How to run

The **testrun** folder contains a working example of a simple household with photovoltaic panels, air conditioner, heat pump and a battery system. Some input files contain comments and a brief description of each file is given in the following. The output files are saved in the same folder and, again, a brief description is given in this document.

The economic analysis is conducted through the Net Present Value method. The program compares two different cases. Case 0, the reference case, where electricity is bought from the grid, thermal demands are satisfied by a traditional NG fired boiler and cooling demand through an air conditioner. Case 1 is defined by the user through the input files. The time horizon is 30 years. This is a very specific type of economic analysis, but results of case 1 can be used independently from this analysis.

Input files

All input files must be included in the working folder.

globalparam.dat
Reference year is used to produce the timestamp in the output files.
Simulation starting time and ending time must be re 1 and 8760. Possibility of considering subsets not yet implemented.
Battery life estimation: if 0 it is considered to be 10 years, if 1 it is computed based on cyclic ageing and shelf ageing.

aggregate.dat
Number of buildings to be considered and a list of all buildings name. Listed names must match the individual .dat files describing the different locations.

location1.dat
Example of a possible location. The filename matches the listed names in aggregate.dat.
First line: components number, must be lower or equal to 10.
The order in which the components are listed is the order in which they are solved.
A list of technologies and related inputs can be found in componentslibrary.dat.

AmbData.dat
Ambient data. First line must be 8760 (hours in a year).
First column = index, second column = temperature [°C], third column = air density [kg/m^3], fourth column = solar irradiance [W/m^2], fifth column = wind speed @ 10 m [m/s].

demand_Wel.dat
Electrical energy demand. First line, first number must be 8760 (hours in a year), second number must be number of electrical demand profiles in the file.
First column = index, next columns = demand profiles.

demand_Th.dat
Thermal energy demand. First line must be 8760 (hours in a year).
Unlike electricity demand here the columns represent different types of thermal demands and not different demand profiles. Hence only one demand profile can be considered per type in all locations.
First column = index, second column = demand for ambient heating, third column = demand for hot water, fourth column = demand for process heat (higher temperatures), fifth column = demand for ambient cooling, sixth column = demand for other purposes (e.g. cooking).

elenprices.dat
Electrical energy prices. First line must be 8760 (hours in a year).

First column = index, second column = price to buy from the grid [€/kWh], third column = price to sell energy to the grid [€/kWh]

gasprices.dat
Natural gas prices. First line must be 8760 (hours in a year).
First column = index, second column = price for a small-sized (annual consumption < 525.36 Sm^3) household [€/Sm^3], third column = price for a medium-sized (annual consumption between 525.36 Sm^3 and 5253.60 Sm^3) household [€/Sm^3], fourth column = price for a big-sized (annual consumption > 5253.60 Sm^3) household [€/Sm^3]

Output files

locationsenergybalances.csv
File with energy balances of all locations. First row: column names. Each column contains the hourly values of the energy balance, the energy production and the energy consumption of electricity, ambient heating and cooling and hot water. All columns are repeated for each location. Locations are identified by the number at the beginning of each column name, following the order in which they are listed in aggregate.dat.

aggregatedenergybalances.csv
Same structure of locationsenergybalances.csv, but in this case the balances are the sum of the single locations' energy balances.

techinfo.csv
Technology-specific parameters. Each column is identified by a 4 (or 5) digits-number (A)ABBC.
(A)A is the number of the location as listed in aggegate.dat
BB is the technology-specific code as listed in following table.
C is a number between 1 and 6 and identifies technology-specific parameters, again listed in the following table.

NPVanalysis.out
Text file with the results of the NPV analysis.
First value = Actualized Pay Back Period, second value = Profit Index, third to fifth values = Net Present Values after 10, 20 and 30 years.

NPVcompletedata.csv
Daily NPV values for the reference case, the user-defined case and the difference between the two cases, which represents the actual NPV curve to be considered for the study case.

Component	**Code (BB)**	**Parameter 1 (C=1)**	**Parameter 2 (C=2)**	**Parameter 3 (C=3)**	**Parameter 4 (C=4)**	**Parameter 5 (C=5)**	**Parameter 6 (C=6)**
Electricity demand	01	El. dem. [kWh]					
Thermal demand	02	Amb. heat dem. [kWh]	Hot water dem. [kWh]	Amb. cool. dem. [kWh]			
Photovoltaic	03	El. prod. [kWh]					
Wind turbine	04	El. prod. [kWh]					
Solar collector	05	SoC water tank [-]	Heat prod. [kWh]	Heat used [kWh]	Heat stored [kWh]		
Air conditioner	06	Cool prod. [kWh]	El. cons. [kWh]				
Heat pump	07	Heat prod. [kWh]	El. cons. [kWh]				
HVAC el	08	Heat prod. [kWh]	Cool prod. [kWh]	El. cons. [kWh]			
HVAC gas	09	Heat prod. [kWh]	Cool prod. [kWh]	Fuel cons. [Sm^3]	El. cons. [kWh]	Recovery heat [kWh]	
Electric chiller	10	Cool. prod. [kWh]	El. cons. [kWh]	El. cons. fan [kWh]	COP		
ESS – LiIon battery	11	SoC [-]	El. stored or cons. [kWh]				
ESS – H2	12	SoC H2 tank [-]	H2 stored. or cons. [Sm^3]	El. stored or cons. [kWh]	FC heat prod. [kWh]	eta electr or eta FC [-]	
CCHP	13	El. prod. [kWh]	Heat prod. [kWh]	Cool. prod. [kWh]	Fuel cons. [Sm^3]	El. cons. fan [kWh]	Heat cons. chiler [kWh]
NG boiler	14	Fuel cons. [kWh]	Fuel cons. [Sm^3]				