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**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	2	6	9			
	XFMR2	XFMR3	Reactor	Line/Cable/ Busway	Impedance	Tie PD	Total
Number of Branches:	3	0	0	6	0	0	9
	Synchronous Generator	Power Grid	Synchronous Motor	Induction Machines	Lumped Load	Total	
Number of Machines:	3	0	0	0	4	7	

System Frequency:	60.00
Unit System:	English
Project Filename:	grid3
Output Filename:	C:\Users\owner's\Desktop\PSA PBL\grid3\grid3\Untitled.SQ1S

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**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	6.600	6.600	1	100.00	0.00
Bus2	Load	20.000	20.000	1	100.00	30.00
Bus3	Load	20.000	20.000	1	100.00	30.00
Bus4	Load	20.000	20.000	1	100.00	30.00
Bus_5	Gen.	6.600	6.600	1	100.00	0.00
Bus_6	Load	20.000	20.000	1	100.00	30.00
Bus_7	Load	20.000	20.000	1	100.00	30.00
Bus_8	Load	20.000	20.000	1	100.00	30.00
Bus_9	Gen.	6.600	6.600	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.

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**Line/Cable/Busway Input Data**

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

Line/Cable/Busway			Length		#/Phase	T (°C)	R1	X1	Y1	R0	X0	Y0
ID	Library	Size	Adj. (ft)	% Tol.								
Cable1	25MCUS1	750	3000.0	0.0	12	75	0.0247982	0.093		0.2861325	0.248	
Cable3	25MCUS1	750	3000.0	0.0	12	75	0.0247982	0.093		0.2861325	0.248	
Line1		477	5280.0	0.0	1	75	0.0446045	0.1577493	0.000001	0.0956523	0.4853866	0.0000005
Line3		477	5280.0	0.0	1	75	0.0446045	0.1577493	0.000001	0.0956523	0.4853866	0.0000005
Line7		477	5280.0	0.0	1	75	0.0446045	0.1577493	0.000001	0.0956523	0.4853866	0.0000005
Line8		477	5280.0	0.0	1	75	0.0446045	0.1577493	0.000001	0.0956523	0.4853866	0.0000005

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
T3		100.000	6.600	20.000	6.50	34.10	0	0	0	0	0	6.50	YNd	30.00
T6		100.000	20.000	6.600	6.50	34.10	0	0	0	0	0	6.50	Dyn	30.00
T7		100.000	20.000	6.600	6.50	34.10	0	0	0	0	0	6.50	Dyn	30.00

2-Winding Transformer Grounding Input Data

Transformer	Rating			Grounding									
	ID	MVA	Prim. kV	Sec. kV	Conn.	Primary				Secondary			
	ID	MVA	Prim. kV	Sec. kV	Type	Type	kV	Amp	ohm	Type	kV	Amp	ohm
T3		100.000	6.600	20.000	D/Y					Solid			
T6		100.000	20.000	6.600	D/Y					Solid			
T7		100.000	20.000	6.600	D/Y					Solid			

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**Branch Connections**

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVAb			
ID	Type	From Bus	To Bus	R	X	Z	Y
T3	2W XFMR	Bus1	Bus2	0.19	6.50	6.50	
T6	2W XFMR	Bus4	Bus_5	0.19	6.50	6.50	
T7	2W XFMR	Bus_8	Bus_9	0.19	6.50	6.50	
Cable1	Cable	Bus_7	Bus_8	0.15	0.58	0.60	
Cable3	Cable	Bus_6	Bus_8	0.15	0.58	0.60	
Line1	Line	Bus2	Bus3	5.89	20.82	21.64	0.0020566
Line3	Line	Bus3	Bus4	5.89	20.82	21.64	0.0020566
Line7	Line	Bus2	Bus_6	5.89	20.82	21.64	0.0020566
Line8	Line	Bus4	Bus_7	5.89	20.82	21.64	0.0020566

Synchronous Generator Input Data

Synchronous Generator					Positive Seq. Impedance					Grounding			Zero Seq. Impedance		
					Rating										
ID	Type	MVA	kV	RPM	X''/R	% R	Adj.	Tol.	% Xd'	Conn.	Type	Amp	X/R	% R0	% X0
Gen1	Steam Turbo	15.000	6.600	1800	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00
Gen3	Steam Turbo	25.000	6.600	1800	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00
Gen5	Steam Turbo	30.000	6.600	1800	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00

Total Connected Synchronous Generators ( = 3 ): 70.000 MVA

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**Total Connected Lumped Loads (= 4): 13100.0 kVA**



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**SHORT- CIRCUIT REPORT**Fault at bus: **Bus\_6**

Prefault voltage = 20.000 kV

= 100.00 % of nominal bus kV ( 20.000 kV)

= 100.00 % of base kV ( 20.000 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			kA Symm. rms		% Impedance on 100 MVA base			
				Va	Vb	Vc	Ia	3I0	R1	X1	R0	X0
Bus_6	Total	0.00	17.404	0.00	125.72	130.11	9.799	9.799	1.02E+000	1.66E+001	9.88E+000	5.47E+001
Bus_8	Bus_6	1.53	7.326	1.18	125.83	129.67	3.578	2.415	3.06E+000	3.93E+001	4.25E+001	2.22E+002
Bus2	Bus_6	17.78	2.372	62.40	95.56	96.46	3.357	7.384	1.22E+001	1.21E+002	1.28E+001	7.27E+001
Wind Farm	Bus_6	101.01	7.176	101.01	101.01	101.01	2.669	0.000	1.15E+000	4.02E+001		
GOVT. University	Bus_6	100.00	0.538	100.00	100.00	100.00	0.200	0.000	5.34E+001	5.34E+002		
Bus_7	Bus_8	2.21	3.262	2.06	125.82	129.11	2.032	2.415	9.19E+000	8.67E+001	4.07E+001	2.20E+002
Bus_9	Bus_8	10.66	4.067	77.44	75.45	99.64	1.546	0.000	3.52E+000	6.98E+001		
Bus3	Bus2	22.16	0.585	45.83	104.72	106.78	0.587	2.415	4.01E+001	4.05E+002	1.06E+000	2.64E+001
Bus1	Bus2	21.71	1.787	80.56	77.89	99.62	3.944	9.799 *	6.86E+000	1.33E+002	1.91E-001	6.50E+000
Bus4	Bus_7	23.92	2.896	28.29	115.98	118.90	1.897	2.415	1.02E+001	9.70E+001	3.89E+001	2.19E+002
OLD_AGE_HOME	Bus_7	100.00	0.365	100.00	100.00	100.00	0.136	0.000	7.69E+001	7.69E+002		
Gen5	Bus_9	100.00	12.323	100.00	100.00	100.00	4.025	0.000	3.33E+000	6.33E+001	3.33E+000	2.33E+001
Bus4	Bus3	23.92	0.234	28.29	115.98	118.90	0.716	2.415	6.96E+001	9.61E+002	1.37E+001	9.04E+001
HOSPITAL	Bus3	100.00	0.351	100.00	100.00	100.00	0.130	0.000	6.41E+001	6.41E+002		
Gen1	Bus1	100.00	5.416	100.00	100.00	100.00	1.766	0.000	6.67E+000	1.27E+002	6.67E+000	4.67E+001

# Indicates fault current contribution is from three-winding transformers

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

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### 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_6	20.000	1.066	-17.372	17.404	1.362	-9.704	9.799	15.174	1.113	15.215	-15.672	2.236	15.830

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.

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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_6	20.000	0.04064	0.66221	0.66345	0.05549	0.64877	0.65114	0.39514	2.18976	2.22512	0.00000	0.00000	0.00000

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Sequence-of-Operation Event Summary Report

Symmetrical 3-Phase Fault at Bus\_6.

Time (ms)	ID	If (kA)	T1 (ms)	T2 (ms)	Condition
99.4	Relay3	2.372	99.4		Phase - OC1 - 51
183	CB1		83.3		Tripped by Relay3 Phase - OC1 - 51
183	CB2		83.3		Tripped by Relay3 Phase - OC1 - 51