

EV Charging and Billing System

hymate Tech Task

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Design a simplified backend script that schedules electric vehicle (EV) charging for a small residential building and computes session costs based on charging duration and electricity prices.

Scenario

- You manage 5 EVs and 3 charging ports for a shared parking area.
- Each EV may have a charging request on certain days to reach a target state of charge (SoC) by a specific hour.
- Charging is allowed only when the car is available at the station, and each port can charge one car at a time.

Requirements

1. Charging Logic

- Schedule charging sessions based on:
 - * Port availability
 - * Car's max charging rate
 - * Arrival SoC and capacity
 - * Desired SoC at a specific time
- Distribute charging sessions across available ports fairly.

2. Billing

- For each session, compute:
 - * **Energy Charged** = (target SoC – initial SoC) × capacity
 - * **Cost** = $\sum_{t=h_0}^H \text{energy charged}_t \times \text{price}_t$ where t represents each hour
 - * Assume 95% efficiency (i.e., real energy = energy / 0.95)

3. Output

- Charging schedule (hours and power)
- Final SoC
- Total Cost

You will Receive

- `cars.json` — list of 5 cars with capacity, max rate, efficiency
- `availability.csv` — car \times hour matrix (1 = available, 0 = not)
- `requirements.json` — `{car:{day:{hour:target_soc}}}`
- `prices.csv` - hourly electricity price in €/kWh (for 7 days)

Assumptions

- Charging step = 1 hour
- Each port can charge only one car per hour
- Ignore battery degradation
- No need for authentication or user interface

Deliverables

- Python script or notebook
- Charging schedule per car
- Cost summary table
- Readme (explain structure, assumptions, and how to run)

Submission

Upload your solution to a public GitHub repository or share as a ZIP file. Include a README.md with:

- Setup instructions
- Model explanation
- Notes on optional parts