ELECTICAL SMART METER

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INTRODUCTION

What are smart meters?

Key components of advanced metering infrastructure, smart meters are digital devices that measure and record electricity, gas or water consumption in real time and relay the information to utility companies. Smart meters are quickly becoming an essential tool in modern energy management.

At a time when energy consumption and efficiency have become critical concerns, smart meters have emerged as an innovative solution for managing household, small business and commercial energy metering more effectively. These digital devices are gradually replacing traditional meters (smart meter installations have tripled in the last decade.)

1 And with smart meters on track to comprise 93 percent of all metering systems, they are transforming the way utilities and consumers interact with energy resources

Unlike analog (traditional) metering, which requires manual readings by meter readers, smart metering provides accurate and up-to-date

consumption data that enables both utilities and consumers to monitor and manage energy usage more effectively.

Smart meters are essential for building smart grid infrastructure—a modernized electrical grid system that uses digital technology to enhance the reliability, efficiency and sustainability of electricity usage distribution.

How do smart meters work?

The metering device within a smart meter is designed to accurately measure energy consumption by using digital technology. However, the sensors and measurement techniques you use depend on the type of energy you're measuring.

For electricity meters, sensors measure the voltage and current flowing through the electrical circuits. These values are then multiplied to calculate the power consumption (measured in watts). By integrating the power consumption over time, the meter can determine total electricity use (measured in kilowatt-hours).

Natural gas and water meters use flow sensors to measure the volume of gas or water passing through the meter. These sensors can use a

range of technologies, like ultrasonic, turbine or diaphragm-based meters. The smart meter then calculates the energy consumption based on the volume of gas or water used and the energy content of the respective resource.

Purpose:

- 1. For more accurate accounting

- 2. Knowing current voltage and amps per meter at any time

- 3.limitation for each meter at any time

- 4. Reduce fraud by consumers

- 5. Reduce electrical losses

- 6.Easy to collect electricity bills from participants

- 7. Reducing overload on transformer and feeders.

- 8.prepaid system can be applied in smart meters

- ## **Types of Electrical smart meter**

- 1-Single phase: is used to account and control electricity consumption for Single phase users.

  MK32H

  Advanced Single Phase DIN Rail Meter

  Designed with home use in mind, The Mk32H is a single-phase DIN Rail meter that has an integrated 100A UC3 compliant relay. It can function in both post-paid and STS compliant prepaid modes. Mk32H can function as a split meter when used in conjunction with the EDMI CIU (Customer Interface Unit) - HD18 wirelessly. It can also function as a full AMI system when used in conjunction with the EDMI Head End System - Multidrive and the EDMI Gateway - GW30.

- 2-Tree Phase: is used to account and control electricity consumption for Three phase users.

MK6E

High Accuracy Three Phase Smart Mete

The improved Mk6 meter is called the Mk6E. designed with a 0.2S higher class accuracy to target upscale markets. A high-precision meter designed for generation and transmission applications is the Mk6E. additionally for revenue metering in upscale retail establishments.

MK10M

Three Phase WC Smart Meter

based on an improved metering operating system platform, High-quality measurement engine and smart grid solutions are features of the Mk10M. large data storage capacity, modulable communication capabilities and data processing

MK10E

Three Phase CT/WC Smart Meter

based on the cutting-edge Atlas metering system, With numerous improvements, such as smart grid solutions, the Mk10E's Class 0.5S measurement engine, large data storage capacity, information processing, UPS setup and improved communication capabilities

Parts of smart meters

In generally smart meter consists of two parts

1-hardwear

2-software

1- Hardware department also consists of the below components.

- BOX: consists of the box that used for collecting all other components inside it. And any box has special number that it's so important in software implementation.

- inside any boxes we have M.C.B That used for turn off or turn on power of the meters in case of maintenance and any other necessary purpose

- Busbar that used for dividing power by the meters.

- Gateway it is used to connect all meters by data center for controlling and getting information.
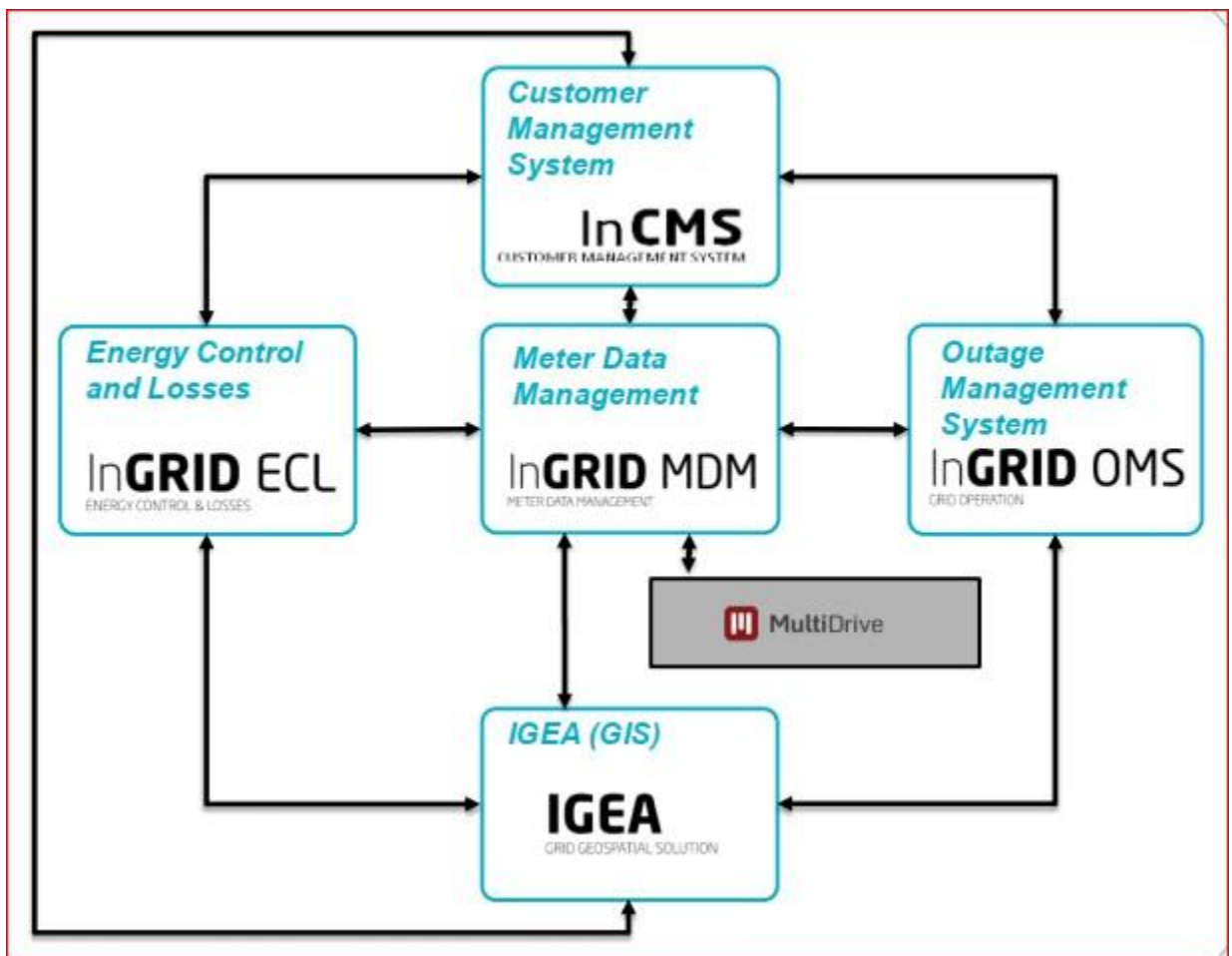
- Meters.

Requirements for hardware installation

- Each customer must have special cables and separated from other meters.

- Each customer must have special customers number to be controlled.

- Good internet connection is need to connect meters by data center.

- Arranging customer meters and divided by boxes properly to know how many meters arranged in any boxes.

2-Software department

- Software part is an important part of smart meters, because we can do all essential smart meter tasks in this part like limitation and controlling and sending and receiving data from data center to meters and from meters to data center also.

Main parts of smart meter software are below

- ## CMS: Customer Management System.

  In Customer Management System we can do all works that related to customer

  ## Most important functionalities are

  Geographical and Organizational Structure, Customer Care and Contracting, Reading and Billing, Devices, Work Orders, Irregularities, Prepayment processes, Collection and Debt, Management, Accounting.

- ## ECL: Energy control and losses.

  In Energy control and losses, we can monitor all energy and losses that we have in the distribution network and supply points consumption, and making Necessary actions to reduce losses and makes fulfillment reports about energy and losses.

Most important functionalities in Energy control and losses are:

Daily follow-up of network consumption evolution, Detection and characterization of (regions, sectors, circuits and network elements) by losses level and their evolution, identifying deviations from planning, Planning and control of actions for losses reduction.

- # MDM (METER DATA MANAGMEENT)

Meter data management enables to manage measures, electrical data and events by joining validations
(consumption control over load profiles), estimations (filling gaps), and calculations (formulas used to obtain not registered load profiles or magnitudes). This meter data management is associated with incident generation, fraud detection and reporting functionalities allowing the operator to control the grid in a friendly-user way (dashboard).

- # OMS (outage management system)

Outage management system related to customer complains (Call Center) it make Customer Relationship Management System and, in their customer, complaints are getting and make instant action to solve their issue and getting information from customers and giving any information that customer ask also.

- **IGEA** -geographic information system (GIS)

Geographic information system represents geographical and schematic entities by using different information sources.

Most important functionalities are:

Set of tools to analyze and visualize the grid data, help on making decisions, Interoperable with external applications, Core of Ingrid Network Inventory.

COMPARISON BETWEEN CLASSIC METERS AND SMART METERS:

IN CLASSIC METERS:

1- Classic meters cannot be controlled at all.

2- About accounting it's not so accurate comparing to smart meter.

3- Cannot been knowing anything like (voltage and Amp and KW …) in classic meters

4- Limitation cannot be done in classic meters.

5- Violations can be done very easily.

6- Increasing electrical losses

7- Billing operation more complicated compared by smart meter

8- It causes rising overload on transformers and feeders, because we cannot control meters and transformers in classic meters.

9- prepaid system cannot be applied in classic meters.

IN SMART METER.

1-All meters can be controlled

2- More accurate accounting comparing to classic control.

3- Knowing current voltage and amps per meter at any time

4-limitation for each meter at any time

5.-Reduce fraud by consumers

6- Reduce electrical losses

7-Easy to collect electricity bills from participants

8- Reducing overload on transformer and feeders.

9-prepaid system can be applied in smart meters

REFRENCES:-

1. The main reference of this research is my practical experience in working in electrical smart meter project in Sulaymaniyah.

2. www.edmi-meters.com.