PROSPECTS OF AUTOMATED SYSTEMS OF MONITORING AND METERING OF ELECTRICITY IN UZBEKISTAN

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Abstract. Today, each kilowatt-hour of electricity should be worth as much as it is, taking into account its cost and acceptable profitability, and should be purchased by consumers and market entities in the amount that corresponds to their needs and economic capabilities. . Implementation of this situation requires the establishment of an electric energy system (EES) and a system that collects, processes and transmits information to a suitable data warehouse at each consumer. Therefore, the essence of the new metering of electricity produced and consumed should be based on automated systems of energy metering, in particular automated systems of monitoring and metering of electricity in ASMM ASMM .

Key words: ASMM , electrical energy system, IES, transformer , substation .

ASMM is a high-tech solution to the problems of calculating the electricity sold and received among the entities of the electricity market (commercial aspect), as well as for the purposes of determining irrational losses and unaccounted consumption of electricity throughout the entire technological chain of the energy system and consumers. designed to solve the issues of controlling the transfer of energy as a commodity.

ASMM provides an opportunity to provide indirect management of energy consumption through tariffs, direct management of electric loads in cases of their limitation, as well as management of mode interaction with consumers. The creation of generation, transmission, supply, production and other ASMM groups provides an opportunity to involve a wide range of subjects of the entire "production-transmission- distribution-supply-consumption" technological chain to manage EES regimes [3].

In this regard, in 2002, the "Concept of creating an automated system of commercial accounting of electricity at Uzbekenergo in modern economic conditions" was developed and approved. According to the concept, ASMM and its modernized options should be considered a distributed multi-level system of measurement, processing, storage and commercial accounting data and should be built on the principles of open architecture and distributed operation. The documents describing the information reports on the interaction with electric energy meters, data collection and transmission devices should be available to operators of commercial electricity metering systems, as well as to the main operator [4]. It can be seen that the subject of such interaction in the production and use of electricity and power in the company is the functional branch (FB) of

"Uzbekenergo" "Energosotish". With the beginning of the reform of the energy industry of Uzbekistan, the following independent economic entities were formed :

- open joint-stock companies for electricity production (IES, IEM OJSC);
- open joint-stock companies of electricity transmission, distribution and sale (ES OJSC) ;
- unitary enterprises for electric power transmission "Uzelektramok", HPP cascades, etc.

The subjects of the energy system of Uzbekistan currently use energy facilities designed and built without taking into account the technical requirements related to the operation of electricity accounting systems in the conditions of the operation of the energy market. Therefore, the following specific features of electricity metering systems built before 1991 are characteristic:

- requires replacement of a significant part of electricity meters with outdated and modern multi-function meters;
- voltage losses in measuring circuits of voltage transformers exceed standard values;
- values of loads of current transformers and secondary circuits of voltage transformers do not MEES regulatory requirements;
- meters are not available at some points of purchase and sale of electricity , which is contrary to the requirements of regulatory documents on commercial accounting of electricity;
- commercial electricity metering devices are not installed at all points of purchase and sale of electricity (subjects are not within the limits of the balanced affiliation of electric networks);
- data on electric energy losses are formed in moral and physical outdated calculation methods with large errors in data transmission and transformation;
- electric meters, voltage and current transformers of low accuracy classes operating in the non-linear zone with low sensitivity in case of significant power drops are used in measurement systems;
- operational and synchronized time data collection on electricity production and consumption is not carried out;
- communication channels for transferring data from electricity metering points to data collection and processing centers usually have low transmission speed or are non-existent.

The lack of theoretical developments in the field of commercial accounting of electric energy leads to a whole range of interconnected organizational and technical problems of measurements, processing and transmission of their results, determining balance components (accounting indicators), execution of accounting. makes the review relevant [5].

Such an analysis allows to determine the ways of improving the technological support of the use of electric energy and, as a result, to improve the activity of energy distribution. In order to make the energy system work more efficiently and organize modern interactions, all subjects of interaction use electric energy. it is

necessary to organize accurate and reliable, time-differentiated electricity and power accounting of operational data on production, transmission and consumption. This can be done only on the basis of modern ASMM s, which are used in all EES entities that generate, transmit and use energy supply companies and electricity consumers [2].

The creation of an automated information measurement system for accounting of electricity on a commercial basis allows solving the following issues that are relevant for EES of Uzbekistan:

- ensure commercial accounting of electric energy (active and reactive) within the limits of the balance of power grids and its entities at each accounting point;
- determination of actual electricity (active and reactive) produced by producers in the time interval accepted for calculations ;
- calculation of actual volumes of electric energy (active and reactive) coming to subjects of interaction ;
- increase the accuracy, reliability and efficiency of obtaining information about the production, transmission and consumption of electricity ;
- ensuring synchronization of measurements at all accounting points;
- automation of data collection, transfer and processing processes of accounting instruments ;
- increase the operational efficiency of power production, transmission and consumption regimes management;
- determination and estimation of all component balances of electricity ;
- improvement of electricity supply calculations;
- formation of optimal economic relations between producers, suppliers and consumers of electric energy (power) on the principle of state regulation and competition.

In the process of building an automated accounting system according to the concept, it is necessary to solve a number of organizational, technical and financial-economic issues, in particular, the following issues:

 to determine the exact amount of electricity produced, transmitted and consumed in the part of data collection, transmission and processing, as well as in the part of forming and using information between subjects of production and use of electric energy (later mutually subjects of influence) development of rules of interaction;

 bringing the current regulatory documents, which clearly define the requirements for electrical energy measuring equipment, into line with international and state standards;

 development of methods of determination and relations of electricity loss between subjects of cross-border interaction according to territorial characteristics;

 introduction of the necessary changes to the project solutions related to the current norms, as well as the principles and rules of installation of electricity accounting systems;

 creation of a modern certification and metrological base in the process of operation, repair and service of meters, electricity metering systems, voltage transformers and current transformers at the production stage;

 development, preparation or purchase of reference devices for meter verification;

 creation of conditions for attracting investments and technologies to organize the general production of modern electricity metering systems and meters;

 to determine the sources of financing for the construction of ASMM s, subjects of interactions in the development and consumption of electricity .

Suppliers of electricity, on the one hand, and between the level of control systems, on the other hand, is important for the implementation of the above-mentioned issues . High-frequency communication channels on power lines , physical lines, dedicated and switched telephone channels, radio channels, optical fiber channels, satellite communication channels, etc. can be used as communication channels in ASMM . ASMM communication channels can be specially created or separated from communication channels intended for working with other technical systems of entities at the request of ASMM .

The analysis of the work of electric energy induction system meters used in the networks of the energy supply organizations of the Republic of Uzbekistan, carried out in the period of 1950-2000 , shows that these devices have the following shortcomings:

 low level of accuracy that does not mEES the requirements of the modern level (the average static error of the instruments with induction systems used is 10-12% towards the deficit);

 the possibility of unauthorized interference with the operation of counter mechanisms for the purpose of reducing the indicators and reducing the accuracy of operation;

 low sensitivity of induction system meters leading to different deficit values (both in the facilities of energy companies and in consumer networks);

 the increased prices of meter components necessary for restoration of serviceable devices working capacity in recent years (1998-2002) ;

 opportunities to falsify the readings of meters used in consumer networks in order to reduce the payment for the energy used.

In order to prevent the above- mentioned shortcomings, in order to improve the economic situation of "Uzbekenergo" JSC and energy supply organizations, it is necessary to carry out the following works step by step.

 for all categories of consumers - modern electricity metering devices that do not allow external intervention and allow automatic disconnection of consumers from electricity sources in case of overdue debts;

 In the enterprises of JSC "Uzbekenergo" - integrated systems for accounting for electric energy consumption, which ensure the remote accounting of

consumed electricity and timely and complete payments, their use and transportation in networks loss control.

In order to analyze the effectiveness of the use of introduced single-phase electronic meters, the consumers who are being studied have induction meters of 2-2.5 accuracy classes, about the level of change in electricity consumption in November 2008 compared to November 2007. information was used. It should be noted that the annual average values of electricity consumed in the period of 2004-2008 were determined at each enterprise of the electric network.

Analyzes show that after the introduction of modern electronic meters, the average consumption of electricity in single-phase networks increased by 25-30%, which showed the effectiveness of their use in household and small power consumers [1].

Thus, only in 2005-2008, more than 3 billion soums were obtained in the republic due to the introduction of modern accounting devices, which are the installation of ASMM elements in the sale of electricity to consumers in fixed volumes. The cost of installation of modern electricity meters at consumers was 95,000 soums for one point, taking into account additional devices for the purpose of ASMM -remote polling and influencing the meters.

and control of electricity consumption . Counters can be equipped with a disconnecting relay, differential current sensors and low-voltage modems for data transmission on the 0.4 kV network, according to the wishes and needs of the energy supply organization.

provide accounting and control of electricity consumption .

Taking into account the above, the following scheme of organization of accounting networks is implemented:

 meters should be installed in consumers in such a way that all consumers are supplied from this line or from the transformer substation. In multi- storey buildings, a compact is installed in one box, and energy is supplied to the consumer via an individual cable through the meter. Thus, the authorization of consumers to the meters is prevented, the authorization of the monitoring staff to the instrument indicators is facilitated, the next modification of the accounting system is being prepared for the automatic transmission of information in the energy supply organization;

 routers are installed in 0.4 kV transformer substations, and consumers connected to their network are directly connected to single- and three-phase meters of class 1.0, as well as "balanced" three-phase meters installed at the nodal points of the network provides meter services (inputs of multi-storey buildings and enterprises, connections of individual builders). "Balanced" three-phase meters of class 0.5 with transformer connection are installed in transformer substations ;

 data from the routers is transmitted to the district center of energy supply through appropriate communication lines, including the line using the city ATS network.

When the district center is located near the district substation, a 6-10 kV network can be used for data transmission. Reception, processing and storage of information is organized in the center, work with consumers is carried out. It is planned to install a mnemonic card device of the district for the convenience of using information, accepting solutions and controlling them. It displays operational information about accidents, network failures, disconnection and connection of consumers . The district center information is transmitted to the energy accounting center for further aggregation. In a similar way, information from the city center can be transmitted to the regional or republican center.

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