AMRITA VISHWA VIDYAPEETHAM

SMART METERING PILOT PROJECTS CASE STUDY

19CSE447 - Cloud Computing
Case Study

OUR TEAM

CHARUDHARSHINI K
CB.EN.U4EEE19009

G SRIAADHITH
CB.EN.U4EEE19014

S S SHIVASHANKER
CB.EN.U4EEE19039

TUMMURI VYOMAKESH
CB.EN.U4EEE19046

TABLE OF CONTENTS

01. CHALLENGE

CHALLENGE

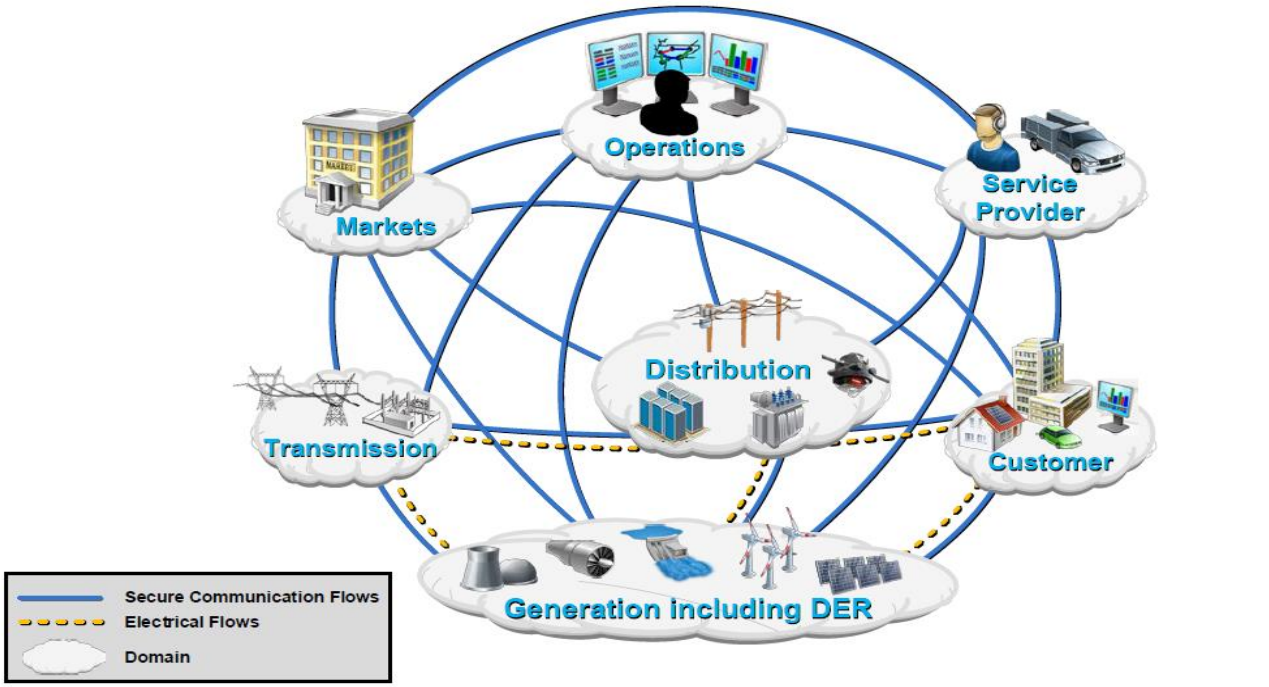
In order to maintain the frequency of the system, a power system needs to properly balance at any given moment the demand of all users with the supply made available by the utility.
The challenge for our problem is internet connectivity, and migration in cloud service.

02. PROBLEM/GOAL

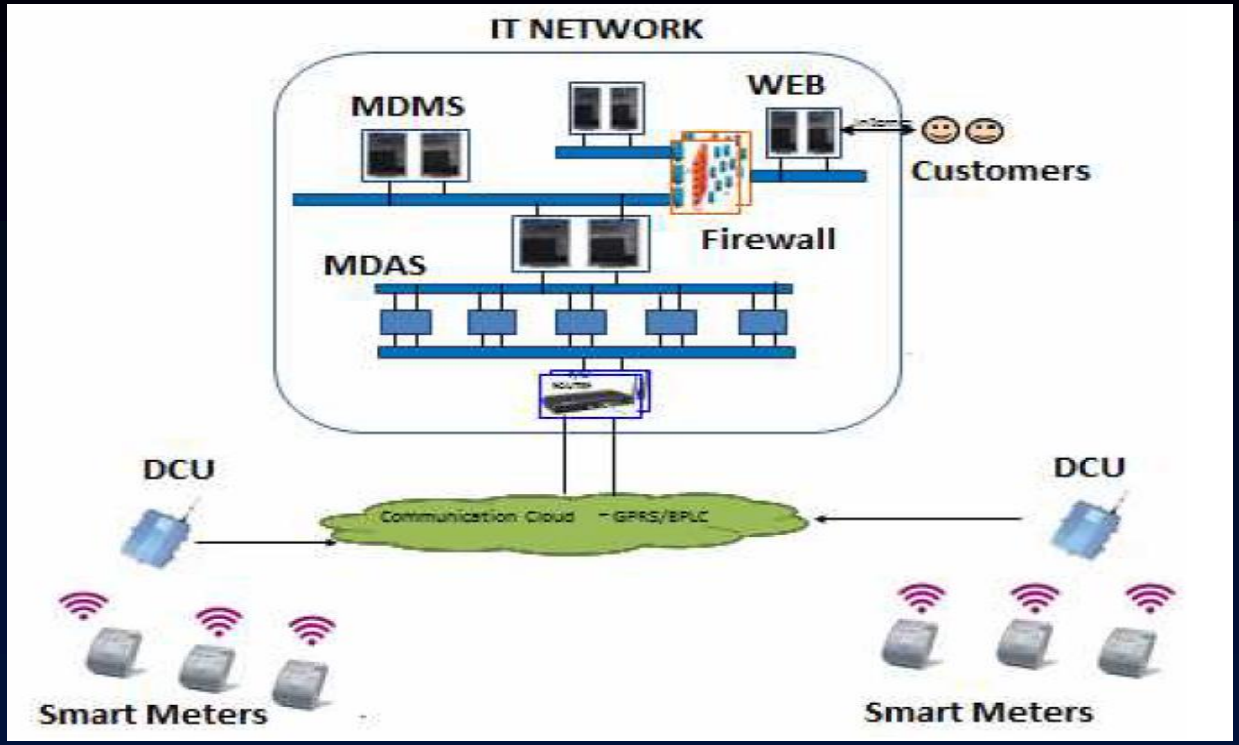
PROBLEM

The system is currently on poorly made machinery and loads, unapproved load extensions, tampered meters and meter readings, altered C.T. ratios and inaccurate recording, meter by passing, theft of electricity, incorrect meter and recording, etc. Due of them, the system is now ineffective and unprofitable.

Smart Grid Conceptual Model



Source: https://www.researchgate.net/publication/303356161_Smart_grid_implementation_in_India_-_A_case_study_of_Puducherry_pilot_project



Source: https://www.researchgate.net/publication/303356161_Smart_grid_implementation_in_India_-_A_case_study_of_Puducherry_pilot_project

GOAL

The system has to be provided with:

- Remote, safe reading of meters
- Reduced network maintenance costs
- Service automation
- Integrating with the customer’s external system

03. SOLUTION

Smart Meter

- Power outages will soon be immediately reported to the DPU through smart meters.
- Leaks or service problems can be automatically reported by AMI to the DPU and the client.
- Prior to receiving a large bill, a customer can set up alerts to provide notification of consumption thresholds.
- AMI does not send personal information and is secure.
- AMI offers comprehensive data on electricity, gas, and water consumption, which enables a client to make monthly savings.
- AMI does not send personal information and is secure.

Data Controller Unit

- Smart meters are used by DCUs to capture real-time usage data, which they then send to a central database server system.
- To implement the time-of-use functionality and incorporate the real-time prices from the power market, energy consumptions are saved in the DCU for 30-minute time periods.
- The unauthorized tampering with power is one of the main issues facing the smart grid system.
- Threshold detection is introduced to the DCU in order to prevent this theft.
- The system may easily add more features in response to changing demands and requirements.
- Although the study claims that one DCU can generally meet needs up to 100 metres away, it was discovered during the interim pilot that this is often not the case, especially when RF transmission is used.

Communication Network

- RF, power line carrier (PLC), and GPRS networks are some of the communication networks employed by the metering system.
- For RF communication, Low Power Radio (LPR) frequently employs the unlicensed ISM (industrial, scientific, and medical) band around 865-867 MHz and ZigBee-based 2.5 GHz.
- The majority of applications that use ZigBee need a low data rate.
- The PLC is a technology that uses the current power transmission and distribution network to transmit data signals.
- In contrast to other communication technologies, the PLC has no additional cost for network construction.

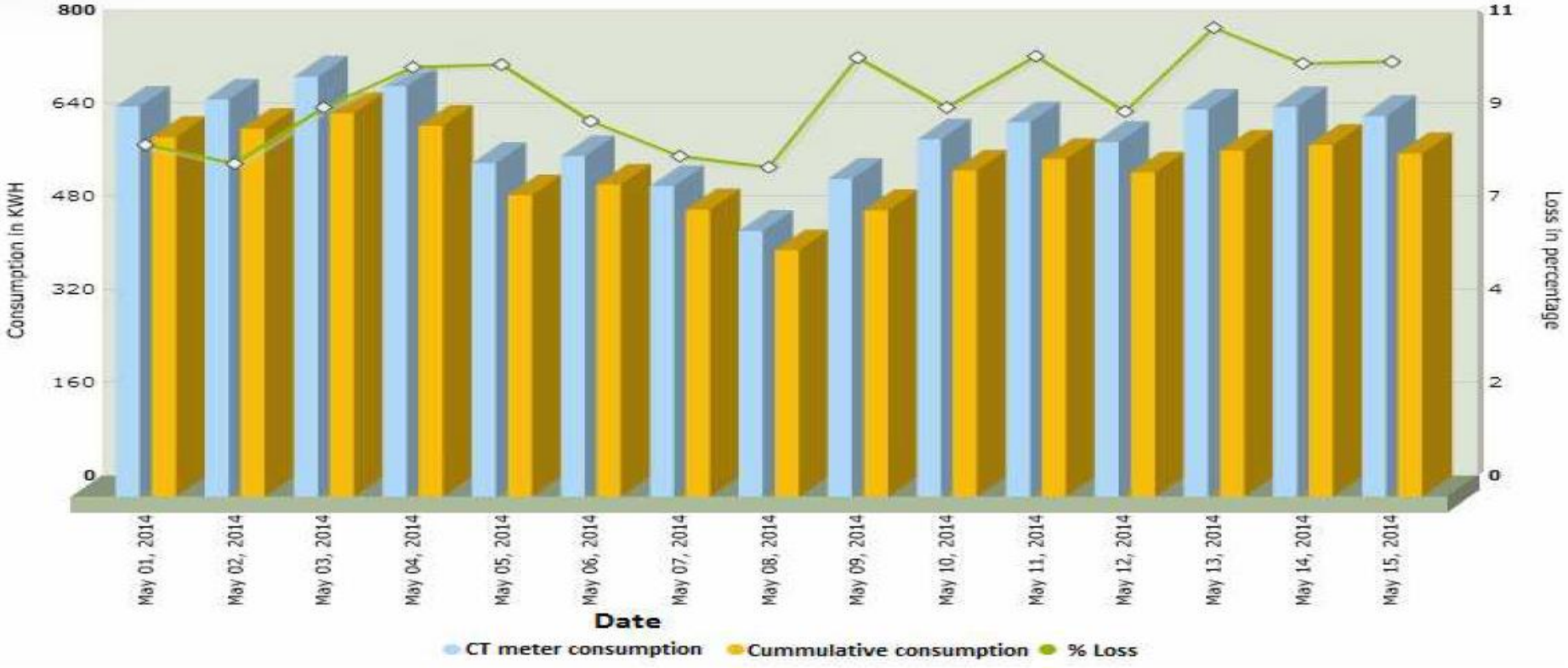
Database and Management System

- Customer data is kept in a centralized database.
- The Meter Data Management System (MDMS) uses the data from the DCUs that have been gathered by the Meter Data Acquisition System (MDAS) to send the appropriate data to the Utility and the Consumer in the formats that have been specified.
- The MDMS's Validation Estimation and Editing (VEE) function is crucial.
- Data syntactic and semantic checks are carried out as customer details, authorized load, and meter data are entered into the database.
- The raw data are then converted into a collection of consistent and useful data for billing using VEE.
- The current VEE function frequently takes weather, holidays, account similarities, historical data statistics, etc. into account.
- To identify "vacancy" and potential "tamper" or "theft," rules are defined.

Energy Audit

- The On-line energy audit is one of the few components of this project that pinpoints immediate technical and monetary losses.
- Consumers of one distribution transformer underwent monthly energy audits, and it was found that 7–10% of the energy was unaccounted for utilizing smart meters and the smart grid.
- One of the biggest obstacles to the energy audit is the integration of diverse manufacturing and communication technologies, which is a major issue for smart grid operators.

Source: https://www.researchgate.net/publication/303356161_Smart_grid_implementation_in_India_-_A_case_study_of_Puducherry_pilot_project



DAY WISE MONTHLY ENERGY AUDIT

04. MAJOR CHALLENGES IN IMPLEMENTATION

MAJOR CHALLENGES IN IMPLEMENTATION

As in smart grid, the communication flow is bidirectional, i.e., the flow is in between the electricity board and the consumer, various challenges were present.

Interoperability

It is essential that the system adopt interoperable standards because the smart grid spans the globe and there are several stakeholders involved in its manufacture and implementation globally.

Cyber Security

Infrastructures for information and communication will be crucial for linking and maximizing the available grid levels. The architecture of a smart grid should support the ability to fend against unwelcome physical and digital intrusions and safeguard customer privacy.

Communication Technologies

The network of data communication for the smart grid is being built using a variety of technologies. Cost, communication success rates, and technological difficulties like Electro Magnetic Interference (EMF), Signal to Noise Ratio (SNR), Baud rate, Parity Check, etc. are all causes for concern.

Social Barriers

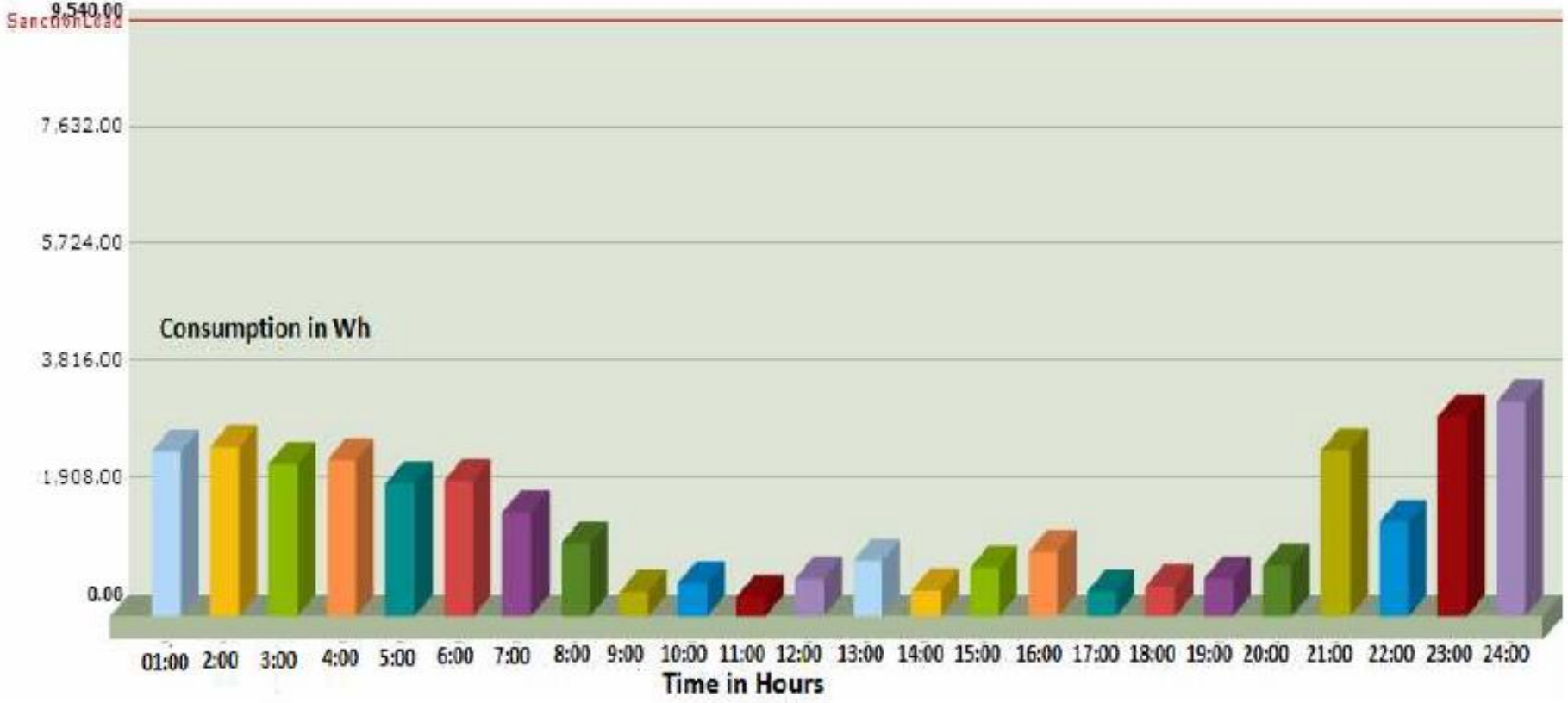
No program will be successful unless the program's target audience engages with it. Consumers are worried about the smart grid issue in large numbers. Programs for raising awareness are essential, and individuals must be made aware of the benefits.

05. FINAL OBJECTIVES

FINAL OBJECTIVES

- System Advanced Metering Infrastructure
- Peak Load Management
- Power Quality Management
- Outage Management System
- Supervisory Control and Data Acquisition / Distribution Management System
- Renewable Energy Integration
- Energy storage system
- Street Lighting
- Electric Vehicle

Source: https://www.researchgate.net/publication/303356161_Smart_grid_implementation_in_India_-_A_case_study_of_Puducherry_pilot_project



DAY WISE LOAD PROFILE OF A CONSUMER

06. CONCLUSION

CONCLUSION

- Initial research suggests that the distribution network's dependability and efficiency have increased.
- Supply and demand balancing at the device level is now possible nearly instantly thanks to the implementation of distributed computing and networking.
- In addition to benefiting from monitoring and changing loads and energy conservation through demand response, customers who receive education and training on smart grid features like load restriction and data consumption display also benefit from these features.
- Incorporating renewable energy through net metering, demand side management that is adapted to tariffs, and improved outage management systems are all advantages of the smart grid for the utility.


THANK YOU!!