EXH. CD-3
DOCKETS UE-22___/UG-22___
2022 PSE GENERAL RATE CASE
WITNESS: DR. CHHANDITA DAS

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-22____** **Docket UG-22____**

SECOND EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF

DR. CHHANDITA DAS

ON BEHALF OF PUGET SOUND ENERGY

JANUARY 31, 2022

Puget Sound Energy
Load Research Report

Class Load Profiling for
July 2020 – June 2021

Prepared by

Puget Sound Energy
Rates and Regulatory Affairs Department

Puget Sound Energy

Load Research

Class Hourly Load Profiles

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1 INTRODUCTION

1.1 Background

The class hourly load profiles developed in this study are to support Puget Sound Energy's (PSE or the Company) electric cost-of-service (COS) study and rate design, integrated resource planning, and energy efficiency program impact evaluation. The class hourly loads were estimated on the basis of the 15-minute interval load data collected during the test-year period from July, 2020 to June, 2021. PSE collects 15-minute interval load data for the residential, commercial and industrial customers sampled for its on-going class load research program. Interval load data for all of the sampled customers are collected by the Company's automated meter reading (AMR) or advanced metering infrastructure (AMI) network. Interval load data for the whole populations of Rate Classes 5 and 35 are also collected by PSE's AMR or AMI network. In addition, interval load data for the populations of large commercial and industrial (C&I) rate classes, such as Classes 46, 49, 449PV, 449HV, 459 and Special Contract are compiled by the MV-90 metering system. The Special Contract device locations are provided with retail wheeling and distribution service by PSE. All of the interval load data are managed by PSE's Metering database management system and analyzed in Statistical Analysis System (SAS). The current class load research samples were established through the sample design and deployment study performed in November 2017.[1]

In its 2019 General Rate Case (GRC) filing, PSE proposed to eliminate Rate Schedule 40 (Campus Rate). Following this decision, schedule 40 customers started migrating to Rate Schedules 24, 25, 26 and 31 and Special Contract based on their electric usage patterns. By October 2020 this migration was complete.

In 2022 GRC, PSE also estimated separate load profiles for net meter customers. The net meter load profiles were estimated based on the 15-minute interval load data collected from a sampled net meter customers for the study year. The sampling design study to collect interval load data for net meter customers was conducted in 2017 and the sample was deployed in early 2018 for data collection.[2] The rate classes studied in this rate case are listed in Table 1.

[1] The historical data analyzed and the statistical analyses and validation performed for 2017 sample design and selection are discussed in 2017 Class Load Research Sample Design and Deployment report, which is submitted as Exhibit CD -5.

[2] The historical data analyzed and the statistical analyses and validation performed for 2017 net meter sample design and selection are discussed in 2017 Net Metering Load Research Sample Design and Deployment, which is submitted as Exhibit CD-6.

Table 1 – Rate Classes[3] Analyzed

PSE System Load	
Rate Schedule	**Description**
7	Residential
5	Sales for Resale
8 & 24	Small General Services <50 kW
11 & 25	Medium General Services 50-350 kW
12 & 26	Large General Service >350 kW
29	Seasonal Irrigation
10 & 31	Primary Voltage General Service
35	Primary Voltage Seasonal Irrigation
43	Primary Voltage Interruptible Service For Total Electric School
46	High Voltage Interruptible Service
49	High Voltage General Service
50 - 59	Street & Area Lighting
PSE Non System Load	
Rate Schedule	**Description**
449HV	Retail Wheeling - High Voltage
449PV	Retail Wheeling - Primary Voltage
459	Back-up Generation
Special Contract	Retail Wheeling & Distribution Service

1.2 Goals

This study is intended to yield the following load research products:

- Validated and edited 15-minute interval load dataset suitable for use in the class load estimation;
- A dataset containing class hourly load estimates for the following scenarios:
  - Class hourly loads without losses and not reconciled to hourly system load;
  - Class hourly loads with losses and not reconciled to hourly system load; and
  - Class hourly load with losses and reconciled to hourly system load
- Summary statistics describing system load consisting of system peak date, time, peak demand and load factor by month.
- General class statistics
- Post-stratification statistics
- A series of summary tables depicting the class contributions for specific cost-of-service studies including:
  - Monthly coincident peaks and non-coincident peaks by rate schedule;
  - Average customer load

[3] Non-System loads are PSE's transportation or "Retail Wheeling" class loads.

- Top 12, 75 and 200 system peak hours average coincident peak demands and mid-winter month (Nov. – Feb.) system peak hour average coincident peak demand (4CP) by schedule;
- Top 12, 75 and 200 class peak hours average non-coincident demands by schedule;

2 METHODOLOGY

The data and methodology for estimating the class load profiles are explained here. This section also explains the summary of system load and annual class sales.

2.1 Data

The basis of load research study is 15-minute interval meter data. Except for the cases of some primary- or high-voltage large C&I rate classes where 15-minute load data were available for all of the customers in the class, most of the 15-minute interval load data were compiled from the samples selected for each rate class. The population characteristics of rate class loads were estimated using the load study samples, because it is not practical to collect load profile data for every customer within the class. The load study sample results were translated to class loads through a load research expansion analysis.

Some large C&I rate classes, such as 46 and 49, have load profile data for all customers. Customers in these classes tend to have large loads and their load profile data are also used for billing purposes. No expansion analysis was necessary for these customers since they form the total class population. Total class hourly loads for the lighting schedules were estimated on the basis of lighting fixture inventories and assumed number of daylight hours.

15-minute interval load data were compiled from the customers sampled for the following rate schedules:

- Residential (7);
- Small general service (8 & 24);
- Medium general service (11 & 25);
- Large general service (12 & 26);
- Seasonal irrigation and drainage pumping service (29);
- Primary voltage service (10 & 31); and
- Interruptible primary voltage service for total electric schools (43).

Net meter load profiles used 15-minute interval load data compiled from the customers for the following rate schedules:[4]

- Residential net meters (07) ;
- Small general service net meters - Commercial (08 & 24);

The interval data used to estimate the load profiles for the net meter customers were collected from a sampling study which was conducted in 2017 and deployed in early 2018. The details of the sample design for the net meter customers can be found in Exh. CD- 6 submitted with this report.

[4] Note, net meter residential and net meter small general services are not separate tariff defined rate schedules. They are treated here as separate rate schedules only for analytical purposes.

The net meter sample design study was conducted by analyzing the population statistics of electric billing data of the net meter customers for their annual delivered and received kWh. During the sampling study period, at the end of April, 2017, the number of net meter customer accounts considered eligible to be included in the sample was 4,681. Since then, the net metering population has changed significantly. By the end of June 2021, there were over 11,000 net meter customer accounts registered to be served by PSE. Because of the changes in the size and composition of the net meter population, net meter profiles were estimated only for the two rate classes which had sufficient net meter population and sample coverage. Exh. CD-4 gives an overview of PSE's net metering program and discusses in more detail the net meter load research methodology and results.

Hourly load data for the ***total*** rate class were available for the following Rate Schedules:

- Small resale (05);
- Seasonal primary voltage irrigation (35);
- High voltage interruptible service (46);
- High voltage general service (49);
- Retail wheeling – high voltage (449 HV);
- Retail wheeling – primary voltage (449 PV);
- Backup generation (459); and
- Special contract (SC).

The total class load profiles are referred to in this report as "deemed" profiles since they have been calculated for the entire class and were not included in the load research expansion analysis. Deemed profiles include rate schedules 05, 46, 49, non-system loads (449HV, 449PV, 459 and SC)[5] and lighting loads.

Rate schedule 35 was treated somewhat differently in this proceeding. In the past, there was only one customer in rate schedule 35, but recently another customer was included in this rate schedule. The new customer accounts for less than 5% of schedule 35 total load. A full year's interval load data was not available for this new customer. However, the full year's interval data were available for the original customer which accounts for more than 95% of the schedule 35 total load. In order to deal with this data gap for schedule 35 customers and also to validate schedule 35 interval load data, daily energy use data were used. Since majority (over 95%) of the data were available for schedule 35, it is treated similar to a deemed profile.

All interval load data used in this study were for the test-year period, starting from July 2020 to end of June 2021. 15-minute interval load data were aggregated to hourly loads and were used for all of the analyses performed. The class load estimates presented in this report include losses. Therefore, the sum of class load estimates amounts to the Company's official system hourly load at the generation, purchased and intertie (GPI) level.

Additional data such as total monthly and annual delivered energy sales by rate schedule, customer counts, annual billed kWh by customer, the control area loads and scheduled losses, were used to validate the customer-level load profiles constructed from the interval load data, and to estimate monthly loss factors by service voltage and rate schedule.

[5] Since the PSE system load data does not include loads for its transportation customers, those loads are called "non-system" loads in this report.

2.2 Analysis Approach

For the 2022 GRC study, PSE estimated the hourly class load profiles using a software tool named "Load Research Software (LRS)" developed by DNV. This software uses industry standard methodology to estimated class loads and are being used by many major utilities for load research studies. The LRS has several advantages compared to the process PSE used in the past. For example, LRS is highly customizable so that it can accommodate different type of data structure which is often encountered across companies. Accordingly, PSE has customized the tool to be able to estimate separate load profiles for net meter and non-net meter customers. In addition, PSE also made distinction between Commercial and Industrial customer class for the appropriate rate schedules. Since Commercial customer's electric usages are different from the Industrial customers usages', this distinction in the analysis phase allows better stratification and hence improves the overall class load estimation. The LRS framework allows estimation of load profiles at such different levels of aggregations with minimal effort.

Although, LRS generally follows the same analytical steps which were used in the past GRC to estimate class load profiles, LRS brings flexibility and efficiency in the process. A major component in load research is the validation, editing and estimation of the interval load data, which is commonly referred to as "Validation-Editing-Estimation" or "VEE" in the load research literature. The VEE is a very complex and time consuming step in the load research analysis. LRS significantly improve the VEE step by automating tasks and incorporating sophisticated data validation mechanisms. More details on LRS VEE step are described in section 2.3 and in Exh. CD-7 submitted with this report.

In general, the following steps were taken to develop the class hourly load profiles and the information needed for electric cost of service studies. These steps are consistent with the analysis steps adopted in the past GRC study.

1. The first step in this process is to extract and compile the 15-minute interval load data, and aggregate them to hourly loads profiles.
2. Summarize current billing data to develop a distribution of the total annual energy use for the rate class population of interest;
3. Conduct VEE on the hourly data to assess and clean and prepare it for analyses.
4. Model-based Sampling Stratification techniques outlined in Exh. CD-7 were used to construct a post-stratification framework for analyzing the interval load data. MBSS methodology has been applied in load research for more than thirty years. MBSS is grounded in theory of model-assisted survey sampling developed by C.E. Sarndal and others[6,7] MBSS and conventional methodologies are currently taught in the AEIC Advanced Methods in Load Research seminar. It has been used in countless load research and program evaluation studies. It has also been examined in public utility hearings and in at least two EPRI studies. Details on this methodology can be found on LRS manual (see Exh. CD-7) and AEIC load research manuals.[8]
5. Hourly expansions were generated for each rate class using stratified ratio estimation and tied to official booked records without losses. The step was executed for Commercial (C), Industrial (I), net meter, and non-net meter customers separately.

[6] Model Assisted Survey Sampling, by Carl Erik Sarndal, Bengt Swensson and Jan Wretman, Springer-Verlag, 1992.
[7] Wright, R. L. (1983), "Finite population sampling with multivariate auxiliary information," Journal of the American Statistical Association, **78**, 879-884.
[8] AEIC load research publication is available via https://aeic.org/committees/load-research/publications/

6. The population expansions were then used to estimate average loss factors for each delivery voltage and rate class;
7. The loss factors were then applied to the class hourly load estimates to produce the class hourly load estimates with losses;
8. The hourly load estimate with loss for each rate class were summed for all of the system rate classes and compared with the actual system hourly load. This results in a residual load known as unaccounted for energy[9] (or UFE); and
9. Finally, the UFE was applied to each rate class based on the proportion of the rate class contribution to the individual hourly load yielding the reconciled class load. Since the hourly load profiles for "deemed profiles" (Rate Schedules 5, 35, 46, 49, special contract and lighting classes) provides actual interval load data, UFE allocation was done among only the system rate classes for which the population expansions were required.
10. The UFE adjusted load profiles for the C & I, and Net meter and non-net meter hourly profiles are then aggregated to get hourly class load profiles.
11. Finally, the hourly class load profiles were used to calculate a range of summary statistics and charts to support Cost of Service study.

2.3 Validation, Editing and Estimation

The meter data used for analysis are collected primarily using three technologies: AMR, AMI and MV-90. While the interval load data collected through the wired MV-90 system were comparatively of better quality, the data collected through the wireless AMR and AMI system often have many data issues, such as missing observations and erroneous readings. Therefore, the first task in load research is to systematically and thoroughly examine interval load data and identify and correct anomalous points and missing data. In this analysis, the VEE was performed in two steps. The first VEE step is a default data verification process embedded within the Meter Data Management System (MDMS), and the next VEE step is performed within LRS.

2.3.1 Step 1 – Default VEE

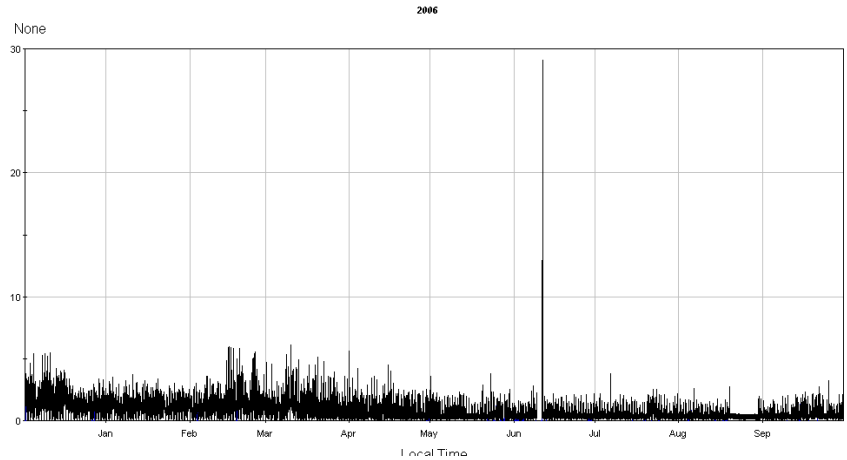
All data stored and managed within MDMS goes through an automated data validation process. This data validation is done by a proprietary software called "iWave" subscribed by PSE. [10] The primary role of "iWave" is to receive and audit daily meter readings. The "iWave" is designed to visualize and identify anomalous data points based on the levels of error tolerance set for various possible causes of data inconsistencies to be examined and a constraint set by the corresponding customer's daily total energy use. This process screens out anomalous data points, such as power outages, meter reading failures, spikes, or changes in multipliers and performs daily energy use calculations and estimations, if necessary, using customer billings.

Figure 1 shows an example scenario of VEE for an individual site. The figure shows load shape for an individual site. For a brief number of intervals, this site exhibited a spike in demand 10 times

[9] Unaccounted for energy (UFE) refers to the difference between the total of system rate class estimates and the actual system load data, which is resulted from sampling and estimation errors. In this report, UFE does not refer to the energy unaccounted due to theft or "lost" meters.
[10] "Wave" and iWave" are proprietary Meter Data Management System (MDMS) software developed by Ecologic Analytics, which was integrated into Landis and Gyr's Gridstream Solutions in January 2012.

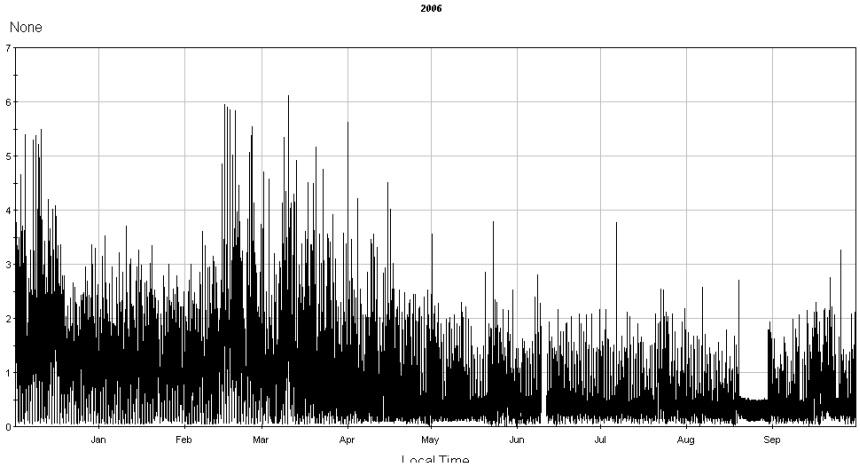
larger than the typical demand. This spike was not supported by the billing data. Accordingly, it was deemed anomalous, and eliminated from the individual customer profile.

Figure 1 – Example of an Anomalous Spike



Next, "iWave" attempts to correct the anomalies and estimate the missing interval loads. It uses a straight- or flat-line interpolation technique with the neighboring observations if only a few observations are missing or uses reference load shapes differentiated by type of day if several or more observations are missing. The same-day or like-day reference load shapes are developed from the accurate interval load readings recorded for the non-missing days prior to the missing interval. If the situations of missing or erroneous intervals are so messy or prolonged that "iWave" cannot produce a reasonable estimate to meet the pre-set criteria, then it stops the estimation effort and identifies those intervals as "Exception." [11] **Error! Not a valid bookmark self-reference.** shows the same site with the anomalous data omitted. Every data that's downloaded from MDMS are verified and improved by "iWave".

Figure 2 – Load Shape with the Spike Corrected



[11] If a missing interval is a result of power outage or lasts more than 48 hours, "iWave" did not attempt to estimate the missing loads.

2.3.2 Step 2- LRS VEE

After the interval data, verified by "iWave", are downloaded and compiled, LRS performs a very thorough VEE process to further validate the interval data. The LRS uses several pre-defined modules that look for outliers (spikes and valleys), determines and handles outages, creates weather-regression models to fill in missing data, and performs bill-to-meter comparisons in order to validate the load data for analysis. The LRS VEE modules particularly follow the steps outlined below. Further details of these steps are presented in the description of the LRS software submitted as Exh. CD-7.

1. *Percentage missing*: This factor controls what percentage of non-missing values that goes into the analysis for an individual sample customer. The threshold was set at 75% in this analysis. This percentage threshold impacts the regression models which are used at later stages to fill missing data. To be able to create robust models, it's necessary to have enough non-missing load data. If a sample customer's interval data were not at least 75% non-missing, it was excluded from the analysis. Seasonal Irrigation (Schedule 29) tends to have more missing intervals coming out of the metering system, so the thresholds were lowered to 0% for this rate.

2. *Validated sample meters*: This module identifies meters which can be considered complete in terms of data validity and does not need any further VEE and hence can be excluded from the detail VEE process. The criteria to be considered a validated sample was customers with no missing data, no identified outliers, and within a defined threshold of the bill at either the aggregate level (5%) or on a bill-by-bill basis (20%).

3. *Identify erroneous data*: Any site not validated in the step above will go through a "bad data" detection step. The LRS system uses various methods to identify spikes/valleys in the load data. It will also use outage detection to list out any zero found in the load data. The billing data was also used in this step to identify if the zeros are acceptable as valid data points. Note that the Seasonal Irrigation class (schedule 29) is again excluded from this outage identification step due to the large number of zeroes that are often found in the load data for these customers.

Manual review: At this point, the software will list the meters which could not be validated after applying the logics explained above. These meters are then inspected visually using the same process as explained above for Figure 1 and Next, "iWave" attempts to correct the anomalies and estimate the missing interval loads. It uses a straight- or flat-line interpolation technique with the neighboring observations if only a few observations are missing or uses reference load shapes differentiated by type of day if several or more observations are missing. The same-day or like-day reference load shapes are developed from the accurate interval load readings recorded for the non-missing days prior to the missing interval. If the situations of missing or erroneous intervals are so messy or prolonged that "iWave" cannot produce a reasonable estimate to meet the pre-set criteria, then it stops the estimation effort and identifies those intervals as "Exception." **Error! Not a valid bookmark self-reference.** shows the same site with the anomalous data omitted. Every data that's downloaded from MDMS are verified and improved by "iWave".

4. Figure 2 under Section 2.3.1.

5. *Gap filling*: Once the bad data are identified and replaced with missing values, these gaps are filled by using temperature regression models for time-of-day and day-of-week built on each individual customer based on their non-missing load data. For shorter gaps (less

than 2 hours in length), the load data are interpolated, except on the peak hours (hours 6 to 9 and 14 to 22).

6. *Bill to meter comparison*: The final step as part of the software's VEE processes is to ensure that the load data after removing bad data and gap filling will match the billing data to some degree. Any sites with larger samples that still do not match the billing data after VEE are removed from the analysis when the sample size is deemed large enough. Some rates will have their load data scaled to match the billing data to ensure enough load data are included in the final analysis. Meter multiplier issues will also be identified as part of this step where the entire load data is scaled on a single multiplier to match the billing data. Other meters, which require more scrutiny, will result in visual checks along with the bill-to-meter comparison to determine how best to handle that load data. This is specifically done with the smaller samples and the Seasonal Irrigation rate class (schedule 29) which tend to have unique shapes.

7. *Final visual review*: When the class shapes have been created, additional review of the data is done in the instance that the final class shapes are not valid. If more anomalies are detected at this stage, additional review is performed on the sample customers that make up the class shape to determine the source of the anomalies. When detected, they are either removed or set to missing and re-estimated. In that case some of the previous steps are re-run to fill gaps and compared with billing data.

Table 2 Show the number of validated sample device locations with interval load after VEE. For the twelve months ending June 30, 2021, the number of sampled units utilized for analyses was 1,475. Net meter customers has bi-directional energy flows; one direction is from grid to meter (delivered energy) and another direction is from meter to grid (received energy). For these customers, only those devices that have complete data for both directions were included in the analysis. In addition, schedule 40 post migration loads were also included in this analysis. For the deemed profiles, population data were used.

Table 2 – Number of Sample Device Locations Utilized for Class Load Profiling

Rate Schedule	Customer Type	# of Sampeled Devices
7	Non Net Meter	191
7	Net Meter	186
8 & 24	Non Net Meter	390
8 & 24	Net Meter	67
11 & 25	Non Net Meter	166
12 & 26	Non Net Meter	96
29	Non Net Meter	221
10 & 31	Non Net Meter	115
43	Non Net Meter	43
Total Sample		1,475

2.4 Annual Sales by Rate Class

Table 3 shows the number of accounts, total annual sales in kWh, and the average annual kWh sales per account in each rate class for the study period of July, 2020 to June, 2021.

Table 3 – Population Counts[12] and Consumption[13] Data

Rate Schedule	Description	No. of Account	Total Annual kWh	Avg. kWh Use pe	% of Total kWh Sales
7	Residential	1,046,434	11,333,893,562	10,831	54.59%
5	Sales for Resale	8	7,298,620	912,328	0.04%
8 & 24	Small General Services <50 kW	124,107	2,662,847,989	21,456	12.82%
11 & 25	Medium General Services 50-350 kW	7,915	2,862,860,605	361,697	13.79%
12 & 26	Large General Service >350 kW	832	1,770,292,475	2,127,116	8.53%
29	Seasonal Irrigation	611	15,293,728	25,017	0.07%
10 & 31	Primary Voltage General Service	489	1,309,927,369	2,679,245	6.31%
35	Primary Voltage Seasonal Irrigation	2	4,387,644	2,193,822	0.02%
43	Primary Voltage Interruptible Service For	146	112,161,995	768,233	0.54%
46	High Voltage Interruptible Service	6	100,810,051	16,801,675	0.49%
49	High Voltage General Service	18	513,293,737	28,782,826	2.47%
50 - 59	Street & Area Lighting	8,683	69,892,883	8,049	0.34%
System Total		1,189,251	20,762,960,658	17,459	100.00%
Non System Loads					
449HV	Retail Wheeling - High Voltage	12	1,629,551,277	135,795,940	73.29%
449PV	Retail Wheeling - Primary Voltage	1	20,203,165	20,203,165	0.91%
459	Back-up Generation	3	295,459,725	98,486,575	13.29%
Special Contract	Retail Wheeling & Distribution Service	83	278,070,311	3,350,245	12.51%
Non System Totals		99	2,223,284,478	22,457,419	100.00%

The Residential class (Schedule 7) contains 1,046,434 accounts (87.9% of all accounts) with a total annual energy use of 11,334 GWh (54.6% of the total system energy use). The average annual use per residential customer is 10,831 kWh.

The Commercial and Industrial class contains the following rate schedules:

1. Schedules 8 & 24: Secondary Voltage General Service with demands of 50 kW or less,
2. Schedules 11 & 25: Secondary Voltage General Service "Small" demands between 50 kW and 350 kW,
3. Schedules 12& 26: Secondary Voltage General Service "Large" demands greater than 350 kW,
4. Schedule 29: Secondary Voltage Seasonal Irrigation & Drainage Pumping Service,
5. Schedules 10 & 31: Primary Voltage General Service,
6. Schedule 35: Primary Voltage Seasonal Irrigation & Drainage Pumping Service,
7. Schedule 43: Primary Voltage Interruptible Service for Total Electric Schools,

12 Number of Accounts is average of monthly account counts for the test period ranging from July, 2020 to June, 2021.

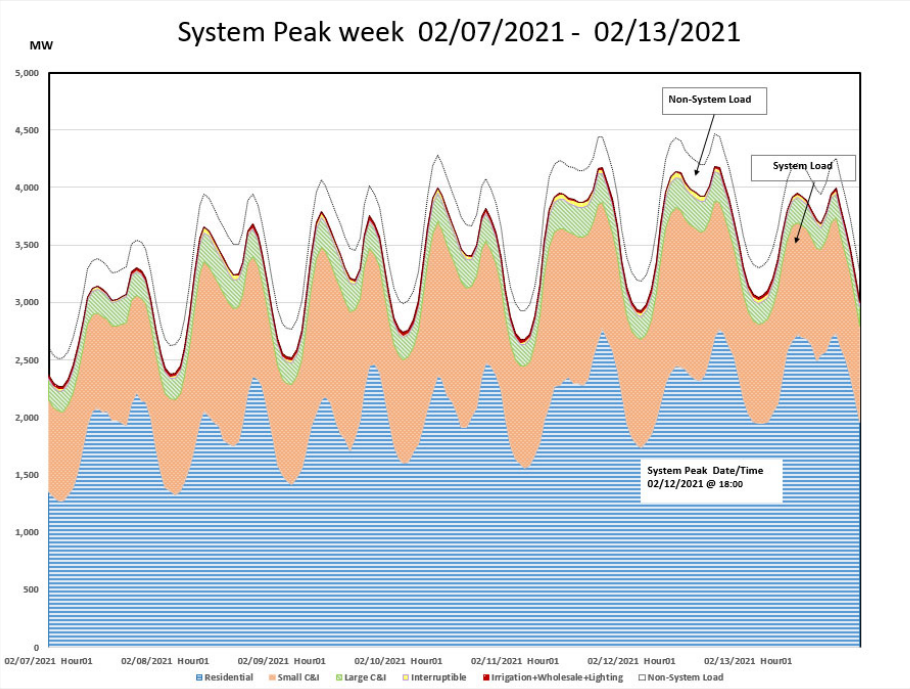
13 Total Annual Energy Use is the annual delivered energy sales (billed & unbilled) for the test period from July, 2020 to June, 2021.

8. Schedule 46: High Voltage Interruptible Service, and
9. Schedule 49: High Voltage General Service.

In addition to the Commercial and Industrial customer classes, there is a sale for resale customer class (Schedule 05 – Small Resale). Also, separate class profiles were developed for Area Lighting and Street Lighting. Finally, hourly load profiles were developed for four non-system tariff classes, i.e., 449HV - Retail Wheeling High Voltage, 449PV - Retail Wheeling Primary Voltage, 459 - Back-up Generation, and Special Contract – Retail Wheeling and Distribution Service.

Figure 3 shows how the total PSE system loads are comprised of the class loads during the annual system peak demand week. As shown in the graph, the Residential class contributes to the largest share of the system peak demand and the Small C&I class is the second largest contributor to the system peak. Figure 3 also superimposes non-system loads on top of the system loads to illustrate the total loads transmitted by PSE during its system peak week.

Figure 3 – Composition of System Load during Annual System Peak Week



3. SYSTEM CLASS LOAD PROFILES

This section presents the total system load and final shapes for each system rate classes. The final shapes for the system rate classes reflects hourly loads after loss and reconciled to the system load which are developed by using the VEE'd data from Section 2.3. The non-system load profiles are obtained after applying the loss factor to the VEE'd data but they do not go through population expansion and system reconciliation steps. The average loss factors applied to different rate classes are shown in Table 4.

Table 4 – Estimated Loss Factor by Rate Class

Rate Schedule	Loss Factor
SCH_7	8.20%
SCH_24	8.13%
SCH_25	8.09%
SCH_26	8.11%
SCH_29	8.06%
SCH_31	3.79%
SCH_35	3.71%
SCH_43	3.75%
SCH_46	1.74%
SCH_49	1.73%
SCH_5	3.84%
SCH_50	8.60%
SCH_55	8.60%
SCH_SC	2.76%
SCH_449HV	1.68%
SCH_449PV	3.15%
SCH_459HV	1.71%

3.1 Total System Load

This section describes the system load for the study year.

Figure 4 presents a two-dimensional time series plot of the PSE system load during the 12-month period ending June 30, 2021.

Figure 4 also shows a vertical EnergyPrint, and illustrates energy use intensity by hour, day and month. In the vertical EnergyPrint, the days are measured on the y-axis and hours of the day on the x-axis. The load is displayed using the color scale shown on the top of the plot. In this case, the EnergyPrint shows that the PSE system load is winter peaking with the highest demands in the early morning (i.e., 6AM to 9AM) and early evening (i.e., 5 PM to 8 PM) periods during the months of November through March. The PSE system load peaked at 4,182 MW on Friday, February 12, 2021 at 6 PM.

Figure 4 – PSE System Load

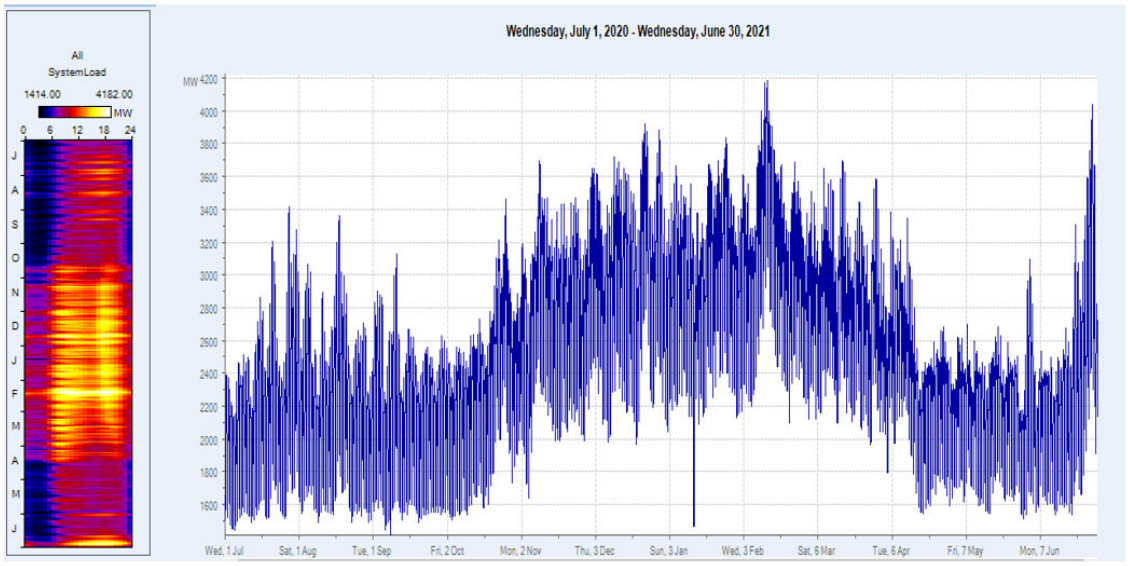


Table 5 summarizes the monthly statistics from the system loads for the twelve months ending June 30, 2021.

Figure 5 presents monthly system energy requirement, peak demand and load factor in graphics. The total monthly peak demand varied from a low of 2,697 MW in May, 2021 to the high of 4,182 MW in February 2021. The monthly load factor of the system varied from 58.2% to 80.2%.

Table 5 – Monthly System Total and Peak Demands

Month	Monthly Energy Use (MWh)	Date of System Peak	Time of System Peak	System Peak Demand (MW)	Load Factor (%)
Jul-20	1,622,691	Monday, July 27, 2020	18:00	3,414	63.9%
Aug-20	1,637,225	Monday, August 17, 2020	18:00	3,361	65.5%
Sep-20	1,543,508	Thursday, September 10, 2020	18:00	3,124	68.6%
Oct-20	1,718,652	Monday, October 26, 2020	9:00	3,463	66.7%
Nov-20	1,981,137	Monday, November 9, 2020	9:00	3,691	74.5%
Dec-20	2,232,334	Wednesday, December 23, 2020	18:00	3,924	76.5%
Jan-21	2,184,617	Tuesday, January 26, 2021	18:00	3,833	76.6%
Feb-21	2,086,098	Friday, February 12, 2021	18:00	4,182	74.2%
Mar-21	2,077,502	Tuesday, March 16, 2021	9:00	3,697	75.5%
Apr-21	1,698,953	Monday, April 5, 2021	9:00	3,383	69.8%
May-21	1,610,126	Friday, May 7, 2021	10:00	2,697	80.2%
Jun-21	1,691,088	Monday, June 28, 2021	17:00	4,036	58.2%
Annual	22,083,931	Friday, February 12, 2021		4,182	60.3%

Figure 5 – Monthly System Energy, Demand and Load Factor

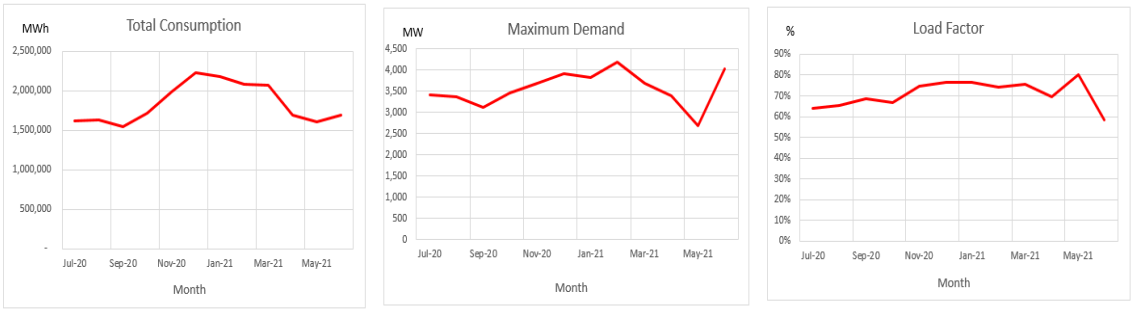
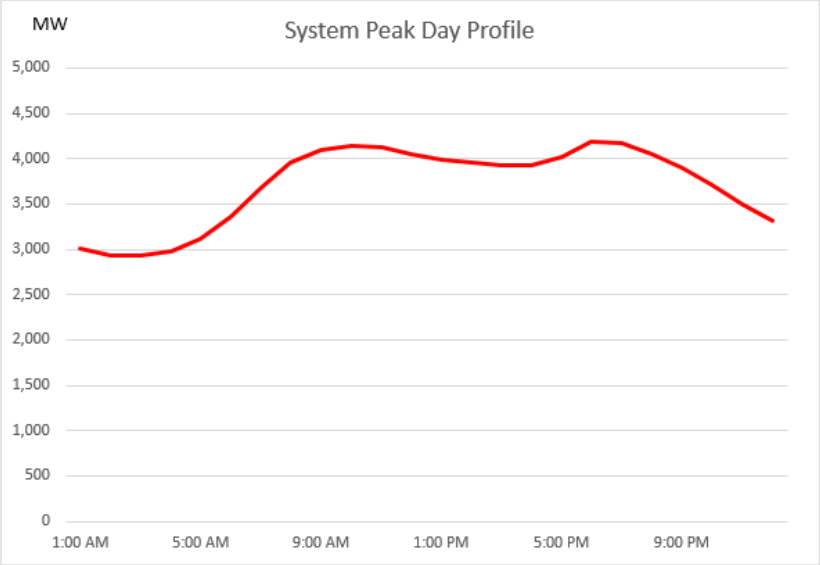


Figure 6 shows the 24-hour profile of the total system load on the day when PSE system hit its annual peak load. The annual peak load day happens usually in the winter and is bi-modal with mid-morning and early evening peaks. Winter is defined as the October through May period with summer defined as June through September.

Figure 6 – Hourly Load Profile on Annual System Peak Day (February 12, 2021)



3.2 Residential Class (Schedule 7)

The residential class profiles are estimated by expanding the historical sample data via post-stratification. Since residential class consists of many net meter customers, the class profiles are estimated separately for net meter and non-net meter customers and then the final profiles are added up to get the final class profile. Table 6 presents the post-stratification done for sample expansion to population using a case weighting scheme for both net meter and non-net meter customers separately. The table shows population count, number of sample points and case weight by annual energy usage bracket. For net meter customers, the delivered energy was used as the stratification variable.

Table 6 – Residential Class Post-Stratification

Maximum kWh	N(h)	n(h)	Case Weights
Non Net Meter Customers			
7,364	384,936	37	10,403.68
10,434	236,566	31	7,631.16
14,076	183,587	33	5,563.24
19,725	143,428	23	6,236.00
2,856,079	96,405	67	1,438.88
Total	1,044,922	191	31,272.96
Net Meter Customers (Forward and Reverse Channels)			
8,928	3,980	63	63.17
13,663	2,327	46	50.59
20,299	1,702	40	42.55
134,648	1,096	37	29.62
Total	9,105	186	185.93

In the second stage of analysis, the line loss factor of 8.20% estimated for the Residential class was applied to the hourly load estimated at a premise metering point. The estimated line loss factor is an annual average loss factor and was applied uniformly to all 8,760 hourly loads estimates for each customer types. The hourly load estimates including line losses were preliminary estimates of residential class' contribution to system's hourly demand. Finally, the residential hourly load estimates are reconciled to the system hourly loads by allocating the unaccounted for energy (UFE) to the Residential class on the basis of preliminary percentage estimate of its contribution to the system demand for that particular hour.

Figure 7 presents the results of the reconciled hourly expansion analysis for the Residential class. The figure displays the EnergyPrint to the left of a more standard two-dimensional x-y plot. The vertical form of the EnergyPrint displays time on the x-axis, day of the year on the y-axis and the magnitude of the load on the z-axis. The magnitude of load is displayed as a color gradient with low levels of load in the black-blue spectrum and high levels of load in the yellow-white spectrum. The dominance of the winter load is clearly evident with bi-modal peaks occurring in the morning and early evening periods. The Residential class peak 2,778.5 MW occurred at 7 PM on Thursday, February 11, 2021.

Figure 7 – Residential Class Total Load

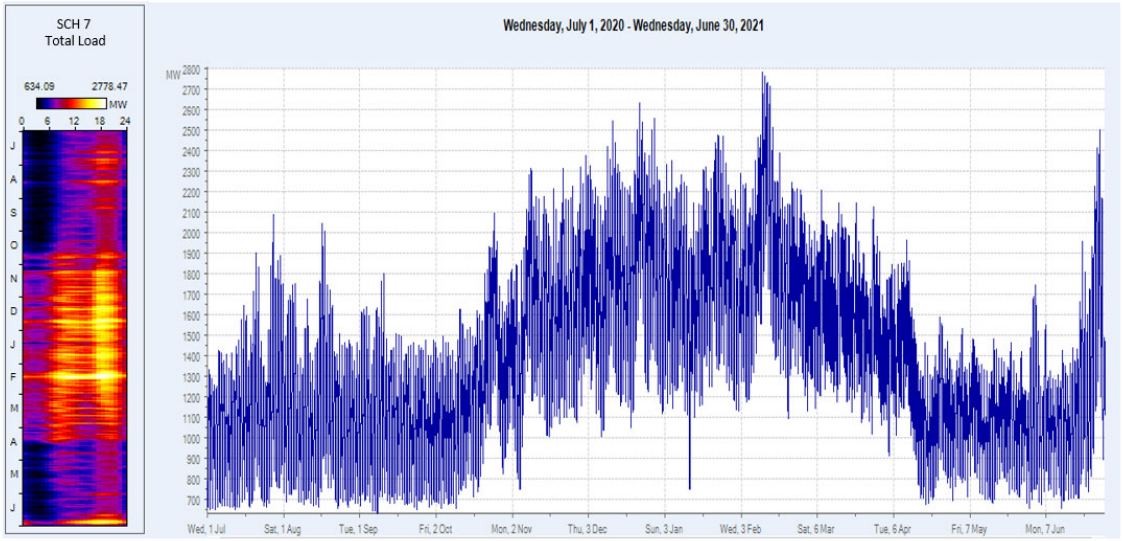


Figure 8 presents the Residential class load during the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The Residential class load at the time of the system peak was 2,708.1 MW, or 97.5% of its class peak demand of 2,778.5 MW. The system peak demand occurred at 6 PM on February 12, 2021.

Figure 8 – Residential Class: Total Load during System Peak Week

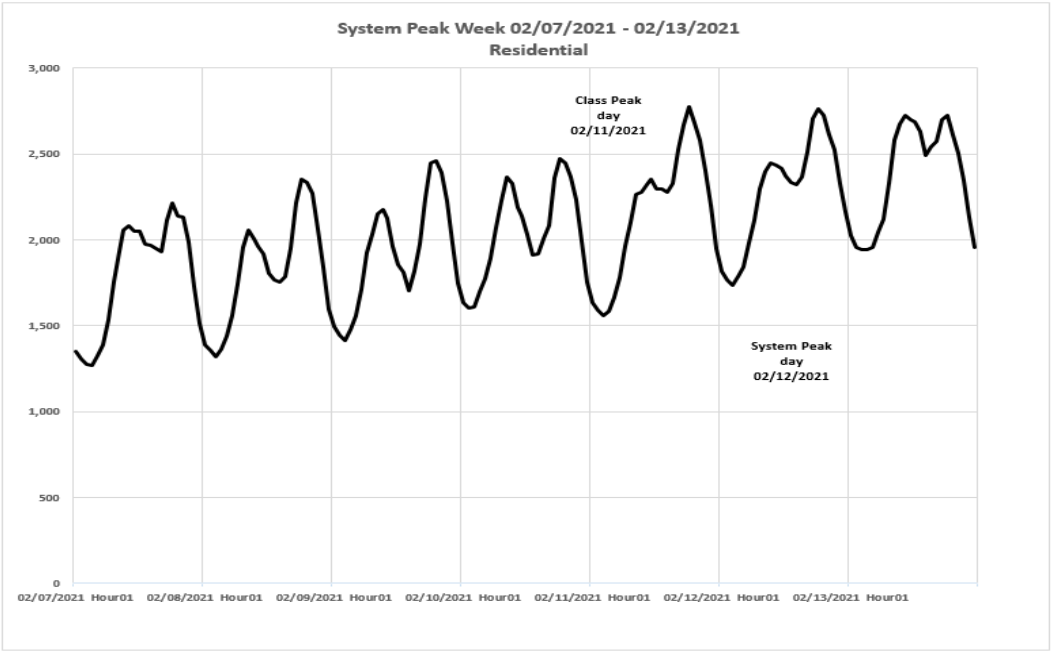
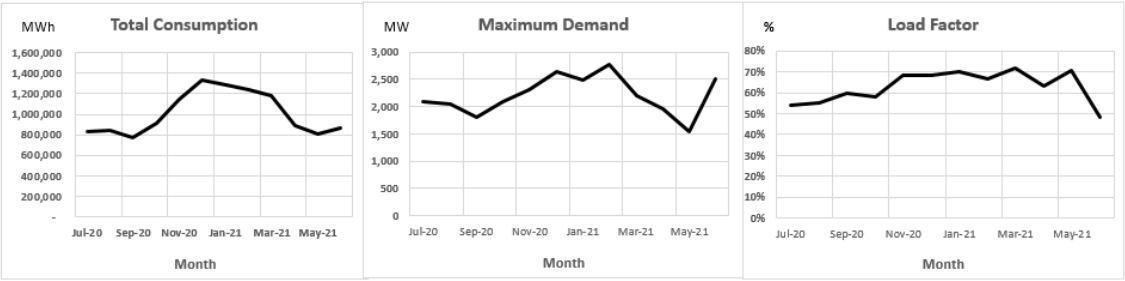


Figure 9 presents the monthly Residential class energy consumption, peak demand and load factor in graphics.

Figure 9 –Residential Class: Monthly Energy, Demand and Load Factor



Achieved precision associated with the Residential class analysis can be evaluated in terms of the deviation of the sum of Residential class hourly loads net of losses estimated for the 12 months ending June 2021 from the total actual sales to the class in the same 12-month period. The sum of estimated Residential hourly loads net of losses is 11,132,159 MWh, 1.78% less than the actual delivered Residential energy sales of 11,333,894 MWh. The implied error percentage is significantly lower than the maximum error margin of ±10% tolerated in typical load research practice.

Table 7 presents summary statistics for the Residential class load after applying losses and reconciliation to the system load. The table displays class totals and includes monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak (i.e., class system-coincident peak load) and coincidence factor calculated as the class coincident peak divided by the class non-coincident peak demand. In addition, the table displays other summary characteristics including:

- 12-month average coincident peak contribution;
- Average class demand associated with top 12, 75 and 200 system peak hours;
- Average class demand associated with top 12, 75 and 200 class peak hours; and
- 4 winter-month (Nov. –Feb.) average coincident peak contribution.

Residential monthly class non-coincident peak (NCP) load factors ranged from a low of 48.3% in June, 2021 to a high of 71.9% in March, 2021. The Residential load coincides heavily with the system peak displaying a system peak coincidence factor of over 85% for all of the 12 months of the study period, with the minimum of 85.4% occurring in May, 2021.

Table 7 – Residential Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	834,256,233	Monday, July 27, 2020	19:00	2,087,282	1,121,312	53.7%	Monday, July 27, 2020	18:00	2,020,816	96.8%
Aug-20	837,372,270	Sunday, August 16, 2020	20:00	2,046,287	1,125,500	55.0%	Monday, August 17, 2020	18:00	1,978,780	96.7%
Sep-20	777,765,217	Thursday, September 10, 2020	19:00	1,804,022	1,080,229	59.9%	Thursday, September 10, 2020	18:00	1,761,986	97.7%
Oct-20	907,478,887	Sunday, October 25, 2020	20:00	2,092,991	1,219,730	58.3%	Monday, October 26, 2020	9:00	1,840,538	87.9%
Nov-20	1,141,372,275	Sunday, November 29, 2020	18:00	2,317,773	1,585,239	68.4%	Monday, November 9, 2020	9:00	2,056,056	88.7%
Dec-20	1,338,364,885	Wednesday, December 23, 2020	19:00	2,632,804	1,798,878	68.3%	Wednesday, December 23, 2020	18:00	2,591,832	98.4%
Jan-21	1,293,338,979	Sunday, January 24, 2021	19:00	2,476,421	1,738,359	70.2%	Tuesday, January 26, 2021	18:00	2,467,307	99.6%
Feb-21	1,243,159,910	Thursday, February 11, 2021	19:00	2,778,468	1,849,940	66.6%	Friday, February 12, 2021	18:00	2,708,079	97.5%
Mar-21	1,181,790,832	Sunday, March 7, 2021	19:00	2,210,153	1,588,429	71.9%	Tuesday, March 16, 2021	9:00	2,028,390	91.8%
Apr-21	895,173,627	Sunday, April 11, 2021	9:00	1,965,273	1,243,297	63.3%	Monday, April 5, 2021	9:00	1,844,989	93.9%
May-21	807,733,344	Monday, May 3, 2021	20:00	1,535,584	1,085,663	70.7%	Friday, May 7, 2021	10:00	1,311,807	85.4%
Jun-21	868,728,562	Monday, June 28, 2021	19:00	2,500,283	1,206,567	48.3%	Monday, June 28, 2021	17:00	2,421,965	96.9%
Annual	12,126,535,022	Annual Class Peak		2,778,468	1,384,308	49.8%	Annual System Peak		2,708,079	97.5%
		Average 12 Monthly NCPs		2,203,945		62.8%	Average 12 Monthly CPs		2,086,045	94.7%
		Average Top 12 NCPs		2,715,315		51.0%	Average Top 12 CPs		2,575,929	94.9%
		Average Top 75 NCPs		2,540,428		54.5%	Average Top 75 CPs		2,462,285	96.9%
		Average Top 200 NCPs		2,411,053		57.4%	Average Top 200 CPs		2,337,877	97.0%
							Average 4CPs *		2,455,819	

* Monthly CPs for November, December, January and February

Table 8 presents the data on an average-per-customer basis. The average Residential customer used 11,588 kWh during the 12 months ending June 2021 and had an annual peak demand of 2.66 kW.

Table 8 – Residential Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	803	Monday, July 27, 2020	19:00	2.01	1.08	53.7%	Monday, July 27, 2020	18:00	1.95	96.8%
Aug-20	805	Sunday, August 16, 2020	20:00	1.97	1.08	55.0%	Monday, August 17, 2020	18:00	1.90	96.7%
Sep-20	747	Thursday, September 10, 2020	19:00	1.73	1.04	59.9%	Thursday, September 10, 2020	18:00	1.69	97.7%
Oct-20	870	Sunday, October 25, 2020	20:00	2.01	1.17	58.3%	Monday, October 26, 2020	9:00	1.76	87.9%
Nov-20	1,092	Sunday, November 29, 2020	18:00	2.22	1.52	68.4%	Monday, November 9, 2020	9:00	1.97	88.7%
Dec-20	1,278	Wednesday, December 23, 2020	19:00	2.51	1.72	68.3%	Wednesday, December 23, 2020	18:00	2.48	98.4%
Jan-21	1,234	Sunday, January 24, 2021	19:00	2.36	1.66	70.2%	Tuesday, January 26, 2021	18:00	2.35	99.6%
Feb-21	1,185	Thursday, February 11, 2021	19:00	2.65	1.76	66.6%	Friday, February 12, 2021	18:00	2.58	97.5%
Mar-21	1,126	Sunday, March 7, 2021	19:00	2.11	1.51	71.9%	Tuesday, March 16, 2021	9:00	1.93	91.8%
Apr-21	852	Sunday, April 11, 2021	9:00	1.87	1.18	63.3%	Monday, April 5, 2021	9:00	1.76	93.9%
May-21	768	Monday, May 3, 2021	20:00	1.46	1.03	70.7%	Friday, May 7, 2021	10:00	1.25	85.4%
Jun-21	826	Monday, June 28, 2021	19:00	2.38	1.15	48.3%	Monday, June 28, 2021	17:00	2.30	96.9%
Annual	11,588	Annual Class Peak		2.66	1.32	49.8%	Annual System Peak		2.59	97.5%

3.3 Schedule 05 Sales for Resale

The interval load data were collected from all of the eight resale metering device locations under Schedule 05. The interval load data were verified, edited and integrated to form an hourly load shape. Since the interval load data cover the whole population of the sales for resale customers, there is no need for sample post-stratification and expansion. In the next step, an average loss factor of 3.84% was applied to the hourly load data to produce the class hourly load profile with losses. The estimated average loss factor by rate schedule is presented in Table 4.

Figure 10 presents the total load for Schedule 05. The figure displays the EnergyPrint to the left of a two-dimensional x-y plot. The dominance of the winter load is clearly evident. The Schedule 05 class load peaked on Wednesday, December 23, 2020 at 10 PM. The peak demand was 2,191 kW.

Figure 10 – Schedule 05: Class Total Load

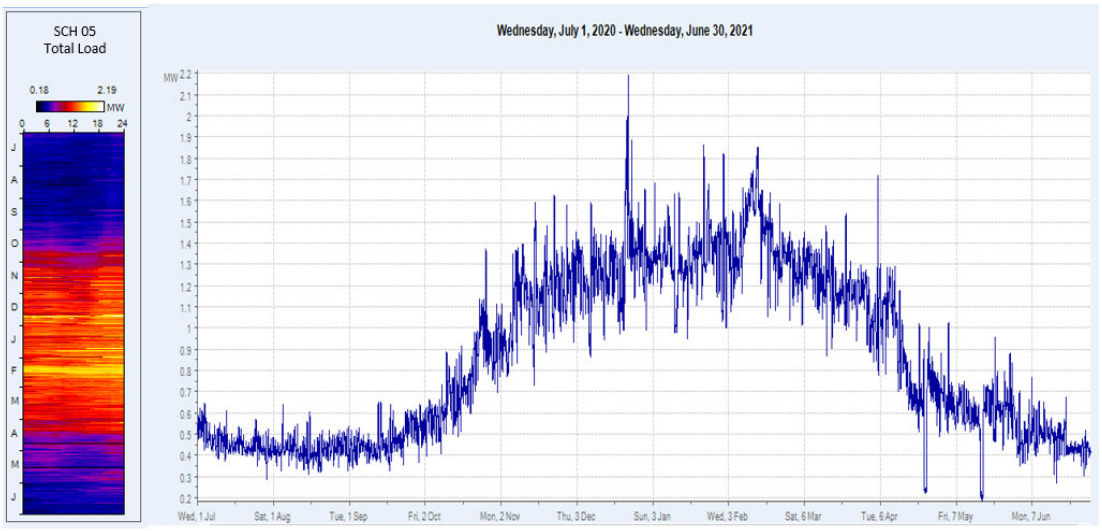


Figure 11 presents Schedule 05 class loads during the system peak week of Sunday, February 07, 2021 through Saturday, February 13, 2021. The total Schedule 05 load at the time of the system peak was 1,724 kW.

Figure 11 – Schedule 05: Total Load during System Peak Week

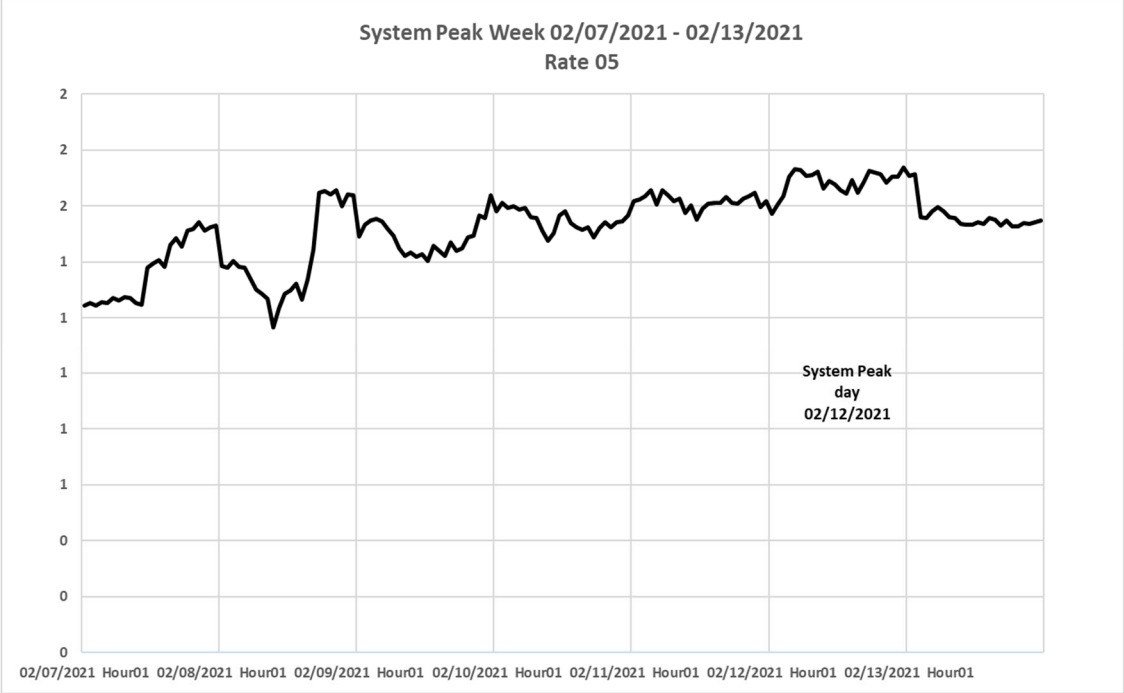
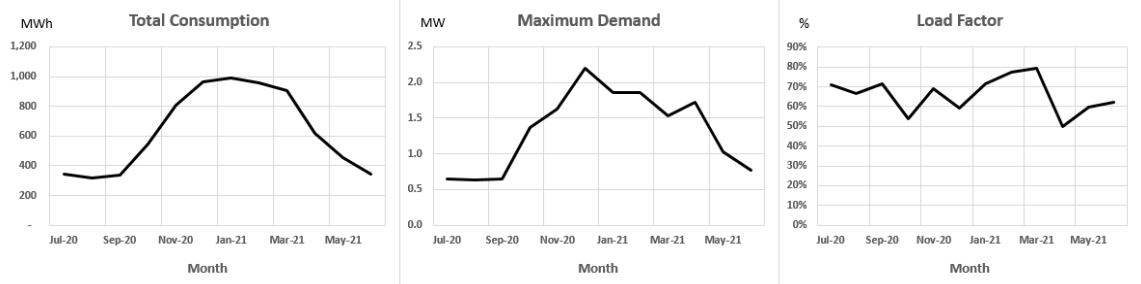


Figure 12 presents the monthly Sales for Resale class energy consumption, peak demand and load factor in graphics.

Figure 12 –Schedule 05: Class Monthly Energy, Demand and Load Factor



Achieved precision associated with the deemed profiles are perfect. Since population data are available for all customers and they are all reconciled with the delivered load, the precision is perfect for this class.

Table 9 presents system total summary statistics for the Schedule 05 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month average coincident peak contribution and class peaks, 4 winter-month average coincident peak contribution, average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. Monthly NCP load factors ranged from a low of 49.9% in April, 2021 to a high of 79.3% in March, 2021. The Schedule 05 load is fairly coincident with the system peak during the peak winter season displaying system peak coincidence factors of 70% or higher for most of the winter months.

Table 9 – Schedule 05 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	340,802	Friday, July 3, 2020	24:00	644	458	71.1%	Monday, July 27, 2020	18:00	431	66.9%
Aug-20	316,512	Tuesday, August 4, 2020	21:00	637	425	66.8%	Monday, August 17, 2020	18:00	452	71.0%
Sep-20	334,797	Sunday, September 13, 2020	22:00	651	465	71.5%	Thursday, September 10, 2020	18:00	393	60.4%
Oct-20	546,864	Monday, October 26, 2020	21:00	1,368	735	53.7%	Monday, October 26, 2020	9:00	1,028	75.1%
Nov-20	810,086	Monday, November 23, 2020	19:00	1,624	1,125	69.3%	Monday, November 9, 2020	9:00	1,190	73.3%
Dec-20	967,766	Wednesday, December 23, 2020	22:00	2,191	1,301	59.4%	Wednesday, December 23, 2020	18:00	1,617	73.8%
Jan-21	991,746	Saturday, January 23, 2021	22:00	1,859	1,333	71.7%	Tuesday, January 26, 2021	18:00	1,487	80.0%
Feb-21	960,655	Sunday, February 14, 2021	24:00	1,852	1,430	77.2%	Friday, February 12, 2021	18:00	1,724	93.1%
Mar-21	906,493	Monday, March 22, 2021	24:00	1,537	1,218	79.3%	Tuesday, March 16, 2021	9:00	1,185	77.1%
Apr-21	616,600	Sunday, April 4, 2021	24:00	1,716	856	49.9%	Monday, April 5, 2021	9:00	874	51.0%
May-21	454,744	Monday, May 3, 2021	24:00	1,024	611	59.7%	Friday, May 7, 2021	10:00	637	62.2%
Jun-21	343,015	Sunday, June 6, 2021	24:00	766	476	62.2%	Monday, June 28, 2021	17:00	487	63.5%
Annual	7,590,079	Annual Class Peak		2,191	866	39.5%	Annual System CP		1,724	78.7%
		Average 12 Monthly NCPs		1,322		65.5%	Average 12 Monthly CPs		959	72.5%
		Average Top 12 NCPs		1,968		44.0%	Average Top 12 CPs		1,475	75.0%
		Average Top 75 NCPs		1,793		48.3%	Average Top 75 CPs		1,474	82.2%
		Average Top 200 NCPs		1,686		51.4%	Average Top 200 CPs		1,421	84.3%
							Average 4CPs *		1,504	

* Monthly CPs for November, December, January and February

Table 10 presents the data on an average-per-customer basis. For Schedule 05, the average annual use per account is 948,760 kWh with average annual peak demand of 273.92 kW.

Table 10 – Schedule 05 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	42,600	Friday, July 3, 2020	24:00	80.51	57.26	71.1%	Monday, July 27, 2020	18:00	53.87	66.9%
Aug-20	39,564	Tuesday, August 4, 2020	21:00	79.63	53.18	66.8%	Monday, August 17, 2020	18:00	56.52	71.0%
Sep-20	41,850	Sunday, September 13, 2020	22:00	81.34	58.12	71.5%	Thursday, September 10, 2020	18:00	49.12	60.4%
Oct-20	68,358	Monday, October 26, 2020	21:00	171.04	91.88	53.7%	Monday, October 26, 2020	9:00	128.45	75.1%
Nov-20	101,261	Monday, November 23, 2020	19:00	202.97	140.64	69.3%	Monday, November 9, 2020	9:00	148.78	73.3%
Dec-20	120,971	Wednesday, December 23, 2020	22:00	273.92	162.60	59.4%	Wednesday, December 23, 2020	18:00	202.08	73.8%
Jan-21	123,968	Saturday, January 23, 2021	22:00	232.34	166.62	71.7%	Tuesday, January 26, 2021	18:00	185.85	80.0%
Feb-21	120,082	Sunday, February 14, 2021	24:00	231.48	178.69	77.2%	Friday, February 12, 2021	18:00	215.50	93.1%
Mar-21	113,312	Monday, March 22, 2021	24:00	192.13	152.30	79.3%	Tuesday, March 16, 2021	9:00	148.08	77.1%
Apr-21	77,075	Sunday, April 4, 2021	24:00	214.45	107.05	49.9%	Monday, April 5, 2021	9:00	109.31	51.0%
May-21	56,843	Monday, May 3, 2021	24:00	127.98	76.40	59.7%	Friday, May 7, 2021	10:00	79.58	62.2%
Jun-21	42,877	Sunday, June 6, 2021	24:00	95.77	59.55	62.2%	Monday, June 28, 2021	17:00	60.82	63.5%
Annual	948,760	Annual Class Peak		273.92	108.31	39.5%	Annual System CP		215.50	78.7%

3.4 Schedules 8 & 24 Small General Service

The historical sample data was expanded by post-stratifying the data available for Schedules 8 & 24 Small General Service class.

Table 11 presents the post-stratification used in the sample expansion analysis by customer types. The table shows population count, number of sample points and the case weight by annual energy usage bracket. The stratification is done separately for each type of customer, net meter, non-net meter types as well as by Commercial and Industrial customers. For net meter customers, the delivered energy was used as the stratification variable.

Table 11 – Schedules 8 & 24: Post-Stratification

Maximum kWh	N(h)	n(h)	Case Weights
Commercial Non-Net Meter Customers			
16,323	86,718	90	963.53
40,190	22,153	57	388.65
86,079	11,516	50	230.32
7,800,560	5,578	84	66.40
Total	125,965	281	1,649
Commercial Net Meter Customers (Forward and Reverse Channels)			
24,747	439	45	9.76
76,360	103	17	6.06
710,477	36	5	7.20
Total	578	67	23
Industrial Customers			
20,678	1,813	31	58.48
47,087	587	24	24.46
87,859	330	23	14.35
854,376	177	31	5.71
Total	2,907	109	103

In the next step, the average loss factor estimated for Schedules 8 & 24 was applied to the hourly expansions to produce the class hourly load profile with losses. As shown in Table 4, the average loss factor estimated for the Small General Service class is 8.13%.

The hourly load estimates including line losses were preliminary estimates of the Small General Service class' contribution to system's hourly demand. In the final stage of the analysis, the unaccounted for energy (UFE) was allocated to the Schedules 8 & 24 based on preliminary percentage estimate of its contribution to the system demand for that particular hour.

Figure 13 presents the Schedules 8 & 24 class load. The figure displays the EnergyPrint to the left of a two-dimensional x-y plot. The figure shows dominance of early morning winter load. The Small General Service class peak occurred on Wednesday, February 10, 2021 at 8AM. The peak demand was about 563.9 MW.

Figure 13 – Schedules 8 & 24: Class Total Load

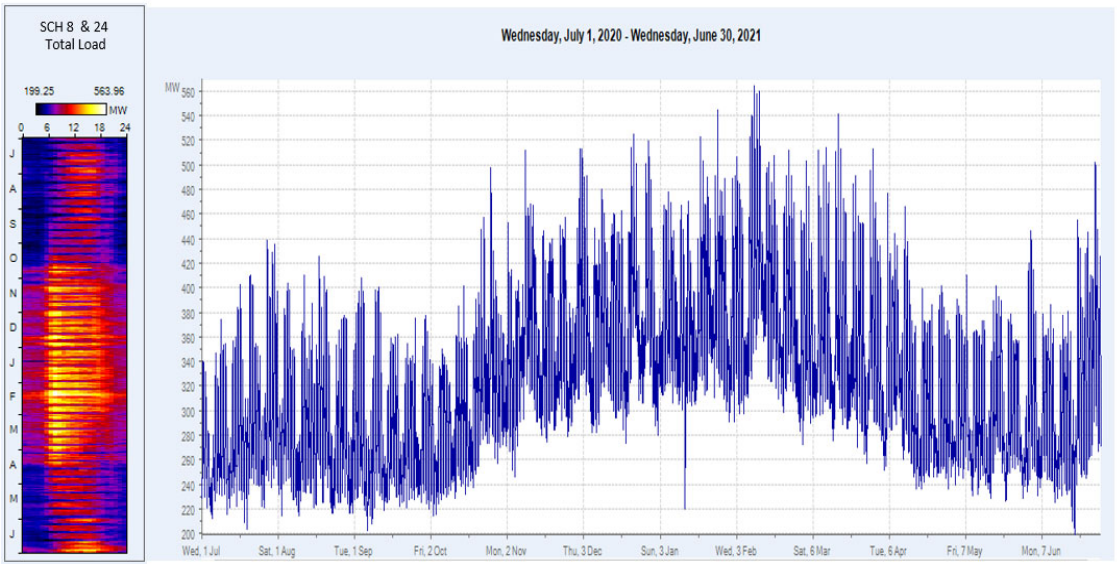


Figure 14 presents the Small General Service class load during the system peak week of Sunday, February 07, 2021 through Saturday, February 13, 2021. The Small General Service class load at the time of the system peak was 478.5 MW or 84.9% of its class peak demand of 563.9 MW.

Figure 14 – Schedules 8 & 24: Total Load during System Peak Week

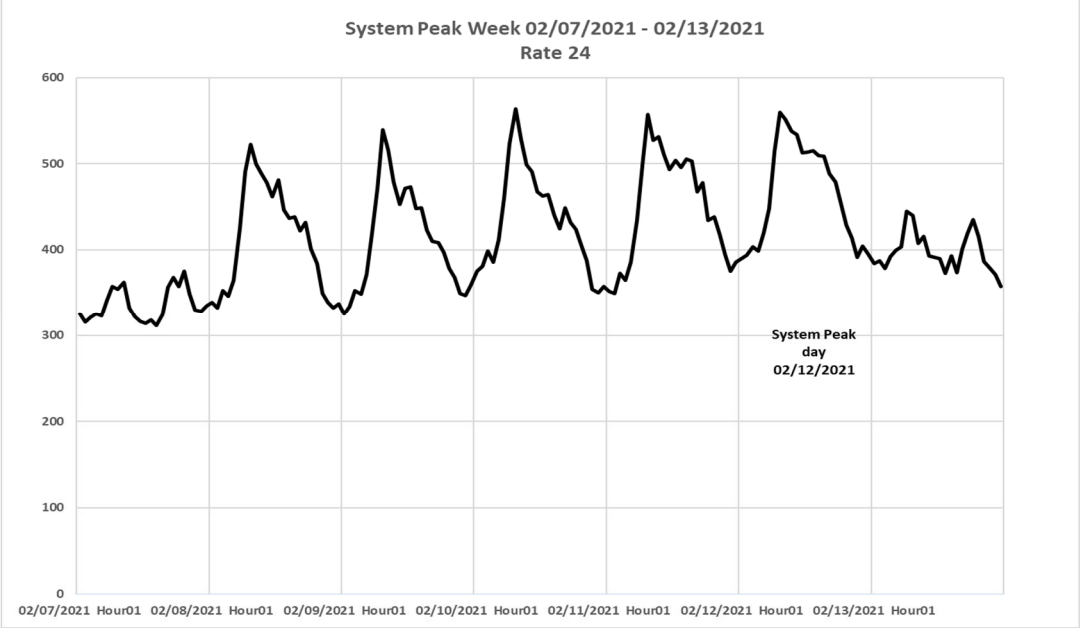
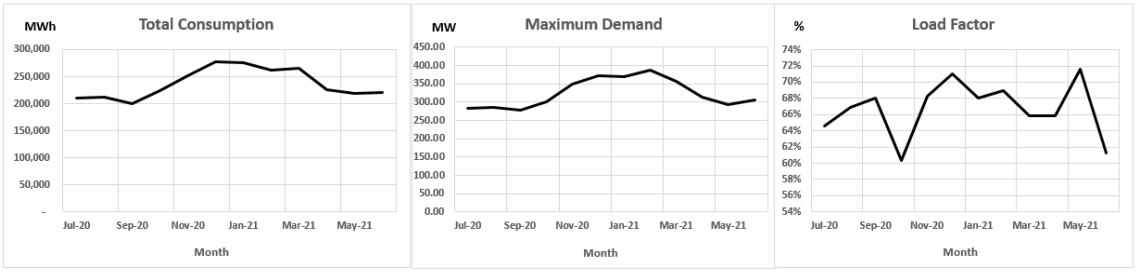


Figure 15 presents the monthly Small General Service class energy consumption, peak demand and load factor in graphics.

Figure 15 – Schedules 8 & 24: Class Monthly Energy, Demand and Load Factor



Achieved precision associated with the Small General Service class analysis can be evaluated in terms of the deviation of the annual sum of estimated class hourly loads net of losses from the total actual sales to the class in the same period. The sum of estimated hourly loads net of losses was 2,611,140 MWh, 1.94% lower than the actual class sales of 2,662,848 MWh.

Table 12 presents summary statistics for the Schedules 8 & 24 total class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. Monthly NCP load factors range from a low of 60.3% in October, 2020 to a high of 71.6% in May, 2021. The coincidence factors for Schedules 8 & 24 are over 90% for six out of twelve months and over 80% for eleven out of twelve months.

Table 12 – Schedules 8 & 24 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	211,065,646	Monday, July 27, 2020	14:00	439,015	283,690	64.6%	Monday, July 27, 2020	18:00	381,211	86.8%
Aug-20	211,753,628	Monday, August 17, 2020	16:00	425,283	284,615	66.9%	Monday, August 17, 2020	18:00	368,238	86.6%
Sep-20	199,829,483	Thursday, September 3, 2020	16:00	407,777	277,541	68.1%	Thursday, September 10, 2020	18:00	360,200	88.3%
Oct-20	223,471,350	Monday, October 26, 2020	9:00	497,716	300,365	60.3%	Monday, October 26, 2020	9:00	497,716	100.0%
Nov-20	251,397,468	Monday, November 9, 2020	7:00	511,456	349,163	68.3%	Monday, November 9, 2020	9:00	495,243	96.8%
Dec-20	277,310,570	Wednesday, December 23, 2020	8:00	524,381	372,729	71.1%	Wednesday, December 23, 2020	18:00	438,439	83.6%
Jan-21	275,612,526	Tuesday, January 26, 2021	8:00	543,989	370,447	68.1%	Tuesday, January 26, 2021	18:00	417,022	76.7%
Feb-21	261,220,257	Wednesday, February 10, 2021	8:00	563,964	388,721	68.9%	Friday, February 12, 2021	18:00	478,558	84.9%
Mar-21	264,811,234	Tuesday, March 16, 2021	8:00	540,807	355,929	65.8%	Tuesday, March 16, 2021	9:00	519,618	96.1%
Apr-21	225,925,022	Monday, April 5, 2021	8:00	476,477	313,785	65.9%	Monday, April 5, 2021	9:00	462,412	97.0%
May-21	218,471,005	Friday, May 7, 2021	11:00	409,916	293,644	71.6%	Friday, May 7, 2021	10:00	385,741	94.1%
Jun-21	221,343,200	Monday, June 28, 2021	15:00	501,602	307,421	61.3%	Monday, June 28, 2021	17:00	500,942	99.9%
Annual	2,842,211,388	Annual Class Peak		563,964	324,453	57.5%	Annual System CP		478,558	84.9%
		Average 12 Monthly NCPs		486,865		66.6%	Average 12 Monthly CPs		442,112	90.8%
		Average Top 12 NCPs		542,934		59.8%	Average Top 12 CPs		484,598	89.3%
		Average Top 75 NCPs		512,675		63.3%	Average Top 75 CPs		461,819	90.1%
		Average Top 200 NCPs		490,527		66.1%	Average Top 200 CPs		445,760	90.9%
							Average 4CPs *		457,315	

* Monthly CPs for November, December, January and February

Table 13 presents the data on an average-per-customer basis. For Schedules 8 & 24, the average annual use per customer is 22,903 kWh with annual average peak demand of 4.54 kW.

Table 13 – Schedules 8 & 24 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	1,713	Monday, July 27, 2020	14:00	3.56	2.30	64.6%	Monday, July 27, 2020	18:00	3.09	86.8%
Aug-20	1,715	Monday, August 17, 2020	16:00	3.45	2.31	66.9%	Monday, August 17, 2020	18:00	2.98	86.6%
Sep-20	1,615	Thursday, September 3, 2020	16:00	3.30	2.24	68.1%	Thursday, September 10, 2020	18:00	2.91	88.3%
Oct-20	1,806	Monday, October 26, 2020	9:00	4.02	2.43	60.3%	Monday, October 26, 2020	9:00	4.02	100.0%
Nov-20	2,030	Monday, November 9, 2020	7:00	4.13	2.82	68.3%	Monday, November 9, 2020	9:00	4.00	96.8%
Dec-20	2,237	Wednesday, December 23, 2020	8:00	4.23	3.01	71.1%	Wednesday, December 23, 2020	18:00	3.54	83.6%
Jan-21	2,222	Tuesday, January 26, 2021	8:00	4.39	2.99	68.1%	Tuesday, January 26, 2021	18:00	3.36	76.7%
Feb-21	2,102	Wednesday, February 10, 2021	8:00	4.54	3.13	68.9%	Friday, February 12, 2021	18:00	3.85	84.9%
Mar-21	2,128	Tuesday, March 16, 2021	8:00	4.35	2.86	65.8%	Tuesday, March 16, 2021	9:00	4.18	96.1%
Apr-21	1,812	Monday, April 5, 2021	8:00	3.82	2.52	65.9%	Monday, April 5, 2021	9:00	3.71	97.0%
May-21	1,749	Friday, May 7, 2021	11:00	3.28	2.35	71.6%	Friday, May 7, 2021	10:00	3.09	94.1%
Jun-21	1,772	Monday, June 28, 2021	15:00	4.02	2.46	61.3%	Monday, June 28, 2021	17:00	4.01	99.9%
Annual	22,903	Annual Class Peak		4.54	2.61	57.5%	Annual System CP		3.86	84.9%

3.5 Schedules 11 & 25 Medium General Service

The historical sample data was expanded by post-stratifying the data available for Schedules 11 & 25 Medium General Service class. Table 14 presents the post-stratification used in the sample expansion analysis. The table shows population count, number of sample points and the case weight by annual energy usage bracket. The stratification is done separately for Commercial and Industrial customers types.

Table 14 – Schedules 11 & 25: Post-Stratification

Maximum kWh	N(h)	n(h)	Case Weights
Commercial Customer			
251,843	3,834	37	103.62
434,472	1,862	23	80.96
771,128	1,213	17	71.35
5,793,570	666	31	21.48
Total	7,575	108	277.41
Industrial Customer			
235,790	243	18	13.50
425,636	112	10	11.20
778,304	72	16	4.50
1,997,720	42	14	3.00
Total	469	58	32.20

In the next step, the average loss factor estimated for the Medium General Service class was applied to the hourly expansions to produce the class hourly load profile with losses. As listed in Table 4, the estimated average loss factor for Schedules 11 & 25 is 8.09%. In the final step, the unaccounted for energy (UFE) was allocated to the Schedules 11 & 25 based on preliminary percentage estimate of its contribution to the system demand for that particular hour.

Figure 16 presents the total load for Schedules 11 & 25. The figure displays the EnergyPrint to the left of a two-dimensional x-y plot. Due to space heating and cooling loads, the Schedules 11 & 25

load profile shows that its mid-winter and mid-summer loads tend to be higher than other seasonal loads. The Schedules 11 & 25 class load peaked on Monday, June 28 2021 at 12PM. The class peak demand was 572.5 MW.

Figure 16 – Schedules 11 & 25: Class Total Load

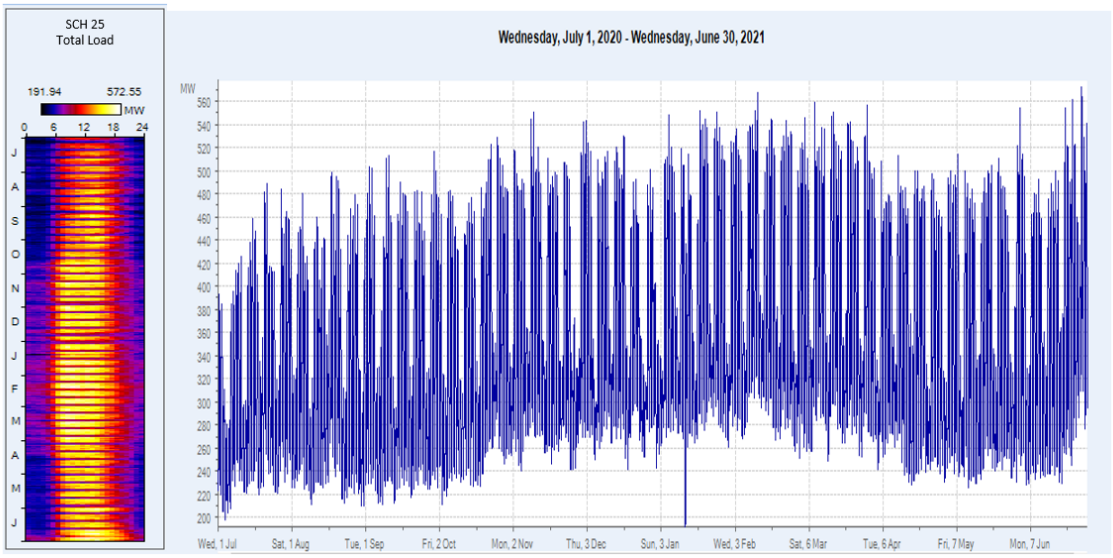


Figure 17 presents the Schedules 11 & 25 class load during the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. At the system peak hour, the class demand was 451.2 MW, or 78.8% of the class peak demand of 572.5 MW.

Figure 17 – Schedules 11 & 25: Total Load during System Peak Week

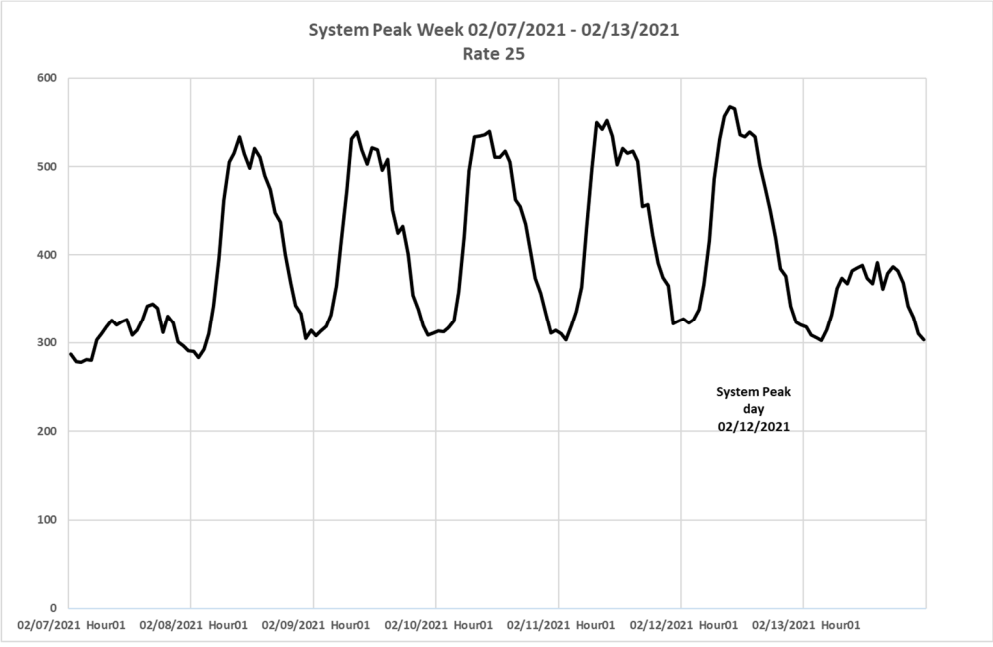
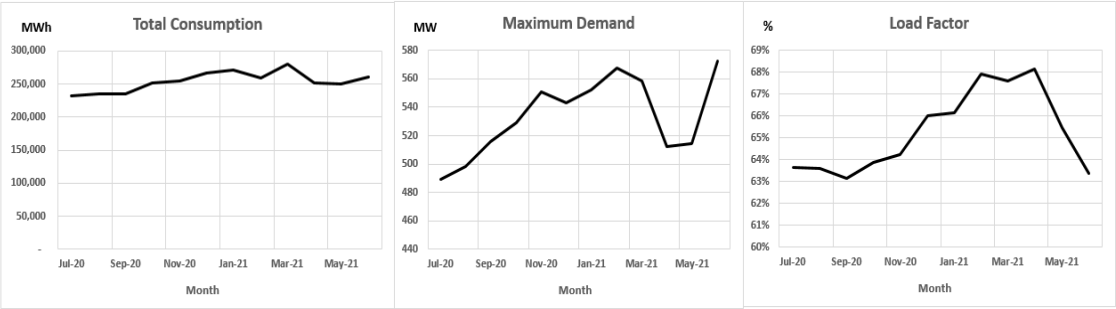


Figure 18 presents the monthly Medium General Service class energy consumption, peak demand and load factor in graphics. The monthly peak loads in January and June were winter and summer seasonal peak loads.

Figure 18 – Schedules 11 & 25: Class Monthly Energy, Demand and Load Factor



Achieved precision associated with the Medium General Service class analysis is evaluated in terms of the deviation of the annual sum of the class hourly loads net of losses estimated for the study period from the total actual sales to the class during the same period. The sum of estimated hourly loads net of losses was 2,803,003 MWh, 2.09% lower than the actual class sales of 2,862,861 MWh. The percentage of error is much less than the maximum error margin of ±10% tolerated in typical load research practice.

Table 15 presents summary statistics for the Schedules 11 & 25 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. Monthly NCP load factors varies from a low of 63.1% in September, 2020 to a high of 68.1% in April, 2021. Monthly system coincidence factor of Schedule 11 & 25 load fluctuates form 72.1% in December, 2020 to 100% in October, 2020.

Table 15 – Schedules 11 & 25 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	231,590,520	Tuesday, July 21, 2020	15:00	488,899	311,278	63.7%	Monday, July 27, 2020	18:00	429,942	87.9%
Aug-20	235,689,177	Monday, August 17, 2020	15:00	498,188	316,787	63.6%	Monday, August 17, 2020	18:00	438,280	88.0%
Sep-20	234,607,702	Tuesday, September 29, 2020	15:00	516,000	325,844	63.1%	Thursday, September 10, 2020	18:00	441,595	85.6%
Oct-20	251,278,570	Monday, October 26, 2020	9:00	528,847	337,740	63.9%	Monday, October 26, 2020	9:00	528,847	100.0%
Nov-20	254,764,041	Tuesday, November 10, 2020	9:00	550,775	353,839	64.2%	Monday, November 9, 2020	9:00	544,220	98.8%
Dec-20	266,808,164	Wednesday, December 2, 2020	9:00	543,175	358,613	66.0%	Wednesday, December 23, 2020	18:00	391,821	72.1%
Jan-21	271,751,049	Tuesday, January 19, 2021	9:00	552,026	365,257	66.2%	Tuesday, January 26, 2021	18:00	428,384	77.6%
Feb-21	259,201,772	Friday, February 12, 2021	10:00	567,745	385,717	67.9%	Friday, February 12, 2021	18:00	451,244	79.5%
Mar-21	280,889,941	Monday, March 8, 2021	9:00	558,393	377,540	67.6%	Tuesday, March 16, 2021	9:00	550,819	98.6%
Apr-21	251,340,180	Monday, April 12, 2021	13:00	512,335	349,084	68.1%	Monday, April 5, 2021	9:00	501,765	97.9%
May-21	250,477,514	Friday, May 7, 2021	12:00	514,224	336,663	65.5%	Friday, May 7, 2021	10:00	476,640	92.7%
Jun-21	261,326,806	Monday, June 28, 2021	12:00	572,547	362,954	63.4%	Monday, June 28, 2021	17:00	517,713	90.4%
Annual	3,049,725,436	Annual Class Peak		572,547	348,142	60.8%	Annual System CP		451,244	78.8%
		Average 12 Monthly NCPs		533,596		65.2%	Average 12 Monthly CPs		475,106	89.0%
		Average Top 12 NCPs		561,848		62.0%	Average Top 12 CPs		480,917	85.6%
		Average Top 75 NCPs		543,931		64.0%	Average Top 75 CPs		457,882	84.2%
		Average Top 200 NCPs		530,868		65.6%	Average Top 200 CPs		446,087	84.0%
							Average 4CPs *		453,917	

* Monthly CPs for November, December, January and February

Table 16 presents the data on an average-per-customer basis. For Schedule 25, the average annual use per customer is 385.3 MWh with annual average peak demand of 72.34 kW.

Table 16 – Schedules 11 & 25 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	29,431	Tuesday, July 21, 2020	15:00	62.13	39.56	63.7%	Monday, July 27, 2020	18:00	54.64	87.9%
Aug-20	29,887	Monday, August 17, 2020	15:00	63.17	40.17	63.6%	Monday, August 17, 2020	18:00	55.58	88.0%
Sep-20	29,750	Tuesday, September 29, 2020	15:00	65.43	41.32	63.1%	Thursday, September 10, 2020	18:00	56.00	85.6%
Oct-20	31,751	Monday, October 26, 2020	9:00	66.82	42.68	63.9%	Monday, October 26, 2020	9:00	66.82	100.0%
Nov-20	32,220	Tuesday, November 10, 2020	9:00	69.66	44.75	64.2%	Monday, November 9, 2020	9:00	68.83	98.8%
Dec-20	33,748	Wednesday, December 2, 2020	9:00	68.70	45.36	66.0%	Wednesday, December 23, 2020	18:00	49.56	72.1%
Jan-21	34,377	Tuesday, January 19, 2021	9:00	69.83	46.21	66.2%	Tuesday, January 26, 2021	18:00	54.19	77.6%
Feb-21	32,703	Friday, February 12, 2021	10:00	71.63	48.66	67.9%	Friday, February 12, 2021	18:00	56.93	79.5%
Mar-21	35,408	Monday, March 8, 2021	9:00	70.39	47.59	67.6%	Tuesday, March 16, 2021	9:00	69.43	98.6%
Apr-21	31,663	Monday, April 12, 2021	13:00	64.54	43.98	68.1%	Monday, April 5, 2021	9:00	63.21	97.9%
May-21	31,495	Friday, May 7, 2021	12:00	64.66	42.33	65.5%	Friday, May 7, 2021	10:00	59.93	92.7%
Jun-21	32,859	Monday, June 28, 2021	12:00	71.99	45.64	63.4%	Monday, June 28, 2021	17:00	65.10	90.4%
Annual	385,326	Annual Class Peak		72.34	43.99	60.8%	Annual System CP		57.01	78.8%

3.6 Schedules 12 & 26 Large General Service

The historical sample data was expanded by post-stratifying the data available for Schedules 12 & 26 Large General Service class. Table 17 presents the post-stratification used in the sample expansion analysis for both commercial and industrial customers. The table shows population count, number of sample points and the case weight by annual energy usage bracket.

Table 17 – Schedules 12 & 26: Post-Stratification

Schedule 26

Maximum kWh	N(h)	n(h)	Case Weights
Commercial Customers			
1,917,338	391	25	15.64
3,033,450	213	12	17.75
14,847,770	136	28	4.86
Total	740	65	38.25
Industrial Customer			
1,874,682	52	15	3.47
3,058,163	24	8	3.00
7,950,238	15	8	1.88
Total	91	31	8.34

In the second step, the average loss factor estimated for Schedules 12 & 26 was applied to the hourly expansions to produce the class hourly load profile with losses. As seen in Table 4, the estimated average loss factor for the Large General Service class is 8.11%. In the final step, the unaccounted for energy (UFE) was allocated to the Schedules 12 & 26 based on preliminary percentage estimate of its contribution to the system demand for that particular hour.

Figure 19 presents the total load for the Schedules 12 & 26 class. The figure displays the EnergyPrint to the left of a two-dimensional x-y plot. The Schedules 12 & 26 class load shows

comparatively higher in the day time during summer months. The Large General Service class load peaked on Tuesday, June 28, 2021 at 2 PM. The class peak demand was 327 MW.

Figure 19 – Schedules 12 & 26: Class Total Load

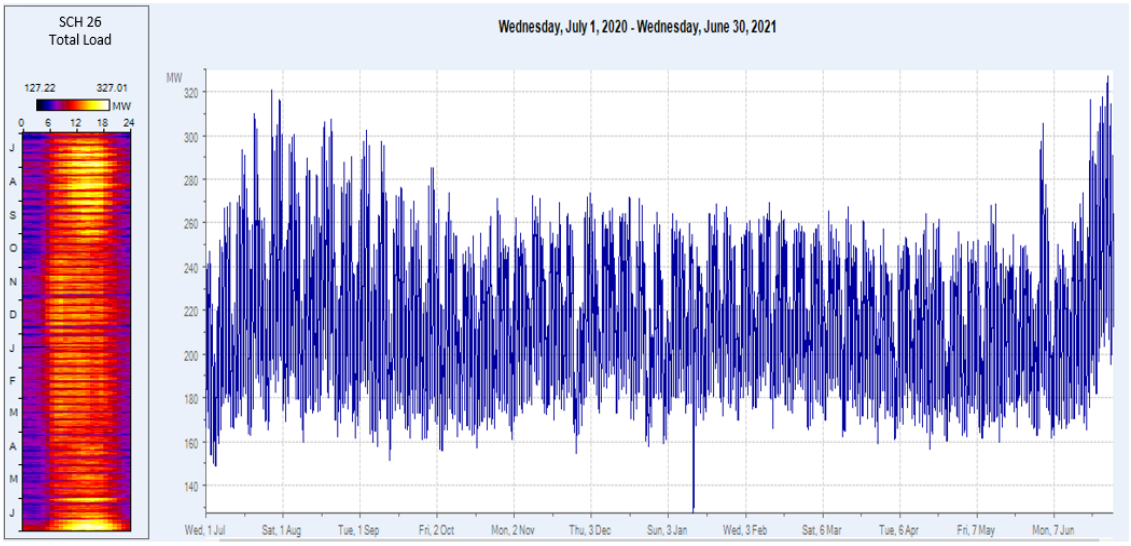


Figure 20 presents the Schedule 12 & 26 class loads during the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. At the system peak hour, the class demand was 260.8 MW, or 79.8% of the class peak demand of 327 MW.

Figure 20 – Schedules 12 & 26: Total Load during System Peak Week

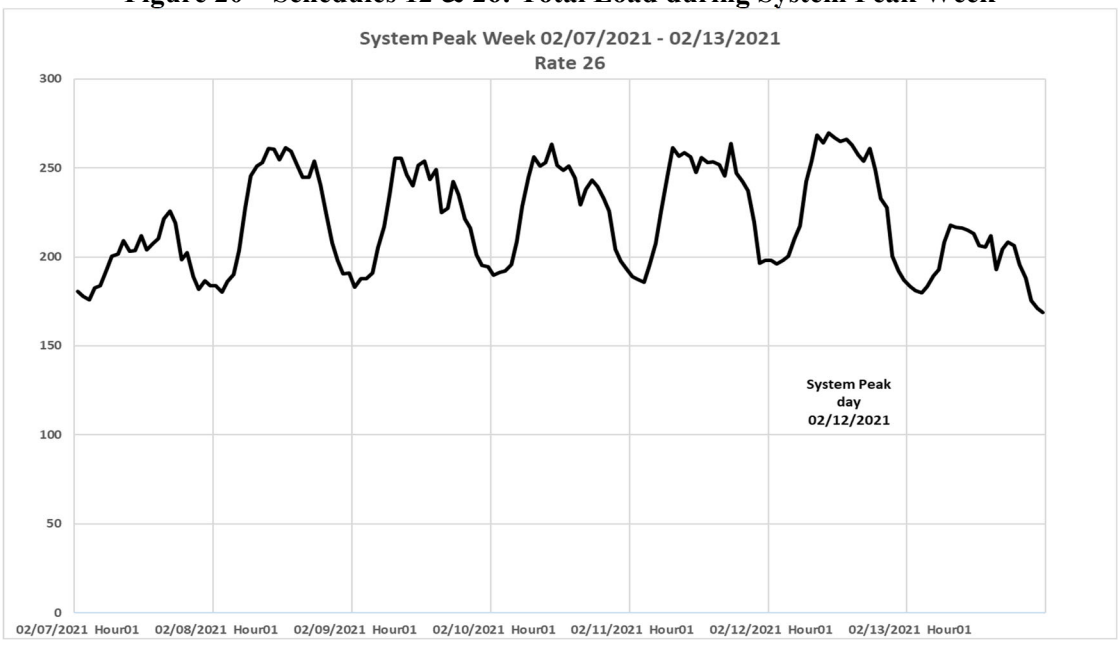
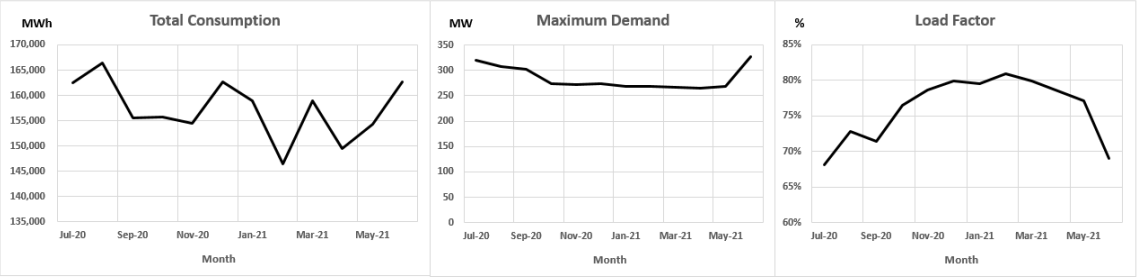


Figure 21 presents monthly Schedules 12 & 26 class energy consumption, peak demand and load factor in graphics. The total consumptions shows variability across months however peak hourly demands are primarily in the summer months.

Figure 21 –Schedules 12 & 26: Class Monthly Energy, Demand and Load Factor



Achieved precision of the Large General Service class analysis is evaluated in terms of the deviation of the sum of the estimated class hourly loads net of losses from the total actual sales to the class during the 12-month study period. The sum of estimated hourly loads net of losses was 1,734,976 MWh, 1.99% lower than the actual class sales of 1,770,292 MWh. The percentage of error is much less than the maximum tolerable error margin of ±10% set for a typical load research practice.

Table 18 presents summary statistics for the Schedules 12 & 26 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. Monthly NCP load factors fluctuate with a low of 68.1% in July, 2020 and a high of 80.9% in February, 2021. The Schedules 12 & 26 load is fairly coincident with the system peak displaying a system peak coincidence factor of over 90% for 10 of the 12 months.

Table 18 – Schedules 12 & 26 Class: Summary Statistics (Totals –kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	162,525,700	Monday, July 27, 2020	14:00	320,837	218,449	68.1%	Monday, July 27, 2020	18:00	296,951	92.6%
Aug-20	166,502,655	Thursday, August 20, 2020	14:00	307,515	223,794	72.8%	Monday, August 17, 2020	18:00	301,343	98.0%
Sep-20	155,522,809	Thursday, September 03, 2020	16:00	302,300	216,004	71.5%	Thursday, September 10, 2020	18:00	284,123	94.0%
Oct-20	155,783,371	Tuesday, October 06, 2020	17:00	273,710	209,386	76.5%	Monday, October 26, 2020	9:00	270,992	99.0%
Nov-20	154,470,401	Monday, November 09, 2020	9:00	272,538	214,542	78.7%	Monday, November 9, 2020	9:00	272,538	100.0%
Dec-20	162,660,939	Wednesday, December 02, 2020	9:00	273,359	218,630	80.0%	Wednesday, December 23, 2020	18:00	234,621	85.8%
Jan-21	158,923,457	Friday, January 22, 2021	9:00	268,649	213,607	79.5%	Tuesday, January 26, 2021	18:00	249,571	92.9%
Feb-21	146,526,790	Friday, February 12, 2021	11:00	269,439	218,046	80.9%	Friday, February 12, 2021	18:00	260,827	96.8%
Mar-21	158,860,602	Tuesday, March 16, 2021	8:00	266,998	213,522	80.0%	Tuesday, March 16, 2021	9:00	260,826	97.7%
Apr-21	149,424,425	Friday, April 16, 2021	16:00	264,199	207,534	78.6%	Monday, April 5, 2021	9:00	249,747	94.5%
May-21	154,302,428	Friday, May 14, 2021	15:00	268,782	207,396	77.2%	Friday, May 7, 2021	10:00	236,562	88.0%
Jun-21	162,597,883	Monday, June 28, 2021	14:00	327,012	225,830	69.1%	Monday, June 28, 2021	17:00	314,501	96.2%
Annual	1,888,101,462	Annual Class Peak		327,012	215,537	65.9%	Annual System CP		260,827	79.8%
		Average 12 Monthly NCPs		284,611		75.7%	Average 12 Monthly CPs		269,384	94.6%
		Average Top 12 NCPs		319,161		67.5%	Average Top 12 CPs		266,713	83.6%
		Average Top 75 NCPs		306,334		70.4%	Average Top 75 CPs		250,008	81.6%
		Average Top 200 NCPs		295,579		72.9%	Average Top 200 CPs		247,312	83.7%
							Average 4CPs *		254,389	

* Monthly CPs for November, December, January and February

Table 19 presents the data on an average-per-customer basis. For Schedules 12 & 26, the average annual use per customer is 2,269,353 kWh with annual average peak demand of 393.04 kW.

Table 19 – Schedules 12 & 26 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	197,001	Monday, July 27, 2020	14:00	388.89	264.79	68.1%	Monday, July 27, 2020	18:00	359.94	92.6%
Aug-20	202,312	Thursday, August 20, 2020	14:00	373.65	271.92	72.8%	Monday, August 17, 2020	18:00	366.15	98.0%
Sep-20	188,512	Thursday, September 3, 2020	16:00	366.42	261.82	71.5%	Thursday, September 10, 2020	18:00	344.39	94.0%
Oct-20	186,344	Tuesday, October 6, 2020	17:00	327.40	250.46	76.5%	Monday, October 26, 2020	9:00	324.15	99.0%
Nov-20	184,773	Monday, November 9, 2020	9:00	326.00	256.63	78.7%	Monday, November 9, 2020	9:00	326.00	100.0%
Dec-20	195,037	Wednesday, December 2, 2020	9:00	327.77	262.15	80.0%	Wednesday, December 23, 2020	18:00	281.32	85.8%
Jan-21	190,556	Friday, January 22, 2021	9:00	322.12	256.12	79.5%	Tuesday, January 26, 2021	18:00	299.25	92.9%
Feb-21	175,692	Friday, February 12, 2021	11:00	323.07	261.45	80.9%	Friday, February 12, 2021	18:00	312.74	96.8%
Mar-21	190,709	Tuesday, March 16, 2021	8:00	320.53	256.33	80.0%	Tuesday, March 16, 2021	9:00	313.12	97.7%
Apr-21	179,166	Friday, April 16, 2021	16:00	316.79	248.84	78.6%	Monday, April 5, 2021	9:00	299.46	94.5%
May-21	184,793	Friday, May 14, 2021	15:00	321.89	248.38	77.2%	Friday, May 7, 2021	10:00	283.31	88.0%
Jun-21	194,728	Monday, June 28, 2021	14:00	391.63	270.46	69.1%	Monday, June 28, 2021	17:00	376.65	96.2%
Annual	2,269,353	Annual Class Peak		393.04	259.06	65.9%	Annual System CP		313.49	79.8%

3.7 Schedule 29 Seasonal Irrigation

The historical sample data was expanded to the population level by post-stratifying the data available for Schedule 29 Seasonal Irrigation and Pumping Service class. Table 20 presents the post-stratification used in the sample expansion analysis.

Table 20 – Schedule 29: Post-Stratification

Schedule 29			
Maximum kWh	N(h)	n(h)	Case Weights
All Customer			
23,266	541	129	4.19
51,719	146	57	2.56
362,800	64	35	1.83
Total	751	221	8.58

In the next step, the average loss factor estimated for Schedule 29 was applied to the hourly expansions to produce the class hourly load profile. Table 4 indicates that the estimated average loss factor for the irrigation rate schedule is 8.06%. In the final step, the unaccounted for energy (UFE) was allocated to the Schedule 29 in proportion to preliminary estimate of its contribution to the system demand for hour by hour.

Figure 22 presents the total load for the Seasonal Irrigation and Pumping Service class. The figure displays the EnergyPrint to the left of a two-dimensional x-y plot. Dominance of the summer seasonal load is clearly evident. The Seasonal Irrigation and Pumping Service class peak occurred on Thursday, July 30, 2020 at 5 PM. The class peak demand was 8.2 MW.

Figure 22 – Schedule 29: Class Total Load

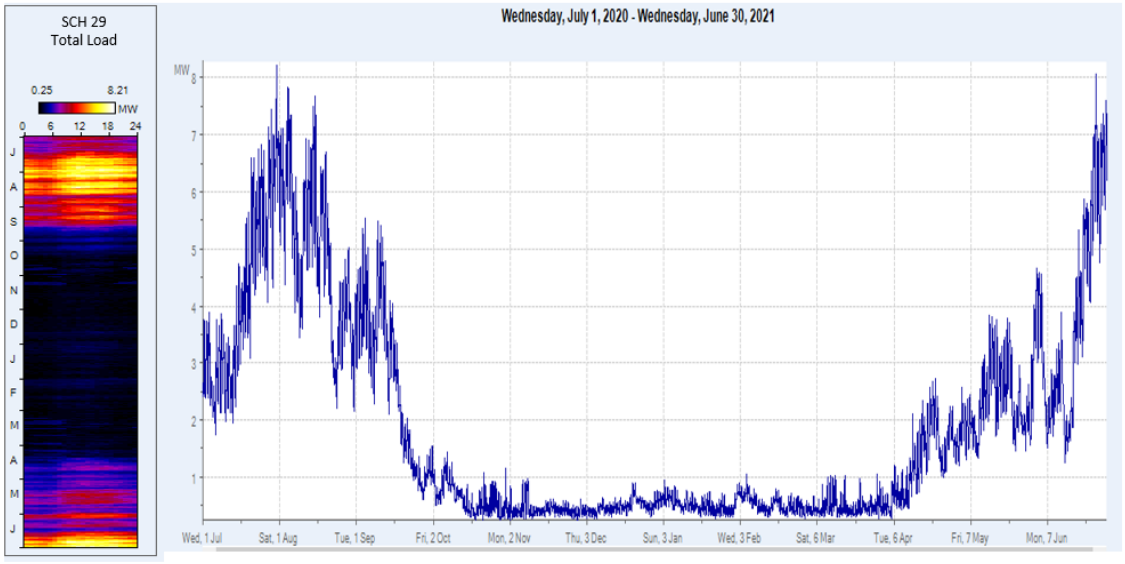


Figure 23 presents the total Seasonal Irrigation Rate Schedule 29 loads during the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. The class had a system peak hour load of about 396 kW or 4.8% of its July peak of 8.2 MW.

Figure 23 – Schedule 29: Total Load during System Peak Week

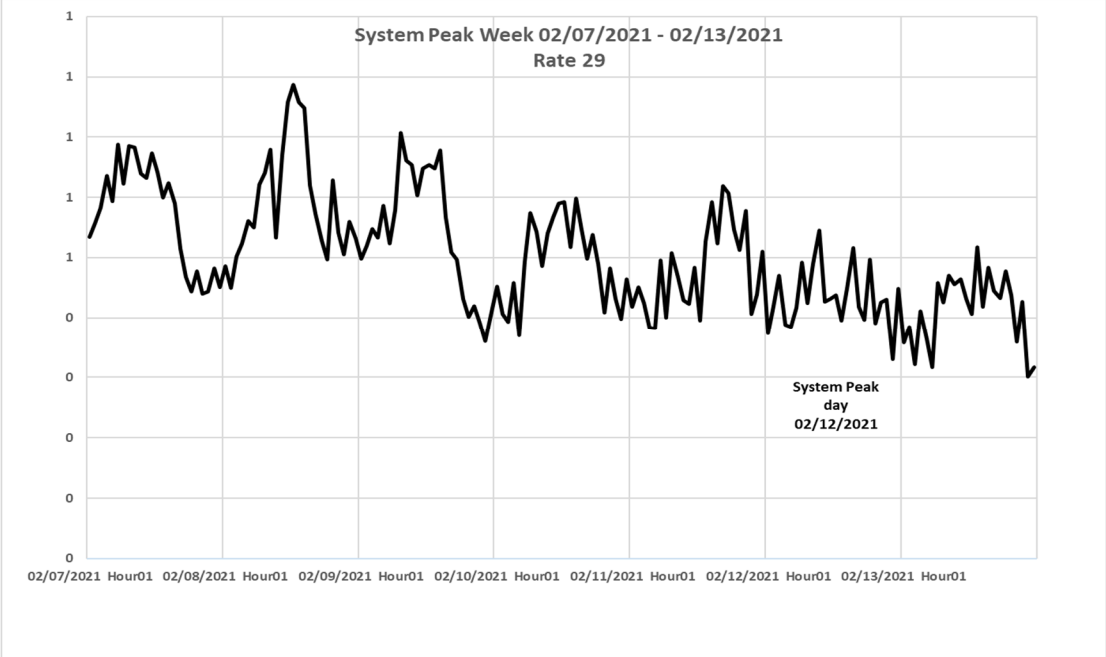
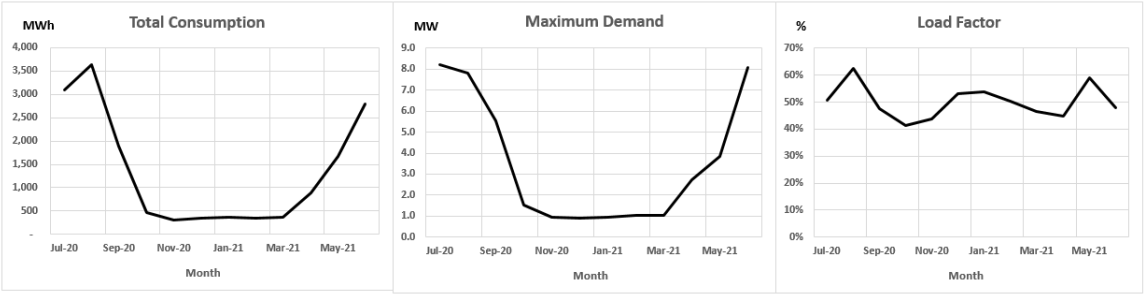


Figure 24 shows the monthly Schedule 29 class energy consumption, peak demand and load factor in graphics. The Seasonal Irrigation and Pumping Service load is highest during the summer months.

Figure 24 –Schedule 29: Class Monthly Energy, Demand and Load Factor



For Schedule 29, the sum of estimated hourly loads net of losses for the 12 months ending June 2021 was 14,903 MWh, 2.55% lower than the actual class sales of 15,294 MWh. The error margin is again below the tolerated threshold.

Table 21 presents summary statistics for the Seasonal Irrigation and Pumping Service load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. Monthly load factors range from a low of 41.2% in October, 2020 to a high of 62.5% in August, 2020. Seasonal Irrigation load is highly coincident with the system peak during the months of June, July, August, and September with a coincidence factor over 75% in each of these months.

Table 21 – Schedule 29 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	3,097,480	Thursday, July 30, 2020	17:00	8,214	4,163	50.7%	Monday, July 27, 2020	18:00	6,422	78.2%
Aug-20	3,637,260	Tuesday, August 4, 2020	11:00	7,826	4,889	62.5%	Monday, August 17, 2020	18:00	5,995	76.6%
Sep-20	1,898,340	Friday, September 4, 2020	17:00	5,546	2,637	47.5%	Thursday, September 10, 2020	18:00	5,299	95.5%
Oct-20	475,397	Thursday, October 1, 2020	17:00	1,550	639	41.2%	Monday, October 26, 2020	9:00	468	30.2%
Nov-20	305,298	Monday, November 9, 2020	7:00	968	424	43.8%	Monday, November 9, 2020	9:00	702	72.5%
Dec-20	354,449	Monday, December 21, 2020	16:00	899	476	53.0%	Wednesday, December 23, 2020	18:00	644	71.7%
Jan-21	374,135	Sunday, January 3, 2021	12:00	935	503	53.8%	Tuesday, January 26, 2021	18:00	491	52.5%
Feb-21	355,770	Friday, February 5, 2021	12:00	1,049	529	50.5%	Friday, February 12, 2021	18:00	396	37.8%
Mar-21	359,763	Tuesday, March 30, 2021	8:00	1,039	484	46.5%	Tuesday, March 16, 2021	9:00	454	43.7%
Apr-21	883,559	Thursday, April 22, 2021	17:00	2,733	1,227	44.9%	Monday, April 5, 2021	9:00	919	33.6%
May-21	1,678,732	Friday, May 14, 2021	13:00	3,831	2,256	58.9%	Friday, May 7, 2021	10:00	2,012	52.5%
Jun-21	2,789,983	Saturday, June 26, 2021	11:00	8,076	3,875	48.0%	Monday, June 28, 2021	17:00	6,823	84.5%
Annual	16,210,164	Annual Class Peak		8,214	1,850	22.5%	Annual System CP		396	4.8%
		Average 12 Monthly NCPs		3,555		52.0%	Average 12 Monthly CPs		2,552	71.8%
		Average Top 12 NCPs		7,781		23.8%	Average Top 12 CPs		1,556	20.0%
		Average Top 75 NCPs		7,307		25.3%	Average Top 75 CPs		1,280	17.5%
		Average Top 200 NCPs		6,984		26.5%	Average Top 200 CPs		1,040	14.9%
							Average 4CPs *		558	

* Monthly CPs for November, December, January and February

Table 22 presents the data on an average-per-customer basis. The average annual use per customer in Rate Schedule 29 is 26,578 kWh with annual average peak demand of 13.47 kW.

Table 22 – Schedule 29 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	4,751	Thursday, July 30, 2020	17:00	12.60	6.39	50.7%	Monday, July 27, 2020	18:00	9.85	78.2%
Aug-20	5,381	Tuesday, August 4, 2020	11:00	11.58	7.23	62.5%	Monday, August 17, 2020	18:00	8.87	76.6%
Sep-20	2,796	Friday, September 4, 2020	17:00	8.17	3.88	47.5%	Thursday, September 10, 2020	18:00	7.80	95.5%
Oct-20	752	Thursday, October 1, 2020	17:00	2.45	1.01	41.2%	Monday, October 26, 2020	9:00	0.74	30.2%
Nov-20	523	Monday, November 9, 2020	7:00	1.66	0.73	43.8%	Monday, November 9, 2020	9:00	1.20	72.5%
Dec-20	635	Monday, December 21, 2020	16:00	1.61	0.85	53.0%	Wednesday, December 23, 2020	18:00	1.15	71.7%
Jan-21	672	Sunday, January 3, 2021	12:00	1.68	0.90	53.8%	Tuesday, January 26, 2021	18:00	0.88	52.5%
Feb-21	638	Friday, February 5, 2021	12:00	1.88	0.95	50.5%	Friday, February 12, 2021	18:00	0.71	37.8%
Mar-21	642	Tuesday, March 30, 2021	8:00	1.86	0.86	46.5%	Tuesday, March 16, 2021	9:00	0.81	43.7%
Apr-21	1,485	Thursday, April 22, 2021	17:00	4.59	2.06	44.9%	Monday, April 5, 2021	9:00	1.54	33.6%
May-21	2,648	Friday, May 14, 2021	13:00	6.04	3.56	58.9%	Friday, May 7, 2021	10:00	3.17	52.5%
Jun-21	4,401	Saturday, June 26, 2021	11:00	12.74	6.11	48.0%	Monday, June 28, 2021	17:00	10.76	84.5%
Annual	26,578	Annual Class Peak		13.47	3.03	22.5%	Annual System CP		0.65	4.8%

3.8 Schedules 10 & 31 Primary General Service

The historical sample data was expanded to the population level by post-stratifying the data available for Schedules 10 & 31 Large Primary General Service class. Table 23 presents the post-stratification used in the sample expansion analysis.

Table 23 – Schedules 10 & 31: Post-Stratification

Schedule 31			
Maximum kWh	N(h)	n(h)	Case Weights
Commercial Customers			
2,246,565	263	44	5.98
6,966,400	65	31	2.10
28,274,640	24	7	3.43
Total	352	82	11.50
Industrial Customer			
5,402,880	88	19	4.63
12,208,125	19	10	1.90
31,006,866	10	4	2.50
Total	117	33	9.03

In the next step, the average loss factor estimated for the primary voltage general service class was applied to the hourly expansions to produce the class hourly load profile. According to Table 4, the estimated average loss factor for Schedules 10 & 31 is 3.79%. Finally, the unaccounted for energy (UFE) was allocated to the Schedules 10 & 31 in proportion to preliminary estimate of its contribution to the system demand on an hourly basis.

Figure 25 presents the total load for the Schedules 10 & 31 class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. An overall consistency of the load throughout the year is clearly visible in the EnergyPrint. The Schedules 10 & 31 class peak occurred on Monday, July 20, 2020 at 12 PM. The class peak demand was 222.2 MW.

Figure 25 – Schedules 10 & 31 Class Total Load

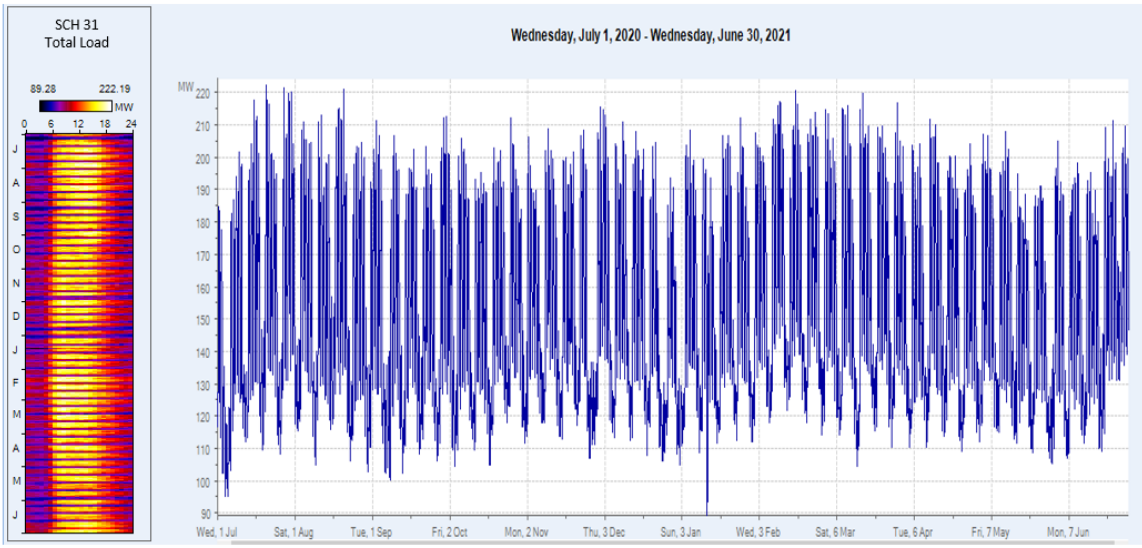


Figure 26 presents Schedules 10 & 31 class load during the system peak eek of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. The class had a system peak hour load of 178.9 MW or 80.5% of the July class peak demand of 222.2 MW.

Figure 26 – Schedules 10 & 31: Total Load during System Peak Week

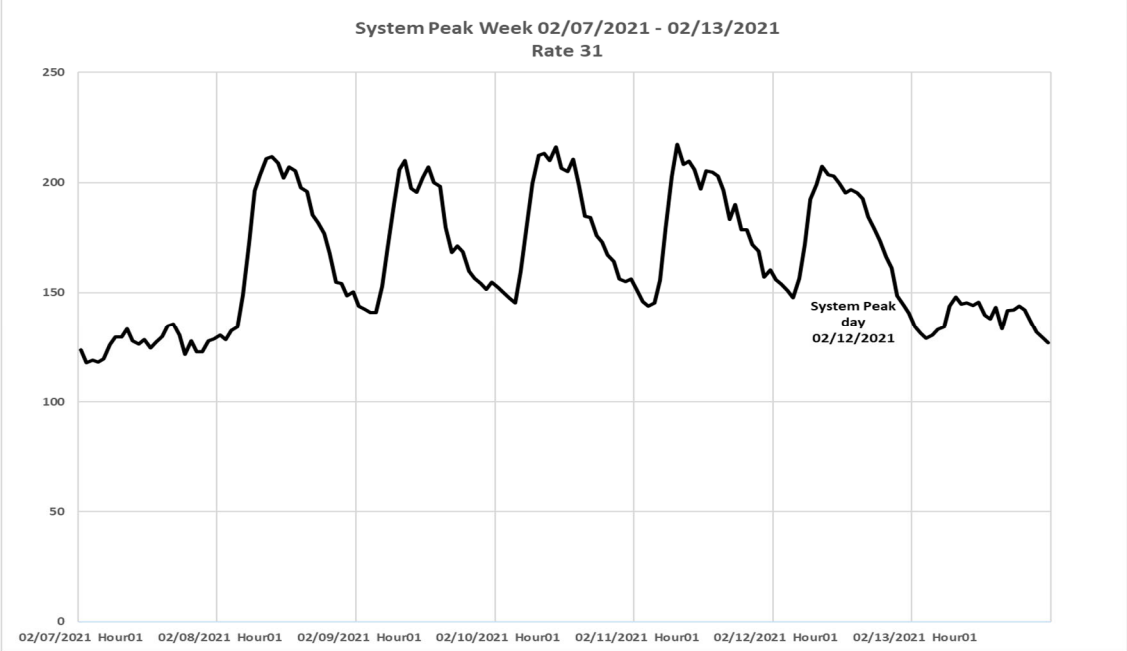
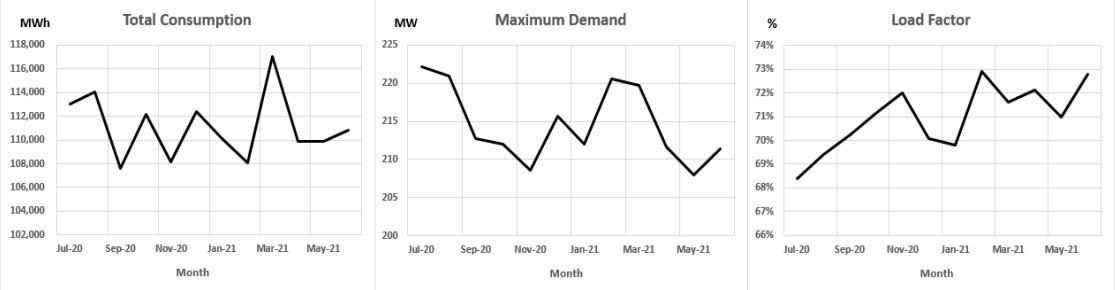


Figure 27 presents the monthly Schedules 10 & 31 class energy consumption, peak demand and load factor in graphics. Total monthly consumption as well as peak consumption fluctuate from month to month. Monthly load factor varies from a low of 68.4% in July, 2020 to a high of 72.8% in June, 2021.

Figure 27 – Schedules 10 & 31: Class Monthly Energy, Demand and Load Factor



Achieved precision of the Primary General Service class analysis is reflected in the difference between the sum of the estimated class hourly loads net of losses and the total actual sales to the class in the study period. The sum of estimated hourly loads net of losses was 1,282,879 MWh, 2.06% lower than the actual class sales of 1,309,927 MWh. The percentage of error is less than the maximum error margin of ±10% accepted in a typical load research practice.

Table 24 presents summary statistics for the Schedules 10 & 31 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The Schedules 10 & 31 load is fairly coincident with the system peak displaying a system peak coincidence factor of over 80% for 10 of the 12 months.

Table 24 – Schedules 10 & 31 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	113,040,930	Monday, July 20, 2020	12:00	222,186	151,937	68.4%	Monday, July 27, 2020	18:00	185,040	83.3%
Aug-20	114,078,371	Thursday, August 20, 2020	14:00	220,923	153,331	69.4%	Monday, August 17, 2020	18:00	185,764	84.1%
Sep-20	107,585,018	Wednesday, September 30, 2020	14:00	212,767	149,424	70.2%	Thursday, September 10, 2020	18:00	181,017	85.1%
Oct-20	112,190,849	Monday, October 26, 2020	9:00	212,014	150,794	71.1%	Monday, October 26, 2020	9:00	212,014	100.0%
Nov-20	108,193,958	Tuesday, November 10, 2020	9:00	208,632	150,269	72.0%	Monday, November 9, 2020	9:00	201,875	96.8%
Dec-20	112,440,525	Tuesday, December 1, 2020	9:00	215,700	151,130	70.1%	Wednesday, December 23, 2020	18:00	157,248	72.9%
Jan-21	110,120,630	Tuesday, January 26, 2021	9:00	212,041	148,012	69.8%	Tuesday, January 26, 2021	18:00	164,569	77.6%
Feb-21	108,115,957	Wednesday, February 17, 2021	9:00	220,630	160,887	72.9%	Friday, February 12, 2021	18:00	178,913	81.1%
Mar-21	117,054,008	Tuesday, March 16, 2021	8:00	219,701	157,331	71.6%	Tuesday, March 16, 2021	9:00	214,463	97.6%
Apr-21	109,925,021	Monday, April 12, 2021	9:00	211,620	152,674	72.1%	Monday, April 5, 2021	9:00	203,703	96.3%
May-21	109,858,996	Wednesday, May 12, 2021	15:00	207,968	147,660	71.0%	Friday, May 7, 2021	10:00	176,429	84.8%
Jun-21	110,810,765	Thursday, June 24, 2021	14:00	211,416	153,904	72.8%	Monday, June 28, 2021	17:00	188,823	89.3%
Annual	1,333,415,027	Annual Class Peak		222,186	152,216	68.5%	Annual System CP		178,913	80.5%
		Average 12 Monthly NCPs		214,633		70.9%	Average 12 Monthly CPs		187,488	87.4%
		Average Top 12 NCPs		220,707		69.0%	Average Top 12 CPs		188,051	85.2%
		Average Top 75 NCPs		214,397		71.0%	Average Top 75 CPs		178,170	83.1%
		Average Top 200 NCPs		209,961		72.5%	Average Top 200 CPs		175,759	83.7%
							Average 4CPs *		175,651	

* Monthly CPs for November, December, January and February

Table 25 presents the data on an average-per-customer basis. For a Schedules 10 & 31, the average use per customer is 2,728,680 kWh with annual average peak demand of 454.68 kW.

Table 25 – Schedules 10 & 31 Customer: Summary Statistics (Means – kW)

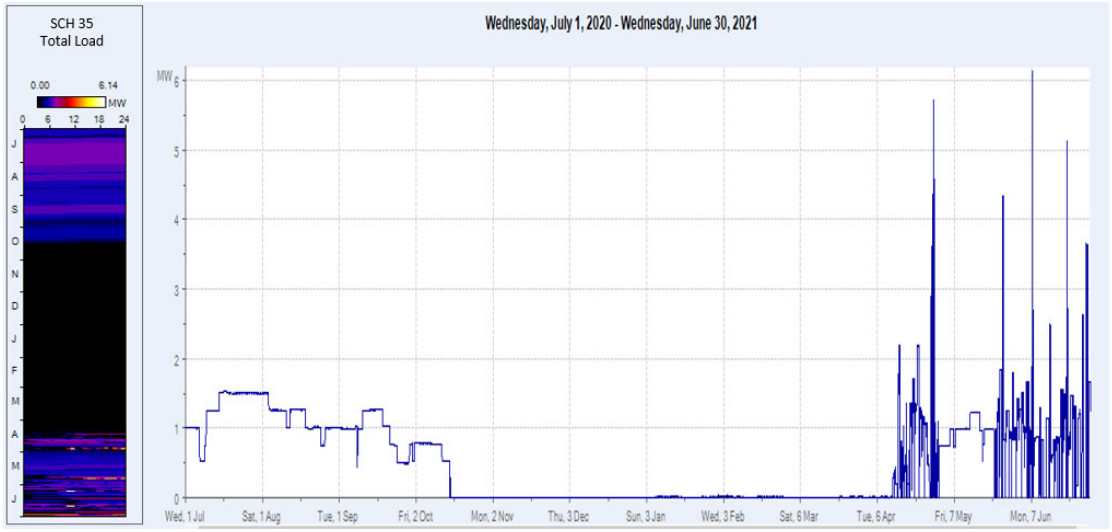
		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	234,039	Monday, July 20, 2020	12:00	460.01	314.57	68.4%	Monday, July 27, 2020	18:00	383.11	83.3%
Aug-20	235,699	Thursday, August 20, 2020	14:00	456.45	316.80	69.4%	Monday, August 17, 2020	18:00	383.81	84.1%
Sep-20	222,283	Wednesday, September 30, 2020	14:00	439.60	308.73	70.2%	Thursday, September 10, 2020	18:00	374.00	85.1%
Oct-20	228,961	Monday, October 26, 2020	9:00	432.68	307.74	71.1%	Monday, October 26, 2020	9:00	432.68	100.0%
Nov-20	221,256	Tuesday, November 10, 2020	9:00	426.65	307.30	72.0%	Monday, November 9, 2020	9:00	412.83	96.8%
Dec-20	229,940	Tuesday, December 1, 2020	9:00	441.10	309.06	70.1%	Wednesday, December 23, 2020	18:00	321.57	72.9%
Jan-21	223,368	Tuesday, January 26, 2021	9:00	430.10	300.23	69.8%	Tuesday, January 26, 2021	18:00	333.81	77.6%
Feb-21	220,645	Wednesday, February 17, 2021	9:00	450.26	328.34	72.9%	Friday, February 12, 2021	18:00	365.13	81.1%
Mar-21	238,886	Tuesday, March 16, 2021	8:00	448.37	321.08	71.6%	Tuesday, March 16, 2021	9:00	437.68	97.6%
Apr-21	224,337	Monday, April 12, 2021	9:00	431.88	311.58	72.1%	Monday, April 5, 2021	9:00	415.72	96.3%
May-21	223,745	Wednesday, May 12, 2021	15:00	423.56	300.73	71.0%	Friday, May 7, 2021	10:00	359.33	84.8%
Jun-21	225,684	Thursday, June 24, 2021	14:00	430.58	313.45	72.8%	Monday, June 28, 2021	17:00	384.57	89.3%
Annual	2,728,680	Annual Class Peak		454.68	311.49	68.5%	Annual System CP		366.12	80.5%

3.9 Schedule 35 Primary Seasonal Irrigation

The Schedule 35 Primary Seasonal Irrigation is one of the deemed profiles with almost 99% of its interval load data available and hence this data did not go through a population expansion process. The estimated average loss factor applied to the class load is 3.71%, according to Table 4.

Figure 28 presents the total load for the Schedule 35 class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. The dominance of the summer seasonal load is obvious with almost no load during the winter months. The Schedule 35 class peak occurred on Monday, June 07, 2021 at 11 AM. The class peak demand was 6.1 MW.

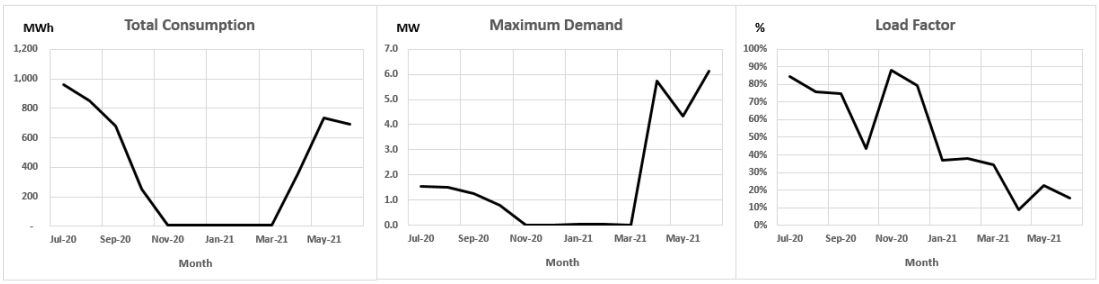
Figure 28 – Schedule 35: Class Total Load



There was almost no demand during the system peak week of February 7 – February 13, 2021, hence not displayed.

Figure 29 presents the monthly Schedule 35 class energy consumption, peak demand and load factor in graphics. As shown in the graphs, Schedule 35 load is highly summer seasonal with virtually no load during the winter period.

Figure 29 – Schedule 35: Class Monthly Energy, Demand and Load Factors



Since population data are available for all customers and they are all reconciled with the total sales, the precision is perfect for this class.

Table 26 presents summary statistics for the Schedule 35 class. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The class displays virtually no load in the winter months therefore the class load at the system peak was merely 9 kW.

Table 26 – Schedule 35 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	959,556	Friday, July 17, 2020	3:00	1,532	1,290	84.2%	Monday, July 27, 2020	18:00	1,499	97.9%
Aug-20	848,387	Sunday, August 2, 2020	5:00	1,504	1,140	75.8%	Monday, August 17, 2020	18:00	1,261	83.8%
Sep-20	679,084	Thursday, September 17, 2020	4:00	1,266	943	74.5%	Thursday, September 10, 2020	18:00	1,251	98.8%
Oct-20	253,044	Thursday, October 1, 2020	11:00	783	340	43.5%	Monday, October 26, 2020	9:00	9	1.1%
Nov-20	6,256	Tuesday, November 3, 2020	12:00	10	9	87.9%	Monday, November 9, 2020	9:00	10	96.1%
Dec-20	6,338	Tuesday, December 22, 2020	17:00	11	9	79.3%	Wednesday, December 23, 2020	18:00	8	72.3%
Jan-21	9,105	Sunday, January 31, 2021	24:00	33	12	37.2%	Tuesday, January 26, 2021	18:00	30	91.3%
Feb-21	10,261	Thursday, February 4, 2021	11:00	40	15	38.1%	Friday, February 12, 2021	18:00	9	23.3%
Mar-21	4,906	Monday, March 22, 2021	2:00	19	7	34.6%	Tuesday, March 16, 2021	9:00	5	25.8%
Apr-21	356,622	Wednesday, April 28, 2021	12:00	5,726	495	8.6%	Monday, April 5, 2021	9:00	1	0.0%
May-21	733,040	Wednesday, May 26, 2021	16:00	4,341	985	22.7%	Friday, May 7, 2021	10:00	734	16.9%
Jun-21	690,099	Monday, June 7, 2021	11:00	6,140	958	15.6%	Monday, June 28, 2021	17:00	0	0.0%
Annual	4,556,697	Annual Class Peak		6,140	520	8.5%	Annual System CP		9	0.2%
		Average 12 Monthly NCPs		1,784		29.2%	Average 12 Monthly CPs		401	22.5%
		Average Top 12 NCPs		4,849		10.7%	Average Top 12 CPs		7	0.2%
		Average Top 75 NCPs		3,188		16.3%	Average Top 75 CPs		8	0.3%
		Average Top 200 NCPs		2,314		22.5%	Average Top 200 CPs		81	3.5%
							Average 4CPs *		14	

* Monthly CPs for November, December, January and February

Although currently two customers are served under the Primary Seasonal Irrigation class, because of the dominance of one customer no summary table is presented on a per-customer basis.

3.10 Schedule 43 Interruptible Primary Service for Electric Schools

The historical sample data was expanded to the population level by post-stratifying the data available for the Schedule 43 Interruptible Primary Service for Electric Schools class. Table 27 presents the post-stratification used in the sample expansion analysis.

Table 27 – Schedule 43: Post-Stratification

Schedule 43			
Maximum kWh	N(h)	n(h)	Case Weights
All Customers			
572,775	75	16	4.69
1,153,160	47	13	3.62
6,048,638	23	14	1.64
Total	145	43	9.95

In the second step, the average loss factor estimated for Schedule 43 was applied to the hourly expansion. As stated in Table 4, the estimated average loss factor is 3.75%.

Figure 30 presents the total load for the Schedule 43 class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. The dominance of the winter seasonal load and the summer shut-down of schools are clearly evident. The Schedule 43 class peak occurred on Tuesday, March 30, 2020 at 9 AM. The class peak demand was 45.1 MW.

Figure 30 – Schedule 43: Class Total Load

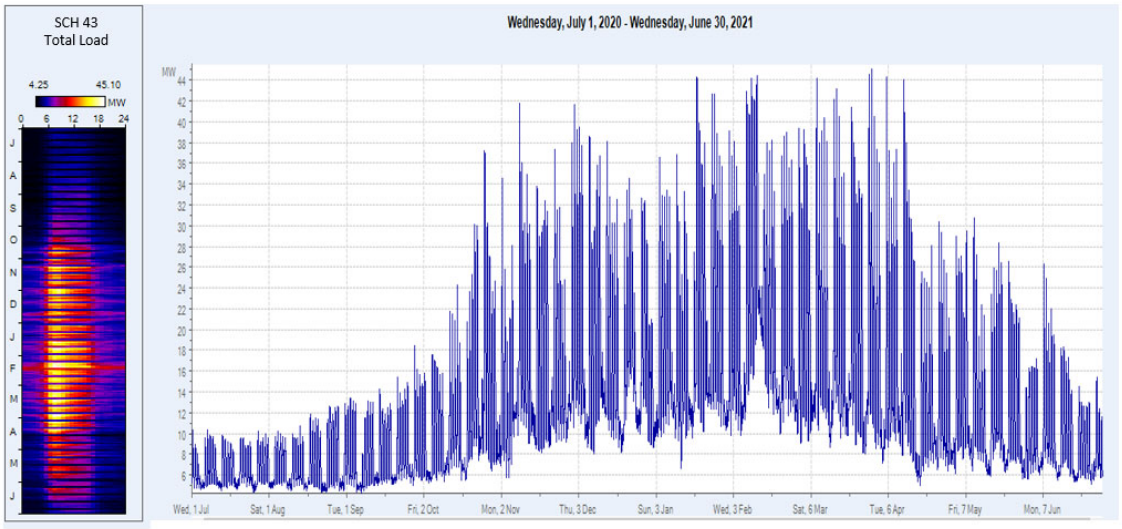
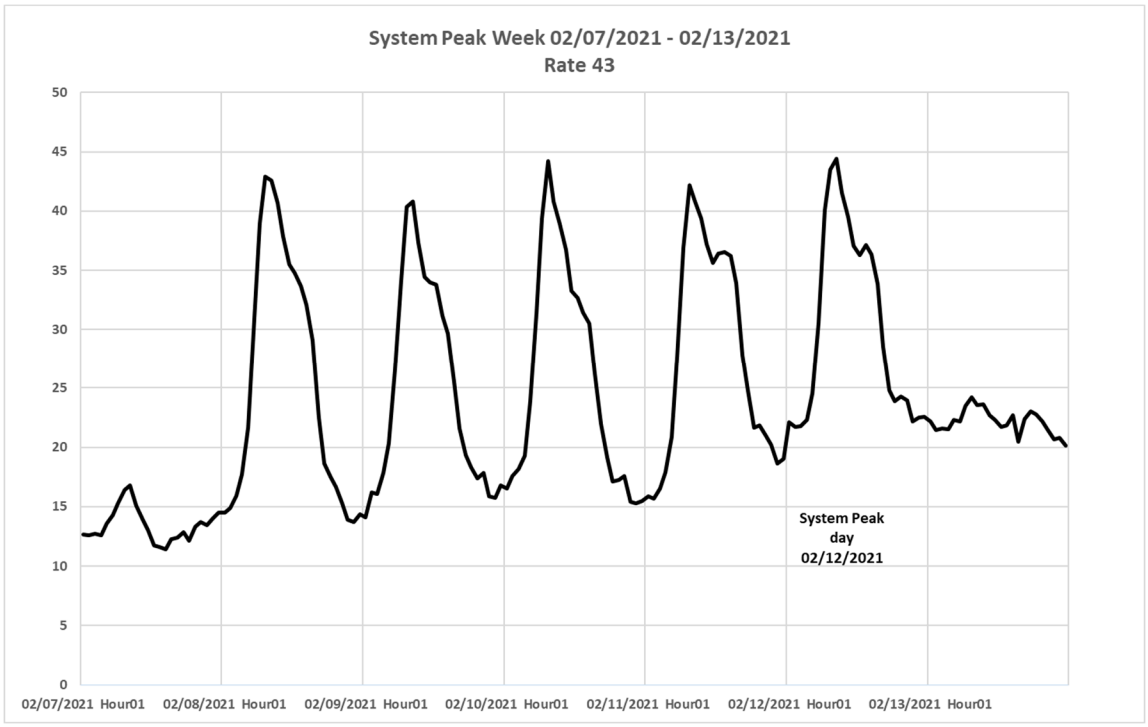


Figure 31 presents the total Schedule 43 load during the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. The class had a system peak hour load of 24.8 MW or 55.0% of the class peak demand of 45.1 MW.

Figure 31 – Schedule 43: Total Load during System Peak Week

Figure 32 presents the monthly Schedule 43 class energy consumption, peak demand and load factor in graphics. As shown in the graphs, the Interruptible Primary Service load of all-electric schools is highly seasonal with electric space-heating load in the winter months. The loads in July and August are substantially lower, reflecting the annual summer break at schools.

Figure 32 – Schedule 43: Class Monthly Energy, Demand and Load Factor



Achieved precision of the Interruptible Primary Service class analysis can be evaluated in terms of the difference between the sum of the estimated class hourly loads net of losses for the study period and the total actual sales to the class in the same period. The sum of estimated hourly loads net of losses was 109,908 MWh, 2.01% lower than the actual class sales of 112,162 MWh. The percentage of error is substantially lower than the maximum tolerable error margin of ±10% allowed in a typical load research practice.

Table 28 presents summary statistics for the Schedule 43 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by

the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The monthly NCP load factor tends to be low and ranges from a low of 30% in October, 2020 to a high of 63% in July, 2020. The system coincidence factors fluctuate from 39.5% in December 2020 to 100.0% in November.

Table 28 – Schedule 43 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	4,796,817	Tuesday, July 7, 2020	9:00	10,305	6,447	63%	Monday, July 27, 2020	18:00	7,428	72.1%
Aug-20	5,047,591	Monday, August 31, 2020	10:00	12,889	6,784	53%	Monday, August 17, 2020	18:00	8,186	63.5%
Sep-20	5,680,304	Monday, September 28, 2020	8:00	18,459	7,889	43%	Thursday, September 10, 2020	18:00	8,713	47.2%
Oct-20	8,214,890	Monday, October 26, 2020	8:00	37,154	11,042	30%	Monday, October 26, 2020	9:00	36,762	98.9%
Nov-20	11,293,740	Monday, November 9, 2020	9:00	41,804	15,686	38%	Monday, November 9, 2020	9:00	41,804	100.0%
Dec-20	12,863,712	Tuesday, December 1, 2020	9:00	41,685	17,290	41%	Wednesday, December 23, 2020	18:00	16,478	39.5%
Jan-21	13,091,197	Tuesday, January 19, 2021	9:00	44,315	17,596	40%	Tuesday, January 26, 2021	18:00	18,017	40.7%
Feb-21	13,839,086	Friday, February 12, 2021	9:00	44,396	20,594	46%	Friday, February 12, 2021	18:00	24,819	55.9%
Mar-21	13,642,068	Tuesday, March 30, 2021	9:00	45,104	18,336	41%	Tuesday, March 16, 2021	9:00	41,663	92.4%
Apr-21	10,128,016	Monday, April 5, 2021	8:00	44,271	14,067	32%	Monday, April 5, 2021	9:00	40,802	92.2%
May-21	8,731,547	Monday, May 10, 2021	8:00	30,714	11,736	38%	Friday, May 7, 2021	10:00	27,518	89.6%
Jun-21	6,861,763	Monday, June 7, 2021	8:00	26,346	9,530	36%	Monday, June 28, 2021	17:00	12,251	46.5%
Annual	114,190,732	Annual Class Peak		45,104	13,035	29%	Annual System CP		24,819	55.0%
		Average 12 Monthly NCPs		33,120		39%	Average 12 Monthly CPs		23,703	71.6%
		Average Top 12 NCPs		44,158		30%	Average Top 12 CPs		27,249	61.7%
		Average Top 75 NCPs		40,988		32%	Average Top 75 CPs		26,535	64.7%
		Average Top 200 NCPs		38,178		34%	Average Top 200 CPs		25,290	66.2%
							Average 4CPs *		25,280	

* Monthly CPs for November, December, January and February

Table 29 presents the data on an average-per-customer basis. The annual average use per customer for Schedule 43 is estimated to be 782,128 kWh with annual average peak demand of 308.93 kW.

Table 29 – Schedule 43 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	32,855	Tuesday, July 7, 2020	9:00	70.58	44.16	62.6%	Monday, July 27, 2020	18:00	50.88	72.1%
Aug-20	34,573	Monday, August 31, 2020	10:00	88.28	46.47	52.6%	Monday, August 17, 2020	18:00	56.07	63.5%
Sep-20	38,906	Monday, September 28, 2020	8:00	126.43	54.04	42.7%	Thursday, September 10, 2020	18:00	59.68	47.2%
Oct-20	56,266	Monday, October 26, 2020	8:00	254.48	75.63	29.7%	Monday, October 26, 2020	9:00	251.80	98.9%
Nov-20	77,354	Monday, November 9, 2020	9:00	286.33	107.44	37.5%	Monday, November 9, 2020	9:00	286.33	100.0%
Dec-20	88,108	Tuesday, December 1, 2020	9:00	285.51	118.42	41.5%	Wednesday, December 23, 2020	18:00	112.86	39.5%
Jan-21	89,666	Tuesday, January 19, 2021	9:00	303.53	120.52	39.7%	Tuesday, January 26, 2021	18:00	123.40	40.7%
Feb-21	94,788	Friday, February 12, 2021	9:00	304.08	141.05	46.4%	Friday, February 12, 2021	18:00	170.00	55.9%
Mar-21	93,439	Tuesday, March 30, 2021	9:00	308.93	125.59	40.7%	Tuesday, March 16, 2021	9:00	285.36	92.4%
Apr-21	69,370	Monday, April 5, 2021	8:00	303.22	96.35	31.8%	Monday, April 5, 2021	9:00	279.46	92.2%
May-21	59,805	Monday, May 10, 2021	8:00	210.37	80.38	38.2%	Friday, May 7, 2021	10:00	188.48	89.6%
Jun-21	46,998	Monday, June 7, 2021	8:00	180.45	65.28	36.2%	Monday, June 28, 2021	17:00	83.91	46.5%
Annual	782,128	Annual Class Peak		308.93	89.28	28.9%	Annual System CP		170.00	55.0%

3.11 Schedule 46 High Voltage Interruptible Service

Since the 15-minute interval load data are available for all of the loads on Schedule 46, the Schedule 46 High Voltage Interruptible Service class hourly loads were calculated on the basis of the actual interval load data collected for population. Finally, the average loss factor estimated for the high voltage interruptible service was applied to the hourly loads. Table 4 shows that the estimated average loss factor is 1.74%.

Figure 33 presents the total load for the Schedule 46 class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. No significant seasonality is observed with this class load. The Schedule 46 class peak occurred on Thursday July 23, 2020 at 3 PM. The class peak demand was 20.2 MW.

Figure 33 – Schedule 46: Class Total Load

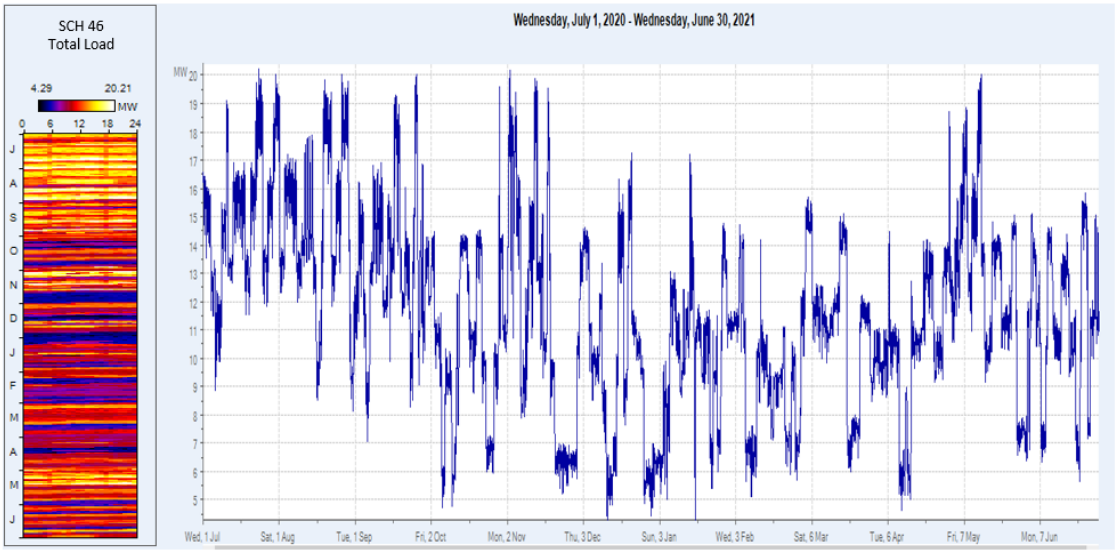


Figure 34 presents the total Schedule 46 class load for the system peak week of Sunday, February

7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. The class had a system peak hour load of 9 MW, or 44.7% of the July class peak demand of 20.2 MW.

Figure 34 – Schedule 46: Total Load during System Peak Week

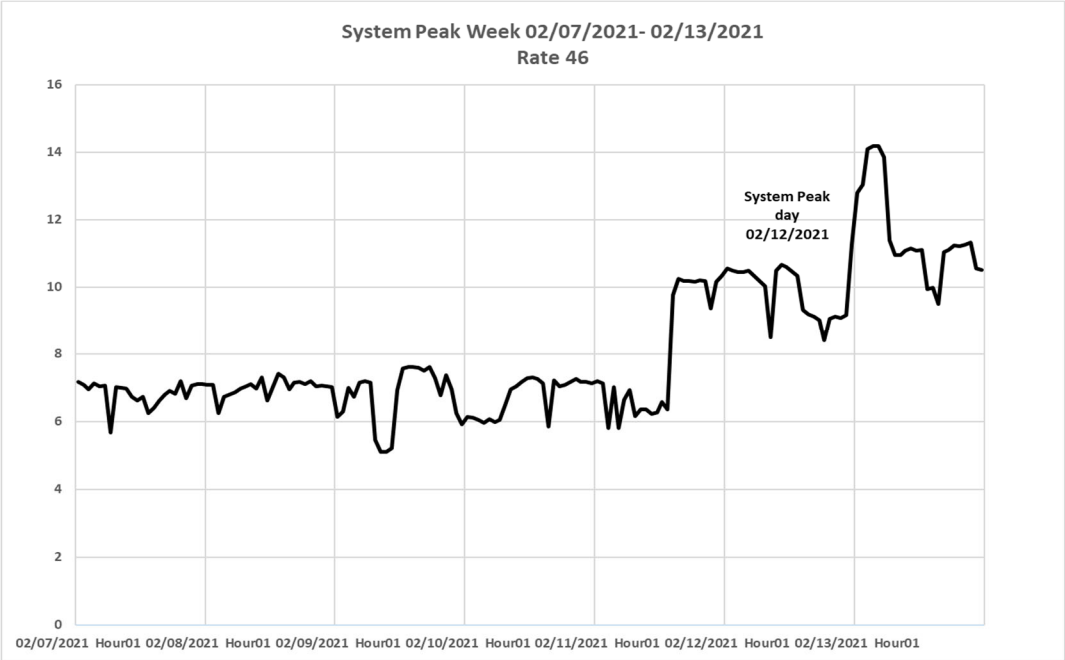
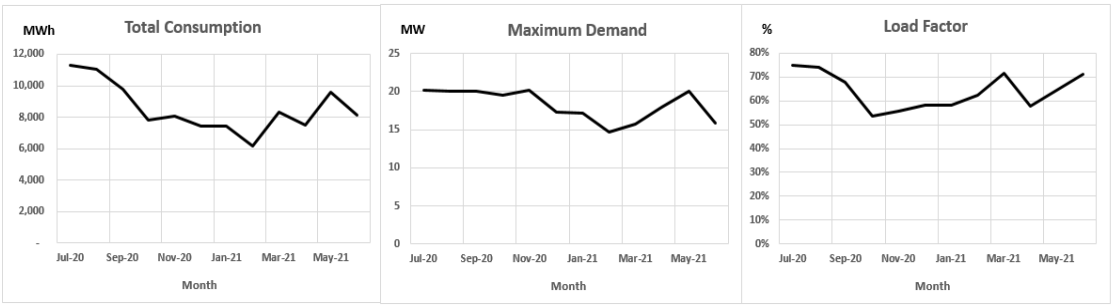


Figure 35 shows the monthly energy consumption, peak demand and load factor of the Schedule 46 class in graphics. As illustrated in the graphs, the interruptible high voltage service load of Schedule 46 tends to have slightly higher load in the summer than in the winter,

Figure 35 – Schedule 46: Class Monthly Energy, Demand and Load Factor



The achieved precision is expected to be perfect since the interval load data for all of the customers in this rate class were available for the full twelve-month period examined.

Table 30 presents summary statistics for the Schedule 46 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class

peaks and the class loads at top 12, 75 and 200 system peak hours. The class displays some volatility in its monthly energy use and peak demand. The monthly class load factors range from a low of 53.6% in October, 2020 to a high of 75.0% in July, 2020. The load is rarely coincident with the system peak with a coincidence factor over 70% for only 1 of the 12 months.

Table 30 – Schedule 46 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	11,271,284	Thursday, July 23, 2020	15:00	20,211	15,150	75.0%	Monday, July 27, 2020	18:00	13,066	64.6%
Aug-20	11,030,149	Wednesday, August 26, 2020	13:00	20,019	14,825	74.1%	Monday, August 17, 2020	18:00	10,220	51.1%
Sep-20	9,759,759	Saturday, September 26, 2020	2:00	20,025	13,555	67.7%	Thursday, September 10, 2020	18:00	12,971	64.8%
Oct-20	7,808,912	Thursday, October 29, 2020	19:00	19,566	10,496	53.6%	Monday, October 26, 2020	9:00	6,821	34.9%
Nov-20	8,081,291	Tuesday, November 3, 2020	3:00	20,178	11,224	55.6%	Monday, November 9, 2020	9:00	11,123	55.1%
Dec-20	7,460,239	Tuesday, December 22, 2020	12:00	17,253	10,027	58.1%	Wednesday, December 23, 2020	18:00	11,292	65.4%
Jan-21	7,463,901	Friday, January 15, 2021	9:00	17,217	10,032	58.3%	Tuesday, January 26, 2021	18:00	6,732	39.1%
Feb-21	6,176,503	Thursday, February 4, 2021	15:00	14,700	9,191	62.5%	Friday, February 12, 2021	18:00	9,025	61.4%
Mar-21	8,349,617	Thursday, March 4, 2021	14:00	15,695	11,223	71.5%	Tuesday, March 16, 2021	9:00	11,776	75.0%
Apr-21	7,494,206	Friday, April 30, 2021	24:00	17,961	10,409	58.0%	Monday, April 5, 2021	9:00	10,247	57.1%
May-21	9,574,095	Thursday, May 13, 2021	23:00	20,003	12,868	64.3%	Friday, May 7, 2021	10:00	17,597	88.0%
Jun-21	8,125,252	Friday, June 25, 2021	11:00	15,833	11,285	71.3%	Monday, June 28, 2021	17:00	9,997	63.1%
Annual	102,595,208	Annual Class Peak		20,211	11,712	57.9%	Annual System CP		9,025	44.7%
		Average 12 Monthly NCPs		18,222		64.3%	Average 12 Monthly CPs		10,906	59.8%
		Average Top 12 NCPs		20,015		58.5%	Average Top 12 CPs		9,870	49.3%
		Average Top 75 NCPs		19,661		59.6%	Average Top 75 CPs		9,614	48.9%
		Average Top 200 NCPs		19,326		60.6%	Average Top 200 CPs		9,529	49.3%
							Average 4CPs *		9,543	

* Monthly CPs for November, December, January and February

Since only six customers are served under the Interruptible High Voltage Service rate, no summary table is presented on a per-customer basis.

3.12 Schedule 49 High Voltage General Service

Since all of the customers in the High Voltage General Service class are metered with interval load readings, the entire load data for the class was used for the class hourly load profiling. The average loss factor estimated for the class was applied to the hourly loads. Table 4 shows that the estimated average loss factor is 1.73%.

Figure 36 presents the results for the Schedule 49 class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. The annual load profile does not show much seasonality across months. The Schedule 49 class peak occurred on Thursday, August 27, 2020 at 1 PM. The class peak demand was 74.4 MW. .

Figure 36 – Schedule 49: Class Total Load

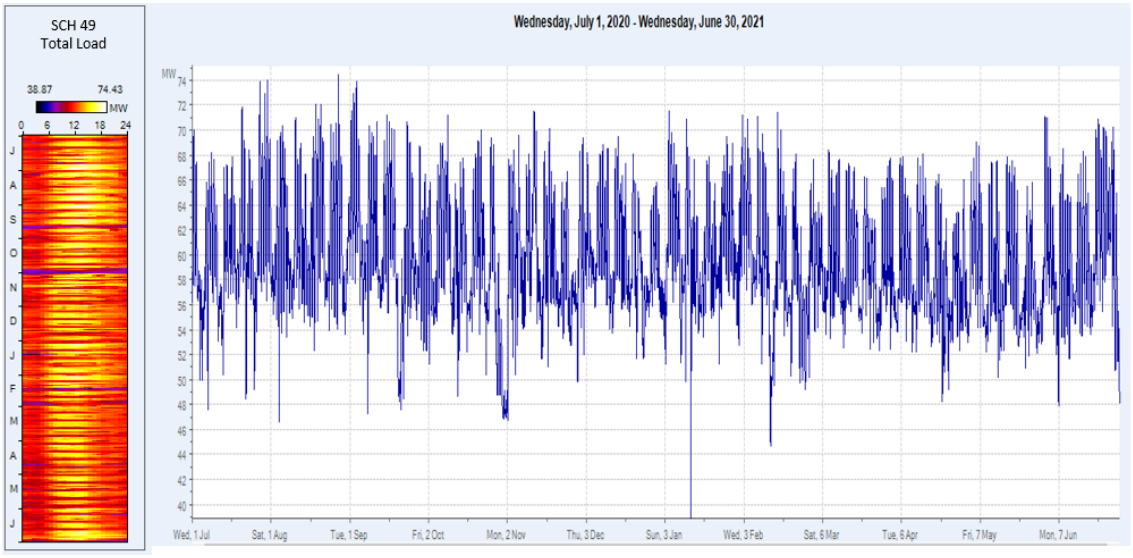


Figure 37 presents the total Schedule 49 class load for the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peaked on Friday, February 12 at 6 PM. The class had a system peak hour load of 61.0 MW or 82.0% of the July class peak demand of 74.4 MW.

Figure 37 – Schedule 49: Total Load during System Peak Week

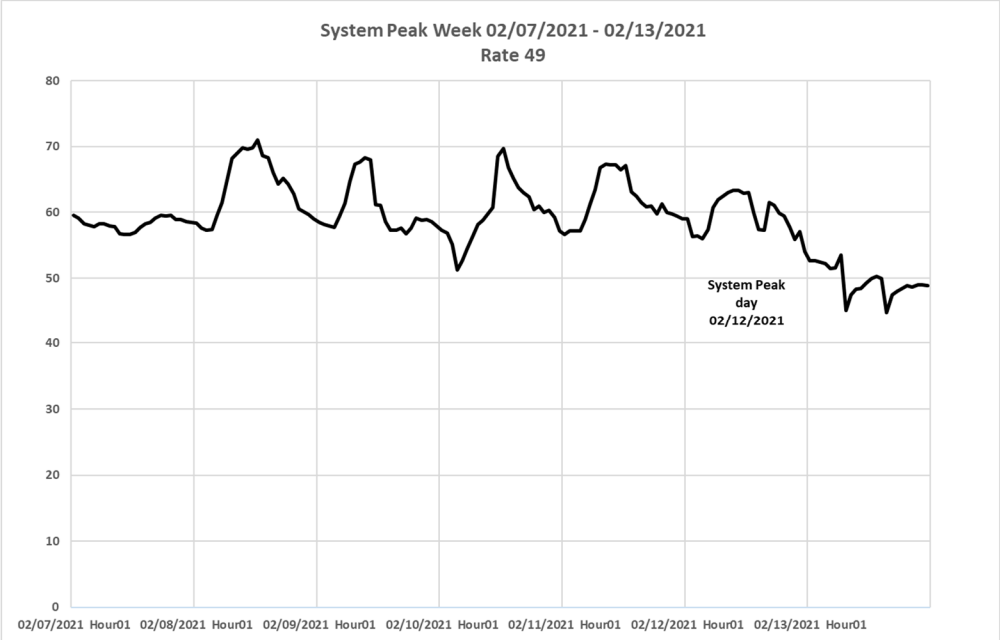
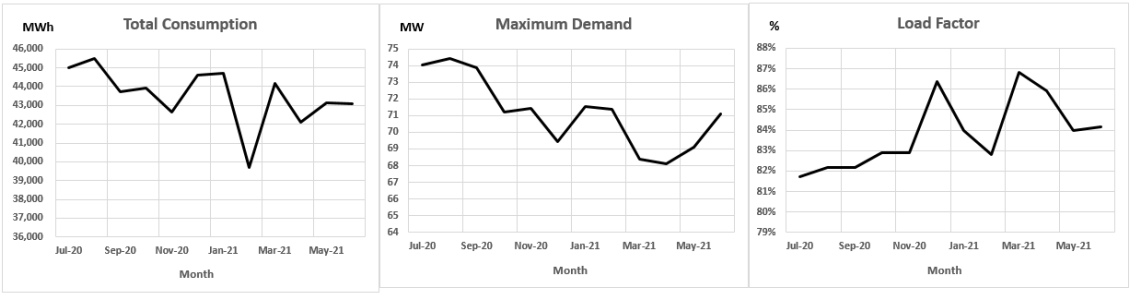


Figure 38 presents the monthly energy consumption, peak demand and load factors of the Schedule 49 class in charts. As shown in the charts, the High Voltage General Service loads were stable throughout the year and the percentage difference between the highest monthly peak of 74.4 MW and the lowest monthly peak load of 68.1 MW was only 9%.

Figure 38 – Schedule 49: Class Monthly Energy, Demand and Load Factor



The achieved precision for this class was perfect since the interval load data for all of the customers in this rate class were available for the full twelve-month period examined.

Table 31 presents summary statistics for the Schedule 49 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The monthly class NCP load factors are high and stable, ranging from a low of 81.7% in July, 2020 to a high of 86.8% in March.

2021. The load is highly coincident with the system peak with a coincidence factor over 80% for all of the 12 months.

Table 31 – Schedule 49 Class: Summary Statistics (Totals – MW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	44,999,538	Thursday, July 30, 2020	13:00	74,027	60,483	81.7%	Monday, July 27, 2020	18:00	70,674	95.5%
Aug-20	45,505,931	Thursday, August 27, 2020	13:00	74,425	61,164	82.2%	Monday, August 17, 2020	18:00	61,959	83.2%
Sep-20	43,725,188	Thursday, September 3, 2020	15:00	73,886	60,729	82.2%	Thursday, September 10, 2020	18:00	65,933	89.2%
Oct-20	43,913,770	Friday, October 9, 2020	13:00	71,197	59,024	82.9%	Monday, October 26, 2020	9:00	67,286	94.5%
Nov-20	42,652,695	Thursday, November 12, 2020	13:00	71,458	59,240	82.9%	Monday, November 9, 2020	9:00	65,719	92.0%
Dec-20	44,614,658	Tuesday, December 15, 2020	11:00	69,436	59,966	86.4%	Wednesday, December 23, 2020	18:00	62,331	89.8%
Jan-21	44,689,188	Monday, January 4, 2021	13:00	71,517	60,066	84.0%	Tuesday, January 26, 2021	18:00	64,293	89.9%
Feb-21	39,714,551	Tuesday, February 16, 2021	9:00	71,368	59,099	82.8%	Friday, February 12, 2021	18:00	61,025	85.5%
Mar-21	44,162,960	Monday, March 8, 2021	10:00	68,362	59,359	86.8%	Tuesday, March 16, 2021	9:00	67,281	98.4%
Apr-21	42,121,653	Wednesday, April 14, 2021	12:00	68,103	58,502	85.9%	Monday, April 5, 2021	9:00	67,019	98.4%
May-21	43,154,545	Wednesday, May 5, 2021	13:00	69,083	58,003	84.0%	Friday, May 7, 2021	10:00	60,801	88.0%
Jun-21	43,075,371	Tuesday, June 1, 2021	14:00	71,104	59,827	84.1%	Monday, June 28, 2021	17:00	61,979	87.2%
Annual	522,330,047	Annual Class Peak		74,425	59,627	80.1%	Annual System CP		61,025	82.0%
		Average 12 Monthly NCPs		71,164		83.8%	Average 12 Monthly CPs		64,692	90.9%
		Average Top 12 NCPs		73,639		81.0%	Average Top 12 CPs		61,374	83.3%
		Average Top 75 NCPs		71,691		83.2%	Average Top 75 CPs		59,514	83.0%
		Average Top 200 NCPs		70,498		0.0%	Average Top 200 CPs		61,047	86.6%
							Average 4CPs *		63,342	

* Monthly CPs for November, December, January and February

Table 32 presents the data on an average-per-customer basis. There were about 18 customers under Schedule 49 during the study period. The average use per customer in the class is estimated to be 29,289,535 kWh with annual average peak demand of 4,207 kW.

Table 32 – Schedule 49 Customer: Summary Statistics (Means – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Timing of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	2,368,397	Thursday, July 30, 2020	13:00	3,896	3,183	81.7%	Monday, July 27, 2020	18:00	3,720	95.5%
Aug-20	2,395,049	Thursday, August 27, 2020	13:00	3,917	3,219	82.2%	Monday, August 17, 2020	18:00	3,261	83.2%
Sep-20	2,301,326	Thursday, September 3, 2020	15:00	3,889	3,196	82.2%	Thursday, September 10, 2020	18:00	3,470	89.2%
Oct-20	2,311,251	Friday, October 9, 2020	13:00	3,747	3,107	82.9%	Monday, October 26, 2020	9:00	3,541	94.5%
Nov-20	2,369,594	Thursday, November 12, 2020	13:00	3,970	3,291	82.9%	Monday, November 9, 2020	9:00	3,651	92.0%
Dec-20	2,478,592	Tuesday, December 15, 2020	11:00	3,858	3,331	86.4%	Wednesday, December 23, 2020	18:00	3,463	89.8%
Jan-21	2,628,776	Monday, January 4, 2021	13:00	4,207	3,533	84.0%	Tuesday, January 26, 2021	18:00	3,782	89.9%
Feb-21	2,336,150	Tuesday, February 16, 2021	9:00	4,198	3,476	82.8%	Friday, February 12, 2021	18:00	3,590	85.5%
Mar-21	2,597,821	Monday, March 8, 2021	10:00	4,021	3,492	86.8%	Tuesday, March 16, 2021	9:00	3,958	98.4%
Apr-21	2,477,744	Wednesday, April 14, 2021	12:00	4,006	3,441	85.9%	Monday, April 5, 2021	9:00	3,942	98.4%
May-21	2,538,503	Wednesday, May 5, 2021	13:00	4,064	3,412	84.0%	Friday, May 7, 2021	10:00	3,577	88.0%
Jun-21	2,533,845	Tuesday, June 1, 2021	14:00	4,183	3,519	84.1%	Monday, June 28, 2021	17:00	3,646	87.2%
Annual	29,289,535	Annual Class Peak		4,207	3,344	79.5%	Annual System CP		3,422	81.3%

3.13 Schedules 50-59 Area and Street Lighting

The Area and Street Lighting hourly load profiles were produced by allocating the energy sales to those customer classes billed during the study period to each day and hour, based on the daily and hourly lighting energy requirements calculated with the lighting fixture and capacity data and the daily sunset and sunrise times. The portion of traffic lighting energy use was estimated with the traffic lighting fixture and wattage data for the study period.

Average loss factor estimated for the Area and Street Lighting classes was applied to the hourly load estimates. The estimated loss factor is 8.60%.

Figure 39 and Figure 40 present the class total load results for the two lighting classes. The figure

displays the EnergyPrint to the left of two-dimensional x-y plot. The lighting loads track the nighttime hours. Both the Area Lighting class load and the Street Lighting class load reach their peaks after the sunset and stay at the peak levels during the nighttime hours. The Area Lighting class peak was 1.6 MW, while the Street Lighting class peak was 16.1 MW.

Figure 39 – Area Lighting: Class Total Load

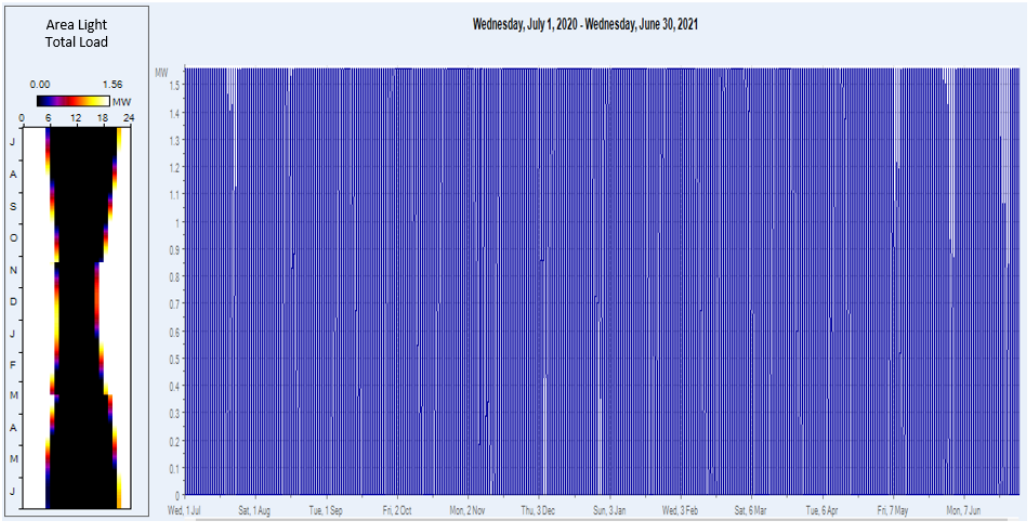


Figure 40 – Street Lighting: Class Total Load

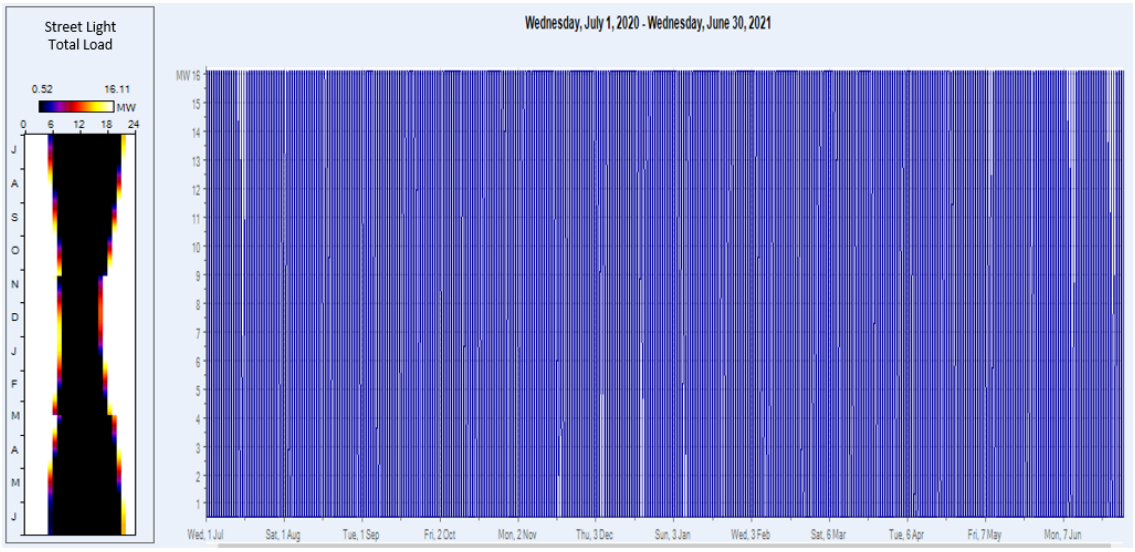


Figure 41 and Figure 42 present the total loads of the lighting classes for the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peak occurred on Friday, February 12, 2021 at 6 PM. The Area Lighting class system coincident peak was 623 KW, 40% of the class peak and the Street Lighting class reached a system-coincident peak of 6,757 kW which was 41.9% of the class peak.

Figure 41 – Area Lighting: Total Load during System Peak Week

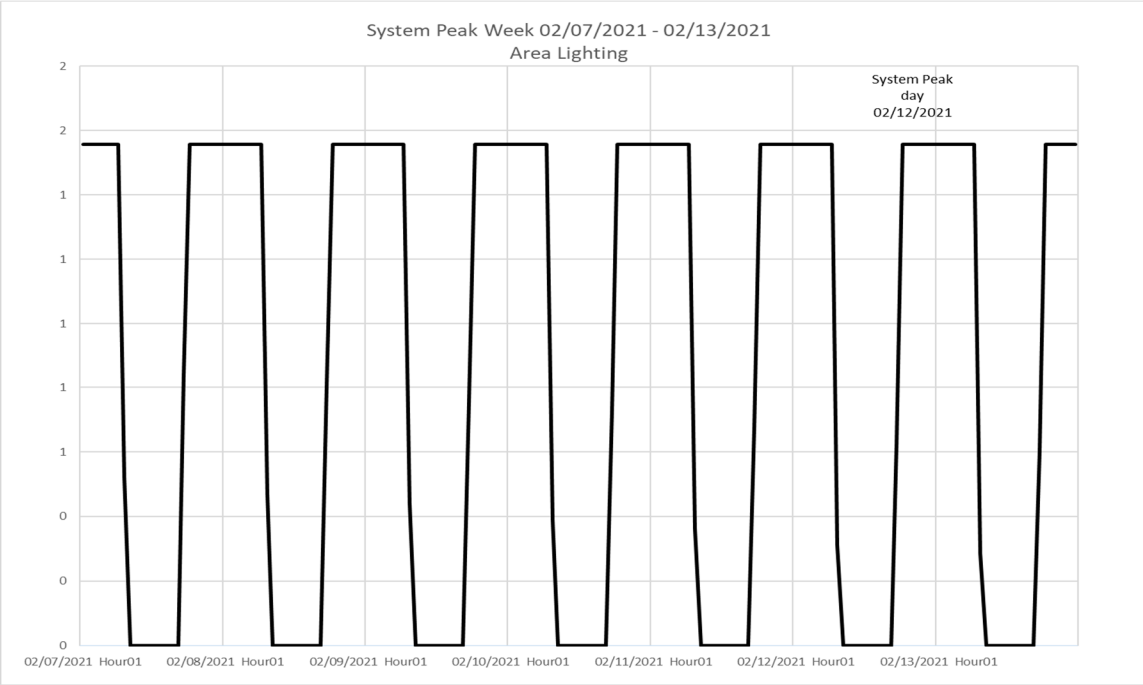


Figure 42 – Street Lighting: Total Load during System Peak Week

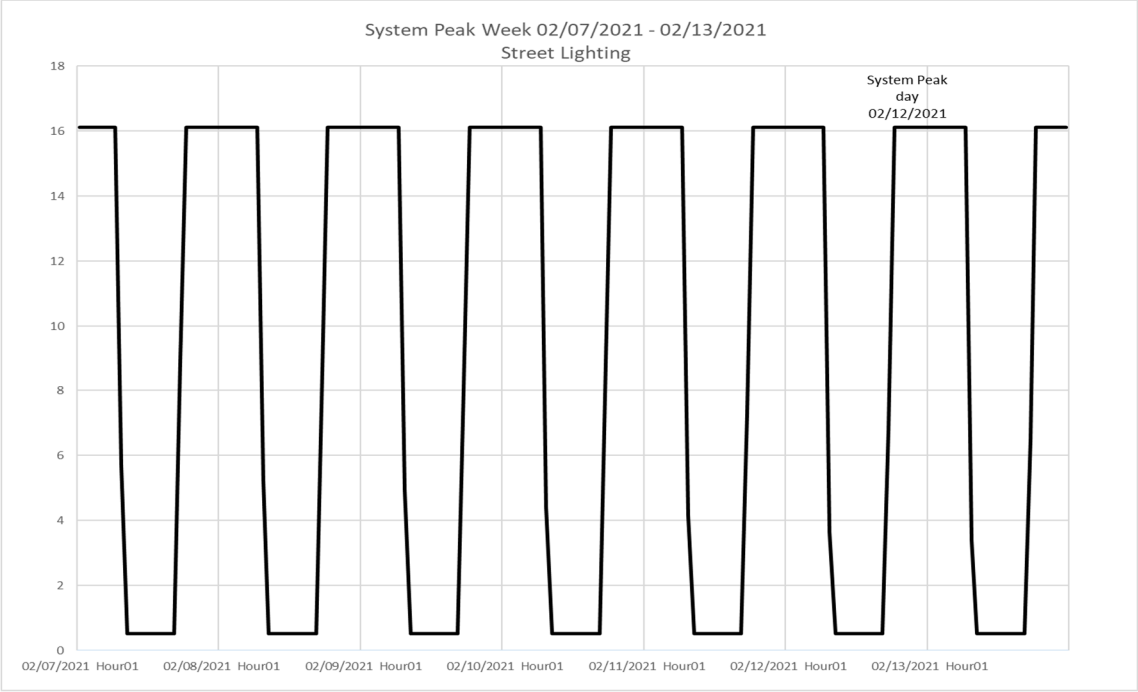


Figure 43 and Figure 44 presents the monthly energy consumption, peak demand and load factors of the lighting classes in charts. As reflected in the monthly energy consumption and maximum

demand charts, the lighting classes consume more electricity in the winter months due to a longer lighting period, while the maximum demand stays about the same with the number of lighting fixtures and their wattage requirements changing rarely month to month.

Figure 43 – Area Lighting: Class Monthly Energy, Demand and Load Factor

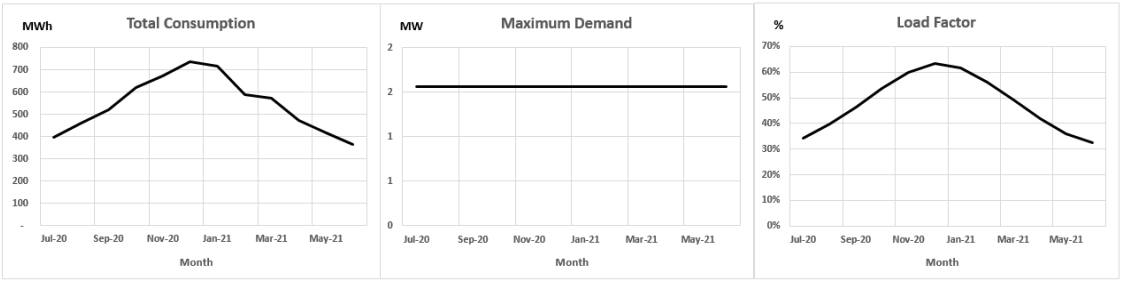


Figure 44 – Street Lighting: Class Monthly Energy, Demand and Load Factor

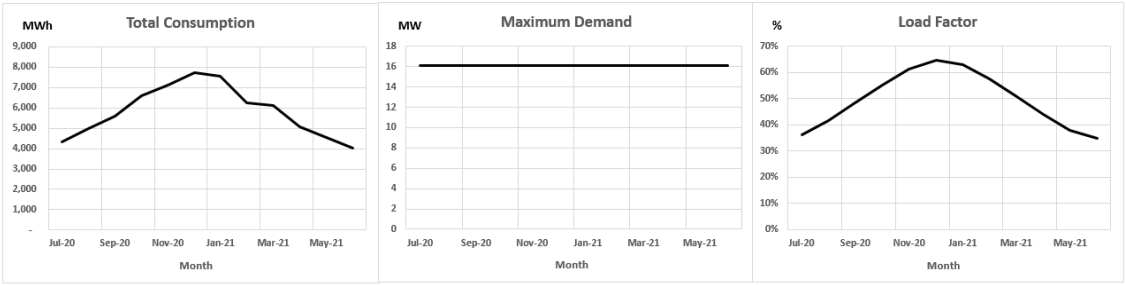


Table 33 and Table 34 present summary statistics for the lighting classes. Each table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The lighting class load factors tend to be higher in the winter months reflecting more lighting hours in the winter but the monthly maximum demand staying same throughout the study period. Monthly load factors ranges from low 30% to low to mid 60%. Monthly system coincidence factors are 100% in December, 2021, over 80% in January, 2021, and about 40% in February, 2021 and zero or close to zero for rest of the year.

Table 33 – Area Lighting Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	395,868	Wednesday, July 1, 2020	1:00	1,557	532	34.2%	Monday, July 27, 2020	18:00	0	0.0%
Aug-20	459,120	Saturday, August 1, 2020	1:00	1,557	617	39.6%	Monday, August 17, 2020	18:00	0	0.0%
Sep-20	521,750	Tuesday, September 1, 2020	1:00	1,557	725	46.5%	Thursday, September 10, 2020	18:00	0	0.0%
Oct-20	621,937	Thursday, October 1, 2020	1:00	1,557	836	53.7%	Monday, October 26, 2020	9:00	0	0.0%
Nov-20	673,276	Sunday, November 1, 2020	1:00	1,557	935	60.0%	Monday, November 9, 2020	9:00	0	0.0%
Dec-20	735,049	Tuesday, December 1, 2020	1:00	1,557	988	63.4%	Wednesday, December 23, 2020	18:00	1,557	100.0%
Jan-21	714,103	Friday, January 1, 2021	1:00	1,557	960	61.6%	Tuesday, January 26, 2021	18:00	1,324	85.0%
Feb-21	587,235	Monday, February 1, 2021	1:00	1,557	874	56.1%	Friday, February 12, 2021	18:00	623	40.0%
Mar-21	570,494	Monday, March 1, 2021	1:00	1,557	767	49.2%	Tuesday, March 16, 2021	9:00	0	0.0%
Apr-21	471,241	Thursday, April 1, 2021	1:00	1,557	655	42.0%	Monday, April 5, 2021	9:00	0	0.0%
May-21	414,893	Saturday, May 1, 2021	1:00	1,557	558	35.8%	Friday, May 7, 2021	10:00	0	0.0%
Jun-21	365,111	Tuesday, June 1, 2021	1:00	1,557	507	32.6%	Monday, June 28, 2021	17:00	0	0.0%
Annual	6,530,077	Annual Class Peak		1,557	745	47.9%	Annual System CP		623	40.0%
		Average 12 Monthly NCPs		1,557		47.9%	Average 12 Monthly CPs		292	18.8%
		Average Top 12 NCPs		1,557		47.9%	Average Top 12 CPs		627	40.3%
		Average Top 75 NCPs		1,557		47.9%	Average Top 75 CPs		438	28.1%
		Average Top 200 NCPs		1,557		47.9%	Average Top 200 CPs		576	37.0%
							Average 4CPs *		876	

* Monthly CPs for November, December, January and February

Table 34 – Street Lighting Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	4,350,627	Wednesday, July 1, 2020	1:00	16,113	5,848	36.3%	Monday, July 27, 2020	18:00	520	3.2%
Aug-20	4,983,948	Saturday, August 1, 2020	1:00	16,113	6,699	41.6%	Monday, August 17, 2020	18:00	520	3.2%
Sep-20	5,598,550	Tuesday, September 1, 2020	1:00	16,113	7,776	48.3%	Thursday, September 10, 2020	18:00	520	3.2%
Oct-20	6,614,160	Thursday, October 1, 2020	1:00	16,113	8,890	55.2%	Monday, October 26, 2020	9:00	520	3.2%
Nov-20	7,115,714	Sunday, November 1, 2020	1:00	16,113	9,883	61.3%	Monday, November 9, 2020	9:00	520	3.2%
Dec-20	7,746,706	Tuesday, December 1, 2020	1:00	16,113	10,412	64.6%	Wednesday, December 23, 2020	18:00	16,113	100.0%
Jan-21	7,536,985	Friday, January 1, 2021	1:00	16,113	10,130	62.9%	Tuesday, January 26, 2021	18:00	13,774	85.5%
Feb-21	6,229,254	Monday, February 1, 2021	1:00	16,113	9,270	57.5%	Friday, February 12, 2021	18:00	6,757	41.9%
Mar-21	6,099,083	Monday, March 1, 2021	1:00	16,113	8,198	50.9%	Tuesday, March 16, 2021	9:00	520	3.2%
Apr-21	5,092,828	Thursday, April 1, 2021	1:00	16,113	7,073	43.9%	Monday, April 5, 2021	9:00	520	3.2%
May-21	4,541,117	Saturday, May 1, 2021	1:00	16,113	6,104	37.9%	Friday, May 7, 2021	10:00	520	3.2%
Jun-21	4,030,189	Tuesday, June 1, 2021	1:00	16,113	5,597	34.7%	Monday, June 28, 2021	17:00	520	3.2%
Annual	69,939,161	Annual Class Peak		16,113	7,984	49.6%	Annual System CP		6,757	41.9%
		Average 12 Monthly NCPs		16,113		49.6%	Average 12 Monthly CPs		3,444	21.4%
		Average Top 12 NCPs		16,113		49.6%	Average Top 12 CPs		6,801	42.2%
		Average Top 75 NCPs		16,113		49.6%	Average Top 75 CPs		4,907	30.5%
		Average Top 200 NCPs		16,113		49.6%	Average Top 200 CPs		6,286	39.0%
							Average 4CPs *		9,291	

* Monthly CPs for November, December, January and February

4 NON-SYSTEM CLASS LOAD PROFILES

There are four classes that are termed "non-system loads" and are included in the cost-of-service analysis. These classes are considered non-system because they are transportation customers and are not included in PSE's measurement of system load. These classes include:

- Rate 449PV – Retail Wheeling Service Primary Voltage;
- Rate 449HV – Retail Wheeling Service High Voltage;
- Rate 459 – Back-Up Generation; and
- Special Contract – Retail Wheeling and Distribution Service.

4.1 Schedule 449 Primary Voltage Retail Wheeling Service

Since all of the customers under the Schedule 449 Primary Voltage (PV) are metered with interval load readings, the class hourly load profile was constructed by integrating their interval load data. The average loss factor estimated for the class was applied to the hourly loads. As listed in Table 4, the estimated average loss factor is 3.15%.

Figure 45 presents the total load for the Schedule 449PV class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. This class displays a relatively higher load in the winter

months than the summer months. The Schedule 449PV class peak occurred on Friday, February 12, 2021 at 3 PM. The class peak demand was 4.5 MW.

Figure 45 – Schedule 449PV: Class Total Load

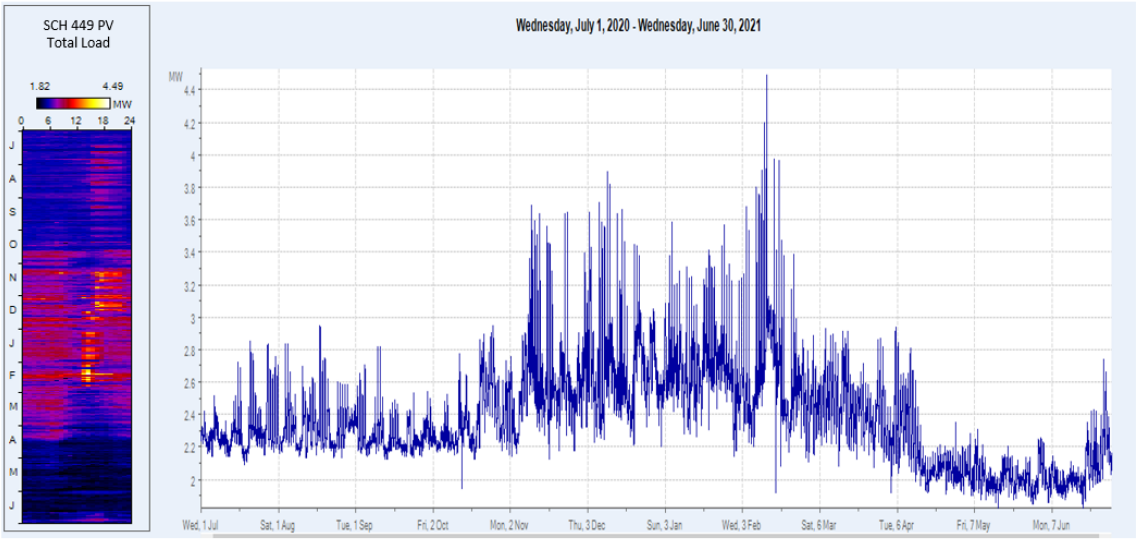


Figure 46 presents the total Schedule 449PV class load for the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The system peak occurred on Friday, February 12, 2021 at 6 PM. The class total load was about 3.8 MW at the time of the system coincident peak which was 84.7% of the class peak.

Figure 46 – Schedule 449PV: Total Load during System Peak Week

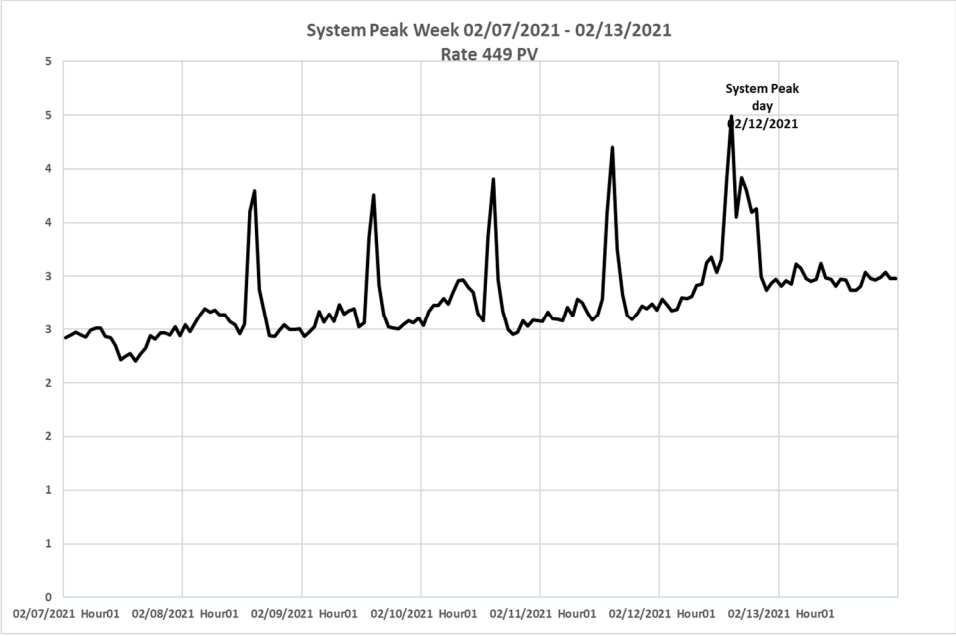


Figure 47 presents the monthly energy consumption, peak demand and load factor of the Schedule 449-PV class in charts. As reflected in the monthly energy charts, total electric energy uses of the retail wheeling primary voltage customers is slightly higher in the winter months compared to the rest of the year. This class also shows its monthly load factors above 75% for eight months out of the 12 months of the test year.

Figure 47 – Schedule 449PV: Class Monthly Energy, Demand and Load Factor

The achieved precision was perfect since the data for every customer in the class was available for the whole twelve-month period examined.

Table 35 presents summary statistics for the Schedule 449PV class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contributions, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The monthly NCP load factor ranges from a low of 78.8% in February, 2020 to a high of 87.2% in May, 2021. The load is fairly coincident with the system peak as shown by the system coincidence factors of over 80% in 10 of the 12 months in the study period.

Table 35 – Schedule 449PV Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	1,707,554	Monday, July 20, 2020	17:00	2,847	2,295	80.6%	Monday, July 27, 2020	18:00	2,833	99.5%
Aug-20	1,726,790	Monday, August 17, 2020	17:00	2,944	2,321	78.8%	Monday, August 17, 2020	18:00	2,903	98.6%
Sep-20	1,633,426	Wednesday, September 9, 2020	17:00	2,813	2,269	80.6%	Thursday, September 10, 2020	18:00	2,757	98.0%
Oct-20	1,760,466	Monday, October 26, 2020	1:00	2,945	2,366	80.4%	Monday, October 26, 2020	9:00	2,841	96.5%
Nov-20	1,859,046	Tuesday, November 10, 2020	9:00	3,684	2,582	70.1%	Monday, November 9, 2020	9:00	2,894	78.5%
Dec-20	2,010,789	Thursday, December 10, 2020	18:00	3,891	2,703	69.5%	Wednesday, December 23, 2020	18:00	3,176	81.6%
Jan-21	2,002,490	Tuesday, January 5, 2021	16:00	3,579	2,692	75.2%	Tuesday, January 26, 2021	18:00	2,820	78.8%
Feb-21	1,772,659	Friday, February 12, 2021	15:00	4,488	2,638	58.8%	Friday, February 12, 2021	18:00	3,800	84.7%
Mar-21	1,830,543	Monday, March 8, 2021	6:00	2,924	2,460	84.1%	Tuesday, March 16, 2021	9:00	2,831	96.8%
Apr-21	1,570,779	Monday, April 5, 2021	9:00	2,933	2,182	74.4%	Monday, April 5, 2021	9:00	2,933	100.0%
May-21	1,497,581	Saturday, May 8, 2021	6:00	2,308	2,013	87.2%	Friday, May 7, 2021	10:00	2,156	93.4%
Jun-21	1,488,141	Sunday, June 27, 2021	17:00	2,735	2,067	75.6%	Monday, June 28, 2021	17:00	2,645	96.7%
Annual	20,860,263	Annual Class Peak		4,488	2,381	53.1%	Annual System CP		3,800	84.7%
		Average 12 Monthly NCPs		3,174		75.0%	Average 12 Monthly CPs		2,883	90.8%
		Average Top 12 NCPs		3,952		60.3%	Average Top 12 CPs		3,041	76.9%
		Average Top 75 NCPs		3,554		67.0%	Average Top 75 CPs		2,962	83.3%
		Average Top 200 NCPs		3,336		71.4%	Average Top 200 CPs		2,877	86.3%
							Average 4CPs *		3,173	

* Monthly CPs for November, December, January and February

Since only one customer is served under Schedule 449PV, no summary table is presented on a per-customer basis.

2.5 Schedule 449 High Voltage Retail Wheeling Service

All of the customers under the Schedule 449 High Voltage (HV) are metered with interval load readings. Therefore, the class hourly load profile is based on the population's actual load data. The average loss factor estimated for the class was applied to the hourly loads. As shown in Table 4, the estimated average loss factor is 1.68%.

Figure 48 presents the total load for the Schedule 449HV class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. Except the sudden drops in mid-April and May, this class load profile shows a fairly stable profile like 449PV's but at much higher loads. The Schedule 449HV class peak occurred on Friday, June 25, 2021 at 1 PM. The class peak demand was 215.8 MW.

Figure 48 – Schedule 449HV: Class Total Load

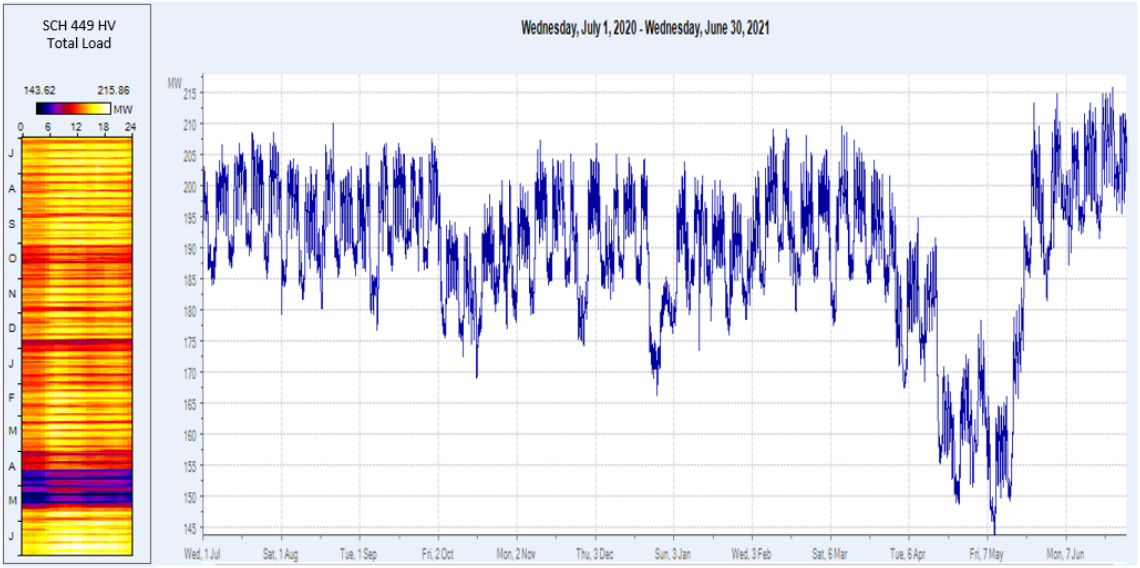


Figure 49 presents the total Schedule 449HV class load for the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The total class demand was 201.7 MW at the time of the system peak, which was 93.4% of the class peak demand.

Figure 49 – Schedule 449HV: Total Load during System Peak Week

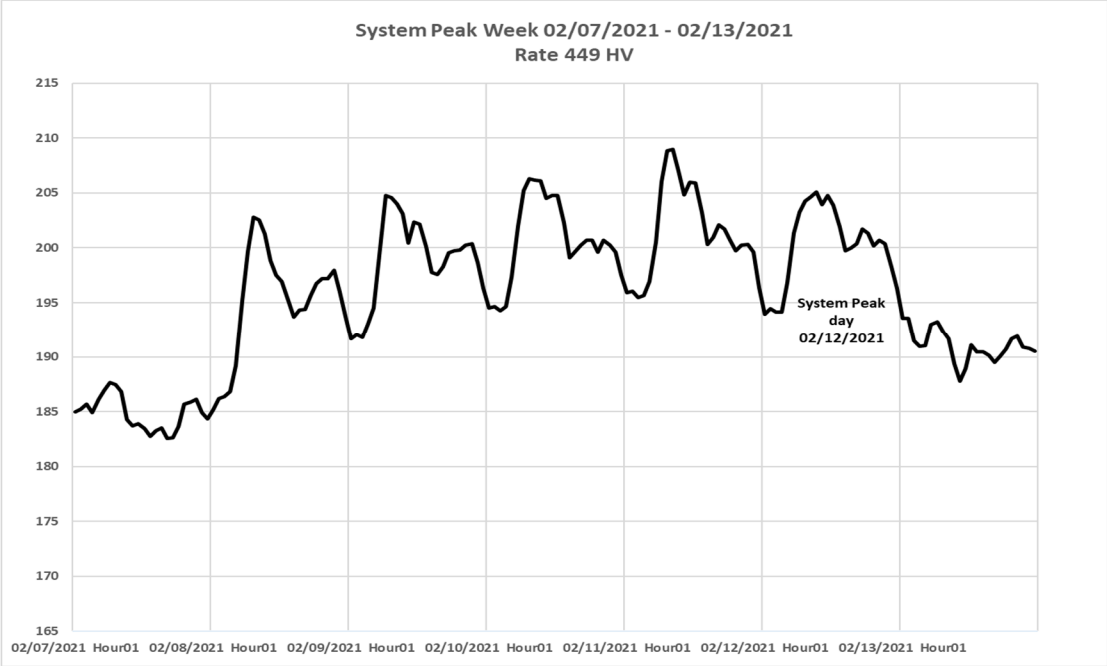
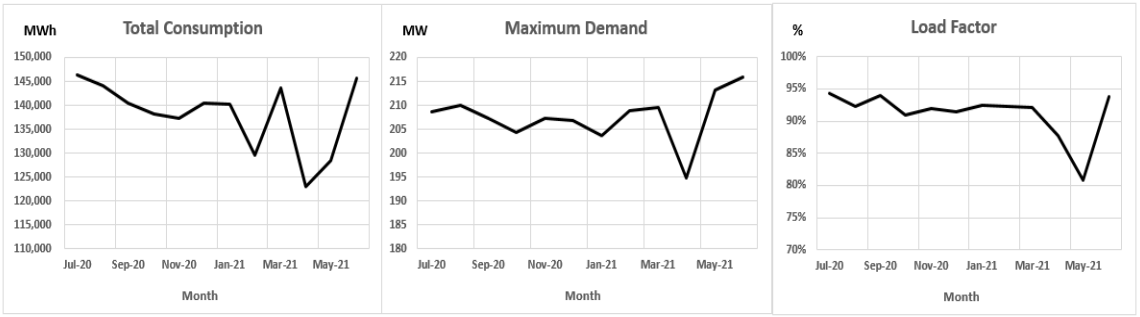


Figure 50 presents the monthly energy consumption, peak demand and load factors of the Schedule 449HV class in charts. As indicated by the monthly energy and maximum demand charts, the retail wheeling high voltage customer class load is slightly higher in the mid-summer and mid-winter months. Monthly load factors are significantly higher than the Schedule 449PV's with 90% or more for 10 of the 12 months.

Figure 50 – Schedule 449HV: Class Monthly Energy, Demand and Load Factors



The achieved precision was perfect since the interval load data for the entire customer class was available for the full twelve-month period examined.

Table 36 presents summary statistics for the Retail Wheeling High Voltage class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contribution, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The class

displays very high monthly NCP load factors ranging from a low of 80.9% in May, 2021 to a high of 94.3% in July, 2020. The class load is highly coincident with the system peak with the monthly system coincident factors of over 95% for 11 of the 12 months in the study period.

Table 36 – Schedule 449HV Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	146,395,473	Tuesday, July 28, 2020	17:00	208,573	196,768	94.3%	Monday, July 27, 2020	18:00	204,109	97.9%
Aug-20	144,149,230	Friday, August 21, 2020	10:00	209,999	193,749	92.3%	Monday, August 17, 2020	18:00	197,040	93.8%
Sep-20	140,400,519	Tuesday, September 29, 2020	12:00	207,390	195,001	94.0%	Thursday, September 10, 2020	18:00	204,795	98.7%
Oct-20	138,120,056	Thursday, October 1, 2020	10:00	204,329	185,645	90.9%	Monday, October 26, 2020	9:00	197,047	96.4%
Nov-20	137,293,448	Wednesday, November 11, 2020	8:00	207,213	190,685	92.0%	Monday, November 9, 2020	9:00	200,011	96.5%
Dec-20	140,526,498	Thursday, December 3, 2020	3:00	206,743	188,880	91.4%	Wednesday, December 23, 2020	18:00	189,912	91.9%
Jan-21	140,126,074	Thursday, January 7, 2021	8:00	203,625	188,341	92.5%	Tuesday, January 26, 2021	18:00	191,046	93.8%
Feb-21	129,673,128	Thursday, February 11, 2021	9:00	208,961	192,966	92.3%	Friday, February 12, 2021	18:00	201,703	96.5%
Mar-21	143,691,182	Wednesday, March 10, 2021	7:00	209,512	193,133	92.2%	Tuesday, March 16, 2021	9:00	204,920	97.8%
Apr-21	122,981,921	Friday, April 9, 2021	9:00	194,753	170,808	87.7%	Monday, April 5, 2021	9:00	186,840	95.9%
May-21	128,370,601	Tuesday, May 25, 2021	10:00	213,276	172,541	80.9%	Friday, May 7, 2021	10:00	165,886	77.8%
Jun-21	145,667,390	Friday, June 25, 2021	13:00	215,859	202,316	93.7%	Monday, June 28, 2021	17:00	205,367	95.1%
Annual	1,657,395,522	Annual Class Peak		215,859	189,200	87.6%	Annual System CP		201,703	93.4%
		Average 12 Monthly NCPs		207,519		91.2%	Average 12 Monthly CPs		195,723	94.3%
		Average Top 12 NCPs		214,466		88.2%	Average Top 12 CPs		202,738	94.5%
		Average Top 75 NCPs		212,068		89.2%	Average Top 75 CPs		198,158	93.4%
		Average Top 200 NCPs		210,089		90.1%	Average Top 200 CPs		196,517	93.5%
							Average 4CPs *		195,668	

* Monthly CPs for November, December, January and February

Since only twelve customers are served under Schedule 449HV, no summary table is presented on a per-customer basis.

2.6 Schedule 459 – Back-Up Generation

Schedule 459 Back-Up Generation class hourly loads were calculated by integrating the class customers' interval load data. There were only three customers under Schedule 459. The average loss factor estimated for the class was applied to the hourly loads. As listed in Table 4, the estimated average loss factor is 1.71%.

Figure 51 presents the total load for the Schedule 459 class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. The class energy use is significantly lower in July compared to rest of the year. This is consistent with other years when usage go significantly low in summer for a certain period of time. The Schedule 459 class peak occurred on Tuesday, August 4, 2020 at 1 PM. The class peak demand was 40.6 MW.

Figure 51 – Schedule 459: Class Total Load

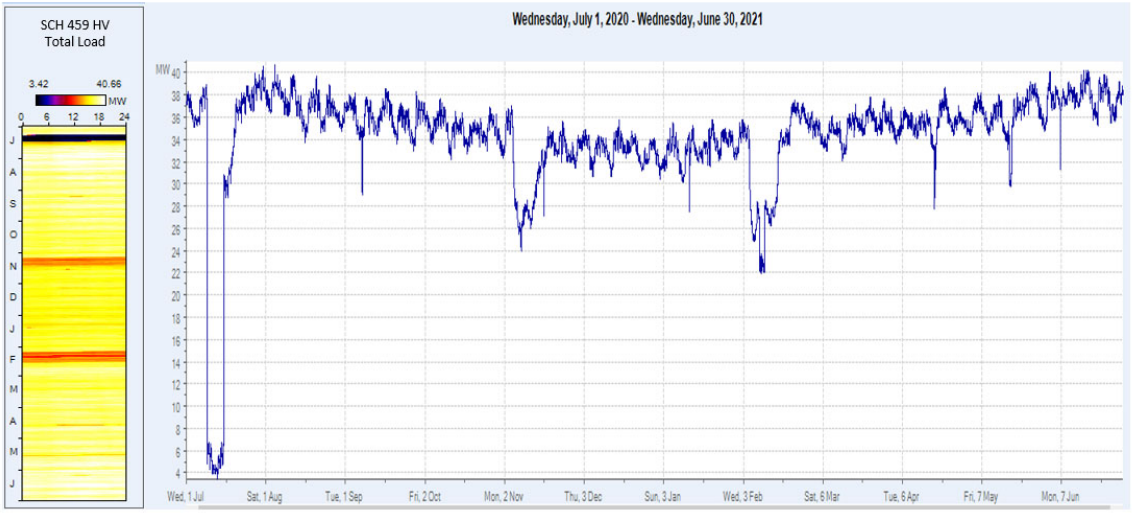


Figure 52 presents the total Schedule 459 class load for the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The class demand was 27.4 MW at the time of the system peak which was 67.5% of the class peak.

Figure 52 – Schedule 459: Total Load during System Peak Week

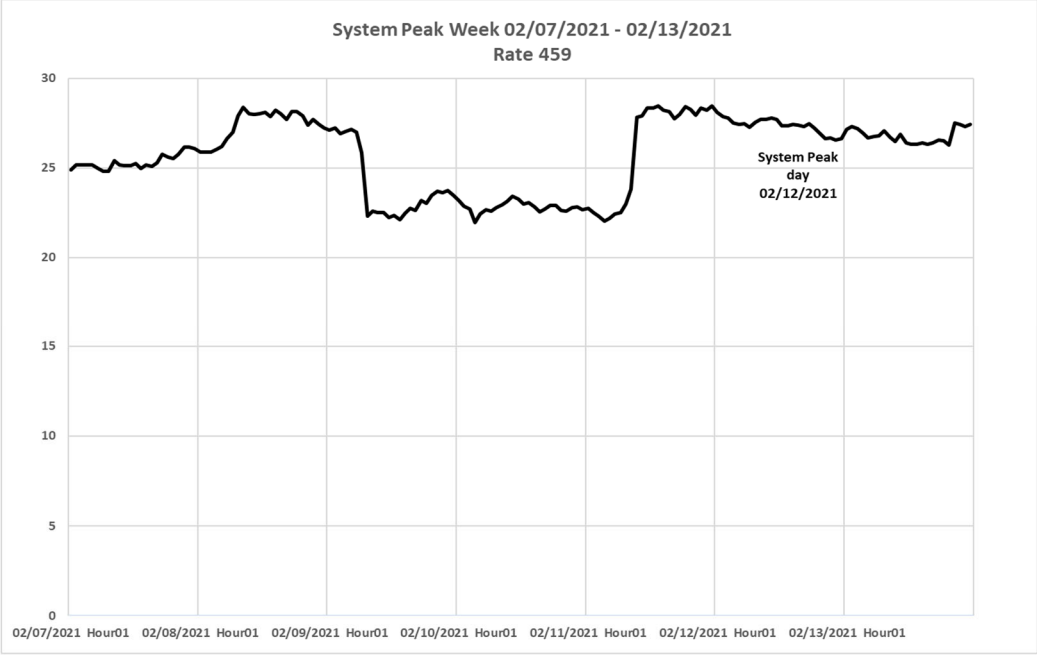
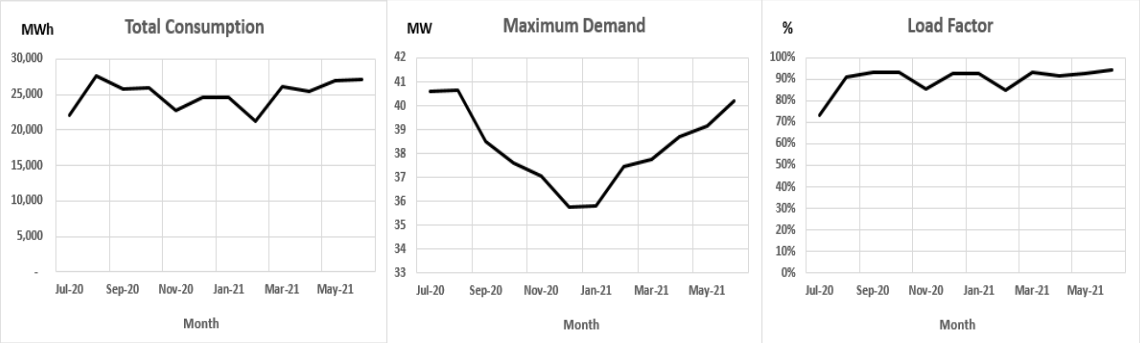


Figure 53 illustrates the monthly energy consumption, peak demand and load factor of the Schedule 459 class. The monthly energy consumption and demand charts show a slight summer-seasonality of the class load.

Figure 53 – Schedule 459: Class Monthly Energy, Demand and Load Factor



The achieved precision was perfect since the interval load data for all of the customers in the class were available for the full twelve-month period examined.

Table 37 presents summary statistics for the Schedule 459 class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contribution, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The monthly NCP load factors are high across the study period being over 90% for nine out of twelve months. The monthly system-coincidence factors are also over 90% for 10 of 12 months in the study period.

Table 37 – Schedule 459 Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	22,132,214	Thursday, July 30, 2020	22:00	40,582	29,748	73.3%	Monday, July 27, 2020	18:00	39,680	97.8%
Aug-20	27,572,251	Tuesday, August 4, 2020	13:00	40,657	37,059	91.2%	Monday, August 17, 2020	18:00	37,504	92.2%
Sep-20	25,868,587	Wednesday, September 16, 2020	16:00	38,511	35,929	93.3%	Thursday, September 10, 2020	18:00	36,921	95.9%
Oct-20	25,993,391	Wednesday, October 7, 2020	21:00	37,613	34,937	92.9%	Monday, October 26, 2020	9:00	34,840	92.6%
Nov-20	22,708,392	Wednesday, November 4, 2020	16:00	37,036	31,539	85.2%	Monday, November 9, 2020	9:00	27,424	74.0%
Dec-20	24,625,545	Wednesday, December 16, 2020	14:00	35,736	33,099	92.6%	Wednesday, December 23, 2020	18:00	33,776	94.5%
Jan-21	24,618,548	Friday, January 22, 2021	1:00	35,790	33,089	92.5%	Tuesday, January 26, 2021	18:00	34,458	96.3%
Feb-21	21,325,474	Monday, February 22, 2021	22:00	37,456	31,734	84.7%	Friday, February 12, 2021	18:00	27,453	73.3%
Mar-21	26,127,759	Wednesday, March 24, 2021	11:00	37,752	35,118	93.0%	Tuesday, March 16, 2021	9:00	36,165	95.8%
Apr-21	25,482,180	Thursday, April 22, 2021	12:00	38,682	35,392	91.5%	Monday, April 5, 2021	9:00	35,882	92.8%
May-21	26,935,005	Tuesday, May 25, 2021	17:00	39,176	36,203	92.4%	Friday, May 7, 2021	10:00	36,828	94.0%
Jun-21	27,210,639	Tuesday, June 15, 2021	18:00	40,199	37,793	94.0%	Monday, June 28, 2021	17:00	38,072	94.7%
Annual	300,599,985	Annual Class Peak		40,657	34,315	84.4%	Annual System CP		27,453	67.5%
		Average 12 Monthly NCPs		38,266		89.7%	Average 12 Monthly CPs		34,917	91.2%
		Average Top 12 NCPs		40,279		85.2%	Average Top 12 CPs		29,414	73.0%
		Average Top 75 NCPs		39,858		86.1%	Average Top 75 CPs		29,465	73.9%
		Average Top 200 NCPs		39,467		86.9%	Average Top 200 CPs		30,767	78.0%
							Average 4CPs *		30,778	

* Monthly CPs for November, December, January and February

Since only three customers are served under Schedule 459, no summary table is presented on a per-customer basis.

2.7 Special Contract – Retail Wheeling and Distribution Service

Special Contract class hourly loads were calculated by integrating the interval load data collected from all the metering device locations belonged to the Special Contract customer.[14] As listed in Table 4, the estimated average loss factor is 2.76%.

Figure 51 presents the total load for the Special Contract class. The figure displays the EnergyPrint to the left of two-dimensional x-y plot. The class energy use tends to be higher in the winter months but picks up again in June. The Special Contract class peak occurred on Monday, June 28, 2021 at 5 PM. The class peak demand was 52.4 MW.

Figure 54 – Special Contract: Class Total Load

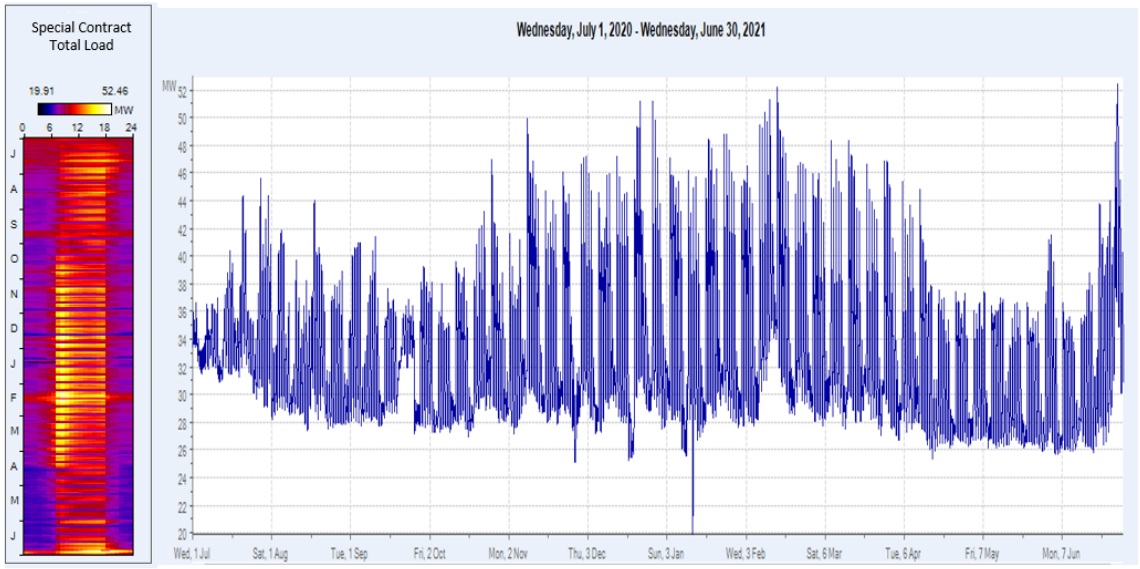


Figure 52 presents the Special Contract class for the system peak week of Sunday, February 7, 2021 through Saturday, February 13, 2021. The class demand was 47.6 MW at the time of the system peak which was 90.8% of the class peak.

[14] Only one customer is served under a special contract since April 1, 2019.

Figure 55 – Special Contract: Total Load during System Peak Week

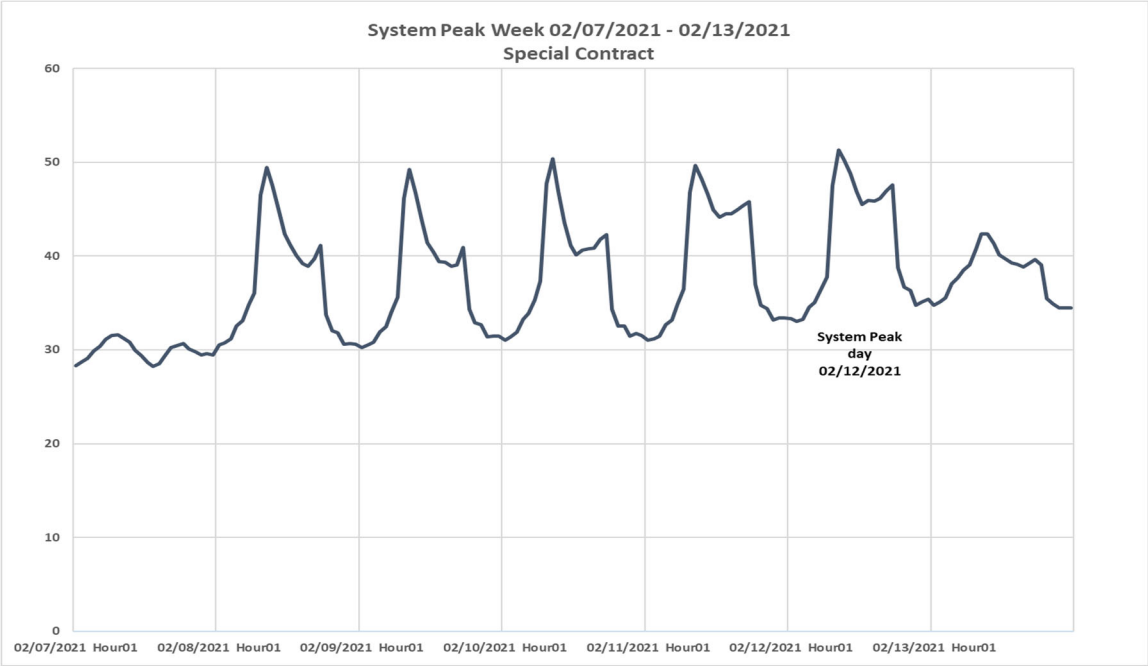
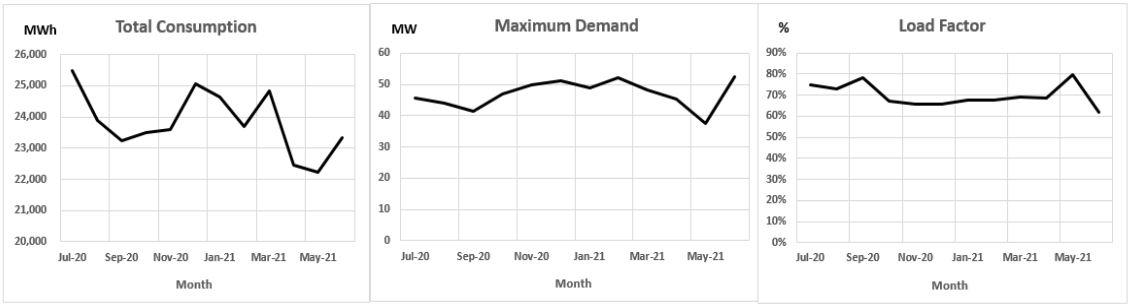


Figure 56 illustrates the monthly energy consumption, peak demand and load factor of the Special Contract class. The monthly energy consumption and demand charts show some summer and winter seasonality of the class load.

Figure 56 – Special Contract: Class Monthly Energy, Demand and Load Factor



The achieved precision was perfect since the interval load data for all of the metering device locations in the class were available for the full twelve-month period examined.

Table 38 presents summary statistics for the Special Contract class load. The table displays monthly energy use, timing of the class peak demand, magnitude of the class peak demand, average demand, load factor based on the class peak demand, timing of the system peak and class load at the time of system peak and the coincidence factor calculated as the class system-coincident load divided by the class peak. In addition, the table displays other summary characteristics, such as 12-month and 4-month average coincident peak contribution, and average values of the top 12, 75 and 200 class peaks and the class loads at top 12, 75 and 200 system peak hours. The monthly NCP load factors range from a low of 61.7% in June, 2021 to a high of 79.8% in May, 2021. The monthly system-coincidence factors of class load are 80% or higher for all of the 12 months and 100% for six of the twelve months in the study period.

Table 38 – Special Contract Class: Summary Statistics (Totals – kW)

		Class Peak Demand					Class Demand at System Peak Hour			
Month	Monthly Energy Use (kWh)	Date of Class Peak	Time of Class Peak	Class Peak Demand (kW)	Average Demand (kW)	Load Factor (%)	Date of System Peak	Time of System Peak	Class Demand @ System Peak (kW)	Coincidence Factor (%)
Jul-20	25,487,234	Monday, July 27, 2020	18:00	45,652	34,257	75.0%	Monday, July 27, 2020	18:00	45,652	100.0%
Aug-20	23,890,184	Monday, August 17, 2020	18:00	44,039	32,110	72.9%	Monday, August 17, 2020	18:00	44,039	100.0%
Sep-20	23,226,120	Thursday, September 10, 2020	15:00	41,337	32,259	78.0%	Thursday, September 10, 2020	18:00	40,566	98.1%
Oct-20	23,500,061	Monday, October 26, 2020	9:00	46,979	31,586	67.2%	Monday, October 26, 2020	9:00	46,979	100.0%
Nov-20	23,609,369	Monday, November 9, 2020	9:00	49,864	32,791	65.8%	Monday, November 9, 2020	9:00	49,864	100.0%
Dec-20	25,068,072	Wednesday, December 23, 2020	9:00	51,216	33,694	65.8%	Wednesday, December 23, 2020	18:00	43,316	84.6%
Jan-21	24,636,953	Tuesday, January 26, 2021	9:00	48,821	33,114	67.8%	Tuesday, January 26, 2021	18:00	44,347	90.8%
Feb-21	23,700,926	Monday, February 15, 2021	9:00	52,139	35,269	67.6%	Friday, February 12, 2021	18:00	47,608	91.3%
Mar-21	24,836,667	Monday, March 15, 2021	9:00	48,299	33,383	69.1%	Tuesday, March 16, 2021	9:00	47,285	97.9%
Apr-21	22,455,823	Monday, April 5, 2021	9:00	45,378	31,189	68.7%	Monday, April 5, 2021	9:00	45,378	100.0%
May-21	22,228,824	Friday, May 7, 2021	9:00	37,458	29,877	79.8%	Friday, May 7, 2021	10:00	37,004	98.8%
Jun-21	23,322,653	Monday, June 28, 2021	17:00	52,459	32,393	61.7%	Monday, June 28, 2021	17:00	52,459	100.0%
Annual	285,962,887	Annual Class Peak		52,459	32,644	62.2%	Annual System Peak		47,608	90.8%
		Average 12 Monthly NCPs		46,970		69.5%	Average 12 Monthly CPs		45,375	96.6%
		Average Top 12 NCPs		51,618		63.2%	Average Top 12 CPs		45,202	87.6%
		Average Top 75 NCPs		48,526		67.3%	Average Top 75 CPs		43,771	90.2%
		Average Top 200 NCPs		46,567		70.1%	Average Top 200 CPs		42,182	90.6%
							Average 4CPs *		46,284	

* Monthly CPs for November, December, January and February

Since only one customer is served under Special Contract, no summary table is presented on a per-customer basis.