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Article

Voltage Regulation of DC Microgrid using PLC and SCADA

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A B S T R A C T

Electric power distribution is an essential part of electrical structure. Microgrid are low voltage distribution network comprising various Distributed Generators (DG), storage devices and administrable loads that operates interconnected. Microgrid are now becoming an alternative solution for the future structure. Microgrid provide adjustability to the distribution system operator. The controller that we are using helps to optimize the operation of microgrid during interconnected operation. Operation of DC microgrids are important for power control and power sharing between diverse types of loads. In this paper we are using programmable logic controller for shifting of loads and scada will be preferred for monitoring the system.

Keywords: Plc and Scada, Microgrid, Distributed Generator (DG), Interconnected, Load sharing

Introduction

The word automation means doing the specific work automatically in a sequence with quick operation rate. This desires the use of plc together with scada and relevant software programming. Application of computerization in microgrid can be defined as automatically monitoring and shifting operation through plc and scada and maintain operating condition back to normal operation.[1-5]

A microgrid is defined as a self-reliant distribution network comprising various DGs,energy storage systems, and manageable loads.[1] The DC microgrid concept has introduce as the more suitable linkage concept for DC loads and DC outputs DGs,such as photovoltaic systems,fuel cells and batteries. The DC/AC and AC/DC modification systems required in AC microgrid can be exclude in DC microgrid. Therefore, the adaptability of energy conversion is growthd, and the employment cost and system size are reduced. Additionally, synchronization and reactive power problems, which are inherent drawbacks of Ac grids and do not occur in a DC grid.[2,3] The microgrid concept naturally arose to cope with the penetration of renewable energy sources which can be realistic if the final user is able to generate, store, control and manage the part of energy that it will consume.[4] The power connection between microgrid components that is distribution generation sources, storages and load, can be done through direct current link. In this paper a DC link microgrid is considered,with emphasis on its control and load associated grid in islanded operation mode.

Microgrid Concept

Due to the ever increasing demand for high quality and safe electric power, the concept of distributed power generation and energy storage has appeal far reaching study in modern years. Distributed Generation and storage system includes of comparably small scale generation and energy storage devices that are accommodate with low or medium voltage distribution structure through power converter and can balance the regional power utilization,or even send out power to the challenging structure if there generation

exceeds the regional utilization. An upcoming theory of operation which is conventional to build the utilization of distributed od the energy storage is known as the microgrid concept.[6-10]

Main advantages of microgrids are high energy enactment, high aspect and accuracy of delivered electric power, more adjustable power structure operation and environmental and cost effective.

Microgrid Load Management

So,how we apply this concept to a community microgrid? we must keep in mind that a "micro"-grid has all of the properties of the "Big" grid on the small scale. Here's how we can apply the principle of large grid to community microgrids.

Load Measurement

Real time data from distributed generation and from Ties to main grid, combined to give flawless picture of power dispatched to community microgrid.

Load Management

In the large scale grid, load organization is mainly last emergency plan. For a community microgrid,load management has becomes a abundant additional diagnostic function as there is lesser pool of generation possessions to support the island operation.[11-15]

Managed Load within The Microgrid Can Change From

individual customer or group of customers to particular appliances and systems within the customers premises. since the overall intent of community microgrid is to provide reliable electric service to the customer,with improved efficiency, the selection of specific managed loads must be done to provide the required system flexibility with minimum unsuitableness to the consumer.[16-20]

Organization of loads

load 1 (must run)

The load which must not be disconnected in any condition

load 2 (discretionary load)

load that can be disconnected for a short period of time to reduced load peaks, or to shift them.

load 3 (emergency load)

These are loads shed in emergency. This loads will be shed only in emergency to protect the microgrid stability to avoid the blackout.

Load Management on Microgrid using PLC and SCADA :

PLC

PLC is a device which is arrange to perform the logic functions.In the past times these spent are accomplished by relays, timers etc. These are large structure, chances of mistakes are maximum and if the error occurring in these structure.This difficulty is overcome by PLC.PLC stands for programmable logic control. For automation control of Machines the firstly make the program in the software. PLC can run many multi tasking if there working process is same. The PLC has ability for handling many input and output signal.[21,22]

SCADA

SCADA is define as supervisory authority and data acquisition. The severe function of the SCADA structure is the assembly of the data and control in the supervisory level.There are multiple types of software for the SCADA structure;some are used for the data acquisition and not for authority the process in a real time but there are separate automated .

We are representing two supply connected to microgrid and a battery backup is connected to grid and loads are also connected to grid. When the input of supply that is generated energy from solar or wind is not sufficient to fulfill the needs of loads then battery can supply the energy to the grid with the help of switching operation and grid mainly operates on the DC supply. The output of the supply is also DC and loads are operated on DC.

Conclusion

The microgrid Load conserve System plays a main role in maintaining the necessary balance between load and generation capacity during island operation, and also make available fixed solutions for emergency that can occur during grid-paralleled operation. Preselected and load reduction calculations based on constantly updated active load computation allows the microgrid to perfectly and smoothly make load reductions when events require it, with a less of customer difficulty. Binary determination of load status is an not exclusive and easy another to analog data collection methods that would be more exclusive to applied, and require greater connection bandwidth. As microgrids grow from the single-user/campus model to true many users community systems, a uniform approach to load management that integrates commercially available smart grid technology becomes increasingly essential to reliable operation. Load management, while important, would be approximately transparent to the end user of

the power. Ideally, the microgrid load planned system ought to have diminutive or no visible influence to the consumer. Upcoming technologies that allow for wireless monitoring and control of loads have the greatest chance for accept customer.[23,24]

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