Consume or store?

This is the dilemma often faced by anyone who wants to produce their own energy.

Fortunately, the technical/legal energy regulations have lifted the ban on storage systems being integrated into self-consumption equipment with renewable energies.

It is a logic-based online recognition system and it stores any surplus power that may be produced by generation systems with renewable energies during off-peak hours when there is high solar production so that it can later be consumed when the resource decreases and demand increases.

Spanish Electric Code RD900/2015, approved on 10 October 2015, allows storage systems to be integrated into any self-consumption project with renewable energies.

Despite storage systems becoming legal, there is still one final hurdle to overcome. In this case, it comes in the form of a tax, included in the aforementioned Code that governs self-consumption. Indeed, the so-called "fixed charge" of the tax on the sun only applies to systems that are defined as manageable. In other words, that are capable of producing energy on demand and not only depending on the whims of the resource that they are using.

It appears that being able to manage when you self-consume is a greater privilege, which has led to the lawmakers adding a specific additional cost.

This is in contrast with the incentives to implement storage systems being applied in other countries in the European Union, not only in new self-consumption projects, but to improve the management of existing ones.

Leaving aside the temporary setback presented by this tax on storage that is sure to disappear soon, as it represents an administrative barrier to the development of an activity which the European Commission itself has established as a...
priority in the fight against climate change.

Storage systems are quickly becoming popular, although they are facing other challenges such as cost, efficiency, their service life and their management.

Impact of the cost of an electrochemical battery on a self-consumption system:
Integrating an electrochemical battery into a self-consumption system can increase the investment required by 60% to 100%. Which makes it very difficult to obtain a reasonable return. Given the cost of storing electricity, this should be the last thing you should choose when selecting what system to implement in a self-consumption project. Before evaluating the capacity of the battery, you need to know exactly what the facility’s energy demand will be like and explore how consumption can be reduced by improving efficiency or what loads can be moved to daylight hours so that they can be covered by instantaneous self-consumption.

Impact of integrating an electrochemical battery on the efficiency of a self-consumption system:
It should be noted that producing solar power for self-consumption can instantly have an average yield that is above 90%, while energy that is stored to be consumed in the future can struggle to achieve an average yield above 80% and in some cases it is even lower than 70%.

Therefore, changing consumption habits will always be more efficient and useful, planning for certain loads to be connected and consumed during the middle of the day rather than storing this energy in batteries and then consuming it during hours of low solar radiation.

Programming the domestic water heating and the running of a swimming pool filter system, increasing the setpoint temperature of the heating at the beginning of the afternoon or cooling the air conditioning system’s buffer tank are solar power storage systems that do not require a lot of investment and, in many cases, they can make it possible to minimise the size of the batteries that are really required and, therefore, improve the financial return provided by the system simply by avoiding losses during battery charging and discharging processes.

Impact of an electrochemical battery on the durability of a self-consumption system:
One of the appeals of instantaneous self-consumption systems is the long service life of photovoltaic modules.

With manufacturers providing 25-year warranties for the power that they produce, we can safely say that a self-consumption system will be able to operate for over 30 years generating electricity, without anticipating any further costs, other than occasionally repairing and/or replacing one of the inverter’s electronic components. However, when we include a battery component in the self-consumption system, using existing technologies, the life of the battery will force the user to invest more money to replace it far

CIRCUTOR’s photovoltaic kits for off-grid systems contain all of the devices necessary to autonomously self-consume energy for systems that are off-the-grid.
sooner than the rest of the system. Five years in the case of lead-acid batteries with gelled electrolyte and 10 years in the case of lithium-ion batteries. These three impacts are forcing the designers of self-consumption systems to figure out how to make the benefits of using storage systems outweigh these disadvantages.

Advantages of self-consumption systems with storage:
Without a doubt, the main draw of energy storage systems used for self-consumption is energy independence. To be able to produce and consume the energy produced in a building and reduce consumption from the grid to a minimum or even go off-grid.

Indeed, storing the surplus solar power from the middle of the day allows you to increase your energy self-sufficiency. In the residential sector and similar, where loads tend to become concentrated in the late afternoon and early evening, storage can enable the levels of self-consumption to increase from 30% to levels of between 60% and 90%, with the corresponding reductions in greenhouse gas emissions. As well as increasing the percentage of self-consumption, storage systems allow the supply security of buildings to be increased. As there is an energy backup supply, if there is a grid failure, certain sensitive loads can continue to receive power from the solar power system, even in the absence of solar radiation. Finally, a property that has a self-consumption system with storage can use the stored energy to minimise peak power demand from the grid and therefore reduce its contracted power. This reduction in contracted power can, in many cases, be extremely helpful for increasing the return on investment. Especially in those cases with extremely sporadic peak consumption, such as in weekend homes. Or in seasonal water pumping systems. This advantage offered by storage systems is also extremely useful in those places where the infrastructure of the distribution lines means that it is not possible to increase the contracted power without requiring a disproportionate investment. In those cases, a self-consumption system can generate and store the energy to provide the additional power required that cannot be supplied by the grid.

Using existing technologies, the life of the battery will force the user to invest more money to replace it far sooner than the rest of the system. Five years in the case of lead-acid batteries with gelled electrolyte and 10 years in the case of lithium-ion batteries.

The most complete inverter

The PowerBox Hybrid by CIRCUTOR are hybrid inverters for self-consumption photovoltaic energy systems. They are able to manage surplus energy loads in batteries and their subsequent discharge in order to power consumption when the instantaneous power of the solar generator is not enough.
Case study.
The case described below is that of a weekend home high in the mountains with a harsh climate, especially in the winter. These types of properties keep their heating systems on throughout the winter to prevent the temperature inside from falling below a certain security value (14 … 16 C) to prevent the accelerated deterioration of their walls and avoid the difficulty of achieving setpoint temperatures again at the weekend.

Oil boiler consumption in this type of property is normally between 3,000 and 5,000 litres per season.

By incorporating a modular radiant heating system powered by a photovoltaic module installation with storage, 4 kW of power and a capacity of 7.2 kWh, as well as an EDS load management system, it has been possible to reduce the amount of fossil fuel used to maintain temperatures on unoccupied days to zero. Also, by changing the operating mode, the system is able to cover the property’s power needs during the rest of the year and guarantee a basic supply in the event of a grid failure, which is quite common in mountain areas.

Despite having a high cost, this system has a payback period of six years and prevents 14 T of CO₂ from being emitted into the atmosphere.