

Implementation of Prepaid Metering System necessity for the Albanian Power System (OSHEE)

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Abstract

Approval of the new Albanian Power Market Model, constitutes an important step towards the consolidation and sustainable development of the Electricity Market in Albania.

The Albanian Power sector is facing serious financial and operational challenges, manifested by a large unfunded deficit of about US\$550 million and a high level of technical and commercial losses of about 42 percent (year 2013) – the highest in the region – due to non-payment of electricity bills by consumers, as well as poor collection rates.

To increase the management level of the whole meter management sector it was necessary the implementation of SMART Metering Applications. Implementation of reading all customers consumption by using PDA equipment's. Reading the value of the monthly energy consumed and transmit online to "MyAvis" System through GPRS mobile companies system. Implementing on big customers, online data transmitting of energy consumed without the presence of the readers through the GPRS mobile companies network - "Converge" System. Implementation of Prepaid Metering System, piloting a small zone in

Tirana around of 2000 clients.

The main goal of implementing SMART Metering System Applications is supplying costumers with electricity in both quality and economical manner, this fact will come as a necessity for OSHEE management level to establish the Smart Grid and Scada System, making the existing distributed system to be monitored and operated from the distance, in order to carry out optimization, automation of control, and better management of Billing and Collection Systems.

Keywords

Smart Grid and SCADA System, Smart Metering System, MyAvis, Converge, Billing and Collection System.

1 Introduction

Based on the the currents situation for OSHEE it's necessity to design and implement a new reform for power sector covering in order to reduce distribution losses and improve collection, improve the power market model in line with EU directives and diversify generation source.

Implementing of smart systems has been analysed and implemented partially since former CEZ Albania Company, and for the state owned Company now OSHEE this new technology is highly efficient and can realise the ideas for the development of Smart Systems further.

The implementation of SMART Systems will impact the OSHEE Distribution System as follow:

- upgrade of the distribution infrastructure;
 - upgrade the transmission meter/data center;
- and the OSHEE Distribution Company-Sales:
- will benefit from the reduction of losses and

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improved billing and collection rates.

This project is a necessary step to support sector reforms, leading to improved quality of service and reliability for OSHEE and other main actors in Albania. The reliability of the electrical system (due to under-investment in the infrastructure), growing demand and the increasing difficulty of building new transmission infrastructures are the primary drivers for smart grid implementation system in Albania.

“Smart grid” generally refers to such a technology, people are using to bring utility electricity delivery systems, using computer-based remote control and automation. These systems are made possible by two-way communication technology and computer processing. They are beginning to be used on electricity networks, all the way to the consumers of electricity in homes and businesses. They offer many benefits to utilities and consumers, mostly seen in big improvements in energy efficiency on the electricity grid and in the energy users’ homes and offices [1], [2].

2 Smart Metering System

Meter is defined as a kind of equipment which would measure the amount of electricity consumed in houses, workplaces, offices and social institutions in correct and reliable way. As it is understood from its definition above they were measuring only the amount of electricity which is consumed and they had no other function.

There are continuous research and development studies about technological improvements, in order to make life much easier for human being.

Even though traditional meters have considerably long history, it is obvious that they could not resist any more against recent technological innovations.

As a result, classical mechanical meters are getting outdated and is being replaced by modern new electronic meters operated by pre-paid smart electronic credit card. By this new system, both the OSHEE (Distribution Authority) and the outsourced company delivering such technology saves not only their time, but also their money.

A smart meter, is an advanced meter for home energy monitors, as well as for gather data for remote reporting and control. Smart Metering equipment and advanced software enables real-time communication between control centre and consumers. With Advanced Metering the energy flow (optimization of energy flow) and load peak reduction can be controlled.

Multi-energy solutions can cover all energy forms, leading to preservation of the transportation cost and

energy consumption. This group includes all consumers: large, medium, and small ones. A smart meter records consumption in intervals of an hour or less and communicates that information via some communications network back to the utility for monitoring and billing purposes.



Fig. 1 Operation on the Sustainable Prepaid System

Meter system that is operated by pre-paid smart chip card has been in use around in many countries for years and become a reality in the world. It replaces the old mechanical meter so fast within a plan. Digital Meter Operated by (Pre-Paid) Smart chip card is manufactured specifically for the needs of the consumers within internationally norms [3], [7].

3 The Development Strategy of Advanced Metering Infrastructure

The Albanian Distribution Company OSHEE in collaboration with key actors: Ministry of Energy and Industry/ERE and World Bank are constantly working on the development strategy for improving the measuring point, which is based in the following fundamental of power flow:

- the replacement of measuring points at household consumers and small businesses;
- strategy of improving the measuring points is also estimated that multifunctional measurements with remote monitoring are unique and necessary choice;
- pilot project for implementation of the system called: AAMI (Albanian Advanced Metering Infrastructure) which according to the analyses provided a significant results in both commercial/financial and technical aspects;

Albanian Advanced Metering Infrastructure (AAMI) is an integrated system of smart meters, communications

networks, and data management systems that enables two-way communication between utilities and customers.

The multifunctional meter points are analysed as :

1. Expected benefits from replacement of old measurement points with “AAMI” components, and
2. Analysis of the impact of increasing accuracy in measurement.

The pilot project consist on installing around 53.000 smart meters, from the total around 13.000 smart meters will be installed mostly in the territory of Tirana City (in Babrru, Paskuqan and Bathore) and the rest around 40.000 smart meters will be installed all around Albania at the most problematic zones with a very poor collection rates of the invoices, and where the loses are much higher than the rest of the other zones [5], [7].

The overall cost for implementing such a system is based on:

1. Cost of Smart Meters
2. IT hardware, systems, and applications that enable AMI features and functionalities.
3. Other AMI related costs need for the implementation of this Pilot Project.

3.1 Smart Meters and Home Energy Management Systems

Smart meters provide the Smart Grid interface between customers and Albanian Energy Provider OSHEE. Installed in place of our old, mechanical meter, these meters operate digitally, and allow for automated and complex transfers of information between our home and our energy provider. For instance, smart meters will deliver signals from our energy provider that can help us cut our energy costs. Smart meters also provide utilities with greater information about how much electricity is being used throughout their service areas.

This energy information coming to and from our home through our smart meter can be run through a home energy management system (EMS), which will allow the customers to view it in an easy-to-understand format on your computer or hand-held device. A home EMS allows the customer to track his energy use in detail to better save energy.

EMS also allows us to monitor real-time information and price signals from our utility and create settings to automatically use power when prices are lowest. We can also choose settings that allow specific appliances and equipment to turn off automatically when a large demand threatens to cause an outage-avoiding peak demand rates, helping to balance the energy load in our area, and

preventing blackouts. Our utility may provide financial incentives for doing so.



Fig. 2 Energy Management System

3.1 Home Power Generation

As consumers move toward home energy generation systems, the interactive capacity of the Smart Grid will become more and more important. Rooftop solar electric systems and small wind turbines are now widely available, and people in rural areas may even consider installing a small hydropower system on a nearby stream. The Smart Grid, with its system of controls and smart meters, will help to effectively connect all these mini-power generating systems to the grid, to provide data about their operation to utilities and owners, and to know what surplus energy is feeding back into the grid versus being used on site. A potential feature of the Smart Grid will be to allow our community to use our solar array and our neighbour’s to keep the lights on even when there is no power coming from a utility. Called “islanding,” it will allow a home to grab power from “distributed resources,” such as local rooftop solar, small hydropower, and wind projects, until utility workers can bring the grid back online.

Distribution Division is developing the project of smart meter installation in all available 10/0.4 kV substation. This project is very important to reduce technical and commercial losses. The project is expected to be completed in early 2016.

3.2 Costs and benefits estimation

The study estimates the costs and benefits of smart meters implementation project in three years period taken into account the load forecasts, capacity costs, and smart meter costs. The study estimates the operational benefits that would accrue as it replaces the existing metering infrastructure with smart meters, which allow for two-way communication between the consumer and the utility.

Some of the issues that will directly affect this are:

- Maintenance of meters which are read in manual

mode by the meter-readers through PDA's presents a high cost to company.

- Principal priority is to establish measurement sensitivity which can reduce losses up to 5%.
- Reduction of site visits to be made in the case of manual meters when it is required by customers.
- Reduce costs required by the workers of the company relating to different cases of disasters that could happen during their site visits, and disconnections.
- Possibility for remotely switch-on of customers, when an abnormal operation occurs that will reduce the outage time and will increase the quality of service standards and avoid penalties for loss of energy.

The project of smart meter installation has had a good impact also in reduction of the technical losses. An analysis of meter self-expense as a result of measurement error, unmarked of several small loads and losses in electric meter itself is done. From this analysis of measuring points, by taking into account the own expenses and sensitivity, and by cancelling their subjective effects which are very large, it can result that the technical losses will decrease for 1.4% of total energy received.

In the future it is foreseen that all measuring points will be digital and remotely reading. The database server will be connected with:

- Billing server, where it will prepare automatically the bill,
- ABC module (module for comparison between the energy billing and energy expenses of the costumers)
- module for the calculation of technical losses, with different applications for network analysis, and
- dispatch centre.

Evaluation of the project should also be viewed in the future perspective where the calculation of every euro spent will be justified for each step of the project.

Some of the issues that will directly affect this are:

- Information about energy consumption, tariffs the costumers may receive at any time,
- reading accuracy at any time that would help in reading improvement, reducing associated costs and the elimination of inaccuracies that occur during manual reading of meters.
- Increased income that will result from the use of smart grid will be visible.
- Installation of smart grid would prevent the capital expenditures caused due to removal of the manual meters

- Reduce costs required by the workers of the company relating to different cases of disasters that could happen during their site visits, and disconnection
- will provide data that can be used for various researches regarding loads. This would impact directly on the elimination of costs that would be made for site visits and research regarding load distribution, and symmetries of the system (R,S,T).
- will provide visibility of electricity consumption that directly would enable better electricity management.

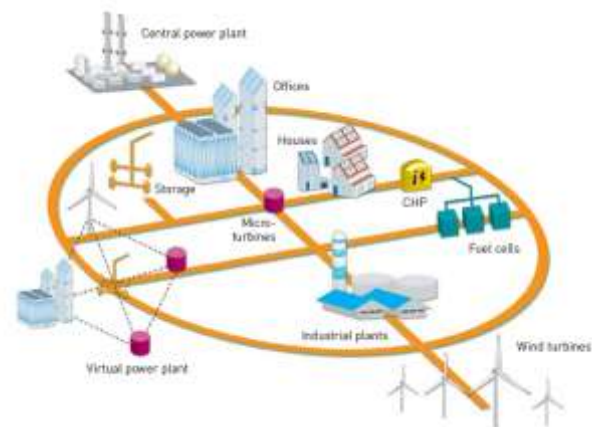


Fig. 3 Future Smart Grid Network for the Albanian Electroenergetic Distribution Operator OSHEE

5 Conclusion

The smart meters provide operational benefits by eliminating or avoiding the cost of reading meters. Based on the experience of energy companies in developed countries it can be concluded that the most rational way is the introduction of smart metering and control system on many levels and stages.

To realise the control of energy flow through all voltage levels, it must be continued with the implementation of Smart Grid Project through Prepaid Metering Project in Tirana/Albania.

In order to lead and execute the work for automation on distribution networks it is required to create professional teams who will perform the supervision and coordination during implementation of the system.

Telecommunications subsystem should be designed based on concrete analysis of the consumers as the optimal version or combination of telecommunication technologies.

Digital meter allows the OSHEE Distribution Authority to save its expenditures by:

- Cancelling first and last reading,
- Cancelling pull-up / re-install and locking/unlocking procedures of the meter,

- Transferring the values that is counted to the computer.
- Identifying paid and unpaid bills from the banks and charging interest to unpaid bills.
- Customer satisfaction for bills and payments,
- In addition to the above, its main difference from similar meters around the world is its advanced system of security.
- Strong supporting structure
- Vending management

Project implementation saves 85% of personnel and their expenses, 90 % of transportation costs, 25 % as financial revenue from pre-payment and 100% of non-collectable credits.

Adding up all these benefits, clearly, the system will amortize itself within a short period of time and it will be seen that, having a modern, economic and healthy solution won't be difficult.

Critical Success Factor for OSHEE to implement Prepaid Metering Project are:

- Know why you are implementing a prepayment system
- Customers should understand the prepaid meter service philosophy
- Set clear functional and technical specifications
- Set criteria for manufacturers to qualify for tender
- Validate and update customer database regularly
- Keep the implementation process simple
- Set a vendor selection criteria

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