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Load flow analysis of an IEEE 57 Bus system under steady state conditions

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Abstract— **In this Paper an IEEE 57 Bus system is analysed in detailed, using PSAT. PSAT is a software working with MATLAB platform. PSAT is used for analysis of small and medium size power system. The advantage of this software is that it can develop and edit any test system using the Simulink based library. It is clear knowledge regarding to bus voltage, magnitude and angle, line flows. A number of methods are being used all over the world for power flow analysis. To obtain power flow solutions, the most popular method is Newton Raphson method. The objective of this paper is to develop an user friendly software to perform power flow analysis for an IEEE 57 bus system. Through this paper**

Keywords—IEEE 57 bus system, MATLAB, PSAT, Power flow analysis

I. Introduction

Normally an ideal Power System consists of three main networks that are Generating network, Transmission network and Distribution network. These networks consist of various kinds of Loads. Conducting a power flow analysis will give a clear picture about any system or network. For any changes in any power system like contingency analysis, expansion of power system power flow analysis is must. The power flow analysis will give four main electrical parameters. There are Real Power, Reactive Power, Frequency, Phase Angle. These results will help us to analyse the present system and to desire the future steps for the power system enhancement. Conducting a power flow analysis to a large system is a very difficult because there is a huge mathematical burden with the data. If we go with manual calculations so many errors will occur and time will also take for large system calculations. Because of that errors we choose software which are suitable for calculating the power flow analysis. There are many software based on power flow analysis.

There are:

Educational Simulation Tool (EST)

MatEMTP

Mat Power

Power Analysis Toolbox (PAT)

Power System Analysis Toolbox (PSAT)

Power System Toolbox (PST)

Sim Power System (SPS)

Voltage Stability Toolbox (VST)

Some of software from this is open source freely downloadable tools like PSAT, VST and Mat Power. Basically, the main thing of this analysis is to conduct power flow analysis of a IEEE 57 bus system to obtain accurate and fast results. After the analysis also we have the chances to change the values of any equipment like generator, load, transformer for that we want suitable software. The software should be editable at any stage of the system like add or remove any different elements. This will helpful to the future generation who are interested in power system stability and enhancement. This result is reference for the future generation.

For this analysis we selected the PSAT software because of two reasons they

are

- It is open source freely downloadable software and it will run in MATLAB software as platform
- We can edit/develop any type of system using Simulink based library

2.POWER FLOW ANALYSIS

The power flow analysis is a very important and fundamental tool involving numerical analysis applied to a power system. The results of this play a major role in the day to day operation of any system for its control and economic schedule. The purpose of power flow analysis is to compute the precise steady-state voltage and voltage angles of all type's busses in the network. By conducting this analysis, we know the four main parameters like real power, reactive power, voltage magnitude, phase angle. Normally power flow analysis is conducted by three methods.

- Gauss -Siedal method
- Newton-Raphson method
- Fast decoupled method

Among these all the Newton Raphson method is very popular due to its fast convergence with less iterations. PSAT's default power flow analysis is using this method for any test system network. After conducting power flow analysis, we found four parameters they are

1. Real Power
2. Reactive Power
3. Phase Angle
4. Voltage Magnitude

By these results we control any type of system by changing the values of elements. Among these four two are specified and two are to be found out for any busses in a system network.

There are three different types of busses are there in system where they are interconnected in a single system or a network.

SLACK BUS

In electrical power system a slack bus is used to balance the active power and reactive power in a system while performing load flow studies. We assume the voltage and the angle initially and after getting the results, that results will be used to find the generations and the losses. Generally, a high value generation bus is selected as a slack bus.

PV or GENERATOR BUS

In this bus the active powers and the voltage magnitudes are specified values, the reactive powers, and the phase angles are to be found out.

PQ or LOAD BUS

In this bus active and reactive powers are specified values, the voltage, and the phase angles are to be found out.

3.NEWTON RAPHSON TECHNIQUE

The Newton Raphson method used mainly for solving nonlinear equations. It transforms the nonlinear problem into linear problems whose solution approach the solutions of the original problem. The fundamental of this method is to allows for converges to be assessed by comparing power mismatches against a prespecified tolerance rather than voltage comparisons.

4.MGETHODOLOY

The objective of the paper is to build a Simulink 57 bus system model for conducting the load flow analysis using Psat software on MATLAB platform. In Psat no inbuilt 57 bus system model

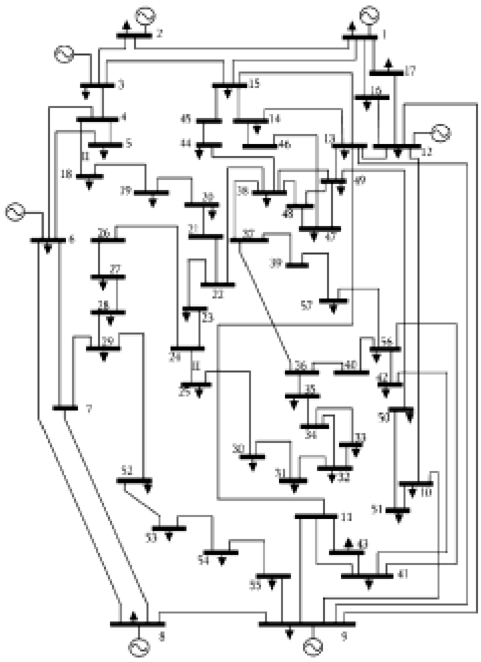
All the bus system in Psat are 2,3,6,9,14,24 only. There is necessity to build a large system like 57 bus system and 118 bus system for many power systems researches.

The model we have developed IEEE 57 bus system will help for future researches and academicians in the field of power system stability and Enhancement

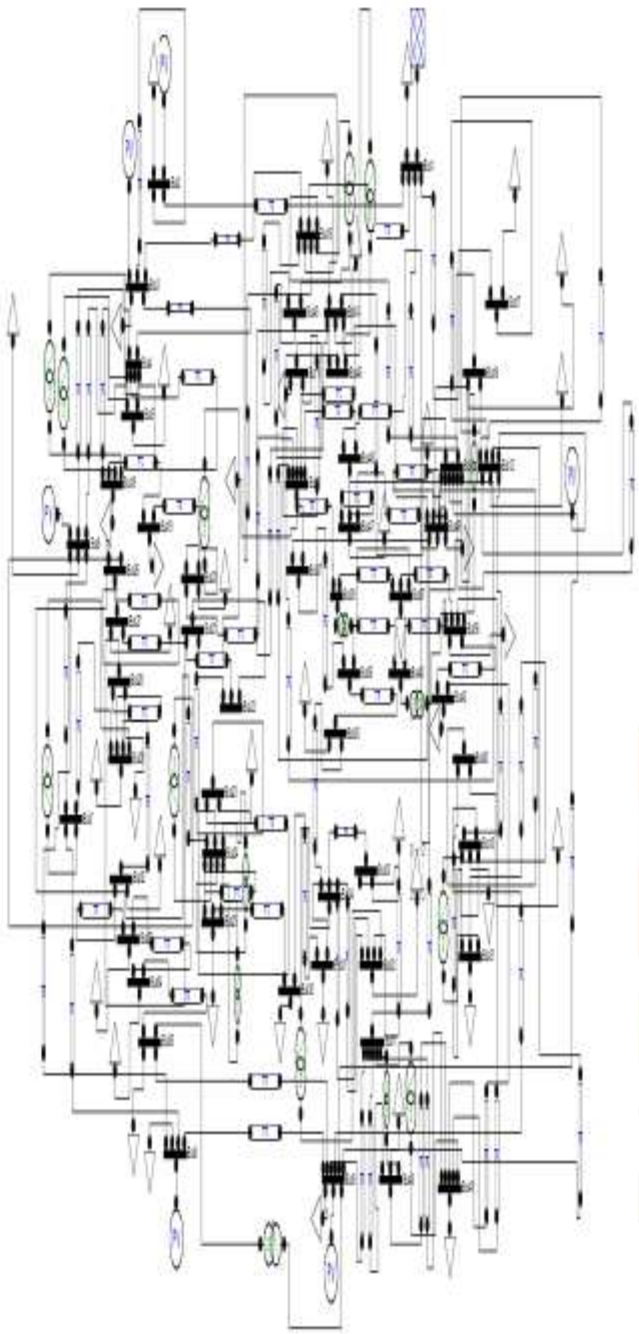
The procedure to conduct the load flow analysis for an IEEE 57 bus system model in PSAT.

- Take the SLG of an IEEE 57 bus test system with corresponding data
- Use the Simulink library to select necessary components like slack bus, PV bus, PQ load bus, transformer and transmission line etc.,
- Select and drag the components and draw the single line diagram.
- Load the standard data to the corresponding components.
- Select the fixed MVA base values.
- Divide or sectionalize the test system into areas with different kva ratings.
- Check the model connections with the standard test system.
- Save the model in PSAT software.
- Conduct the load flow analysis.

5.SINGLE LINE DIAGRAM



6.CIRCUIT DIAGRAM



7.THE PROPOSED SYSTEM STRUCTURE TO BE CONVERTED AS A SIMULINK MODEL

7(a)LINE DATA

Line No.	From Bus	To Bus	Line Impedance		Half Line Charging Susceptance (p.u)
			Resistance (p.u)	Reactance (p.u)	
1	1	2	0.0083	0.028	0.0645
2	2	3	0.0298	0.085	0.0409
3	3	4	0.0112	0.0366	0.0190
4	4	5	0.0625	0.132	0.0129
5	4	6	0.043	0.148	0.0174
6	6	7	0.02	0.102	0.0138
7	6	8	0.0339	0.173	0.0235
8	8	9	0.0099	0.0505	0.0274
9	9	10	0.0369	0.1679	0.0220
10	9	11	0.0258	0.0848	0.0109
11	9	12	0.0648	0.295	0.0386
12	9	13	0.0481	0.158	0.0203
13	13	14	0.0132	0.0434	0.0055
14	13	15	0.0269	0.0869	0.0115
15	1	15	0.0178	0.091	0.0494
16	1	16	0.0454	0.206	0.0273
17	1	17	0.0238	0.108	0.0143
18	3	15	0.0162	0.053	0.0272
19	4	18	0	0.555	0
20	4	18	0	0.43	0
21	5	6	0.0302	0.0641	0.0062
22	7	8	0.0139	0.0712	0.0097
23	10	12	0.0277	0.1262	0.0164
24	11	13	0.0223	0.0732	0.0094
25	12	13	0.0178	0.058	0.0302
26	12	16	0.018	0.0813	0.0108
27	12	17	0.0397	0.179	0.0238
28	14	15	0.0171	0.0547	0.0074
29	18	19	0.461	0.685	0
30	19	20	0.283	0.434	0
31	21	20	0	0.7767	0
32	21	22	0.0736	0.117	0
33	22	23	0.0099	0.0152	0
34	23	24	0.166	0.256	0.0042
35	24	25	0	1.182	0
36	24	25	0	1.23	0
37	24	26	0	0.0473	0
38	26	27	0.165	0.254	0
39	27	28	0.0618	0.0954	0
40	28	29	0.0418	0.0587	0
41	7	29	0	0.0648	0
42	25	30	0.135	0.202	0
43	30	31	0.326	0.497	0
44	31	32	0.507	0.755	0
45	32	33	0.0392	0.036	0
46	34	32	0	0.953	0
47	34	35	0.052	0.078	0.0016

48	35	36	0.043	0.0537	0.0008
49	36	37	0.029	0.0366	0
50	37	38	0.0651	0.1009	0.0010
51	37	39	0.0239	0.0379	0
52	36	40	0.03	0.0466	0
53	22	38	0.0192	0.0295	0
54	11	41	0	0.749	0
55	41	42	0.207	0.352	0
56	41	43	0	0.412	0
57	38	44	0.0289	0.0585	0.0010
58	15	45	0	0.1042	0
59	14	46	0	0.0735	0
60	46	47	0.023	0.068	0.0016
61	47	48	0.0182	0.0233	0
62	48	49	0.0834	0.129	0.0024
63	49	50	0.0801	0.128	0
64	50	51	0.1386	0.22	0
65	10	51	0	0.0712	0
66	13	49	0	0.191	0
67	29	52	0.1442	0.187	0
68	52	53	0.0762	0.0984	0
69	53	54	0.1878	0.232	0
70	54	55	0.1732	0.2265	0
71	11	43	0	0.153	0
72	44	45	0.0624	0.1242	0.0020
73	40	56	0	1.195	0
74	56	41	0.553	0.549	0
75	56	42	0.2125	0.354	0
76	39	57	0	1.355	0
77	57	56	0.174	0.26	0
78	38	49	0.115	0.177	0.0030
79	38	48	0.0312	0.0482	0
80	9	55	0	0.1205	0

7(b)Bus Data**:**

Bus No.	Bus Voltage		Generation		Load		Reactive Power Limits	
	Magnitude (p.u)	Phase Angle (degrees)	Real Power (p.u)	Reactive Power (p.u)	Real Power (p.u)	Reactive Power (p.u)	Q_{min} (p.u)	Q_{max} (p.u)
1	1.040	0.000	4.78	1.289	0.55	0.17	-	-
2	1.010	0.000	0.000	-0.008	0.03	0.88	-0.17	0.50
3	0.985	0.000	0.4	-0.01	0.41	0.21	-0.10	0.60
4	1.000	0.000	0.000	0.000	0.000	0.000	-	-
5	1.000	0.000	0.000	0.000	0.13	0.04	-	-
6	0.98	0.000	0.000	0.008	0.75	0.02	-0.08	0.25
7	1.000	0.000	0.000	0.000	0.000	0.000	-	-
8	1.005	0.000	4.50	0.621	1.50	0.22	-1.40	2
9	0.98	0.000	0.000	0.022	1.21	0.26	-0.03	0.09
10	1.000	0.000	0.000	0.000	0.05	0.02	-	-
11	1.000	0.000	0.000	0.000	0.000	0.000	-	-
12	1.015	0.000	3.10	1.285	3.77	0.24	-0.5	1.55
13	1.000	0.000	0.000	0.000	0.18	0.023	-	-
14	1.000	0.000	0.000	0.000	0.105	0.053	-	-

15	1.000	0.000	0.000	0.000	0.22	0.05	-	-
16	1.000	0.000	0.000	0.000	0.43	0.03	-	-
17	1.000	0.000	0.000	0.000	0.42	0.08	-	-
18	1.000	0.000	0.000	0.000	0.272	0.098	-	-
19	1.000	0.000	0.000	0.000	0.033	0.06	-	-
20	1.000	0.000	0.000	0.000	0.023	0.01	-	-
21	1.000	0.000	0.000	0.000	0.000	0.000	-	-
22	1.000	0.000	0.000	0.000	0.000	0.000	-	-
23	1.000	0.000	0.000	0.000	0.063	0.021	-	-
24	1.000	0.000	0.000	0.000	0.000	0.000	-	-
25	1.000	0.000	0.000	0.000	0.063	0.032	-	-
26	1.000	0.000	0.000	0.000	0.000	0.000	-	-
27	1.000	0.000	0.000	0.000	0.093	0.005	-	-
28	1.000	0.000	0.000	0.000	0.046	0.023	-	-
29	1.000	0.000	0.000	0.000	0.17	0.026	-	-
30	1.000	0.000	0.000	0.000	0.036	0.018	-	-
31	1.000	0.000	0.000	0.000	0.058	0.029	-	-
32	1.000	0.000	0.000	0.000	0.016	0.008	-	-
33	1.000	0.000	0.000	0.000	0.038	0.019	-	-
34	1.000	0.000	0.000	0.000	0.000	0.000	-	-
35	1.000	0.000	0.000	0.000	0.06	0.03	-	-
36	1.000	0.000	0.000	0.000	0.000	0.000	-	-
37	1.000	0.000	0.000	0.000	0.000	0.000	-	-
38	1.000	0.000	0.000	0.000	0.14	0.07	-	-
39	1.000	0.000	0.000	0.000	0.000	0.000	-	-
40	1.000	0.000	0.000	0.000	0.000	0.000	-	-
41	1.000	0.000	0.000	0.000	0.063	0.03	-	-
42	1.000	0.000	0.000	0.000	0.071	0.044	-	-
43	1.000	0.000	0.000	0.000	0.02	0.01	-	-
44	1.000	0.000	0.000	0.000	0.12	0.018	-	-
45	1.000	0.000	0.000	0.000	0.000	0.000	-	-
46	1.000	0.000	0.000	0.000	0.000	0.000	-	-
47	1.000	0.000	0.000	0.000	0.297	0.116	-	-
48	1.000	0.000	0.000	0.000	0.000	0.000	-	-
49	1.000	0.000	0.000	0.000	0.18	0.085	-	-
50	1.000	0.000	0.000	0.000	0.21	0.105	-	-
51	1.000	0.000	0.000	0.000	0.18	0.053	-	-
52	1.000	0.000	0.000	0.000	0.049	0.022	-	-
53	1.000	0.000	0.000	0.000	0.20	0.10	-	-
54	1.000	0.000	0.000	0.000	0.041	0.014	-	-
55	1.000	0.000	0.000	0.000	0.068	0.034	-	-
56	1.000	0.000	0.000	0.000	0.076	0.022	-	-
57	1.000	0.000	0.000	0.000	0.067	0.02	-	-

7(c)Transformer tap setting data:

From Bus	To Bus	Tap Setting Value (p.u.)
4	18	0.97
4	18	0.978
21	20	1.043
24	26	1.043
7	29	0.967
34	32	0.975
11	41	0.955
15	45	0.955
14	46	0.9
10	51	0.93
13	49	0.895
11	43	0.958
40	56	0.958
39	57	0.98
9	55	0.94
24	24	1.000
24	25	1.000

8.OUTPUT RESULTS

NETWORK STATISTICS

Buses: 57

Lines: 80

Transformers: 17

Generators: 7

Loads: 42

SOLUTION STATISTICS

Number of Iterations: 3

Maximum P mismatch [p.u.] 0

Maximum Q mismatch [p.u.] 0

Power rate [MVA] 100

9.POWER FLOW RESULTS

Bus	V [p.u.]	phase [rad]	P gen [p.u.]	Q gen [p.u.]	P load [p.u.]	Q load [p.u.]
Bus1	1.04	0	45.2356	1414.2815	0.55	0.17
Bus10	1.0015	0.00687	0	0	0.8	0.6
Bus11	1.0019	0.00653	0	0	0	0
Bus12	1	0.00752	0.8	-354.6332	0.8	0.6
Bus13	1.003	0.00645	0	0	0.8	0.6
Bus14	1.0039	0.00612	0	0	0.8	0.6
Bus15	1.0055	0.00637	0	0	0.8	0.6
Bus16	1.0124	0.00503	0	0	0.8	0.6
Bus17	1.0262	0.00241	0	0	0.8	0.6
Bus18	0.99263	0.01038	0	0	0.8	0.6
Bus19	0.99515	0.00727	0	0	0.8	0.6
Bus2	1.01	0.00767	0	-704.1377	0.03	0.88
Bus20	0.99735	0.00556	0	0	0.8	0.6
Bus21	1.0022	0.00598	0	0	0	0
Bus22	1.003	0.00559	0	0	0	0
Bus23	1.0029	0.00557	0	0	0.8	0.6
Bus24	1.0019	0.00567	0	0	0	0
Bus25	1.0002	0.00374	0	0	0.8	0.6
Bus26	1.0017	0.00567	0	0	0	0
Bus27	1.0007	0.00629	0	0	0.8	0.6
Bus28	1.0005	0.00658	0	0	0.8	0.6
Bus29	1.0005	0.00679	0	0	0.8	0.6
Bus3	0.985	0.01369	0.0032	-717.5835	0.41	0.21
Bus30	0.99995	0.00369	0	0	0.8	0.6
Bus31	1	0.00382	0	0	0.8	0.6
Bus32	1.0012	0.00437	0	0	0.8	0.6
Bus33	1.0013	0.00442	0	0	0.8	0.6
Bus34	1.0021	0.00474	0	0	0	0
Bus35	1.0023	0.00491	0	0	0.8	0.6
Bus36	1.0026	0.00509	0	0	0	0
Bus37	1.0027	0.0052	0	0	0	0
Bus38	1.0033	0.00553	0	0	0.8	0.6
Bus39	1.0027	0.00521	0	0	0	0
Bus4	0.99031	0.01169	0	0	0	0
Bus40	1.0025	0.00511	0	0	0	0
Bus41	1.0018	0.00546	0	0	0.8	0.6
Bus42	1.0014	0.00505	0	0	0.8	0.6
Bus43	1.0018	0.00614	0	0	0.8	0.6
Bus44	1.0038	0.00558	0	0	0.8	0.6
Bus45	1.005	0.00582	0	0	0	0
Bus46	1.0038	0.00585	0	0	0	0
Bus47	1.0035	0.00567	0	0	0.8	0.6
Bus48	1.0034	0.00564	0	0	0	0
Bus49	1.0033	0.00585	0	0	0.8	0.6
Bus5	0.99724	0.00871	0	0	0.13	0.04
Bus50	1.0026	0.00615	0	0	0.8	0.6
Bus51	1.0018	0.00678	0	0	0.8	0.6
Bus52	0.99986	0.0067	0	0	0.8	0.6
Bus53	0.9997	0.0067	0	0	0.8	0.6
Bus54	0.99964	0.00679	0	0	0.8	0.6
Bus55	0.99991	0.00696	0	0	0.8	0.6
Bus56	1.0015	0.00482	0	0	0.8	0.6
Bus57	1.0015	0.00463	0	0	0.8	0.6
Bus6	1	0.00757	0.8	62.755	0.8	0.6
Bus7	1.0005	0.00709	0	0	0	0
Bus8	1	0.00725	0.8	-30.1372	0.8	0.6
Bus9	1	0.0072	0.8	-90.8489	0.8	0.6

LINE FLOWS

From Bus	To Bus	Line	P Flow [p.u.]	Q Flow [p.u.]	P Loss [p.u.]	Q Loss [p.u.]
Bus15	Bus1	1	-0.96923	-340.5099	2.1393	-32.4908
Bus19	Bus20	2	0.36506	-4.469	0.00684	0.01049
Bus2	Bus1	3	-25.3084	-928.3836	7.8636	-30.4182
Bus6	Bus7	4	3.1543	-10.1012	0.00068	-11.5959
Bus29	Bus7	5	-3.93	0.04153	0	0.00119
Bus28	Bus29	6	-1.6294	1.9469	0.00032	0.00045
Bus29	Bus52	7	1.5103	1.4752	0.00076	0.00099
Bus26	Bus27	8	-0.02694	3.1507	0.00194	0.00299
Bus27	Bus28	9	-0.82889	2.5477	0.00053	0.00081
Bus26	Bus24	10	0.01667	-3.3561	0	0.00063
Bus21	Bus20	11	0.44886	5.2867	0	0.02591
Bus3	Bus15	12	15.4769	-336.1181	2.1044	-15.7545
Bus22	Bus21	13	0.4444	5.1156	0.0023	0.00365
Bus22	Bus23	14	2.1602	1.424	8e-05	0.00012
Bus24	Bus23	15	-1.3585	-4.3669	0.00169	-3.543
Bus25	Bus24	16	-1.3749	-1.1945	0	0.00467
Bus30	Bus25	17	-0.58488	-0.60225	0.00011	0.00017
Bus53	Bus52	18	-0.70941	-0.87404	0.00012	0.00015
Bus54	Bus53	19	0.09061	-0.27402	2e-05	2e-05
Bus55	Bus54	20	0.89079	0.32622	0.00019	0.00024
Bus9	Bus8	21	-0.74967	-11.3632	1e-05	-23.0203
Bus9	Bus55	22	1.6736	0.60798	0	0.00045
Bus2	Bus3	23	25.2784	223.366	2.0399	-28.3777
Bus7	Bus8	24	-0.78672	1.359	0.0005	-8.1506
Bus6	Bus8	25	1.537	-10.1728	0.0001	-19.7433
Bus1	Bus16	26	4.0306	103.8956	0.67656	-21.0881
Bus17	Bus12	27	3.2528	114.9952	0.70747	-17.3366
Bus1	Bus17	28	4.3744	104.2313	0.32162	-11.3639

Bus12	Bus10	29	1.9624	-17.5182	0.00385	-13.7822
Bus10	Bus9	30	0.04958	-1.6026	0.00257	-18.5001
Bus12	Bus9	31	0.86364	-16.4046	6e-05	-32.4299
Bus13	Bus9	32	0.82239	7.2664	0.01433	-17.0597
Bus16	Bus12	33	2.5541	124.3838	0.34817	-7.6142
Bus3	Bus4	34	7.3549	-129.9317	0.20588	-14.8986
Bus12	Bus13	35	1.9252	-56.9806	0.04165	-25.3138
Bus15	Bus13	36	6.2548	17.7036	0.0174	-9.6885
Bus14	Bus13	37	-1.1365	14.9355	0.00467	-4.6375
Bus15	Bus14	38	2.7866	-2.9294	0.00277	-20.1723
Bus14	Bus46	39	3.0877	1.0864	0	0.00093
Bus46	Bus47	40	3.1172	1.6444	0.00041	-1.3529
Bus49	Bus50	41	0.49586	3.9679	0.00151	0.00242
Bus10	Bus51	42	1.0883	-3.1369	0	0.00093
Bus11	Bus41	43	1.2104	0.18767	0	0.00133
Bus38	Bus22	44	2.6058	6.5414	0.00113	0.00173
Bus4	Bus5	45	-1.5643	-48.2207	0.13983	-10.4083
Bus38	Bus37	46	4.0032	1.3872	0.00149	-0.84293
Bus39	Bus37	47	-0.36653	-0.88085	3e-05	4e-05
Bus57	Bus39	48	-0.35805	-0.7691	0	0.00116
Bus37	Bus36	49	3.6352	1.3492	0.00052	0.00065
Bus40	Bus36	50	-0.21568	-0.96767	3e-05	5e-05
Bus35	Bus36	51	-3.4183	-1.0555	0.00062	-0.67464
Bus35	Bus34	52	2.6183	0.45546	0.0005	-1.3494
Bus33	Bus34	53	-2.2872	-0.88002	0.00158	0.00143
Bus31	Bus32	54	-1.0151	-0.59778	0.00084	0.00125
Bus34	Bus32	55	0.32039	0.78727	0	0.00082
Bus6	Bus4	56	-6.5705	49.6755	0.16841	-13.8981
Bus33	Bus32	57	1.4872	0.28002	0.00011	0.0001
Bus30	Bus31	58	-0.21512	0.00225	2e-05	3e-05
Bus15	Bus45	59	4.4849	4.5205	0	0.00497
Bus45	Bus44	60	4.4998	4.7557	0.0038	-1.6876
Bus44	Bus38	61	3.696	5.8433	0.00181	-0.84247
Bus11	Bus9	62	-0.76517	14.6458	0.01134	-9.138
Bus11	Bus43	63	2.1783	0.52625	0	0.00091
Bus41	Bus43	64	-1.3914	-0.14423	0	0.00096
Bus13	Bus11	65	2.659	7.9132	0.00391	-7.9237
Bus42	Bus41	66	-1.1122	-0.2294	0.00032	0.00054
Bus5	Bus6	67	-1.8342	-37.8525	0.04507	-5.099
Bus56	Bus41	68	-0.70632	0.26332	0.00037	0.00037
Bus56	Bus57	69	0.43365	-0.27726	5e-05	8e-05
Bus56	Bus40	70	-0.20244	-0.73211	0	0.00082
Bus56	Bus42	71	-0.31215	0.3707	6e-05	0.0001
Bus49	Bus47	72	-0.16934	-0.84885	0.0002	0.00018
Bus13	Bus49	73	2.6622	-1.1375	0	0.00189
Bus38	Bus48	74	-2.6398	-1.2207	0.00031	0.00048
Bus49	Bus38	75	1.0752	-1.9146	0.00021	-2.5367
Bus49	Bus48	76	0.49319	-2.3564	0.0002	-2.0296
Bus47	Bus48	77	2.1472	1.5482	0.00015	0.00019
Bus4	Bus18	78	1.949	-3.483	0	0.01073
Bus51	Bus50	79	0.30753	-3.3625	0.00187	0.00297
Bus18	Bus19	80	1.1741	-3.8555	0.00905	0.01344
Bus4	Bus18	81	0.01383	0.14379	0.0002	0.004
Bus10	Bus51	82	0.02067	0.40345	0.00141	0.02814
Bus13	Bus49	83	0.03619	0.65612	0.00344	0.06876
Bus11	Bus43	84	0.01355	0.22952	0.00048	0.00967
Bus40	Bus56	85	0.01324	0.23474	0.0005	0.0101
Bus39	Bus57	86	0.00848	0.1106	0.00012	0.00235
Bus9	Bus55	87	0.01823	0.33907	0.00102	0.02038
Bus24	Bus24	88	0	0	0	0
Bus24	Bus25	89	0.01007	0.00793	0	3e-05
Bus4	Bus18	90	0.0116	0.10044	0.0001	0.00199
Bus21	Bus20	91	-0.00675	-0.17475	0.00033	0.00662
Bus24	Bus26	92	-0.00985	-0.19698	0.00042	0.00843
Bus7	Bus29	93	0.01037	0.17608	0.00029	0.00581
Bus34	Bus32	94	0.00867	0.13618	0.00018	0.00353
Bus11	Bus41	95	0.01803	0.24762	0.00056	0.0112
Bus15	Bus45	96	0.01549	0.25161	0.00057	0.01146
Bus14	Bus46	97	0.03255	0.62099	0.00311	0.06216

LINE FLOWS

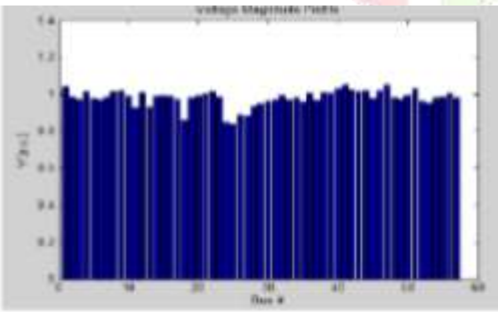
From Bus	To Bus	Line	P Flow	Q Flow	P Loss	Q Loss
			[p.u.]	[p.u.]	[p.u.]	[p.u.]
Bus1	Bus15	1	3.1086	308.0192	2.1393	-32.4908
Bus20	Bus19	2	-0.35822	4.4794	0.00684	0.01049
Bus1	Bus2	3	33.172	897.9654	7.8636	-30.4182
Bus7	Bus6	4	-3.1536	-1.4947	0.00068	-11.5959
Bus7	Bus29	5	3.93	-0.04034	0	0.00119
Bus29	Bus28	6	1.6297	-1.9465	0.00032	0.00045
Bus52	Bus29	7	-1.5095	-1.4742	0.00076	0.00099
Bus27	Bus26	8	0.02889	-3.1477	0.00194	0.00299
Bus28	Bus27	9	0.82941	-2.5469	0.00053	0.00081
Bus24	Bus26	10	-0.01667	3.3568	0	0.00063
Bus20	Bus21	11	-0.44886	-5.2608	0	0.02591
Bus15	Bus3	12	-13.3725	320.3636	2.1044	-15.7545
Bus21	Bus22	13	-0.44211	-5.112	0.0023	0.00365
Bus23	Bus22	14	-2.1602	-1.4239	8e-05	0.00012
Bus23	Bus24	15	1.3602	0.82389	0.00169	-3.543
Bus24	Bus25	16	1.3749	1.1992	0	0.00467
Bus25	Bus30	17	0.58499	0.60242	0.00011	0.00017
Bus52	Bus53	18	0.70953	0.87419	0.00012	0.00015
Bus53	Bus54	19	-0.09059	0.27404	2e-05	2e-05
Bus54	Bus55	20	-0.89061	-0.32598	0.00019	0.00024
Bus8	Bus9	21	0.74968	-11.6571	1e-05	-23.0203
Bus55	Bus9	22	-1.6736	-0.60753	0	0.00045
Bus3	Bus2	23	-23.2385	-251.7437	2.0399	-28.3777
Bus8	Bus7	24	0.78721	-9.5097	0.0005	-8.1506
Bus8	Bus6	25	-1.5369	-9.5705	0.0001	-19.7433
Bus16	Bus1	26	-3.3541	-124.9838	0.67656	-21.0881
Bus12	Bus17	27	-2.5453	-132.3318	0.70747	-17.3366
Bus17	Bus1	28	-4.0528	-115.5952	0.32162	-11.3639
Bus10	Bus12	29	-1.9585	3.736	0.00385	-13.7822
Bus9	Bus10	30	-0.04701	-16.8976	0.00257	-18.5001
Bus9	Bus12	31	-0.86358	-16.0252	6e-05	-32.4299
Bus9	Bus13	32	-0.80807	-24.3262	0.01433	-17.0597
Bus12	Bus16	33	-2.2059	-131.998	0.34817	-7.6142
Bus4	Bus3	34	-7.149	115.0331	0.20588	-14.8986
Bus13	Bus12	35	-1.8836	31.6668	0.04165	-25.3138
Bus13	Bus15	36	-6.2374	-27.3921	0.0174	-9.6885
Bus13	Bus14	37	1.1412	-19.573	0.00467	-4.6375
Bus14	Bus15	38	-2.7838	-17.2429	0.00277	-20.1723
Bus46	Bus14	39	-3.0877	-1.0855	0	0.00093
Bus47	Bus46	40	-3.1168	-2.9972	0.00041	-1.3529
Bus50	Bus49	41	-0.49434	-3.9655	0.00151	0.00242
Bus51	Bus10	42	-1.0883	3.1378	0	0.00093
Bus41	Bus11	43	-1.2104	-0.18634	0	0.00133
Bus22	Bus38	44	-2.6046	-6.5396	0.00113	0.00173
Bus5	Bus4	45	1.7042	37.8125	0.13983	-10.4083
Bus37	Bus38	46	-4.0017	-2.2301	0.00149	-0.84293
Bus37	Bus39	47	0.36655	0.88089	3e-05	4e-05
Bus39	Bus57	48	0.35805	0.77025	0	0.00116
Bus36	Bus37	49	-3.6347	-1.3485	0.00052	0.00065
Bus36	Bus40	50	0.21572	0.96772	3e-05	5e-05
Bus36	Bus35	51	3.419	0.38082	0.00062	-0.67464
Bus34	Bus35	52	-2.6178	-1.8049	0.0005	-1.3494
Bus34	Bus33	53	2.2888	0.88144	0.00158	0.00143
Bus32	Bus31	54	1.016	0.59903	0.00084	0.00125
Bus32	Bus34	55	-0.32039	-0.78645	0	0.00082
Bus4	Bus6	56	6.7389	-63.5736	0.16841	-13.8981
Bus32	Bus33	57	-1.4871	-0.27992	0.00011	0.0001
Bus31	Bus30	58	0.21514	-0.00222	2e-05	3e-05
Bus45	Bus15	59	-4.4849	-4.5156	0	0.00497
Bus44	Bus45	60	-4.496	-6.4433	0.0038	-1.6876
Bus38	Bus44	61	-3.6942	-6.6858	0.00181	-0.84247
Bus9	Bus11	62	0.77652	-23.7838	0.01134	-9.138
Bus43	Bus11	63	-2.1783	-0.52534	0	0.00091
Bus43	Bus41	64	1.3914	0.14519	0	0.00096
Bus11	Bus13	65	-2.6551	-15.8369	0.00391	-7.9237
Bus41	Bus42	66	1.1125	0.22994	0.00032	0.00054
Bus6	Bus5	67	1.8792	32.7535	0.04507	-5.099
Bus41	Bus56	68	0.70669	-0.26295	0.00037	0.00037
Bus57	Bus56	69	-0.43359	0.27735	5e-05	8e-05
Bus40	Bus56	70	0.20244	0.73293	0	0.00082
Bus42	Bus56	71	0.31221	-0.3706	6e-05	0.0001
Bus47	Bus49	72	0.16953	0.84902	0.0002	0.00018
Bus49	Bus13	73	-2.6622	1.1394	0	0.00189
Bus48	Bus38	74	2.6401	1.2212	0.00031	0.00048
Bus38	Bus49	75	-1.075	-0.62204	0.00021	-2.5367
Bus48	Bus49	76	-0.49299	0.32682	0.0002	-2.0296
Bus48	Bus47	77	-2.1471	-1.548	0.00015	0.00019
Bus18	Bus4	78	-1.949	3.4938	0	0.01073

Bus50	Bus51	79	-0.30566	3.3655	0.00187	0.00297
Bus19	Bus18	80	-1.1651	3.869	0.00905	0.01344
Bus18	Bus4	81	-0.01363	-0.13979	0.0002	0.004
Bus51	Bus10	82	-0.01926	-0.37531	0.00141	0.02814
Bus49	Bus13	83	-0.03275	-0.58736	0.00344	0.06876
Bus43	Bus11	84	-0.01306	-0.21985	0.00048	0.00967
Bus56	Bus40	85	-0.01274	-0.22464	0.0005	0.0101
Bus57	Bus39	86	-0.00836	-0.10825	0.00012	0.00235
Bus55	Bus9	87	-0.01721	-0.3187	0.00102	0.02038
Bus24	Bus24	88	0	0	0	0
Bus25	Bus24	89	-0.01007	-0.0079	0	3e-05
Bus18	Bus4	90	-0.0115	-0.09845	0.0001	0.00199
Bus20	Bus21	91	0.00708	0.18138	0.00033	0.00662
Bus26	Bus24	92	0.01027	0.20541	0.00042	0.00843
Bus29	Bus7	93	-0.01008	-0.17026	0.00029	0.00581
Bus32	Bus34	94	-0.0085	-0.13266	0.00018	0.00353
Bus41	Bus11	95	-0.01747	-0.23642	0.00056	0.0112
Bus45	Bus15	96	-0.01492	-0.24014	0.00057	0.01146
Bus46	Bus14	97	-0.02944	-0.55883	0.00311	0.06216

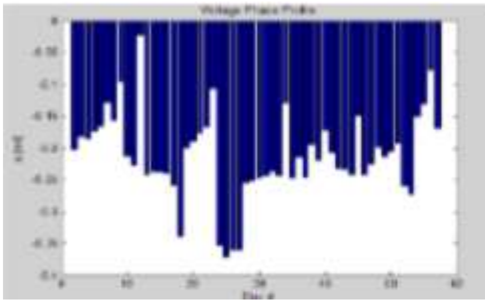
10.GLOBAL SUMMARY REPORT

TOTAL GENERATION	
REAL POWER [p.u.]	48.4388
REACTIVE POWER [p.u.]	-420.304
TOTAL LOAD	
REAL POWER [p.u.]	31.52
REACTIVE POWER [p.u.]	24.1
TOTAL LOSSES	
REAL POWER [p.u.]	16.9188
REACTIVE POWER [p.u.]	-444.404

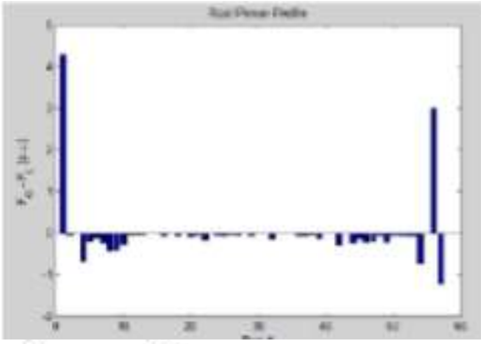
11.GRAPHS



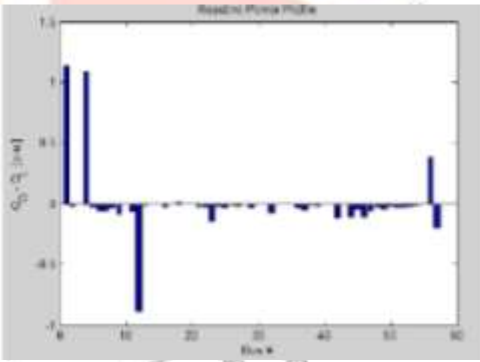
VOLTAGE MAGNITUDE



PHASE ANGLE



REAL POWER



REACTIVE POWER

12.RESULT:

In this work, we have conducted the power low analysis in Power System Analysis Toolbox (PSAT). An IEEE 57 bus test system with its standard data has selected for this purpose. Then we have designed the single line diagram of IEEE 57 bus test system in to a PSAT modal. The power flow analysis has conducted using this model and all the results are tabulated. The corresponding graphs for the voltage, angle, active and reactive power profiles were also been drawn. All the active and the reactive power mismatches are zero and the number of iterations for the convergence is only 3. This gives the validity of this work and this method can be used for any power systemanalysis researches.

13.CONCLUSION:

In this paper we have a load flow analysis in power system analysis toolbox (PSAT). An IEEE 57 Bus test system with its standard data has selected for this purpose. Then we have designed the single line diagram of IEEE 57 Bus system in to a psat in a MATLAB platform. The load flow analysis has conducted using this model and all the results are tabulated. All the active and reactive power mismatches are zero and the number of iterations for this convergence is only 3. In this power flow equation is satisfied (Pg.=Pd+Pl). This gives the validity of this paper and this method can be used for any power system analysis.

14. REFERANCES:

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