

THE SMART METERING AS A SOLUTION TO FACE THE ENERGY POVERTY IN THE “BUILT ENVIRONMENT”.

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SHORT SUMMARY

In the so called “built environment” of Northern Italy, the energy bills are roughly the 7% of the total income of the average family. For the poorest ones, this percentage might reach the 10%, and for that we speak of Energy Poverty. Generally, the 70% of the energy cost is used to buy natural gas for heating from the national grid, while the remaining 30% is used for the electricity vector. If it addresses the attention on private apartment blocks composed by several staircases or on big social houses, it is noticeable that the total amount of the electricity expenses may reach a considerable value.

Aim of this paper is to present and to discuss a successful pilot project promoted and carried out by the startup Nostraenergy srl in Bologna, Northern Italy.

The final result has led to reduce drastically, up to 60% from the initial condition, the electricity bills related to the common services (lighting, lifts, timing, etc..) in a private apartment block. The latter is characterized by 5 staircases, 5 distributor meters, 4 lifts and 36 apartments, nor central heating system, neither connected to a district heating.

INTRODUCTION

Energy Poverty (EP) is one of the main social, technical and legislative issues of the present time in Europe, with an estimated number of affected people ranging from 50 to 125 million. The European Commission has put a lot of effort to solve this issue, as shown, for example, by the recent launch of the EU Energy Poverty Observatory in January 2018. Many projects related to EP give recommendations and best practices in order to reduce the energy consumptions of vulnerable consumers, through activities of raising awareness inside a community and education.

However, taking into account a recent analysis of FIRE (the Italian Federation for the Rational Energy Use), it is not only a matter of reducing the energy consumption, but it is important to act on the general electricity tariff structure of each Member State. In Italy, for example, with the present electricity tariff structure the final cost of the electrical kWh is composed mainly by taxes, transmission and distribution costs, the activity of reading and metering, fix costs for each Point of Delivery (POD) established by the electricity supplier. The POD simply is the physical access point to the local distribution grid. The simple cost of the raw material kWh only in few cases reaches the 50% of the entire electricity bill.

EXECUTION OF THE PROJECT IN A CONDOMINIUM IN BOLOGNA (ITALY)

Firstly, Nostraenergy srl realized an electrical audit of the entire apartment block (our pilot project, Via Papini 16 in Bologna, Italy) taking into consideration only the common services of each staircase. The audit of the 5 PODs revealed the following most remarkable facts:

- 1) The contracted power was too high in relation to the real power needs. The staircases with the lifts had 15 kW three-phase power contract, while the maximum demand registered by the Distributor System Operator (DSO) was 1 kWp. The peak current is tolerated by the protection switch installed in each DSO meter;
- 2) The total amount of contracted power in all the common PODs was 66 kW and the condominium paid taxes according to the Italian electricity tariff for 66 kW yearly;
- 3) In terms of energy consumption, the external lighting was the most energy consuming service;
- 4) The time of functioning of the internal lighting was too high in relation to the real need of the community, so that it is also possible to deliver process measure to achieve energy efficiency;
- 5) There is no complete simultaneity in the use of the lifts, so we could dimension our system presuming a simultaneity of 3 lifts;
- 6) The annual cost of the common electricity vector was around 7.500 Euros in 2017.

Starting from these considerations, Nostraenergy srl immediately suggested to the building administrator a smart metering system as a solution to decrease drastically the electricity bill. The Nostraenergy technical staff carried out a feasibility study (cost-benefit analysis) of this kind of intervention. From one side, it has been estimated the cost of installation of an internal distribution grid, formed by 5 smart metering devices, together with the economic benefit of the realization in terms of decreasing of the yearly electricity bill.

Eventually, Nostraenergy proposed to cut the number of PODs, installing an internal distribution grid, totally managed by the community through smart metering devices. These devices will be used yearly to share the electricity costs inside the community itself. The installation was completed at the end of July, 2018.



Some pictures taken during the installation phase. The total length of the internal distribution grid was of 120 meters, passing through the cellars of the building.



Other pictures that detail the structure of the intervention. The first one is the main electric panel, equipped by the POD and 1 smart meter for the energy metering of 1 staircase.

In the second picture it is possible to notice the smart meter and the dismantling of the POD of that staircase.

THE ACHIEVED RESULTS

The system is running correctly. After 3 months of functioning, the peak power detected by the local grid has been only 3,7 kW and there has not been any breakdown. The total contracted power presently is 15 kW with the possibility to lower it to 10 kW. The internal grid is planned to sustain additional electrical loads. Nostraenergy srl prefigures economical savings of about 4.000 euros yearly, compared to the initial conditions. Every installed meter is measuring the amount of kWh consumed in each staircase, so there is a clear communication of the real consumption inside the community.

In this case, the reading will be executed manually and yearly by the community itself (along with the Nostraenergy consulting), even if for other systems it will be integrated in the already existing radio communication Wireless MBus platform (heat and water metering according to UNI 10200).

CONCLUSIONS. A PARTICULAR VISION ON ENERGY COMMUNITIES

The smart metering systems will play a remarkable role in the energy transition towards a new energy *paradigma*. The new *paradigma* will boost also electricity autoconsumption with PV solar plants, the electrification of the heating systems and at last the concept of energy communities.

The term *Energy Community* is used to mean community projects or initiatives focused on four thread of reducing energy use, managing energy better through energy awareness, generating energy or purchasing energy. The most famous cases of energy communities are the so called energy cooperatives, brought together under the umbrella of the European federation of renewable energy cooperatives (www.rescoop.eu).

Even a small community of users such as an apartment block may get this label: it actively cooperates in order to develop high levels of smart energy supply, favoring the optimization of the use of renewable sources and technological innovation in the distributed generation and enabling the application of efficiency measures.

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