Natural Resources Canada / Ressources naturelles Canada

# Field Data Analysis of Standard Electric Operation of Water Heaters Installed in Sherbrooke, QC

**Prepared by:**
Thomas Paulin-Bessette

**Project Manager:**
Véronique Delisle

Natural Resources Canada (NRCan)
CanmetENERGY in Varennes Research Centre
1615 Lionel-Boulet Blvd.
Varennes, Quebec, J3X 1P7

Date: 2021-08-05

Canada

# Abstract

The purpose of this report is to assess the influence of certain parameters, such as seasonal temperature variations or water heater type, on the energy and power consumption of a community of approximately 160 electric water heaters (EWHs). Installed in Sherbrooke, Quebec, these devices were equipped with an intelligent controller which allowed for temperature and current data collection, from 2018 to 2020.

To evaluate the influence of different parameters, the data was categorized in different subsets. It was sorted by period of the week (weekdays vs weekend), by season and by EWH type. Lastly, a subset was created to analyze the influence of the COVID-19 pandemic on the results.

Results showed an important difference in the electrical consumption profile of weekdays and weekends. Also, it was confirmed that three-element EWHs, with their low wattage bottom element, alleviate the morning peak of electrical consumption. In addition, there is an important difference, in terms of temperature, between the bottom, middle and top sections of EWHs. It was found that the EWHs studied failed to meet the recommendations put forward by Quebec's National Public Health Institute (INSPQ) to avoid the growth of Legionella [1] thus preventing the implementation of Demand Response (DR) events.

# Table of Contents

# List of Tables



# List of Figures

# Nomenclature

**Abbreviations & Definitions**

| | |
|---|---|
| BCIP: | Build in Canada Innovation Program |
| DR: | Demand Response |
| EWH: | Electric Water Heater |
| INSPQ: | Institut national de santé publique du Québec (Quebec National Public Health Institute) |

# 1 – Introduction

As part of the Build in Canada Innovation Program (BCIP), Natural Resources Canada acted as the testing department for Electric Water Heaters (EWHs) retrofitted with CaSA's Triton intelligent controllers [2]. These devices, which were installed on a community of around 160 EWHs based in Sherbrooke, Quebec, collect raw temperature and current data. The data corresponds to the normal behaviour of EWHs, i.e. no demand response (DR) events were performed. It was processed to create a clean dataset for analytic purposes. This report presents the results of the analysis performed to assess the influence of parameters, such as seasonal temperature variations or water heater type, on the equipment energy and power consumption.

# 2 – Methodology

First, the raw data collected from CaSA's intelligent controllers was processed to obtain a clean dataset. The data cleaning process [3] detected and corrected errors related to EWH temperature, identified missing data, and eliminated outliers such as unrealistic temperature and current values. Table 1 presents different characteristics of the dataset.

**Table 1 – Dataset Description**

| Characteristics | Description |
|---|---|
| Data collection period | From 2018-10-01 to 2020-06-28 |
| Number of EWHs in the raw dataset | 163 |
| Number of EWHs in the clean dataset | 159 |
| Number of EWHs by type in the clean dataset | 40 imp gal 2 elements: 36<br>60 imp gal 2 elements: 110<br>60 imp gal 3 elements: 12<br>Unidentified: 1 |

Then, to further improve the quality of the dataset, days with recorded data were only kept if they reached the established threshold of at least 274 out of 288 possible timestamps (95%), each representing a five-minute period. Days which satisfied this condition were kept for the analysis and defined as EWH-Days. In addition, some statutory holidays were filtered out of the dataset (Table 5). They were removed because it was assumed that the water consumption profile for those days would be very different from a normal day of the week.

Next, the data was sorted in different categories such as period of the week (weekdays vs weekend), season or EWH type to assess their impact on EWH demand profile, energy consumption and temperature. The data was first sorted into two distinct categories: weekdays vs weekends. Subsequently, four subsamples were created: **COVID-19 Weekdays**, **COVID-19 Weekends** (2020-03-23 to 2020-06-28), **Not COVID-19 Weekdays** and **Not COVID-19 Weekends** (2019-03-23 to 2019-06-28). The objective of these datasets was to evaluate the effect of the **COVID-19** pandemic and the ensuing lockdown on hot water usage. March 23 corresponds to the beginning of the complete lockdown in Quebec. On that day, all non-essential shops and businesses were forced to shut down.

For all following datasets, data from 2020-03-23 to 2020-06-28 (the end of the data collection period) was removed because of the potential effect of the **COVID-19** pandemic on typical hot water usage. Then, the data was sorted by season and week period (**Summer Weekdays, Summer Weekends**, etc.).

Finally, the data was sorted by EWH type: 40 imp gal and 60 imp gal. The latter data sample was also subdivided in two subsamples: 60 imp gal two elements and 60 imp gal three elements. This data was then sorted by period of the week (weekdays and weekends). These last eight subsample datasets only contain data from a single season, winter (December 21 to March 19), since the focus of the analysis was on the influence of the EWH type and not on seasonal temperature variations.

# 3 – Results and Discussion

This section presents the analysis performed on the different subsets listed in the previous section and the results obtained. Additional graphs such as 24-hour consumption profiles (summer, spring and autumn), energy consumption distributions by season, and bottom and top sensor temperature distributions are presented in

Appendix A.1 – Additional Electrical Profile & Energy Consumption Graphs and Appendix A.2 – Additional Temperature Graphs. The results are separated in two subsections: Electrical Profile & Energy Consumption and Temperatures.

## 3.1 – Electrical Profile & Energy Consumption

The objective of this subsection is to assess the influence of certain characteristics (seasons, EWH type and the COVID-19 pandemic) on the EWH energy consumption and electrical profiles. The latter are presented as 24-hour demand profiles which correspond to the average power of all tested EWHs for any given time of day for each specific data subsample; refer to Appendix A.1 – Additional Electrical Profile & Energy Consumption Graphs for average energy distribution graphs.

### Influence of Seasons

Table 2, Figure 1 and Figure 2 present the effects of seasonal temperature variations on average daily energy consumption and electrical profiles. The datasets used to obtain the results are Summer Weekdays, Summer Weekends, Winter Weekdays, Winter Weekends, etc.

**Table 2 – Average Daily Energy Consumption by Season**

| Seasons | Average daily energy consumption (kWh) – Weekdays | Average daily energy consumption (kWh) – Weekend | Average energy consumption increase for weekends (%) |
|---|---|---|---|
| Autumn | 8.1 | 9.3 | 14.8 |
| Winter | 9.5 | 10.3 | 8.4 |
| Spring | 9.2 | 9.9 | 7.6 |
| Summer | 6.8 | 7.0 | 2.9 |

As expected, the energy consumption is greater for colder seasons, such as winter, than it is for warmer ones like summer.

Also, an increase of energy consumption is observed during weekends when compared to weekdays. A possible explanation is that people tend to spend more time at home during weekends.

Figure 1 and Figure 2 present the winter and summer 24-hour electrical profiles. These 24-hour profiles correspond to the aggregated and average daily profile of all EWHs. The peak average power values indicated on the graphs correspond to the morning and evening peaks, from 6:45 AM to 7:45 AM and 6:30 PM to 7:30 PM, respectively. Both periods were identified through data analysis as the one-hour timeframe, on weekdays, with the highest power consumption on average.

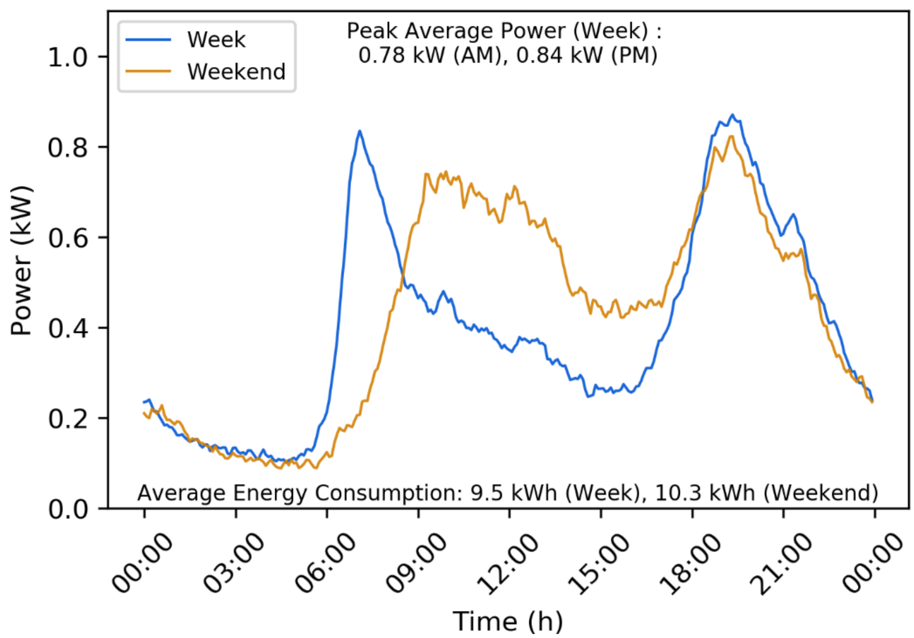


**Figure 1 – 24-Hour Electrical Profile – Winter**

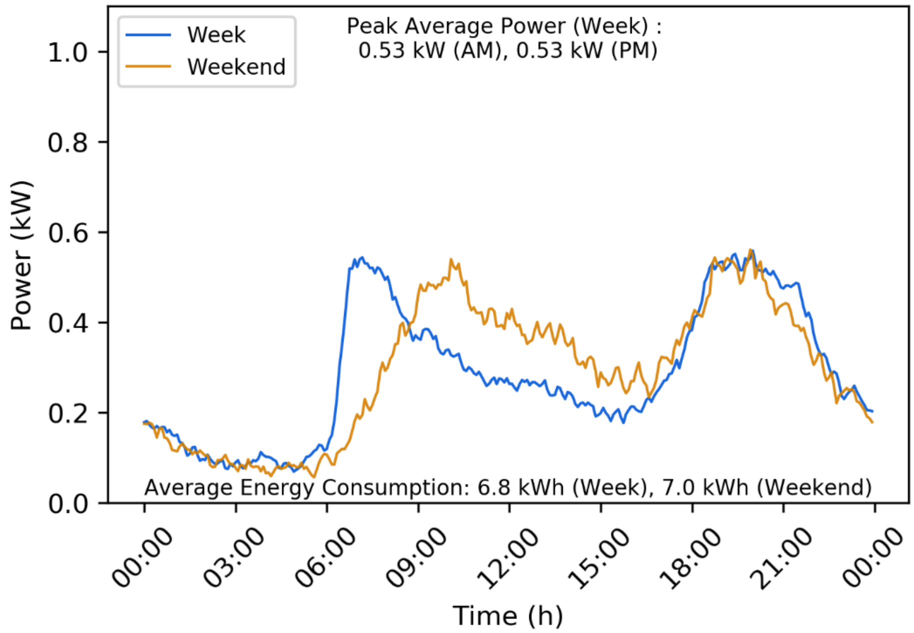


**Figure 2 – 24-Hour Electrical Profile – Summer**

These figures show an important difference between the summer and winter electrical profiles. The average peak power is much higher during winter because the EWH has to heat more during winter to reach its setpoint temperature. When observing the weekday profile, for both seasons, there is a sharp ramp-up in demand on weekdays, from 6:00 AM to 7:30 AM. This corresponds to the time when most people start their day. During the day, when occupants are away from home, the demand drops as confirmed in the later COVID-19 period analysis. The demand then rises again for a second peak between 6:00 PM and 7:30 PM. In addition, the energy consumption (area under the curve) is greater for the evening peak than it is for the morning one. This pattern is also observed for all electrical profile graphs presented, confirming that more energy and hot water are used in the evening than in the morning.

Weekend electrical profiles differ from weekday profiles. On weekends, the morning peak demand happens later and is more widely distributed than during the week. In addition, the demand is higher during the day. A plausible explanation for this given result would be that people generally spend more time at home on weekends than during the week, thus consuming more hot water during the daytime. Finally, both evening peaks, for weekdays and weekends, are similar. This data suggests that hot water usage in the evening is similar for the whole week.

## Influence of EWH Type

Table 3, Figure 3 and Figure 4 present the influence of the EWH Type on the electrical profile and energy consumption of EWHs. The data used to obtain the results presented in this section contains datasets sorted by EWH type (40 imp gal, 60 imp gal, 60 imp gal with two elements and 60 imp gal with three elements) and period of the week (weekends vs weekdays). Refer to Table 6 in Appendix B – Additional Tables for detailed information regarding the different EWH types in the dataset.

**Table 3 – Average Daily Energy Consumption by EWH Type**

| EWH Type | Average daily energy consumption (kWh) – Week | Average daily energy consumption (kWh) – Weekend | Average energy consumption increase for weekends (%) |
|---|---|---|---|
| 40 imp gal | 8.0 | 8.8 | 10.0 |
| 60 imp gal 2 elements | 9.7 | 10.5 | 8.2 |
| 60 imp gal 3 elements | 11.5 | 12.8 | 11.3 |

As seen in Table 3, an increase in energy consumption can be observed during weekends. There is also a significant difference in energy consumption between 40 imp gal and 60 imp gal EWHs. This higher consumption can be partly attributed to the fact that there are more occupants in households with 60 imp gal EWHs. Indeed, for the tested devices, the average number of occupants per household is 2.62 for 40 imp gal EWHs and 2.99 for 60 imp gal models, based on a survey filled out by participants.

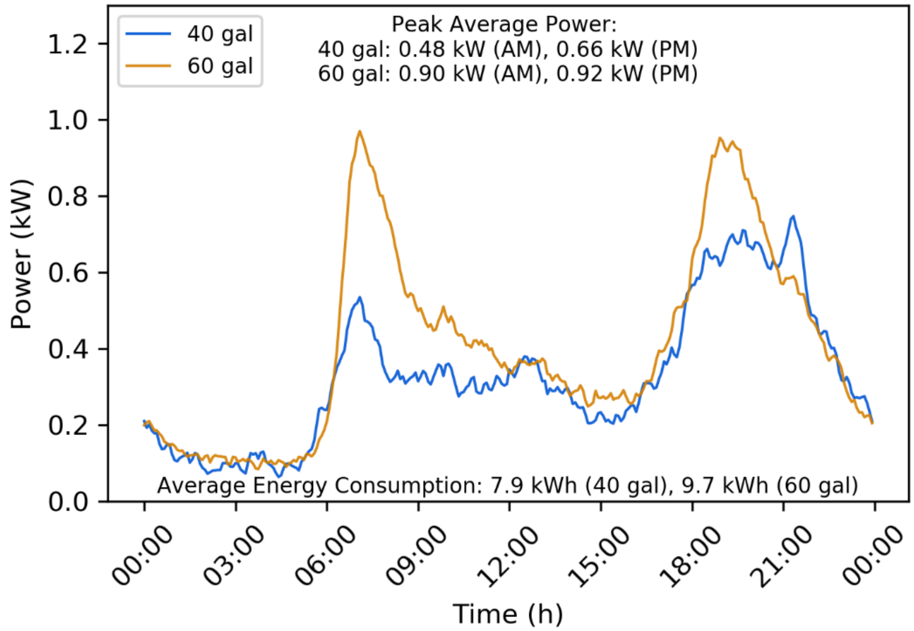


**Figure 3 – 40 imp gal vs 60 imp gal 2 Elements Winter Electrical Profile – Weekdays**

Figure 3 shows the difference in terms of electrical profile between 40 imp gal and 60 imp gal two-element EWHs. Since 40 imp gal EWHs only have two elements, 60 imp gal three-element EWHs were not included in this comparison.

A significant difference between 40 and 60 imp gal EWHs is noted during the morning peak (0.48 kW vs. 0.90 kW). This is consistent with the fact that more water is needed in households where a 60 imp gal EWH is installed and that the larger tank has more powerful heating elements (4500 W for the 60 imp gal vs. 3000 or 3800 W for the 40 imp gal). Then, during working hours, the average power load profiles are similar. During the evening, there is a second peak for both profiles, which is longer than the morning peak. Also, the area under the curve, for both types of EWHs, is greater for the evening peak than it this for the morning one. This would suggest that water consumption is greater during the evening. For 60 imp gal EWHs, both the morning and evening peaks are almost identical. However, for 40 imp gal EWHs, the evening peak maximum power is 37.5% higher than the morning peak. This increase is partly due to the fact that the usage of hot water is greater in the evening than in the morning. It could also be explained by the behaviour of the occupants who are part of the 40 imp gal subsample. Finally, during the night, both electrical profiles are quite similar, indicating that heat losses are similar for both types of EWHs.

Figure 4 shows the difference in electrical profiles between 60 imp gal two-element and three-element EWHs. Both 60 imp gal and 40 imp gal EWHs operate similarly. Hot water exits from the top of the tank and cold water enters from the bottom of the tank. When the cold water rises towards the top of the tank, it eventually reaches the heating element that is the closest to the bottom of the tank. All elements are equipped with mechanical thermostats such that the element turns on if the temperature measured by its thermostat is below the setpoint. Therefore, if the lowest element of an EWH is activated, the power output will depend on the power of that specific element (4500 W for two-element vs 800 W for three-element). For three-element EWHs, since the bottom element is less powerful, it will need to stay activated for longer periods before the water temperature reaches the desired setpoint. Lastly, a strong water draw, which will cause an important rise of the cold water level in the tank, is needed to activate the higher element(s) of an EWH.

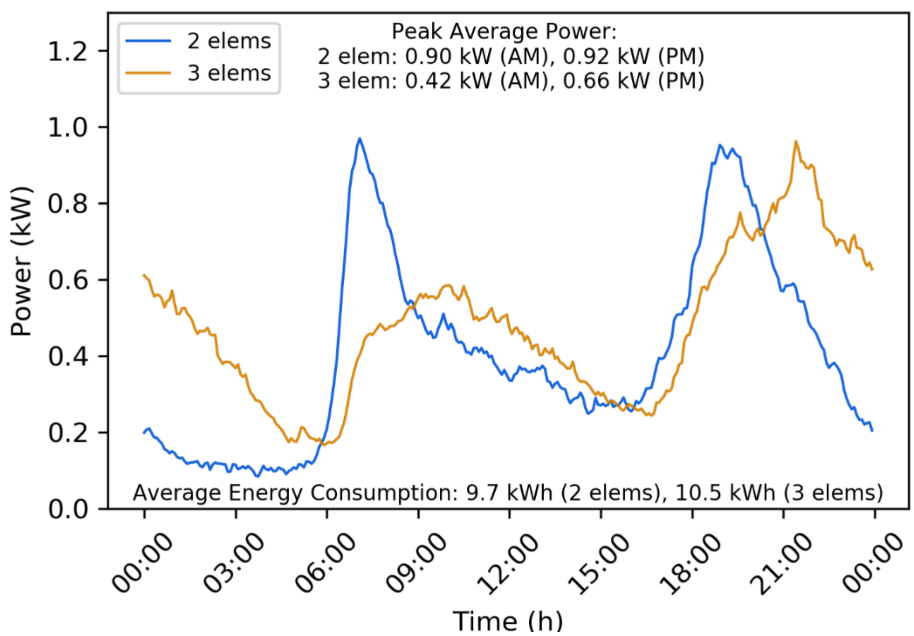


**Figure 4 – 60 imp gal 2 Elements vs 3 Elements Winter Electrical Profile – Weekdays**

Three-element EWHs flatten and reduce the morning peak, and delay both morning and evening peaks. A study from Hydro-Québec, analyzing the same type of EWHs, presents similar results for the morning peak, but shows a greater reduction for the evening peak than what is observed in this analysis [4]. However, it should be noted that the sample of 60 imp gal three-element EWHs used for this analysis contains only 12 units compared to 110 units for 60 imp gal two-element EWHs. Thus, the results obtained may not be representative of a larger population sample.

During the night and early morning, two-element EWHs quickly reach the temperature setpoint because of the 4500 W bottom heating element. However, since three-element EWHs only have an 800 W bottom element, it takes longer for these devices to reach their setpoint temperature. That is the reason why three-element EWHs have a higher power draw during the night.

For three-element EWHs, the evening peak is higher than the morning one. When the morning peak starts, three-element EWHs are full of hot water and do not need to activate their more powerful elements (3000 and 3800 W) for most of the morning and afternoon. In the evening, however, when water consumption increases, the more powerful elements are required to reach the setpoint temperature.

Another observation is that there is a delay in the evening peak between the two-element and three-element EWHs. Also, a greater energy consumption is observed for three-element EWHs than for two-element EWHs (10.5 kWh vs 9.7 kWh). The reasons behind these results are unknown, but the limited sample of 60 imp gal three-element EWHs could be part of the explanation.

## Influence of the COVID-19 Pandemic

Table 4 and Figure 5 present the impacts of the COVID-19 pandemic and the ensuing lockdown on the electrical profile and energy consumption of EWHs. The datasets used to obtain those results are COVID-19 Weekdays, COVID-19 Weekends, Not COVID-19 Weekdays and Not COVID-19 Weekends. The reference timeframe corresponds to all data gathered from 2019-03-23 to 2019-06-28, while the COVID-19 subset contains data from 2020-03-23 to 2020-06-28.

**Table 4 – Average Daily Energy Consumption – COVID-19**

| Categories | Average daily energy consumption (kWh) – Weekdays | Average daily energy consumption (kWh) – Weekends |
|---|---|---|
| COVID-19 (2020) | 10.1 | 9.6 |
| Reference timeframe (2019) | 9.6 | 9.0 |

First, it is noted that the energy consumption during the COVID-19 lockdown is higher than during the same period in 2019.

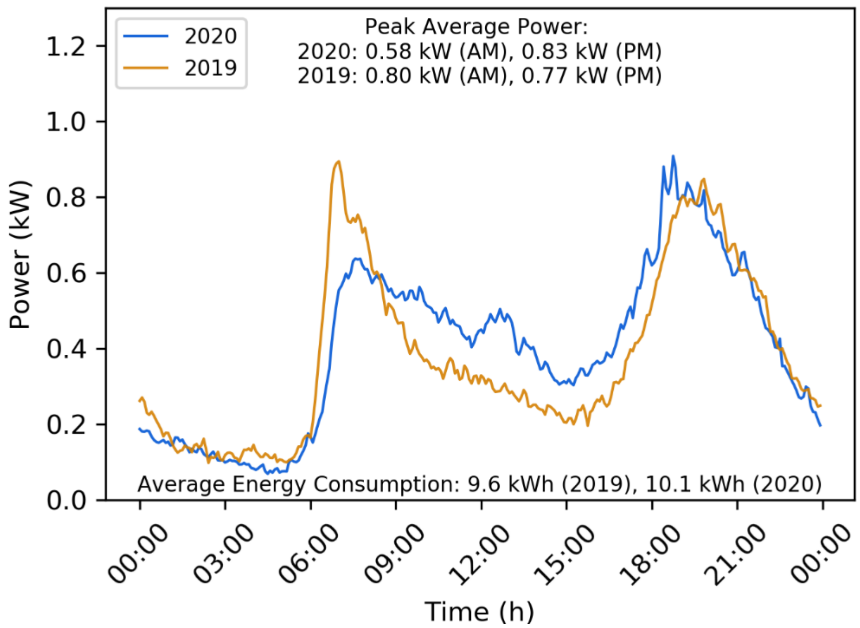


**Figure 5 – COVID-19 – Average 24-Hour Electrical Profile – Weekdays**

Figure 5 shows that the evening and night profiles are similar for both years. However, during the lockdown, the morning peak is slightly delayed and the evening peak happens earlier. This could be explained by the fact that most occupants started their routines later in the morning and earlier in the evening since they did not have to commute to work every day. Also, in the morning, the peak is much higher for the 2019 curve; however, it is flatter during the pandemic than it was in 2019. Indeed, from 9:00 AM to 6:00 PM, the power consumption is higher during the lockdown than it was in 2019. The pattern observed in 2020 is caused by the fact that most people had to stay home. The data is similar to the results observed in Figure 1 and Figure 2 for the weekend curves.

## 3.2 – Temperature

The objective of this subsection is to assess the influence of certain characteristics (period of the week, season and time of day) on the temperature of EWHs. The results presented contain data from the bottom and top sensors of the tested EWHs. For further information regarding EWH temperature, refer to Figure 20 and beyond in Appendix A.2 – Additional Temperature Graphs.

## Bottom Sensor

According to the INSPQ guidelines [1] from 2020, in order to perform DR events on EWHs, the bottom of all water tanks must reach a temperature of at least 55°C for a cumulative period of four hours per day. The bottom sensor temperature was therefore analyzed to verify if it met this criterion. For reference purposes, Figure 6 presents the location of the temperature sensors installed on the tested EWHs. These images were taken from CaSA's Triton Installation Guide [5]. Note that the sensors were installed on the outer surface of the tank inner wall, underneath the insulation layer, and not placed directly in the water.

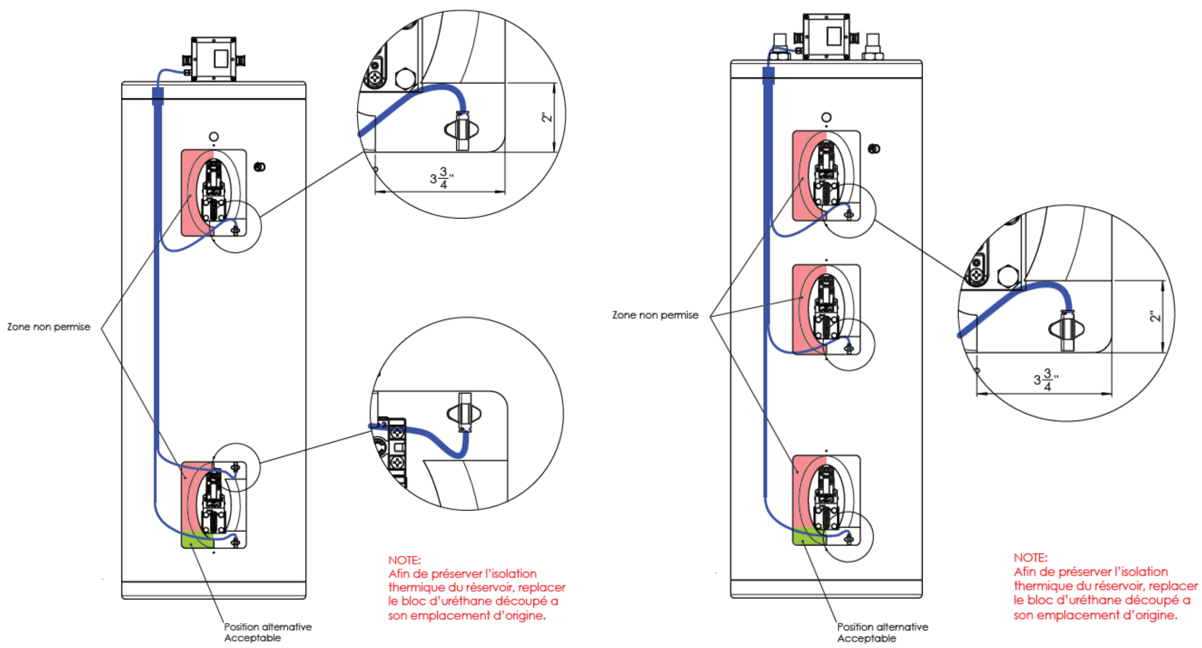


**Figure 6 – Location of Temperature Sensors in Two-Element (Left) and Three-Element (Right) EWHs**

Figure 7 presents the distribution of bottom sensor temperatures measured by season. It is observed that less than 1% of the measurements record a bottom sensor temperature above 55°C. This is due to the bottom sensor being located below the lowest heating element.

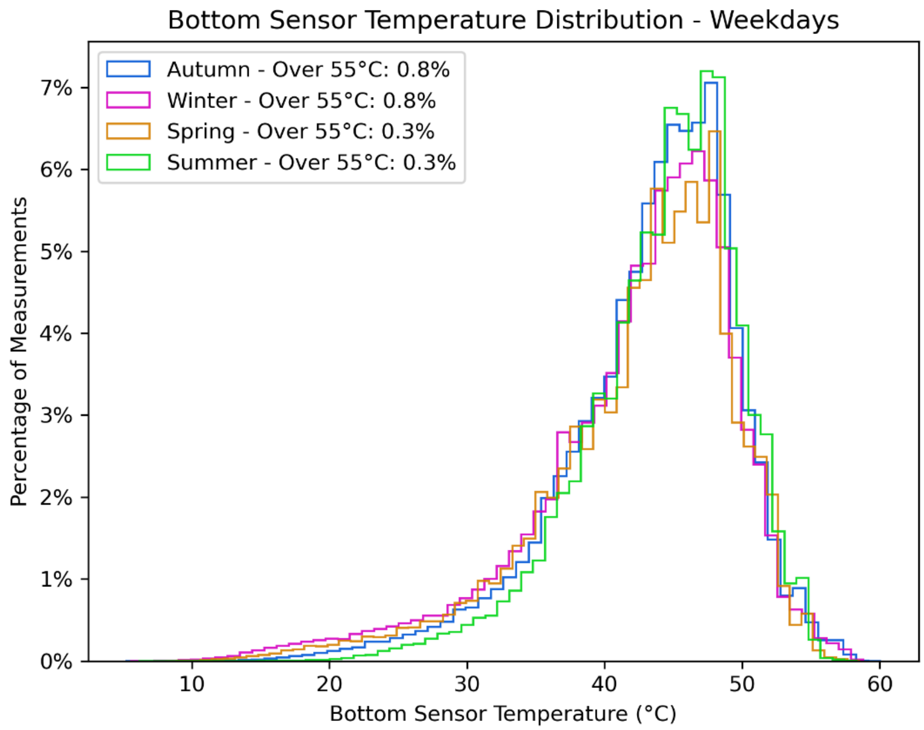


**Figure 7 – Bottom Sensor Temperature Distribution by Season – Weekdays**

Considering that the temperature at the bottom of the tank is rarely above 55°C, the probability is very low of having a cumulative period of four hours that meets the criterion established by the INSPQ. For the EWH sample studied in this project, it can be concluded that, under the current circumstances, DR events cannot be performed.

The bottom sensor temperature was also analyzed to estimate the cold water inlet temperature. This was done by averaging the 25% lowest temperature measurements for each month in order to eliminate most of the measurements where the water at the bottom of the tank could have already started heating up. Figure 8 presents these results using the datasets Summer Weekdays, Summer Weekends, Winter Weekdays, Winter Weekends, etc.

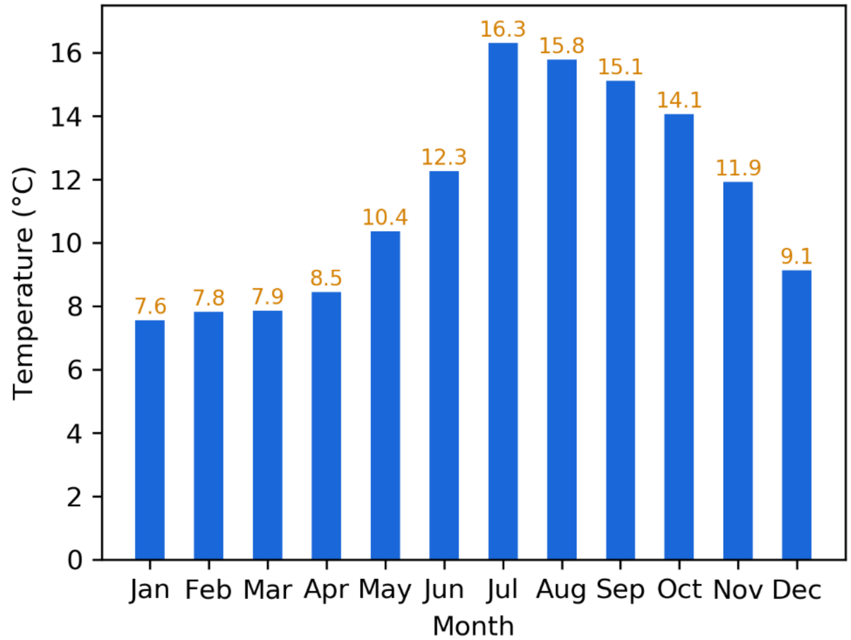


**Figure 8 – Average Calculated Water Inlet Temperature**

After estimating the water inlet temperature, its relation to daily energy consumption was obtained, as presented in Figure 9.

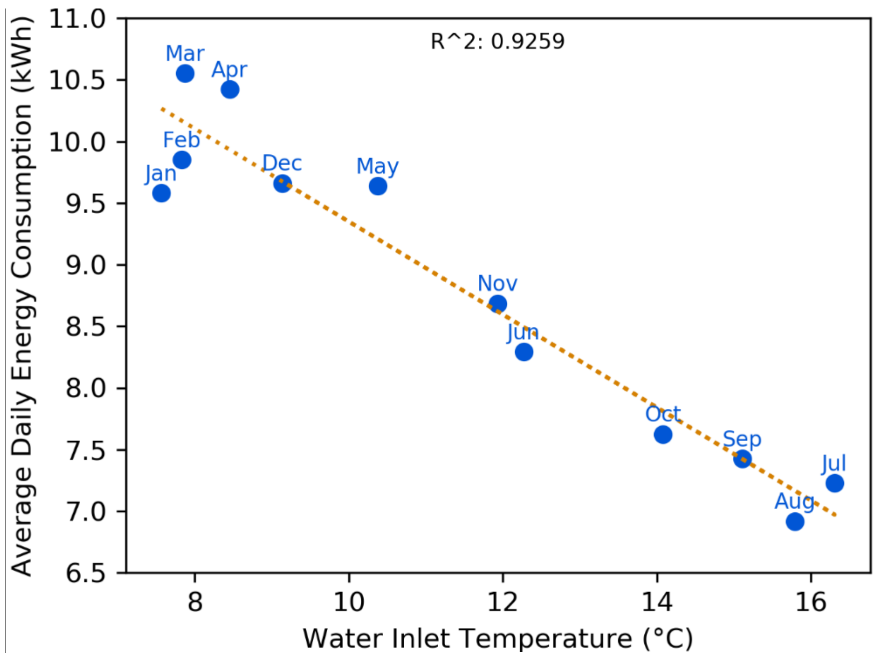


**Figure 9 – Energy Consumption vs Average Calculated Water Inlet Temperature by Month**

It is noted that the calculated water inlet temperature is negatively correlated to the average daily energy consumption ($R^2$ = 0.926). These results are once again coherent:

the colder the entry water, the more energy is required to obtain hot water. In support of this argument, it can be observed that the months of June and November have similar average energy consumption. Even with a large difference in terms of outside air temperature (Jun: 16.2°C, Nov: -3.5°C) [6], the two months have an almost identical average water inlet temperature (Jun: 12.3°C, Nov: 11.9°C). Thus, it can be concluded that the average daily energy consumption has a stronger correlation to the calculated water inlet temperature than to the outside air temperature.

# 4 – Conclusion

Starting from a clean dataset of power and water temperature measurements of approximately 160 EWHs installed in Sherbrooke, Quebec, an analysis was conducted to evaluate the influence of different variables on the energy consumption and water temperature of EWHs.

First, seasons and time of the week have an effect on the energy consumption. Seasonal temperature variations influence the average energy consumption of a household. As expected, the consumption increases during the coldest periods of the year. Also, during weekends, the energy consumption is more significant and the morning peak is delayed and more widely distributed than during the week.

Second, the EWH type influences the consumption profile of EWHs. Larger EWHs consume more energy on average than smaller 40 imp gal EWHs. In addition, three-element EWHs flatten the electrical morning peak and delay the evening peak when compared to two-element EWHs. However, it should be noted that the sample of 60 imp gal three-element EWHs used for this analysis was limited to 12 units. Thus, the results may not be representative of a larger population.

Third, the COVID-19 lockdown (data from 2020-03-23 to 2020-06-28) influenced the average household electricity consumption and load profile. Indeed, the energy consumption was more important and the morning peak was more widely distributed during the lockdown period.

Fourth, a strong correlation was established between the calculated cold-water inlet temperature and the average daily energy consumption of EWHs.

To further this analysis, the next steps would be to perform DR events and use the information presented in this report to evaluate the impact of DR on the electrical peak and energy consumption of EWHs as well as on the comfort of occupants. However, given that the bottom temperature measurements of EWHs observed in this analysis do not fulfill the anti-legionella criterion set by Quebec's National Public Health Institute, these tests could not be performed.

# 5 – Bibliography


[1] Hydro-Québec Distribution, "Réponse d’Hydro-Québec Distribution à la demande de renseignements no 1 du ROEÉ," 1st May 2020. [Online]. Available: http://publicsde.regie-energie.qc.ca/projets/529/DocPrj/R-4110-2019-B-0047-DDR-RepDDR-2020_05_01.pdf.

[2] A. Prieur, L.-P. Proulx, S. Wong, C. Baird, M. Fassier and J. Geissberger, *Annex "A" Statement of Work - BCIP S6-0308 - Triton,* 2017.

[3] T. Paulin-Bessette, "BCIP Data Cleaning Project - Dataset Documentation," Natural Resources Canada, 2020, August 3rd.

[4] Hydro-Québec, "Discover the water heater with ECOPEAK® technology," 2021. [Online]. Available: https://www.hydroquebec.com/residential/energy-wise/hot-water/water-heater.html.

[5] CaSA Energy, "Triton - Guide d'installation du modèle Neptune," 2019.

[6] Government of Canada, "Historical Climate Data," 15th June 2020. [Online]. Available: https://climate.weather.gc.ca/historical_data/search_historic_data_e.html.

# Appendix A.1 – Additional Electrical Profile & Energy Consumption Graphs

The 24-hour electrical profiles presented in this section correspond to the aggregated average daily profile of all EWHs. The peak average power values correspond to the morning and evening peaks from 6:45 AM to 7:45 AM and 6:30 PM to 7:30 PM, respectively. Both periods were identified through data analysis as the one-hour timeframe, on weekdays, with the highest power consumption on average.

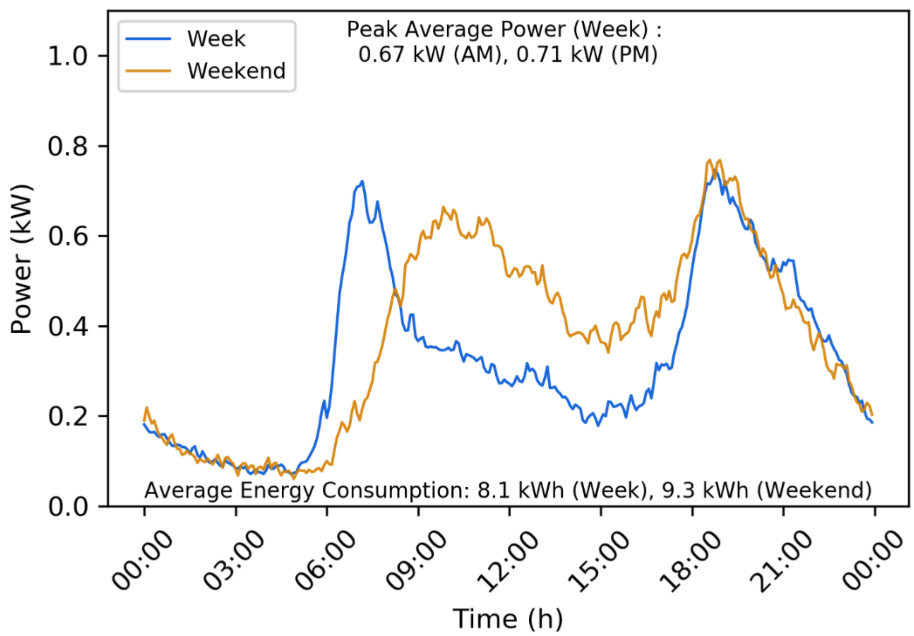


**Figure 10 – 24-Hour Electrical Profile – Fall**

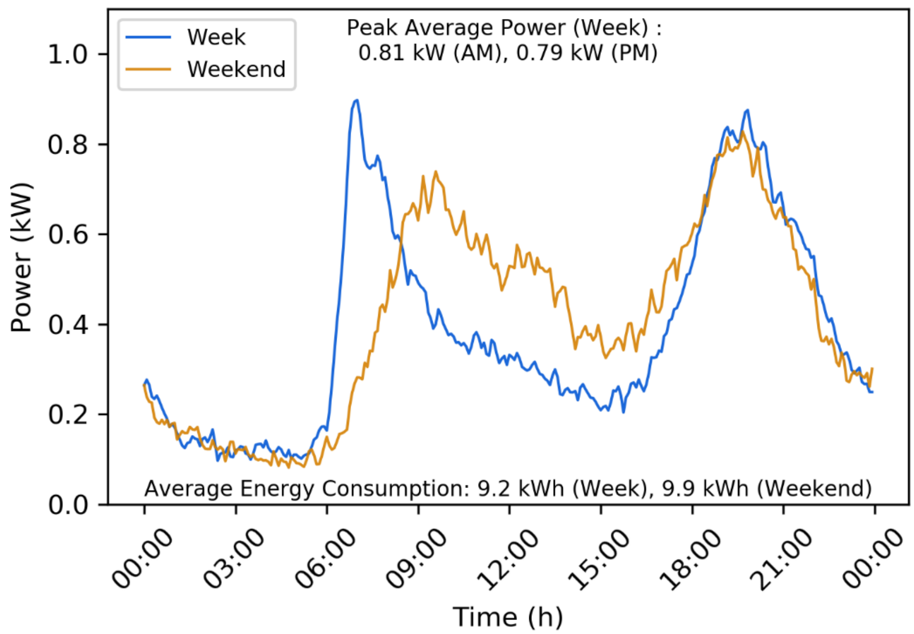


**Figure 11 – 24-Hour Electrical Profile – Spring**

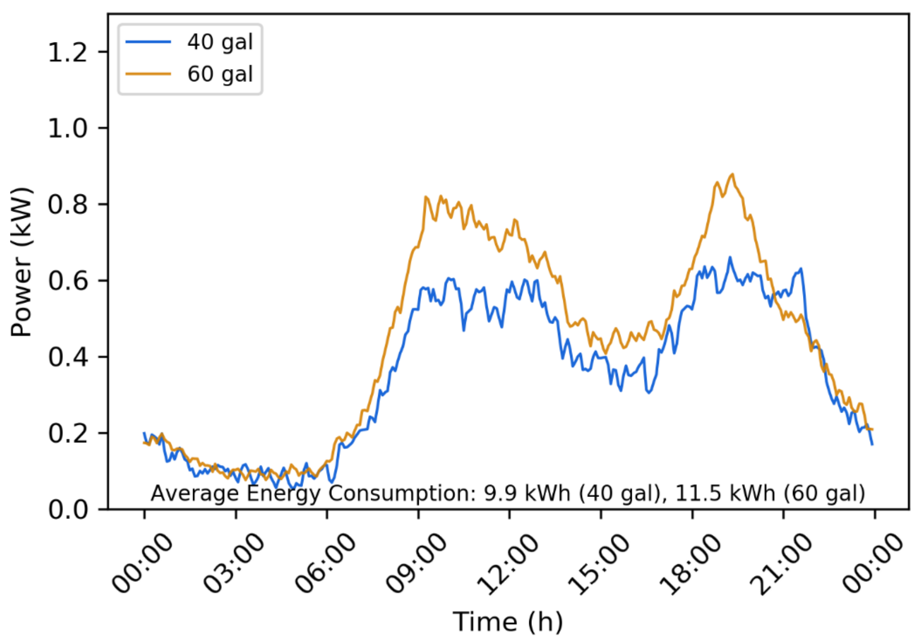


**Figure 12 – 40 imp gal vs 60 imp gal Winter Electrical Profile – Weekends**

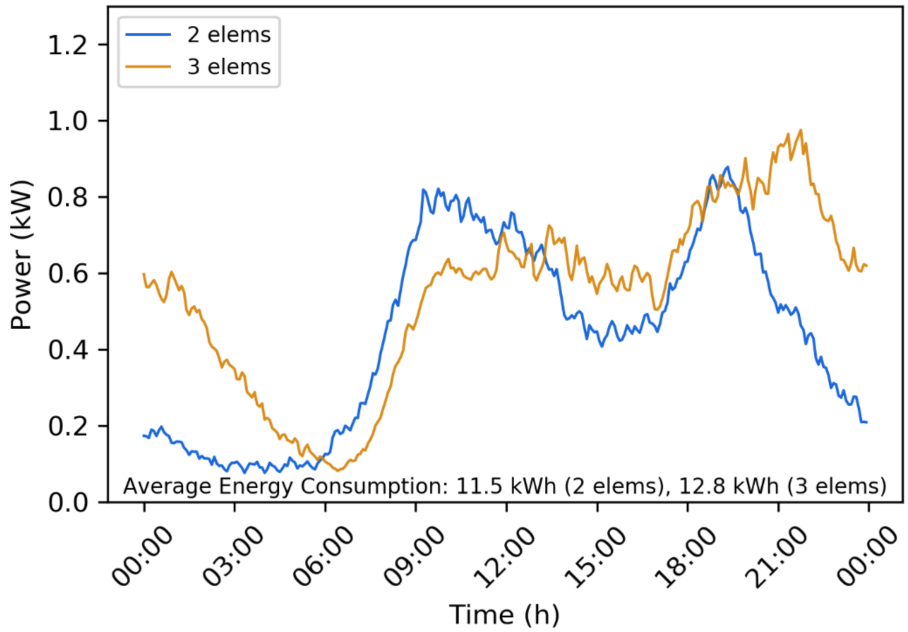


**Figure 13 – 60 imp gal 2 elements vs 3 Elements Winter Electrical Profile – Weekends**

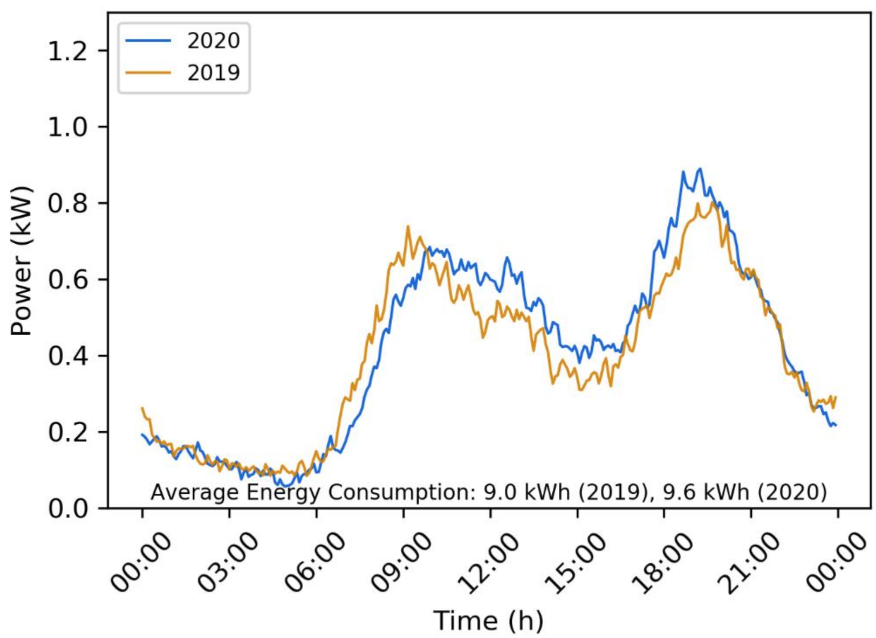


**Figure 14 – COVID-19 – Average 24h Electrical Profile – Weekend**

For each day of the dataset, the total daily energy consumption for all EWHs was calculated and then divided by the number of EWHs to obtain an average consumption per EWH. Figure 15 to Figure 19 present the percentage of these days corresponding to different average daily energy consumption intervals.

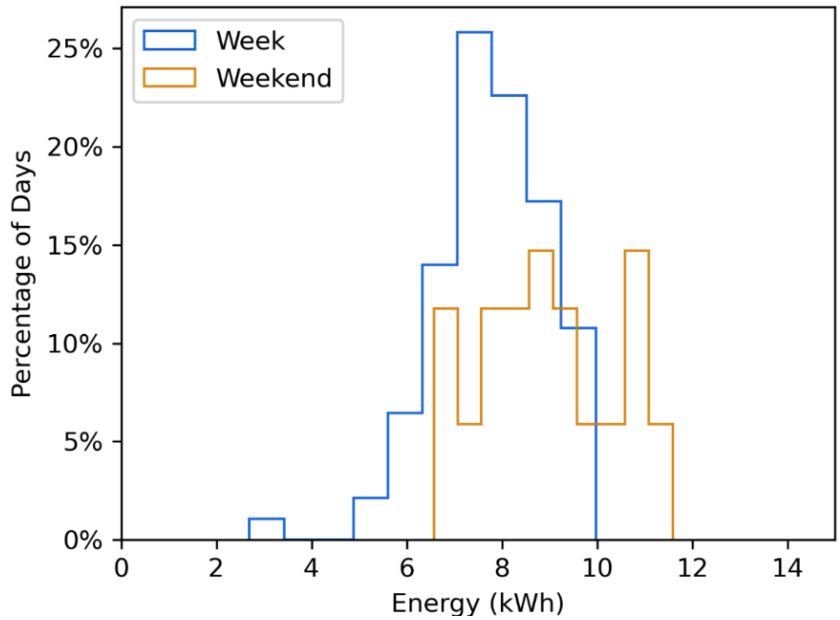


**Figure 15 – Average Daily Energy Consumption Distribution – Fall**

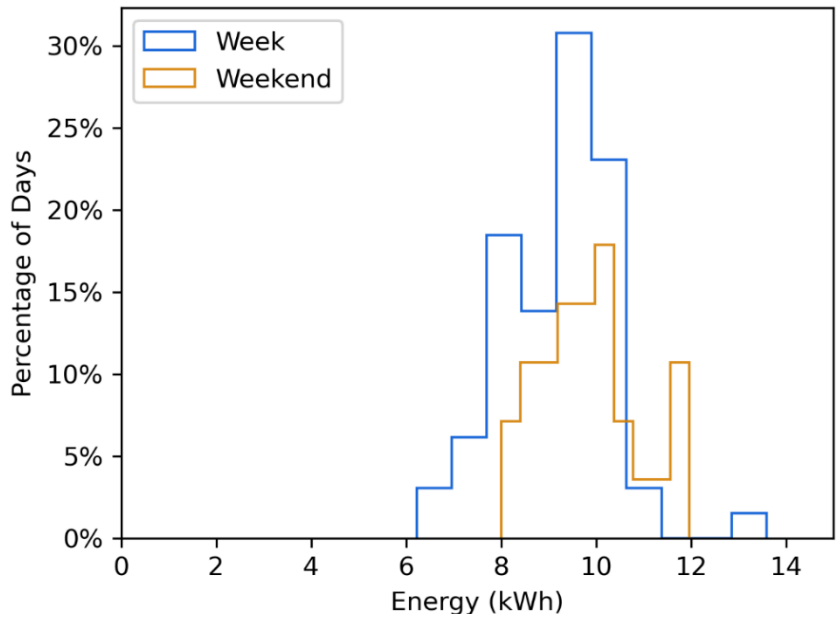


**Figure 16 – Average Daily Energy Consumption Distribution – Spring**

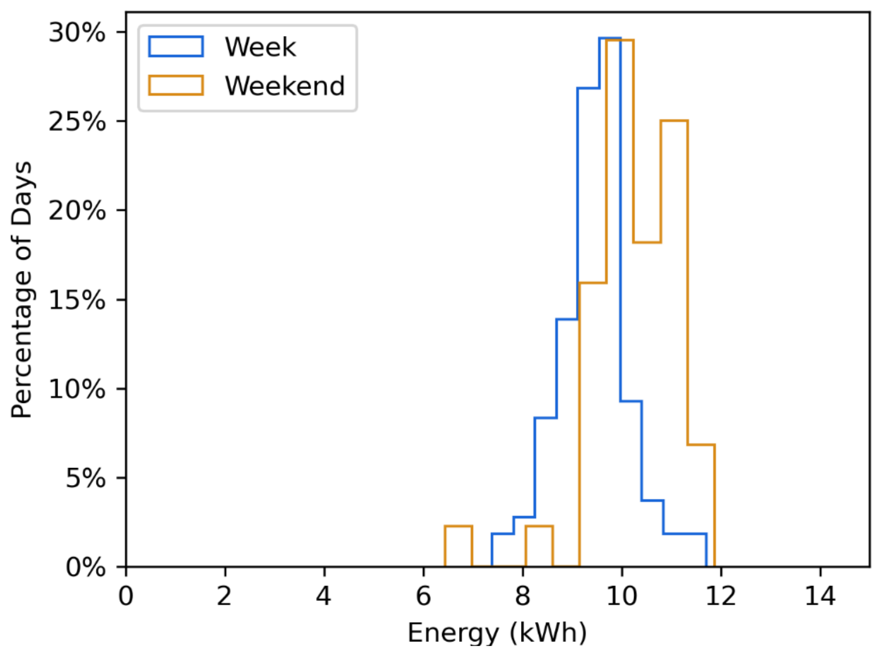


**Figure 17 – Average Daily Energy Consumption Distribution – Winter**

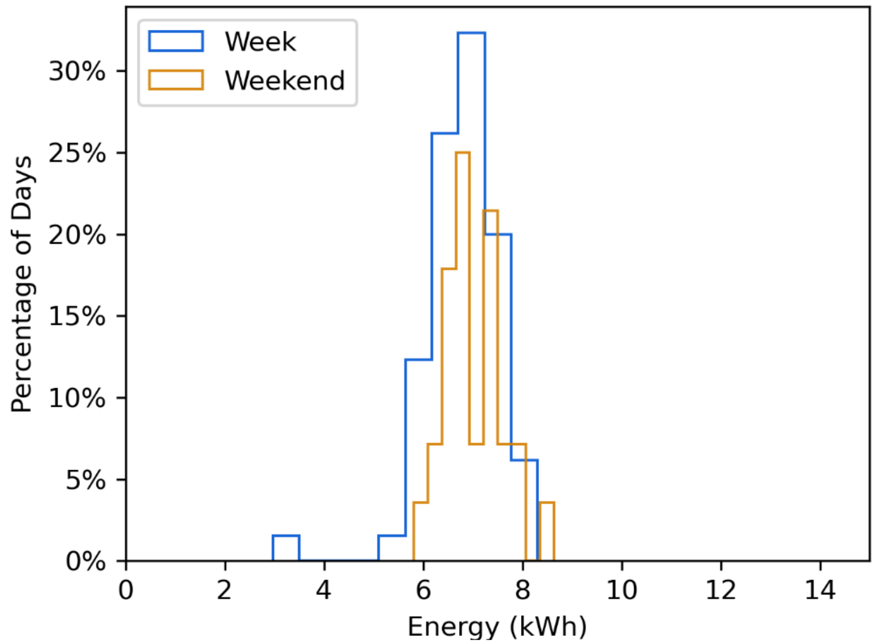


**Figure 18 – Average Daily Energy Consumption Distribution – Summer**

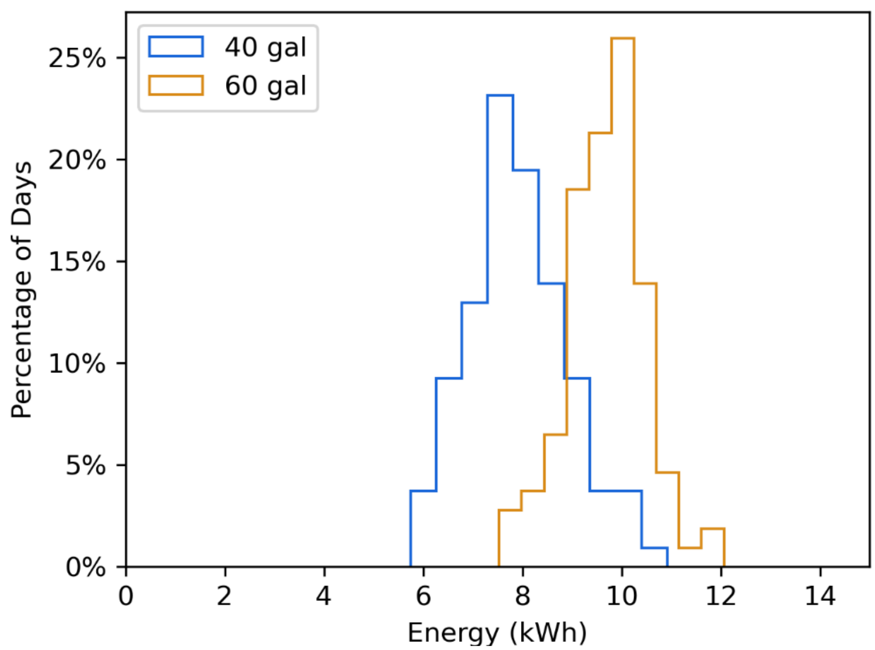


**Figure 19 – Average Daily Energy Consumption Distribution – 40 imp gal vs 60 imp gal**

# Appendix A.2 – Additional Temperature Graphs

The bottom and top sensor temperature distribution graphs present the percentage of measurements collected for different temperature The 24-hour temperature profile graphs for both bottom and top sensors correspond to the aggregated and average daily profile of all EWHs for a specific dataset.

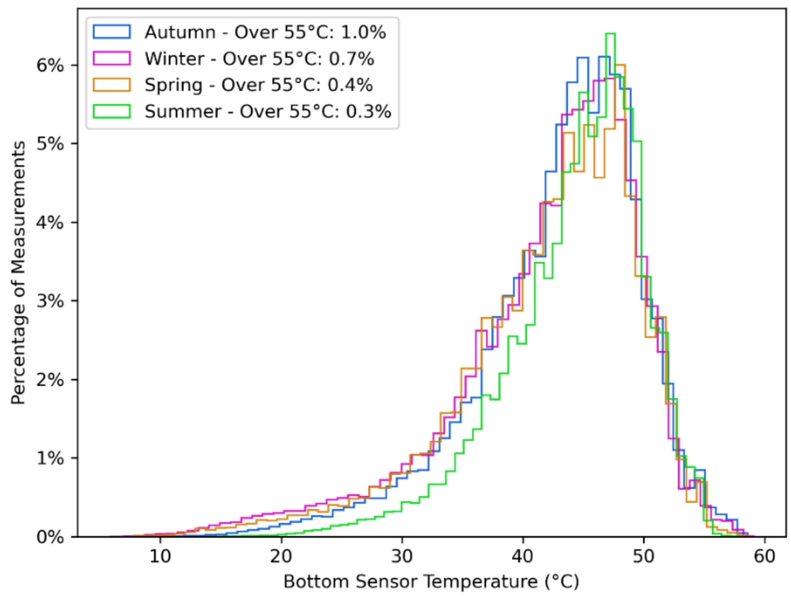


**Figure 20 – Bottom Sensor Temperature Distribution by Season – Weekends**

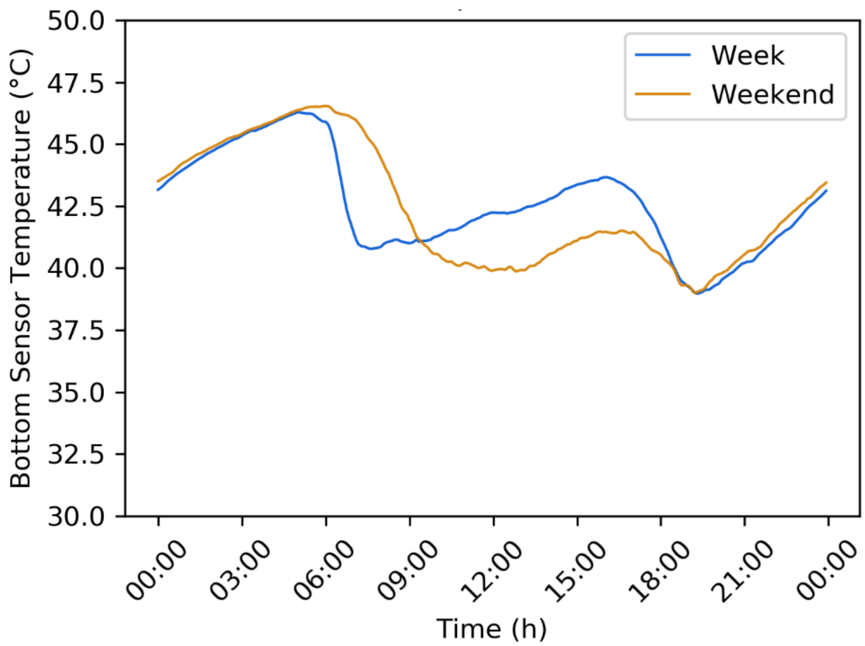


**Figure 21 – Bottom Sensor 24-Hour Temperature Profile - 2 Elements**

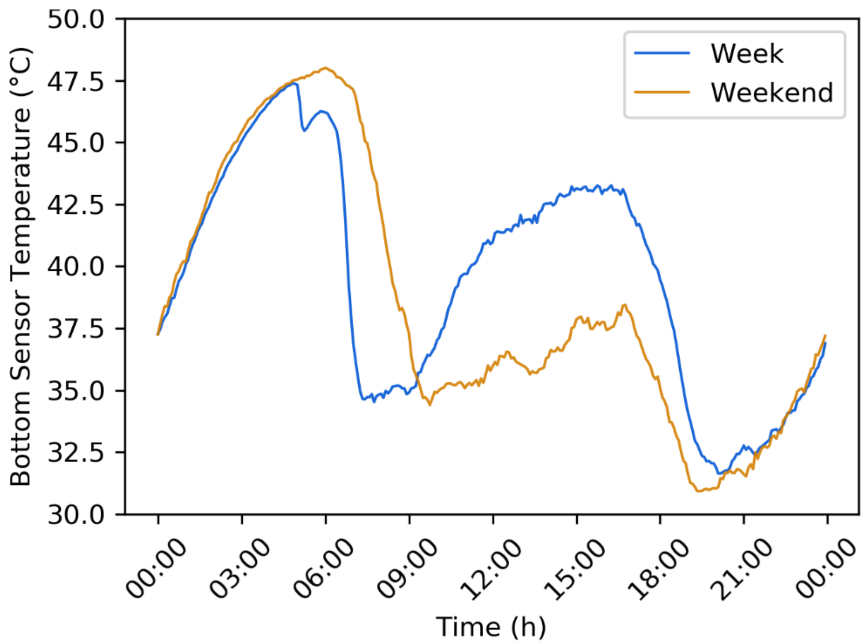


**Figure 22 – Bottom Sensor 24-Hour Temperature Profile – 3 Elements**

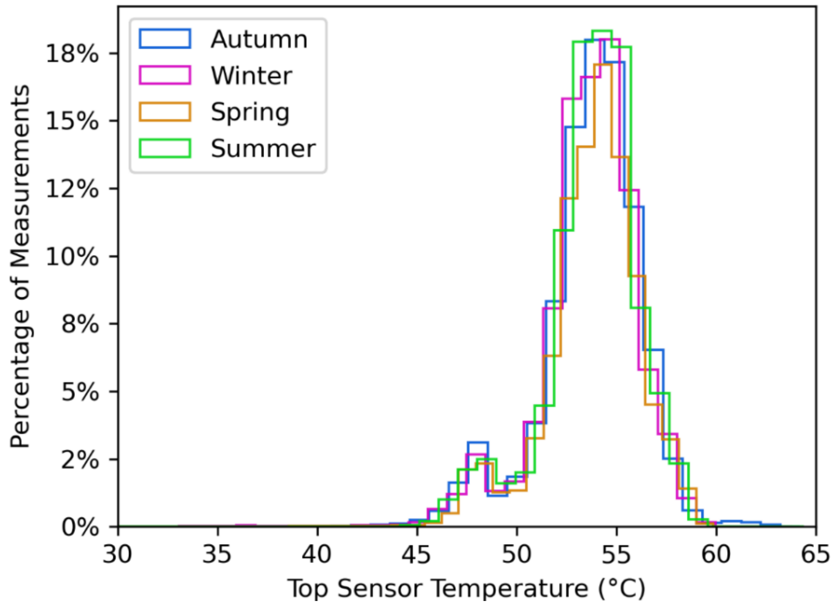


**Figure 23 – Top Sensor Temperature Distribution – Weekdays**

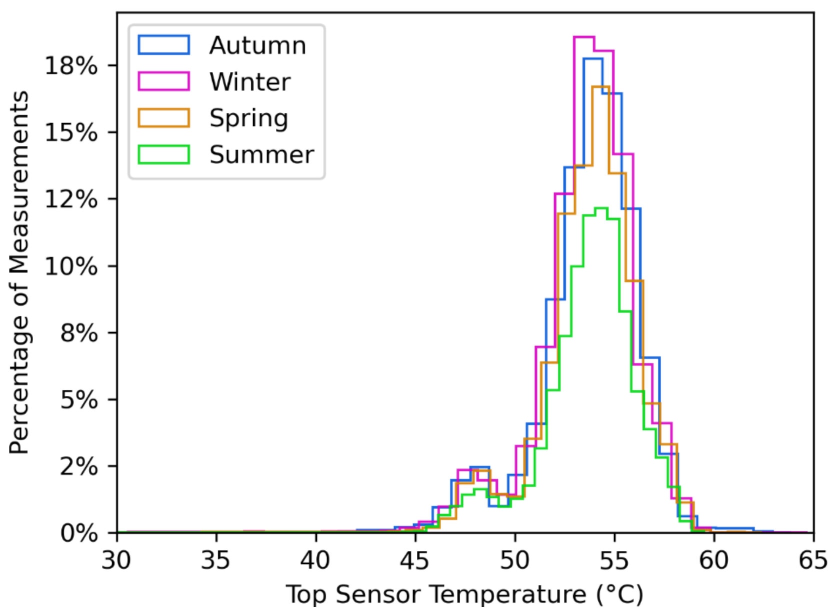


**Figure 24 – Top Sensor Temperature Distribution – Weekends**

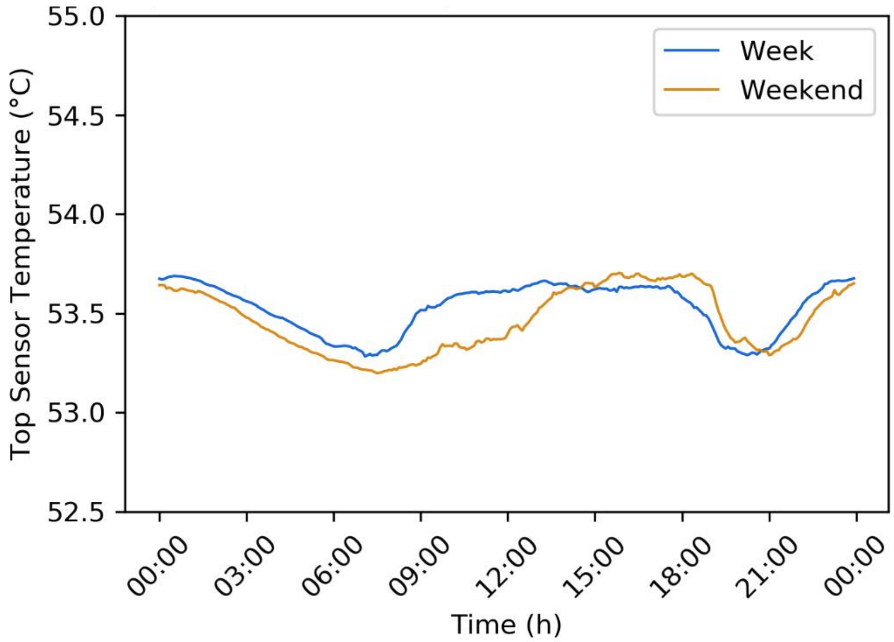


**Figure 25 – Top Sensor 24-Hour Temperature Profile – 2 Elements**

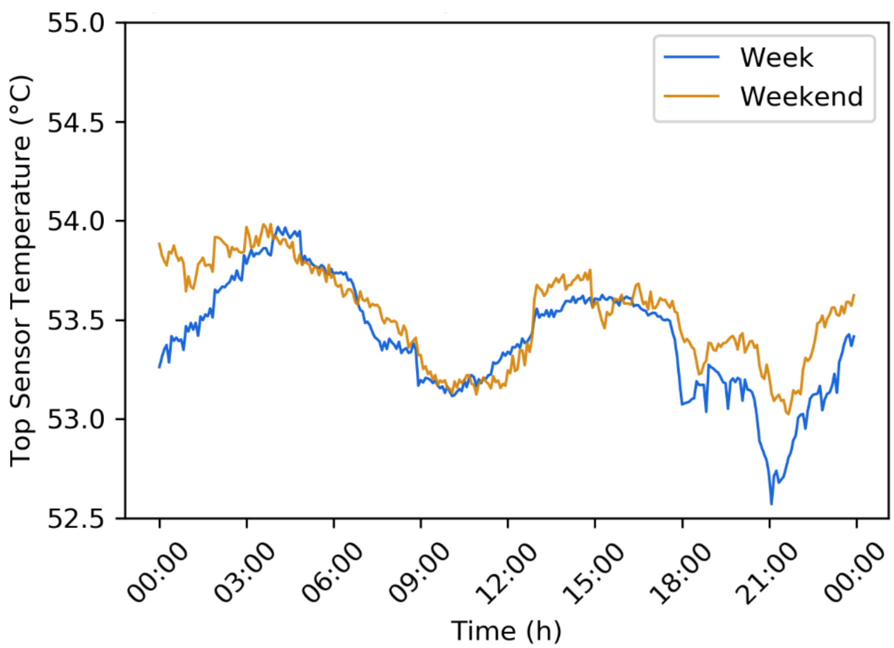


**Figure 26 – Top Sensor 24-Hour Temperature Profile – 3 Elements**

# Appendix B – Additional Tables

**Table 5 – List of Holidays Filtered Out of the Clean Dataset**

```
holidays_list = [date (2018, 12, 24),
date (2018, 12, 25),
date (2018, 12, 26),
date (2018, 12, 27),
date (2018, 12, 28),
date (2018, 12, 29),
date (2018, 12, 30),
date (2018, 12, 31),
date (2019,  3,  8),# Start of Daylight Saving Time
date (2019, 11, 15),# End of Daylight Saving Time
date (2019, 4, 19), #Good Friday
date (2019, 4, 22), #Easter Monday
date (2019, 5, 20), #Patriot’s Day
date (2019, 6, 24), #Saint-Jean-Baptiste
date (2019, 9, 2), #Labour Day
date (2019, 10, 14), #Thanksgiving
date (2019, 12, 24),
date (2019, 12, 25),
date (2019, 12, 26),
date (2019, 12, 27),
date (2019, 12, 28),
date (2019, 12, 29),
date (2019, 12, 30),
date (2019, 12, 31),
date (2020, 1, 1),
date (2020, 1, 2),
date (2020, 1, 3),
date (2020, 1, 4),
date (2020, 1, 5),
date (2020, 3, 8),# Start of Daylight Saving Time
date (2020, 11, 1),# End of Daylight Saving Time
date (2020, 4, 10), #Good Friday
date (2020, 4, 13), #Easter Monday
date (2020, 5, 18), #Patriot’s Day
date (2020, 6, 24), #Saint-Jean-Baptiste
date (2020, 9, 7), #Labour Day
date (2020, 10, 12)] #Thanksgiving]
```

**Table 6 – EWH Type Description**

| EWH Categories | Specifications | Sensor Installation |
|---|---|---|
| 40 imp gallons, 2 elements | V = 240 V<br>Low Element = 3000 W (12.5A)<br>Middle Element = 3000 W (12.5A) | Low Sensor = Under Low Element<br>Middle Sensor = Above Low Element<br>Top Sensor = Under Middle Element |
| 40 imp gallons, 2 elements (Expert +) | V = 240 V<br>Low Element = 3800 W (15.83A)<br>Middle Element = 3800 W (15.83A) | Low Sensor = Under Low Element<br>Middle Sensor = Above Low Element<br>Top Sensor = Under Middle Element |
| 60 imp gallons, 2 elements | V = 240 V<br>Low Element = 4500 W (18.75A)<br>Middle Element = 4500 W (18.75A) | Low Sensor = Under Low Element<br>Middle Sensor = Above Low Element<br>Top Sensor = Under Middle Element |
| 60 imp gallons, 3 elements | V = 240 V<br>Low Element = 800 W (3.33A)<br>Middle Element = 3000 W (12.5A)<br>Top Element = 3800 W (15.83A) | Low Sensor = Under Low Element<br>Middle Sensor = Under Middle Element<br>Top Sensor = Under Top Element |