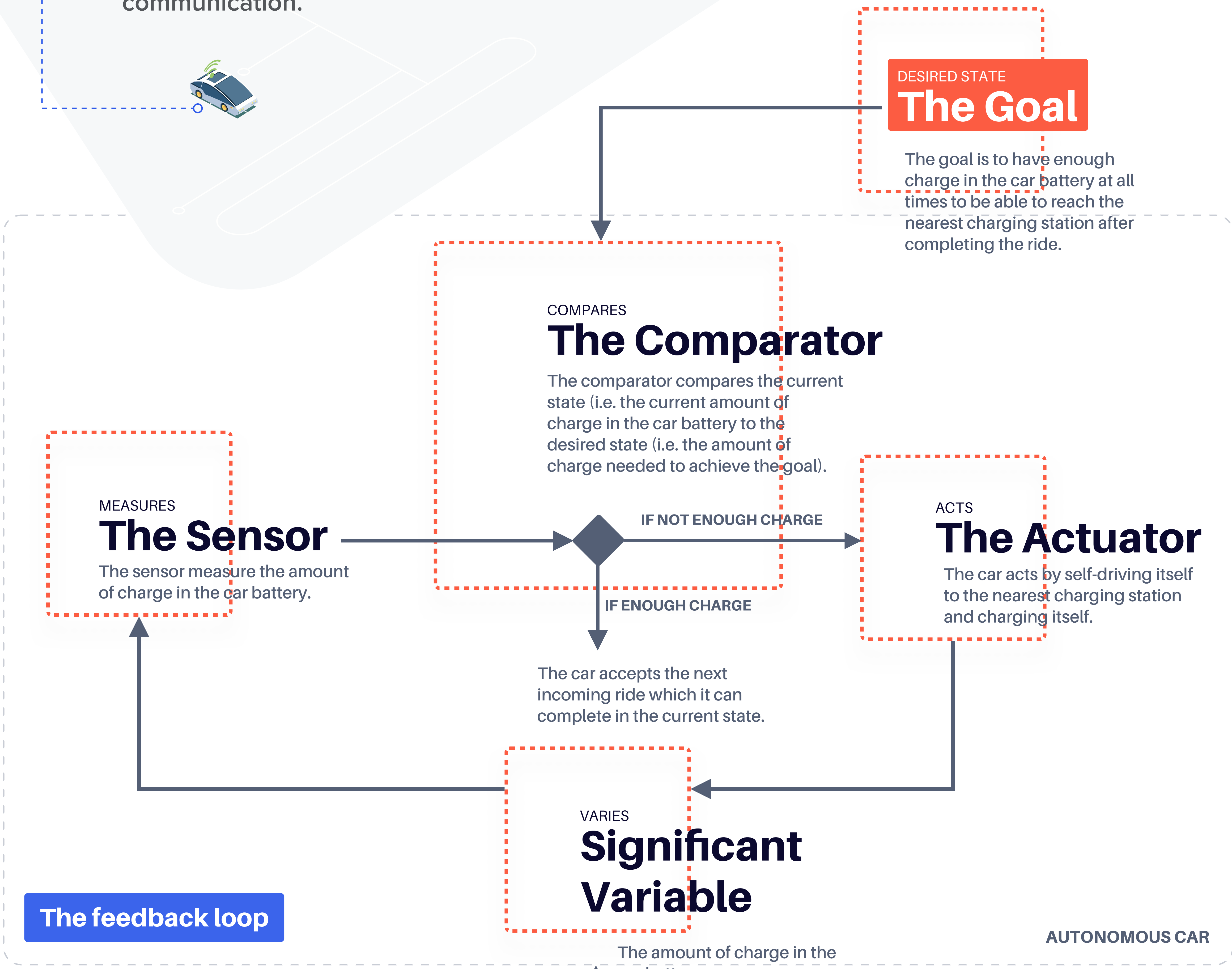


# The System

An ecosystem of fully autonomous self-charging cars running on electricity which are connected over a network enabling communication.



## Boundaries of the System

- It is a closed ecosystem of fully autonomous cars (level 5 and beyond).
- The ecosystem operates within a set x mile radius.
- Only autonomous cars run in this space.

## Rules of the System

- The cars run on electricity and self-charge themselves.
- The amount of cars in the ecosystem is always surplus of the demand. (At a point some cars are always charging).
- The car is a passenger car (upto 4 people) not a cargo/autonomous bus etc. (The self charging flow in such cases will be different since the route is set).

## Setting the Goal

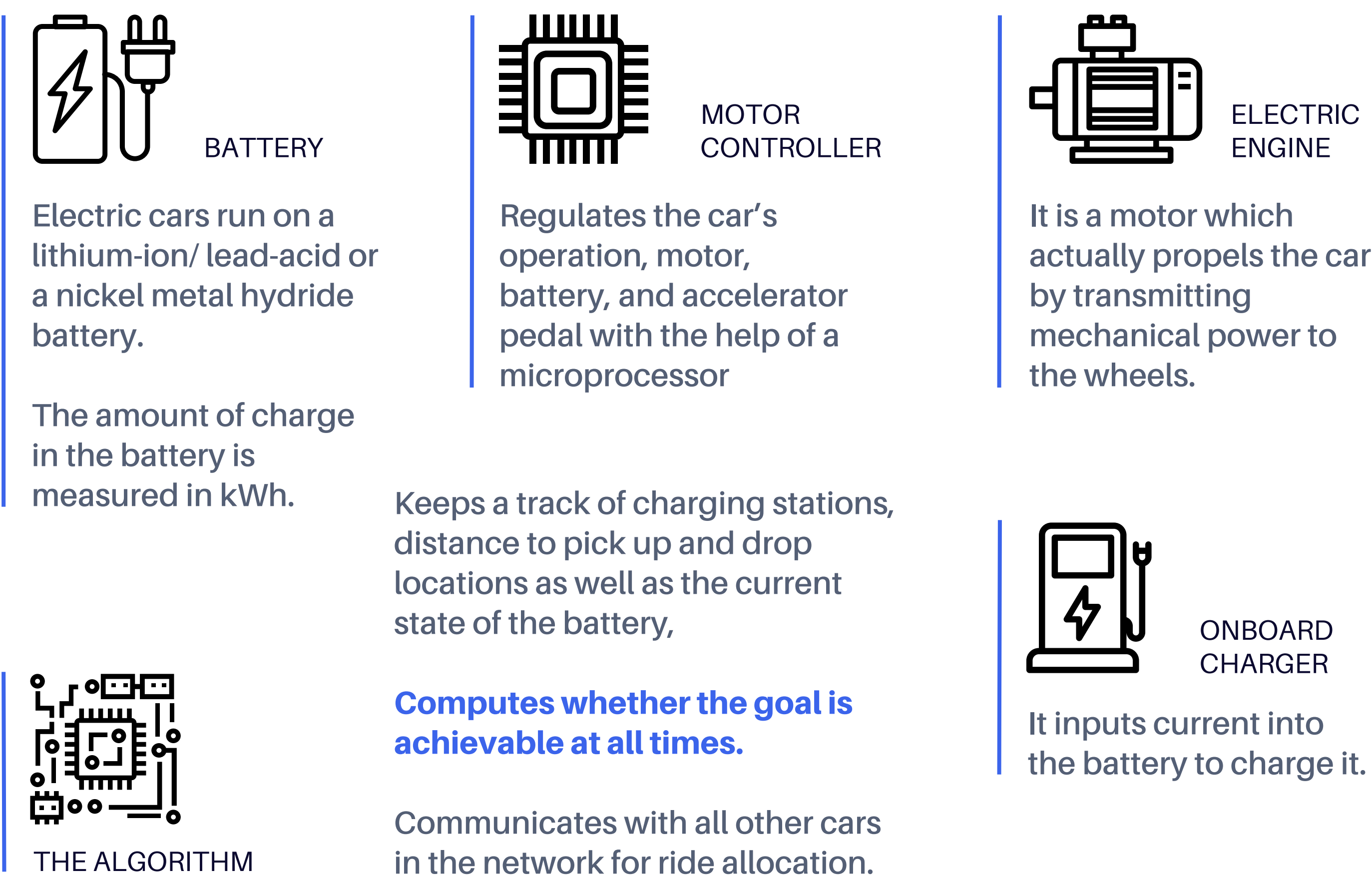
The goal depends on

- The distance between the destination and the nearest charging station
- The distance of the pick up location from the current location of the car.
- The distance between pick up and drop locations.

## Disturbances

- Inaccuracy in calculating the capacity of the battery (battery capacity decreases over time due to temperature conditions. It also depends on the driving speed and passenger load).
- Roadblock (due to accidents/ construction/ natural calamities) causing detours. (changes the time taken to reach the final destination)

## Main components of an electrical autonomous car



## An Example of the System in Action

Lets assume a future scenario where external cars are not allowed into San Francisco. The city has its own fleet of autonomous passenger cars which can communicate with each other.

- If the current state of the car battery reaches a critical level, where it is just slightly over the capacity for the car to drive to the nearest charging-station from the current location of the car, the car stops accepting further rides and self-drives to the charging station.
- The ultimate aim of the system is to gain profit. A car will accept a ride even if it is not fully charged if it crosses a certain level of charge (lets assume 90%) and there are no other available cars in the vicinity.

## Response to Disturbances

### ERROR STATE 1 : Roadblock

In case of a roadblock, the car may have to take a detour which increases the distance and in turn affects the amount of charge left in the battery to complete the trip. In such a scenario, the car may stop at a charging station before completing the trip in order to meet the goal.

### ERROR STATE 2 : Inaccuracy in calculating the battery capacity

In case the algorithm is not able to calculate the battery capacity with precision, the car may die before it is able to reach a charging station. To account for such situations, the minimum current charge requirement is always set slightly higher than the actual requirement to reach the charging station.

