Chapter 1 Introduction

1.1 Overview

The major concern for every electrical utility is the ability to provide reliable and uninterrupted service to their customers. Unlike other commodities, electricity, by nature, must be produced by the same rate as it is consumed. That because the storage of high electric power is not easy or economic practice. On the other hand, the importance of providing good service has increased greatly especially with the appearance of the private sector in the many electricity markets. In the past, most energy provider owned the generation, transmission, and distribution resources. The utilities were guaranteed to recover their costs regardless of how efficient the system was operated. This may lead to unproductive practices such as inefficient production, irrational pricing policies, and overstaffing. By introducing the open market, utilities are no longer protected by exclusive prerogative and are forced to operate at lower costs to stay in business. This emphasizes the importance of demand forecasting as essential information for system planning and operation. The basic operation functions such as fuel allocation, unit commitment, as well as maintenance scheduling should be exercised as close as possible to the optimum point to minimize the system operating cost [1].

The challenge becomes more significant with the fast and sharp increasing need for electric energy in the fast developing countries such as Egypt. The load growth is highly increased depending on new arising singular factors and conditions. Proper planning of new networks, expansion or rehabilitation of existing ones should be based on most accurate and proper planning rules. The first step in proper planning is the accurate load forecasting. The accuracy of the future demand forecast becomes a primary prerequisite. Previous literature shows that planning, operation and control of power system are very sensitive to load forecast error. Large error can cause incredible financial losses. Overestimation causes the startup of too many units or excessive energy purchase from neighbouring systems, therefore supplying an unnecessary level

of reserve. On contrary, underestimation leads to insufficient preparation of spinning reserve, which threats the stability and system security.

Load forecast has been an attractive research topic for many decades and in many countries all over the world, especially in fast developing countries with higher load growth rate. Load forecast can be generally classified into four categories based on forecasting time range. These four categories are:

1. Long Term Load Forecasting: electric power system requires urgently the load forecasts on long run to calculate and allocate the required future capacity and planning for new power stations to face customer requirements. Hence, it's playing an essential role to determine future budget, so, it will be very helpful for decision makers. This is related to power consumption forecasting in a period of 1 to 10 years.
2. Medium Term Load Forecasting: the energy demand is determined over a period of more than one week to a few months. It is important mainly for fuel allocation and maintenance schedules.
3. Short Term Load Forecasting: the forecast time is in range of one hour ahead to a week. Accurate and robust Short Term Load Forecasting is of great importance for power system operation .It is the basis of economic dispatch, hydro-thermal co-ordination, unit commitment, transaction, evaluation and system security analysis among other mandatory functions.
4. Very Short Term Load Forecasting: this category of forecasts has recently appeared, researchers tried to forecast the load in a leading time from one minute to an hour. It's important in EMS (Energy Management Systems).