales, but also includes public authority sales. Total sales are expected to be flat as continued efficiency gains outweigh new street-lighting fixture growth.

Table 8 summarizes industrial and other use sales forecasts.

**Table 8: Industrial Sales Forecast**

| Year | Industrial (MWh) | Chg | Other (MWh) | Chg |
|---|---|---|---|---|
| 2020 | 1,131,030 | | 3,822 | |
| 2021 | 1,123,784 | -0.6% | 3,817 | -0.1% |
| 2022 | 1,123,097 | -0.1% | 3,817 | 0.0% |
| 2023 | 1,122,746 | 0.0% | 3,817 | 0.0% |
| 2024 | 1,123,880 | 0.1% | 3,817 | 0.0% |
| 2025 | 1,124,466 | 0.1% | 3,817 | 0.0% |
| 20-25 | | -0.1% | | 0.0% |

Table 9 shows the disaggregated industrial sales forecast.

**Table 9: Disaggregated Industrial Sales Forecast**

| Year | NoEE(1) | EE(2) | Solar(3) | Spot(4) | TtlAdj | Forecast |
|---|---|---|---|---|---|---|
| 2020 | 1,135,472 | -3,599 | 167 | -1,010 | -4,442 | 1,131,030 |
| 2021 | 1,132,466 | -8,246 | 777 | -1,212 | -8,682 | 1,123,784 |
| 2022 | 1,135,051 | -12,094 | 1,352 | -1,212 | -11,955 | 1,123,097 |
| 2023 | 1,137,830 | -15,785 | 1,913 | -1,212 | -15,084 | 1,122,746 |
| 2024 | 1,142,045 | -19,412 | 2,459 | -1,212 | -18,166 | 1,123,880 |
| 2025 | 1,145,692 | -23,011 | 2,997 | -1,212 | -21,226 | 1,124,466 |

1. No EE forecast assumes no efficiency improvements after 2019.
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. Spot loads for large C&I are based on projections provided by GMP.

## 2. Total Forecast Adjustments

The forecast begins by developing baseline forecasts for each revenue class. The baseline forecast is then adjusted for expected growth in solar capacity, Tier 3 electrification activity, electric vehicle sales, and large C&I load changes. Table 10 shows the breakdown of total billed sales forecast.

### Table 10: Forecast Disaggregation

| Year | NoEE(1) | EE(2) | Solar(3) | Tier3(4) | EV(5) | Spot(6) | TtlAdj | Forecast |
|---|---|---|---|---|---|---|---|---|
| 2020 | 4,135,322 | -25,226 | -52,850 | 6,315 | 918 | -1,922 | -72,765 | 4,062,557 |
| 2021 | 4,159,181 | -59,135 | -60,226 | 21,663 | 3,672 | -2,306 | -96,333 | 4,062,848 |
| 2022 | 4,178,923 | -84,776 | -67,241 | 34,474 | 7,083 | -2,306 | -112,766 | 4,066,156 |
| 2023 | 4,201,776 | -110,099 | -74,096 | 48,382 | 11,598 | -2,306 | -126,521 | 4,075,256 |
| 2024 | 4,224,877 | -135,156 | -80,893 | 63,294 | 17,574 | -2,306 | -137,488 | 4,087,389 |
| 2025 | 4,245,866 | -159,744 | -87,335 | 78,798 | 25,440 | -2,306 | -145,147 | 4,100,719 |

1. No EE forecast assumes no efficiency improvements after 2019.
2. Efficiency includes impacts of new standards, naturally occurring, and program-based efficiency improvements.
3. Solar is derived from GMP solar capacity forecast.
4. Electrification impacts for residential and small C&I.
5. Residential VEIC electric vehicle forecast.
6. Spot loads for C&I are based on projections provided by GMP.

### 1. Energy Efficiency

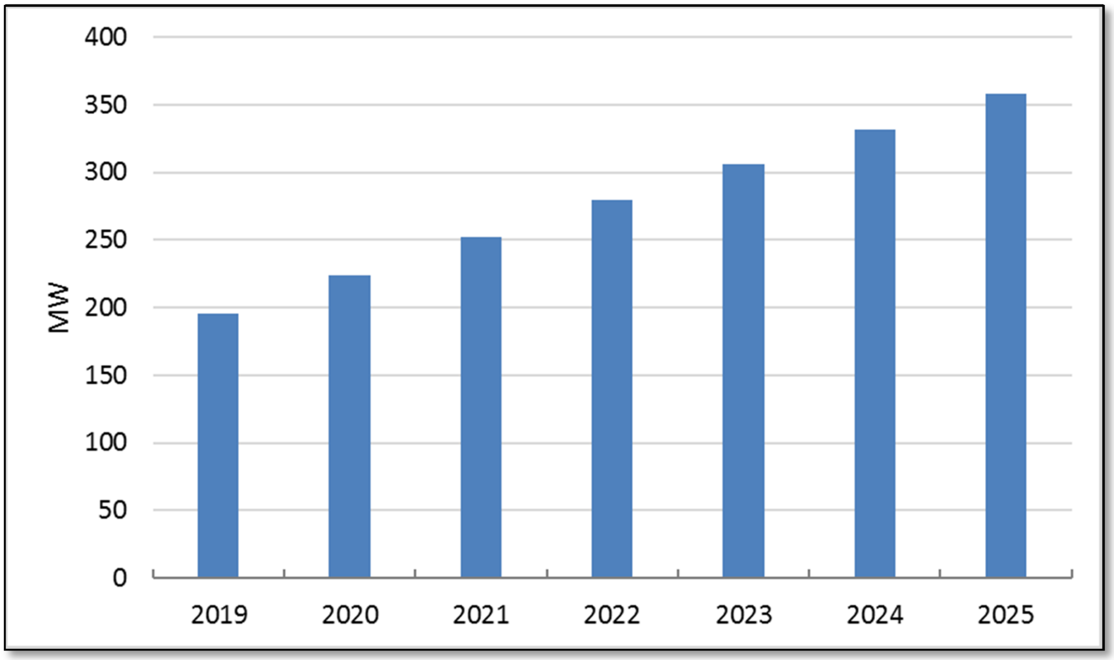
Energy efficiency is captured two ways – through the residential and commercial end-use intensities and additional state-level savings through a cumulative DSM savings variable. The DSM variable is cumulative over the historical and into the forecast period. State EE savings projections are based on VEIC's most recent projections.

### 2. Solar Load Forecast

**Solar Capacity Forecast.** As of December 2019, installed solar capacity is 195 MW. This is a combination of traditional, customer owned or leased roof-top systems, and larger community/group-based systems. GMP projects 29 MW of solar capacity will be installed in 2020, 28 MW of additional solar capacity in 2021 and 2022, and 26 MW each subsequent year.

Figure 3 shows the year-end capacity forecast.

**Figure 3: Year-End Solar Capacity Forecast**




The forecast is adjusted for new solar installations beginning in March 2020; existing solar load is embedded in the historical sales data.

### Allocation of Capacity to Classes

The capacity forecast is allocated to the residential, commercial, and industrial classes based on the previous 12 months of billed solar generation data. Table 11 shows the allocation factors.

**Table 11: Capacity Allocation Factors**

| Class | Previous 12 Mnth Generation (MWh) | Share of Total |
|---|---:|---:|
| Residential | 72,336 | 32.3% |
| Commerical | 121,811 | 54.4% |
| Industrial | 29,922 | 13.4% |
| Total | 224,068 | |

### Capacity to Generation

Monthly generation is derived by applying monthly solar load factors to the capacity forecast. Table 12 shows the solar generation load factors.

**Table 12: 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% |

The monthly load factors are derived from engineering-based solar hourly load profile for 1 MW solar system load. The load shape is a weighted profile, which assumes 33% of systems are roof-mounted, 57% are fixed-tilt, and 10% 2 are axis trackers. The system hourly load profile was estimated by GMP.

The solar generation forecast (MWh) is derived by applying the load factors to solar capacity projections. The following equation shows an example of how 100 MW of capacity is translated into June generation.

$$100MW_{june} \times 0.206LdFct_{june} \times 720hrs_{june} = 14{,}832\ MWh_{june}$$

**Estimation of Solar "Own-Use"**

Solar generation is either consumed by the solar customer (*own-use*) or returned to the connected power-grid (*excess*); own-use reduces billed revenues, while excess is treated as power purchase cost. Historical solar billing data are used to determine the month share that is own-use and excess. 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. Table 13 shows the forecasted generation based on the total capacity, by own-use and excess use.

## Table 13: Solar Generation

| Year | Year End Capacity (MW) | Total MWh Generation | Total MWh Excess | Total MWh Own Use | Residential MWh Generation | Residential MWh Excess | Residential MWh Own Use | Commercial MWh Generation | Commercial MWh Excess | Commercial MWh Own Use | Industrial MWh Generation | Industrial MWh Excess | Industrial MWh Own Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 223.9 | 259,706 | 206,975 | 52,731 | 83,841 | 31,363 | 52,478 | 141,184 | 137,524 | 3,660 | 34,681 | 38,088 | -3,407 |
| 2021 | 251.9 | 296,888 | 236,626 | 60,262 | 95,844 | 35,874 | 59,970 | 161,398 | 157,214 | 4,183 | 39,646 | 43,538 | -3,892 |
| 2022 | 279.6 | 332,183 | 264,758 | 67,426 | 107,239 | 40,137 | 67,102 | 180,585 | 175,907 | 4,678 | 44,359 | 48,714 | -4,355 |
| 2023 | 305.8 | 366,696 | 292,266 | 74,430 | 118,381 | 44,305 | 74,075 | 199,348 | 194,186 | 5,162 | 48,968 | 53,775 | -4,807 |
| 2024 | 332.0 | 400,786 | 319,416 | 81,370 | 129,386 | 48,403 | 80,983 | 217,880 | 212,240 | 5,640 | 53,520 | 58,773 | -5,253 |
| 2025 | 358.3 | 433,277 | 345,333 | 87,944 | 139,875 | 52,348 | 87,527 | 235,543 | 229,447 | 6,096 | 57,859 | 63,538 | -5,679 |

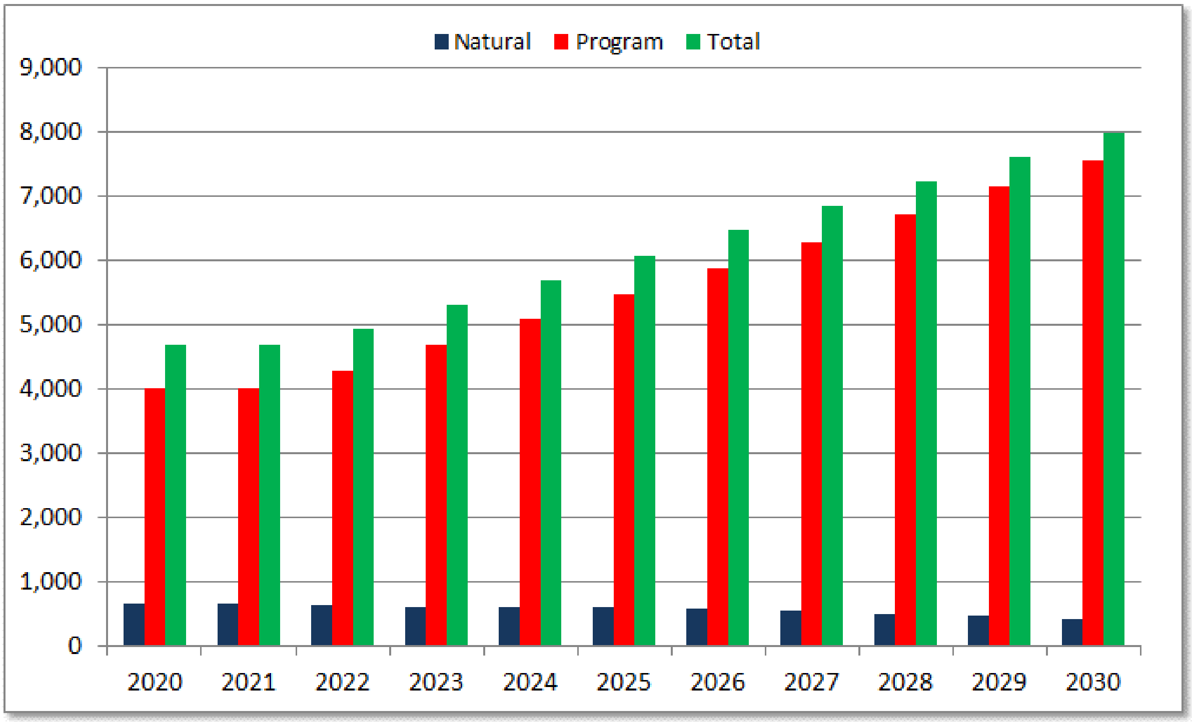
The sales forecast is adjusted for solar load impacts by subtracting cumulative new solar own-use generation from the appropriate class sales forecasts, historical solar own-use is imbedded in the historical billed sales data. By 2025, solar generation reduces residential sales by 87,527 MWh, which represents a reduction of 386 kWh per customer. Industrial own-use is negative, meaning that solar is additive. This is due to how solar generation and excess credits are measured. Own-use is not a measure concept, it is calculated as generation minus excess. The measured excess credits are often transferred across customer classes. As such industrial excess is greater than generation, creating negative own-use.

### 3. Tier 3 Electrification Impacts

To meet Tier 3 obligations, VEIC and GMP are promoting technologies that displace fossil fuel. The largest program is an incentive program promoting adoption of cold-climate heat pumps. In 2019, approximately 4,700 new heat pumps were installed. As GMP, serves most of the state, the GMP forecast is derived by taking 76% of VEIC current state-level forecast.

Given the operating cost-effectiveness, EIA projects heat pump market penetration in New England even without incentives; we would expect some GMP households to take the incentives even if it is not influencing their purchase decision. Program related heat pump sales are reduced to reflect the "natural occurring" adoption reflected in EIA's heat pump saturation forecast. Figure 4 shows the breakdown of cold-climate heat pump adoption by market driven (*Natural*) and program induced (*Program*).

**Figure 4: Cold-Climate Heat Pump Adoption (units)**

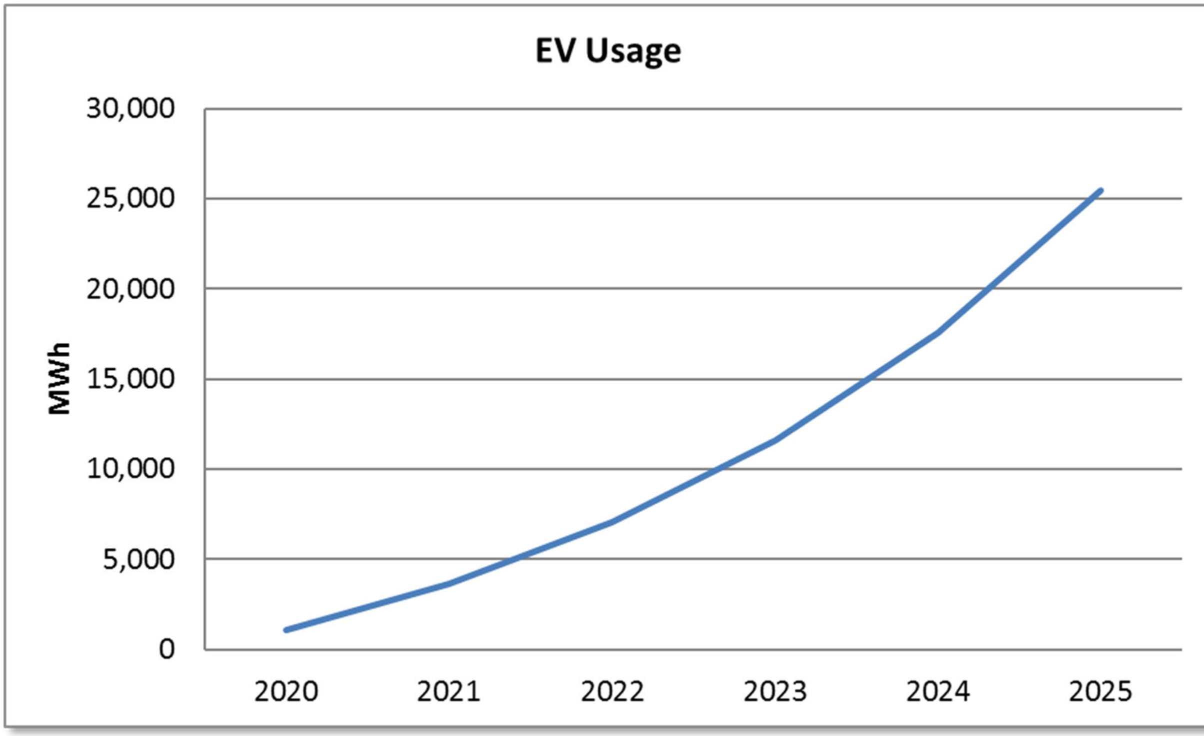



Of the heat pumps sold through the incentive program, roughly 85-90% a year are directly attributable to the offered incentive. A recent Vermont heat pump study (Cadmus, 2017) estimates cold-climate heat pumps on average use 2,085 kWh per year for heating and 146 kWh per year for cooling. Heat pump electricity 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.

### 4. Electric Vehicle Forecast

Forecasts are also adjusted for expected electric vehicle (EV) demand. EV sales are based on VEICs 2017 EV forecast; to date, this forecast has been tracking relatively well. In the near-term EVs contribution to electricity sales is relatively small. The longer-term forecast reflects VEIC's high case usage estimates. By 2025, roughly 25,440 MWh are projected to be used by EV's in the GMP service territory starting from 1,101 in 2020. Figure 5 shows the electric vehicle usage forecast.

**Figure 5: Electric Vehicle Use Forecast**




### 5. Customer Specific Load Adjustments

GMP provides monthly forecasts for their two large transmission customers - Global Foundries and OMYA, which is based on those customers' own projections.

In addition, GMP provides expected load gains and losses for large commercial and industrial customers that are not reflected in the historical sales trend and thus not captured by the baseline forecast models. GMP expects to lose about 2,306 MWh of non-residential sales in the near future that are not captured in the baseline forecast model.

## 3. Baseline Forecast Models

Baseline sales forecasts are derived from estimated linear regression models that relate monthly historical sales to economic conditions, price, weather conditions, past and future DSM, and long-term appliance saturation and efficiency trends. Saturation and efficiency trends are combined to construct annual energy intensity projections that are then adjusted for future EE program savings projections. Once models are estimated, assumptions about future conditions are executed through the models to generate customer and sales forecasts.

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

- Residential
- Commercial (Small C&I)
- Industrial (Large C&I)
- Other

Residential and commercial 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.

## 1. Residential

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:

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

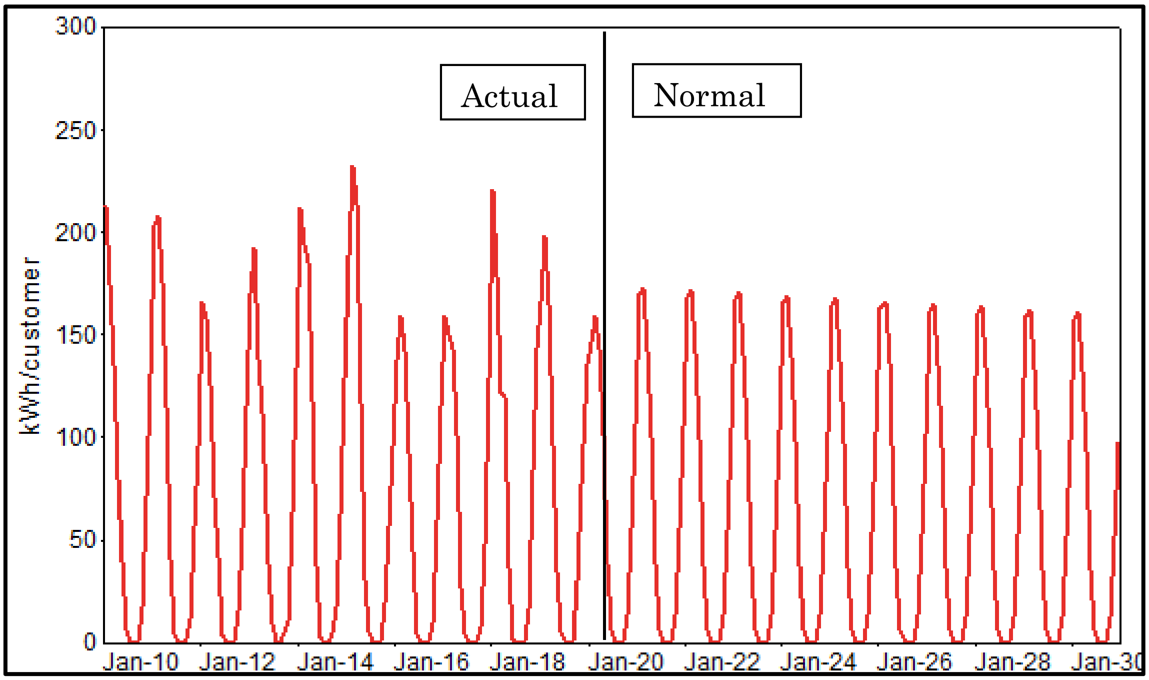
Where:

$$HeatUse_{y,m} = \left(\frac{HDD_{y,m}}{HDD_{09}}\right) \times \left(\frac{HHSize_y}{HHSize_{09}}\right)^{0.20} \times \left(\frac{Income_y}{Income_{09}}\right)^{0.20} \times \left(\frac{Price_{y,m}}{Price_{09}}\right)^{-0.10}$$

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 (2009). 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 6 shows the calculated XHeat variable.

**Figure 6: 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 7 and Figure 8 show XCool and XOther.

**Figure 7: XCool Variable**

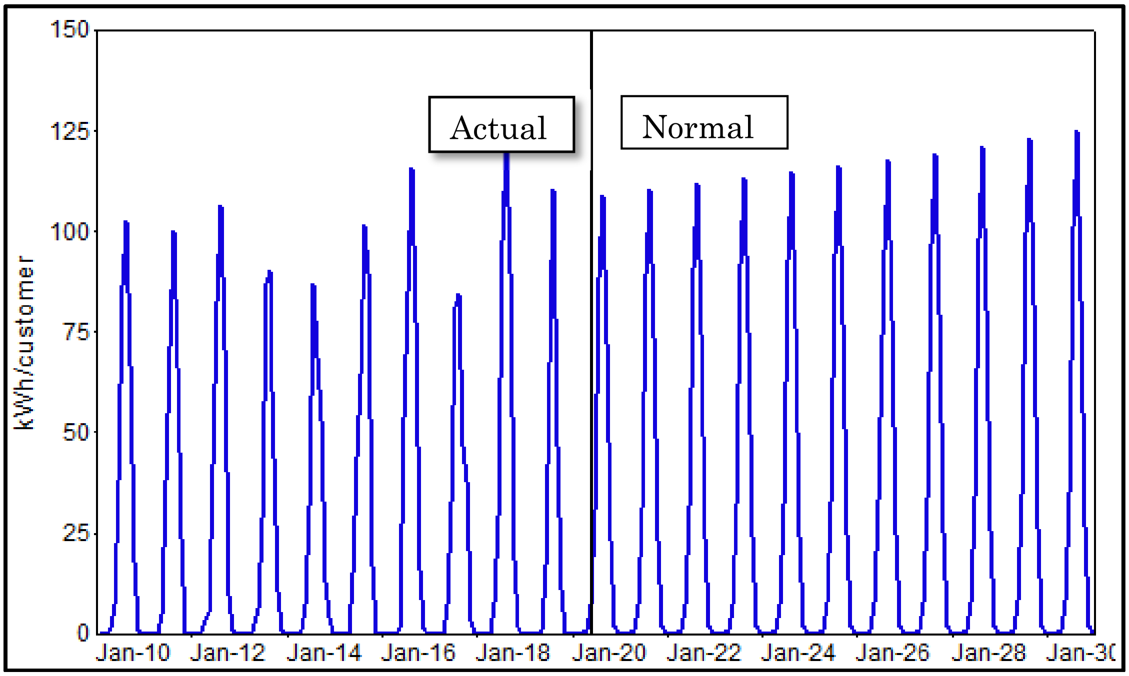
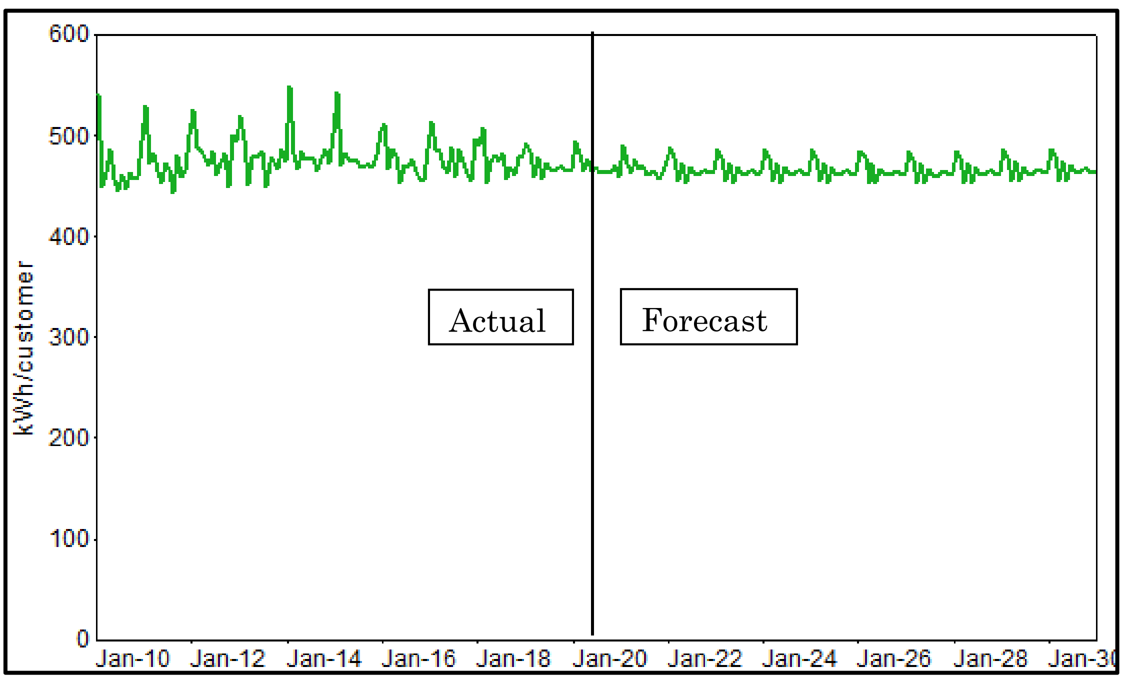



**Figure 8: XOther Variable**

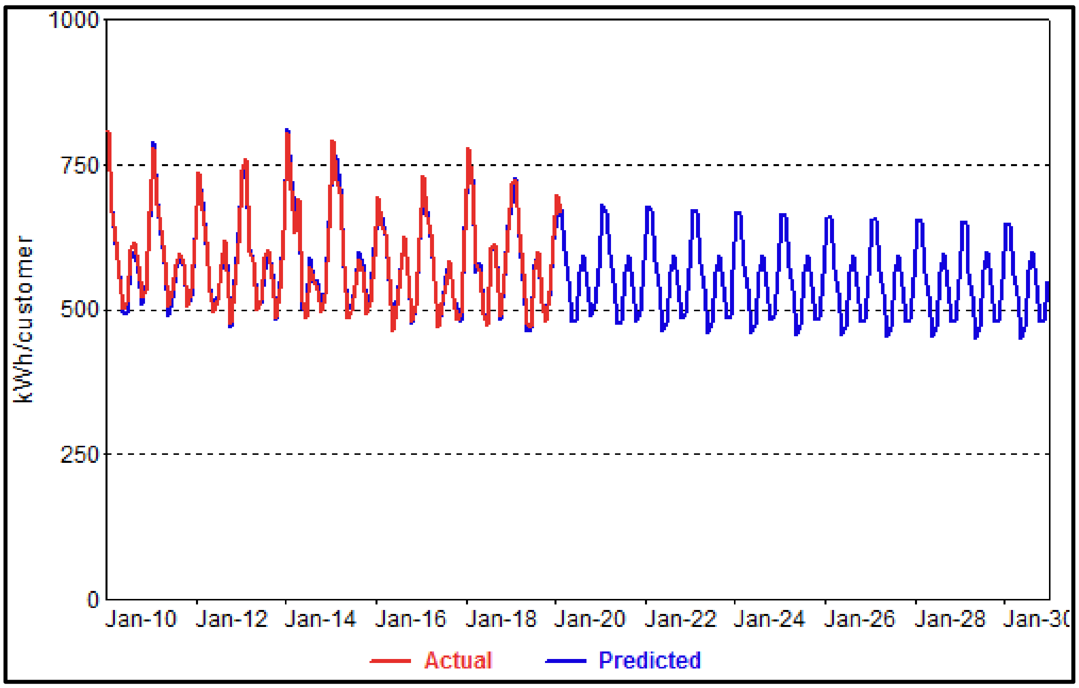



While cooling intensity is relatively small, cooling per household increases over the forecast period largely as a result of increasing air conditioning and heat pump saturation.

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 9 shows actual and predicted residential average use.

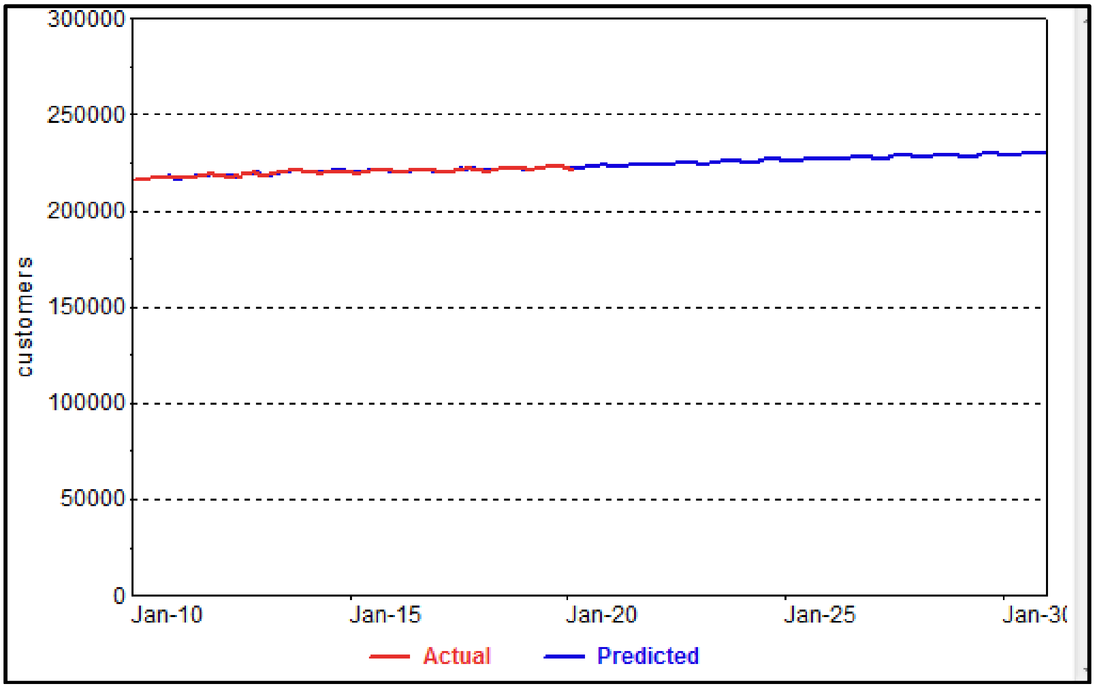
**Figure 9: Residential Average Use**




The model explains historical monthly sales variation well with an Adjusted R-Squared of 0.97 and a MAPE of 1.7%.

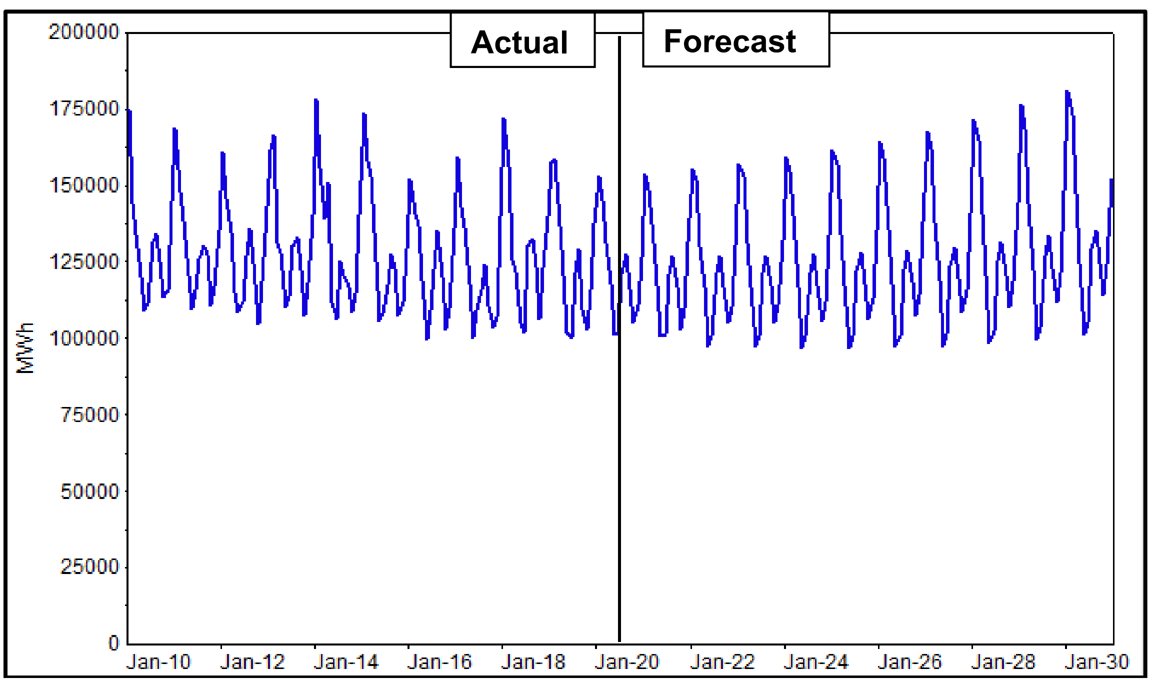
Residential customer projections are based on state household projections. The models explain historical customer growth well with an Adjusted R-Squared of 0.96 and MAPE of 0.1%. Figure 10 shows actual and predicted customers for GMP.

**Figure 10: Residential Customer Forecast**




Customer and average use forecasts are combined to generate monthly billed sales forecast. Figure 11 shows the monthly residential sales forecast.

**Figure 11: 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.

## 2. Commercial

The commercial model is also based on SAE specification. Monthly commercial class sales and customers are derived adding the former North GS (general service) and TOU revenue class and the former GMP South commercial sales.

The SAE commercial 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 commercial 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 differences 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 commercial class is forecasted using a total sales model where XCool is defined as:

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

Where:

$$CoolUse_{y,m} = \left(\frac{CDD_{y,m}}{CDD_{09}}\right) \times \left(\frac{ComVar_y}{ComVar_{09}}\right) \times \left(\frac{Price_{y,m}}{Price_{09}}\right)^{-0.10}$$

.

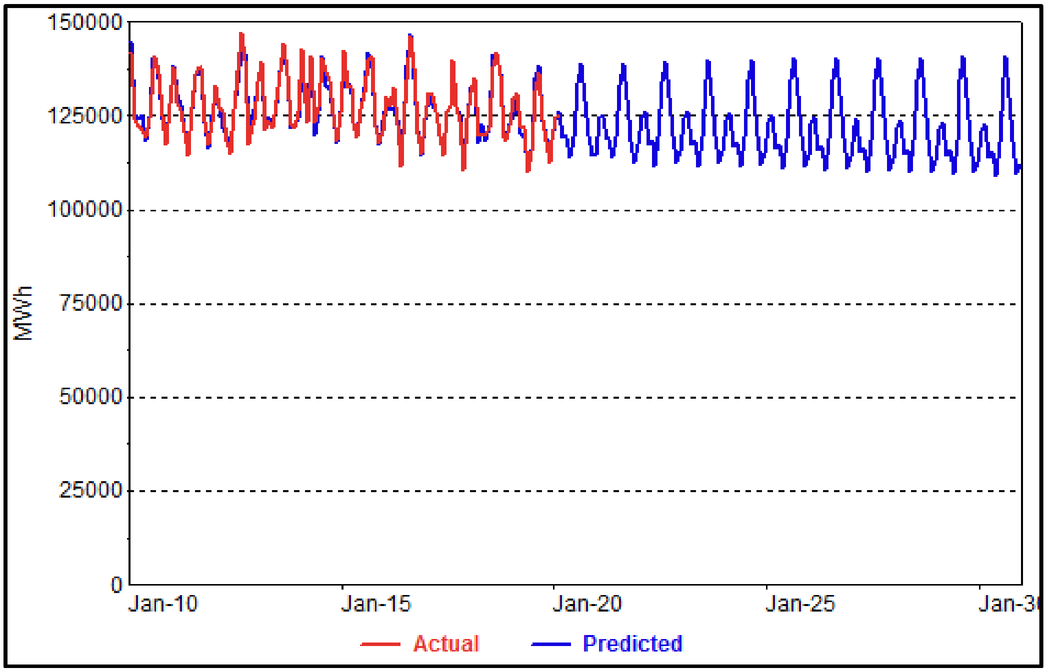
And

$$ComVar_{y,m} = \left(\frac{Emp_{y,m}}{Emp_{09}}\right)^{0.25} \times \left(\frac{GDP_{y,m}}{GDP_{09}}\right)^{0.25} \times \left(\frac{HHs_{y,m}}{HHs_{09}}\right)^{0.50}$$

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) similar to that of XCool. The model variables are used to drive total sales through an estimated monthly regression model. Figure 12 shows the commercial sales model results.

**Figure 12: Commercial Sales Forecast**




This model fits commercial data well with an Adjusted R-Squared of 0.94 and model MAPE of 1.1%. Model statistics can be found in the Appendix A.

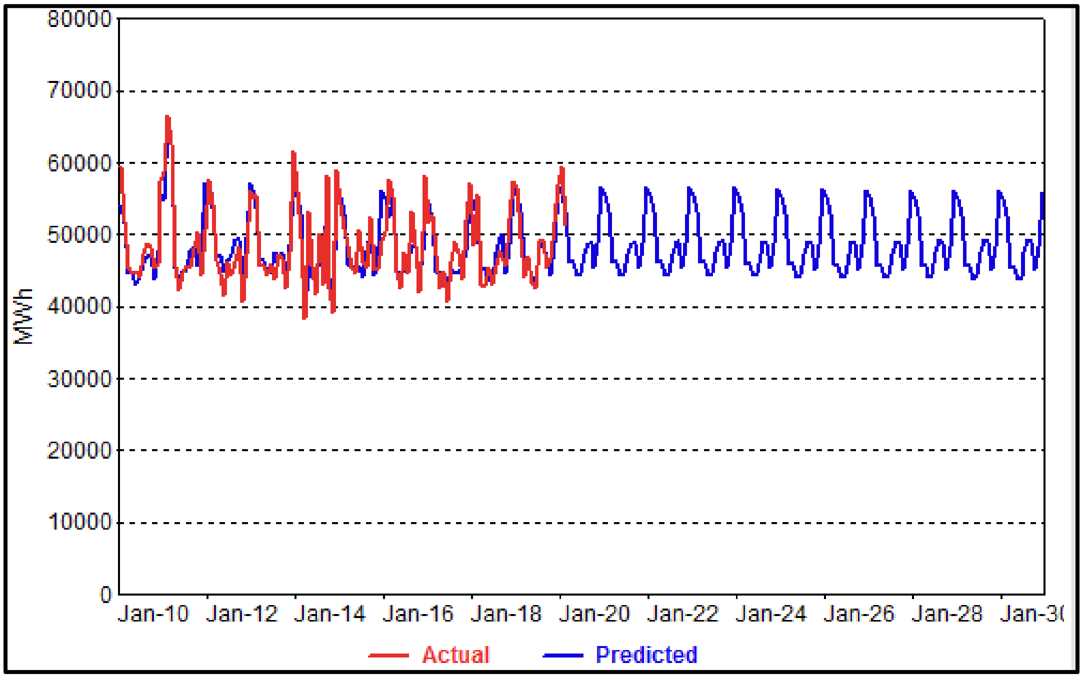
### 3. Industrial

Industrial 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:

$$IndVar_{y,m} = \left(\frac{ManEmp_{y,m}}{ManEmp_{09}}\right)^{0.60} \times \left(\frac{GDP_{y,m}}{GDP_{09}}\right)^{0.40}$$

Seasonal load variation is captured through a set of monthly binary variables. The industrial model excludes Global Foundries and OMYA sales as GMP provides an independent forecast for these customers based on their input. Figure 13 shows actual and predicted industrial sales.

**Figure 13: Industrial Sales Forecast**

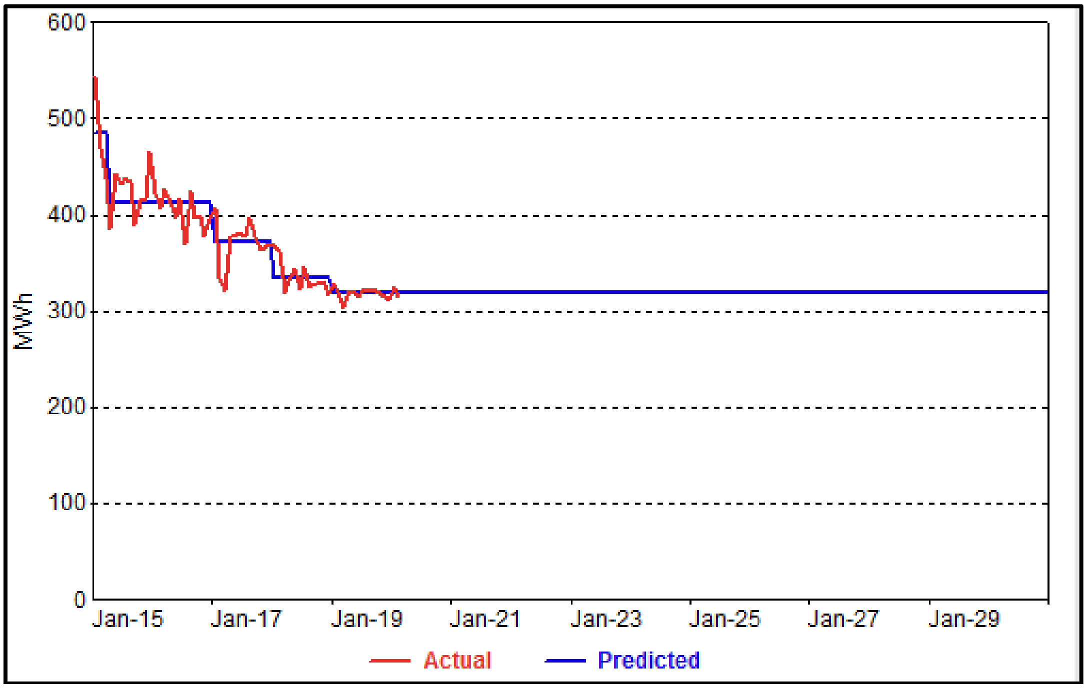



This model Adjusted R-Squared is 0.74 and the MAPE is 4.1%. The lower, relative to other models, Adjusted R-Square is due to the large variation in monthly billed sales data. There is significant month-to-month variation driven by customer-specific activity and billing adjustments that cannot be totally accounted for by economic drivers and weather conditions.

## 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 14 shows actual and forecasted sales for this revenue class.

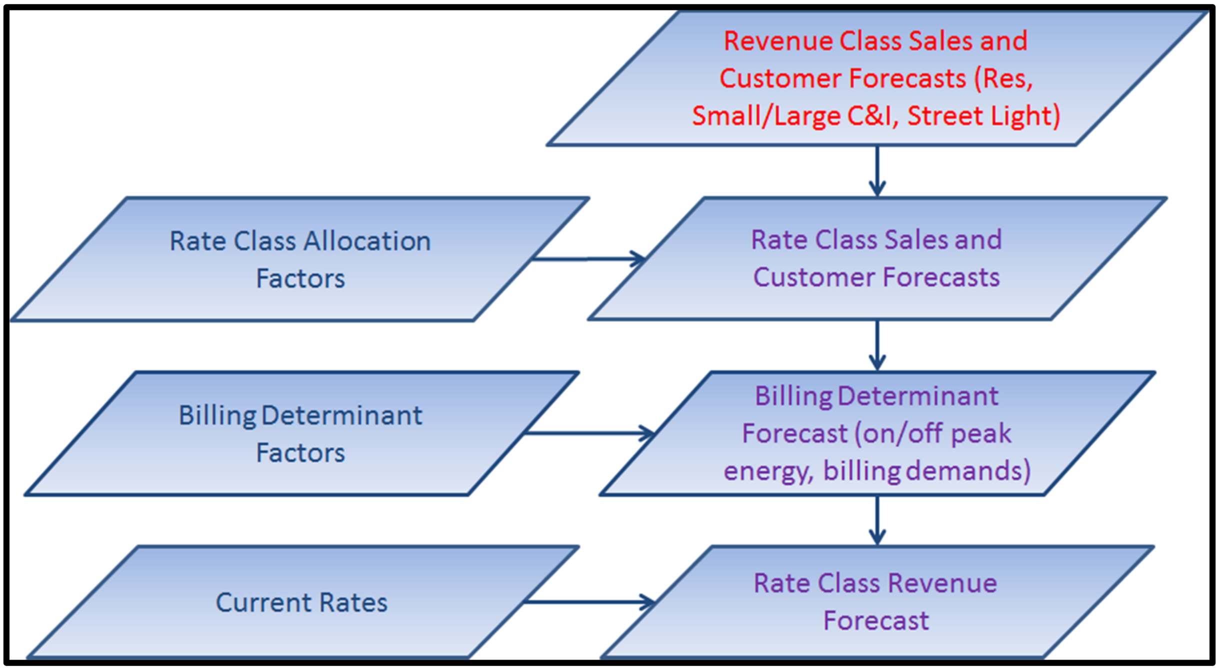
**Figure 14: Other Sales Forecast (MWh)**




## 4. 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 15 provides an overview of the revenue model.

**Figure 15: Revenue Model**



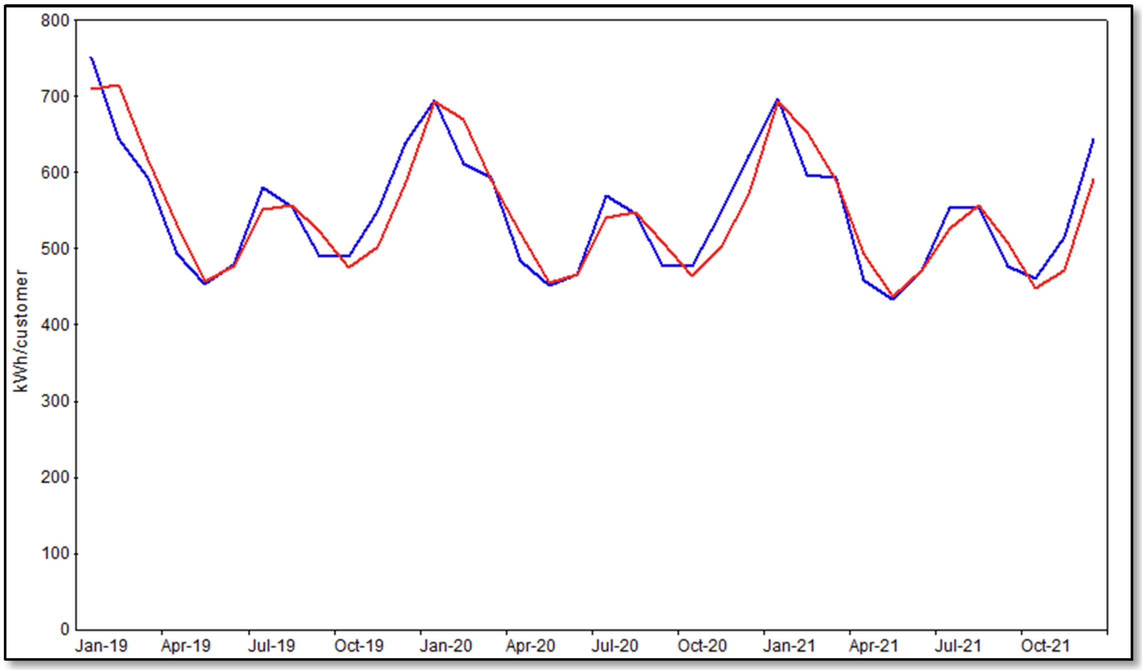

The process is described below.

### 1. Calendarize class sales forecast

The estimated models are based on monthly billed sales data. As such the forecast is also on a billed sales basis. For financial analysis and revenue projections sales are converted to a calendar-month basis.

The billing-month spans across calendar-months. In general, the billing month includes the last two weeks of the prior month and the first two weeks of the current month. The September billing-month for example includes the last half of August and the first half of September. The billing month period is determined by the meter read schedule. We use the meter-read schedule to construct monthly HDD and CDD (cycle-weighted degree-days) and number of billing days that are consistent with the billing month period. Utilities report revenues and costs on a calendar-month basis. A MetrixND Simulation Object is used to convert billed sales to calendar sales. This is done by replacing billing-month normal HDD and CDD with calendar-month normal HDD and CDD and replacing the number of billing days with the number of calendar days. Figure 16 shows the result of this simulation for the residential sales class.

**Figure 16: Comparison of Billed and Calendar-Month Average Use**

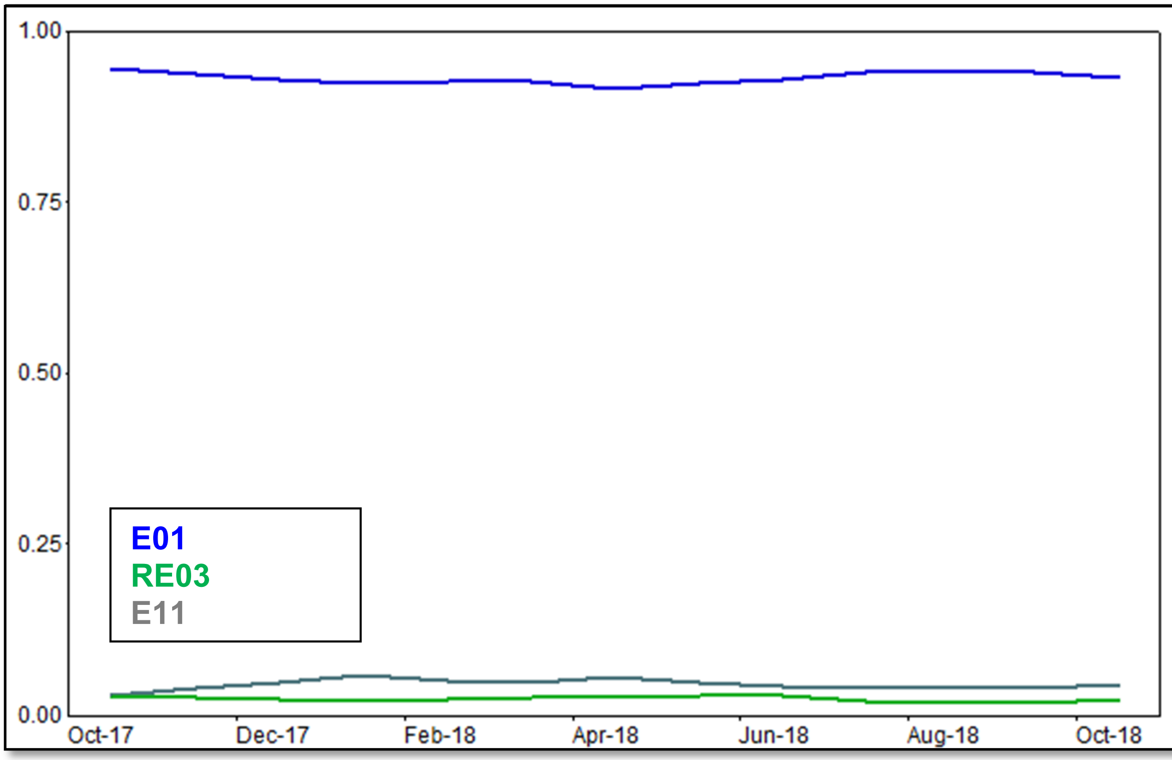



The red line is the forecasted baseline average residential use on a billing month basis and the blue line shows the forecast on a calendar-month basis.

## 2. Derive Rate Class Monthly Sales Forecast

Revenue class sales and customer forecasts are first 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 allow us to capture any seasonal variation in the rate class shares. Residential class sales, for example, are allocated to rate schedules - E01, RE03, and E11 rate classes. Figure 17 shows historical and forecasted residential rate class sales shares.

**Figure 17: Residential Rate Class Share Forecast**



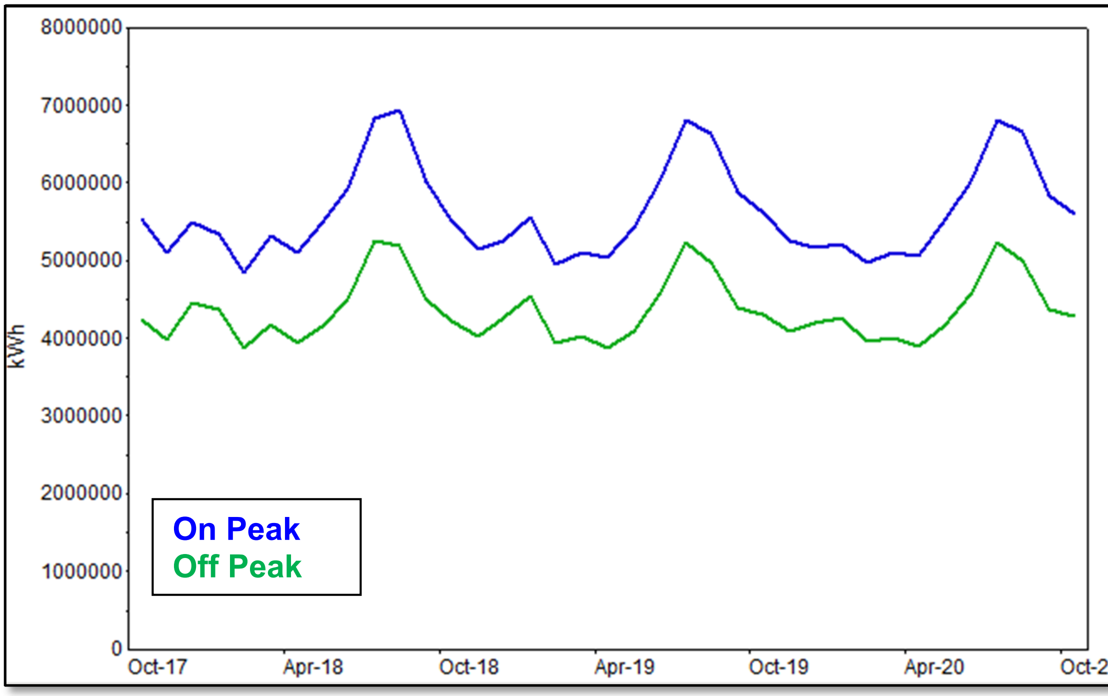

Approximately 95% of residential sales are billed under rate E01. The percentage is slightly lower in the winter months as the electric time-of-use rate (E11) is higher in these months.

### 3. 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 commercial 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 18 shows the resulting sales block forecasts for rate E65 Demand Customers.

**Figure 18: Rate E65 Demand Customer - Sales Billing Block Forecast**




### 4. 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, commercial, industrial and street lighting.

### 5. Fiscal Year Sales and Revenue Forecast

GMP uses a fiscal year for financial planning and reporting. The fiscal year is from October to the following September. Fiscal Year 2021, for example, will run from October 2020 through September 2021. Table 14 and Table 15 show the fiscal year sales and revenue forecasts where sales and revenue are reported on a calendar-month basis.

**Table 14: Fiscal Year Sales Forecast (MWh)**

| Year | Residential | Chg | Commercial | Chg | Industrial | Chg | Other | Chg | Total | Chg |
|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 1,478,508 | | 1,472,482 | | 1,140,550 | | 3,817 | | 4,095,357 | |
| 2021 | 1,462,193 | -1.1% | 1,473,287 | 0.1% | 1,124,283 | -1.4% | 3,821 | 0.1% | 4,063,585 | -0.8% |
| 2022 | 1,464,074 | 0.1% | 1,475,764 | 0.2% | 1,122,304 | -0.2% | 3,821 | 0.0% | 4,065,963 | 0.1% |
| 2023 | 1,469,547 | 0.4% | 1,477,702 | 0.1% | 1,121,878 | 0.0% | 3,821 | 0.0% | 4,072,949 | 0.2% |
| 2024 | 1,477,441 | 0.5% | 1,481,168 | 0.2% | 1,122,830 | 0.1% | 3,821 | 0.0% | 4,085,259 | 0.3% |
| 2025 | 1,488,466 | 0.7% | 1,481,872 | 0.0% | 1,123,018 | 0.0% | 3,821 | 0.0% | 4,097,177 | 0.3% |
| 20-25 | | 0.1% | | 0.1% | | -0.3% | | 0.0% | | 0.0% |

**Table 15: Fiscal Year Revenue Forecast ($)**

| Year | Residential | Chg | Commercial | Chg | Industrial | Chg | Other | Chg | Total | Chg |
|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 285,152,980 | | 245,087,151 | | 126,086,167 | | 2,615,690 | | 658,941,989 | |
| 2021 | 284,311,981 | -0.3% | 243,251,505 | -0.7% | 122,241,707 | -3.0% | 2,623,357 | 0.3% | 652,428,550 | -1.0% |
| 2022 | 284,771,174 | 0.2% | 243,790,930 | 0.2% | 122,012,168 | -0.2% | 2,623,147 | 0.0% | 653,197,420 | 0.1% |
| 2023 | 285,827,558 | 0.4% | 244,232,996 | 0.2% | 121,962,769 | 0.0% | 2,623,147 | 0.0% | 654,646,471 | 0.2% |
| 2024 | 287,384,022 | 0.5% | 244,757,466 | 0.2% | 121,977,201 | 0.0% | 2,623,147 | 0.0% | 656,741,837 | 0.3% |
| 2025 | 289,221,961 | 0.6% | 245,094,227 | 0.1% | 122,099,819 | 0.1% | 2,623,147 | 0.0% | 659,039,155 | 0.3% |
| 20-25 | | 0.3% | | 0.0% | | -0.6% | | 0.1% | | 0.0% |

## 6. COVID-19 Impacts

The sales and resulting revenue forecast are based on Moody Analytics January 2020 state economic forecast. In January Moody was projecting a slow first half economic growth for 2020 and then ramping up after that with total GDP growth for the year of 1.9%. State economic growth was expected to continue to grow at roughly 2.0% over the next five years. This outlook has changed with the Covid-19 induced economic shutdown, and the length of recovery from this activity is uncertain.

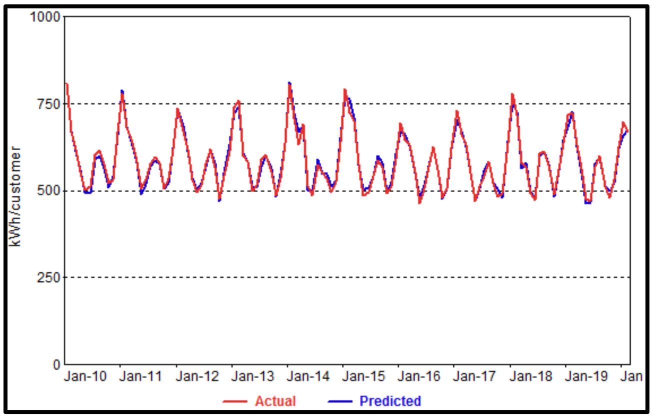
There has been a significant drop in C&I electric sales from the shutdown. In April, *Small C&I* weather-normal sales were 16% below expected trend sales and *Large C&I* was 7%. Residential sales have compensated for some of this loss; April residential sales were up *9.0%* above expected sales trend; in total weather normalized April sales are 4.4% below expected sales. This information is being followed by Vermont state economists and the DPS.

As the economy starts to re-open, we expect sales to begin moving back to trend. There is however significant uncertainty as to the economic recovery path and associated return to normal electricity sales trend. Recovery may be relatively quick particularly if a vaccine is developed in a timely manner, or may follow a longer economic recovery path as we learn to live with the Covid-19 virus.

At this point, the economic projections are changing weekly. We are tracking economic activity and are waiting for Moody's May state economic forecast. We expect to see more clarity on the economic outlook over the next few months.

# APPENDIX A: MODEL STATISTICS AND COEFFICIENTS

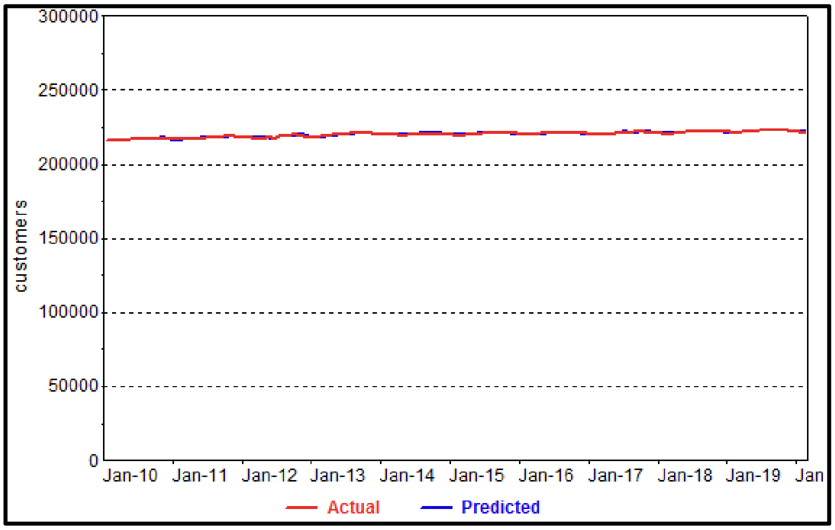
### Figure 19: Residential Average Use Model




| Variable | Coefficient | StdErr | T-Stat | P-Value |
|---|---|---|---|---|
| mStructRev.XHeat | 1.297 | 0.037 | 35.423 | 0.00% |
| mStructRev.XCool | 1.448 | 0.066 | 22.018 | 0.00% |
| mStructRev.XOther | 0.998 | 0.013 | 78.164 | 0.00% |
| mSales.Savings_PC | -0.174 | 0.044 | -3.984 | 0.01% |
| mBin.Mar | -23.912 | 4.779 | -5.004 | 0.00% |
| mBin.Apr | -31.611 | 5.351 | -5.908 | 0.00% |
| mBin.May | -20.18 | 5.731 | -3.521 | 0.06% |
| mBin.Jun | -16.438 | 5.202 | -3.16 | 0.20% |
| mBin.Nov | -11.261 | 4.466 | -2.522 | 1.31% |
| mBin.FebMar11 | -48.856 | 11.347 | -4.306 | 0.00% |
| mBin.Apr14 | 106.442 | 14.171 | 7.511 | 0.00% |
| AR(1) | 0.304 | 0.096 | 3.176 | 0.19% |

| Model Statistics | |
|---|---|
| Iterations | 10 |
| Adjusted Observations | 121 |
| Deg. of Freedom for Error | 109 |
| R-Squared | 0.975 |
| Adjusted R-Squared | 0.972 |
| AIC | 5.323 |
| BIC | 5.6 |
| Log-Likelihood | -481.71 |
| Model Sum of Squares | 785,228.23 |
| Sum of Squared Errors | 20,335.21 |
| Mean Squared Error | 186.56 |
| Std. Error of Regression | 13.66 |
| Mean Abs. Dev. (MAD) | 10.11 |
| Mean Abs. % Err. (MAPE) | 1.71% |
| Durbin-Watson Statistic | 2.112 |

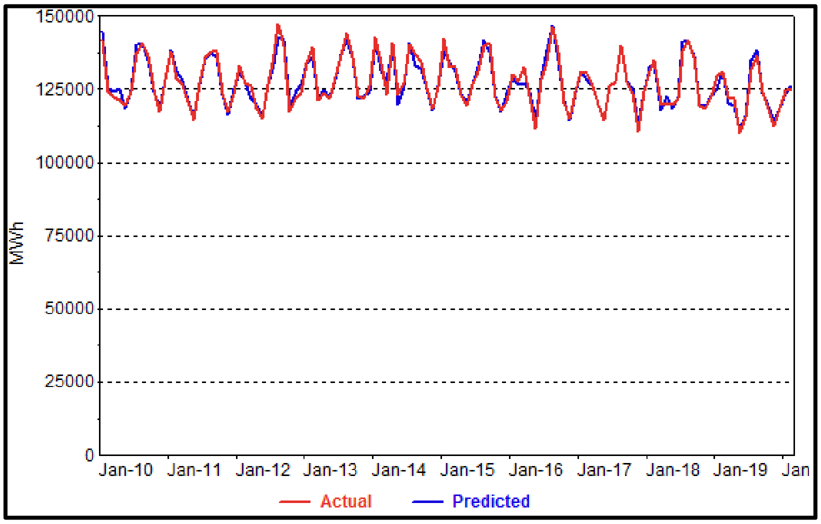
## Figure 20:  Residential Customer Model




| Variable | Coefficient | StdErr | T-Stat | P-Value |
|---|---|---|---|---|
| CONST | 73283.373 | 11162.9 | 6.565 | 0.00% |
| Economics.HHs | 561.269 | 42.491 | 13.209 | 0.00% |
| mBin.Jan | -945.675 | 157.603 | -6 | 0.00% |
| mBin.Feb | -1036.438 | 166.267 | -6.234 | 0.00% |
| mBin.Mar | -895.596 | 165.833 | -5.401 | 0.00% |
| mBin.Apr | -977.924 | 154.183 | -6.343 | 0.00% |
| mBin.May | -443.469 | 125.262 | -3.54 | 0.06% |
| mBin.Dec | -548.295 | 125.299 | -4.376 | 0.00% |
| mBin.Jun12 | -1997.084 | 356.173 | -5.607 | 0.00% |
| mBin.Jul12 | 1093.181 | 349.461 | 3.128 | 0.23% |
| AR(1) | 0.709 | 0.073 | 9.769 | 0.00% |

| Model Statistics | |
|---|---|
| Iterations | 14 |
| Adjusted Observations | 121 |
| Deg. of Freedom for Error | 110 |
| R-Squared | 0.961 |
| Adjusted R-Squared | 0.958 |
| AIC | 11.945 |
| BIC | 12.199 |
| F-Statistic | 272.39 |
| Prob (F-Statistic) | 0 |
| Log-Likelihood | -883.38 |
| Model Sum of Squares | 384,932,621.58 |
| Sum of Squared Errors | 15,544,832.84 |
| Mean Squared Error | 141,316.66 |
| Std. Error of Regression | 375.92 |
| Mean Abs. Dev. (MAD) | 270.12 |
| Mean Abs. % Err. (MAPE) | 0.12% |
| Durbin-Watson Statistic | 1.994 |

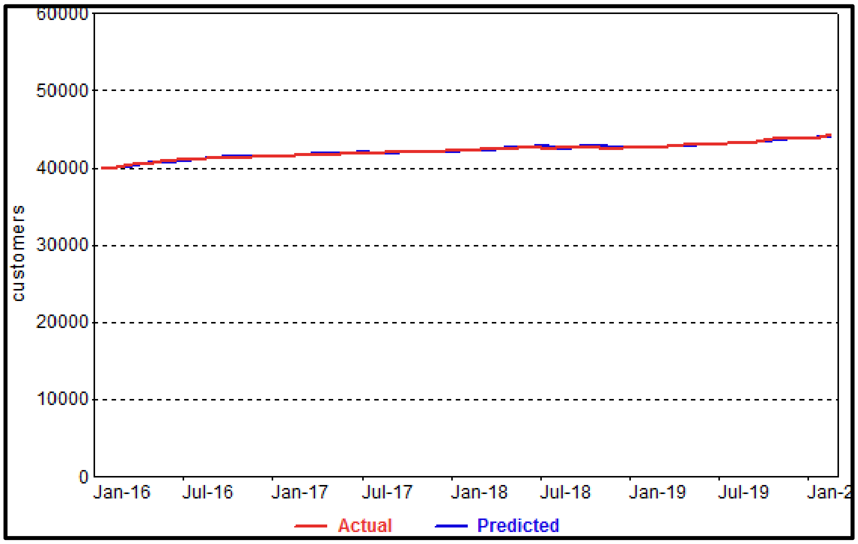
## Figure 21: Commercial Sales Model




| Variable | Coefficient | StdErr | T-Stat | P-Value |
|---|---|---|---|---|
| CONST | 20456.039 | 5931.239 | 3.449 | 0.08% |
| mStructRev.XHeat | 188081.708 | 10318.56 | 18.228 | 0.00% |
| mStructRev.XCool | 81576.811 | 2857.015 | 28.553 | 0.00% |
| mStructRev.XOther | 10148.592 | 626.395 | 16.202 | 0.00% |
| DSMSavings.Com | -0.177 | 0.071 | -2.489 | 1.43% |
| mBin.Sep12Plus | 6565.884 | 892.169 | 7.359 | 0.00% |
| mBin.Yr2019Plus | -2009.743 | 1030.876 | -1.95 | 5.38% |
| mBin.Feb | 2153.785 | 660.165 | 3.262 | 0.15% |
| mBin.Oct | 3079.072 | 649.666 | 4.739 | 0.00% |
| mBin.Apr14 | 16512.644 | 1967.243 | 8.394 | 0.00% |
| mBin.Jul17 | -5916.059 | 1928.241 | -3.068 | 0.27% |
| MA(1) | 0.347 | 0.094 | 3.676 | 0.04% |

| Model Statistics | |
|---|---|
| Iterations | 15 |
| Adjusted Observations | 122 |
| Deg. of Freedom for Error | 110 |
| R-Squared | 0.949 |
| Adjusted R-Squared | 0.944 |
| AIC | 15.304 |
| BIC | 15.58 |
| F-Statistic | 187.152 |
| Prob (F-Statistic) | 0 |
| Log-Likelihood | -1,094.64 |
| Model Sum of Squares | 8,307,945,913.50 |
| Sum of Squared Errors | 443,914,504.13 |
| Mean Squared Error | 4,035,586.40 |
| Std. Error of Regression | 2,008.88 |
| Mean Abs. Dev. (MAD) | 1,468.46 |
| Mean Abs. % Err. (MAPE) | 1.14% |
| Durbin-Watson Statistic | 1.967 |

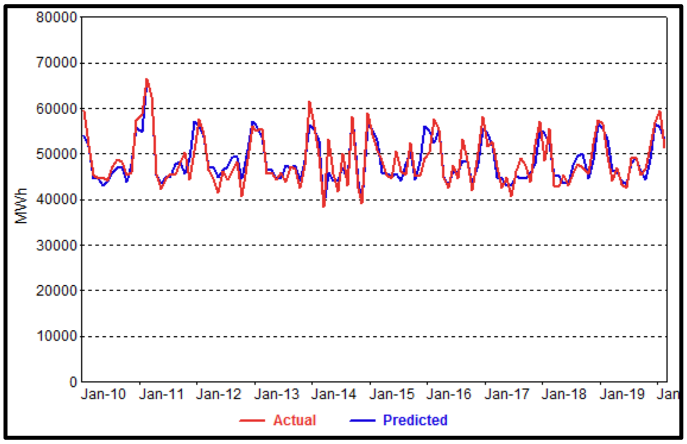
## Figure 22: Commercial Customer Model




| Variable | Coefficient | StdErr | T-Stat | P-Value |
|---|---|---|---|---|
| Economics.NManEmp | 158.413 | 13.589 | 11.66 | 0.00% |
| AR(1) | 0.976 | 0.031 | 31.31 | 0.00% |

| Model Statistics | |
|---|---|
| Iterations | 5 |
| Adjusted Observations | 49 |
| Deg. of Freedom for Error | 47 |
| R-Squared | 0.973 |
| Adjusted R-Squared | 0.972 |
| AIC | 10.165 |
| BIC | 10.242 |
| Log-Likelihood | -316.57 |
| Model Sum of Squares | 42,202,354.46 |
| Sum of Squared Errors | 1,173,010.93 |
| Mean Squared Error | 24,957.68 |
| Std. Error of Regression | 157.98 |
| Mean Abs. Dev. (MAD) | 111.33 |
| Mean Abs. % Err. (MAPE) | 0.26% |
| Durbin-Watson Statistic | 2.39 |

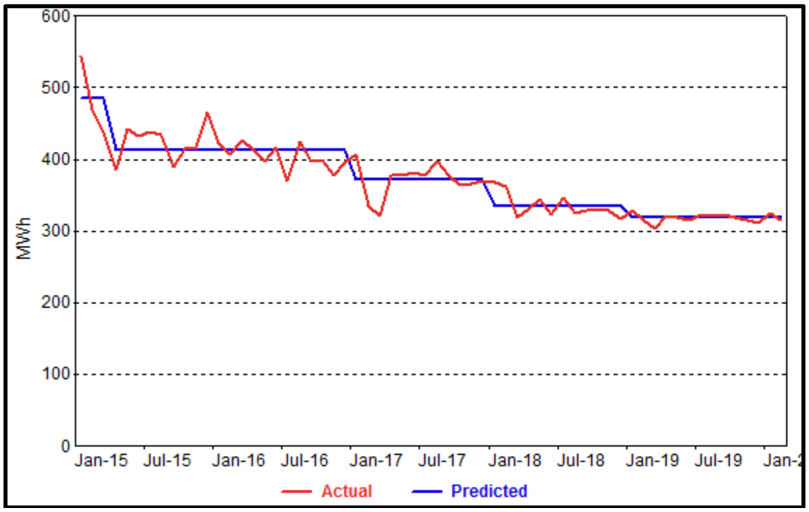
## Figure 23:  Industrial Sales Model




| Variable | Coefficient | StdErr | T-Stat | P-Value |
|---|---|---|---|---|
| mEcon.IndVar | 53834.91 | 898.679 | 59.904 | 0.00% |
| mWthrRev.CDD60 | 36.326 | 11.045 | 3.289 | 0.14% |
| mBin.Jan | 2426.942 | 1219.03 | 1.991 | 4.91% |
| mBin.Mar | -7083.013 | 1375.6 | -5.149 | 0.00% |
| mBin.Apr | -7233.78 | 1248 | -5.796 | 0.00% |
| mBin.May | -9606.899 | 1266.596 | -7.585 | 0.00% |
| mBin.Jun | -12133.495 | 1744.63 | -6.955 | 0.00% |
| mBin.Jul | -15973.656 | 3130.774 | -5.102 | 0.00% |
| mBin.Aug | -16682.865 | 3665.163 | -4.552 | 0.00% |
| mBin.Sep | -12568.104 | 2676.717 | -4.695 | 0.00% |
| mBin.Oct | -10379.836 | 1386.693 | -7.485 | 0.00% |
| mBin.Nov | -4536.899 | 1283.66 | -3.534 | 0.06% |
| mBin.Dec | 3394.006 | 1249.185 | 2.717 | 0.77% |
| mBin.Feb11 | 13924.696 | 2926.909 | 4.757 | 0.00% |
| mBin.Mar11 | 17024.034 | 2985.408 | 5.702 | 0.00% |
| mBin.Mar14 | -7532.844 | 2985.405 | -2.523 | 1.32% |
| mBin.Sep14 | 11748.903 | 2988.205 | 3.932 | 0.02% |
| mBin.Nov14 | -9641.687 | 2945.586 | -3.273 | 0.15% |
| mBin.Mar16 | 9814.138 | 2985.409 | 3.287 | 0.14% |

| Model Statistics | |
|---|---|
| Iterations | 1 |
| Adjusted Observations | 122 |
| Deg. of Freedom for Error | 103 |
| R-Squared | 0.782 |
| Adjusted R-Squared | 0.744 |
| AIC | 16.012 |
| BIC | 16.448 |
| Log-Likelihood | -1,130.82 |
| Model Sum of Squares | 2,881,963,902.35 |
| Sum of Squared Errors | 803,250,950.45 |
| Mean Squared Error | 7,798,552.92 |
| Std. Error of Regression | 2,792.59 |
| Mean Abs. Dev. (MAD) | 1,983.09 |
| Mean Abs. % Err. (MAPE) | 4.06% |
| Durbin-Watson Statistic | 1.928 |

**Figure 24: Other Sales Model**




| Variable | Coefficient | StdErr | T-Stat | P-Value |
|---|---|---|---|---|
| CONST | 484.504 | 12.461 | 38.88 | 0.00% |
| mBin.Apr15Plus | -71.531 | 13.322 | -5.369 | 0.00% |
| mBin.Yr2017Plus | -41.871 | 7.811 | -5.361 | 0.00% |
| mBin.Yr2018Plus | -35.859 | 8.812 | -4.07 | 0.01% |
| mBin.Yr2019Plus | -17.12 | 8.491 | -2.016 | 4.85% |

| Model Statistics | |
|---|---|
| Iterations | 1 |
| Adjusted Observations | 62 |
| Deg. of Freedom for Error | 57 |
| R-Squared | 0.83 |
| Adjusted R-Squared | 0.819 |
| AIC | 6.221 |
| BIC | 6.393 |
| F-Statistic | 69.81 |
| Prob (F-Statistic) | 0 |
| Log-Likelihood | -275.83 |
| Model Sum of Squares | 130,087.52 |
| Sum of Squared Errors | 26,554.03 |
| Mean Squared Error | 465.86 |
| Std. Error of Regression | 21.58 |
| Mean Abs. Dev. (MAD) | 15.1 |
| Mean Abs. % Err. (MAPE) | 3.92% |
| Durbin-Watson Statistic | 1.7 |