Economic Dispatch

November 15, 2018

0.0.1 Importing the necessary packages :

```
In [1]: import pandas as pd
        import numpy as np
        from pandas import DataFrame
```

Reading the input excel file (data about Gas turbines from the task sheet) :

```
In [2]: data=pd.read_excel('./input.xlsx')
```

```
In [3]: data.head()
```

```
Out[3]:    Unit    a       b         c  Minimum Capacity  Maximum Capacity
        0     1  300  2.3200  0.002978               100               440
        1     2  250  2.5000  0.003378                98               437
        2     3   18  2.1793 -0.026000                20                47
        3     4   20  2.1000 -0.021000                19                45
```

a (€) values from fuel cost curves of Gas turbines :

```
In [4]: a=data['a']
```

b (€/MWh) values from fuel cost curves of Gas turbines :

```
In [5]: b=data['b']
```

c (€/MWhˆ2)values from fuel cost curves of Gas turbines :

```
In [6]: c=data['c']
```

Minimum capacitiy (MW) values of Gas turbines :

```
In [7]: Minimum_Capacity=data['Minimum Capacity']
```

Maximum capacitiy (MW) values of Gas turbines :

```
In [8]: Maximum_Capacity=data['Maximum Capacity']
```

Power demand (MWh) at 13:00 Uhr :

```
In [9]: Load=823.65

In [10]: Power_Demand=Load
         P = []
```

Assuming lambda value to solve the problem :

```
In [11]: Lambda=max(b)

In [12]: while abs(Power_Demand)>0.00001:
             multiplier = (Lambda-b)/2
             P =np.divide(multiplier,c)
             P=np.minimum(P,Maximum_Capacity)
             P=np.maximum(P,Minimum_Capacity)
             Power_Demand=Load-np.sum(P)
             Lambda=Lambda+((Power_Demand*2)/(np.sum(np.divide(1,c))))

         squaredP = np.multiply(P,P)

In [13]: Fuel_Cost= np.add(a,np.multiply(b,P)+np.multiply(c,squaredP))

In [14]: total_Fuel_Cost=np.sum(Fuel_Cost)

In [15]: Units = ['GT1','GT2','GT3','GT4']

In [16]: output = DataFrame(data = Units,columns=['1_Unit'])

In [17]: output = DataFrame({'1_Unit':Units,'2_Power Produced':P,'3_Fuel Cost':Fuel_Cost})

In [18]: output

Out[18]:   1_Unit  2_Power Produced  3_Fuel Cost
         0    GT1        431.174908  1853.971131
         1    GT2        353.475097  1555.750748
         2    GT3         20.000000    51.186000
         3    GT4         19.000000    52.319000
```

Total fuel cost (€) to genearate the Power demand of 823.65 MWh :

```
In [19]: total_Fuel_Cost

Out[19]: 3513.2268791872766
```