TCS Quantum Computing Challenge

Addendum to

Challenge 2 - Optimising Power Distribution Network

We are sharing this addendum that will simplify the understanding of this challenge statement for the participants.

1. The "Scenario 2" on Page Number 6 of the challenge statement has been rephrased as follows:
   Scenario 2: After network changes (such as the addition of load or reduction in generation at a particular node, breaking of a certain transmission line, a faulty bus, and so on), finding the corrective topology with the least generation cost that ensures efficient power transmission to all parts of the network within a given timeframe and that all the components operate within the specified limits.

2. The Page Number 7 of the Challenge Statement listed the Actual dataset with Dataset link for (IEEE 14-Bus System) as below:
   https://icseg.iti.illinois.edu/ieee-14-bus-system/

   Please find more details of the dataset – referred from above link - as shown below:

   The data given in the following tables is on 100MVA base. The minimum and maximum limits of voltage magnitude and phase angle are 0.94 p.u. to 1.06 p.u. and -45 to +45 respectively.

Actual dataset

Table A.1: Line data - IEEE 14 bus system

Line number	From bus	To bus	Line Impedance (p.u.)		Half-line charging susceptance (p.u.)	MVA rating
			Resistance	Reactance		
1	1	2	0.01938	0.05917	0.02640	140
2	1	5	0.05403	0.22304	0.02460	70
3	2	3	0.04699	0.19797	0.02190	60
4	2	4	0.05811	0.17632	0.01700	50
5	2	5	0.05695	0.17388	0.01730	50
6	3	4	0.06701	0.17103	0.00640	50
7	4	5	0.01335	0.04211	0	50
8	4	7	0	0.20912	0	25
9	4	9	0	0.55618	0	20

10	5	6	0	0.25202	0	50
11	6	11	0.09498	0.19890	0	20
12	6	12	0.12291	0.25581	0	20
13	6	13	0.06615	0.13027	0	20
14	7	8	0	0.17615	0	20
15	7	9	0	0.11001	0	40
16	9	10	0.03181	0.0845	0	20
17	9	14	0.12711	0.27038	0	20
18	10	11	0.08205	0.19207	0	20
19	12	13	0.22092	0.19988	0	20
20	13	14	0.17093	0.34802	0	20

Table A.2: Generator data - IEEE 14 bus system

Generator Number	Bus Number	Generation Limits		Ramp up/Ramp down limits		a_i ($/(MWhr)²)	b_i ($/MWhr)	c_i ($/hr)
		g_i^{min}	g_i^{max}	g_i^{up}	g_i^{down}			
G1	1	0	332.4	50	-50	0.043	20	0
G2	2	0	140	20	-20	0.25	20	0
G3	3	0	100	10	-10	0.01	40	0
G4	6	0	100	10	-10	0.01	40	0
G5	8	0	100	10	-10	0.01	40	0

Table A.3: Transformer tap setting data - IEEE 14 bus system

From Bus	To Bus	Tap setting value ($p.u.$)
4	7	0.978
4	9	0.969
5	6	0.932

Table A.4: Bus data - IEEE 14 bus system

Bus number	Bus voltage		Generation				Load	
	Magnitude ($p.u.$)	Phase angle ($degree$)	Real power (MW)	Reactive power ($MVAR$)	Q_{min} ($MVAR$)	Q_{max} ($MVAR$)	Real power (MW)	Reactive power ($MVAR$)
1	1.06000	0	232.392	-16.549	0	0	0	0
2	1.04500	-4.9826	40	43.556	-40	50	21.7	12.7
3	1.01000	-12.7250	0	25.075	0	40	94.2	19.0
4	1.01767	-10.3128	0	0	0	0	47.8	-3.9
5	1.01951	-8.7738	0	0	0	0	7.6	1.6
6	1.07000	-14.2209	0	12.730	-6	24	11.2	7.5
7	1.06152	-13.3596	0	0	0	0	0	0
8	1.09000	-13.3596	0	17.623	-6	24	0	0
9	1.05593	-14.9385	0	0	0	0	29.5	16.6
10	1.05099	-15.0972	0	0	0	0	9.0	5.8
11	1.05691	-14.7906	0	0	0	0	3.5	1.8
12	1.05519	-15.0755	0	0	0	0	6.1	1.6
13	1.05038	-15.1562	0	0	0	-0	13.5	5.8
14	1.03553	-16.0336	0	0	0	0	14.9	5.0

Table A.5: Shunt capacitor data - IEEE 14 bus system

Bus Number	susceptance $(p.u.)$
9	0.19