Paper 1101 - Optimal Management of Energy Communities considering Electric Mobility

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Introduction

Energy Communities (ECs) help the EU meet climate goals by cutting emissions and enabling local, peer-to-peer energy trades. As part of the EV4EU project, **this study presents a deterministic optimisation algorithm that manages EC** generation and demand while coordinating EV and battery storage charging and discharging.

PyECOM Deterministic Optimisation Tool

• The Deterministic Optimisation Tool was developed with **PyECOM (Python Energy Communities)**, a user-friendly Python-based algorithm for simulating and optimising energy communities.

• To cover different scenarios, three methods were implemented to adjust load and production inputs

➢ Method 1: uses forecast data, trained with historical data obtained from

➢ Method 2: uses real-time data.

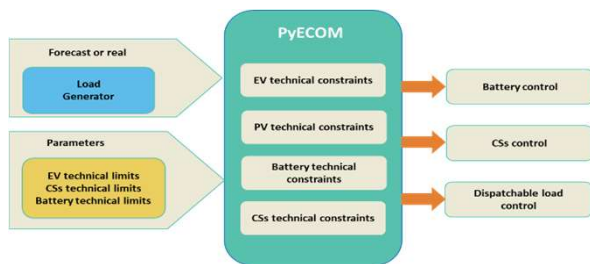➢ Method 3: combines both forecast and real-time data for more robust inputs.

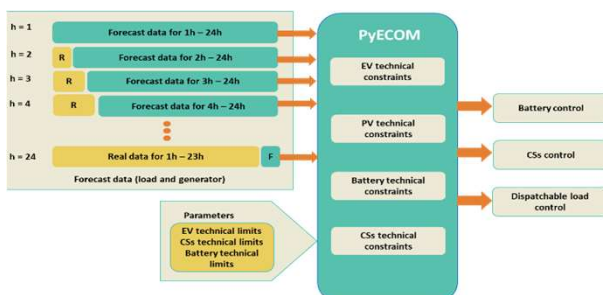*Figure 1: Data input process in the PyECOM tool for Method 1 and 2.*

Figure 2: Data input process in the PyECOM tool for Method 3

Results

For an EC of 20 participants, grid imports peaked during high solar generation as EVs, and BESS were charged across all methods. The algorithm manages controllable loads via curtailment, reduction, and energy not supplied ENS. In Method 3, due to forecasting uncertainties, a peak load reduction of 64.03 kW occurred at 03h00.
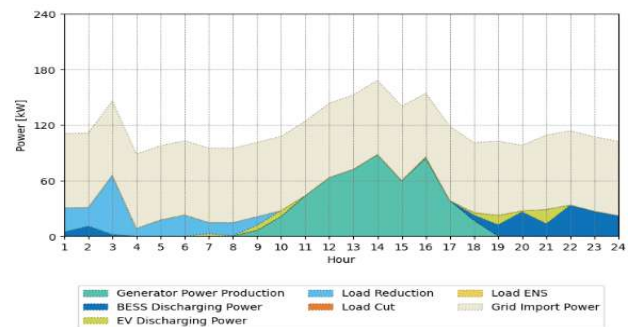

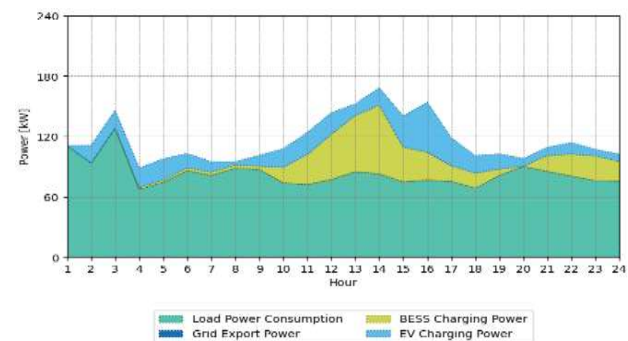*Figure 3: Production for model using Method 3*

Figure 4: Consumption for model using Method 3

Conclusions

The deterministic model efficiently manages the EC by leveraging both forecasted and real-time data. It effectively schedules BESS and EV charging during periods of high generation availability and coordinates discharging during times of power scarcity.

Acknolegments