1.1 Background

Economic operation and planning of electric energy generating systems have always been given proper attention in the electric power system industry. A saving in the cost of generation represents a significant reduction in the operating cost (including the fuel cost) and hence this area has warranted a great deal of attention from operating and planning engineers. The original problem of economic dispatch of thermal power generating systems used to be solved by numerous methods. However, with the development of mathematical tools and advance computational methods, the economic scheduling of generators has become more accurate and can be applied even in complex networks. Thermal scheduling being of prime importance, hydrothermal coordination scheduling has emerged as another aspect of economic scheduling. The basic purpose of economic operation of power system is to reduce fuel cost for the operation of power system economic operation is achieved when the generators in the system share load to minimize overall generation cost. The main economic factor in the power system operation is the cost of generating real power [1].

As power systems are getting larger and more complicated due to the increase of load demand, the fossil fuel demand of thermal power plants increases which causes rising costs and rising emissions into the environment. Therefore, optimization has become essential for the operation of power system utilities in terms of fuel cost savings and environmental preservation [2].

The optimal operating point of a power generation system is where the operating level of each generating unit is adjusted such that the total cost of delivered power is at a minimum. In an energy management system, Economic Dispatch is used to determine each generating level in the system in order to

minimize the total generator fuel cost or total generator cost and emission of thermal units while still covering load demand plus transmission losses [3].

Recently, methods based on artificial intelligence have been widely used for solving optimization problems. These methods have the advantage that they can deal with complex problems that cannot be solved by conventional methods. Moreover, these methods are easy to apply due to their simple mathematical structure and easy to combine with other methods to hybrid systems adding the strengths of each single method [4].

1.2 Problem Statement

Economic dispatch determines the optimal real power outputs for the generating units online so that fuel cost of generating units is minimized while all unit and system operating constraints are satisfied. By using conventional method and artificial intelligent methods in this thesis and compare between the two results to find the optimal generation schedule the methods were applied to IEEE 39 New England bus system with 10 generator units.

1.3 Objective

The main objective is to minimize the overall cost of production of power generation considering all system constrains by using conventional method *(Newton Raphson Method);* and intelligent method (*Particle Swarm Optimization*) in MatLab program, and to compare between the two methods.

1.4 Thesis Layout

The thesis organization is summarized as follow:

- Chapter one about research background, thesis problem and objectives.
- Chapter two about the economic operation in power system

- Chapter three discusses the conventional and artificial intelligent methods in power systems.
- Chapter four summarized the results of the software simulation in MatLab by using Newton Raphson (NR) and Particle Swarm Optimization (PSO) techniques.
- Chapter five gives thesis conclusion and recommendations.