

¹ ChaProEV: Generating Charging Profiles for Electric Vehicles

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Software

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⁷ Summary

⁸ ChaProEV is

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⁹ Statement of need

- ¹⁰ ▪ Profiles are good and useful, but optimisation modes might also need some underlying parameters to do optimisation computations as well
- ¹¹ ▪ Provide optimisation models with the boundary conditions they need
- ¹² ▪ ChaProEV provides the necessary parameters (as exemplified in COMPETES, Mopo/Ines, etc.) in a clear and accessible way, with the user also allowing a clear way to modify them without touching code (Sijm et al., 2022)

Conceptual innovations: Supporting optimisation models

¹⁷ Basic elements

¹⁸ A commonly used aggregated EV formulation is (Morales-España et al., 2022):

$$e_t = e_{t-1} + \eta^{\text{G2V}} p_t^{\text{G2V}} \Delta - \frac{p_t^{\text{V2G}}}{\eta^{\text{V2G}}} \Delta - E_t^{\text{drive}} \Delta N \alpha \quad \forall t$$

¹⁹ labels (?) (?)

²⁰ Further modelling

²¹ Software innovations

²² No code parameters and profiles modification (explain what kind of modifications are possible)
²³ Scenarios

- ²⁴ 1. Demand for next leg (kWh) (from network): The charge that the vehicles leaving in the next time step need to pull from the network for the leg they are about to undertake, corrected by the charger efficiency.
- ²⁵ 2. Demand for next leg (kWh) (to vehicles): The part of the above that vehicles get. ($\{E_t^{\text{drive}}\}$ in Equation)
- ²⁶ 3. Connected vehicles: The share of vehicles that are connected to a charger ($\{N_t^{\text{plugged}}\}$ in Equation)

- 31 4. *Charging Power from Network (kW)*: Maximum power that connected vehicles can
32 potentially draw from the network. ($\{\bar{P}_t^{G2V}\}$ in Equation)
33 5. Charging Power to Vehicles (kW): Maximum power that can potentially go to vehicles
34 go to vehicles (i.e. the same as above with a charger efficiency correction).
35 6. *Vehicle Discharge Power (kW)*: The amount of power connected vehicles can discharge
36 to the network.
37 7. Discharge Power to Network (kW): How much of that discharged power can go to the
38 network. ($\{\bar{P}_t^{V2G}\}$ in Equation)
39 8. Effective charging efficiency: Ratio between charging power going to the vehicle and
40 power coming from the network. This can vary in time, as the location of the charging
41 vehicles (and thus the efficiency of the involved chargers) changes as they move around.
42 (η^{G2V} in Equation)
43 9. Effective discharging efficiency: Same as above, but for discharging (it is the power going
44 out of the vehicles divided by the power going into the network). (η^{V2G} in Equation)

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