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Automated System For Commercial Metering Of Electricity In Uzbekistan

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***Abstract* —** *The Automated system for commercial metering of electricity(ASFCME), the prerequisites for creation, the main units are considered, the main problems are touched upon: the place of installation, the degree of accuracy of metering devices, the issue of quality and control of electricity, the accuracy of accounting for losses.*

Keywords — ASFCME, ASDC, energy metering, metering device.

Introduction

In connection with the transition to a market economy, it became necessary to improve the efficiency of energy consumption management, since this meets the economic interests of electricity suppliers and consumers. One of the directions for solving this problem is precise control and metering of electricity. It is this direction that should provide a significant part of the total energy saving, the potential of which is more than 1/3 of the total current volume of energy consumption. New economic relations in the field of energy consumption management are manifested in the formation of a single electricity market. Based on the foregoing, the electricity market should be a multi-component mechanism for coordinating the economic interests of electricity suppliers and consumers. One of the most important components of the electricity market is its instrumental support, which is a combination of systems, instruments, devices, communication channels, algorithms, etc. for monitoring and controlling energy consumption parameters [1]. The basis for the formation and development of instrumental support is the automated control and metering systems for electricity consumption.

Under the conditions of centralized planning of energy consumption by the state, the balance of economic interests of producers and consumers of electricity was reduced to the level of state plans, while the consumer had to receive the planned amount of cheap electricity at a convenient time. Therefore, the main purpose of the electric power industry was a reliable, uninterrupted power supply to consumers in the planned volumes. To achieve this goal, the process of production, transmission and distribution of electricity was controlled. The load was regulated by a direct control method at the request of government agencies and utilities. Under these conditions, electrical energy was considered, first of all, as a physical substance, therefore, the primary (and only necessary) means of energy consumption management) was the automated dispatch control system (ASDU), which plays the role of a regulator of electrical energy flows in the process of its production, transmission and distribution [2]. The need to take into account large flows of electricity during its export and during flows between power systems, interconnected power systems and at the scale of the Unified Energy System, necessitated the creation of local automated systems for measuring (monitoring) electricity (AEMS). During the transition to a market economy, electricity becomes a full-fledged commodity, an object of purchase and sale. Since the process of buying and selling is completed only after payment (sale), electricity as a commodity is expressed not only in quantity, but also in value. At the same time, the main market parameters are the amount of useful energy supplied and its paid cost, while the emerging retail and wholesale electricity markets are, in fact, a market for useful consumed electricity. The development of the electricity market based on the economic management method required the creation of full-scale hierarchical systems: automated electricity metering systems (AEMS), electricity consumption and sales metering (ASUPSE), dispatch control (ASDC), energy consumption control and accounting (ASFCME). The main feature of the economic management method is the consideration of energy consumption as the main link governing the electricity market, which in turn is represented by the totality of the actual technological process (production, transmission, distribution and consumption of electricity), the accounting and financial process of energy consumption, as well as the political and economic (reflecting the current policy in the field of energy use). This is the prerequisite for managing the electricity market by creating a unified, integrated energy consumption management system based on AEMS, ASUPSE, ASDC and ASFCME systems.

Materials and methods

The organization of the all-Russian wholesale and retail energy and capacity markets necessitates improving the accuracy and reliability of electricity metering by creating an industrial hierarchical system of AMR and its integration with banking systems to control and accelerate payments in the wholesale and retail energy and capacity markets.

The current state of technical means of electricity metering and equipping power systems with computer facilities create the prerequisites for creating an automated metering system that provides the delivery of the necessary commercial information in real time to all levels of management and banks serving them [3].

ASCE systems that automate control and accounting of energy and power flows in the power system are based on receiving information from electricity meters, collecting it, processing it and storing it at facilities using specialized microprocessor controllers with subsequent transfer of data from them via communication channels to processing centers

information and allow:

1) to provide legitimate and reliable information to commercial

settlements in the wholesale market for energy and capacity flows between entities in the UES of Uzbekistan, as well as commercial settlements with entities in the retail energy and capacity markets using economically feasible tariffs (differentiated, multi-unit, block);

2) to carry out accurate accounting and control of energy and power balances in uniform time phases for power system objects (power plants and substations), for nodes, DES, TES and the power system for RAO power grids;

3) make more accurate accounting and forecasting of the generation and losses of electricity in the power system, as well as specific fuel consumption and other technical and economic indications at the structural divisions of the power system;

4) exercise control and management of power consumption modes

management, including the control of contractual amounts of electricity and power consumption by large industrial enterprises on the basis of commercial, metrologically secured data and management of their load;

5) to ensure the automation of settlements for the supplied electricity with various groups of consumers, settlements with banking structures, as well as to carry out in real time the movement of payments and control over their passage through the machine-to-machine facility;

6) generate reliable and accurate data for production and statistical reporting on useful supplied and sold electricity, as well as analysis of power consumption modes by facilities, nodes, districts, power systems, interregional power grids of radioactive waste, power system interconnections and radioactive waste in general;

7) create an information base to improve the efficiency of the use of fuel and energy resources, energy saving and rational use of energy in energy systems and among consumers.

Discussion

The AMR systems are based on the following basic provisions:

1) the initial information for the systems should be the data received from the energy sensors;

2) systems installed at facilities should be created as settlement (commercial) systems using the same sets of technical means for settlement and technical accounting;

3) collection, processing, storage and delivery of information about energy and power at facilities should be carried out using metrologically certified devices and systems that are protected from unauthorized access and certified for commercial calculations;

4) systems for collecting and transmitting information (SSPI) ASFCME should, if possible, be combined with SSPI of automated dispatch control systems of the association;

5) information about electricity and power generated and circulating in ASUE systems of all levels should be linked to a single astronomical time of its formation and provide uniform time in general.

The main level at which the collection and processing of information about energy and power from all AMR facilities, regardless of their belonging, is carried out, is the level of the power system, which in turn has its own hierarchy:

1) the level of enterprises of electrical networks and energy sales;

2) the level of the areas of electrical networks and areas of power sales

(this level is created taking into account expediency);

3) the level of ASFCME facilities - power plants and substations, as well as

the same consumers of electricity (industrial and similar enterprises, agricultural, municipal and other consumers).

The ASFCME means include:

1) induction and electronic meters of active and reactive

energy, supplemented or with built-in electronic meters) pulse sensors;

2) information-measuring systems and devices for collecting and transmitting data, ensuring the collection, processing, storage, storage and transmission via communication channels to the corresponding centers for the collection and processing of information about the consumption of electricity, power at controlled points at the AMR facilities;

3) technical means of a system for collecting and transmitting information from information-measuring systems to information processing centers, including communication channels, modems, signal switching devices, etc .;

4) computer facilities for objects and information processing centers of ASFCME and machine-to-machine information exchange between the levels of the ASFCME hierarchy.

Dedicated workstations or personal computers are used as computer equipment for processing information ASFCME at large power plants and substations, as well as centers for processing information about energy and power in electrical enterprises (areas of electrical networks) and in the power system as a whole. , standard configuration and designed for round-the-clock operation, as a rule, connected to local local networks [4].

Creation of ASFCME together with the use of more accurate measuring instruments would allow to get rid of many of the disadvantages inherent in existing electricity metering systems.

In the ASFCME system, the readings of all measuring instruments are taken at the same time. This allows you to avoid significant errors in the metering of electricity due to the difference in timing of readings of measuring instruments.

The use of electronic meters with a high accuracy class also contributes to an increase in the accuracy of electricity and power metering. Currently, the imbalance between the supplied and consumed electricity often reaches 20 ... 25%. By excluding or significantly reducing with the help of ASFCME from such an imbalance the share that may be due to the error in measuring electricity, it is possible to look for sources of various kinds of losses and take adequate measures to limit them.

A very positive effect can be brought about by the introduction of ASFCME at the level of household and socially-communal consumers4) computer equipment for objects and information processing centers ASFCME and machine-to-machine information exchange between the levels of the ASFCME hierarchy.

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A very positive effect can be brought by the introduction of ASFCME at the level of household and socially-communal consumers. This will significantly streamline the system of settlements with them, as well as receive accurate information on energy consumption. Accurate and domestic information about the electricity consumed by household consumers contributes to the rapid identification of places where electricity is stolen, the bulk of which falls on this particular group of consumers [5].

Conclusion

The introduction of ASFCME would improve the accuracy of metering electricity losses. As mentioned above, when calculating the values of technical losses of electricity, the distribution of the load between consumers is conventionally assumed to be the same as on the day of control measurements (the "Crown" program) or in proportion to the power of the installed transformers , which is not entirely fair. Real-time information about the distribution of the load between consumers would allow to increase the accuracy of calculating electricity losses.

Based on the foregoing, the following conclusions can be drawn.

1. The introduction of automated control and accounting systems in power systems allows:

- to improve the accuracy, efficiency and reliability of metering of electricity and power consumption;
- to carry out operational control over the modes of power consumption, including control over the agreed values of electricity and power;
- promptly impose sanctions on enterprises for exceeding contractual and permitted capacity values.

2. The introduction of ASFCME at industrial enterprises makes it possible for the power system to:

- to carry out in an automated mode tight control over the consumption of energy and power by subscriber enterprises;
- organize the shutdown of violators of the regime;
- make payments for consumed energy and power;
- to impose penalties on enterprises in case of exceeding

their negotiated values.

This gives not only an economic effect, but also increases the responsibility

the awareness of consumers for the use of energy encourages them to carry out energy-saving measures in order to reduce energy consumption.

References

[1] Mirzaev, Uchkun and Abdullaev, Elnur, Mathematical Description of Asynchronous Motors (April 15, 2020). International Journal of Academic and Applied Research (IJAAR), 2020, Available at SSRN: https://ssrn.com/abstract=3593185 or http://dx.doi.org/10.2139/ssrn.3593185

[2] Mirzaev, Uchkun and Abdullaev, Elnur, Experiment of Open-circuit Voltage in 'EPH 2 Advanced Photovoltaics Trainer' Laboratory and Types of PV Cell (April 30, 2020). International Journal of Engineering and Information Systems (IJEAIS) Vol. 4, Issue 4, April – 2020, Pages: 41-46; ISSN: 2643-640X, Available at SSRN: https://ssrn.com/abstract=3623014

[3] Mirzaev, Uchkun and Abdullaev, Elnur, Study of the Electrical Characteristics of a Solar Panel for Multi-Residential Apartments Using a Computerized Measuring Stand 'Eph 2 Advanced Photovoltaic Trainer' (2020) . International Journal of Academic Engineering Research (IJAER) ISSN: 2643-9085 Vol. 4, Issue 4, April – 2020, Pages: 59-61 , Available at SSRN: https://ssrn.com/abstract=3622045

[4] Mirzaev, Uchkun, Experiment of Open-circuit Voltage in 'EPH 2 Advanced Photovoltaics Trainer' Laboratory and Types of PV Cell (April 30, 2020). International Journal of Engineering and Information Systems (IJEAIS) Vol. 4, Issue 4, April – 2020, Pages: 41-46; ISSN: 2643-640X, Available at SSRN: https://ssrn.com/abstract=3623014

[5] Mirzayev, U. and Tulakov Jakhongir Turakul ugl, J. T."THE MODERN METHODS OF USING ALTERNATIVE ENERGY SOURCES" // Central Asian Problems of Modern Science and Education: Vol. 4 : Iss. 2 , Article 165. 19-29 Pages

[6] Acarnley PP. Stepping Motors: A Guide to Modern Theory and Practice. 4th ed. London, IET; 2002. Pages: 85-86

[7] Saodullaev, Abror, Classification of Transformers (September 30, 2020). International Journal of Engineering and Information Systems (IJEAIS) ISSN: 2643-640X Vol. 4 Issue 9, September – 2020, Pages:46-51, Available at SSRN: https://ssrn.com/abstract=3794637