

- 1- An 8 MW/4 Mvar load is supplied at 13.8 kV through a feeder with an impedance of $(1 + j2)$. The load is compensated with a capacitor whose output, Q_{cap} . Write an OpenDSS simulation script for this circuit that maintains the voltage at the load at 13.8 kV and then measure the following quantities for values of Q_{cap} of 0, 4, 4.5, and 6 Mvar. Write the results in a table
 - a. How much losses are in the feeder
 - b. The value of the voltage at the SourceBus
 - c. How much active and reactive power should be supplied by the source (at SourceBus)

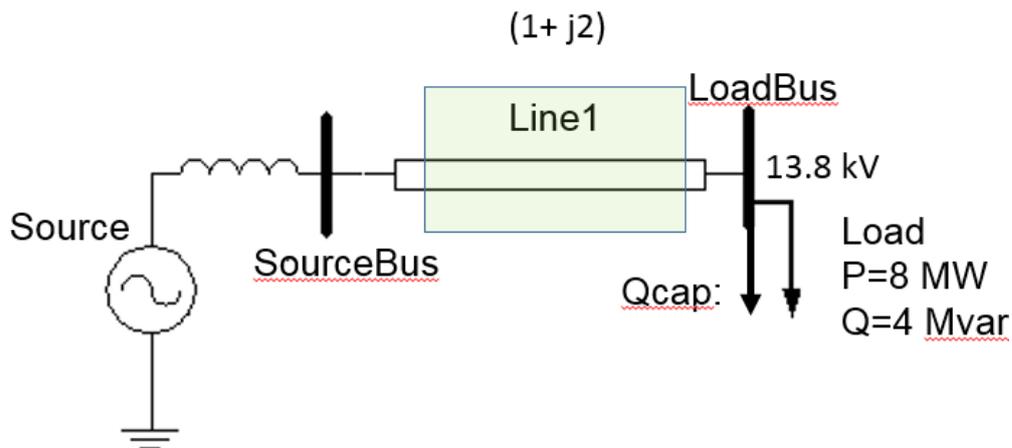


Figure 1

- Q#2) For the power system in Figure 2 with the data provided in table1 (provided as text file), all lines have $Z=0.1j$ and the fuel-cost curves of the three generators are given as follows:

$$C_{G1}(P1) = 60 + 15P1 + 0.04P1^2$$

$$C_{G2}(P2) = 65 + 20P2 + 0.04P2^2$$

$$C_{G4}(P4) = 80 + 21P4 + 0.05P4^2$$

Constraints

- $$1 \leq P1 \leq 4 \text{ MW}$$
- $$1 \leq P2 \leq 4 \text{ MW}$$
- $$0 \leq P4 \leq 10 \text{ MW}$$

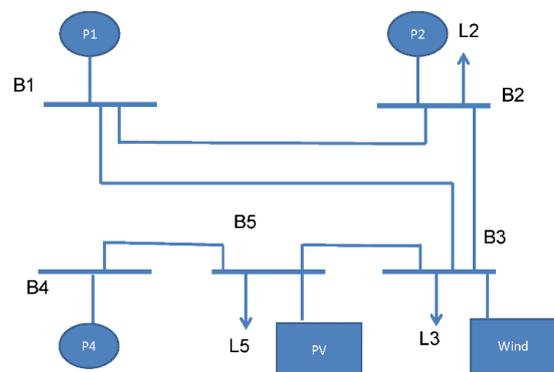
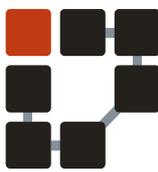


Figure 2

- 1- Using R, Calculate the optimal dispatch values of $P1$, $P2$ and $P3$ for each hour if there is no limitation on the transmission lines.
- 2- Plot the Power flows in Line from B1 to B3.



3- Repeat part 1 and 2, if the allowed power from B1 to B3 is limited to 1.5 MW

(Hint: use $S_{bas}=1MW$)

Time	L3 (MW)	L2 (MW)	L5 (MW)	PV (MW)	Wind (MW)
0	1	2.5	0.5	0	0.3
1	1	2.5	0.5	0	0.3
2	1	2.5	0.5	0	0.3
3	1	2.5	0.5	0	0.3
4	1.5	2.5	0.5	0	0.2
5	1	2.5	0.5	0	0.2
6	1.5	2.5	0.5	0	0.1
7	1.5	2	0.5	0	0.3
8	2	2	1	0.2	0.6
9	2	2	1	0.3	0.3
10	2	2	1	0.4	0.6
11	2	3	1	0.5	0.8
12	2	3	1	0.6	0.4
13	3	3	1	0.6	0.3
14	3	3	1	0.7	0.3
15	4	3	1	0.7	0.6
16	4	3	2	0.6	0.6
17	4	3	2	0.3	0.6
18	4	2	2	0.1	0.3
19	3	2	2	0	0.5
20	3	2	2	0	0.6
21	2	2	2	0	0.5
22	2	1	1	0	0.5
23	2	1	1	0	0.6

Q#3) The file (CVR.dss) represents an OpenDSS script for the network in Figure 3. Answer the following questions.

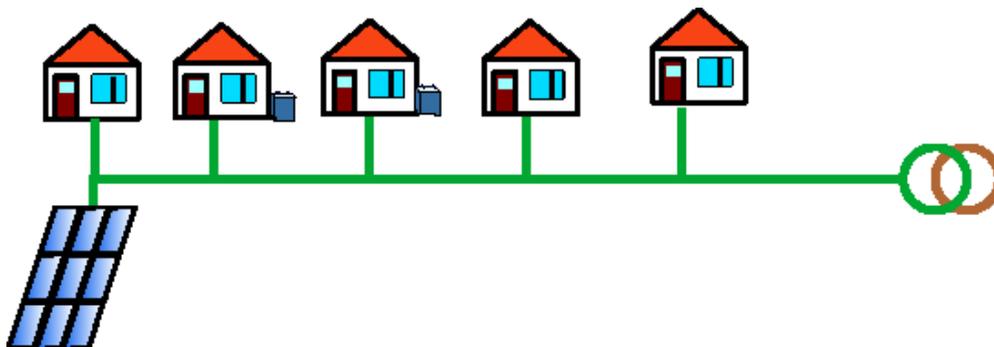
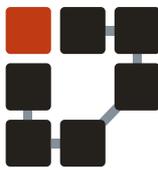


Figure 3



- 1- Run the example! How much power (active) should be supplied at the sourcebus?
Is there any voltage limits violation?
- 2- CVR: Reduce the voltage at the transformer (TR1) such that it reduces the power consumption and doesn't violate the standard limits (253 to 207 volt), do it by changing the voltage (the value of vreg) at the LTC using the following command
- 3- **new regcontrol.TR1 transformer=TR1 winding=2 vreg=(250)
ptratio=(1) band=1**
- 4- How much power is required now from sourcebus?
- 5- Using the original CVR.dss (with voltage vreg=(250)), Add a 40 KVA PV at bus house5 with 400 volt and assume it is a sunny day (irrad=1.0) use the following command:
**new PVsystem.house5 bus1=house5 phases=3 kV=0.4 KVA=40
irrad=1.0 Pmpp=40 kvar=0 temperature=25**
- 6- Is there any voltage limits violation? How much power is required now from sourcebus?
- 7- Now reduce the loads at house1 and 3 to 1 kW (instead of 10kW). Is there any voltage limits violation now? If yes add Batteries (as much as necessary) such that there is no voltage limitation, use the following command
**New Storage.Bat1 Phases=3 Bus1=house1 kV=0.4 kWRated=5
kWhRated=20 pf=1.0 %stored=50.0 dispmode=trigger state=IDLING**
And you can enable the charging buy using
Storage.Bat1.state=CHARGING