

SHORT-TERM SOLUTION FOR ACCIDENTAL INCREASING OF ELECTRICAL POWER DEMAND USING PHOTO-VOLTAIC ENERGY

Author: Ahmed Rezaq, DAR Engineering, Egypt

Abstract--As a result of the accidental increase in electrical power demand, along with the economic constraints of new power generation stations, the gap between power demand and generation increases. This increasing gap forces the utility operators to an undesirable load shedding to maintain system stability and power quality. In this paper, Photo energy is investigated as one of the Distributed Generation (DG) resources to provide a short-term solution for this problem. The solution is studied and evaluated in the presence of Deregulation of the electricity market. A case study of using PV energy as a green and cheap DG resource locally at loads in Egypt is presented. The economic evaluation of the proposed solution is introduced as a feasibility study for a green and smart electric grid.

Index Terms--Deregulated Power System, Distributed generation (DG), Renewable Energy, Photo Smart Grid, Green Building.

I. NOMENCLATURE

- I_0 : Saturation current.
- η : Efficiency of PV cell.
- P: Power delivered by the PV generator.
- G: Solar radiation falling on the PV generator.
- FF: Fill Factor.
- MPPT: Maximum Power Point Tracking.
- PSH: Peak Sun Hours.
- W_p : Watt-peak rating.

II. INTRODUCTION

Photo-voltaic energy system is provided to be short-term solution for accidental increasing of electrical power demand.

In the following sections, electrical power system will be viewed as it's divided into two main systems; one of them is called regulated power system power system and the other one is called deregulated power system, DG is a way of applying deregulated power system which is divided into more types, one of them is the renewable energy is represented in wind energy and photovoltaic energy systems.

After that, PV system is obtained to show the system major components, load, PV module, inverter, battery solar charge controller are shown. Then sizing is discussed, load determination, PV cells sizing, inverter sizing, battery sizing are obtained.

Finally, cost estimation of PV system is taken in consideration according to components price.

III. SYSTEM OVERVIEW

A. Regulated & Deregulated Power Systems

In typical regulated power systems, Generation, transmission & distribution were owned by monopolies, but in deregulated power systems monopolies aren't the only owner of generation, transmission & distribution systems.

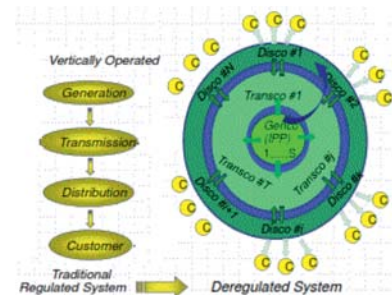


Fig. 1. Regulated & deregulated power system charts

Distributed generation definition appeared as a result of deregulated power system, as it's a source of electric power is used to provide part or all of a customer's power demand. Therefore, there is no need to supply reactive power from DG's. The location of DG is defined as the installation and operation of electric power generation modular connected directly to the distribution network or connected to the network on the customer site of the meter. So, Distributed generation leads to energy savings because the power is used where it's produced, not far away. That means there's less energy lost in the transmission of electricity from point of production to point of use. However, DGs can feedback some of their generated electric powers to the transmission system, if it's applicable for the connected systems, if it exceeds the distribution system's load demand where Dgs are installed.

*This paper was presented at Saudi Arabia Smart Grid 2013, Jeddah

