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Progress of Complexes of Local Emergency Control Automation

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1 INTRODUCTION

Analysis of progress of complexes of local emergency control automation (ECA) should be done in the context of microprocessor-based devices used in the power industry as a whole. Considering the complexes of local ECA as a subclass of a broader class of microprocessor-based devices used in power industry, can do more detailed analysis of various aspects of the progress of modern complexes of local ECA. Among the aspects considered – hardware, software, algorithms of emergency control automation, digital input/output, and the process of commissioning.

2 PROGRESS OF COMPLEXES OF LOCAL EMERGENCY CONTROL AUTOMATION

2.1 Hardware

Recent achievements of the element base have an influence on the development of microprocessor-based devices that use in power industry.

The basic characteristics of systems of local emergency control automation like reliability, performance, usability, takes a turn for the better, thanks to new element base.

Need to note a growing characteristic of PLD. This gives a new features to systems of local emergency control automation.

In the field of communications equipment, the trend large manufacturers are development and supply highly reliable and high-performance solutions for the needs of energy.

Note, that the all recent achievements of hardware are actively applied and used for the needs of the systems of local emergency control automation.

2.2 Software

Software of modern complexes of local ECA, in recent years, has undergone substantial modification. It is connected first of all with introduction of standard IEC 61850 [3,4,5].

To meet the standard IEC 61850, vendors modify the existing software of microprocessor-based devices. In addition, appears new software of different vendors which is designed to ensure correspondence with standard IEC 61850 processes such as commissioning, engineering, configuration of devices.

Thus, we can conclude that the software of microprocessor-based devices recently developed fast enough.

2.3 Algorithms of emergency control automation

Algorithms of emergency control automation are constantly being improved and upgraded. It is connected with the specifics of the issues solved by emergency control automation, as well as the ever-increasing demands to a complex of local ECA from customers.

However, it should be noted, that changes of the algorithms of ECA to have are largely local in nature and are related to adaptation of algorithms for energy facilities, or are related to refinement of existing algorithms to improve the reliability of their work. Mathematical apparatus of algorithms no changes were undergoing.

Algorithms of local ECA, which would use a new fundamentally different mathematical technique, have not recently appeared. While opportunities exist for this. Such opportunities provide IEC 61850 standard, is constantly evolving hardware and communications equipment.

2.4 Digital input/output

One of the areas of microprocessor-based devices, which received the greatest development in recent years this, is the digital input-output data.

It is connected first of all with introduction of standard IEC 61850.

Digital input/output data used in systems of relay protected and ECA of power industry before, but it was only due to the transfer of data from the devices in the SCADA-system for protocols such as, for example, as IEC 870-104 or OPC DA. Digital input is used very rarely and in very specific cases.

IEC 61850 provides a qualitatively new level in the transmission and digital signal processing. It provides an opportunity to devices from different vendors to share digital information in real time.

In recent years gained wide experience of operation of devices that support digital input/output data in accordance with IEC 61850. Identified numerous difficulties in the practical implementation of IEC 61850 standard that are described in detail in various publications, in particular in [2].

Many of the difficulties, related with practical application of IEC 61850 standard, was solved. A very important event in this area can be considered an event UCA Interoperability Test 61850 (UCA IOP), elapsed from March 28 to April 1 in Paris, France on base company EDF R&D. The purpose of this event - find out in practice, the degree of interoperability of devices from different vendors. To this end, the world's largest vendors, including from Russia, brought their microprocessor-based device of RP and ECA. Collected in one place devices from different vendors participated in a variety of tests for interoperability with use protocols GOOSE-messages, MMS, and Sampled Values. In addition, the devices were tested for correspondence with the protocol of time synchronization (SNTP).

Testing results indicate that the tests were successful. Devices which participated to test to meet the standard IEC 61850 have a high degree of mutual interoperability.

Note that this was possible because the vendors of the equipment of RP and ECA over the last year or two removed the shortcomings and led their equipment in correspondence with the standard IEC 61850.

In addition to equipment vendors RP and ECA, in tests participated the world's leading vendors of communications equipment for power industry. With the help of their equipment was built tire process according to IEC 61850, which has been tested in various topologies and emergency situations. The test was successful, however, the process of constructing process bus with communications equipment from different vendors took a long time, and it was brought to the attention.

As a whole results UCA IOP are recognized by successful. Thanks to them, it can be argued that at present one of the main difficulties, interoperability of devices from different manufacturers - have successfully overcome.

2.5 The process of commissioning

In recent years, IEC 61850 was the main factor determining the development of process of commissioning of devices of RP and ECA. A Large number of software and hardware-software solutions for testing devices in accordance IEC 61850 were presented at the UCA IOP Testing in Paris. The software and hardware-software testing tools are simplify the process of commissioning. These tools were involved in testing interoperability on a par with the devices of the RP and ECA.

3 PROSPECTS

As a conclusion, complexes of the local PA have been developed in all aspects that were considered. In addition, it should be noted a great influence IEC 61850 on the development of devices RP and ECA as a whole.

In recent years, the main factor determining the development of complexes of local emergency control automation is the standard IEC 61850. Currently, work is underway to further the learning of IEC 61850. So that in the near future standard IEC 61850 will continue to influence the development of systems of local emergency control automation. Development of hardware, communication equipment, active development of the concept of Smart Grid technologies and WAMS\WACS, all combine to have a large impact on both microprocessor-based devices used in the power sector in general and in the systems of local emergency control automation in particular.

REFERENCES

- [1] Бородин О.С., Копылов П.А., Иванов Ю.В., Леснов А.Е., Апросин К.И. Противоаварийная автоматика энергосистем, современные технические решения. Стандарт IEC 61850 и его влияние на функции релейной защиты и противоаварийной автоматики // Энергетик. 2009, № 9.
- [2] Бородин О.С., Иванов Ю.В., Леснов А.Е., Апросин К.И. Практический опыт применения и реализации стандарта МЭК 61850 в устройствах противоаварийной автоматики ООО «Прософт-Системы». Современное состояние и перспективы // Автоматизация и IT в энергетике. 2009, №1.
- [3] IEC 61850. Part 8-1: Specific Communication Service Mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3.
- [4] IEC 61850. Part 9-1: Specific Communication Service Mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link.
- [5] IEC 61850. Part 6: Configuration description language for communication in electrical substations related to IEDs.