INTEGRATED SMART GRID CROSS-FUNCTIONAL SOLUTIONS FOR OPTIMIZED SYNERGETIC ENERGY DISTRIBUTION, UTILIZATION STORAGE TECHNOLOGIES

www.inteGRIDy.es

INTEGRATING A BUILDING ENERGY MANAGEMENT SYSTEM WITH SOLAR PV PRODUCTION, ELECTRIC VEHICLES AND ENERGY STORAGE

António Sequeira, Vasco Abreu, Nuno Limas, Carlos Raposo

Lisboa E-Nova

ARTICLE INFORMATION

Published August 2019

Key words: energy consumption, savings, CO2, billing, smart buildings, dynamic tariffs.

ABSTRACT

The Lisbon Municipality holds a large stock of administrative buildings under its responsibility. Campo Grande 25 is a five-block building, that comprises most part of the municipality's public services, with around 2000 workers and an average yearly consumption of 3,2 GWh. In both -1 and -2 floors it is possible to find 45 charging stations, with different charging velocities, from normal and semi-fast options to fast ones, in order to ensure the supply of a fleet of around 100 electric vehicles. Due to the fact that this is one of the city's buildings with the highest consumption there is a need to integrate the available resources and technologies to modernize it. The development of the Lisbon pilot leads to a reduction in the energy consumption and in the CO2 emissions to the atmosphere, as well as a decrease in the energy bill.

Introduction

The Lisbon Pilot consists in the development of a building energy management system (BEMS), integrating innovative technologies in the energy storage area, mobility sector and renewable energy production.

The Solution

The presented pilot lays in 3 of the 4 inteGRIDy project pillars: Demand response, Energy Storage Technologies and Smart Integration of grid users from Transport. In the Demand response area, the inclusion of dynamic tariffs with the demand side management, aiming to associate bigger loads to low priced tariff times will enable savings. The proposed load shifting will take place with the help of the ice banks to produce ice, storing energy during the off-peak hours to use it during the day. Regarding the EV charging, it must be scheduled to match low price periods of the dynamic tariffs. The EV batteries may also be used to store energy during the night in off-peak hours. Moreover, the pilot also includes a small photovoltaic (PV) system, to be installed at the rooftop, with an installed capacity of 16 kWp, that will also enable to reduce the grid load, leading to savings. In fact, the renewable energy production will be integrated with the EV fleet management.

To sum up, the Lisbon pilot will integrate numerous sustainable measures, backed up by energy storage, load shifting criteria and renewable energy production in a twofold aim: to contribute to a greener electric vehicle supply and to reduce the grid load requirements. Bearing this in mind, the Lisbon pilot will certainly manage to help Campo Grande 25 reach its objectives and reducing their energy consumption.

Conclusions

Managing an administrative building in a traditional way is already gone! Nowadays, it is crucial to be connected to the grid and take advantage of the numerous available technologies, getting to know our needs in a shorter time frame and choosing the best option to suit them, either consuming from the grid, through the PV system or resorting to the stored energy in the ice banks. Thanks to the BEMS and the different technologies integrated in the Lisbon pilot it is possible to aim for a decrease in energy consumption and a reduction in energy bills, increasing energy efficiency. Not all the buildings have space in the roof to install PV or have EV chargers and specially don't have ice banks, like in the pilot site. However, the demand and response principles for the use of electric energy may be replicated in other buildings reaching positive results with energy consumption savings. The Lisbon Pilot results may encourage the implementation of a BEMS in other Municipality buildings, adapting for the type of equipment existing in each site.

About LISBOA E-NOVA

LISBOA E-NOVA is a non-profit association operating under private law that seeks to contribute to the sustainable development of the city of Lisbon through mainstreaming good practices in urban planning, construction, urban management and mobility, involving all the city's key stakeholders, among political decision makers, all major urban stakeholders and the citizens of Lisbon. LISBOA E-NOVA is composed by a General Assembly, a Board of Administrators, a Consultancy Committee and a Supervisory Board. The General Assembly comprises 26 affiliates who are active in very distinct sectors, including local administration, education, water and energy utilities, transport, among others. LISBOA E-NOVA is responsible for the development and monitoring of Lisbon's Energy-Environment Strategy, signed by the Lisbon Municipality in 2008, setting targets in the field of energy, water and materials resources, for the period from 2009 to 2013. LISBOA E-NOVA also coordinates Lisbon's participation in the Covenant of Mayors assuring the communication with the European Commission and the status of results. Within this context LISBOA E-NOVA coordinates several projects, both in the technical and communication fields, with which it addresses the sustainability challenges that the Lisbon city faces, raising the awareness of all key stakeholders and motivating their participation in the systematic and continuous improvement of the city's energy and environmental performance.

Information about the authors

António Sequeira, Vasco Abreu, Nuno Limas, Carlos Raposo are Project Managers working in the technical department of LISBOA E-NOVA.

Acknowledgment

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731268.