Emobility in Python & Vehicle Energy Consumption in Python
Demonstration of two Open Source tools describing electric vehicle energy demand
DLR Knowledge exchange workshop
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Niklas Wulff, niklas.wulff@dlr.de
When does electric charging occur?

Electric demand is mainly driven by

- Number of electric vehicles
- Technical characteristics of vehicles
- Individual mobility behavior
- Charging infrastructure availability
- Charging strategy
When does electric charging occur? emobpy and VencoPy model pipelines

Mobility

Driving and connection

Charging strategy & battery states

Individual vehicle

emobpy

Charging profile

Aggregated vehicle fleet

VencoPy

Energy system model
Emobpy – individual profile calculation

Section 1
Demand calculation

Section 2
Grid Connection Calculation

Section 3
Charging Strategy Calculation

Temporal scope
Energy consumption
Setting of rules

Charge station availability
Charging eff.
SOC min

Immediate vs balanced charging

Immediate vs balanced charging
Emobpy – individual profile calculation

https://jupyter.org/

RISE 5.6.1
Jupyter slideshow extension
## Emobpy – individual profile calculation

### Function

- individual profile
- given charging strategy

### Modeling

- Single electric vehicle
- One profile set per vehicle
- Stochastic trip synthesisization procedure

### Code

- Object-oriented programming
- Interfaces: jupyter notebook,
- License: MIT

### Data

- Probabilities of distance, trip-purpose and departure times in .csv,
- technical assumptions in dictionary
VencoPy – vehicle fleet profiles as constraints

VencoPy

Trip profiles
Connection profiles
Technical assumptions
Config

Section 1
Input & Preprocessing
Section 2
Profile calculation
Section 3
Filtering, correction & aggregation
VencoPy – vehicle fleet profiles as constraints

VencoPy

Demonstration Time

RISE 5.6.1
Jupyter slideshow extension

https://jupyter.org/
## Comparing emobpy & VencoPy

### emobpy
- Individual profile
- Given charging strategy

### VencoPy
- Normalized scalable profiles
- Input to energy system model

### Modeling
- Single electric vehicle
- One profile set per vehicle
- Stochastic trip synthesisation procedure
- Vehicle fleets
- One output per technology
- Aggregated, normalized profiles
- Deterministic

### Code
- Object-oriented programming
- Interfaces: jupyter notebook, License: MIT
- Functional programming
- Four library files holding functions
- Repo on gitlab
- Interfaces: .csv, .xlsx, .yaml
- Licensed via BSD-3-Clause

### Data
- Distance, trip-purpose and departure times in .csv,
- Technical assumptions in dictionary,
- Hourly driving and connection profiles
- Technical assumptions via .xlsx
Wrap-up and conclusion

- Both tools are still **in development** and you’re welcome to join into development

- If you are interested in describing single vehicles and their charging, use emobpy

- If you want to calculate a technical flexibility potential of a future electric vehicle fleet use VencoPy

- Outlook: Potential merge of multiple emobpy runs with VencoPy fleet aggregation
Links & Contact

Emobpy: https://gitlab.com/diw-evu/emobpy
VencoPy: https://gitlab.dlr.de/wulf_ni/vencopy

German Aerospace Center e.V. (DLR)
Institute of Engineering Thermodynamics | Pfaffenwaldring 38-40 | 70569 Stuttgart

Niklas Wulff | Ph.D. Candidate
+49 711 6862-348 | niklas.wulff@dlr.de