How can the different charging behavior of EV users have impact on EV charging Scheduling?

Mahla Shariatzadeh (2nd year)

mahlashariatzadeh@efs.uc.pt

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Supervisors: Carlos Henggeler Antunes[1], Marta Lopes[2]

1. University of Coimbra, INESC Coimbra
2. Polytechnic of Coimbra, ESAC, INESC Coimbra

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Context

- **EV sales market** acceleration, reaching **230 million** by 2030
- **Electricity charging demand** increasing, reaching **555 TWh** for private and publicly accessible areas by 2030
- Increasing potential **challenges** to the grid

Objectives

Smart charging accounts as a solution to overcome the challenges:

- **Flexibility** to the grid
- Profits for both **EV users** and **Charging Managers**
- Requires understanding the **charging behavior of EV users**

The main objective is to exploit the **flexibility potential of EV smart charging** operation by considering technical, financial, and the **behavioural dimensions of EV users**:

- **Developing models and algorithms** to support EVs smart charging
- Coping **with multiple objectives** and **charging behavior** of the EV users
- Eliciting and integrating the **charging behaviors into mathematical modelling**

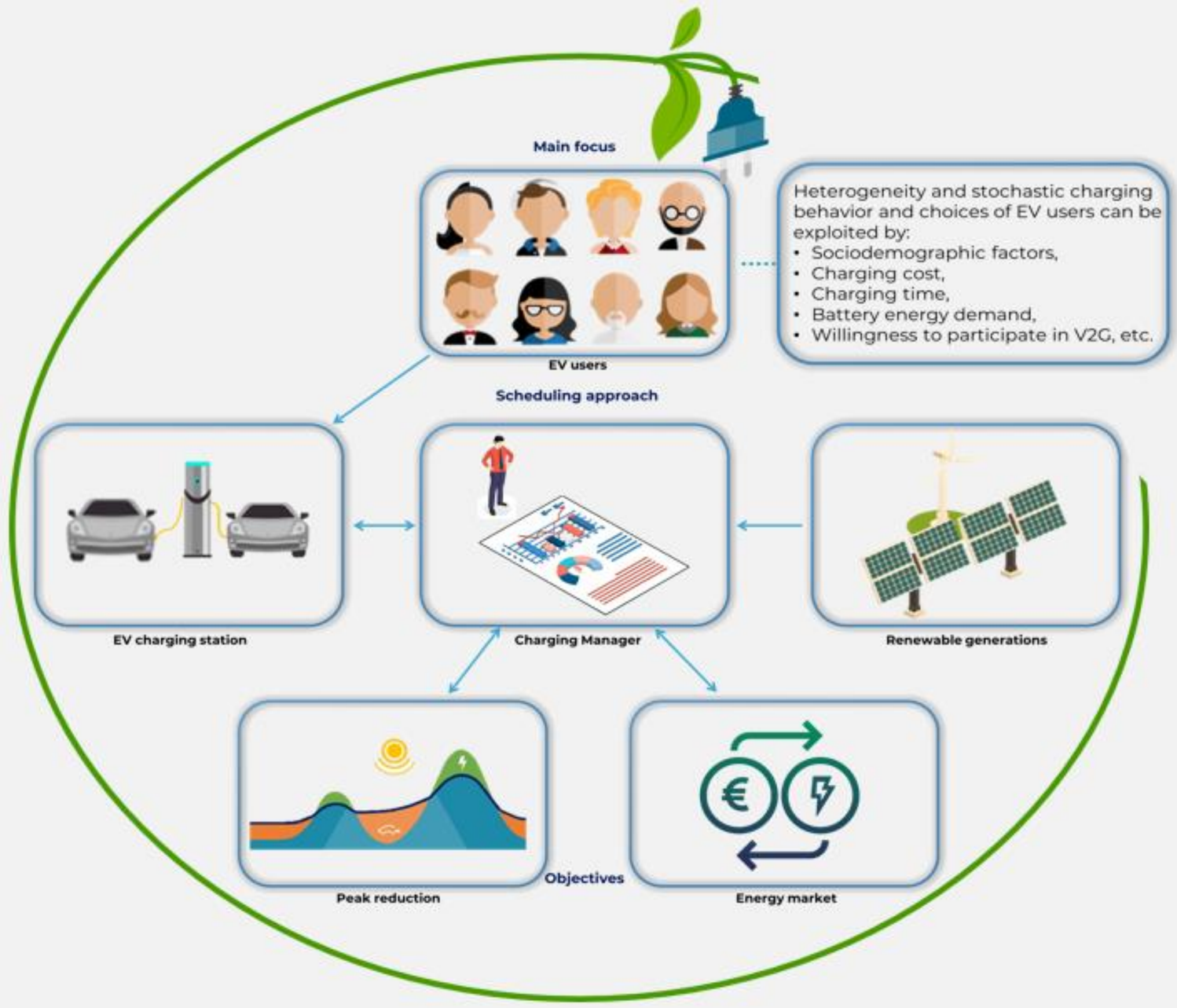
Work in Progress

- The main **preferences of EV users** based on the **charging cost and final battery SoC** are modelled
- Highlighting that the **Charging Managers control** the **charging and discharging process** to avoid exceeding the contracted power of the parking lot
- The different factors influencing the **charging behavior** are exploited. Specifically, the **charging cost, psychological factors, and technical characterization of EVs** have a higher impact on the charging behavior of EV users.

This Ongoing study in the future will focus on;

- Exploit the trade-off between the charging cost and final SoC of the EV users
- Exploit the willingness of the EV users to participate in V2G
- Exploit the flexibility potential of EV smart charging
- Clustering of different types of EV users
- Integrate previous steps into mathematical models

Research Approach

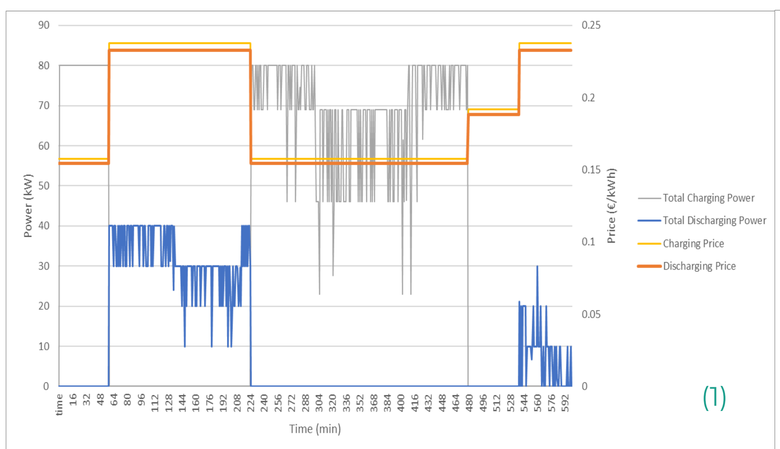


1) Developing **mathematical models** and approaches for charging scheduling focusing on the EV users' technical and financial expectations using **MILP optimization** and evolutionary algorithms
2) Exploiting **charging behavior** and flexibility of EV users by utilizing **social research tools** alongside **data-mining** of existing data sources
3) Incorporating **stochastic models** of EV users charging behavior into **optimization models**
4) Analyzing the impact of the charging behavior and **flexibility** of the EV users on the grid in different **scenarios**

Preliminary Results

Smart charging scheduling based on financial and technical expectations of the EV users:

1) Minimizing their **charging cost**
2) Maximizing the **final battery State-of-Charge (SoC)**



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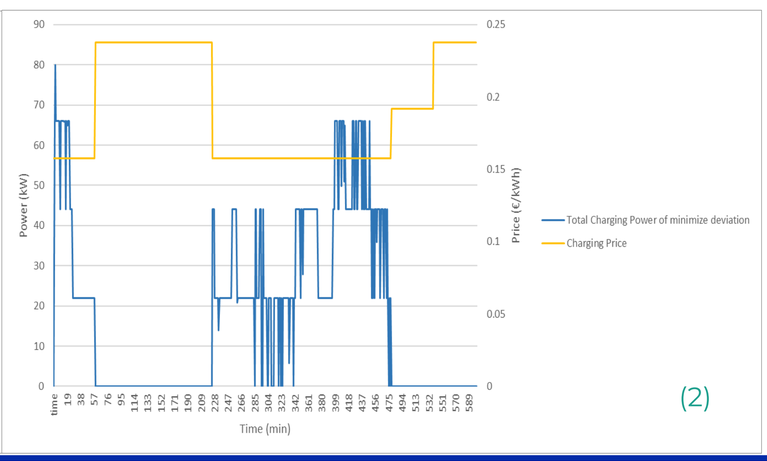

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