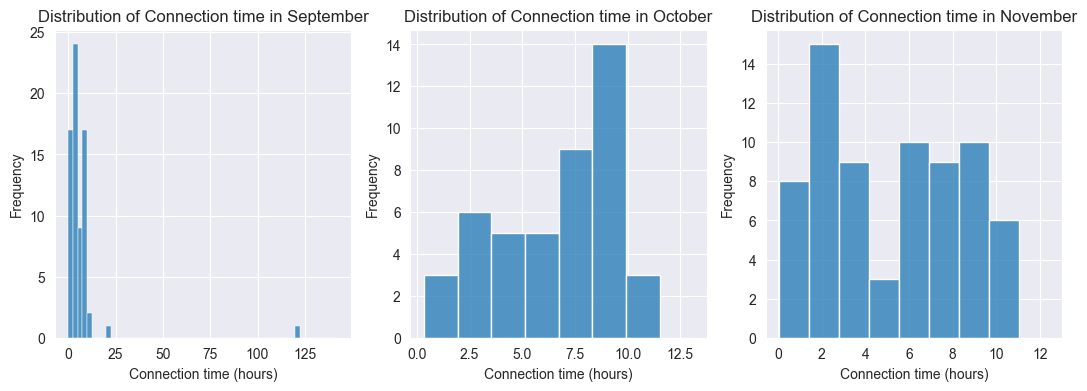
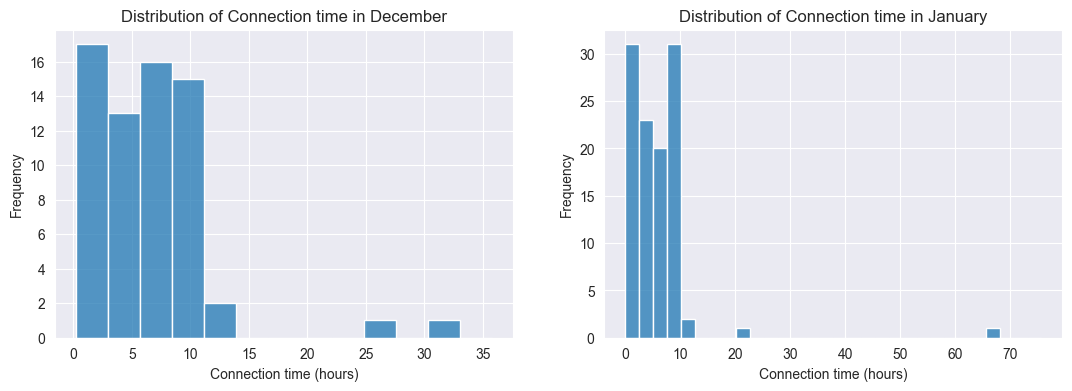
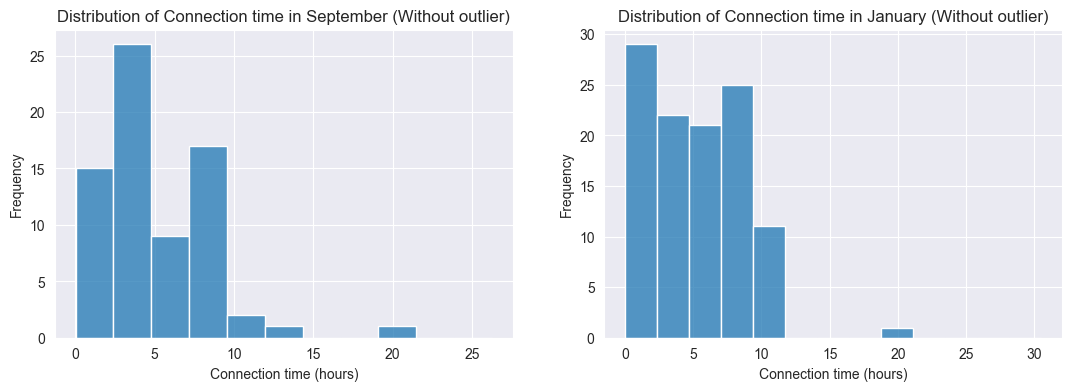
**CONNECTION TIME DISTRIBUTION**

****

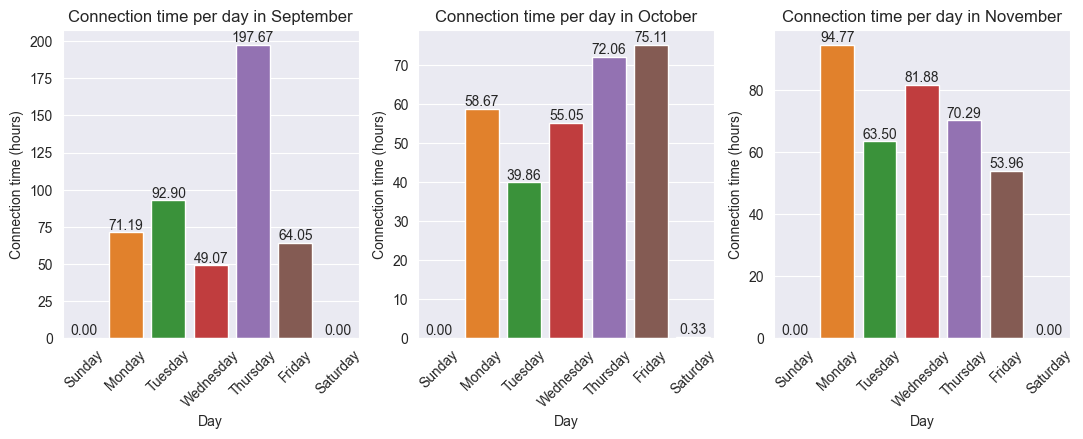
****

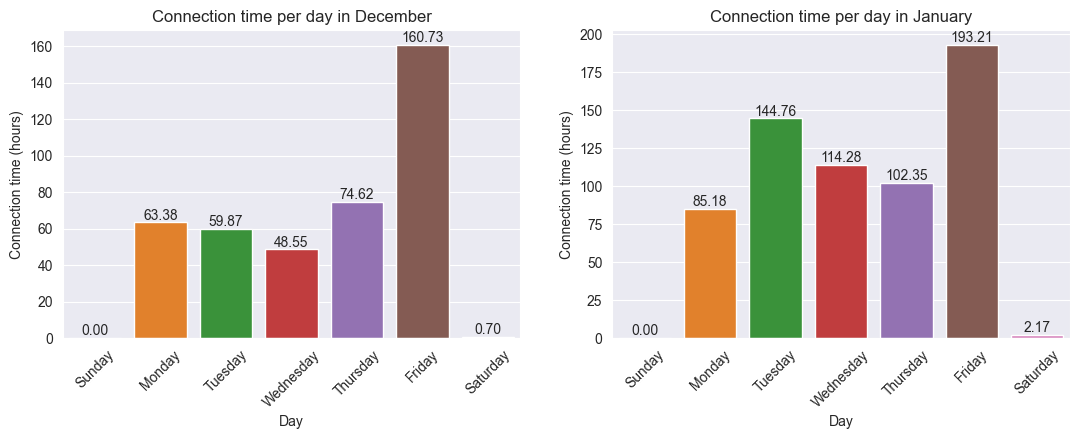
The connection time is skewed to the right in September, December and January. These are due to high connection times, which occur very less frequently, compared to other connection times in the respective months. To avoid generalizing wrongly due to these outlier connection times, the median is used to calculate the connection time, instead of mean, for the days of the week in each month. This is because the mean is more affected by these outliers.

***WITHOUT OUTLIERS***



**TOTAL CONNECTION TIME (MONTHLY)**



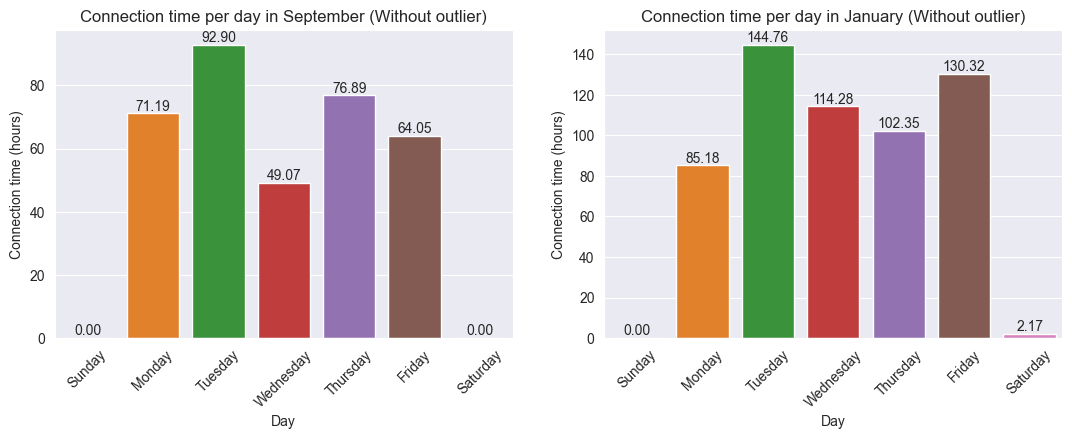


**MEDIAN CONNECTION TIME (HOURS) FOR EACH DAY IN EACH MONTH**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | - | 7.64 | 5.72 | 3.11 | 8.07 | 3.57 | - |
| October | - | 7.39 | 4.48 | 8.80 | 7.60 | 7.88 | 0.33 |
| November | - | 6.60 | 3.74 | 6.71 | 6.06 | 3.56 | - |
| December | - | 3.18 | 7.06 | 3.08 | 9.34 | 6.34 | 0.70 |
| January | - | 4.70 | 7.45 | 5.13 | 5.14 | 3.98 | 2.17 |

No employee connected their EV on Sunday. Some connected on Saturday in November, December and January.

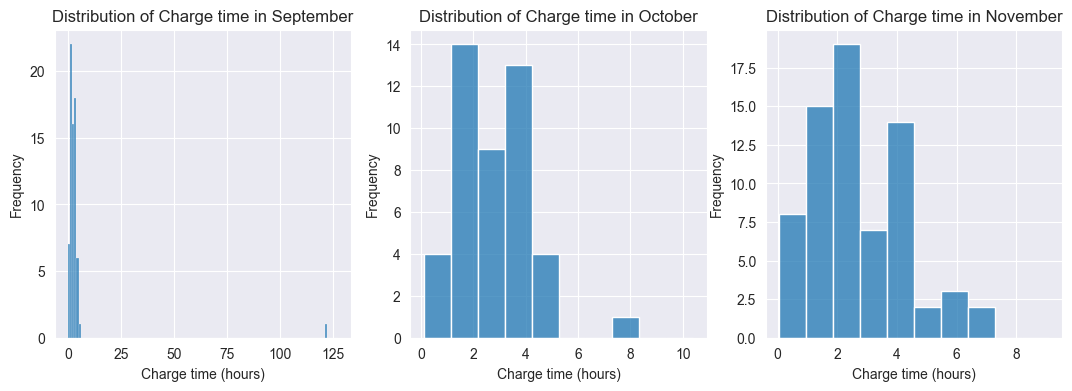
***WITHOUT OUTLIERS***

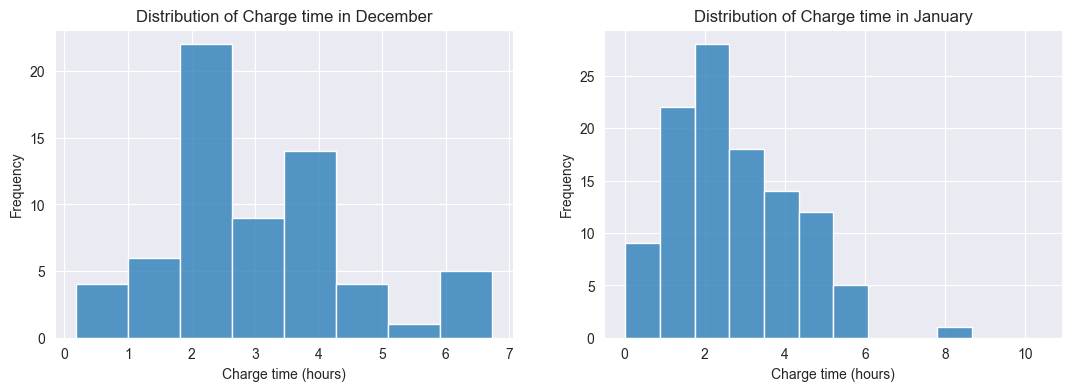


**MEAN CONNECTION TIME (HOURS) FOR EACH DAY IN EACH MONTH (CORRECTED DATA)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | - | 5.93 | 6.63 | 3.27 | 5.91 | 3.77 | - |
| October | - | 7.33 | 5.69 | 6.88 | 6.55 | 7.51 | 0.33 |
| November | - | 5.92 | 4.88 | 5.12 | 5.41 | 4.49 | - |
| December | - | 4.88 | 6.65 | 4.05 | 8.29 | 7.65 | 0.70 |
| January | - | 5.32 | 6.58 | 5.19 | 5.39 | 4.49 | 2.17 |

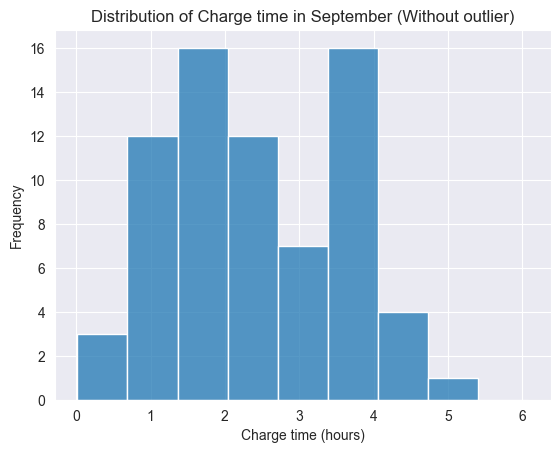
**DISTRIBUTION OF CHARGE TIME**



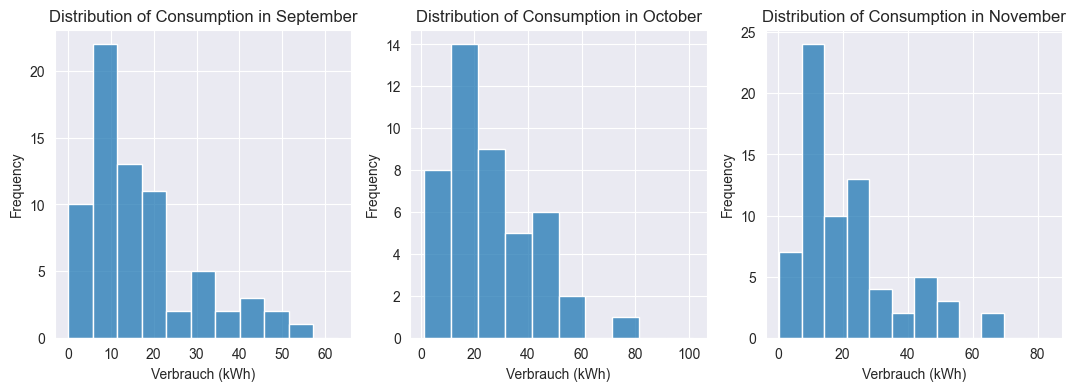


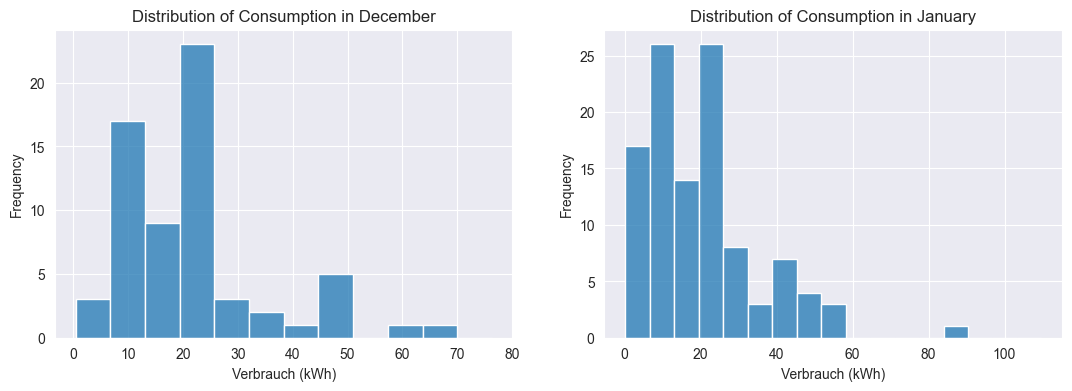
Most of the charge time in September had a duration less than 8 hours. There is an outlier with a charge time of over 120 hours. The rest of the months had a charge time duration less than 8 hours, with majority of the duration falling between 1 and 5 hours.

***WITHOUT OUTLIERS***



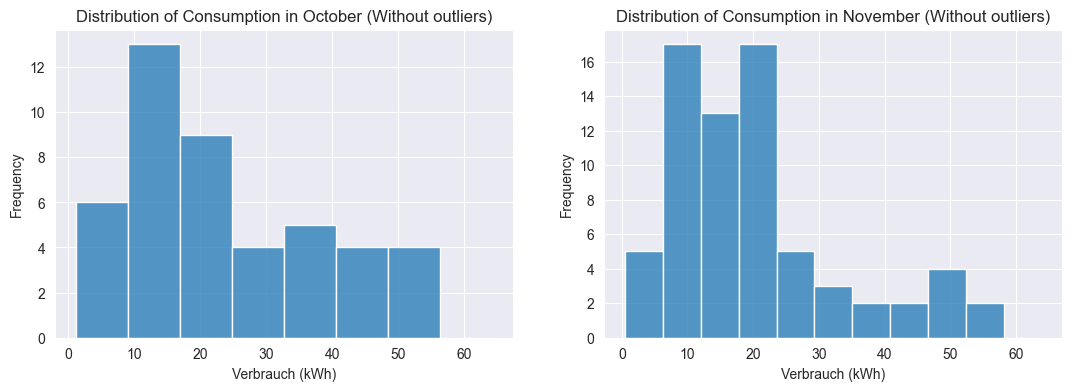
**CONSUMPTION DISTRIBUTION**

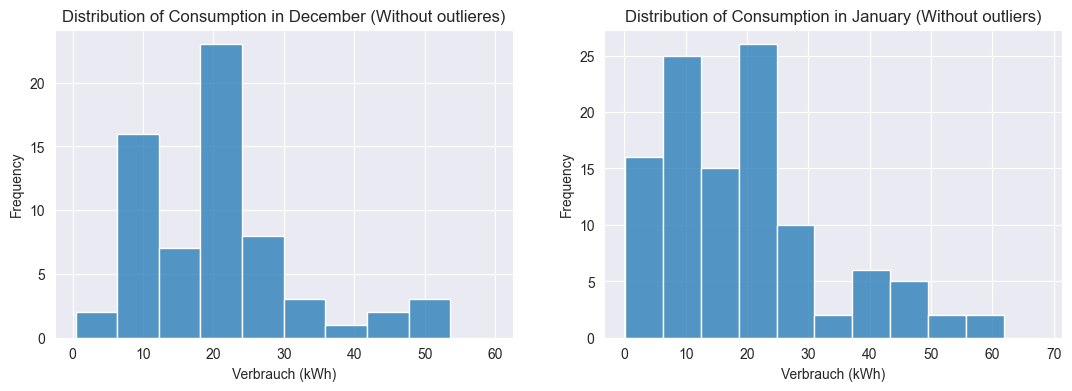




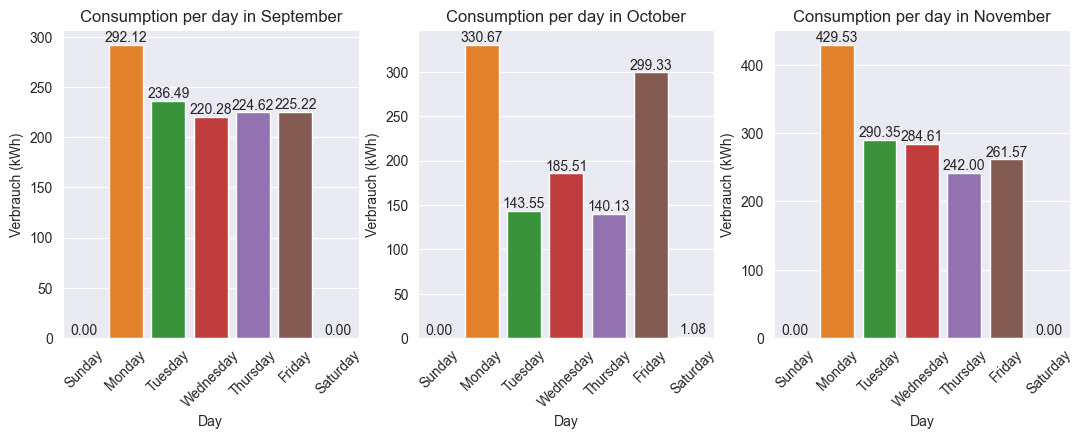
Energy consumption was mostly between 5 and 40 kWh. Consumption was as high as 80 kWh for a charge session in January, with the rest of the months having less than 65 kWh. The energy consumption for all the months seems to be right skewed, which means the mean is consumption is likely to be influenced by outlier consumption (like the 80 kWh) for each month.

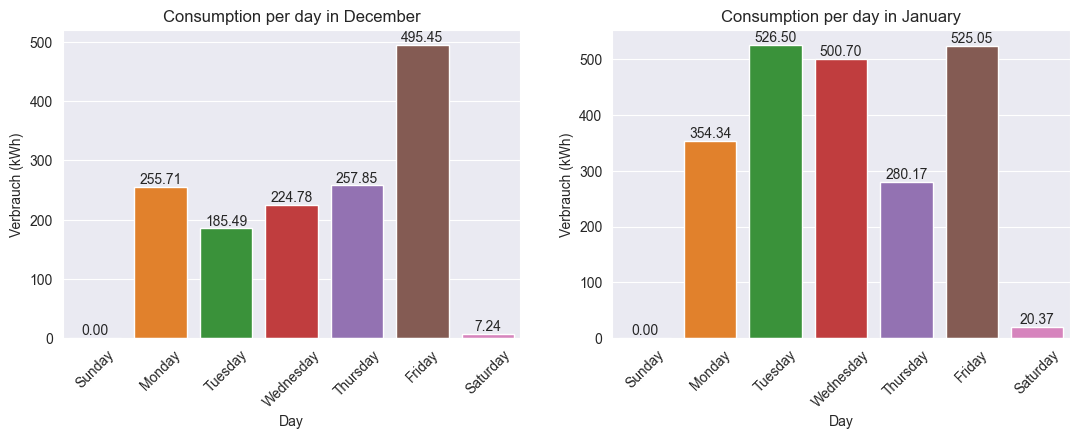
***WITHOUT OUTLIERS***





**TOTAL CONSUMPTION (MONTHLY)**

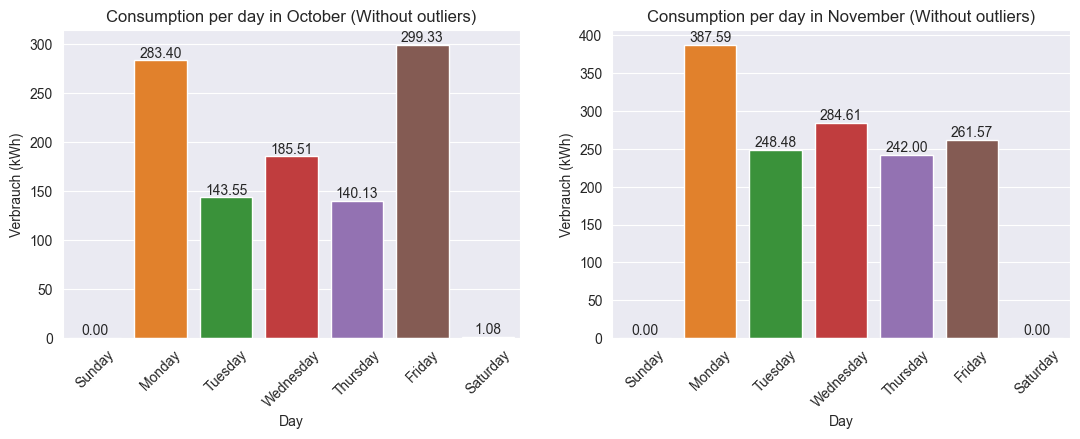


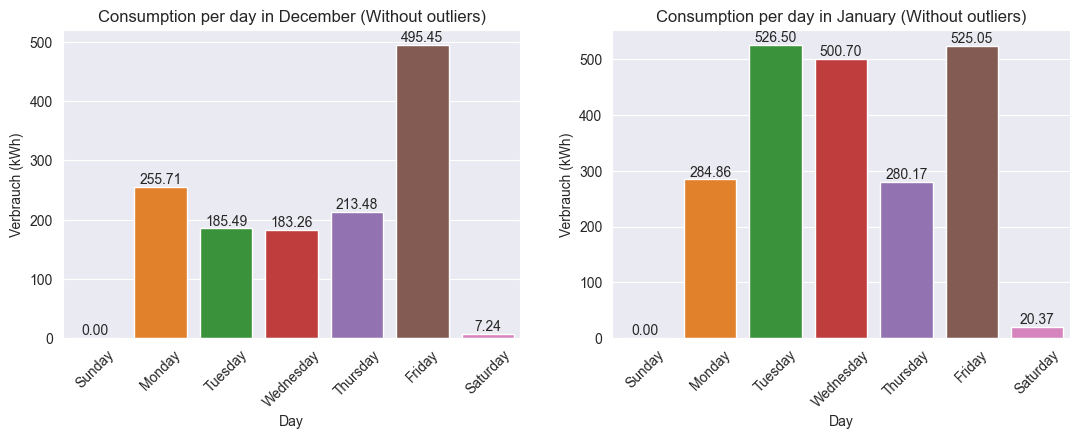


**MEDIAN ENERGY CONSUMPTION (kWh) FOR EACH DAY**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | - | 22.411 | 11.308 | 11.280 | 11.961 | 11.208 | - |
| October | - | 40.826 | 18.115 | 22.263 | 12.360 | 30.254 | 1.077 |
| November | - | 23.1115 | 15.640 | 14.791 | 14.1330 | 17.2455 | - |
| December | - | 21.285 | 21.011 | 16.229 | 22.917 | 21.327 | 7.239 |
| January | - | 17.6045 | 21.5595 | 21.9175 | 10.8830 | 15.6500 | 20.3670 |

***WITHOUT OUTLIERS***

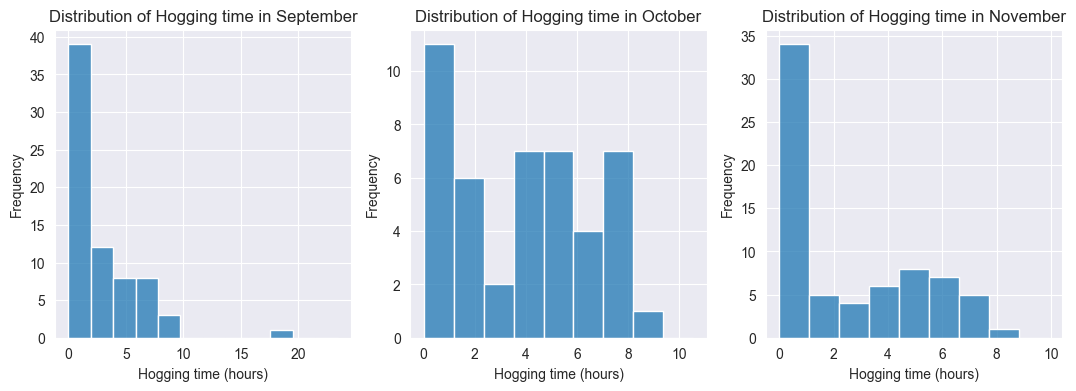


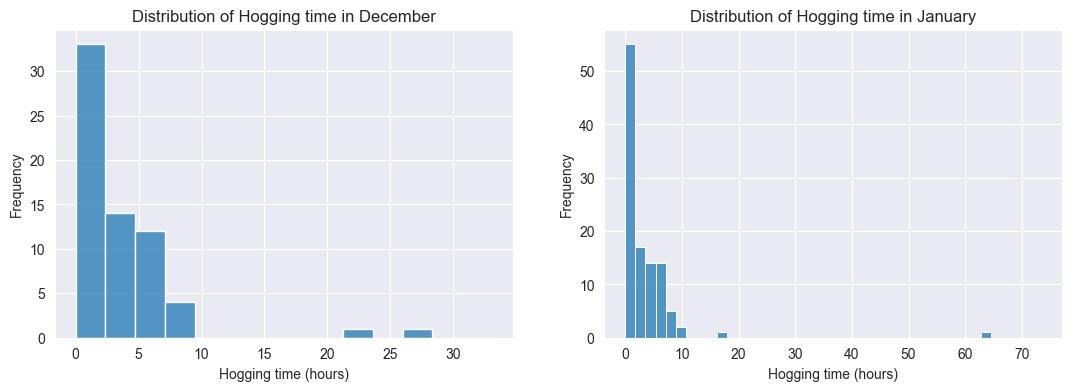


**MEDIAN ENERGY CONSUMPTION (kWh) FOR EACH DAY (CORRECTED DATA)**

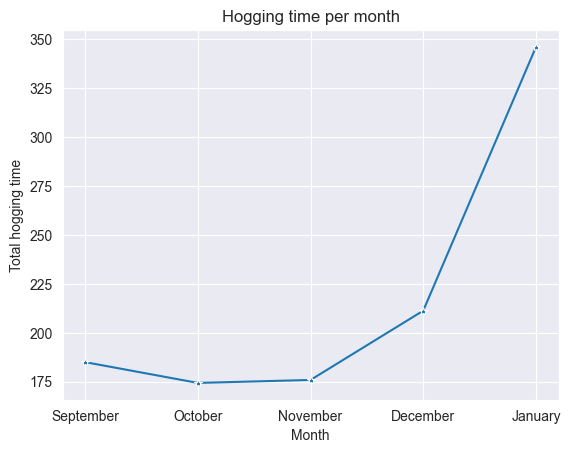
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | - | 24.34 | 16.89 | 14.68 | 17.28 | 13.25 | - |
| October | - | 35.43 | 20.51 | 23.19 | 12.74 | 29.93 | 1.08 |
| November | - | 24.22 | 19.11 | 17.79 | 18.62 | 21.79 | - |
| December | - | 19.67 | 20.61 | 15.27 | 23.72 | 23.59 | 7.24 |
| January | - | 17.80 | 23.93 | 22.76 | 14.75 | 18.11 | 20.37 |

**HOGGING TIME DISTRIBUTION**

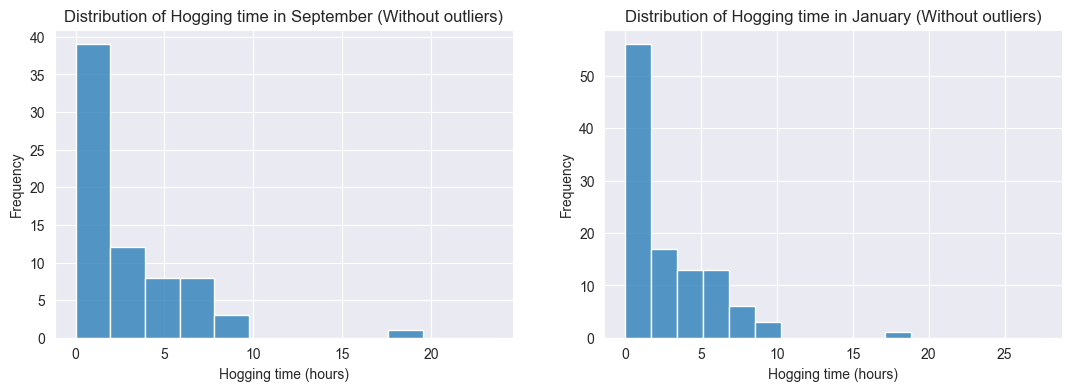




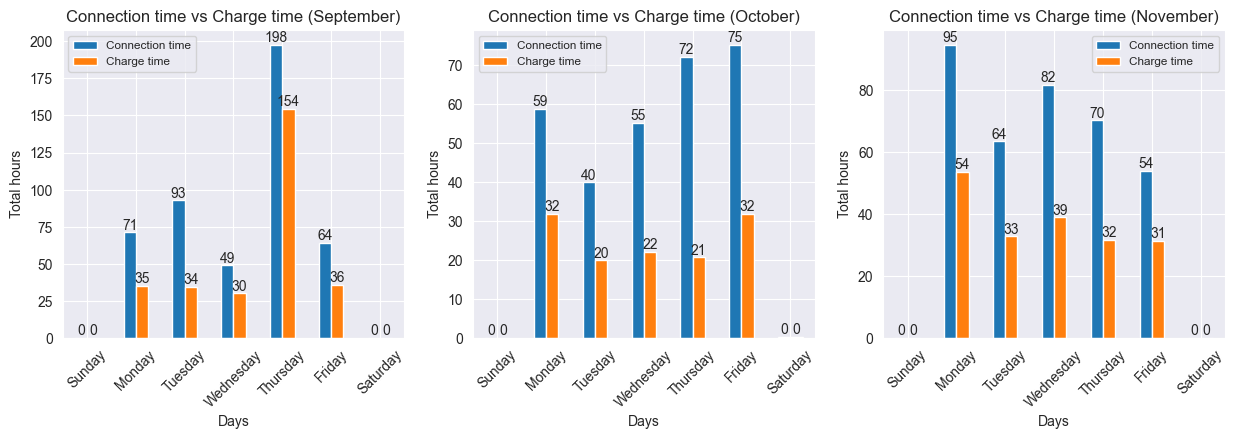
Hogging time in October seems balanced between 0 and 9 hours. In September, only 1% of the hogging time was above 15 hours. 47% of the hogging time in November was less than 1 hour. December and January had longer hogging time with 2 charge sessions above 20 hours (December) and 1 charge session above 60 hours (January).

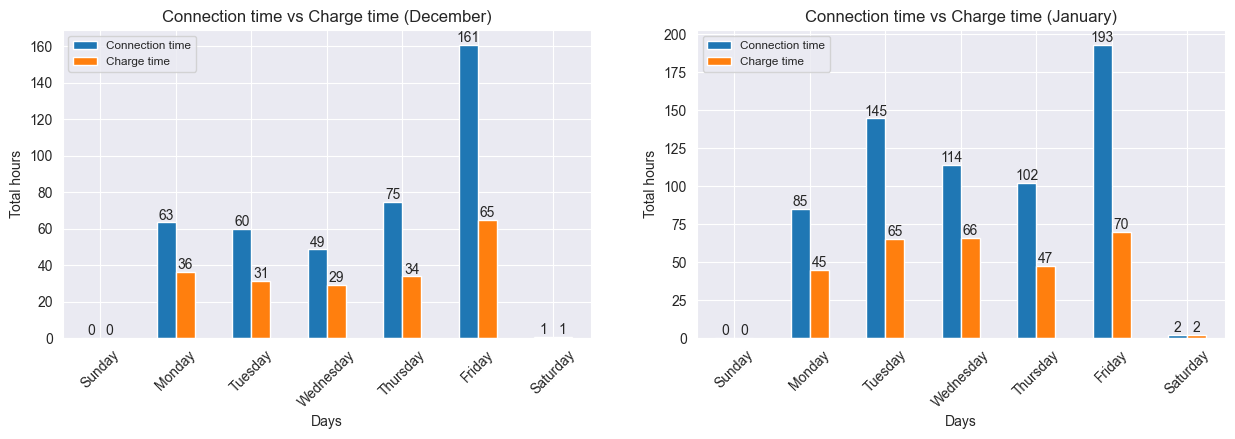


***WITHOUT OUTLIERS***



**CONNECTION AND CHARGE TIME (MONTHLY)**

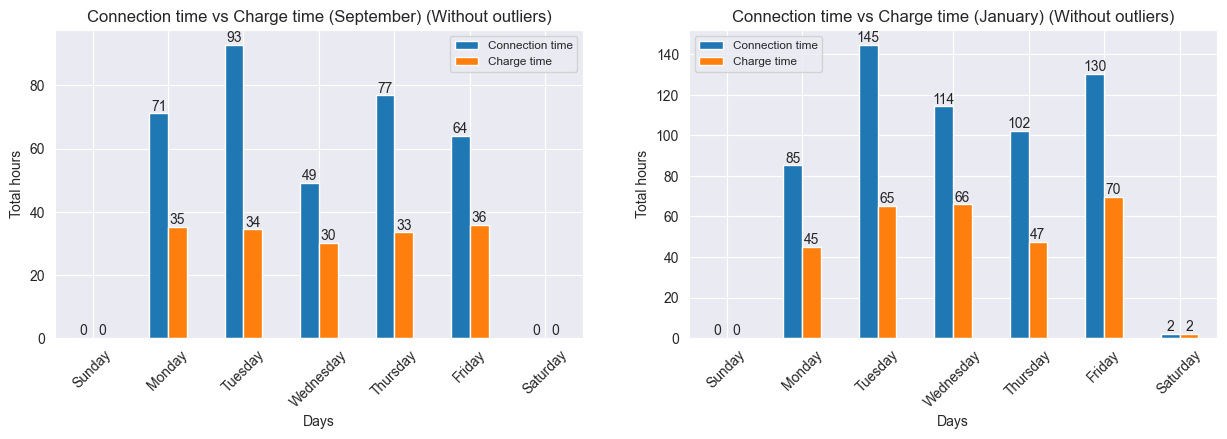




**MEAN CONNECTION AND CHARGE TIME (HOURS) PER MONTH**

|  |  |  |
| --- | --- | --- |
|  | Average connection time | Average charge time |
| September | 6.69 | 4.08 |
| October | 6.69 | 2.82 |
| November | 5.21 | 2.69 |
| December | 6.27 | 3.02 |
| January | 5.89 | 2.71 |

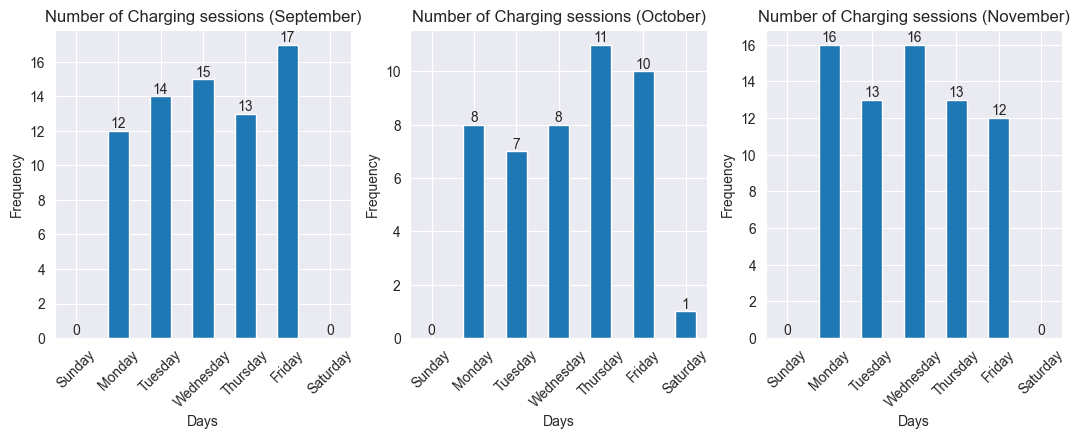
***WITHOUT OUTLIERS***

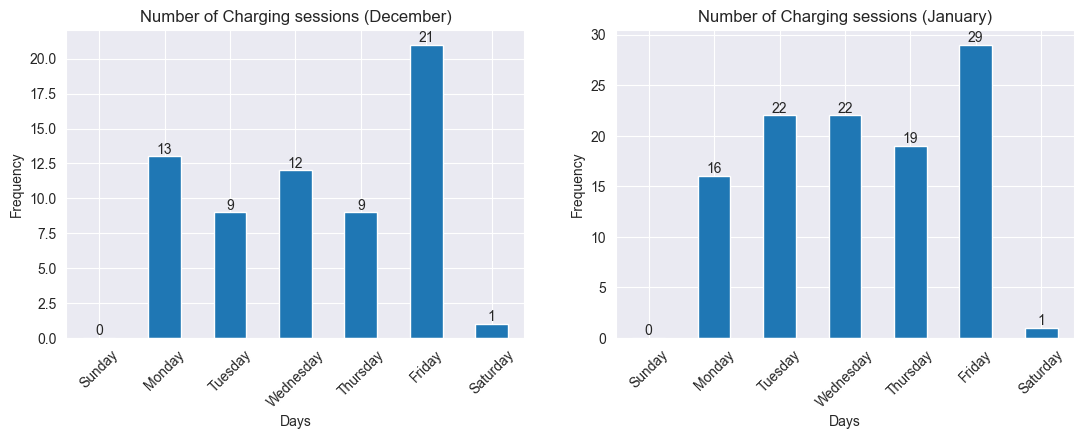


**MEAN CONNECTION AND CHARGE TIME (HOURS) PER MONTH (CORRECTED DATA)**

|  |  |  |
| --- | --- | --- |
|  | Average connection time | Average charge time |
| September | 4.98 | 2.38 |
| October | 6.69 | 2.82 |
| November | 5.21 | 2.69 |
| December | 6.27 | 3.02 |
| January | 5.31 | 2.71 |

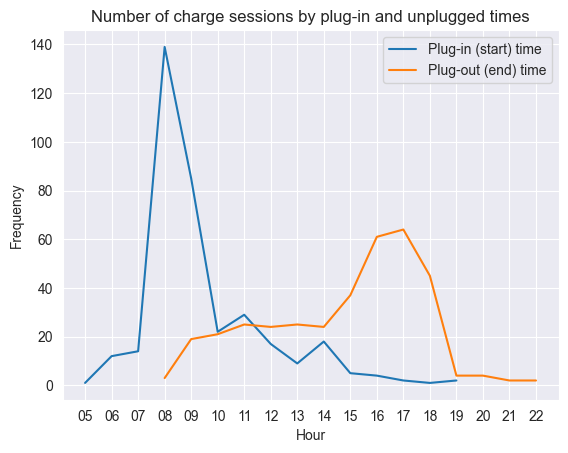
**NUMBER OF CHARGE SESSIONS (DAILY)**

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****

Most employees charged during the weekdays. There were 3 charge sessions overall that occurred during the weekend (3 Saturday and none on Sunday).

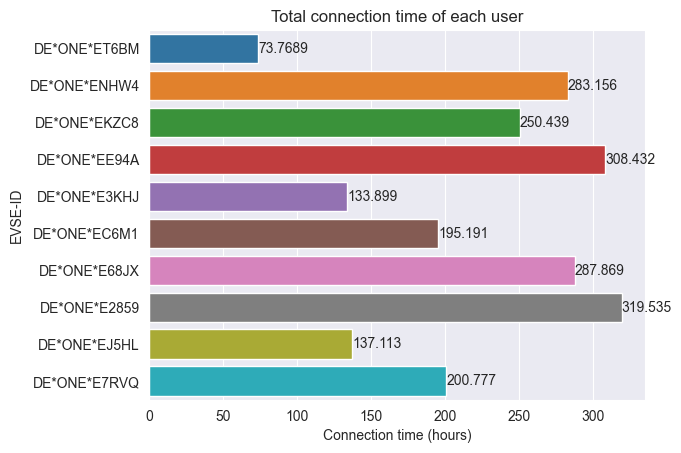
**NUMBER OF CHARGE SESSIONS BY PLUG-IN AND UNPLUGGED TIMES**



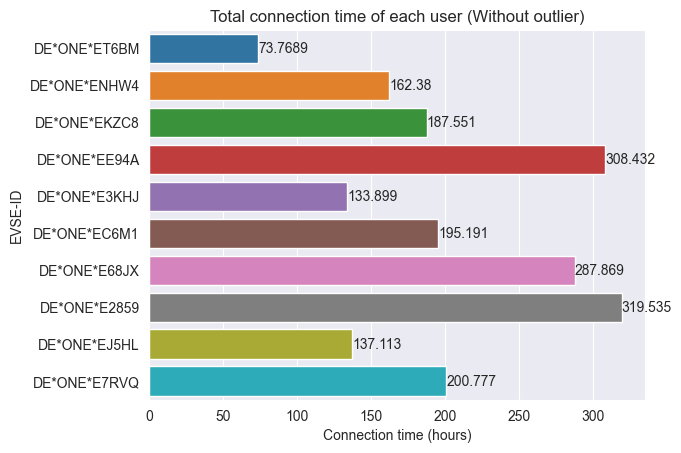
*NB: 24-hour time format used*

Most charging sessions occurred between 08:00 and 09:00. The number of charge sessions reduced as the hour passes towards the evening. Employees unplugged their EVs mostly between 16:00 and 18:00 (4pm to 6pm). The earliest plug-in occurred between 05:00 and 06:00 and the latest between 19:00 and 20:00. The earliest plug-out time was between 08:00 and 09:00 and the latest between 22:00 and 23:00.

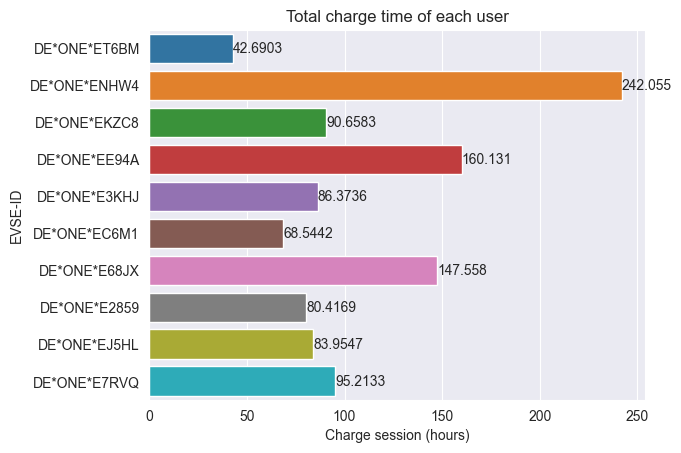
**CONNECTION TIME OF EACH EMPLOYEE**



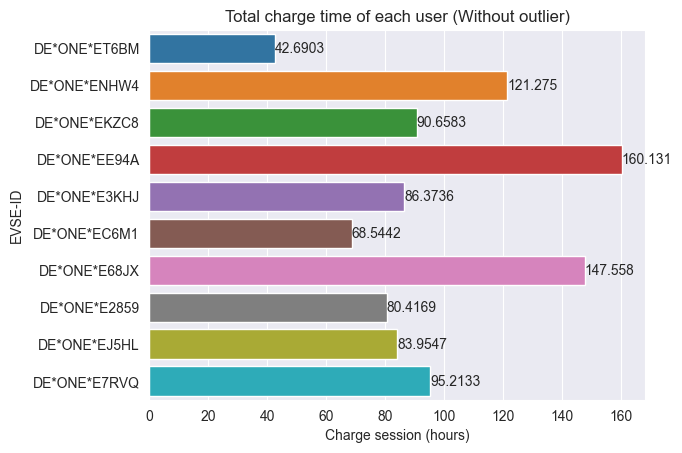
***WITHOUT OUTLIERS***



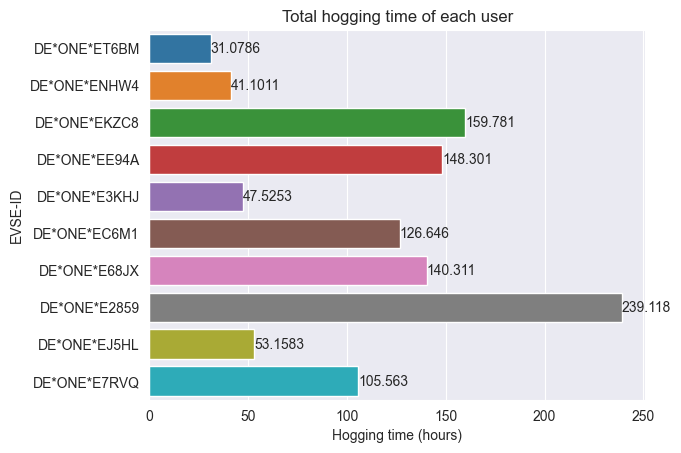
**CHARGE TIME OF EACH EMPLOYEE**



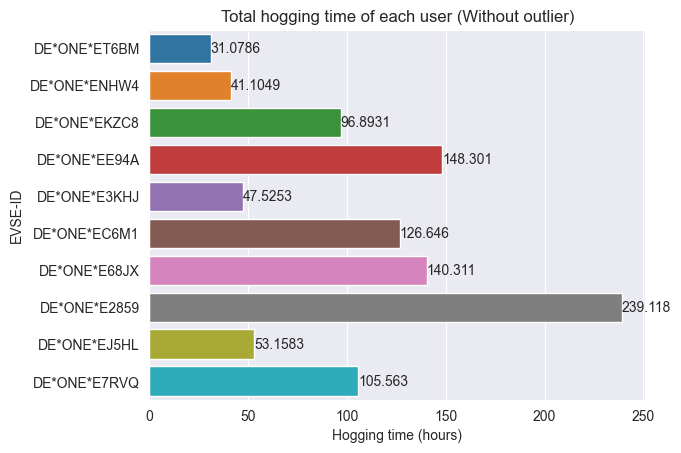
***WITHOUT OUTLIERS***



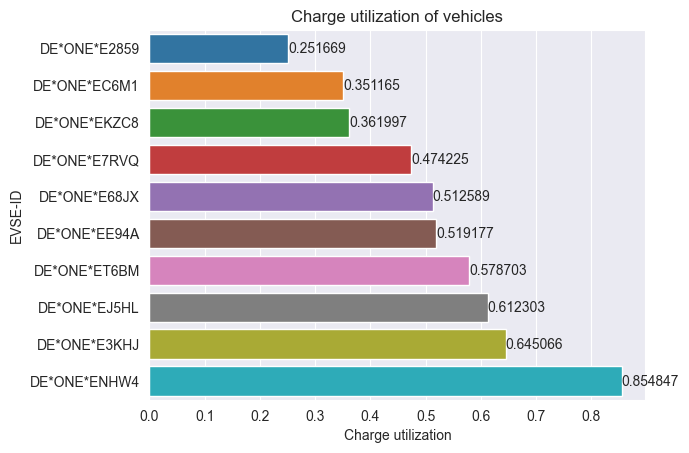
**HOGGING TIME OF EACH EMPLOYEE**



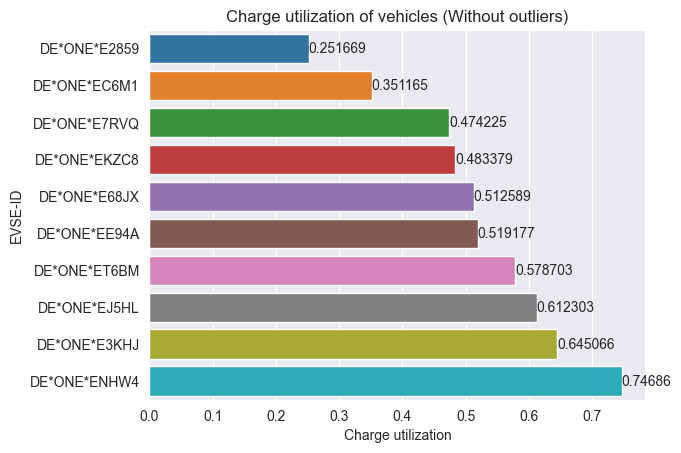
***WITHOUT OUTLIERS***



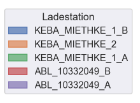
**CHARGE UTILIZATION**

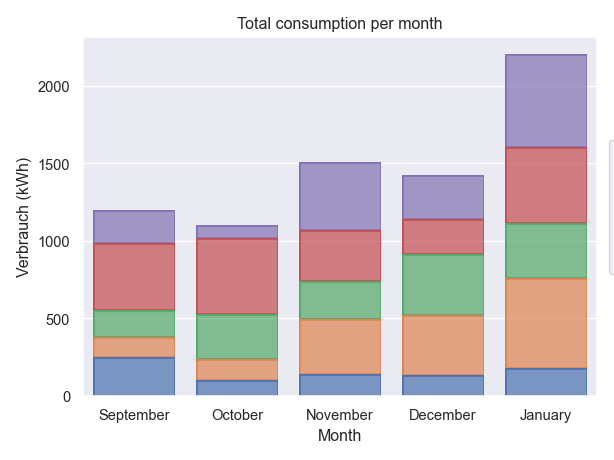


***WITHOUT OUTLIERS***



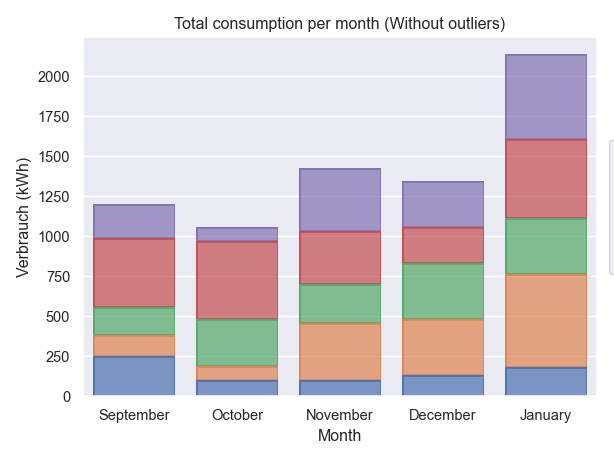
**CONSUMPTION PER MONTH**





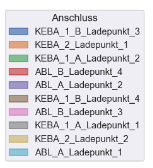
|  |  |
| --- | --- |
| Month | Total energy consumption (kWh) |
| September | 1198.732 |
| October | 1100.265 |
| November | 1508.063 |
| December | 1426.529 |
| January | 2207.120 |

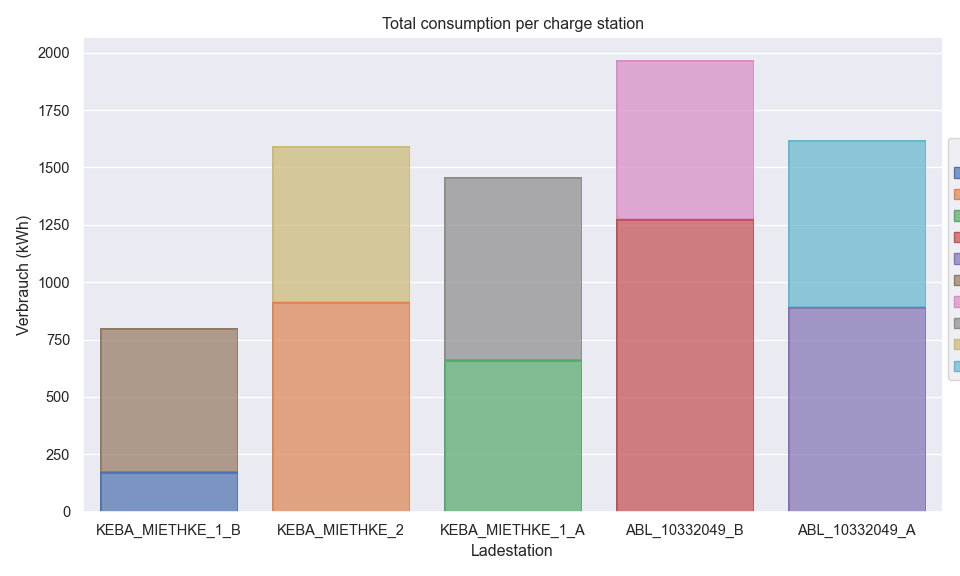
***WITHOUT OUTLIERS***



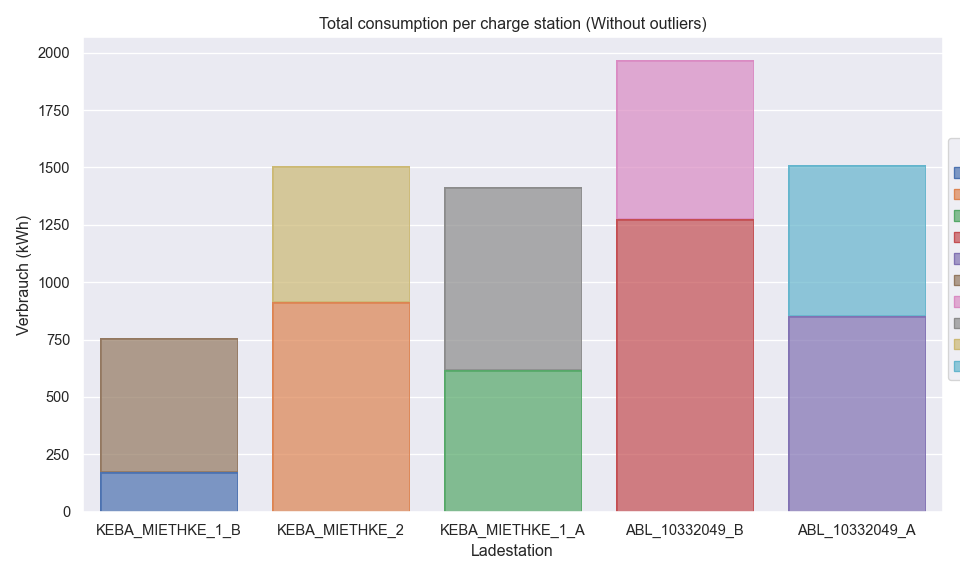
|  |  |
| --- | --- |
| Month | Total energy consumption (kWh) |
| September | 1198.732 |
| October | 1053.003 |
| November | 1424.257 |
| December | 1340.632 |
| January | 2137.644 |

**CONSUMPTION PER CHARGE STATION**

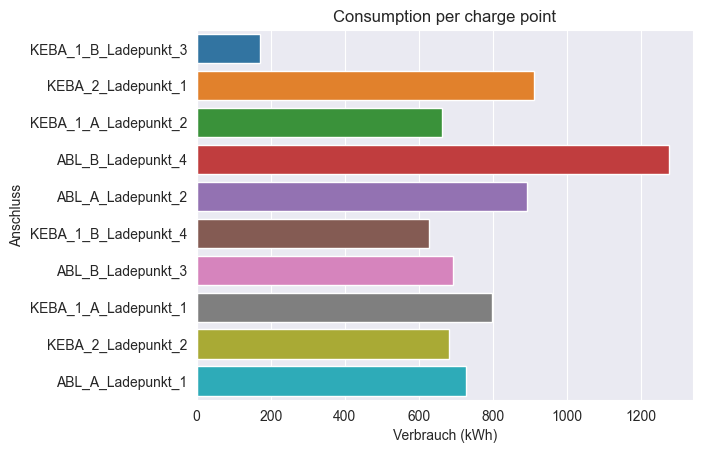




***WITHOUT OUTLIERS***

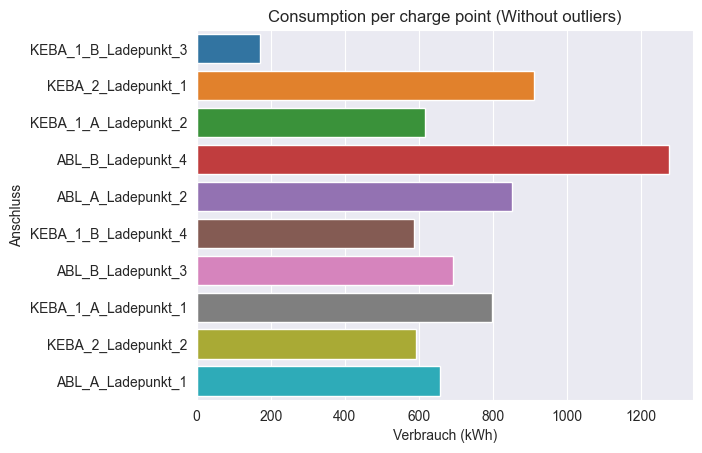


**CONSUMPTION PER CHARGE POINT**



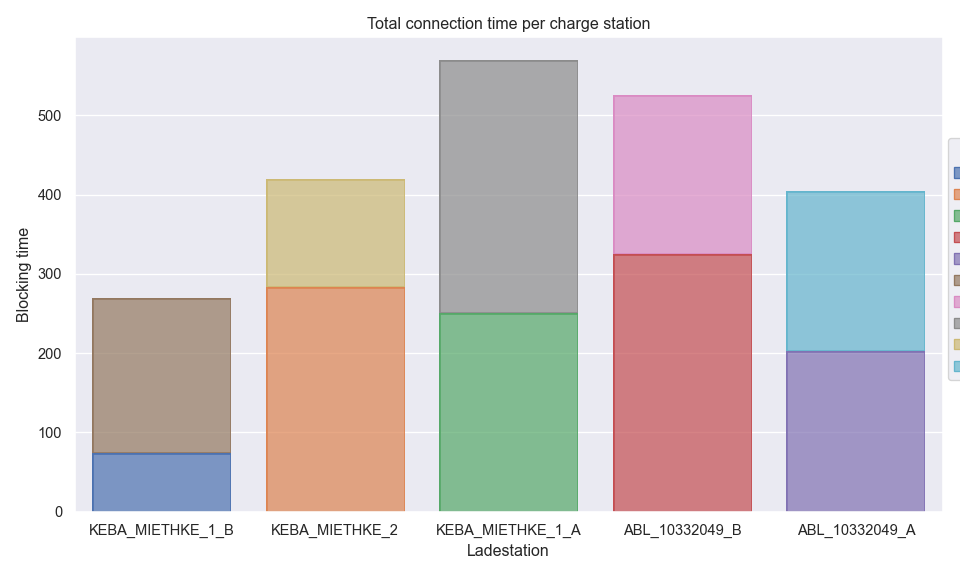
|  |  |  |  |
| --- | --- | --- | --- |
| Standort | Ladestation | Anschluss | Total energy consumed (kWh) |
| Fritz-von-der-Lacken-Strabe | KEBA\_MIETHKE\_2 | KEBA\_2\_Ladepunkt\_1 | 911.517 |
|  |  | KEBA\_2\_Ladepunkt\_2 | 682.054 |
| Ulanweg | ABL\_10332049\_A | ABL\_A\_Ladepunkt\_1 | 727.947 |
|  |  | ABL\_A\_Ladepunkt\_2 | 892.803 |
|  | ABL\_10332049\_B | ABL\_B\_Ladepunkt\_3 | 692.556 |
|  |  | ABL\_B\_Ladepunkt\_4 | 1275.973 |
|  | KEBA\_MIETHKE\_1\_A | KEBA\_1\_A\_Ladepunkt\_1 | 796.810 |
|  |  | KEBA\_1\_A\_Ladepunkt\_2 | 661.597 |
|  | KEBA\_MIETHKE\_1\_B | KEBA\_1\_B\_Ladepunkt\_3 | 171.733 |
|  |  | KEBA\_1\_B\_Ladepunkt\_4 | 627.719 |

***WITHOUT OUTLIERS***

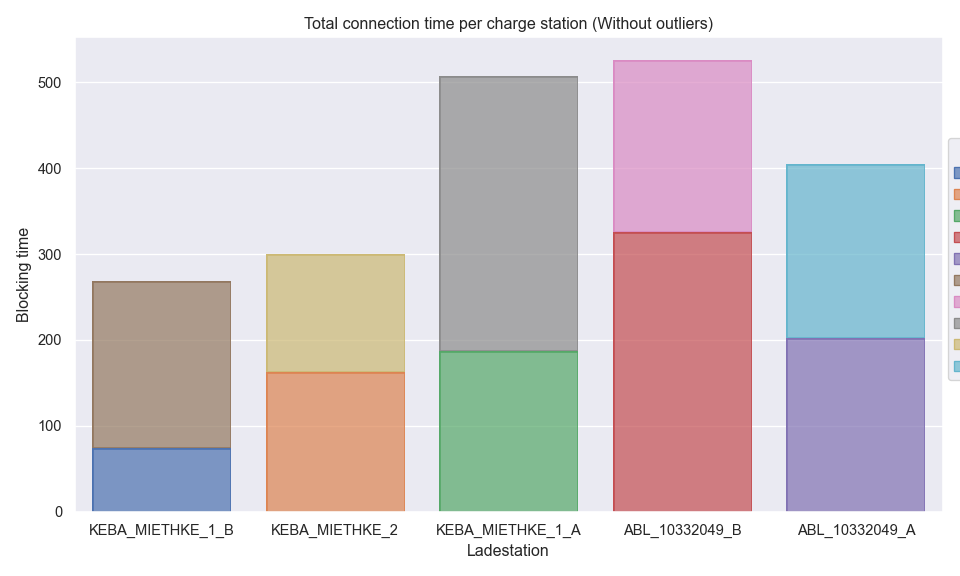


|  |  |  |  |
| --- | --- | --- | --- |
| Standort | Ladestation | Anschluss | Total energy consumed (kWh) |
| Fritz-von-der-Lacken-Strabe | KEBA\_MIETHKE\_2 | KEBA\_2\_Ladepunkt\_1 | 911.517 |
|  |  | KEBA\_2\_Ladepunkt\_2 | 593.27 |
| Ulanweg | ABL\_10332049\_A | ABL\_A\_Ladepunkt\_1 | 658.471 |
|  |  | ABL\_A\_Ladepunkt\_2 | 850.868 |
|  | ABL\_10332049\_B | ABL\_B\_Ladepunkt\_3 | 692.556 |
|  |  | ABL\_B\_Ladepunkt\_4 | 1275.973 |
|  | KEBA\_MIETHKE\_1\_A | KEBA\_1\_A\_Ladepunkt\_1 | 796.810 |
|  |  | KEBA\_1\_A\_Ladepunkt\_2 | 617.222 |
|  | KEBA\_MIETHKE\_1\_B | KEBA\_1\_B\_Ladepunkt\_3 | 171.733 |
|  |  | KEBA\_1\_B\_Ladepunkt\_4 | 585.849 |

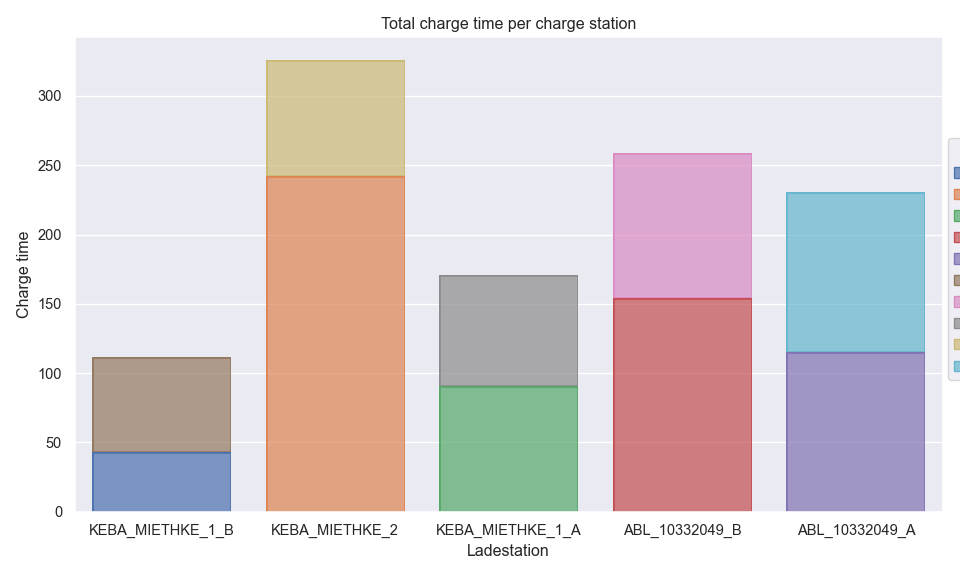
**CONNECTION TIME PER CHARGE STATION**



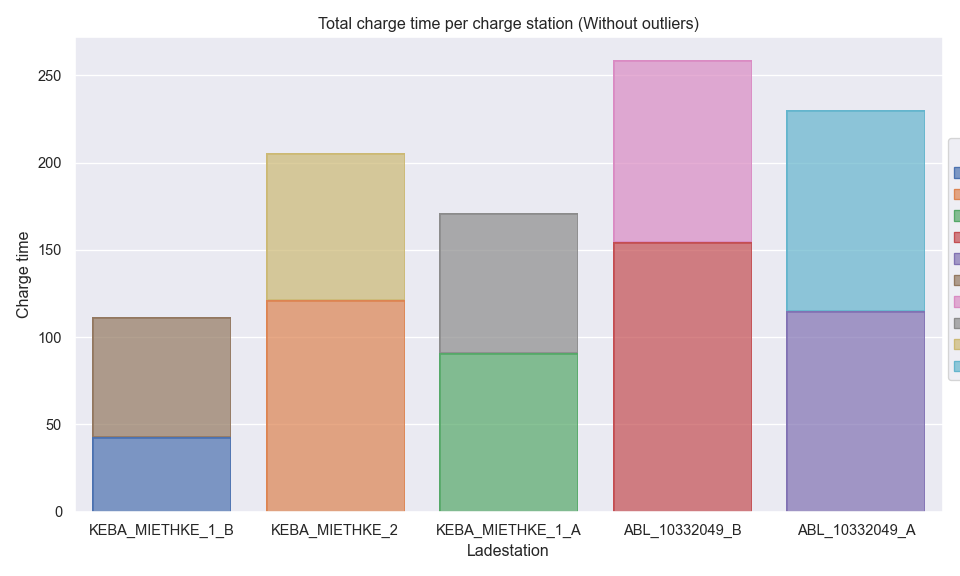
***WITHOUT OUTLIERS***



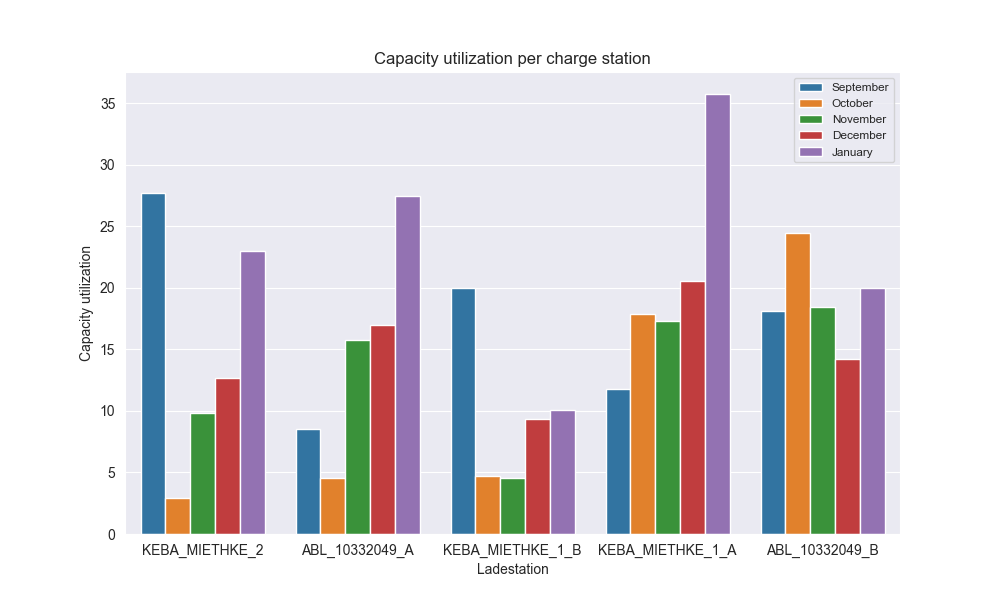
**CHARGE TIME PER CHARGE STATION**



***WITHOUT OUTLIERS***

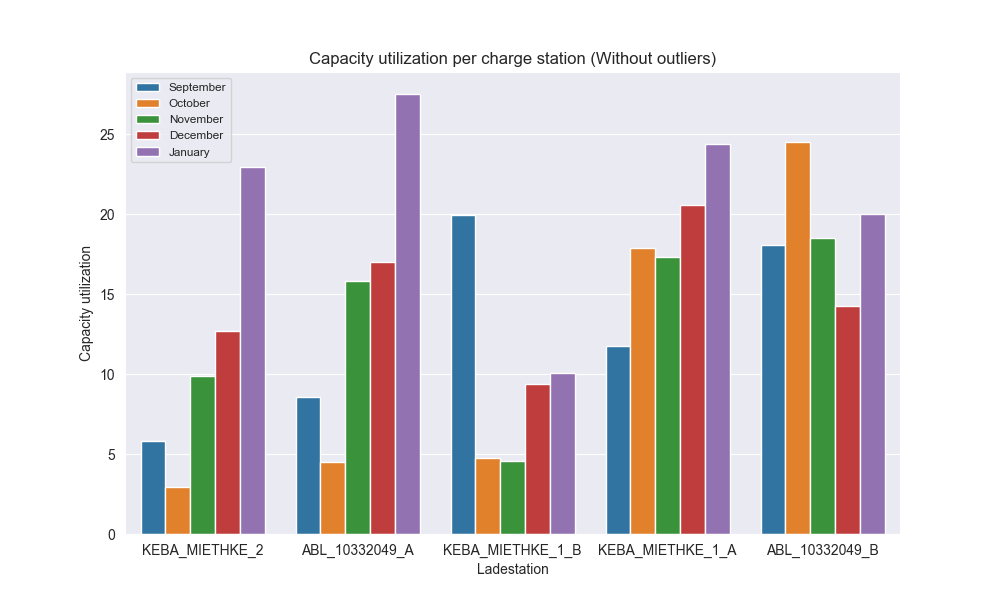


**CAPACITY UTILIZATION**



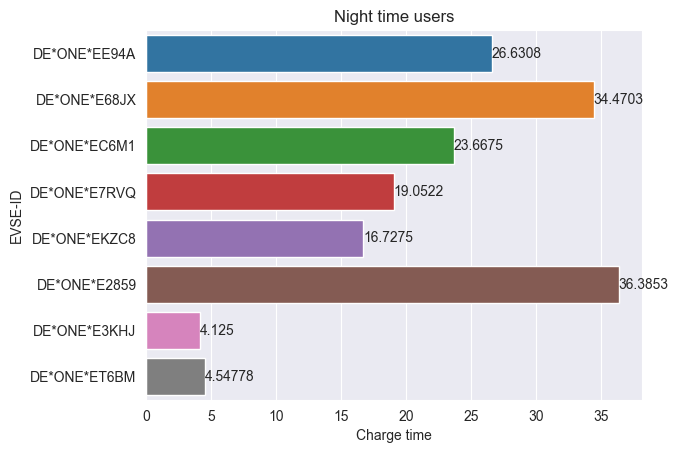
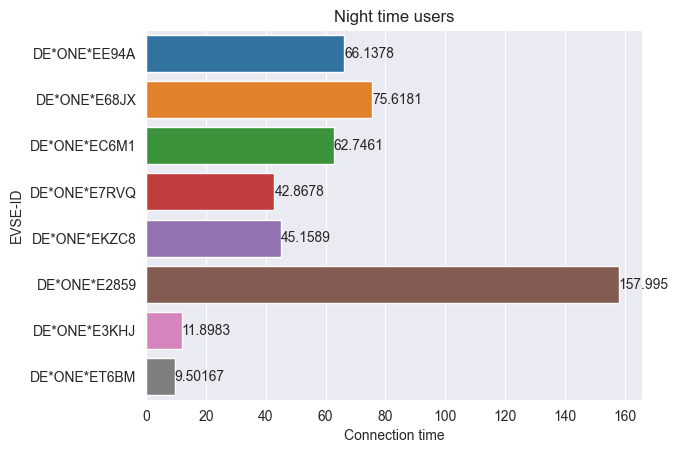
Capacity utilization increased generally in the charge stations over the months from October to January. Overall, the average capacity utilization for ABL\_A was 14.6%, ABL\_B with 19.1%, KEBA\_1\_A with 20.6%, KEBA\_1\_B with 9.7% and KEBA\_2 with 15.2%.

***WITHOUT OUTLIERS***

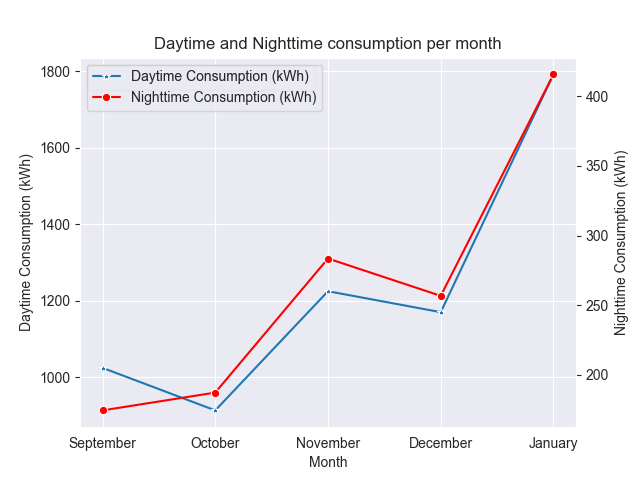


The capacity utilization changed for two charge stations after correcting the outliers. Overall, the average capacity utilization for KEBA\_1\_A was 18.3% and KEBA\_2 with 10.8%.

**NIGHTTIME USERS**



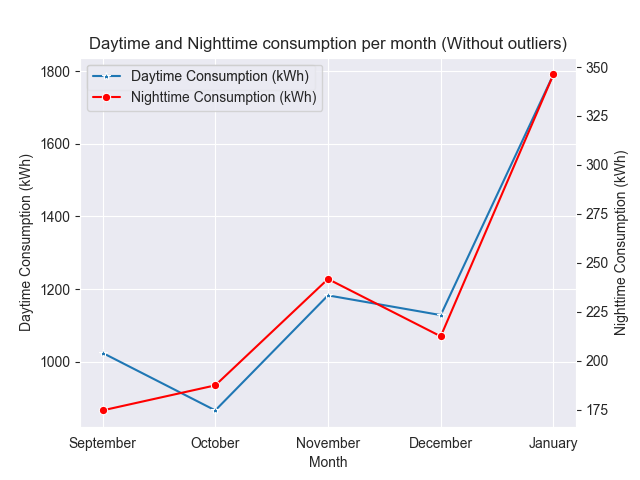
**DAYTIME AND NIGHTIME CONSUMPTION**



Although different in numbers, the energy consumption for daytime and nighttime users had similar trend pattern over the months. Daytime and nighttime consumption were highest in January with 1791.419 kWh and 415.701 kWh consecutively. Daytime consumption was lowest in October while Nighttime consumption was lowest in September

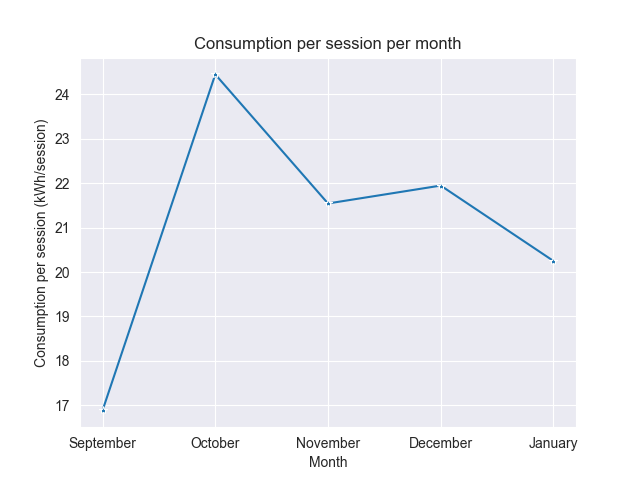
|  |  |  |
| --- | --- | --- |
| Month | Daytime consumption (kWh) | Nighttime consumption (kWh) |
| September | 1024.149 | 174.583 |
| October | 912.891 | 187.374 |
| November | 1224.488 | 283.575 |
| December | 1169.745 | 256.784 |
| January | 1791.419 | 415.701 |

***WITHOUT OUTLIERS***



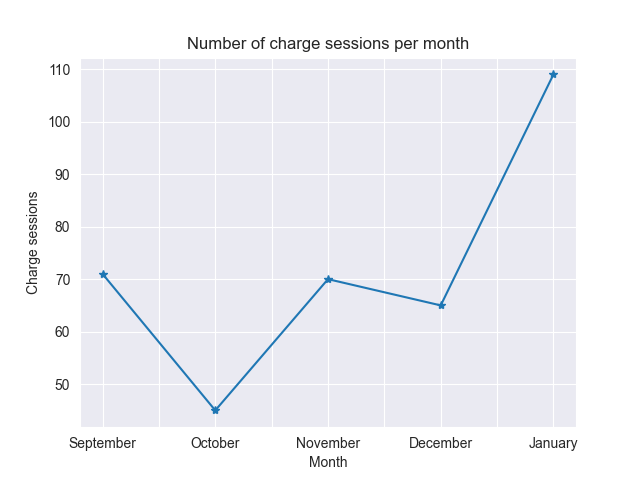
|  |  |  |
| --- | --- | --- |
| Month | Daytime consumption (kWh) | Nighttime consumption (kWh) |
| September | 1024.149 | 174.583 |
| October | 865.629 | 187.374 |
| November | 1182.553 | 241.705 |
| December | 1128.224 | 212.409 |
| January | 1791.419 | 346.225 |

**CONSUMPTION PER SESSION PER MONTH**

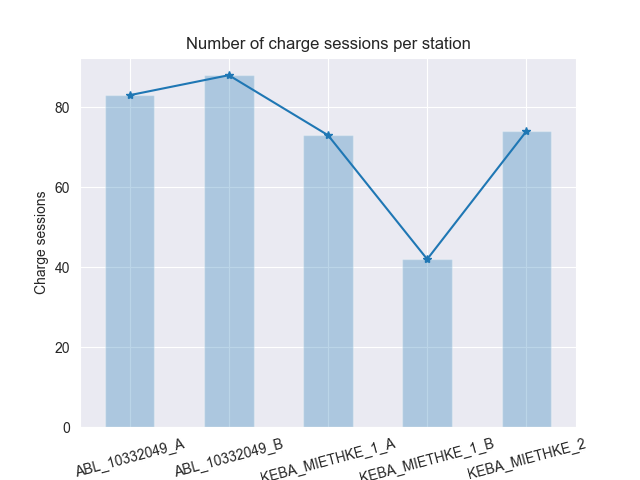


Assume an average consumption of 5.5 km/kWh. When 7440.709 kWh total energy was consumed, 40923.8995 km was driven by the employees. On average, 21.014 kWh of energy was consumed per charge session. This means that per charge session, 115.577 km was driven emission-free.

**CHARGE SESSIONS PER MONTH**

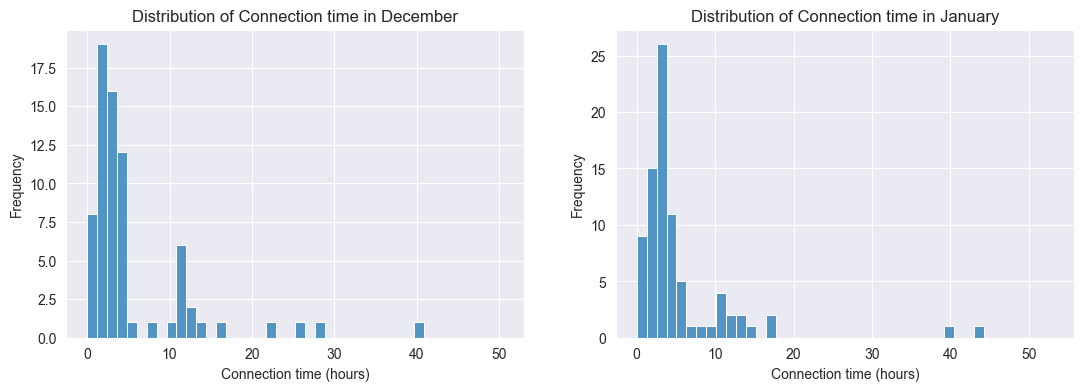
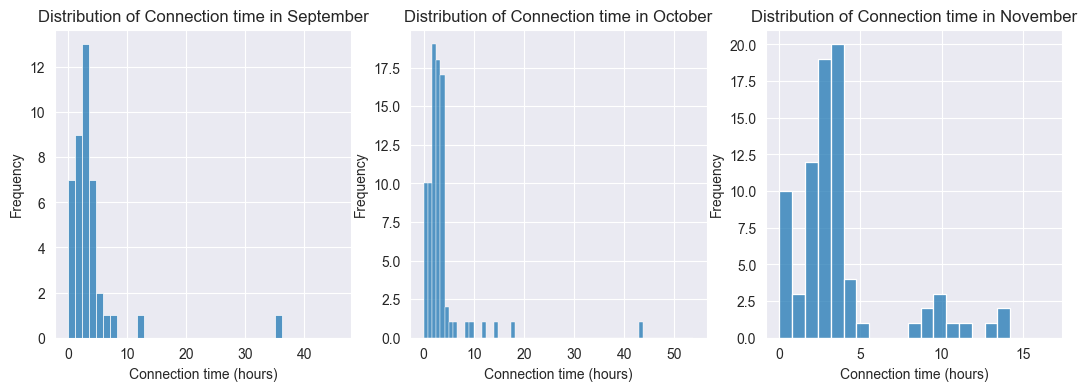


**CHARGE SESSIONS PER CHARGE STATION**



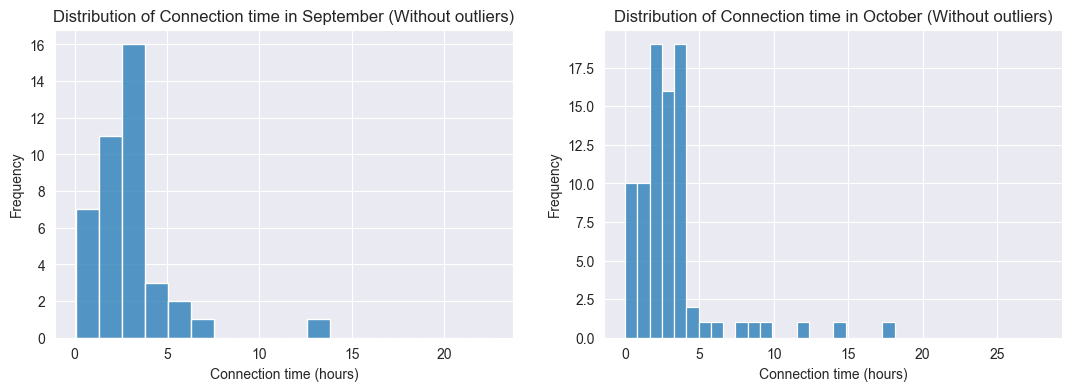
USERS

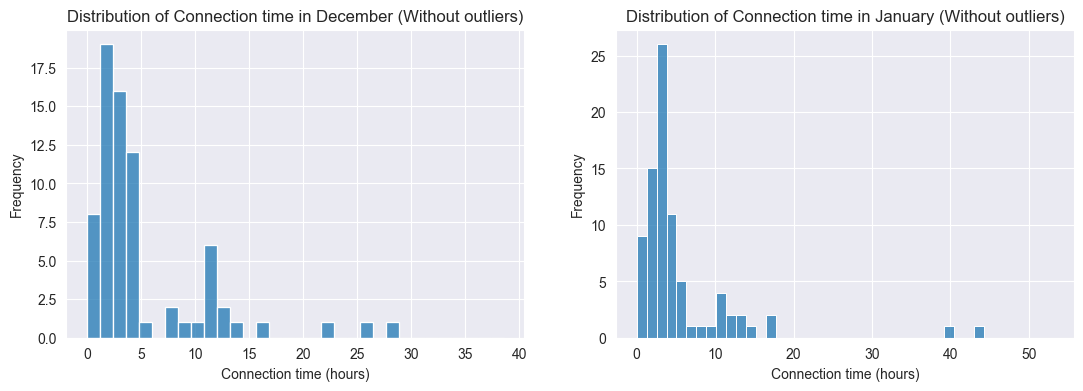
**DISTRIBUTION OF CONNECTION TIME**



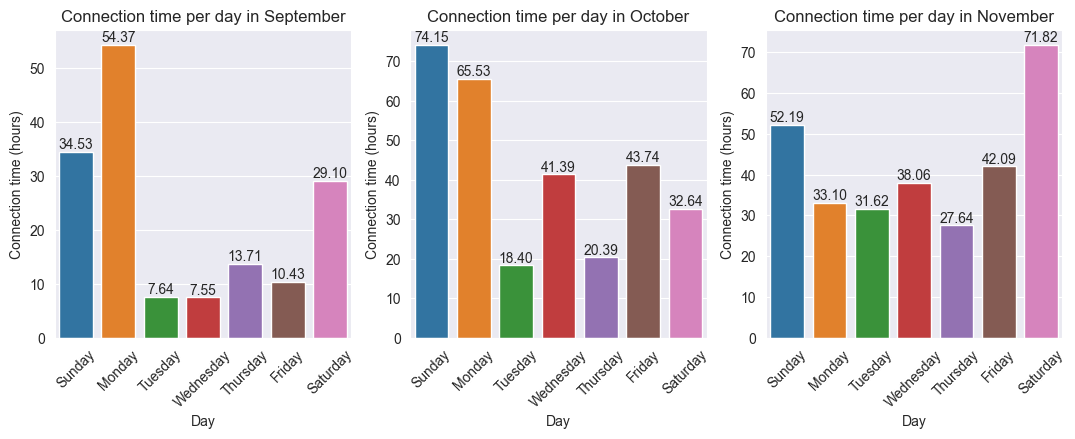
The distribution for all the months is right skewed, which means it contains outliers. Most of the connection time were less than 7 hours. 3 sessions in October, December and January had a connection time of over 40 hours each. Since there are outliers, median is a better measure of central tendency to aggregate the data. Mean is affected by outliers.

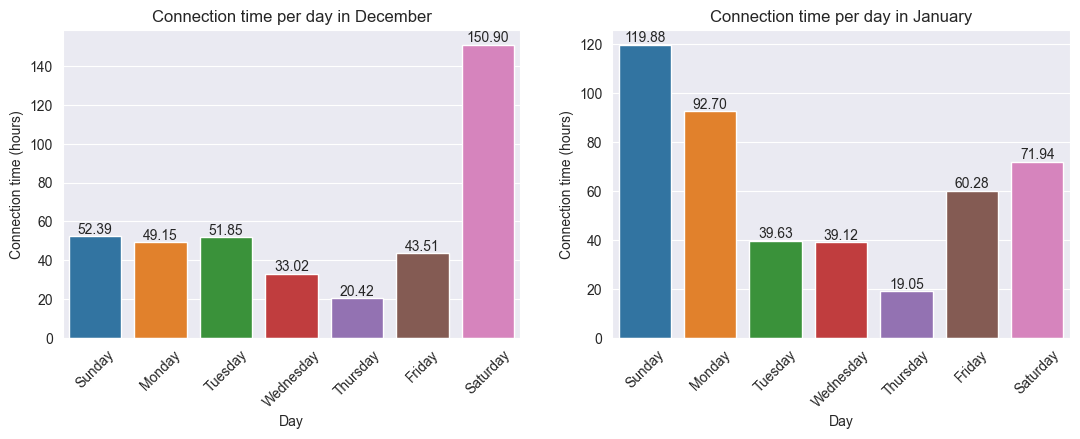
***WITHOUT OUTLIER***





**CONNECTION TIME (MONTHLY)**

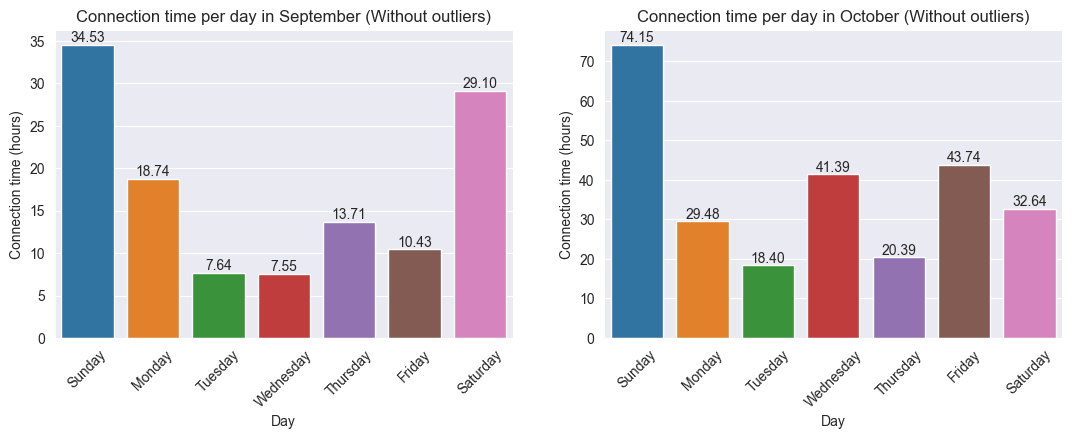
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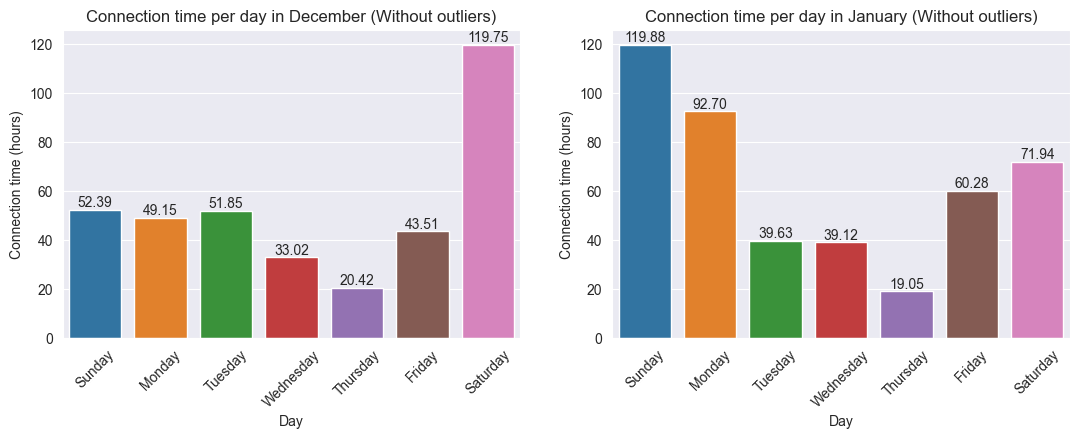
****

**MEDIAN CONNECTION TIME (HOURS) FOR EACH DAY IN EACH MONTH**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | 3.54 | 12.58 | 1.78 | 2.49 | 3.64 | 2.15 | 2.62 |
| October | 2.46 | 3.31 | 2.84 | 2.21 | 3.34 | 1.65 | 2.57 |
| November | 3.44 | 3.82 | 3.01 | 3.70 | 6.84 | 1.65 | 2.53 |
| December | 2.87 | 3.63 | 2.15 | 4.29 | 3.60 | 2.32 | 3.08 |
| January | 4.94 | 3.06 | 2.79 | 4.24 | 2.74 | 3.58 | 3.30 |

***WITHOUT OUTLIER***

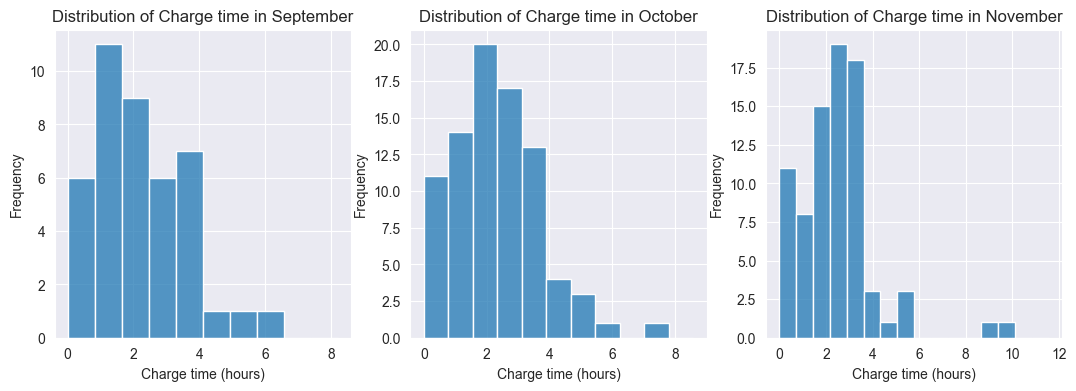


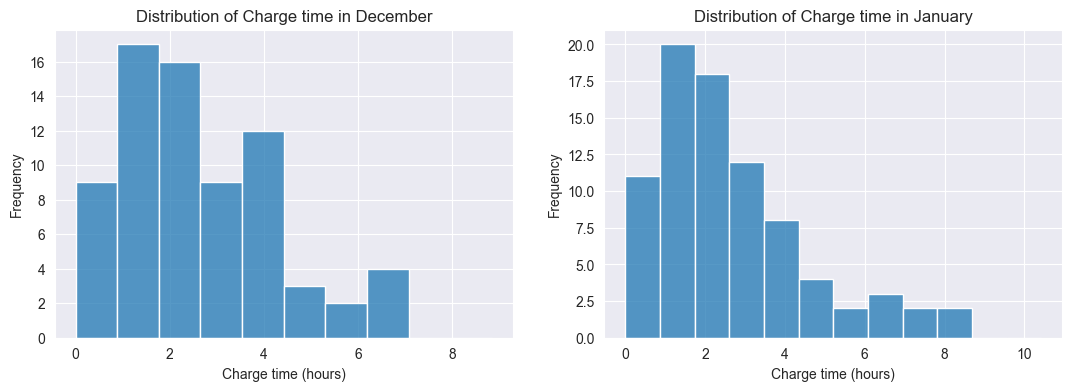


**MEAN CONNECTION TIME (HOURS) FOR EACH DAY IN EACH MONTH**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | 3.14 | 9.37 | 1.91 | 2.52 | 3.43 | 2.09 | 2.43 |
| October | 2.97 | 3.28 | 2.63 | 3.76 | 3.39 | 2.73 | 3.26 |
| November | 3.48 | 5.52 | 3.95 | 4.76 | 6.91 | 3.24 | 2.76 |
| December | 3.74 | 9.83 | 5.76 | 6.60 | 5.10 | 3.96 | 4.99 |
| January | 7.99 | 6.62 | 3.61 | 7.82 | 3.17 | 5.48 | 3.59 |

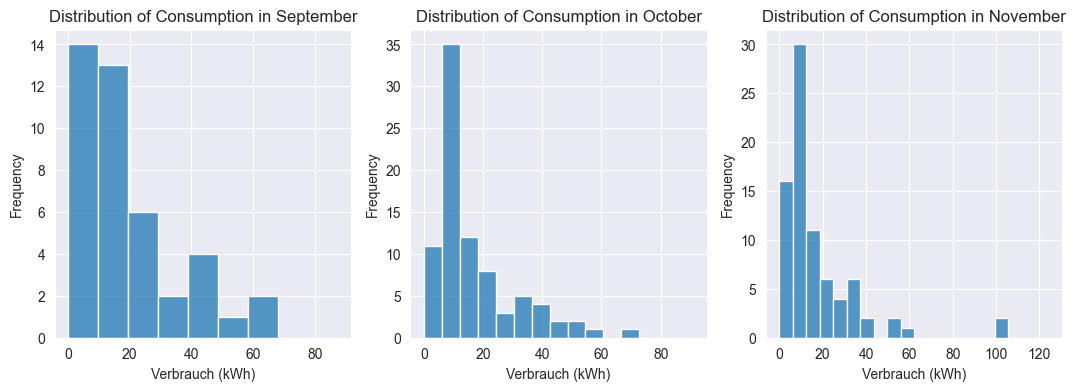
**DISTRIBUTION OF CHARGE TIME**

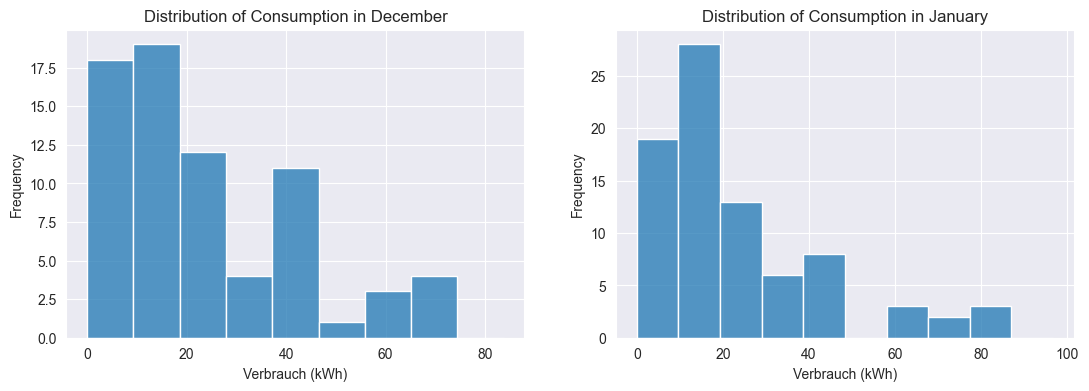
****

****

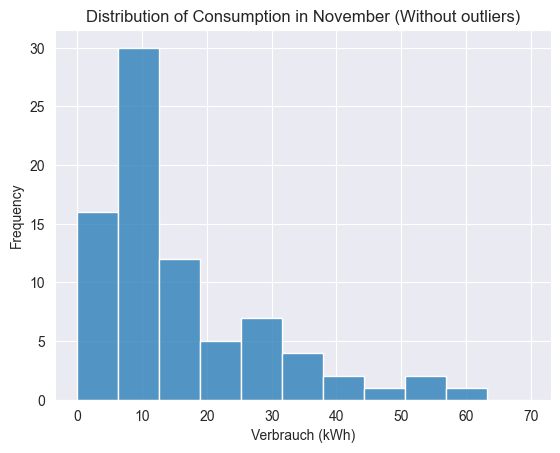
Most EV charge times were less than 4 hours in all the months. There were 2 sessions with a charge time of over 8 hours in November and also 2 sessions in January**.**

**DISTRIBUTION OF CONSUMPTION**

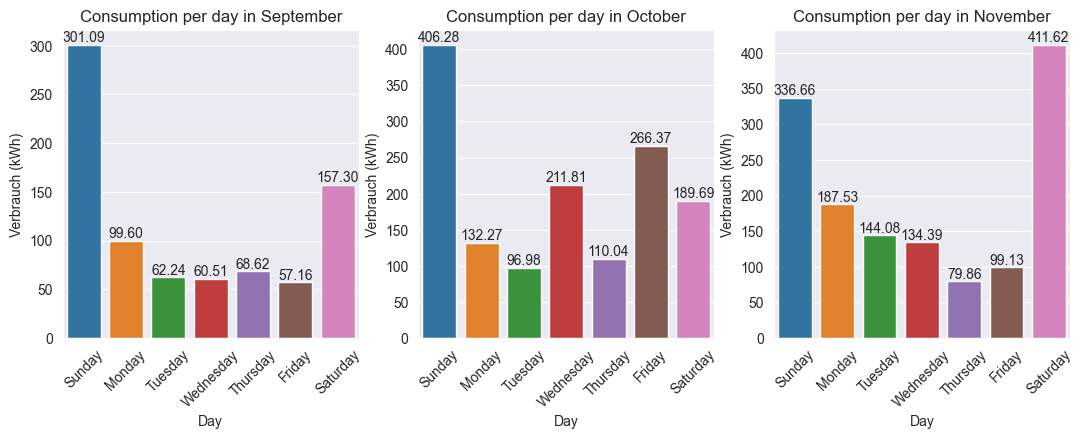


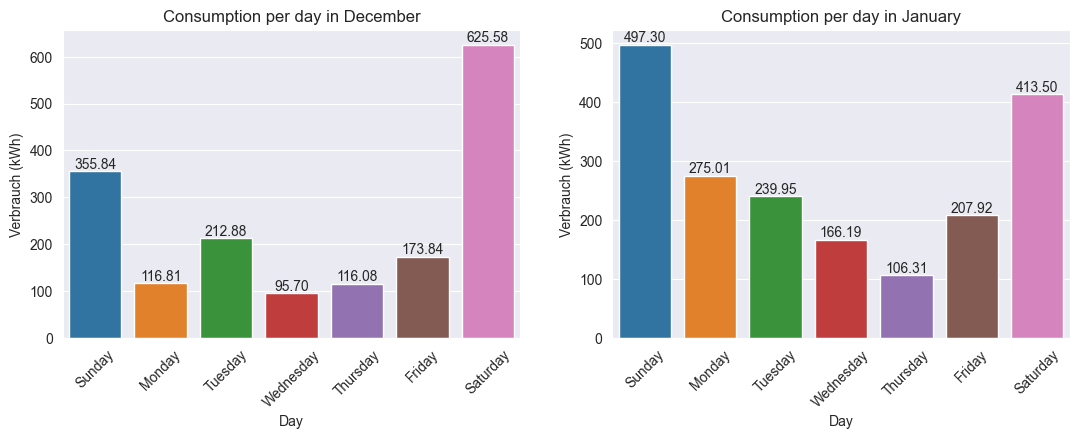


***WITHOUT OUTLIERS***



**CONSUMPTION (MONTHLY)**

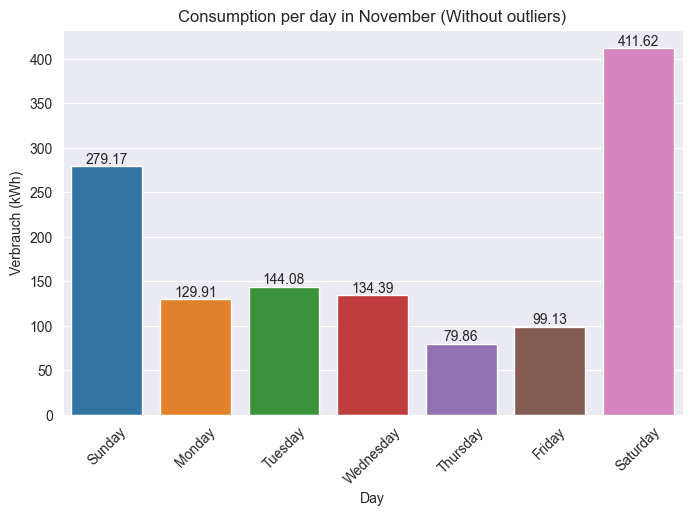




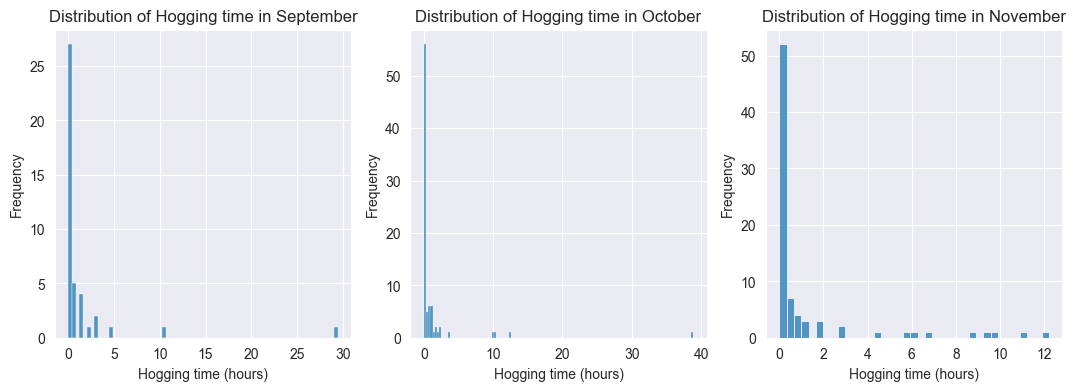
**MEDIAN ENERGY CONSUMPTION (kWh) FOR EACH DAY**

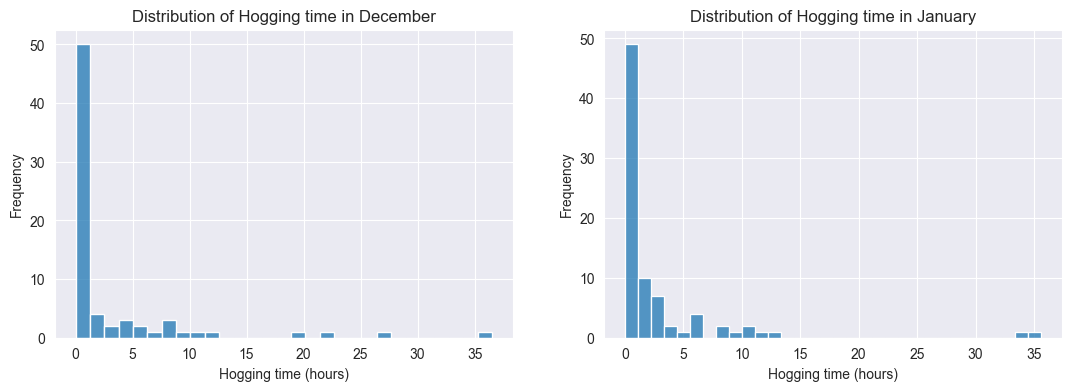
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
| September | 37.33 | 16.40 | 15.27 | 24.97 | 10.82 | 10.29 | 10.13 |
| October | 10.80 | 10.64 | 10.10 | 17.98 | 11.14 | 11.11 | 11.00 |
| November | 13.69 | 15.80 | 13.25 | 10.00 | 12.43 | 8.66 | 12.13 |
| December | 26.15 | 13.67 | 18.17 | 14.84 | 13.93 | 12.10 | 19.61 |
| January | 28.74 | 20.34 | 18.08 | 15.50 | 15.77 | 15.44 | 12.66 |

***WITHOUT OUTLIERS***

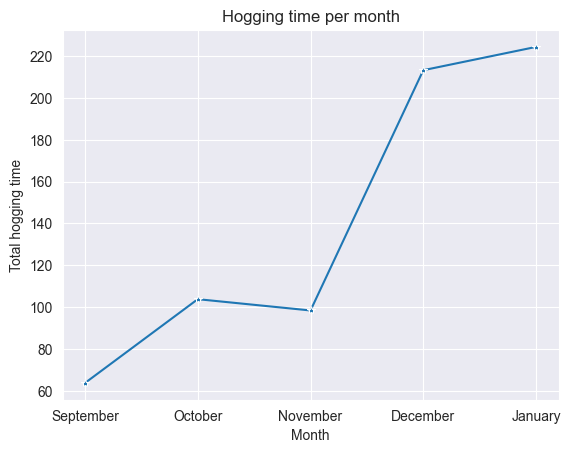


**DISTRIBUTION OF HOGGING TIME**

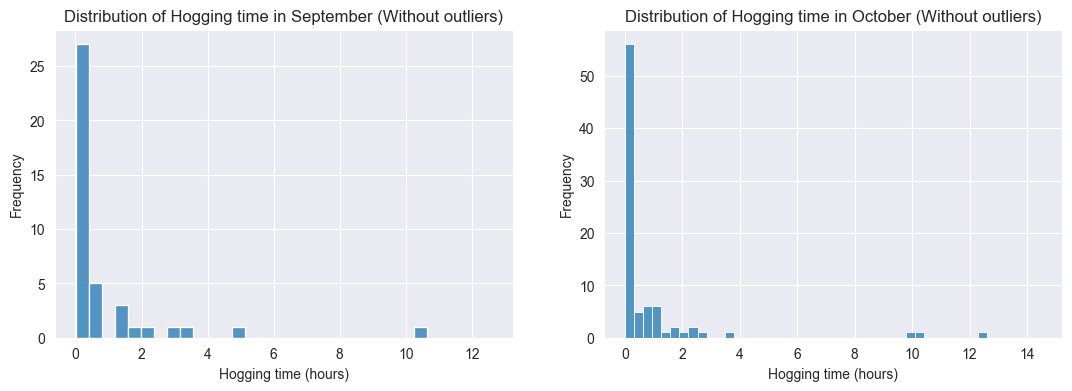


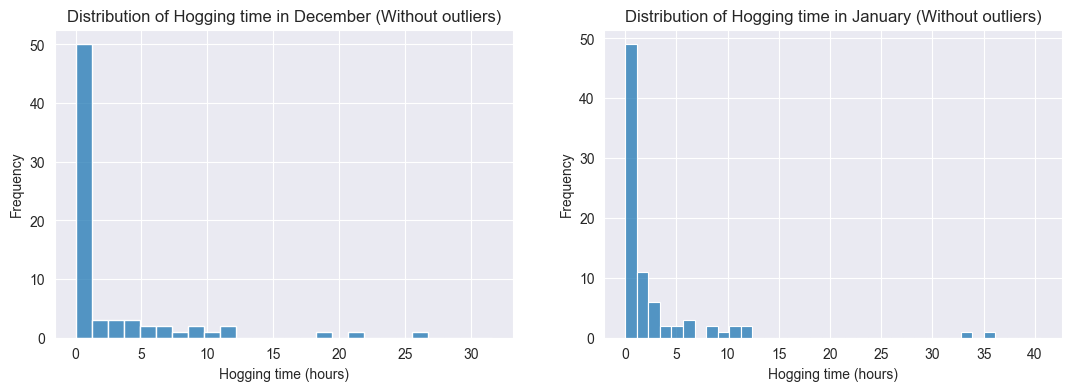


Hogging time for all the months was largely right skewed. Hogging time was mostly less than 2 hours in each month.

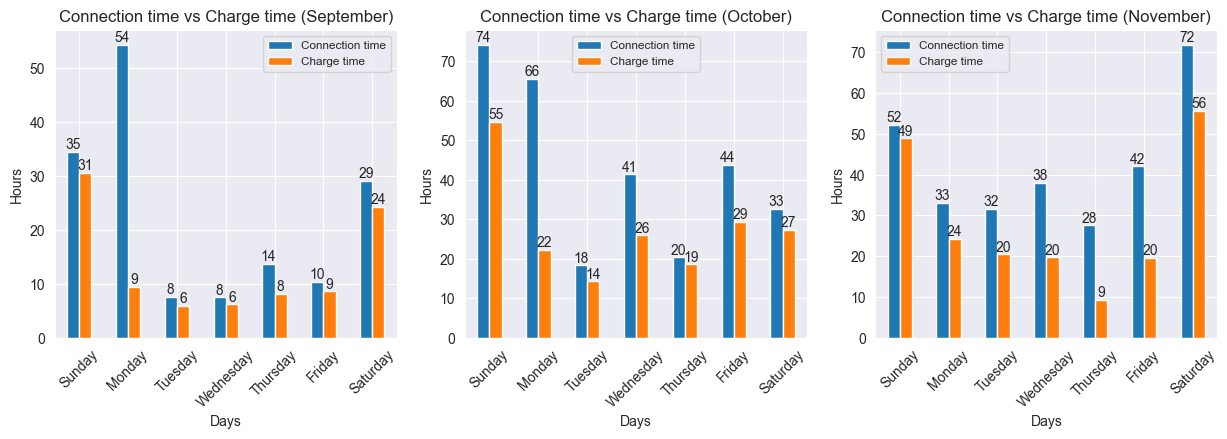


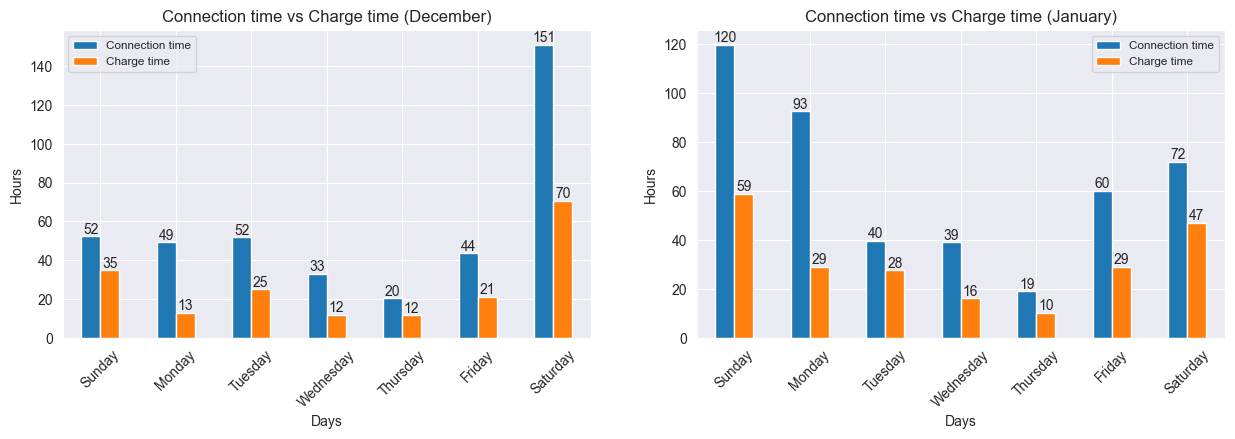
***WITHOUT OUTLIERS***



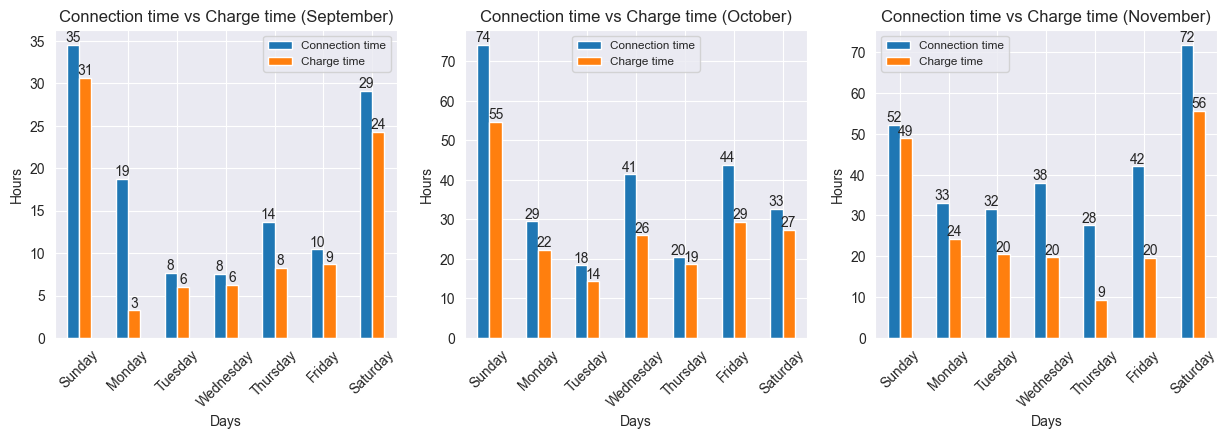


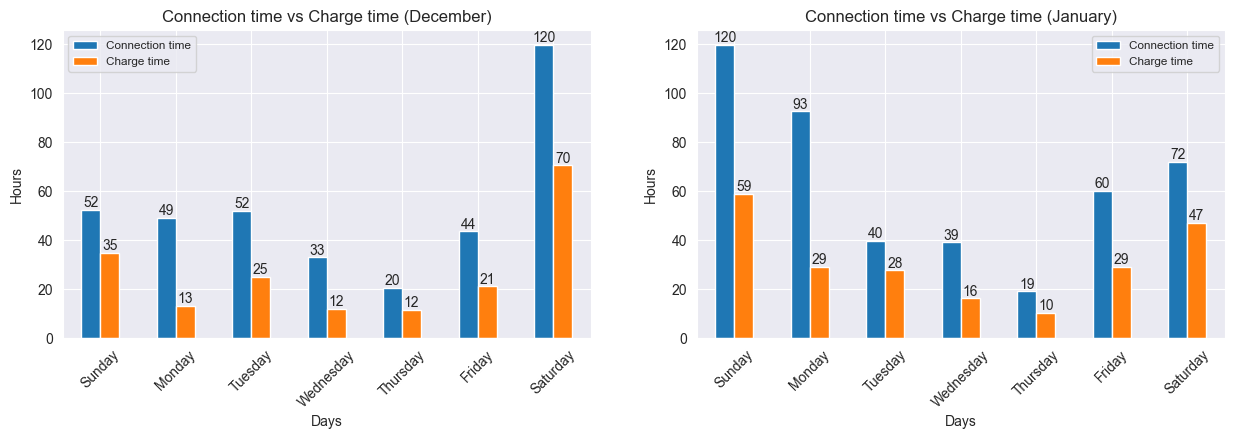
**CONNECTION VS BLOCKING TIMES (MONTHLY)**





***WITHOUT OUTLIERS***





**AVERAGE CONNECTION AND CHARGE TIME PER MONTH**

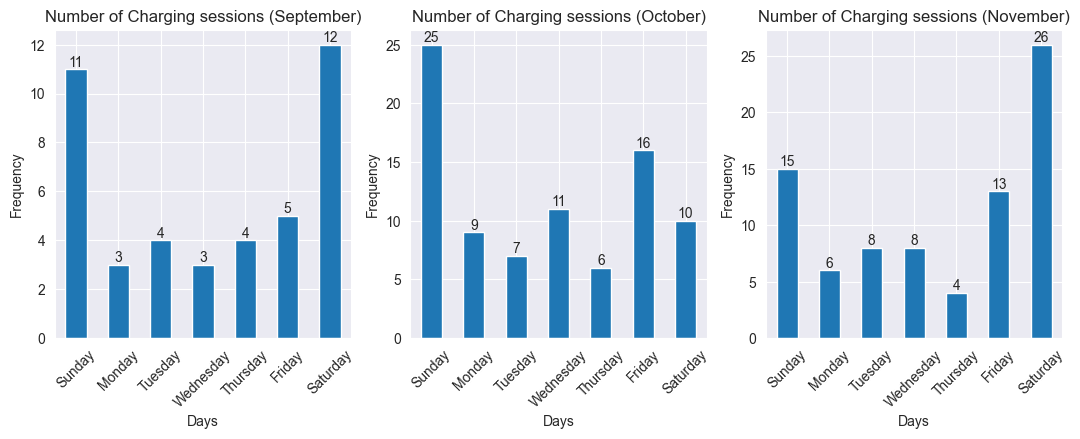
|  |  |  |
| --- | --- | --- |
|  | Average connection time | Average charge time |
| September | 3.75 | 2.23 |
| October | 3.53 | 2.29 |
| November | 3.71 | 2.48 |
| December | 5.57 | 2.61 |
| January | 5.40 | 2.66 |

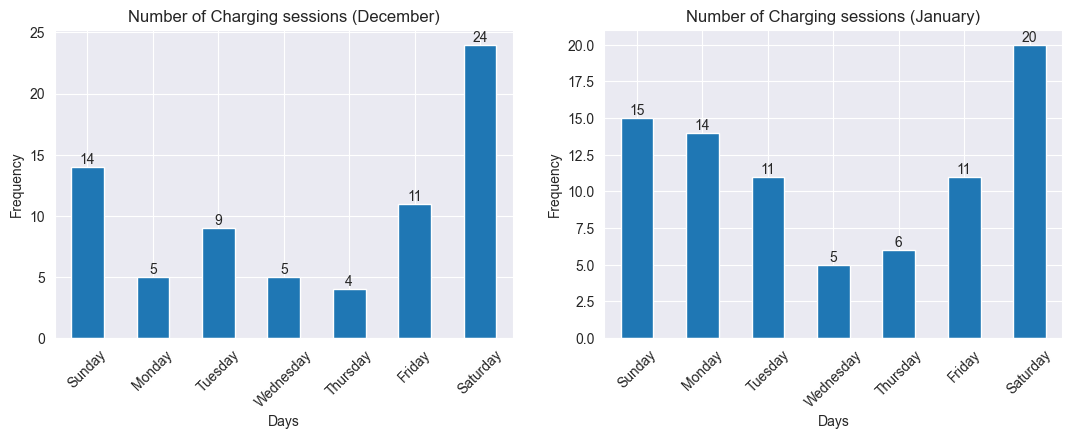
***WITHOUT OUTLIERS***

**MEAN CONNECTION AND CHARGE TIME (HOURS) PER MONTH (CORRECTED DATA)**

|  |  |  |
| --- | --- | --- |
|  | Average connection time | Average charge time |
| September | 2.97 | 2.13 |
| October | 3.09 | 2.29 |
| November | 3.71 | 2.48 |
| December | 5.14 | 2.61 |
| January | 5.39 | 2.66 |

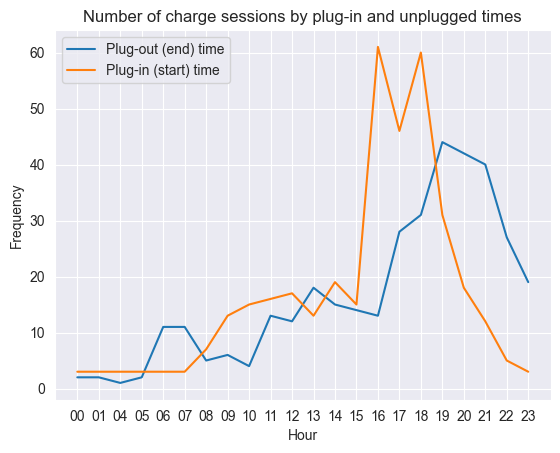
**NUMBER OF CHARGE SESSIONS**





October had the highest number of charge sessions while September had the lowest. Users charged their EVs mostly during the weekends more than weekdays.

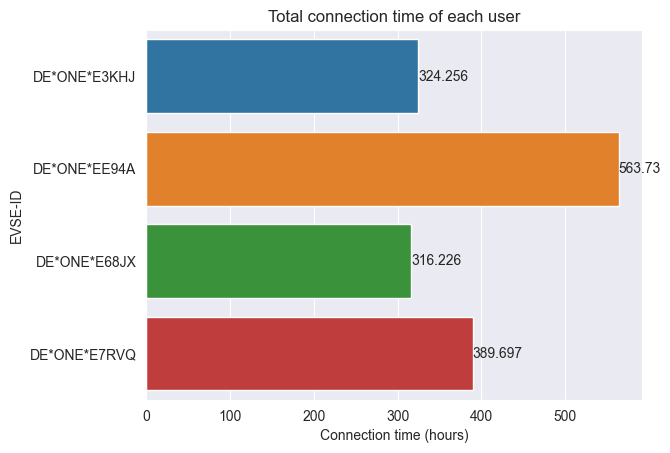
**PLUG-IN AND PLUG-OUT FREQUENCY**



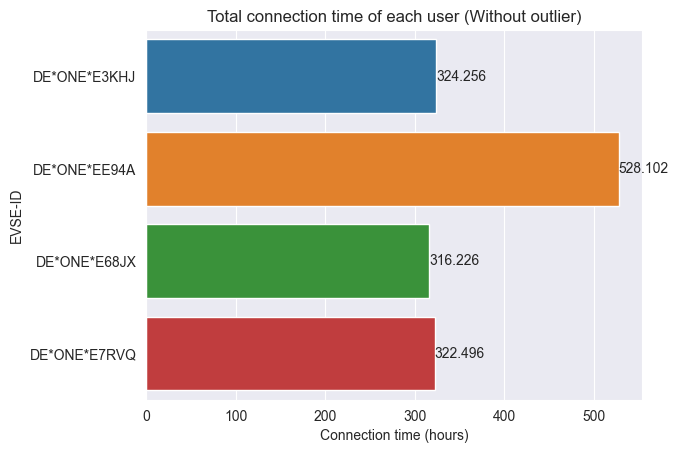
*NB: Hour is represented in a 24-hour format*

Majority of the plug-in sessions occurred between 16:00 and 18:00 while majority of the plug-out sessions occurred between 19:00 and 21:00. This means connection time was mostly for 5 hours. The earliest plug-in time was between 00:00 and 01:00 and the latest was between 23:00 and 00:00. The earliest plug-out time was between 02:00 and 03:00 and the latest was between 23:00 and 00:00.

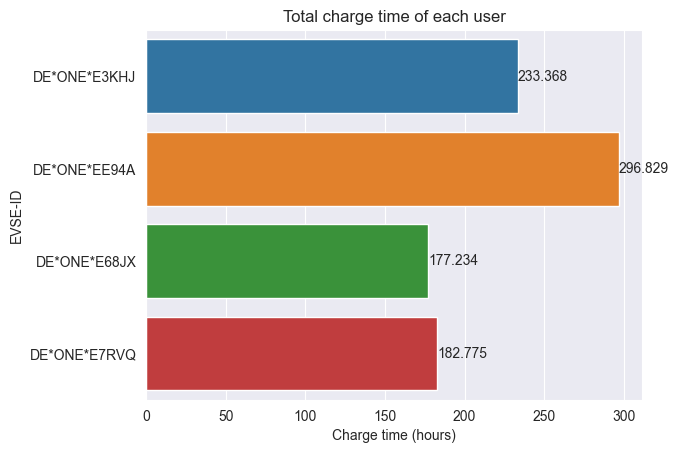
**CONNECTION TIME**



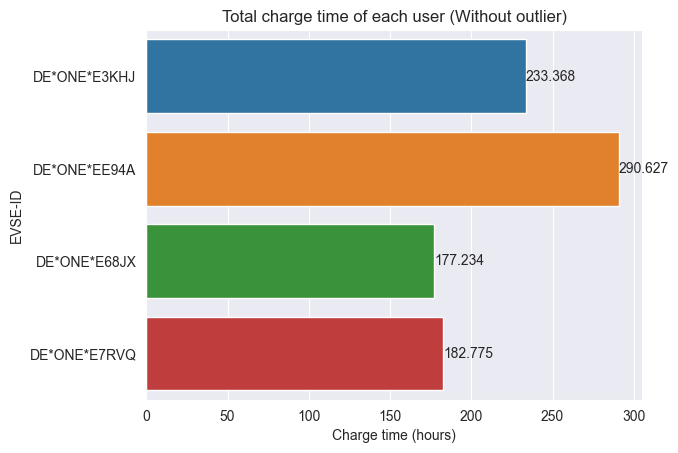
***WITHOUT OUTLIERS***



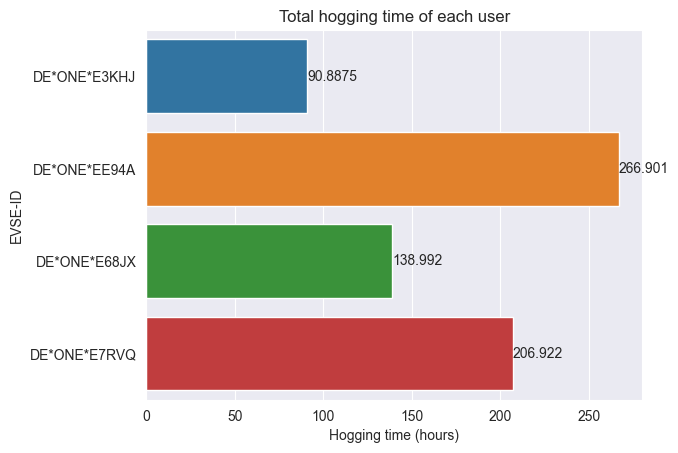
**CHARGE TIME**



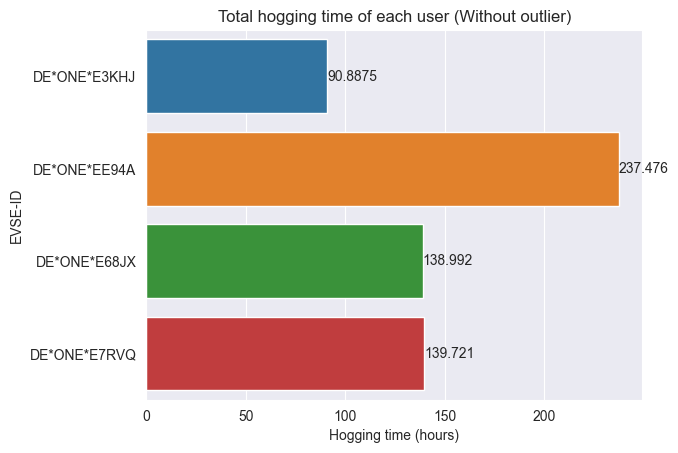
***WITHOUT OUTLIERS***



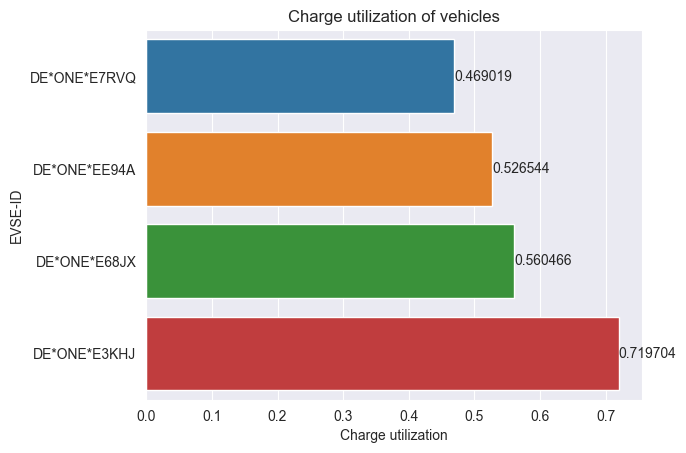
**HOGGING TIME**



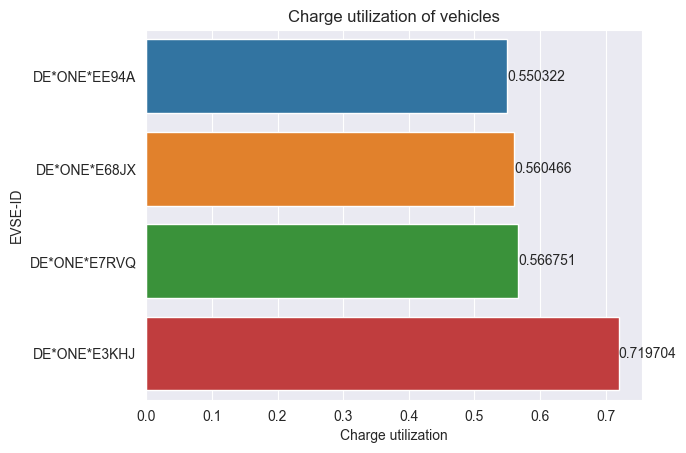
***WITHOUT OUTLIERS***



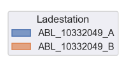
**CHARGE UTILIZATION**

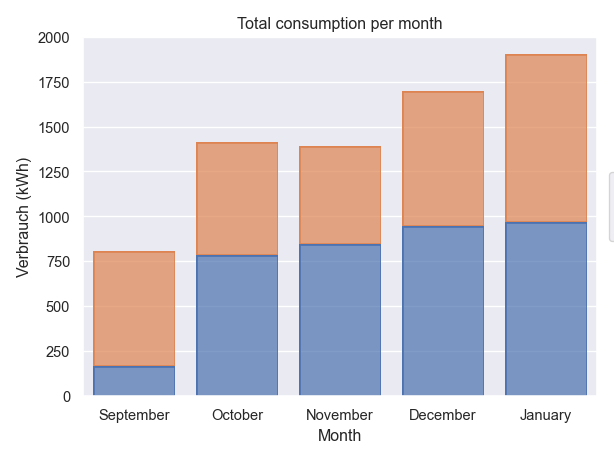


***WITHOUT OUTLIERS***



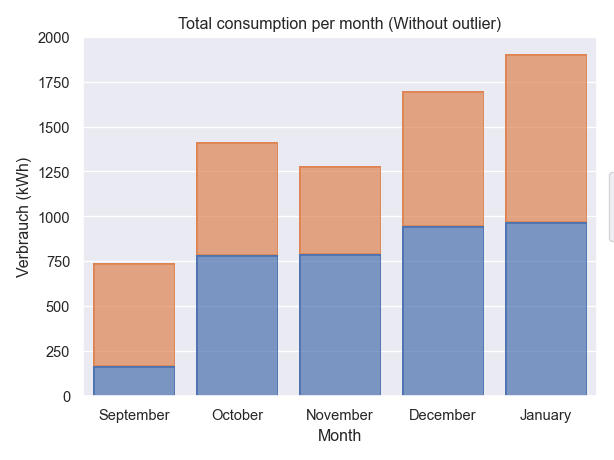
**CONSUMPTION PER MONTH**





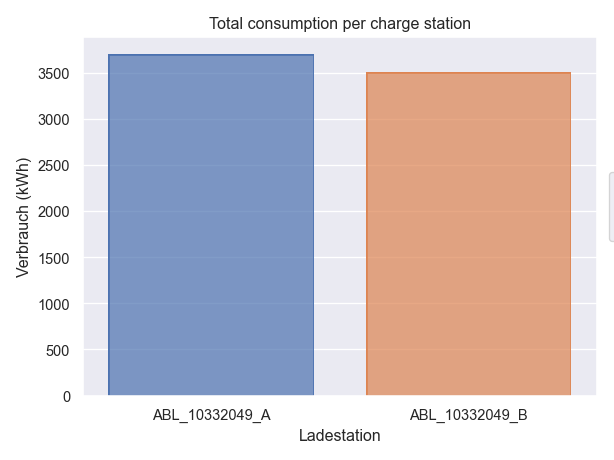
|  |  |
| --- | --- |
| Month | Total energy consumption (kWh) |
| September | 806.527 |
| October | 1413.450 |
| November | 1393.269 |
| December | 1696.735 |
| January | 1906.173 |

***WITHOUT OUTLIERS***

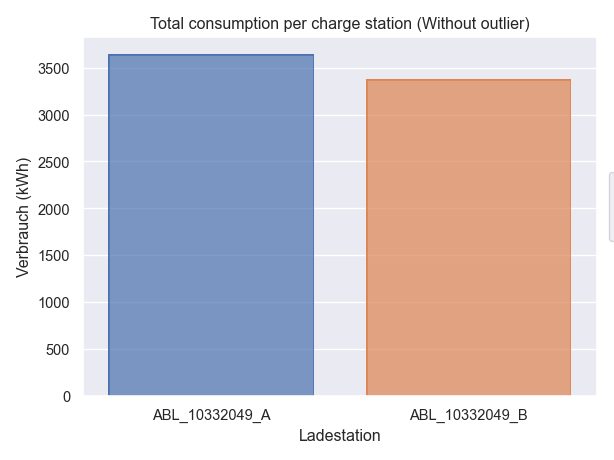


|  |  |
| --- | --- |
| Month | Total energy consumption (kWh) |
| September | 739.185 |
| October | 1413.450 |
| November | 1278.162 |
| December | 1696.162 |
| January | 1906.173 |

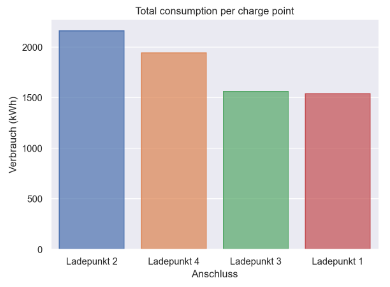
**CONSUMPTION PER CHARGE STATION**



***WITHOUT OUTLIERS***

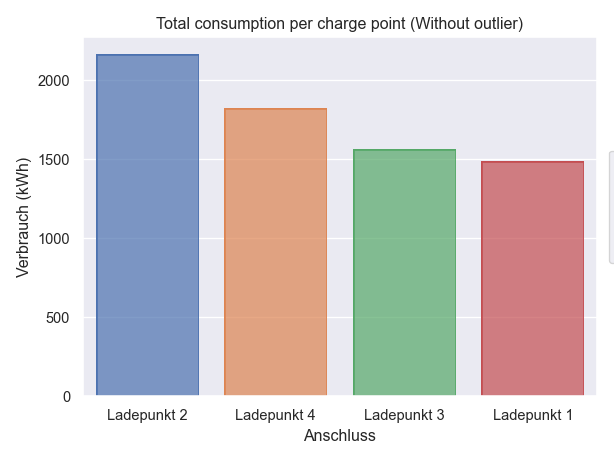


**CONSUMPTION PER CHARGE POINT**



|  |  |  |  |
| --- | --- | --- | --- |
| Standort | Ladestation | Anschluss | Total energy consumed (kWh) |
| Ulanweg | ABL\_10332049 | Ladepunkt1 | 1543.049 |
|  |  | Ladepunkt2 | 2164.218 |
|  |  | Ladepunkt3 | 1563.233 |
|  |  | Ladepunkt4 | 1945.654 |

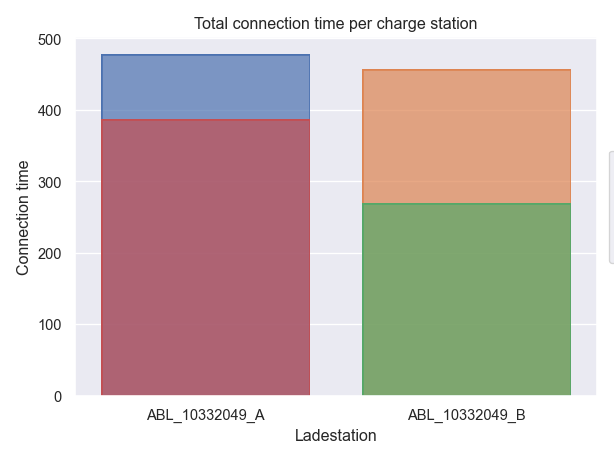
***WITHOUT OUTLIERS***



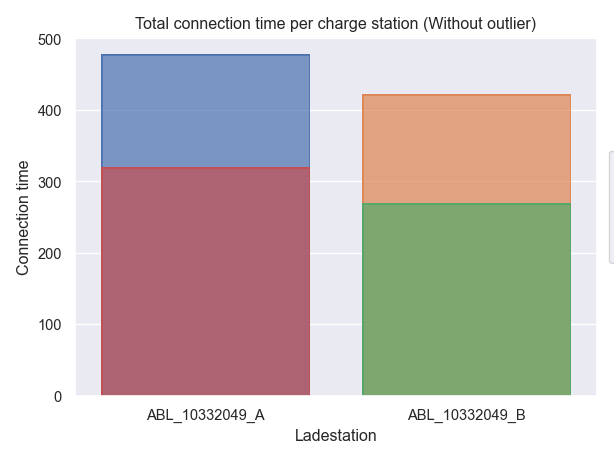
|  |  |  |  |
| --- | --- | --- | --- |
| Standort | Ladestation | Anschluss | Total energy consumed (kWh) |
| Ulanweg | ABL\_10332049 | Ladepunkt1 | 1485.560 |
|  |  | Ladepunkt2 | 2164.218 |
|  |  | Ladepunkt3 | 1563.233 |
|  |  | Ladepunkt4 | 1829.694 |

**CONNECTION TIME PER CHARGE STATION**

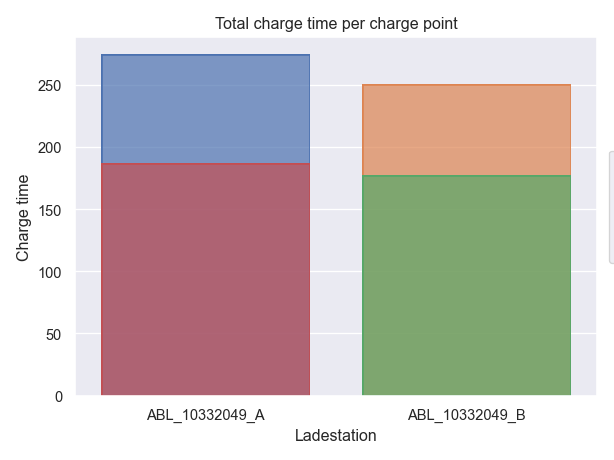




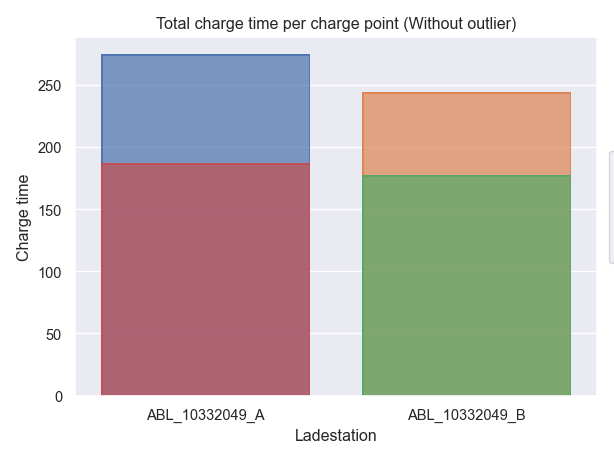
***WITHOUT OUTLIERS***



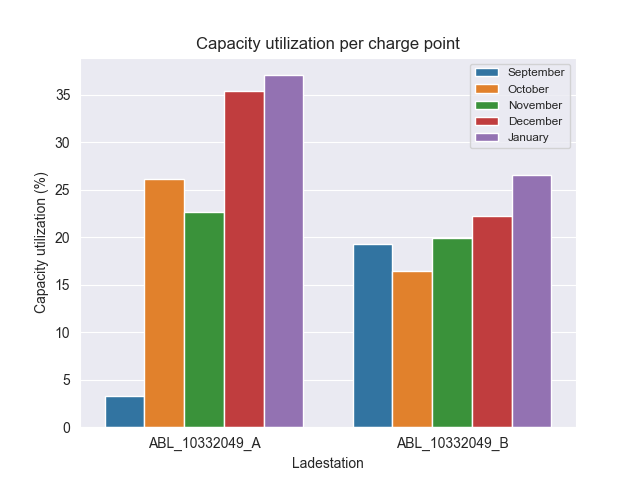
**CHARGE TIME PER CHARGE STATION**



***WITHOUT OUTLIERS***

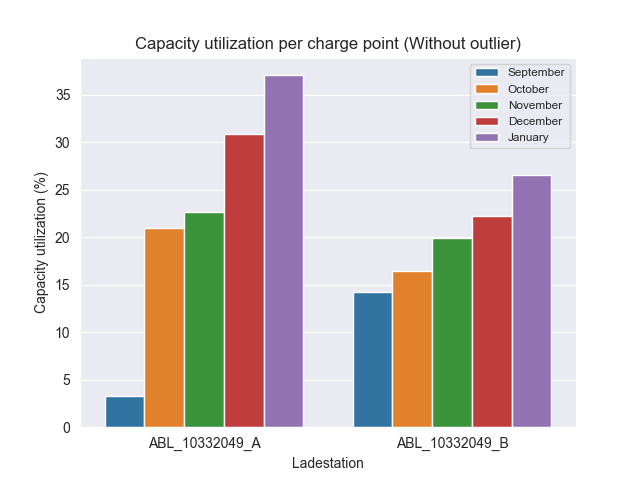


**CAPACITY UTILIZATION**



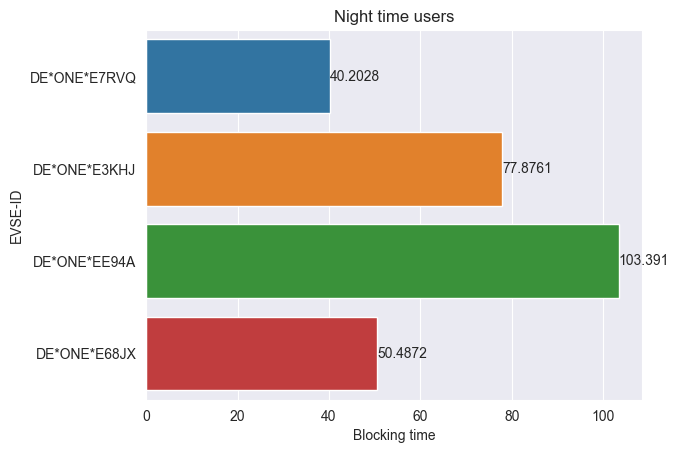
Overall, ABL\_A had an average capacity utilization of 24.9% and ABL\_B with an average capacity utilization of 20.9%.

***WITHOUT OUTLIERS***

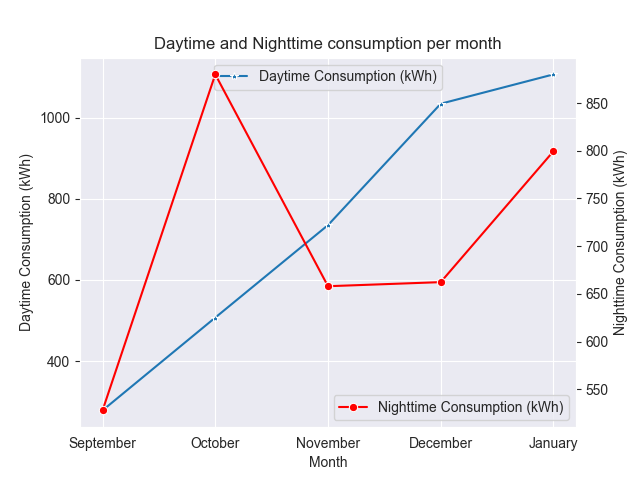


After correcting the outliers, ABL\_A had an average capacity utilization of 22.9% and ABL\_B with 19.9%

**NIGHTTIME USERS**



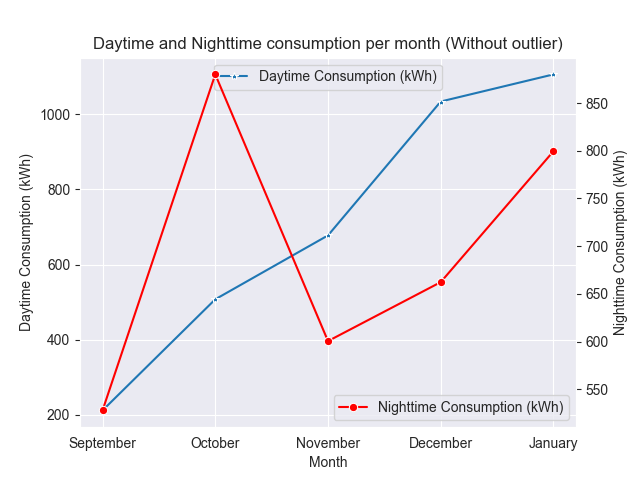
**DAYTIME AND NIGHTTIME CONSUMPTION**



Daytime consumption increased throughout the 5-month period. Nighttime consumption peaked in October at 880.025 kWh while daytime consumption peaked in January at 1106.663 kWh.

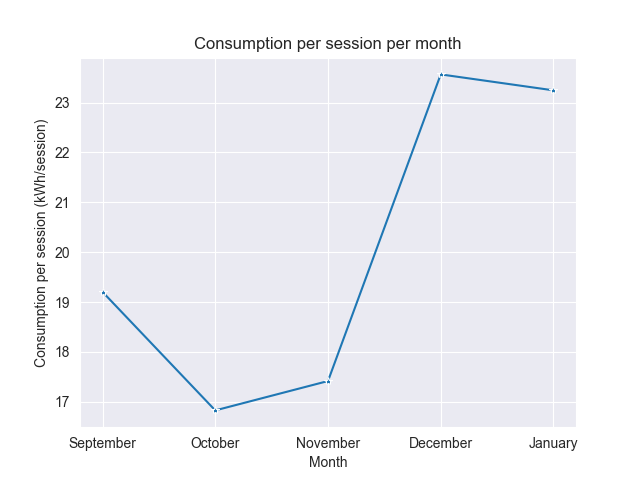
|  |  |  |
| --- | --- | --- |
| Month | Daytime consumption (kWh) | Nighttime consumption (kWh) |
| September | 278.568 | 527.959 |
| October | 507.301 | 880.025 |
| November | 735.195 | 658.074 |
| December | 1034.373 | 662.362 |
| January | 1106.663 | 799.510 |

***WITHOUT OUTLIERS***

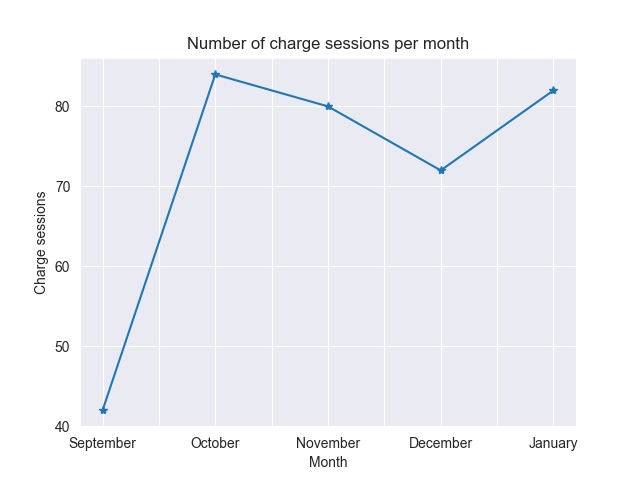


|  |  |  |
| --- | --- | --- |
| Month | Daytime consumption (kWh) | Nighttime consumption (kWh) |
| September | 211.226 | 527.959 |
| October | 507.301 | 880.025 |
| November | 677.577 | 600.585 |
| December | 1034.373 | 662.362 |
| January | 1106.663 | 799.510 |

**CONSUMPTION PER SESSION PER MONTH**



Assume an average consumption of 5.5 km/kWh. When 7216.154 kWh total energy was consumed, 39688.847 km was driven by the employees. On average, 20.0514 kWh of energy was consumed per charge session. This means that per charge session, 110.2827 km was driven emission-free.

**CHARGE SESSIONS PER MONTH**

**CHARGE SESSIONS PER CHARGE POINT**

