Low Voltage AMI Modular Meter Communication System

(Meter Team: Wu Shenpei, Chen Shengwen, Zhang Yujia)

(i) Background :

With global climate change, summer temperatures are rising year after year, and the demand for electricity in Taiwan is also growing. The shortage of electricity reserve capacity in summer may become a norm. In order to ensure a stable supply of electricity, while taking our commitment to international carbon reduction and goal of nuclear-free homeland into account, the government is not only expanding the development of renewable energy, but also actively promoting energy conservation measures.

To achieve energy saving and promote low-carbon energy transition, the existing electricity network has been being upgraded to a "smart grid" and has been listed as a national priority for electricity construction and development. To promote energy saving and carbon reduction policies, Taiwan has included smart grid as one of the benchmark projects in the "National Energy Saving and Carbon Reduction Master Plan", and has focused on promoting smart meter infrastructure, planning smart grid and smart electricity services.

Taipower's low-voltage AMI system is expected to be installed in 1 million households by 2020. The meters are designed with a modular structure and CNS14607-compliant performance and have pluggable communication functions in accordance with IEC62056 and CNS15593 standards (see Figure 1). The purpose of the test is to ensure that the performance, quality, and standardized data transmission of the installed meters can meet the requirements of low-voltage AMI system installations.

(ii) Study content.

Taipower's low-voltage AMI system architecture (Figure 2) is divided into seven major components and five communication functions, including the metering unit, AMI communication system Route A, back-end management system, and Route B communication system, etc. Among them, "Route A" refers to the communication path from the meter to the utility; "Route B" is the communication path from the meter to the customer's side, as follows.

Metering Unit: It refers to the meter body, which plays the role of server, responsible for measuring, recording, and storing power information and events, etc. The meter body can accommodate Field Area Network (FAN) and Home Area Network (HAN) communication units (or "communication modules"). The AMI communication system (Route A) and the client system can access the information in the metering unit through the standard P1 interface within the scope of authorization, and communicate with the head-end server; the metering unit can also broadcast information to the client system through the HAN communication module.

AMI Communication System (Route A): A communication system that connects the back-end management system and the metering unit of the electricity industry. The FAN communication unit acts as a gateway between the metering unit and the AMI communication network, while the head-end server acts as a gateway between the AMI communication network and the back-end management system and is responsible for the management of the network and devices in the Route A communication system. There is no restriction on the technology used for the AMI communication network between FAN communication module and the head-end server.

HAN communication module (Route B): The communication system connects the client system and the meter (P2 interface), including the HAN communication unit on the meter side and the communication box on the client side, etc. There is no restriction on the communication technology used for HAN.

Back-end management system: e.g. Meter Data Management System (MDMS).

Handheld device: The device performs proximal operation of the meter. For example, when the meter must be accessed or tested proximally for installation, replacement, or failure of the AMI communication network, the handheld device can operate the meter through the optical port of the meter measurement unit.

Client systems such as HEMS, etc. The HAN communication module acts as a gateway between the HAN network and the user, and there is no restriction on which communication technology the HAN uses.

The Key Management System and Agent consist of the Key Management System (KMS) located in the control center and the KMS Agent located in each district, which is responsible for the generation of the Key Management System.

(iii) Research results.

1. Accumulated 1.5 million modular meters and communication acceptance tests.
2. The new test items of communication module will be updated for each manufacturer's products immediately.
3. Additional low-voltage AMI long term test platform
4. Complete evaluation of 20 types of low voltage AMI modular meters in 2021.
5. Accelerate the Test of no load condition speed by communication.
6. Single-phase 3-wire meter to promote no voltage hookup and test.
7. Build interactive, stable and real meter test platform.

8. Technical Services Modular Meter Performance and Communication (P1 P5)

Test 6 manufacturers with single-phase and three-phase meters.

9. Evaluation of 6 Communication Module Manufacturers

10.Completed the technical service of P2 communication module for one communication vendor.

11. Set up the communication lab.

(As shown in Figure 3)

(iv) Conclusion.

The quality of the meters and transformers is very important to the company's profitability, so we are constantly improving our testing capability and developing testing techniques and methods to improve test reliability and quality. We also actively participate in the technical discussions and planning for the construction of our AMI and cooperate with the planning and installation process to complete the high voltage communication upgrade and low voltage communication test platform construction, and complete the acceptance and performance test work as scheduled.

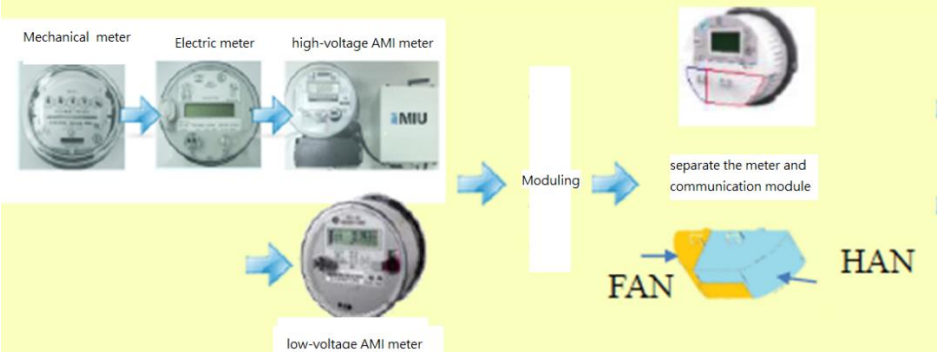

Figure 1

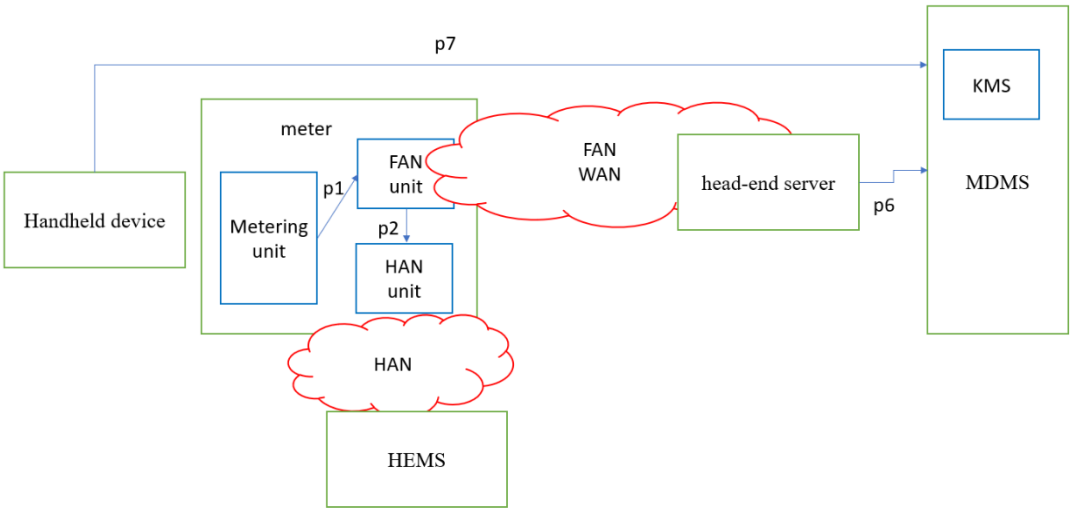

Figure 2

Figure 3