Renewable Energy using smart Grid Embedded System in an Internet of Thing

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Abstract— **The smart grid customer domain is naturally integrated with smart home systems and smart buildings, but the typical approaches proposed are "dealer-centric" rather than "customer-centric", compromising user acceptance and often sparingly scalable. For solve this issue, we propose a definite design and execution of a smart "last meter" intelligent network, the portion of the intelligent network in the client's services, included into an Internet of Things (IoT) platform. Our system determines both the fraction of power consumed by the network compared to the energy storage based on the battery in the site, and when and how much to charge the battery-based storage using the power of the network. The main inputs of our control algorithm are 1) the current energy level of the battery, 2) a prophecy of the future generation of solar / wind energy, 3) a calculation of future models of energy consumption and 4) prices of electricity based on the market .The output is the measure of vitality that the system must expend, and also the vitality to release or charge the battery from inexhaustible sources or the system, for any timeframe. The vitality spending plan broadens our underlying work in Smart Charge in various ways.**

Keywords— Internet of Things, Renewable Energy, Sensors, Smart Grid, Wireless transmission.

I. INTRODUCTION

In the present a long time there has been an exponential advancement and movements in figuring development. There has in like manner been an extension being utilized of these headways, even, reason the robotization is so notable now is on record of it gives security, comfort and the ability to be dependable for various gadgets. Here the diverse sensors assembles the data from nature and sends the data or updates it in the server which at that point inspects it and does the required task.

IoT raised the possibility of remotely observing articles through the Web. With regards to our home, security is essential issue to the overall population. At present, the augmentations of wrong doing related to the house was various. As to decrease that extent this idea gets to be unmistakably possible that extended the security level of home. The insightful game plan is that make our home as propelled home in the security perspectives. In earlier days, we have one pet at our home for the security, yet the circumstance has changed ends up being present days. People start tolerating on the development to accomplish some level of security in family unit. From this condition, we are prodded to make such framework that would be set up for society or organizations give security. In case one cannot available at home and robbery was happened at your home that would give you a noteworthy bother. This suddenly address climb as an essential concern that lights up you're that your house is not ensured! This structure is the reaction to the issues as specified above and can exhort about thievery at your home in a split second with the photo of your home current development.

India is fast growing country in the world. In recent years the electricity demand in India is increasing rapidly because of fast growing industry. 1.4 billion Still don't approach power (87% of which live in provincial regions) and one billion that approaches just too temperamental power networks. We need intelligent and practical approaches because energy, as the engine of development, plays a central role in the fight against poverty and climate change. The government of India's make in India campaign will introduce more industry in India then there will be acute demand for more and more reliable power supplies The vitality sources in India are chiefly coal (56.65%), hydroelectric (19.13%), gas (9.2%), atomic (2.32%), oil (0.58%) and different sources sustainable (12.9%). The existing system has several disadvantages, such as solar energy and wind energy, which are found in the system, since an energy source can supply the load only during a certain period of time. One of the main disadvantages of the existing system is the energy charge of the sun and the wind is not always available.

The rule target of this task is to use vitality in home by observing distinctive conditions utilizing diverse sensor and additionally compute the produced vitality utilizing sustainable power sources. Then calculate the total energy consumption and the expenses will lead to the energy balance. It is a very simple way to save energy and costs in your home. The energy balance system helps you easily and comfortably control your heating, ventilation and air conditioning systems, as well as lights, blinds and many other devices in your home with power generation. For you, this can mean up to 30% less energy for the heating used and lower CO2 emissions for your home. The result is the amount of energy that must be consumed by the network, as well as the ability to discharge or charge the battery from the electricity grid or renewable during each tariff period. In order to improve the battery life cycle is implemented in this project, to control the operation mode of the battery. This design concept is primarily for increasing the useful life of lithium batteries and includes a mechanism of protection from charging and excessive discharge. The innovative design of the system not only makes the automation of environmental conditions particularly easy, but also integrates harmoniously into environmental environments, even in exclusive interiors. In this system, the energy comes from the sun and the wind that is stored in the battery. This renewable energy can be used at home.

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All data such as current, voltage are displayed on the LCD and sent wirelessly to the server (PC). The paper is prepared as follows: Section I gives the brief introduction of paper and how system is efficient for user or customer is given in Section II. Section III provides related work of project and Section III gives existing system which we will improve in proposed system. Section IV focuses the proposed architecture including the system overview and elements in the system. Section V explains system algorithm including system operation and hardware model. Section VII gives the conclusion.

II. PROBLEM STATEMENT

We propose architecture of system and a control calculation called green charge for the organization of in situ renovations. Our framework decides both the division of energy devoured by the system contrasted with the vitality stockpiling in view of the battery in the site, and when and the amount to charge the battery-based capacity utilizing the energy of the system. This system is designed to estimate the electrical parameters of familiar devices. The essential features for the framework are the simplicity of viewing, configuration and use. From the point of view of the buyer, the use of electricity from different appliances in a house together with the voltage and current supply is the key parameter. The sensor execution signals are incorporated and associated with the ZigBee module to transmit data. These parameters will be stored in a database and analyzed. The collected data will be displayed on the computer via the graphical user interface (GUI) and will be updated to the web page.

III. RELATED WORK

Distributed generation (DG) utilizes numerous little on location vitality gathering intercessions in singular structures to produce power. The DG can possibly make age more proficient by lessening transmission and dissemination misfortunes, carbon discharges. Be that as it may, since sustainable power sources are irregular and wild, structures still need to depend, to some degree, on the power network. This venture proposes a few approaches to decrease power charges by investigating an elective approach that consolidates advertise based power estimating models with inexhaustible sources (sun based vitality) and unassuming vitality stockpiling (as batteries) from of a framework engineering called Green Charge. This undertaking likewise displays the outline and execution of a diffuse vitality administration framework for a miniaturized scale matrix DC framework. The demonstrating, examination and control of the appropriated stockpiling gadget and simulink vitality are proposed [1].

In this paper, they investigate an elective approach that consolidates advertise based power evaluating models with a sustainable and unobtrusive on location vitality stockpiling (as batteries) to boost the DG. They propose improvement calculation and framework design, called Green Charge, to productively oversee sustainable power source and capacity to diminish the power bill of a building. To decide when to charge and release the battery consistently, the calculation utilizes forecast models to foresee both future vitality request and future vitality collecting [2].

The utilization of sustainable power sources are expanded due to the consumption of regular assets and the expanding contamination level from vitality creation. The vitality and the sun based vitality are most generally utilized among the sustainable power sources. Power hardware is required in a wide range of sustainable power source framework. It controls the inexhaustible source and interfaces with the heap adequately, which can be matrix association or working in remain solitary mode. In this paper, review of wind and photovoltaic vitality frameworks are presented. Next, the power electronic circuits behind the most widely recognized breeze and photovoltaic setups are talked about. At long last, their controls and essential necessities for matrix association are clarified [3].

They focuses on the IOT elements, protocols and configuration of the test bench for IOT environments along with protocols and software projects that have been used to control and control consumer energy consumption patterns. They have actualized brilliant home innovation in a true with each 3 room unit and a lounge that can suit 6 to 9 customers. Every unit comprises of sensors, actuators, savvy meters, shrewd attachments, Universal Home Gateway (UHG) and together builds up a neighborhood (HAN). Every one of these brilliant gadgets speaks with the UHG through an alternate communication protocol [4].

The development of smart networks allows the introduction of dynamic electricity rates, with prices that change hourly. Dynamic tariffs may reflect the dependence of time on supply and demand of electricity and the capacity of the grid, thus avoiding peak loads and promoting the use of floating sources of renewable energy. They exhibit a reproduction demonstrate that reviews the interest for power for warming and cooling of present day office structures with regards to dynamic power costs. The model permits the recreation of situations in which the current warm vitality tanks (chilly and heated water tanks) are utilized for the coordination of the keen system through adjusted control methodologies. The adjustment to dynamic power rates, and accordingly by implication to the fluctuating supply of wind and sunlight based vitality, is just accomplished by altering the control of the current foundation without changing the framework itself [5].

Home vitality conveyance has gotten expanding enthusiasm because of the vast measure of burdens in the private division. This article introduces an equipment plan of the keen home vitality administration framework (SHEMS) with the uses of correspondence, recognition innovation and machine learning calculation [6].

IV. EXISTING SYSTEM

The latest intelligent metro network is the portion of the intelligent network closest to the home and one that interacts with customers. It permits a two-path stream of information amongst clients and electrical administrations, changing "generally aloof customers into dynamic players" into the vitality showcase. Considering the seven spaces of the applied model of savvy matrices proposed by the National Institute of Standards and Technology, the most recent insightful metro organize compares to the "client area". It allows residential, commercial and industrial customers according to their different energies. Needs: improve

vitality utilization and nearby age and effectively take an interest sought after reaction arrangements, a standout amongst the most exasperating. Non-technical customers need a simple way to monitor energy consumption and production and exchange energy usage data at the appropriate level of granularity with the energy provider or distributors. From the point of view of acceptance and market penetration, the latest intelligent metro network is just one aspect of the broader concept of smart home and smart buildings. The result of this thought is that one can barely envision a circumstance where the customer side of the smart grid and other savvy home applications rely upon various and isolate frameworks or stages. Be that as it may, the savvy network structures proposed in the writing by and large spotlight on the necessities of vitality wholesalers to deal with the whole power grid. They don't consider the likelihood that clients as of now have other keen home foundations. On the other hand, some solutions proposed in the literature, based on an intelligent domestic infrastructure, are not designed to be perfectly scalable for large deployments. We overcome the problem of invoicing and we share the energy of saving. All information must be updated on the website wirelessly.

V. PROPOSED SOLUTION

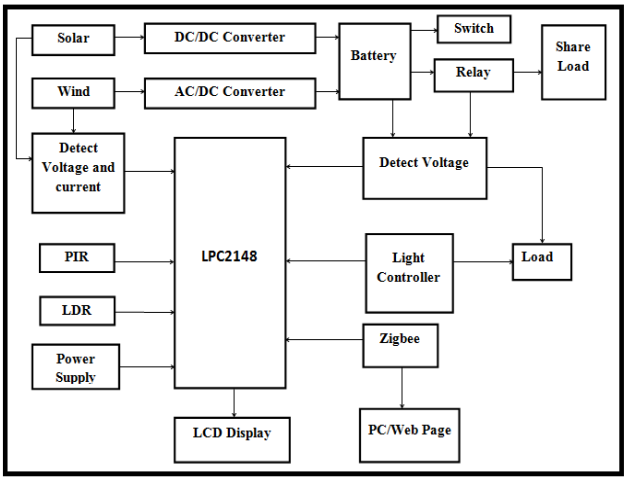

Fig. 1 Block Diagram of System

Figure 1 demonstrates the block diagram of proposed framework. The networked meter-reading system consists of terminal measure solar & wind energy and devices work on that energy remaining energy will provided to another home (load). As per provided energy they will pay the bill from her account automatically. The least complex approach to quantify utilization and power age is to wrap the present transducers (CT) around the links in the building's electrical panel. For this situation, two CTs are required to measure current from solar and wind energy. And this information sends to the ARM controller to take some definite action. If the battery storage level is high as threshold value then that energy will be share with another load (as a home) through relay. If the battery storage level is low as threshold value then that energy will not be share. There is one switch for ON, OFF purpose when we don't want to send energy to another then switch OFF otherwise switch is ON. We used ARM controller LPC2148. Current sensor is interfaced to ARM controller, it sense the current from load (solar and wind). PIR sensor used to detect the motion (Person), if detected then light will be ON. All information will be send to Server (PC) through Zigbee. All this information will display on web page and also automatically updating on the internet using IOT. As per definition of smart grid, it permits simple sparing through meter perusing, more noteworthy information precision; enhance charging velocity and purchaser benefit.

A. Elements of Block Diagram

a) ARM Microntroller (LPC2148):

The LPC2148 microcontrollers rely upon a 16 bit/32 bit ARM7TDMI-S CPU with steady impersonating and fused after enable, which to join the microcontroller with facilitated quick flicker memory running from 32 from kB to 512 kB. A broad 128-piece memory interface and a lone expanding speed configuration allow 32-bit code execution and no more hoisted clock speed. For basic code-sized applications, the 16-bit elective mode Thumb decreases the code by over 30% with a base execution punishment.

b) ACS712:

ACS712 current sensor is used to sense the current value. The sensor gives exact current estimation for both AC and DC signals. Thick copper channel and flag follows considers survival of the gadget up to 5 times over current conditions. The ACS712 yields a simple voltage yield flag that changes directly with detected current.

c) PIR:

The PIR sensor itself has two spaces in it, each opening is made of a unique material that is delicate to IR. The focal point utilized here isn't generally doing much thus we see that the two spaces can 'see' out past some separation (essentially the affectability of the sensor). At the point when the sensor is sit out of gear, the two spaces recognize a similar measure of IR, the encompassing sum transmitted from the room or dividers or outside. PIR sensor is utilized for recognizing individual (movement).

d) Relay:

Relay is just a small electrical switch consisting of an electromagnet, a switch and a spring, that opens and closes beneath the control of another electrical circuit. The spring holds the switch in a solitary position, until the point that a current is gone through the loop; the coil produces an attractive field which moves the switch. As the relay has the capacity to control an output circuit of higher power compared to input circuit, it's often used to automatically switch large electrical energy appliances.

e) ZigBee:

The main part of data transformation for ZigBee packet is address translation. This is implemented at application gateway, a program used for determining the destination or source address of any packet that essentially encapsulates the payload of the ZigBee packet. The equivalent program for application gateway achieves this address transformation for Zig-Bee to address non-ZigBee nodes.

f) Solar:

The most proficient and costly solar panels are made

with Monocrystalline cells. These solar cells utilize exceptionally unadulterated silicon and include a confounded crystal development process.

g) Battery:

Batteries are used to store the electricity generated by the solar panel. During the day, electricity generated by the solar panels is supplied to the battery and/or the load. When the load demand is higher than the energy received from the solar panels, these batteries will provide stable energy to the load.

h) LDR:

LDR tells the light information in our home. If light is not in home then automatically our system will be ON the light.

VI. IMPLEMENTATION DETAILS AND RESULTS

A. System Operation

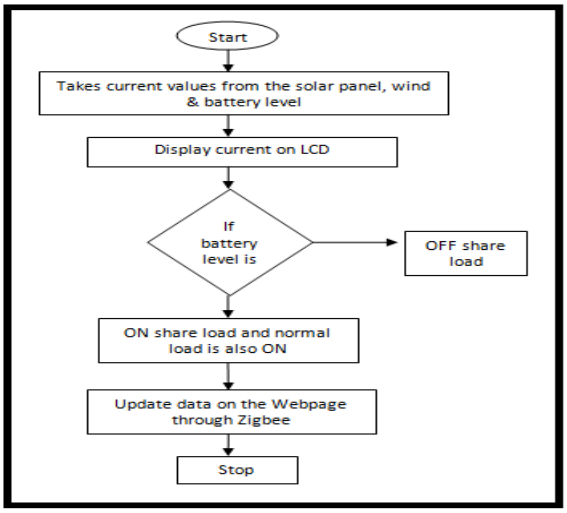

Fig. 2 Flowchart of system display current from solar, wind & battery values on LDC

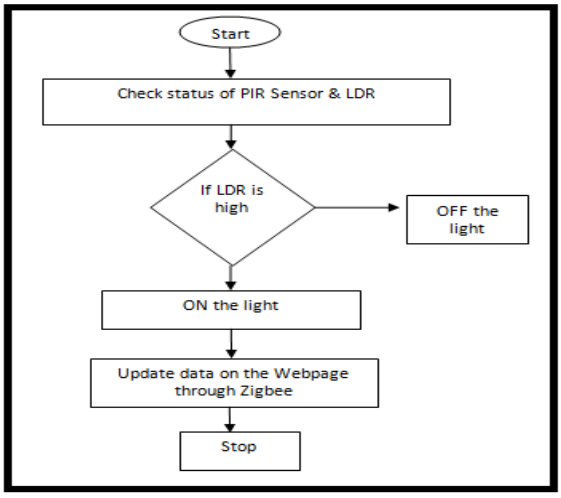

Fig. 3 Flowchart of system display status of PIR sensor & LDR

B. System Model

Figure 4 shows the actual hardware model of system. In that system Sensors such as PIR and LDR are interfaced to ARM controller LPC 2148. Also current sensor is connected to the solar panel and wind energy source. It sense the current and this values are send to ARM controller. Controller will take action as per generating energy from renewable resource. If our system save same energy then that energy will be we share with another user. In such way that the user can share energy can as per amount of energy it will be take charges from share user. Such data should be updated on webpage by sending from zigbee wirelessly. And also PIR senor is used to sense the motion and LDR tells the light information in our home. If light is not in home then automatically our system will be ON the light. And this all data also updated on the webpage. LCD display in that display all data of solar, wind, PIR, LDR, battery is how much is charge. In fig (c) actual webpage are shown. In that fig user registration new user create a new account and register all details. After registration is successful user get user ID and password. Sign in the account and enter user ID and password and then login. After login we get all sensor information and all data. In that web page we get information about LDR is detected or not, PIR is detected or not. How much energy generate from solar suppose from solar we get 12 voltage then Bulb is ON and wind energy generate from 2 voltage then LED is ON and display all data on web page and also how much unit share to user that much of amount cut from user account.

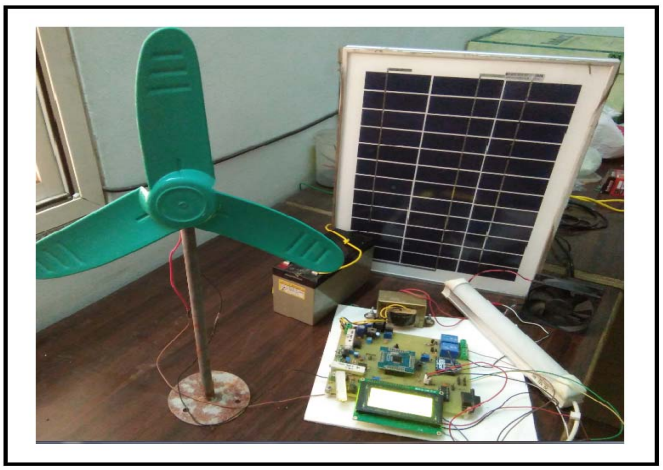

Fig. 4 Hardware Model

C. Actual Webpage

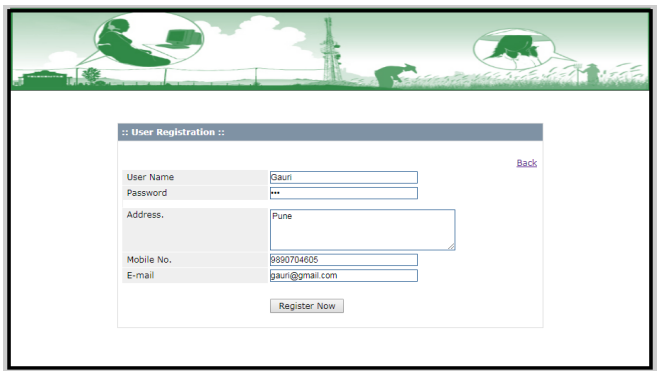

Fig. 5 User Registration

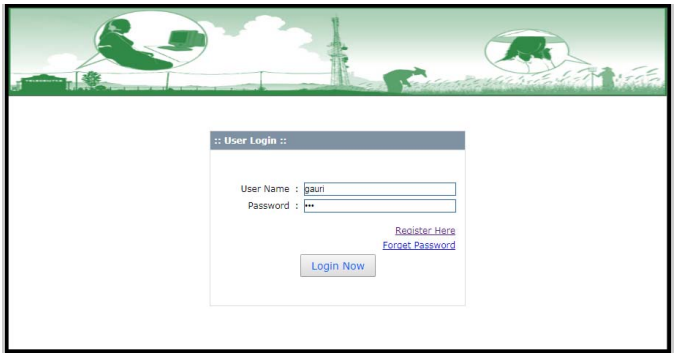

Fig. 6 Login Page

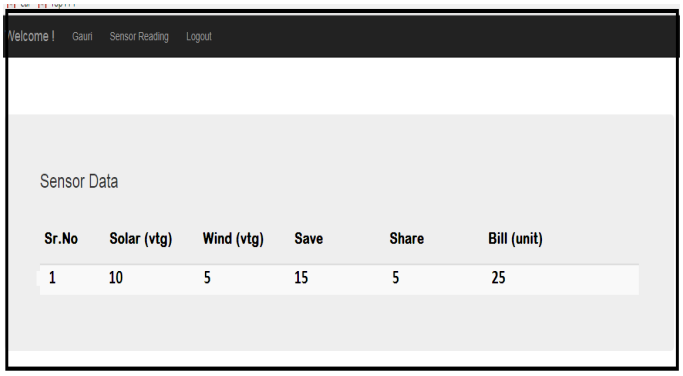

Fig. 7 Sensor information (a)

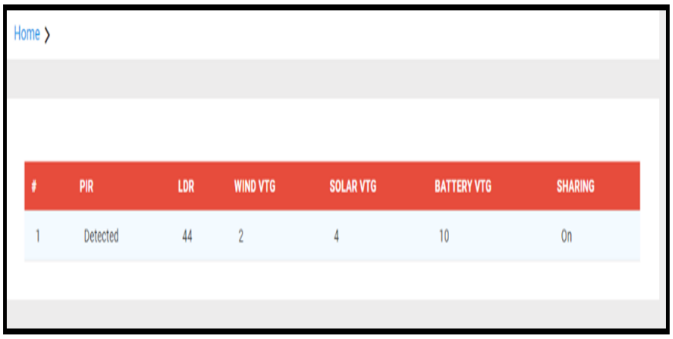

Fig. 8 Sensor information from hardware (b)

VII.CONCLUSION

We have presented the architecture, implementation, and a demonstration of the Customer Domain of the smart grid, based on a platform for the IoT that can host a broad range of smart home applications using renewable energy (solar and wind). In this sense, our proposal has unique advantages and elements of novelty with respect to the state of the art: it is customer centric, it minimizes the deployment of particular smart grid framework, and it use conceivably accessible shrewd home applications, sensors, and systems. We can share the saving energy to another user. In such way that we can plot the graph of sharing energy (current and voltage) and which can display on LCD also on web page through Zigbee. Thus, by the Green charge have numerous benefits over Distributed generation in the case of cost, the efficiency, the power usage. We investigate how to bring down electric bills utilizing Green Charge by putting away minimal effort vitality for use amid high cost periods.

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REFERENCES

[1] Ms. Kaavya.T and Mr. Balachandran.S, "GREEN CHARGE MANAGING RENEWABLE ENERGY IN SMART BUILDINGS WITH FUZZY LOGIC CONTROL", International Journal of Advanced Science and Engineering Research, Volume:2, Issue: 1, June 2017.

[2] Aditya Mishra, David Irwin, Prashant Shenoy, Jim Kurose, and Ting Zhu, "Green Charge: Managing Renewable Energy in Smart Buildings", IEEE Journal on Selected Areas in Communications, Volume: 31, Issue: 7, July 2013.

[3] 2. U. M. Choi, and K. B. Lee, F. Blaabjerg., "Power Electronics for Renewable Energy Systems: Wind Turbine and Photovoltaic Systems", International Conference on 2012.

[4] S. K. Viswanath, Chau Yuen, "System Design of Internet-of-Things for Residential Smart Grid," IEEE Trans. Ind. Informat., vol. 7, no. 3, pp. 381–388, Aug. 2016.

[5] Lorenz M. Hilty, Nikolaus A. Bornhöft, "Smart Grid Integration of an Existing Office Building: Modelling and Simulation of Adaptation Strategies", Proceedings of the 27th EnviroInfo 2013 Conference, Hamburg, Germany, September 2–4, 2013.

[6] Qinran Hu and Fangxing Li, "Hardware Design of Smart Home Energy Management System with Dynamic Price Response," IEEE transactions on smart grid, vol. 4, no. 4, dec 2013.

[7] D.Vignesh,S.Sathish, "Embedded system based control and monitoring of smart grid using raspberry-pi under wsn and internet-of-things" Vol. 1, issue 4, pp.315 - 319, november, 2015.

[8] GUNDA SRIKANTH, SWARNA VENKATESH , Aug. 2015"Automated Electric Meter Reading and Monitoring System using Zigbee -Integrated Raspberry PI Single Board Computer via Ethernet"

[9] Aug. 2015 Santoshkumar and K. Ramesh" Automated Electric Meter Reading and Monitoring System Using E Board Computer via Ethernet"

[10] S. K. Viswanath, Chau Yuen, "System Design of Internet-of-Things for Residential Smart Grid," IEEE Trans. Ind. Informat., vol. 7, no. 3, pp. 381–388, Aug. 2016.