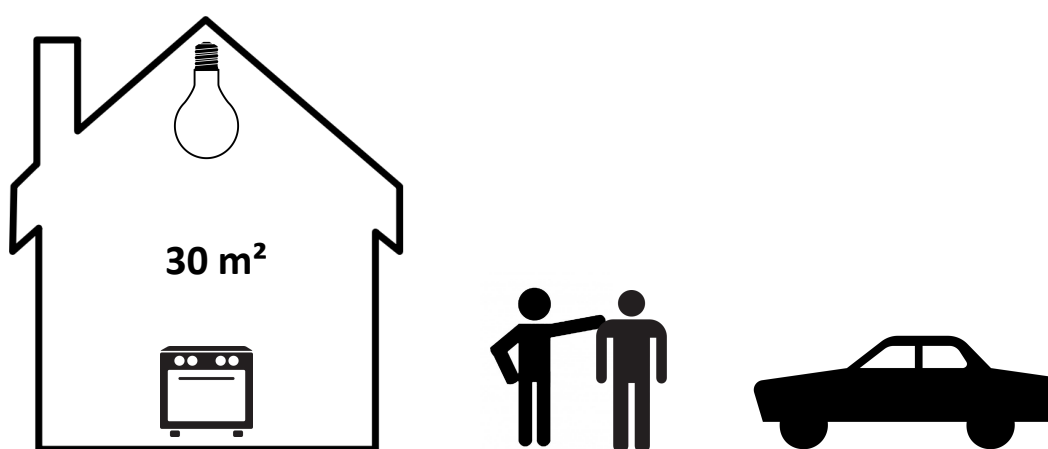




CASE STUDY

At the end of 2022, following the almost total cessation of Russian gas deliveries to Europe and the lack of availability of the French nuclear fleet, the call for sobriety has resulted in a reduction of about 8% in electricity consumption. This very encouraging energy saving effort must be continued and completed by measures to improve energy efficiency (thermal insulation of buildings, less energy consuming systems, etc.) to reduce final energy consumption by 40% to 50% by 2050, which is one of the objectives of the national strategies to achieve carbon neutrality and get out of dependence on fossil fuels, in line with international commitments. The solutions, whether high-tech, low-tech or a combination of both, must allow us to achieve these goals.



The challenge we propose is to reduce the energy consumption of a 2-person household in a 30 m² dwelling that is inaccessible by public transport to the various key places (university, shops, leisure areas) and therefore has a gasoline-powered thermal car.

Assuming all-electricity (heating, domestic hot water and cooking), the electrical consumption of the dwelling is distributed according to the main categories shown in figure 1.

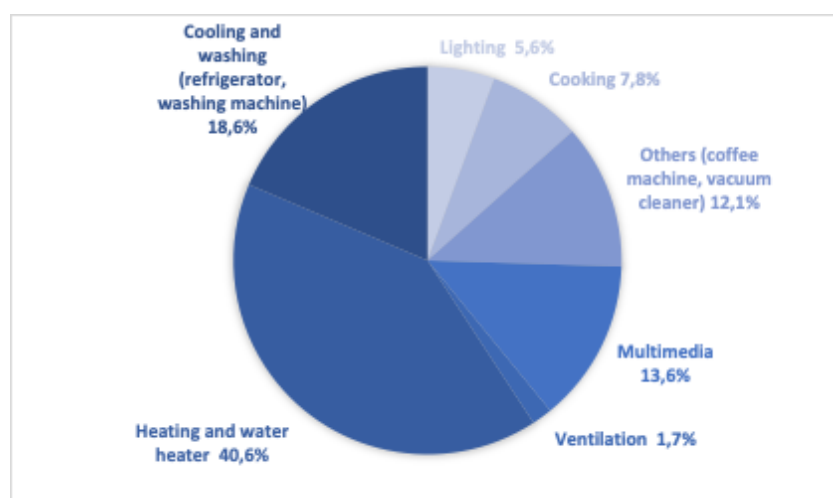


Figure 1: Average distribution of electricity use in the household considered. Source: ADEME

The total electricity consumption of the household during a year is 4800 kWh.

In this household, the **average electricity consumption of household appliances is as follows** (RTE, 2020 electricity balance).

The **average electricity consumption of cooling and washing appliances** is as follows:

Household appliances	Average electricity consumption per year
Refrigerator	260 kWh
Freezer	320 kWh
Washing machine	120 kWh
Dishwasher	190 kWh

The **average electricity consumption of multimedia equipment** is as follows:

Multimedia equipment	Average electricity consumption per year
TV	170 kWh
Internet box	220 kWh
Computing (computer, tablet)	260 kWh

The **average electricity consumption of cooking appliances** is as follows:

Kitchen equipment	Average electricity consumption per year
Electric plates	200 kWh
Electric oven	140 kWh
Other	35 kWh

The **average annual consumption for all trips by car is 8000 kWh (primary energy)**.

The objective of the challenge is to define the modalities, acceptable to you, to reduce the annual energy consumption of the household (housing consumption, transport) by 40% for final energy in 10 years from an initial profile, to estimate the global cost of the project and to define a deployment schedule of the project. The challenge includes 2 deliverables, the first at $t_0 + 3$ weeks (where t_0 is the kick-off date of the challenge) and the second at $t_0 + 6$ weeks.

Deliverable 1 (at $t_0 + 3$ weeks where t_0 is the kick-off date of the challenge):

- From the above data, define your home's equipment (power, usage rate) compatible with the given average energy consumption profile.
 - **Example:** For the washing machine: class A machine, which consumes 1.15 kWh per cycle, used twice a week, that is 120 kWh per year.
 - The appliances are given as an example, you can modify the list if you do not find it realistic, but keeping the same total annual consumption, and a similar distribution by sector.
- From the above data, define your mobility mode: type of car, usage rate and type of usage (weekdays, weekends, vacations,... studies, shopping, leisure,...)

Deliverable 2 (at $t_0 + 6$ weeks where t_0 is the kick-off date of the challenge):

- Explanatory note of your project to reduce your energy consumption to 40% within 10 years and precise quantification of the choices and the associated budget.
- 3-5 minutes video pitch to present your project