AUTOMATIZACIJA SISTEMA ZA DALJINSKI MONITORING I KONTROLU ENERGETSKIH PREKIDAČA

AUTOMATION OF SYSTEMS FOR REMOTE MONITORING AND CONTROL OF POWER SWITCHGEAR

Ivan POPOVIĆ
Innovation center of School of Electrical Engineering in Belgrade, Belgrade
School of Electrical Engineering, University of Niš, Niš

У овом раду пројектован је систем за аутоматизацију даљинског надзора и управљања електроенергетским објектима на средњенапонској дистрибутивној мрежи на територији ЕД Нови Сад. Сврха пројекта је повезивање свих енергетских објеката у јединствен и целовит систем. На основу овог рада Инвеститор је могао да приступи реализацији реалног система на енергетској мрежи.

Кључне речи: *Енергетски расклопни елементи, даљински надзор и управљање, дигитални радио пренос.*

In this paper, a system for automation of remote monitoring and control of electric power facilities on the medium voltage distribution network on the territory of ED Novi Sad is designed. The purpose of the project is to connect all energy facilities into a single and complete system. Based on this work, the Investor was able to approach the realization of a real system on the energy network.

Key words*: Power switchgear, remote monitoring and control, digital radio transmission.*

1 Introduction

In order to modernize existing distribution system and make it less sensitive to power supply interruptions electric distribution company of Novi Sad, department of Subotica installed system for remote monitoring and control of substations on their medium voltage network. This system consists of control center, automated substations and pole mounted switchgears and radio system which provides communication between control center and remote substations. The implemented system is used to remotely monitor and control equipment across a large geographic area within the cities of Subotica, Bačka Topola, Senta, Kanjiža and rural communities.

Telecommunication network is divided in 7 remote sub-systems. Each subsystem consists of data concentrator, automated substations, and radio network . Radio network equipped with digital packet radio modem. To meet all communication needs, DNP3 protocol is used.

Communication between all 7 remote subsystems and SCADA system located in Dispatcher center in Subotica is done by microwave links. Communication between substations and data concentrator in one subsystem is realized at UHF frequency.

The dispatcher receives information about the statues from each automated substation. He also gets an alarm when a malfunction occurs. Based on the time of the malfunction and the sequence of events, it is possible to determine what caused the fault.

Data transmission speed via radio in narrowband digital radio system in licensed frequency band 430-470 MHz is at least 9600 bp/s with a channel width of 12.5 KHz. The BER (bit error rate) of a narrowband radio system is at least 10-6. The bit rate of transmission in broadband radio data transmission is 10Mbps with user-configurable channel width from 7-56 MHz.

The purpose of the project is to connect all energy facilities into a single and complete system. Based on this project, the Investor will be able to access the implementation of the system for remote monitoring and management and to obtain licenses for the operation of radio stations by RATEL.

The goal of automating the medium-voltage distribution network is that the dispatcher from the dispatch center can monitor and manage all energy facilities that are connected to the system for remote monitoring and management. The dispatch center uses a SCADA server through which

they issue commands to energy facilities and on which measurements and conditions on the facilities are monitored. Automation includes different types of energy facilities: substations, reclosers, disconnect switches and line disconnectors. In order to connect the facility to the remote monitoring system, a packet radio modem is installed. Through this radio modem, the device that

is automated can communicate with the server in the dispatch center. The device can send analog and digital measurements and statuses, while the dispatcher can also issue commands remotely to manage the energy facility [1].

2 System organization

The entire system for remote monitoring and management within the ED Subotica branch is divided into 7 independent subsystems. Radio communication is hierarchically divided into two levels. In the lower level, radio communication is carried out between energy facilities and the control center within one subsystem. At a higher level, radio communication is carried out between control centers in different subsystems. Within each individual subsystem there is a device, a data concentrator, which controls and manages the radio connection with energy facilities within that system. Radio communication is carried out directly from the energy facility to the control center, without using additional repeaters. At this level, radio communication will be realized in licensed UHF frequency range [2]. Control centers will be set up in the following locations: ED Subotica, Senta, Kanjiža, Bačka Topola, 110 kV Kula substation, substation 110 kV Bajmok and substation 110 kV Ada.

Communication between control centers will be realized by broadband microwaves links in the licensed range. All control centers will be linked so that there will be communication from the dispatch center in Subotica with everyoneenergy facilities in all subsystems.

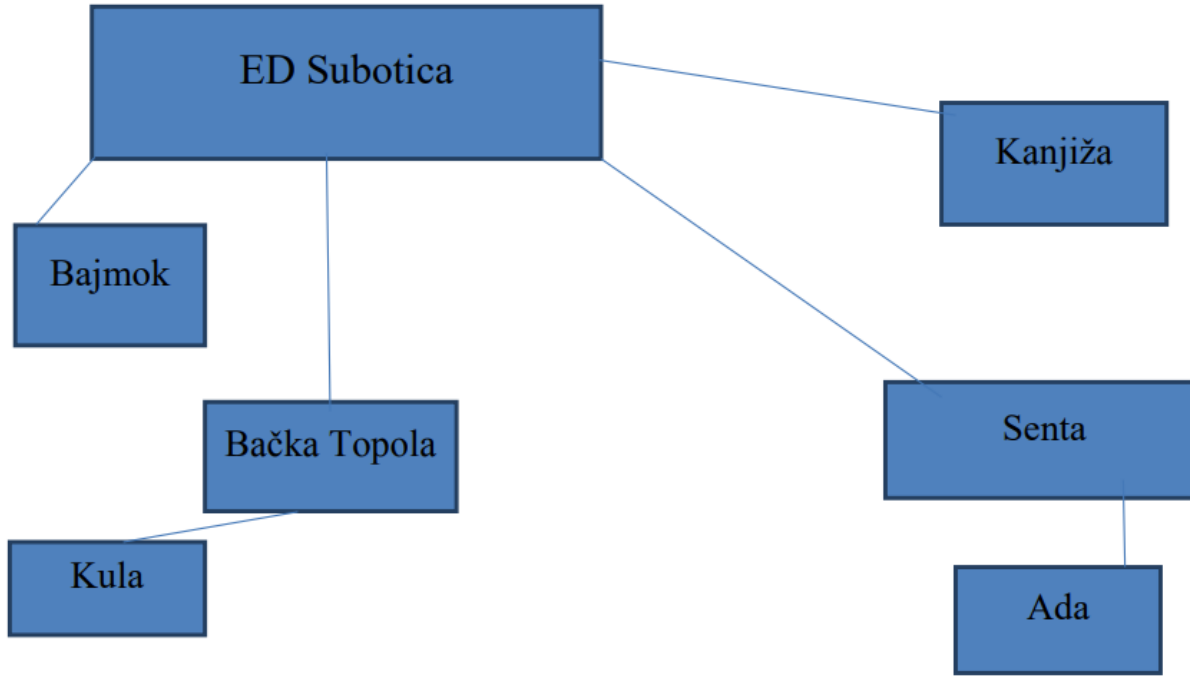

Figure 1 - Communication between different subsystems

SENTA

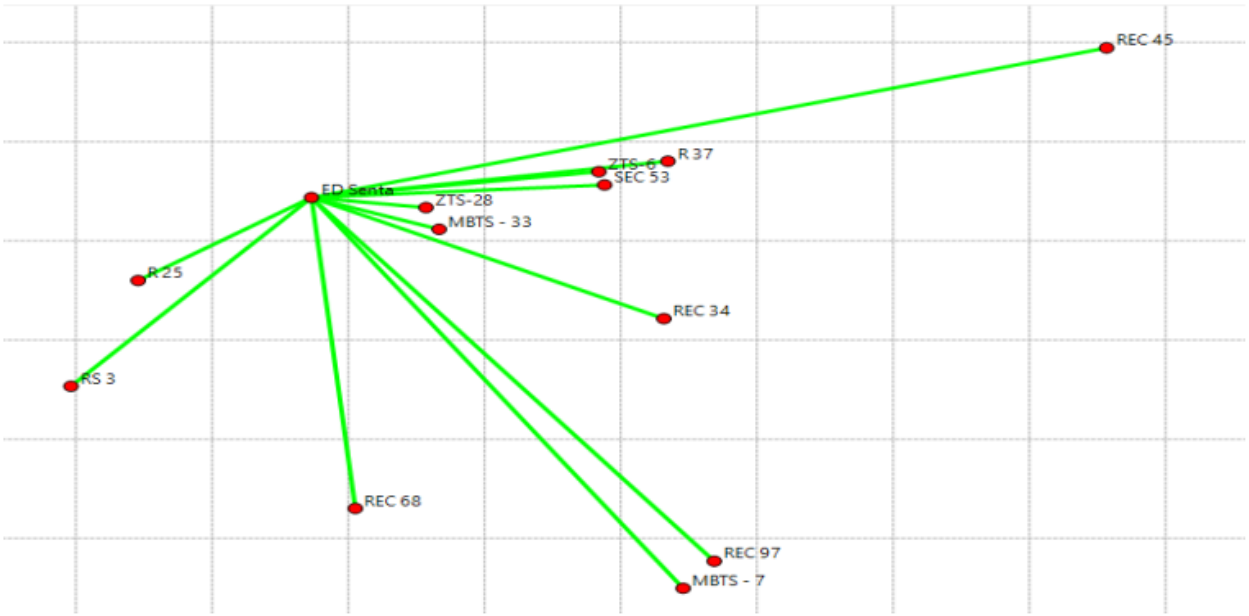

Figure 2 - Communication in subsystem Senta

3 Conclusion

By modernizing electricity distribution network of Subotica, a lot of benefits are achieved:

- Fast and reliable fault localization and isolation
- Transmission of multiple analog and digital parameters
- Redundancy in communication
- Increased reliability in data transmission
- High degree of future expansion possibilities

In the future, this system could be expanded up to 1000 automated substations and divided in more than 10 different subsystems. Using microwave links, it can be integrated with Motorola system for voice communications.

4 Acknowledgement

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5 References

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