READINESS OF AN ELECTRIC NETWORK FOR THE ONCOMING OF THE SMART TECHNOLOGY

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ABSTRACT

This paper summarizes the readiness of the Czech Republic electric network for the oncoming of the smart technology. It describes the individual parts of the smart networks and the necessary alterations of the these parts that must be done for the smart technology to be deployed to the whole Czech republic electric network.

KEYWORDS

Smart meter, smart technology, smart grid, communication, security

1. INTRODUCTION

Nowadays the whole world is dependent on the electric energy supply. The problem with it would cause big damages and could be a threat to human lives. If the black out persisted for a long time, the non-reversible situations would come on.

Therefore we have to put effort to make this never occur. It is necessary to secure the continual electric energy supply. We can not use for the production the big local power plants only, but also the small power plants. They can supply the electric energy for the most costumers even in the case of blackout of the big power plant and the important transit power lines.

For this reason it is necessary to build a compact communication network that will be using the most modern technology for the data transfer and its security.

2. SMART TECHNOLOGY

It is a modern technology that is used for the control of the electric energy transmission from power plants to costumers and for the control of the system configuration, the most modern measuring instruments (smart meters), the most modern communication lines (smart lines) and the most modern estimation devices (smart control centers). The name for this complex is the smart grid. There are also additional parts of the smart grid e.g. an accumulations system.

2.1. Smart meters

The smart meter is an equipment that measures an actual electric power in the real time. These data are transmitted through a communication lines to a smart control centers. These centers interpreter the data and give a command to an electric system configuration for an optimal transmission of an electric energy. If there is a problem, it will separate the network to small parts. These parts will be energy free or energy free after disconnecting of a circumstantial electric load.

It consists of several parts. The general part is a measuring system that measures an actual absorbed power. The secondary part is a ripple control that switches the appliances with a low priority in time with an excess electric power, e.g. heating and accumulation systems. The next part is an

interface that does the peer to peer communication with a local control system for the concrete network part. The local control systems communicate with a central control system considered as the general control brain.

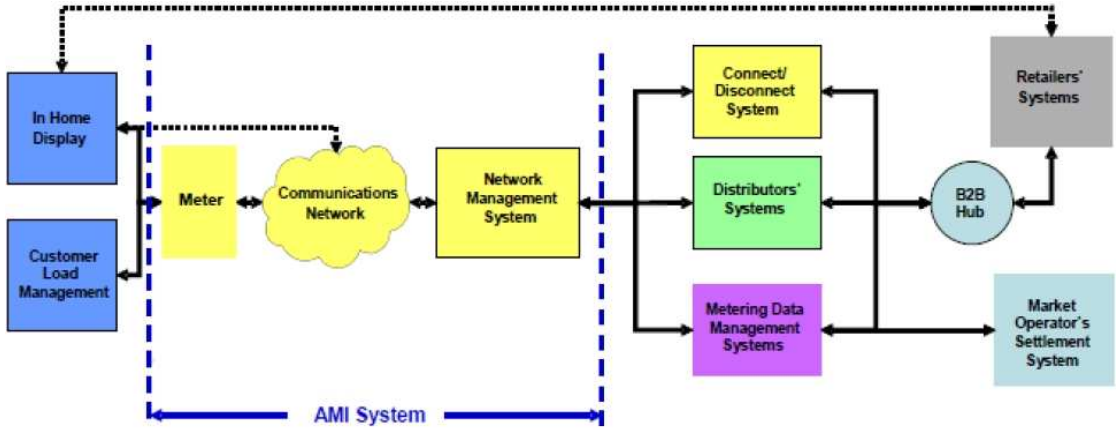

Figure 1 – Smart meter and AMI system scope

2.2. Smart lines

Besides electric power these lines also transfer informations. The frequency modulation of network frequency 50 Hz is used for the shortest distance. For longer distance, the self communication lines must be used. The communication lines are constructed either stable or wireless. A few wireless technologies exist, but there is only one appropriate technology. The others are not suitable. The communication through a mobile phone network has problem with a packet priority in the time when the network is overloaded. Data packets using is blocked and the priority is given to the voice packets. The next wireless technology is ZigBEE. It is developed for such purpose. Its disadvantage is the relatively short communication distance.

The next possibility is a stable communication line. We can use frequency modulation on power line only for a short distance. An ideal communication is the communication per self lines. We can use only a communication per optical fiber lines. These lines must be backuped.

The communication must be secured not only between smart meters and control systems, but also between control centers and an electric network protection and systems for a network configuration. It is possible to change an electric network configuration and a protection setting according to a actual needs and size of the made and the desired power.

2.3. Security

The big communication interconnected network produces a problem with safety. The electric network becomes one huge complex covering everything from a power plant to a costumer. It is necessary to make sure that no third person can infiltrate the network and then damage or modify the communication settings, cause the loss of data or only gather information about consumer consumption. It can be a big problem and even if the amount of electric power is sufficient, it could cause very fast and complete black out.

3. CONCLUSIONS

The Czech republic electric network is not prepared to the install of smart technology. The smart meters tests are at the beginning at the moment and the whole communication between them and the control systems must be checked, tested and tuned. After this it will be possible to apply them to the productive running.

Communication lines in a lower voltage network don't exist or exist only in a scarceness. In most cases they must be built again or must be reconstructed.

Control systems of a required power don’t exist and nobody knows at the moment which power control system will be needed to be able to communicate with a lot of smart meters, protections and next control equipment in the real time.

This means that the Czech republic electric network is not ready for the install of smart technologies in the full extent. We will have to do heavy investment into this for these technologies to be implemented into normal operation. I estimate the needed time for their implementation at 10 to 20 years.

REFERENCES

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