Dashboards:

Separated the report into 3 main pages:

1. Healthy Sessions Analysis
2. Faulty Sessions Analysis
3. Charge Points Analysis

On the “Healthy Sessions Analysis” page, I defined 3 KPIs – Count of Sessions per Day, Average Energy per Day and Average Energy Per Session Length.

* Average Energy per Day directly contributes to revenue – assuming services are charged based on energy used.
* Count of Sessions per Day provide insights on how well stations are being utilised – this is especially useful when drilled in further to look at this data per locations.
* Average Energy Per Session Length provide insight on each charging sessions. Higher Average Energy Per Session Length means that overall customers are spending more time charging rather than just plugged in.

3 filters are applied to this page to pick out only healthy sessions

* Only look at “Finished” sessions
* Only look at sessions which has a duration >= 30 minutes. (An electric car with smaller battery takes around 5 hours to fully charge so any sessions with duration < 30 minutes are likely to be faulty sessions)
* Only look at sessions with >= 1000 Watts energy. (Electric car on average has 40kWh battery size. Any sessions with < 1000 Watts are likely to be faulty sessions)

On the “Healthy Sessions Analysis” page, there is also a focus on analysing the capacity of each station. I set 0.5 as the targeted capacity (any station with > 0.5 capacity will be considered as overused). Given the session length and peak hours distribution (roughly 0700-1859), if any car is using a station during peak hours, it is very unlikely for a second car to be able to use the same station on the same day.

An estimate of incremental benefits in terms of energy per day is calculated per station. This is calculated with (Capacity – 0.5) \* 1440 \* average energy per session length for that station. This metric can help identify which station could bring the most benefits in terms of energy per day should we decide to expand.

There is also a map in this page marking all the stations I have session data for. The higher the bubble size, the higher the number of sessions per day in that station. This could be used to determine where we should build our next new station if we want to go for that route instead of expanding the existing ones. Similar principle can be followed, we can pick a station with high incremental benefit and choose a location nearby for our next station.

This page also shows that there 15% of the sessions are long (> 12 hours). These sessions will have a negative impact on the turnover rate and on the Average Energy Per Session Length KPI. Given that on average it takes 8 hours for an EV to fully charge with a 7kW charge point), it is very likely that all long sessions have > 4 hours of idle time (time when the EV is plugged in but not charging). I would suggest incurring an additional charge on long sessions. This could allow us to generate additional profit on long sessions to compensate for the lost in turnover rate. Or encourage people to leave on time to improve turnover rate and Average Energy Per Session Length KPI.

On the “Faulty Sessions Analysis” page, I defined Ratio of Faulty Sessions as the KPI. Lower ratio means that there are less Faulty sessions in general. In April, this metric is 0.36. Have set 0.30 as the target.

No filters were applied to this page so I can look at all the data – including the faulty ones.

Faulty sessions are defined as ones that are expired/failed or finished with < 30 session duration or < 1000 energy (in line with page 1).

The main metric to look at from this page is the Potential Gain in Energy per Day. This metric is calculated for each station (Ratio of Faulty Sessions per Day – 0.3) \* Number of sessions per day \* Average Energy Per Session Length\* Average Session Duration Per Day).

This metric can help identify which station could bring the most benefits in terms of energy per day if we managed to repair it to a state where its Faulty rate to the targeted 0.3.

On the “Charge Points Analysis” Page, I defined Total number of Sessions as KPI. The purpose of this page is to look at the ratio of peak sessions for each station to determine whether an upgrade to the charging points (to a higher powered one (22kW)) could improve the KPI - Total number of Sessions. The same 3 filters were applied to look at only Healthy Sessions.

* Only look at “Finished” sessions
* Only look at sessions which has a duration >= 30 minutes. (An electric car with smaller battery takes around 5 hours to fully charge so any sessions with duration < 30 minutes are likely to be faulty sessions)
* Only look at sessions with >= 1000 Watts energy. (Electric car on average has 40kWh battery size. Any sessions with < 1000 Watts are likely to be faulty sessions)

Any sessions started between 0700 and 1859 are considered as peak sessions. Otherwise, it is considered as nonpeak. This matches with what are shown on the Number of Sessions per Start Hour graph.

I expect that users who begin charging in non-peak hours are less likely to drive away as soon as their car is fully charged because by the time that happens it would be in midnight already (Assuming charging would take roughly 4-5 hours on a 7kW charge point). On the other hand, users who begin charging in peak hours are more likely to do so. I set 0.7 (roughly equal to the overall Ratio of Peak Sessions (0.73)) as the threshold to determine whether it could be beneficial to upgrade charge points to a 22kW one for charge points which have a Peak Ratio > 0.7. The results are listed in the table on the page. The expectation is that by doing so, we can improve the Total Number of Sessions due to shorter sessions. As this will have no effect on the amount of energy charged, it is also expected to see an improvement to the Average Energy Per Session Length metric on the “Healthy Sessions Analysis” page.

Unexpected data points:

There is an entry with -1 energy which is unrealistic.

This is filtered out by the Healthy session filters.

This is the case for id: 4464

The Display Max Power column has records of 0 which is unrealistic.

This is the case of chargePointIdMasked 1002.

There are duplicate values in the charge points name column. I assume that these are valid, it just means that there are multiple charge points/plugs under the same name.

There is an entry of both failed and expired sessions which has energy of 51. Both of these are under chargePointIdMasked 1222.

This is filtered out by the Healthy session filters.

There is an entry with stoppedAt as 1970-01-01T00:00:35+00:00 which is unrealistic.

This is the case for id: 11467

This is filtered out by the Healthy session filters.

There are entries with duplicate startAt time. For Healthy sessions (>= 1000 Watts), these seems to be valid entried but for Faulty ones, these seem to be actual duplicates. When counting number of Faulty sessions, I am only counting distinct values of startAt.

There are stations with capacity > 1. This is because the capacity is calculated per day while some sessions in these stations last longer than 24 hours.