USE OF ELECTRIC VEHICLES AS A QUICK RESPONSE ENERGY STORAGE: CASE STUDY FOR SRI LANKA

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Declaration

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Signature of the supervisor: Date

Dr.W.D.A.S.Rodrigo

Abstract

Use of Electric Vehicles as a Quick Response Energy Storage: Case Study for Sri Lanka

With the fossil fuels depleting, the non-conventional energy sources is taking the wheel I the field of electricity generation. Yet, their inconsistencies owing to reliance on intermittent energy sources such as wind and solar necessitate means of catering the dips in generation. V2G systems become instrumental is levelling out the load curve, facilitating charging of plugin vehicles during over generation and discharging at times of lack of generation.
The study was done to analyse the practicability of implementing plugin vehicle based energy storage in Sri Lanka.
A survey was done to identify the plugin electric demographic that included plugin patterns, distance driven, length of ownership and the willingness to remain in EV segment, traction battery degradation and overall attitude towards partaking in a V2G scheme. Main challenge is quantifying the battery degradation with extensive usage as a V2G source. In contrast, using EV batteries as quick response, low duration, low energy power source, it was understood that enormous financial and economic benefits can be yield merely by minimising un-served energy following load shedding caused by frequency violation events. With low count of average daily frequency violations battery discharge becomes minimal, alleviating the adverse effect on the vehicle range with remaining charge and cyclic ageing.
Considering the cost benefit obtained from preventing load shedding versus the costs incurred by EV owners, using EVs as a fast response, low duration energy storage that can cater system emergencies is profitable in utility perspective.

Keywords: V2G, plugin vehicle, EV, range anxiety

To my wife and my parents

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List of Abbreviations

Abbreviation	Description
EV	Electric vehicle
PEV	Plugin Electric Vehicle
HPR	Hornsdale Power Reserve
SOC	State of Charge
SOH	State of Health
CEO	Chief Executive Officer
PV	Photo voltaic
V2G	Vehicle to Grid
BEV	Battery Electric Vehicle
IEA	International Energy Authority
PHEV	Plugin Hybrid Electric Vehicle
APC	Available Power Capacity
CPC	Contracted Power Capacity
D.o.D	Depth of Discharge
LKR	Sri Lankan Rupee
USD	United State Dollars
DMT	Department of Motor Traffic

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