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Integral Management System for the energy efficiency improvement in commercial facilities: Application to the Polytechnic University of Valencia

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Key words
Energy efficiency, control systems, control strategies, Web interface

Main interest

The goal of this paper lies in the design and development of a new Integral Management System (IMS) in order to improve the management of different energy resources used in existing infrastructures, resulting in a reduction in energy consumption, increased overall efficiency and the control of distributed loads. The university campus environment is selected since it encompasses many service enterprises including healthcare delivery, sports facilities, businesses and startups in research parks, as well as overall faculty and student service, research and educational facilities. In Europe there are about 4,000 colleges and universities, so this system has a huge potential for this type of infrastructures.

The structure of the IMS (Fig. 1) is presented in this paper including the different components and actions of management, as well as the interesting results that has been obtained from its application to the Campus of the Polytechnic University of Valencia. One of the most interesting aspects is that reductions of about 15-20% in energy consumptions can be achieved (it has been demonstrated in the UPV Campus). It implies that important energy and economic savings could be achieved, that means a reduction in the environmental impact (reduction of CO2 emissions and in building of new power plants and transport lines).

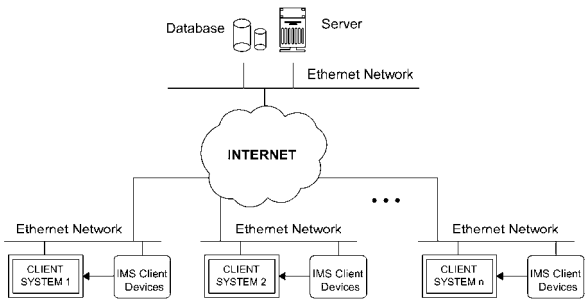

Fig. 1 Architecture of the IMS

The IMS is based on a secure website to inform and to get in touch with different agents that could be interested in the use of available distributed energy resources, as generation, storage and demand response. It would allow the facility managers to measure energy consumptions, to store and manage data, to control energy consumptions and to watch power not to exceed a pre-fixed set point.

Additionally, the IMS permits to obtain reports and results about energy consumptions, so energy demand forecast can be easily performed. In conclusion, a new information place to improve the energy efficiency and the interaction between different energy agents is being created.

This IMS is expected to contribute to the improvement of operation and management in electricity systems, since the access to centralized and controlled loads through a

website provide the place where the operator of the grid, utilities and the consumer are able to interact.

Management options proposed here may imply the reduction in the necessity of new generation plants and new transport lines, that means a significant reduction of the environmental impact (reduction of 1 Ton CO2 emissions per MWh) and a reduction of needs and costs of electricity transport and system operation.

Main originalities

It seems evident that the installation and development of the IMS opens the gate to new possibilities in energy management for the different facilities in a site. Once main loads are controlled and centralized, the access to them through a web site provide the place where the operator of the grid, utilities and the consumer are able to interact.

The development of this project provides the infrastructure with the ability to participate in electricity markets where disconnection of power could be offered as a service to the grid. Furthermore, since the manner in which energy is consumed by the different facilities can be perfectly known, the electricity contract could be optimized, so that the electricity bill would be reduced.

In this new framework, energy consumers could have influence on the price and quantity of generated energy, so customers may offer energy not by producing it, but by not consuming it. In this way, this system would allow demand response to be monitored by different agents, and price signals may be provided.

One important impact is the achievement of a social energy commitment. This project promotes the best use of energy by the different components of the university community (professors, students, resource managers, services and administrative staff (SAS)) or the infrastructure. Thus, responsibilities for each collective are promoted in different areas.

References

L. Buil. Diseño e implementación de medidas de eficiencia energética en edificios de la U.P.V. PFC. Director G. Escrivá. Universidad Politécnica de Valencia, mayo 2007

A. Molina, A. Gabaldón, J. A. Fuentes and C. Álvarez, “Implementation and Assessment of physically based electrical load models: application to direct load control residential programmes”. Proc. Inst. Elect. Eng. Gen. Transm. Dist., vol. 150, no. 1, pp. 61-66, Jan 2003

C. Alvarez, A. Gabaldon, and A. Molina. “Assessment and Simulation of the Responsive Demand Potential in End-User Facilities: Application to a University Customer”. IEEE Trans. Power Syst., vol. 19, pp. 1223-1231, May 2004

J. Fuentes, A. Gabaldón, A. Molina and E. Gómez. “Development and assessment of load decompositions method applied to distribution level”. Proc. Inst. Elect. Eng. Gen. Transm. Dist., vol. 150, n1 2, pp. 245-251, Mar. 2003.