

RESOLUTION NO. 2500

May 7, 2019

A RESOLUTION OF THE COMMISSION OF
PUBLIC UTILITY DISTRICT NO. 1 OF BENTON COUNTY, WASHINGTON
APPROVING THE TEN YEAR LOAD AND CUSTOMER FORECAST 2019-2028

WHEREAS, the Ten Year Load and Customer Forecast 2019-2028 (Forecast) has been prepared by District staff and reflects customer load information; AND

WHEREAS, information contained in the Forecast is updated annually and is necessary for the District's revenue forecasting, Pacific Northwest Utilities Conference Committee's (PNUCC) and the Bonneville Power Administration's (BPA) regional load forecasting; AND

WHEREAS, the Forecast is used in conjunction with other fiscal planning tools including, but not limited to, the Cost of Service Analysis (COSA), the Integrated Resource Plan (IRP), Rate Analysis, Budgeting, Power Requirements Planning, and Five-Year Capital Plan.

NOW, THEREFORE BE IT HEREBY RESOLVED that the Commission of Public Utility District No. 1 of Benton County approves and adopts the attached Ten Year Load and Customer Forecast 2019-2028.

BE IT FURTHER RESOLVED that this Resolution supersedes Resolution No. 2448 dated April 10, 2018.

APPROVED AND ADOPTED by the Commission of Public Utility District No. 1 of Benton County at an open public meeting as required by law, this 7th day of May, 2019.



Jeffrey D. Hall, President

ATTEST:



Barry A. Bush, Secretary



Public Utility District No. 1 of Benton County

Ten Year Load & Customer Forecast 2019-2028

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1. Executive Summary

The Ten Year Load and Customer Forecast (Forecast) provides an estimate of the District's annual and monthly load and customer counts for each customer class and for the total system. The Forecast is developed annually and used as critical input to a number of different analyses and processes including the Cost of Service Analysis (COSA), the Integrated Resource Plan (IRP), Rate Analysis, Budgeting, Power Requirements Planning, and the Five-Year Capital Plan.

This year's Forecast expects the total system retail load in 2019 to be 201.5 aMW and the 5-year and 10-year annual average rates of growth to be 0.35% and 0.27%, respectively. The 2019 Forecast for calendar year 2019 is about the same as was estimated by the 2018 Forecast, but the 2019 Forecast has a slightly higher annual average rate of growth, as shown by the Forecast comparison in **Figure 1-1**.

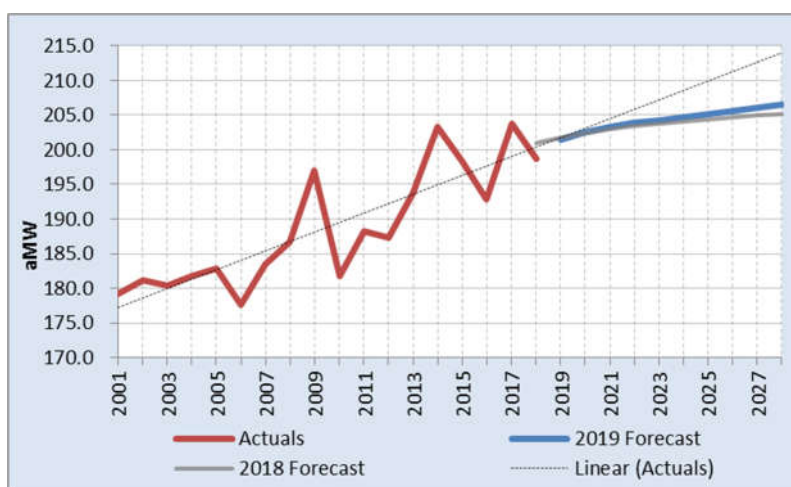


Figure 1-1 – Total system retail load comparison of 2019 Forecast to 2018 Forecast

This year's Forecast expects continued growth in the District's number of customers, with the total system average annual customer count forecast to increase by 831 customers in 2019 and then by a rate of about 685 customers per year over the Forecast period.

The following are the key assumptions of the 2019 Forecast:

- Uses regression modeling to relate retail load to economic and weather variables.
- Assumes average weather based on the 12-year average of heating degree days, cooling degree days and precipitation.
- Includes 14.5 aMW of cumulative conservation over the ten year forecast period, based on the same conservation potential assessment inputs that were used for the 2018 Forecast.
- Includes increases in load expected in 2019 due to a new large irrigation project and for load increases realized in 2018 for large general service.
- Does not include a forecast for additions of customer generation, electric vehicles or electricity intensive loads and their potential impact on load.

Overall the 2019 Forecast reflects the continuing trend of the District having strong growth in our customer count, but a relatively low rate of retail load growth, primarily due to declining trends in energy usage per customer as a result of energy efficiency and conservation.

2. Forecast Methodology

2.1 Overview

The Ten Year Load and Customer Forecast (Forecast) is a forecast of the District's total system and customer class annual and monthly energy (MWh), average power (aMW) and average annual number of customers. The Forecast inputs include historical load and average annual customer counts by customer class, plus historical and forecast weather and economic data. Regression modeling is used to establish a relationship between annual load, weather and economic variables as well as between the annual average customer count and the economic variables. The regression modeling results in a forecast for each customer class that is then combined with the conservation forecast and any manual adjustments as determined by Staff. Additional details of the Forecast methodology and assumptions are provided in the following sections.

2.2 Customer Classes

The Forecast results include a total system forecast that is a summation of the forecasts for each customer class. **Table 2-1** below summarizes the relationship of the District's customer classes (i.e. revenue classes) to its rate schedules and also identifies the section of this report that discusses the Forecast results. Refer to the [District's website](#) for detailed descriptions of the rate schedules.

Table 2-1 – District customer class relationship to rate schedules

Customer Class	Rate Schedule(s)	Report Section
Total System	All	4.0
Residential	11, 12	5.1
Small General	21, 90, 95	5.2
Medium General	22	5.3
Large General	23, 24	5.4
Large Industrial	34	5.5
Small Irrigation	71	5.6
Large Irrigation	72, 73, 74, 75, 76	5.7
Street Lights	51	5.8
Security Lights	61	5.9
Unmetered Flats	85	5.10

2.3 Historical Data

Historical monthly retail energy sales (MWh) and monthly customer counts (i.e. number of active services), as reported by the District's monthly financial statements by customer class, are key inputs to the Forecast regression modeling. Additionally, the Forecast utilizes the historical monthly energy (MWh) and peak demand (MW) values reported by the Bonneville Power Administration (BPA) Meter Data Management Reporting (MDMR2) system for the District's total system load at the BPA point-of-delivery (Meter #8110).

2.4 Economic Data

Economic variables are a key input for the Forecast's regression modeling. The Energy Authority (TEA) subscribes to Woods & Poole Economic Forecasts, which are updated annually. The statements below from Woods & Poole provide a summary of their economic data, as described by *Summary Technical Description of the Woods & Poole Economics, Inc. 2018 Regional Projections and Database*:

- “The Woods & Poole Economics, Inc. database contains more than 900 economic and demographic variables for every county in the United States for every year from 1970 to 2050 or 1990 to 2050.”
- “This comprehensive database includes detailed population data by age, sex, and race; employment and earnings by major industry; personal income by source of income; retail sales by kind of business; and data on the number of households, their size, and their income. All of these variables are projected for each year through 2050.”
- “The Woods & Poole projection for each county in the United States is done simultaneously so that changes in one county will affect growth or decline in other counties.”

Table 2-2 identifies the four Woods & Poole economic variables for Benton County that are utilized for the Forecast’s regression modeling.

Table 2-2 – Woods & Poole economic variables utilized for regression modeling

Economic Variable
Total population (in thousands)
Total employment (in thousands of jobs)
Total number of households (in thousands)
Total retail sales, including eating and drinking places sales (in millions of 2009 dollars)

In order to adjust the Benton County variables to more closely represent the District’s service territory, estimates for the City of Richland and West Richland are gathered by various sources such as the Washington State Office of Financial Management’s (OFM) website and Google Public Data Explorer, and backed out of the Benton County data totals. **Figure 2-1** shows the values of the economic variables from the years 2000 to 2028 for the District’s service territory estimate.

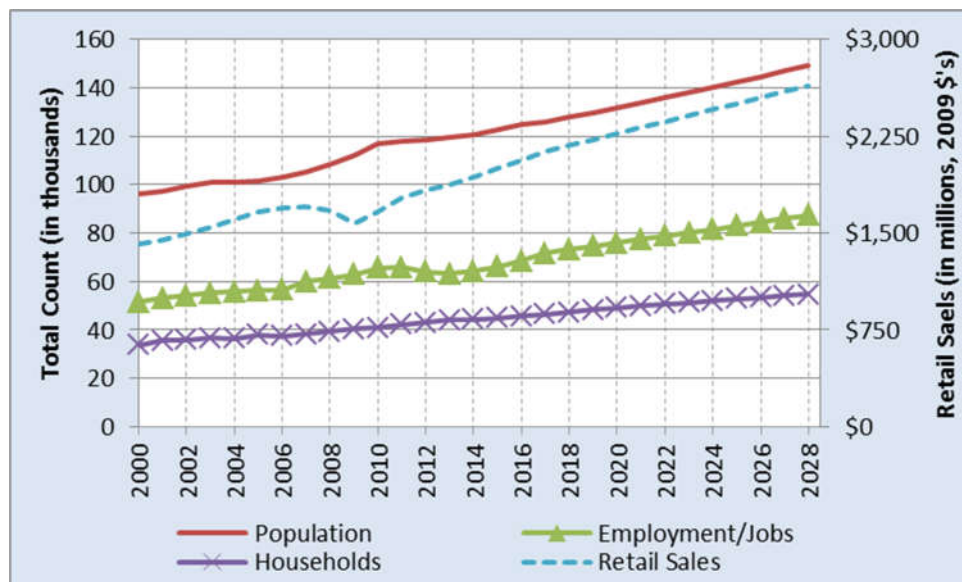


Figure 2-1 – Estimates of economic variables from 2000-2028 for the District’s service territory

2.5 Weather Data

Weather data from the Tri-Cities Airport Pasco, WA weather station is a key input for the Forecast's regression modeling. **Table 2-3** identifies the three weather variables that are utilized.

Table 2-3 – Types of weather variables utilized for regression modeling

Weather Variable
Heating degree days (HDD) ¹
Cooling degree days (CDD) ¹
Precipitation inches

1) Degree days assume 65°F base

Heating degree days represent days where customers are forecasted to need heating services; whereas, cooling degree days represent days where customers are forecasted to need cooling services. As the need for heating and cooling services increases, the District's customers' energy usage increases as well. For the purposes of this forecast, heating and cooling degree days have been calculated using a 65 degree base. Precipitation is also used to correlate with loads, especially for the small and large irrigation customer classes.

In addition to the historical weather data being critical for the regression modeling, the data is utilized to calculate averages for each weather variable to define the "average weather" assumed for the base case forecast. For the 2019 forecast, the average weather was calculated using a 12-year average, similar to past years, but a change from the 5-year average that was utilized by last year's forecast. The longer time period was selected because it is more representative of "average" weather and the high and low cases show a range for more extreme weather. **Figure 2-2** and **Figure 2-3** show the annual historical values for degree days and precipitation, respectively, including the 12-year average. **Table 2-4** summarizes the 12-year minimum, average and maximum values for the weather variables.

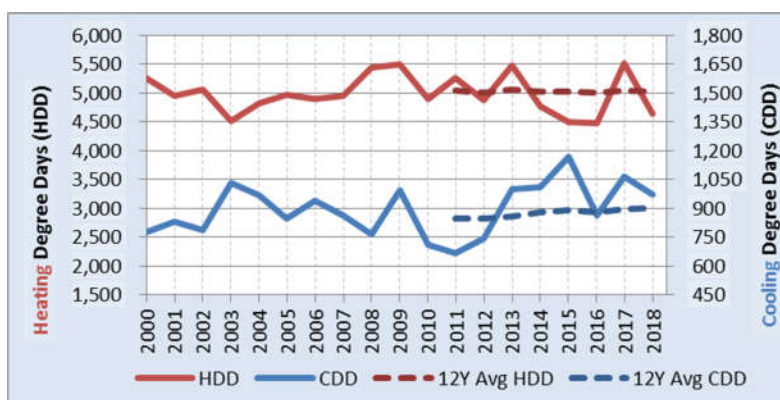


Figure 2-2 – Annual heating and cooling degree days from 2000-2018 at Tri-Cities Airport

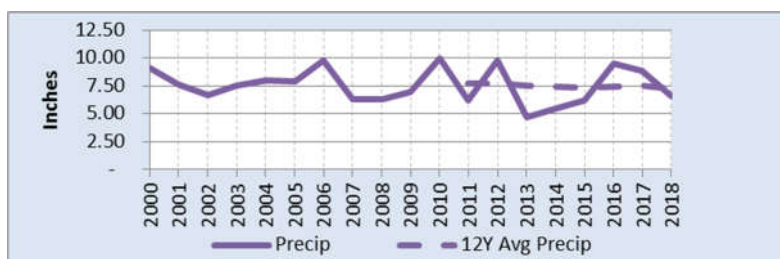


Figure 2-3 – Annual precipitation from 2000-2018 at Tri-Cities Airport

Table 2-4 – Weather variables 12-year min., avg. and max. values at Tri-Cities Airport

Weather Variable	Minimum	Average (Base Case)	Maximum
Heating degree days (HDD) ¹	4,474	5,023	5,512
Cooling degree days (CDD) ¹	665	902	1,168
Precipitation inches	4.72	7.22	9.96

1) Degree days assume 65°F base

2.6 Regression Modeling

The main component of the Forecast methodology is the regression modeling that determines the correlation, or relationship, of historical loads to historical economic and weather variables to produce a trend line forecast. The District provides historical data and average weather assumptions to the Energy Authority (TEA), who the District has contracted with to perform the regression modeling. TEA runs the models they have developed using MATLAB® software and returns the model output to the District.

The relationship between the annual historical load data and the annual economic and weather variables is determined by partial least squares (PLS) regression. This is a typical approach when constructing predictive models with factors that are highly correlated, as is the case when dealing with econometric factors. PLS regression is a technique that generalizes and combines features from principal component analysis and multiple regressions. It is particularly useful when it is necessary to predict a set of dependent variables from a large set of independent variables. PLS regression tends to outperform multiple linear regressions when there are a large number of variables because it avoids over-fitting the data. An over fit model is one that is too complicated for the data set and can result in misleading forecasts of future behavior.

TEA utilizes separate regression models for load and customer forecasts for each customer class. **Table 2-5** for the load forecast and **Table 2-6** for the customer forecast summarize the input variables used by TEA's regression models. In some cases District staff has overridden the model output (see Section 2.7 – Manual Adjustment); however this section is intended to document the “as-is” status of the TEA models, which have evolved over time.

Table 2-5 – Load forecast regression model variables by customer class

Customer Class	Input Years	Economic				Weather		
		Population	Employment	Households	Retail Sales	HDD	CDD	Precip
Residential	2000-2018	✓	✓	✓	✓	✓	✓	✓
Small General	2000-2018	✓	✓	✓	✓	✓	✓	✓
Medium General	2000-2018	✓	✓	✓	✓	✓	✓	✓
Large General	2001-2018	✓	✓	✓	✓	✓	✓	✓
Large Industrial	2002-2018	✓	✓	✓	✓	✓	✓	✓
Small Irrigation	2000-2018	✓	✓	✓	✓	✓	✓	✓
Large Irrigation	2000-2018	✓	✓	✓	✓	✓	✓	✓
Street Lights	2013-2018	✓	✓	✓	✓	✓	✓	✓
Security Lights	2000-2018	✓	✓	✓	✓	✓	✓	✓
Unmetered Flats	2006-2018	✓	✓	✓	✓	✓	✓	✓

Table 2-6 – Customer forecast regression model variables by customer class

Customer Class	Input Years	Economic				Weather		
		Population	Employment	Households	Retail Sales	HDD	CDD	Precip
Residential	2005-2018	✓	✓	✓	✓	✓	✓	✓
Small General	2005-2018	✓	✓	✓	✓	✓	✓	✓
Medium General	2005-2018	✓	✓	✓	✓	✓	✓	✓
Large General	2005-2018	✓	✓	✓	✓	✓	✓	✓
Large Industrial	2005-2018	✓	✓	✓	✓	✓	✓	✓
Small Irrigation	2005-2018	✓	✓	✓	✓	✓	✓	✓
Large Irrigation	2005-2016	✓	✓	✓	✓	✓	✓	✓
Street Lights	2013-2018	✓	✓	✓	✓	✓	✓	✓
Security Lights	2005-2016	✓	✓	✓	✓	✓	✓	✓
Unmetered Flats	2006-2016	✓	✓	✓	✓	✓	✓	✓

2.7 Monthly Shaping

The regression modeling uses annual historical loads and annual economic and weather variables. To create a monthly forecast, the annual forecast values are shaped using a five year average of the percentage of the month's billed retail load compared to the annual billed retail load. Monthly regression modeling would be preferred, but currently the District's historical data is limited to the month billed rather than aligned with the actual month when the usage occurred. For example, a customer may be billed in February for usage that occurred from January 5 to February 5. Therefore, it would not be valid to find a correlation between the customers billed "February usage" and February weather, given that most of the usage actually occurred in January. The District is working on using advanced meter data combined with business intelligence analytics to overcome this limitation in the future, which would deliver significant improvements to the regression modeling.

2.8 Conservation Forecast

In addition to natural energy saving effects due to electricity rate inflation and economic conditions, the District has an established conservation program in place to proactively assist our customers with efforts to reduce their energy consumption. In order to account for these extra efforts, the District uses the latest Conservation Potential Assessment (CPA) report as an input to the Forecast. The CPA details recent historical conservation savings and provides a 2-year, 10-year and 20-year forecast of conservation savings by customer sector. In October 2017, the District's Commission passed Resolution No. 2427 to adopt a new CPA, which was used as the input for both the 2018 and 2019 Forecasts. **Figure 2-4** shows the historical achieved conservation from 2010 to 2018 by customer sector.

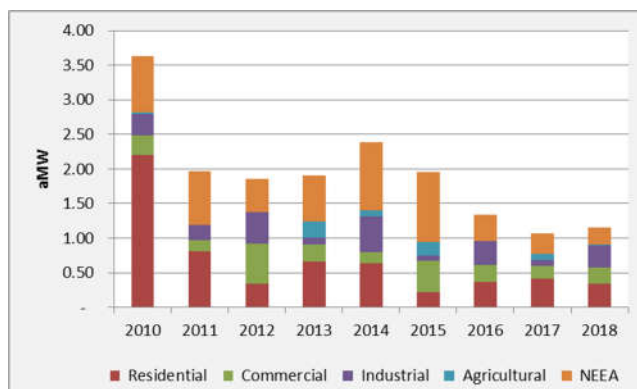


Figure 2-4 – Historical annual conservation by customer sector from 2010-2018

The CPA's forecasted conservation by customer sector is allocated, by staff analysis, to the District's customer classes and then subtracted from the forecasted loads to account for load reductions associated with conservation activities. District staff observed that approximately 1.0 aMW of annual conservation has consistently been achieved since the year 2000. In order to account for the impact of historical conservation activities on the regression model's trend line, District staff subtracted 1.0 aMW from the CPA's annual conservation projection. Therefore, the Forecast only includes the expected annual incremental conservation savings above 1.0 aMW. **Figure 2-5** shows the forecast of annual cumulative incremental conservation by customer class for the years 2019-2028.

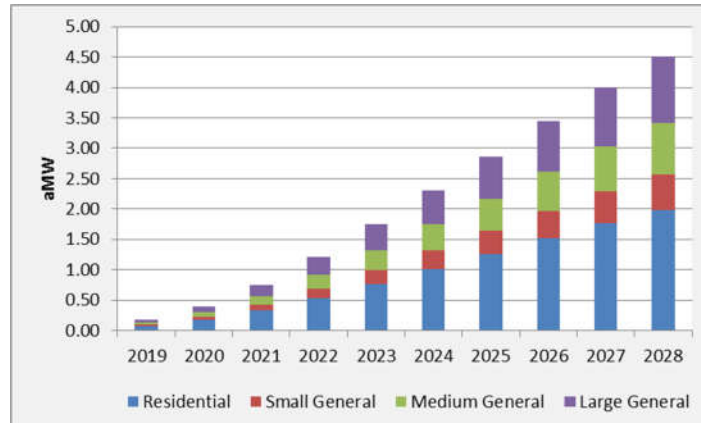


Figure 2-5 - Forecast of annual cumulative incremental conservation by customer class from 2019-2028

2.9 Manual Adjustment

Staff uses professional judgement to implement manual adjustments to the regression model's forecast, primarily for two reasons: 1) to adjust for step-changes or high growth in load or customers that the regression analysis trend line would not be able to consider, and 2) to adjust for modeling results that do not reflect reasonable expectations. In general, it is preferred to make as few adjustments as possible and instead to focus on improving the modeling methodology.

Regarding item number two above, the regression modeling not only forecasts the values going forward, but it also determines the expected historical values given the historical actuals for the economic and weather variables. The regression modeling attempts to minimize the forecast error such that the modeled values align closely with the historical actuals, but there is always some model error. At times there is a need to adjust the starting point for the first year of the forecast (in this case 2019) to account for the forecast error between the previous year's modeled and actual value (in this case 2018's value). This "first year forecast error" can result in an over or under stated annual change from the last year of actuals to the first year of the forecast because the annual change includes the forecast error. Removing and/or smoothing the first year forecast error is a common type of adjustment.

Table 2-7 summarizes the manual adjustments that were utilized for the Forecast.

Table 2-7 – Manual adjustments applied to the forecast after regression modeling

Customer Class	Adjustment Type	Adjustment Description
Residential	Customer	1) Removed first year forecast error 2) Increased customer growth per month from model's 50 to 55 customers per month for 2019
Small General	Customer	3) Removed first year forecast error
Medium General	Customer	4) Removed first year forecast error
Large General	Customer & Load	5) Removed first year forecast error 6) Added 1.0 aMW given the model's lower than expected 2019 forecast and known customer additions in 2018 over 2017, resulting in a new expected normal going forward 7) Removed model's baseline negative load growth to return the load forecast to flat (prior to the conservation adjustment)

Customer Class	Adjustment Type	Adjustment Description
Large Industrial	Customer & Load	8) Kept load and customer forecasts flat
Small Irrigation	None	None
Large Irrigation	Customer & Load	9) Kept load and customer forecasts flat, except for item 10 10) Added 1.0 aMW for a new irrigation project expected to operate at 60% in 2019 and 100% thereafter
Street Lights	None	None
Security Lights	Customer & Load	11) Kept load and customer forecasts flat
Unmetered Flats	None	None

2.10 System Losses

The historical customer class load data used for the Forecast is based on the District’s billed load, which includes both District metered and unmetered loads. The unmetered loads (street lighting, security lighting and flats) utilize estimates for monthly energy consumption. The aggregation of District billed loads is referred to as “retail load” and this term implies the exclusion of losses associated with serving this load over the District’s transmission and distribution system or the Bonneville Power Administration’s (BPA’s) system. Refer to the following paragraphs for additional background on system losses and to **Appendix A, Table 6-1** for a summary of the how the losses impact the total system load.

The Bonneville Power Administration (BPA) separately meters the District’s load. The District’s contract with BPA defines both a “point-of-delivery” and a “point-of-metering”. The aggregation of load measured by BPA’s points-of-metering will include the District’s entire retail load, as defined above, but only a portion of the losses associated with the District’s transmission and distribution system, because not all of BPA’s meters are physically positioned to measure 100% of the losses at their locations. For example, BPA metering is typically installed on the low-side of a substation power transformer and therefore does not measure the losses associated with the District’s power transformer. Another example is when BPA metering is installed at the substation, but the point-of-delivery is defined at a point upstream where the District’s transmission line taps BPA’s line. For billing, BPA estimates the losses associated with the difference between the point-of-metering and the point-of-delivery. BPA’s billed aggregate load at the point-of-delivery, also referred to as the District’s “wholesale load”, is inclusive of the District’s entire retail load and the District’s entire transmission and distribution system losses.

The difference between BPA’s billed total load at the point-of-delivery and the District’s billed retail load is equal to the District’s transmission and distribution system losses. These losses are typically represented as a percentage of the total point-of-delivery load. The Forecast assumes for 2019 to 2028 that the District’s transmission and distribution system losses are 3.3%, which is the ten year average of historical annual losses.

The District is not only responsible for procuring the energy necessary to serve our customers’ load and our system losses, but also the losses associated with the transport of electricity over BPA’s equipment and power lines from regional generation resources to our points-of-delivery. BPA transmission customers are required to return real power losses to BPA. Schedule 9 of BPA’s Open Access Transmission Tariff (OATT) sets the real power loss factor at 1.9% of kWh delivered.

2.11 Peak Forecast

To calculate a monthly peak forecast, a five year monthly average load factor was calculated using the historical relationship between monthly average total retail load with assumed losses and the monthly BPA point-of-delivery peak demand. The calculated load factor was then applied to the monthly load forecast to generate peak demands for every month. **Appendix A – Summary Tables, Table 6-1** includes the historical and forecast of the system peak hourly demand.

3. Forecast Considerations

3.1 Forecast History

Figure 3-1 shows the past five years of ten year forecasts of total system retail load from 2014 to 2018 and the current 2019 ten year forecast. As seen in the graph, the more recent forecasts have a lower growth rate compared to past years based on the flattening slopes of the recent forecasts. The Forecast's growth rate has trended downward similar to what has been observed regionally by the Pacific Northwest Utilities Conference Committee (PNUCC).

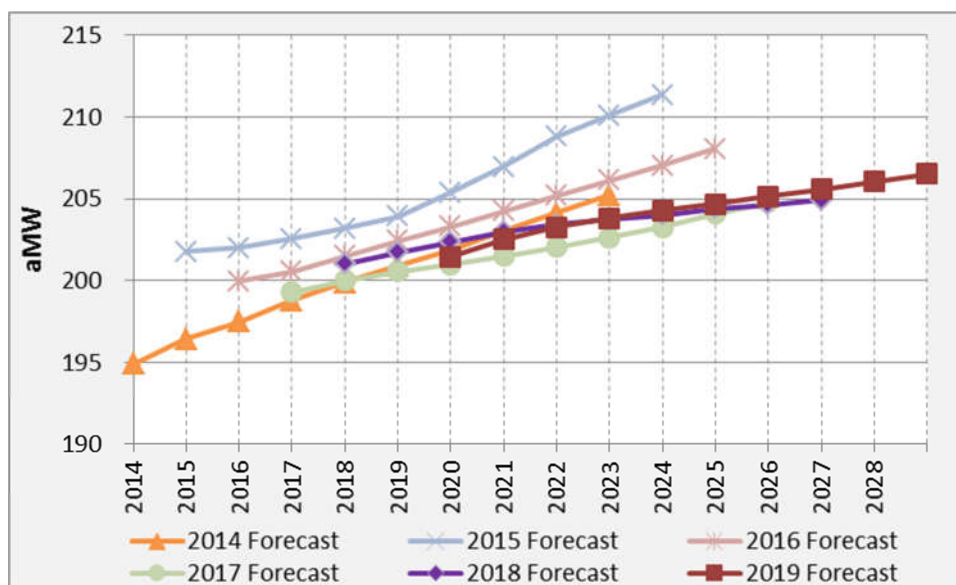


Figure 3-1 – Total system retail load ten year forecasts from 2014 to 2019

3.2 Forecast Variances

A number of factors can cause variations from the Forecast compared to actuals, including weather, large irrigation customer crop rotations and unforeseen new loads or loss of loads. The most common driver of the variance is weather, given that the Forecast is based on average weather. **Figure 3-2** below shows that over the past 10 years the District's total system retail load forecast variance has ranged from +5.9% to -3.7%. For an annual forecast near 200 aMW, a 5% variance is equivalent to 10 aMW. **Table 3-1** shows the variance by customer class for the 2018 forecast versus actuals.

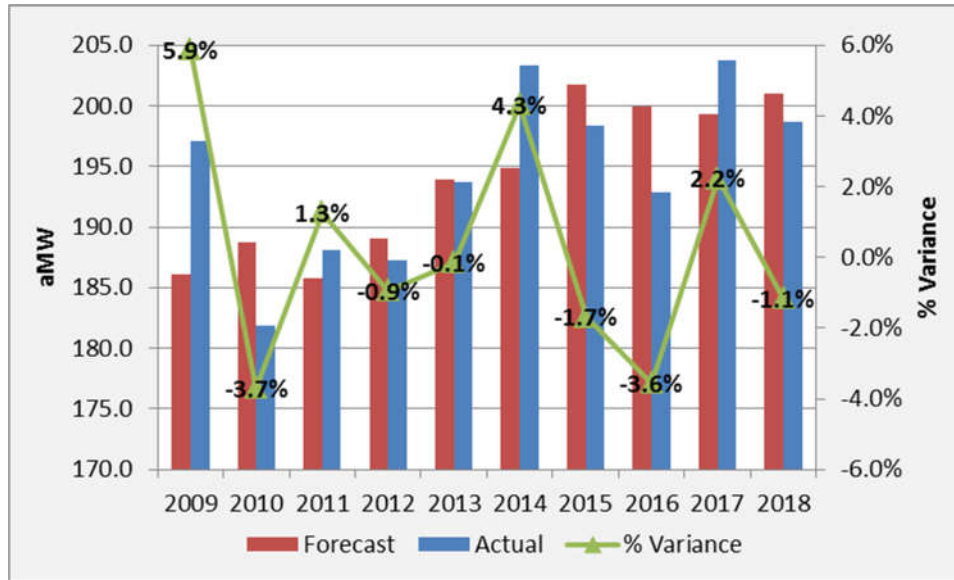


Figure 3-2 – Forecast vs. actuals variance of total system retail load from 2009 to 2018

Table 3-1 – Forecast vs. actuals variance of retail load (aMW) by customer class for 2018

Customer Class	2018 Forecast	2018 Actual	2018 % Variance
Residential	82.2	79.6	-3.2%
Small General	14.3	14.3	0.0%
Medium General	21.0	20.9	-0.5%
Large General	25.4	27.2	7.1%
Large Industrial	7.7	7.5	-2.6%
Small Irrigation	1.7	1.7	0.0%
Large Irrigation	47.9	46.7	-2.5%
Street Lights	0.3	0.3	0.0%
Security Lights	0.1	0.1	0.0%
Unmetered Flats	0.3	0.3	0.0%
Total System	200.9	198.6	-1.1%

3.3 Forecast High & Low Cases

To account for some of the load uncertainties, the District's Forecast includes high and low cases, in addition to a base case load forecast. In past Forecasts, the high and low cases were based on adjusting the economic variables and/or the weather variables input to the regression modeling. Last year's Forecast adjusted the economic variables up/down by 30% combined with using the five year maximum/minimum weather variables and also manual set the large irrigation class high/low values, resulting in high and low cases for the total system retail load that were about $\pm 7.0\%$ (± 14 MW), compared to the base case. For 2019, a different approach was utilized that adjusts the base case regression model output up/down based on a statistical analysis of the historical percentage deviation from the average from 2001 to 2018 for each customer class. These historical deviations are representative of variances that can be expected going forward, including for above or below average weather. For the 2019 Forecast, the high and low cases are $\pm 4.2\%$ (± 8.5 MW). **Figure 3-3** shows graphically the historical annual variability along with the Forecast base, high, and low case forecasts.

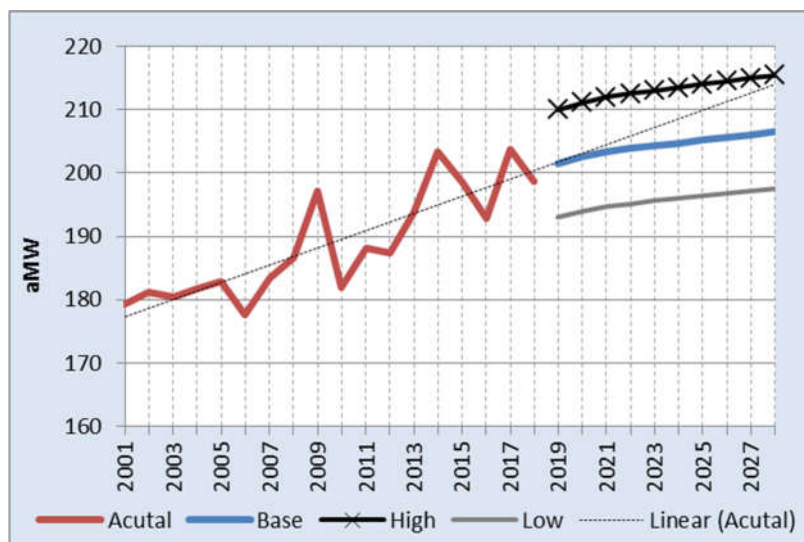


Figure 3-3 –Total system retail load historical and base forecast with high and low case

3.4 Load Preservation and Load Growth

Many utilities are experiencing lower retail sales growth due to a number of factors which may include general economic activity, energy efficiency programs, or customer self-generation from rooftop solar installations and community solar installations. Flattening or declining retail sales puts upward pressure on customer retail rates as general inflation causes costs to increase while sales remain stagnant. More importantly, about one-half of total utility costs are fixed costs such as poles, wires and substations required to safely and reliably serve customer loads. Fixed costs do not decrease as sales flatten or decrease.

Proactively growing loads has become a strategic focus for the District. This is primarily due to the fact that the District has surplus energy above what is required to meet loads (“long on resources”) on an annual average basis. When the District has excess energy from its resources, it sells the energy on the wholesale market. Wholesale market prices have declined significantly in recent years due a number of different factors including overbuilding of renewable generation due to state mandated renewable energy policies and large increases in natural gas supplies due to fracking technologies. By growing loads and selling the District’s energy at retail rather than wholesale, it will decrease pressure on customer retail rates. The District has partnered with TRIDEC and other local agencies to market and highlight areas within the District’s service territory that have excess capacity and are ready to interconnect new loads.

Due to the District’s interest in growing loads, staff is currently working to develop a New Large Load (NLL) policy that will address loads that are above the District’s Industrial Rate Schedule of 3.5 megawatts (MW) to 10 MW of demand. Rates for new loads in excess of 10 MW are currently subject to negotiations. The NLL policy will develop the process and procedure to facilitate the interconnection of a NLL while considering equity between the new customer and existing customers and possible economic benefit to our community.

3.5 Customer Generation

In 2018 the District added 169 new services for customer generation net metering and so far in 2019 the District has added another 48 new services through March 2019. The 2018 and 2019 year-to-date additions have increased the total number of services from 170 as of December 2017 to 381 as of March

2019. The services are predominantly roof top solar, with only about 3 services being wind. In addition to its net metered customers, the District has 154 customers that funded the construction of two community solar projects, the 74.8 kW Ely Community Solar Project in Kennewick, WA (commissioned July 1, 2015) and the 24.6 kW Old Inland Empire (OIE) Community Solar Project in Prosser, WA (commissioned March 4, 2016).

The aggregate of the District's customer generation, including the District's community solar projects, reduced the District's retail load in 2018 by about 0.3 aMW or 2,666 MWh and had an hourly peak of 1.6 MW. Through April 23, 2019, the hourly peak has increased to 2.6 MW. The impact of customer generation reducing load has not been modeled in the Forecast. Significantly slower growth of new customer solar installations is expected during 2019 due to the end of the Washington State incentive funding.

3.6 Electricity Intensive Loads

The District has assigned the term Electricity Intensive Loads (EIL) to the emergence of new loads associated with cryptocurrency mining and block chain operations. The District has developed a policy to address the requirements and risks associated with EIL customers. As of April 2019 the District has about 13 EIL services. One of the District's largest EIL services accounted for 0.7 aMW of new load in 2018 (did not exist in 2017). The Forecast includes a 1.0 aMW manual adjustment increase for the Large General rate class that is partially attributed to this 0.7 aMW EIL increase in 2018; however, the Forecast does not assume any additional EIL growth.

3.7 Electric Vehicles

Another possible source of load growth is electric vehicles (EVs). The impact of electric vehicles on load growth has not been modeled in the Forecast. EVs present an opportunity for the District to offset the impact of flattening or declining retail sales by preserving and possibly growing loads. Similar to any new business that enters the community, EVs have the potential to generate more energy sales over the long run that will help mitigate upward pressure on rates. The District is developing programs to educate customers about EVs and their potential benefits to help increase adoption in its service territory.

Washington State has set a goal of increasing electric vehicle registrations from approximately 8,000 in 2013 to 50,000 by 2020, per the [Washington State Electric Vehicle Action Plan 2015-2020](#), published in February 2015. The Washington State Department of Transportation (WSDOT) reports the number of electric vehicles registered in Washington State by county, using data provided by the Washington State Department of Licensing. The table below has been updated with [the latest WSDOT report](#).

Table 3-2 – Number of electric vehicles registered in Washington State & Benton County

Reported As of Date	Washington State	Benton County
12/31/2014	12,351	112
12/31/2015	16,529	169
6/30/2016	17,941	195
6/30/2017	24,624	283
12/31/2018	42,542	466

4. Forecast for Total System

The total system forecast is an aggregation of the forecasts of each customer class. The forecast for the total system load in 2019 is 201.5 aMW, an increase of 1.4% over the 2018 actual of 198.7 aMW. The five and ten year average annual rates of growth are 0.35% and 0.27% respectively. The ten year forecast includes 4.51 aMW of cumulative incremental conservation. The forecast for the average annual customer count is an increase of about 831 customers in 2019, then leveling off to about 685 customers per year. See **Figure 4-1** and **Table 4-1** for more detail.

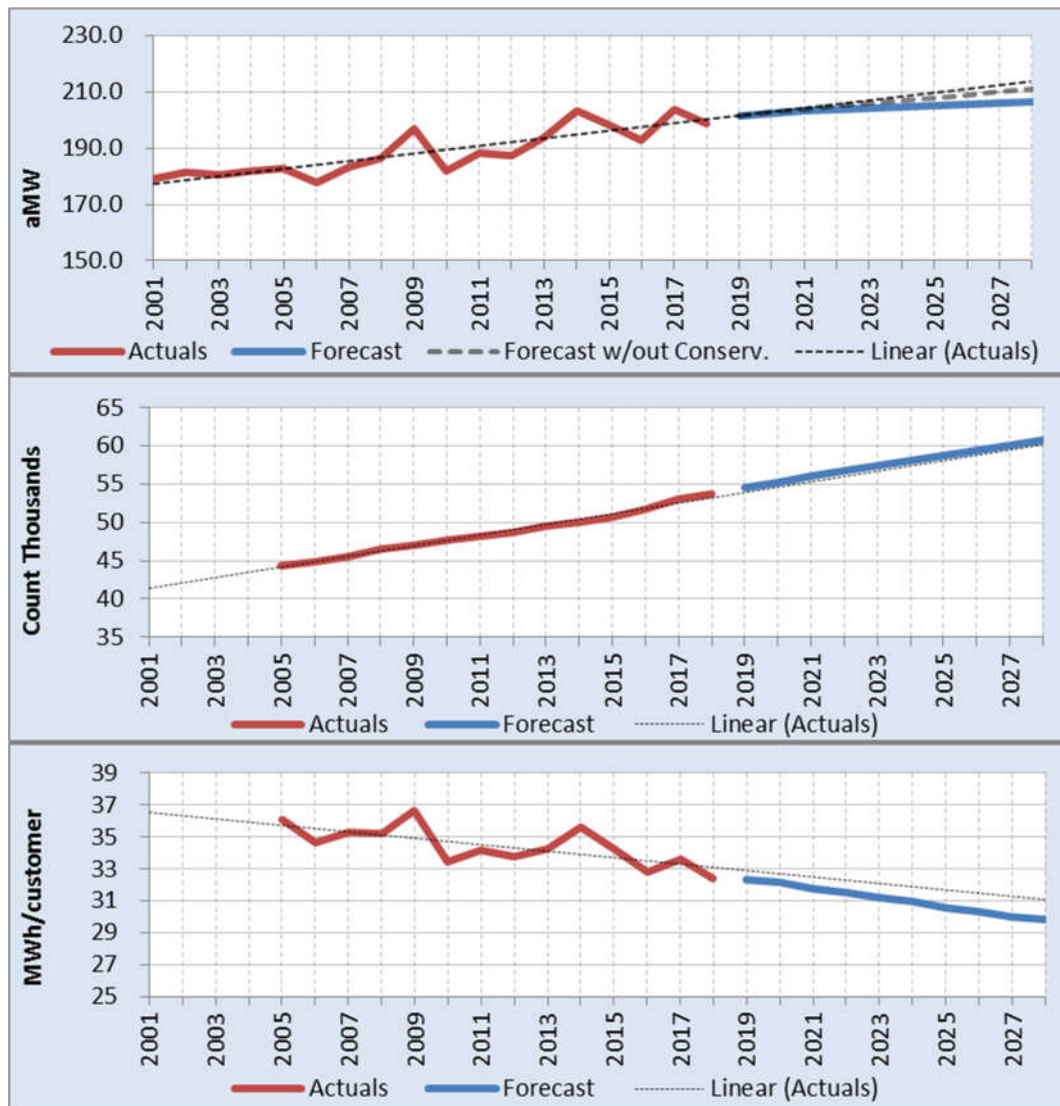


Figure 4-1 – Total System forecast of retail load, customers and usage per customer

Table 4-1 – Total System forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	1,569,982	#N/A	179.22	-11.52%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	1,587,678	#N/A	181.24	1.13%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	1,580,751	#N/A	180.45	-0.44%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	1,597,054	#N/A	181.81	0.76%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	1,602,508	#N/A	182.93	0.62%	#N/A	#N/A	44,389	#N/A	#N/A	36.102
2006	1,555,710	#N/A	177.59	-2.92%	#N/A	#N/A	44,855	466	1.05%	34.683
2007	1,607,265	#N/A	183.48	3.31%	#N/A	#N/A	45,570	715	1.59%	35.270
2008	1,639,856	#N/A	186.69	1.75%	#N/A	#N/A	46,601	1,031	2.26%	35.189
2009	1,726,341	#N/A	197.07	5.56%	#N/A	#N/A	47,074	473	1.01%	36.673
2010	1,592,802	#N/A	181.83	-7.74%	#N/A	#N/A	47,616	542	1.15%	33.451
2011	1,648,362	#N/A	188.17	3.49%	#N/A	#N/A	48,197	581	1.22%	34.201
2012	1,645,277	#N/A	187.30	-0.46%	#N/A	#N/A	48,710	513	1.07%	33.777
2013	1,696,774	#N/A	193.70	3.41%	#N/A	#N/A	49,519	809	1.66%	34.265
2014	1,781,322	#N/A	203.35	4.98%	#N/A	#N/A	50,052	533	1.08%	35.589
2015	1,738,022	#N/A	198.40	-2.43%	#N/A	#N/A	50,761	709	1.42%	34.239
2016	1,694,078	#N/A	192.86	-2.79%	#N/A	#N/A	51,642	881	1.74%	32.804
2017	1,785,098	#N/A	203.78	5.66%	#N/A	#N/A	53,109	1,467	2.84%	33.612
2018	1,740,849	#N/A	198.73	-2.48%	#N/A	#N/A	53,744	634	1.19%	32.392
2019	#N/A	1,764,913	201.47	1.38%	1,766,486	201.65	54,575	831	1.55%	32.339
2020	#N/A	1,779,008	202.53	0.52%	1,782,545	202.93	55,295	721	1.32%	32.173
2021	#N/A	1,780,641	203.27	0.37%	1,787,158	204.01	56,000	705	1.27%	31.797
2022	#N/A	1,785,579	203.83	0.28%	1,796,176	205.04	56,692	692	1.24%	31.496
2023	#N/A	1,789,537	204.29	0.22%	1,804,864	206.03	57,373	680	1.20%	31.191
2024	#N/A	1,797,909	204.68	0.19%	1,818,150	206.98	58,055	683	1.19%	30.969
2025	#N/A	1,797,262	205.17	0.24%	1,822,381	208.03	58,742	686	1.18%	30.596
2026	#N/A	1,801,026	205.60	0.21%	1,831,246	209.05	59,430	689	1.17%	30.305
2027	#N/A	1,805,045	206.06	0.22%	1,840,118	210.06	60,117	687	1.16%	30.025
2028	#N/A	1,814,032	206.52	0.22%	1,853,653	211.03	60,803	686	1.14%	29.834
AARG % ¹ (2019-2023)			0.35%							
AARG % ¹ (2019-2028)			0.27%							

1) AARG % = Annual Average Rate of Growth Percentage

5. Forecast by Customer Class

5.1 Residential

The forecast for residential retail load in 2019 is 82.9 aMW, an increase of 4.2% over the 2018 actual of 79.6 aMW. The five and ten year average annual rates of growth are 0.72% and 0.68% respectively. The ten year forecast includes 1.98 aMW of cumulative incremental conservation. The forecast for the average annual customer count is an increase of about 753 customers in 2019, then leveling off to about 600 customers per year. See **Figure 5-1** and **Table 5-1** for more detail.

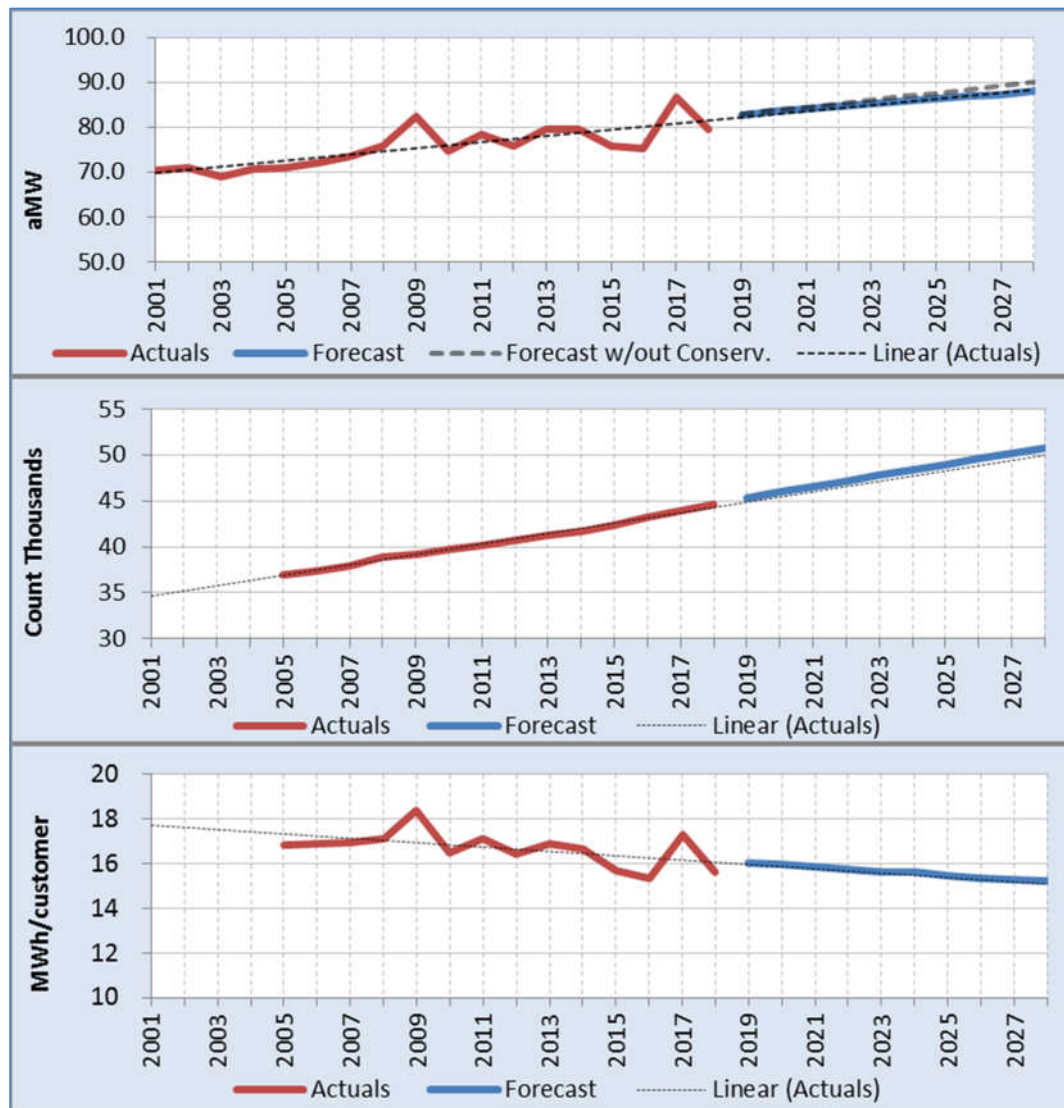


Figure 5-1 - Residential forecast of retail load, customers and usage per customer

Table 5-1 – Residential forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	617,763	#N/A	70.52	-2.75%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	622,196	#N/A	71.03	0.72%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	604,618	#N/A	69.02	-2.83%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	621,386	#N/A	70.74	2.49%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	622,639	#N/A	71.08	0.48%	#N/A	#N/A	36,963	#N/A	#N/A	16.845
2006	632,213	#N/A	72.17	1.54%	#N/A	#N/A	37,418	455	1.23%	16.896
2007	644,392	#N/A	73.56	1.93%	#N/A	#N/A	37,969	551	1.47%	16.971
2008	666,418	#N/A	75.87	3.14%	#N/A	#N/A	38,855	886	2.33%	17.151
2009	721,719	#N/A	82.39	8.60%	#N/A	#N/A	39,220	365	0.94%	18.402
2010	654,775	#N/A	74.75	-9.28%	#N/A	#N/A	39,687	466	1.19%	16.499
2011	687,953	#N/A	78.53	5.07%	#N/A	#N/A	40,201	514	1.30%	17.113
2012	668,018	#N/A	76.05	-3.16%	#N/A	#N/A	40,645	444	1.10%	16.436
2013	697,887	#N/A	79.67	4.76%	#N/A	#N/A	41,321	676	1.66%	16.890
2014	696,804	#N/A	79.54	-0.16%	#N/A	#N/A	41,758	437	1.06%	16.687
2015	665,505	#N/A	75.97	-4.49%	#N/A	#N/A	42,375	617	1.48%	15.705
2016	661,742	#N/A	75.33	-0.84%	#N/A	#N/A	43,157	783	1.85%	15.333
2017	759,634	#N/A	86.72	15.11%	#N/A	#N/A	43,870	712	1.65%	17.316
2018	697,107	#N/A	79.58	-8.23%	#N/A	#N/A	44,550	680	1.55%	15.648
2019	#N/A	726,345	82.92	4.19%	727,037	83.00	45,303	753	1.69%	16.033
2020	#N/A	734,708	83.64	0.87%	736,264	83.82	45,941	638	1.41%	15.992
2021	#N/A	737,686	84.21	0.68%	740,553	84.54	46,562	621	1.35%	15.843
2022	#N/A	742,922	84.81	0.71%	747,585	85.34	47,171	609	1.31%	15.749
2023	#N/A	747,605	85.34	0.63%	754,350	86.11	47,771	600	1.27%	15.650
2024	#N/A	755,102	85.96	0.73%	764,008	86.98	48,372	601	1.26%	15.610
2025	#N/A	756,947	86.41	0.52%	768,000	87.67	48,977	605	1.25%	15.455
2026	#N/A	761,617	86.94	0.62%	774,914	88.46	49,584	607	1.24%	15.360
2027	#N/A	766,402	87.49	0.63%	781,834	89.25	50,189	606	1.22%	15.270
2028	#N/A	774,268	88.15	0.75%	791,700	90.13	50,794	605	1.20%	15.243
AARG % ¹ (2019-2023)			0.72%							
AARG % ¹ (2019-2028)			0.68%							

1) AARG % = Annual Average Rate of Growth Percentage

5.2 Small General

The forecast for small general service retail load in 2019 is 14.3 aMW, an increase of 0.44% over the 2018 actual of 14.3 aMW. The five and ten year average annual rates of growth are 0.23% and 0.16% respectively. The ten year forecast includes 0.59 aMW of cumulative incremental conservation. The forecast for the average annual customer count is an increase of about 70 customers per year. See **Figure 5-2** and **Table 5-2** for more detail.

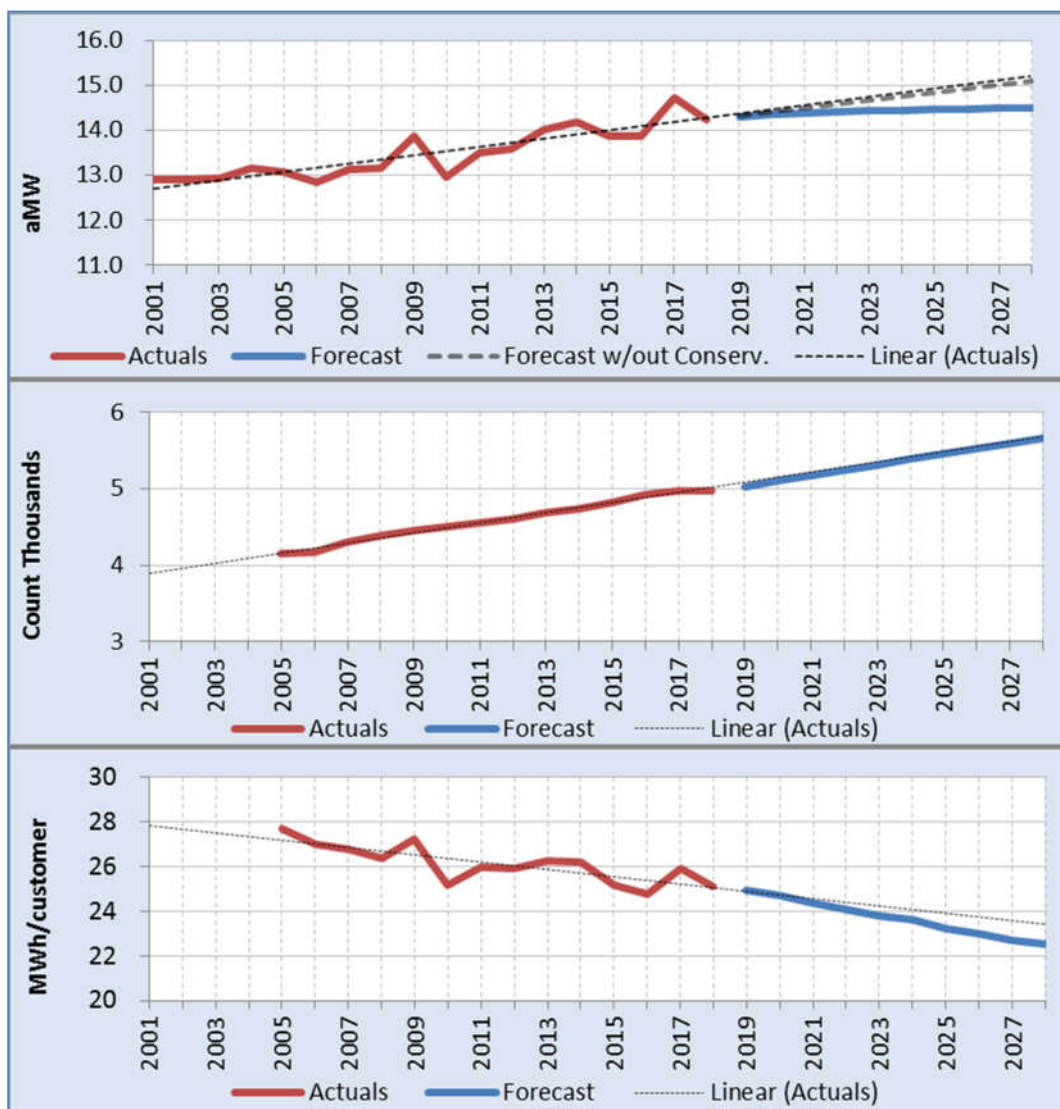


Figure 5-2 – Small General forecast of retail load, customers and usage per customer

Table 5-2 – Small General forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	113,104	#N/A	12.91	-1.89%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	113,127	#N/A	12.91	0.02%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	113,253	#N/A	12.93	0.11%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	115,574	#N/A	13.16	1.77%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	114,710	#N/A	13.09	-0.48%	#N/A	#N/A	4,144	#N/A	#N/A	27.681
2006	112,705	#N/A	12.87	-1.75%	#N/A	#N/A	4,169	25	0.61%	27.033
2007	115,049	#N/A	13.13	2.08%	#N/A	#N/A	4,295	126	3.03%	26.785
2008	115,616	#N/A	13.16	0.22%	#N/A	#N/A	4,385	90	2.10%	26.364
2009	121,580	#N/A	13.88	5.45%	#N/A	#N/A	4,460	75	1.70%	27.260
2010	113,483	#N/A	12.95	-6.66%	#N/A	#N/A	4,503	43	0.97%	25.201
2011	118,338	#N/A	13.51	4.28%	#N/A	#N/A	4,553	50	1.12%	25.989
2012	119,421	#N/A	13.60	0.64%	#N/A	#N/A	4,610	57	1.25%	25.902
2013	122,928	#N/A	14.03	3.22%	#N/A	#N/A	4,682	72	1.55%	26.256
2014	124,285	#N/A	14.19	1.10%	#N/A	#N/A	4,741	60	1.27%	26.213
2015	121,498	#N/A	13.87	-2.24%	#N/A	#N/A	4,828	87	1.83%	25.165
2016	121,868	#N/A	13.87	0.03%	#N/A	#N/A	4,915	87	1.80%	24.796
2017	129,054	#N/A	14.73	6.19%	#N/A	#N/A	4,977	62	1.25%	25.933
2018	124,864	#N/A	14.25	-3.25%	#N/A	#N/A	4,972	-4	-0.09%	25.113
2019	#N/A	125,410	14.32	0.44%	125,616	14.34	5,029	57	1.15%	24.936
2020	#N/A	126,161	14.36	0.32%	126,623	14.42	5,100	71	1.41%	24.737
2021	#N/A	126,179	14.40	0.29%	127,030	14.50	5,172	72	1.41%	24.396
2022	#N/A	126,418	14.43	0.19%	127,803	14.59	5,243	71	1.38%	24.111
2023	#N/A	126,549	14.45	0.10%	128,551	14.67	5,313	70	1.33%	23.819
2024	#N/A	127,038	14.46	0.11%	129,682	14.76	5,383	70	1.32%	23.601
2025	#N/A	126,773	14.47	0.07%	130,055	14.85	5,453	70	1.31%	23.248
2026	#N/A	126,865	14.48	0.07%	130,814	14.93	5,524	71	1.29%	22.968
2027	#N/A	126,989	14.50	0.10%	131,572	15.02	5,594	71	1.28%	22.700
2028	#N/A	127,542	14.52	0.16%	132,719	15.11	5,665	70	1.26%	22.516
AARG % ¹ (2019-2023)			0.23%							
AARG % ¹ (2019-2028)			0.16%							

1) AARG % = Annual Average Rate of Growth Percentage

5.3 Medium General

The forecast for medium general service retail load in 2019 is 21.1 aMW, an increase of 0.85% over the 2018 actual of 20.9 aMW. The five and ten year average annual rates of growth are 0.31% and 0.24% respectively. The ten year forecast includes 0.84 aMW of cumulative incremental conservation. The forecast for the average annual customer count is an increase of about 14 customers per year. See **Figure 5-3** and **Table 5-3** for more detail.

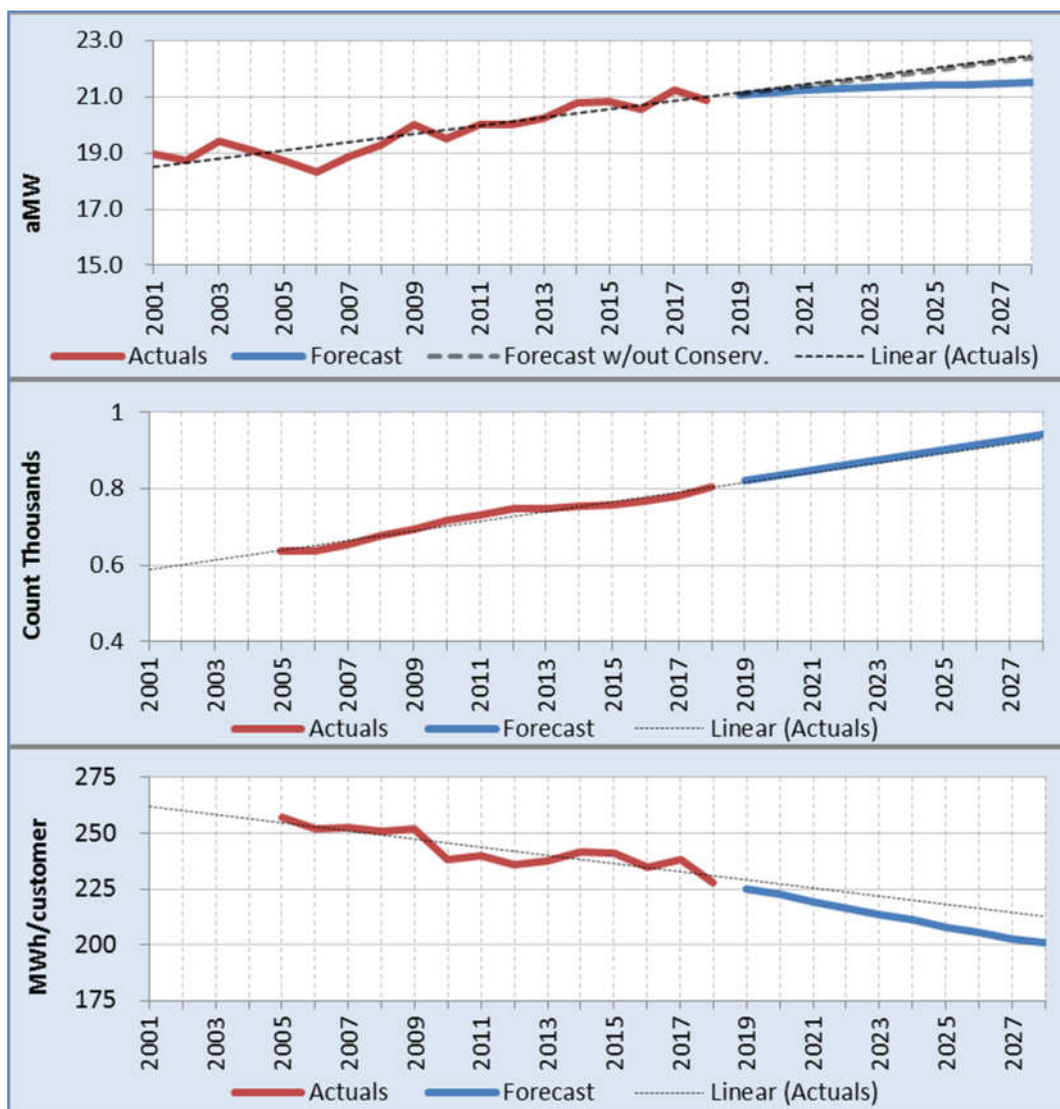


Figure 5-3 – Medium General forecast of retail load, customers and usage per customer

Table 5-3 – Medium General forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	166,300	#N/A	18.98	-0.33%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	164,197	#N/A	18.74	-1.26%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	170,005	#N/A	19.41	3.54%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	167,622	#N/A	19.08	-1.67%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	164,043	#N/A	18.73	-1.87%	#N/A	#N/A	637	#N/A	#N/A	257.456
2006	160,440	#N/A	18.32	-2.20%	#N/A	#N/A	636	-1	-0.16%	252.197
2007	165,186	#N/A	18.86	2.96%	#N/A	#N/A	654	18	2.86%	252.449
2008	169,571	#N/A	19.30	2.37%	#N/A	#N/A	676	21	3.27%	250.938
2009	175,265	#N/A	20.01	3.64%	#N/A	#N/A	695	19	2.85%	252.179
2010	170,868	#N/A	19.51	-2.51%	#N/A	#N/A	718	23	3.29%	238.032
2011	175,463	#N/A	20.03	2.69%	#N/A	#N/A	732	14	1.92%	239.841
2012	175,999	#N/A	20.04	0.03%	#N/A	#N/A	747	15	2.06%	235.713
2013	177,250	#N/A	20.23	0.99%	#N/A	#N/A	746	-1	-0.09%	237.601
2014	182,044	#N/A	20.78	2.70%	#N/A	#N/A	754	8	1.08%	241.411
2015	182,610	#N/A	20.85	0.31%	#N/A	#N/A	758	4	0.49%	240.990
2016	180,467	#N/A	20.54	-1.44%	#N/A	#N/A	768	10	1.32%	235.059
2017	186,155	#N/A	21.25	3.43%	#N/A	#N/A	782	14	1.86%	238.050
2018	183,125	#N/A	20.90	-1.63%	#N/A	#N/A	803	21	2.73%	227.956
2019	#N/A	184,687	21.08	0.85%	184,981	21.12	822	18	2.26%	224.817
2020	#N/A	185,932	21.17	0.40%	186,592	21.24	835	14	1.64%	222.673
2021	#N/A	186,148	21.25	0.39%	187,364	21.39	849	14	1.65%	219.320
2022	#N/A	186,658	21.31	0.27%	188,636	21.53	862	13	1.58%	216.499
2023	#N/A	187,006	21.35	0.19%	189,867	21.67	875	13	1.54%	213.620
2024	#N/A	187,846	21.39	0.17%	191,625	21.82	889	13	1.53%	211.340
2025	#N/A	187,654	21.42	0.17%	192,343	21.96	902	13	1.49%	208.023
2026	#N/A	187,951	21.46	0.16%	193,592	22.10	916	14	1.50%	205.280
2027	#N/A	188,294	21.49	0.18%	194,841	22.24	929	13	1.47%	202.685
2028	#N/A	189,228	21.54	0.22%	196,624	22.38	942	13	1.43%	200.826
AARG %¹ (2019-2023)			0.31%							
AARG %¹ (2019-2028)			0.24%							

1) AARG % = Annual Average Rate of Growth Percentage

5.4 Large General

The forecast for large general service retail load in 2019 is 26.5 aMW, a decrease of 2.8% under the 2018 actual of 27.2 aMW. The five and ten year average annual rates of growth are -0.36% and -0.45% respectively. The ten year forecast includes 1.09 aMW of cumulative incremental conservation. The forecast for the average annual customer count is an increase of about 3 customers per year. See **Figure 5-4** and **Table 5-4** for more detail.

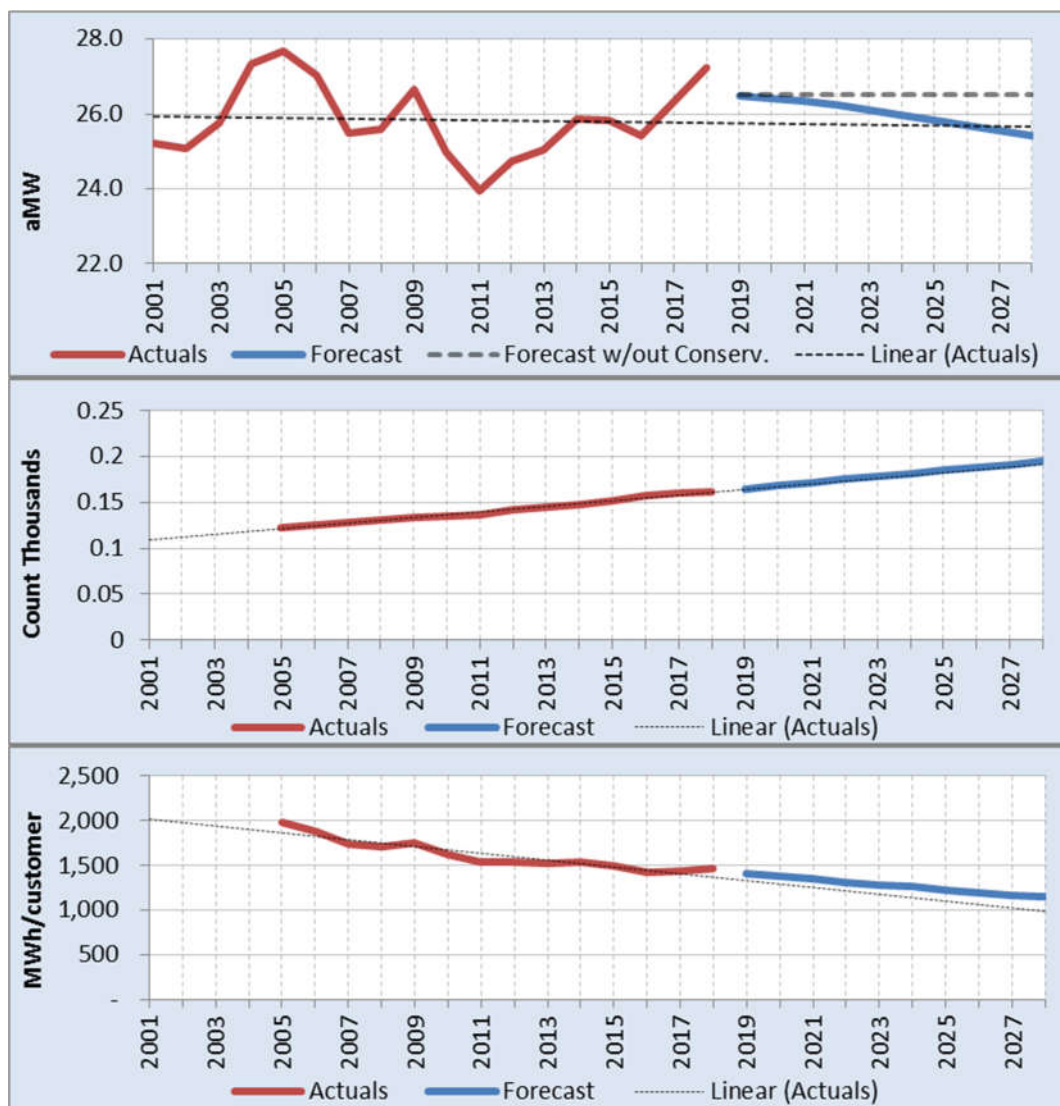


Figure 5-4 – Large General forecast of retail load, customers and usage per customer

Table 5-4 – Large General forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	220,952	#N/A	25.22	-10.49%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	219,625	#N/A	25.07	-0.60%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	225,799	#N/A	25.78	2.81%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	240,192	#N/A	27.34	6.08%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	242,555	#N/A	27.69	1.26%	#N/A	#N/A	122	#N/A	#N/A	1,989.519
2006	236,908	#N/A	27.04	-2.33%	#N/A	#N/A	126	4	3.28%	1,881.465
2007	223,317	#N/A	25.49	-5.74%	#N/A	#N/A	128	2	1.79%	1,742.392
2008	224,958	#N/A	25.61	0.46%	#N/A	#N/A	131	3	2.34%	1,715.052
2009	233,410	#N/A	26.65	4.04%	#N/A	#N/A	134	2	1.84%	1,747.302
2010	218,686	#N/A	24.96	-6.31%	#N/A	#N/A	135	2	1.12%	1,618.900
2011	209,669	#N/A	23.93	-4.12%	#N/A	#N/A	136	1	0.80%	1,539.795
2012	217,377	#N/A	24.75	3.39%	#N/A	#N/A	142	6	4.16%	1,532.625
2013	219,315	#N/A	25.04	1.17%	#N/A	#N/A	144	2	1.70%	1,520.385
2014	226,679	#N/A	25.88	3.36%	#N/A	#N/A	148	4	2.60%	1,531.617
2015	226,175	#N/A	25.82	-0.22%	#N/A	#N/A	151	3	2.14%	1,496.196
2016	223,268	#N/A	25.42	-1.56%	#N/A	#N/A	157	6	3.91%	1,421.334
2017	230,674	#N/A	26.33	3.60%	#N/A	#N/A	160	3	1.75%	1,443.218
2018	238,606	#N/A	27.24	3.44%	#N/A	#N/A	162	2	1.36%	1,472.877
2019	#N/A	231,992	26.48	-2.77%	232,373	26.53	165	3	1.70%	1,408.143
2020	#N/A	232,106	26.42	-0.22%	232,965	26.52	168	3	2.07%	1,380.215
2021	#N/A	230,792	26.35	-0.29%	232,373	26.53	171	3	1.93%	1,346.380
2022	#N/A	229,802	26.23	-0.43%	232,373	26.53	175	3	1.94%	1,315.032
2023	#N/A	228,654	26.10	-0.50%	232,373	26.53	178	3	1.81%	1,285.174
2024	#N/A	228,053	25.96	-0.54%	232,965	26.52	181	3	1.87%	1,258.222
2025	#N/A	226,278	25.83	-0.51%	232,373	26.53	185	3	1.79%	1,226.438
2026	#N/A	225,040	25.69	-0.55%	232,373	26.53	188	3	1.76%	1,198.615
2027	#N/A	223,862	25.56	-0.52%	232,373	26.53	191	3	1.78%	1,171.543
2028	#N/A	223,350	25.43	-0.50%	232,965	26.52	194	3	1.70%	1,149.314
AARG % ¹ (2019-2023)			-0.36%							
AARG % ¹ (2019-2028)			-0.45%							

1) AARG % = Annual Average Rate of Growth Percentage

5.5 Large Industrial

The forecast for large industrial service retail load in 2019 is 7.65 aMW and is expected to remain flat over the ten year forecast period, with no incremental conservation and no additional customers. See **Figure 5-5** and **Table 5-5** for more detail.

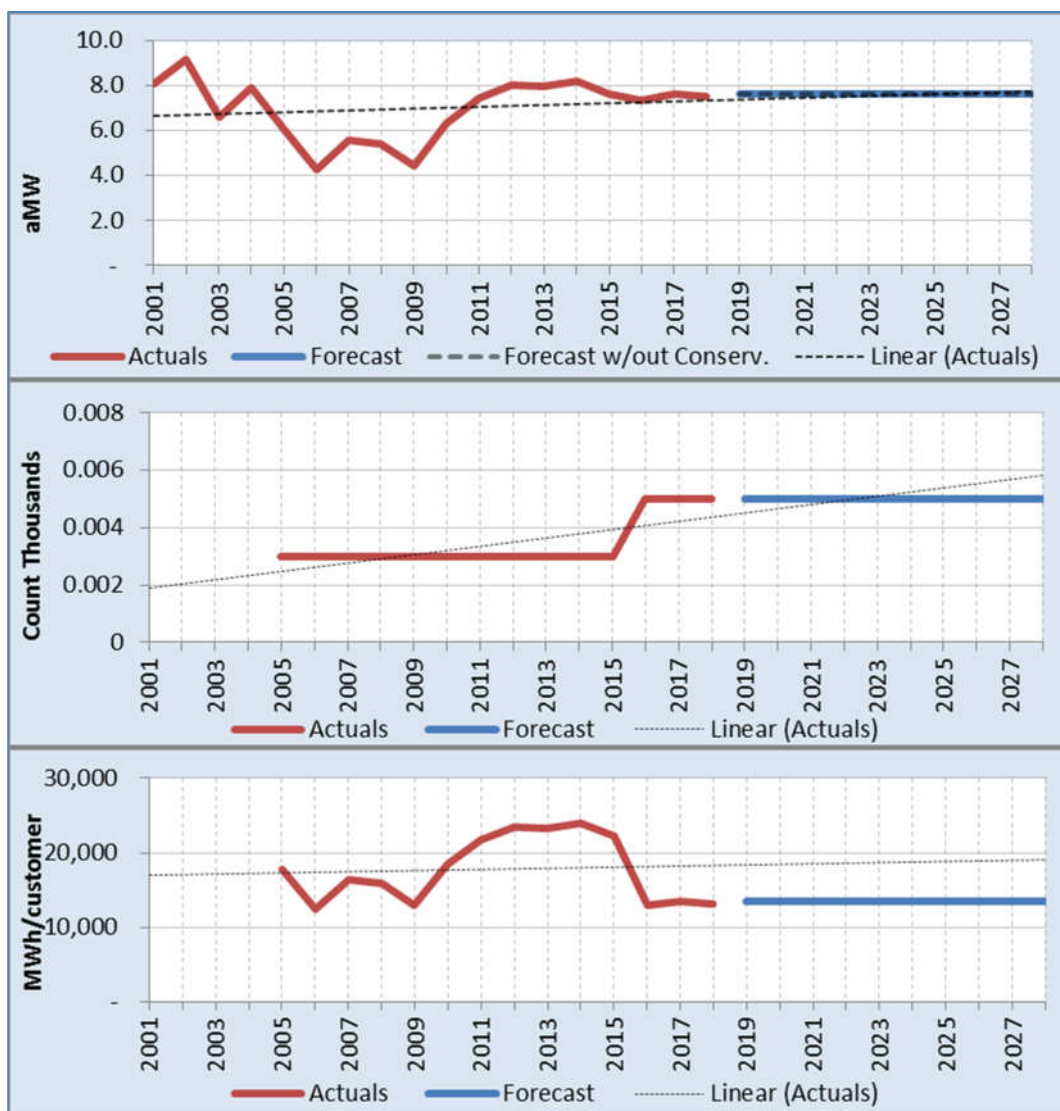


Figure 5-5 – Large Industrial forecast of retail load, customers and usage per customer

Table 5-5 – Large Industrial forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	70,897	#N/A	8.09	-67.82%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	80,551	#N/A	9.20	13.62%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	58,054	#N/A	6.63	-27.93%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	69,479	#N/A	7.91	19.35%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	53,286	#N/A	6.08	-23.10%	#N/A	#N/A	3	#N/A	#N/A	17,761.932
2006	37,456	#N/A	4.28	-29.71%	#N/A	#N/A	3	0	0.00%	12,485.305
2007	49,045	#N/A	5.60	30.94%	#N/A	#N/A	3	0	0.00%	16,348.383
2008	47,760	#N/A	5.44	-2.89%	#N/A	#N/A	3	0	0.00%	15,920.098
2009	38,909	#N/A	4.44	-18.31%	#N/A	#N/A	3	0	0.00%	12,969.692
2010	55,365	#N/A	6.32	42.29%	#N/A	#N/A	3	0	0.00%	18,454.887
2011	65,411	#N/A	7.47	18.15%	#N/A	#N/A	3	0	0.00%	21,803.603
2012	70,575	#N/A	8.03	7.60%	#N/A	#N/A	3	0	0.00%	23,525.055
2013	69,803	#N/A	7.97	-0.82%	#N/A	#N/A	3	0	0.00%	23,267.593
2014	71,869	#N/A	8.20	2.96%	#N/A	#N/A	3	0	0.00%	23,956.495
2015	66,942	#N/A	7.64	-6.86%	#N/A	#N/A	3	0	0.00%	22,313.962
2016	64,612	#N/A	7.36	-3.74%	#N/A	#N/A	5	2	66.67%	12,922.450
2017	67,084	#N/A	7.66	4.11%	#N/A	#N/A	5	0	0.00%	13,416.822
2018	65,997	#N/A	7.53	-1.62%	#N/A	#N/A	5	0	0.00%	13,199.344
2019	#N/A	66,984	7.65	1.50%	66,984	7.65	5	0	0.00%	13,396.717
2020	#N/A	67,159	7.65	-0.01%	67,159	7.65	5	0	0.00%	13,431.877
2021	#N/A	66,984	7.65	0.01%	66,984	7.65	5	0	0.00%	13,396.717
2022	#N/A	66,984	7.65	0.00%	66,984	7.65	5	0	0.00%	13,396.717
2023	#N/A	66,984	7.65	0.00%	66,984	7.65	5	0	0.00%	13,396.717
2024	#N/A	67,159	7.65	-0.01%	67,159	7.65	5	0	0.00%	13,431.877
2025	#N/A	66,984	7.65	0.01%	66,984	7.65	5	0	0.00%	13,396.717
2026	#N/A	66,984	7.65	0.00%	66,984	7.65	5	0	0.00%	13,396.717
2027	#N/A	66,984	7.65	0.00%	66,984	7.65	5	0	0.00%	13,396.717
2028	#N/A	67,159	7.65	-0.01%	67,159	7.65	5	0	0.00%	13,431.877
AARG % ¹ (2019-2023)			0.00%							
AARG % ¹ (2019-2028)			0.00%							

1) AARG % = Annual Average Rate of Growth Percentage

5.6 Small Irrigation

The forecast for small irrigation retail load in 2019 is 1.8 aMW, about the same as the 2018 actual. The five and ten year average annual rates of growth are -0.24% and -0.27% respectively. The ten year forecast does not include any conservation. The forecast for the average annual customer count is a decrease of about 6 customers per year. See **Figure 5-6** and **Table 5-6** for more detail.

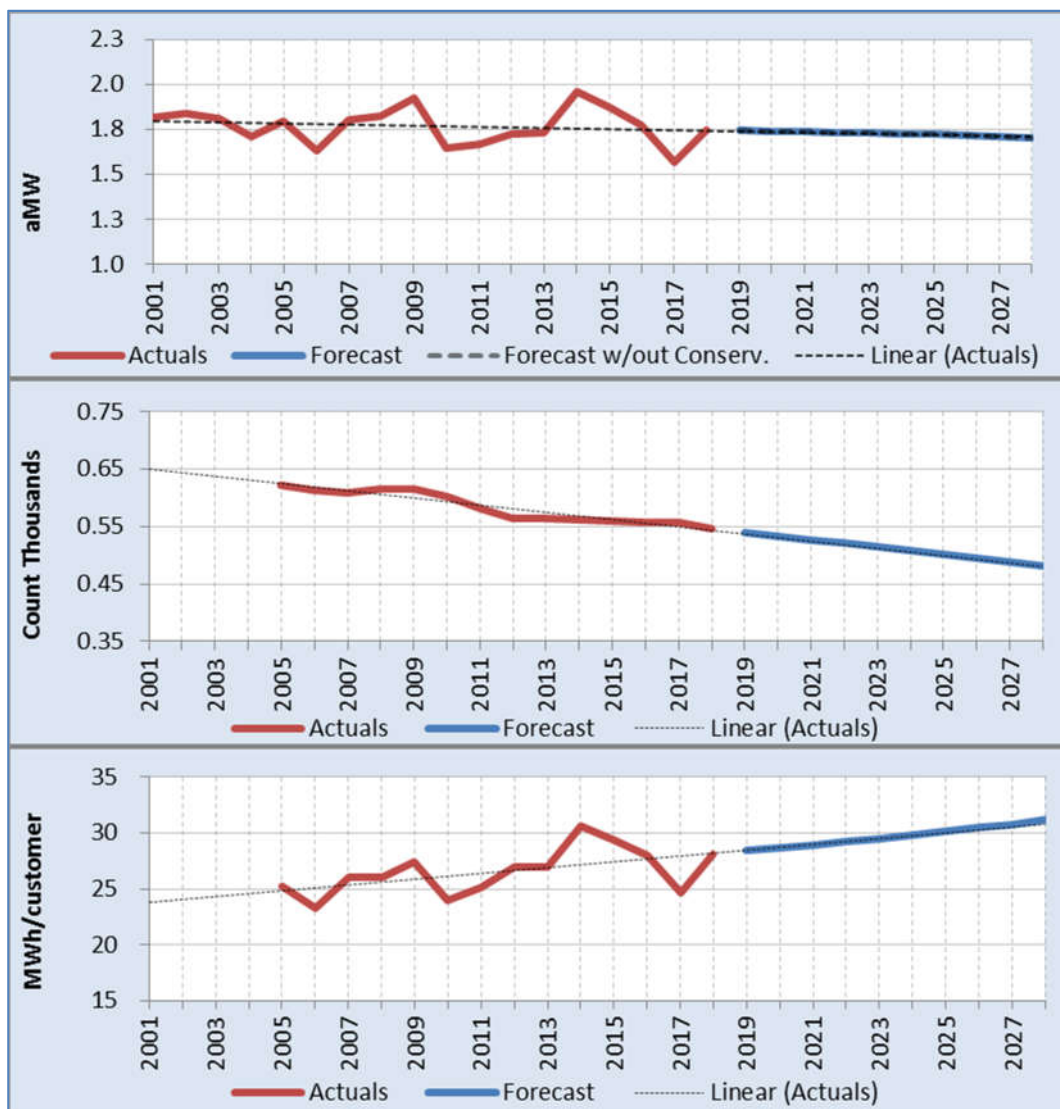


Figure 5-6 – Small Irrigation forecast of retail load, customers and usage per customer

Table 5-6 – Small Irrigation forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	15,951	#N/A	1.82	-5.45%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	16,119	#N/A	1.84	1.05%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	15,873	#N/A	1.81	-1.52%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	15,071	#N/A	1.72	-5.31%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	15,724	#N/A	1.80	4.62%	#N/A	#N/A	622	#N/A	#N/A	25.270
2006	14,305	#N/A	1.63	-9.03%	#N/A	#N/A	614	-8	-1.34%	23.301
2007	15,849	#N/A	1.81	10.79%	#N/A	#N/A	607	-7	-1.07%	26.096
2008	16,043	#N/A	1.83	0.95%	#N/A	#N/A	615	8	1.33%	26.068
2009	16,884	#N/A	1.93	5.53%	#N/A	#N/A	615	-1	-0.09%	27.460
2010	14,446	#N/A	1.65	-14.44%	#N/A	#N/A	602	-13	-2.09%	23.997
2011	14,607	#N/A	1.67	1.11%	#N/A	#N/A	582	-20	-3.35%	25.104
2012	15,165	#N/A	1.73	3.54%	#N/A	#N/A	563	-19	-3.28%	26.948
2013	15,211	#N/A	1.74	0.58%	#N/A	#N/A	564	1	0.19%	26.978
2014	17,209	#N/A	1.96	13.13%	#N/A	#N/A	563	-1	-0.22%	30.589
2015	16,425	#N/A	1.87	-4.56%	#N/A	#N/A	560	-3	-0.46%	29.330
2016	15,597	#N/A	1.78	-5.30%	#N/A	#N/A	558	-3	-0.45%	27.977
2017	13,754	#N/A	1.57	-11.57%	#N/A	#N/A	557	-1	-0.15%	24.708
2018	15,312	#N/A	1.75	11.32%	#N/A	#N/A	546	-11	-1.98%	28.060
2019	#N/A	15,330	1.75	0.12%	15,330	1.75	540	-6	-1.13%	28.414
2020	#N/A	15,297	1.74	-0.48%	15,297	1.74	533	-6	-1.16%	28.687
2021	#N/A	15,259	1.74	0.02%	15,259	1.74	527	-6	-1.17%	28.954
2022	#N/A	15,221	1.74	-0.25%	15,221	1.74	521	-6	-1.19%	29.229
2023	#N/A	15,184	1.73	-0.24%	15,184	1.73	514	-6	-1.22%	29.517
2024	#N/A	15,147	1.72	-0.51%	15,147	1.72	508	-6	-1.25%	29.818
2025	#N/A	15,110	1.72	0.03%	15,110	1.72	501	-7	-1.30%	30.135
2026	#N/A	15,073	1.72	-0.25%	15,073	1.72	495	-7	-1.31%	30.460
2027	#N/A	15,035	1.72	-0.25%	15,035	1.72	488	-7	-1.35%	30.800
2028	#N/A	14,998	1.71	-0.52%	14,998	1.71	482	-7	-1.37%	31.149
AARG % ¹ (2019-2023)			-0.24%							
AARG % ¹ (2019-2028)			-0.27%							

1) AARG % = Annual Average Rate of Growth Percentage

5.7 Large Irrigation

The forecast for large irrigation retail load in 2019 is 46.5 aMW, a decrease of 0.42% under the 2018 actual of 46.7 aMW. The forecast for large irrigation is expected to remain relatively flat over the ten year forecast period, with no incremental conservation and no additional customers. See **Figure 5-7** and **Table 5-7** for more detail.

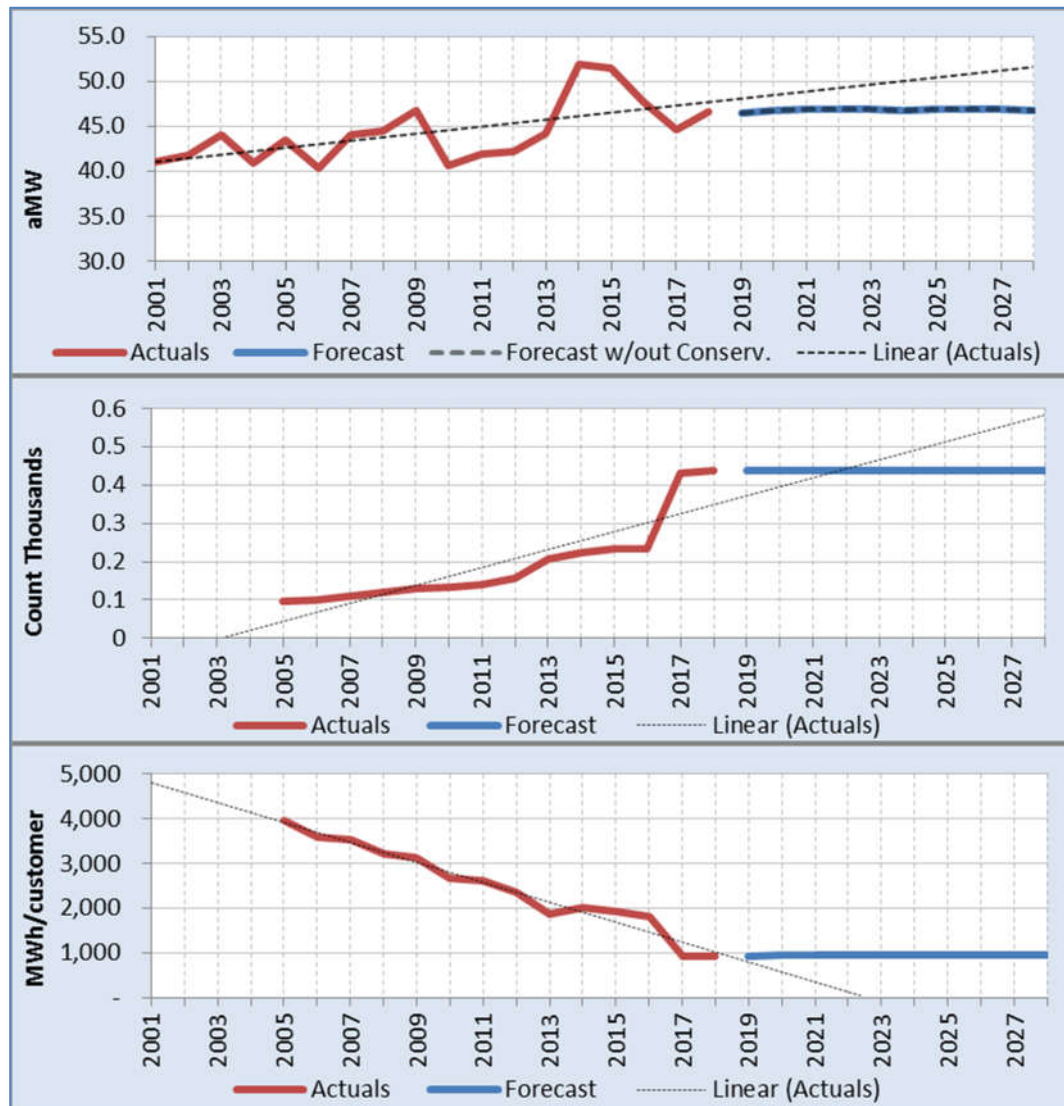


Figure 5-7 – Large Irrigation forecast of retail load, customers and usage per customer

Table 5-7 – Large Irrigation forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	359,731	#N/A	41.07	-2.20%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	366,431	#N/A	41.83	1.86%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	385,995	#N/A	44.06	5.34%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	360,292	#N/A	41.02	-6.91%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	381,927	#N/A	43.60	6.30%	#N/A	#N/A	96	#N/A	#N/A	3,978.407
2006	353,743	#N/A	40.38	-7.38%	#N/A	#N/A	99	3	2.69%	3,588.264
2007	386,402	#N/A	44.11	9.23%	#N/A	#N/A	110	11	11.16%	3,526.102
2008	391,389	#N/A	44.56	1.01%	#N/A	#N/A	121	12	10.80%	3,223.518
2009	410,386	#N/A	46.85	5.14%	#N/A	#N/A	131	10	7.89%	3,132.715
2010	356,875	#N/A	40.74	-13.04%	#N/A	#N/A	134	3	2.23%	2,664.906
2011	367,393	#N/A	41.94	2.95%	#N/A	#N/A	140	6	4.54%	2,624.234
2012	370,573	#N/A	42.19	0.59%	#N/A	#N/A	158	18	12.86%	2,345.402
2013	387,408	#N/A	44.22	4.83%	#N/A	#N/A	208	50	31.86%	1,859.559
2014	455,435	#N/A	51.99	17.56%	#N/A	#N/A	225	17	7.92%	2,025.654
2015	451,777	#N/A	51.57	-0.80%	#N/A	#N/A	234	9	3.97%	1,932.736
2016	419,588	#N/A	47.77	-7.38%	#N/A	#N/A	233	-1	-0.36%	1,801.453
2017	392,051	#N/A	44.75	-6.31%	#N/A	#N/A	430	197	84.72%	911.216
2018	409,299	#N/A	46.72	4.40%	#N/A	#N/A	437	6	1.49%	937.326
2019	#N/A	407,565	46.53	-0.42%	407,565	46.53	437	0	0.08%	932.644
2020	#N/A	411,045	46.79	0.58%	411,045	46.79	437	0	0.00%	940.607
2021	#N/A	411,035	46.92	0.27%	411,035	46.92	437	0	0.00%	940.584
2022	#N/A	411,035	46.92	0.00%	411,035	46.92	437	0	0.00%	940.584
2023	#N/A	411,035	46.92	0.00%	411,035	46.92	437	0	0.00%	940.584
2024	#N/A	411,045	46.79	-0.27%	411,045	46.79	437	0	0.00%	940.607
2025	#N/A	411,035	46.92	0.27%	411,035	46.92	437	0	0.00%	940.584
2026	#N/A	411,035	46.92	0.00%	411,035	46.92	437	0	0.00%	940.584
2027	#N/A	411,035	46.92	0.00%	411,035	46.92	437	0	0.00%	940.584
2028	#N/A	411,045	46.79	-0.27%	411,045	46.79	437	0	0.00%	940.607
AARG % ¹ (2019-2023)			0.21%							
AARG % ¹ (2019-2028)			0.06%							

1) AARG % = Annual Average Rate of Growth Percentage

5.8 Street Lighting

The forecast for street lighting retail load in 2019 is 0.29 aMW, the same as 2018. The five and ten year average annual rates of growth are -1.60% and -1.66% respectively. Expected conversions to LED lighting may accelerate the load decrease, but no adjustments were made to account for this possibility. The forecast does not include any conservation and expects no additional customers. New street lighting installations are typically metered and would be classified as small general service. See **Figure 5-8** and **Table 5-8** for more detail.

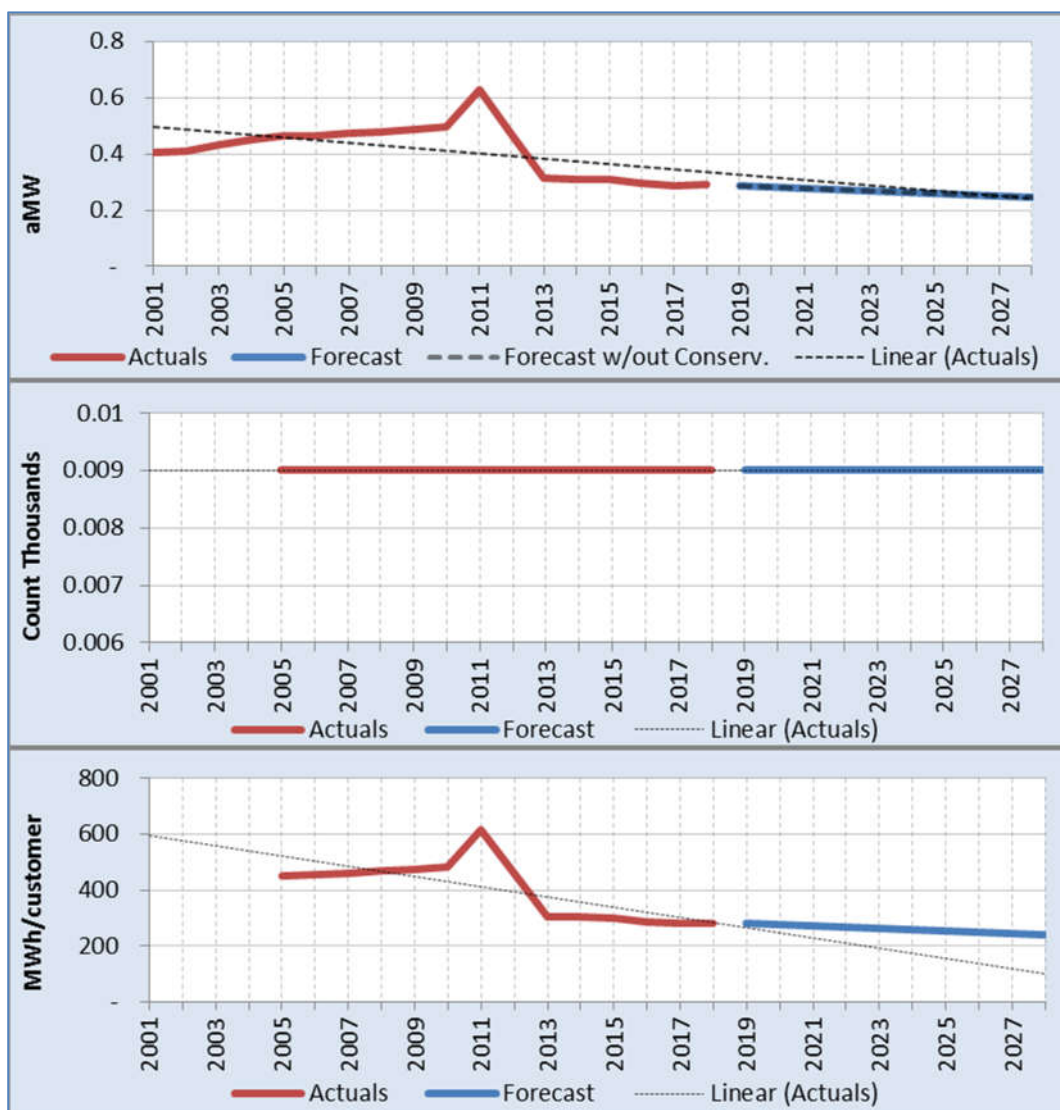


Figure 5-8 – Street Lighting forecast of retail load, customers and usage per customer

Table 5-8 – Street Lighting forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	3,547	#N/A	0.40	1.55%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	3,593	#N/A	0.41	1.30%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	3,807	#N/A	0.43	5.94%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	3,957	#N/A	0.45	3.66%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	4,067	#N/A	0.46	3.06%	#N/A	#N/A	9	#N/A	#N/A	451.882
2006	4,084	#N/A	0.47	0.41%	#N/A	#N/A	9	0	0.00%	453.740
2007	4,151	#N/A	0.47	1.66%	#N/A	#N/A	9	0	0.00%	461.266
2008	4,218	#N/A	0.48	1.33%	#N/A	#N/A	9	0	0.00%	468.669
2009	4,268	#N/A	0.49	1.46%	#N/A	#N/A	9	0	0.00%	474.203
2010	4,339	#N/A	0.50	1.68%	#N/A	#N/A	9	0	0.00%	482.159
2011	5,532	#N/A	0.63	27.48%	#N/A	#N/A	9	0	0.00%	614.671
2012	4,136	#N/A	0.47	-25.43%	#N/A	#N/A	9	0	0.00%	459.597
2013	2,751	#N/A	0.31	-33.31%	#N/A	#N/A	9	0	0.00%	305.647
2014	2,721	#N/A	0.31	-1.10%	#N/A	#N/A	9	0	0.00%	302.278
2015	2,704	#N/A	0.31	-0.62%	#N/A	#N/A	9	0	0.00%	300.405
2016	2,589	#N/A	0.29	-4.50%	#N/A	#N/A	9	0	0.00%	287.682
2017	2,535	#N/A	0.29	-1.83%	#N/A	#N/A	9	0	0.00%	281.642
2018	2,537	#N/A	0.29	0.10%	#N/A	#N/A	9	0	0.00%	281.920
2019	#N/A	2,520	0.29	-0.68%	2,520	0.29	9	0	0.00%	279.997
2020	#N/A	2,489	0.28	-1.51%	2,489	0.28	9	0	0.00%	276.511
2021	#N/A	2,441	0.28	-1.63%	2,441	0.28	9	0	0.00%	271.262
2022	#N/A	2,401	0.27	-1.65%	2,401	0.27	9	0	0.00%	266.793
2023	#N/A	2,363	0.27	-1.60%	2,363	0.27	9	0	0.00%	262.511
2024	#N/A	2,330	0.27	-1.64%	2,330	0.27	9	0	0.00%	258.920
2025	#N/A	2,285	0.26	-1.69%	2,285	0.26	9	0	0.00%	253.849
2026	#N/A	2,245	0.26	-1.72%	2,245	0.26	9	0	0.00%	249.477
2027	#N/A	2,206	0.25	-1.76%	2,206	0.25	9	0	0.00%	245.090
2028	#N/A	2,173	0.25	-1.77%	2,173	0.25	9	0	0.00%	241.409
AARG % ¹ (2019-2023)			-1.60%							
AARG % ¹ (2019-2028)			-1.66%							

1) AARG % = Annual Average Rate of Growth Percentage

5.9 Security Lighting

The forecast for security lighting retail load in 2019 is 0.12 aMW, the same as 2018 and is expected to remain flat over the ten year forecast period, with no incremental conservation and no additional customers. See **Figure 5-9** and **Table 5-9** for more detail.

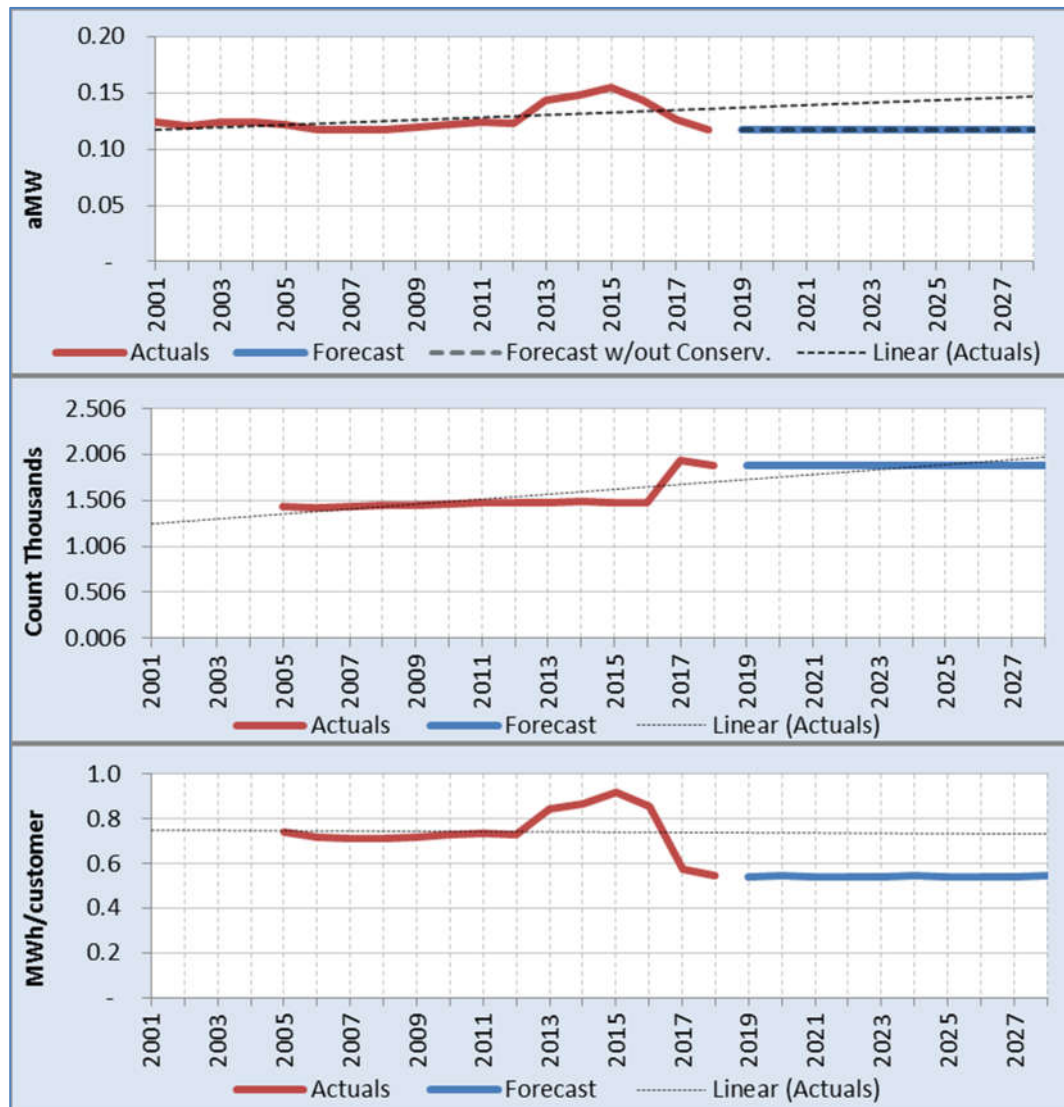


Figure 5-9 – Security Lighting forecast of retail load, customers and usage per customer

Table 5-9 – Security Lighting forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	1,086	#N/A	0.12	1.92%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	1,055	#N/A	0.12	-2.87%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	1,094	#N/A	0.12	3.71%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	1,091	#N/A	0.12	-0.51%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	1,066	#N/A	0.12	-1.99%	#N/A	#N/A	1,440	#N/A	#N/A	0.741
2006	1,025	#N/A	0.12	-3.92%	#N/A	#N/A	1,429	-11	-0.76%	0.717
2007	1,028	#N/A	0.12	0.29%	#N/A	#N/A	1,440	11	0.79%	0.714
2008	1,036	#N/A	0.12	0.52%	#N/A	#N/A	1,451	11	0.75%	0.714
2009	1,045	#N/A	0.12	1.19%	#N/A	#N/A	1,453	2	0.13%	0.720
2010	1,068	#N/A	0.12	2.22%	#N/A	#N/A	1,468	15	1.05%	0.728
2011	1,087	#N/A	0.12	1.72%	#N/A	#N/A	1,482	14	0.95%	0.733
2012	1,084	#N/A	0.12	-0.56%	#N/A	#N/A	1,480	-1	-0.10%	0.732
2013	1,257	#N/A	0.14	16.34%	#N/A	#N/A	1,488	7	0.50%	0.845
2014	1,297	#N/A	0.15	3.12%	#N/A	#N/A	1,493	5	0.34%	0.869
2015	1,364	#N/A	0.16	5.19%	#N/A	#N/A	1,482	-11	-0.75%	0.921
2016	1,263	#N/A	0.14	-7.64%	#N/A	#N/A	1,476	-6	-0.39%	0.856
2017	1,112	#N/A	0.13	-11.72%	#N/A	#N/A	1,943	467	31.61%	0.573
2018	1,028	#N/A	0.12	-7.60%	#N/A	#N/A	1,888	-55	-2.82%	0.544
2019	#N/A	1,028	0.12	0.00%	1,028	0.12	1,892	4	0.23%	0.543
2020	#N/A	1,031	0.12	0.04%	1,031	0.12	1,892	0	0.00%	0.545
2021	#N/A	1,028	0.12	-0.04%	1,028	0.12	1,892	0	0.00%	0.543
2022	#N/A	1,028	0.12	0.00%	1,028	0.12	1,892	0	0.00%	0.543
2023	#N/A	1,028	0.12	0.00%	1,028	0.12	1,892	0	0.00%	0.543
2024	#N/A	1,031	0.12	0.04%	1,031	0.12	1,892	0	0.00%	0.545
2025	#N/A	1,028	0.12	-0.04%	1,028	0.12	1,892	0	0.00%	0.543
2026	#N/A	1,028	0.12	0.00%	1,028	0.12	1,892	0	0.00%	0.543
2027	#N/A	1,028	0.12	0.00%	1,028	0.12	1,892	0	0.00%	0.543
2028	#N/A	1,031	0.12	0.04%	1,031	0.12	1,892	0	0.00%	0.545
AARG % ¹ (2019-2023)			0.00%							
AARG % ¹ (2019-2028)			0.00%							

1) AARG % = Annual Average Rate of Growth Percentage

5.10 Unmetered Flats

The forecast for unmetered flats retail load in 2019 is 0.35 aMW, about the same as 2018. The five and ten year average annual rates of growth are 0.62% and 0.63% respectively. The ten year forecast does not include any conservation. The forecast for the average annual customer count is an increase of 1 customer per year. See **Figure 5-10** and **Table 5-10** for more detail.

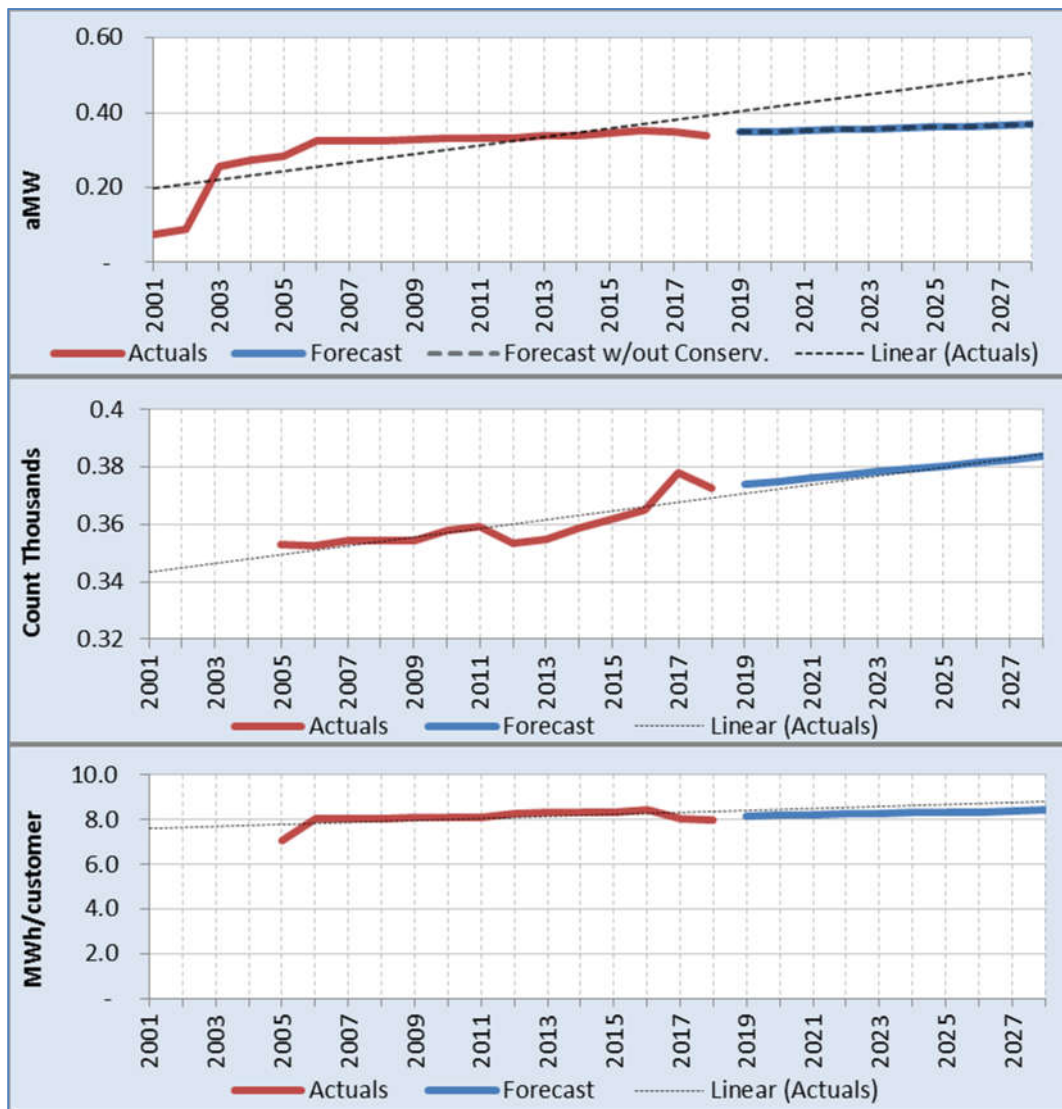


Figure 5-10 – Unmetered Flats forecast of retail load, customers and usage per customer

Table 5-10 – Unmetered Flats forecast of retail load, customers and usage per customer

Calendar Year	Historical Energy (MWh)	Forecast Energy (MWh)	Average Power (aMW)	Average Power % Change	Forecast without Conservation (MWh)	Forecast without Conservation (aMW)	Average Customer Count	Customer Count Change	Customer Count % Change	Usage Per Customer (MWh)
2001	651	#N/A	0.07	2.47%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	784	#N/A	0.09	20.35%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	2,254	#N/A	0.26	187.61%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	2,390	#N/A	0.27	5.74%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	2,492	#N/A	0.28	4.56%	#N/A	#N/A	353	#N/A	#N/A	7.064
2006	2,833	#N/A	0.32	13.70%	#N/A	#N/A	353	0	-0.05%	8.035
2007	2,846	#N/A	0.32	0.47%	#N/A	#N/A	354	2	0.47%	8.035
2008	2,848	#N/A	0.32	-0.21%	#N/A	#N/A	354	0	-0.05%	8.044
2009	2,875	#N/A	0.33	1.22%	#N/A	#N/A	354	0	0.07%	8.114
2010	2,896	#N/A	0.33	0.72%	#N/A	#N/A	358	3	0.94%	8.096
2011	2,909	#N/A	0.33	0.46%	#N/A	#N/A	359	1	0.40%	8.101
2012	2,928	#N/A	0.33	0.36%	#N/A	#N/A	353	-6	-1.60%	8.286
2013	2,964	#N/A	0.34	1.50%	#N/A	#N/A	355	1	0.38%	8.356
2014	2,981	#N/A	0.34	0.57%	#N/A	#N/A	359	4	1.13%	8.310
2015	3,023	#N/A	0.35	1.41%	#N/A	#N/A	362	3	0.91%	8.352
2016	3,083	#N/A	0.35	1.72%	#N/A	#N/A	365	3	0.83%	8.448
2017	3,044	#N/A	0.35	-0.98%	#N/A	#N/A	378	13	3.59%	8.054
2018	2,975	#N/A	0.34	-2.28%	#N/A	#N/A	372	-6	-1.48%	7.988
2019	#N/A	3,053	0.35	2.62%	3,053	0.35	374	2	0.40%	8.164
2020	#N/A	3,080	0.35	0.62%	3,080	0.35	375	1	0.27%	8.215
2021	#N/A	3,091	0.35	0.62%	3,091	0.35	376	1	0.29%	8.220
2022	#N/A	3,110	0.36	0.62%	3,110	0.36	377	1	0.29%	8.247
2023	#N/A	3,129	0.36	0.62%	3,129	0.36	378	1	0.29%	8.275
2024	#N/A	3,158	0.36	0.63%	3,158	0.36	379	1	0.29%	8.326
2025	#N/A	3,169	0.36	0.63%	3,169	0.36	380	1	0.29%	8.332
2026	#N/A	3,189	0.36	0.64%	3,189	0.36	382	1	0.31%	8.359
2027	#N/A	3,209	0.37	0.64%	3,209	0.37	383	1	0.28%	8.388
2028	#N/A	3,239	0.37	0.64%	3,239	0.37	384	1	0.28%	8.441
AARG %¹ (2019-2023)			0.62%							
AARG %¹ (2019-2028)			0.63%							

1) AARG % = Annual Average Rate of Growth Percentage

Appendix A

6. Appendix A – Summary Tables

Appendix A

Table 6-1 – Total system historical and forecast of annual load, losses and peak demand

Calendar Year	Total Retail Load (aMW)			+ BPUD T&D ¹ System Losses (aMW) (%)		= Total Load at BPA Point-of-Delivery (aMW)			+ BPA Trans. ² Loss Returns (aMW) (%)		= Total Power Supply Requirement (aMW)			System Peak Hourly Demand (MW)		
2001	179.2			8.6	4.6%	187.8			#N/A	#N/A	#N/A			352.0		
2002	181.2			5.9	3.2%	187.1			#N/A	#N/A	#N/A			374.0		
2003	180.5			6.2	3.3%	186.7			#N/A	#N/A	#N/A			384.2		
2004	181.8			5.5	3.0%	187.4			#N/A	#N/A	#N/A			382.2		
2005	182.9			4.5	2.4%	187.5			#N/A	#N/A	#N/A			366.5		
2006	177.6			5.3	2.9%	182.9			#N/A	#N/A	#N/A			373.3		
2007	183.5			6.7	3.5%	190.2			#N/A	#N/A	#N/A			384.3		
2008	186.7			7.3	3.8%	194.0			#N/A	#N/A	#N/A			396.9		
2009	197.1			6.2	3.1%	203.3			#N/A	#N/A	#N/A			402.1		
2010	181.8			7.0	3.7%	188.9			#N/A	#N/A	#N/A			392.1		
2011	188.2			6.2	3.2%	194.3			#N/A	#N/A	#N/A			379.5		
2012	187.3			5.8	3.0%	193.1			3.5	1.8%	196.7			394.0		
2013	193.7			8.7	4.3%	202.4			3.3	1.6%	205.7			414.5		
2014	203.3			5.1	2.4%	208.4			3.5	1.7%	211.9			430.5		
2015	198.4			7.5	3.6%	205.9			3.4	1.7%	209.3			429.5		
2016	192.9			7.4	3.7%	200.3			3.2	1.6%	203.4			425.1		
2017	203.8			7.1	3.4%	210.9			3.2	1.5%	214.1			426.0		
2018	198.7			5.9	2.9%	204.7			3.2	1.6%	207.9			419.0		
Forecast	Low	Base	High	aMW	%	Low	Base	High	aMW	%	Low	Base	High	Low	Base	High
2019	192.9	201.5	210.0	6.7	3.3%	199.7	208.2	216.7	4.0	1.9%	203.6	212.1	220.7	405.7	425.6	445.4
2020	193.9	202.5	211.1	6.8	3.3%	200.7	209.3	217.9	4.0	1.9%	204.7	213.3	221.8	408.2	428.1	448.0
2021	194.6	203.3	211.9	6.8	3.3%	201.4	210.0	218.7	4.0	1.9%	205.4	214.0	222.7	409.1	429.1	449.0
2022	195.2	203.8	212.5	6.8	3.3%	202.0	210.6	219.3	4.0	1.9%	206.0	214.6	223.3	409.8	429.9	449.9
2023	195.6	204.3	213.0	6.8	3.3%	202.4	211.1	219.8	4.0	1.9%	206.4	215.1	223.8	410.4	430.5	450.5
2024	195.9	204.7	213.4	6.8	3.3%	202.8	211.5	220.3	4.0	1.9%	206.8	215.5	224.3	410.9	431.1	451.2
2025	196.4	205.2	214.0	6.8	3.3%	203.2	212.0	220.8	4.0	1.9%	207.2	216.0	224.8	411.5	431.7	451.9
2026	196.7	205.6	214.4	6.9	3.3%	203.6	212.5	221.3	4.0	1.9%	207.6	216.5	225.3	412.0	432.3	452.5
2027	197.2	206.1	214.9	6.9	3.3%	204.0	212.9	221.8	4.0	1.9%	208.1	217.0	225.9	412.6	432.9	453.2
2028	197.6	206.5	215.4	6.9	3.3%	204.5	213.4	222.3	4.1	1.9%	208.5	217.5	226.4	413.2	433.6	454.0

1) BPUD T&D = Benton P.U.D. Transmission & Distribution; Forecast loss factor is equal to the 10-year historical average.

2) BPA Trans. = Bonneville Power Administration Transmission; Forecast loss factor is per Schedule 9 of BPA's Open Access Transmission Tariff (OATT).

Appendix A

Table 6-2 – Historical & BASE case forecast of annual retail load (aMW) by customer class

Calendar Year	Residential	Small General	Medium General	Large General	Large Industrial	Small Irrigation	Large Irrigation	Street Lights	Security Lights	Unmetered Flats	Total System	Annual % Change
2001	70.5	12.9	19.0	25.2	8.1	1.8	41.1	0.4	0.1	0.1	179.2	#N/A
2002	71.0	12.9	18.7	25.1	9.2	1.8	41.8	0.4	0.1	0.1	181.2	1.13%
2003	69.0	12.9	19.4	25.8	6.6	1.8	44.1	0.4	0.1	0.3	180.5	-0.44%
2004	70.7	13.2	19.1	27.3	7.9	1.7	41.0	0.5	0.1	0.3	181.8	0.76%
2005	71.1	13.1	18.7	27.7	6.1	1.8	43.6	0.5	0.1	0.3	182.9	0.62%
2006	72.2	12.9	18.3	27.0	4.3	1.6	40.4	0.5	0.1	0.3	177.6	-2.92%
2007	73.6	13.1	18.9	25.5	5.6	1.8	44.1	0.5	0.1	0.3	183.5	3.31%
2008	75.9	13.2	19.3	25.6	5.4	1.8	44.6	0.5	0.1	0.3	186.7	1.75%
2009	82.4	13.9	20.0	26.6	4.4	1.9	46.8	0.5	0.1	0.3	197.1	5.56%
2010	74.7	13.0	19.5	25.0	6.3	1.6	40.7	0.5	0.1	0.3	181.8	-7.74%
2011	78.5	13.5	20.0	23.9	7.5	1.7	41.9	0.6	0.1	0.3	188.2	3.49%
2012	76.0	13.6	20.0	24.7	8.0	1.7	42.2	0.5	0.1	0.3	187.3	-0.46%
2013	79.7	14.0	20.2	25.0	8.0	1.7	44.2	0.3	0.1	0.3	193.7	3.41%
2014	79.5	14.2	20.8	25.9	8.2	2.0	52.0	0.3	0.1	0.3	203.3	4.98%
2015	76.0	13.9	20.8	25.8	7.6	1.9	51.6	0.3	0.2	0.3	198.4	-2.43%
2016	75.3	13.9	20.5	25.4	7.4	1.8	47.8	0.3	0.1	0.4	192.9	-2.79%
2017	86.7	14.7	21.3	26.3	7.7	1.6	44.8	0.3	0.1	0.3	203.8	5.66%
2018	79.6	14.3	20.9	27.2	7.5	1.7	46.7	0.3	0.1	0.3	198.7	-2.48%
2019	82.9	14.3	21.1	26.5	7.6	1.7	46.5	0.3	0.1	0.3	201.5	1.38%
2020	83.6	14.4	21.2	26.4	7.6	1.7	46.8	0.3	0.1	0.4	202.5	0.52%
2021	84.2	14.4	21.2	26.3	7.6	1.7	46.9	0.3	0.1	0.4	203.3	0.37%
2022	84.8	14.4	21.3	26.2	7.6	1.7	46.9	0.3	0.1	0.4	203.8	0.28%
2023	85.3	14.4	21.3	26.1	7.6	1.7	46.9	0.3	0.1	0.4	204.3	0.22%
2024	86.0	14.5	21.4	26.0	7.6	1.7	46.8	0.3	0.1	0.4	204.7	0.19%
2025	86.4	14.5	21.4	25.8	7.6	1.7	46.9	0.3	0.1	0.4	205.2	0.24%
2026	86.9	14.5	21.5	25.7	7.6	1.7	46.9	0.3	0.1	0.4	205.6	0.21%
2027	87.5	14.5	21.5	25.6	7.6	1.7	46.9	0.3	0.1	0.4	206.1	0.22%
2028	88.1	14.5	21.5	25.4	7.6	1.7	46.8	0.2	0.1	0.4	206.5	0.22%
AARG %¹ 2019-2023	0.72%	0.23%	0.31%	-0.36%	0.00%	-0.24%	0.21%	-1.60%	0.00%	0.62%	0.35%	
AARG %¹ 2019-2028	0.68%	0.16%	0.24%	-0.45%	0.00%	-0.27%	0.06%	-1.66%	0.00%	0.63%	0.27%	

1) AARG % = Annual Average Rate of Growth Percentage

Appendix A

Table 6-3 – HIGH case forecast of annual retail load (aMW) by customer class

Calendar Year	Residential	Small General	Medium General	Large General	Large Industrial	Small Irrigation	Large Irrigation	Street Lights	Security Lights	Unmetered Flats	Total System
2019	86.8	14.8	21.8	27.2	7.6	1.8	49.2	0.3	0.1	0.3	210.0
2020	87.6	14.8	21.9	27.2	7.6	1.8	49.5	0.3	0.1	0.4	211.1
2021	88.2	14.9	22.0	27.1	7.6	1.8	49.6	0.3	0.1	0.4	211.9
2022	88.8	14.9	22.0	27.0	7.6	1.8	49.6	0.3	0.1	0.4	212.5
2023	89.4	14.9	22.1	26.9	7.6	1.8	49.6	0.3	0.1	0.4	213.0
2024	90.0	14.9	22.1	26.7	7.6	1.8	49.5	0.3	0.1	0.4	213.4
2025	90.5	14.9	22.2	26.6	7.6	1.8	49.6	0.3	0.1	0.4	214.0
2026	91.1	15.0	22.2	26.4	7.6	1.8	49.6	0.3	0.1	0.4	214.4
2027	91.7	15.0	22.2	26.3	7.6	1.8	49.6	0.3	0.1	0.4	214.9
2028	92.4	15.0	22.3	26.2	7.6	1.8	49.5	0.2	0.1	0.4	215.4
AARG % ¹ 2019-2023	0.73%	0.24%	0.32%	-0.35%	0.00%	-0.24%	0.20%	-1.60%	0.00%	0.62%	0.35%
AARG % ¹ 2019-2028	0.69%	0.17%	0.25%	-0.44%	0.00%	-0.27%	0.06%	-1.66%	0.00%	0.63%	0.28%

1) AARG % = Annual Average Rate of Growth Percentage

Table 6-4 – LOW case forecast of annual retail load (aMW) by customer class

Calendar Year	Residential	Small General	Medium General	Large General	Large Industrial	Small Irrigation	Large Irrigation	Street Lights	Security Lights	Unmetered Flats	Total System
2019	79.0	13.9	20.4	25.7	7.6	1.7	43.8	0.3	0.1	0.3	192.9
2020	79.7	13.9	20.5	25.7	7.6	1.7	44.1	0.3	0.1	0.4	193.9
2021	80.3	13.9	20.5	25.6	7.6	1.7	44.2	0.3	0.1	0.4	194.6
2022	80.8	14.0	20.6	25.5	7.6	1.7	44.2	0.3	0.1	0.4	195.2
2023	81.3	14.0	20.6	25.3	7.6	1.7	44.2	0.3	0.1	0.4	195.6
2024	81.9	14.0	20.7	25.2	7.6	1.6	44.1	0.3	0.1	0.4	195.9
2025	82.3	14.0	20.7	25.1	7.6	1.7	44.2	0.3	0.1	0.4	196.4
2026	82.8	14.0	20.7	24.9	7.6	1.6	44.2	0.3	0.1	0.4	196.7
2027	83.3	14.0	20.7	24.8	7.6	1.6	44.2	0.3	0.1	0.4	197.2
2028	83.9	14.0	20.8	24.7	7.6	1.6	44.1	0.2	0.1	0.4	197.6
AARG % ¹ 2019-2023	0.71%	0.21%	0.30%	-0.37%	0.00%	-0.24%	0.23%	-1.60%	0.00%	0.62%	0.34%
AARG % ¹ 2019-2028	0.67%	0.14%	0.23%	-0.46%	0.00%	-0.27%	0.07%	-1.66%	0.00%	0.63%	0.27%

1) AARG % = Annual Average Rate of Growth Percentage

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Table 6-5 – Total System historical BASE case forecast of MONTHLY and annual retail load (aMW)

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	196.3	186.2	157.4	159.9	191.3	216.5	234.0	208.1	190.2	140.4	132.3	138.1	179.2
2002	174.7	174.8	155.8	172.8	184.3	208.9	249.3	240.7	169.9	133.5	159.2	150.0	181.2
2003	164.5	165.0	139.7	147.9	183.3	239.3	256.4	237.7	185.5	144.1	141.0	159.2	180.5
2004	202.1	175.1	147.2	165.0	177.0	211.2	260.8	231.8	178.4	138.6	146.1	147.1	181.8
2005	188.8	165.8	163.5	168.1	177.3	229.3	255.6	251.2	170.2	124.0	134.7	164.2	182.9
2006	167.3	162.9	155.4	151.7	177.2	221.6	250.4	233.4	171.8	131.1	135.0	171.0	177.6
2007	182.2	185.4	148.3	155.5	187.7	235.0	254.1	236.0	187.5	127.6	143.7	158.6	183.5
2008	176.4	188.5	147.5	182.2	191.7	228.2	262.4	234.6	177.5	149.1	127.3	174.0	186.7
2009	201.8	185.2	161.9	172.6	209.5	258.3	267.4	250.3	187.6	144.4	142.3	181.6	197.1
2010	191.9	157.1	150.6	180.6	175.6	204.6	253.5	250.5	167.1	133.4	129.5	183.6	181.8
2011	186.4	180.8	156.1	173.6	174.5	221.0	247.3	253.8	209.0	136.1	136.1	182.3	188.2
2012	190.0	188.1	145.8	165.4	205.4	207.7	245.0	258.7	197.4	141.2	146.8	155.2	187.3
2013	185.8	187.3	150.1	167.3	206.6	234.1	274.0	249.5	186.1	148.6	148.8	184.3	193.7
2014	194.0	207.4	161.0	184.7	210.4	265.2	283.5	255.1	199.3	161.9	145.4	172.1	203.3
2015	178.8	178.2	148.2	181.5	201.0	288.8	296.2	248.9	197.7	154.4	136.6	168.9	198.4
2016	191.6	175.0	145.0	193.5	205.2	257.1	258.1	249.9	190.4	143.8	135.2	168.4	192.9
2017	228.0	221.2	169.4	160.9	191.5	266.3	289.6	261.5	193.4	148.1	148.5	167.1	203.8
2018	194.5	177.9	163.2	170.5	210.0	260.7	285.1	263.1	191.1	146.0	148.8	171.1	198.7
Min. 2001-2018	164.5	157.1	139.7	147.9	174.5	204.6	234.0	208.1	167.1	124.0	127.3	138.1	177.6
Avg. 2009-2018	194.3	185.8	155.1	175.1	199.0	246.4	270.0	254.1	191.9	145.8	141.8	173.4	194.5
Max. 2001-2019	228.0	221.2	169.4	193.5	210.4	288.8	296.2	263.1	209.0	161.9	159.2	184.3	203.8
2019	207.6	183.4	164.1	177.6	206.5	261.4	285.0	259.7	192.5	154.7	144.5	178.0	201.5
2020	208.7	184.3	165.2	178.8	207.9	263.3	286.7	261.0	193.3	155.1	145.1	178.9	202.5
2021	210.0	185.3	165.9	179.3	208.3	263.8	287.3	261.7	193.9	155.5	145.7	179.8	203.3
2022	211.0	186.2	166.4	179.7	208.6	264.2	287.8	262.3	194.3	155.8	146.2	180.6	203.8
2023	212.0	187.0	166.9	180.0	208.8	264.4	288.3	262.9	194.7	156.0	146.5	181.3	204.3
2024	212.9	187.7	167.4	180.3	208.9	264.7	288.7	263.4	195.0	156.2	146.8	182.0	204.7
2025	213.9	188.5	167.8	180.6	209.1	265.0	289.1	263.9	195.4	156.4	147.2	182.7	205.2
2026	214.8	189.2	168.3	180.9	209.2	265.2	289.4	264.4	195.7	156.5	147.5	183.4	205.6
2027	215.8	190.0	168.7	181.2	209.4	265.5	289.9	264.9	196.0	156.7	147.8	184.1	206.1
2028	216.8	190.8	169.3	181.5	209.7	265.8	290.3	265.5	196.4	157.0	148.2	184.8	206.5

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Table 6-6 – 2019 BASE case forecast of MONTHLY and annual retail load (aMW) by customer class

Customer Class	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Small Irrigation	0.0	0.0	0.6	1.5	2.9	3.6	4.3	3.9	2.7	1.3	0.1	0.0	1.7
Large Irrigation	0.3	0.4	12.9	43.5	82.5	122.5	129.0	89.3	44.3	26.1	3.7	0.3	46.5
Residential	133.8	113.8	86.7	68.4	56.6	65.2	77.8	87.3	71.1	55.7	72.3	107.5	82.9
Small General	16.9	15.4	13.1	12.3	12.6	14.2	15.5	16.9	15.2	12.6	12.4	14.8	14.3
Medium General	22.5	21.1	18.7	19.1	19.4	21.1	22.1	23.8	22.3	21.1	20.7	21.2	21.1
Large General	25.5	24.6	23.6	24.3	25.2	26.4	27.8	29.6	29.0	29.0	27.0	25.6	26.5
Large Industrial	7.8	7.3	7.9	7.8	6.7	7.8	7.7	8.2	7.2	8.1	7.6	7.7	7.6
Street Lights	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Security Lights	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unmetered Flats	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
System Total	207.6	183.4	164.1	177.6	206.5	261.4	285.0	259.7	192.5	154.7	144.5	178.0	201.5

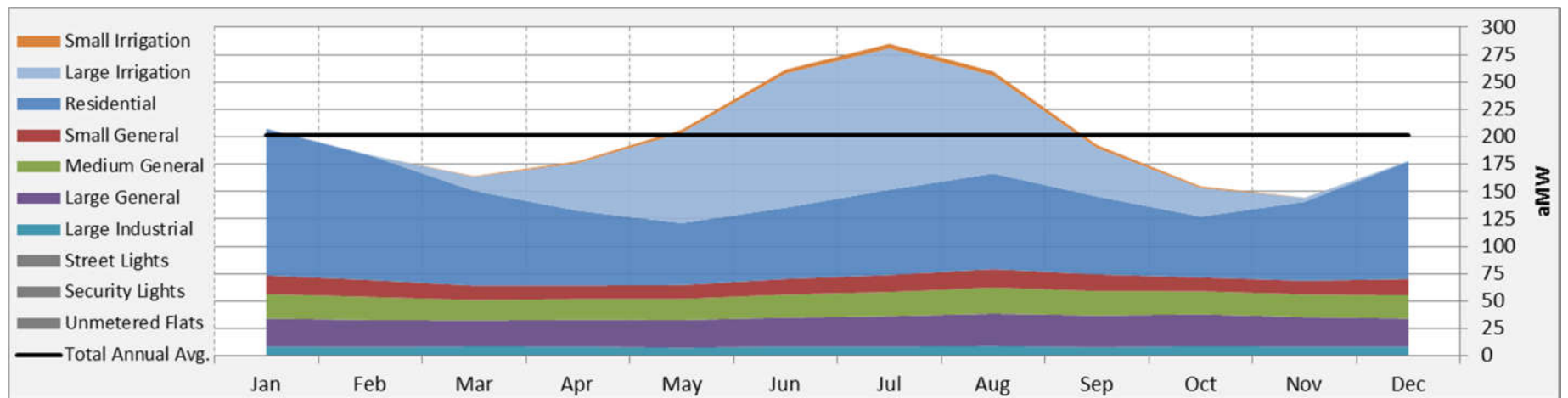


Figure 6-1 – 2019 BASE case forecast of MONTHLY and annual retail load (aMW) by customer class

Appendix A

Table 6-7 – Historical and forecast of annual average number of customers by customer class

Calendar Year	Residential	Small General	Medium General	Large General	Large Industrial	Small Irrigation	Large Irrigation	Street Lights	Security Lights	Unmetered Flats	Total System	Annual % Change
2001	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	36,963	4,144	637	122	3	622	96	9	1,440	353	44,389	#N/A
2006	37,418	4,169	636	126	3	614	99	9	1,429	353	44,855	1.05%
2007	37,969	4,295	654	128	3	607	110	9	1,440	354	45,570	1.59%
2008	38,855	4,385	676	131	3	615	121	9	1,451	354	46,601	2.26%
2009	39,220	4,460	695	134	3	615	131	9	1,453	354	47,074	1.01%
2010	39,687	4,503	718	135	3	602	134	9	1,468	358	47,616	1.15%
2011	40,201	4,553	732	136	3	582	140	9	1,482	359	48,197	1.22%
2012	40,645	4,610	747	142	3	563	158	9	1,480	353	48,710	1.07%
2013	41,321	4,682	746	144	3	564	208	9	1,488	355	49,519	1.66%
2014	41,758	4,741	754	148	3	563	225	9	1,493	359	50,052	1.08%
2015	42,375	4,828	758	151	3	560	234	9	1,482	362	50,761	1.42%
2016	43,157	4,915	768	157	5	558	233	9	1,476	365	51,642	1.74%
2017	43,870	4,977	782	160	5	557	430	9	1,943	378	53,109	2.84%
2018	44,550	4,972	803	162	5	546	437	9	1,888	372	53,744	1.19%
2019	45,303	5,029	822	165	5	540	437	9	1,892	374	54,575	1.55%
2020	45,941	5,100	835	168	5	533	437	9	1,892	375	55,295	1.32%
2021	46,562	5,172	849	171	5	527	437	9	1,892	376	56,000	1.27%
2022	47,171	5,243	862	175	5	521	437	9	1,892	377	56,692	1.24%
2023	47,771	5,313	875	178	5	514	437	9	1,892	378	57,373	1.20%
2024	48,372	5,383	889	181	5	508	437	9	1,892	379	58,055	1.19%
2025	48,977	5,453	902	185	5	501	437	9	1,892	380	58,742	1.18%
2026	49,584	5,524	916	188	5	495	437	9	1,892	382	59,430	1.17%
2027	50,189	5,594	929	191	5	488	437	9	1,892	383	60,117	1.16%
2028	50,794	5,665	942	194	5	482	437	9	1,892	384	60,803	1.14%
AARG %¹ 2019-2023	1.34%	1.38%	1.60%	1.94%	0.00%	-1.18%	0.00%	0.00%	0.00%	0.28%	1.26%	
AARG %¹ 2019-2028	1.28%	1.33%	1.54%	1.85%	0.00%	-1.26%	0.00%	0.00%	0.00%	0.29%	1.21%	

1) AARG % = Annual Average Rate of Growth Percentage

Appendix A

Table 6-8 – Historical and BASE case forecast of annual usage per customer (kWh) by customer class

Calendar Year	Residential	Small General	Medium General	Large General	Large Industrial	Small Irrigation	Large Irrigation	Street Lights	Security Lights	Unmetered Flats	Total System	Annual % Change
2001	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2002	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2003	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2004	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2005	16,845	27,681	257,456	1,989,519	17,761,932	25,270	3,978,407	451,882	741	7,064	36,102	#N/A
2006	16,896	27,033	252,197	1,881,465	12,485,305	23,301	3,588,264	453,740	717	8,035	34,683	-3.93%
2007	16,971	26,785	252,449	1,742,392	16,348,383	26,096	3,526,102	461,266	714	8,035	35,270	1.69%
2008	17,151	26,364	250,938	1,715,052	15,920,098	26,068	3,223,518	468,669	714	8,044	35,189	-0.23%
2009	18,402	27,260	252,179	1,747,302	12,969,692	27,460	3,132,715	474,203	720	8,114	36,673	4.22%
2010	16,499	25,201	238,032	1,618,900	18,454,887	23,997	2,664,906	482,159	728	8,096	33,451	-8.79%
2011	17,113	25,989	239,841	1,539,795	21,803,603	25,104	2,624,234	614,671	733	8,101	34,201	2.24%
2012	16,436	25,902	235,713	1,532,625	23,525,055	26,948	2,345,402	459,597	732	8,286	33,777	-1.24%
2013	16,890	26,256	237,601	1,520,385	23,267,593	26,978	1,859,559	305,647	845	8,356	34,265	1.44%
2014	16,687	26,213	241,411	1,531,617	23,956,495	30,589	2,025,654	302,278	869	8,310	35,589	3.87%
2015	15,705	25,165	240,990	1,496,196	22,313,962	29,330	1,932,736	300,405	921	8,352	34,239	-3.79%
2016	15,333	24,796	235,059	1,421,334	12,922,450	27,977	1,801,453	287,682	856	8,448	32,804	-4.19%
2017	17,316	25,933	238,050	1,443,218	13,416,822	24,708	911,216	281,642	573	8,054	33,612	2.46%
2018	15,648	25,113	227,956	1,472,877	13,199,344	28,060	937,326	281,920	544	7,988	32,392	-3.63%
2019	16,033	24,936	224,817	1,408,143	13,396,717	28,414	932,644	279,997	543	8,164	32,339	-0.16%
2020	15,992	24,737	222,673	1,380,215	13,431,877	28,687	940,607	276,511	545	8,215	32,173	-0.51%
2021	15,843	24,396	219,320	1,346,380	13,396,717	28,954	940,584	271,262	543	8,220	31,797	-1.17%
2022	15,749	24,111	216,499	1,315,032	13,396,717	29,229	940,584	266,793	543	8,247	31,496	-0.95%
2023	15,650	23,819	213,620	1,285,174	13,396,717	29,517	940,584	262,511	543	8,275	31,191	-0.97%
2024	15,610	23,601	211,340	1,258,222	13,431,877	29,818	940,607	258,920	545	8,326	30,969	-0.71%
2025	15,455	23,248	208,023	1,226,438	13,396,717	30,135	940,584	253,849	543	8,332	30,596	-1.20%
2026	15,360	22,968	205,280	1,198,615	13,396,717	30,460	940,584	249,477	543	8,359	30,305	-0.95%
2027	15,270	22,700	202,685	1,171,543	13,396,717	30,800	940,584	245,090	543	8,388	30,025	-0.92%
2028	15,243	22,516	200,826	1,149,314	13,431,877	31,149	940,607	241,409	545	8,441	29,834	-0.64%
AARG %¹ 2019-2023	-0.60%	-1.14%	-1.27%	-2.26%	0.00%	0.96%	0.21%	-1.60%	0.00%	0.34%	-0.90%	
AARG %¹ 2019-2028	-0.56%	-1.13%	-1.25%	-2.23%	0.03%	1.03%	0.09%	-1.63%	0.03%	0.37%	-0.89%	

1) AARG % = Annual Average Rate of Growth Percentage