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Overview of Structure, Applications and Control of Energy Management System in Different Fields of Business Management

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Abstract

To optimize, monitor and control the performance of the transmission system or generation a system of computer-aided tools that used by electric utility grids operators is known as an energy management system (EMS). It can also use at a small scale like microgrids. In different field of business management the energy management system have its different perspectives. This paper studies the factors, applications and importance of an energy management system.

Keywords: Monitor, Control, Computer-aided tools, Microgrids, Business management, EMS

1 Introduction

For controlling the both energy consumption and energy production the operation and planning of methods are including in the definition of Energy Management system. Savings of energy cost, climate protection and control, conservation are the most important objectives of the energy management system. With energy production management and environmental management it is closely connected (1-10). To enhance the reliability, to reduce the cost optimize the usages of energy, to reduce consumption of energy, to predict performance of electrical system and to improve the utilization of the system, it designed an intelligent energy management software control system.

In financial budgeting the cost of energy is becoming a major factor. Today many industrial environments host control and metering devices. The system is deployed unless a supervisory control and data acquisition (SCADA), these devices not accessible remotely and rarely communicate with each other. By adapting new technologies it can unlock the new efficiencies and discover energy leaks. To get the granular visibility of usages of energy it can use a software named KloudEMS. To diligently manage the total consumption of energy, it provide actionable insights (11-15).

Figure 1: Energy Management

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Figure 2: Example of Energy Management system

2 Factors for Choose an Energy Management System

Choosing the correct energy system is considered as the important prerequisite for success of an organization. Some point that should take care are as follows: (17-21).

1. For effectively run the program select an EMS (Energy Management System) vendor that can provide consulting support, hardware and software.

2. When it choose the energy meter it should check that it provide the required measurement. On an open protocol for example MODBUS it can communicate the meters. In this way it is not depend on a single software or hardware vendor. It can choose from the meters that are given as follows:

a. Demand Controllers, RMS Meter or Energy Meter – Key parameters like Demand, Energy, and Power Factor (PF) provided.

b. Analyzers of Network Energy – These meters provide individual harmonics or Total Harmonic Distortion (THD).

3. The below factor should keep in mind while selecting the software:

a. A decent EMS ought to be expandable and enable to screen other related parameters like temperature, fuel level and so forth related to measurement of energy.

b. To handle enterprise level reporting and sharing on web technologies energy management software is developed.

c. Attempt to maintain a strategic distance from work area applications that cutoff sharing of information to a solitary area, plant or PC. These applications are poor in drawing in clients.

d. Through SMS, interactive dashboards and email the software support the involvement

3 Energy Management system in Business Management

Given that structures are by a long shot the best customers of energy in any propelled economy, it isn't astonishing that there's a great deal of spotlight on improving structure vitality proficiency. On the off chance that it isn't improving the vitality effectiveness, at that point it is passing up huge business openings. It's the main way it can settle on quick and sound business choices around the activity of the structures that: (1) Corporate image improvement. (2) Costly unexpected downtime should be avoid potentially. (3) Vacancy rates decreament. (4) Productivity of workforce improvement. (5) Immediately save the money. (6) Capital value of building improve significantly.

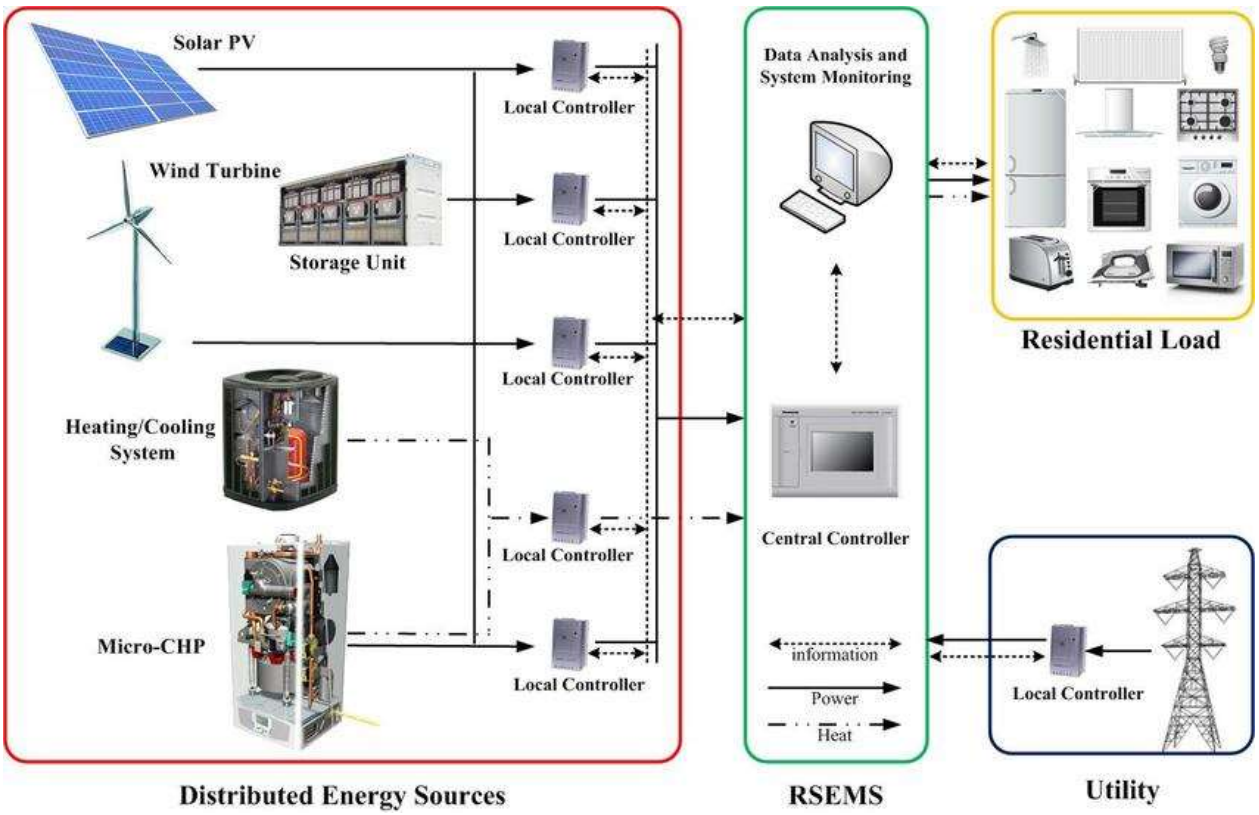

Figure 3: Home Applications of Energy management system

4 Implement an Energy Management System

For implementing an energy management system it involves the following steps: (1) it should choose a vendor that can provide all solution of Consulting, hardware and software. (2) The area in which energy is going to be consumes should identify and in these areas the plant is broken down. In a small number of processes in general it concentrated the most of the energy consumption. These processes are included heating, certain machinery or lighting. (3) To monitor the areas install the separate meters. (4) To analyze the consumption properly it will require the assess of other measurements. To chart against the consumption of energy this data will be used. (5) To engage the end users develop a communicating program. This can be in form of interactive dashboards, emails, posters or SMS. (6) To monitor actual consumption according to the set target create management report and target. (7) The areas that have more consumption that the targeted consumption to identify them analyze the collected data. (8) To decrease the consumption in problem areas implements the controls.

5 EMS Structure

In real time operation control and monitoring of power systems SCADA and EMS are consider as two significant entities. Between three modules the flow of information and power can be observed. From power system using SCADA to EMS it flow the power. This flow is unidirectional. Forms the interface between Power Systems and EMS information flow SCADA. This flow is bi directional. By SCADA the data of power system both discrete and continuous is collected and sent to the EMS selectively. Consisting of various application programs the EMS is consider as a power systems that controlled computerized. In a table and secure operating state to maintain the power system this program execute or run by the operator. To obtain the solution in real time in a particular manner various programs are interconnected in EMS. Transformers, generators, consumers, different loads to industry and transmission lines are containing in power system. Mostly hardware components are consist in SCADA from several meters they measure the quantities. Through Remote Terminal Units (RTUS) SCADA contain much information from meters distributed throughout the field.

6 Business benefits of EMS

The reasons for the business why it should have the energy management system are described below:

1. Being Aware Solar System Health awareness: Owning a solar system will give a once in a lifetime opportunity to diminish power cost and request charges, yet it is critical to know whether solar system is functioning as it require.
2. Know about the needs of energy: Here's an energy management technique that will comprehend the

utilization designs; i.e., when it is utilizing the energy most seriously and which sorts of procedures or gear are adding to this. It can pinpoint the energy waste with cutting edge information investigation.

3. HVAC System Is Under Control: One of the greatest energy consuming equipment is HVAC and necessities to work productively. For a critical extent of all out structure energy utilization HVAC (Heating Ventilation and Air Conditioning) is commonly responsible

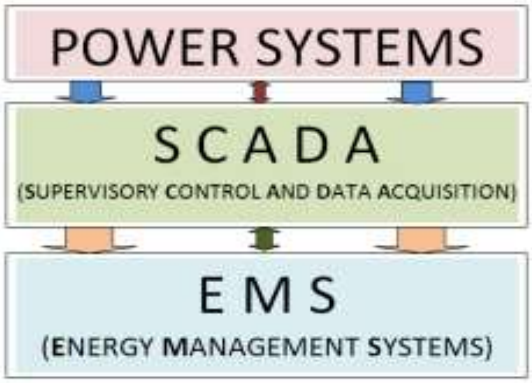

Figure 4: Between, SCADA, Power systems and EM flow of information and power

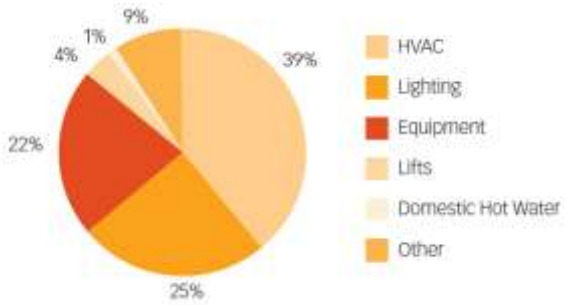

Figure 6: Energy Consumption in Buildings

4. Electricity Demand Charge Reduction: An demand charge is a piece of business bill where a day by day charge is controlled by the most elevated power demand saw during a certain time period during the day in a predetermined period. It is typically the greatest interest at a 15-or 30-min interim and determined on kVA or kW. The electricity bill will for the most part be affected by the most astounding interest for utilized energy at this specific point in time.

5. To Reduce the Operational Cost track Energy KPIs: By effective energy management systems the building energy performance can also improved. Diverse business portions have distinctive execution criteria.

6. To Reduce Electricity Bill improve the power factor: To understand the power factor an energy management system will likewise demonstrate the reactive and active power data. Between apparent power and real power the relationship is represents through power factor. The real power is utilized in the framework yet the apparent power is the mix of reactive and real power. Between some type loads and network reactive power is a circulating component and it isn't changed over straightforwardly to a work

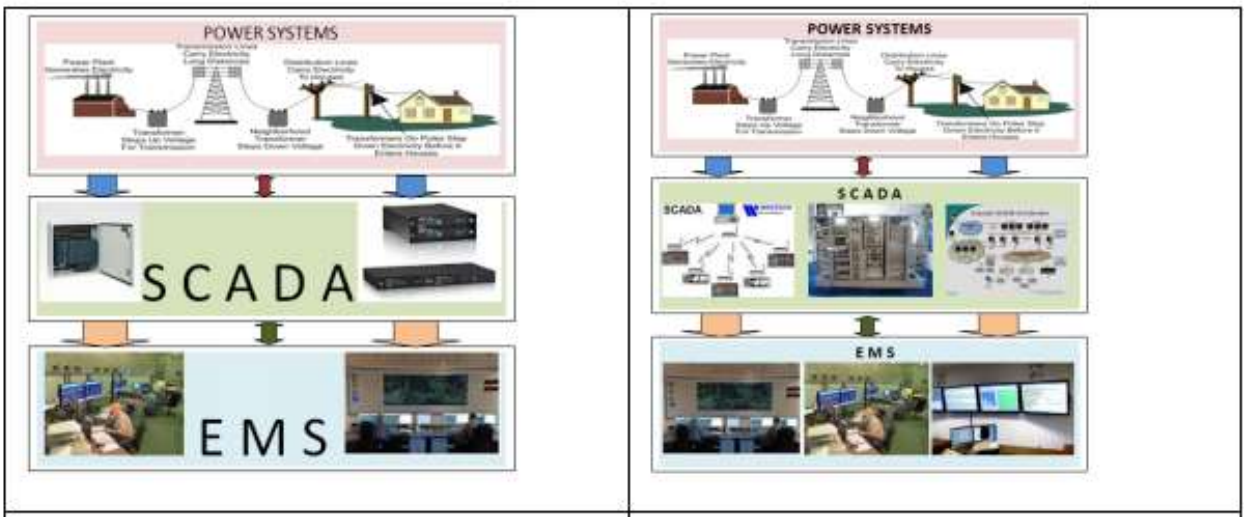

Figure 5: (a) EMS or SCADA components and (b) EMS or SCADA structure

7 Conclusion

In real time on the basis of supervisory control and data acquisition (SCADA) the energy management system create advanced and statistics analysis of the microgrid. Specifically, propelled examination incorporates programmed move between islanded mode and grid-

connected mode, curve control of discharge and ES charge, and in an emergency control the power.

References

1. Communication Based Control for DC Microgrids – IEEE Journals & Magazine. ieeexplore.ieee.org. Retrieved 2018-05-05.
2. Ma'ruf A, Damayanti R, Hidajati N, Atik MG. SOCS (Suppressor of Cytokine Signaling) protein as material to enhance the effect of growth hormone in broilers. Eurasian Journal of Biosciences. 2019 Jul 7;13(2):701-5.
3. Shafie-Khah M, Siano P. A stochastic home energy management system considering satisfaction cost and response fatigue. IEEE Transactions on Industrial Informatics. 2017 Jul 19;14(2):629-38.
4. Kusakabe S, Lin HH, Omori Y, Araki K. Requirements development of energy management system for a unit in smart campus. In2014 IIAI 3rd international conference on advanced applied informatics 2014 Aug (pp. 405-410). IEEE.
5. Liu J, Lian X, Zhang X, Yu C. Automatic control system of intelligent building based on WebAccess. In2008 7th World Congress on Intelligent Control and Automation 2008 Jun 25 (pp. 7079-7084). IEEE.
6. Madakam S, Ramaswamy R, Tripathi S. Internet of Things (IoT): A literature review. Journal of Computer and Communications. 2015 May 25;3(05):164.
7. Okafor KC, Oparaku OU, Achumba IE, Ezeh GN, Chilakpu KO. R-SGEMS: A Novel Green Energy Management System for Renewable Energy Utility.
8. Smith, I. G. The internet of things. New Horizon: IERC, 2012.
9. Tsai, T. C., Ho, W. C., & Lin, C. T. Case study of implementation of web-based energy management and control system onto campus buildings. 2010 ACEEE Summer Study on Energy Efficiency in Buildings, 2010;10:237-246.
10. Wu, Y. W., Young, L. M., & Wen, M. H. Developing an iBeacon-based ubiquitous learning environment in smart green building courses. International Journal of Engineering Education, 2016;32:782-789.
11. Bhagyashree, B., Kulkarni, S., & Patane, R. D. Energy management technology based on cloud network. IOSR Journal of Electrical and Electronics Engineering, 2014:23-26.
12. Hannan, M. A., Lipu, M. S. H., Hussain, A., & Mohamed, A. A review of lithium-ion battery state of charge estimation and management system in electric vehicle applications: challenges and recommendations. Renewable & Sustainable Energy Reviews, 2017;78:834-854.
13. Liu, X., Chen, S., Pu, J., & Wang, X. A flexible all-solid-state micro supercapacitor and its application in electrostatic energy management system. Journal of Microelectromechanical Systems, 2016;25(5):929-936.
14. Saenger P, Devillers N, Deschinkel K, Péra MC, Couturier R, Gustin F. Optimization of electrical energy storage system sizing for an accurate energy management in an aircraft. IEEE Transactions on Vehicular Technology. 2016 Oct 12;66(7):5572-83.
15. Li L, Yan B, Yang C, Zhang Y, Chen Z, Jiang G. Application-oriented stochastic energy management for plug-in hybrid electric bus with AMT. IEEE Transactions on Vehicular Technology. 2015 Nov 12;65(6):4459-70.
16. Yang Y, Ye Q, Tung LJ, Greenleaf M, Li H. Integrated size and energy management design of battery storage to enhance grid integration of large-scale PV power plants. IEEE Transactions on industrial electronics. 2017 Jun 29;65(1):394-402.
17. Ugbede Itodo H. Controlled Release of Herbicides Using Nano-Formulation: A Review. Journal of Chemical Reviews. 2019 Mar 1;1(2. pp. 78-153):130-8.
18. Eldefrawy M, Gomaa EG, Salem S, Abdel Razik F. Cyclic Voltammetric studies of calcium acetate salt with Methylene blue (MB) Using Gold Electrode. Progress in Chemical and Biochemical Research. 2018 Oct 1;1(1, pp. 1-80):11-8.
19. Abdussalam-Mohammed W. Comparison of Chemical and Biological Properties of Metal Nanoparticles (Au, Ag) with Metal Oxide Nanoparticles (ZnO-NPs) and their Applications.
20. Mahdieh G, Fazilati M, Izadi M, Pilehvarian A, Nazem H. Investigation of ACE Inhibitory Effect and Antioxidant Activity of Peptide Extracted from Spirulina Platensis. Chemical Methodologies. 2019 Sep 15.
21. Matam S, Kaliyan P, Sethuramasamy P, Muthu SP. Synthesis and anti-microbial activities of azomethine and aminomethyl phenol derivatives. Asian Journal of Green Chemistry. 2019 Oct 1;3(4, pp. 418-549):508-17.