BEng Project Mission Statement

# Remote activated demand control and response of aggregated electric vehicles

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Supervisor: Dr Sasa Djokic

Subject Area: Electric Vehicles, Smart Grid

# Project Definition:

The aim of the project is to analyse the feasibility and design an algorithm to calculate the predicted demand capabilities of a fleet of high end electric vehicles. Methods of analysis will include research into current vehicle to grid demand response methods and a machine learning analysis of user profiles to predict the charge status and capabilities of individual vehicles. The response design and techno-economic potential will be analysed following which the algorithm will be developed using sample data provided by the industrial supervising company (Jaguar Land Rover)

# Functionality of project

This project will examine the feasibility and initial design of a control algorithm that would allow JLR to aggregate demand response across their future electric vehicles. Through the incentivising of customers to opt in to the scheme and remuneration for demand response this system could therefore generate an income for the company on a product that has already been sold.

# Assumptions

Due to the scope at which this project could be applied to it has been chosen to focus on controlling only a high-end battery electric vehicle (BEV) with a battery capacity of approximately 100kWh that is to be charged primarily at a home charging station without smart control. The demand response will be analysed in both the English and Scottish grids initially with room for expansion at a later date. Further assumptions will be based off public specifications of a Tesla Model S for simplicity.

# Preparatory Tasks:

* Search for alternative sources and methods of demand response.
* Search for alternative sources and methods of remote vehicle charge control.
* Search for predicted fleet size and demand capabilities of electric vehicles currently available and predicted growth rates.
* Research potential algorithms for adaptive learning algorithm.

# Main Tasks:

* Predict capability of fleet and whether grid demand response capabilities are met
* Analyse historic data to design initial block diagram of proposed algorithm
* Formulate algorithm and data structures for Python implementation.
* Test Python implementation.

# Scope for Extension:

* Investigate use algorithm in different grids.
* Extend functionality to the other vehicles and multiple OEMs all aggregated by a single algorithm or OBD port.

# Background Knowledge:

* Python Programming
* Charging methods and protocols of electric vehicles.
* Demand response and grid stabilisation methods.

# Resources:

* Driving data from BEV test application (Supplied by JLR)
  + Sample Data from range of user within same time period including
  + Location of BEV
  + Charge level of BEV
  + Charge status of BEV
  + Departure Time of BEV
  + Max available charge rate
* Computational time (TBC dependant on amount of data)

# Location:

* Research to be established at the University of Edinburgh
* Industrial supervision will be provided from the Innovation Acceleration Team of Jaguar Land Rover based at Warwick University.

The academic supervisor and student are satisfied that this project is suitable for performance and assessment in accordance with the guidelines of the course documentation.

**Signed**

Student: Michael McDonald

Academic Supervisor: Dr Sasa Djokic

Date: