Densys in Liège

Operational planning and sizing

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Introduction.

You are asked to size a household microgrid (the microgrid you could set up in your house). You will have to construct an optimization model.

You can choose your grid connection capacity, invest in a genset to disconnect from the public grid or buy battery packs where the energy capacity can be sized independently of the inverter power. Similarly, PV capacity can be sized independently of the PV inverter power.

You should also modify some key parameters to discuss their impact on the results.

Instructions:

1. Use the normalized load and power profile from `sizing.csv`. Add your annual consumption in `parameters.py` and make sense of every parameter.

2. Solve the operational planning problem (in `OP_opt.py`) using a linear programming formulation. You can assume you have full knowledge of the future and the sizes of the devices are known. You want to minimize OPEX (compare cases of net-metering, selling to the grid or giving it away).

3. Change your model to add CAPEX in the objective and set the device sizes as variables. Compute the optimal sizing for the three previous export tariffs (in `sizing_opt.py`).

4. Solve the same problem after removing the grid connection to isolate your house from the grid. Compute the CO2 emissions of such a system.

5. Stay in islanded mode, now your goal is to minimize CO2 emissions and change the objective accordingly. Compute the cost of such a system.

6. Use another approach where you decide on yearly CO2 budgets as parameters. Implement this as a constraint in your model. Then compute the optimal cost associated with each of the values.

7. **BONUS:** Add parameters and a time series for an electrical heating system and/or an EV. Append those devices to your model.

For questions and remarks, please contact tstegen@uliege.be