ETAP Load Flow

The ETAP V&V process for the Load Flow program has over 1500 test case scenarios that are run before each ETAP release. The following case samples are from the Load Flow Solutions & Methods category.

Load Flow Comparison Case # 1

Comparison of ETAP Load Flow Results against a Published Textbook Example

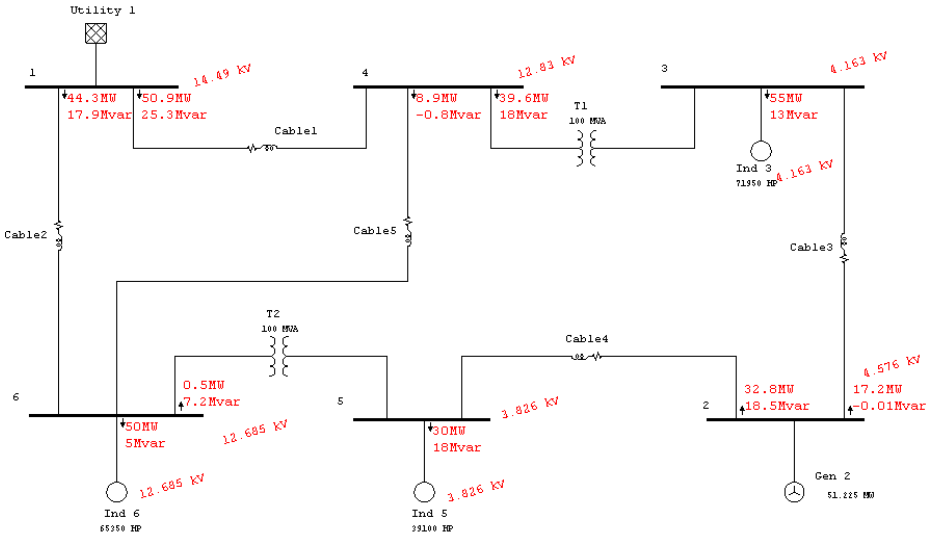
Excerpts from Validation Cases and Comparison Results (TCS-LF-006)

Highlights

- Comparison between ETAP Load Flow (LF) results against those published in the textbook "Computer Aided Power System Operation and Analysis" by R.N Dhar, page 89.
- Comparison of results for the Newton Rhapson Method.
- Comparison of results for the Accelerated Gauss Seidel Method.
- Comparison of results for the Fast Decoupled Method.
- Study includes generation, motor loads, transformers and cables.
- Considers line impedance and admittance.
- Comparisons are made against generation schedule, bus voltages and power flows in per-unit.
- The difference in the results is less than 1% for all bus voltages and power flows.

System Description

This is a six-bus system that is composed of lines, cables, transformers, generators and utility. The line impedance and charging effects are considered. The schedule of generation and loading for each bus were taken as described in Table 6.2 of the published example.



Comparison of Results

The following tables of comparison show the differences between ETAP Results and those published in the textbook example. Please notice that the percent difference for all branch flows and bus voltages is less than 1%.

COMPARISON BETWEEN ETAP AND REFERENCE FOR LOAD FLOW											
BUS	REFERENCE		ETAP								
			AGS			NR			FD		
	% Mag.	Ang.	% Mag.	Ang.	% Diff Mag	% Mag.	Ang.	% Diff Mag	% Mag.	Ang.	% Diff Mag
1	105	0	105	0	**0.00**	105	0	**0.00**	105	0	**0.00**
2	110	-3.34	110	-3.3	**0.00**	110	-3.3	**0.00**	110	-3.3	**0.00**
3	100.08	-12.78	100.08	-12.8	**0.00**	100.08	-12.8	**0.00**	100.08	-12.8	**0.00**
4	92.98	-9.84	92.97	-9.8	**0.01**	92.97	-9.8	**0.01**	92.97	-9.8	**0.01**
5	91.98	-12.33	91.98	-12.3	**0.00**	91.98	-12.3	**0.00**	91.98	-12.3	**0.00**
6	91.92	-12.3	91.92	-12.2	**0.00**	91.92	-12.2	**0.00**	91.92	-12.2	**0.00**

Table 1: Bus Voltage Comparison for all three Load Flow methods against published results.

COMPARISON BETWEEN ETAP AND REFERENCE FOR LOAD FLOW															
From BUS	To BUS	REFERENCE		ETAP											
				AGS				NR				FD			
		MW	Mvar	MW	Mvar	% Diff MW	%Diff Mvar	MW	Mvar	% Diff MW	%Diff Mvar	MW	Mvar	% Diff MW	%Diff Mvar
1	4	50.907	25.339	50.91	25.34	**-0.01**	**0.00**	50.91	25.34	-0.01	0.00	50.91	25.34	-0.01	0.00
1	6	44.3	17.913	44.3	17.92	**0.00**	**-0.04**	44.3	17.92	0.00	-0.04	44.3	17.92	0.00	-0.04
2	3	17.183	-0.01	17.18	-0.01	**0.02**	**0.00**	17.18	-0.01	0.02	0.00	17.18	-0.01	0.02	0.00
2	5	32.832	18.446	32.82	18.45	**0.04**	**-0.02**	32.82	18.45	0.04	-0.02	32.82	18.45	0.04	-0.02
3	2	-15.419	2.582	-15.42	2.57	**-0.01**	**0.46**	-15.42	2.57	-0.01	0.46	-15.42	2.57	-0.01	0.46
3	4	-39.58	-15.57	-39.58	-15.57	**0.00**	**-0.01**	-39.58	-15.57	0.00	-0.01	-39.59	-15.57	-0.03	-0.01
4	1	-48.497	-17.15	-48.5	-17.15	**-0.01**	**-0.02**	-48.5	-17.15	-0.01	-0.02	-48.5	-17.15	-0.01	-0.02
4	6	8.916	-0.824	8.92	-0.83	**-0.04**	**-0.73**	8.92	-0.83	-0.04	-0.73	8.92	-0.83	-0.04	-0.73

Table 2: Power Flow Comparison for all three Load Flow methods against published results.

Reference

1. "Computer Aided Power System Operation and Analysis," R.N Dhar, page 89.
2. ETAP Load Flow V&V Documents, Case Number TCS-LF-006.