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Design of Distribution Automation System with SCADA

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ABSTRACT

The electric power distribution network, an essential section of the electric power system, supplies electrical power to the customer. Automating the distribution network allows for better efficiency, reliability, and level of work through the installation of distribution control systems. Presently, research and development efforts are focused in the area of communication technologies. An electrical power system consists of generators, transformers, transmission lines distribution lines etc. The aim of this project is to design real time visualization, monitoring and controlling of electrical distribution system using SCADA. All the equipment must be visible, all the parameters must be measured and if any fault or abnormal condition occurs in distributed feeders then it should be discriminate from healthy part of power system. It increases reliability of power system. The goal of this project is to provide a better understanding of the design challenges of electric distribution line monitoring system and identify important research in this increasing important field.

I.INTRODUCTION

The fundamental role of protection is to protection the entire system to maintain continuity of supply by detecting faults and to minimize damage to equipment. A good safety system must ensure system reliability through the operation of the protection system for all types of faults in all locations in the network. The system must be dependable and secured. In a power distribution network, fault can occur due to overloading, overvoltage, power swings, etc. When a fault occurs, protection equipment initiates operation of circuit breakers, to reenergize the faulted part. Generally, circuit breakers serve as one of the primary devices in the network protection scheme against faults. This protective action must be done before excessive currents and voltages cause damage to connected equipment, such as transformers. Fault detection and location and classification have been a goal of power system engineers since the creation of distribution and transmission systems. Quick fault detection can help protect equipment by allowing the disconnection of faulted lines before any significant damage is done. SCADA technology has been matured enough now due to advances that has taken place in semiconductor technologies & telemetric. In this Project, the discussion is limited to Distribution Automation Systems. The early SCADA systems were built on replicating the existing system remote controls, lamps, and analog indications at the functional equivalent of pushbuttons, often placed on a mimic board for easy operator interface. The SCADA masters simply replicated point-for-point, control circuits connected to the remote, or slave, unit. At the same time as SCADA systems were developing, a parallel technology on remote teleprinting was taking shape. The invention of the "modem" (Modulator / Demodulator) allowed digital information to be sent over wire pairs which had been engineered to only carry the electronic equivalent of

human voice communication.. The goal of Advanced Distribution Automation is real-time adjustment to changing loads, generation, and failure conditions of the distribution system, usually without operator intervention. Presently the distribution utilities across the world are either implementing or have implemented distribution automation solutions for fulfilling one or more of these business objectives:

- Better monitoring & control of their distribution assets
- As part of their Smart Grid compliance put by the regulation

SCADA systems are globally accepted as a means of real-time monitoring and control of electric power systems, particularly for generation, transmission and distribution systems.

II.RESERCH METHEODOLOGY

By observing the voltage and current signals of a feeder line in distribution substation, one is able to identify the existence of faults in the system. These signals are also used to identify, locate and classify faults and based on these observations the faulted line is isolated. The project is consisting of the following stages.

I. The Fault Detection.
II. Measurement of currents and voltages at each feeder of the network

In order to perform the above tasks, the module of the data collector device was designed and simulated in SCADA and this provides a convenient means of modeling the feeder line.

III.OPERATION OF DISTRIBUTION SYSTEM IN SCADA

Table 1 shows the operation of feeder in normal operating condition ,in this the load connected to the respective feeder operated normally means the circuit breaker connected to the feeder line 1 , feeder line 2,feeder line 3 are normally open fig.1 shows the output on scada display. A overload condition the respective feeder share the another feeder so that load will continuously in operating condition table 2 shows the status of feeder at overload condition and fig 2 shows the scada display at overload condition

Feeder	Load Status	Measurement		
		Voltage(Volt)	Current (A)	Power (Watt)
1	ON	415	10	4150
2	ON	415	10	4150
3	ON	415	12	4980

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Table 1: Normal operating condition

Feeder	Load Status	Feeder Status	Load Shared by Feeder	Measurement		
				Voltage(Volt)	Current (A)	Power (Watt)
1	ON	Normal	-	415	30	12450
	ON	Overload 1	Feeder 2	415	35	14525
	ON	Overload 2	Feeder2 & Feeder3	415	62	25730
2	ON	Normal	-	415	30	12450
	ON	Overload 1	Feeder 3	415	35	14525
	ON	Overload 2	Feeder1 & Feeder3	415	62	25730
3	ON	Normal	-	415	30	12450
	ON	Overload 1	Feeder 1	415	35	14525
	ON	Overload 2	Feeder1 & Feeder3	415	62	25730

Table 2: Overload operating condition

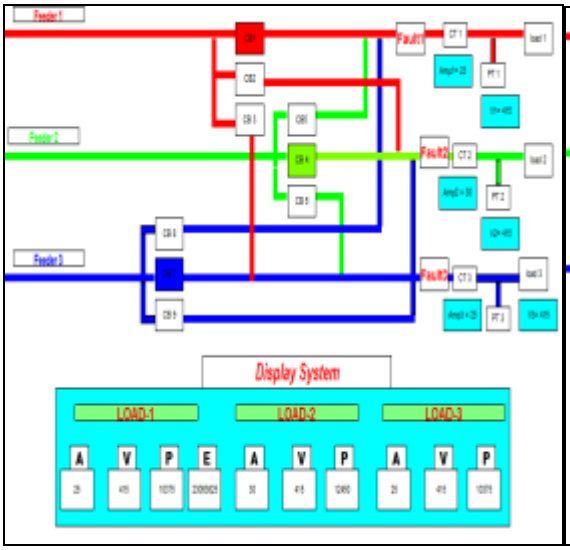

Fig.1: Normal Operating Condition

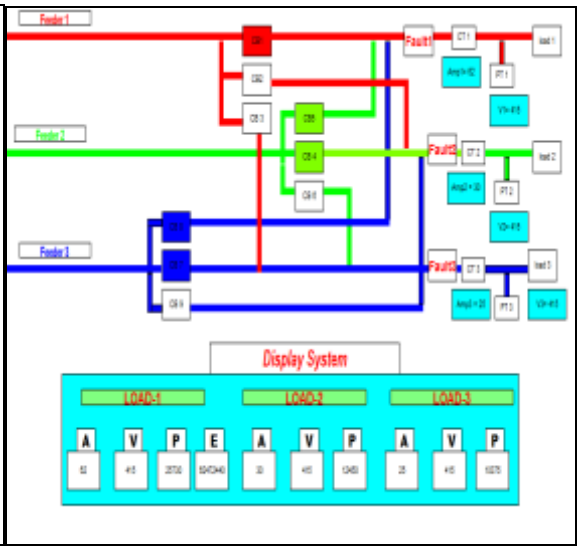

Fig.2: Overload Operating Condition.

IV.CONCLUSION

Many technical issues affect the cost-benefit analysis of implementing different types of distribution automation functions. However, some of the technologies for meeting those requirements have universal themes that present the key challenges to implementing automation. The development of Distribution Automation Scenarios, based on both secondary and primary DA functions, allows utilities to understand both the benefits and the challenges involved in implementing these functions. Primary functions typically require heavy capital expenditures to implement equipment, communication, and data infrastructures whose payback can only truly come when one or more secondary functions utilize these infrastructures. Therefore, using this approach permits utilities to fully appreciate the need for a comprehensive, multi-function approach to distribution automation. The cost and other challenges of implementing the primary functions may be daunting. In this project we have presented a design of a system based on SCADA environment that is used to monitor and control the voltage, current and power factor and different powers at different position of a distributed network. The proposed system which has been designed to monitor the electrical distribution system's essential parameters continuously monitors the parameters throughout its operation. If the proposed system recognizes any increase in the level of voltage, current values the unit has been made shutdown in order to prevent it from further damages. The system not only controls the substation by shutting it down, but also displays the values throughout the process in the form of digital display. This claims that the proposed design of the system makes the distribution network more robust against some key power quality issues which make the voltage, current to peak. Hence the distribution is made more secure, reliable and efficient by means of the proposed system.

V.FUTURESCOPE

The future promises more advanced control algorithms to accommodate distributed generation and provide security assessment, demand management, and other valuable functions in distribution networks.The system can be used to create an ideal image for the existing substation to improve the performance.

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