Electrical Transient Analyzer Program

Short-Circuit Analysis

IEC 60909 Standard

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

	Swing	V-Control	Load	Total
Number of Buses:	1	0	4	5

	XFMR2	XFMR3	Reactor	Line/Cable/ Busway	Impedance	Tie PD	Total
Number of Branches:	2	0	0	2	0	0	4

	Synchronous Generator	Power Grid	Synchronous Motor	Induction Machines	Lumped Load	Total
Number of Machines:	1	1	0	0	6	8

System Frequency:	50.00
Unit System:	English
Project Filename:	powergrid_sld
Output Filename:	C:\ETAP 1901\powergrid_sld\Untitled.SI2S

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	Global	20
Cable / Busway Resistance:	Yes	Global	20

Bus Input Data

Bus					Initial Voltage	
ID	Type	Nom. kV	Base kV	Sub-sys	%Mag.	Ang.
Bus1	Load	11.000	11.000	1	100.00	0.00
Bus3	Load	11.000	11.000	1	100.00	0.00
LT Panel A	Load	0.400	0.400	1	100.00	-30.00
LT Panel A2	Load	0.400	0.400	1	100.00	-30.00
Main Bus	SWNG	11.000	11.000	1	100.00	0.00

5 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.

Line/Cable/Busway Input Data

ohms or siemens per 1000 ft per Conductor (Cable) or per Phase (Line/Busway)

Line/Cable/Busway			Length									
ID	Library	Size	Adj. (ft)	% Tol.	#/Phase	T (°C)	R1	X1	Y1	R0	X0	Y0
Cable1	11NALS3	300	328.1	0.0	1	20	0.0309045	0.0266395		0.0491381	0.0676644	
Cable #2	11NALS3	300	328.1	0.0	1	20	0.0309045	0.0266395		0.0491381	0.0676644	

Line / Cable / Busway resistances are listed at the specified temperatures.

2-Winding Transformer Input Data

Transformer	Rating					Z Variation			% Tap Setting		Adjusted	Phase Shift	
ID	MVA	Prim. kV	Sec. kV	% Z	X/R	+ 5%	- 5%	% Tol.	Prim.	Sec.	% Z	Type	Angle
T1	2.000	11.000	0.400	12.50	45.00	0	0	0	0	0	12.50	Dyn	30.00
T3	1.500	11.000	0.400	12.50	45.00	0	0	0	0	0	12.50	Dyn	30.00

2-Winding Transformer Grounding Input Data

Transformer	Rating			Grounding								
				Conn.	Primary				Secondary			
ID	MVA	Prim. kV	Sec. kV	Type	Type	kV	Amp	ohm	Type	kV	Amp	ohm
T1	2.000	11.000	0.400	D/Y					Solid			
T3	1.500	11.000	0.400	D/Y					Solid			

Branch Connections

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
T1	2W XFMR	Bus1	LT Panel A	12.88	579.81	579.95	
T3	2W XFMR	Bus3	LT Panel A2	17.18	773.08	773.27	
Cable1	Cable	Main Bus	Bus1	0.84	0.72	1.11	
Cable #2	Cable	Main Bus	Bus3	0.84	0.72	1.11	

Power Grid Input Data

Power Grid ID	Connected Bus ID	Rating MVAsc	Rating kV	% Impedance 100 MVA Base R	% Impedance 100 MVA Base X"	% Impedance 100 MVA Base R/X"	Grounding Type
U2	Main Bus	285.788	11.000	2.90584	34.87006	0.08	Wye - Solid

Total Connected Power Grids (= 1): 285.788 MVA

Synchronous Generator Input Data

Synchronous Generator ID	Synchronous Generator Type	Rating MVA	Rating kV	Rating RPM	Rating % PF	% Impedance in Machine Base R	Xd" Adj.	Xd" Tol.	Xd" R/X	Xd" Xd, sat	Grounding Conn.	Grounding Type	Grounding Amp	Excitation Type
Gen1	Diesel	2.500	11.000	1500	85.00	1.000	19.00	0.0	0.05	155.00	Wye	Solid	0.00	Turbine 130%

Total Connected Synchronous Generators (= 1.00) : 2.500 MVA

Lumped Load Input Data

	Lumped Load						Motor Loads								
	Rating				% Load		Loading		% Impedance (Machine Base)			Grounding			mFact.
Lumped Load ID	kVA	kV	Amp	% PF	MTR	STAT	kW	kvar	R	X"	R/X"	Conn.	Type	Amp	MW/PP
Lump1	500.0	0.400	721.69	90.00	80	20	360.00	174.36	6.46	15.37	0.42	Delta			0.36
Lump3	250.0	0.400	360.84	80.00	80	20	160.00	120.00	6.46	15.37	0.42	Delta			0.16
Lump5	250.0	0.400	360.84	80.00	80	20	160.00	120.00	6.46	15.37	0.42	Delta			0.16
Lump9	500.0	0.400	721.69	90.00	80	20	360.00	174.36	6.46	15.37	0.42	Delta			0.36
Lump10	250.0	0.400	360.84	80.00	80	20	160.00	120.00	6.46	15.37	0.42	Delta			0.16
Lump11	250.0	0.400	360.84	80.00	80	20	160.00	120.00	6.46	15.37	0.42	Delta			0.16

Total Connected Lumped Loads (= 6): 2000.0 kVA

SHORT- CIRCUIT REPORT

Fault at bus: **Main Bus**
Nominal kV = 11.000
Voltage c Factor = 1.10 (Maximum If)

Contribution		3-Phase Fault		Line-To-Ground Fault					Positive & Zero Sequence Impedances Looking into "From Bus"			
From Bus	To Bus	% V	kA	% Voltage at From Bus			kA Symm. rms		% Impedance on 100 MVA base			
ID	ID	From Bus	Symm. rms	Va	Vb	Vc	Ia	3I0	R1	X1	R0	X0
Main Bus	Total	0.00	16.172	0.00	109.02	109.01	16.464	16.464	3.12E+000	3.56E+001	3.05E+000	3.37E+001
Bus1	Main Bus	0.05	0.219	0.03	109.02	109.03	0.149	0.000	8.21E+002	2.50E+003		
Bus3	Main Bus	0.04	0.205	0.03	109.02	109.03	0.139	0.000	8.25E+002	2.69E+003		
Gen1	Main Bus	110.00	0.759	110.00	110.00	110.00	1.184	1.973	4.00E+001	7.60E+002	4.00E+001	2.80E+002
U2	Main Bus	110.00	15.000	110.00	110.00	110.00	15.000	14.495	3.20E+000	3.84E+001	3.20E+000	3.84E+001

		3-Phase	L-G	L-L	L-L-G
Initial Symmetrical Current (kA, rms)	:	16.172	16.464	14.022	16.322
Peak Current (kA), Method C	:	40.645	41.380	35.242	41.023
Breaking Current (kA, rms, symm)	:		16.464	14.022	16.322
Steady State Current (kA, rms)	:	15.247	16.464	14.022	16.322

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

Short-Circuit Summary Report

3-Phase, LG, LL, LLG Fault Currents

Bus		3-Phase Fault			Line-to-Ground Fault				Line-to-Line Fault				*Line-to-Line-to-Ground			
ID	kV	I"k	ip	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik	I"k	ip	Ib	Ik
Main Bus	11.000	16.172	40.645	15.247	16.464	41.380	16.464	16.464	14.022	35.242	14.022	14.022	16.322	41.023	16.322	16.322

All fault currents are in rms kA. Current ip is calculated using Method C.

* 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
Main Bus	11.000	0.03777	0.43032	0.43198	0.03887	0.42919	0.43095	0.03692	0.40835	0.41001	0.00000	0.00000	0.00000