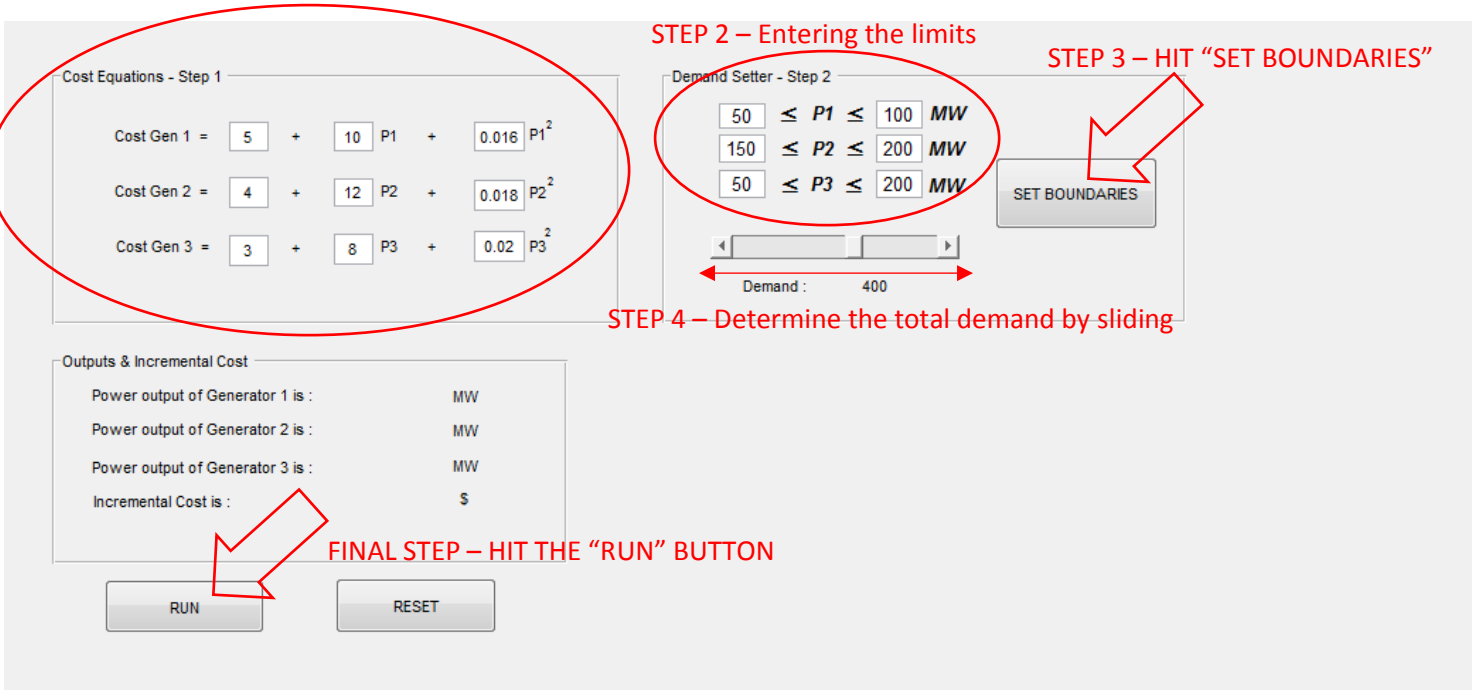
# Özyeğin University
# EE303 Fundamentals of Power Systems
# FINAL PROJECT REPORT

**How to use this program:**

The user should enter the cost equations and min-max power limits of 3 generetors. Then the user will select the power demand from the slider just after clicking the “SET BOUNDARIES” button. That button determines the mininum and maxiumum power demand by summing up the generator’s boundaries. After clicking the button the user will be able to select the total demand of the system by sliding the slider. While sliding the slider, demand will be shown instantly.

STEP 1 – Entering the cost coefficients




Now the user can hit the “RUN” button to see the power outputs, incremental cost and the graphs. User can click to “RESET” button to delete the entered values and the results to type different equations and limits. If user only wants to change the boundaries, instead of clicking “RESET” button, just hitting the “SET BOUNDARIES” button will be enough after changing the boundary values, then click “RUN” again.

**Purpose of this program:**

The purpose of this program is determining the output power genereted by 3 different generators to supply the specified demand in a way that will minimize the total cost of fuel. Each generators has a unique production costs defined by its fuel coefficients. This process is called Economic Dispatch. Economic dispatch is defined as the coordination of the production costs of all the participating units in supplying the total load. The purpose of economic dispatch is to determine the optimal power generation of the units participating in supplying the load. The sum of the total power generation should equal to the load demand at the station.

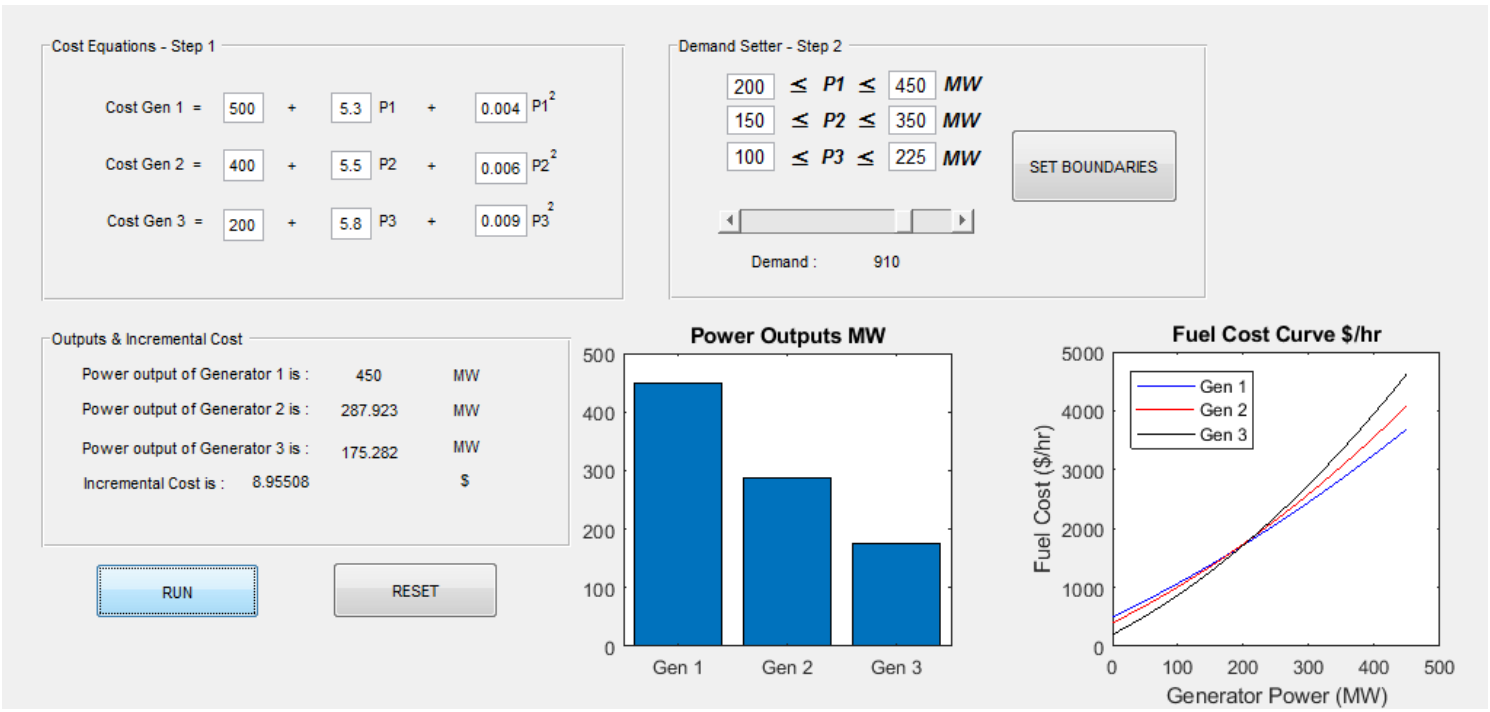
Economic Dispatch models the electric power system and dispatches the available generation resources to supply a given load for each control area in the most economic way in real-time operation. The objective is to minimize the total generation cost by meeting the system load demand and Lower and Upper power limits of each generator.

**Method of this program :**

How our program does this minimization as follows: First it defines a Lagrangian function which is a function of power supplies and lamda. Then it takes the derivatives and set these equal to zero for minimization purpose. After this step power supplies become functions of lamda. Our program need a perfect lamda such that total power supply is equal to demand. For this reason the program estimates two lamdas in a way that lamda high makes total power supply greater than demand and lamda low makes total power supply less than demand. Thus the perfect lamda must be between lamda high and lamda low. Then the program defines lamda middle and checks according to lamda middle if the total power supply is greater than demand or not. If it is greater then demand then lamda middle becomes lamda high else lamda midle becomes lamda low and it iterates like that. After a reasonable times of iteration the gap between lamda high and lamda low becomes too small such that it satisfies our limit then the program terminates iterrations and it assumes that perfect lamda is lamda middle. Therefore the program eliminates an infinite iteration and it gets a good value of lamda. Finally depending on the perfect lamda the program calculates the total power supply in a way that total cost is minimum.

## Sample Program 1


## Sample Program 2




**Prepared by: Muhammet AKGÜL**

**Salih Emre KAYNAR**