Electrical Transient Analyzer Program

Short-Circuit Analysis

ANSI Standard

3-Phase, LG, LL, & LLG Fault Currents

1/2 Cycle Network

	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

	Synchronous Generator	Power Grid	Synchronous Motor	Induction Machines	Lumped Load	Total
Number of Machines:	3	0	0	0	8	11

System Frequency:	50.00
Unit System:	English
Project Filename:	NEW_PSA
Output Filename:	C:\ETAP 1901\NEW_PSA\Untitled.SA2S

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	
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.	Ang.
Bus1	SWNG	11.000	11.000	1	103.00	0.00
Bus 2	Load	11.000	11.000	1	100.00	0.00
Bus 3	Load	11.000	11.000	1	100.00	0.00
Bus 4	Load	11.000	11.000	1	100.00	0.00
Bus 5	Load	11.000	11.000	1	100.00	0.00
Bus 6	Load	11.000	11.000	1	100.00	0.00
Bus 7	Load	11.000	11.000	1	100.00	0.00
Bus 8	Gen.	11.000	11.000	1	100.00	0.00
Bus 9	Load	11.000	11.000	1	100.00	0.00

9 Buses Total

All voltages reported by ETAP are in % of bus Nominal kV.
Base kV values of buses are calculated and used internally by ETAP.

Impedance Input Data

Impedance	Positive Sequence Impedanc			Zero Sequence Impedance			
ID	R	X	Y	R0	X0	Y0	Unit
Z1	1.8	5.4	0.9	1.8	5.4	0.9	% in 11.000 kV base and 100.0 MVA base
Z2	1.8	5.6	0	1.8	5.6	0	% in 11.000 kV base and 100.0 MVA base
Z3	1.5	4.5	0.76	1.5	4.5	0.76	% in 11.000 kV base and 100.0 MVA base
Z4	1.3	3.6	0.6	1.3	3.6	0.6	% in 11.000 kV base and 100.0 MVA base
Z5	2	6.6	0	2	6.6	0	% in 11.000 kV base and 100.0 MVA base
Z6	1	5	0	1	5	0	% in 11.000 kV base and 100.0 MVA base
Z7	1.4	3.6	0.6	1.4	3.6	0.6	% in 11.000 kV base and 100.0 MVA base
Z8	3.2	7.6	0	3.2	7.6	0	% in 11.000 kV base and 100.0 MVA base
Z10	2	6	0	2	6	0	% in 11.000 kV base and 100.0 MVA base
Z11	2.2	6.5	0	2.2	6.5	0	% in 11.000 kV base and 100.0 MVA base
Z12	6	3	0.56	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 MVAb			
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

Synchronous Generator Input Data

Synchronous Generator		Rating			Positive Seq. Impedance					Grounding			Zero Seq. Impedance		
							% Xd"								
ID	Type	MVA	kV	RPM	X"/R	% R	Adj.	Tol.	% Xd'	Conn.	Type	Amp	X/R	% R0	% X0
Gen1	Steam Turbo	176.471	11.000	1500	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00
Gen2	Steam Turbo	94.118	11.000	1500	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00
Gen 3	Steam Turbo	141.177	11.000	1500	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00

Total Connected Synchronous Generators (= 3): 411.765 MVA

Lumped Load Input Data

Lumped Load	Lumped Load				Motor Loads									
	Rating		% Load		Loading		X/R Ratio		Impedance (Machine Base)			Grounding		
ID	kVA	kV	MTR	STAT	kW	kvar	X"/R	X'/R	% R	% X"	% X'	Conn.	Type	Amp.
Lump1	11180.3	11.000	100	0	10000.0	5000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump2	29154.8	11.000	100	0	25000.0	15000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump3	22360.7	11.000	80	20	16000.0	8000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump4	44721.4	11.000	100	0	40000.0	20000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump5	100000.0	11.000	100	0	80000.0	60000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump6	11180.3	11.000	100	0	10000.0	5000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump7	128062.5	11.000	100	0	100000.0	80000.0	10.00	10.00	1.538	15.38	23.08	Delta		
Lump8	72111.0	11.000	100	0	60000.0	40000.0	10.00	10.00	1.538	15.38	23.08	Delta		

Total Connected Lumped Loads (= 8): 418771.0 kVA

SHORT- CIRCUIT REPORT

Fault at bus: **Bus 8**

Prefault voltage = 11.000 kV = 100.00 % of nominal bus kV (11.000 kV)
= 100.00 % of base kV (11.000 kV)

Contribution		3-Phase Fault		Line-To-Ground Fault					Positive & Zero Sequence Impedances Looking into "From Bus"			
From Bus ID	To Bus ID	% V From Bus	kA Symm. rms	% Voltage at From Bus Va	Vb	Vc	kA Symm. rms Ia	3I0	% Impedance on 100 MVA base R1	X1	R0	X0
Bus 8	Total	0.00	122.683	0.00	95.64	95.75	133.829	133.829	7.26E-001	4.22E+000	6.31E-001	3.23E+000
Bus 7	Bus 8	53.04	33.760	49.93	98.62	100.24	31.780	22.259	4.40E+000	1.49E+001	5.92E+000	1.89E+001
Bus 9	Bus 8	46.25	35.377	43.80	97.74	99.83	33.503	23.978	3.23E+000	1.45E+001	5.04E+000	1.77E+001
Gen 3	Bus 8	100.00	38.945	100.00	100.00	100.00	58.045	87.931	7.08E-001	1.35E+001	7.08E-001	4.96E+000
Lump4	Bus 8	100.00	15.181	100.00	100.00	100.00	10.935	0.000	3.44E+000	3.44E+001		

\# Indicates fault current contribution is from three-winding transformers
* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta- Y transformer

Short-Circuit Summary Report

1/2 Cycle - 3-Phase, LG, LL, & LLG Fault Currents

Prefault Voltage = 100 % of the Bus Nominal Voltage

Bus		3-Phase Fault			Line-to-Ground Fault			Line-to-Line Fault			*Line-to-Line-to-Ground		
ID	kV	Real	Imag.	Mag.	Real	Imag.	Mag.	Real	Imag.	Mag.	Real	Imag.	Mag.
Bus 8	11.000	20.820	-120.904	122.683	24.505	-131.567	133.829	105.521	19.277	107.268	-117.963	52.153	128.977

All fault currents are symmetrical (1/2 Cycle network) values in rms kA.
* LLG fault current is the larger of the two faulted line currents.

Sequence Impedance Summary Report

Bus		Positive Seq. Imp. (ohm)			Negative Seq. Imp. (ohm)			Zero Seq. Imp. (ohm)			Fault Zf (ohm)		
ID	kV	Resistance	Reactance	Impedance	Resistance	Reactance	Impedance	Resistance	Reactance	Impedance	Resistance	Reactance	Impedance
Bus 8	11.000	0.00879	0.05102	0.05177	0.00964	0.04986	0.05079	0.00764	0.03908	0.03982	0.00000	0.00000	0.00000