On the Challenges of Charging Electric Vehicles in Domestic Environments

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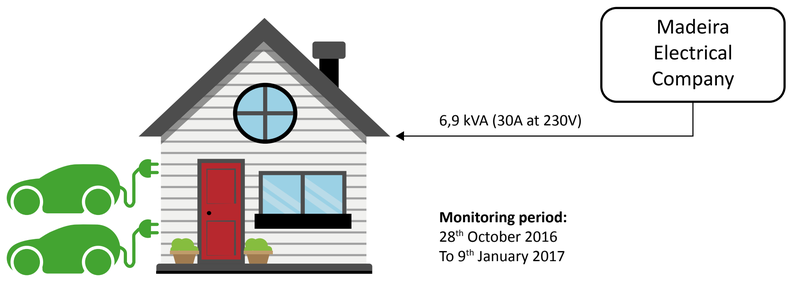
Introduction

Domestic households typically have a limit of maximum instantaneous power that can be drawn, which is determined by the contract between the household and the electricity supplier. In this poster, we present a case study, where we simulate the charging of two Electric Vehicles (EV) in a household environment, based on the analysis of the household power consumption, and the driving routines of the dwellers.

Objective

Understand how the driving routines affect the charging needs and how the charging of EVs may affect the stability of the domestic electric circuit.

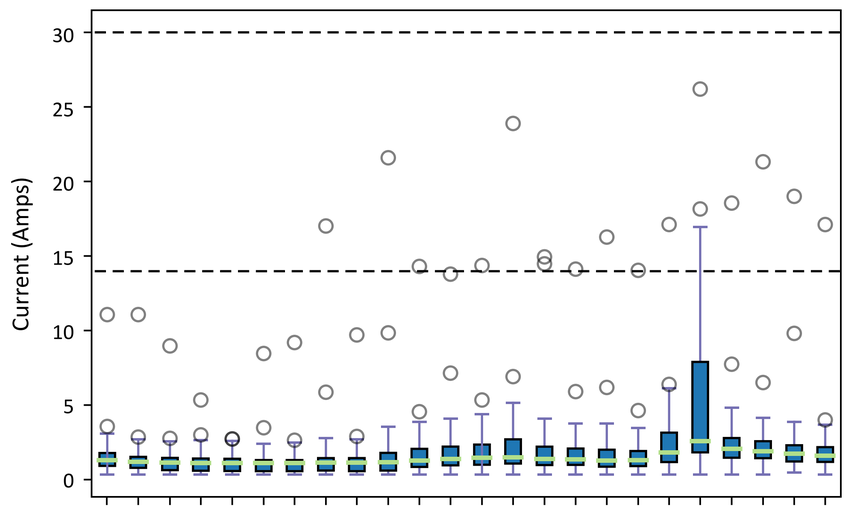
Data collection and simulation



DRIVING ROUTINES FOR EACH EV

	EV 1 (probability)		EV 2 (probability)	
Distance Mon.-Fri.[km/d]	12 (.40)	18(.60)	20(.95)	60(.05)
Distance Sat.-Sun.[km/d]	25(.50)	12(.50)	6(.75)	20(.25)

HOUSEHOLD CONSUMPTION DATA



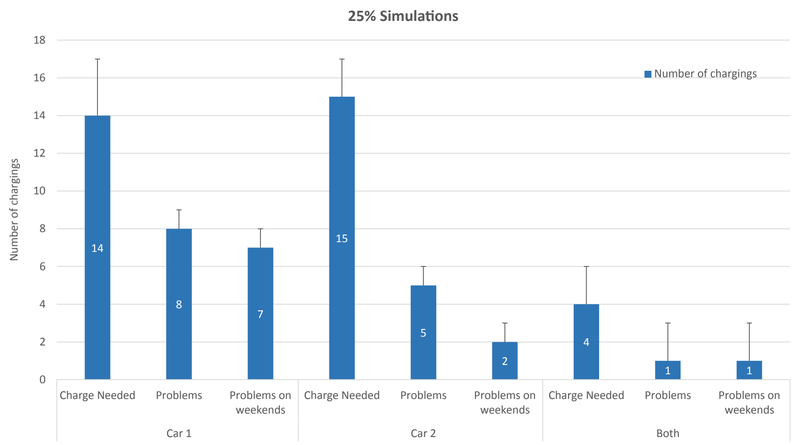
SIMULATIONS

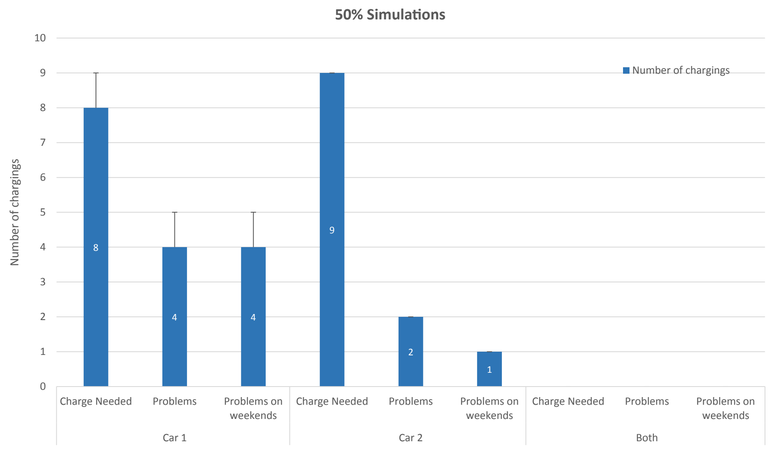
25% 50% 75% (Battery DOD)

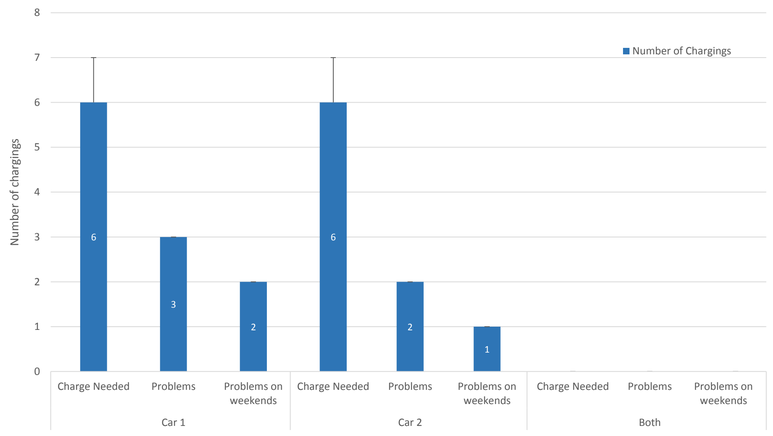
Simulation Analysis

- No. of days EVs needed a recharge
- No. of days where issues occur while charging
- No. of weekend days that EV charging was requested

Results

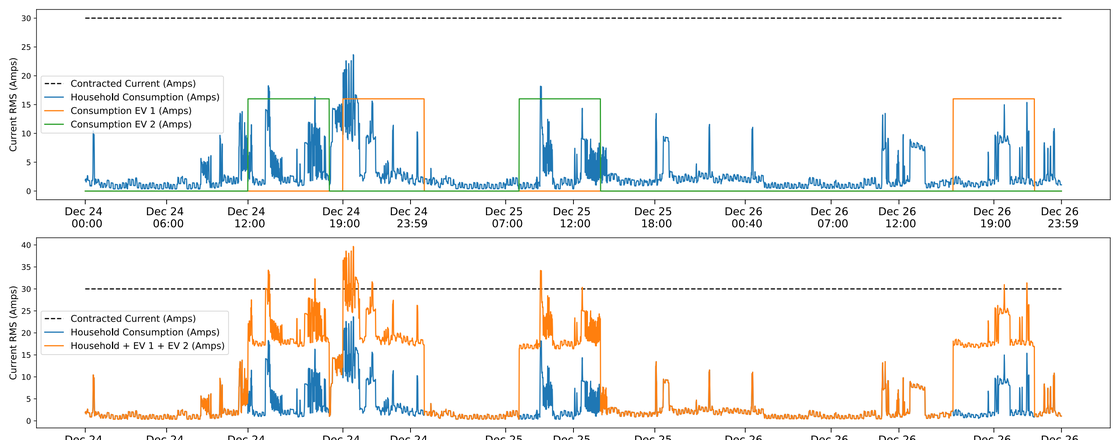






- Most problems happened when it was necessary to charge only 25% of the battery – mostly on weekends;
- Periods with higher chances of going over the contracted power occurred on weekdays between 7PM and 8PM;

Illustration of jeopardizing effect



Future work

- Sub-metering should be employed to gather more realistic charging times;
- Monitor the actual driving routines using smartphone applications (tracking speed limits and distance);
- Apply different combinations of charging thresholds and battery sizes;
- Use individual appliance consumption information to improve scheduling (E.g: switch OFF equipment).

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