

Project: **ETAP**
Location: **19.0.1C**
Contract:
Engineer:
Filename: NEW_PSA
Study Case: LF

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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	1	7	9

	XFMR2	XFMR3	Reactor	Line/Cable/ Busway	Impedance	Tie PD	Total
Number of Branches:	0	0	0	0	11	0	11

Method of Solution: Adaptive Newton-Raphson Method
Maximum No. of Iteration: 99
Precision of Solution: 0.0001000

System Frequency: 50.00 Hz
Unit System: English
Project Filename: NEW_PSA
Output Filename: C:\ETAP 1901\NEW_PSA\Untitled.lfr

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Adjustments

<u>Tolerance</u>	<u>Apply Adjustments</u>	<u>Individual /Global</u>	<u>Percent</u>
Transformer Impedance:	Yes	Individual	
Reactor Impedance:	Yes	Individual	
Overload Heater Resistance:	No		
Transmission Line Length:	No		
Cable / Busway Length:	No		
<u>Temperature Correction</u>	<u>Apply Adjustments</u>	<u>Individual /Global</u>	<u>Degree C</u>
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.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
Bus1	11.000	1	103.0	0.0								
Bus 2	11.000	1	100.0	0.0	10.000	5.000						
Bus 3	11.000	1	100.0	0.0	25.000	15.000						
Bus 4	11.000	1	100.0	0.0	60.000	40.000						
Bus 5	11.000	1	100.0	0.0	10.000	5.000						
Bus 6	11.000	1	100.0	0.0	100.000	80.000						
Bus 7	11.000	1	100.0	0.0	80.000	60.000						
Bus 8	11.000	1	100.0	0.0	40.000	20.000						
Bus 9	11.000	1	100.0	0.0	16.000	8.000	4.000	2.000				
Total Number of Buses: 9					341.000	233.000	4.000	2.000	0.000	0.000	0.000	0.000

Generation Bus				Voltage		Generation			Mvar Limits	
ID	kV	Type	Sub-sys	% Mag.	Angle	MW	Mvar	% PF	Max	Min
Bus1	11.000	Swing	1	103.0	0.0					
Bus 5	11.000	Mvar/PF Control	1	100.0	0.0	80.000	94.118	64.8		
Bus 8	11.000	Voltage Control	1	100.0	0.0	120.000			74.369	0.000
						200.000	94.118			

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Impedance Input Data

Impedance		Positive Sequence Impedance			Unit
ID		R	X	Y	
Z1		1.8	5.4	0.9	% in 11.000 kV base and 100.0 MVA base
Z2		1.8	5.6	0	% in 11.000 kV base and 100.0 MVA base
Z3		1.5	4.5	0.76	% in 11.000 kV base and 100.0 MVA base
Z4		1.3	3.6	0.6	% in 11.000 kV base and 100.0 MVA base
Z5		2	6.6	0	% in 11.000 kV base and 100.0 MVA base
Z6		1	5	0	% in 11.000 kV base and 100.0 MVA base
Z7		1.4	3.6	0.6	% in 11.000 kV base and 100.0 MVA base
Z8		3.2	7.6	0	% in 11.000 kV base and 100.0 MVA base
Z10		2	6	0	% in 11.000 kV base and 100.0 MVA base
Z11		2.2	6.5	0	% in 11.000 kV base and 100.0 MVA base
Z12		6	3	0.56	% in 11.000 kV base and 100.0 MVA base

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	Bus 2	1.80	5.40	5.69	0.9000000
Z2	Impedance	Bus 2	Bus 3	1.80	5.60	5.88	
Z3	Impedance	Bus 4	Bus1	1.50	4.50	4.74	0.7600000
Z4	Impedance	Bus 5	Bus 4	1.30	3.60	3.83	0.6000000
Z5	Impedance	Bus 4	Bus 6	2.00	6.60	6.90	
Z6	Impedance	Bus 6	Bus 9	1.00	5.00	5.10	
Z7	Impedance	Bus 5	Bus 7	1.40	3.60	3.86	0.6000000
Z8	Impedance	Bus 7	Bus 8	3.20	7.60	8.25	
Z10	Impedance	Bus 9	Bus 3	2.00	6.00	6.32	
Z11	Impedance	Bus 8	Bus 9	2.20	6.50	6.86	
Z12	Impedance	Bus 5	Bus 6	6.00	3.00	6.71	0.5600000

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LOAD FLOW REPORT

Bus		Voltage		Generation		Load		Load Flow					XFMR	
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap	
* Bus1	11.000	103.000	0.0	151.901	91.327	0.000	0.000	Bus 2	46.683	32.236	2890.9	82.3		
								Bus 4	105.218	59.091	6149.3	87.2		
Bus 2	11.000	100.487	-1.1	0.000	0.000	10.000	5.000	Bus1	-46.132	-31.514	2918.1	82.6		
								Bus 3	36.132	26.514	2340.8	80.6		
Bus 3	11.000	98.374	-2.0	0.000	0.000	25.000	15.000	Bus 2	-35.774	-25.400	2340.8	81.5		
								Bus 9	10.774	10.400	798.9	71.9		
Bus 4	11.000	98.939	-2.2	0.000	0.000	60.000	40.000	Bus1	-103.152	-53.669	6168.5	88.7		
								Bus 5	15.415	-22.898	1464.3	-55.8		
								Bus 6	27.737	36.566	2434.8	60.4		
Bus 5	11.000	99.562	-2.7	80.000	94.118	10.000	5.000	Bus 4	-15.315	22.582	1438.4	-56.1		
								Bus 7	35.405	46.577	3084.3	60.5		
								Bus 6	49.911	19.959	2833.7	92.9		
Bus 6	11.000	95.945	-2.8	0.000	0.000	100.000	80.000	Bus 4	-27.307	-35.146	2434.8	61.4		
								Bus 9	-24.538	-25.238	1925.6	69.7		
								Bus 5	-48.155	-19.616	2844.5	92.6		
Bus 7	11.000	97.372	-3.0	0.000	0.000	80.000	60.000	Bus 5	-34.917	-45.906	3108.9	60.5		
								Bus 8	-45.083	-14.094	2546.1	95.4		
* Bus 8	11.000	100.000	-1.3	120.000	62.659	40.000	20.000	Bus 7	45.836	15.882	2546.1	94.5		
								Bus 9	34.164	26.777	2278.3	78.7		
Bus 9	11.000	97.522	-2.2	0.000	0.000	19.804	9.902	Bus 6	24.673	25.911	1925.6	69.0		
								Bus 3	-10.727	-10.261	798.9	72.3		
								Bus 8	-33.750	-25.552	2278.3	79.7		

* 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

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Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic		MVA	% PF	Amp	Percent Loading
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar				
Bus1	11.000										177.241	85.7	9031.8	
Bus 2	11.000		10.000	5.000							55.868	82.6	2918.1	
Bus 3	11.000		25.000	15.000							43.874	81.5	2340.8	
Bus 4	11.000		60.000	40.000							128.463	80.3	6814.9	
Bus 5	11.000		10.000	5.000							133.952	71.2	7061.6	
Bus 6	11.000		100.000	80.000							128.063	78.1	7005.6	
Bus 7	11.000		80.000	60.000							100.000	80.0	5390.3	
Bus 8	11.000		40.000	20.000							135.374	88.6	7105.3	
Bus 9	11.000		16.000	8.000	3.804	1.902					57.103	77.9	3073.3	

* 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).

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Branch Losses Summary Report

Branch ID	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
	MW	Mvar	MW	Mvar	kW	kvar	From	To	
Z1	46.683	32.236	-46.132	-31.514	551.3	722.2	103.0	100.5	2.51
Z10	10.774	10.400	-10.727	-10.261	46.3	139.0	98.4	97.5	0.85
Z11	34.164	26.777	-33.750	-25.552	414.5	1224.7	100.0	97.5	2.48
Z12	49.911	19.959	-48.155	-19.616	1755.7	342.5	99.6	95.9	3.62
Z2	36.132	26.514	-35.774	-25.400	358.0	1113.9	100.5	98.4	2.11
Z3	105.218	59.091	-103.152	-53.669	2065.7	5422.1	103.0	98.9	4.06
Z4	15.415	-22.898	-15.315	22.582	99.4	-315.8	98.9	99.6	0.62
Z5	27.737	36.566	-27.307	-35.146	430.4	1420.2	98.9	95.9	2.99
Z6	-24.538	-25.238	24.673	25.911	134.6	673.0	95.9	97.5	1.58
Z7	35.405	46.577	-34.917	-45.906	487.4	671.4	99.6	97.4	2.19
Z8	-45.083	-14.094	45.836	15.882	753.0	1788.4	97.4	100.0	2.63
					7096.4	13201.7			

* This Transmission Line includes Series Capacitor.

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Alert Summary Report

% Alert Settings

	<u>Critical</u>	<u>Marginal</u>
<u>Loading</u>		
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
<u>Bus Voltage</u>		
OverVoltage	105.0	102.0
UnderVoltage	95.0	98.0
<u>Generator Excitation</u>		
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
Gen 3	Generator	Overload	120.000	MW	120.000	100.0	3-Phase
Gen1	Generator	Over Excited	89.822	Mvar	91.327	101.7	3-Phase
Gen2	Generator	Overload	80.000	MW	80.000	100.0	3-Phase
Gen2	Generator	Over Excited	49.580	Mvar	94.118	189.8	3-Phase

Marginal Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Bus 6	Bus	Under Voltage	11.000	kV	10.554	95.9	3-Phase
Bus 7	Bus	Under Voltage	11.000	kV	10.711	97.4	3-Phase
Bus 9	Bus	Under Voltage	11.000	kV	10.727	97.5	3-Phase
Bus1	Bus	Over Voltage	11.000	kV	11.330	103.0	3-Phase

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SUMMARY OF TOTAL GENERATION , LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	151.901	91.327	177.241	85.70 Lagging
Source (Non-Swing Buses):	200.000	156.777	254.124	78.70 Lagging
Total Demand:	351.901	248.104	430.569	81.73 Lagging
Total Motor Load:	341.000	233.000	413.001	82.57 Lagging
Total Static Load:	3.804	1.902	4.253	89.44 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	7.096	13.202		
System Mismatch:	0.000	0.000		

Number of Iterations: 4