1a. Excel Program Input/Output

Module 1a shows the excel program input values and output solution. Excel solver is used for this particular model. Since the objective function is linear, we can choose 'Simplex LP' or 'GRG Nonlinear' as the solver methodology.

The following diagrams are of both the cases that were mentioned in module 1. Case 1 is with only 2 generators at node 2 and 3. Case 2 is with 3 generators at all the nodes.

Case 1 – 2 generators

Input -

Total cost ($/h):	0		
	Cost($/h)		
Generator 2:	0		
Generator 3:	0		
Required delivery (MW):	920		
Planned delivery (MW):	0		
	Power= P_gen_i (MW)	Lower bound	Upper bound
Generator 2:	0	0	
Generator 3:	0	0	
theta_1:	0	-3.141592654	3.141592654
theta_2:	0	-3.141592654	3.141592654
theta_3:	0	-3.141592654	3.141592654
100[Bx]	1	2	3
1	1800	-1000	-800
2	-1000	1500	-500
3	-800	-500	1300
	(MW)		
P_load_1	270		
P_load_2	550		
P_load_3	100		
	DC power flow formulation		
Bus_1	0		
Bus_2	0		
Bus_3	0		
	(MW)	Line Reactance (ohms)	Transmision Limit
P_flow_12	0	0.1	210
P_flow_21	0		210
p_flow_13	0	0.125	
p_flow_23	0	0.2	

Output –

Total cost ($/h):	7233.1

	Cost($/h)
Generator 2:	6495.875
Generator 3:	737.225

Required delivery (MW):	920
Planned delivery (MW):	920

	Power= P_gen_i (MW)	Lower bound	Upper bound
Generator 2:	827.5	0	
Generator 3:	92.5	0	
theta_1:	0	-3.141592654	3.141592654
theta_2:	0.21	-3.141592654	3.141592654
theta_3:	0.075	-3.141592654	3.141592654

100[Bx]	1	2	3
1	1800	-1000	-800
2	-1000	1500	-500
3	-800	-500	1300

	(MW)
P_load_1	270
P_load_2	550
P_load_3	100

	DC power flow formulation
Bus_1	270
Bus_2	550
Bus_3	100

	(MW)	Line Reactance (ohms)	Transmision Limit
P_flow_12	-210	0.1	210
P_flow_21	210		210
p_flow_13	-60	0.125	
p_flow_23	67.5	0.2	

Case 2 – 3 generators

Input –

Total cost ($/h):	0

	Cost($/h)
Generator 1:	0
Generator 2:	0
Generator 3:	0

Required delivery (MW):	920
Planned delivery (MW):	0

	Power= P_gen_i (MW)	Lower bound	Upper bound
Generator 1:	0	0	
Generator 2:	0	0	
Generator 3:	0	0	
theta_1:	0	-3.141592654	3.141592654
theta_2:	0	-3.141592654	3.141592654
theta_3:	0	-3.141592654	3.141592654

100[Bx]	1	2	3
1	1800	-1000	-800
2	-1000	1500	-500
3	-800	-500	1300

	(MW)
P_load_1	270
P_load_2	550
P_load_3	100

	DC power flow formulation
Bus_1	0
Bus_2	0
Bus_3	0

	(MW)	Line Reactance (ohms)	Transmision Limit
P_flow_12	0	0.1	210
P_flow_21	0		210
p_flow_13	0	0.125	
p_flow_23	0	0.2	

Output –

Total cost ($/h):	7225.984615

	Cost($/h)
Generator 1:	450.8307692
Generator 2:	6775.153846
Generator 3:	0

Required delivery (MW):	920
Planned delivery (MW):	920

	Power= P_gen_i (MW)	Lower bound	Upper bound
Generator 1:	56.92307692	0	
Generator 2:	863.0769231	0	
Generator 3:	0	0	
theta_1:	0	-3.141592654	3.141592654
theta_2:	0.21	-3.141592654	3.141592654
theta_3:	0.003846154	-3.141592654	3.141592654

100[Bx]	1	2	3
1	1800	-1000	-800
2	-1000	1500	-500
3	-800	-500	1300

	(MW)
P_load_1	270
P_load_2	550
P_load_3	100

	DC power flow formulation
Bus_1	270
Bus_2	550
Bus_3	100

	(MW)	Line Reactance (ohms)	Transmision Limit
P_flow_12	-210	0.1	210
P_flow_21	210		210
p_flow_13	-3.076923077	0.125	
p_flow_23	103.0769231	0.2	

***Note** – The total production cost decreases when we add generator at node 1 because the marginal cost of this generator is lower than G3 and the total demand is met by a combination of G2 and G1.*