ENERGREEN: A Software Platform to Increase the Efficiency of the Power Network.

Angel Lagares-Lemos, , Juan Miguel Gómez-Berbís
Computer Science Department, Universidad Carlos III de Madrid, Avenida de la Universidad 30, 28911, Leganés, Madrid, Spain
{ angel.lagares, juanmiguel.gomez}@uc3m.es

Abstract

The households, factories, office buildings and communities can reduce their energy consumption, while maintaining the same level of activity and comfort, by identifying and avoiding unnecessary energy waste. Governments around the world are taking initiatives in this direction and also international coordinated initiatives such as the future ISO 50001.

To support these plans, the general goal of the ENERGREEN project is to design and a new open information platform built on customizable, adaptive and open service-oriented architecture, providing connectivity to the energy grids and information to the users.

The user of the different platform modules will interact with the energy information through intuitive user interfaces that help them save energy, while maintaining the desired comfort levels.

For companies, the system will support the execution of the energy policy of the company and the management of all processes included in the ISO 50001.

The system will monitor all possible elements of local production and consumption of energy, due that in order to generate energy saving advices, detail energy data are required such as: solar, fuel cells, micro-turbines, heating, cooling, lighting, ventilation, air conditioning, PC, etc.

Therefore, the Energreen project will provide an innovative platform for the development of a key piece in a new generation suite of Smart Grid products.

The Energreen project, through the spread of services on energy management, will encourage more energy conservation at demand side and will contribute to the achievement of low-carbon society to come.

Energreen will work to increase the social awareness of the citizens in saving energy and the improvement in new and more efficient habits triggered by IT solutions.

1. Introduction

Importance of power monitoring in the industry, buildings or organizations is well known. However, in the last decade it has gained more importance due to a major awareness on the economic implications of saving and efficiently using energy and also because the existence of specific directives oriented to reduce CO2 emissions. Therefore the energy market is tending to use the software-oriented solutions to improve energy efficiency in buildings and organizations.

Electricity marketplace is opening up in many countries. It means that current information systems need change and there will be more actors on the market and more software will be used for data processing and analyses.

With the rise up in the prices of energy and the environmental concerns like climate change, global warming and CO2 emission, the need for more energy efficient power network becomes a must. The old situation main problems with respect to energy efficiency are: power losses and un-needed generation/consumption of energy

The data that can be collected from the power network is coming from a lot of sources and the analysis of such enormous amount of data and building a real time system requires a lot of work towards software intensive methodologies especially when it comes to data mining algorithms as well as statistical algorithms.

2. System features

The features of the proposed project will be:
- An open platform architecture for the management of energy data and processes in buildings, facilities and electronic devices.
- Contribution to standardization of efficient building monitoring by definition of an open source prototype platform.
- An intelligent energy management methodology for information systems and a set of software engineering best practices for companies to envisage a wise and forthcoming energy management policy face to the integration of Information Systems.
- Algorithms to precisely define (in near real time)/predict the energy needs and the use of the various devices such as illumination, air conditioning/heating tec.

- Interfaces: Customer User Interface is capable of displaying real-time data on the Energy cost vs consumption and enables the smart planning/programming of the plant/building devices.
- Automatic mechanism for detection of abnormal situations and proposals of solutions.

3. Innovation

The main innovations that this project will provide are:

- Extension of Energy-Management Applications to the Consumer. The practical applications of this project aim to develop features and services that will enable the energy user to configure his consumption profile, to monitor its evolution and to make decisions based on this information.
- Independence of Equipment. The system will provide a flexible platform that supports a large number of meters devices, protocols, technologies, etc. and that can be integrated with the new generation of smart devices or smart metering devices. For this purpose, the project will take into account both, the devices and technologies that are currently available in the market. In order to achieve this goal, a standard data record has to be designed and approved by the different actors and stakeholders. This data record will represent the information about all the events that could happen representing the what, where, who, when and why.
- Introduction of computational intelligence and optimization methods in energy efficiency monitoring and decision support provide and avenue for the generation of new knowledge and methods in this field. We will improve the data analysis and processing algorithms to evaluate and improve the energy management system, as well as the security techniques and algorithms needed to increase trust in final users and companies providing energy services, in order to authenticate them according to their profiles and keep their specific information safe.
- Support of all aspects of the future ISO50001 for Energy Management facilitating the auditing and ISO certification process.
- New concepts facilitating asynchronous processing in energy management. The tools that will be delivered in the scope of this project will facilitate the emergence of the new decentralized energy paradigm.