International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 2 Feb 2022, pp: 1670-1674 www.ijaem.net ISSN: 2395-5252

An Effective Communication Methodsas a Driving Force in Smart and Prepaid Energy meters

Chioma Lizzy Nwagbo[1], Barida Baah[2]
[1]*Department of Computer Science and Robotics Education, College of Education, Nsugbe, Anambra State, Nigeria*
[2]*Department of Computer Science, Ebonyi State University, Abakaliki- Nigeria*

Submitted: 25-02-2022 Revised: 28-02-2022 Accepted: 03-03-2022

ABSTRACT
This research paper is based on the use communication methods as driving force in smart and prepaid energy meters, the smart and prepaid energy types of meters cannot be effective without an effective method of communication going on in the meters. Hence the main reason for this research papers is take a look at the various methods of communication like K,Y Z which is the form C contact supply and K, Y which is refers to as form A methods in energy meters with the view of highlighting their strength and weakness.The benefits of this research works is that it is cost effective in terms of methods of communication when used which serves as a driving force in smart and prepaid energy meters.
Keyword: Effective communication, downstream, upstream, and Meters.

I. INTRODUCTION

Communication is an integral part of life without communication life itself will be meaningless, this is also applicable to smart and prepaid energy meter so we can say that the driving force of smart and prepaid energy meters is communication but it must be effective before you can say that communication is successful. Communication is a two way process it is based the sender and receiver of the message(s) which is been communicated that is to say that the sender and receiver of the messages must understand what is been communicated This is applicable in smart and prepaid energy meters, the methods of communication that are used in this devices maybe the K,Y Z which is called the form C or the Y,Z on the other hand which is refers to as the form A.

What is Effective Communication?

An effective communication can be defined as the process of sending voices or messages from persons to person or via any communication device with intension of ensuring that the receiving ends understand every bit of messages of voice calls been communicated. In general it may involves two or more persons.This is also applicable to devices like smart and prepaid energy meters.

Review of Related Literature

Ling et al[1] utilized a (digital signal processors)DSP-based meter to measure the electricity consumption of multiple users in a residential area. A Personal Computer (PC) at the control center was used to send commands to a remote meter, which in turn transmitted data back, using the power Line Communication (PLC) technique. The major problem with this system is that it cannot detect tampering by consumers.

Nwaoko (2006) presented a design and implementation of SMS -based control for monitoring systems. The paper has three modules involving sensing unit for monitoring the complex applications. The SMS is used for status reporting such as power failure. Issues on billing system for electricity board usage were not considered. Prepaid meters can also make use of state of art technologies like WiMAX owing to the idea of centralized accounting, monitoring and charging. It brings telecommunication to the core of its activities to support more Smart Grid applications such as Demand Response and Plug-in electric vehicles. Prepayment polyphase electricity metering systems have also been developed consisting of local prepayment and a card reader based energy meter.

Maheswari and Jejanthi, [2]in their paper suggested a method where telecommunication

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 2 Feb 2022, pp: 1670-1674 www.ijaem.net ISSN: 2395-5252

systems will be utilized for automated transmission of data in order to facilitate bill generation at the server end and also to the customer via SMS and Email.

II. COMMUNICATION METHODS IN SMART/PREPAID ENERGY METERS

Ling [1] opined that Remote meter reading is a practical example of telemetry. It saves the cost of a human meter reader and the resulting mistakes, but it also allows more measurements, and remote provisioning. Many smart meters now include a switch to interrupt or restore service. Historically, rotating meters could report their metered information remotely, using a pair of electrical contacts attached to a KYZ line. A KYZ interface is a Form C contact supplied from the meter. In a KYZ interface, the Y and Z wires are switch contacts, shorted to K for a measured amount of energy. When one contact closes the other contact opens to provide count accuracy security[2].. Each contact change of state is considered one pulse. The frequency of pulses indicates the power demand. The number of pulses indicates energy metered.The **KYZ** relay creates pulses. The term KYZ refers to the contact designations

a. K for common,
b. Y for Normally Open, and
c. Z for Normally Closed.

When incorporated into an electrical meter, the relay changes state with each rotation (or half rotation) of the meter disc. Each state change is called a "pulse." When connected to external equipment, rate of use (kW) as well as total usage (kWh) can be determined from the rate and quantity of pulses.KYZ outputs were historically attached to "totalizer relays" feeding a "totalizer" so that many meters could be read all at once in one place. KYZ outputs are also the classic way of attaching electricity meters to programmable logic controllers, or other control systems. Some modern meters also supply a contact closure that warns when the meter detects a demand near a higher electricity tariff, to improve demand side management. Some meters have an open collector or IR LED output that give 32-100 ms pulses for each metered amount of electrical energy, usually 1000-10000 pulses per kWh. Output is limited to max 27 V DC and 27 mA DC. These outputs usually follow the DIN 43864 standard. Often, meters designed for semi-automated reading have a serial port that communicates by infrared LED through the faceplate of the meter. In some multi-unit buildings, a similar protocol is used, but in a wired bus a serial current loop connects all the meters to a single plug. In the European Union, the most common infrared and protocol is "FLAG", a simplified subset of mode C of IEC 61107. In the United States and Canada, the infrared protocol is ANSI C12.18. Some industrial meters use a protocol for programmable logiccontrollers (Modbus or DNP3).
DLMS/COSEM is a recommended protocol which can operate over any medium, including serial ports. The data can be transmitted by Zigbee, WiFi, telephone lines or over the power lines themselves. Some meters can be read over the internet. Other more modern protocols are also becoming widely used, like OSGP (Open Smart Grid Protocol).

Basically we will classify the methods of communication in smart/prepaid energy meters into two main categories which are as follows:
a. Form C (K,Y,Z)
b. Form A., (K,Y)

Form C is the same as a 3-wire pulse interface. Form A is a 2-wire interface. The standard in the utility industry is Form C. Form C pulses are single pole double throw (SPDT), while Form A pulses are single-pole single throw (SPST). A Form C output can be used as a Form A pulse by using only K and Y, or K and Z, and doubling the Form C pulse value.Form A pulse values are always double Form C pulse values.Example: 0.024kwh for a 2-wire equivalent of the pulse value in Standard #1.KYZ Pulse initiators are Dry-Contact switches.This means that there is no internally applied voltage from the electric meter. The “wetting voltage” must come from an external source. The convention in KYZ pulse metering is that the downstream which is the receiving device piece of equipment supplies the wetting voltage to the upstream which is the sending device as indicated in figure 1.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 2 Feb 2022, pp: 1670-1674 www.ijaem.net ISSN: 2395-5252

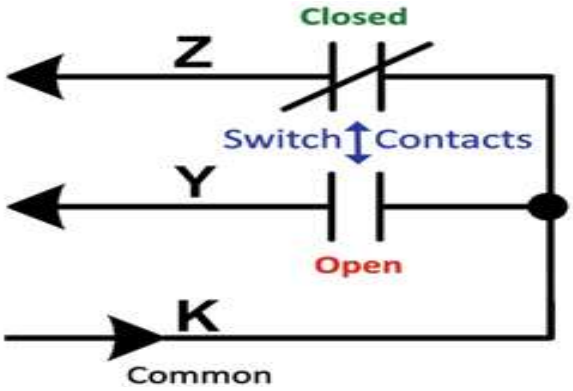

Figure 1: Form C (K,Y,Z Pulse)

Table 1: Strength and Weakness of Communication Method in smart/Prepaid Energy Meters

Methods	Strength	Weakness
Form C (K,Y,Z)	It can be reused as form A by using only K and Y	It lack the strength of providing high end-metering application which the Ethernet communication provide
	It is a standard in the Utility industry	It requires more three wire contact interface compare to the form A which as just two wire contact Y-Z
	It transmit energy used from electric meter to another piece of equipment	
	It is cost effective and simple to connect	
	It provide a more accurate result	
Form A (Y-Z)	It transmit energy used from electric meter to another equipment	It cannot be reused as form C since it has only K and Y interface
		It is less accurate compare to form C which is K,Y, Z pulse

III. RESULT

Figure 1 shows the result of full implementation of a KYZ pulse communication method with the energy battery which is the energy management system, the SSI relay interconnected with the meter. KYZ pulses are used to transmit instantaneous energy used information from the electric meter to another piece of equipment. The downstream (receiving device) may be a type of control equipment, recording device, SCADA system, etc. A KYZ interface (SPDT) includes two switch contacts; Y and Z. The electric current travels/ toggles between K and these two switch contacts (Y and Z) changing from one state to another. A pulse is defined as this change of state, and represents some amount of ENERGY that has gone past the meter, or in other words, consumed by the customer

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 2 Feb 2022, pp: 1670-1674 www.ijaem.net ISSN: 2395-5252

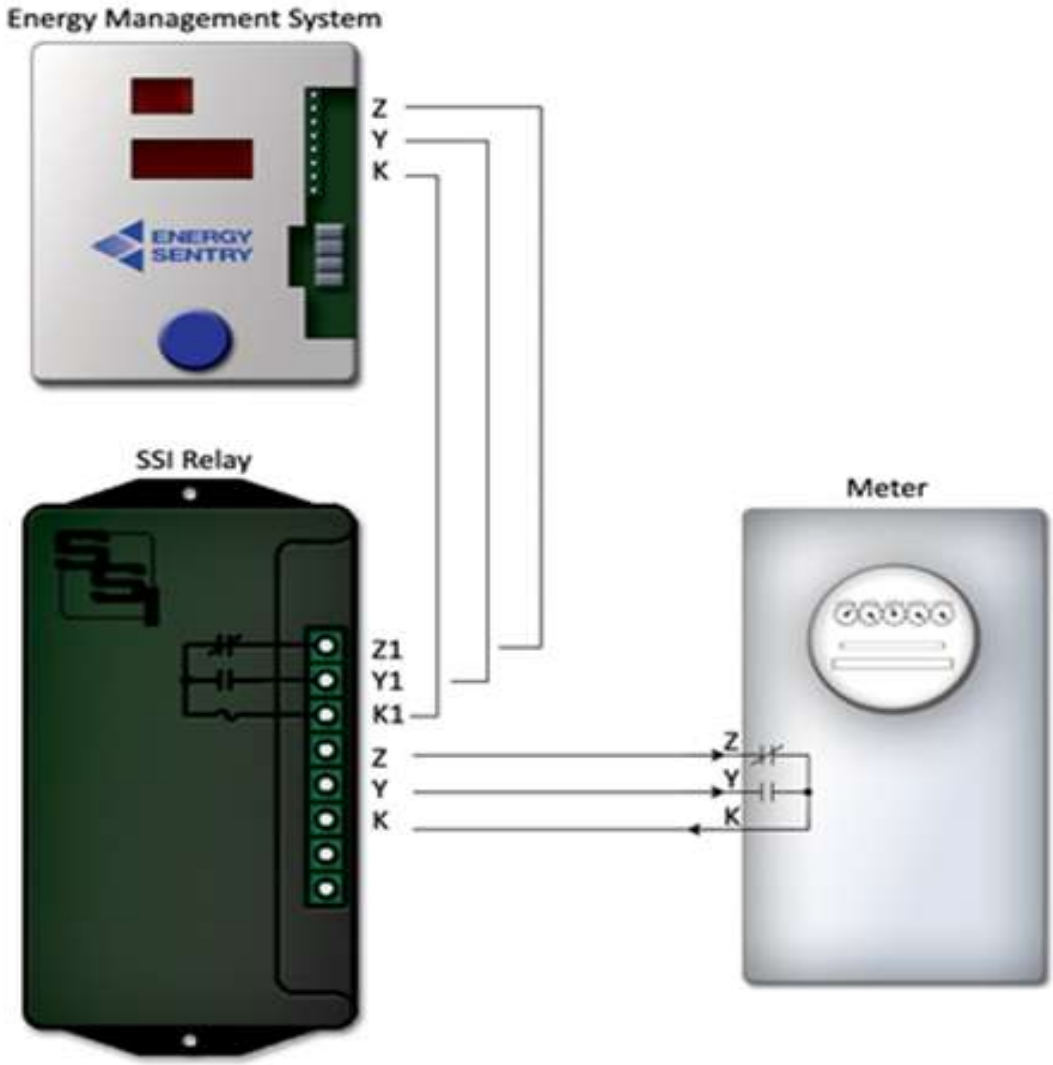

Figure 1: A Communication Method Using KYZ pulse Implementation

From Figure 1 it shows that when energy use is high the speed of switching from K – Y to K – Z increases, and as energy used declines the switching slows. While the speed of switching increases and decreases with power used, the duty cycle (time each switch is closed) is always approximately 50/50; meaning that each side's on and off times are the same. This provides a universal way to record and transmit energy usage information.

Most SSI devices are used to protect the meter from transient damage like a lightening strike, and/or to provide multiple outputs of information to different downstream (receiving) devices. We also provide totalizing devices that take multiple inputs (such as multiple meter information) and tabulate/ totalize the information for one output.

IV. CONCLUSION

Conclusively, the driving force in smart and prepaid energy meters depend on the methods of communication use, based on this fact KYZ pulse which is refers to as form C has proving to reliable because of its numerous strength that is provide compare to other communication method like the K-Y or K-Z pulse which is also refers to as form A. Most importantly the KYZ pulse or the form C is cost effective and it is simple to implement.

REFERENCES

[1] Ling, Z., Sihong, C., & Biao, G. (2010). The Design of Prepayment Polyphase Smart Electriicity Meter System.International

Conference on Intelligent Computing and Integrated Systems (ICISS) (pp. 430-432). Wuhan China: IEEE.

[2] Maheswari, C., &Jejanthi, R. (2009). Implementation of Energy Management Structure for Street Lighting System.A Journal of Modern Applied Science , 5-10.

[3] Nwaoko, K. J. (2006). Electrical Energy Accounting Methods. Lagos Nigeria: Impressed Publishers.