Electrical Transient Analyzer Program

Load Flow Analysis

Loading Category (1): Design

Generation Category (1): Design

Load Diversity Factor: None

	Swing	V-Control	Load	Total
Number of Buses:	1	0	9	10

	XFMR2	XFMR3	Reactor	Line/Cable/ Busway	Impedance	Tie PD	Total
Number of Branches:	0	0	0	0	9	0	9

Method of Solution:	Adaptive Newton-Raphson Method
Maximum No. of Iteration:	99
Precision of Solution:	0.0001000
System Frequency:	60.00 Hz
Unit System:	English
Project Filename:	IEEE_10_BUS
Output Filename:	C:\Users\ctant\Desktop\Temp\IEEE_10_BUS\IEEE_10_BUS\LF.lfr

Adjustments

Tolerance	Apply Adjustments	Individual /Global	Percent
Transformer Impedance:	Yes	Individual	
Reactor Impedance:	Yes	Individual	
Overload Heater Resistance:	No		
Transmission Line Length:	No		
Cable / Busway Length:	No		

Temperature Correction	Apply Adjustments	Individual /Global	Degree C
Transmission Line Resistance:	Yes	Individual	
Cable / Busway Resistance:	Yes	Individual	

Bus Input Data

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	kW	kvar	kW	kvar	kW	kvar	kW	kvar
Bus1	23.000	1	100.0	0.0								
Bus2	23.000	1	100.0	0.0	1840.0	460.0						
Bus3	23.000	1	100.0	0.0	980.0	340.0						
Bus4	23.000	1	100.0	0.0	1790.0	446.0						
Bus5	23.000	1	100.0	0.0	1598.0	1840.0						
Bus6	23.000	1	100.0	0.0	1610.0	600.0						
Bus7	23.000	1	100.0	0.0	780.0	110.0						
Bus8	23.000	1	100.0	0.0	1150.0	60.0						
Bus9	23.000	1	100.0	0.0	980.0	130.0						
Bus10	23.000	1	100.0	0.0	1640.0	200.0						
Total Number of Buses: 10					12368.000	4186.001	0.000	0.000	0.000	0.000	0.000	0.000

Generation Bus				Voltage		Generation			kvar Limits	
ID	kV	Type	Sub-sys	% Mag.	Angle	kW	kvar	% PF	Max	Min
Bus1	23.000	Swing	1	100.0	0.0					
						0.000	0.000			

Impedance Input Data

Impedance	Positive Sequence Impedance			
ID	R	X	Y	Unit
Z1	0.1233	0.4127	0	Ohm
Z2	0.014	0.6057	0	Ohm
Z3	0.7463	1.205	0	Ohm
Z4	0.6984	0.6084	0	Ohm
Z5	1.9831	1.7276	0	Ohm
Z6	0.9053	0.7886	0	Ohm
Z7	2.0552	1.164	0	Ohm
Z8	4.7943	2.716	0	Ohm
Z9	5.3434	3.0264	0	Ohm

Branch Connections

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
Z1	Impedance	Bus1	Bus2	2.33	7.80	8.14	
Z2	Impedance	Bus2	Bus3	0.26	11.45	11.45	
Z3	Impedance	Bus3	Bus4	14.11	22.78	26.79	
Z4	Impedance	Bus4	Bus5	13.20	11.50	17.51	
Z5	Impedance	Bus5	Bus6	37.49	32.66	49.72	
Z6	Impedance	Bus6	Bus7	17.11	14.91	22.70	
Z7	Impedance	Bus7	Bus8	38.85	22.00	44.65	
Z8	Impedance	Bus8	Bus9	90.63	51.34	104.16	
Z9	Impedance	Bus9	Bus10	101.01	57.21	116.09	

LOAD_FLOW_REPORT

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	kW	kvar	kW	kvar	ID	kW	kvar	Amp	%PF	%Tap
* Bus1	23.000	100.000	0.0	13151.8	5222.7	0.0	0.0	Bus2	13151.760	5222.650	355.2	92.9	
Bus2	23.000	99.290	-0.5	0.0	0.0	1840.0	460.0	Bus1	-13105.090	-5066.429	355.2	93.3	
								Bus3	11265.090	4606.429	307.7	92.6	
Bus3	23.000	98.737	-1.3	0.0	0.0	980.0	340.0	Bus2	-11261.110	-4434.398	307.7	93.0	
								Bus4	10281.110	4094.398	281.3	92.9	
Bus4	23.000	96.340	-2.3	0.0	0.0	1790.0	446.0	Bus3	-10103.890	-3808.256	281.3	93.6	
								Bus5	8313.892	3362.256	233.7	92.7	
Bus5	23.000	94.801	-2.7	0.0	0.0	1598.0	1840.0	Bus4	-8199.492	-3262.598	233.7	92.9	
								Bus6	6601.491	1422.599	178.8	97.8	
Bus6	23.000	91.717	-3.7	0.0	0.0	1610.0	600.0	Bus5	-6411.270	-1256.885	178.8	98.1	
								Bus7	4801.269	656.887	132.6	99.1	
Bus7	23.000	90.716	-4.1	0.0	0.0	780.0	110.0	Bus6	-4753.493	-615.270	132.6	99.2	
								Bus8	3973.495	505.269	110.8	99.2	
Bus8	23.000	88.895	-4.6	0.0	0.0	1150.0	60.0	Bus7	-3897.752	-462.371	110.8	99.3	
								Bus9	2747.752	402.372	78.4	98.9	
Bus9	23.000	85.869	-5.4	0.0	0.0	980.0	130.0	Bus8	-2659.305	-352.266	78.4	99.1	
								Bus10	1679.309	222.263	49.5	99.1	
Bus10	23.000	83.750	-6.0	0.0	0.0	1640.0	200.0	Bus9	-1640.001	-200.000	49.5	99.3	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

\# Indicates a bus with a load mismatch of more than 0.1 MVA

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					Percent
ID	kV	Rated Amp	kW	kvar	kW	kvar	kW	kvar	kW	kvar	kVA	% PF	Amp	Loading
Bus1	23.000										14150.790	92.9	355.2	
Bus2	23.000		1840.000	460.000							14050.340	93.3	355.2	
Bus3	23.000		980.000	340.000							12102.750	93.0	307.7	
Bus4	23.000		1790.000	446.000							10797.750	93.6	281.3	
Bus5	23.000		1598.001	1839.999							8824.751	92.9	233.7	
Bus6	23.000		1610.001	599.998							6533.309	98.1	178.8	
Bus7	23.000		779.999	110.000							4793.147	99.2	132.6	
Bus8	23.000		1150.000	60.000							3925.081	99.3	110.8	
Bus9	23.000		979.996	130.003							2682.535	99.1	78.4	
Bus10	23.000		1640.001	200.000							1652.151	99.3	49.5	

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).
# Indicates operating load of a bus exceeds the bus marginal limit (95.0% of the Continuous Ampere rating).

Branch Losses Summary Report

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
	kw	kvar	kw	kvar	kW	kvar	From	To	in Vmag
Z1	13151.8	5222.7	-13105.1	-5066.4	46.7	156.2	100.0	99.3	0.71
Z2	11265.1	4606.4	-11261.1	-4434.4	4.0	172.0	99.3	98.7	0.55
Z3	10281.1	4094.4	-10103.9	-3808.3	177.2	286.1	98.7	96.3	2.40
Z4	8313.9	3362.3	-8199.5	-3262.6	114.4	99.7	96.3	94.8	1.54
Z5	6601.5	1422.6	-6411.3	-1256.9	190.2	165.7	94.8	91.7	3.08
Z6	4801.3	656.9	-4753.5	-615.3	47.8	41.6	91.7	90.7	1.00
Z7	3973.5	505.3	-3897.8	-462.4	75.7	42.9	90.7	88.9	1.82
Z8	2747.8	402.4	-2659.3	-352.3	88.4	50.1	88.9	85.9	3.03
Z9	1679.3	222.3	-1640.0	-200.0	39.3	22.3	85.9	83.8	2.12
					783.8	1036.7			

* This Transmission Line includes Series Capacitor.

Alert Summary Report

	% Alert Settings	
	Critical	Marginal
Loading		
Bus	100.0	95.0
Cable / Busway	100.0	95.0
Reactor	100.0	95.0
Line	100.0	95.0
Transformer	100.0	95.0
Panel	100.0	95.0
Protective Device	100.0	95.0
Generator	100.0	95.0
Inverter/Charger	100.0	95.0
Bus Voltage		
OverVoltage	105.0	102.0
UnderVoltage	95.0	98.0
Generator Excitation		
OverExcited (Q Max.)	100.0	95.0
UnderExcited (Q Min.)	100.0	

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus10	Bus	Under Voltage	23.000	kV	19.263	83.8	3-Phase
Bus5	Bus	Under Voltage	23.000	kV	21.804	94.8	3-Phase
Bus6	Bus	Under Voltage	23.000	kV	21.095	91.7	3-Phase
Bus7	Bus	Under Voltage	23.000	kV	20.865	90.7	3-Phase
Bus8	Bus	Under Voltage	23.000	kV	20.446	88.9	3-Phase
Bus9	Bus	Under Voltage	23.000	kV	19.750	85.9	3-Phase

Marginal Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus4	Bus	Under Voltage	23.000	kV	22.158	96.3	3-Phase

SUMMARY OF TOTAL GENERATION , LOADING & DEMAND

	kW	kvar	kVA	% PF
Source (Swing Buses):	13151.8	5222.7	14150.8	92.94 Lagging
Source (Non-Swing Buses):	0.0	0.0	0.0	
Total Demand:	13151.8	5222.7	14150.8	92.94 Lagging
Total Motor Load:	12368.0	4186.0	13057.2	94.72 Lagging
Total Static Load:	0.0	0.0	0.0	
Total Constant I Load:	0.0	0.0	0.0	
Total Generic Load:	0.0	0.0	0.0	
Apparent Losses:	783.8	1036.7		
System Mismatch:	0.0	0.0		

Number of Iterations: 3