GDC-UTP SYSTEM STUDIES

By

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CERTIFICATION OF APPROVAL

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Approved:

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May 2011

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

Muhamad Hafiz Bin Yaziz

ABSTRACT

The power system analysis studies serve as the basis for ensuring reliability, improving system performance and power quality, reducing operating costs, and providing a reliable supply power during system operation. Thus, this paper presents a case study for designing power supply system for a plant which will include load flow study, short circuit study and protection relay study. The studies mentioned will be conducted through simulation by using DIG SILENT Power Factory Software. This study will focus in island system which is Gas District Cooling (GDC) in Universiti Teknologi PETRONAS (UTP). The load flow study will be emphasized on loading and voltage. The short circuit study will be emphasized on fault current for three phase, line to line, line to ground and line to line to ground. Finally, the protections relay study is to know the correct Time Multiplier Setting (TMS) to make the relay operate coordinately. The purpose of this study to understand the importance of system study analysis in plant, study and performed the analysis simulation for designing a power system and finally to familiarize with software which is DIGSilent Power Factory. The system study should be done in Universiti Teknologi PETRONAS because of total blackout and increasing in load every year. The method that used to do this study such as gathering data, model the system in software and analysis the data. The simulation base on four scenarios for load flow study and short circuit study and one scenario for protection relay study. The result that obtained from this study is for load flow study, the voltage deviation with the limit base on PETRONAS Technical Standard (PTS). For short circuit study, the current faults that obtained from the study will not damage the buses. For protection relay study, some breaker has been suggested to have new Time Multiplier Setting (TMS) during overcurrent and cannot manage to do the earthfault due to limitation on software.

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LIST OF ABBREVIATIONS

TNB	Tenaga Nasional Berhad
GDC	Gas District Cooling
UTP	Universiti Teknologi PETRONAS
AC	Alternating Current
PTS	PETRONAS Technical Standard
HV	High Voltage
LV	Low Voltage

CHAPTER 1
INTRODUCTION

1.1 Background of Study

The power system shall be designed to meet the objective, primarily safety to personnel operation and maintenance of plant and also reliability and continuity of power supply for maximum production and energy-efficient operation.

A load flow analysis shall be carried out for both normal and emergency operation modes to determine the steady-state operating characteristics of the electrical system and to check that the steady-state voltage drops and voltage deviations in the power system are within operating limits of the equipment. The load flow study highlights the system power flows, percentage voltage drop, power factors and transformer loading in the system during steady state operations under normal and peak load conditions.

A short circuit analysis which is the calculation of fault-current levels at all buses in the system is studied to minimize the consequences of a potential short circuit in the system [1]. The short circuit study is conducted to ensure the adequacy of the existing switchgear fault level capacity by taking into account the fault contribution by generator and equipment in the system.

A protection relaying study should be performed in order to prevent protection maloperation total blackout during operation. The basic components in protection system are sensing device (current transformer, voltage transformer, and transducer), relay (decision maker to trip), and circuit breaker (fault isolation)

1.2 Problem Statement

1.2.1 Problem Identification

Power system analysis is an important consideration that must be dealt with during the design of power supply system. The design of power supply system must meet requirement for maximum production and energy efficient operation. In the design process, it is not practical to design a system to be stable under all possible circumstances. Thus the design criteria specify the disturbances for which the system must be designed to be stable. In system design, therefore, a wide number of scenario or disturbances are assessed and if the system is found to be unstable, a variety of action can be taken to improve the situation.

In order to do that, the need of powerful software that performs various calculation and studies is a necessity. Therefore DIG SILENT Power Factory Software has been chosen to do modeling and simulation for load flow, short circuit and relay protection coordination study in this project.

1.2.2 Significant of Project

The power system analysis is like main element in designing a plant. Since all the equipment in the plant using electricity as their source of power, the modeling and simulation is required to determine the performance of the power system in the plant [3].

As for the load flow study, the need to calculate the total load demands in UTP. This is important as to ensure the generators available can cater all the loads or find other alternatives.

Short circuit study is conducted to verify and establish the maximum three phase symmetrical short circuit current at all busses. The result obtained from study is used to verify whether the existing short circuit ratings are sufficient to withstand the fault current.

A protection relaying study is very important in order to solve problems that occurred in UTP which is total blackout even though fault happened at the low voltage. The objectives of this study are:

a. Reliability – Correct operation in clearing a fault
b. Security – avoidance of incorrect operation or mal-operation in clearing fault
c. Speed – minimum operation time to clear a fault so as to minimize equipment damage.
d. Selectivity – disconnection of minimum section of the network to isolate the fault and maintain continuity of supply

1.2.3 Objective and Scope of Study

The objectives of the project are outlined as below:

- ❖ To understand the importance of system study analysis in plant.
- ❖ To study and perform the analysis and simulations for designing a power system.
- ❖ To familiarization the selected computer aided tool which is DIG SILIENT Software.

The scope of study can be summarized as preview on the basic of electrical system installation for a plant including the power system simulation based on the demand load. The system study analysis will cover load flow study, short circuit study, and relay protection coordination.

CHAPTER 2
LITERATURE REVIEW

2.1 Power System Design Requirements

The design of the electrical power generation and distribution systems shall be based on good engineering practice and internationally accepted standards and shall provide [5]:

- Safety to personnel during operation and maintenance of the plant
- Reliability and continuity of services of electrical systems to ensure the plant produce optimum power.
- Energy efficient power distribution and utilization.
- Ease of operation and minimum maintenance of equipment
- Remote control facility.
- Fail-safe feature for safety-related controls.
- Standardization of components for maximum interchange ability and minimal spare stockholding.
- Ease of future extension to the existing facilities.

2.2 System Studies

2.2.1 Load Flow Study

The load flow study also known as power flow study is one of the most common used tools in power system engineering which is widely applied to analyze a variety of the system planning and off-line and on-line operation [6]. The load flow serves a purpose which to calculate the steady state conditions and focuses on various forms of AC power rather than voltage and current [7].

A load flow study is basically performed to verify:

- The total power generation against the power demand of the plant.
- Load flow characteristic in the whole electrical system.
- Any current loading violations at any point in the system
- Any voltage violation at any bus in the system.

2.2.2 Short Circuit Study

Short circuit study is an important part in power system analysis. It consists of determining fault-current levels at all buses in the system in order to minimize the consequences of potential short circuit in the system. Whenever a fault occurs in electrical power system, relatively high current flow, it will produce large amounts of destructive energy in the forms of heat and magnetic forces. A short circuit study ensures that protective device rating within a power system is adequate [8].

Type of Faults

Faults on power systems are divided into three phase balanced faults and unbalances faults. Different types of faults are:

- Three-Phase Fault (3P)
- Single Line to Ground Fault (L-G)
- Line to Line Fault (L-L)
- Line to Line Ground Fault (L-L-G)

The three phase balances fault (3P) is defined as the simultaneous short circuit across all three phases. It occurs independently, but it is the most severe type of fault encountered. The information obtain from three phase balanced fault is used to select and set phase relays, while the line-to-ground fault (L-G) is used for ground relays [2].

2.2.3 Protection Relaying Studies

Overcurrent

An overcurrent relay operates when the magnitude of the current exceeds the pickup or operating level for a time greater than a pre-set delay (definite time) or a time delay determined by the operating characteristic (inverse) [11]. An overcurrent relay can also be set instantaneous, i.e. it operates with no intentional time delay.

A requirement of an overcurrent relay is that it should remain stable, i.e. not operate, on a starting current, a permissible overcurrent or a current surge. This requires the inclusion of a time delay that inhibits operation for a period that in an inverse relay depends upon the magnitude of the current. In a definite time relay the overcurrent must be greater than the current operating setting for a preset period.

If a delay is unacceptable, an instantaneous overcurrent relay can be used but its operating setting must be set sufficiently high to prevent maloperation on non-fault current surges or remote faults which should be cleared by other protection devices. Grading or relay coordination must consider the operating behavior of neighboring overcurrent relays, i.e. on a radial system a downstream fault must be cleared by a downstream relay. [8]

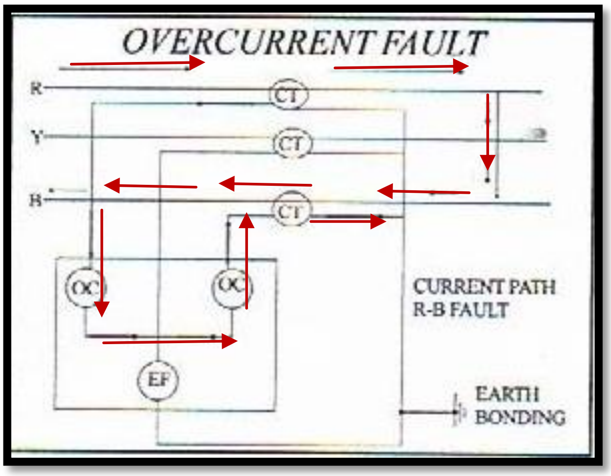

Figure 1: Overcurrent Fault (R-B Fault)

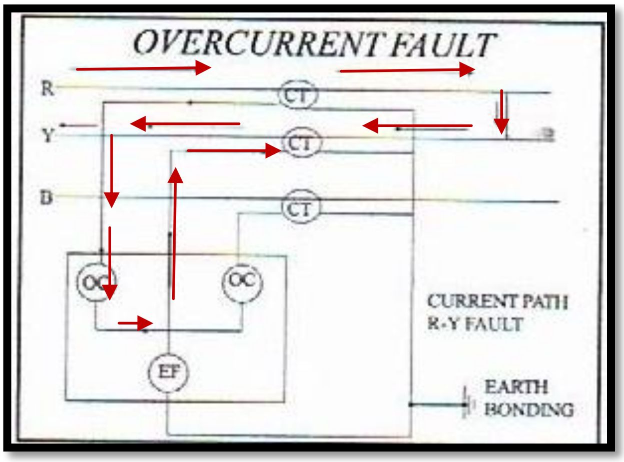

Figure 2: Overcurrent Fault (R-Y Fault)

During overcurrent fault (Figure 1 and Figure 2), if line to line fault happen which is R-B fault or R-Y fault, the overcurrent (OC) relay will see the fault and the relay will operate base on the current flow in the figure.

Earthfault

An earth fault relay (Figure 3) is activated by the fault current flowing from line to earth, while an overcurrent relay is activated if the line current exceeds a certain value. Normally these are combined to form what is known as a combined overcurrent and earth fault relay, which is widely used as back up protection if the main protection fails. An earthfault will cause the unbalanced current in the CTs and would cause residual current to flow through the earthfault relay element.

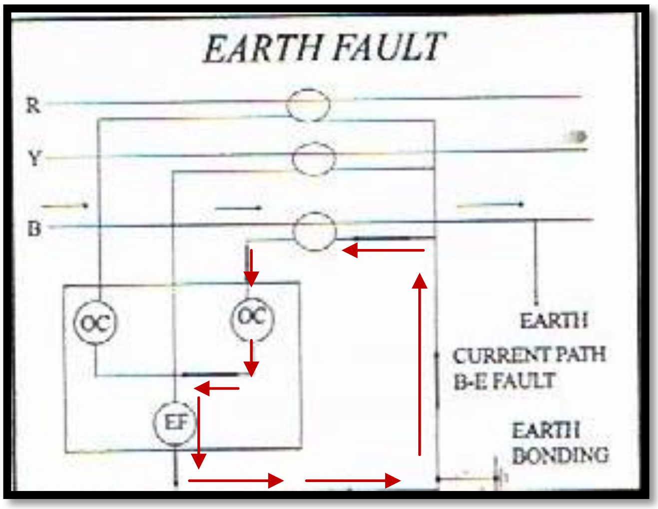

Figure 3: Earth Fault

Operation for overcurrent and earthfault relay

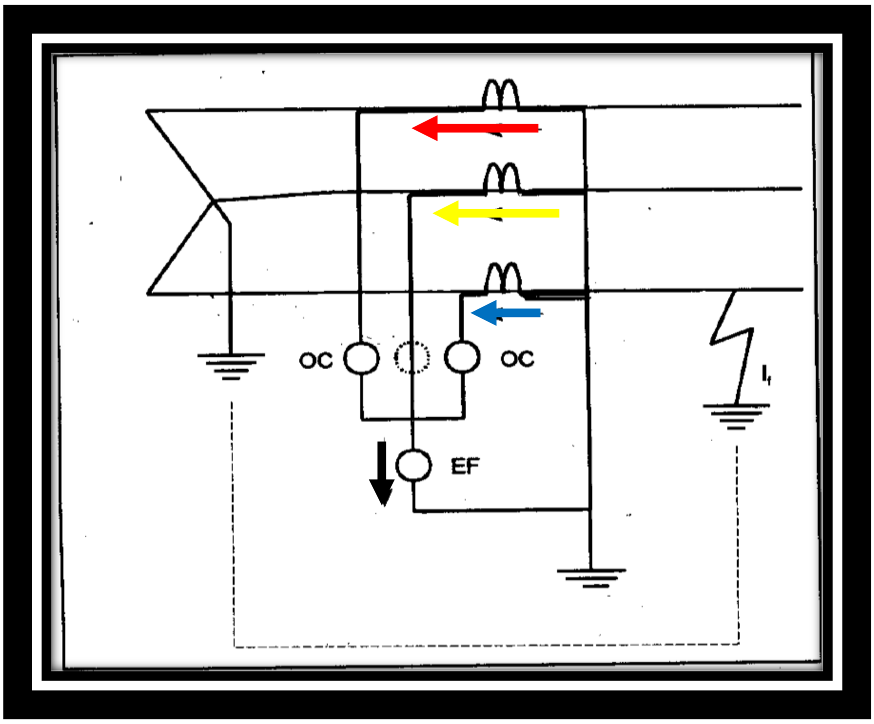

Figure 4: Combined overcurrent and earth fault protection

Relays are normally combined for overcurrent and earth fault protection (Refer Figure 4). It is no necessary to provide overcurrent relay at the yellow phase because line to line fault will be covered by red and blue phase. An earthfault will cause the unbalanced current in the CTs and would cause residual current to flow through the earthfault relay element. [10]

CHAPTER 3

METHODOLOGY

3.1 Procedure Identification

3.1.1 Load Flow

i. Collect all the data regarding load flow such as load data, generator data, cable size, and single line diagram.
ii. Model the single line diagram or the system in the DIGSilent Power Factory.
iii. The modeling and simulations have been performed with DigSILENT Power Factory. The parameters for the generator and transformer used in the calculation are as follows:

(i) Gas Turbine Generator

Site Rating : 4.2MW (5.3MVA at 0.85 p.f.)
System Voltage : 11.17kV, 50Hz

(ii) Transformer

Rating : 1250 / 1750 kVA
Voltage : 11kV / 433V

Rating : 1000kVA
Voltage : 11kV / 433V

Rating : 1600kVA
Voltage : 11kV / 433V

Rating : 1500kVA
Voltage : 11kV / 433V

Load flow analysis is performed to determine the steady-state operating characteristics of electrical system and to check that the steady-state voltage drops and voltage deviation in the power system are within acceptable operating limits of the equipment.

iv. Scenario Option

The scenarios considered for this load flow analysis are briefly described as follows:

Table 1: Scenario options for load flow study

Scenario	Characteristic of Scenario	Description
1	• 1 Turbine generator is running. • 1 Turbine generator is standby. • All transformers are in operation. • TNB-A and TNB-B are standby • 3 backup generators are standby	i. Normal operation from Monday until Friday ii. Morning and evening
2	• 2 Turbine generators are running. • All transformers are in operation. • TNB-A and TNB-B are standby. • 3 backup generators are standby.	i. Normal operation from Monday until Friday. ii. Afternoon
3	• 2 Turbine generators are down. • TNB-A and TNB-B is connected to the system. • All transformers in operation. • 3 backup generators are standby	i. Happen especially during blackout.
4	• 1 Turbine Generator is running. • TNB-A is connected to the system. • 1 Turbine generator and TNB-B are • 3 backup generators are standby. • All transformers in operation.	

3.1.2 Short Circuit

i. Collect all the data regarding load flow such as load data, generator data, cable size, and single line diagram.

ii. Model the single line diagram or the system in the DIGSilent Power Factory.

iii. Scenario Option

The scenarios considered for this load flow analysis are briefly described as follows:

Table 2: Scenario options for short circuit study

Scenario	Characteristic of Scenario	Description
1	• 1 Turbine generator is running. • 1 Turbine generator is standby. • All transformers are in operation. • TNB-A and TNB-B are standby • 3 backup generators are standby	iii. Normal operation from Monday until Friday iv. Morning and evening
2	• 2 Turbine generators are running. • All transformers are in operation. • TNB-A and TNB-B are standby. • 3 backup generators are standby.	iii. Normal operation from Monday until Friday. iv. Afternoon
3	• 2 Turbine generators are down. • TNB-A and TNB-B is connected to the system. • All transformers in operation. • 3 backup generators are standby	ii. Happen especially during blackout.
4	• 1 Turbine Generator is running. • TNB-A is connected to the system. • 1 Turbine generator and TNB-B are • 3 backup generators are standby. • All transformers in operation.	

3.1.3 Protection Relay Study

i. Collect all the data regarding load flow such as load data, generator data, cable size, and single line diagram.
ii. Model the single line diagram or the system in the DIGSilent Power Factory.
iii. Scenario has been created in order to have a study case.

Table 3: Scenario for protection relay study

Scenario	Characteristic of Scenario
1	• 1 Turbine generator is running.

3.2 Flow Chart

The project activities flow chart is shown in Figure 5. The studies start with literature review. After that learning Dig Silent software which is the structure of the software. Then do some analysis on the electrical load. After that, modeling the system and verify it. Then the studies begin with load flow study, short circuit study and finally protection relaying study. Finally, the result from the studies was analyzed and interpreted. Then the project complete with conclusion and recommendation.

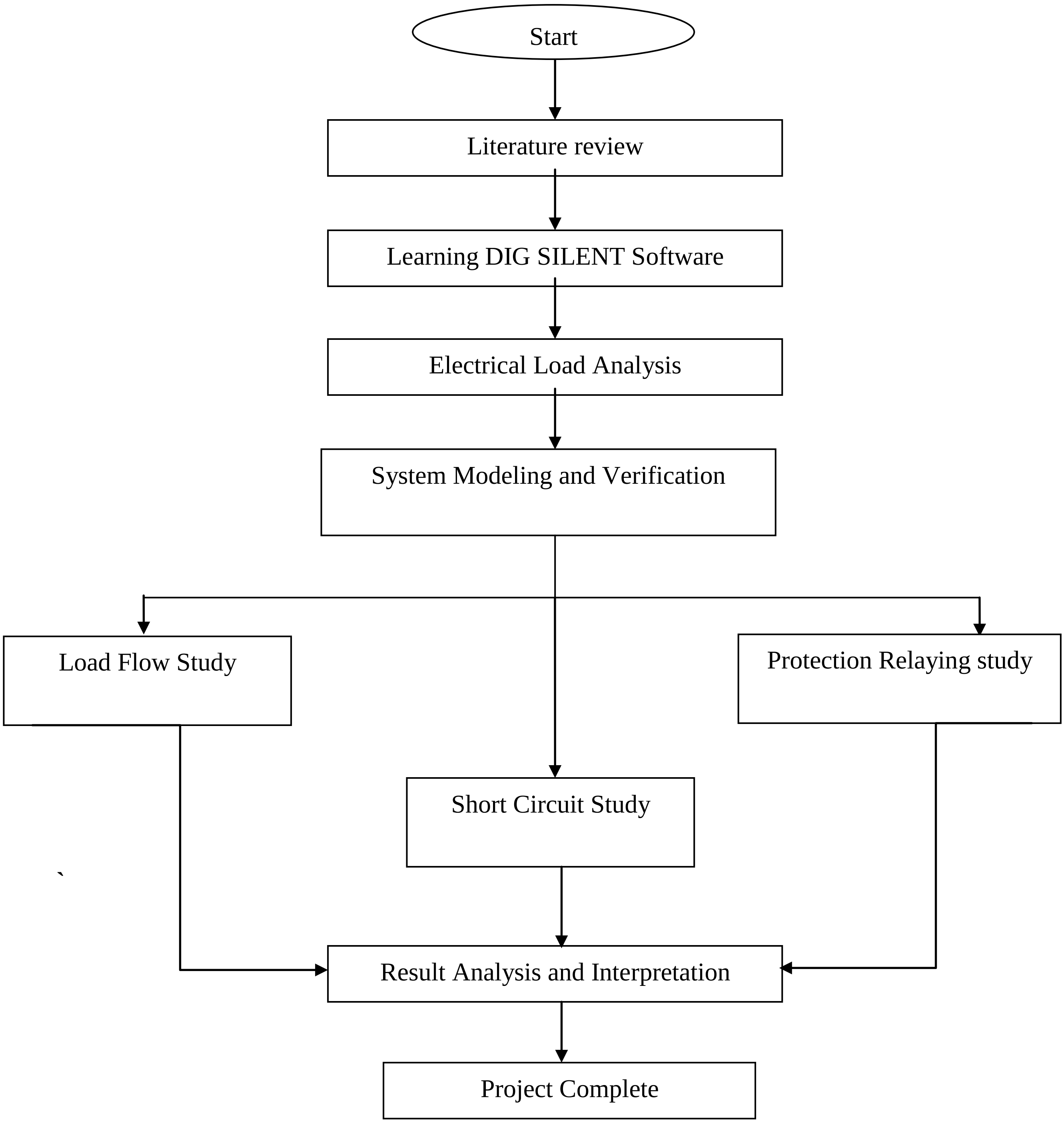

Figure 5: Flow Chart of the Project

3.2 Tools / Software / Equipment Required

1. DIG SILENT Power Factory Software
2. Laptop

Chapter 4

RESULT AND DISCUSSION

4.1 Load Flow Study

4.1.1 Voltage Drop

Table 4: Summary of HV (11kV) buses voltage drop (kV)

LOCATION	**VOLTAGE DROP (kV)**			
	SCENARIO			
	1	**2**	**3**	**4**
CBTG1	0.00	0.00	0.00	0.00
CBTG2	0.01	0.00	0.00	0.00
GDC	0.01	0.00	0.00	0.00
GDC(2)	0.01	0.00	0.00	0.00
Substation 4 (TX)	0.13	0.12	0.11	0.11
MIS	0.01	0.01	0.00	0.00
Block 05 (2)	0.02	0.02	0.01	0.01
Undercroft	0.02	0.02	0.01	0.01
Substation 1	0.01	0.01	0.00	0.00
MPH Substation	0.01	0.01	0.00	0.00
Substation 5	0.11	0.11	0.1	0.1
Substation 5B	0.02	0.1	0.09	0.09
Block 05	0.02	0.01	0.00	0.00
Substation 5A	0.09	0.09	0.07	0.07
Substation ETS	0.04	0.04	0.02	0.02
Block 3A	0.02	0.02	0.01	0.01
DS1A	0.1	0.1	0.09	0.09

DS1B	0.12	0.12	0.11	0.11
DS2	0.13	0.13	0.12	0.12
Substation 3	0.14	0.14	0.12	0.12
Substation 4	0.13	0.12	0.11	0.11
Substation 2	0.09	0.09	0.08	0.08

From the result in Table 4, voltage deviations at all HV buses are in +- 5% base on PETRONAS Technical Standard (PTS). These voltage deviations are within the limit of the standard.

Table 5: Analysis of each scenario

SCENARIO	RESULT ANALYSIS
1	1. Maximum reactive power limit exceeded , (9.54 MVAR >6.63 MVAR) 2. Maximum active power limit (15.05MW > 5.3MW) 3. The generator loadings is about 268.99%
2	1. No problem occurred 2. The generator loadings for GTG A is 190.04% 3. The generators loading for GTG B is 79.25%
3	1. No problem occurred.
4	1. No problem occurred. 2. The generator loadings for GTG A is 79.25

From the result in Table 5, the loading of the generator is high while loadings at the average around 50%.

4.1.2 Losses

Table 6: Total losses of the system

SCENARIO	TOTAL LOSSES (MW)
1	0.12
2	0.12
3	0.11
4	0.11

From the Table 6, the total loss in almost the same around 0.11 and 0.12 MW due to the incorrect load scaling.

4.2 Short Circuit Analysis

Table 7: Result of Short Circuit Analysis (Three Phase Fault)

LOCATION	**Fault Current (kA)**			
	SCENARIO			
	1	**2**	**3**	**4**
CBTG1	1.47	2.01	1.31	1.31
CBTG2	1.47	2.01	1.31	1.31
GDC	1.47	2.01	1.31	1.31
GDC(2)	1.47	2.01	1.31	1.31
Substation 4 (TX)	1.42	1.92	1.27	1.27
MIS	1.47	2.01	1.31	1.31
Block 05 (2)	1.45	1.98	1.29	1.29
Undercroft	1.44	1.96	1.28	1.28
Substation 1	1.43	1.94	1.27	1.27
MPH Substation	1.37	1.83	1.23	1.23
Substation 5	1.38	1.85	1.24	1.24
Substation 5B	1.40	1.88	1.25	1.25
Block 05	1.45	1.97	1.29	1.29
Substation 5A	1.42	1.92	1.27	1.27
Substation ETS	1.45	1.99	1.30	1.20
Block 3A	1.44	1.95	1.28	1.28
DS1A	1.43	1.93	1.27	1.28
DS1B	1.42	1.92	1.27	1.27
DS2	1.42	1.92	1.27	1.27
Substation 3	1.42	1.92	1.27	1.27

Substation 4	1.42	1.92	1.28	1.27
Substation 2	1.43	1.94	1.27	1.28

Table 8: Result of Short Circuit Analysis (Phase to Phase Fault)

LOCATION	**Fault Current (kA)**			
	SCENARIO			
	1	**2**	**3**	**4**
CBTG1	1.45	2.07	1.13	1.58
CBTG2	1.45	2.07	1.13	1.58
GDC	1.45	2.07	1.13	1.58
GDC(2)	1.45	2.07	1.13	1.58
Substation 4 (TX)	1.39	1.95	1.10	1.51
MIS	1.45	2.07	1.13	1.58
Block 05 (2)	1.43	2.03	1.12	1.55
Undercroft	1.41	2.00	1.11	1.54
Substation 1	1.40	1.98	1.10	1.52
MPH Substation	1.34	1.86	1.07	1.45
Substation 5	1.35	1.87	1.07	1.46
Substation 5B	1.37	1.91	1.08	1.48
Block 05	1.42	2.03	1.12	1.55
Substation 5A	1.39	1.95	1.10	1.51
Substation ETS	1.43	2.04	1.12	1.56
Block 3A	1.41	2.00	1.11	1.53
DS1A	1.40	1.97	1.11	1.52
DS1B	1.40	1.96	1.10	1.51
DS2	1.39	1.96	1.10	1.51

Substation 3	1.39	1.95	1.10	1.51
Substation 4	1.39	1.96	1.10	1.51
Substation 2	1.40	1.98	1.11	1.52

Table 9: Result of Short Circuit Analysis (Phase to Ground Fault)

LOCATION	**Fault Current (kA)**			
	SCENARIO			
	1	**2**	**3**	**4**
CBTG1	0.18	0.19	0.96	0.76
CBTG2	0.18	0.19	0.96	0.76
GDC	0.18	0.19	0.96	0.76
GDC(2)	0.18	0.19	0.96	0.76
Substation 4 (TX)	0.18	0.18	0.93	0.75
MIS	0.18	0.19	0.96	0.76
Block 05 (2)	0.18	0.19	0.95	0.76
Undercroft	0.18	0.19	0.94	0.75
Substation 1	0.18	0.19	0.94	0.75
MPH Substation	0.18	0.19	0.92	0.74
Substation 5	0.18	0.18	0.91	0.73
Substation 5B	0.18	0.18	0.92	0.74
Block 05	0.18	0.19	0.95	0.76
Substation 5A	0.18	0.18	0.93	0.74
Substation ETS	0.18	0.19	0.95	0.76
Block 3A	0.18	0.19	0.94	0.75
DS1A	0.18	0.18	0.94	0.75
DS1B	0.18	0.18	0.94	0.75
DS2	0.18	0.18	0.93	0.75

Substation 3	0.18	0.18	0.93	0.74
Substation 4	0.18	0.18	0.93	0.75
Substation 2	0.18	0.19	0.94	0.75

Table 10: Result of Short Circuit Analysis (Phase to Phase to Ground Fault)

LOCATION	Fault Current (kA)							
	SCENARIO							
	1		2		3		4	
CBTG1	1.41	1.48	2.04	2.11	1.01	1.34	1.43	1.72
CBTG2	1.41	1.48	2.04	2.11	1.01	1.34	1.43	1.72
GDC	1.41	1.48	2.04	2.11	1.01	1.34	1.43	1.72
GDC(2)	1.41	1.48	2.04	2.11	1.01	1.34	1.43	1.72
Substation 4 (TX)	1.36	1.43	1.92	1.99	0.98	1.31	1.37	1.67
MIS	1.41	1.48	2.04	2.10	1.01	1.34	1.43	1.72
Block 05 (2)	1.39	1.46	1.99	2.06	1.00	1.33	1.41	1.69
Undercroft	1.38	1.45	1.97	2.04	0.99	1.32	1.39	1.67
Substation 1	1.37	1.44	1.94	2.01	0.98	1.31	1.38	1.66
MPH Substation	1.30	1.37	1.82	1.89	0.95	1.28	1.31	1.59
Substation 5	1.31	1.38	1.84	1.91	0.96	1.27	1.32	1.59
Substation 5B	1.33	1.38	1.88	1.95	0.97	1.29	1.34	1.62
Block 05	1.39	1.46	1.99	2.06	1.00	1.33	1.40	1.69
Substation 5A	1.36	1.43	1.92	1.99	0.98	1.30	1.37	1.64
Substation ETS	1.40	1.47	2.00	2.07	1.00	1.33	1.41	1.70
Block 3A	1.38	1.45	1.97	2.03	0.99	1.32	1.39	1.67
DS1A	1.37	1.44	1.94	2.01	0.99	1.31	1.38	1.66
DS1B	1.36	1.43	1.93	1.99	0.98	1.31	1.37	1.65

DS2	1.36	1.43	1.92	1.99	0.98	1.31	1.37	1.65
Substation 3	1.36	1.43	1.92	1.99	0.98	1.31	1.37	1.65
Substation 4	1.36	1.43	1.92	1.99	0.98	1.31	1.37	1.65
Substation 2	1.37	1.44	1.94	2.01	0.99	1.31	1.38	1.66

Base on the Table 7, 8, 9 and 10 for three phase fault, the maximum fault occurred happen during two generators are running. For phase to phase fault, the maximum current occurred during two generators are running. For phase to ground fault, the maximum fault current occurred both TNBs are connected into the system. Finally, for phase to phase to ground, the maximum current fault occurred during two generators are running. During the generator in parallel, the current will add up that caused the current high.

4.3 Protection Relay Studies

Overcurrent

Table 11: Overcurrent

LOCATION	FAULT CURRENT (A)	CT RATIO (A)	TMS	NEW TMS
K03	14680	400/5	0.2	0.1
GS05	14680	400/5	0.5	0.1
K01(MIS)	14680	400/5	0.15	0.44
K02(MIS)	14680	400/5	0.15	0.325
K03 (MIS)	14680	400/5	0.15	0.300
K04 (MIS)	14680	400/5	0.175	0.225
K10(MIS)	14680	400/5	0.175	0.225

K11(MIS)	14680	400/5	0.125	0.15
K12(MIS)	14680	400/5	0.15	0.15
K14(MIS)	14680	400/5	0.1	0.1

From the Table 11, to get the margin 0.4s the new Time Multiplier Setting (TMS) should be change to new TMS. Total blackout or generator trip will occur due to the wrong setting of TMS.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The power system analysis serve as the basis for improving system performance and power quality and providing a reliable supply power during system operation. In this project, author have conducted study on power system design requirement, power system operating philosophy and further knowledge on power system studies as well.

For load flow study can conclude that, the system in UTP still reliable due to the low voltage deviation and low power loss. For short circuit study can conclude that fault current for every buses will not damage the bus bar due to the correct breaker current which is lower than fault current. For protection relay study can conclude that some changes should be done in order to prevent UTP from total blackout.

5.2 Recommendations

For further studies, for load flow study should study the different off-point and study for load forecasting. For protection relay coordination should study the two generator are running at the same time.

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APPENDICES

APPENDIX A

GANTT CHART

Activities	WEEK													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Literature Review on load flow, short circuit and protection relaying study														
Software Familiarization														
Site Visit to GDC														
Progress Report Submission														
Electrex (Pre-EDX)														
Engineering Design Exhibition (EDX)														
Draft Report Submission														
Technical Paper Submission														
Final Presentation														
Final Report Submission														

APPENDIX B

POWER SYSTEM DATA

Generator Spec

Real Power (kW)	5.3 MW
Reactive Power (kVAR)	5.2 MVAR
Phase	3 phase
Voltage (kV)	11 kV
Current (A)	348 A
Frequency	50Hz
Power Factor	0.8
Rotor speed (rpm)	1500 rpm

TRANSFORMER DATA

FACT AND FIGURE UTP ELECTRICAL									
Bil	**Substation**	**Rated (kVA)**	**Transformer Brand**	**Impedence (%)**	**Transformer type**	**Year**	**Oil liter**	**HV Amp**	**LV Amp**
1	Compact Substation	750	EWT	4.56	Hermitically seal	**1996**	429l	39.4	1000
2	MPH Substation	1000	EWT	4.66	Hermitically seal	**1996**	490l	52.48	1333.33
3	Substation 1	1000	EB	5.19	Conservator tank	**1998**	794l	52.48	1333.33
4	Substation 5	1000	SGB	6.04	Hermitically seal	2001	644l	52.48	1333.33
5	Substation 5A	1000	SGB	6.13	Hermitically seal	2004	659l	52.48	1333.33
6	Substation 5B	1000	SGB	6.03	Hermitically seal	2004	659l	52.48	1333.33
		1000	SGB	6.03	Hermitically seal	2004	659l	52.48	1333.33
7	Substation ETS	1000	SGB		Cast resin	2005		52.48	1333.33
8	Substation DS1A	1000	LG		Cast resin	2003		52.48	1333.33
9	Substation DS1B	1000	LG		Cast resin	2003		52.48	1333.33

10	Substation DS2	1600	EWT	5.11	Hermitically seal	**2000**	829l	84	2133
11	Substation 4	1000	MTM	4.67	Hermitically seal	**1994**	528l	52.48	1333.33
12	Substation 3	1500	EB	6.15	Conservator tank	**1988**	953l	78.7	2000
		1500	EB		Conservator tank	**1988**	953l	78.7	2000
13	Substation Desajaya	1000	EB	5.24	Conservator tank	**1998**	794l	52.48	1333.33
14	3A Substation	3000/4200	LG	5.9	Cast resin	2002		157/220	4000/5600
		3000/4200	LG	5.9	Cast resin	2002		157/220	4000/5600
	Undercroft	1000/1400	LG		Cast resin	2007		52.48	1333.33
15	Building 5 Substation	2000/2800	LG	5.8	Cast resin	2001		105/144	2667/3732
		2000/2800	LG	5.8	Cast resin	2001		105/144	2667/3732
16	Pocket C Substation	1250/1750	LG	6.2	Cast resin	2004		65.6	1677
		1250/1750	LG	6.2	Cast resin	2004		65.6	1677
17	Pocket D	2000/2800	LG	5.8	Cast resin	2004		105	2667

	Substation								
		2000/2800	LG	5.8	Cast resin	2004		105	2667
18	MIS 11kV Substation	500	EWT	4.41	Hermitically seal	2000	275l	26.2	667

Bil	**Genset**	**Rated (kVA)**	**Brand**
1	Site Office	450kVA/360kW	Volvo Penta
2	Main Hall	125kVA/100kW	Cummins 6CT
3	MPH	300kVA/240kW	Scavia
4	Pocket C	200 kVA/140kW	Volvo Penta
5	Pocket D	200kVA/140kW	Volvo Penta

Bil	**UPS**	**Rated (kVA)**	**Brand**
1	Main Hall	60	Protec
2	Main Control Room	40	Chloride EDP 70
3	Data Centre	160	Chloride EDP 90
4	Chancellor Hall	160	Chloride EDP 90

APPENDIX C

LOAD FLOW RESULT

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Reactive Power Limit Exceeded (9.54 Mvar > 6.63 Mvar)
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (15.05 MW > 5.30 MW)
```

		DIgSILENT PowerFactory 13.2.333	Project: / Date: 4/27/2011

Load Flow Calculation — Complete System Report: Substations, Voltage Profiles, Area Interchange

Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 1

	rated Voltage [kV]	Bus-voltage [p.u.]	[kV]	[deg]	Active Power [MW]	Reactive Power [Mvar]	Power Factor [-]	Current [kA]	Loading [%]	Additional Data
Station1										
MIS	11.00	1.00	10.99	-0.02						
Cub_0.0/Coup		Breaker/Switch			2.91	1.82	0.85	0.18	0.00	
Cub_0.6/Lne		K01			0.05	0.00	1.00	0.00	0.65	Pv: 0.01 kW cLod: 0.02 Mvar L: 1.14 km
Cub_0.6/Lne		K02			3.73	2.49	0.83	0.24	53.59	Pv: 27.61 kW cLod: 0.03 Mvar L: 1.68 km
Cub_0.4/Lne		K03			0.53	0.31	0.86	0.03	6.74	Pv: 0.22 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.3/Lne		K04			0.30	0.15	0.90	0.02	3.64	Pv: 0.04 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.6/Lne		Line(6)			-7.52	-4.76	-0.84	0.47	76.43	Pv: 4.15 kW cLod: 0.00 Mvar L: 0.10 km
Station10										
Block 05 (.00		1.00	10.98	-0.04						
Cub_0.3/Coup		Breaker/Switch(1)			0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne		K10			-1.69	-1.06	-0.85	0.10	21.58	Pv: 1.44 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.3/Lne		TX-05/1			0.59	0.37	0.85	0.04	9.42	Pv: 0.01 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.3/Lne		TX-MB/1			1.10	0.69	0.85	0.07	17.72	Pv: 0.59 kW cLod: 0.01 Mvar L: 0.33 km
Station11										
Undercroft.00		1.00	10.98	-0.03						
Cub_0.4/Coup		Breaker/Switch(2)			0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne		K11			-0.80	-0.49	-0.86	0.05	10.16	Pv: 0.50 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.4/Lne		TX-MB/3			0.08	0.05	0.85	0.01	1.35	Pv: 0.00 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.4/Lne		TX-PC2			0.12	0.06	0.88	0.01	1.93	Pv: 0.02 kW cLod: 0.01 Mvar L: 0.66 km
Cub_0.4/Lne		TX-PD2			0.60	0.37	0.85	0.04	9.60	Pv: 0.19 kW cLod: 0.01 Mvar L: 0.35 km
Station12										
MSB PC	0.43	1.00	0.43	-0.15						
Cub_0.2/Lod		MSBPC1			0.12	0.07	0.85	0.19		P10: 0.12 MW Q10: 0.07 Mvar
Cub_0.3/Coup		Breaker/Switch(3)			0.00	0.00	1.00	0.00	0.00	
Cub_0.3/Tr2		TX-PC2(1)			-0.12	-0.07	-0.85	0.19	8.13	Tap: 0.00 Min: 0 Max: 0

		DIgSILENT PowerFactory 13.2.333	Project:
			Date: 4/27/2011

Load Flow Calculation — Complete System Report: Substations, Voltage Profiles, Area Interchange

Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 14

	rtd.V [kV]	Bus - voltage [p.u.]	[kV]	[deg]	Voltage - Deviation [%] (-10, -5, 0, +5, +10)
Station1					
MIS	11.00	0.999	10.99	-0.02	
Station10					
Block 05 (2)	11.00	0.998	10.98	-0.04	
Station11					
Undercroft	11.00	0.998	10.98	-0.03	
Station12					
MSB PC	0.43	0.997	0.43	-0.15	
Station13					
MSB PD	0.43	0.994	0.43	-0.40	
Station14					
MSB-05	0.43	0.994	0.43	-0.40	
Station15					
MSB-MB Building	0.43	0.996	0.43	-0.23	
Station16					
RMU-Substation	11.00	0.999	10.99	-0.02	
Station17					
RMU-MPH Substat	11.00	0.999	10.99	-0.02	
Station18					
RMU-Substation	11.00	0.990	10.89	-0.15	
Station19					
RMU-Substation	11.00	0.990	10.89	-0.14	
Station2					
Transformer Poc	11.00	0.999	10.98	-0.02	
Station20					
RMU-Substation	11.00	0.992	10.91	-0.12	
Station21					
RMU-Substation	11.00	0.997	10.96	-0.05	
Station22					
Substation 1	0.43	0.998	0.43	-0.12	
Station23					
B1	0.43	0.999	0.43	-0.02	
Station24					
Main Compact Su	0.43	0.999	0.43	-0.02	
Station25					
MSB-MPH	0.43	0.000	0.00	0.00	

DIgSI/wrng - 1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (10.85 MW > 5.30 MW)

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Load Flow Calculation		Complete System Report: Substations, Voltage Profiles, Area Interchange	
Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 1

	rated Voltage [kV]	Bus-voltage [p.u.]	[kV]	[deg]	Active Power [MW]	Reactive Power [Mvar]	Power Factor [-]	Current [kA]	Loading [%]	Additional Data
Station1										
MIS	11.00	1.00	10.99	-0.02						
Cub_0.0/Coup		Breaker/Switch			2.91	1.82	0.85	0.18	0.00	
Cub_0.6/Lne		K01			0.05	0.00	1.00	0.00	0.65	Pv: 0.01 kW cLod: 0.02 Mvar L: 1.14 km
Cub_0.6/Lne		K02			3.73	2.49	0.83	0.24	53.58	Pv: 27.60 kW cLod: 0.03 Mvar L: 1.68 km
Cub_0.4/Lne		K03			0.53	0.31	0.86	0.03	6.74	Pv: 0.22 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.3/Lne		K04			0.30	0.15	0.90	0.02	3.64	Pv: 0.04 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.6/Lne		Line(6)			-7.52	-4.76	-0.84	0.47	76.42	Pv: 4.15 kW cLod: 0.00 Mvar L: 0.10 km
Station10										
Block 05 (.00		1.00	10.98	-0.04						
Cub_0.3/Coup		Breaker/Switch(1)			0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne		K10			-1.69	-1.06	-0.85	0.10	21.58	Pv: 1.44 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.3/Lne		TX-05/1			0.59	0.37	0.85	0.04	9.42	Pv: 0.01 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.3/Lne		TX-MB/1			1.10	0.69	0.85	0.07	17.72	Pv: 0.59 kW cLod: 0.01 Mvar L: 0.33 km
Station11										
Undercroft.00		1.00	10.98	-0.03						
Cub_0.4/Coup		Breaker/Switch(2)			0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne		K11			-0.80	-0.49	-0.86	0.05	10.16	Pv: 0.50 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.4/Lne		TX-MB/3			0.08	0.05	0.85	0.01	1.35	Pv: 0.00 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.4/Lne		TX-PC2			0.12	0.06	0.88	0.01	1.93	Pv: 0.02 kW cLod: 0.01 Mvar L: 0.66 km
Cub_0.4/Lne		TX-PD2			0.60	0.37	0.85	0.04	9.60	Pv: 0.19 kW cLod: 0.01 Mvar L: 0.35 km
Station12										
MSB PC	0.43	1.00	0.43	-0.15						
Cub_0.2/Lod		MSBPC1			0.12	0.07	0.85	0.19		Pl0: 0.12 MW Ql0: 0.07 Mvar
Cub_0.3/Coup		Breaker/Switch(3)			0.00	0.00	1.00	0.00	0.00	
Cub_0.3/Tr2		TX-PC2(1)			-0.12	-0.07	-0.85	0.19	8.13	Tap: 0.00 Min: 0 Max: 0

		DIgSILENT PowerFactory 13.2.333	Project:
			Date: 4/27/2011

Load Flow Calculation	Complete System Report: Substations, Voltage Profiles, Area Interchange

Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 14

	rtd.V [kV]	Bus - voltage [p.u.]	[kV]	[deg]	Voltage - Deviation [%] -10 -5 0 +5 +10
Station1					
MIS	11.00	0.999	10.99	-0.02	
Station10					
Block 05 (2)	11.00	0.998	10.98	-0.04	
Station11					
Undercroft	11.00	0.998	10.98	-0.03	
Station12					
MSB PC	0.43	0.997	0.43	-0.15	
Station13					
MSB PD	0.43	0.994	0.43	-0.40	
Station14					
MSB-05	0.43	0.994	0.43	-0.40	
Station15					
MSB-MB Building	0.43	0.996	0.43	-0.23	
Station16					
RMU-Substation	11.00	0.999	10.99	-0.02	
Station17					
RMU-MPH Substat	11.00	0.999	10.99	-0.02	
Station18					
RMU-Substation	11.00	0.990	10.89	-0.15	
Station19					
RMU-Substation	11.00	0.990	10.90	-0.14	
Station2					
Transformer Poc	11.00	0.999	10.99	-0.02	
Station20					
RMU-Substation	11.00	0.992	10.91	-0.12	
Station21					
RMU-Substation	11.00	0.997	10.96	-0.05	
Station22					
Substation 1	0.43	0.998	0.43	-0.12	
Station23					
B1	0.43	0.999	0.43	-0.02	
Station24					
Main Compact Su	0.43	0.999	0.43	-0.02	
Station25					
MSB-MPH	0.43	0.000	0.00	0.00	

DIgSI/wrng -   1 area(s) are unsupplied.

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Load Flow Calculation		Complete System Report: Substations, Voltage Profiles, Area Interchange	
Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 1

		rated Voltage [kV]	Bus-voltage [p.u.]	Bus-voltage [kV]	[deg]	Active Power [MW]	Reactive Power [Mvar]	Power Factor [-]	Current [kA]	Loading [%]	Additional Data
Station1											
MIS		11.00	1.00	11.00	0.00						
Cub_0.2/Xnet	TNB A 11kV					4.61	2.94	0.84	0.29		Sk": 5.30 MVA
Cub_0.0/Coup	Breaker/Switch					0.00	0.00	1.00	0.00	0.00	
Cub_0.6/Lne	K01					0.05	0.00	1.00	0.00	0.65	Pv: 0.01 kW cLod: 0.02 Mvar L: 1.14 km
Cub_0.6/Lne	K02					3.73	2.48	0.83	0.24	53.52	Pv: 27.54 kW cLod: 0.03 Mvar L: 1.68 km
Cub_0.4/Lne	K03					0.53	0.31	0.86	0.03	6.73	Pv: 0.22 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.3/Lne	K04					0.30	0.15	0.90	0.02	3.63	Pv: 0.04 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.6/Lne	Line(6)					0.00	-0.00	0.00	0.00	0.02	Pv: 0.00 kW cLod: 0.00 Mvar L: 0.10 km
Station10											
Block 05 (.00			1.00	10.99	-0.02						
Cub_0.3/Coup	Breaker/Switch(1)					0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne	K10					-1.69	-1.06	-0.85	0.10	21.56	Pv: 1.43 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.3/Lne	TX-05/1					0.59	0.37	0.85	0.04	9.41	Pv: 0.01 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.3/Lne	TX-MB/1					1.10	0.69	0.85	0.07	17.70	Pv: 0.59 kW cLod: 0.01 Mvar L: 0.33 km
Station11											
Undercroft.00			1.00	10.99	-0.01						
Cub_0.4/Coup	Breaker/Switch(2)					0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne	K11					-0.80	-0.49	-0.86	0.05	10.15	Pv: 0.50 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.4/Lne	TX-MB/3					0.08	0.05	0.85	0.01	1.35	Pv: 0.00 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.4/Lne	TX-PC2					0.12	0.06	0.88	0.01	1.93	Pv: 0.02 kW cLod: 0.01 Mvar L: 0.66 km
Cub_0.4/Lne	TX-PD2					0.60	0.37	0.85	0.04	9.59	Pv: 0.19 kW cLod: 0.01 Mvar L: 0.35 km
Station12											
MSB PC		0.43	1.00	0.43	-0.13						
Cub_0.2/Lod	MSBPC1					0.12	0.07	0.85	0.19		Pl0: 0.12 MW Ql0: 0.07 Mvar
Cub_0.3/Coup	Breaker/Switch(3)					0.00	0.00	1.00	0.00	0.00	
Cub_0.3/Tr2	TX-PC2(1)					-0.12	-0.07	-0.85	0.19	8.12	Tap: 0.00 Min: 0 Max: 0

		DIgSILENT PowerFactory 13.2.333	Project:
			Date: 4/27/2011

Load Flow Calculation — Complete System Report: Substations, Voltage Profiles, Area Interchange

Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 14

	rtd.V [kV]	Bus - voltage [p.u.]	[kV]	[deg]	Voltage - Deviation [%] -10 -5 0 +5 +10
Station1					
MIS	11.00	1.000	11.00	0.00	
Station10					
Block 05 (2)	11.00	0.999	10.99	-0.02	
Station11					
Undercroft	11.00	0.999	10.99	-0.01	
Station12					
MSB PC	0.43	0.998	0.43	-0.13	
Station13					
MSB PD	0.43	0.995	0.43	-0.38	
Station14					
MSB-05	0.43	0.995	0.43	-0.38	
Station15					
MSB-MB Building	0.43	0.997	0.43	-0.21	
Station16					
RMU-Substation	11.00	1.000	11.00	-0.00	
Station17					
RMU-MPH Substat	11.00	1.000	11.00	-0.00	
Station18					
RMU-Substation	11.00	0.991	10.90	-0.13	
Station19					
RMU-Substation	11.00	0.992	10.91	-0.12	
Station2					
Transformer Poc	11.00	1.000	11.00	-0.00	
Station20					
RMU-Substation	11.00	0.993	10.93	-0.10	
Station21					
RMU-Substation	11.00	0.998	10.98	-0.03	
Station22					
Substation 1	0.43	0.999	0.43	-0.09	
Station23					
B1	0.43	1.000	0.43	-0.00	
Station24					
Main Compact Su	0.43	1.000	0.43	-0.00	
Station25					
MSB-MPH	0.43	0.000	0.00	0.00	

DIgSI/wrng -   1 area(s) are unsupplied.

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Load Flow Calculation	Complete System Report: Substations, Voltage Profiles, Area Interchange
Balanced, positive sequence Automatic Tap Adjust of Transformers: No Consider Reactive Power Limits: No	Automatic Model Adaptation for Convergency: No Max. Acceptable Load Flow Error for Nodes: 1.00 kVA Model Equations: 0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 1

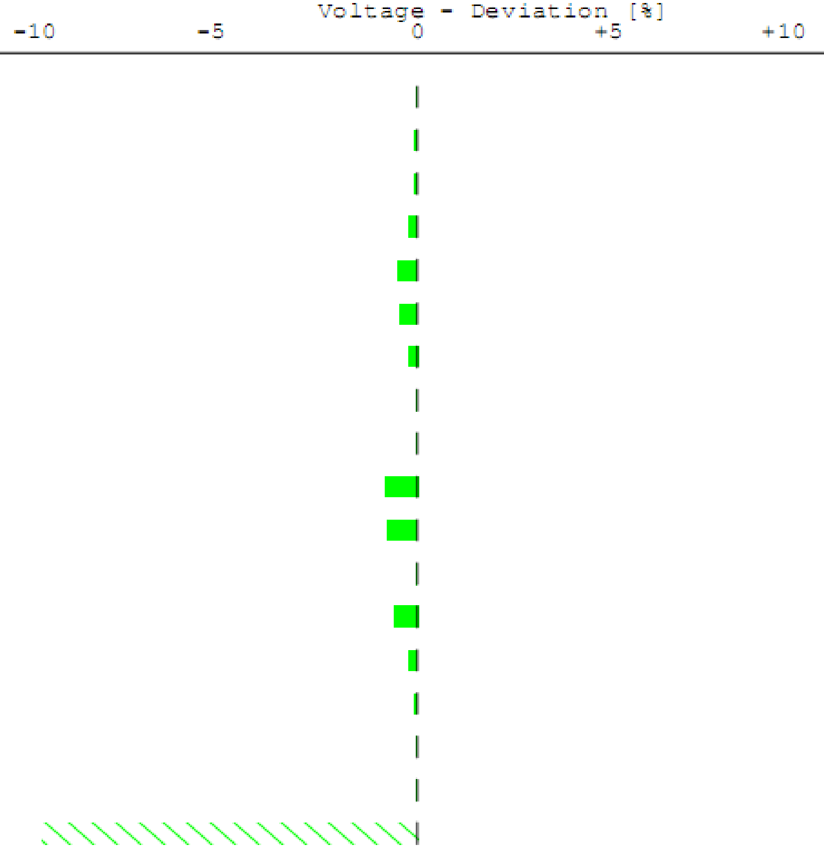
		rated Voltage [kV]	Bus-voltage [p.u.]	[kV]	[deg]	Active Power [MW]	Reactive Power [Mvar]	Power Factor [-]	Current [kA]	Loading [%]	Additional Data
Station1											
MIS		11.00	1.00	11.00	0.00						
Cub_0.2/Xnet	TNB A 11kV					10.84	6.37	0.86	0.66		Sk": 5.30 MVA
Cub_0.0/Coup	Breaker/Switch					8.33	5.00	0.86	0.51	0.00	
Cub_0.6/Lne	K01					0.05	0.00	1.00	0.00	0.65	Pv: 0.01 kW cLod: 0.02 Mvar L: 1.14 km
Cub_0.6/Lne	K02					3.73	2.48	0.83	0.24	53.52	Pv: 27.54 kW cLod: 0.03 Mvar L: 1.68 km
Cub_0.4/Lne	K03					0.53	0.31	0.86	0.03	6.73	Pv: 0.22 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.3/Lne	K04					0.30	0.15	0.90	0.02	3.63	Pv: 0.04 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.6/Lne	Line(6)					-2.10	-1.58	-0.80	0.14	22.52	Pv: 0.36 kW cLod: 0.00 Mvar L: 0.10 km
Station10											
Block 05 (.00			1.00	10.99	-0.02						
Cub_0.3/Coup	Breaker/Switch(1)					0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne	K10					-1.69	-1.06	-0.85	0.10	21.56	Pv: 1.43 kW cLod: 0.01 Mvar L: 0.55 km
Cub_0.3/Lne	TX-05/1					0.59	0.37	0.85	0.04	9.41	Pv: 0.01 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.3/Lne	TX-MB/1					1.10	0.69	0.85	0.07	17.70	Pv: 0.59 kW cLod: 0.01 Mvar L: 0.33 km
Station11											
Undercroft.00			1.00	10.99	-0.01						
Cub_0.4/Coup	Breaker/Switch(2)					0.00	0.00	1.00	0.00	0.00	
Cub_0.0/Lne	K11					-0.80	-0.49	-0.86	0.05	10.15	Pv: 0.50 kW cLod: 0.02 Mvar L: 0.86 km
Cub_0.4/Lne	TX-MB/3					0.08	0.05	0.85	0.01	1.35	Pv: 0.00 kW cLod: 0.00 Mvar L: 0.01 km
Cub_0.4/Lne	TX-PC2					0.12	0.06	0.88	0.01	1.93	Pv: 0.02 kW cLod: 0.01 Mvar L: 0.66 km
Cub_0.4/Lne	TX-PD2					0.60	0.37	0.85	0.04	9.59	Pv: 0.19 kW cLod: 0.01 Mvar L: 0.35 km
Station12											
MSB PC		0.43	1.00	0.43	-0.13						
Cub_0.2/Lod	MSBPC1					0.12	0.07	0.85	0.19		Pl0: 0.12 MW Ql0: 0.07 Mvar
Cub_0.3/Coup	Breaker/Switch(3)					0.00	0.00	1.00	0.00	0.00	
Cub_0.3/Tr2	TX-PC2(1)					-0.12	-0.07	-0.85	0.19	8.12	Tap: 0.00 Min: 0 Max: 0

		DIgSILENT PowerFactory 13.2.333	Project:
			Date: 4/27/2011

Load Flow Calculation		Complete System Report: Substations, Voltage Profiles, Area Interchange	
Balanced, positive sequence		Automatic Model Adaptation for Convergency	No
Automatic Tap Adjust of Transformers	No	Max. Acceptable Load Flow Error for	
Consider Reactive Power Limits	No	Nodes	1.00 kVA
		Model Equations	0.10 %

Grid: Grid	System Stage: Grid	Study Case: Study Case	Annex: / 14

	rtd.V [kV]	Bus - voltage [p.u.]	[kV]	[deg]
Station1				
MIS	11.00	1.000	11.00	0.00
Station10				
Block 05 (2)	11.00	0.999	10.99	-0.02
Station11				
Undercroft	11.00	0.999	10.99	-0.01
Station12				
MSB PC	0.43	0.998	0.43	-0.13
Station13				
MSB PD	0.43	0.995	0.43	-0.38
Station14				
MSB-05	0.43	0.995	0.43	-0.38
Station15				
MSB-MB Building	0.43	0.997	0.43	-0.21
Station16				
RMU-Substation	11.00	1.000	11.00	-0.00
Station17				
RMU-MPH Substat	11.00	1.000	11.00	-0.00
Station18				
RMU-Substation	11.00	0.991	10.90	-0.13
Station19				
RMU-Substation	11.00	0.992	10.91	-0.12
Station2				
Transformer Poc	11.00	1.000	11.00	-0.00
Station20				
RMU-Substation	11.00	0.993	10.93	-0.10
Station21				
RMU-Substation	11.00	0.998	10.98	-0.03
Station22				
Substation 1	0.43	0.999	0.43	-0.09
Station23				
B1	0.43	1.000	0.43	-0.00
Station24				
Main Compact Su	0.43	1.000	0.43	-0.00
Station25				
MSB-MPH	0.43	0.000	0.00	0.00



APPENDIX D

SHORT CIRCUIT STUDY RESULT

(Three Phase)

DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders
Short-Circuit Calculation complete — 3-Phase Short-Circuit /

Short-Circuit Duration	Fault Impedance	Decaying Aperiodic Component
Breaker Time 0.10 s	Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	Using Method B

Grid: Grid — System Stage: Grid — Annex: / 1

	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	Ik [kA]	Ith [kA]
Station1												
MIS	11.00	0.00	0.00	1.00	27.96 MVA	1.47 kA	-25.13	4.15 kA	1.40	26.77	1.47	1.47
Breaker/Switch	Station9				13.98 MVA	0.73 kA	154.87	2.08 kA				
K01	Station16				0.00 MVA	0.00 kA	0.00	0.00 kA				
K02	Station34				0.00 MVA	0.00 kA	0.00	0.00 kA				
K03	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K04	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
Line(6)	Station53				13.98 MVA	0.73 kA	154.87	2.08 kA				
Station10												
Block 05 (2)	11.00	0.00	0.00	1.00	27.61 MVA	1.45 kA	-25.43	4.10 kA	1.39	26.43	1.45	1.45
Breaker/Switch(	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
K10	Station9				27.61 MVA	1.45 kA	154.57	4.10 kA				
TX-05/1	Station61				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-MB/1	Station63				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station11												
Undercroft	11.00	0.00	0.00	1.00	27.39 MVA	1.44 kA	-25.61	4.07 kA	1.38	26.22	1.44	1.44
Breaker/Switch(	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K11	Station9				27.39 MVA	1.44 kA	154.39	4.07 kA				
TX-MB/3	Station71				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2	Station60				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PD2	Station70				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station12												
MSB PC	0.43	0.00	0.00	1.00	21.12 MVA	28.16 kA	-44.80	79.64 kA	27.22	20.42	24.38	28.16
Breaker/Switch(	Station4				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2(1)	Station60				21.12 MVA	28.16 kA	135.20	79.64 kA				
MSBPC1					0.00 MVA	0.00 kA	0.00	0.00 kA				
Station13												
MSB PD	0.43	0.00	0.00	1.00	23.52 MVA	31.36 kA	-38.56	88.71 kA	30.18	22.64	27.16	31.36

DIgSI/wrng - 1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (10.85 MW > 5.30 MW)
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete		3-Phase Short-Circuit /
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	Decaying Aperiodic Component Using Method B

Grid: Grid	System Stage: Grid		Annex: / 1

	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	Ik [kA]	Ith [kA]
Station1												
MIS	11.00	0.00	0.00	1.00	38.30 MVA	2.01 kA	-21.78	5.69 kA	1.98	37.66	2.01	2.01
Breaker/Switch	Station9				19.15 MVA	1.01 kA	158.22	2.84 kA				
K01	Station16				0.00 MVA	0.00 kA	0.00	0.00 kA				
K02	Station34				0.00 MVA	0.00 kA	0.00	0.00 kA				
K03	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K04	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
Line(6)	Station53				19.15 MVA	1.01 kA	158.22	2.84 kA				
Station10												
Block 05 (2)	11.00	0.00	0.00	1.00	37.65 MVA	1.98 kA	-22.26	5.59 kA	1.94	37.03	1.98	1.98
Breaker/Switch(	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
K10	Station9				37.65 MVA	1.98 kA	157.74	5.59 kA				
TX-05/1	Station61				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-MB/1	Station63				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station11												
Undercroft	11.00	0.00	0.00	1.00	37.25 MVA	1.96 kA	-22.53	5.53 kA	1.92	36.64	1.96	1.96
Breaker/Switch(	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K11	Station9				37.25 MVA	1.96 kA	157.47	5.53 kA				
TX-MB/3	Station71				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2	Station60				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PD2	Station70				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station12												
MSB PC	0.43	0.00	0.00	1.00	26.47 MVA	35.29 kA	-47.61	99.83 kA	34.93	26.20	30.57	35.29
Breaker/Switch(	Station4				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2(1)	Station60				26.47 MVA	35.29 kA	132.39	99.83 kA				
MSBPC1					0.00 MVA	0.00 kA	0.00	0.00 kA				

DIgSI/wrng -   1 area(s) are unsupplied.
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':

		DIgSILENT PowerFactory 13.2.333	Project:
			Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete		3-Phase Short-Circuit /
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	Decaying Aperiodic Component Using Method B

Grid: Grid   System Stage: Grid   Annex: / 1

	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	Ik [kA]	Ith [kA]
Station1												
MIS	11.00	0.00	0.00	1.00	24.92 MVA	1.31 kA	-50.06	3.70 kA	1.31	24.92	1.31	1.31
Breaker/Switch	Station9				15.76 MVA	0.83 kA	133.81	2.34 kA				
K01	Station16				0.00 MVA	0.00 kA	0.00	0.00 kA				
K02	Station34				0.00 MVA	0.00 kA	0.00	0.00 kA				
K03	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K04	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
Line(6)	Station53				0.00 MVA	0.00 kA	0.00	0.00 kA				
TNB A 11kV					9.26 MVA	0.49 kA	-56.65	1.37 kA				
Station10												
Block 05 (2)	11.00	0.00	0.00	1.00	24.62 MVA	1.29 kA	-50.01	3.65 kA	1.29	24.62	1.29	1.29
Breaker/Switch(	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
K10	Station9				24.62 MVA	1.29 kA	129.99	3.65 kA				
TX-05/1	Station61				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-MB/1	Station63				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station11												
Undercroft	11.00	0.00	0.00	1.00	24.43 MVA	1.28 kA	-49.99	3.63 kA	1.28	24.43	1.28	1.28
Breaker/Switch(	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K11	Station9				24.43 MVA	1.28 kA	130.01	3.63 kA				
TX-MB/3	Station71				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2	Station60				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PD2	Station70				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station12												
MSB PC	0.43	0.00	0.00	1.00	17.89 MVA	23.86 kA	-61.06	67.48 kA	23.86	17.89	20.66	23.86
Breaker/Switch(	Station4				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2(1)	Station60				17.89 MVA	23.86 kA	118.94	67.48 kA				
MSBPC1					0.00 MVA	0.00 kA	0.00	0.00 kA				
Station13												

DIgSI/wrng - 1 area(s) are unsupplied.
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete		3-Phase Short-Circuit /
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	Decaying Aperiodic Component Using Method B

Grid: Grid	System Stage: Grid		Annex: / 1

	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	Ik [kA]	Ith [kA]
Station1												
MIS	11.00	0.00	0.00	1.00	24.92 MVA	1.31 kA	-50.06	3.70 kA	1.31	24.92	1.31	1.31
Breaker/Switch	Station9				15.76 MVA	0.83 kA	133.81	2.34 kA				
K01	Station16				0.00 MVA	0.00 kA	0.00	0.00 kA				
K02	Station34				0.00 MVA	0.00 kA	0.00	0.00 kA				
K03	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K04	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
Line(6)	Station53				0.00 MVA	0.00 kA	0.00	0.00 kA				
TNB A 11kV					9.26 MVA	0.49 kA	-56.65	1.37 kA				
Station10												
Block 05 (2)	11.00	0.00	0.00	1.00	24.62 MVA	1.29 kA	-50.01	3.65 kA	1.29	24.62	1.29	1.29
Breaker/Switch(	Station2				0.00 MVA	0.00 kA	0.00	0.00 kA				
K10	Station9				24.62 MVA	1.29 kA	129.99	3.65 kA				
TX-05/1	Station61				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-MB/1	Station63				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station11												
Undercroft	11.00	0.00	0.00	1.00	24.43 MVA	1.28 kA	-49.99	3.63 kA	1.28	24.43	1.28	1.28
Breaker/Switch(	Station3				0.00 MVA	0.00 kA	0.00	0.00 kA				
K11	Station9				24.43 MVA	1.28 kA	130.01	3.63 kA				
TX-MB/3	Station71				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2	Station60				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PD2	Station70				0.00 MVA	0.00 kA	0.00	0.00 kA				
Station12												
MSB PC	0.43	0.00	0.00	1.00	17.89 MVA	23.86 kA	-61.06	67.48 kA	23.86	17.89	20.66	23.86
Breaker/Switch(	Station4				0.00 MVA	0.00 kA	0.00	0.00 kA				
TX-PC2(1)	Station60				17.89 MVA	23.86 kA	118.94	67.48 kA				
MSBPC1					0.00 MVA	0.00 kA	0.00	0.00 kA				
Station13												

APPENDIX E

SHORT CIRCUIT STUDY RESULT

(Phase to Phase)

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Reactive Power Limit Exceeded (9.54 Mvar > 6.63 Mvar)
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (15.05 MW > 5.30 MW)
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete	2-Phase Short-Circuit /

Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid System Stage: Grid		Annex: / 1

	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1											

DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders
Short-Circuit Calculation complete — 2-Phase Short-Circuit /

Short-Circuit Duration — Breaker Time 0.10 s
Fault Impedance — Resistance, Rf 0.00 Ohm; Reactance, Xf 0.00 Ohm

Grid: Grid — System Stage: Grid — Annex: / 1

			rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor		Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1														
MIS		A	11.00	5.16	3.91	1.00		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.00
		B		2.58	-176.09			13.15 MVA	2.07 kA	-114.47	5.86 kA	2.07	13.15	0.00
		C		2.58	-176.09			13.15 MVA	2.07 kA	65.53	5.86 kA	2.07	13.15	0.00
Breaker/Switch	Station9						A	0.93 MVA	0.15 kA	-28.10	0.41 kA			
							B	6.62 MVA	1.04 kA	69.55	2.95 kA			
							C	6.56 MVA	1.03 kA	-118.53	2.92 kA			
K01	Station16						A	0.01 MVA	0.00 kA	0.97	0.01 kA			
							B	0.01 MVA	0.00 kA	-179.03	0.00 kA			
							C	0.01 MVA	0.00 kA	-179.03	0.00 kA			
K02	Station34						A	1.22 MVA	0.19 kA	-29.78	0.54 kA			
							B	0.61 MVA	0.10 kA	150.22	0.27 kA			
							C	0.61 MVA	0.10 kA	150.22	0.27 kA			
K03	Station3						A	0.17 MVA	0.03 kA	-26.25	0.07 kA			
							B	0.08 MVA	0.01 kA	153.75	0.04 kA			
							C	0.08 MVA	0.01 kA	153.75	0.04 kA			
K04	Station2						A	0.09 MVA	0.01 kA	-22.42	0.04 kA			
							B	0.04 MVA	0.01 kA	157.58	0.02 kA			
							C	0.04 MVA	0.01 kA	157.58	0.02 kA			
Line(6)	Station53						A	2.42 MVA	0.38 kA	151.57	1.08 kA			
							B	6.60 MVA	1.04 kA	55.01	2.94 kA			
							C	6.77 MVA	1.07 kA	-104.21	3.01 kA			
Station10														
Block 05 (2)		A	11.00	5.19	3.91	1.00		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.00
		B		2.59	-176.09			12.88 MVA	2.03 kA	-114.98	5.74 kA	2.03	12.88	0.00

DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders
Short-Circuit Calculation complete — 2-Phase Short-Circuit /

Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm

Grid: Grid — System Stage: Grid — Annex: / 1

			rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor		Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1														
MIS		A	11.00	6.35	0.00	1.00		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.00
		B		3.18	-180.00			7.19 MVA	1.13 kA	-140.06	3.20 kA	1.13	7.19	0.00
		C		3.18	-180.00			7.19 MVA	1.13 kA	39.94	3.20 kA	1.13	7.19	0.00
Breaker/Switch	Station9						A	0.00 MVA	0.00 kA	-135.34	0.00 kA			
							B	4.55 MVA	0.72 kA	43.81	2.03 kA			
							C	4.55 MVA	0.72 kA	-136.19	2.03 kA			
K01	Station16						A	0.02 MVA	0.00 kA	-2.87	0.01 kA			
							B	0.01 MVA	0.00 kA	177.13	0.00 kA			
							C	0.01 MVA	0.00 kA	177.13	0.00 kA			
K02	Station34						A	1.49 MVA	0.24 kA	-33.69	0.67 kA			
							B	0.75 MVA	0.12 kA	146.31	0.33 kA			
							C	0.75 MVA	0.12 kA	146.31	0.33 kA			
K03	Station3						A	0.20 MVA	0.03 kA	-30.16	0.09 kA			
							B	0.10 MVA	0.02 kA	149.84	0.05 kA			
							C	0.10 MVA	0.02 kA	149.84	0.05 kA			
K04	Station2						A	0.11 MVA	0.02 kA	-26.32	0.05 kA			
							B	0.06 MVA	0.01 kA	153.68	0.02 kA			
							C	0.06 MVA	0.01 kA	153.68	0.02 kA			
Line(6)	Station53						A	0.00 MVA	0.00 kA	89.98	0.00 kA			
							B	0.00 MVA	0.00 kA	-90.01	0.00 kA			
							C	0.00 MVA	0.00 kA	-90.02	0.00 kA			
TNB A 11kV							A	1.82 MVA	0.29 kA	-32.53	0.81 kA			
							B	3.16 MVA	0.50 kA	-161.93	1.41 kA			
							C	2.45 MVA	0.39 kA	53.22	1.09 kA			

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete		2-Phase Short-Circuit /
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid		System Stage: Grid					Annex:	/ 1			
		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	5.53	1.22	1.00	0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.00
	B		2.76	-178.78		10.02 MVA	1.58 kA	-123.78	4.46 kA	1.58	10.02	0.00
	C		2.76	-178.78		10.02 MVA	1.58 kA	56.22	4.46 kA	1.58	10.02	0.00

APPENDIX F

SHORT CIRCUIT STUDY RESULT

(Phase to Ground)

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Reactive Power Limit Exceeded (9.54 Mvar > 6.63 Mvar)
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (15.05 MW > 5.30 MW)
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete	Single Phase to Ground /	
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid	System Stage: Grid						Annex:	/ 1		
	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1											

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (10.85 MW > 5.30 MW)
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders
Short-Circuit Calculation complete — Single Phase to Ground /

Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm

Grid: Grid — System Stage: Grid — Annex: / 1

		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	0.00	0.00	1.00	1.18 MVA	0.19 kA	-87.19	0.53 kA	0.19	1.18	0.00
	B		10.97	-147.34		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.74

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete		Single Phase to Ground /
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid | System Stage: Grid | Annex: / 1

		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	0.00	0.00	1.00	6.08 MVA	0.96 kA	-68.73	2.71 kA	0.96	6.08	0.00
	B		8.67	-126.26		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.36
	C		6.51	141.94		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.02

```
DIgSI/wrng -     1 area(s) are unsupplied.
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders
Short-Circuit Calculation complete — Single Phase to Ground /

Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm

Grid: Grid — System Stage: Grid — Annex: / 1

		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	0.00	0.00	1.00	4.84 MVA	0.76 kA	-72.78	2.15 kA	0.76	4.84	0.00
	B		10.15	-136.11		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.62
	C		8.46	154.13		0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.28

APPENDIX G

SHORT CIRCUIT STUDY RESULT

(Phase to Phase to Ground)

```
DIgSI/wrng -     1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Reactive Power Limit Exceeded (9.54 Mvar > 6.63 Mvar)
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (15.05 MW > 5.30 MW)
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete	2-Phase to Ground	/
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid	System Stage: Grid								Annex: / 1	
	rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1											

```
DIgSI/wrng -     1 area(s) are unsupplied.
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\GTG A.ElmSym':
DIgSI/wrng - Maximum Active Power Limit Exceeded (10.85 MW > 5.30 MW)
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X(
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=F
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete		2-Phase to Ground /
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid System Stage: Grid Annex: / 1

		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	7.70	4.57	1.00	0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.49
	B		0.00	-120.00		12.93 MVA	2.04 kA	-114.88	5.76 kA	2.04	12.93	0.00

```
DIgSI/wrng -    1 area(s) are unsupplied.
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete	2-Phase to Ground	/
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

Grid: Grid	System Stage: Grid										Annex: / 1
		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	8.04	6.02	1.00	0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.27
	B		0.00	-120.00		6.41 MVA	1.01 kA	-158.27	2.86 kA	1.01	6.41	0.00
	C		0.00	120.00		8.54 MVA	1.34 kA	53.52	3.80 kA	1.34	8.54	0.00

```
DIgSI/wrng -     1 area(s) are unsupplied.
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14(1).ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01 (5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS1B.ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K02 DS2.ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K03.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K04.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K10.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K11.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K12 (Sub 2).ElmLne': R0 and X0 too low! Assumed: R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K14.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line.ElmLne': R0 and X0 too low! Assumed: R0=R1, X
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(3).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(4).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(5).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(6).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 3 (2).ElmLne': R0 and X0 too low! Assumed: R0=
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Sub 4.ElmLne': R0 and X0 too low! Assumed: R0=R1,
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(7).ElmLne': R0 and X0 too low! Assumed: R0=R1
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(55).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\K01.ElmLne': R0 and X0 too low! Assumed: R0=R1, X0
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(78).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(79).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - Line '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Line(80).ElmLne': R0 and X0 too low! Assumed: R0=R
DIgSI/wrng - No short-circuit computed on busbars
DIgSI/wrng - in isolated areas without syn. machine or external net !
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station25.ElmStat\MSB-MPH.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station32.ElmStat\B1.StaBar':
DIgSI/wrng - '\UTM.IntUser\GDC-UTP System Studies Latest.IntPrj\Grid.ElmNet\Station33.ElmStat\B1.StaBar':
```

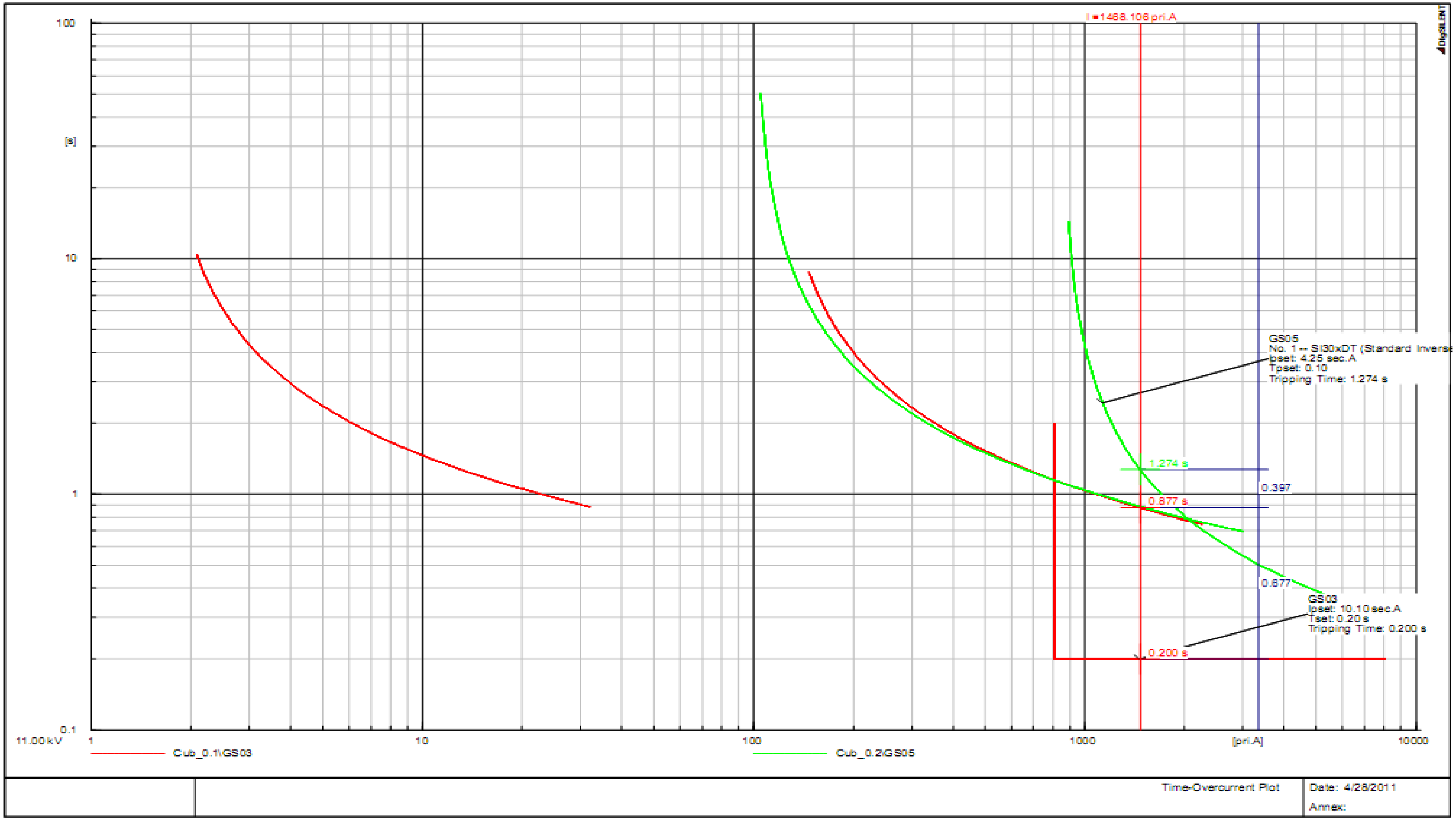
		DIgSILENT PowerFactory 13.2.333	Project: Date: 4/27/2011

Fault Locations with Feeders Short-Circuit Calculation complete	2-Phase to Ground	/
Short-Circuit Duration Breaker Time 0.10 s	Fault Impedance Resistance, Rf 0.00 Ohm Reactance, Xf 0.00 Ohm	

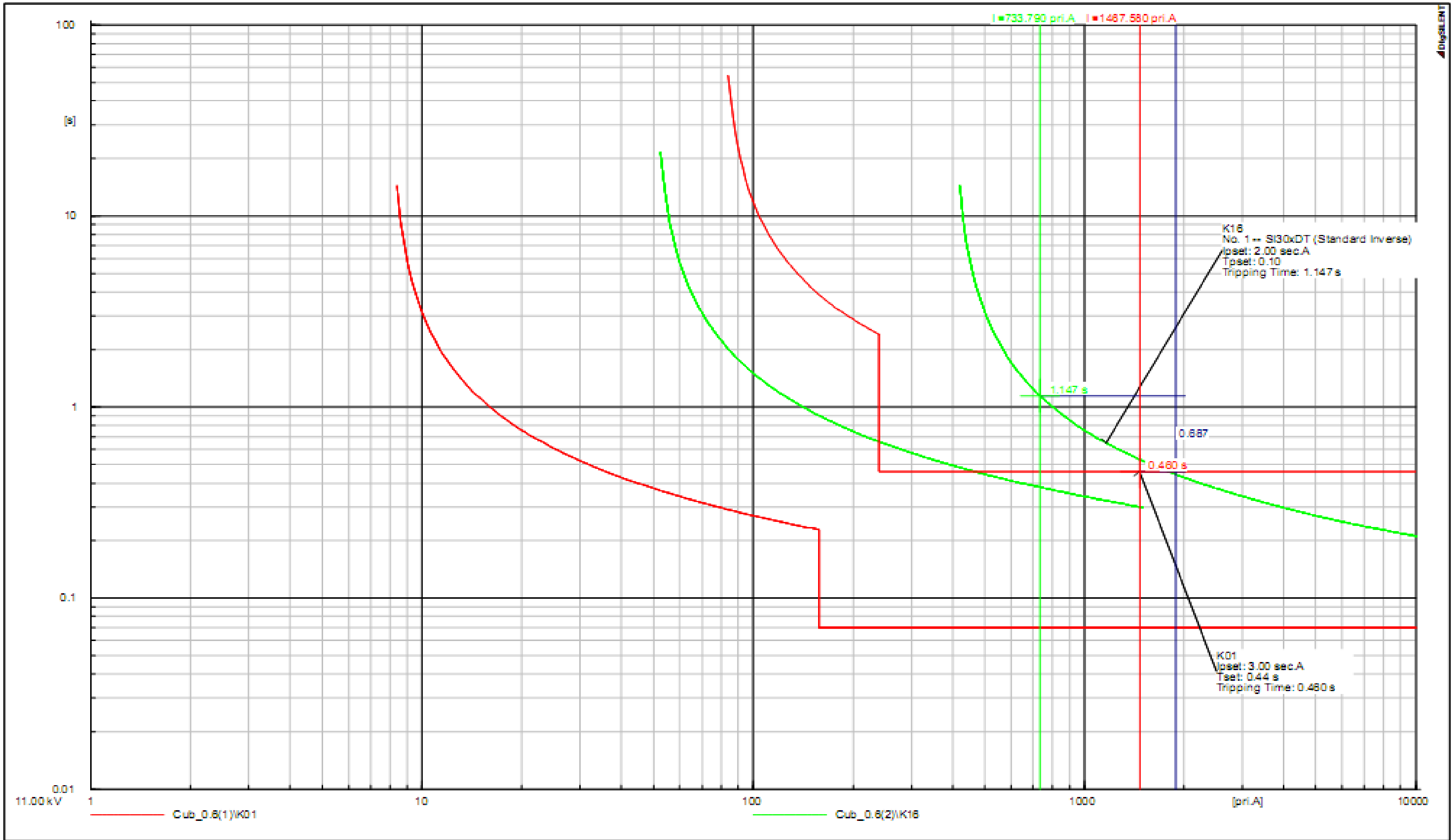
Grid: Grid		System Stage: Grid							Annex: / 1			
		rtd.V. [kV]	Voltage [kV]	[deg]	c-Factor	Sk" [MVA/MVA]	Ik" [kA/kA]	[deg]	ip [kA/kA]	Ib [kA]	Sb [MVA]	EFF [-]
Station1												
MIS	A	11.00	7.85	4.84	1.00	0.00 MVA	0.00 kA	0.00	0.00 kA	0.00	0.00	1.41
	B		0.00	-120.00		9.09 MVA	1.43 kA	-128.66	4.05 kA	1.43	9.09	0.00
	C		0.00	120.00		10.91 MVA	1.72 kA	61.10	4.86 kA	1.72	10.91	0.00

APPENDIX H

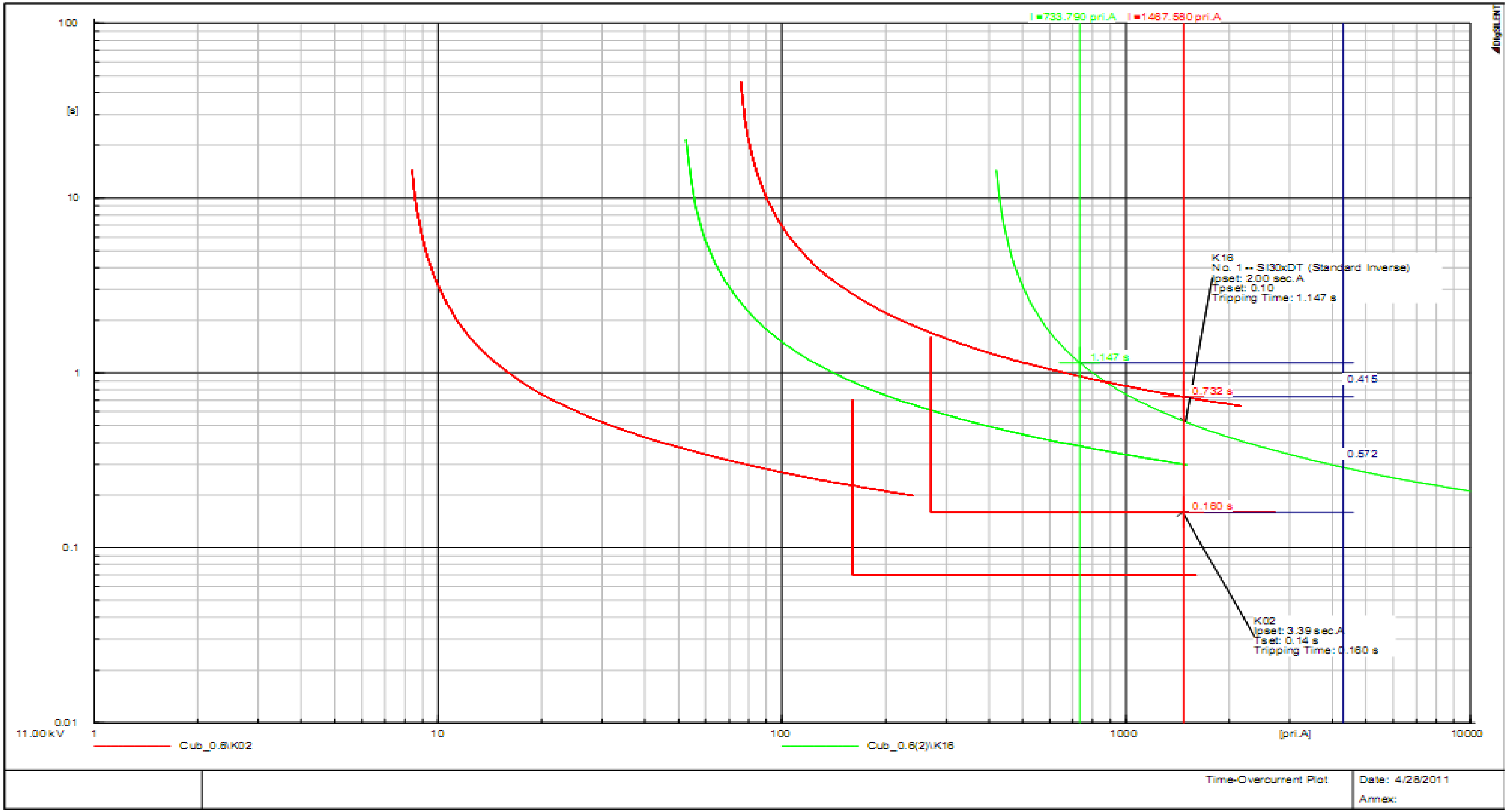
Protection Relay Studies Result

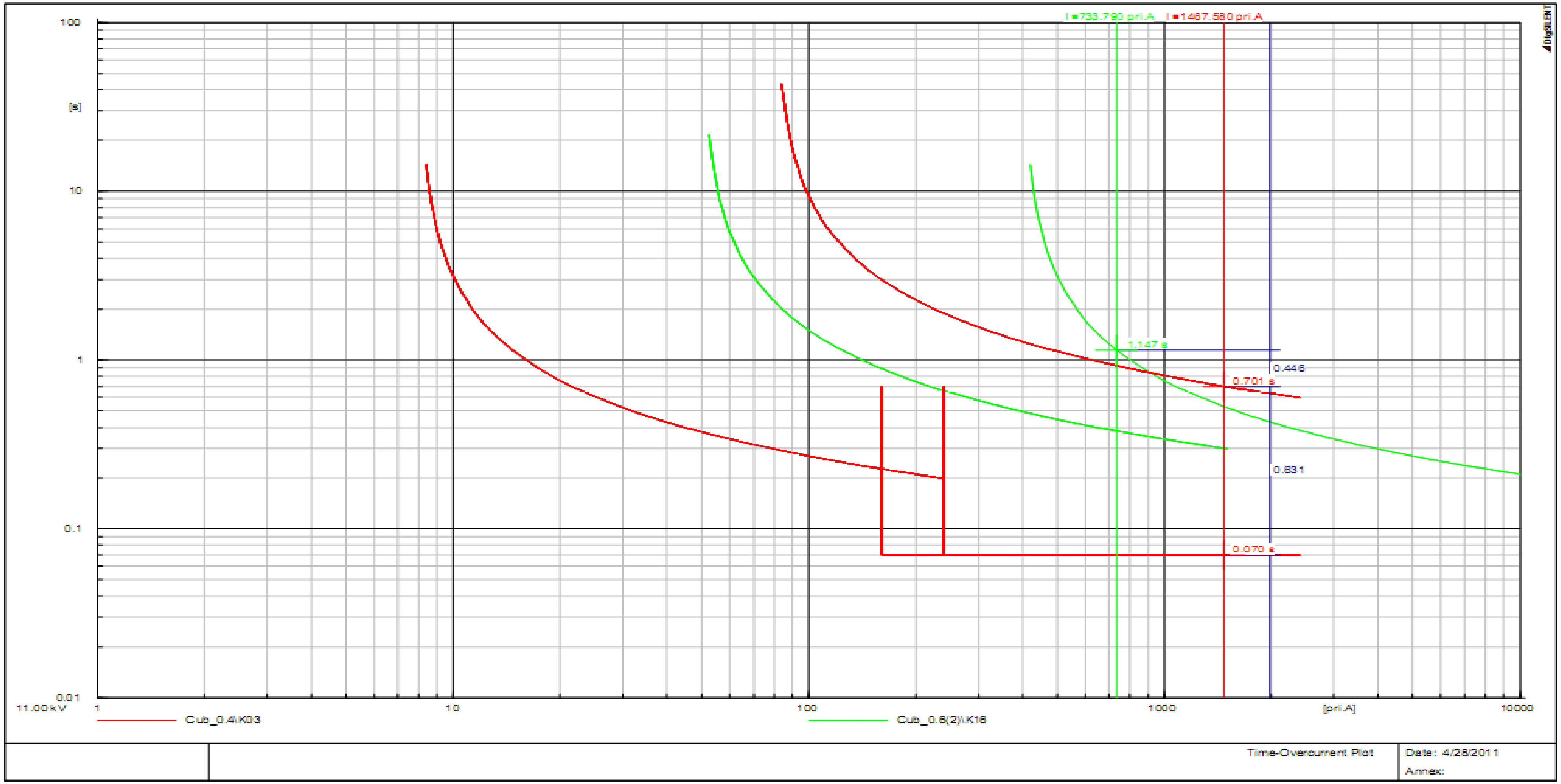


I =1468.106 pri.A
DIgSILENT
100
[s]
10
1
0.1
11.00 kV
1
10
100
1000
[pri.A]
10000
GS05
No. 1 -- SI30xDT (Standard Inverse
Ipset: 4.25 sec.A
Tpset: 0.10
Tripping Time: 1.274 s
1.274 s
0.397
0.877 s
0.677
GS03
Ipset: 10.10 sec.A
Tset: 0.20 s
Tripping Time: 0.200 s
0.200 s
Cub_0.1\GS03
Cub_0.2\GS05
Time-Overcurrent Plot
Date: 4/28/2011
Annex:



		Time-Overcurrent Plot	Date: 4/28/2011 Annex:


I =733.790 pri.A
I =1467.580 pri.A
DIgSILENT
100
[s]
10
1
0.1
0.01
11.00 kV
1
10
100
1000
[pri.A]
10000
K16
No. 1 -- SI30xDT (Standard Inverse)
Ipset: 2.00 sec.A
Tpset: 0.10
Tripping Time: 1.147 s
1.147 s
0.415
0.732 s
0.572
0.160 s
K02
Ipset: 3.39 sec.A
Tset: 0.14 s
Tripping Time: 0.160 s
Cub_0.6\K02
Cub_0.6(2)\K16
Time-Overcurrent Plot
Date: 4/28/2011
Annex:



I =733.790 pri.A
I =1467.580 pri.A
100
[s]
10
1
0.1
0.01
11.00 kV
1
10
100
1000
[pri.A]
10000
1.147 s
0.446
0.701 s
0.631
0.070 s
Cub_0.4\K03
Cub_0.6(2)\K16
Time-Overcurrent Plot
Date: 4/28/2011
Annex: