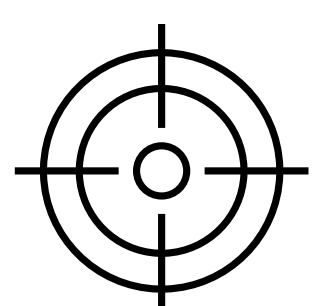


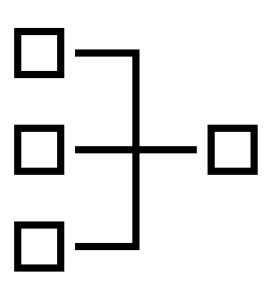
1092 – ResFlex: A residential load profile generator to model individual demand response in distribution grids

Thomas Stegen, Joakim Castiaux, Noé Diffels, Maxime Duchesne, Bertrand Cornélusse
Montefiore Institute, University of Liège, Belgium



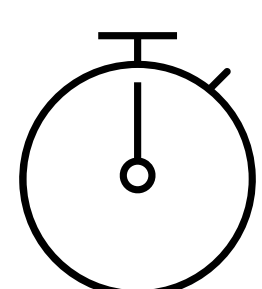
Goal

Modelling **evolving** residential load to achieve efficient **energy transition** and **distribution system planning**.



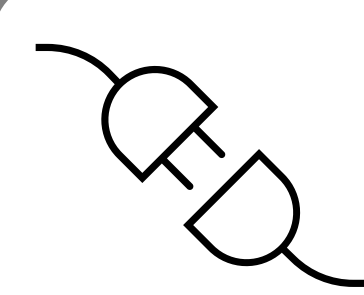
Synthetic generator

Due to lack of data, our aim is to get **synthetic profiles** for **known populations** from **realistic individuals**.



Household Occupancy

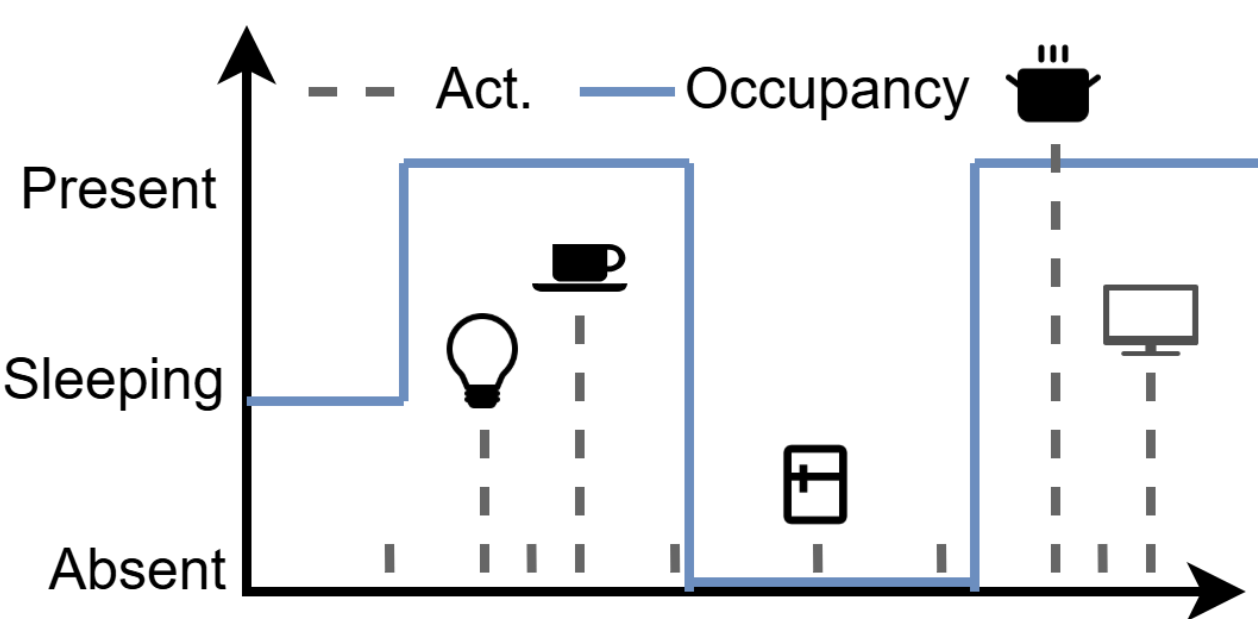
A family is modelled in the house and **individual behavior** is defined for the **full year** using StROBe [1].



Base Load

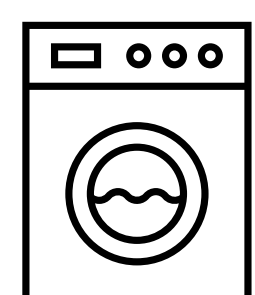
Stochastic use of plugged-in loads

Inhabitants number and occupations



Activated by people in patterns

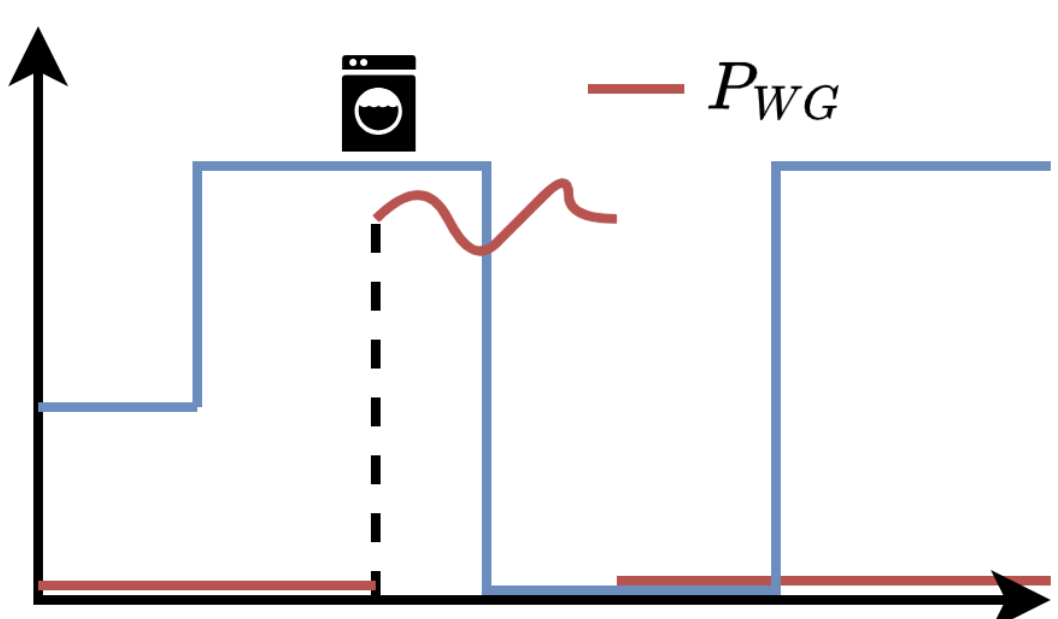
No flexibility



White Goods

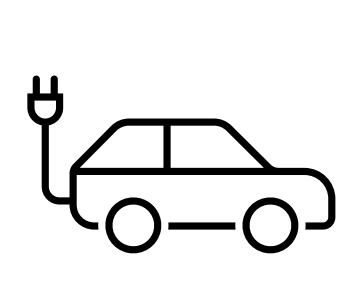
Launched at specific times

Cycles per week
Program types



Activated for a full cycle

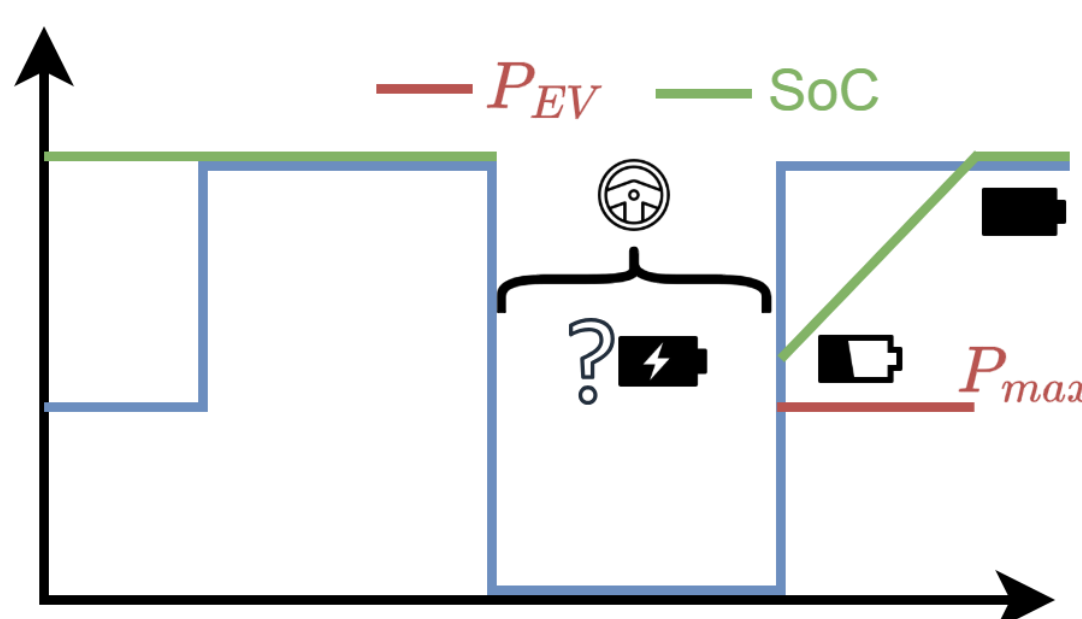
Flexibility windows



Electric Vehicle

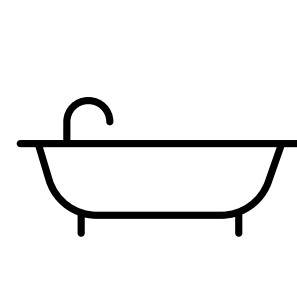
Driving events, energy & charge

Consumption, Max power, km/year



Main driver is back with discharged EV

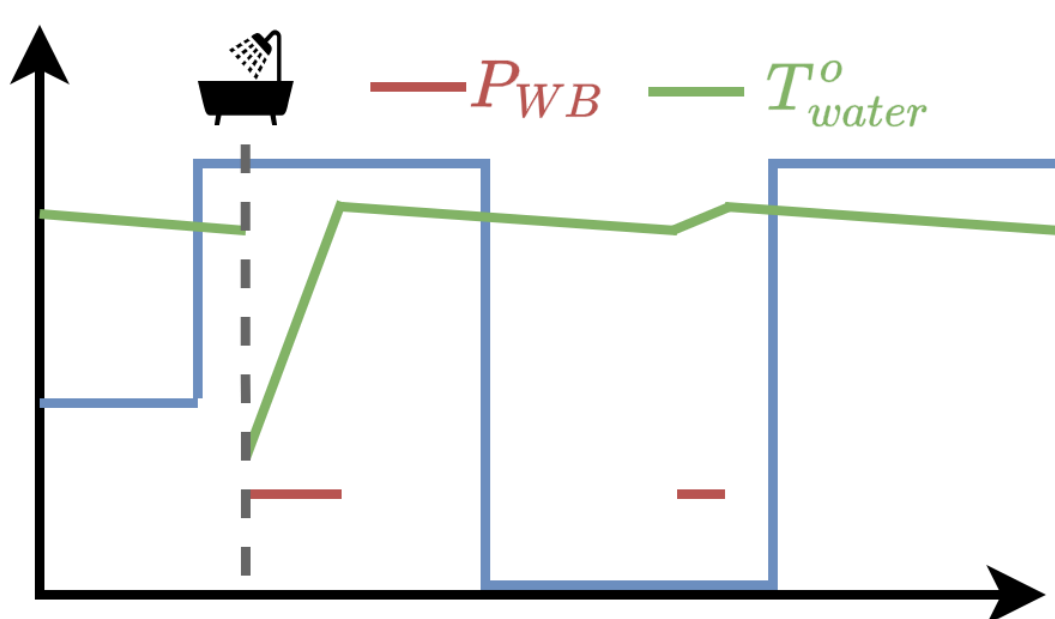
When plugged



Water Boiler

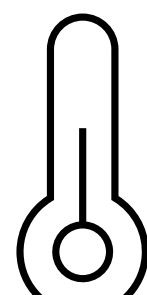
Water cons. with thermostat. control

Inhabitants number
Boiler model



Thermostat with water usage events

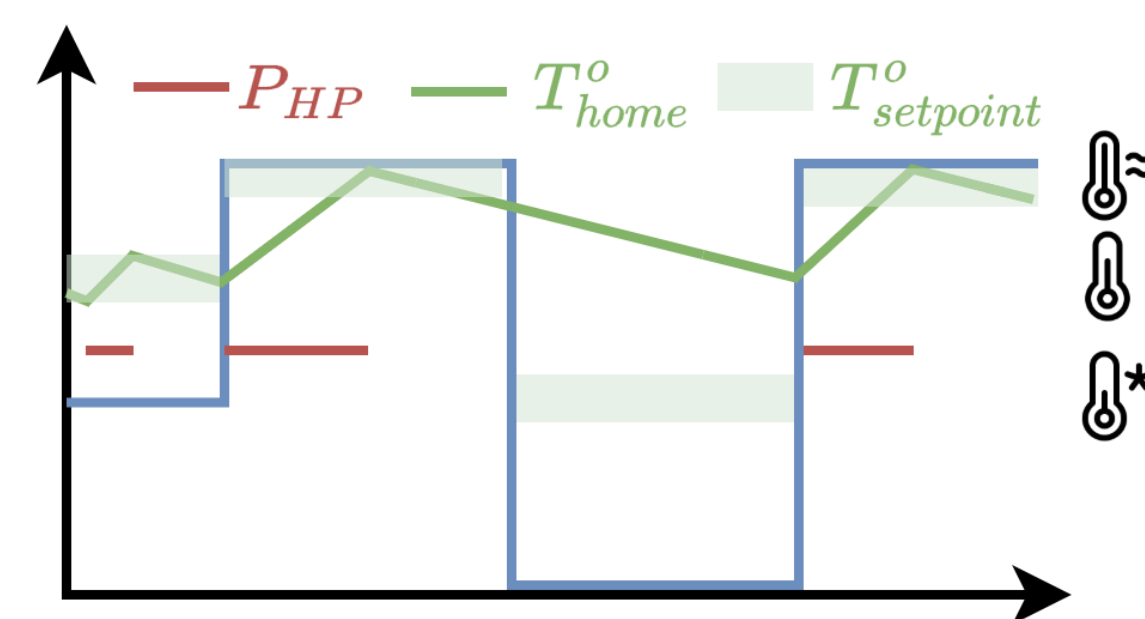
Minimum output T°



Space Heating

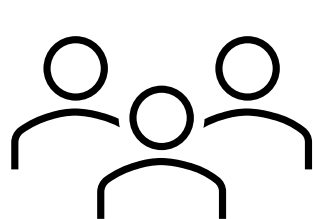
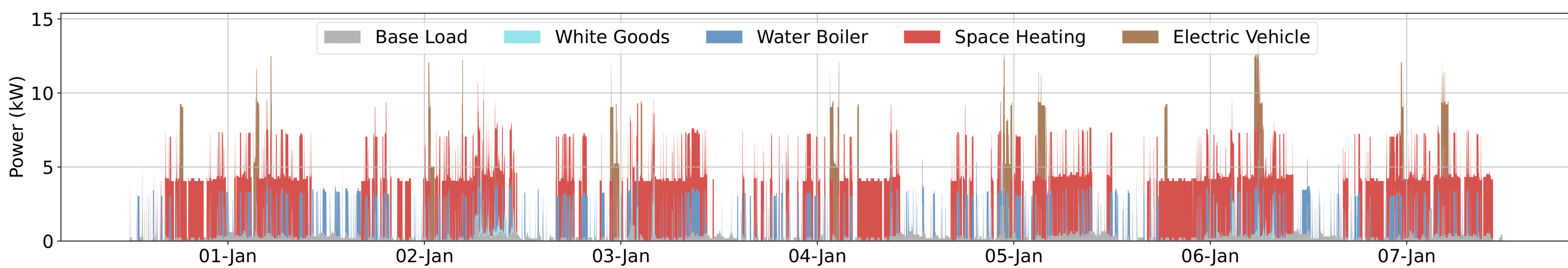
Block model with therm. loss & coef.

House year, volume
Heating system



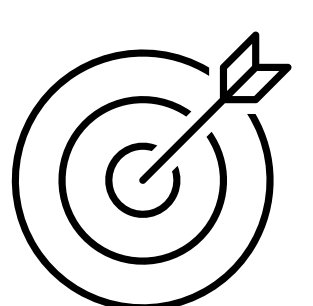
Thermostat with three T° setpoints

Thermal comfort



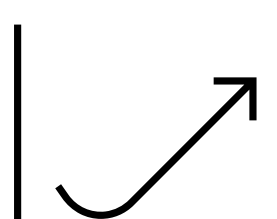
Population modelling

This tool aims to model **complete distribution grids**. Adapted function and inputs can be used to match **known parameters** for the population at **feeder level**.



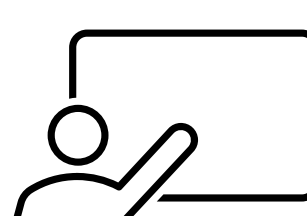
Conclusions

This tool provides load profiles with a **flexibility component** that are realistic regarding users' behavior, assets' models and populations' metrics. Results have been **validated** on Belgian data.



Evolving scenarios

For **long term planning**, evolving populations can be created with increasing **penetration** parameters representing mass **electrification**.



Reference

[1] Baetens, R., Saelens, D.: 'Modelling uncertainty in district energy simulations by stochastic residential occupant behaviour', Journal of Building Performance Simulation, 2016

Download the tool

<https://github.com/Diffels/ResFlex>

