

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

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Electrical Transient Analyzer Program

Short-Circuit Analysis

ANSI Standard

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

1/2 Cycle Network

	<u>Swing</u>	<u>V-Control</u>	<u>Load</u>	<u>Total</u>			
Number of Buses:	1	0	8	9			
	<u>XFMR2</u>	<u>XFMR3</u>	<u>Reactor</u>	<u>Line/Cable/ Busway</u>	<u>Impedance</u>	<u>Tie PD</u>	<u>Total</u>
Number of Branches:	0	0	0	0	11	0	11
	<u>Synchronous Generator</u>	<u>Power Grid</u>	<u>Synchronous Motor</u>	<u>Induction Machines</u>	<u>Lumped Load</u>	<u>Total</u>	
Number of Machines:	2	0	1	0	8	11	

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

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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	

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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	Load	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.

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Impedance Input Data

Impedance		Positive Sequence Impedance			Zero Sequence Impedance			Unit
ID		R	X	Y	R0	X0	Y0	
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

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Branch Connections

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA _b			
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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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	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

Total Connected Synchronous Generators (= 2): 270.588 MVA

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Synchronous Motor Input Data

Synchronous Motor			Rating (Base)			Positive Sequence Imp.					Grounding			Zero Seq. Imp.		
						Xd"					Conn.	Type	Amp	X/R	% R0	% X0
ID	Type	Qty	kVA	kV	RPM	X"/R	% R	Adj.	Tol.	% X'						
Syn1	Motor	1	98.8	11.000	1500	7.79	1.975	15.385	0.0	23.077	Wye	Open		7.79	1.98	15.38

Total Connected Synchronous Motors (= 1): 98.8 kVA

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Lumped Load Input Data

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.	
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

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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			kA Symm. rms		% Impedance on 100 MVA base			
				Va	Vb	Vc	Ia	I3I0	R1	X1	R0	X0
Bus 8	Total	0.00	84.167	0.00	106.46	110.02	71.662	71.662	1.39E+000	6.08E+000	2.73E+000	9.13E+000
Bus 7	Bus 8	53.04	33.760	48.18	105.61	107.40	30.665	34.501	4.40E+000	1.49E+001	5.92E+000	1.89E+001
Bus 9	Bus 8	46.25	35.377	42.45	104.91	107.95	32.472	37.166	3.23E+000	1.45E+001	5.04E+000	1.77E+001
Syn1	Bus 8	100.00	0.033	100.00	100.00	100.00	0.019	0.000	2.00E+003	1.56E+004		
Lump4	Bus 8	100.00	15.181	100.00	100.00	100.00	8.607	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

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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 8	11.000	18.777	-82.045	84.167	18.060	-69.348	71.662	71.097	16.458	72.977	-79.462	13.560	80.611

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 8	11.000	0.01683	0.07355	0.07546	0.01716	0.07330	0.07528	0.03301	0.11044	0.11527	0.00000	0.00000	0.00000