

Integrate battery dynamics into ETM

Problem:

The Energy Transition Model (ETM) models the hourly demand of electric vehicles (EV) as time curve. At the same time, the batteries of EV can be (partially) used as a storage device for electricity. The time curves and the storage behaviour are currently not consistent.

Proposed solution:

Using ABM, produce (hourly) time curves for one year for all combinations of the following four 'variables':

1. The charging location:
 - a. Charging at home only
 - b. Charging at the office only
 - c. Charging both at the office and at home
 - d. Using fast chargers in a combination with a, b and c?
2. The traveling behaviour:
 - a. Commute to work on workdays
 - b. Trips to shops etc. on work and weekend days
 - c. Trips on weekend days
3. The charging behaviour:
 - a. Charging when arriving
 - b. Charging when there is expected capacity on the network
 - c. Smart charging to optimize profit?
4. The storage (vehicle-to-grid) behaviour:
 - a. Allowing 5% of the battery volume to be used for V2G
 - b. Allowing 10% of the battery volume to be used for V2G
 - c. ...
 - d. Allowing 95% of the battery volume to be used for V2G
 - e. Allowing 100% of the battery volume to be used for V2G

This yields a library of hourly profiles that can be used in the ETM to describe the hourly demand of EV depending on the choice of users for

- Charging behaviour:

▼ Demand response - electric vehicles

Demand response is a form of flexibility where energy demand is adjusted or shifted in time. The goal is to reduce peaks in energy demand. With the sliders in this section, you can adjust the charging behaviour of electric vehicles. The chart shows the impact this has on the shape of the electricity demand curve.

The total set of electric vehicles can be set in the [car technology section](#).

Charging strategy for electric vehicles

Charging everywhere		100.0 % ?
Charging at home		0.0 % ?
Fast charging		0.0 % ?
Charging smart (Elaad)		0.0 % ?
Charging regular (Elaad)		0.0 % ?

- Storage (V2G) behaviour:

Electricity storage

Using the sliders below you can set the electricity storage options for the different network levels. Excess electricity is stored and supplied to the grid later, once the "excess event" has passed.

Low voltage network	share
Batteries in households	0.0 % ?
Batteries in electric vehicles	0.0 % ?
Medium voltage network	electricity input
Large-scale batteries	0 MW ?
High voltage network	electricity input
Underground pumped hydro storage	0 MW ?

Further suggestions:

Using the API of the ETM, the ABM vehicles can interact with the rest of the energy system to get information about electricity price and expected network impact.

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