

Project:

Location:

Contract:

Engineer:

Filename:

ETAP

19.0.1C

Study Case: SC

project-final

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Revision: Base

Config.: Normal

Electrical Transient Analyzer Program

Short-Circuit Analysis

ANSI Standard

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

1.5-4 Cycle Network

	Swing	V-Control	Load	Total			
Number of Buses:	1	0	4	5			
					Line/Cable/ Busway	Impedance	Tie PD
	XFMR2	XFMR3	Reactor				Total
Number of Branches:	0	0	0	0	7	0	7
	Synchronous Generator	Power Grid	Synchronous Motor	Induction Machines	Lumped Load	Total	
Number of Machines:	2	0	0	0	4	6	

System Frequency:

Unit System:

Project Filename:

Output Filename:

60.00

English

project-final

E:\MIST projects\Level 3-1\Power system project\Fault.SA2S

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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	10.600	10.600	1	100.00	0.00
Bus2	Load	10.000	10.600	1	100.00	0.00
Bus3	Load	10.000	10.600	1	100.00	0.00
Bus4	Load	10.000	10.600	1	100.00	0.00
Bus5	Load	10.000	10.600	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.

Impedance Input Data

Impedance		Positive Sequence Impedanc			Zero Sequence Impedance			Unit
ID		R	X	Y	R0	X0	Y0	
1-2		2	6	6	2	6	6	% in 10.000 kV base and 100.0 MVA base
1-3		8	24	5	8	24	5	% in 10.000 kV base and 100.0 MVA base
2-3		6	25	4	6	25	4	% in 10.000 kV base and 100.0 MVA base
2-4		6	18	4	6	18	4	% in 10.000 kV base and 100.0 MVA base
2-5		4	12	3	4	12	3	% in 10.000 kV base and 100.0 MVA base
3-4		1	3	2	1	3	2	% in 10.000 kV base and 100.0 MVA base
4-5		8	24	5	8	24	5	% in 10.000 kV base and 100.0 MVA base

Branch Connections

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA <sub>b</sub>			
ID	Type	From Bus	To Bus	R	X	Z	Y
1-2	Impedance	Bus1	Bus2	1.78	5.34	5.63	6.7416010
1-3	Impedance	Bus1	Bus3	7.12	21.36	22.52	5.6180010
2-3	Impedance	Bus3	Bus2	5.34	22.25	22.88	4.4944010
2-4	Impedance	Bus4	Bus2	5.34	16.02	16.89	4.4944010
2-5	Impedance	Bus2	Bus5	3.56	10.68	11.26	3.3708000
3-4	Impedance	Bus3	Bus4	0.89	2.67	2.81	2.2472000
4-5	Impedance	Bus4	Bus5	7.12	21.36	22.52	5.6180010

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
Generator-1	Steam Turbo	10.000	10.600	1800	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00
Generator 2	Steam Turbo	47.059	10.000	1800	19.00	1.000	19.00	0.0	28.00	Wye	Solid		7.00	1.000	7.00

Total Connected Synchronous Generators ( = 2 ): 57.059 MVA

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Lumped Load					Motor Loads										
Lumped Load		Rating		% Load		Loading		X/R Ratio		Impedance			Grounding		
										(Machine Base)					
ID	kVA	kV	MTR	STAT	kW	kvar	X"/R	X'/R	% R	% X"	% X'	Conn.	Type	Amp.	
load 2	22360.7	10.000	100	0	20000.0	10000.0	10.00	10.00	1.538	15.38	23.08	Delta			
Load 3	47434.2	10.000	100	0	45000.0	15000.0	10.00	10.00	1.538	15.38	23.08	Delta			
load 4	40311.3	10.000	100	0	40000.0	5000.0	10.00	10.00	1.538	15.38	23.08	Delta			
Lump5	60827.6	10.000	100	0	60000.0	10000.0	10.00	10.00	1.538	15.38	23.08	Delta			
Total Connected Lumped Loads ( = 4 ): 170933.8 kVA															

SHORT- CIRCUIT REPORT

Fault at bus: Bus1

Prefault voltage = 10.600 kV  
= 100.00 % of nominal bus kV ( 10.600 kV)  
= 100.00 % of base kV ( 10.600 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	I3I0	R1	X1	R0	X0
Bus1	Total	0.00	40.857	0.00	99.45	98.57	41.882	41.882	1.99E+000	1.32E+001	2.57E+000	1.42E+001
Bus2	Bus1	31.33	28.599	31.73	105.51	104.81	28.963	28.264	2.92E+000	1.88E+001	4.03E+000	2.10E+001
Bus3	Bus1	41.23	9.410	36.10	108.44	108.77	8.238	5.094	9.64E+000	5.71E+001	2.13E+001	1.17E+002
Generator-1	Bus1	100.00	2.863	100.00	100.00	100.00	4.690	8.532	1.00E+001	1.90E+002	1.00E+001	7.00E+001

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



Fault at bus: Bus3

Prefault voltage = 10.000 kV  
= 100.00 % of nominal bus kV ( 10.000 kV)  
= 94.34 % of base kV ( 10.600 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
Bus3	Total	0.00	45.970	0.00	105.84	108.50	41.313	41.313	1.25E+000	1.11E+001	3.45E+000	1.72E+001
Bus1	Bus3	25.21	6.098	29.16	96.48	97.09	7.054	10.817	1.32E+001	8.32E+001	1.46E+001	6.54E+001
Bus2	Bus3	31.22	7.010	34.99	102.24	102.86	7.858	11.624	5.45E+000	7.31E+001	8.51E+000	6.18E+001
Bus4	Bus3	11.53	21.051	10.29	105.87	108.51	18.793	18.901	3.34E+000	2.42E+001	8.49E+000	3.74E+001
Load 3	Bus3	100.00	11.841	100.00	100.00	100.00	7.635	0.000	2.89E+000	4.33E+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

1.5-4 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.
Bus1	10.600	6.100	-40.399	40.857	7.239	-41.251	41.882	37.778	6.504	38.334	34.159	24.182	41.852
Bus3	10.000	5.149	-45.681	45.970	6.605	-40.781	41.313	44.613	5.719	44.978	-45.973	9.383	46.921

All fault currents are symmetrical (1.5-4 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
Bus1	10.600	0.02236	0.14811	0.14979	0.02455	0.12440	0.12680	0.02885	0.15926	0.16186	0.00000	0.00000	0.00000
Bus3	10.000	0.01407	0.12480	0.12559	0.01420	0.09572	0.09677	0.03876	0.19334	0.19718	0.00000	0.00000	0.00000