bamboo energy

notes

Note #2 | September 2021

5 Steps to Valorize the Flexibility of your Assets

Authors:
Joan Recasens, Energy Advisor for Bamboo Energy
Cristina Corchero, CSO & CTPO at Bamboo Energy

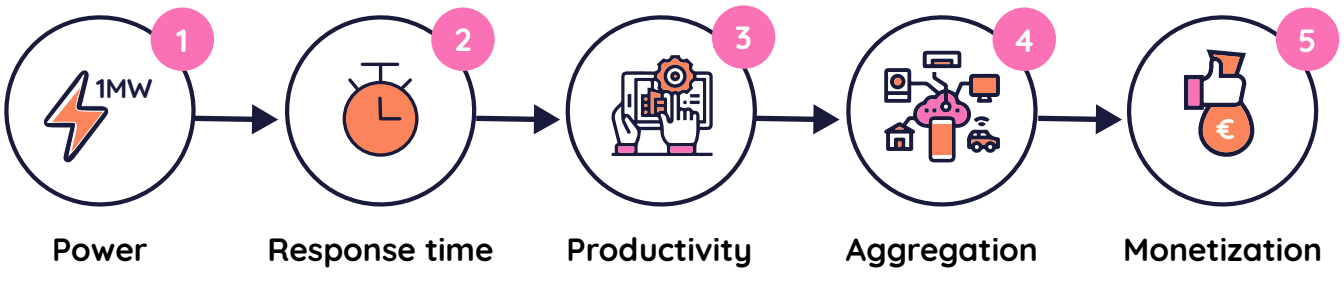
5 Steps to Valorize the Flexibility of your Assets

Explore how to reduce your business energy costs with Bamboo Energy's platform.

This note explains the **opportunities to valorize the flexibility of your energy-consuming assets** in ancillary services markets and in flexibility markets. Specifically, on one hand, this note explains the rules of the currently existing flexibility markets, and, on the other hand, how to identify the best conditioned assets to offer your flexible power to the electricity system operator.

In any case, we recommend you to follow the **5 steps** described below in order to understand the process to evaluate your possibilities to participate in the flexibility services with your available energy-consuming assets.

5 Step Process:



STEP 1:
Calculate the power of your assets. Does your energy-consuming equipment have the total power required?

WHAT IS POWER?

The power of an asset refers to the amount of energy consumed or generated by that asset per unit of time. In other words, the power at which an asset works is the amount of energy that the asset is generating or consuming in each moment in time. Thus, when we talk about the **nominal power** of an asset, we are referring to the amount of energy that the asset generates or consumes over time when working under normal conditions. In addition, if the level of energy that an asset can generate or consume is variable, the nominal power indicated in the technical specifications of the installation is usually the maximum generation or consumption.

POWER vs ENERGY

It is important to **distinguish between power and energy**. An asset can consume or generate a lot of energy during a day by being on for many hours despite having a low power rating. Conversely, an asset with a very high-power rating may consume or generate little energy per day if it works only a few hours. When the intention is to use your assets to **provide flexibility to the system operator**, it is important to look at the power of those assets, rather than the energy they consume. By **identifying the assets with the highest power**, you identify the assets with the greatest capacity for instantaneous flexibility, which is what the system operator will demand in the event of a mismatch between generation and demand in the electricity system.

TRANSMISSION CODES

According to the transmission codes of the Spanish power system and some other European countries, in order to participate in the ancillary flexibility markets, **a minimum availability of 1 MW of flexible power must be accredited**. Most of our installations will not reach 1 MW of power individually. It is important to find a solution to aggregate medium and low power units so that they can jointly participate in these markets, and thus contribute to democratize the energy sector. For that reason, in one of the following steps we will explain how to overcome this entry barrier to the flexibility market thanks to the platform offered by Bamboo Energy.

Accrediting the availability of flexible power of an asset consists of performing a test to demonstrate to the system operator that the facility can respond to a call requiring a certain amount of flexible power within a set time range.

It is necessary to **accredit** a facility for it to be able to offer flexibility services to the system operator.

STEP 2:
Evaluate your response times - do they meet the requirements for varying power?

WHAT IS RESPONSE TIME?

Power is not the only important factor in establishing whether an energy-consuming asset is suitable to offer its flexibility to the electricity system operator. Another key factor is the **time it takes for the asset to vary its power**. In other words, the time it takes to increase or decrease the power of an asset depending on what the system operator requires. In the event that there is an excess of energy in the network, the operator requests that the consuming equipment consumes more energy, and that the generating equipment produces less. If there is a deficit of energy in the grid, the opposite situation occurs. These variations must occur quicker or slower depending on the ancillary market product to which we offer our flexibility.

RESPONSE TIMES IN EUROPEAN POWER MARKETS

The following 3 products can be found in most European markets:

Frequency Containment Reserve (FCR) or primary regulation: This is the product that requires the fastest response time, in the **order of seconds**. In fact, the primary regulation is provided automatically and continuously depending on the oscillations in the grid frequency. For this reason, for example, large-scale electric batteries are very suitable assets to offer this service.

Automatic Frequency Restoration Reserve (aFRR) or secondary regulation: In this case, the response time is slower, usually around **5 minutes**. In addition, the system operator expressly requires the activation of the facilities participating in this service.

Manual Frequency Restoration Reserve (mFRR) or tertiary regulation: When secondary regulation is not sufficient, the system operator activates tertiary regulation, which has the slowest response time of the three, about **15 minutes**.

RELAXATION OF TECHNICAL REQUIREMENTS IN FLEXIBILITY MARKETS

Both the minimum power to be offered and the response time are essential technical requirements stipulated by the electricity system operator in order to participate in the ancillary markets. If our assets do not meet these requirements, they will not be able to access these markets. Fortunately, the flexibility markets in Europe are evolving to establish **more permissive and affordable requirements** so that a greater number of assets can participate in the electricity system to ensure its proper functioning. In that sense, the Spanish electricity system is a great example of this trend, as it is being reformed to be more inclusive and allow more assets to help balance generation and demand by favoring the increased penetration of renewables.

STEP 3:
First and foremost, the comfort and production of my assets. Do flexibility services affect these parameters?

If the combination of all our assets can offer a flexible power output of more than 1 MW with a response time lower than that required by the system operator, we can assess whether these assets can alter their energy consumption -or generation- **without altering our industrial process or the comfort** of users in general.

This is not a problem for a wide range of energy consuming assets. There are many installations that only operate at certain times during the day. Therefore, the rest of the time they can be used to meet the requests of the system operator. Moreover, there are installations that can operate with irregular consumption without altering their performance, such as industrial refrigeration machines.

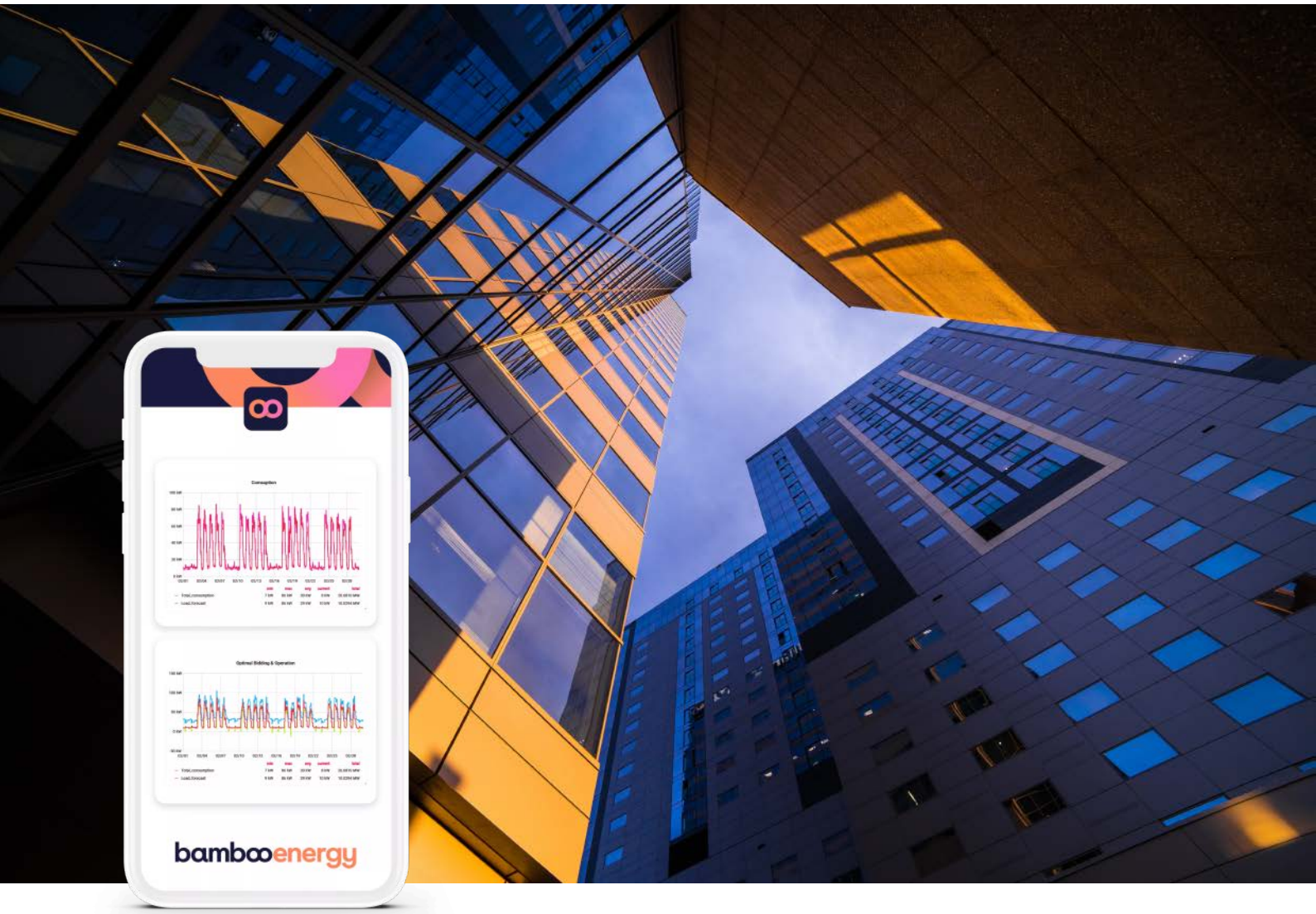
Some of the **most powerful installations**, and ideal for offering their flexibility to the system operator, are: heating and cooling systems; large electric ovens for industrial processes; large refrigerators in the food industry; electric batteries for large self-consumption installations; batteries for electric vehicles; hydrogen electrolyzers, emergency generators, etc. We can also find less conventional facilities, such as restaurant coffee machines.

OTHER REQUIREMENTS

- It is important that the assets have ample operating hours, so that they are available to offer their flexibility to the system operator for as long as possible.

- It is essential that the assets have management or control systems, as these will be the "Gateway" that will connect to the demand aggregation platform and through which the assets will be remotely managed.

- Likewise, connectivity between the asset and the demand aggregation platform must be constant and robust so that the asset is available to be managed from the platform 24/7.



STEP 4:
Connects assets digitally to a platform to enable centralized control.

HOW TO REACH 1 MW OF POWER?

In most cases, none of our assets will have a capacity equal to or greater than 1 MW. As explained above, it is necessary to have at least a 1 MW block of flexible power available to the grid operator to participate in ancillary flexibility services. For that reason, we can **digitally aggregate flexible power** from our assets using a platform such as the one offered by Bamboo Energy. With the combined power of a few assets remotely controlled from a centralized entity, it is possible to reach more than 1 MW of power **to participate in the flexibility markets in an automated way**.

DEMAND AGGREGATION

This solution is known as demand aggregation. By digitally aggregating a portfolio of assets, we can **monitor and manage those assets remotely** in a centralized way. In addition, asset management can be configured using **artificial intelligence-based algorithms** - such as those developed by Bamboo Energy - so that it is possible to participate in flexibility markets and services in an **automated and optimized** way. A similar concept is virtual power plants (VPPs). Although in the latter case, mainly generation facilities are added, in addition to flexible consumption facilities and energy storage systems.

STEP 5:

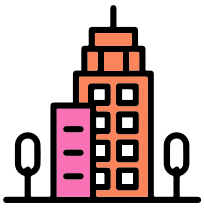
To offer the flexibility of your assets in ancillary energy markets to generate new revenue streams.

MONETIZATION OF FLEXIBLE ASSETS

At Bamboo Energy we have estimated the valuation of some typical facilities that have ample possibilities to participate in markets and flexibility services to **develop new sources of income**. Obviously, these estimates are determined by the assumptions evaluated and depend on the services in which they participate as well as on the evolution of prices and markets.

A commercial building with 150 kW of flexibility (e.g., HVAC) can generate extra revenue of between €3,000 and €15,000 annually. An industrial process with 500 kW of flexibility has the potential to generate between €10,000 and €40,000 annually. Finally, an asset such as a 10kW battery can generate €1,000 to €3,000. These **extra revenue streams** can be achieved by adding the assets to **Bamboo Energy's demand-side management platform**.

Potential Economic Value

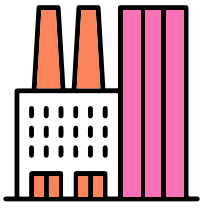


Commercial Building
150kW

3k € - 15k € / year

Battery
10kW

1k € - 3k € / year



Industrial Building
500kW

10k € - 40k € / year

MARKET POTENTIAL IN SPAIN

In recent years, Europe has promoted a legislative discontinuity in the electricity markets to facilitate the participation of more assets in the electricity system. This impulse has also reached Spain, and thanks to this there are more facilities that have access to the flexibility and ancillary services markets. This opens new lines of business and new markets in the Spanish electricity system. For that reason, at Bamboo Energy we have also estimated the potential of the flexibility and ancillary services markets. Specifically, the potential of the demand flexibility market in Spain between 2021 and 2022 is €18.5 million. In addition, the potential of the Spanish ancillary services market for the same period could reach around €370 million.

Market Potential in Spain: 2021 -2022

370M €

Ancillary Services

18.5M €

Demand Fexibility

Bamboo Energy offers a platform designed to enable energy traders and independent aggregators to participate in these new services and operate them optimally together with their customers.

Authors:
Joan Recasens, Energy Advisor for Bamboo Energy
Cristina Corchero, CSO & CTPO at Bamboo Energy

Ask for a DEMO and start monetizing your assets

Cristina Corchero
CSO & CTPO

ccorchero@bambooenergy.tech

Manel Sanmartí
Business Developer

msanmarti@bambooenergy.tech

bamboo energy

notes

Note #2 | September 2021

5 Steps to Valorize the Flexibility of your Assets