



A peer-to-peer
energy sharing community



Virtual Power
Solutions



CASE STUDY

The **Community S project** was a big step for the validation of new business models in energy communities with a restrictive legal framework.

New frameworks to facilitate renewable energy communities are being designed across the world. Energy communities demonstration projects are necessary to understand the main barriers from both technological and socioeconomic dimensions.

In 2016 the **European Commission** published a recast Directive focused on the promotion of the use of energy from renewable sources (RES). The revised RES Directive seeks to contribute towards the EU goal of at least 27 % of EU energy from renewable sources in final consumption by 2030. Among others, the new directive includes progressive initiatives such as clearer rights and obligations for '**renewable self-consumers**' and '**renewable energy communities**'.

E N E R G Y
E F F I C I E N C Y
D I G I T A L I S A T I O N
C O N N E C T E D
C O M M U N I T I E S
A U T O M A T E D
O P T I M I S A T I O N

■ The challenge

The Project

- Community S project represents the first P2P (peer-to-peer) energy sharing initiative trialled in real-life settings and under real market conditions in Portugal. Community S project envisioned a new approach for the collaborative use of the surplus electricity generation from PV (photovoltaic) systems in public buildings within Low Voltage P2P energy sharing communities.
- This project consisted in the demonstration of an advanced technological system to manage demand and creating energy communities. Community S was also intended to develop and validate a new tariff model based on energy sharing, specifically developed for the Portuguese energy market and successfully tested in 3 local pilots under real market conditions.

The Problem

The growing availability of distributed generation and energy storage technologies, together with the rapid penetration of interconnected ICT systems in the market, is changing the energy sector worldwide. Nowadays, electricity consumers have greater autonomy to manage and control their energy flexibility, thus evolving from merely passive paying customers to active participants in the energy market.

At the heart of such innovative value streams is the P2P energy sharing concept which refers to flexible, independent and direct exchanges of electricity between grid-connected peers. Consumers are able to purchase green electricity, from renewable generation, from other grid-connected peers instead of purchasing electricity from the main grid at higher prices.

At the same time, prosumers can develop a new revenue stream by selling surplus electricity generation from their own renewables to grid-connected peers, as an alternative to injecting it into the main grid at unattractive rates.

In this sense, end-users can trade locally-sourced renewable electricity directly between each other without the need for a middle-man/gatekeeper to carry out these transactions on their behalf. As such, P2P energy sharing networks aim to push the makeover of traditional energy systems from an overly controlled, outdated, unidirectional and centralised model, towards a highly collaborative, accessible, adaptive, networked, distributed and dynamic one.

■ The path

Initiatives to Solve the Problem

The energy surplus from PV systems in public buildings is sometimes injected into the network for free or at a reduced price. There are no solutions or business models which make it possible to share that energy with the community, creating more well-being and sustainability.

PV systems in public buildings usually generate surplus electricity during periods of low electricity consumption. Bearing this in mind, Community S project proposed an innovative vision for the use of surplus electricity from distributed generation. The designed business model focused on the creation of P2P energy sharing communities within the Low Voltage network. In this case, all surplus generation from PV systems in public buildings should be sold to grid-connected households instead of being sold to the main grid as usual.





In other words, this surplus would be sold at a more affordable price (a reduction between 22% and 56% compared to the price of energy purchased from the grid). What happens now is that users sell the surplus of locally produced electricity at a much lower price than the one they buy on the grid. With the creation of the proposed tariff model users would sell their surplus to the communities at a fair price.

■ The solution

Key Advantages

- End users do not need to bear the full costs of accessing networks when there is shared power in their low-voltage network
- Energy purchase and sale become more accessible
- Consumption and costs are more realistic
- Renewable and decentralised electricity is produced and consumed locally
- Greater network balance

Educational Aspect

- Each user becomes an active player in the energy market
- Greater control and transparency of the energy produced/consumed
- More sustainable lifestyle
- More collaborative economy
- Use of renewable energy sources
- Concept of P2P power sharing

■ Implementation

The demonstration project was implemented from September 2016 to September 2018. The pilot lasted 12 months – 6 months of previous study and installation of the advanced management system for energy communities and 6 months of data collection and analysis.

Each of the 3 energy Portuguese energy communities consisted of 4 public buildings with renewable energy production and 35 final energy users.

Monitoring and remote-control systems for consumption and renewable production were installed in all participating buildings/homes.

By installing these systems, it was possible to know when and how much energy was produced and consumed in the community and was possible to control remotely some loads (e.g. HVAC from public buildings), allowing P2P transactions.



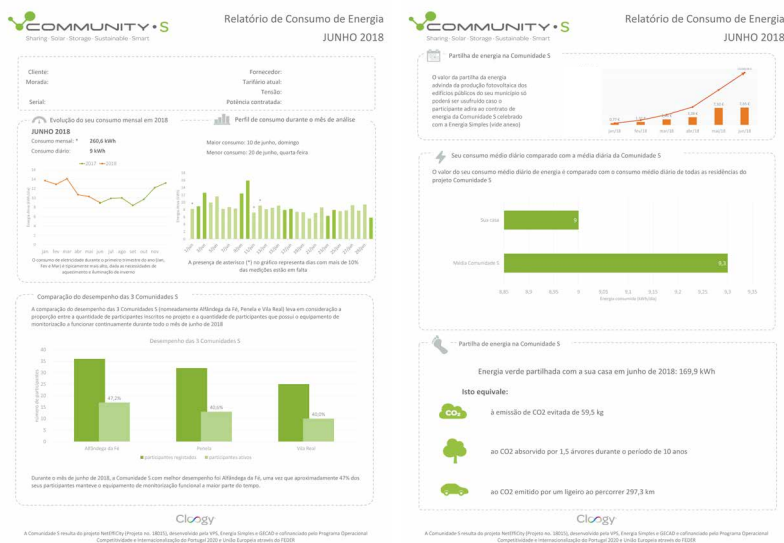
■ Results

Validation of the advanced energy community management system and successful validation of the business model with an energy sharing tariff in all 3 different Portuguese pilots, under real market conditions.

Consumers paid a lower price for the electricity bought from grid-connected prosumers, within the P2P energy sharing market, compared to the electricity bought from energy utilities, since they were exempted from paying Network Access Tariff charges. Similarly, prosumers made bigger profits by trading surplus generation within the P2P energy sharing community rather than selling it back to the main grid. This energy sharing cost reduction was delivered as rebates in the consumers energy bill, detailing all sharing benefits.

As said before, with the proposed tariff model there was a reduction between 22% and 56%(*) of shared energy costs in these energy communities.

* Savings vary according to the user's tariff plan (single tariff, dual tariff, triple tariff) and the consumption profile.



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