8th International Conference on Sustainability in Energy and Buildings, SEB-16, 11-13 September 2016, Turin, ITALY

Monet: an innovative system to manage energy services

Maurizio Bigoloni[a], Sara Filipponi[a] *

[a]*Siemens SpA, Via Vipiteno 4,Milan 20128,Italy*

Abstract

The "Mastering and Operate Next generation of Energy of Things" (Monet) is an innovative solution for energy efficiency services. It supports monitoring, controlling and remote management of field devices in order to offer advanced energy management services, towards Active Demand. It is a multi-tenant platform, able to address the needs of multiple stakeholders. Monet can manage third party field devices installed in different areas and connected to internet with the aim to obtain energy monitoring and management. Monet can be also interfaced to other asset management systems and service platforms, in order to exploit a comprehensive set of data and tools.

The system has been applied in the Universal Exposition EXPO 2015 in Milano, integrated with the smart grid therein installed, to manage the exposition area as a real smart city.

An evolution of the system has been applied in "Smart Recharge Island" (SRI), an innovative microgrid project for the Piedmont region, to manage the generation and the consumption of data in the Environmental Park.

The system will be used in Sharing Cities Horizon 2020 funded project, as a complete dashboard for energy building manager and municipality manager.

In this paper both the system architecture and concept, and the challenges encountered during the implementation of SRI will be reported as interesting lessons learned in designing a solution for energy efficiency and microgrid load management.

© 2017 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of KES International.

Keywords: smartgrid, microgrid, energy management, monitoring and control

* Corresponding author.
  E-mail address: maurizio.bigoloni@siemens.com Tel.: + 393348888744

1. Introduction

Smart grids combine the most innovative devices and services with advanced monitoring, control and communication technologies in order to fully integrate renewable energy sources into the electricity grids, engage customers in Active Demand, implement the charging infrastructure for electric mobility, significantly reduce the environmental impact of the electricity sector, enhance the reliability of the whole network.

In this context, Monet[1],[2] is used as a Smart City system, aims at providing advanced energy management services to allow large adoption of energy efficiency and active demand programs.

The system has been applied in EXPO 2015[3] to provide advanced energy management services to the pavilions and exposition areas, being able to manage the most common field devices for energy management while providing both user-friendly interfaces for the energy managers and public interfaces for the visitors of the exposition.

The system was used to collect energy data for each Smart Grid system: distribution network, public lighting, electric mobility, providing real time energy monitoring and reporting at exhibition level, integrating data and correlating consumption information.

A smart grid is a complex structure and one of its components is a microgrid, a very specific portion of the smart grid that deals with integration of small-rated distributed energy and storage resources closer to the loads - chiefly within the distribution domain. A microgrid could be defined as a group of interconnected loads and distributed energy resources, with clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and can connect and disconnect from the grid to enable it to operate in both grid connected or island mode.

In this specific context, Monet has evolved during the SRI project to support the monitor of the energy profile of the microgrid and to follow an assigned load profile, thus achieving the objective to implement a full chain smart grid. The system now implements load and generation profiling and forecast, optimization algorithm towards energy efficiency, renewable optimization and energy dispatching optimization.

2. Monet for microgrid

The project SRI was born with the objective of achieving an "island" of urban electric vehicle charging energy "self-sufficient"; the management of the SRI was performed by a new plug-in of Monet called "Recharge Island Management System" (RIMS).

The objective of the SRI was to integrate generation plants from a renewable source (specifically a photovoltaic plant) with an electrochemical storage system and with the charging system for electric vehicles, in order to maximize the consumption of electricity produced from renewable sources and to optimize the balance between the availability of energy sources and loads/requests charging. This goal was achieved by the use of RIMS in Monet platform, that allows to manage and supervise in real time both the micro-grid energy production, storage and electric vehicle charging system.

3. Architectural model

The Monet platform, based on multi-tenant concept, offers differentiated services to the various stakeholders, manages multi-vendor devices and it is enabled to interact with other asset management systems, such as network management systems, electric mobility management systems, and public lighting management systems.

The architectural model includes four tiers: Field Devices Tier, Front End Tier, Business Logic Tier, and the Presentation Tier. Herein after the architectural model is described making reference to the equipment used for the microgrid of SRI, that is however expected to be quite similar to what could be found in other microgrid.

3.1. Field Devices Tier

The microgrid is a node of the network and it represents a technological ecosystem characterized by its own devices, as it could be one of the components of a smart city environment.

The technological level is constituted by the field infrastructure that allows a microgrid manager to monitor and control selected loads and the overall energy profile of the microgrid.