# ABSTRACT

This research work presents a case study in which Data Envelopment Analysis (DEA) is applied to measure the relative operational efficiency, benchmark share measure and Malmquist Productive Index of the 29 State Owned Electric Utilities (SOEUs) in India. DEA is a new data oriented, multi-factor productivity analysis approach which calculates the Relative Efficiency (RE) of homogeneous peer units called Decision Making Units (DMU). This method aims at measuring how efficiently a DMU uses the resources available to generate the set of outputs.

The definition, measurement and improvement of organizational performance are of critical importance to the organizations today. The recession, both national and international, experience over the past ten years has undoubtedly increased the importance of performance measurement at the inter and intra–organization level. Company strategists are also concerned with the performance of their firms as well as the general performance trends within the industrial sector in which they operate.

To aid in the task of performance measurement, organizations frequently employ benchmarking policies, for identifying their competitors' strengths and weaknesses which in turn aid the preparation of strategic plans. As a result of privatization of public utilities, the need for assessing the corporate performance has become during the last decade.

Electricity is one of the most vital infrastructure inputs for the economic development of the country. Even after restructuring, the erstwhile major players in the Indian Power sector continue to be State Owned Electric Utilities previously known as State Electricity Boards. Therefore, the benchmarking has become a vital requirement at this stage.

Two different models, viz., Charnes, Cooper and Rhodes (CCR) model and Banker, Charnes and Cooper (BCC) model are employed in this research. The concept of Returns to Scale is also analyzed. While the RE score calculated by the CCR model is Constant Returns to Scale (CRS) efficiency, the RE score calculated by the BCC model is Variable Returns to Scale (VRS) efficiency. The scale efficiency is derived from the VRS and CRS efficiency scores. The Most Productive Scale Size (MPSS) calculated for the inefficient DMU is also validated with the basic dual variable $\lambda$. The DMU, which has the operating value of less than the MPSS has to increase its scale of operation. On the other hand, the DMU which has the operating value that is higher than the MPSS has to decrease its scale of operation.

This study compares the operational efficiency of 29 SOEUs based on the selective parameters namely the installed capacity, circuit length and % Aggregate Technical and Commercial (AT&C) losses as input parameters and number of consumers and quantity of energy supplied as output parameters. In order to find the information indicating how much and in what parameter an inefficient DMU needs to improve, the BCC projection analysis is adopted. It gives an insight into the potential improvement for the inefficient DMU to become an efficient DMU as its peer unit.

Next, sensitivity analysis which helps in investigating the effects of the solutions of making possible changes in the values of the model parameter, is also applied. In particular, the differences between the relative efficiencies of the various SOEUs are analyzed using various input and output factors. While doing so, one particular input or output factor is eliminated each time in the DEA formulation. Following this, the benchmark share measure of efficient DMU is calculated so that the impact of each efficient DMU on the various input/output parameters and its contribution in its group of DMUs is calculated. Finally, the Malmquist productivity index is measured for the DMU over a period of time. This index is also decomposed into two different components which give an insight into aspects like technical efficiency change and technology change.