



ReDREAM
change your energy

WHY DO WE NEED A NEW ENERGY MODEL for allowing the ENERGY TRANSITION

Europe is facing an energy crisis derived from decreasing gas reserves in Europe and high oil, gas and coal prices. These events have an impact on businesses all around the world, increasing their energy bill, rising manufacturing costs, contributing to rising prices for consumers, and introducing more uncertainty in their forecasts. Thus, many businesses' profitability will be greatly threatened by the rise in energy cost, which is expected to remain high until 2023. This context has foregrounded the need for self-sufficiency in energy production. Self-sufficient businesses will be more resilient and less vulnerable to external threats and thus more able to sustain themselves, facing lower financial risks under unfavourable conditions.

Moreover, there is rising consciousness of consumers that seek more sustainable products. Pressure from conscious consumers has pushed organisations to take action and integrate sustainable energy solutions that reduce their energy bill and contribute to creating a sustainable energy system.

European countries are devising a new energy model that counteracts these threats, reduces emissions that contribute to global rising temperatures, and facilitates economic prosperity and social cohesion. A fundamental pillar of the energy transition is to increase the intake of renewable sources of energy to facilitate the decarbonisation of the energy industry. **The objective is that 45% of total energy will come from clean sources in 2030.**

Energy is different from other goods in that, so far, it cannot be entirely stored. Moreover, demand and production need to match exactly every second. This continuous match requires a very complex system that integrates a very large number of components, including sources of electricity generation with different sources of energy, forecasting algorithms that estimate the amount of available primary energy, transformation, electrical transmission and distribution lines, electrical machines, protection, control and management systems, electrical circuits inside homes, businesses, and industries. All these components are interconnected, making up what has been called the Electrical System.

Demand response or flexible demand is one of the elements of this new Electrical System that is introduced to synchronise demand with energy production in a context of growing renewable energy sources and generating new revenue streams for companies.

Regarding the first fundamental to increase the self-production of renewable energy that can satisfy consumers' needs. Self-production is enabled with the installation of solar PVs, for instance.

Once we have reached a sufficient intake of renewable generation, it is necessary to make the most of this self-produced energy. Much as we do not like to waste money, we do not want to waste energy. Even if it is renewable, its production is costly, and it is smart to make the most of our resources.

If your organization produces more energy than it consumes, you could reap the surplus in different ways.

1. First, you can inject this electricity into the grid and sell it at a price well below market price (if it is allowed to do it in your country).
2. Second, you can enable the storage of self-produced energy with ad hoc batteries. However, the economy of scale makes grid-level batteries more appealing than distributed ones since the latter are more expensive. In addition, although batteries help to shift the surpluses of renewable energy, they create other negative environmental impacts due to the chemical leakage from them. In short, batteries could help store energy, but at the moment, they do not seem to be a scalable and affordable solution. Beyond batteries, energy can be stored in electric vehicles, industrial refrigerators or in other devices that allow accumulation. For instance, thermal energy can be saved inside the building and later used for heating or cooling: they actually work as an air battery.
3. A third alternative is to share this energy generated with other big consumers, for example, near-by industries or buildings. This last solution is named collective self-consumption and allows residential, industrial and commercial buildings to share the energy they generate with surrounding consumers. If you form a community with other consumers, you could give away to them the energy you are not using and, reciprocally, receive the energy that they are not using and that you need. This last alternative is very efficient: because it is generated in the same place that is consumed, it avoids losses along the distribution network. It is also cheaper because prosumers do not have to pay distribution and transmission fees. Public organisations can form part of these energy communities: you could give your surplus energy to the local school, the local library, or the local council. They can use your donated energy to power the streetlamps, for instance. This would bring down their costs and liberate the budget for undertaking other projects that improve the quality of life of our communities.

Local energy markets, energy communities and renewable energy cooperatives are already an important building block in the energy transition.

At least 2 million people in the EU are already involved with more than 7700 energy communities, and the engagement is on the rise. They have also contributed up to 7% of nationally installed capacities of renewables, estimated at 6.3 GW (source: <https://smarten.eu/report-energy-communities-to-increase-local-system-efficiency-february/>).

In sum, decarbonising the energy model demands increasing the intake of renewable energy. For this, we need to mainstream the self-production of energy. This will also contribute to gain independence. However, if we want to increase the production of renewable energy, we also need to change the way in which energy is consumed. We turn our attention to these problems next.

Why you can be interested in the energy transition

As we increase the amount of self-produced green energy, we are going towards a model of distributed energy production. However, this model demands that we change the way in which energy is consumed. Renewable energies are clean, abundant, and cheaper to produce than brown energies. However, they are intermittent. This implies that the generation is not stable; when most users need a lot of energy (because we are all at home, with lights and heaters on, preparing our dinners in the oven or when offices and industries that start operating in the morning), the produced energy may be insufficient for us all.

This intermittence of renewable energy demands a major change in how we consume energy. Consumers need to adopt a more active role for this new energy model to work. This new role is commonly referred to as demand response or flexibility. This label puts the emphasis on the fundamental change: consumers – also big and small companies- need to be flexible in their use of energy and need to respond to generation cycles.

There are different ways in which demand response can enable synchronisation:

One way is through tariffs. As you have probably experienced, the price of energy is greater when there is more demand and cheaper when there is less demand. When there is more demand, renewable energies may not be sufficient, and we need to use “dirtier” sources of energy. So, peak energy production is more expensive because it is also more polluting.

Tariffs aim to shift demand from the peaks to the valleys, so to ensure that renewable production can meet the energy requirements of all.

However, tariffs may limitedly shift demand. You cannot start your operations at 2 am just because prices are lower, or energy is cleaner. Similarly, you cannot change the business hours of a supermarket to the evening. Societal practices and business requirements limit our ability to shift demand.

Another way to use the flexibility of your demand is to participate in different electricity markets. This is known as explicit demand response. **In this case, as a consumer, you can participate in electricity markets by using your demand's ability to increase or decrease for a period of time. With this action, your energy price could be lower than the price market or even get paid for mobilising this flexibility.**

Flexibility can obtain savings of €4,6bn in generation costs and €262-690 million saved in balancing markets and the potential direct and indirect cost reduction of €371bn to people in the EU27. (<https://smarten.eu/demand-side-flexibility-quantification-of-benefits-in-the-eu/>)

Whether you are a commercial or industrial organisation, you can flexibilise your energy and even be paid for this. For example, a data centre could be flexible. In this case, the flexible asset is not the servers but the air conditioners. Imagine a requirement in the market to reduce electricity demand for 15 minutes; the temperature A/C of the data centre can be reduced or even switched off during this period, and the data centre will be paid in return for using the liberated flexibility. In all cases, all flexibility activated will not put the correct operation of the processes/services at risk.

In order to enable your company to participate in the electricity market, the intervention to be made is minimum. In the case that your company has already a BMS, devices can be connected

directly to manage the assets. If you are not digitalised through a BMS, other devices will have to be installed to enable your flexibility.

Industrial organisations can also flexibilise their energy, even small organisations. For example, an industry that uses ovens and mills. Ovens cannot be switched off because they take much time to heat again, but mills can be flexibilised by turning them off for a while. Imagine there is a requirement in the market to reduce electricity demand for 15 minutes; then, the mills of the industry will switch off during this period and, in return, the firm will be paid for using the flexibility of their processes. In all cases, all flexibility activated will not put the correct operation of the processes/services at risk nor imply higher costs. Moreover, you are paid for the energy that you are flexibilising and putting into the system.

In order to enable your company to participate in the electricity market, the intervention to be made is minimum. If your company already uses a SCADA, devices can be connected directly to manage the assets and take measures about energy consumption. If you are not digitalised through a SCADA, some devices will be installed to enable flexibility.

FLEXIBILITY BY DESIGN

As we said, some processes or assets can reduce their electricity demand or be turned off for some time and not affect the normal functioning of the industry/company. To identify which elements of your company are flexible, the following information:

1. Business constraints, such as working hours
2. Operational constraints: the temperature necessary for keeping food in the fridge, the number of hours that a machine needs to be in operation, when you need the electrical forklifts charged...
3. Your electrical tariffs

With the information, flexible assets can be identified. The smart intelligence will learn the demand behaviour, determine which the potential periods in which there is available demand flexibility are and then take part in electricity markets to get revenues from them. If you also have self-production, the algorithm will adjust your production to your demands.

This automatisisation gets the most of your usage of energy. It is like this device that can be added to the shower and that pre-heat the water so that it starts pouring when it is already hot. With these systems, we avoid wasting water. These smart technologies for flexibility are similar, but they present another advantage: the energy that you are not “wasting”, can be sold back to the grid if required. In any case this technology will allow you to control your energy in a traditional way in the case that you don't want to flexibilise your energy in a period.

This is a smart technology indeed: it avoids waste, it saves resources, it reduces your bill, and it helps citizens and other businesses in your area.

Of course, we can be even more flexible with our comfort levels, adapting them also to the activities that are carried out. If you are doing maintenance work in your factory, you may decrease the temperature a degree in winter, and this will liberate more energy to be shared in the grid. This flexibilisation will also result in lower bills for you and lower footprint of the energy used, while also reducing our dependence from fuel-based energy.

By reducing your carbon footprint, your organisation may be entitled to environmental labels that increase the market value of your product/service or that give you access to customers that screen in suppliers with lower environmental impact. So, by adopting flex technology you may also create business opportunities for your organisation.

WHY NOT?

If this technology is so smart, why is it not mainstreamed in every industry/commercial? Well, there are several reasons for this.

First, not all industries/commercials are eligible for this technology. As we have explained above, it is necessary to have processes/assets that can be turned off for a while.

Second, some companies are afraid of changes. The idea of turning off some elements of your company could make you afraid to impact your business, but it will only flexibilised the assets that demand can be modified without affecting the correct operation of your enterprise.

Third, the security of your data. You may be worried about sending data outside your company, but you must be confident that the data is encrypted with the highest security today.

Forth, the future of demand-side flexibility. Demand flexibility could be seen as promising but risky because it is new and has not been tested. This is not entirely true: demand flexibility has been applied for years in different mature markets like the USA or UK, but now the European Union is pushing to use this opportunity to integrate more renewable with a low cost (compared to the cost of installing new transmission lines and batteries). Moreover, this alternative to decarbonize the energy system is endorsed by different institutions like ENTSO-E, Delta-E...

Now that you are familiar with the new energy model, are you ready to join?

Explore more about ReDREAM:

www.redream-energy-network.eu