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Modeling and Analysis of Load Flow Analysis across Solar Power Generator

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Abstract- For problem of load flow and power flow analysis is variable stability index. Also, arrangement of different bus system and fault tolerance occurrence across the load. In this case, resolution of power quality and improvement of power distribution performance apply islanding protection method. This paper is resenting result and simulation section arrangement of 9 bus system and Reducing Fault effects.

Keywords- Active and passive islanding detection, Load flow analysis, line and bus parameters, voltage stability index.

I. INTRODUCTION

With larger portion of growing electricity demand which is being fed through distributed generation (DG), the concept of micro-grid has been introduced as one of the most promising technologies to modernize current power system. Being able to operate in both grid-connected and islanded mode, a micro-grid manages and controls distributed energy resources, energy storage systems and loads, most of them are power electronic system interfaced, in a coordinated and hierarchical way [1], [2].

Similar to the bulk power system, the steady-state power flow analysis plays a very important role for the planning and operational stages of the micro-grid in terms of systematic analysis, protection, coordination design, network optimization and optimal operation, and so on, which requires more investigation when applied to the micro-grids, especially during islanded operation mode.

Recently, in order to address the power flow analysis problem in micro-grids and islanded power system, a lot of state-of-the-art work has been done [3]−[6]. Most of the previous work is based on conventional power flow method using conceptual PQ, PV and slack buses. However, it has the limitation that when analyzing an islanded micro-grid, there is no such a slack bus which is able to maintain bus voltage and system frequency constants. Instead of assuming one slack bus in the model, in [4]−[6], power flow analysis methods adopting the droop equation constrains in DG units modeling were presented.

II. DISTRIBUTED ENERGY RESOURCES AND MICROGRIDS

DG technologies typically include wind turbines, solar photovoltaic (PV) systems, fuel cells, small hydro, micro turbines and other cogeneration plants. These DGs along with distributed storage systems such as batteries, super capacitors have formed the concept of distributed energy resources (DERs) which are usually connected to the medium voltage (MV) or low voltage (LV) grid within the distribution system.

DERs are being increasingly integrated as a means of power supply into the distribution system as opposed to reliance on bulk supply points from traditional centralized power plants.

III. SOLAR POWER GENERATION

Solar power generation is the process of converting sunlight into electrical energy using solar photovoltaic (PV) cells or solar thermal systems. It is one of the most popular and cleanest forms of renewable energy.

Types of Solar Power Generation:

- **Photovoltaic (PV) Systems:**
- Use solar panels made of semiconductor materials (like silicon).
- Convert sunlight directly into electricity using the photovoltaic effect.
- Common in homes, industries, and solar farms.
- **Solar Thermal Systems:**
- Use mirrors or lenses to concentrate sunlight.
- Convert sunlight into heat to produce steam and drive a turbine-generator.
- Used in large-scale power plants (CSP – Concentrated Solar Power).
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IV. LOAD FLOW ANALYSIS

Load Flow Analysis, also called Power Flow Analysis, is a fundamental tool in power system engineering used to determine the voltage, current, real power (P), and reactive power (Q) at different points (buses) in an electrical power system under steady-state conditions.

Formal Definition:
Load flow analysis is the process of computing the voltage magnitude and phase angle at each bus, as well as the power flowing in transmission lines, to ensure efficient and reliable operation of the power system.

Purpose of Load Flow Analysis:

- To calculate bus voltages (both magnitude and angle),
- To determine power flows in lines and transformers,
- To evaluate power losses in the network,
- To check voltage stability and system performance,
- To assist in network planning, operation, and control.

V. PROPOSED SYSTEM MODELLING LOAD FLOW ANALYSIS ACROSS SOLAR POWER GENERATOR

Load flow is the way toward evaluating the quick loads working in an establishment. The load gives the heap to the specific establishment as far as evident, receptive and dynamic power (kVA, KVAR and kW) and normally done at the sub office zone or at the switch board.

The burden plan arrangement ought to in a perfect world be the main errand to perform during the electrical framework configuration organize since it identifies with the gear sizes and other power framework necessities. Specifically, it gives data about the hardware appraisals during typical and top tasks, in this manner controlling the circuit tester in deciding the conductor sizes. Burden planning is one type of burden the board activity that enables organizations to spare vitality by limiting their interest. So as to have a proficient burden plan task, the vitality supervisor or business should lead power logging and record all sessions in order to quantify the use of vitality over a particular time. This empowers the customer to distinguish huge burdens that might work simultaneously.

Electrical burden booking is a fundamental practice that an electrical professional should do at the underlying phases of an electrical power establishment. The heap timetable gives information that is a nearby gauge of the measure of intensity devoured for typical and pinnacle burdens and anything in the middle. The heap calendar can support the electrical specialist or architect to appropriately measure the hardware, links, control rigging and insurance frameworks in like manner. Furthermore, it very well may be set up for various working situations, including when there is a prerequisite for reinforcement control frameworks.

So as to achieve burden planning .vigorously appraised burdens are not turned on pointlessly during pinnacle house the heaps ought to be booked remembering that the client's sol ace isn't blocked. Then, those heaps which don't legitimately influence the essential solace worry of the client or the heaps which could be kept running whenever of the day might be booked thinking about the vitality accessibility and wastage imperatives.

VI. RESULT AND DISCUSSION

The power system analysis and design is generally done by using power flow analysis .This analysis is carried out at the state of planning, operation, control and economic scheduling .they are useful in determining the magnitude and phase angle of load buses, and active and reactive power flows over transmission lines, and active and reactive powers that are injected at the buses. For this work the Load flow method is used for numerical analysis. The objective of this project is to develop a MATLAB program to calculate voltages, active and reactive power at each bus for IEEE 5 bus systems.
At first IEEE 5 bus system is calculated by using hand calculations and compared with MATLAB Program results and then IEEE bus system MATLAB program is executed with the input data. This type of analysis is useful for solving the power flow problem in different power systems which will useful to calculate the unknown quantities.

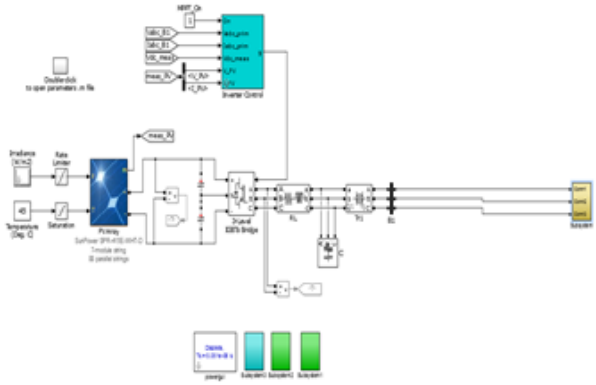

Fig.1 Simulation

Fig.2 PV parameters

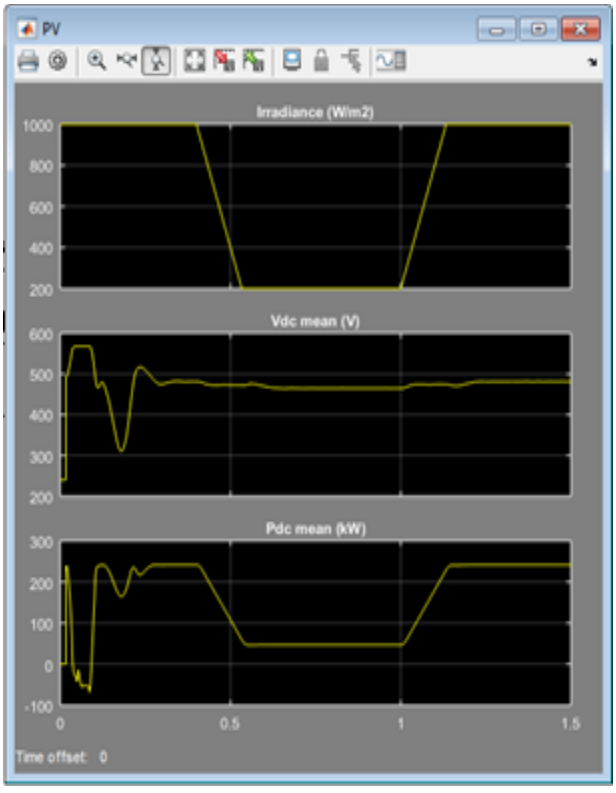

Fig.3 Solar power variation

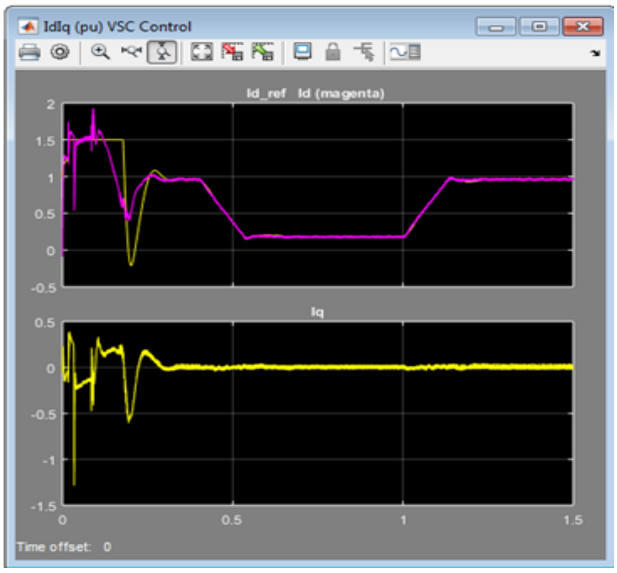

Fig.4 Solar current variation

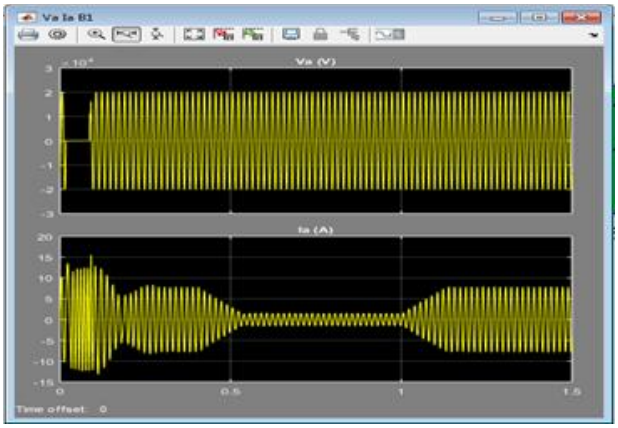

Fig.5 Voltage and current characteristics

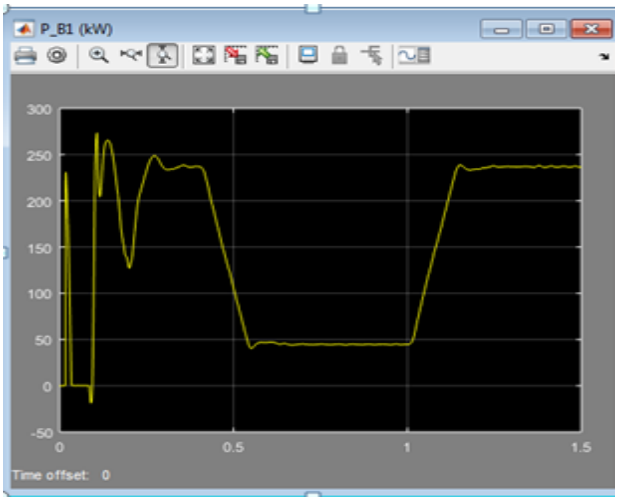

Fig.6 Power With sun radiation variation with respect to time

VII. CONCLUSION

The simulation model of the IEEE 5- bus system has been build to analyze the system behavior and related simulation results have been presented. It is concluded that power should have a very low critical time. Due to low critical time relays of faulty sections operate in a very short time so that system can obtain stability otherwise it will go out of synchronism.

In this research work, the transient stability analysis of the system, performed by load studies. Also, this study investigates the behavior of three-phase balanced fault and load switching impact. That reveals that the protection system provided for the system should have a fast response. Accordingly, system stability adopts the fast fault clearing and load shedding methodologies.

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