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SMART ENERGY METER USING Wi-Fi CLOUD SERVER

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ABSTRACT

Demand response applications under the smart grid concept have been widely adopted as a means of managing electrical demand. Numerous studies have been conducted around the world, especially regarding residential demand response applications, which have been widely adopted. This study provides general information about demand response and summarises demand response research conducted globally and in Turkey. To demonstrate the impact of demand response application in a residential home using load shifting, a project study has been completed. Electrical appliances that are meant to be used at expensive times are moved forward in time in the project study to manage the peak demand of the home. Demand response will present new viewpoints on electrical energy generation/consumption and power system operation, taking into account new smart appliances and internet of things (IOT) applications.

Keywords: Internet of Things (IOT); electrical energy; smart grid

I. INTRODUCTION

The process of using gadgets for energy efficiency is known as smart energy. It focuses on strong, enduring renewable energy sources that advance greater environmental responsibility while reducing costs. Smart energy is becoming more and more significant in the modern era, with forward-thinking businesses prioritising the installation of smart energy systems. The environment, consumers, and energy providers as a whole stand to gain greatly from the increased investment in smart energy systems. Sunlight is a very alluring choice because it is so accessible and free. Solar energy is one of the most talked-about types of renewable energy due to its limitless resource and continuous, high supply. In fact, solar energy has overtaken wind as the nation's fastest-growing source of renewable energy. A record number of new renewable energy sources are discovered each year in the United States as the push for smart energy continues. As more nations join the global movement to move away from traditional energy sources, there is a push that can be felt all over the world.

The fact is that smart energy is rapidly emerging as the preferred energy of the future for a variety of factors. These factors have already been briefly discussed, but a more thorough examination is necessary to fully comprehend how smart energy will affect the global market for energy efficiency. The following are some of the most coveted advantages of modern smart energy technology:

- A power source with more variety
- A decrease in emissions and air pollution that contribute to global warming
- An increase in environmental harm caused by traditional energy sources

A brighter, more environmentally friendly future will result from the transition to smart energy, to put it briefly. The switch to smart energy is more crucial than ever, as global warming and other climate issues are currently a top policy concern for governments all over the world. Fortunately, consumers can contribute to the spread of smart energy by using the resources that are already accessible. Customers can further encourage the development of the vital infrastructure required for a future dependent on smart energy by increasing demand for smart energy across the country. One can start by improving the energy efficiency of their home. The crucial actions you can take to make sure your home is energy-efficient and that you're taking advantage of the expanding smart energy movement, which aims to influence the future of global energy, are discussed below.

Turkey is one of the developing nations with the highest energy demand because of its expanding economy and rising populace. The Ministry of Energy and Natural Resources and Republic of Turkey Energy Market Regulatory are in charge of Turkey's energy policies (EPDK). The necessary studies to adapt to smart grids and the new energy market infrastructures under the smart grid concept are being completed under the direction of these government departments. To start, this goal is accomplished through the privatisation of distribution companies, incentives for promoting the use of renewable energy sources, and licencing of unlicensed generation. Additionally, there are numerous incentives to use electric vehicles and to spread the infrastructure required for them. The existing electricity grid needs to be renewed in light of all these developments. There are currently 21 research and development projects in Turkey dealing with applications for the smart grid and demand response. EPDK provides the majority of the funding for these current systems, which are run by Turkish electricity distribution companies (EDAS). Additionally, the data was transmitted through IoT using GSM. which experiences more data loss and transmits data very slowly.

II. LITERATURE SURVEY

The survey shows that the majority of empirical studies either test whether energy (electricity) plays a role in promoting economic growth or look at the causal relationship between these two variables. Despite the stylized fact that energy promotes growth, there are some methodological concerns with the findings of these empirical studies [1]. The framework and driving forces behind the creation of a multilayered protection and control scheme that begins with local measurement devices and incorporates higher-level control schemes into a comprehensive control strategy are defined in this article [2]. Depending on the design of the ISO/RTO market and applicable operational standards, the market products DER/DR can offer in the context of the energy and ancillary service markets facilitated by the independent system operators (ISOs)/regional transmission organisations (RTOs) may include energy, ancillary services, and/or capacity [3]. The proposed stochastic model uses a mixed-integer representation of the reserve provided by DRPs and its associated cost function. A two-stage stochastic mixed-integer programming (SMIP) problem is how the proposed stochastic model is presented [4]. The proposed price-based self-scheduling optimization model takes the aggregation of DR contracts into account when determining the best DR schedules for participants in day-ahead energy markets [5]. Convergence is the idea that after a finite number of iterations between the ED problem and the price-sensitive DR load adjustment, load and/or price values will eventually converge to a fixed point [6]. In a smart microgrid, this paper presents a comprehensive central DR algorithm for frequency regulation that reduces the amount of manipulated load. An IEEE 13-bus standard distribution system operating as a microgrid with and without variable wind generation has been the subject of simulation studies [7]. The demand side can be more responsive thanks to smart grid technology, making it easier for demand-serving entities like big consumers and retailers to find the best deals on the electricity they need. We create a stochastic complementarity model to represent the uncertainty and use the resulting bidding curves to demonstrate the benefits of such a bidding scheme over non-strategic ones [8].

III. PROPOSED METHOD

Demand response applications under the smart grid concept have been widely adopted as a means of managing electrical demand. Numerous studies have been conducted around the world, especially regarding residential demand response applications, which have been widely adopted. This study provides general information on demand response and global demand response research. A project that utilised load shifting to demonstrate the impact of demand response application in a residential home has been completed. To manage the peak demand of the house, electrical appliances that are meant to be used at expensive times are moved forward in time. Demand response will present fresh

viewpoints on electrical energy production/consumption and power system operation, taking into account new smart appliances and internet of things (IOT) applications. Figure 1 shows the block diagram.

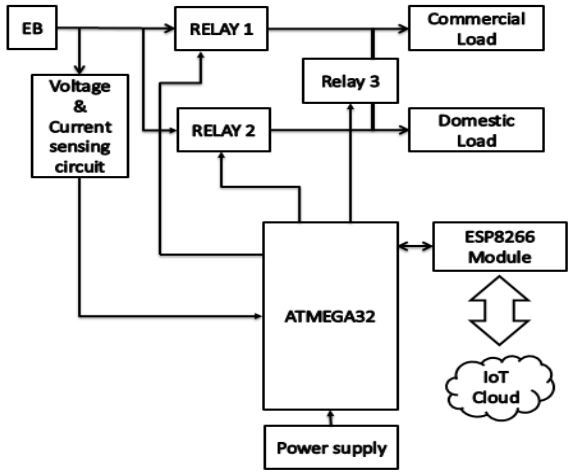

Fig 1 Block diagram of proposed method

3.1. Relay

A relay can be of many different types, but the most common type is made of electromagnets and functions as a switch most of the time. This device can be described as a relay because the signal received from one side of the device controls the switching operation on the other. According to the dictionary, relay means the act of passing something from one thing to another. Relay is a switch that electromechanically controls (opens and closes) circuits. This device's primary function is to establish or break contact with the aid of a signal without the need for human intervention in order to turn it ON or OFF. It is primarily used to use a low power signal to control a high powered circuit.

3.2. Atmel Studio

In Windows XP, Windows Vista, Windows 7 or Windows 8 environments, Atmel Studio is an Integrated Development Environment (IDE) for creating and debugging AVR/ARM applications. A project management tool, source file editor, simulator, assembler, and front-end for C/C++ programming and on-chip debugging are all included in Atmel Studio. All Microchip AVR tools are supported by Atmel Studio. Every new release includes support for fresh AVR/ARM devices as well as the most recent tool updates. Because of its modular architecture, Atmel Studio enables communication with outside software providers. Other modules and GUI plugins can be created and hooked up to the system. To learn more, speak with Microchip.

3.3. EAGLE

Electronic design automation (EDA) software is available from Autodesk. enabling the seamless connection of schematic diagrams, component placement, PCB routing, and extensive library content for printed circuit board (PCB) designers. Electronic design automation software called EAGLE has features like schematic capture, printed circuit board layout, auto-routing, and computer-aided manufacturing. Easily Applicable Graphical Layout Editor, or EAGLE, is a programme created by CadSoft Computer GmbH. A schematic editor is available in EAGLE for creating circuit diagrams. Parts are defined in device libraries with the.LBR extension, while schematics are stored in files with the.SCH extension. Parts can be arranged on numerous sheets and connected via ports. Board files with the.BRD extension are stored in the PCB layout editor. It enables auto-routing to connect traces automatically based on the connections defined in the schematic as well as back-annotation to the schematic. Along with Excellon and Sieb & Meyer drill files, EAGLE also saves Gerber and PostScript layout files. Many PCB fabricators and assembly shops also accept EAGLE board files (with extension.BRD) directly to export optimised production files and pick-and-place data themselves. These are standard file formats that PCB fabrication businesses accept, but given that EAGLE's typical user base consists of small design firms and hobbyists, many of these businesses also accept EAGLE board files. For editing, managing projects, and customising the user interface and design parameters, EAGLE offers a multi-window graphical user interface and menu system. Hotkeys on the keyboard, the mouse, or specific commands typed into an embedded command line can all be

used to control the system. Script files can be created by combining numerous repeating commands (with file extension .SCR). Another option is to use an object-oriented programming language designed specifically for EAGLE to explore design files (with extension .ULP).

3.4. AVR ATmega32A Microcontroller

The asynchronous mode of communication offered by the ATmega32A USART is accomplished without the use of a dedicated clock line between the transmitting and receiving ends. By correctly setting the baud rate, start, and stop bits in a transmission sequence, synchronisation is made possible. The data frame's start bit and stop bit are used to synchronise it. Every frame begins with a start bit, which is a single low bit that indicates the following bits are data bits. The stop bit, which signifies the end of the frame, can be one or two high bits. Baud rate is the rate at which serial data is transferred, to put it simply.

3.5. Power supply

An electrical device known as a power supply provides electricity to an electrical load. A power supply's primary function is to transform electrical current from a source into the proper voltage, current, and frequency needed to drive a load. Because of this, power supplies are also known as electric power converters. A computer's internal components receive low-voltage, regulated DC power from a power supply unit (PSU), which converts mains AC. Switched-mode power supplies are utilised by all contemporary personal computers. While some power supplies automatically adjust to the mains voltage, others have a manual switch for choosing the input voltage. One essential component of every PC is the power supply (PSU). A bad or faulty one can bring down your entire computer because it powers every component inside. The main purposes of power supply circuits are to convert energy from one state to another, such as from AC to DC or vice versa, to change levels, increase or decrease voltage, or to change frequency. Input and output circuit isolation can also be accomplished using AC-AC power supplies. The four main processes shown in a block diagram of a regulated DC power supply are step down transformation, rectification, DC filtration, and regulation. Unregulated power supply and regulated power supply are the two categories that define DC power supply designs. The regulated power supply can be switched or linearly regulated.

IV. RESULTS AND DISCUSSION

A control coil encircles an iron core. As displayed, the electromagnet receives power from the power source via a control switch, and the load receives power via contacts. The electromagnet begins energising and amplifying the magnetic field when current begins to flow through the control coil. As a result, the upper contact arm begins to be drawn toward the lower fixed arm, closing the contacts and cutting off the power to the load. If the relay was already de-energized when the contacts were closed, on the other hand, the contacts would move the other way and create an open circuit. Figure 2 shows the working diagram.

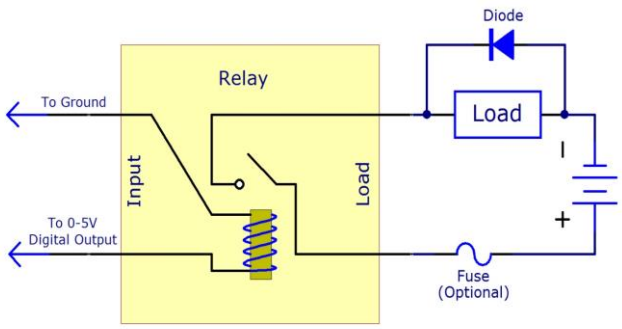

Fig 2 working diagram

When the coil current is turned off, a force will push the movable armature back to its starting position. The strength of this force will be almost half that of the magnetic force. Two things primarily contribute to this force. They are gravity and the spring. Relays are primarily designed for two fundamental tasks. High voltage is used in one application and low voltage in the other. More emphasis will be placed on lowering overall circuit noise for low voltage applications. They are

primarily made to lessen an occurrence known as arcing for high voltage applications.

V. CONCLUSION

An overview of DR applications worldwide and in Turkey is provided in this paper. In order to evaluate the potential of frequently used residential DR applications on lowering peak grid demand when the DR is used on a large scale under the smart grid concept, a simulation study was completed. A new perspective on the production and consumption of electrical energy as well as the functioning of power systems will be provided by DR when taking into account new smart appliances and Internet of Things (lOT) applications. DR can be used at the commercial and industrial customer levels as well, it should be noted. However, it is necessary to measure and examine these customers' electrical consumption first. For instance, the demand for these customers during peak hours can be effectively managed by managing the heating, ventilation, and air conditioning loads. Shifting these loads will only cause minor discomfort because temperature change has long been a constant. To maintain a comfortable environment, a small time step, such as 15 minutes, should be used in DR applications. Due to their high power demands, industrial and commercial customers may benefit more from DR applications at these levels for the grid's ability to manage peak load and operate economically. The authors intend to conduct DR research at the commercial and industrial customer levels in the future. Although DR applications are currently only being used in pilot projects in Turkey, this will soon change as Turkey moves toward a smarter grid.

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