# Marshall Wind Farm
# Generation Interconnect Study

## Part 1 of 2

## Steady State Analysis
## May 7, 2007

(Photo: Chanarambie Township area, MN. RD, 2006)

**Performed by**

MISSOURI RIVER ENERGY SERVICES®

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## *Disclaimer*

# Introduction

By December 2007 an IPP is planning on building an 18.9 MW wind farm near Marshall, Minnesota and Western Minnesota Municipal Power Agency (WMMPA), MRES' financing agent, is planning on building the 34.5 kV collector system connecting the wind farm into the new 115 kV Marshall Southwest substation. This substation is planned in-service during the summer of 2007 as a part of a separate distribution system upgrade project, and will belong to Marshall Municipal Utilities (MMU), an MRES member.

A total of 9 Suzlon S88 turbines will be installed, each with a maximum capacity of 2.1 MW. Each turbine will have a capacitor bank package consisting of 14x75 kVAR capacitors that the turbine control system will switch to obtain as close to unity power factor as possible. Three different 34.5 kV underground cables will connect the turbines to a common 34.5 kV bus, which again will connect to the MMU Southwest sub via close to an 8 miles long 34.5 kV line, and a 34.5/115 kV step-up transformer. MRES will have a power purchase agreement for the output of the wind farm.

The intent is to operate the wind farm in a manner that would not require any new transmission service. Presently MMU, and MRES member, has a peaking power plant at the Saratoga Street substation with a DRS approved limit of 19.98 MW, one bus away on the 115 kV system from where the new Marshall southwest substation will be located. This peaking plant and the wind farm will be operated in such a manner that the maximum output of the generation combined will be equal to or less than the existing DRS approved amount of generation in Marshall.

This report discusses the steady state impacts to the system of operating the generation in this manner. A separate report discusses the stability study work performed by WAPA. The study work was performed to be in adherence with the DRS Policies and Procedures as of 12/7/2006.

# Executive Summary

An independent power producer is planning to build an 18.9 MW wind farm near Marshall, Minnesota connecting into the new Marshall Southwest 115 kV substation that Marshall Municipal Utilities (MMU), an MRES member, plans to have in service shortly (summer 2007). (The Southwest substation is part of a separate distribution system upgrade in Marshall). The wind farm will consist of 9 Suzlon S88 turbines each capable of 2.1 MW maximum output. Each turbine will have the power factor correction package included. This consists of 14 x 75 kVAR shunt capacitors that are controlled to give a close of a power factor to unity as is possible. MRES plans to purchase the output, and to utilize the transmission rights of the existing peaking unit connected to MMU's Saratoga Street 115/13.8 kV substation. This will be done in such a manner that the output of both the generators will not exceed the rights the peaking generation presently has to inject power into the system.

A steady state study was performed to make sure that operating the system in the manner described above would not cause any new thermal or voltage constraints, or impact base case overloads significantly. This also includes flowgates. PSS/E activity ACCC and the SCREENACCC IPLAN program were utilized to perform the contingency analysis, and the IPLAN program DFCALC was utilized for the flowgate analysis. Two scenarios were studied. One summer off-peak (70% summer peak load, high transfer) scenario, which is using the same powerflow model as that fed into stability analysis to be performed by WAPA, and a summer peak scenario. The n-1 contingency analysis and the flowgate analysis did not show any Significantly Affected Facilities that the wind farm project would have to mitigate. The incremental flows shown on highly loaded or overloaded facilities were due to the gas turbine not running. Analysis showed that it in those situations it would be better have the wind farm injecting power to the system rather than not running any generation at all. MMU's peaking generation is not something that is usually running. It is there for capacity and emergency use purposes. If needed though, MMU's 24x7 staffed control center can trip the breaker to the wind farm and start up the gas turbine.

Prior outage analysis did show some concerns. The concerns result from the prior outage of the 115 kV line from Lyon County – Minnesota Valley. This forces more of the wind power generated in southwestern Minnesota to flow across the Marshall 115 kV loop. In addition, a contingency was modeled opening the southern part of the loop in one scenario, and the northern part of the loop in a second scenario. Both scenarios showed overloads with respect to the present ratings of the Marshall 115 kV loop. Upon further review of the northern part of the loop, the Marshall Switching Station – North 7$^{th}$ Street 115 kV line can likely be dynamically rated as is the Lyon County – Marshall Switching Station 115 kV line to the east without any further line or terminal equipment upgrades. This would be more than adequate to handle the flows observed in this study. Alternatively the wind farm can be tripped within 30 minutes of either of the outages occurring (n-1 condition) in preparation for the second contingency. Upon further review it was not deemed feasible to dynamically rate the Southwest – Saratoga Street 115 kV line segment on the southern part of the loop. The overload on this line is below the emergency rating, but above the normal rating, and can be mitigated by tripping the wind farm within 30 minutes after both the outages occur, and an overload is observed. MMU will have the capability to trip the wind farm remotely from their around the clock staffed control center.

# 1 Overview of the Marshall Wind Farm project

## *1.1 Location*

An IPP is planning to build an 18.9 MW wind farm (maximum rated nameplate output) near Marshall, Minnesota. The wind farm will consist of 9 x 2.1 MW (maximum rated output) Suzlon S88 turbines. Each turbine will have a 14x75 kVAR capacitor package for powerfactor correction. The turbine control system will utilize this control system to obtain close to unity powerfactor at the turbine output terminals. Three 34.5 kV collector lines will connect all the turbines to a common 34.5 kV bus. This bus again will be connected to Marshall Municipal Utilities' (MMU) Marshall Southwest substation via a 7-8 miles long 34.5 kV line, and a 34.5/115 kV step-up transformer. The collector system will be built and owned by Western Minnesota Municipal Power Agency, which is MRES' financing agent. MRES plans to sign a PPA with the developer for the output of the wind farm.

Figure 1.1 below shows a cutout of a transmission line map pointing out the general location of the project.

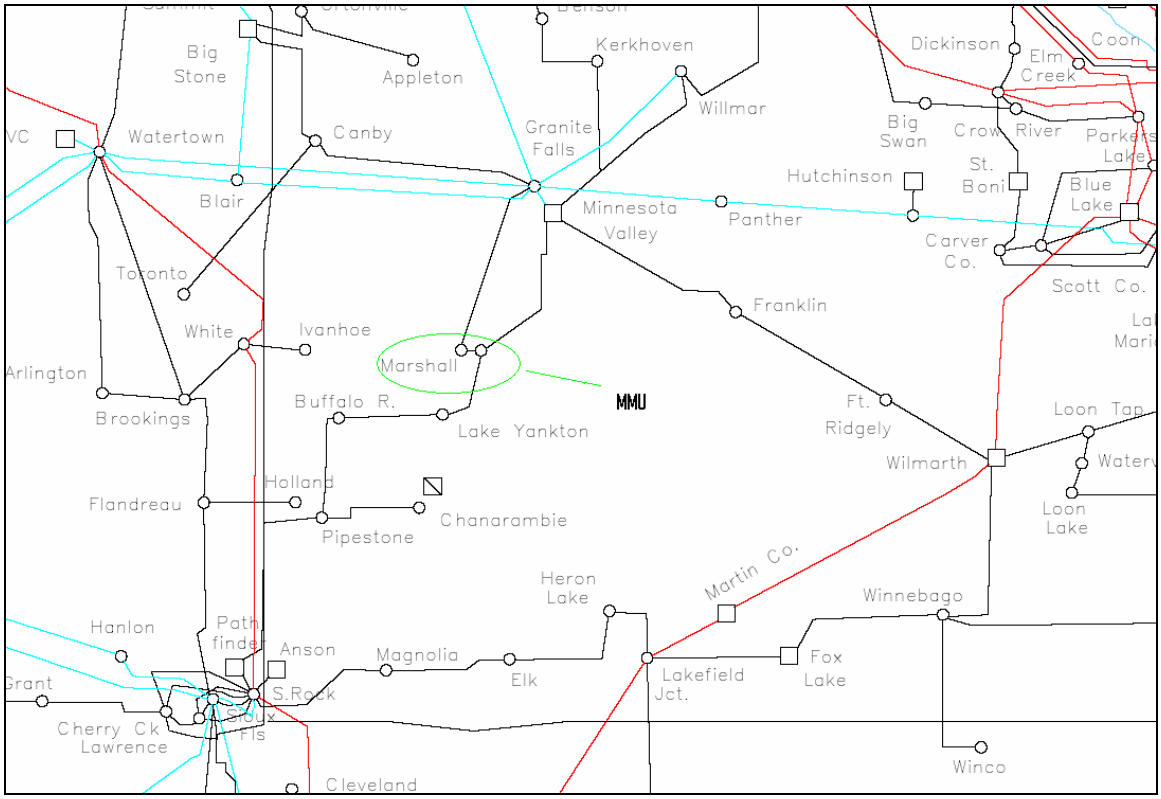



**Figure 1.1: Location of Marshall, MN on a transmission map.**

The Marshall Southwest substation is due to be in-service sometime in the summer of 2007. It will be a tap on the existing 115 kV line between MMU's Southeast substation and MMU's Saratoga Street substation, and will be a part of the Marshall 115 kV loop. The new substation is being built for load

serving purposes, and will have approximately 8-10 MW (summer peak) of load connected to it through MMU's 13.8 kV distribution system. Figure 1.2 shows a one-line diagram of the Marshall area including the planned wind farm and the Southwest substation. Note the in this figure that there is an existing generator at the Saratoga
Street bus, just one bus away from the Marshall Southwest substation on the 115 kV system. The MMU loop is in the WAPA control area. The Marshall – Lyon County 115 kV line is on the WAPA/Xcel control area boundary.

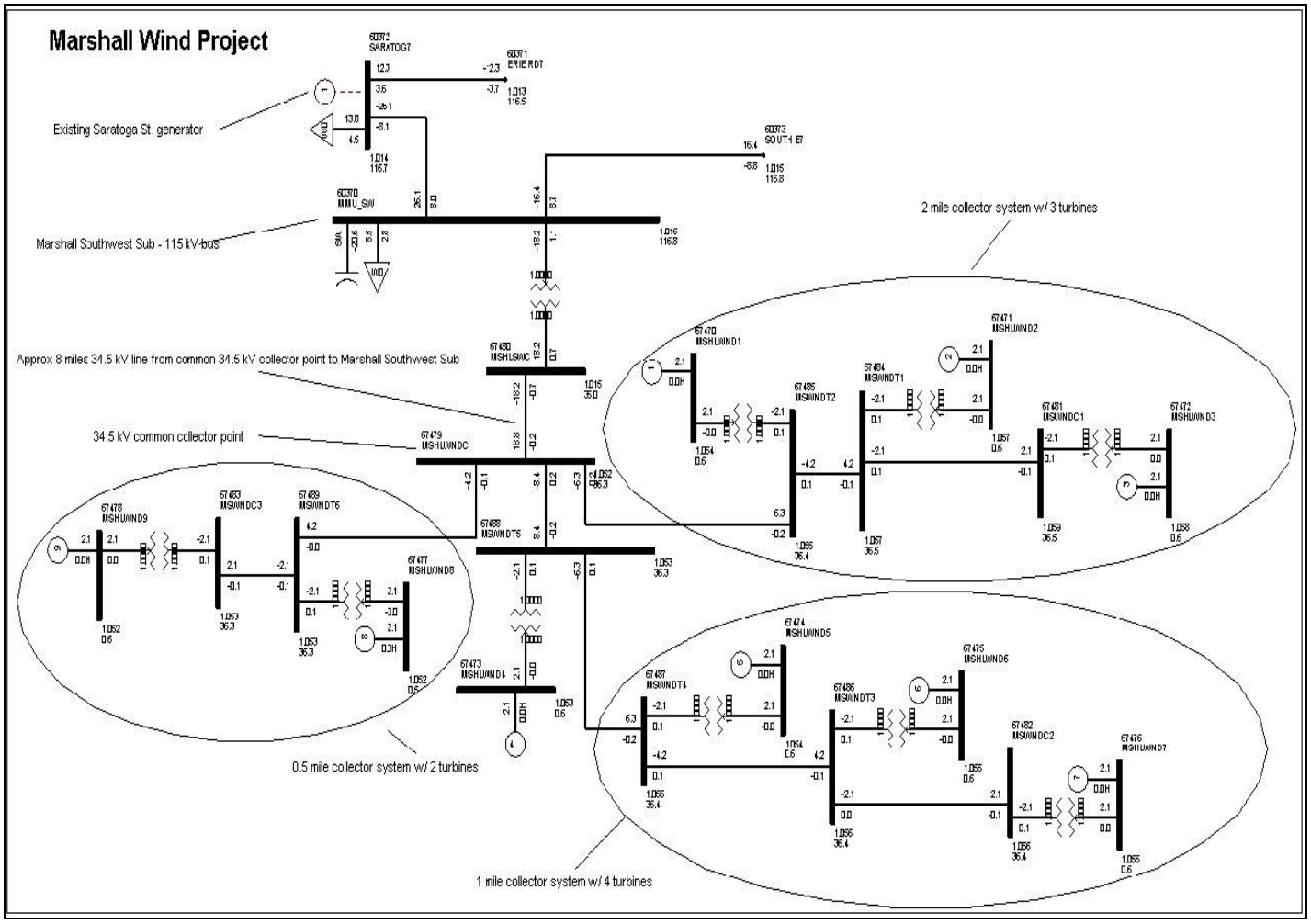



**Figure 1.2: Marshall Wind Farm topology and connection to 115 kV**

Figure 1.3 on the following page shows a one-line diagram of the entire Marshall loop, and how it connects to the regional transmission system. Note that wind farm is not shown in this figure. The Marshall Southwest substation is though.

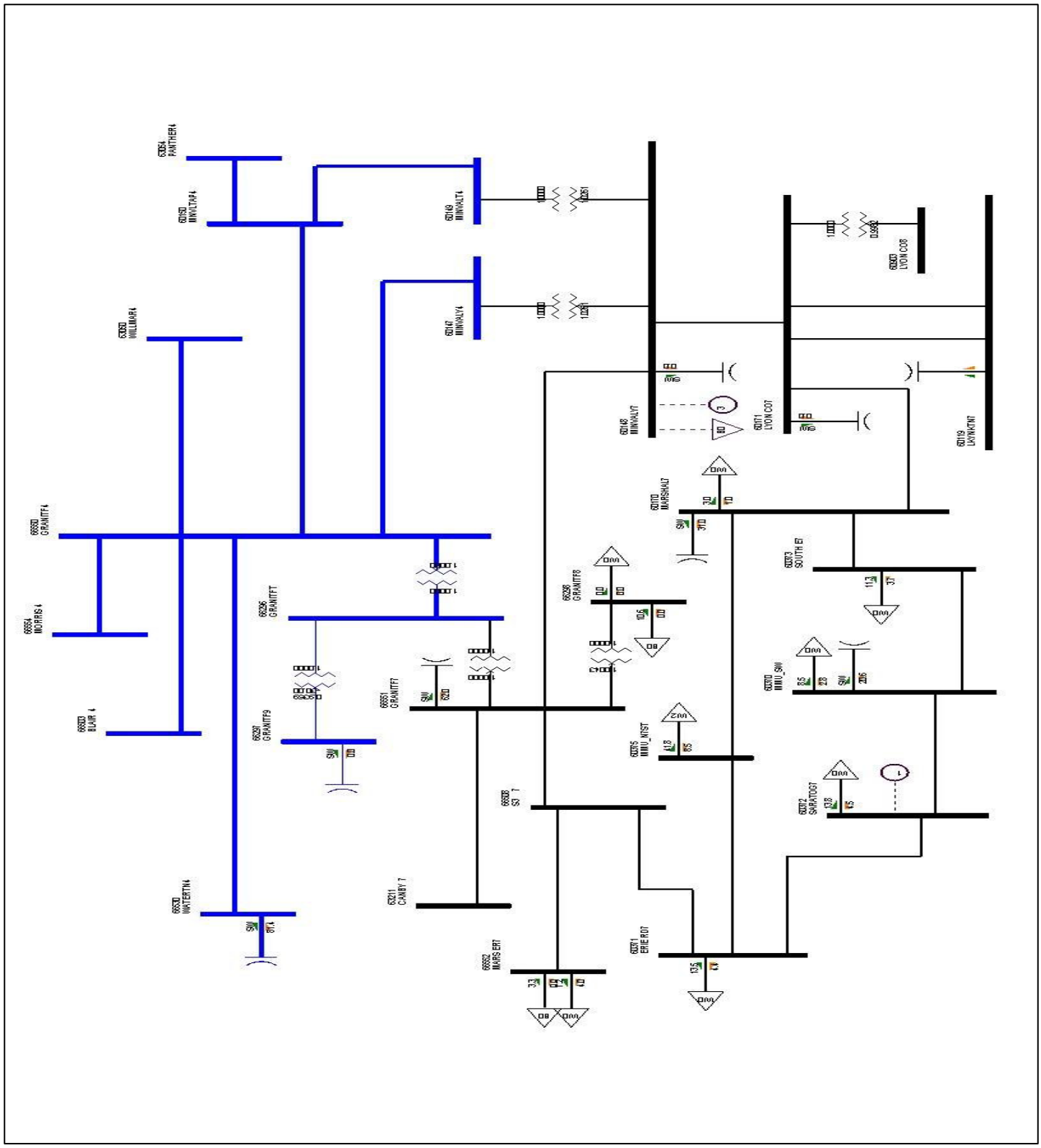



**Figure 1.3: Marshall Area one-line diagram (blue is 230 kV, black is 115 kV and lower).**

## *1.2 Operation of the wind farm vs. the existing gas turbine*

MRES does not seek additional transmission service for this project. The existing peaking unit at Saratoga Street and the new wind farm will rather be operated such that the existing DRS approved generation amount (19.98 MW) at Saratoga Street will not be exceeded. This peaking unit is not typically something that is dispatched. MMU has a control room manned 24x7, and will have control of the wind collector system such that they could trip the wind farm, as well has having control of the peaking unit. *Therefore at any time if it is required MMU can trip the wind farm and start up the peaking unit.* The study work described herein investigates if there are any adverse differences between allowing the planned wind farm injecting power into the Marshall Southwest 115 kV bus versus the peaking gas turbine injecting power into the Saratoga Street 115 kV bus.

# 2 Scope of Steady State Study

## *2.1 Study criteria*

This report is meant to address all the steady state study requirements. This study investigated the impact of operating the wind farm as described in section 1.2 on thermal limitations and on steady state bus voltages flagging Significantly Affected Facilities (SAF's) according to the MAPP DRS Policies and Procedures. The following criteria were utilized:

- Thermal Screening
  - All analysis screened against normal MVA rating (PSS/E Rate A field)
  - A 3% OTDF and 5% PTDF cutoff criteria and that is loaded higher than the normal rating is flagged as a potential SAF and thermal constraint.
  - Any impacts at or above the 3%/5% DF cutoffs were flagged, though absolute impacts that are less than 1 MW in magnitude are not assumed to be constraints.
  - Emergency ratings are only assumed applicable for MAPP non-MISO lines when studies shows that remedial action is available to reduce the flow on a facility back to or below normal rating within the time frame of the emergency rating.
- Bus voltage screening
  - All analysis where screened against criteria in the MAPP Members Reliability Criteria and Study Procedures Manual. The general criteria assumes that acceptable bus voltages ranges are within 0.95 – 1.05 pu system intact, or 0.90-1.10 pu post contingent unless otherwise noted.

## *2.2 Areas monitored and contingencies simulated*

The following control areas were monitored in the studies:

- Xcel (Area 600)
- WAPA(Area 652)
- ALTW (Area 331)
- OTP (Area 626)
- GRE (Area 618)

The following contingencies were simulated:

- All single contingencies in:
  - Xcel – Minnesota and South Dakota
  - WAPA
  - GRE
  - OTP
- Contingencies in the MAPP multi-element contingency file in:
  - Western Minnesota
  - Eastern South Dakota

A somewhat limited set of contingencies were run since not much loop flows were anticipated outside of the MMU 115 kV loop due to the close proximity between the MMU gas turbine and the wind farm.

Prior outage conditions were also studied. This included the following prior outages:

1. MMU Southwest – Saratoga Street 115 kV & Marshall – North 7th Street 115 kV.

*This opens the MMU 115 kV loop at 2 points, and the Wind farm output is forced to take a different path than on MMU wire when sinking to the MMU peak unit. Shortest loop would appear to be via S3 – Granite Falls – Minn.Valley – Lyon County*

2. Marshall – Lyon County 115 kV & MMU Southwest – Saratoga Street 115 kV.

*This forces the wind farm output to flow the opposite direction on the now opened MMU loop than the predominant direction of flow during system intact conditions. There's only one normally closed tie to the external grid up to Granite Falls.*

3. Erie Road – S3 115 kV & MMU Southwest – Saratoga Street 115 kV.

*This is similar to number 2, but now with the tie to the external grid to Granite Falls opened, and the tie to Lyon County in-service.*

4. MMU Southwest – Saratoga Street 115 kV & Lyon County – Minn.Valley 115 kV

*This forces flows on Lyon County – Minn.Valley to go through the northern part of MMU's 115 kV system, and adds the wind farm flow on top of that by opening up the direct tie between the wind farm and the peaking plant.*

5. Marshall – MMU North 7th Street 115 kV & Lyon County – Minn.Valley 115 kV.

*This forces flow on Lyon County – Minn.Valley to go through the southern part of MMU's 115 kV system, and adds the wind farm flow on top of that by opening up the northern part of the loop such the load served at the North 7th Street substation is flowing on the southern part of the loop.*

## 2.3 Flowgate analysis

Flowgate analysis was completed using the DFCALC IPLAN program. The flowgate list utilized included the list posted as a DFCALC input file on the MAPP web-site at the time the analysis was completed, as well as a full list based on the list of flowgates presently monitored by the MAPP OASIS. Due to the way the wind farm will be operated (reference section 1.2) all the flowgate analysis was performed as generation to generation, with the source being the wind farm, and the sink being the Saratoga Street peaking generator.

## *2.4 Model(s) utilized*

Contingency analysis was performed utilizing a summer off-peak and a summer peak model. This section describes the cases utilized.

### 2.4.1 Summer off-peak model

The summer off-peak case is the urg-so06aa.uzvV454 case from the latest version of the 2006 NMORWG package. This is summer off-peak case w/ 70% of summer peak loads, and the northern MAPP interfaces maxed out. (NDEX = 1950 MW, MHEX_S = 2175 MW, MWSI (w/o Arrowhead – Weston) = 1480 MW). Figure 2.1 below shows the title field form the PSS/E case identifying the case based on the NMORWG convention.

```
URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
 ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
```

**Figure 2.1: PSS/E title field for 2006 summer off-peak NMORWG case**

The only changes performed to this model were in the Marshall area:

- The new MMU North 7th Street sub was modeled, tapping the 115 kV line between the MMU's Erie Road and Marshall substations.
- The new MMU Southwest Substation was modeled, tapping the 115 kV line between MMU's Southeast and Saratoga Street substations
- The MMU load modeling was modified with the new substations. (For more detail see idev's in Appendix E).
- The Marshall Wind Farm was added in, to include the 34.5 kV collector system, and each of the 9 turbines modeled individually.
- In the base case, the peaking unit modeled at the Saratoga Street 115 kV bus was turned on-line at 18.9 MW's, while the wind farm is offline.
- In the change case, the peaking unit modeled at the Saratoga Street 115 kV bus was turned off-line, and the wind farm "turned on-line" at a total output (at turbine terminals) of 18.9 MW's.

Note that since the Marshall Wind Farm is "dispatched" to the MMU peaking unit, no further adjustments were done utilizing 'setexports'. Any flow changes on the MAPP interfaces are expected to be insignificant.

### 2.4.2 Summer peak model

The summer peak case is the 2009 summer peak base case utilized for Phase 2 of the Big Stone II Delivery Service Studies (w/o the BSPII project modeled). For details on this case please reference "Big Stone II , Delivery Study Report (Phase 1-4)" submitted to the DRS August 18, 2006. No changes were done to this case, beyond the changes in the Marshall area identical to those noted in section 2.3.1 for the summer off-peak model.

## 2.5 Tools

PSS/E Revision 29.5.0 ACCC function and the SCREENACCC IPLAN program were utilized to perform the contingency analysis. I.e. only non-linear contingency analysis tools were utilized. The DFCALC IPLAN program was utilized for flowgate analysis.

The ACCC analysis was performed using the Full Newton Raphson Solution algorithm (FNSL). Area interchange control was not enabled, and transformers taps, phase shifter taps, DC taps, and switched shunts were not allowed to move. The non-divergent algorithm was disabled.

# 3 Steady State analysis

This section discusses the analysis results. Section 3.1 covers steady state thermal contingency analysis, steady state voltage analysis, and flowgate analysis for the summer off-peak scenario, and section 3.2 covers the same aspects of the summer peak scenario.

## *3.1 Summer off-peak steady state analysis*

The full output from the PSS/E analysis using ACCC and SCREENACCC can be found in Appendix D.1. This also shows all the contingencies simulated that did not converge when running ACCC on the base case and the change case. Given that the impact to the transmission system is relatively confined, only the Split Rock – Pathfinder – Pipestone 115 kV contingencies where manually simulated for further analysis. This analysis did not show any additional concerns beyond what is reported in section 3.1.1 and 3.1.2.

### 3.1.1 Thermal analysis

Each entry in the thermal section of the SCREENACCC output in Appendix D.1 is referenced by it's number in this section. There were no system intact overloads caused by the wind farm project, or base case system intact overloads significantly affected by this project.

1) *Douglas County 115/69 kV transformer (Xcel) (flo. Grant Co. – Hoot Lake 115 kV)*
This transformer is showed as loaded to it's normal rating of 47 MVA, but not overloaded in the change case. The transformer has a 61 MVA emergency rating. The SCREENACCC output does not display a value for the base case. Manual simulation of the Grant County – Hoot Lake 115 kV contingency showed that the loading was also 47 MVA in the base case. This is therefore a loading issue that is not Significantly Affected by the Marshall Wind Farm.

2) *Big Stone 1 Generator Step-up Unit (OTP) (Multiple contingencies)*
The Big Stone GSU has a normal rating of 471.5 MVA and an emergency rating of 575 MVA. The transformer was flagged as overloaded with respect to its normal rating for two contingencies for the change case with no corresponding values for transformer load in the base case. The first contingency was the loss of the Pathfinder – Split Rock 115 kV line, during which the flow was 480.2 MVA in the change case. Manual simulations to obtain the base case value showed a GSU loading of 479.9 MVA, i.e. the impact is 0.3 MVA or 1.6% relative to the size of the wind farm. Contingency '160 1' was the second contingency. It showed a 479.7 MVA post contingent load in the change case, with no base case value listed. Manual simulation of this contingency using the base case showed a loading of 479.9 MVA. I.e. the loading is reduced slightly in the change case. This is not a Significantly Affected Facility.

3) *Chisago 500 kV series capacitor (Xcel) (Multiple Contingencies)*
This facility was flagged as loaded to 100.1% of Rate A for loss of the Pathfinder – Split Rock 115 kV in the change case. This contingency blew up in the base case run. Further analysis was completed to

make sure that this relatively distant facility was not significantly affected by the Marshall wind farm project. The base case system intact flow was 1724.0 MW – j222.7 MVAR injected into the Chisago transformers' 500 kV bus. In the change case the system intact flow was 1724.0 MW – j222.8 MVAR. I.e. the difference is 0.1 MVAR, or approximately 0.01 MVA. Normal rating is 1732 MVA, and emergency rating is 1905 MVA. This facility is not significantly impacted by the Marshall Wind Farm.

4) This flags that the scenario where Pathfinder – Pipestone 115 kV was outaged did not converge. Manual simulations was performed to check for constraint, and will be discussed later.

5) *Marshall – Lyon County 115 kV (MMU/MRES) (flo. Pathfinder – Split Rock 115 kV)*
This line is at present one of the two 115 kV feeds to the 115 kV loop around Marshall belonging to Marshall Municipal Utilities. The line has a normal rating of 127.9 MVA, and an emergency rating of 140.7 MVA. It ties the Marshall loop to Xcel Energy's system, and is a control area tie-line between WAPA and Xcel. This line was flagged as loaded at 161.5 MVA or 131.4% of normal rating for the outage of Pathfinder – Split Rock 115 kV in the change case. The base case fields do not list any values, as the contingency blew up during the base case simulations. Performing manual simulation of this contingency in the base case shows a post contingent load of 162.8 MVA. I.e., with the Marshall Wind Farm online the flow is somewhat less. This is therefore not a Significantly Affected Facility for this project. This line will also be dynamically rated. See further discussion on this in section 4 on the prior outage analysis.

6) *Marshall – North 7$^{th}$ Street 115 kV (MMU/MRES) (flo. Pathfinder – Split Rock 115 kV)*
This line has a normal rating of 127.9 MVA, and an emergency rating of 140.7 MVA. Similar to the Marshall – Lyon County 115 kV line an overload was flagged in the change case for loss of the Pathfinder – Split Rock 115 kV line, but with no base case values due to this contingency not converging in the base case ACCC run. The load in the change case is 133.5 MVA, higher than the normal rating, but lower than the emergency rating. Simulating the scenario manually using the base case shows a 129.4 MVA post contingent flow on this line. I.e., the MVA impact is 4.1 MVA, which equates to a 21.69% DF. This contingency causes the voltages in Marshall to go down. In the base case the reactive capabilities of the Marshall peaking unit at the Saratoga Street substation maxes out during the simulations to attempt and control the voltage at the Saratoga Street bus to 1.02 pu. It fails short of that, and the bus voltage is 0.9662 pu. In the scenario with the wind farm generating at its maximum capability and the gas turbine offline, there is no additional source of reactive power available to help limit the impact on the voltage (cap banks are not allowed to move in this solution). A sensitivity analysis was performed using the base case and turning the Marshall gas turbine offline, and letting the system swing in TVA pick up the swing to avoid interference from local sources. During an outage of the Pathfinder – Split Rock 115 kV, and the gas turbine (and the wind farm remains offline), the flow on the Marshall – MMU North 7$^{th}$ Street 115 kV line was 134.0 MVA. This is 0.5 MVA higher than in the change case when the wind farm in online, the gas turbine is offline, and the Pathfinder – Split Rock 115 kV line is out. This indicates that this issue is in its entirety flagged because of turning the gas turbine off-line, and not wind turbine coming online. In fact letting the wind turbines generate cause a slightly better performance than not running any generation. The bus voltage is also above the low voltage criteria, and the $Q_{MAX}$ level of reactive power is not required to maintain the bus voltage within criteria. This line will also be dynamically rated. See further discussion on this in section 4 on the prior outage analysis.

There are various upgrades planned and proposed that in general should help out this situation. Xcel Energy is currently working on constructing a new 345 kV line from Split Rock (Sioux Falls) to Lakefield, MN that will have a 345/115 kV substation in Nobles County, MN (near Reading). A 115 kV line will be constructed from this substation to a new Fenton substation, and from there up to the existing Chanarambie substation which ties into the 115 kV system at Buffalo Ridge area that at present relies heavy upon the Split Rock – Pathfinder – Pipestone 115 kV line. These improvements are expected in-service late 2007 – early 2008. Xcel Energy has also filed for a Minnesota Certificate of Need for building a 2nd 115 kV line from Nobles County – Fenton, and a line from their Lyon County substation to the Marshall system. This should further reduce the impact of the outage of the Split Rock – Pathfinder – Pipestone line.

7) *Watertown SVC step-up transformer (WAPA) (Multiple contingencies)*

The Watertown SVC step-up transformer connects the Watertown SVC to the 230 kV system in Watertown, SD. It has a normal rating of 150 MVA, and an emergency rating of 188 MVA. Three contingencies are listed as having a higher than 1 MVA impact on this transformer, and an overload is listed in the change case for the Pathfinder – Split Rock 115 kV outage, with no base case value due to the solution diverging in the base case ACCC run. All the overloads are barely above the normal rating, and below the emergency rating. The Pathfinder – Split Rock 115 kV outage was manually simulated using the base case, and the flow on the Watertown SVC step-up transformer recorded to be 153.3 MVA. This is the same value observed in the change case. This contingency vs. this transformer therefore does not constitute a Significantly Affected Facility. Remaining contingencies showing impacts above 1 MVA were investigated:

a. *Granite Falls – Morris 230 kV*

The current loading in the change case was 87%. (The voltage at the terminals of the SVC is 1.1709 pu). Again this appears as an issue flagged due turning off the Marshall gas turbine, and not letting the wind farm generate. In the case both the 20 MVAR capacitors were offline at the Marshall Southwest bus. Turning one of them online brings the flow of the step-up transformer to 148.9 MVA without causing high voltage issues in Marshall. Turning the MMU gas turbine off-line in the base case, and applying the outage shows a flow of 153.0 MVA on the transformer. I.e. the issue is due turning off the gas turbine rather than "turning on" the wind farm. It can also be observed that the overload is reported as a pre-existing issue.

b. *Moorhead – Morris 230 kV*

As for the previous outage studied in more detail, the current load is reported to be 87% with a high voltage on the low side of the step-up transformer. In this scenario allowing one of the 20 MVAR capacitor banks at the Marshall Southwest substation to come on-line reduces the loading on the transformer from 153.3 MVA to 149.4 MVA. I.e. the loading reported is below the MVA rating. Turning the MMU gas turbine off-line in the base case, and applying the outage shows a flow of 152.8 MVA on the transformer. I.e. the issue is due to turning off the gas turbine rather than "turning on" the wind farm. It can also be observed that the MVA overload is reported as a preexisting issue.

c. *106 3 – Outage of Utica 230 kV bus*

As for the previous outage studied in more detail, the current load is report to be 87% with a high voltage on the low side of the step-up transformer. In this scenario allowing one of the 20 MVAR capacitor banks at the Marshall Southwest substation to come on-line reduces the loading on the transformer from 151.9 MVA to 147.9 MVA. I.e. the loading reported is below the MVA rating.

Turning the MMU gas turbine off-line in the base case, and applying the outage shows a flow of 151.6 MVA on the transformer. I.e. the issues is due to turning off the gas turbine rather than "turning on" the wind farm. It can also be observed that the MVA overload is reported as a preexisting issue.

d. *Bison – Hettinger 230 kV*

As for the previous outage studied in more detail, the current load is report to be 86% with a high voltage on the low side of the step-up transformer. In this scenario allowing one of the 20 MVAR capacitor banks at the Marshall Southwest substation to come on-line reduces the loading on the transformer from 151.0 MVA to 146.6 MVA. I.e. the loading reported is below the MVA rating. Turning the MMU gas turbine off-line in the base case, and applying the outage shows a flow of 150.3 MVA on the transformer. I.e. the issue is partially due to turning off the gas turbine rather than "turning on" the wind farm. It can also be observed that the MVA overload is reported as a preexisting issue.

With the further analysis performed this is not an issue that the Marshall Wind Farm project would have to mitigate.

### 3.1.2 Voltage analysis

As in the previous section the entries in the SCREENACCC output in Appendix D.1 is referenced in the order in which they appear in the discussion of the results.

Low Voltage reported

1) *Jackson Municipal 69 kV (Multiple contingencies)*

This bus is presently radially fed from the Heron Lake 161/69 kV substation. The change case shows a bus voltage of 0.9317 pu post contingent for a Twin Cities 345 kV outage that does not significantly impact this bus voltage. System intact the bus voltage in the change case is 0.9323 pu. The system intact voltage in the base case is also 0.9323 pu. No further analysis was done with respect to this bus voltage as it is not a function of the Marshall Wind Farm. Also in late 2007 – early 2008 the Jackson load will be moved over to a new tap on the Lakefield – Fox Lake #2 161 kV line, which would increase the voltage on the 69 kV system fed from Heron Lake.

2) *Jackson North Municipal 69 kV (Multiple contingencies)*

Same logic used in item 1) applies to this bus.

3) *Enterprise West 69 kV (Multiple contingencies)*

Enterprise is in the Jackson area, and the same logic used in item 1 and 2 applies to this bus

.

4) *Enterprise 69 kV (Multiple contingencies)*

Same logic as applied to item 3 applies to this bus.

5) *East Melrose 69 kV (flo. Black Oak – Melrose Municipal 69 kV)*

The voltage criteria for this bus post contingent is 0.90 pu. The 0.9499 voltage reported post contingent for the change case is therefore not an issue. This is also not sensitive to the contingency vs. the project at hand. The same post contingent bus voltage in the base case is 0.9502, which is a negligible difference.

6) *Belgrade 69 kV (flo. Villard – West Port 69kV)*
The voltage criteria for this bus post contingent is 0.90 pu. The 0.9499 voltage report for the change case is therefore not an issue. This is also not sensitive to the Marshall Wind Farm project. The base case post contingent voltage is 0.9511, which yields a negligible difference.

7) *Danube 69 kV (for contingency '795' – Minn.Valley 230 kV outage)*
The voltage criteria for this bus post contingent is 0.90 pu. The 0.9488 bus voltage report for the change case is therefore not an issue. This is also not sensitive to the Marshall Wind Farm project. The base case post contingent voltage is 0.9502, which yields a negligible difference.

8) *Hutchinson 115 kV (flo. Hutchinson – Hutchinson 3M 115 kV)*
The voltage criteria for this bus post contingent is 0.92 pu. The 0.9499 bus voltage for the change case is therefore not an issue. This is also not sensitive to the Marshall Wind Farm project. The base case post contingent voltage is 0.9501, which yields a negligible difference.

9) *Marshall Southwest 115 kV (flo. Marshall Switching Station bus)*
The post contingent criteria for this bus voltage is 0.90 pu so the voltage is not in violation. Note also that the 2x20 MVAR capacitor banks at this bus was not allowed to move during the solution. Engaging only one of the capacitor banks would increase the voltage to 0.9670. The impact of 0.032 pu degradation in the voltage is likely due to loosing the modeled reactive power capabilities of the MMU gas peaker. Thus is not voltage constraint for the Marshall Wind Farm.

10) Erie Road 115 kV (flo. Marshall Switching Station bus)
The post contingent criteria for this bus voltage is 0.90 pu so the voltage is not in violation at 0.9076 per unit. This is the exact same issue as described in item 9. Engaging one of the 20 MVAR capacitor banks at the Southwest substation raises the voltage to 0.9628 pu.

11) *Saratoga Street 115 kV (flo. Marshall Switching Station bus)*
This is again the same issue as described in item 9. The bus voltage is not in violation of the 0.90 pu criteria. Engaging one of the capacitor banks at the Southwest substation raises the voltage to 0.9642 pu.

12) *South East 115 kV (flo. Marshall Switching Station bus)*
This is again the same issue as described in item 9. The bus voltage is not in violation of the 0.90 pu criteria. Engaging one of the capacitor banks at the Southwest substation raises the voltage to 0.9662 pu.

13) *MMU North 7$^{th}$ Street 115 kV (flo. Marshall Switching Station bus)*
This is again the same issue as described in item 9. The bus voltage is not in violation of the 0.90 pu criteria. Engaging one of the capacitor banks at the Southwest substation raises the voltage to 0.9617 pu.

14) *S3 115 kV (flo. Marshall Switching Station bus)*
This is again the same issue as described in item 9. The bus voltage is not in violation of the 0.90 pu criteria. Engaging one of the capacitor banks at the Southwest substation raises the voltage to 0.9665 pu.

15) *Marshall East River 115 kV (flo. Marshall Switching Station bus)*
This is again the same issue as described in item 9. The bus voltage is not in violation of the 0.90 pu criteria. Engaging one of the capacitor banks at the Southwest substation raises the voltage to 0.9660 pu.

High Voltage reported
1) *Chisago 500 kV bus (Multiple contingencies)*
This bus voltage is within the 1.10 pu criteria and is not an issue. The contingency of Pathfinder – Split Rock 115 kV was also check in the base case, and the voltage was found to be 1.0558 pu in the base case, which is the same voltage shown in the change case for the same contingency.

2) *Panther 69 kV (Multiple contingencies)*
This bus voltage is reported to be 1.0565 pu., which is within the 0.92 – 1.10 pu criteria, and is therefore not a constraint. The same post contingent voltage is 1.0570 in the base case scenario, which yields a negligible difference.

3) *Douglas County 69 kV (Multiple contingencies)*
This bus voltage is reported to be in the 1.0550 pu area, which is within the 0.90 – 1.10 pu criteria.

4) *Osakis 69 kV (Multiple contingencies)*
This bus voltage is reported to be in the 1.0515 pu area, which is within the 0.90 – 1.10 pu criteria.

5) *Stinson 69 kV (Multiple contingencies)*
This bus voltage is reported to be about 1.0500 pu, which is within the 0.92 – 1.10 criteria.

6) *Birch 69 kV (Multiple contingencies)*
This bus voltage is reported to be 1.0505 pu, which is within the 0.90 – 1.10 criteria.

### 3.1.3 Flowgate analysis

Two sets of flowgate analysis were performed. One with the "traditional" set of flowgates (as posted with the DFCALC program), and one with a set reflecting what is monitored by the automated evaluation tool on the MAPP OASIS. The output generated by the DFCALC program can be found in Appendices C.1.1 and C.1.2 respectively. There were significant flowgate impacts according to either of the flowgate analysis runs.

### 3.1.4 Summer off-peak constraints for the Marshall Wind Farm

The analysis performed for the summer off-peak scenario shows that there are no Significantly Affected Facilities due to the addition of the Marshall Wind Farm utilizing the existing transmission rights of the Marshall peaking facility to the transmission system. While the results indicate impacts on some thermal issues, this is proven to be more due to not having the reactive power capabilities of the peaking unit online, than the wind farm being online. In fact having the wind farm online in some situations is more beneficial to the system that not running any generation at all in the Marshall area.

The MMU peaking unit typically does not run other than during regularly scheduled tests, and during emergencies. Should it be necessary for the Marshall 115 kV system, MMU's control center will have control of the breaker to the wind farm, as well as being capable of starting up the peaking unit.

## *3.2 Summer peak steady state analysis*

The full output from the PSS/E analysis using ACCC and SCREENACCC can be found in Appendix D.2. This also shows all the contingencies simulated that did not converge when running ACCC on the base case and the change case. None of the non-convergent contingencies were deemed necessary to simulate manually because of their distance from the Marshall area.

### 3.2.1 Thermal Analysis

This section discusses the entries related to thermal issues shown in Appendix D.2, and addressed them in the order they appear in the SCREENACCC output. There were no system intact overloads caused by the wind farm project, or base case system intact overloads significantly affected by this project.

1) *Nobles County – Fenton 115 kV (Multiple contingencies)*
The normal rating of this line will be 620 MVA, and not 310 MVA as shown in the model. This is therefore not a constraint, if even sensitive to the wind farm.

2) *Pipestone – Chanarambie 115 kV (flo. Nobles 345/115 kV transformer)*
This line is shown as impacted by 0.7 MVA or with a DF of 3.7% for the outage of the Nobles County 345/115 kV transformer. This line is not a constraint for three reasons. The line is dynamically rated by Xcel Energy to accommodate Buffalo Ridge wind outlet. The line is modeled with a normal rating of 231 MVA. At 44 ft/sec wind speed at Buffalo Ridge the dynamic rating is 384 MVA, well above the 249.5 MVA of flow shown. The powerflow case utilized has a high southwest Minnesota wind dispatch modeled, with Buffalo Ridge area wind at 962 MW, and additional wind modeled at Lakefield, and in northern Iowa. This rating should therefore be applicable to accommodate the wind scenario modeled. Further the impact observed is less than 1 MW. This Xcel Energy (MISO) line also has an emergency rating of 254 MVA. This would accommodate the post contingent line flow of 249.5 MVA observed in the change case. Xcel Energy has also proposed to install a 2$^{nd}$ 345/115 kV transformer at the Nobles County substation that would parallel the one outaged.

3) *Marshall – MMU North 7$^{th}$ Street 115 kV (flo. Nobles – Fenton facilities)*
This line is a part of the Marshall 115 kV loop, and has a normal rating of 127.9 MVA, and an emergency rating of 140.7 MVA. The SCREENACCC output indicates the overload is further increased by the project at hand for loss of either the Nobles County 345/115 kV transformer or the Nobles County – Fenton 115 kV line. The loading is still below emergency rating though. The impact is 4.0 MVA / 21.16% and 4.2 MVA / 22.22% respectively. The outages in question will force more of the wind power produced in the Buffalo Ridge area to move across the Marshall loop as a connection the new 345 kV line from Sioux Falls – Lakefield is severed. Further sensitivity studies were done to determine the cause of these impacts. The outage of Nobles County – Fenton 115 kV was applied to

the base case, and the Marshall peaking generator was tripped, without "turning on" the wind farm. The loading on the Marshall – MMU North 7th Street 115 kV line was observed to be 135.1 MVA. The loading observed in the ACCC result for the change case is 133.1 MVA. This shows that it is turning off the peaking unit that causes the impact to on the line, and not adding the output of the wind farm. The wind farm actually help to reduce the impact of the peaking unit not running by 2 MVA. This line will also be dynamically rated. For further discussion on this see section 4 on the prior outage analysis.

### 3.2.2 Voltage Analysis

As in the previous section the entries in the SCREENACCC output in Appendix D.2 are referenced in the order in which they appear in the discussion of the results. Numerous of the bus voltage listed in the Appendix are only listed due to a lack of base value likely caused by the voltage barely varying around the criteria limits. Most of them are remote from the Marshall Wind Farm location, and not sensitive to this project.

Low Voltage issues:

1) *Leon 69 kV (for con. 530 – Lyon Co. 115 kV bust, and Lake Yankton 115/69 kV transformer)*

This bus is located straight south of Des Moines close to the Missouri – Iowa border. This was flagged to no value being report in the base case. The post contingent voltage was found to be 0.9415 in both the base case and change case, and this is not a constraint for the Marshall Wind Farm project.

2) *Montevideo 69 kV (Multiple contingencies)*

This bus voltage is within the 0.90 – 1.10 criteria measuring in at a low of 0.9490 , and is not a constraint for the Marshall Wind Farm project.

3) *Fiesta C 69 kV (Multiple contingencies)*

This bus voltage is within the 0.90 – 1.10 criteria measuring in at a low of 0.9450, and is not a concern for the Marshall Wind Farm project.

4) *Sedan 69 kV (Multiple contingencies)*

This bus voltage is within the 0.90 – 1.10 criteria measuring in at a low of 0.9478 , and is not a constraint for the Marshall Wind Farm project.

5) *Glenwood 69 kV (Multiple contingencies)*

This bus voltage is within the 0.90 – 1.10 criteria measuring in at a low of 0.9445 , and is not a constraint for the Marshall Wind Farm project.

6) *Williams Tap 69 kV (Multiple contingencies)*

This bus voltage is within the 0.90 – 1.10 criteria measuring in at a low of 0.9499, and is not a concern for the Marshall Wind Farm project.

7) *Marshall Southwest 115 kV (for Marshall Switching Station bus fault)*
The post contingent low voltage criteria for this bus is 0.90, and therefore a post contingent bus voltage of 0.8960 is in violation. The outage is simulated is generally covering two different types of events. One is a bus fault of the Marshall Switching Station 115 kV bus, and the other is a breaker failure on either of the lines coming into this substation causing the whole bus to trip. This is flagged as a violation of criteria since switched shunts were not allowed to move in the case. System intact only one of the two 20 MVAR switched shunt capacitor banks at the Marshall Southwest substation was energized. Allowing the 2$^{nd}$ capacitor bank to engage raises the post contingent voltage to 0.9643 pu, which is above the system intact low volt criteria of 0.95 pu. Further investigation using the base case showed that the voltage dip seen is really due to turning off the peaking generation, and not the wind farm addition itself. Simulating the outage in the base without the peaking generation in Marshall online shows a bus voltage of 0.8674 pu, i.e. worse than if the wind farm is injecting power (again without allowing the 2$^{nd}$ capacitor bank at Marshall Southwest to switch in). This is therefore not an issue the Marshall Wind Farm project would have to mitigate. The issue can also be resolved by having both capacitors at the Southwest substation in-service system intact. Further, Xcel Energy has filed a Certificate of Need application with the state of Minnesota to build a new 115 kV line from Lake Yankton to Marshall, which should address the issue.

8) *Erie Road 115 kV (for Marshall Switching Station bus fault)*
This bus voltage at 0.8949 pu is in violation of the post contingent low voltage criteria of 0.90. The issue is the exact same as that described in item 7. In the base case without running either the wind or the gas fired generation the voltage is 0.8680 pu. I.e. the wind farm helps the voltage in the Marshall area. Switching in the second capacitor at the Southwest substation increases the voltage to 0.9564, which is within criteria.

9) *Saratoga Street 115 kV (for Marshall Switching Station bus fault)*
This bus voltage at 0.8946 pu is in violation of the post contingent low voltage criteria of 0.90. The issue is the exact same as that described in item 7. In the base case without running either the wind or the gas fired generation the voltage is 0.8670 pu. I.e. the wind farm helps the voltage in the Marshall area. Switching in the second capacitor at the Southwest substation increases the voltage to 0.9592, which is within criteria.

10) *South East 115 kV (for Marshall Switching Station bus fault)*
This bus voltage at 0.8945 pu is in violation of the post contingent low voltage criteria of 0.90. The issue is the exact same as that described in item 7. In the base case without running either the wind or the gas fired generation the voltage is 0.8659 pu. I.e. the wind farm helps the voltage in the Marshall area.Switching in the second capacitor at the Southwest substation increases the voltage to 0.9629, which is within criteria.

11) *MMU North 7$^{th}$ Street 115 kV (for Marshall Switching Station bus fault)*
This bus voltage at 0.8937 pu is in violation of the post contingent low voltage criteria of 0.90. The issue is the exact same as that described in item 7. In the base case without running either the wind or the gas fired generation the voltage is 0.8668 pu. I.e. the wind farm helps the voltage in the Marshall area. Switching in the second capacitor at the Southwest substation increases the voltage to 0.9553, which is within criteria.

12) *S3 115 kV (for Marshall Switching Station bus fault)*
This bus voltage at 0.9030 pu is within the post contingent low voltage criteria of 0.90. The issue is the exact same as that described in item 7. In the base case without running either the wind or the gas fired generation the voltage is 0.8777 pu. I.e. the wind farm helps the voltage in the Marshall area. Switching in the second capacitor at the Southwest substation increases the voltage to 0.9585, which is within criteria.

13) *Marshall East River 115 kV (for Marshall Switching Station bus fault)*
This bus voltage at 0.9024 pu is within the post contingent low voltage criteria of 0.90. The issue is the exact same as that described in item 7. In the base case without running either the wind or the gas fired generation the voltage is 0.8771 pu. I.e. the wind farm helps the voltage in the Marshall area. Switching in the second capacitor at the Southwest substation increases the voltage to 0.9580, which is within criteria.

High Voltage issues:
1) *ROSSWCP 230 kV (Multiple contingencies)*
The voltage noted in Appendix D.2 is 1.0549 pu, which is within the 0.90 – 1.10 pu criteria. The system intact base case value was observed to be 1.0548, i.e. this bus voltage is not sensitive to the outage listed.

2) *Sheyenne 115 kV (Multiple contingencies)*
The voltage noted in Appendix D.2 is 1.0644 pu, which is within the 0.90 – 1.10 pu criteria. The system intact base case values were observed to be 1.0645 pu, i.e. this bus voltage is not sensitive to the outage listed.

3) *Roseau 500 kV (Multiple contingencies)*
The voltage noted in Appendix D.2 is 1.0966 pu, which is within the 0.90 – 1.10 pu criteria. The system intact base case values were observed to be 1.0969 pu, i.e. this bus voltage is not sensitive to the outage listed.

4) *Drayton 115 kV (Multiple contingencies)*
The voltage noted in Appendix D.2 is 1.0578 pu, which is within the 0.90 – 1.10 pu criteria. The system intact base case values were observed to be 1.0579 pu, i.e. this bus voltage is not sensitive to the outage listed.

5) *Hetland 115 kV (Multiple contingencies)*
Three contingencies showed bus voltage slightly higher than 1.05 pu on this bus. This is well within the post contingent high voltage criteria of 1.10 pu.

### 3.2.3 Flowgate analysis

Two sets of flowgate analysis were performed. One with the “traditional” set of flowgates (as posted with the DFCALC program), and one with a set reflecting what is monitored by the automated evaluation tool on the MAPP OASIS. The output generated by the DFCALC program can be found in Appendices C.2.1 and C.2.2 respectively. There were significant flowgate impacts according to either of the flowgate analysis runs.

### 3.2.4 Summer peak constraints for the Marshall Wind Farm

The analysis performed for the summer peak scenario shows that there are no Significantly Affected Facilities due to the addition of the Marshall Wind Farm utilizing the existing transmission rights of the Marshall peaking facility to the transmission system. While the results indicate impacts on some thermal issues, this is proven to be more due to not having the reactive power capabilities of the peaking unit online, than the wind farm being online. In fact having the wind farm online in some situations is more beneficial to the system that not running any generation at all in the Marshall area. The MMU peaking unit typically does not run other than during regularly scheduled tests, and during emergencies. Should it be necessary for the Marshall 115 kV system, MMU's control center will have control of the breaker to the wind farm, as well as being capable of starting up the peaking unit.

# 4 Prior Outage Analysis

Prior outage analysis was performed for both the summer off-peak and the summer peak scenario. The scenarios studied are described in section 2.2, and is also described in more detail in section 4.1 discussing results of this analysis using the summer off-peak model, and in section 4.2 discussing results of this analysis using the summer peak model.

## *4.1 Prior outage analysis – Summer off-peak*

### 4.1.1 MMU Southwest – Saratoga Street & Marshall – MMU North 7th St

A voltage comparison was done between the base case and the change case with these outages applied. Table 4.1 shows a list of voltages impacted by more than 0.01 pu.

```
BUSES WITH VOLTAGE DIFFERING BY MORE THAN 0.01000 PU:
                        IN WORKING CASE     IN Z:\Studies\...\Marshall Wind\Marshall Wind
Study Spring 2007\PRIOR_OUTAGE\SUOP\MWIND_SUOP_BASE_1.sav
 X------ BUS -------X  VOLTAGE   ANGLE     VOLTAGE   ANGLE    DELTA VLT  ANGLE
 60371 [ERIE RD7 115]  0.91951   28.29     0.96465   31.19     0.04514    2.90
 60372 [SARATOG7 115]  0.91874   28.23     0.96591   31.27     0.04716    3.03
 60375 [MMU_N7ST 115]  0.91837   28.18     0.96356   31.09     0.04519    2.91
 66508 [S3     7 115]  0.92756   29.17     0.96887   31.75     0.04132    2.58
 66552 [MARS ER7 115]  0.92708   29.13     0.96841   31.71     0.04134    2.58
```

**Table 4.1: Prior outage voltage comparison**

While none of the voltage are outside of the 0.90 pu low voltage criteria, the buses listed have rather low voltages. The reduction in voltage is due to the MMU peaking unit being turned off, and these buses are isolated from all the shunt capacitors in the Marshall area, and not a function of whether or not the wind farm is on-line. In this scenario Granite Falls is the only transmission source for all of the buses with the lower voltages.

Thermal analysis did not show any new overloads or any preexisting overloads that were significantly impacted.

### 4.1.2 Marshall – Lyon Co. & MMU Southwest – Saratoga St.

A voltage comparison between the base and change case and this outage combination applied did not show any voltage concerns.

Thermal analysis did not show any new overloads or any preexisting overloads that were significantly impacted.

### 4.1.3 Erie Road – S3 & MMU Southwest – Saratoga St.

No voltages changed by more than 0.01 pu between the base case and the change case due to this outage combination and the wind farm.

Thermal analysis did not show any new overloads or any preexisting overloads that were significantly impacted.

### 4.1.4 MMU Southwest – Saratoga St. & Lyon County – Minn.Valley

No voltages change by more than 0.01 pu between the base case and the change case due to this outage combination and the wind farm.

The thermal analysis showed one line overloaded and impacted further by the change caused by assuming the wind farm is producing at maximum output, and turning off the peaking generation at the Saratoga St. substation.

The outage combination essentially forces the wind farm to take the long way around the Marshall loop to reach the Saratoga Street substation, while reducing the amount of flow looping around on the external transmission system by tripping the Lyon County – Minn.Valley 115 kV line. The base case scenario (with the Saratoga Street unit online, and the wind farm offline) shows a flow of 132.2 MVA on the Marshall – MMU North 7$^{th}$ Street 115 kV line. This line has a normal rating of 127.9 MVA, and an emergency rating of 140.7 MVA. The change case showed a flow of 150.5 MVA on this line for the same two contingencies.

The impact of the wind farm could be mitigated by tripping the wind farm after either of the two contingencies (i.e. an n-1 condition). Doing so causes the overload to reduce to 140.5 MVA (as reported by the PSS/E limit check functionality). Turning on the Saratoga Street generation at 18.9 MW reduces the loading to 132.2 MVA.

This line can likely be dynamically rated with wind speed. The line segment to the east is presently dynamically rated (Marshall – Lyon County) to allow for higher flows in higher wind speed and therefore higher Buffalo Ridge area wind generation levels. The same dynamic rating can be applied to the Marshall – MMU North 7$^{th}$ Street 115 kV line, which would be more than adequate to accommodate the 150.5 MVA post contingent flow. No terminal or line upgrades will be required to dynamically rate this line.

### 4.1.5 MMU North 7$^{th}$ Street – Marshall & Lyon County – Minn.Valley

This contingency pair is similar to the one described in the paragraph above, but now looking at the southern part of the Marshall 115 kV loop.

No voltages changed by more than 0.01 pu between the base case and the change case due to this outage combination and the wind farm

Similar to what was described in section 4.1.4 an impact was shown on the part of the Marshall 115 kV loop that now ties Lyon County and Granite Falls together. An 18.2 MW impact was seen on the Marshall Southwest – Saratoga Street 115 kV line. This line has a normal rating of 127.9 MVA and an emergency rating of 140.7 MVA. The post contingent loading is 121.3 MVA in the base case, and 139.5 MVA in the change case. Tripping the wind farm would of course remove the impact of the wind farm. Starting the Saratoga Street generation would counterflow this segment of the loop, but could move the overload to the Saratoga St. – Erie Road 115 kV line.

Since the flow on the overloaded line is still below emergency rating, it would also be permissible to have the MMU around the clock staffed control center trip the wind farm within the 30 minute time frame after both the outages has occurred in order to fully remove the wind farm's impact on the line in question.

## *4.2 Prior outage analysis – Summer peak*

### 4.2.1 MMU Southwest – Saratoga Street & Marshall – MMU North 7th St

A voltage comparison was performed between the base case and the change case with the outage combination applied to both of the cases.

```
BUSES WITH VOLTAGE DIFFERING BY MORE THAN 0.01000 PU:
                        IN WORKING CASE     IN Z:\Studies\...\Marshall Wind\Marshall Wind
Study Spring 2007\PRIOR_OUTAGE\SUPK\MWIND-2009SUPK-BASE_1.sav
 X------ BUS -------X  VOLTAGE   ANGLE     VOLTAGE   ANGLE    DELTA VLT  ANGLE
 60371 [ERIE RD7 115]  0.87795  -38.81     0.92846  -35.49     0.05051    3.32
 60372 [SARATOG7 115]  0.87661  -38.93     0.92926  -35.46     0.05265    3.47
 60375 [MMU_N7ST 115]  0.87675  -38.94     0.92733  -35.61     0.05058    3.33
 66508 [S3     7 115]  0.88825  -37.69     0.93459  -34.75     0.04634    2.94
 66552 [MARS ER7 115]  0.88765  -37.74     0.93401  -34.80     0.04637    2.94
```

**Table 4.2 Voltage concerns for prior outage 1**

All the bus voltages above are in the Marshall area and are below the 0.90 pu low voltage criteria in the change case, but not in the base case. The capacitor banks at Marshall Southwest were not allowed to move when solving the cases where these voltages were observed. Only one of the Marshall Southwest 20 MVAR capacitor banks is online in the system intact cases. In this scenario the Marshall Southwest sub, and therefore the wind farm, is largely isolated from the buses listed in table 4.2 above, and the status of the wind farm is not directly impacting the bus voltages. The change in bus voltages in this case is solely due to turning off the peaking unit at the Saratoga Street substation. This was confirmed by taking the generator out of service in the base case with the outages applied, and recording the same bus voltages, which are shown in table 4.3.

```
60371 - Erie Road 115 kV            0.8789 pu
60372 - Saratoga St. 115 kV         0.8776 pu
60375 - MMU N. 7th St. 115 kV       0.8777 pu
66508 - S3 115 kV                   0.8892 pu
66552 - Marshall East River         0.8886 pu
```

**Table 4.3 Voltages in base case w/o MMU generation online, and w/ prior outage**

While these are not voltage concerns caused by the wind farm, and therefore not something this project will have to address, it is a concern for the northwestern part of MMU's system, and East River Electric Coop's system. WAPA plans to add an additional 230/115 kV transformer at Granite Falls, and additional reactive capability that may address this prior outage issue.

No thermal concerns were flagged for this scenario.

### 4.2.2 Marshall – Lyon Co. & MMU Southwest – Saratoga St.

A voltage comparison between the base and change case and this outage combination applied did not show any voltage concerns.

Thermal analysis did not show any new overloads or any preexisting overloads that were significantly impacted.

### 4.2.3 Erie Road – S3 & MMU Southwest – Saratoga St.

No voltages changed by more than 0.01 pu between the base case and the change case due to this outage combination and the wind farm.

Thermal analysis did not show any new overloads or any preexisting overloads that were significantly impacted.

### 4.2.4 MMU Southwest – Saratoga St. & Lyon County – Minn.Valley

No voltages changed by more than 0.01 pu between the base case and the change case due to this outage combination and the wind farm.

As for the summer off-peak scenario this outage combination causes an overload on the Marshall – MMU North 7$^{th}$ Street 115 kV line. The line has a summer normal rating of 127.9 MVA with an emergency rating of 140.7 MVA. The post contingent loading observed in the change case is 149.5 MVA.

The impact of the wind farm could be mitigated by tripping the wind farm after either of the two contingencies. Doing so causes the overload to reduce to 142.3 MVA (as reported by the PSS/E limit check functionality), which is still above the emergency rating.

This line can be dynamically rated with wind speed. The line segment to the east is presently dynamically rated (Marshall – Lyon County) to allow for higher flows in higher wind speed and therefore higher Buffalo Ridge area wind generation levels. The same dynamic rating can be applied to the Marshall – MMU North 7th Street 115 kV line, which would be more than adequate to accommodate the 149.5 MVA post contingent flow. No terminal or line upgrades will be required to dynamically rate this line.

### 4.2.5 MMU North 7th Street – Marshall & Lyon County – Minn.Valley

No voltages changed by more than 0.01 pu between the base case and the change case due to this outage combination and the wind farm.

Similar to what was described in section 4.1.5, and 4.2.4 an impact was shown on the part of the Marshall 115 kV loop that now ties Lyon County and Granite Falls together. An 18.6 MVA impact was seen on the Marshall Southwest – Saratoga Street 115 kV line. This line has a normal rating of 127.9 MVA and an emergency rating of 140.7 MVA. The post contingent loading is 116.5 MVA in the base case, and 135.1 MVA in the change case. Tripping the wind farm would of course remove the impact of the wind farm. Starting the Saratoga Street generation would counterflow this segment of the loop, but could move the overload to the Saratoga St. – Erie Road 115 kV line.

Since the flow on the overloaded line is still below emergency rating, it would also be permissible to have the MMU around the clock staffed control center trip the wind farm within the 30 minute time frame after both the outages has occurred in order to fully remove the wind farms impact on the line in questions.

# 5 Conclusion

The analysis performed did not show any steady state system intact or n-1 Significantly Affected Facilities due to the addition of the Marshall Wind Farm utilizing the transmission rights currently held by the peaking generator that belongs to Marshall Municipal Utilities. This also include flowgate impacts. In some instances the wind farm will provide smaller benefits to the system over that of the existing peaking generator, and over not running any generation in the Marshall area.

Prior outage concerns were observed. The prior outage of the 115 kV line from the Southwest sub to the Saratoga St. sub, and the 115 kV line from Lyon County – Minn.Valley showed potential overloads on the northern portion of the Marshall loop. Similarly, the prior outage of the 115 kV line from Marshall Switching Station to the MMU North 7$^{th}$ St. sub and the 115 kV line from Lyon County – Minn.Valley showed potential overloads on the southern portion of the Marshall loop. These issues were seen in both the summer off-peak and the summer peak scenario. The impact on the Marshall – North 7$^{th}$ Street 115 kV line will likely be mitigated by dynamically rating the line identical to the Lyon County – Marshall 115 kV line is at present. It would also be permissible to trip the wind farm if the system is in an n-1 condition to prepare for the next contingency. The Southwest – Saratoga Street 115 kV line cannot be dynamically rated. The prior outage overload is below the emergency rating however, and the wind farm can therefore be tripped within 30 minutes after both the concerning outages has occurred from the MMU control center in order to remove the wind farm's impact on the system during this situation.

# Appendix A: Input files to contingency simulations

## A.1 Contingency file

This shows the contingency file used for the summer peak scenario, as this scenario had 4 additional contingencies associated with the new 345 kV line from Split Rock – Lakefield.

```
COM ' THIS CONTINGENCY FILE WAS UPDATED WITH THE NEW FINAL-MAPP-CONT04S'
COM ' THE FOLLOWING TWO LINES WERE ADDED TO REPRESENT SINGLE LINE '
COM ' CONTINGENCIES IN THE MAPP REGION  (JBS - BEPC, 1-26-05)'
COM ' '
SINGLE BRANCH IN SYSTEM MWINDCON
COM 'SINGLE TIE FROM SYSTEM MWINDCON
COM '  COMPLETED UPDATING June and MARCH 16, 2004,  LOREN '
COM '  Pass2 Updates performed from March 26 to April 5, 2004'
COM '  '
COM '   Current MAPP Contingency File 2004 Summer'

COM 'NSP - 1 Defined as multi-circuit'
COM 'SPLIT ROCK-WHITE & SPLIT ROCK-SIOUX CITY 345'
COM 'A 60126-60130  SPLT RK3-SPLTRTA3 CKT 1   OPENS  C   tower, B MTL'
COM 'B 60130-66537  SPLTRTA3-WHITE  3 CKT 1   OPENS  A   MTL'
COM 'C 60126-60131  SPLT RK3-SPLTRTB3 CKT 1   OPENS  A   tower, D MTL'
COM 'D 60131-66564  SPLTRTB3-SIOUXCY3 CKT 1   OPENS  C   MTL'
COM '-------------------------------------------------------'
CONTINGENCY 'NSP - 1'
TRIP LINE FROM BUS 60126 TO BUS 60130 CKT 1
TRIP LINE FROM BUS 60130 TO BUS 66537 CKT 1
TRIP LINE FROM BUS 60126 TO BUS 60131 CKT 1
TRIP LINE FROM BUS 60131 TO BUS 66564 CKT 1
END

COM 'NSP - 2  DEFINED AS MULTI-CIRCUIT'
COM 'SPLIT ROCK-CHERRY CREEK/WEST SIOUX FALLS'
COM 'A 60129-60117  SPLT RK7-CHERRYC7 CKT 1   OPENS B TOWER'
COM 'B 60129-60132  SPLT RK7-WSX FLS7 CKT 1   OPENS A TOWER'
COM '-------------------------------------------------------'
CONTINGENCY 'NSP - 2'
TRIP LINE FROM BUS 60129 TO BUS 60117 CKT 1
TRIP LINE FROM BUS 60129 TO BUS 60132 CKT 1
END

COM '108   Defined as multi-circuit, tower'
COM 'A 66507-66509 FTTHOMP4-FTRANDL4   OPENS  B or C  tower'
COM 'B 66507-66516 FTTHOMP4-LAKPLAT4   OPENS  A       tower'
COM 'C 66509-66516 FTRANDL4-LAKPLAT4   OPENS  A       tower'
COM '-------------------------------------------------------'
CONTINGENCY '108     1'
TRIP LINE FROM BUS 66507 TO BUS 66509 CKT 1
TRIP LINE FROM BUS 66507 TO BUS 66516 CKT 1
TRIP LINE FROM BUS 66509 TO BUS 66516 CKT 1
END
```

```
COM '110  Defined as multi-circuit, tower'
COM 'A 66503-66530 BLAIR  4-WATERTN4 CKT 1   OPENS  B        tower'
COM 'B 66530-66550 WATERTN4-GRANITF4 CKT 1   OPENS  A or C   tower'
COM 'C 66503-66550 BLAIR  4-GRANITF4 CKT 1   OPENS  B        tower'
COM '-------------------------------------------------------'
CONTINGENCY '110     1'
TRIP LINE FROM BUS 66503 TO BUS 66530 CKT 1
TRIP LINE FROM BUS 66530 TO BUS 66550 CKT 1
CHANGE BUS 63315 GENERATION BY  -78.5 MW
END
CONTINGENCY '110     2'
TRIP LINE FROM BUS 66530 TO BUS 66550 CKT 1
TRIP LINE FROM BUS 66503 TO BUS 66550 CKT 1
CHANGE BUS 63315 GENERATION BY  -78.5 MW
END

COM '111 WAPA Defined as multi-terminal, Interregional'
COM 'ASH STREET TAP'
COM 'A 66600-66601 ASHTAP 7-ASH ST 7 CKT 1   OPENS  B C'
COM 'B 66600-66520 ASHTAP 7-OAHE   7 CKT 1   OPENS  A B'
COM 'C 66600-66489 ASHTAP 7-PIERRE 7 CKT 1   OPENS  A C'
COM '-------------------------------------------------------'
CONTINGENCY '111 '
TRIP LINE FROM BUS 66600 TO BUS 66601 CKT 1
TRIP LINE FROM BUS 66600 TO BUS 66520 CKT 1
TRIP LINE FROM BUS 66600 TO BUS 66489 CKT 1
END

COM '112 WAPA Defined as multi-terminal, Interregional'
COM 'EVANS STREET TAP'
COM 'A 66602-66601 EVANSST7-ASH ST 7 CKT 1   OPENS  A B'
COM 'B 66602-66489 EVANSST7-PIERRE 7 CKT 1   OPENS  B C'
COM '-------------------------------------------------------'
CONTINGENCY '112 '
TRIP LINE FROM BUS 66602 TO BUS 66601 CKT 1
TRIP LINE FROM BUS 66602 TO BUS 66489 CKT 1
END

COM '113 WAPA Defined as multi-terminal, Interregional'
COM 'NWPS huron-westpark-redfield'
COM 'A 67411-66515 BTAP WP7-HURON  7 CKT 1   OPENS  B C'
COM 'B 67411-67403 BTAP WP7-REDFLD 7 CKT 1   OPENS  A C'
COM 'C 67411-67404 BTAP WP7-HURONWP7 CKT 1   OPENS  A B'
COM '-------------------------------------------------------
CONTINGENCY '113'
TRIP LINE FROM BUS 67411 TO BUS 66515 CKT 1
TRIP LINE FROM BUS 67411 TO BUS 67403 CKT 1
TRIP LINE FROM BUS 67411 TO BUS 67404 CKT 1
END
```

```
COM '120   Defined as multi-circuit, tower'
COM 'A 66504-66531 BROOKNG7-WATERTN7 CKT 1   OPENS  B    tower'
COM 'B 66529-66537 WATERTN3-WHITE  3 CKT 1   OPENS  A    tower'
COM '-------------------------------------------------------'
CONTINGENCY '120     '
TRIP LINE FROM BUS 66504 TO BUS 66531 CKT 1
TRIP LINE FROM BUS 66529 TO BUS 66537 CKT 1
END

COM '121   Defined as multi-circuit, tower, SPS'
COM 'A 66504-66531 BROOKNG7-WATERTN7 CKT 1   OPENS  B    tower'
COM 'B 66529-66537 WATERTN3-WHITE  3 CKT 1   OPENS  A    tower'
COM 'C 66531-66500 WATERTN7-ARLGNTN7 CKT 1   OPENS  C    SPS'
COM 'D 66500-66504 ARLGNTN7-BROOKNG7 CKT 1   OPENS  D    SPS'
COM '-------------------------------------------------------'
CONTINGENCY '121     '
TRIP LINE FROM BUS 66504 TO BUS 66531 CKT 1
TRIP LINE FROM BUS 66529 TO BUS 66537 CKT 1
TRIP LINE FROM BUS 66531 TO BUS 66500 CKT 1
TRIP LINE FROM BUS 66500 TO BUS 66504 CKT 1
END

COM '130  Defined as multi-circuit, tower'
COM 'A 66507-66523  FTTHOMP4-SIOUXFL4   OPENS  BorCorD  tower'
COM 'B 66507-67122  FTTHOMP4-STORLA 4   OPENS  A        tower, MTL'
COM 'C 66513-67122  HANLON 4-STORLA 4   OPENS  A        tower, MTL'
COM 'D 66513-66523  HANLON 4-SIOUXFL4   OPENS  A        tower'
COM '**    Defined as multi-terminal, MTL'
COM 'E 66507-67122  FTTHOMP4-STORLA 4   OPENS  F G'
COM 'F 66513-67122  HANLON 4-STORLA 4   OPENS  E G'
COM 'G 67122-67123  STORLA 4-STORLA 7      VLD SGL'
COM '-------------------------------------------------------'
CONTINGENCY '130       1'
TRIP LINE FROM BUS 66507 TO BUS 66523 CKT 1
TRIP LINE FROM BUS 66507 TO BUS 67122 CKT 1
COM 'Also trips the following because of B mtl'
TRIP LINE FROM BUS 66507 TO BUS 67122 CKT 1
TRIP LINE FROM BUS 66513 TO BUS 67122 CKT 1
TRIP LINE FROM BUS 67122 TO BUS 67123 CKT 1
END
CONTINGENCY '130       2'
TRIP LINE FROM BUS 66507 TO BUS 66523 CKT 1
TRIP LINE FROM BUS 66513 TO BUS 66523 CKT 1
END

COM '140  Defined as multi-circuit, tower'
COM 'A 66507-66514  FTTHOMP4-HURON  4  1   OPENS  B     tower'
COM 'B 66507-66514  FTTHOMP4-HURON  4  2   OPENS  A     tower'
COM '-------------------------------------------------------'
CONTINGENCY '140    '
TRIP LINE FROM BUS 66507 TO BUS 66514 CKT 1
TRIP LINE FROM BUS 66507 TO BUS 66514 CKT 2
END
```

```
COM '150  Defined as multi-circuit, tower'
COM 'A 66507-66519  FTTHOMP4-OAHE   4  1   OPENS  B     tower'
COM 'B 66507-66519  FTTHOMP4-OAHE   4  2   OPENS  A     tower'
COM '-------------------------------------------------------'
CONTINGENCY '150    '
TRIP LINE FROM BUS 66507 TO BUS 66519 CKT 1
TRIP LINE FROM BUS 66507 TO BUS 66519 CKT 2
END

COM '151  Defined as multi-circuit'
COM 'A 66507-66519  FTTHOMP4-OAHE   4  3   OPENS  B     tower'
COM 'B 66507-66519  FTTHOMP4-OAHE   4  4   OPENS  A     tower'
COM '-------------------------------------------------------'
CONTINGENCY '151    '
TRIP LINE FROM BUS 66507 TO BUS 66519 CKT 3
TRIP LINE FROM BUS 66507 TO BUS 66519 CKT 4
END

COM '160  Defined as multi-circuit, tower'
COM 'A 66509-66565  FTRANDL4-SIOUXCY4   OPENS  BorCorD  tower'
COM 'B 66509-66526  FTRANDL4-UTICAJC4   OPENS  A        tower, MTL'
COM 'C 66526-66536  UTICAJC4-RASMUSN4   OPENS  A        tower, MTL'
COM 'D 66536-66565  RASMUSN4-SIOUXCY4   OPENS  A        tower'
COM '**    Defined as multi-terminal'
COM 'E 66509-66526  FTRANDL4-UTICAJC4   OPENS  F G'
COM 'F 66526-66398  UTICAJC4-VFODNES4   OPENS  E G'
COM 'G 66526-66536  UTICAJC4-RASMUSN4   OPENS  E F'
COM '-------------------------------------------------------'
CONTINGENCY '160       1'
TRIP LINE FROM BUS 66509 TO BUS 66565 CKT 1
TRIP LINE FROM BUS 66509 TO BUS 66526 CKT 1
COM 'Also trips the following because of B'
TRIP LINE FROM BUS 66526 TO BUS 66536 CKT 1
TRIP LINE FROM BUS 66398 TO BUS 66526 CKT 1
END
CONTINGENCY '160       2'
TRIP LINE FROM BUS 66509 TO BUS 66565 CKT 1
TRIP LINE FROM BUS 66536 TO BUS 66565 CKT 1
END
CONTINGENCY '160       3'
TRIP LINE FROM BUS 66509 TO BUS 66526 CKT 1
TRIP LINE FROM BUS 66398 TO BUS 66526 CKT 1
TRIP LINE FROM BUS 66526 TO BUS 66536 CKT 1
END

COM '170  Defined as multi-circuit, tower'
COM 'A 66514-66530  HURON  4-WATERTN4  1   OPENS  B   tower'
COM 'B 66514-66530  HURON  4-WATERTN4  2   OPENS  A   tower'
COM '-------------------------------------------------------'
CONTINGENCY '170    '
TRIP LINE FROM BUS 66514 TO BUS 66530 CKT 1
TRIP LINE FROM BUS 66514 TO BUS 66530 CKT 2
END
```

```
COM '500      GRE Defined as multi-terminal line'
COM 'A 66550-63050 GRANITF4-WILLMAR4   OPENS B'
COM 'B 63050-62427 WILLMAR4-WILLMAR8 OPENS A'
COM '-------------------------------------------------------'
CONTINGENCY '500'
TRIP LINE FROM BUS 66550 TO BUS 63050 CKT 1
TRIP LINE FROM BUS 63050 TO BUS 62427 CKT 1
END

COM '505  Defined as multi-circuit, NSP'
COM 'A 66551-66508 GRANITF7-S3     7 CKT 1   OPENS B C'
COM 'B 66552-66508 MARS ER7-S3     7 CKT 1   OPENS A C'
COM 'B 60371-66508 ERIE RD7-S3     7 CKT 1   OPENS A B'
COM '-------------------------------------------------------'
CONTINGENCY '505    '
TRIP LINE FROM BUS 66551 TO BUS 66508 CKT 1
TRIP LINE FROM BUS 66552 TO BUS 66508 CKT 1
TRIP LINE FROM BUS 60371 TO BUS 66508 CKT 1
END

COM '510  Defined as multi-terminal'
COM 'A 66550-66554  GRANITF4-MORRIS 4 CKT 1   OPENS  B C'
COM 'B 66554-66555  MORRIS 4-MORRIS 7 CKT 1   OPENS  A C'
COM 'C 66553-66554  MOORHED4-MORRIS 4 CKT 1   VLD SGL'
COM '-------------------------------------------------------'
CONTINGENCY '510    '
TRIP LINE FROM BUS 66550 TO BUS 66554 CKT 1
TRIP LINE FROM BUS 66554 TO BUS 66555 CKT 1
TRIP LINE FROM BUS 66553 TO BUS 66554 CKT 1
END

COM '530  Defined as multi-circuit'
COM 'A 60119-60171  LKYNKTN7-MARSHTP7 CKT 1   OPENS B C D'
COM 'B 60148-60171  MINVALY4-MARSHTP7 CKT 1   OPENS A C D'
COM 'C 60170-60171  MARSHAL7-MARSHTP7 CKT 1   OPENS A B'
COM 'D 60119-60853  LKYNKTN7-LK YANK8 CKT 2   OPENS A B C'
COM '-------------------------------------------------------'
CONTINGENCY '530      '
TRIP LINE FROM BUS 60119 TO BUS 60171 CKT 1
TRIP LINE FROM BUS 60148 TO BUS 60171 CKT P1
TRIP LINE FROM BUS 60170 TO BUS 60171 CKT 1
TRIP LINE FROM BUS 60119 TO BUS 60853 CKT 2
END


COM '545  Defined as multi-terminal'
COM 'A 63325-63327   BROWNSV4-HANKSON4 CKT 1   OPENS  B C'
COM 'B 63314-63325   BIGSTON4-BROWNSV4 CKT 1   OPENS  A C'
COM 'C 63325-63125   BROWNSV4-BROWNSV9 CKT 1   OPENS  A B'
COM '-------------------------------------------------------'
CONTINGENCY '545    '
TRIP LINE FROM BUS 63325 TO BUS 63327 CKT 1
TRIP LINE FROM BUS 63314 TO BUS 63325 CKT 1
TRIP LINE FROM BUS 63325 TO BUS 63125 CKT 1
END
```

```
COM '590  Defined as multi-terminal'
COM 'A 63214-63213   BIGSTON7-MARIETT7 CKT 1   OPENS  B C D E'
COM 'B 63213-63212   MARIETT7-BURR   7 CKT 1   OPENS  A C D E'
COM 'C 63212-63211   BURR   7-CANBY  7 CKT 1   OPENS  A B D E'
COM 'D 63212-63210   BURR   7-TORONTO7 CKT 1   OPENS  A B C E'
COM 'E 63213-63113   MARIETT7-MARIETT9 CKT 1   OPENS  A B C D'
COM '-------------------------------------------------------'
CONTINGENCY '590    '
TRIP LINE FROM BUS 63214 TO BUS 63213 CKT 1
TRIP LINE FROM BUS 63213 TO BUS 63212 CKT 1
TRIP LINE FROM BUS 63212 TO BUS 63211 CKT 1
TRIP LINE FROM BUS 63212 TO BUS 63210 CKT 1
TRIP LINE FROM BUS 63213 TO BUS 63113 CKT 1
END


COM '595  Defined as multi-terminal'
COM 'A 63215-63216  HIWY12 7-ORTONVL7 CKT 1   OPENS  B'
COM 'B 63214-63215  BIGSTON7-HIWY12 7 CKT 1   OPENS  A'
COM '-------------------------------------------------------'
CONTINGENCY '595    '
TRIP LINE FROM BUS 63215 TO BUS 63216 CKT 1
TRIP LINE FROM BUS 63214 TO BUS 63215 CKT 1
END


COM '640  Defined as multi-terminal line, GRE'
COM 'A 62425-62427 WILLMAR7-WILLMAR8 CKT 1   OPENS B'
COM 'B 62425-62005 WILLMAR7-KERKHOT7 CKT 1   OPENS A'
COM '-------------------------------------------------------'
CONTINGENCY 640  '
COM 'Fault at Wilmarth, between Wilmarth'
COM 'and Paynesville 115 kV'
TRIP LINE FROM BUS 62425 TO BUS 62427 CKT 1
TRIP LINE FROM BUS 62425 TO BUS 62005 CKT 1
END

COM '  690 Defined as multi-terminal, GRE'
COM 'A 62425-62005 WILLMAR7-KERKHOT7   OPENS B C D'
COM 'B 60357-62005 MAYNARD7-KERKHOT7   OPENS A C D'
COM 'C 62005-62006 KERKHOT7-KERKHO 7   OPENS A B D'
COM 'D 62006-62001 KERKHO 7-BENSON 7   OPENS A B C'
COM '-------------------------------------------------------'
CONTINGENCY '690      '
TRIP LINE FROM BUS 62425 TO BUS 62005 CKT 1
TRIP LINE FROM BUS 60357 TO BUS 62005 CKT 1
TRIP LINE FROM BUS 62005 TO BUS 62006 CKT 1
TRIP LINE FROM BUS 62006 TO BUS 62001 CKT 1
END
```

```
COM '785 GRE Defined as multi-terminal'
COM 'A 60129-60128  SPLIT R7-SPLIT R5   OPENS  B C D E F'
COM 'B 60128-34003  SPLIT R5-MAGNLIA5   OPENS  A C D E F'
COM 'C 34003-34004  MAGNLIA5-ELK    5   OPENS  A B D E F'
COM 'D 34004-62709  ELK     -BREWSTR5   OPENS  A B C E F'
COM 'E 62709-34005  BREWSTR5-HRN LK 5   OPENS  A B C D F'
COM 'F 34005-34225  HRN LK 5-HERONLK8 CKT 1'
COM 'Altered reflecting that breaker has been installed looking west out of Elk
COM '-------------------------------------------------------'
CONTINGENCY '785    '
TRIP LINE FROM BUS 60129 TO BUS 60128 CKT  6
TRIP LINE FROM BUS 60128 TO BUS 60064 CKT 1
TRIP LINE FROM BUS 34003 TO BUS 34004 CKT 1
END

COM '790  Defined as multi-terminal'
COM 'A 66550-60147  GRANITF4-MINVALY4     OPENS  B'
COM 'B 60147-60148  MINVALY4-MINVALY7  5   OPENS  A'
COM '-------------------------------------------------------'
CONTINGENCY '790    '
TRIP LINE FROM BUS 66550 TO BUS 60147 CKT 1
TRIP LINE FROM BUS 60147 TO BUS 60148 CKT P5
END

COM '795  Defined as multi-terminal'
COM 'A 66550-60150  GRANITF4-MNVLTAP4   OPENS  B C D E'
COM 'B 60148-60149  MINVALY7-MINVALT4   OPENS  A C D E'
COM 'C 60150-63054  MNVLTAP4-PANTHER4   OPENS  A B D E'
COM 'D 60149-60150  MINVALT4-MNVLTAP4   OPENS  A B C E'
COM 'E 63054-60742  PANTHER4-PANTHER8   OPENS  A B C D'
COM '-------------------------------------------------------'
CONTINGENCY '795    '
TRIP LINE FROM BUS 66550 TO BUS 60150 CKT 1
TRIP LINE FROM BUS 60148 TO BUS 60149 CKT P6
TRIP LINE FROM BUS 60150 TO BUS 63054 CKT 1
TRIP LINE FROM BUS 60149 TO BUS 60150 CKT 1
TRIP LINE FROM BUS 63054 TO BUS 60742 CKT 1
END


COM '810  Defined as multi-terminal'
COM 'A 60189-62980 BLK DOG4-MCLEOD 4   OPENS  B'
COM 'B 60189-60190 BLK DOG4-BLK DOG7   OPENS  A'
COM 'Last line altered to reflect line now terminates @ Blue Lake
COM '-------------------------------------------------------'
CONTINGENCY '810    '
TRIP LINE FROM BUS 60191 TO BUS 62980 CKT 1
TRIP LINE FROM BUS 60191 TO BUS 60193 CKT P1
END
```

```
COM '860  Defined as multi-terminal'
COM 'A 66555-63218  MORRIS 7-MOROTP 7 CKT 1   OPENS B C D E'
COM 'B 63218-62002  MOROTP 7-WALDON 7 CKT 1   OPENS A C D E'
COM 'C 62002-62001  WALDON 7-BENSON 7 CKT 1   OPENS A B C D'
COM 'D 62001-62013  BENSON 7-BENSON 9 CKT 1   OPENS A B C E'
com 'E 62001-62006  BENSON 7-KERKHO 7 CKT 1   OPENS A B C D'
COM '-------------------------------------------------------'
CONTINGENCY '860     '
TRIP LINE FROM BUS 66555 TO BUS 63218 CKT 1
TRIP LINE FROM BUS 63218 TO BUS 62002 CKT 1
TRIP LINE FROM BUS 62002 TO BUS 62001 CKT 1
TRIP LINE FROM BUS 62001 TO BUS 62013 CKT 1
TRIP LINE FROM BUS 62001 TO BUS 62006 CKT 1
END

COM ' ALTW-26'
COM ' 01/28/03
COM ' **** Lakefield Generating Station (LGS) OPG ****'
COM ' '
COM ' LGS GUIDE REQUIRES LGS TRIP FOR LOSS OF'
COM ' LGS-WILMARTH 345KV LINE'
COM '-------------------------------------------------------'
CONTINGENCY 'ALTW-26'
TRIP LINE FROM BUS 60331 TO BUS 60108 CKT 1 / LGS-WILMARTH
TRIP LINE FROM BUS 60331 TO BUS 63091 CKT 1  / LGS 1-2
TRIP LINE FROM BUS 60331 TO BUS 63092 CKT 1  / LGS 3-4
TRIP LINE FROM BUS 60331 TO BUS 63093 CKT 1  / LGS 5-6
END

COM 'MMU_SWITCH_BUS'
COM 'This contingency simulates breaker failure one one of the breakers on the MMU
Switching Station bus - or bus fault.'
COM 'Trips Marshall - Lyon County 115 kV'
COM 'Trips Marshall - MMU Southeast 115 kV'
COM 'Trips Marshall - MMU North 7th St. 115 kV'
COM 'This is effect trip the entire Marshall bus, and the capacitor located on the
bus as well'
COM
CONTINGENCY 'MMUSWBUS'
TRIP LINE FROM BUS 60170 TO BUS 60171
TRIP LINE FROM BUS 60170 TO BUS 60373
TRIP LINE FROM BUS 60170 TO BUS 60375
END


COM 'ERIES3GFLS'
COM 'Trips Erie - S3 - Granite Falls 115 kV line'
CONTINGENCY 'ERIE_S3_GFLS'
TRIP LINE FROM BUS 60371 TO BUS 66508
TRIP LINE FROM BUS 66508 TO BUS 66551
END
```

```
COM 'This section adds new multiple contingencies associated with the Xcel 825
wind upgprades
COM
COM
COM


CONTINGENCY 'NSP 825 1'
COM 'TRIP NOBLES CO - LAKEFIELD JC 345 KV LINE'
COM 'TRIP HERON LAKE - ELK 161 KV LINE (4 MILE DOUBLE CKT BREWSTER - ELK'
TRIP BRANCH FROM BUS 34006 TO BUS 60286 CKT P1
TRIP BRANCH FROM BUS 34005 TO BUS 62709
TRIP BRANCH FROM BUS 62709 TO BUS 34004
END
CONTINGENCY 'NSP 825 2'
COM 'TRIP NOBLES CO - LAKEFIELD JC 345 KV LINE\par'
COM 'TRIP LAKEFIELD JC - TRIBOJI 161 KV LINE (6 MILE DOUBLE CKT)\par'
TRIP BRANCH FROM BUS 34006 TO BUS 60286 CKT P1
TRIP BRANCH FROM BUS 34137 TO BUS 34007
END
CONTINGENCY 'NSP 825 3'
COM 'TRIP SPLIT ROCK - NOBLES CO 345 KV LINE\par'
COM 'TRIP ELK - SPLITROCK 161 KV LINE (8 MILE DOUBLE CKT ELK - MAGNOLIA)\par'
TRIP BRANCH FROM BUS 60126 TO BUS 60286 CKT P1
TRIP BRANCH FROM BUS 34003 TO BUS 34004
TRIP BRANCH FROM BUS 60128 TO BUS 60064
END
CONTINGENCY 'NSP 825 4'
COM 'TRIP SPLIT ROCK - NOBLE CO 345 KV\par'
COM 'TRIP SPLIT ROCK - SIOUX CITY 345 KV (5 MILES DOUBLE CKT)\par'
TRIP BRANCH FROM BUS 60126 TO BUS 60286 CKT P1
TRIP BRANCH FROM BUS 60131 TO BUS 60126
END

END
```

## A.2 Monitored element files

```
MONITOR BRANCHES IN SYSTEM MWINDMON
MONITOR TIES FROM SYSTEM MWINDMON
COM
MONITOR VOLTAGE RANGE SYSTEM MWINDMON 0.95 1.05
END
```

## A.3 Subsystem files

### A.3.1 Contingency subsystem

The following subsystem was utilized for defining what contingencies to simulate.

```
SYSTEM MWINDCON
 JOIN 'GROUP1'
  ZONE 600
  KVRANGE 69 500
 END
 JOIN 'GROUP2'
  ZONE 601
  KVRANGE 69 500
 END
 JOIN 'GROUP3'
  ZONE 603
  KVRANGE 69 500
 END
 JOIN 'GROUP4'
  ZONE 605
  KVRANGE 69 500
 END
 JOIN 'GROUP5'
  AREA 618
  KVRANGE 100 345
 END
 JOIN 'GROUP6'
  AREA 626
  KVRANGE 100 230
 END
 JOIN 'GROUP7'
  AREA 652
  KVRANGE 100 345
 END
END
```

### A.3.2 Monitored element subsystem

```
SYSTEM MWINDMON
 JOIN 'GROUP1'
      AREA 331
      KVRANGE 69 345
 END
  JOIN 'GROUP2'
  ZONE 600
  KVRANGE 69 500
 END
 JOIN 'GROUP3'
  ZONE 601
  KVRANGE 69 500
 END
 JOIN 'GROUP4'
  ZONE 603
  KVRANGE 69 500
 END
 JOIN 'GROUP5'
  ZONE 605
  KVRANGE 69 500
 END
 JOIN 'GROUP6'
  AREA 613
  KVRANGE 69 345
 END
 JOIN 'GROUP7'
  AREA 618
  KVRANGE 69 345
 END
 JOIN 'GROUP8'
  AREA 626
  KVRANGE 69 345
 END
 JOIN 'GROUP9'
  AREA 635
  KVRANGE 100 345
 END
 JOIN 'GROUP10'
  AREA 652
  KVRANGE 69 345
 END
END
```

# Appendix B: One-line diagrams

## *B.1 Summer off-peak one-line diagrams*

**B.1.1 Base Case**

**B.1.1.1 System Intact**

**B.1.1.2 Outage of MMU Southwest – Saratoga Street 115 kV**

**B.1.1.3 Outage of Pathfinder – Split Rock 115 kV**

**B.1.1.4 Breaker failure / Bus fault on Marshall Switching Station**

**B.1.2 Change Case**

**B.1.2.1 System Intact**

**B.1.2.2 Outage of MMU Southwest – Saratoga Street 115 kV**

**B.1.2.3 Outage of Pathfinder – Split Rock 115 kV**

**B.1.2.4 Breaker failure / Bus fault on Marshall Switching Station**

## *B.2 Summer peak one-line diagrams*

**B.2.1 Base Case**

**B.2.1.1 System Intact**

**B.2.1.2 Outage of MMU Southwest – Saratoga Street 115 kV**

**B.2.1.3 Nobles Co. 345/115 kV transformer / Nobles County – Fenton 115 kV**

**B.2.1.4 Breaker failure / Bus fault on Marshall Switching Station**

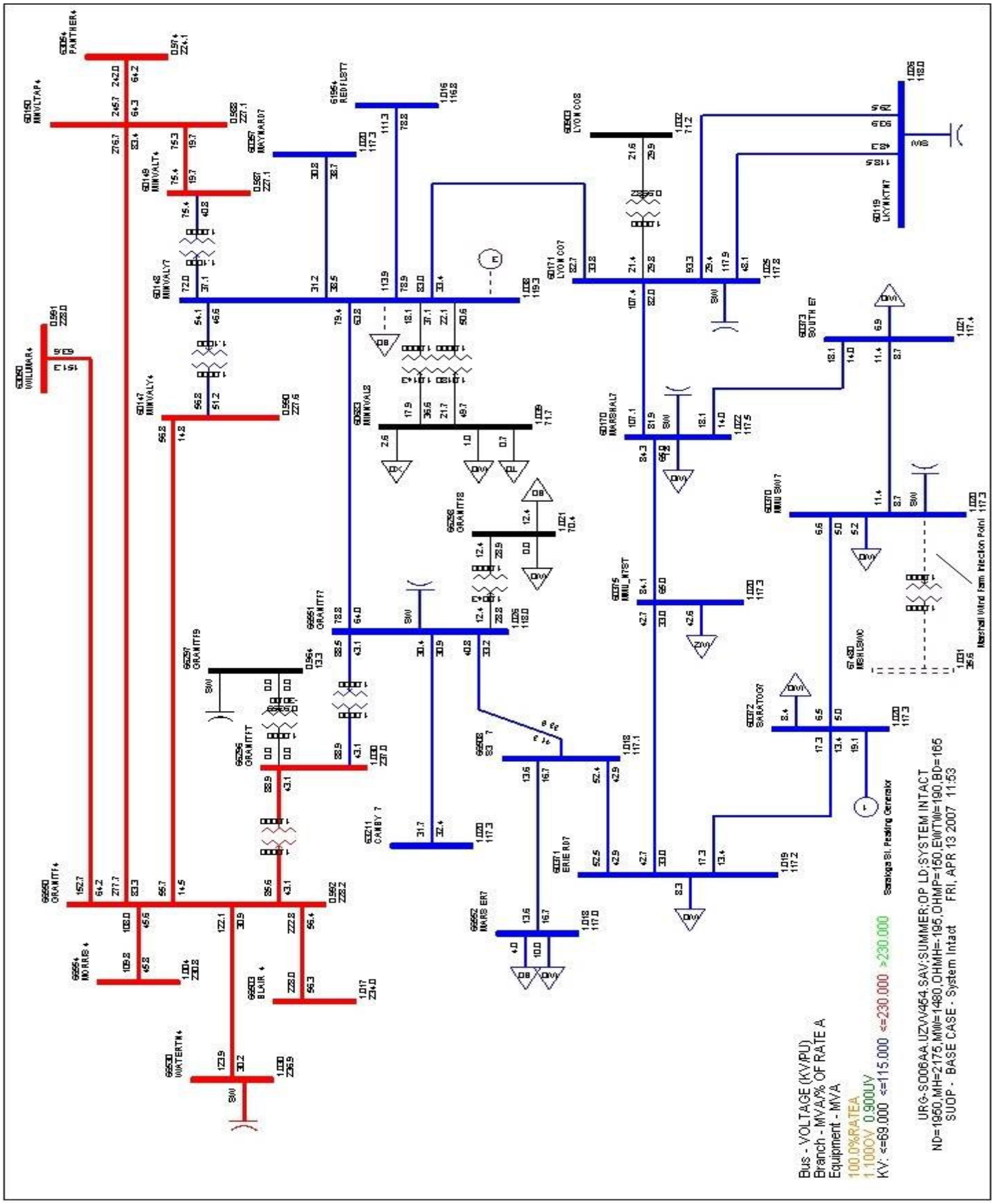
**B.2.2 Change Case**

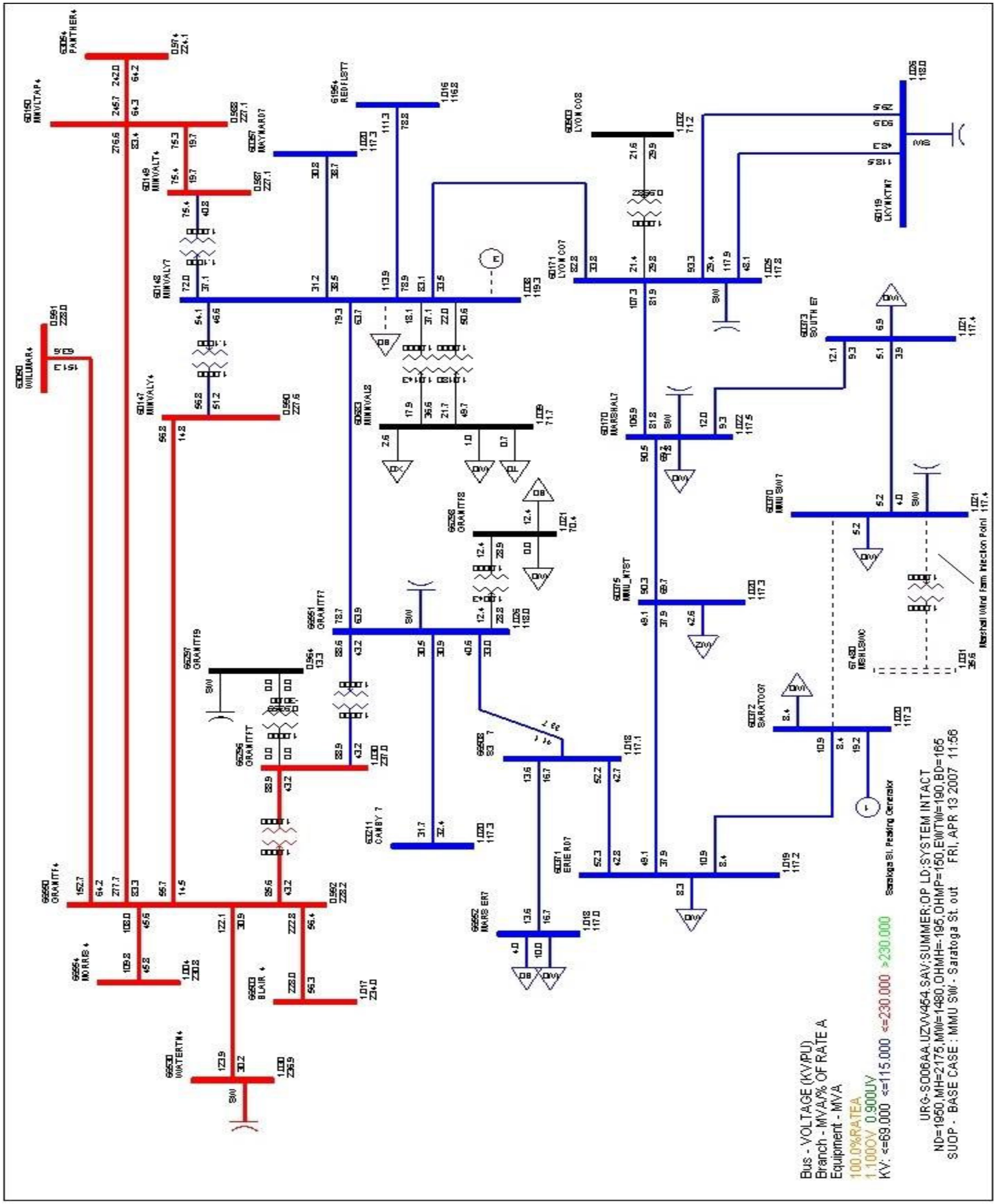
**B.2.2.1 System Intact**

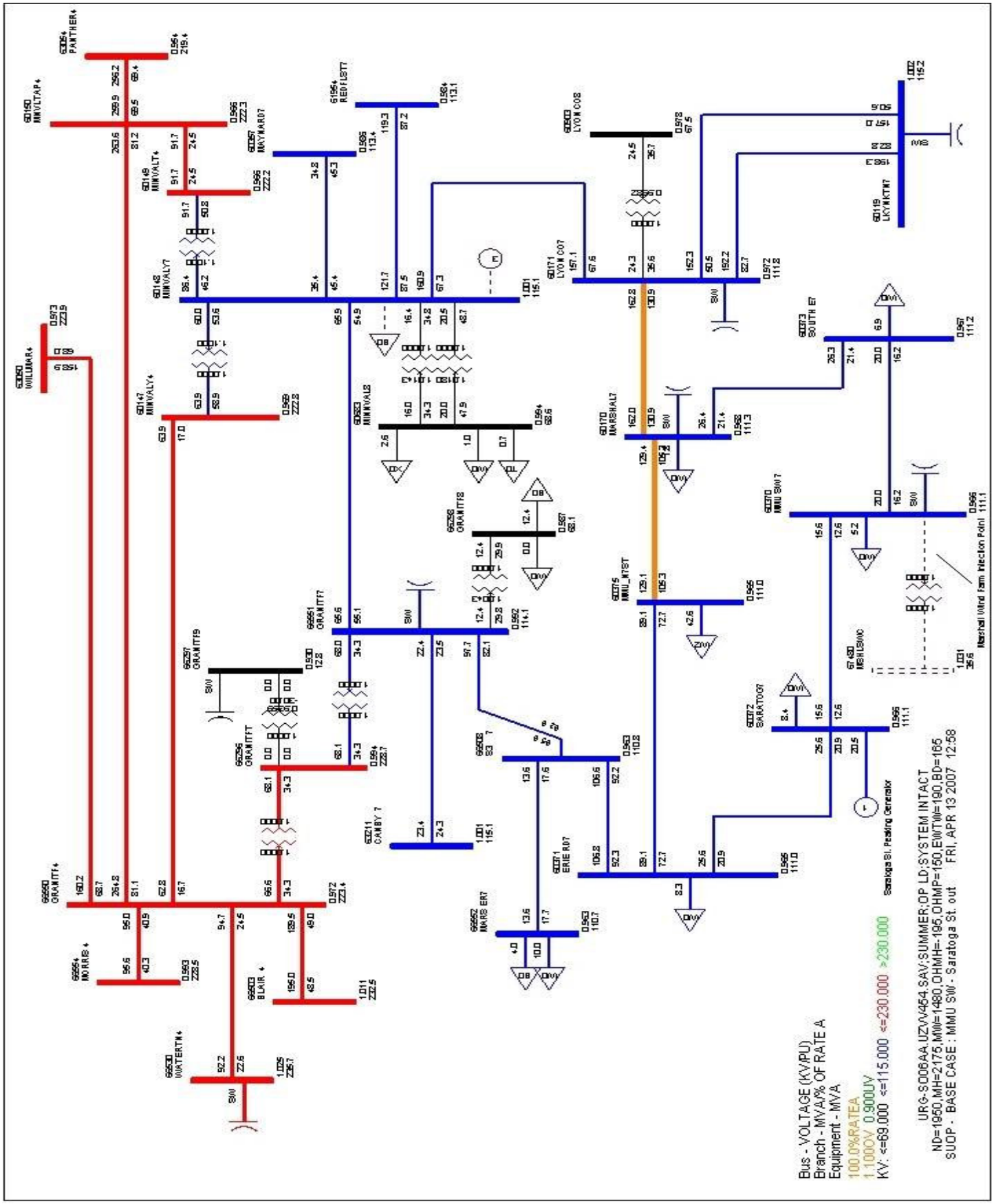
**B.2.2.2 Outage of MMU Southwest – Saratoga Street 115 kV**

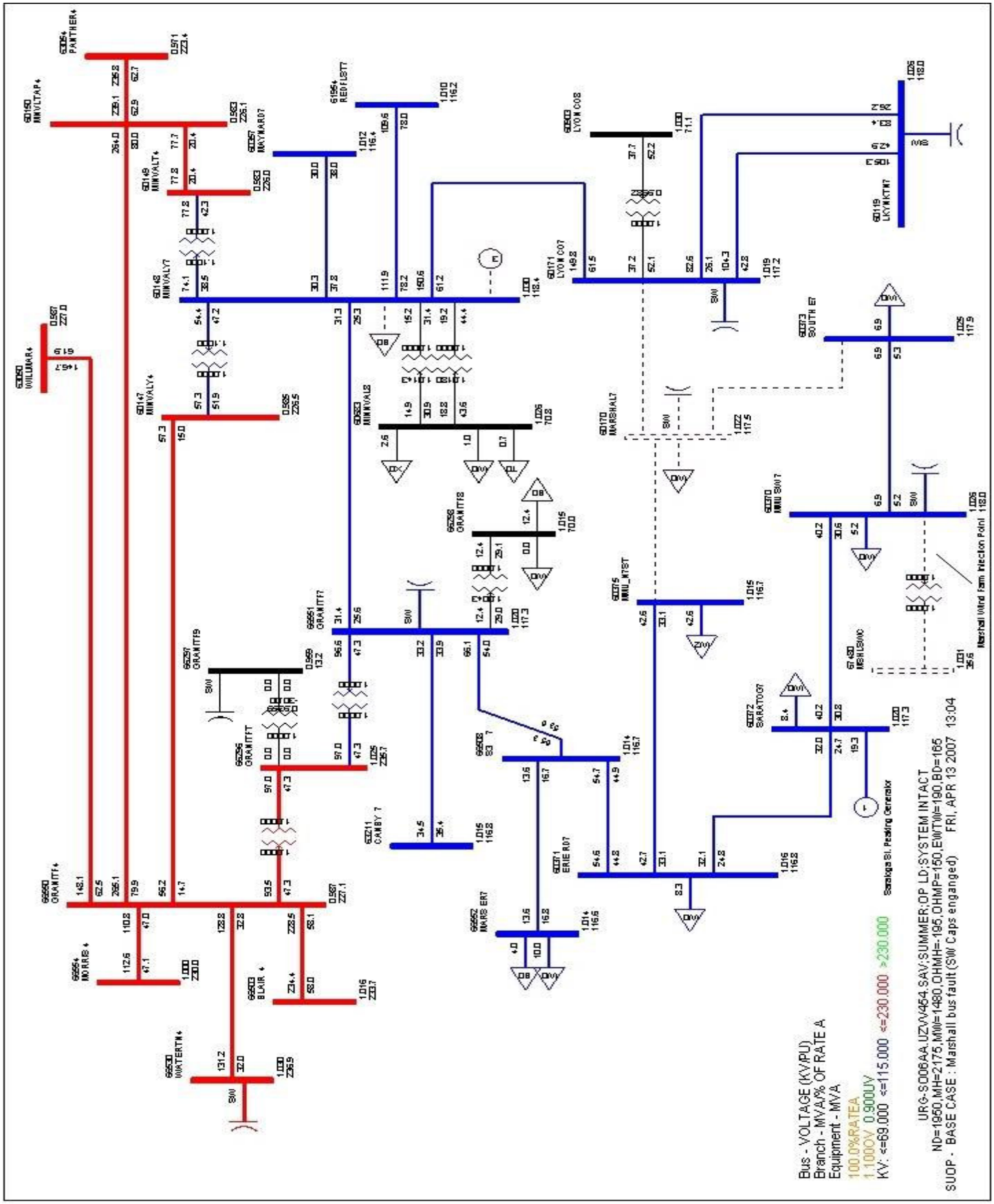
**B.2.2.3 Nobles Co. 345/115 kV transformer / Nobles County – Fenton 115 kV**

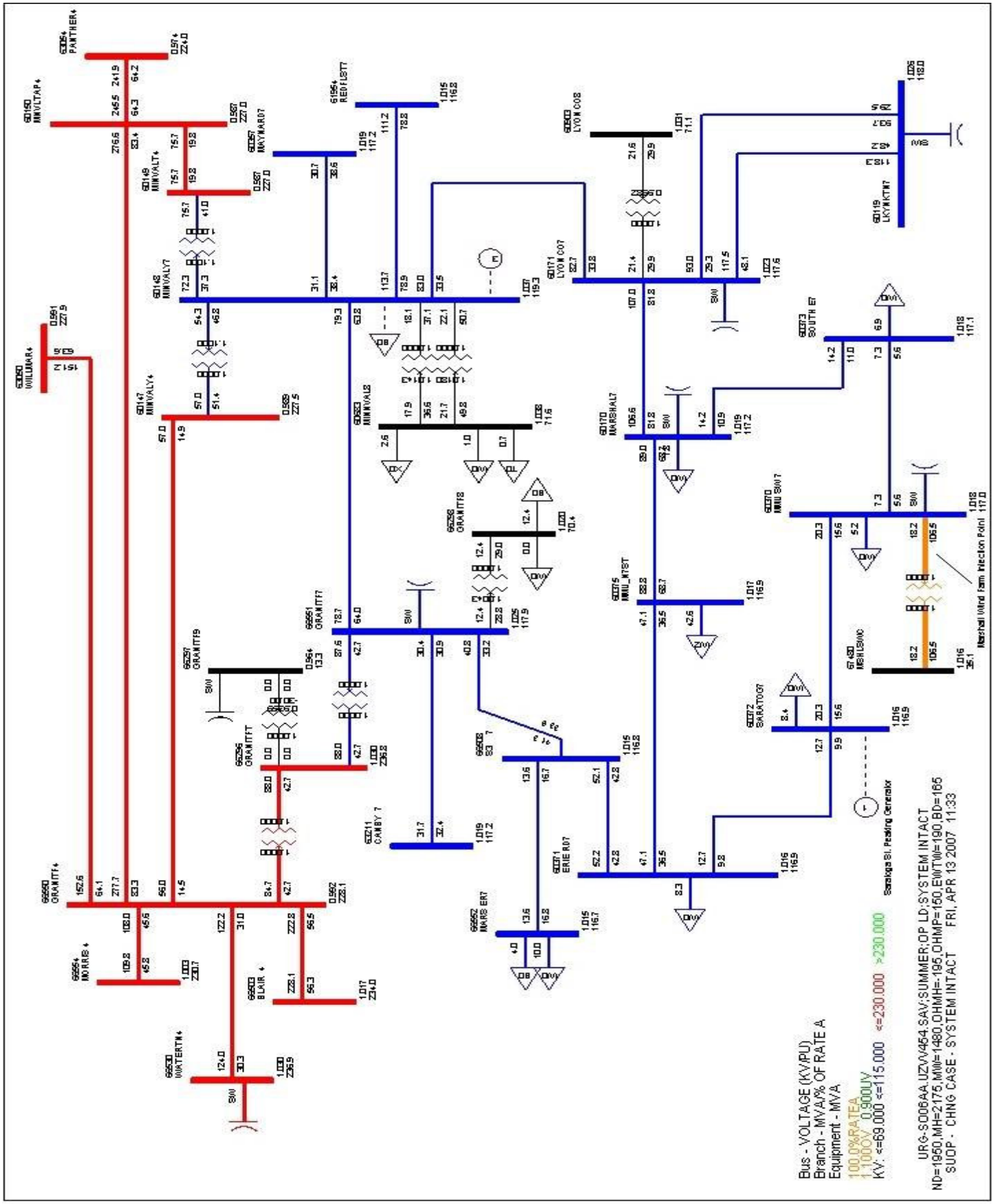
**B.2.2.4 Breaker failure / Bus fault on Marshall Switching Station**

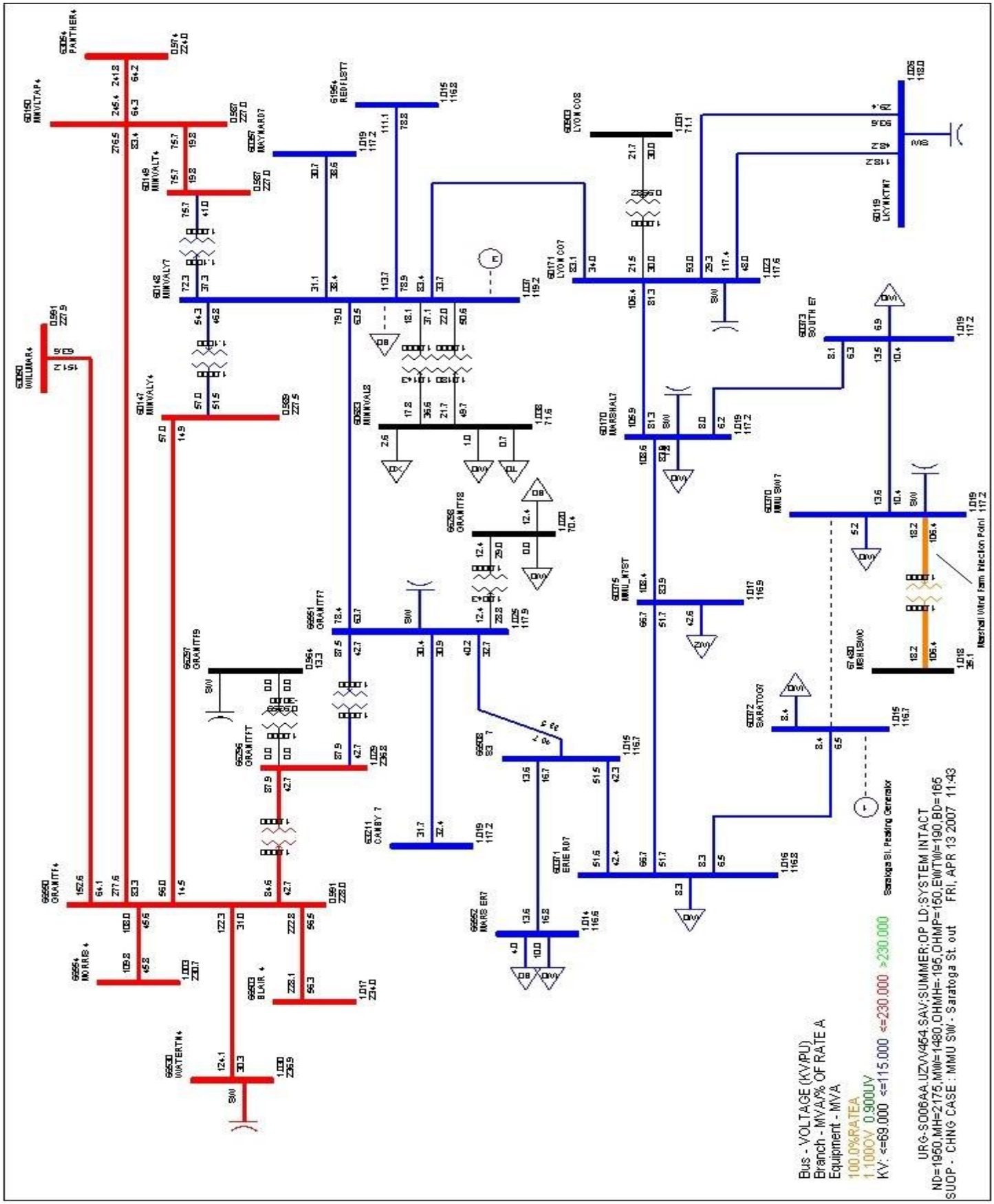

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZV/454.SAV:SUMMER:OP LD:SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EW(T)W=190,BD=165
SUOP - BASE CASE - System Intact FRI, APR 13 2007 11:53
Saratoga St. Peaking Generator
Marshall Wind Farm Interconnection Point

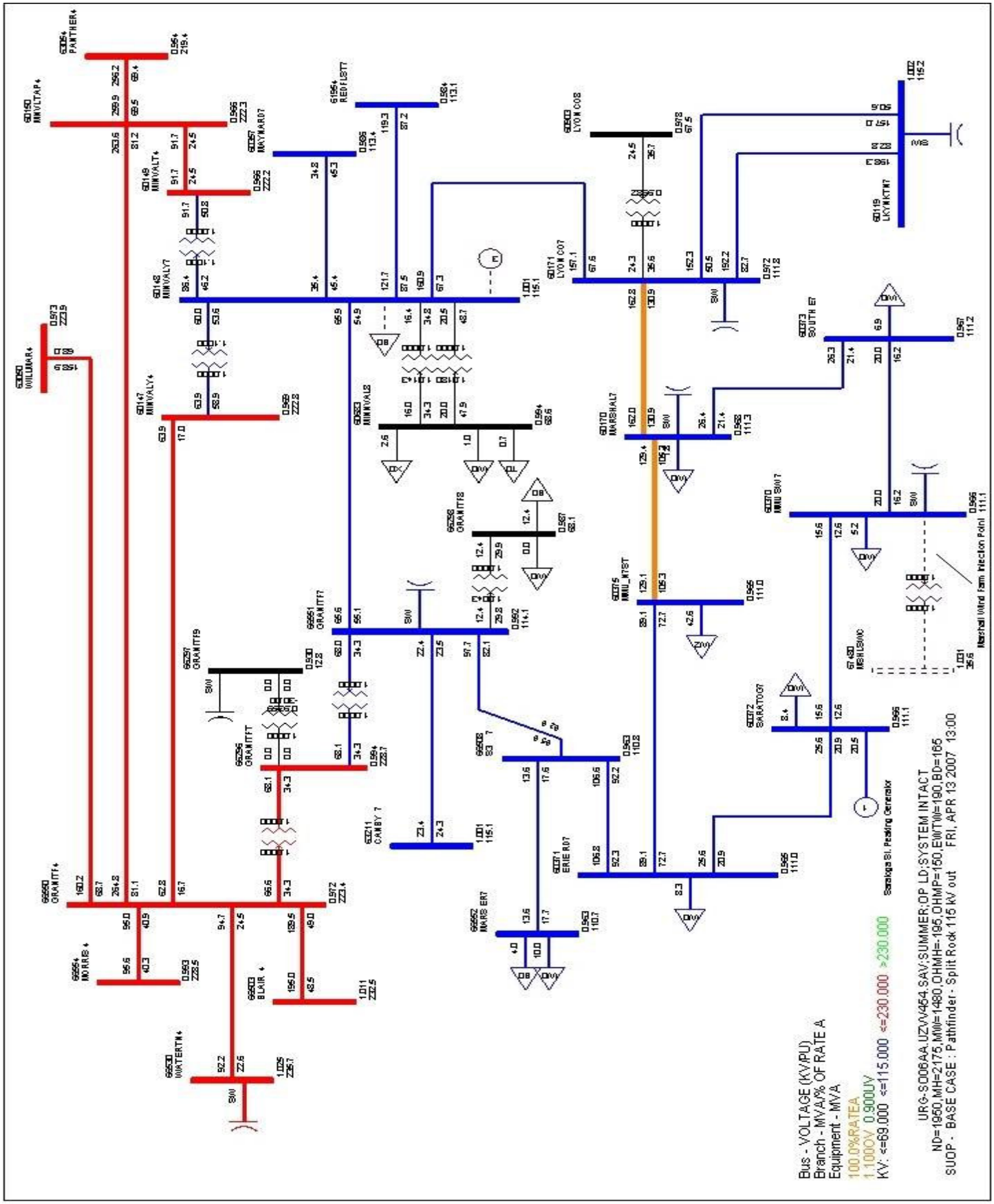

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100OV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - BASE CASE : MMU SW - Saratoga St. out FRI, APR 13 2007 11:56
Saratoga St. Peaking Generator
Marshall Wind Farm Interconnection Point

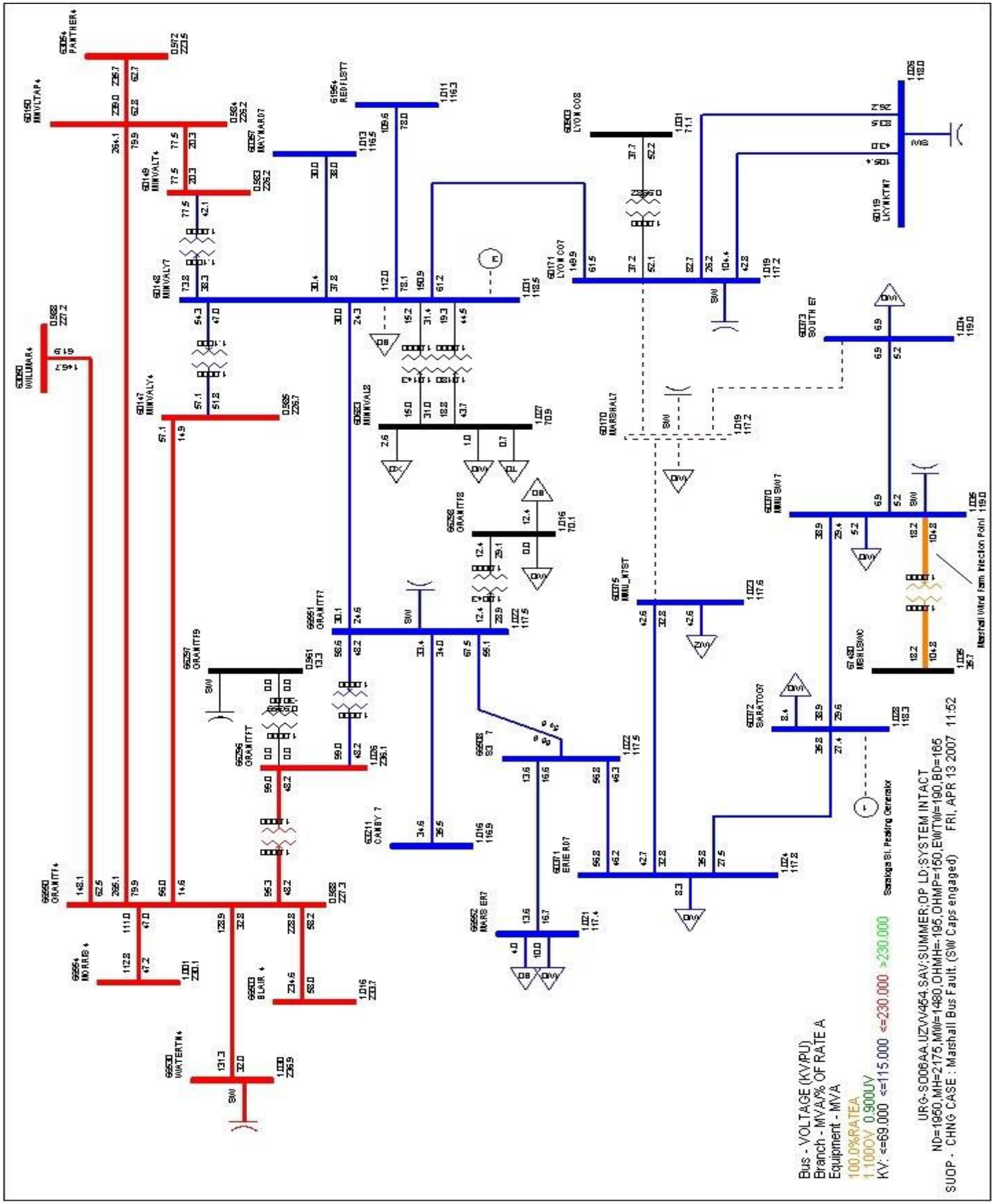

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100UV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - BASE CASE : MMU SW - Saratoga St. out FRI, APR 13 2007 12:58
Marshall Wind Farm Injection Point
Saratoga St. Peaking Generator

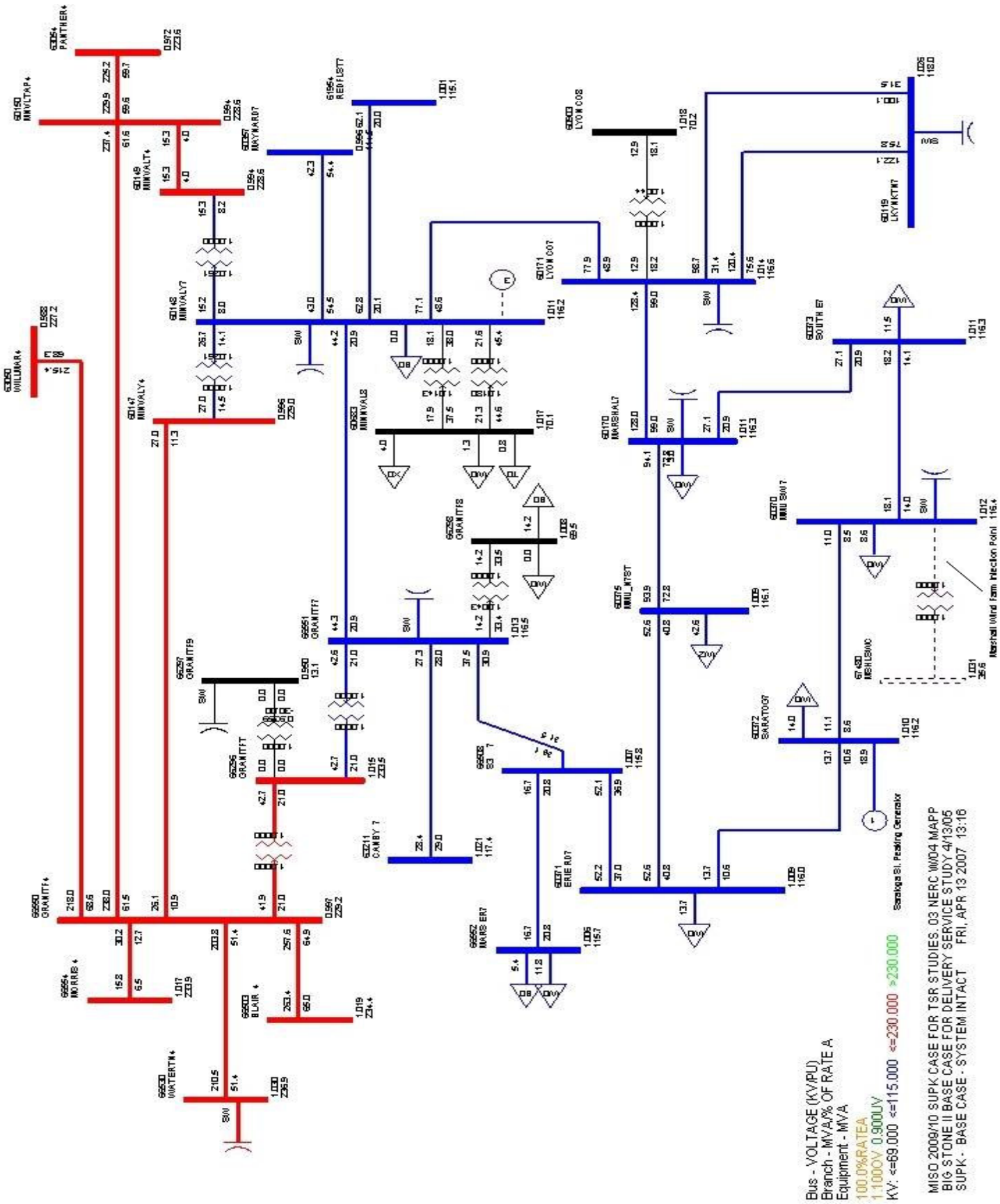

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100UV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - BASE CASE : Marshall bus fault (SW Caps enganged) FRI, APR 13 2007 13:04
Marshall Wind Farm Interior Point
Saratoga St. Peaking Generator

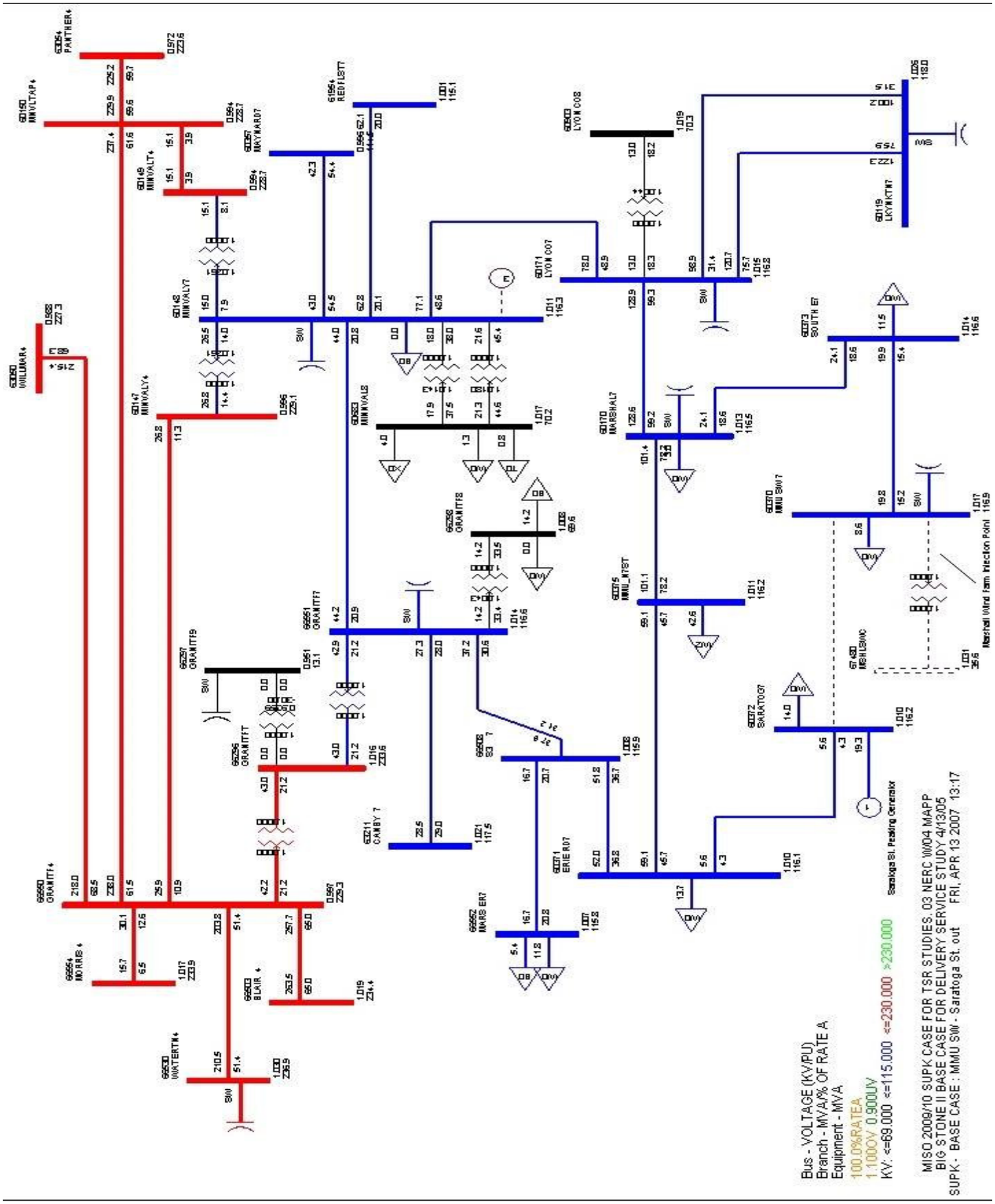

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000UV 0.9000UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - CHNG CASE - SYSTEM INTACT FRI, APR 13 2007 11:33
Marshall Wind Farm Interconnection Point
Saratoga St. Peaking Generator

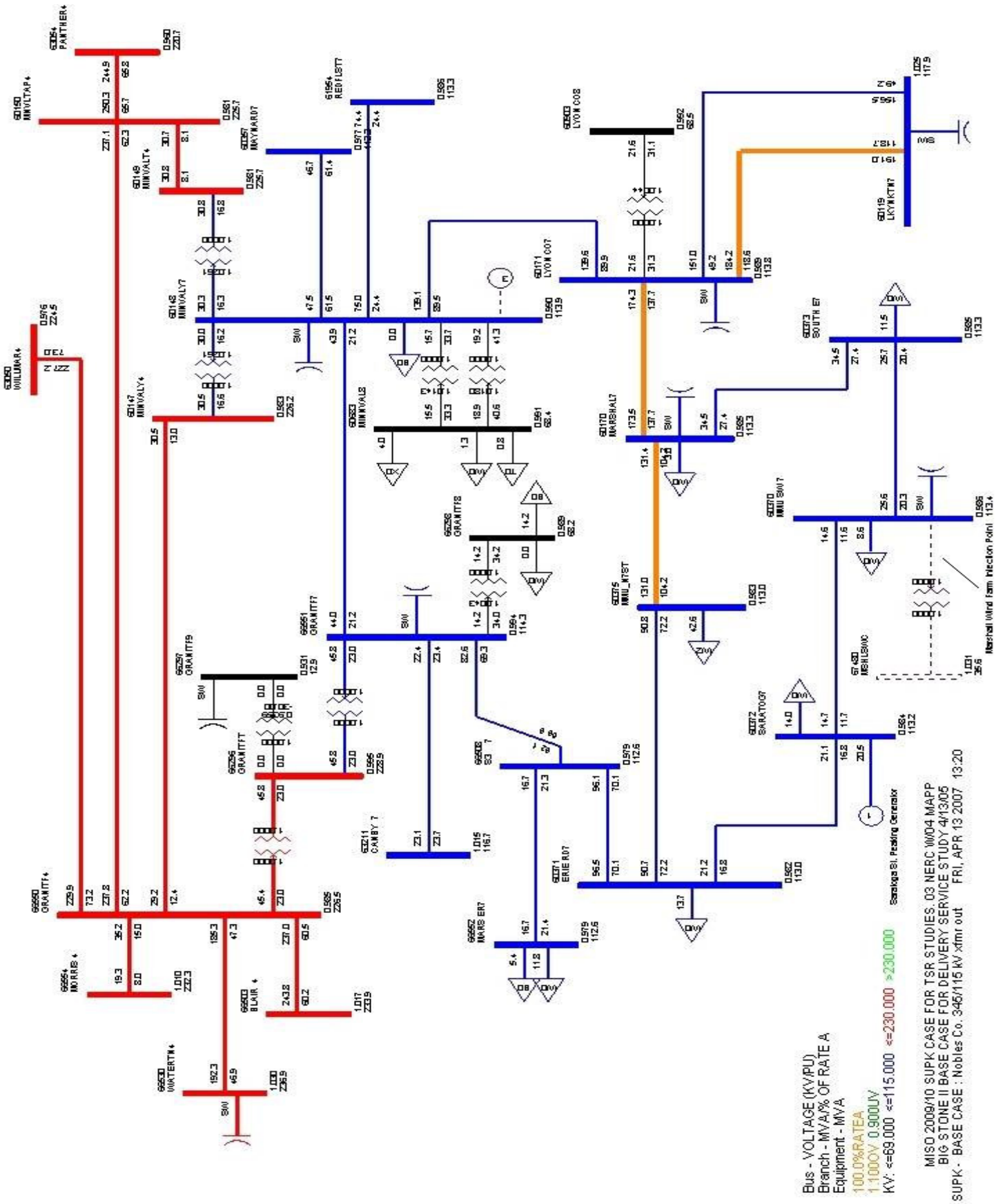

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100UV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - CHNG CASE : MMU SW - Saratoga St. out FRI, APR 13 2007 11:43
Marshall Wind Farm Interior Point
Saratoga St. Peaking Generator

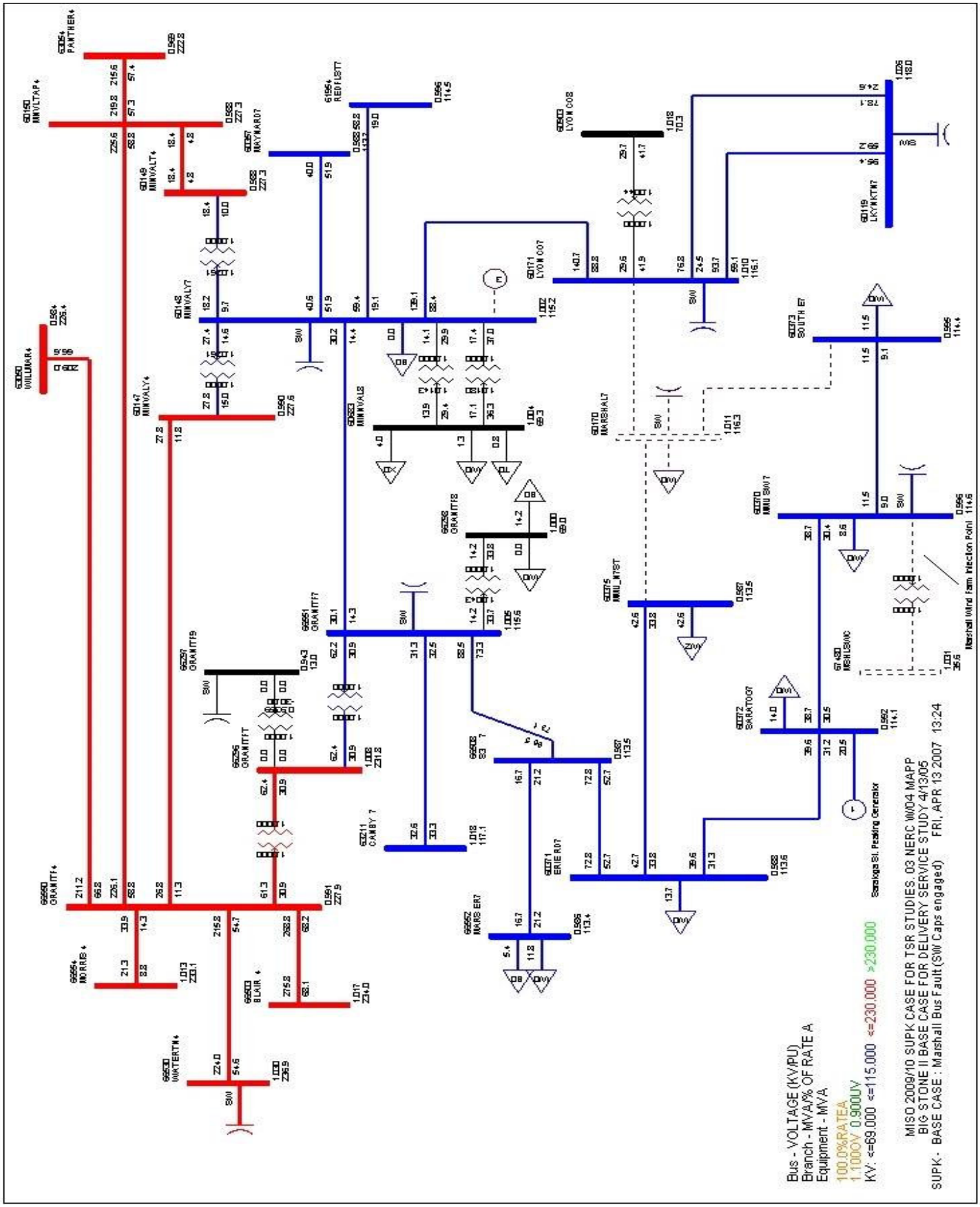

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100UV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - BASE CASE : Pathfinder - Split Rock 115 kV out FRI, APR 13 2007 13:00
Marshall Wind Farm Interconnection Point
Saratoga St. Peaking Generator

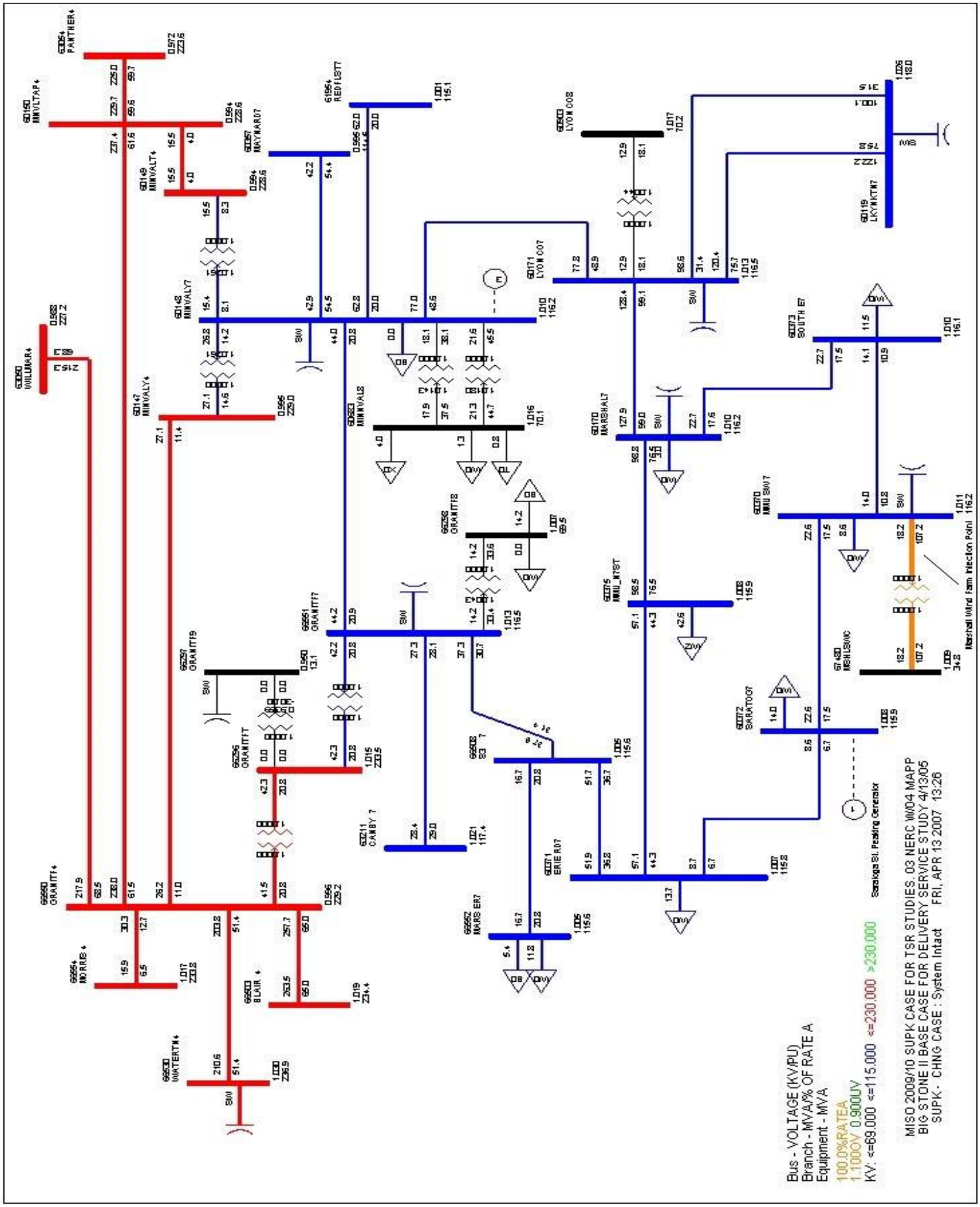

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
URG-S006AA.UZ\V454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
SUOP - CHNG CASE : Marshall Bus Fault. (SW Caps engaged) FRI, APR 13 2007 11:52
Marshall Wind Farm Interconnection Point
Saratoga St. Peaking Generator

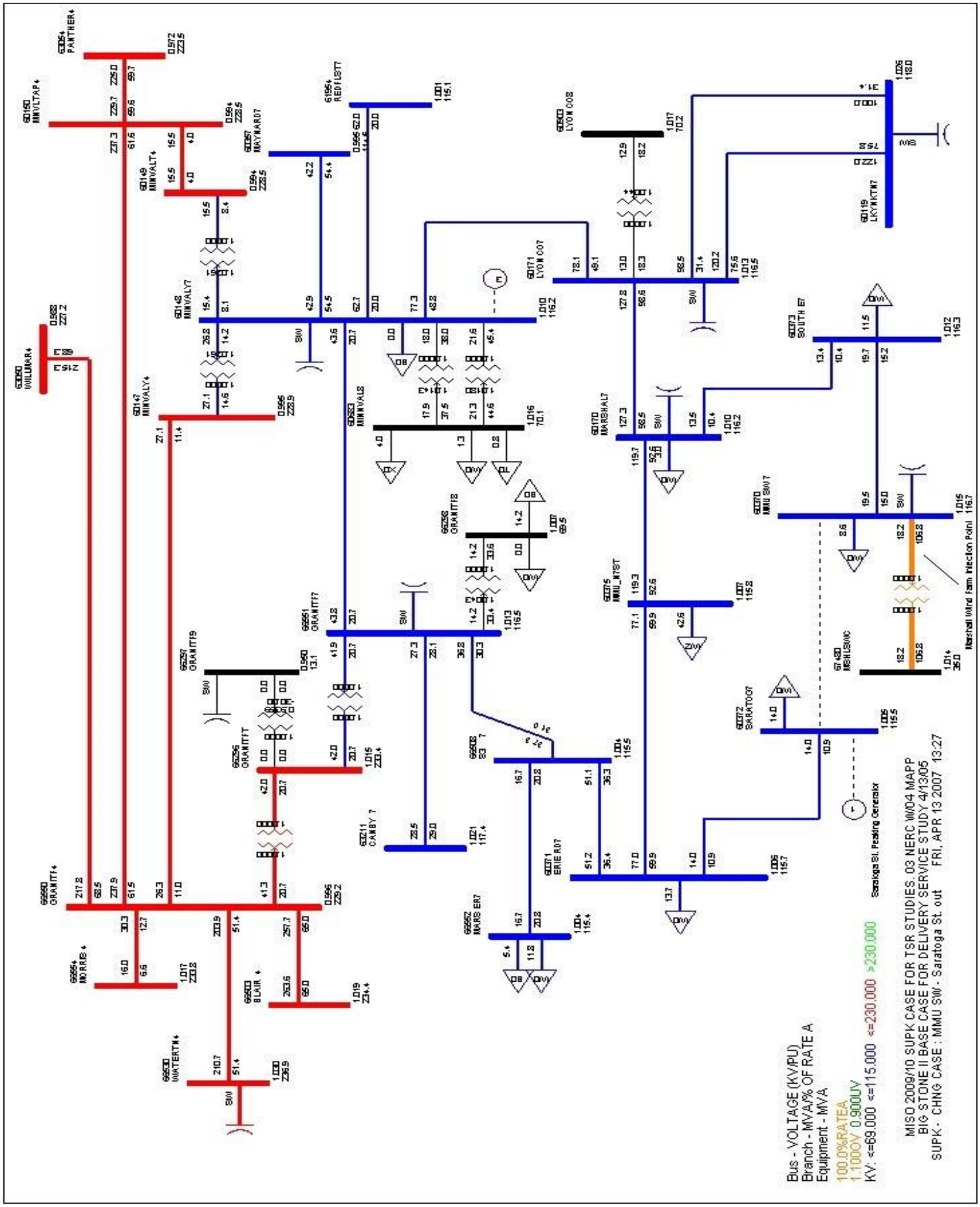

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100OV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - BASE CASE - SYSTEM INTACT FRI, APR 13 2007 13:16
Marshall Wind Farm Interchon Point
Saratoga Sl. Peaking Generator

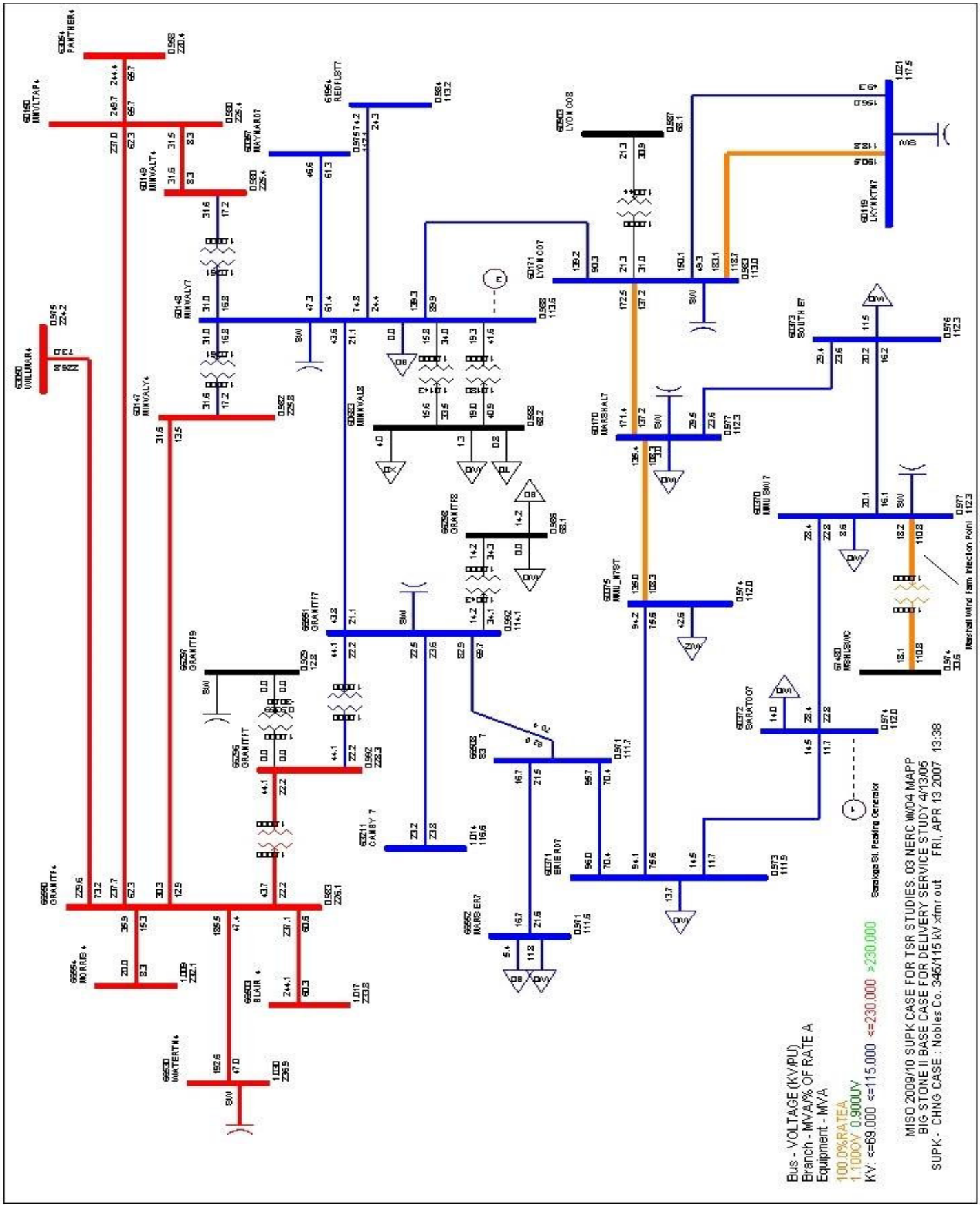

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - BASE CASE : MMU SW - Saratoga St. out FRI, APR 13 2007 13:17
Saratoga St. Peaking Generator
Marshall Wind Farm Interction Point

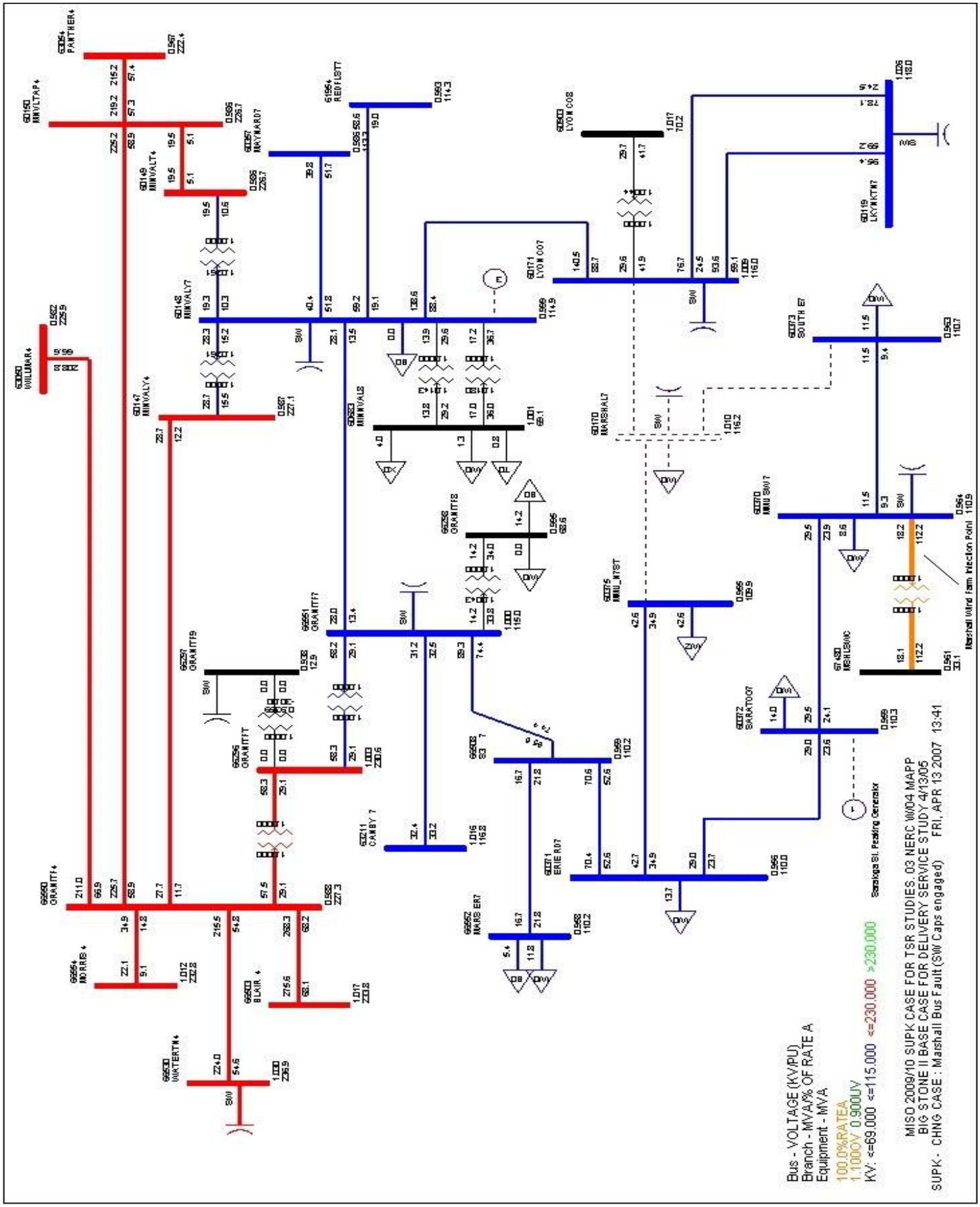

Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.100OV 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - BASE CASE : Nobles Co. 345/115 kV xfmr out FRI, APR 13 2007 13:20
Marshall Wind Farm Interconnection Point


Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 >=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - BASE CASE : Marshall Bus Fault (SW Caps engaged) FRI, APR 13 2007 13:24
Marshall Wind Farm Interconnection Point


Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK- CHNG CASE : System Intact FRI, APR 13 2007 13:26
Marshall Wind Farm Interction Point


Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - CHNG CASE : MMU SW - Saratoga St. out FRI, APR 13 2007 13:27
Saratoga St. Peaking Generator
Marshall Wind Farm Injection Point


Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - CHNG CASE : Nobles Co. 345/115 kV xfmr out FRI, APR 13 2007 13:38
Marshall Wind Farm Interction Point


Bus - VOLTAGE (KV/PU)
Branch - MVA/% OF RATE A
Equipment - MVA
100.0%RATEA
1.1000V 0.900UV
KV: <=69.000 <=115.000 <=230.000 >230.000
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05
SUPK - CHNG CASE : Marshall Bus Fault (SW Caps engaged) FRI, APR 13 2007 13:41
Marshall Wind Farm Interction Point

# Appendix C: Flowgate Analysis

## *C.1 Flowgate Analysis Generation – Generation Summer off-peak*

### C.1.1 Posted DRS list of flowgates

```
***** BASE CASE:
URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

***** ERROR: GETTING LINE FLOW  63311 TO  66550 CKT 1 IERR= 1 (Note this is only relevant for BSPII
runs)
***** ERROR: GETTING LINE FLOW  63314 TO  63050 CKT 1 IERR= 2 (Note this is only relevant for BSPII
runs)

***** CHNG CASE:
URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:    18.900


## PTDF INTERFACES ##

64786 COOPER 3  - 59393 ST JOE 3   BASE:   385.8 CHNG:   385.7 DIFF:     0.0%
64786 COOPER 3  - 96039 7FAIRPT    BASE:   301.3 CHNG:   301.2 DIFF:     0.0%

SUBTOTALS FOR: COOPER_S            BASE:   687.1 CHNG:   686.9 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.7%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    BASE:   650.9 CHNG:   650.8 DIFF:     0.0%

SUBTOTALS FOR: EAUARP__XCEL        BASE:   650.9 CHNG:   650.8 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

60101 FORBES 2  - 60198 CHIS-N 2   BASE:  1777.0 CHNG:  1777.0 DIFF:     0.0%

SUBTOTALS FOR: FORCHS_PTDF         BASE:  1777.0 CHNG:  1777.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

65351 S3451  3  - 65354 S3454  3   BASE:   207.7 CHNG:   207.6 DIFF:     0.0%
65351 S3451  3  - 65359 S3459  3   BASE:   329.1 CHNG:   329.1 DIFF:     0.0%
65451 S1251  5  - 65497 S1297  5   BASE:    75.1 CHNG:    75.1 DIFF:     0.0%

SUBTOTALS FOR: FTCAL_S             BASE:   611.8 CHNG:   611.7 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.5%
*******************************************************************************

64832 GENTLMN4  - 64909 N.PLATT4   BASE:   144.7 CHNG:   144.7 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   145.1 CHNG:   145.1 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   149.3 CHNG:   149.3 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   289.7 CHNG:   289.7 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   347.9 CHNG:   347.9 DIFF:     0.0%
64831 GENTLMN3  - 64943 REDWILO3   BASE:   462.8 CHNG:   462.8 DIFF:     0.0%

SUBTOTALS FOR: GGS                 BASE:  1539.7 CHNG:  1539.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

64933 PAULINE3  - 64902 MOORE  3   BASE:   214.7 CHNG:   214.7 DIFF:     0.0%
```

```
64839 GR ISLD4  - 64780 COLMB.W4   BASE:    74.5 CHNG:    74.6 DIFF:     0.0%
66571 GR ISLD3  - 64896 MCCOOL 3   BASE:   432.2 CHNG:   432.1 DIFF:     0.0%

SUBTOTALS FOR: GRIS_LNC            BASE:   721.4 CHNG:   721.4 DIFF:     0.0%
                                         DIFF:     0.0   DF:    -0.1%
*******************************************************************************

37632 LEECO;BP  - 36362 NELSO; B   BASE:    71.5 CHNG:    71.5 DIFF:     0.0%

SUBTOTALS FOR: LEECONELS           BASE:    71.5 CHNG:    71.5 DIFF:     0.0%
                                         DIFF:     0.0   DF:     0.1%
*******************************************************************************

60175 ROSEAU 4  - 67576 RICHER 4   BASE:  -129.4 CHNG:  -129.4 DIFF:     0.0%
60173 ROSEAUN2  - 67564 DORSEY 2   BASE: -1691.3 CHNG: -1691.3 DIFF:     0.0%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -281.6 CHNG:  -281.6 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:   -26.0 CHNG:   -26.0 DIFF:     0.0%

SUBTOTALS FOR: MHEX_N+             BASE: -2128.3 CHNG: -2128.4 DIFF:     0.0%
                                         DIFF:     0.0   DF:    -0.1%
*******************************************************************************

67576 RICHER 4  - 60175 ROSEAU 4   BASE:   131.5 CHNG:   131.5 DIFF:     0.0%
67564 DORSEY 2  - 60173 ROSEAUN2   BASE:  1729.5 CHNG:  1729.6 DIFF:     0.0%
67557 LETELER4  - 66752 DRAYTON4   BASE:   288.0 CHNG:   288.0 DIFF:     0.0%
67523 GLENBOR4  - 63379 RUGBY  4   BASE:    26.1 CHNG:    26.1 DIFF:     0.0%

SUBTOTALS FOR: MHEX_S+             BASE:  2175.1 CHNG:  2175.2 DIFF:     0.0%
                                         DIFF:     0.0   DF:     0.1%
*******************************************************************************

68613 AUBURNT4  - 67525 RESTON 4   BASE:   121.7 CHNG:   121.7 DIFF:     0.0%
68615 YORKTON4  - 67514 ROBLIN 4   BASE:   -37.7 CHNG:   -37.7 DIFF:     0.0%
68630 EBCAMPB4  - 67515 RALL   4   BASE:  -139.0 CHNG:  -139.0 DIFF:     0.0%

SUBTOTALS FOR: MH_SPC_E+           BASE:   -55.0 CHNG:   -55.0 DIFF:     0.0%
                                         DIFF:     0.0   DF:     0.0%
*******************************************************************************

67525 RESTON 4  - 68613 AUBURNT4   BASE:  -120.5 CHNG:  -120.5 DIFF:     0.0%
67514 ROBLIN 4  - 68615 YORKTON4   BASE:    37.9 CHNG:    37.9 DIFF:     0.0%
67515 RALL   4  - 68630 EBCAMPB4   BASE:   143.4 CHNG:   143.4 DIFF:     0.0%

SUBTOTALS FOR: MH_SPC_W+           BASE:    60.8 CHNG:    60.8 DIFF:     0.0%
                                         DIFF:     0.0   DF:     0.0%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   BASE:   -49.5 CHNG:   -49.5 DIFF:    -0.1%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -49.5 CHNG:   -49.5 DIFF:    -0.1%
                                         DIFF:     0.1   DF:     0.3%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   BASE:   833.9 CHNG:   833.7 DIFF:     0.0%
60304 EAU CL 3  - 39244 ARP 345    BASE:   650.9 CHNG:   650.8 DIFF:     0.0%

SUBTOTALS FOR: MWSI                BASE:  1484.7 CHNG:  1484.5 DIFF:     0.0%
                                         DIFF:    -0.3   DF:    -1.4%
*******************************************************************************

66756 SQBUTTE4  - 63049 STANTON4   BASE:   -67.2 CHNG:   -67.2 DIFF:     0.0%
66756 SQBUTTE4  - 66751 CENTER 4   BASE:     6.6 CHNG:     6.6 DIFF:     0.0%
66756 SQBUTTE4  - 66791 CENTER 3   BASE:    58.9 CHNG:    58.9 DIFF:     0.0%
63041 COAL CR4  - 63042 COAL TP4   BASE:   -13.5 CHNG:   -13.5 DIFF:     0.0%
63041 COAL CR4  - 63049 STANTON4   BASE:   -78.4 CHNG:   -78.4 DIFF:     0.0%
63041 COAL CR4  - 63381 UNDERWD4   BASE:    89.7 CHNG:    89.7 DIFF:     0.0%

SUBTOTALS FOR: NDDC                BASE:    -3.8 CHNG:    -3.8 DIFF:     0.0%
                                         DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

```
67105 LELANDO3  - 66506 FTTHOMP3   BASE:   358.4 CHNG:   358.3 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   416.7 CHNG:   416.7 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   381.0 CHNG:   381.0 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   300.3 CHNG:   300.2 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:   108.0 CHNG:   108.0 DIFF:     0.0%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   135.5 CHNG:   135.5 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:    98.8 CHNG:    98.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:   114.2 CHNG:   114.2 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:   117.1 CHNG:   117.0 DIFF:     0.0%
61638 AKELEY7   - 61640 BADOURA7   BASE:     9.7 CHNG:     9.7 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    51.0 CHNG:    51.0 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:    43.3 CHNG:    43.3 DIFF:     0.0%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    40.9 CHNG:    40.9 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:    31.6 CHNG:    31.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    26.3 CHNG:    26.4 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    20.2 CHNG:    20.2 DIFF:     0.1%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -288.0 CHNG:  -288.0 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:   -26.1 CHNG:   -26.1 DIFF:     0.0%

SUBTOTALS FOR: NDEX                BASE:  1938.8 CHNG:  1938.8 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   358.4 CHNG:   358.3 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   416.7 CHNG:   416.7 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   381.0 CHNG:   381.0 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   300.3 CHNG:   300.2 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:   108.0 CHNG:   108.0 DIFF:     0.0%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   135.5 CHNG:   135.5 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:    98.8 CHNG:    98.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:   114.2 CHNG:   114.2 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:   117.1 CHNG:   117.0 DIFF:     0.0%
61638 AKELEY7   - 61640 BADOURA7   BASE:     9.7 CHNG:     9.7 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    51.0 CHNG:    51.0 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:    43.3 CHNG:    43.3 DIFF:     0.0%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    40.9 CHNG:    40.9 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:    31.6 CHNG:    31.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    26.3 CHNG:    26.4 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    20.2 CHNG:    20.2 DIFF:     0.1%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -288.0 CHNG:  -288.0 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:   -26.1 CHNG:   -26.1 DIFF:     0.0%
63311 ********  - 66550 GRANITF4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
63314 BIGSTON4  - 63050 WILLMAR4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: NDEX-BSP2           BASE:  1938.8 CHNG:  1938.8 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   BASE:   833.9 CHNG:   833.7 DIFF:     0.0%

SUBTOTALS FOR: PR_ISL_BYRON        BASE:   833.9 CHNG:   833.7 DIFF:     0.0%
                                          DIFF:    -0.1   DF:    -0.8%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   BASE:   174.4 CHNG:   174.5 DIFF:     0.0%
64400 MECCORD3  - 64403 E MOLIN3   BASE:    24.7 CHNG:    24.7 DIFF:     0.1%

SUBTOTALS FOR: QUADCITY_W          BASE:   199.1 CHNG:   199.2 DIFF:     0.0%
                                          DIFF:     0.1   DF:     0.4%
*******************************************************************************

64831 GENTLMN3  - 64943 REDWILO3   BASE:   462.8 CHNG:   462.8 DIFF:     0.0%

SUBTOTALS FOR: WNE_WKS             BASE:   462.8 CHNG:   462.8 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.2%
*******************************************************************************



66756 SQBUTTE4  - 63049 STANTON4   BASE:   -67.2 CHNG:   -67.2 DIFF:     0.0%
```

```
66756 SQBUTTE4  - 66751 CENTER 4   BASE:     6.6 CHNG:     6.6 DIFF:     0.0%
66756 SQBUTTE4  - 66791 CENTER 3   BASE:    58.9 CHNG:    58.9 DIFF:     0.0%

SUBTOTALS FOR: Y2DC                BASE:    -1.7 CHNG:    -1.7 DIFF:     0.0%
                                             DIFF:     0.0   DF:     0.0%
*******************************************************************************

## OTDF INTERFACES ##

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34045 ALBANY 6  - 36773 GARDE;     BASE:    89.5 CHNG:    89.5 DIFF:     0.0%

SUBTOTALS FOR: ALBGARQUAST         BASE:    89.5 CHNG:    89.5 DIFF:     0.0%
                                             DIFF:     0.0   DF:    -0.1%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34091 ARNOLD 5  - 34089 VINTON 5   BASE:    37.1 CHNG:    37.1 DIFF:     0.1%

SUBTOTALS FOR: ARNVINARNHAZ        BASE:    37.1 CHNG:    37.1 DIFF:     0.1%
                                             DIFF:     0.0   DF:     0.2%
*******************************************************************************

36280 BYRON; B  - 36288 CHERR; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36281 BYRON; R  - 36289 CHERR; R   BASE:  1283.4 CHNG:  1283.4 DIFF:     0.0%

SUBTOTALS FOR: BYCHEBYCHE          BASE:  1283.4 CHNG:  1283.4 DIFF:     0.0%
                                             DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64425 DAVNPRT5  - 34909 ********   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: DAVCALQUARCK        BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
                                             DIFF:     0.0   DF:     0.0%
*******************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64350 HILLS  3  - 34110 HILLSIE5   BASE:     8.2 CHNG:     8.2 DIFF:     0.4%

SUBTOTALS FOR: HLSXFMTIFARN        BASE:     8.2 CHNG:     8.2 DIFF:     0.4%
                                             DIFF:     0.0   DF:     0.2%
*******************************************************************************

57981 LACYGNE7  - 57968 STILWEL7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57981 LACYGNE7  - 57965 W.GRDNR7   BASE:   866.2 CHNG:   866.3 DIFF:     0.0%

SUBTOTALS FOR: LACWGRLACSTI        BASE:   866.2 CHNG:   866.3 DIFF:     0.0%
                                             DIFF:     0.0   DF:     0.3%
*******************************************************************************

36310 ELECT; B  - 36362 NELSO; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
37632 LEECO;BP  - 36280 BYRON; B   BASE:   209.8 CHNG:   209.7 DIFF:     0.0%

SUBTOTALS FOR: LEEBYREJNEL         BASE:   209.8 CHNG:   209.7 DIFF:     0.0%
                                             DIFF:    -0.1   DF:    -0.3%
*******************************************************************************



60331 LKFLDXL3  - 60108 WILMART3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
```

```
-------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:    42.1 CHNG:    42.1 DIFF:     0.1%

SUBTOTALS FOR: LKFFOXLKGWLM        BASE:    42.1 CHNG:    42.1 DIFF:     0.1%
                                            DIFF:     0.0   DF:     0.1%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34028 LORE   5  - 34033 TRK RIV5   BASE:    28.2 CHNG:    28.3 DIFF:     0.0%

SUBTOTALS FOR: LORTRKWEMPAD        BASE:    28.2 CHNG:    28.3 DIFF:     0.0%
                                            DIFF:     0.0   DF:     0.1%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34185 POWESHK5  - 34191 REASNOR5   BASE:    -0.2 CHNG:    -0.2 DIFF:   -11.6%

SUBTOTALS FOR: POWREAMTZBON        BASE:    -0.2 CHNG:    -0.2 DIFF:   -11.6%
                                            DIFF:     0.0   DF:     0.1%
*******************************************************************************

65351 S3451  3  - 63875 RAUN   3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
65426 S1226  5  - 64987 TEKAMAH5   BASE:  -110.6 CHNG:  -110.6 DIFF:     0.0%

SUBTOTALS FOR: S1226TEKAMAH        BASE:  -110.6 CHNG:  -110.6 DIFF:     0.0%
                                            DIFF:     0.0   DF:     0.2%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   124.5 CHNG:   124.5 DIFF:     0.0%

SUBTOTALS FOR: SALXFMQUADAV        BASE:   124.5 CHNG:   124.5 DIFF:     0.0%
                                            DIFF:     0.0   DF:     0.1%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   123.6 CHNG:   123.6 DIFF:     0.0%

SUBTOTALS FOR: SALXFMWEMPAD        BASE:   123.6 CHNG:   123.6 DIFF:     0.0%
                                            DIFF:     0.0   DF:     0.1%
*******************************************************************************

63875 RAUN   3  - 34006 LAKEFLD3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
66563 SPENCER5  - 34137 TRIBOJI5   BASE:   -27.3 CHNG:   -27.2 DIFF:    -0.3%

SUBTOTALS FOR: SPETRILAKRAU        BASE:   -27.3 CHNG:   -27.2 DIFF:    -0.3%
                                            DIFF:     0.1   DF:     0.4%
*******************************************************************************

56873 SUMMIT 6  - 56872 EMCPHER6   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -15.3 CHNG:   -15.3 DIFF:     0.0%
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -17.9 CHNG:   -17.9 DIFF:     0.0%

SUBTOTALS FOR: SPHWMCSUMEMC        BASE:   -33.2 CHNG:   -33.2 DIFF:     0.0%
                                            DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

## C.1.2 Flowgates monitored by the MAPP OASIS

```
***** BASE CASE:
URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

***** ERROR: GETTING LINE FLOW  63311 TO  66550 CKT 1 IERR= 1 (Note this is only relevant for BSPII
runs)
***** ERROR: GETTING LINE FLOW  63314 TO  63050 CKT 1 IERR= 2 (Note this is only relevant for BSPII
runs)

***** CHNG CASE:
URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:    18.900


## PTDF INTERFACES ##

39247 ARCADN3   - 36420 ZION ; B   BASE:   121.8 CHNG:   121.8 DIFF:     0.0%

SUBTOTALS FOR: ADNZIO__PTDF        BASE:   121.8 CHNG:   121.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.2%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   BASE:  -607.6 CHNG:  -607.6 DIFF:     0.0%
36407 WEMPL; R  - 39058 PAD 345    BASE:    93.7 CHNG:    93.7 DIFF:     0.0%

SUBTOTALS FOR: WEMPAD__PTDF        BASE:  -513.9 CHNG:  -513.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    BASE:   650.9 CHNG:   650.8 DIFF:     0.0%

SUBTOTALS FOR: EAUARP__PTDF        BASE:   650.9 CHNG:   650.8 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

69503 CASVILL5  - 39010 NED 161    BASE:    -5.3 CHNG:    -5.3 DIFF:    -0.1%

SUBTOTALS FOR: CSVNED__PTDF        BASE:    -5.3 CHNG:    -5.3 DIFF:    -0.1%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

36406 WEMPL; B  - 39119 ROE 345    BASE:   339.7 CHNG:   339.7 DIFF:     0.0%

SUBTOTALS FOR: WEMROE__PTDF        BASE:   339.7 CHNG:   339.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

31230 MONTGMRY  - 31992 SPENCER    BASE:   137.0 CHNG:   137.1 DIFF:     0.0%

SUBTOTALS FOR: MTGSPC__PTDF        BASE:   137.0 CHNG:   137.1 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
*******************************************************************************

31408 OVERTON   - 59201 SIBLEY 7   BASE:   -77.7 CHNG:   -77.7 DIFF:     0.0%

SUBTOTALS FOR: OVESIB__PTDF        BASE:   -77.7 CHNG:   -77.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

39249 ALBERS-2  - 39410 PARIS WE   BASE:    12.1 CHNG:    12.1 DIFF:     0.1%

SUBTOTALS FOR: ALBPRS__PTDF        BASE:    12.1 CHNG:    12.1 DIFF:     0.1%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

```
39253 ARCADN1   - 39329 GRANVL1    BASE:  -244.7 CHNG:  -244.7 DIFF:     0.0%

SUBTOTALS FOR: ARCGVL__PTDF        BASE:  -244.7 CHNG:  -244.7 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

38894 N APP 3   - 39785 ROCKY RN   BASE:  -113.0 CHNG:  -112.9 DIFF:    -0.1%

SUBTOTALS FOR: NAPRRN__PTDF        BASE:  -113.0 CHNG:  -112.9 DIFF:    -0.1%
                                                DIFF:     0.1   DF:     0.5%
*******************************************************************************

38849 PLS PR2   - 36421 ZION ; R   BASE:   737.2 CHNG:   737.1 DIFF:     0.0%

SUBTOTALS FOR: PLPZION_PTDF        BASE:   737.2 CHNG:   737.1 DIFF:     0.0%
                                                DIFF:    -0.1   DF:    -0.3%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    BASE:  -121.4 CHNG:  -121.3 DIFF:     0.0%

SUBTOTALS FOR: ZIOARC__PTDF        BASE:  -121.4 CHNG:  -121.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

36421 ZION ; R  - 38849 PLS PR2    BASE:  -735.1 CHNG:  -735.0 DIFF:     0.0%

SUBTOTALS FOR: ZIOPLP__PTDF        BASE:  -735.1 CHNG:  -735.0 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.3%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   BASE:    -2.5 CHNG:    -2.4 DIFF:    -4.5%

SUBTOTALS FOR: ARNHAZ__PTDF        BASE:    -2.5 CHNG:    -2.4 DIFF:    -4.5%
                                                DIFF:     0.1   DF:     0.6%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   BASE:   277.6 CHNG:   277.6 DIFF:     0.0%
64400 MECCORD3  - 64403 E MOLIN3   BASE:    24.7 CHNG:    24.7 DIFF:     0.1%

SUBTOTALS FOR: QUARCKCORMOL        BASE:   302.3 CHNG:   302.3 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.3%
*******************************************************************************

34036 ROCK CK3  - 34037 ROCK CK5   BASE:   165.6 CHNG:   165.6 DIFF:     0.0%

SUBTOTALS FOR: RCKXFM__PTDF        BASE:   165.6 CHNG:   165.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   BASE:   277.6 CHNG:   277.6 DIFF:     0.0%

SUBTOTALS FOR: QUARCK__PTDF        BASE:   277.6 CHNG:   277.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   358.4 CHNG:   358.3 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   416.7 CHNG:   416.7 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   381.0 CHNG:   381.0 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   300.3 CHNG:   300.2 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:   108.0 CHNG:   108.0 DIFF:     0.0%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   135.5 CHNG:   135.5 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:    98.8 CHNG:    98.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:   114.2 CHNG:   114.2 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:   117.1 CHNG:   117.0 DIFF:     0.0%
61638 AKELEY7   - 61640 BADOURA7   BASE:     9.7 CHNG:     9.7 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    51.0 CHNG:    51.0 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:    43.3 CHNG:    43.3 DIFF:     0.0%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    40.9 CHNG:    40.9 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:    31.6 CHNG:    31.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    26.3 CHNG:    26.4 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    20.2 CHNG:    20.2 DIFF:     0.1%
```

```
66752 DRAYTON4  - 67557 LETELER4   BASE:  -288.0 CHNG:  -288.0 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:   -26.1 CHNG:   -26.1 DIFF:     0.0%

SUBTOTALS FOR: NDEX                BASE:  1938.8 CHNG:  1938.8 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   358.4 CHNG:   358.3 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   416.7 CHNG:   416.7 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   381.0 CHNG:   381.0 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   300.3 CHNG:   300.2 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:   108.0 CHNG:   108.0 DIFF:     0.0%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   135.5 CHNG:   135.5 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:    98.8 CHNG:    98.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:   114.2 CHNG:   114.2 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:   117.1 CHNG:   117.0 DIFF:     0.0%
61638 AKELEY7   - 61640 BADOURA7   BASE:     9.7 CHNG:     9.7 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    51.0 CHNG:    51.0 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:    43.3 CHNG:    43.3 DIFF:     0.0%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    40.9 CHNG:    40.9 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:    31.6 CHNG:    31.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    26.3 CHNG:    26.4 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    20.2 CHNG:    20.2 DIFF:     0.1%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -288.0 CHNG:  -288.0 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:   -26.1 CHNG:   -26.1 DIFF:     0.0%
63311 ********  - 66550 GRANITF4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
63314 BIGSTON4  - 63050 WILLMAR4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: NDEX-BSP2           BASE:  1938.8 CHNG:  1938.8 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   BASE:   833.9 CHNG:   833.7 DIFF:     0.0%
60304 EAU CL 3  - 39244 ARP 345    BASE:   650.9 CHNG:   650.8 DIFF:     0.0%

SUBTOTALS FOR: MWSI                BASE:  1484.7 CHNG:  1484.5 DIFF:     0.0%
                                          DIFF:    -0.3   DF:    -1.4%
*******************************************************************************

64832 GENTLMN4  - 64909 N.PLATT4   BASE:   144.7 CHNG:   144.7 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   145.1 CHNG:   145.1 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   149.3 CHNG:   149.3 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   289.7 CHNG:   289.7 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   347.9 CHNG:   347.9 DIFF:     0.0%
64831 GENTLMN3  - 64943 REDWILO3   BASE:   462.8 CHNG:   462.8 DIFF:     0.0%

SUBTOTALS FOR: GGS                 BASE:  1539.7 CHNG:  1539.7 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

64831 GENTLMN3  - 64943 REDWILO3   BASE:   462.8 CHNG:   462.8 DIFF:     0.0%

SUBTOTALS FOR: WNE_WKS             BASE:   462.8 CHNG:   462.8 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.2%
*******************************************************************************

64933 PAULINE3  - 64902 MOORE  3   BASE:   214.7 CHNG:   214.7 DIFF:     0.0%
64839 GR ISLD4  - 64780 COLMB.W4   BASE:    74.5 CHNG:    74.6 DIFF:     0.0%
66571 GR ISLD3  - 64896 MCCOOL 3   BASE:   432.2 CHNG:   432.1 DIFF:     0.0%

SUBTOTALS FOR: GRIS_LNC            BASE:   721.4 CHNG:   721.4 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

64786 COOPER 3  - 59393 ST JOE 3   BASE:   385.8 CHNG:   385.7 DIFF:     0.0%
64786 COOPER 3  - 96039 7FAIRPT    BASE:   301.3 CHNG:   301.2 DIFF:     0.0%

SUBTOTALS FOR: COOPER_S            BASE:   687.1 CHNG:   686.9 DIFF:     0.0%
                                          DIFF:    -0.1   DF:    -0.7%
*******************************************************************************
```

```
60105 PR ISLD3  - 61950 BYRON  3   BASE:   833.9 CHNG:   833.7 DIFF:     0.0%

SUBTOTALS FOR: PR_ISL_BYRON        BASE:   833.9 CHNG:   833.7 DIFF:     0.0%
                                           DIFF:    -0.1   DF:    -0.8%
*******************************************************************************

65351 S3451  3  - 65354 S3454  3   BASE:   207.7 CHNG:   207.6 DIFF:     0.0%
65351 S3451  3  - 65359 S3459  3   BASE:   329.1 CHNG:   329.1 DIFF:     0.0%
65451 S1251  5  - 65497 S1297  5   BASE:    75.1 CHNG:    75.1 DIFF:     0.0%

SUBTOTALS FOR: FTCAL_S             BASE:   611.8 CHNG:   611.7 DIFF:     0.0%
                                           DIFF:    -0.1   DF:    -0.5%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   BASE:   174.4 CHNG:   174.5 DIFF:     0.0%
64400 MECCORD3  - 64403 E MOLIN3   BASE:    24.7 CHNG:    24.7 DIFF:     0.1%

SUBTOTALS FOR: QUADCITY_W          BASE:   199.1 CHNG:   199.2 DIFF:     0.0%
                                           DIFF:     0.1   DF:     0.4%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   BASE:   -49.5 CHNG:   -49.5 DIFF:    -0.1%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -49.5 CHNG:   -49.5 DIFF:    -0.1%
                                           DIFF:     0.1   DF:     0.3%
*******************************************************************************

59394 ST JOE 5  - 59392 MIDWAY 5   BASE:    42.6 CHNG:    42.6 DIFF:     0.0%

SUBTOTALS FOR: SJOMDY__PTDF        BASE:    42.6 CHNG:    42.6 DIFF:     0.0%
                                           DIFF:     0.0   DF:     0.1%
*******************************************************************************

57982 IATAN  7  - 59393 ST JOE 3   BASE:   162.9 CHNG:   163.0 DIFF:     0.0%

SUBTOTALS FOR: IATSJO__PTDF        BASE:   162.9 CHNG:   163.0 DIFF:     0.0%
                                           DIFF:     0.1   DF:     0.3%
*******************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   BASE:  -100.5 CHNG:  -100.4 DIFF:    -0.1%

SUBTOTALS FOR: TIFARN__PTDF        BASE:  -100.5 CHNG:  -100.4 DIFF:    -0.1%
                                           DIFF:     0.1   DF:     0.6%
*******************************************************************************

60101 FORBES 2  - 60198 CHIS-N 2   BASE:  1777.0 CHNG:  1777.0 DIFF:     0.0%

SUBTOTALS FOR: FORCHS_PTDF         BASE:  1777.0 CHNG:  1777.0 DIFF:     0.0%
                                           DIFF:     0.0   DF:     0.1%
*******************************************************************************

34006 LAKEFLD3  - 60331 LKFLDXL3   BASE:   -49.1 CHNG:   -49.0 DIFF:    -0.2%

SUBTOTALS FOR: LKFLKG__PTDF        BASE:   -49.1 CHNG:   -49.0 DIFF:    -0.2%
                                           DIFF:     0.1   DF:     0.6%
*******************************************************************************


## OTDF INTERFACES ##

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36284 CORDO; B  - 36362 NELSO; B   BASE:   898.0 CHNG:   898.0 DIFF:     0.0%

SUBTOTALS FOR: CDVNELQUA471        BASE:   898.0 CHNG:   898.0 DIFF:     0.0%
                                           DIFF:    -0.1   DF:    -0.4%
*******************************************************************************
```

```
38849 PLS PR2   - 36421 ZION ; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39247 ARCADN3   - 36420 ZION ; B   BASE:   494.4 CHNG:   494.3 DIFF:     0.0%

SUBTOTALS FOR: ADNZIOPLPZIO        BASE:   494.4 CHNG:   494.3 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.3%
*******************************************************************************

38849 PLS PR2   - 36421 ZION ; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39362 LAKEVIEW  - 37384 ZION ;     BASE:   156.5 CHNG:   156.5 DIFF:     0.0%

SUBTOTALS FOR: LKVZIOZIOPLP        BASE:   156.5 CHNG:   156.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60304 EAU CL 3  - 39244 ARP 345    BASE:   665.2 CHNG:   665.1 DIFF:     0.0%

SUBTOTALS FOR: EAUARPWMPPAD        BASE:   665.2 CHNG:   665.1 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

36406 WEMPL; B  - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39058 PAD 345   - 39059 PAD 138    BASE:   229.1 CHNG:   229.2 DIFF:     0.0%

SUBTOTALS FOR: PADXFMWEMROE        BASE:   229.1 CHNG:   229.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39010 NED 161   - 39020 NED 138    BASE:    28.9 CHNG:    28.8 DIFF:     0.0%

SUBTOTALS FOR: NED_T1WEMPAD        BASE:    28.9 CHNG:    28.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39010 NED 161   - 39020 NED 138    BASE:    50.7 CHNG:    50.7 DIFF:     0.0%

SUBTOTALS FOR: NED_T1EARP_G        BASE:    50.7 CHNG:    50.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60304 EAU CL 3  - 39244 ARP 345    BASE:   716.4 CHNG:   716.3 DIFF:     0.0%

SUBTOTALS FOR: EAUARPPRIBYR        BASE:   716.4 CHNG:   716.3 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.4%
*******************************************************************************

39059 PAD 138   - 39141 TOWNLINE   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39059 PAD 138   - 38057 NWT 138    BASE:    46.6 CHNG:    46.7 DIFF:     0.0%
38057 NWT 138   - 39048 BLK 138    BASE:    38.6 CHNG:    38.6 DIFF:     0.0%

SUBTOTALS FOR: PADBLKPADTLR        BASE:    85.2 CHNG:    85.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

```
39059 PAD 138   - 39141 TOWNLINE   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39048 BLK 138   - 39060 COR 138    BASE:    49.8 CHNG:    49.8 DIFF:     0.0%

SUBTOTALS FOR: BLKCORPADTLR        BASE:    49.8 CHNG:    49.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

36406 WEMPL; B  - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39090 RSS 138   - 39120 ROE 138    BASE:   226.9 CHNG:   226.9 DIFF:     0.0%

SUBTOTALS FOR: RSSROEWEMROE        BASE:   226.9 CHNG:   226.9 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

39676 GARDR PK  - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39786 ROCKY RN  - 38952 ********   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
38952 ********  - 39788 NORTHPT    BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: RRNNPTRRNGPK        BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

36406 WEMPL; B  - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39048 BLK 138   - 39060 COR 138    BASE:   120.5 CHNG:   120.5 DIFF:     0.0%

SUBTOTALS FOR: BLKCRDWEMROE        BASE:   120.5 CHNG:   120.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

39059 PAD 138   - 38057 NWT 138    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39059 PAD 138   - 39141 TOWNLINE   BASE:    14.3 CHNG:    14.3 DIFF:     0.1%

SUBTOTALS FOR: PADTLRPADBLK        BASE:    14.3 CHNG:    14.3 DIFF:     0.1%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

39119 ROE 345   - 39120 ROE 138    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39119 ROE 345   - 39120 ROE 138    BASE:   210.0 CHNG:   210.0 DIFF:     0.0%

SUBTOTALS FOR: ROE_T2ROE_T3        BASE:   210.0 CHNG:   210.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

39058 PAD 345   - 39059 PAD 138    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39119 ROE 345   - 39120 ROE 138    BASE:   215.2 CHNG:   215.2 DIFF:     0.0%

SUBTOTALS FOR: RKDLFLOPADDK        BASE:   215.2 CHNG:   215.2 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

39244 ARP 345   - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60315 T-CRNRS7  - 39706 WIEN       BASE:    66.0 CHNG:    65.9 DIFF:     0.0%

SUBTOTALS FOR: TCRWIEARPRRN        BASE:    66.0 CHNG:    65.9 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60315 T-CRNRS7  - 39706 WIEN       BASE:   157.8 CHNG:   157.8 DIFF:     0.0%

SUBTOTALS FOR: TCRWIEEARP_G        BASE:   157.8 CHNG:   157.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
```

```
*******************************************************************************

36406 WEMPL; B  - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39059 PAD 138   - 39141 TOWNLINE   BASE:    41.8 CHNG:    41.8 DIFF:     0.0%

SUBTOTALS FOR: PADTLRWEMROE        BASE:    41.8 CHNG:    41.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

30395 COFFEEN   - 31445 PANA       *CONTINGENCY* BASE:     0.0 CHNG:     0.0
31445 PANA      - 36343 KINCA; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
31230 MONTGMRY  - 31992 SPENCER    BASE:   149.5 CHNG:   149.5 DIFF:     0.0%

SUBTOTALS FOR: MTGSPCCOFPAN        BASE:   149.5 CHNG:   149.5 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.4%
*******************************************************************************

30154 BLAND     - 96041 7FRANKS    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
31088 MCCREDIE  - 31408 OVERTON    BASE:   186.7 CHNG:   186.7 DIFF:     0.0%

SUBTOTALS FOR: MCROVEBLAF_G        BASE:   186.7 CHNG:   186.7 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

31088 MCCREDIE  - 31408 OVERTON    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
30154 BLAND     - 96041 7FRANKS    BASE:   459.0 CHNG:   459.0 DIFF:     0.0%

SUBTOTALS FOR: BLAFRAMCROVE        BASE:   459.0 CHNG:   459.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36281 BYRON; R  - 36289 CHERR; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36280 BYRON; B  - 36288 CHERR; B   BASE:  1226.2 CHNG:  1226.2 DIFF:     0.0%

SUBTOTALS FOR: BYNCHEBYNCHE        BASE:  1226.2 CHNG:  1226.2 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36281 BYRON; R  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36280 BYRON; B  - 36288 CHERR; B   BASE:  1021.2 CHNG:  1021.2 DIFF:     0.0%

SUBTOTALS FOR: BYCH_BBYNWEM        BASE:  1021.2 CHNG:  1021.2 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36280 BYRON; B  - 36288 CHERR; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36281 BYRON; R  - 36289 CHERR; R   BASE:  1283.4 CHNG:  1283.4 DIFF:     0.0%

SUBTOTALS FOR: BYRCHEBYRCHE        BASE:  1283.4 CHNG:  1283.4 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36281 BYRON; R  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36281 BYRON; R  - 36289 CHERR; R   BASE:  1138.0 CHNG:  1137.9 DIFF:     0.0%

SUBTOTALS FOR: BYCH_RBYNWEM        BASE:  1138.0 CHNG:  1137.9 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************
```

```
36284 CORDO; B  - 36362 NELSO; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36382 QUAD ;    - 36368 H471 ;     BASE:   904.3 CHNG:   904.2 DIFF:     0.0%

SUBTOTALS FOR: QUA471CDVNEL        BASE:   904.3 CHNG:   904.2 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.4%
*******************************************************************************

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36382 QUAD ;    - 36284 CORDO; B   BASE:   535.0 CHNG:   534.9 DIFF:     0.0%
36284 CORDO; B  - 36362 NELSO; B   BASE:   898.0 CHNG:   898.0 DIFF:     0.0%

SUBTOTALS FOR: QUACDVQUA471        BASE:  1433.0 CHNG:  1432.9 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36406 WEMPL; B  - 36407 WEMPL; R   BASE:  -606.0 CHNG:  -606.0 DIFF:     0.0%
36407 WEMPL; R  - 39058 PAD 345    BASE:    88.0 CHNG:    88.0 DIFF:     0.0%

SUBTOTALS FOR: WEMPADZIOARC        BASE:  -518.0 CHNG:  -518.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

36421 ZION ; R  - 38849 PLS PR2    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36406 WEMPL; B  - 36407 WEMPL; R   BASE:  -608.1 CHNG:  -608.1 DIFF:     0.0%
36407 WEMPL; R  - 39058 PAD 345    BASE:    26.7 CHNG:    26.7 DIFF:     0.1%

SUBTOTALS FOR: WEMPADZIOPLP        BASE:  -581.4 CHNG:  -581.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36406 WEMPL; B  - 36407 WEMPL; R   BASE:  -555.7 CHNG:  -555.7 DIFF:     0.0%
36407 WEMPL; R  - 39058 PAD 345    BASE:   191.1 CHNG:   191.2 DIFF:     0.0%

SUBTOTALS FOR: WEMPADCHVSLA        BASE:  -364.5 CHNG:  -364.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36421 ZION ; R  - 38849 PLS PR2    BASE:  -825.6 CHNG:  -825.5 DIFF:     0.0%

SUBTOTALS FOR: ZIOPLPZIOARC        BASE:  -825.6 CHNG:  -825.5 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.5%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36421 ZION ; R  - 38849 PLS PR2    BASE:  -676.4 CHNG:  -676.4 DIFF:     0.0%

SUBTOTALS FOR: ZIOPLPWEMPAD        BASE:  -676.4 CHNG:  -676.4 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.4%
*******************************************************************************

36421 ZION ; R  - 38849 PLS PR2    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36420 ZION ; B  - 39247 ARCADN3    BASE:  -488.7 CHNG:  -488.6 DIFF:     0.0%

SUBTOTALS FOR: ZIOARCZIOPLP        BASE:  -488.7 CHNG:  -488.6 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
*******************************************************************************
```

```
36362 NELSO; B  - 36310 ELECT; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36289 CHERR; R  - 36389 SILVE; R   BASE:  1118.0 CHNG:  1117.9 DIFF:     0.0%

SUBTOTALS FOR: CHESILNELELC        BASE:  1118.0 CHNG:  1117.9 DIFF:     0.0%
                                                DIFF:    -0.1   DF:    -0.3%
*******************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36362 NELSO; B  - 36310 ELECT; B   BASE:   858.2 CHNG:   858.1 DIFF:     0.0%

SUBTOTALS FOR: NELELCCHESIL        BASE:   858.2 CHNG:   858.1 DIFF:     0.0%
                                                DIFF:    -0.1   DF:    -0.4%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
37632 LEECO;BP  - 36362 NELSO; B   BASE:   214.4 CHNG:   214.4 DIFF:     0.0%

SUBTOTALS FOR: LCONELWEMPAD        BASE:   214.4 CHNG:   214.4 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

39253 ARCADN1   - 39329 GRANVL1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39268 BUTLER    - 39327 GRANVL 5   BASE:  -230.4 CHNG:  -230.4 DIFF:     0.0%

SUBTOTALS FOR: BTRGVLARCGVL        BASE:  -230.4 CHNG:  -230.4 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
38851 PLS PR4   - 38850 PLS PR3    BASE:   449.0 CHNG:   449.0 DIFF:     0.0%
38850 PLS PR3   - 39471 RACINE1    BASE:   167.1 CHNG:   167.2 DIFF:     0.0%

SUBTOTALS FOR: PLPRACWEMPAD        BASE:   616.2 CHNG:   616.2 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

38894 N APP 3   - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
38892 ELLNGTN3  - 39534 HINTZ      BASE:    82.5 CHNG:    82.5 DIFF:     0.0%

SUBTOTALS FOR: ELNHNZNAPRRN        BASE:    82.5 CHNG:    82.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

38849 PLS PR2   - 36421 ZION ; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39345 KENOSH45  - 39362 LAKEVIEW   BASE:   183.7 CHNG:   183.7 DIFF:     0.0%

SUBTOTALS FOR: KSHLKVPLPZIO        BASE:   183.7 CHNG:   183.7 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

38851 PLS PR4   - 38850 PLS PR3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
38850 PLS PR3   - 39471 RACINE1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39432 PLS PR1   - 39253 ARCADN1    BASE:    40.8 CHNG:    40.8 DIFF:     0.1%

SUBTOTALS FOR: PLPARCPLRRAC        BASE:    40.8 CHNG:    40.8 DIFF:     0.1%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************
```

```
36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39432 PLS PR1   - 39253 ARCADN1    BASE:   -25.0 CHNG:   -25.0 DIFF:    -0.2%

SUBTOTALS FOR: PLPARCZIOARC        BASE:   -25.0 CHNG:   -25.0 DIFF:    -0.2%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
38883 WHTWTR5   - 39357 MUKWONGO   BASE:   205.5 CHNG:   205.5 DIFF:     0.0%

SUBTOTALS FOR: WHIMUKCHESIL        BASE:   205.5 CHNG:   205.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
38849 PLS PR2   - 36421 ZION ; R   BASE:   873.4 CHNG:   873.3 DIFF:     0.0%

SUBTOTALS FOR: PLPZIOCHESIL        BASE:   873.4 CHNG:   873.3 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.4%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
38849 PLS PR2   - 36421 ZION ; R   BASE:   828.3 CHNG:   828.2 DIFF:     0.0%

SUBTOTALS FOR: PLPZIOZIOARC        BASE:   828.3 CHNG:   828.2 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.5%
*******************************************************************************

38851 PLS PR4   - 38850 PLS PR3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
38850 PLS PR3   - 39471 RACINE1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39249 ALBERS-2  - 39410 PARIS WE   BASE:    94.2 CHNG:    94.2 DIFF:     0.0%

SUBTOTALS FOR: ALBPARPLPRAC        BASE:    94.2 CHNG:    94.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

39432 PLS PR1   - 39253 ARCADN1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
38851 PLS PR4   - 38850 PLS PR3    BASE:   453.6 CHNG:   453.6 DIFF:     0.0%
38850 PLS PR3   - 39471 RACINE1    BASE:   145.7 CHNG:   145.8 DIFF:     0.0%

SUBTOTALS FOR: PLPRACPLPADN        BASE:   599.3 CHNG:   599.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.3%
*******************************************************************************

38894 N APP 3   - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39786 ROCKY RN  - 39790 WHITNG A   BASE:   180.3 CHNG:   180.3 DIFF:     0.0%

SUBTOTALS FOR: RRNWAVRRNNAP        BASE:   180.3 CHNG:   180.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

39785 ROCKY RN  - 39676 GARDR PK   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39210 CW8 115   - 39686 WESTON     BASE:   -28.0 CHNG:   -28.0 DIFF:     0.0%

SUBTOTALS FOR: RRNWESRRNGPK        BASE:   -28.0 CHNG:   -28.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

```
36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34093 ARNOLD 3  - 34018 HAZLTON3   BASE:    11.0 CHNG:    11.1 DIFF:     1.1%

SUBTOTALS FOR: ARNHAZWEMPAD        BASE:    11.0 CHNG:    11.1 DIFF:     1.1%
                                                DIFF:     0.1   DF:     0.6%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34028 LORE   5  - 34033 TRK RIV5   BASE:    28.2 CHNG:    28.3 DIFF:     0.0%

SUBTOTALS FOR: LORTRKWEMPAD        BASE:    28.2 CHNG:    28.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:    34.7 CHNG:    34.7 DIFF:     0.0%

SUBTOTALS FOR: LKJFOXARNHAZ        BASE:    34.7 CHNG:    34.7 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34036 ROCK CK3  - 34037 ROCK CK5   BASE:   187.6 CHNG:   187.6 DIFF:     0.0%

SUBTOTALS FOR: RCKXFMQUADAV        BASE:   187.6 CHNG:   187.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34035 ROCKCKW5  - 34124 DEWITT 5   BASE:    21.9 CHNG:    21.9 DIFF:     0.1%

SUBTOTALS FOR: RCKDWTQUAS91        BASE:    21.9 CHNG:    21.9 DIFF:     0.1%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   124.5 CHNG:   124.5 DIFF:     0.0%

SUBTOTALS FOR: SALXFMQUAS91        BASE:   124.5 CHNG:   124.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

64400 MECCORD3  - 64403 E MOLIN3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   112.8 CHNG:   112.8 DIFF:     0.0%

SUBTOTALS FOR: SALXFMCORMOL        BASE:   112.8 CHNG:   112.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   124.5 CHNG:   124.5 DIFF:     0.0%

SUBTOTALS FOR: SALXFMQUADAV        BASE:   124.5 CHNG:   124.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

```
64350 HILLS  3  - 64095 MNTZUMA3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64352 TIFFIN 3  - 34093 ARNOLD 3   BASE:  -139.5 CHNG:  -139.4 DIFF:    -0.1%

SUBTOTALS FOR: TIFARNHILMON        BASE:  -139.5 CHNG:  -139.4 DIFF:    -0.1%
                                                 DIFF:     0.1   DF:     0.6%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34091 ARNOLD 5  - 34089 VINTON 5   BASE:    37.1 CHNG:    37.1 DIFF:     0.1%

SUBTOTALS FOR: ARNVINARNHAZ        BASE:    37.1 CHNG:    37.1 DIFF:     0.1%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64425 DAVNPRT5  - 34909 ********   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: DAVCALQUARCK        BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34052 AMES   7  - 34076 BNE JCT7   BASE:     3.2 CHNG:     3.2 DIFF:     0.1%

SUBTOTALS FOR: AMEBJCMTZBON        BASE:     3.2 CHNG:     3.2 DIFF:     0.1%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

34006 LAKEFLD3  - 60331 LKFLDXL3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:    27.2 CHNG:    27.2 DIFF:     0.1%

SUBTOTALS FOR: LAKFOXLAKLKF        BASE:    27.2 CHNG:    27.2 DIFF:     0.1%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34087 DYSART 5  - 64269 WASHBRN5   BASE:   134.2 CHNG:   134.3 DIFF:     0.0%

SUBTOTALS FOR: DYSWASARNHAZ        BASE:   134.2 CHNG:   134.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

***** ERROR: OTDF #  65 BASE CONTINGENT LINE NOT FOUND OR ALREADY STATUS=0  64080 TO  64198 CKT 1 IERR=
1
***** ERROR: OTDF #  65 CHNG CONTINGENT LINE NOT FOUND OR ALREADY STATUS=0  64080 TO  64198 CKT 1 IERR=
1
64080 SYCAMOR3  - 64198 ********   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64067 BONDRNT5  - 34529 HUXLEYT5   BASE:    16.8 CHNG:    16.8 DIFF:     0.0%

SUBTOTALS FOR: BONBJCSYCLEH        BASE:    16.8 CHNG:    16.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

64202 LEHIGH 3  - 64200 WEBSTER3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64067 BONDRNT5  - 34529 HUXLEYT5   BASE:    75.4 CHNG:    75.4 DIFF:     0.0%

SUBTOTALS FOR: BONBJCLEHWBS        BASE:    75.4 CHNG:    75.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

```
34007 LAKEFLD5  - 34137 TRIBOJI5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:    42.0 CHNG:    42.0 DIFF:     0.0%

SUBTOTALS FOR: LKJFOXLKJTRI        BASE:    42.0 CHNG:    42.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

***** ERROR: OTDF #  68 BASE CASE LAST SOLUTION DID NOT REACH TOLERANCE, FIX AND RERUN PROGRAM

***** ERROR: OTDF #  68 BASE CASE NOT SOLVED WELL, MISMATCH=  18923.21 FIX AND RERUN PROGRAM

***** ERROR: OTDF #  68 CHNG CASE LAST SOLUTION DID NOT REACH TOLERANCE, FIX AND RERUN PROGRAM

***** ERROR: OTDF #  68 CHNG CASE NOT SOLVED WELL, MISMATCH=  18910.51 FIX AND RERUN PROGRAM

60173 ROSEAUN2  - 67564 DORSEY 2   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34093 ARNOLD 3  - 34018 HAZLTON3   BASE:   247.3 CHNG:   247.6 DIFF:     0.1%

SUBTOTALS FOR: ARNHAZDORFOR        BASE:   247.3 CHNG:   247.6 DIFF:     0.1%
                                                DIFF:     0.3   DF:     1.3%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34020 HAZL S 5  - 34135 DUNDEE 5   BASE:   116.8 CHNG:   116.8 DIFF:     0.0%

SUBTOTALS FOR: HAZDUNEAUARP        BASE:   116.8 CHNG:   116.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

63875 RAUN   3  - 34006 LAKEFLD3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
66563 SPENCER5  - 34137 TRIBOJI5   BASE:   -27.3 CHNG:   -27.2 DIFF:    -0.3%

SUBTOTALS FOR: SPETRILAKRAU        BASE:   -27.3 CHNG:   -27.2 DIFF:    -0.3%
                                                DIFF:     0.1   DF:     0.4%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   123.6 CHNG:   123.6 DIFF:     0.0%

SUBTOTALS FOR: SALXFMWEMPAD        BASE:   123.6 CHNG:   123.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64350 HILLS  3  - 34110 HILLSIE5   BASE:     8.2 CHNG:     8.2 DIFF:     0.4%

SUBTOTALS FOR: HILXFMTIFARN        BASE:     8.2 CHNG:     8.2 DIFF:     0.4%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34032 8TH ST.5  - 34908 ********   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: 8STKERWEMPAD        BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

```
34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34032 8TH ST.5  - 34908 ********   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: 8STKERARNHAZ        BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34045 ALBANY 6  - 36773 GARDE;     BASE:    89.5 CHNG:    89.5 DIFF:     0.0%

SUBTOTALS FOR: ALBGARQUAST         BASE:    89.5 CHNG:    89.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34066 M-TOWN 7  - 34071 FERNALD7   BASE:    21.8 CHNG:    21.8 DIFF:     0.0%

SUBTOTALS FOR: MRTFERMTZBON        BASE:    21.8 CHNG:    21.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

64202 LEHIGH 3  - 64200 WEBSTER3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34015 LIME CK5  - 34016 EMERYN     BASE:   129.3 CHNG:   129.3 DIFF:     0.0%

SUBTOTALS FOR: LIMEMELEHWEB        BASE:   129.3 CHNG:   129.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34028 LORE   5  - 34033 TRK RIV5   BASE:    28.2 CHNG:    28.3 DIFF:     0.0%

SUBTOTALS FOR: LORTRKWPAD_G        BASE:    28.2 CHNG:    28.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34089 VINTON 5  - 34087 DYSART 5   BASE:   110.0 CHNG:   110.0 DIFF:     0.0%

SUBTOTALS FOR: VINDYSARNHAZ        BASE:   110.0 CHNG:   110.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

60102 ADAMS  3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34015 LIME CK5  - 34016 EMERYN     BASE:   142.3 CHNG:   142.3 DIFF:     0.0%

SUBTOTALS FOR: LIMEMEADAHAZ        BASE:   142.3 CHNG:   142.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.2%
*******************************************************************************

36406 WEMPL; B  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
36407 WEMPL; R  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34030 SALEM  5  - 34508 JULIAN 5   BASE:    65.5 CHNG:    65.5 DIFF:     0.0%

SUBTOTALS FOR: SALJCRWEMPAD        BASE:    65.5 CHNG:    65.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

```
60331 LKFLDXL3  - 60108 WILMART3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:    42.1 CHNG:    42.1 DIFF:     0.1%

SUBTOTALS FOR: LKFFOXLKFWLM        BASE:    42.1 CHNG:    42.1 DIFF:     0.1%
                                                DIFF:     0.0   DF:     0.1%
********************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34093 ARNOLD 3  - 34018 HAZLTON3   BASE:   -10.9 CHNG:   -10.8 DIFF:    -1.1%

SUBTOTALS FOR: ARNHAZMTZBON        BASE:   -10.9 CHNG:   -10.8 DIFF:    -1.1%
                                                DIFF:     0.1   DF:     0.7%
********************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   101.8 CHNG:   101.8 DIFF:     0.0%

SUBTOTALS FOR: SALXFMTIFARN        BASE:   101.8 CHNG:   101.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
********************************************************************************

64350 HILLS  3  - 64352 TIFFIN 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM  5   BASE:   110.5 CHNG:   110.6 DIFF:     0.0%

SUBTOTALS FOR: SALXFMHL3TIF        BASE:   110.5 CHNG:   110.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
********************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
64352 TIFFIN 3  - 34093 ARNOLD 3   BASE:  -112.1 CHNG:  -112.0 DIFF:    -0.1%

SUBTOTALS FOR: TIFARNMTZBON        BASE:  -112.1 CHNG:  -112.0 DIFF:    -0.1%
                                                DIFF:     0.1   DF:     0.6%
********************************************************************************

34091 ARNOLD 5  - 34090 ARNOLD1G   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
64350 HILLS  3  - 34110 HILLSIE5   BASE:    82.6 CHNG:    82.6 DIFF:     0.0%

SUBTOTALS FOR: HILXFMARNXFM        BASE:    82.6 CHNG:    82.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
********************************************************************************

34016 EMERYN    - 64252 FLOYD  5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34016 EMERYN    - 34015 LIME CK5   BASE:   -75.1 CHNG:   -75.1 DIFF:     0.0%

SUBTOTALS FOR: EMELIMEMEFYD        BASE:   -75.1 CHNG:   -75.1 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
********************************************************************************

56769 LANG   7  - 56796 WICHITA7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
57981 LACYGNE7  - 56793 NEOSHO 7   BASE:   438.0 CHNG:   438.0 DIFF:     0.0%

SUBTOTALS FOR: LACNEOLANWIC        BASE:   438.0 CHNG:   438.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.2%
********************************************************************************

59396 LAKE RD5  - 58028 NASHUA-5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
57982 IATAN  7  - 56772 STRANGR7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
59393 ST JOE 3  - 57972 HAWTH  7   BASE:   715.0 CHNG:   714.9 DIFF:     0.0%
```

```
SUBTOTALS FOR: SJOHTHIATSTC        BASE:   715.0 CHNG:   714.9 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.5%
*******************************************************************************

57981 LACYGNE7  - 57968 STILWEL7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57981 LACYGNE7  - 57965 W.GRDNR7   BASE:   866.2 CHNG:   866.3 DIFF:     0.0%

SUBTOTALS FOR: LACWGRLACSTI        BASE:   866.2 CHNG:   866.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.3%
*******************************************************************************

56873 SUMMIT 6  - 56872 EMCPHER6   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -15.3 CHNG:   -15.3 DIFF:     0.0%
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -17.9 CHNG:   -17.9 DIFF:     0.0%

SUBTOTALS FOR: SPHWMCSUMEMC        BASE:   -33.2 CHNG:   -33.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

59396 LAKE RD5  - 58028 NASHUA-5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
59393 ST JOE 3  - 57972 HAWTH  7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57982 IATAN  7  - 56772 STRANGR7   BASE:   771.4 CHNG:   771.2 DIFF:     0.0%

SUBTOTALS FOR: IATSTRLRDNUA        BASE:   771.4 CHNG:   771.2 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.5%
*******************************************************************************

65351 S3451  3  - 63875 RAUN   3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
65426 S1226  5  - 64987 TEKAMAH5   BASE:  -110.6 CHNG:  -110.6 DIFF:     0.0%

SUBTOTALS FOR: S12TEKS34RAU        BASE:  -110.6 CHNG:  -110.6 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36382 QUAD ;    - 64405 SUB 91 3   BASE:   279.0 CHNG:   279.1 DIFF:     0.0%

SUBTOTALS FOR: QUAS91QUARCK        BASE:   279.0 CHNG:   279.1 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
*******************************************************************************

34018 HAZLTON3  - 60102 ADAMS  3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60102 ADAMS  3  - 34014 ADAMS  5   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: ADMXFMHAZADM        BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

96039 7FAIRPT   - 64786 COOPER 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
96039 7FAIRPT   - 59393 ST JOE 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
59394 ST JOE 5  - 59392 MIDWAY 5   BASE:    75.3 CHNG:    75.3 DIFF:     0.0%

SUBTOTALS FOR: STJMIDSTJFRC        BASE:    75.3 CHNG:    75.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

64350 HILLS  3  - 64095 MNTZUMA3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34110 HILLSIE5  - 34109 BERTRAM5   BASE:    22.5 CHNG:    22.5 DIFF:     0.1%

SUBTOTALS FOR: HL5PRLHL3MTZ        BASE:    22.5 CHNG:    22.5 DIFF:     0.1%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

```
63041 COAL CR4  - 63042 COAL TP4   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
63049 STANTON4  - 63041 COAL CR4   BASE:    90.6 CHNG:    90.6 DIFF:     0.0%

SUBTOTALS FOR: SONCOCCOCCCT        BASE:    90.6 CHNG:    90.6 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

63041 COAL CR4  - 63049 STANTON4   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
63041 COAL CR4  - 63042 COAL TP4   BASE:   -87.1 CHNG:   -87.1 DIFF:     0.0%

SUBTOTALS FOR: SONCCTCOCSON        BASE:   -87.1 CHNG:   -87.1 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34191 REASNOR5  - 64062 DMOINES5   BASE:   -20.3 CHNG:   -20.3 DIFF:    -0.1%

SUBTOTALS FOR: READEMMTZBON        BASE:   -20.3 CHNG:   -20.3 DIFF:    -0.1%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

## *C.2 Flowgate Analysis Generation – Generation Summer peak*

### C.2.1 Posted DRS list of flowgates

```
***** BASE CASE:
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05

***** ERROR: GETTING LINE FLOW  63311 TO  66550 CKT 1 IERR= 1 (Note this is only relevant for BSPII
runs)
***** ERROR: GETTING LINE FLOW  63314 TO  63050 CKT 1 IERR= 2 (Note this is only relevant for BSPII
runs)

***** CHNG CASE:
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:    18.900


## PTDF INTERFACES ##

64786 COOPER 3  - 59199 ST JOE 3   BASE:   162.1 CHNG:   162.0 DIFF:    -0.1%
64786 COOPER 3  - 96039 7FAIRPT    BASE:   145.0 CHNG:   144.9 DIFF:     0.0%

SUBTOTALS FOR: COOPER_S            BASE:   307.1 CHNG:   306.9 DIFF:    -0.1%
                                                 DIFF:    -0.2   DF:    -0.9%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    BASE:   433.7 CHNG:   433.5 DIFF:     0.0%

SUBTOTALS FOR: EAUARP__XCEL        BASE:   433.7 CHNG:   433.5 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

60101 FORBES 2  - 60198 CHIS-N 2   BASE:  1555.4 CHNG:  1555.4 DIFF:     0.0%

SUBTOTALS FOR: FORCHS_PTDF         BASE:  1555.4 CHNG:  1555.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

65351 S3451  3  - 65354 S3454  3   BASE:   107.1 CHNG:   107.0 DIFF:     0.0%
65351 S3451  3  - 65359 S3459  3   BASE:   119.3 CHNG:   119.3 DIFF:     0.0%
65451 S1251  5  - 65497 S1297  5   BASE:    63.4 CHNG:    63.3 DIFF:     0.0%

SUBTOTALS FOR: FTCAL_S             BASE:   289.8 CHNG:   289.6 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

64832 GENTLMN4  - 64909 N.PLATT4   BASE:   158.6 CHNG:   158.6 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   159.1 CHNG:   159.1 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   163.6 CHNG:   163.6 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   280.9 CHNG:   280.9 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   336.6 CHNG:   336.6 DIFF:     0.0%
64831 GENTLMN3  - 64943 REDWILO3   BASE:   305.5 CHNG:   305.5 DIFF:     0.0%

SUBTOTALS FOR: GGS                 BASE:  1404.4 CHNG:  1404.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

64933 PAULINE3  - 64902 MOORE  3   BASE:    58.7 CHNG:    58.7 DIFF:     0.0%
64839 GR ISLD4  - 64780 COLMB.W4   BASE:   101.5 CHNG:   101.5 DIFF:     0.0%
66571 GR ISLD3  - 64896 MCCOOL 3   BASE:   176.2 CHNG:   176.2 DIFF:     0.0%
```

```
SUBTOTALS FOR: GRIS_LNC            BASE:   336.4 CHNG:   336.4 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.2%
*******************************************************************************

37632 LEECO;BP  - 36362 NELSO; B   BASE:   -58.2 CHNG:   -58.1 DIFF:    -0.1%

SUBTOTALS FOR: LEECONELS           BASE:   -58.2 CHNG:   -58.1 DIFF:    -0.1%
                                          DIFF:     0.0   DF:     0.2%
*******************************************************************************

60175 ROSEAU 4  - 67576 RICHER 4   BASE:  -134.5 CHNG:  -134.5 DIFF:     0.0%
60173 ROSEAUN2  - 67621 RIEL   2   BASE: -1270.2 CHNG: -1270.2 DIFF:     0.0%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -279.8 CHNG:  -279.8 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:    -9.7 CHNG:    -9.7 DIFF:     0.1%

SUBTOTALS FOR: MHEX_N+             BASE: -1694.2 CHNG: -1694.2 DIFF:     0.0%
                                          DIFF:     0.0   DF:    -0.1%
*******************************************************************************

67576 RICHER 4  - 60175 ROSEAU 4   BASE:   136.8 CHNG:   136.8 DIFF:     0.0%
67621 RIEL   2  - 60173 ROSEAUN2   BASE:  1298.7 CHNG:  1298.7 DIFF:     0.0%
67557 LETELER4  - 66752 DRAYTON4   BASE:   286.2 CHNG:   286.2 DIFF:     0.0%
67523 GLENBOR4  - 63379 RUGBY  4   BASE:     9.7 CHNG:     9.7 DIFF:     0.1%

SUBTOTALS FOR: MHEX_S+             BASE:  1731.4 CHNG:  1731.4 DIFF:     0.0%
                                          DIFF:     0.0   DF:     0.1%
*******************************************************************************

68613 AUBURNT4  - 67525 RESTON 4   BASE:    64.0 CHNG:    64.0 DIFF:     0.0%
68615 YORKTON4  - 67514 ROBLIN 4   BASE:   -84.4 CHNG:   -84.4 DIFF:     0.0%
68630 EBCAMPB4  - 67515 RALL   4   BASE:   -41.6 CHNG:   -41.6 DIFF:     0.0%

SUBTOTALS FOR: MH_SPC_E+           BASE:   -62.0 CHNG:   -62.0 DIFF:     0.0%
                                          DIFF:     0.0   DF:     0.0%
*******************************************************************************

67525 RESTON 4  - 68613 AUBURNT4   BASE:   -63.6 CHNG:   -63.6 DIFF:     0.0%
67514 ROBLIN 4  - 68615 YORKTON4   BASE:    85.1 CHNG:    85.1 DIFF:     0.0%
67515 RALL   4  - 68630 EBCAMPB4   BASE:    42.2 CHNG:    42.2 DIFF:     0.0%

SUBTOTALS FOR: MH_SPC_W+           BASE:    63.6 CHNG:    63.6 DIFF:     0.0%
                                          DIFF:     0.0   DF:     0.0%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   BASE:  -234.2 CHNG:  -234.1 DIFF:     0.0%

SUBTOTALS FOR: MNTZUMA_W           BASE:  -234.2 CHNG:  -234.1 DIFF:     0.0%
                                          DIFF:     0.1   DF:     0.4%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   BASE:   169.2 CHNG:   169.0 DIFF:    -0.1%
60304 EAU CL 3  - 39244 ARP 345    BASE:   433.7 CHNG:   433.5 DIFF:     0.0%

SUBTOTALS FOR: MWSI                BASE:   602.8 CHNG:   602.6 DIFF:     0.0%
                                          DIFF:    -0.2   DF:    -1.3%
*******************************************************************************

66756 SQBUTTE4  - 63049 STANTON4   BASE:   -52.1 CHNG:   -52.1 DIFF:     0.0%
66756 SQBUTTE4  - 66751 CENTER 4   BASE:   -45.6 CHNG:   -45.6 DIFF:     0.0%
66756 SQBUTTE4  - 66791 CENTER 3   BASE:   132.0 CHNG:   132.0 DIFF:     0.0%
63041 COAL CR4  - 63042 COAL TP4   BASE:   -13.4 CHNG:   -13.4 DIFF:     0.0%
63041 COAL CR4  - 63049 STANTON4   BASE:  -104.7 CHNG:  -104.7 DIFF:     0.0%
63041 COAL CR4  - 63381 UNDERWD4   BASE:   115.7 CHNG:   115.7 DIFF:     0.0%

SUBTOTALS FOR: NDDC                BASE:    31.9 CHNG:    31.9 DIFF:     0.0%
                                          DIFF:     0.0   DF:     0.0%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   156.0 CHNG:   156.0 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   237.3 CHNG:   237.3 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   201.7 CHNG:   201.7 DIFF:     0.0%
```

```
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   168.1 CHNG:   168.1 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:    10.3 CHNG:    10.4 DIFF:     0.6%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   104.0 CHNG:   104.0 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:   -51.8 CHNG:   -51.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:    92.0 CHNG:    92.0 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:    19.4 CHNG:    19.4 DIFF:    -0.1%
66716 LAPORTE7  - 61640 BADOURA7   BASE:     5.5 CHNG:     5.5 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    39.2 CHNG:    39.2 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:     1.0 CHNG:     1.0 DIFF:    -0.3%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    -3.0 CHNG:    -3.0 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:   -12.6 CHNG:   -12.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    25.8 CHNG:    25.9 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    22.5 CHNG:    22.5 DIFF:     0.1%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -286.2 CHNG:  -286.2 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:    -9.7 CHNG:    -9.7 DIFF:     0.1%

SUBTOTALS FOR: NDEX                BASE:   719.8 CHNG:   719.8 DIFF:     0.0%
                                             DIFF:     0.0   DF:     0.0%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   156.0 CHNG:   156.0 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   237.3 CHNG:   237.3 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   201.7 CHNG:   201.7 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   168.1 CHNG:   168.1 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:    10.3 CHNG:    10.4 DIFF:     0.6%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   104.0 CHNG:   104.0 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:   -51.8 CHNG:   -51.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:    92.0 CHNG:    92.0 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:    19.4 CHNG:    19.4 DIFF:    -0.1%
66716 LAPORTE7  - 61640 BADOURA7   BASE:     5.5 CHNG:     5.5 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    39.2 CHNG:    39.2 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:     1.0 CHNG:     1.0 DIFF:    -0.3%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    -3.0 CHNG:    -3.0 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:   -12.6 CHNG:   -12.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    25.8 CHNG:    25.9 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    22.5 CHNG:    22.5 DIFF:     0.1%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -286.2 CHNG:  -286.2 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:    -9.7 CHNG:    -9.7 DIFF:     0.1%
63311 ********  - 66550 GRANITF4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
63314 BIGSTON4  - 63050 WILLMAR4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: NDEX-BSP2           BASE:   719.8 CHNG:   719.8 DIFF:     0.0%
                                             DIFF:     0.0   DF:     0.0%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   BASE:   169.2 CHNG:   169.0 DIFF:    -0.1%

SUBTOTALS FOR: PR_ISL_BYRON        BASE:   169.2 CHNG:   169.0 DIFF:    -0.1%
                                             DIFF:    -0.1   DF:    -0.7%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   BASE:   355.7 CHNG:   355.8 DIFF:     0.0%
64400 MECCORD3  - 64403 E MOLIN3   BASE:   100.9 CHNG:   101.0 DIFF:     0.0%

SUBTOTALS FOR: QUADCITY_W          BASE:   456.6 CHNG:   456.7 DIFF:     0.0%
                                             DIFF:     0.1   DF:     0.5%
*******************************************************************************

64831 GENTLMN3  - 64943 REDWILO3   BASE:   305.5 CHNG:   305.5 DIFF:     0.0%

SUBTOTALS FOR: WNE_WKS             BASE:   305.5 CHNG:   305.5 DIFF:     0.0%
                                             DIFF:     0.0   DF:    -0.2%
*******************************************************************************

66756 SQBUTTE4  - 63049 STANTON4   BASE:   -52.1 CHNG:   -52.1 DIFF:     0.0%
66756 SQBUTTE4  - 66751 CENTER 4   BASE:   -45.6 CHNG:   -45.6 DIFF:     0.0%
66756 SQBUTTE4  - 66791 CENTER 3   BASE:   132.0 CHNG:   132.0 DIFF:     0.0%

SUBTOTALS FOR: Y2DC                BASE:    34.3 CHNG:    34.3 DIFF:     0.0%
                                             DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

```
## OTDF INTERFACES ##

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34045 ALBANY 6  - 36773 GARDE;     BASE:    54.3 CHNG:    54.3 DIFF:     0.0%

SUBTOTALS FOR: ALBGARQUAST         BASE:    54.3 CHNG:    54.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
********************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34091 ARNOLD 5  - 34089 VINTON 5   BASE:   127.8 CHNG:   127.8 DIFF:     0.0%

SUBTOTALS FOR: ARNVINARNHAZ        BASE:   127.8 CHNG:   127.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
********************************************************************************

36280 BYRON; B  - 36288 CHERR; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
36281 BYRON; R  - 36289 CHERR; R   BASE:  1247.0 CHNG:  1246.9 DIFF:     0.0%

SUBTOTALS FOR: BYCHEBYCHE          BASE:  1247.0 CHNG:  1246.9 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.2%
********************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
64425 DAVNPRT5  - 34909 E CAL T5   BASE:   180.9 CHNG:   180.9 DIFF:     0.0%

SUBTOTALS FOR: DAVCALQUARCK        BASE:   180.9 CHNG:   180.9 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
********************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
64350 HILLS  3  - 34110 HILLSIE5   BASE:   143.7 CHNG:   143.8 DIFF:     0.0%

SUBTOTALS FOR: HLSXFMTIFARN        BASE:   143.7 CHNG:   143.8 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
********************************************************************************

57981 LACYGNE7  - 57968 STILWEL7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
57981 LACYGNE7  - 57965 W.GRDNR7   BASE:   944.7 CHNG:   944.8 DIFF:     0.0%

SUBTOTALS FOR: LACWGRLACSTI        BASE:   944.7 CHNG:   944.8 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.3%
********************************************************************************

36310 ELECT; B  - 36362 NELSO; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
37632 LEECO;BP  - 36280 BYRON; B   BASE:   250.5 CHNG:   250.4 DIFF:     0.0%

SUBTOTALS FOR: LEEBYREJNEL         BASE:   250.5 CHNG:   250.4 DIFF:     0.0%
                                                DIFF:    -0.1   DF:    -0.3%
********************************************************************************

60331 LKFLDXL3  - 60108 WILMART3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:   203.9 CHNG:   203.9 DIFF:     0.0%

SUBTOTALS FOR: LKFFOXLKGWLM        BASE:   203.9 CHNG:   203.9 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.3%
********************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
```

```
34028 LORE   5  - 34033 TRK RIV5   BASE:   156.5 CHNG:   156.5 DIFF:     0.0%

SUBTOTALS FOR: LORTRKWEMPAD        BASE:   156.5 CHNG:   156.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

39058 PAD 345   - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39058 PAD 345   - 39059 PAD 138    BASE:   535.3 CHNG:   535.3 DIFF:     0.0%

SUBTOTALS FOR: PADXFMPADROE        BASE:   535.3 CHNG:   535.3 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34185 POWESHK5  - 34191 REASNOR5   BASE:   -52.1 CHNG:   -52.0 DIFF:    -0.1%

SUBTOTALS FOR: POWREAMTZBON        BASE:   -52.1 CHNG:   -52.0 DIFF:    -0.1%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

65351 S3451  3  - 63875 RAUN   3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
65426 S1226  5  - 64987 TEKAMAH5   BASE:    29.2 CHNG:    29.2 DIFF:     0.1%

SUBTOTALS FOR: S1226TEKAMAH        BASE:    29.2 CHNG:    29.2 DIFF:     0.1%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   272.0 CHNG:   272.0 DIFF:     0.0%

SUBTOTALS FOR: SALXFMQUADAV        BASE:   272.0 CHNG:   272.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   295.1 CHNG:   295.1 DIFF:     0.0%

SUBTOTALS FOR: SALXFMWEMPAD        BASE:   295.1 CHNG:   295.1 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

63875 RAUN   3  - 34006 LAKEFLD3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
66563 SPENCER5  - 34137 TRIBOJI5   BASE:   -79.7 CHNG:   -79.7 DIFF:     0.0%

SUBTOTALS FOR: SPETRILAKRAU        BASE:   -79.7 CHNG:   -79.7 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************

56873 SUMMIT 6  - 56872 EMCPHER6   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -11.5 CHNG:   -11.5 DIFF:     0.0%
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -13.5 CHNG:   -13.5 DIFF:     0.0%

SUBTOTALS FOR: SPHWMCSUMEMC        BASE:   -25.0 CHNG:   -25.0 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

## C.2.1 Flowgates monitored by the MAPP OASIS

```
***** BASE CASE:
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05

***** ERROR: GETTING LINE FLOW  63311 TO  66550 CKT 1 IERR= 1 (Note this is only relevant for BSPII
runs)
***** ERROR: GETTING LINE FLOW  63314 TO  63050 CKT 1 IERR= 2 (Note this is only relevant for BSPII
runs)

***** CHNG CASE:
MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:    18.900


## PTDF INTERFACES ##

39247 ARCADN3   - 36420 ZION ; B   BASE:  -207.7 CHNG:  -207.7 DIFF:     0.0%

SUBTOTALS FOR: ADNZIO__PTDF        BASE:  -207.7 CHNG:  -207.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.2%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    BASE:   812.2 CHNG:   812.3 DIFF:     0.0%

SUBTOTALS FOR: WEMPAD__PTDF        BASE:   812.2 CHNG:   812.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    BASE:   433.7 CHNG:   433.5 DIFF:     0.0%

SUBTOTALS FOR: EAUARP__PTDF        BASE:   433.7 CHNG:   433.5 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

69503 CASVILL5  - 39010 NED 161    BASE:    89.9 CHNG:    89.9 DIFF:     0.0%

SUBTOTALS FOR: CSVNED__PTDF        BASE:    89.9 CHNG:    89.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    BASE:   812.2 CHNG:   812.3 DIFF:     0.0%
39058 PAD 345   - 39119 ROE 345    BASE:   518.5 CHNG:   518.5 DIFF:     0.0%

SUBTOTALS FOR: WEMROE__PTDF        BASE:  1330.7 CHNG:  1330.8 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
*******************************************************************************

31230 MONTGMRY  - 31992 SPENCER    BASE:   278.5 CHNG:   278.6 DIFF:     0.0%

SUBTOTALS FOR: MTGSPC__PTDF        BASE:   278.5 CHNG:   278.6 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.4%
*******************************************************************************

31408 OVERTON   - 59201 SIBLEY 7   BASE:   -88.4 CHNG:   -88.4 DIFF:     0.0%

SUBTOTALS FOR: OVESIB__PTDF        BASE:   -88.4 CHNG:   -88.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

39249 ALBERS-2  - 39410 PARIS WE   BASE:   159.7 CHNG:   159.7 DIFF:     0.0%

SUBTOTALS FOR: ALBPRS__PTDF        BASE:   159.7 CHNG:   159.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

```
39253 ARCADN1   - 39329 GRANVL1    BASE:   145.3 CHNG:   145.4 DIFF:     0.0%

SUBTOTALS FOR: ARCGVL__PTDF        BASE:   145.3 CHNG:   145.4 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.2%
*******************************************************************************

38894 N APP 3   - 39785 ROCKY RN   BASE:   -92.7 CHNG:   -92.7 DIFF:    -0.1%

SUBTOTALS FOR: NAPRRN__PTDF        BASE:   -92.7 CHNG:   -92.7 DIFF:    -0.1%
                                               DIFF:     0.1   DF:     0.5%
*******************************************************************************

38849 PLS PR2   - 36421 ZION ; R   BASE:   102.5 CHNG:   102.5 DIFF:    -0.1%

SUBTOTALS FOR: PLPZION_PTDF        BASE:   102.5 CHNG:   102.5 DIFF:    -0.1%
                                               DIFF:    -0.1   DF:    -0.4%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    BASE:   208.9 CHNG:   208.9 DIFF:     0.0%

SUBTOTALS FOR: ZIOARC__PTDF        BASE:   208.9 CHNG:   208.9 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.2%
*******************************************************************************

36421 ZION ; R  - 38849 PLS PR2    BASE:  -102.5 CHNG:  -102.4 DIFF:    -0.1%

SUBTOTALS FOR: ZIOPLP__PTDF        BASE:  -102.5 CHNG:  -102.4 DIFF:    -0.1%
                                               DIFF:     0.1   DF:     0.4%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   BASE:   254.6 CHNG:   254.7 DIFF:     0.0%

SUBTOTALS FOR: ARNHAZ__PTDF        BASE:   254.6 CHNG:   254.7 DIFF:     0.0%
                                               DIFF:     0.1   DF:     0.6%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   BASE:   479.1 CHNG:   479.1 DIFF:     0.0%
64400 MECCORD3  - 64403 E MOLIN3   BASE:   100.9 CHNG:   101.0 DIFF:     0.0%

SUBTOTALS FOR: QUARCKCORMOL        BASE:   580.0 CHNG:   580.1 DIFF:     0.0%
                                               DIFF:     0.1   DF:     0.3%
*******************************************************************************

34036 ROCK CK3  - 34037 ROCK CK5   BASE:   230.7 CHNG:   230.7 DIFF:     0.0%

SUBTOTALS FOR: RCKXFM__PTDF        BASE:   230.7 CHNG:   230.7 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.0%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   BASE:   479.1 CHNG:   479.1 DIFF:     0.0%

SUBTOTALS FOR: QUARCK__PTDF        BASE:   479.1 CHNG:   479.1 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.2%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   156.0 CHNG:   156.0 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   237.3 CHNG:   237.3 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   201.7 CHNG:   201.7 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   168.1 CHNG:   168.1 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:    10.3 CHNG:    10.4 DIFF:     0.6%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   104.0 CHNG:   104.0 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:   -51.8 CHNG:   -51.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:    92.0 CHNG:    92.0 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:    19.4 CHNG:    19.4 DIFF:    -0.1%
66716 LAPORTE7  - 61640 BADOURA7   BASE:     5.5 CHNG:     5.5 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    39.2 CHNG:    39.2 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:     1.0 CHNG:     1.0 DIFF:    -0.3%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    -3.0 CHNG:    -3.0 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:   -12.6 CHNG:   -12.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    25.8 CHNG:    25.9 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    22.5 CHNG:    22.5 DIFF:     0.1%
```

```
66752 DRAYTON4  - 67557 LETELER4   BASE:  -286.2 CHNG:  -286.2 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:    -9.7 CHNG:    -9.7 DIFF:     0.1%

SUBTOTALS FOR: NDEX                BASE:   719.8 CHNG:   719.8 DIFF:     0.0%
                                              DIFF:     0.0   DF:     0.0%
*******************************************************************************

67105 LELANDO3  - 66506 FTTHOMP3   BASE:   156.0 CHNG:   156.0 DIFF:     0.0%
67105 LELANDO3  - 67160 GROTON 3   BASE:   237.3 CHNG:   237.3 DIFF:     0.0%
67101 ANTELOP3  - 67120 BRDLAND3   BASE:   201.7 CHNG:   201.7 DIFF:     0.0%
63314 BIGSTON4  - 66503 BLAIR  4   BASE:   168.1 CHNG:   168.1 DIFF:     0.0%
66554 MORRIS 4  - 66550 GRANITF4   BASE:    10.3 CHNG:    10.4 DIFF:     0.6%
63336 AUDUBON4  - 63053 HUBBARD4   BASE:   104.0 CHNG:   104.0 DIFF:     0.0%
66521 SULLYBT4  - 66519 OAHE   4   BASE:   -51.8 CHNG:   -51.8 DIFF:     0.0%
63052 INMAN  4  - 61611 WINGRIV4   BASE:    92.0 CHNG:    92.0 DIFF:     0.0%
66470 BISON  4  - 66497 MAURINE4   BASE:    19.4 CHNG:    19.4 DIFF:    -0.1%
66716 LAPORTE7  - 61640 BADOURA7   BASE:     5.5 CHNG:     5.5 DIFF:     0.0%
63222 ALEXAND7  - 60144 DGLASCO7   BASE:    39.2 CHNG:    39.2 DIFF:     0.0%
67327 ELLENDL7  - 67401 ABDNJCT7   BASE:     1.0 CHNG:     1.0 DIFF:    -0.3%
66432 EDGELEY7  - 66534 ORDWAY 7   BASE:    -3.0 CHNG:    -3.0 DIFF:     0.0%
66438 FORMAN 7  - 66522 SUMMIT-7   BASE:   -12.6 CHNG:   -12.6 DIFF:     0.0%
63211 CANBY  7  - 66551 GRANITF7   BASE:    25.8 CHNG:    25.9 DIFF:     0.1%
62006 KERKHO 7  - 62005 KERKHOT7   BASE:    22.5 CHNG:    22.5 DIFF:     0.1%
66752 DRAYTON4  - 67557 LETELER4   BASE:  -286.2 CHNG:  -286.2 DIFF:     0.0%
63379 RUGBY  4  - 67523 GLENBOR4   BASE:    -9.7 CHNG:    -9.7 DIFF:     0.1%
63311 ********  - 66550 GRANITF4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
63314 BIGSTON4  - 63050 WILLMAR4   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: NDEX-BSP2           BASE:   719.8 CHNG:   719.8 DIFF:     0.0%
                                              DIFF:     0.0   DF:     0.0%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   BASE:   169.2 CHNG:   169.0 DIFF:    -0.1%
60304 EAU CL 3  - 39244 ARP 345    BASE:   433.7 CHNG:   433.5 DIFF:     0.0%

SUBTOTALS FOR: MWSI                BASE:   602.8 CHNG:   602.6 DIFF:     0.0%
                                              DIFF:    -0.2   DF:    -1.3%
*******************************************************************************

64832 GENTLMN4  - 64909 N.PLATT4   BASE:   158.6 CHNG:   158.6 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   159.1 CHNG:   159.1 DIFF:     0.0%
64832 GENTLMN4  - 64909 N.PLATT4   BASE:   163.6 CHNG:   163.6 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   280.9 CHNG:   280.9 DIFF:     0.0%
64831 GENTLMN3  - 64984 SWEET W3   BASE:   336.6 CHNG:   336.6 DIFF:     0.0%
64831 GENTLMN3  - 64943 REDWILO3   BASE:   305.5 CHNG:   305.5 DIFF:     0.0%

SUBTOTALS FOR: GGS                 BASE:  1404.4 CHNG:  1404.4 DIFF:     0.0%
                                              DIFF:     0.0   DF:    -0.1%
*******************************************************************************

64831 GENTLMN3  - 64943 REDWILO3   BASE:   305.5 CHNG:   305.5 DIFF:     0.0%

SUBTOTALS FOR: WNE_WKS             BASE:   305.5 CHNG:   305.5 DIFF:     0.0%
                                              DIFF:     0.0   DF:    -0.2%
*******************************************************************************

64933 PAULINE3  - 64902 MOORE  3   BASE:    58.7 CHNG:    58.7 DIFF:     0.0%
64839 GR ISLD4  - 64780 COLMB.W4   BASE:   101.5 CHNG:   101.5 DIFF:     0.0%
66571 GR ISLD3  - 64896 MCCOOL 3   BASE:   176.2 CHNG:   176.2 DIFF:     0.0%

SUBTOTALS FOR: GRIS_LNC            BASE:   336.4 CHNG:   336.4 DIFF:     0.0%
                                              DIFF:     0.0   DF:    -0.2%
*******************************************************************************

64786 COOPER 3  - 59199 ST JOE 3   BASE:   162.1 CHNG:   162.0 DIFF:    -0.1%
64786 COOPER 3  - 96039 7FAIRPT    BASE:   145.0 CHNG:   144.9 DIFF:     0.0%

SUBTOTALS FOR: COOPER_S            BASE:   307.1 CHNG:   306.9 DIFF:    -0.1%
                                              DIFF:    -0.2   DF:    -0.9%
*******************************************************************************
```

```
60105 PR ISLD3  - 61950 BYRON  3   BASE:   169.2 CHNG:   169.0 DIFF:    -0.1%

SUBTOTALS FOR: PR_ISL_BYRON        BASE:   169.2 CHNG:   169.0 DIFF:    -0.1%
                                                DIFF:    -0.1   DF:    -0.7%
*******************************************************************************

65351 S3451  3  - 65354 S3454  3   BASE:   107.1 CHNG:   107.0 DIFF:     0.0%
65351 S3451  3  - 65359 S3459  3   BASE:   119.3 CHNG:   119.3 DIFF:     0.0%
65451 S1251  5  - 65497 S1297  5   BASE:    63.4 CHNG:    63.3 DIFF:     0.0%

SUBTOTALS FOR: FTCAL_S             BASE:   289.8 CHNG:   289.6 DIFF:     0.0%
                                                DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   BASE:   355.7 CHNG:   355.8 DIFF:     0.0%
64400 MECCORD3  - 64403 E MOLIN3   BASE:   100.9 CHNG:   101.0 DIFF:     0.0%

SUBTOTALS FOR: QUADCITY_W          BASE:   456.6 CHNG:   456.7 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.5%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   BASE:  -234.2 CHNG:  -234.1 DIFF:     0.0%

SUBTOTALS FOR: MNTZUMA_W           BASE:  -234.2 CHNG:  -234.1 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.4%
*******************************************************************************

59253 ST JOE 5  - 59252 MIDWAY 5   BASE:    51.5 CHNG:    51.5 DIFF:     0.0%

SUBTOTALS FOR: SJOMDY__PTDF        BASE:    51.5 CHNG:    51.5 DIFF:     0.0%
                                                DIFF:     0.0   DF:     0.1%
*******************************************************************************

57982 IATAN  7  - 59199 ST JOE 3   BASE:   255.9 CHNG:   255.9 DIFF:     0.0%

SUBTOTALS FOR: IATSJO__PTDF        BASE:   255.9 CHNG:   255.9 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.4%
*******************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   BASE:   206.7 CHNG:   206.8 DIFF:     0.0%

SUBTOTALS FOR: TIFARN__PTDF        BASE:   206.7 CHNG:   206.8 DIFF:     0.0%
                                                DIFF:     0.1   DF:     0.5%
*******************************************************************************

60101 FORBES 2  - 60198 CHIS-N 2   BASE:  1555.4 CHNG:  1555.4 DIFF:     0.0%

SUBTOTALS FOR: FORCHS_PTDF         BASE:  1555.4 CHNG:  1555.4 DIFF:     0.0%
                                                DIFF:     0.0   DF:    -0.1%
*******************************************************************************

34006 LAKEFLD3  - 60331 LKFLDXL3   BASE:    61.3 CHNG:    61.3 DIFF:     0.1%

SUBTOTALS FOR: LKFLKG__PTDF        BASE:    61.3 CHNG:    61.3 DIFF:     0.1%
                                                DIFF:     0.0   DF:     0.2%
*******************************************************************************


## OTDF INTERFACES ##

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36284 CORDO; B  - 36362 NELSO; B   BASE:   810.9 CHNG:   810.8 DIFF:     0.0%

SUBTOTALS FOR: CDVNELQUA471        BASE:   810.9 CHNG:   810.8 DIFF:     0.0%
                                                DIFF:    -0.1   DF:    -0.5%
*******************************************************************************
```

```
38849 PLS PR2   - 36421 ZION ; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39247 ARCADN3   - 36420 ZION ; B   BASE:  -155.3 CHNG:  -155.4 DIFF:     0.0%

SUBTOTALS FOR: ADNZIOPLPZIO        BASE:  -155.3 CHNG:  -155.4 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.4%
*******************************************************************************

38849 PLS PR2   - 36421 ZION ; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39362 LAKEVIEW  - 37384 ZION ;     BASE:   -12.6 CHNG:   -12.6 DIFF:     0.2%

SUBTOTALS FOR: LKVZIOZIOPLP        BASE:   -12.6 CHNG:   -12.6 DIFF:     0.2%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60304 EAU CL 3  - 39244 ARP 345    BASE:   519.7 CHNG:   519.6 DIFF:     0.0%

SUBTOTALS FOR: EAUARPWMPPAD        BASE:   519.7 CHNG:   519.6 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
39058 PAD 345   - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39058 PAD 345   - 39059 PAD 138    BASE:     0.0 CHNG:     0.0 DIFF:  -208.5%

SUBTOTALS FOR: PADXFMWEMROE        BASE:     0.0 CHNG:     0.0 DIFF:  -208.5%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39010 NED 161   - 39020 NED 138    BASE:   128.8 CHNG:   128.8 DIFF:     0.0%

SUBTOTALS FOR: NED_T1WEMPAD        BASE:   128.8 CHNG:   128.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39010 NED 161   - 39020 NED 138    BASE:    70.4 CHNG:    70.4 DIFF:     0.0%

SUBTOTALS FOR: NED_T1EARP_G        BASE:    70.4 CHNG:    70.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60105 PR ISLD3  - 61950 BYRON  3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60304 EAU CL 3  - 39244 ARP 345    BASE:   454.2 CHNG:   454.1 DIFF:     0.0%

SUBTOTALS FOR: EAUARPPRIBYR        BASE:   454.2 CHNG:   454.1 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

39059 PAD 138   - 39141 TOWNLINE   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39059 PAD 138   - 38057 NWT 138    BASE:   187.5 CHNG:   187.5 DIFF:     0.0%
38057 NWT 138   - 39048 BLK 138    BASE:   175.3 CHNG:   175.3 DIFF:     0.0%

SUBTOTALS FOR: PADBLKPADTLR        BASE:   362.8 CHNG:   362.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

```
39059 PAD 138   - 39141 TOWNLINE   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39048 BLK 138   - 39060 COR 138    BASE:   171.0 CHNG:   171.0 DIFF:     0.0%

SUBTOTALS FOR: BLKCORPADTLR        BASE:   171.0 CHNG:   171.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

39058 PAD 345   - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39090 RSS 138   - 39120 ROE 138    BASE:   232.3 CHNG:   232.3 DIFF:     0.0%

SUBTOTALS FOR: RSSROEWEMROE        BASE:   232.3 CHNG:   232.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

39676 WESTON    - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39786 ROCKY RN  - 38952 RIVERW     BASE:   -75.1 CHNG:   -75.1 DIFF:     0.0%
38952 RIVERW    - 39788 NORTHPT    BASE:   -83.5 CHNG:   -83.5 DIFF:     0.0%

SUBTOTALS FOR: RRNNPTRRNGPK        BASE:  -158.6 CHNG:  -158.6 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

39058 PAD 345   - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39048 BLK 138   - 39060 COR 138    BASE:   225.3 CHNG:   225.3 DIFF:     0.0%

SUBTOTALS FOR: BLKCRDWEMROE        BASE:   225.3 CHNG:   225.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

39059 PAD 138   - 38057 NWT 138    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39059 PAD 138   - 39141 TOWNLINE   BASE:   160.5 CHNG:   160.5 DIFF:     0.0%

SUBTOTALS FOR: PADTLRPADBLK        BASE:   160.5 CHNG:   160.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

39119 ROE 345   - 39120 ROE 138    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39119 ROE 345   - 39120 ROE 138    BASE:   226.4 CHNG:   226.4 DIFF:     0.0%

SUBTOTALS FOR: ROE_T2ROE_T3        BASE:   226.4 CHNG:   226.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

39058 PAD 345   - 39059 PAD 138    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39119 ROE 345   - 39120 ROE 138    BASE:   278.7 CHNG:   278.7 DIFF:     0.0%

SUBTOTALS FOR: RKDLFLOPADDK        BASE:   278.7 CHNG:   278.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

39244 ARP 345   - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60315 T-CRNRS7  - 39706 WIEN       BASE:    33.6 CHNG:    33.5 DIFF:    -0.1%

SUBTOTALS FOR: TCRWIEARPRRN        BASE:    33.6 CHNG:    33.5 DIFF:    -0.1%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

60304 EAU CL 3  - 39244 ARP 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60315 T-CRNRS7  - 39706 WIEN       BASE:   108.1 CHNG:   108.1 DIFF:     0.0%

SUBTOTALS FOR: TCRWIEEARP_G        BASE:   108.1 CHNG:   108.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.2%
```

```
*******************************************************************************

39058 PAD 345   - 39119 ROE 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
39059 PAD 138   - 39141 TOWNLINE   BASE:   192.1 CHNG:   192.2 DIFF:     0.0%

SUBTOTALS FOR: PADTLRWEMROE        BASE:   192.1 CHNG:   192.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

30395 COFFEEN   - 31445 PANA       *CONTINGENCY* BASE:     0.0 CHNG:     0.0
31445 PANA      - 36343 KINCA; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
31230 MONTGMRY  - 31992 SPENCER    BASE:   302.5 CHNG:   302.6 DIFF:     0.0%

SUBTOTALS FOR: MTGSPCCOFPAN        BASE:   302.5 CHNG:   302.6 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.4%
*******************************************************************************

30154 BLAND     - 96041 7FRANKS    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
31088 MCCREDIE  - 31408 OVERTON    BASE:   206.9 CHNG:   207.0 DIFF:     0.0%

SUBTOTALS FOR: MCROVEBLAF_G        BASE:   206.9 CHNG:   207.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

31088 MCCREDIE  - 31408 OVERTON    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
30154 BLAND     - 96041 7FRANKS    BASE:   497.3 CHNG:   497.3 DIFF:     0.0%

SUBTOTALS FOR: BLAFRAMCROVE        BASE:   497.3 CHNG:   497.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36281 BYRON; R  - 36289 CHERR; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36280 BYRON; B  - 36288 CHERR; B   BASE:  1192.4 CHNG:  1192.4 DIFF:     0.0%

SUBTOTALS FOR: BYNCHEBYNCHE        BASE:  1192.4 CHNG:  1192.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36281 BYRON; R  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36280 BYRON; B  - 36288 CHERR; B   BASE:  1069.0 CHNG:  1069.0 DIFF:     0.0%

SUBTOTALS FOR: BYCH_BBYNWEM        BASE:  1069.0 CHNG:  1069.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************

36280 BYRON; B  - 36288 CHERR; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36281 BYRON; R  - 36289 CHERR; R   BASE:  1247.0 CHNG:  1246.9 DIFF:     0.0%

SUBTOTALS FOR: BYRCHEBYRCHE        BASE:  1247.0 CHNG:  1246.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.2%
*******************************************************************************

36281 BYRON; R  - 36407 WEMPL; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36281 BYRON; R  - 36289 CHERR; R   BASE:  1188.1 CHNG:  1188.1 DIFF:     0.0%

SUBTOTALS FOR: BYCH_RBYNWEM        BASE:  1188.1 CHNG:  1188.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
*******************************************************************************
```

```
36284 CORDO; B  - 36362 NELSO; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36382 QUAD ;    - 36368 H471 ;     BASE:   815.7 CHNG:   815.6 DIFF:     0.0%

SUBTOTALS FOR: QUA471CDVNEL        BASE:   815.7 CHNG:   815.6 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.5%
*******************************************************************************

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36382 QUAD ;    - 36284 CORDO; B   BASE:   429.5 CHNG:   429.5 DIFF:     0.0%
36284 CORDO; B  - 36362 NELSO; B   BASE:   810.9 CHNG:   810.8 DIFF:     0.0%

SUBTOTALS FOR: QUACDVQUA471        BASE:  1240.4 CHNG:  1240.3 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.7%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36406 WEMPL; B  - 39058 PAD 345    BASE:   841.5 CHNG:   841.6 DIFF:     0.0%

SUBTOTALS FOR: WEMPADZIOARC        BASE:   841.5 CHNG:   841.6 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

36421 ZION ; R  - 38849 PLS PR2    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36406 WEMPL; B  - 39058 PAD 345    BASE:   793.2 CHNG:   793.2 DIFF:     0.0%

SUBTOTALS FOR: WEMPADZIOPLP        BASE:   793.2 CHNG:   793.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36406 WEMPL; B  - 39058 PAD 345    BASE:   980.5 CHNG:   980.5 DIFF:     0.0%

SUBTOTALS FOR: WEMPADCHVSLA        BASE:   980.5 CHNG:   980.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36421 ZION ; R  - 38849 PLS PR2    BASE:    58.6 CHNG:    58.7 DIFF:     0.2%

SUBTOTALS FOR: ZIOPLPZIOARC        BASE:    58.6 CHNG:    58.7 DIFF:     0.2%
                                                 DIFF:     0.1   DF:     0.5%
*******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36421 ZION ; R  - 38849 PLS PR2    BASE:   274.2 CHNG:   274.3 DIFF:     0.0%

SUBTOTALS FOR: ZIOPLPWEMPAD        BASE:   274.2 CHNG:   274.3 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.5%
*******************************************************************************

36421 ZION ; R  - 38849 PLS PR2    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36420 ZION ; B  - 39247 ARCADN3    BASE:   156.2 CHNG:   156.3 DIFF:     0.0%

SUBTOTALS FOR: ZIOARCZIOPLP        BASE:   156.2 CHNG:   156.3 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.4%
*******************************************************************************

36362 NELSO; B  - 36310 ELECT; B   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36289 CHERR; R  - 36389 SILVE; R   BASE:   886.8 CHNG:   886.8 DIFF:     0.0%

SUBTOTALS FOR: CHESILNELELC        BASE:   886.8 CHNG:   886.8 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.3%
```

```
******************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
36362 NELSO; B  - 36310 ELECT; B   BASE:   609.6 CHNG:   609.5 DIFF:     0.0%

SUBTOTALS FOR: NELELCCHESIL        BASE:   609.6 CHNG:   609.5 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.4%
******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
37632 LEECO;BP  - 36362 NELSO; B   BASE:   265.0 CHNG:   265.1 DIFF:     0.0%

SUBTOTALS FOR: LCONELWEMPAD        BASE:   265.0 CHNG:   265.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
******************************************************************************

39253 ARCADN1   - 39329 GRANVL1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
39268 BUTLER    - 39327 GRANVL 5   BASE:  -103.8 CHNG:  -103.8 DIFF:     0.0%

SUBTOTALS FOR: BTRGVLARCGVL        BASE:  -103.8 CHNG:  -103.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
******************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
38850 PLS PR3   - 39471 RACINE1    BASE:   652.4 CHNG:   652.5 DIFF:     0.0%

SUBTOTALS FOR: PLPRACWEMPAD        BASE:   652.4 CHNG:   652.5 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
******************************************************************************

38894 N APP 3   - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
38892 ELLNGTN3  - 39534 HINTZ      BASE:    75.7 CHNG:    75.7 DIFF:     0.0%

SUBTOTALS FOR: ELNHNZNAPRRN        BASE:    75.7 CHNG:    75.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
******************************************************************************

38849 PLS PR2   - 36421 ZION ; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
39345 KENOSH45  - 39362 LAKEVIEW   BASE:    24.0 CHNG:    24.0 DIFF:    -0.1%

SUBTOTALS FOR: KSHLKVPLPZIO        BASE:    24.0 CHNG:    24.0 DIFF:    -0.1%
                                                 DIFF:     0.0   DF:    -0.1%
******************************************************************************

38850 PLS PR3   - 39471 RACINE1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
39432 PLS PR1   - 39253 ARCADN1    BASE:   463.9 CHNG:   463.9 DIFF:     0.0%

SUBTOTALS FOR: PLPARCPLRRAC        BASE:   463.9 CHNG:   463.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
******************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
39432 PLS PR1   - 39253 ARCADN1    BASE:   346.9 CHNG:   347.0 DIFF:     0.0%

SUBTOTALS FOR: PLPARCZIOARC        BASE:   346.9 CHNG:   347.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
******************************************************************************
```

```
36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
38937 WALWORTH  - 39357 MUKWONGO   BASE:   110.3 CHNG:   110.3 DIFF:     0.0%

SUBTOTALS FOR: WHIMUKCHESIL        BASE:   110.3 CHNG:   110.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
********************************************************************************

36289 CHERR; R  - 36389 SILVE; R   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
38849 PLS PR2   - 36421 ZION ; R   BASE:   199.4 CHNG:   199.4 DIFF:     0.0%

SUBTOTALS FOR: PLPZIOCHESIL        BASE:   199.4 CHNG:   199.4 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.4%
********************************************************************************

36420 ZION ; B  - 39247 ARCADN3    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
38849 PLS PR2   - 36421 ZION ; R   BASE:   -58.5 CHNG:   -58.6 DIFF:     0.2%

SUBTOTALS FOR: PLPZIOZIOARC        BASE:   -58.5 CHNG:   -58.6 DIFF:     0.2%
                                                 DIFF:    -0.1   DF:    -0.5%
********************************************************************************

38850 PLS PR3   - 39471 RACINE1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
39249 ALBERS-2  - 39410 PARIS WE   BASE:   218.0 CHNG:   218.0 DIFF:     0.0%

SUBTOTALS FOR: ALBPARPLPRAC        BASE:   218.0 CHNG:   218.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

39432 PLS PR1   - 39253 ARCADN1    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
38850 PLS PR3   - 39471 RACINE1    BASE:   583.9 CHNG:   583.9 DIFF:     0.0%

SUBTOTALS FOR: PLPRACPLPADN        BASE:   583.9 CHNG:   583.9 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
********************************************************************************

38894 N APP 3   - 39785 ROCKY RN   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
39786 ROCKY RN  - 39790 WHITNG A   BASE:   204.7 CHNG:   204.7 DIFF:     0.0%

SUBTOTALS FOR: RRNWAVRRNNAP        BASE:   204.7 CHNG:   204.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
********************************************************************************

39785 ROCKY RN  - 39676 WESTON     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
39210 CW8 115   - 39686 WESTONWP   BASE:  -118.2 CHNG:  -118.2 DIFF:     0.0%

SUBTOTALS FOR: RRNWESRRNGPK        BASE:  -118.2 CHNG:  -118.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
********************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34093 ARNOLD 3  - 34018 HAZLTON3   BASE:   323.6 CHNG:   323.7 DIFF:     0.0%

SUBTOTALS FOR: ARNHAZWEMPAD        BASE:   323.6 CHNG:   323.7 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.6%
********************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34028 LORE   5  - 34033 TRK RIV5   BASE:   156.5 CHNG:   156.5 DIFF:     0.0%

SUBTOTALS FOR: LORTRKWEMPAD        BASE:   156.5 CHNG:   156.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************
```

```
34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:   118.5 CHNG:   118.5 DIFF:     0.0%

SUBTOTALS FOR: LKJFOXARNHAZ        BASE:   118.5 CHNG:   118.5 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.0%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34036 ROCK CK3  - 34037 ROCK CK5   BASE:   276.5 CHNG:   276.5 DIFF:     0.0%

SUBTOTALS FOR: RCKXFMQUADAV        BASE:   276.5 CHNG:   276.5 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.1%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34035 ROCKCKW5  - 34124 DEWITT 5   BASE:    87.1 CHNG:    87.1 DIFF:     0.0%

SUBTOTALS FOR: RCKDWTQUAS91        BASE:    87.1 CHNG:    87.1 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.1%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   272.0 CHNG:   272.0 DIFF:     0.0%

SUBTOTALS FOR: SALXFMQUAS91        BASE:   272.0 CHNG:   272.0 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.1%
*******************************************************************************

64400 MECCORD3  - 64403 E MOLIN3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   251.5 CHNG:   251.5 DIFF:     0.0%

SUBTOTALS FOR: SALXFMCORMOL        BASE:   251.5 CHNG:   251.5 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.1%
*******************************************************************************

36382 QUAD ;    - 64405 SUB 91 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   272.0 CHNG:   272.0 DIFF:     0.0%

SUBTOTALS FOR: SALXFMQUADAV        BASE:   272.0 CHNG:   272.0 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.1%
*******************************************************************************

64350 HILLS  3  - 64095 MNTZUMA3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64352 TIFFIN 3  - 34093 ARNOLD 3   BASE:   116.7 CHNG:   116.9 DIFF:     0.1%

SUBTOTALS FOR: TIFARNHILMON        BASE:   116.7 CHNG:   116.9 DIFF:     0.1%
                                               DIFF:     0.1   DF:     0.6%
*******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34091 ARNOLD 5  - 34089 VINTON 5   BASE:   127.8 CHNG:   127.8 DIFF:     0.0%

SUBTOTALS FOR: ARNVINARNHAZ        BASE:   127.8 CHNG:   127.8 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.2%
*******************************************************************************

36382 QUAD ;    - 34036 ROCK CK3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64425 DAVNPRT5  - 34909 E CAL T5   BASE:   180.9 CHNG:   180.9 DIFF:     0.0%

SUBTOTALS FOR: DAVCALQUARCK        BASE:   180.9 CHNG:   180.9 DIFF:     0.0%
                                               DIFF:     0.0   DF:     0.1%
```

```
******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
34052 AMES   7  - 34076 BNE JCT7   BASE:   -24.6 CHNG:   -24.6 DIFF:     0.0%

SUBTOTALS FOR: AMEBJCMTZBON        BASE:   -24.6 CHNG:   -24.6 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
******************************************************************************

34006 LAKEFLD3  - 60331 LKFLDXL3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:   119.8 CHNG:   119.9 DIFF:     0.0%

SUBTOTALS FOR: LAKFOXLAKLKF        BASE:   119.8 CHNG:   119.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
******************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
34087 DYSART 5  - 64269 WASHBRN5   BASE:   181.9 CHNG:   181.9 DIFF:     0.0%

SUBTOTALS FOR: DYSWASARNHAZ        BASE:   181.9 CHNG:   181.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
******************************************************************************

64080 SYCAMOR3  - 64198 GRIMES 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
64067 BONDRNT5  - 34529 HUXLEYT5   BASE:    76.3 CHNG:    76.3 DIFF:     0.0%

SUBTOTALS FOR: BONBJCSYCLEH        BASE:    76.3 CHNG:    76.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
******************************************************************************

64202 LEHIGH 3  - 64200 WEBSTER3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
64067 BONDRNT5  - 34529 HUXLEYT5   BASE:   150.2 CHNG:   150.2 DIFF:     0.0%

SUBTOTALS FOR: BONBJCLEHWBS        BASE:   150.2 CHNG:   150.2 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
******************************************************************************

34007 LAKEFLD5  - 34137 TRIBOJI5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:   120.3 CHNG:   120.3 DIFF:     0.0%

SUBTOTALS FOR: LKJFOXLKJTRI        BASE:   120.3 CHNG:   120.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
******************************************************************************

***** ERROR: OTDF #  68 BASE CASE LAST SOLUTION DID NOT REACH TOLERANCE, FIX AND RERUN PROGRAM

***** ERROR: OTDF #  68 BASE CASE NOT SOLVED WELL, MISMATCH=  12633.61 FIX AND RERUN PROGRAM

***** ERROR: OTDF #  68 CHNG CASE LAST SOLUTION DID NOT REACH TOLERANCE, FIX AND RERUN PROGRAM

***** ERROR: OTDF #  68 CHNG CASE NOT SOLVED WELL, MISMATCH=  12367.65 FIX AND RERUN PROGRAM

60173 ROSEAUN2  - 67621 RIEL   2   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
67621 RIEL   2  - 67564 DORSEY 2   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
------------------------------------------------------------------------------
34093 ARNOLD 3  - 34018 HAZLTON3   BASE:   370.9 CHNG:   371.0 DIFF:     0.0%

SUBTOTALS FOR: ARNHAZDORFOR        BASE:   370.9 CHNG:   371.0 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.6%
******************************************************************************
```

```
60304 EAU CL 3  - 39244 ARP 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34020 HAZL S 5  - 34135 DUNDEE 5   BASE:   119.1 CHNG:   119.1 DIFF:     0.0%

SUBTOTALS FOR: HAZDUNEAUARP        BASE:   119.1 CHNG:   119.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
********************************************************************************

63875 RAUN   3  - 34006 LAKEFLD3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
66563 SPENCER5  - 34137 TRIBOJI5   BASE:   -79.7 CHNG:   -79.7 DIFF:     0.0%

SUBTOTALS FOR: SPETRILAKRAU        BASE:   -79.7 CHNG:   -79.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
********************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   295.1 CHNG:   295.1 DIFF:     0.0%

SUBTOTALS FOR: SALXFMWEMPAD        BASE:   295.1 CHNG:   295.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
64350 HILLS  3  - 34110 HILLSIE5   BASE:   143.7 CHNG:   143.8 DIFF:     0.0%

SUBTOTALS FOR: HILXFMTIFARN        BASE:   143.7 CHNG:   143.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
********************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34032 8TH ST.5  - 34908 KERPER 8   BASE:    90.1 CHNG:    90.1 DIFF:     0.0%

SUBTOTALS FOR: 8STKERWEMPAD        BASE:    90.1 CHNG:    90.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34032 8TH ST.5  - 34908 KERPER 8   BASE:    76.7 CHNG:    76.8 DIFF:     0.0%

SUBTOTALS FOR: 8STKERARNHAZ        BASE:    76.7 CHNG:    76.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

36382 QUAD ;    - 36368 H471 ;     *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34045 ALBANY 6  - 36773 GARDE;     BASE:    54.3 CHNG:    54.3 DIFF:     0.0%

SUBTOTALS FOR: ALBGARQUAST         BASE:    54.3 CHNG:    54.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
********************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34066 M-TOWN 7  - 34071 FERNALD7   BASE:     2.4 CHNG:     2.4 DIFF:     0.2%

SUBTOTALS FOR: MRTFERMTZBON        BASE:     2.4 CHNG:     2.4 DIFF:     0.2%
                                                 DIFF:     0.0   DF:     0.0%
********************************************************************************

64202 LEHIGH 3  - 64200 WEBSTER3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34015 LIME CK5  - 34016 EMERY  5   BASE:   -99.1 CHNG:   -99.1 DIFF:     0.0%

SUBTOTALS FOR: LIMEMELEHWEB        BASE:   -99.1 CHNG:   -99.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
********************************************************************************
```

```
36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34028 LORE   5  - 34033 TRK RIV5   BASE:   156.5 CHNG:   156.5 DIFF:     0.0%

SUBTOTALS FOR: LORTRKWPAD_G        BASE:   156.5 CHNG:   156.5 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

34093 ARNOLD 3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34089 VINTON 5  - 34087 DYSART 5   BASE:   108.2 CHNG:   108.3 DIFF:     0.0%

SUBTOTALS FOR: VINDYSARNHAZ        BASE:   108.2 CHNG:   108.3 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
********************************************************************************

60102 ADAMS  3  - 34018 HAZLTON3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34015 LIME CK5  - 34016 EMERY  5   BASE:  -129.9 CHNG:  -129.9 DIFF:     0.0%

SUBTOTALS FOR: LIMEMEADAHAZ        BASE:  -129.9 CHNG:  -129.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:    -0.1%
********************************************************************************

36406 WEMPL; B  - 39058 PAD 345    *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34030 SALEM N5  - 34508 JULIAN 5   BASE:   171.8 CHNG:   171.8 DIFF:     0.0%

SUBTOTALS FOR: SALJCRWEMPAD        BASE:   171.8 CHNG:   171.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

60331 LKFLDXL3  - 60108 WILMART3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34007 LAKEFLD5  - 34008 FOX LK 5   BASE:   203.9 CHNG:   203.9 DIFF:     0.0%

SUBTOTALS FOR: LKFFOXLKFWLM        BASE:   203.9 CHNG:   203.9 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
********************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34093 ARNOLD 3  - 34018 HAZLTON3   BASE:   215.5 CHNG:   215.6 DIFF:     0.1%

SUBTOTALS FOR: ARNHAZMTZBON        BASE:   215.5 CHNG:   215.6 DIFF:     0.1%
                                                 DIFF:     0.1   DF:     0.7%
********************************************************************************

64352 TIFFIN 3  - 34093 ARNOLD 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   264.8 CHNG:   264.8 DIFF:     0.0%

SUBTOTALS FOR: SALXFMTIFARN        BASE:   264.8 CHNG:   264.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.2%
********************************************************************************

64350 HILLS  3  - 64352 TIFFIN 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
34029 SALEM  3  - 34030 SALEM N5   BASE:   263.8 CHNG:   263.9 DIFF:     0.0%

SUBTOTALS FOR: SALXFMHL3TIF        BASE:   263.8 CHNG:   263.9 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
********************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
--------------------------------------------------------------------------------
64352 TIFFIN 3  - 34093 ARNOLD 3   BASE:   154.0 CHNG:   154.1 DIFF:     0.1%

SUBTOTALS FOR: TIFARNMTZBON        BASE:   154.0 CHNG:   154.1 DIFF:     0.1%
                                                 DIFF:     0.1   DF:     0.6%
```

```
*******************************************************************************

34091 ARNOLD 5  - 34090 ARNOLD1G   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
64350 HILLS  3  - 34110 HILLSIE5   BASE:   154.7 CHNG:   154.7 DIFF:     0.0%

SUBTOTALS FOR: HILXFMARNXFM        BASE:   154.7 CHNG:   154.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

34016 EMERY  5  - 64252 FLOYD  5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34016 EMERY  5  - 34015 LIME CK5   BASE:   170.8 CHNG:   170.8 DIFF:     0.0%

SUBTOTALS FOR: EMELIMEMEFYD        BASE:   170.8 CHNG:   170.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

56769 LANG   7  - 56796 WICHITA7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57981 LACYGNE7  - 56793 NEOSHO 7   BASE:   434.7 CHNG:   434.6 DIFF:     0.0%

SUBTOTALS FOR: LACNEOLANWIC        BASE:   434.7 CHNG:   434.6 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.3%
*******************************************************************************

59255 LAKE RD5  - 58028 NASHUA-5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
57982 IATAN  7  - 56772 STRANGR7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
59199 ST JOE 3  - 57972 HAWTH  7   BASE:   461.9 CHNG:   461.7 DIFF:     0.0%

SUBTOTALS FOR: SJOHTHIATSTC        BASE:   461.9 CHNG:   461.7 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

57981 LACYGNE7  - 57968 STILWEL7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57981 LACYGNE7  - 57965 W.GRDNR7   BASE:   944.7 CHNG:   944.8 DIFF:     0.0%

SUBTOTALS FOR: LACWGRLACSTI        BASE:   944.7 CHNG:   944.8 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
*******************************************************************************

56873 SUMMIT 6  - 56872 EMCPHER6   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -11.5 CHNG:   -11.5 DIFF:     0.0%
57374 SPHILPJ3  - 57438 WMCPHER3   BASE:   -13.5 CHNG:   -13.5 DIFF:     0.0%

SUBTOTALS FOR: SPHWMCSUMEMC        BASE:   -25.0 CHNG:   -25.0 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

59255 LAKE RD5  - 58028 NASHUA-5   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
59199 ST JOE 3  - 57972 HAWTH  7   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
57982 IATAN  7  - 56772 STRANGR7   BASE:   561.7 CHNG:   561.6 DIFF:     0.0%

SUBTOTALS FOR: IATSTRLRDNUA        BASE:   561.7 CHNG:   561.6 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:    -0.6%
*******************************************************************************

65351 S3451  3  - 63875 RAUN   3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
65426 S1226  5  - 64987 TEKAMAH5   BASE:    29.2 CHNG:    29.2 DIFF:     0.1%

SUBTOTALS FOR: S12TEKS34RAU        BASE:    29.2 CHNG:    29.2 DIFF:     0.1%
                                                 DIFF:     0.0   DF:     0.2%
*******************************************************************************
```

```
36382 QUAD ;    - 34036 ROCK CK3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
36382 QUAD ;    - 64405 SUB 91 3   BASE:   537.6 CHNG:   537.7 DIFF:     0.0%

SUBTOTALS FOR: QUAS91QUARCK        BASE:   537.6 CHNG:   537.7 DIFF:     0.0%
                                                 DIFF:     0.1   DF:     0.3%
*******************************************************************************

34018 HAZLTON3  - 60102 ADAMS  3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
60102 ADAMS  3  - 34014 ADAMS  5   BASE:    39.1 CHNG:    39.0 DIFF:    -0.1%

SUBTOTALS FOR: ADMXFMHAZADM        BASE:    39.1 CHNG:    39.0 DIFF:    -0.1%
                                                 DIFF:     0.0   DF:    -0.2%
*******************************************************************************

96039 7FAIRPT   - 64786 COOPER 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
96039 7FAIRPT   - 59199 ST JOE 3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
59253 ST JOE 5  - 59252 MIDWAY 5   BASE:    79.4 CHNG:    79.4 DIFF:     0.0%

SUBTOTALS FOR: STJMIDSTJFRC        BASE:    79.4 CHNG:    79.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

64350 HILLS  3  - 64095 MNTZUMA3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34110 HILLSIE5  - 34109 BERTRAM5   BASE:    81.4 CHNG:    81.4 DIFF:     0.0%

SUBTOTALS FOR: HL5PRLHL3MTZ        BASE:    81.4 CHNG:    81.4 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************

63041 COAL CR4  - 63042 COAL TP4   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
63049 STANTON4  - 63041 COAL CR4   BASE:   116.8 CHNG:   116.8 DIFF:     0.0%

SUBTOTALS FOR: SONCOCCOCCCT        BASE:   116.8 CHNG:   116.8 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

63041 COAL CR4  - 63049 STANTON4   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
63041 COAL CR4  - 63042 COAL TP4   BASE:  -111.6 CHNG:  -111.6 DIFF:     0.0%

SUBTOTALS FOR: SONCCTCOCSON        BASE:  -111.6 CHNG:  -111.6 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************

64095 MNTZUMA3  - 64064 BONDRNT3   *CONTINGENCY* BASE:     0.0 CHNG:     0.0
-------------------------------------------------------------------------------
34191 REASNOR5  - 64062 DMOINES5   BASE:  -112.7 CHNG:  -112.7 DIFF:     0.0%

SUBTOTALS FOR: READEMMTZBON        BASE:  -112.7 CHNG:  -112.7 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.1%
*******************************************************************************
```

# Appendix D: Contingency analysis results (SCREENACCC output)

## *D.1 Summer off-peak scenario contingency analysis*

```
 SUMMER PEAK CONTINGENCY ANALYSIS COMPARISON - MARSHALL WIND FARM SCREENED TO 100% RATE A

SCREEN RESULTS FILE NAME: ScreenSUOP100LOAD.dat

SCREENACCC PROGRAM (VERSION: BETA-17-1, 07/21/04, MS)  ----- DATE: WED, APR 11 2007  8:56

***** ACCC FILE #1: suop_base_accc100.out
***** ACCC DATE   : WED, APR 11 2007   8:47

URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

ACCC FILE #1 SCANNING LIMIT/RATING:
  LOADING LIMIT  100.0% OF RATE: A

DISTRIBUTION FACTOR FILE:     Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring 2007\Summer
OffPeak\suop_base
SUBSYSTEM DESCRIPTION FILE:   Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp-ne
MONITORED ELEMENT FILE:       Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp.mo
CONTINGENCY DESCRIPTION FILE: Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\Marshal

***** ACCC FILE #2: suop_chng_accc100.out
***** ACCC DATE   : WED, APR 11 2007   8:47

URG-SO06AA.UZVV454.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

ACCC FILE #2 SCANNING LIMIT/RATING:
  LOADING LIMIT  100.0% OF RATE: A

DISTRIBUTION FACTOR FILE:     Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring 2007\Summer
OffPeak\suop_chng
SUBSYSTEM DESCRIPTION FILE:   Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp-ne
MONITORED ELEMENT FILE:       Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp.mo
CONTINGENCY DESCRIPTION FILE: Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\Marshal


***** CRITERIA FOR COMPARING ACCC FILE #2 WITH ACCC FILE #1

  LOADING CHANGE BASED ON MINIMUM MVA INCREASE OF:    0.50 MVA

  VOLTAGE CHANGE BASED ON MINIMUM PU VOLTAGE CHANGE OF:    0.01000 PU


**** LOADING LIMITER CHANGES ****

==================================================================================================================
   1) 60144 DGLASCO7 - 60749 DGLAS C8 CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
------------------------------------------------------------------------------------------------------------------
  SINGLE 616  : 63219 GRANTCO7 - 63223 HOOT LK7 CKT: 1    47.0F  .....    47.0   .....   100.0   .....   *NEW*

==================================================================================================================
   2) 63314 BIGSTON4 - 63315 BIGSTN1G CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
------------------------------------------------------------------------------------------------------------------
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1   480.2T   N/C    471.5    N/C    101.8    N/C    *NEW*
  160       1 : ** MULTIPLE CONTINGENCY **               479.7T  .....   471.5   .....   101.7   .....   *NEW*
              : 66509 FTRANDL4 - 66565 SIOUXCY4 CKT: 1
              : 66509 FTRANDL4 - 66526 UTICAJC4 CKT: 1
              : 66526 UTICAJC4 - 66536 RASMUSN4 CKT: 1
              : 66398 VFODNES4 - 66526 UTICAJC4 CKT: 1

==================================================================================================================
   3) 60197 CHIS CO2 - 60198 CHIS-N 2 CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
```

```
-----------------------------------------------------------------------------------------------------------------
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1  1741.5F   N/C   1732.0    N/C    100.1    N/C    *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

=================================================================================================================
   4) *** NOT CONVERGED ***                            PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
-----------------------------------------------------------------------------------------------------------------
  SINGLE 56   : 60123 PIPESTN7 - 60125 PATHFDR7 CKT: 1     0.0T  .....     0.0   .....     0.0   .....   *NEW*

=================================================================================================================
   5) 60170 MARSHAL7 - 60171 LYON CO7 CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
-----------------------------------------------------------------------------------------------------------------
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1   161.5T   N/C    127.9    N/C    131.4    N/C    *NEW*

=================================================================================================================
   6) 60170 MARSHAL7 - 60375 MMU_N7ST CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
-----------------------------------------------------------------------------------------------------------------
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1   133.5F   N/C    127.0    N/C    110.1    N/C    *NEW*

=================================================================================================================
   7) 66530 WATERTN4 - 66539 WATERSVC CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
-----------------------------------------------------------------------------------------------------------------
  SINGLE 957  : 66550 GRANITF4 - 66554 MORRIS 4 CKT: 1   153.5T  151.6T  150.0   150.0   102.4   101.0     1.9
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1   153.3T   N/C    150.0    N/C    102.2    N/C    *NEW*
  SINGLE 958  : 66553 MOORHED4 - 66554 MORRIS 4 CKT: 1   153.3T  151.9T  150.0   150.0   102.2   101.3     1.4
  160       3 : ** MULTIPLE CONTINGENCY **               152.2T  151.2T  150.0   150.0   101.5   100.8     1.0
              : 66509 FTRANDL4 - 66526 UTICAJC4 CKT: 1
              : 66398 VFODNES4 - 66526 UTICAJC4 CKT: 1
              : 66526 UTICAJC4 - 66536 RASMUSN4 CKT: 1
  SINGLE 918  : 66509 FTRANDL4 - 66526 UTICAJC4 CKT: 1   152.1T  151.2T  150.0   150.0   101.4   100.8     0.9
  SINGLE 853  : 66470 BISON  4 - 67347 HETINGR4 CKT: 1   151.0T  150.0T  150.0   150.0   100.7   100.0     1.0

**** -- LOW-- VOLTAGE LIMITER CHANGES *****

=============================================================================================
   8) 34242 JACKN M8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  SINGLE 210  : 60202 COON CK3 - 60251 TERMINL3 CKT: 1          0.9317   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

=============================================================================================
   9) 34246 JACKSNM8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  SINGLE 210  : 60202 COON CK3 - 60251 TERMINL3 CKT: 1          0.9332   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

=============================================================================================
  10) 62365 ENTPRSW8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  SINGLE 210  : 60202 COON CK3 - 60251 TERMINL3 CKT: 1          0.9340   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

=============================================================================================
  11) 62366 ENTRPRS8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  SINGLE 210  : 60202 COON CK3 - 60251 TERMINL3 CKT: 1          0.9306   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

=============================================================================================
  12) 60686 E MELRO8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  SINGLE 420  : 60752 BLCKOAK8 - 60754 MELRSMU8 CKT: 1          0.9499   .....   *NEW*

=============================================================================================
  13) 60743 BELGRAD8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  SINGLE 416  : 60747 VILLARD8 - 60748 WESTPRT8 CKT: 1          0.9499   .....   *NEW*

=============================================================================================
  14) 60695 DANUBE 8                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
  795         : ** MULTIPLE CONTINGENCY **                      0.9488   .....   *NEW*
              : 66550 GRANITF4 - 60150 MNVLTAP4 CKT: 1
              : 60148 MINVALY7 - 60149 MINVALT4 CKT: 6
              : 60150 MNVLTAP4 - 63054 PANTHER4 CKT: 1
              : 60149 MINVALT4 - 60150 MNVLTAP4 CKT: 1
              : 63054 PANTHER4 - 60742 PANTHER8 CKT: 1

=============================================================================================
  15) 62982 HUTCHMN7                                     PSTCNT2 PSTCNT1 PU-CHNG
---------------------------------------------------------------------------------------------
```

```
  SINGLE 557  : 62982 HUTCHMN7 - 62983 HUTCH3M7 CKT: 1          0.9499   .....   *NEW*

==============================================================================================
  16) 60370 MMU SW 7                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9057  0.9377 -0.0320
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==============================================================================================
  17) 60371 ERIE RD7                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9076  0.9388 -0.0312
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==============================================================================================
  18) 60372 SARATOG7                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9063  0.9390 -0.0327
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==============================================================================================
  19) 60373 SOUTH E7                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9048  0.9368 -0.0320
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==============================================================================================
  20) 60375 MMU_N7ST                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9065  0.9377 -0.0312
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==============================================================================================
  21) 66508 S3     7                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9168  0.9449 -0.0281
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==============================================================================================
  22) 66552 MARS ER7                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                     0.9163  0.9444 -0.0281
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

**** --HIGH-- VOLTAGE LIMITER CHANGES *****

==============================================================================================
  23) 60198 CHIS-N 2                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1          1.0558    N/C    *NEW*
  SINGLE 245  : 60214 HIBRDGE7 - 60228 MERIMPK7 CKT: 1          1.0561   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==============================================================================================
  24) 60742 PANTHER8                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  SINGLE 116  : 60148 MINVALY7 - 60683 MINNVAL8 CKT: 1          1.0565   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==============================================================================================
  25) 60749 DGLAS C8                                          PSTCNT2 PSTCNT1 PU-CHNG
----------------------------------------------------------------------------------------------
  SINGLE 114  : 60148 MINVALY7 - 60171 LYON CO7 CKT: 1          1.0549   .....   *NEW*
  SINGLE 205  : 60200 BLK DG27 - 60258 WILSON 7 CKT: 2          1.0551   .....   *NEW*
  SINGLE 5    : 60060 LYNKSVC7 - 60119 LKYNKTN7 CKT: 1          1.0552   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***
```

```
==========================================================================================
  26) 60750 OSAKIS 8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 244  : 60213 GOPHER 7 - 60252 TERMINL7 CKT: 1            1.0514   .....   *NEW*
  SINGLE 243  : 60213 GOPHER 7 - 60226 MAIN ST7 CKT: 1            1.0515   .....   *NEW*
  SINGLE 114  : 60148 MINVALY7 - 60171 LYON CO7 CKT: 1            1.0516   .....   *NEW*
  SINGLE 5    : 60060 LYNKSVC7 - 60119 LKYNKTN7 CKT: 1            1.0518   .....   *NEW*
  SINGLE 24   : 60110 WILMART7 - 60111 SWAN LK7 CKT: 1            1.0518   .....   *NEW*
  SINGLE 246  : 60214 HIBRDGE7 - 60239 ROGRSLK7 CKT: 1            1.0519   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
  27) 62403 STINSON8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 62   : 60125 PATHFDR7 - 60129 SPLT RK7 CKT: 1            1.0501    N/C    *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
  28) 60770 BIRCH R8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 753  : 66296 GRANITFT - 66550 GRANITF4 CKT: 1            1.0505   .....   *NEW*
  SINGLE 754  : 66296 GRANITFT - 66551 GRANITF7 CKT: 1            1.0505   .....   *NEW*

**** NON-CONVERGED SUMMARY FOR ACCC #1 FILE ****

SINGLE 6      60100 FORBECA2 -  60101 FORBES 2  CKT:  1
SINGLE 7      60101 FORBES 2 -  60198 CHIS-N 2  CKT:  1
SINGLE 62     60125 PATHFDR7 -  60129 SPLT RK7  CKT:  1
SINGLE 199    60197 CHIS CO2 -  60198 CHIS-N 2  CKT:  1
SINGLE 852    66470 BISON  4 -  66497 MAURINE4  CKT:  1

**** NON-CONVERGED SUMMARY FOR ACCC #2 FILE ****

SINGLE 6      60100 FORBECA2 -  60101 FORBES 2  CKT:  1
SINGLE 7      60101 FORBES 2 -  60198 CHIS-N 2  CKT:  1
SINGLE 56     60123 PIPESTN7 -  60125 PATHFDR7  CKT:  1
SINGLE 199    60197 CHIS CO2 -  60198 CHIS-N 2  CKT:  1
SINGLE 852    66470 BISON  4 -  66497 MAURINE4  CKT:  1
```

## D.2 Summer peak scenario contingency analysis

```
 SUMMER PEAK CONTINGENCY ANALYSIS COMPARISON - MARSHALL WIND FARM SCREENED TO 100% RATE A

SCREEN RESULTS FILE NAME: SUMMER PEAK CONTINGENCY ANALYSIS COMPARISON - MARSHALL WIND FARM SCREENED TO 100% RATE A

SCREENACCC PROGRAM (VERSION: BETA-17-1, 07/21/04, MS)  ----- DATE: WED, APR 11 2007 14:49

***** ACCC FILE #1: supk_base_accc100.out
***** ACCC DATE   : WED, APR 11 2007  13:59

MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05

ACCC FILE #1 SCANNING LIMIT/RATING:
  LOADING LIMIT  100.0% OF RATE: A

DISTRIBUTION FACTOR FILE:     Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring 2007\Summer
Peak\SUPK_BASE.df
SUBSYSTEM DESCRIPTION FILE:   Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp-ne
MONITORED ELEMENT FILE:       Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp.mo
CONTINGENCY DESCRIPTION FILE: Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\Marshal

***** ACCC FILE #2: supk_chng_accc100.out
***** ACCC DATE   : WED, APR 11 2007  13:59

MISO 2009/10 SUPK CASE FOR TSR STUDIES. 03 NERC W/04 MAPP
BIG STONE II BASE CASE FOR DELIVERY SERVICE STUDY 4/13/05

ACCC FILE #2 SCANNING LIMIT/RATING:
  LOADING LIMIT  100.0% OF RATE: A

DISTRIBUTION FACTOR FILE:     Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring 2007\Summer
Peak\SUPK_CHNG.df
SUBSYSTEM DESCRIPTION FILE:   Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp-ne
MONITORED ELEMENT FILE:       Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\mapp.mo
CONTINGENCY DESCRIPTION FILE: Z:\Studies\Transmission Studies\Marshall Wind\Marshall Wind Study Spring
2007\Simulation files\Marshal


***** CRITERIA FOR COMPARING ACCC FILE #2 WITH ACCC FILE #1

  LOADING CHANGE BASED ON MINIMUM MVA INCREASE OF:    0.50 MVA

  VOLTAGE CHANGE BASED ON MINIMUM PU VOLTAGE CHANGE OF:    0.01000 PU


**** LOADING LIMITER CHANGES ****

==================================================================================================================
   1) 60287 NOBLES 7 - 60369 FENTON 7 CKT:  P          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
------------------------------------------------------------------------------------------------------------------
  SINGLE 945  : 66509 FTRANDL4 - 66565 SIOUXCY4 CKT: 1   387.6T  .....   310.0   .....   121.6   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==================================================================================================================
   2) 60123 PIPESTN7 - 60362 CHANRMB7 CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
------------------------------------------------------------------------------------------------------------------
  SINGLE 351  : 60286 NOBLES 3 - 60287 NOBLES 7 CKT: P   249.5T  248.8T  231.0   231.0   105.5   105.1     0.7

==================================================================================================================
   3) 60170 MARSHAL7 - 60375 MMU_N7ST CKT:  1          PSTCNT2 PSTCNT1 RATING2 RATING1 PERCNT2 PERCNT1 MVACHNG
------------------------------------------------------------------------------------------------------------------
  SINGLE 351  : 60286 NOBLES 3 - 60287 NOBLES 7 CKT: P   135.4F  131.4F  127.9   127.9   108.3   104.2     4.0
  SINGLE 352  : 60287 NOBLES 7 - 60369 FENTON 7 CKT: P   133.1F  128.9F  127.9   127.9   106.0   102.0     4.2
```

```
**** -- LOW-- VOLTAGE LIMITER CHANGES *****

==========================================================================================
   4) 34639 LEON 8                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  530         : ** MULTIPLE CONTINGENCY **                        0.9415   .....   *NEW*
              : 60119 LKYNKTN7 - 60171 LYON CO7 CKT: 1
              : 60148 MINVALY7 - 60171 LYON CO7 CKT: P
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT: 1
              : 60119 LKYNKTN7 - 60853 LK YANK8 CKT: 2

==========================================================================================
   5) 60688 MNTVDEO8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 18   : 60103 CANNFLS5 - 60104 CANNFLS7 CKT: 5            0.9490   .....   *NEW*
  SINGLE 174  : 60182 ALDRCH27 - 60227 MEDLAKE7 CKT: 1            0.9490   .....   *NEW*
  SINGLE 67   : 60123 PIPESTN7 - 60860 PIPESTN8 CKT: 1            0.9490   .....   *NEW*
  SINGLE 187  : 60187 AS KING7 - 60231 OAKPARK7 CKT: 1            0.9490   .....   *NEW*
  SINGLE 68   : 60123 PIPESTN7 - 60860 PIPESTN8 CKT: 2            0.9490   .....   *NEW*
  SINGLE 42   : 60113 DOME   7 - 60830 EASTWD18 CKT: P            0.9490   .....   *NEW*
  SINGLE 34   : 60110 WILMART7 - 60113 DOME   7 CKT: P            0.9490   .....   *NEW*
  SINGLE 147  : 60160 SHERCO 3 - 60202 COON CK3 CKT: 1            0.9493   .....   *NEW*
  SINGLE 209  : 60196 CHISAGO7 - 60920 LINDSTM7 CKT: P            0.9493   .....   *NEW*
  SINGLE 137  : 60155 PULASKI7 - 60763 PULASKI8 CKT: 1            0.9500   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
   6) 60689 FIESTAC8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 18   : 60103 CANNFLS5 - 60104 CANNFLS7 CKT: 5            0.9450   .....   *NEW*
  SINGLE 174  : 60182 ALDRCH27 - 60227 MEDLAKE7 CKT: 1            0.9450   .....   *NEW*
  SINGLE 34   : 60110 WILMART7 - 60113 DOME   7 CKT: P            0.9450   .....   *NEW*
  SINGLE 187  : 60187 AS KING7 - 60231 OAKPARK7 CKT: 1            0.9450   .....   *NEW*
  SINGLE 67   : 60123 PIPESTN7 - 60860 PIPESTN8 CKT: 1            0.9450   .....   *NEW*
  SINGLE 68   : 60123 PIPESTN7 - 60860 PIPESTN8 CKT: 2            0.9450   .....   *NEW*
  SINGLE 42   : 60113 DOME   7 - 60830 EASTWD18 CKT: P            0.9450   .....   *NEW*
  SINGLE 147  : 60160 SHERCO 3 - 60202 COON CK3 CKT: 1            0.9453   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
   7) 60745 SEDAN  8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 157  : 60170 MARSHAL7 - 60375 MMU_N7ST CKT: 1            0.9478   .....   *NEW*
  SINGLE 56   : 60119 LKYNKTN7 - 60171 LYON CO7 CKT: P            0.9479   .....   *NEW*
  SINGLE 9    : 60065  DANMAR  - 60859 ROCKTAP8 CKT: 1            0.9481   .....   *NEW*
  SINGLE 18   : 60103 CANNFLS5 - 60104 CANNFLS7 CKT: 5            0.9481   .....   *NEW*
  SINGLE 33   : 60110 WILMART7 - 60111 SWAN LK7 CKT: 1            0.9481   .....   *NEW*
  SINGLE 51   : 60117 CHERRYC7 - 60118 GRANT  7 CKT: 1            0.9481   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
   8) 60746 GLENWD 8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 157  : 60170 MARSHAL7 - 60375 MMU_N7ST CKT: 1            0.9445   .....   *NEW*
  SINGLE 167  : 60180 AIRPRT 7 - 60239 ROGRSLK7 CKT: 1            0.9448   .....   *NEW*
  SINGLE 9    : 60065  DANMAR  - 60859 ROCKTAP8 CKT: 1            0.9448   .....   *NEW*
  SINGLE 51   : 60117 CHERRYC7 - 60118 GRANT  7 CKT: 1            0.9448   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
   9) 60767 WLMSTAP8                                              PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 552  : 62001 BENSON 7 - 62002 WALDEN 7 CKT: 1            0.9499   .....   *NEW*
  SINGLE 130  : 60151 MNTCELO3 - 60153 MNTCELO7 CKT: 1            0.9499   .....   *NEW*
  530         : ** MULTIPLE CONTINGENCY **                        0.9499   .....   *NEW*
              : 60119 LKYNKTN7 - 60171 LYON CO7 CKT: 1
              : 60148 MINVALY7 - 60171 LYON CO7 CKT: P
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT: 1
              : 60119 LKYNKTN7 - 60853 LK YANK8 CKT: 2
  SINGLE 24   : 60107 W FARIB7 - 60265 LOONLKTP CKT: P            0.9500   .....   *NEW*
  SINGLE 674  : 63246 BEMIDJI7 - 66710 NARY   7 CKT: 1            0.9500   .....   *NEW*
  SINGLE 1139 : 67462 DLINDUST - 67464 DLWEST   CKT: 1            0.9500   .....   *NEW*
  SINGLE 734  : 63345 WILTON 4 - 66758 WINGER 4 CKT: 1            0.9500   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***
```

```
==========================================================================================
  10) 60370 MMU SW 7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.8960  0.9325 -0.0365
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==========================================================================================
  11) 60371 ERIE RD7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.8949  0.9302 -0.0353
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==========================================================================================
  12) 60372 SARATOG7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.8946  0.9317 -0.0371
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==========================================================================================
  13) 60373 SOUTH E7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.8945  0.9311 -0.0366
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==========================================================================================
  14) 60375 MMU_N7ST                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.8937  0.9291 -0.0354
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==========================================================================================
  15) 66508 S3     7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.9030  0.9349 -0.0319
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

==========================================================================================
  16) 66552 MARS ER7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  MMUSWBUS    : ** MULTIPLE CONTINGENCY **                           0.9024  0.9344 -0.0320
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT:AL
              : 60170 MARSHAL7 - 60373 SOUTH E7 CKT:AL
              : 60170 MARSHAL7 - 60375 MMU_N7ST CKT:AL

**** --HIGH-- VOLTAGE LIMITER CHANGES *****

==========================================================================================
  17) 60168 ROSSWCP4                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 226  : 60202 COON CK3 - 63031 BUNKER 3 CKT: 1               1.0549   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
  18) 60172 SHYSWCP7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 157  : 60170 MARSHAL7 - 60375 MMU_N7ST CKT: 1               1.0644   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
  19) 60173 ROSEAUN2                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 922  : 66503 BLAIR  4 - 66550 GRANITF4 CKT: 1               1.0966   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***
```

```
==========================================================================================
  20) 66705 DRAYTON7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  SINGLE 327  : 60251 TERMINL3 - 61492 TERMID1Y CKT: 1          1.0578   .....   *NEW*
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***
  *** ONLY THE FIRST  100 ACCC #2 CONTINGENCIES SCREENED FOR THIS LIMITER ***

==========================================================================================
  21) 63209 HETLAND7                                                PSTCNT2 PSTCNT1 PU-CHNG
------------------------------------------------------------------------------------------
  NSP 825 1   : ** MULTIPLE CONTINGENCY **                      1.0502   .....   *NEW*
              : 34006 LAKEFLD3 - 60286 NOBLES 3 CKT: P
              : 34005 HRN LK 5 - 62709 BREWSTR5 CKT:K
              : 62709 BREWSTR5 - 34004 ELK    5 CKT:TR
  530         : ** MULTIPLE CONTINGENCY **                      1.0513   .....   *NEW*
              : 60119 LKYNKTN7 - 60171 LYON CO7 CKT: 1
              : 60148 MINVALY7 - 60171 LYON CO7 CKT: P
              : 60170 MARSHAL7 - 60171 LYON CO7 CKT: 1
              : 60119 LKYNKTN7 - 60853 LK YANK8 CKT: 2
  SINGLE 155  : 60170 MARSHAL7 - 60171 LYON CO7 CKT: 1          1.0513   .....   *NEW*

**** NON-CONVERGED SUMMARY FOR ACCC #1 FILE ****
SINGLE 16     60101 FORBES 2 -  60174 ROSEAUS2  CKT:  1
SINGLE 17     60101 FORBES 2 -  60198 CHIS-N 2  CKT:  1
SINGLE 112    60144 DGLASCO7 -  60749 DGLAS C8  CKT:  1
SINGLE 159    60173 ROSEAUN2 -  60174 ROSEAUS2  CKT:  1
SINGLE 210    60197 CHIS CO2 -  60198 CHIS-N 2  CKT:  1
SINGLE 439    60748 WESTPRT8 -  60749 DGLAS C8  CKT:  1
SINGLE 993    66573 STEGALL4 -  67206 STGXFMR4  CKT:  1
SINGLE 1053   67135 STEGALL3 -  67207 STEGALTY  CKT:  1
SINGLE 1068   67206 STGXFMR4 -  67207 STEGALTY  CKT:  1

**** NON-CONVERGED SUMMARY FOR ACCC #2 FILE ****
SINGLE 16     60101 FORBES 2 -  60174 ROSEAUS2  CKT:  1
SINGLE 17     60101 FORBES 2 -  60198 CHIS-N 2  CKT:  1
SINGLE 112    60144 DGLASCO7 -  60749 DGLAS C8  CKT:  1
SINGLE 159    60173 ROSEAUN2 -  60174 ROSEAUS2  CKT:  1
SINGLE 210    60197 CHIS CO2 -  60198 CHIS-N 2  CKT:  1
SINGLE 439    60748 WESTPRT8 -  60749 DGLAS C8  CKT:  1
SINGLE 993    66573 STEGALL4 -  67206 STGXFMR4  CKT:  1
SINGLE 1053   67135 STEGALL3 -  67207 STEGALTY  CKT:  1
SINGLE 1068   67206 STGXFMR4 -  67207 STEGALTY  CKT:  1
```

# Appendix E: Powerflow cases

***These are available upon request to personnel that has signed appropriate confidentiality / non-disclosure agreements***

The following powerflow cases is available with this report:

- **Summer off-peak cases**
  - MWIND_SUOP_BASE.sav : This is the base summer off-peak case referenced in the report
  - MWIND_SUOP_CHNG.sav: This is the change case for the summer off-peak scenario referenced in the report. (I.e. the wind farm is online)
- **Summer peak cases**
  - MWIND-2009SUPK-BASE.sav: This is the base summer peak case reference in the report.
  - MWIND-2009SUPK-CHNG.sav: This is the change case for the summer peak scenario referenced in the report. (I.e. the wind farm is online).

The powerflow cases are all saved with PSS/E Revision 29.5.0, and is solvable with either “fnsl 1,,1” or “fdns 1,,1”.

# Appendix E: Idevs

*Note: These idevs are created using PSS/E Rev 29.5 for specific models. They introduce new bus numbers that may not be available in your models. Prior to using, please make sure the idevs are adjusted to fit with your models.*

## E.1 MMU area 115 kV changes

The version of the idev shown here is a generic version that would require the user to calculate some numbers to distribute the MMU load correctly over the various substations.

```
MENU,OFF      /* FORCE MENU TO CORRECT STATUS
TEXT ****************************************************************************
TEXT
TEXT                  MARSHALL AREA - GENERAL UPGRADES
TEXT
TEXT ****************************************************************************
TEXT
TEXT ******************************************************************
TEXT By: Richard Dahl (MRES), rdahl@mrenergy.com, (605) 330 6999 (Desk)
TEXT Made using and for: PSS/E Rev. 29.5
TEXT Date: 3/5/07
TEXT ******************************************************************
TEXT Note: This idev is intended for very specific powerflow models, and
TEXT                   may not work properly with your particular model.
TEXT                   Note that 2 new bus numbers are utilized.
TEXT       This data is per best knowledge as of 10/30/06.
TEXT                   Contact Richard Dahl if you have questions. (rdahl@mrenergy.com / 605 330 6999)
TEXT                   NOTE IN PARTICULAR THAT LOAD LEVELS ASSUMED IN THIS IDEV LIKELY
TEXT                   WILL HAVE TO BE ALTERED AS DIFFERENT MODELS ARE USED.
TEXT                   (See further information below).
TEXT
TEXT Purpose:
TEXT
TEXT This idev is made for reflecting upgrades that have recently been completed,
TEXT or that will be completed TEXT on MMU's 115 kV system.
TEXT The IDEV will ATTEMPT to do the following:
TEXT
TEXT 1) Marshall Southwest Sub: This new sub is scheduled to be online summer 2007.
TEXT           The bus MMU_SW with bus #60370 will be added
TEXT    by tapping the Saratoga - Southeast 115 kV line. 2x20 MVAR capacitor banks are
TEXT           added to the Southwest sub.
TEXT 2) Marshall North 7th St. Substation: This new sub is already in service, but not
TEXT           reflected in most powerflow models.
TEXT    The bus MMU_N7ST with bus #60375 will be added by taping the Erie Road -
TEXT           Marshall Switching Station 115 kV line.
TEXT 3) Redistribution of load:
TEXT     With the new substations in service, the load as seen on the 115 kV system will be
TEXT     redistributed due to corresponding
TEXT    changes in the distribution system in Marshall.
TEXT           a) A 41.78 MW non scalable load will be added to the North 7th St. Sub, bus #60375
TEXT     b) The total load on all MMU buses (Erie Road, Marshall, Southeast, Saratoga St)
TEXT                   will be added up, and 41.78 MW will be subtracted from this load
TEXT           c) The remaining load should be distributed on Erie Road, Marshall, Southeast,
TEXT                  Saratoga St., and Southwest as follows:
TEXT                   All load with an assumed powerfactor of 0.95 - load consuming VARs:
TEXT           i)   Marshall - 60170:  5.89% (parameters X1 and Y1 in load adjustment statements below)
TEXT           ii)  Southeast sub - 60373: 22.63% (parameters X2 and Y2 in load adjustment statements
below)
TEXT           iii) Saratoga St - 60372: 27.52% (parameters X3 and Y3 in load adjustment statements
below)
```

```
TEXT           iv)  Southwest - 60370: 16.97% (parameters X4 and Y4 in load adjustment statements
below)
TEXT           v)  Erie Road - 60371: 26.99% (parameters X5 and Y5 in load adjustment statements below)
TEXT
TEXT   Note that in any scenarios where load is scaled, the load on the North 7th St. should be
considered
TEXT    non-scalable unless otherwise explicetly stated.
TEXT
TEXT
TEXT Marshall Wind project: This idev does not include detail to include the proposed Marshall wind
project.
TEXT A separate idev, MARSHALL_WIND_103006.IDV, is available that will do this.
TEXT This idev must be applied before the wind project idev though, as the wind project
TEXT idev assumes interconnection to the Southwest 115 kV substation.,
TEXT
TEXT BUSNUMBER AVAILABILITY: Note that this idev assumes bus #60370, and bus #60375 are available.
TEXT OTHER ASSUMPTIONS:Some models may already have the Southwest sub included. If this is the case -
try to
TEXT simply remove the section that inserts the Southwest sub from this idev.
TEXT
TEXT
TEXT
TEXT ******************************************************************************
TEXT   Purging existing 115 kV from Southeast - Saratoga Street
TEXT ******************************************************************************
purg,si
1
60372 60373
1
0

TEXT ******************************************************************************
TEXT   Inserting Marshall Southwest sub, and 115 kV to Saratoga, and to Southeast
TEXT ******************************************************************************
rdch
1
60370,'MMU SW 7', 115.0000,1,     0.000,     0.000, 652, 605,1.00700, 36.0000, 605
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
60372,-60370,'1 ',   0.00590,   0.01690,   0.00207,  127.90,  127.90,  140.70,  0.00000,  0.00000,
0.00000,  0.00000,1,   2.80, 605,1.0000
60373, 60370,'1 ',   0.00640,   0.01810,   0.00222,  127.90,  127.90,  140.70,  0.00000,  0.00000,
0.00000,  0.00000,1,   3.00, 605,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
TEXT
TEXT ******************************************************************************
TEXT                                        Inserting the Southwest Sub 2x20 MVAR caps
TEXT ******************************************************************************
BAT_SWITCHED_SHUNT_DATA, 60370, 2, 0, 0, 0, 0, 0, 0, 0, 1, 0,
20.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
1.02, 1.0, 0.0, "" ;
TEXT ******************************************************************************
TEXT                                        Inserting the North 7th St Sub
TEXT ******************************************************************************
BAT_LTAP  60371  60170 '1 ' 0.42110  60375 'MMU_N7ST'   115.00000
BAT_LOAD_DATA, 60375, "W2", 1, 652, 605, 605, 41.78, 8.48, 0.0, 0.0, 0.0, 0.0 ;
TEXT ******************************************************************************
TEXT                                        Correcting MMU Load
```

```
TEXT ****************************************************************************
TEXT Note:
TEXT For consistency, model reactive load at each bus as: Y = sq.root((X/0.95)^2-X^2)
TEXT (ref load data batch statements below)
TEXT (0.95 PF lagging).
TEXT
TEXT For X1 - X5 values, please see instructions in bullet 3 in the header of the idev
TEXT
BAT_LOAD_DATA, 60170, "W0", , , , , X1, Y1, , , ,  ;
BAT_LOAD_DATA, 60373, "W0", , , , , X2, Y2 , , ,  ;
BAT_LOAD_DATA, 60372, "W0", , , , , X3, Y3, , , ,  ;
BAT_LOAD_DATA, 60370, "W0", 1, 652, 605, 605, X4, Y4, 0.0, 0.0, 0.0, 0.0 ;
BAT_LOAD_DATA, 60371, "W0", , , , , X5, Y5, , , ,  ;
TEXT ****************************************************************************
TEXT   END OF IDEV. CASE NEEDS TO BE SOLVED AND SAVED.
TEXT   MRES OR HCPD GENERATION SHOULD BE ALTERED TO MATCH LOAD
TEXT   AS APPROPRIATE.
TEXT ****************************************************************************
ECHO
@END
```

## E.2 Adding Marshall Wind Farm

The idev shown E.1 have to be applied prior to applying this idev.

```
TEXT ****************************************************************************
TEXT
TEXT                          MARSHALL WIND PROJECT
TEXT
TEXT ****************************************************************************
TEXT
TEXT ******************************************************************
TEXT By: Richard Dahl (MRES), rdahl@mrenergy.com, (605) 330 6999 (Desk)
TEXT Made using and for: PSS/E Rev. 29.5
TEXT Date last revised: 3/5/07
TEXT ******************************************************************
TEXT
TEXT Note: This idev is intended for very specific powerflow models, and
TEXT       may not work properly with your particular model.
TEXT       Note that several new bus numbers are utilized.
TEXT       This data is per best knowledge as of 3/5/07.
TEXT       Contact Richard Dahl if you have questions. (605 330 6999 or rdahl@mrenergy.com).
TEXT
TEXT       This idev will not work if the Marshall Southwest 115 kV sub,
TEXT       planned to be inservice by summer 2007, is not modeled.
TEXT
TEXT Purpose:
TEXT
TEXT This idev will add in the proposed Marshall Wind Farm as follows:
TEXT
TEXT  1) 9 Suxlon S88 turbines added in at 9 different buses, with Pmax=2.1 MW, and with the
TEXT     powerfactor at the units assumed to be 1.0. (No reactive output or consumption).
TEXT  2) Each unit has it's separate 600V -> 34.5 kV GSU that ties directly into a common 34.5 kV bus.
TEXT     The collector system between this 34.5 kV bus and each units GSU is not known at the time,
TEXT     and is not modeled.
TEXT  3) A 7.6 mile 34.5 kV line is modeled from the wind farm to the Marshall Southwest sub.
TEXT  4) A 34.5 kV -> 115 kV xfmr is modeled tying the wind farm in to the Southwest sub.
TEXT  5) 3 of the turbines will be on a 2.0 mile 34.5 kV spur out of the common collector point
TEXT     assumed evenly distributed over the line
TEXT  6) 4 of the turbines will be on a 1.0 mile 34.5 kV spur out of the common collector point assumed
TEXT     evenly distributed over the line
TEXT  7) 2 of the turbines will be on a 0.5 mile 34.5 kV spur out of the common collector point assumed
TEXT     evenly distributed over the line
TEXT
TEXT     NOTE THAT THE WIND TURBINES ARE NOT TURNED ONLINE BY THIS IDEV, NOR IS THE SARATOGA ST.
GENERATION
TEXT    ADJUSTED IN ANY WAYS. THE WIND TURBINES AND THE SARATOGA ST. GENERATION WILL BE OPERATED SUCH
THAT
TEXT    THE GENERATION MAXIMUM DOES NOT EXCEED AT THE DRS APPROVED LEVEL OF THE SARATOGA ST.
GENERATION.
TEXT
TEXT    ASSUMED BUSNUMBER AVAILABILITY: 67470-67489.
TEXT     67470 - 67478: Turbine 600 V buses. 67479 - 34.5 kV bus @ wind farm.
TEXT     67480 - 34.5 kV bus @ Southwest sub.
TEXT  The remaining are 34.5 kV collector system buses for each of the turbines.
TEXT
TEXT
TEXT ******************************************************************
TEXT           DEFINING NEW BUSES AND MACHINES FOR THE WIND FARM
TEXT ******************************************************************
TEXT Assumes fixed 0 VAR flow
rdch
1
67470,'MSHLWND1',   0.6000,2,     0.000,     0.000, 652, 665,1.05440,  45.1149, 665
67471,'MSHLWND2',   0.6000,2,     0.000,     0.000, 652, 665,1.05675,  45.1423, 665
67472,'MSHLWND3',   0.6000,2,     0.000,     0.000, 652, 665,1.05792,  45.1561, 665
67473,'MSHLWND4',   0.6000,2,     0.000,     0.000, 652, 665,1.05264,  45.0939, 665
67474,'MSHLWND5',   0.6000,2,     0.000,     0.000, 652, 665,1.05397,  45.1090, 665
67475,'MSHLWND6',   0.6000,2,     0.000,     0.000, 652, 665,1.05485,  45.1190, 665
```

```
67476,'MSHLWND7',   0.6000,2,     0.000,     0.000, 652, 665,1.05529,  45.1242, 665
67477,'MSHLWND8',   0.5000,2,     0.000,     0.000, 652, 665,1.05177,  45.0822, 665
67478,'MSHLWND9',   0.6000,2,     0.000,     0.000, 652, 665,1.05221,  45.0867, 665
67479,'MSHLWNDC',  34.5000,1,     0.000,     0.000, 652, 665,1.05163,  42.8959, 665
67480,'MSHLSWC ',  34.5000,1,     0.000,     0.000, 652, 665,1.01454,  41.4632, 665
67481,'MSWNDC1 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05866,  43.0070, 665
67482,'MSWNDC2 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05604,  42.9643, 665
67483,'MSWNDC3 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05297,  42.9142, 665
67484,'MSWNDT1 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05749,  42.9884, 665
67485,'MSWNDT2 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05515,  42.9514, 665
67486,'MSWNDT3 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05560,  42.9574, 665
67487,'MSWNDT4 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05472,  42.9437, 665
67488,'MSWNDT5 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05340,  42.9232, 665
67489,'MSWNDT6 ',  34.5000,1,     0.000,     0.000, 652, 665,1.05253,  42.9078, 665
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
67470,'P1 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67471,'P2 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67472,'P3 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67473,'P4 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67474,'P5 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67475,'P6 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67476,'P7 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67477,'P8 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
67478,'P9 ',     2.100,     0.000,     0.000,     0.000,1.00000,    0,     2.100,   0.00530,   0.21160,
0.00000,   0.00000,1.00000,0,  100.0,     2.100,     0.000, 665,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
67479,-67480,'P1',   0.20500,   0.14700,   0.01330,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   7.60, 665,1.0000
67479,-67485,'P1',   0.05947,   0.01540,   0.00021,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.67, 665,1.0000
67479,-67488,'P1',   0.02230,   0.00577,   0.00032,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.25, 665,1.0000
67479,-67489,'P1',   0.02230,   0.00577,   0.00126,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.25, 665,1.0000
67481, 67484,'P1',   0.05947,   0.01540,   0.00021,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.67, 665,1.0000
67482, 67486,'P1',   0.02230,   0.00577,   0.00032,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.25, 665,1.0000
67483, 67489,'P1',   0.02230,   0.00577,   0.00126,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.25, 665,1.0000
67484, 67485,'P1',   0.05947,   0.01540,   0.00021,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.67, 665,1.0000
67486, 67487,'P1',   0.02230,   0.00577,   0.00031,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.25, 665,1.0000
67487, 67488,'P1',   0.02230,   0.00577,   0.00032,    0.00,    0.00,    0.00,  0.00000,  0.00000,
0.00000,  0.00000,1,   0.25, 665,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
60370,67480,    0,'P1',1,1,1,   0.00000,   0.00000,2,'        ',1, 605,1.0000
   0.00000,   0.56550,  100.00
1.00000,   0.000,   0.000,   16.80,   16.80,   16.80, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67470,67485,    0,'P1',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67471,67484,    0,'P2',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
```

```
67472,67481,    0,'P3',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67473,67488,    0,'P4',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67474,67487,    0,'P5',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67475,67486,    0,'P6',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67476,67482,    0,'P7',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67477,67489,    0,'P8',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
67478,67483,    0,'P9',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
   0.00000,   2.00000,  100.00
1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,     0, 1.10000, 0.90000, 1.10000, 0.90000,
33, 0, 0.00000, 0.00000
1.00000,   0.000
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

# Appendix F – ACCC Output files (electronic only)

This appendix material is only available electronically as it is a lot of information. For each of the four base powerflow cases the output report generated upon completion of the PSS/E activity ACCC is included in text file format.

## *F.1 – ACCC report for Summer Off-Peak – Base Case*

## *F.2 – ACCC report for Summer Off-Peak – Change Case*

## *F.3 – ACCC report for Summer Peak – Base Case*

## *F.4 – ACCC report for Summer Peak – Change Case*

# Marshall Wind Farm
# Generation Interconnect Study
## *Part 2/2*
## Stability Analysis
***May 7, 2007***

**GENERATION INTERCONNECTION REQUESTS #GI-0601 & #GI-0606**

**Prepared by:**
**Western Area Power Administration**
**Upper Great Plains Region**
**Transmission System Planning Division**
**Billings, MT**

# Marshall Wind Farm
## Stability Study
## May 7, 2007

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# Marshall Wind Farm
# Generation Interconnect Study (Stability Study)
# May 07, 2007

## 1. Generation Interconnection Request

This study is in response to a 10 MW generation interconnection request IS Queue #GI-0601 received by Western Area Power Administration (Western) on 2/1/06 and the subsequent 9.98 MW generation interconnection request IS Queue #GI-0606 received by Western on 6/6/06. The generation interconnection requests, which represent a single wind farm, were subsequently modified to 18.9 MW total. The wind farm will be operated in lieu of the existing MAPP approved generation in Marshall, Minnesota, and therefore, the requests were evaluated on an out-of-queue basis, to evaluate whether operation of the wind farm, instead of the existing generation, would result in any detrimental impacts to the MAPP transmission system. An operating guide will be developed to ensure that the wind farm and existing generation are operated such that the MAPP approved generation input to the transmission system is not exceeded.

The point of interconnection is the new Missouri River Energy Services (MRES) Southwest 115kV Substation which is located within the Marshall, Minnesota, system located in the WAUE balancing area.

## 2. Background/Summary

An 18.9 MW wind farm is planned to be built by an IPP near Marshall, Minnesota. A new MRES Southwest 115 kV substation will tap the existing 115 kV line between Marshall Municipal Utility (MMU)'s Southeast substation and MMU's Saratoga Street substation. The existing Saratoga Street peaking unit and the new wind farm will be operated so the existing MAPP accreditation generation amount of 19.98 MW at Saratoga Street will not be exceeded.

The Marshall transmission system is an electrical loop within the WAUE balancing area. The Marshall – Lyon County 115 kV feed is on the WAPA/Xcel balancing area boundary. The other end of the 115 kV loop extends from Western's Granite Falls Substation to Marshall.

The wind farm is proposed to be in-service by summer 2007. The customer plans to purchase the wind farm output and will have a power purchase agreement in place for the annual output of the wind farm. The new MRES Southwest substation is being built for load serving purposes, and will have approximately 8-10 MW (summer peak) of load connected to it through MMU's 13.8 kV distribution system, and the new wind farm will also be interconnected there.

The customer is not requesting new transmission service, but instead plans to utilize the existing transmission rights of the Saratoga peaking unit which is connected to MMU's Saratoga Street 115/13.8 kV substation. The Saratoga Street peaking unit and the new wind farm will be operated so the existing MAPP generation accreditation amount of 19.98 MW at Saratoga Street will not be exceeded.

## 3. Purpose

The purpose of this study is to provide stability results to the MAPP Design Review Subcommittee (DRS) regarding the addition of an 18.9 MW wind farm operated in lieu of the Saratoga combustion turbine generator (MAPP approved @ 19.98 MW). It seeks to demonstrate whether adverse effects are created by the planned wind farm injecting power into the new MRES Southwest 115 kV bus versus the peaking gas turbine injecting power into the Saratoga Street 115 kV bus, both of which are located in the local Marshall area. Steady state impacts are under separate cover.

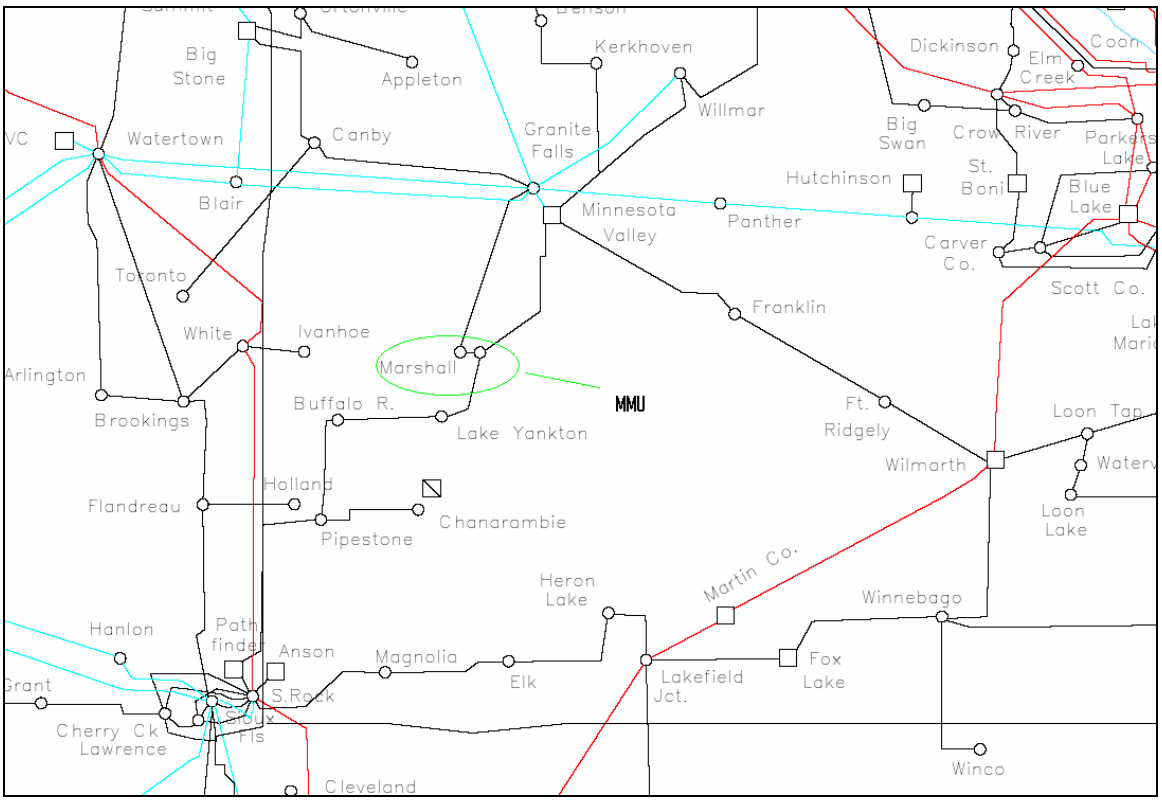

Figure 1. Location of Marshall Area

## 4. Existing System

The 115 kV Marshall transmission area is a loop which feeds from Western's Granite Falls Substation and from Xcel's Lyon County Substation. The local Marshall substations are in the WAUE balancing area. The Marshall – Lyon County 115 kV line is on the WAPA/Xcel balancing area boundary. See Figure 1 for the general location. See Figure 2 for a one-line diagram of the area.

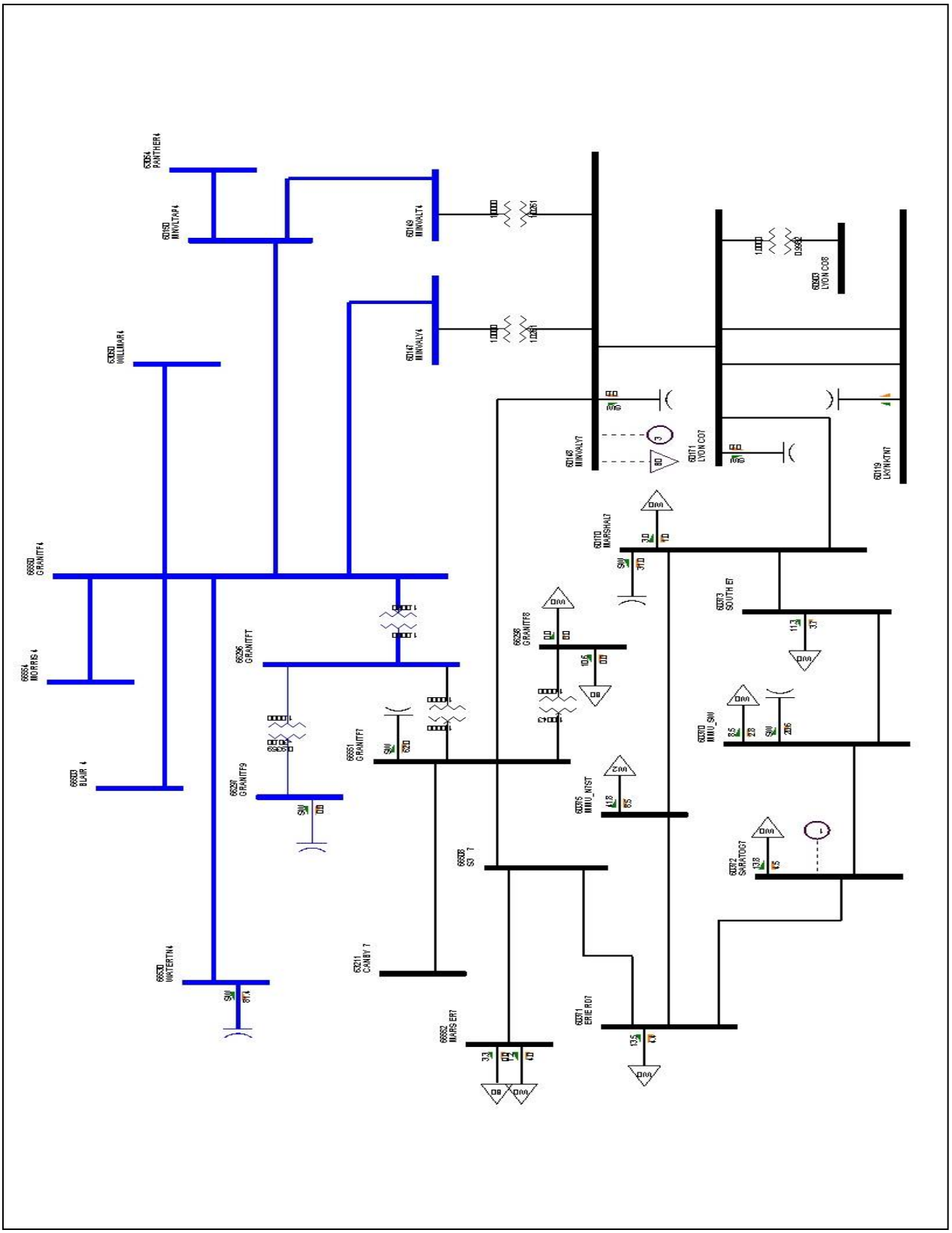


Figure 2. One-Line Diagram Marshall Area

## 5. Proposed Additions

An Independent Power Producer (IPP) plans to build 18.9 MW wind farm near Marshall, Minnesota. A new Marshall Southwest 115 kV substation will tap the existing 115 kV line between MMU's Southeast substation and MMU's Saratoga Street substation, and will be a part of the Marshall 115 kV loop. Two new 20 Mvar shunt capacitors will also be installed on the Southeast substation to provide reactive support to the area loads.

Nine Suzlon S88 turbines will be installed with a 2.1 MW maximum capacity each; total output is 18.9 MW. Each turbine will have a 14x75 kVAR capacitor package for power factor correction to 0.99 pu lag and lead at the turbine output terminals. Three different 34.5 kV underground cables will connect the turbines to a common 34.5 kV bus, which connect to the new Southwest sub via a 7-8 miles 34.5 kV line, and a 34.5/115 kV step-up transformer.

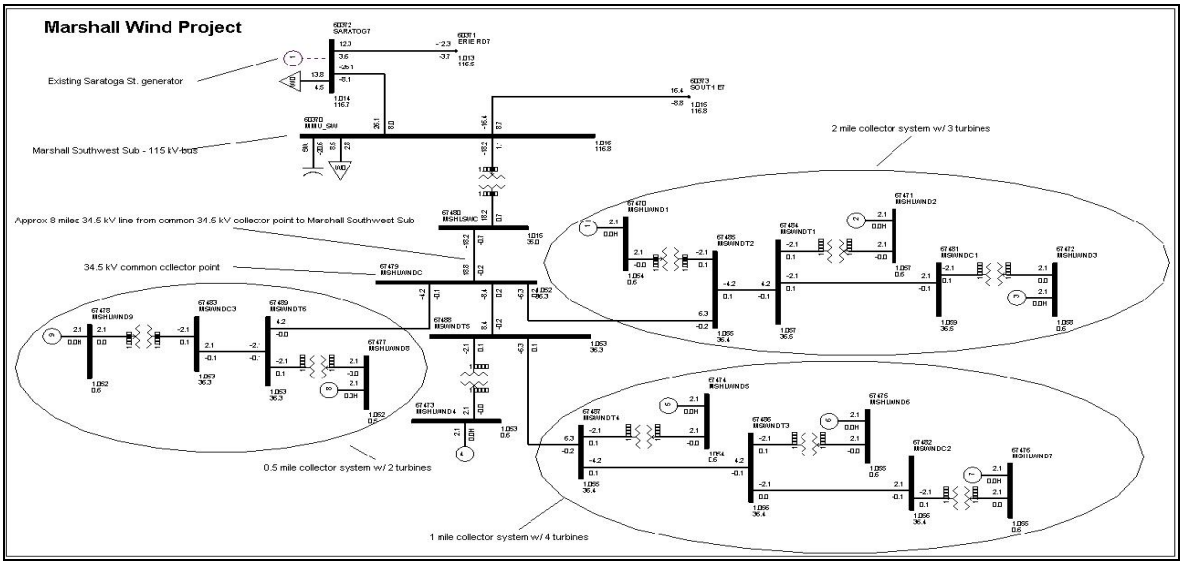


Figure 3. One-line diagram of the Marshall area: Includes the planned wind farm and the Southwest substation. Note the existing generator at the Saratoga Street bus, one bus from the Marshall Southwest substation on the 115 kV system.

## 6. Stability Model

Cases used for off-peak high transfer analysis are taken from the 2006 Northern MAPP Operating Review Working Group (NMORWG) study package. An off-peak summer high transfer case (urg-so06aa.uzvV454.sav) with all critical Northern MAPP generation set at URGE output (i.e. maximum MAPP DRS approved output) was used. Export levels were not changed from the original package.

Modifications to the case included addition of the wind generator units and the associated transformers and infrastructure. The new case names are mar- so06aa.uzvV454.sav and mw1- so06aa.uzvV454.sav. In the mar case, the wind farm is off-line and the Saratoga CT generator is on-line. In the mw1 case, the wind farm is on-line and the Saratoga CT generator is off-line.

All changes made to these cases are outlined in Appendix A in PSS/E idev format. Marshall_wind.idv was provided by the customer for Western's use in performing the stability studies. The idev name was changed to Marshall_wind_3_5_07wgen1 and Marshall_wind_3_5_07_w0s1. These idevs were modified by changing the var component (Qgen) for the generators from a 0 to a -0.3 (Qmax =0.3 and Qmin= -0.3) MVARs. The Qgen value is equivalent to 0.99 pu lagging and is more conservative than the original figure. The generators are designed to maintain a 0.99 to 0.99 lag to lead power factor range. The MMU_115 UPGRADES.idv also provided by customer was modified and is named MMU_115_UPTRADES_hsk.idv. The modifications to this idev are the load values in lines 140-145 of the idev as directed by customer. The Idev Data Sheet in Appendix A shows how the load values and the generator var outputs were determined.

## 7. Stability Analysis

Limited stability sensitivity was performed to evaluate the impacts of the wind farm, given that the wind farm will be operated only when the existing approved CT at Marshall is not in-service. The disturbances used to test for potential impact of operating the wind farm in lieu of the existing generator were regional worst-case faults: ag1 and ei2. These faults are defined as follows:

- **ag1** – Single line to ground fault on the Leland Olds to Fort Thompson 345 kV line with Leland Olds breaker stuck
- **ei2** – Permanent bipole fault on the Coal Creek DC line

The fault simulations were used to check the transient response of the system with the wind farm in-service, compared to with the existing approved CT in-service (i.e. Saratoga CT generator on (wind farm off) versus wind farm on (Saratoga generator off)).

Details on the disturbances may be found in the MAPP Members Reliability Criteria and Study Procedures Manual. Each disturbance report file was examined for violations, and the results are detailed in Appendix D. The disturbances were run for five seconds each.

Table A (below) shows that having the wind farm on-line causes no impact on the transient voltages at critical buses in MAPP Region, and therefore no comprehensive stability analysis was performed. The corresponding stability summary tables are found below in Table A. (Table A was summarized from the disturbance reports, located in Appendix D.) The plots for the critical buses, Groton, Wahpeton, and Watertown can be found in Appendix B.

**Table A**
**Transient Voltages at Critical Buses in MAPP Region**
**Saratoga CT generator on (wind off) versus**
**Wind Farm on (Saratoga generator off)**

| | Groton 345 kV (PU) Transient Voltage Minimum | | | Wahpeton 115 kV (PU) Transient Voltage Minimum | | | Watertown 345 kV (PU) Transient Voltage Minimum | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Disturbance** | | | **Disturbance** | | | **Disturbance** | | |
| | **ag1** | **ei2** | | **ag1** | **ei2** | | **ag1** | **ei2** | |
| mar-so06aa.uzvV454 (Saratoga CT on) Base case | 0.70 | 0.70 | | 0.80 | 0.80 | | 0.75 | 0.75 | |
| mw1-so06aa.uzvV454 (Wind on) | 0.70 | 0.70 | | 0.80 | 0.80 | | 0.75 | 0.75 | |
| Delta Impact | **0.00** | **0.00** | | **0.00** | 0.00 | | **0.00** | **0.00** | |

Plots for the Marshall area buses are found in Appendix C. The Marshall Area MW Flow plot consists of 4 channels. The Saratoga channel 1126 is the MMU_ Southwest sub 115 kV bus (60370)-The Saratoga generator 115 kV bus (60372). Saratoga channels 1128 and 1127 are the same branch (above) shown in reverse direction. Transformer channel 1130 is the Marshall Southwest Sub 115/34.5 kV transformer (60370-67480).

See Appendix E for power flow data from the mw1 and the mar case for verification of the Marshall Area MW Flow plot values.

## 8. Conclusion

The new 18.9 MW wind farm will be operated in lieu of the existing MAPP approved generation in Marshall, Minnesota, and therefore, the requests were evaluated on an out-of-queue basis, to evaluate whether operation of the wind farm, instead of the existing generation, would result in any detrimental impacts to the MAPP transmission system. Given this approach, an operating guide will be developed to ensure that the wind farm and existing generation are operated such that the MAPP approved generation input to the transmission system is not exceeded.

The addition of the 18.9 MW wind farm, which will be operated in lieu of the existing Saratoga combustion turbine generator near Marshall, MN will not adversely affect the Marshall area transmission system, nor regional MAPP transmission system, based upon the stability results outlined in this Part 2 report[1]. Transient response of the MAPP system (e.g. transient voltages at critical buses) is not adversely impacted under the limited number of critical faults studied. Therefore, no impact to the MAPP regional stability limits is expected, and the wind farm can be operated in lieu of the existing Saratoga CT.

The parties need to develop an operating guide to restrict the operation of the Saratoga CT when the wind farm is on-line, to ensure that the existing MAPP generation input limit approval of the Saratoga CT is not exceeded by the wind farm.

[1] The steady state powerflow analysis of the new 18.9 MW wind farm is outlined in the separate Part 1 of the Study Report.

```
TEXT ******************************************************************************
TEXT
TEXT                                                MARSHALL WIND PROJECT
TEXT
TEXT ******************************************************************************
TEXT
TEXT ***********************************************************************
TEXT By: Richard Dahl (MRES), rdahl@mrenergy.com, (605) 330 6999 (Desk)
TEXT Made using and for: PSS/E Rev. 29.5
TEXT Date last revised: 3/5/07 Holli Krizek
TEXT ***********************************************************************
TEXT
TEXT Note: This idev is intended for very specific powerflow models, and
TEXT                    may not work properly with your particular model.
TEXT                    Note that several new bus numbers are utilized.
TEXT      This data is per best knowledge as of 3/5/07.
TEXT                    Contact Richard Dahl if you have questions. (605 330 6999 or rdahl@mrenergy.com).
TEXT
TEXT                    This idev will not work if the Marshall Southwest 115 kV sub,
TEXT                    planned to be inservice by summer 2007, is not modeled.
TEXT
TEXT Purpose:
TEXT
TEXT This idev will add in the proposed Marshall Wind Farm as follows:
TEXT
TEXT      1) 9 Suxlon S88 turbines added in at 9 different buses, with Pmax=2.1 MW, and with the
TEXT            powerfactor at the units assumed to be 1.0. (No reactive output or consumption).
TEXT  2) Each unit has it's separate 600V -> 34.5 kV GSU that ties directly into a common 34.5 kV bus.
TEXT            The collector system between this 34.5 kV bus and each units GSU is not known at the time,
TEXT    and is not modeled.
TEXT  3) A 7.6 mile 34.5 kV line is modeled from the wind farm to the Marshall Southwest sub.
TEXT  4) A 34.5 kV -> 115 kV xfmr is modeled tying the wind farm in to the Southwest sub.
TEXT      5) 3 of the turbines will be on a 2.0 mile 34.5 kV spur out of the common collector point assumed evenly distributed over the line
TEXT      6) 4 of the turbines will be on a 1.0 mile 34.5 kV spur out of the common collector point assumed evenly distributed over the line
TEXT      7) 2 of the turbines will be on a 0.5 mile 34.5 kV spur out of the common collector point assumed evenly distributed over the line
TEXT
TEXT    NOTE THAT THE WIND TURBINES ARE NOT TURNED ONLINE BY THIS IDEV, NOR IS THE SARATOGA ST. GENERATION
TEXT            ADJUSTED IN ANY WAYS. THE WIND TURBINES AND THE SARATOGA ST. GENERATION WILL BE OPERATED SUCH THAT THE GENERATION MAXIMUM DOES NOT
TEXT            EXCEED AT THE ACCREDITED LEVEL OF THE SARATOGA ST. GENERATION.
TEXT
TEXT ASSUMED BUSNUMBER AVAILABILITY: 67470-67489.
TEXT 67470 - 67478: Turbine 600 V buses. 67479 - 34.5 kV bus @ wind farm. 67480 - 34.5 kV bus @ Southwest sub.
TEXT The remaining are 34.5 kV collector system buses for each of the turbines.
TEXT
TEXT
TEXT ***********************************************************************
TEXT                        DEFINING NEW BUSES AND MACHINES FOR THE WIND FARM
TEXT ***********************************************************************
TEXT wind gen from 0.9 lag to 0.9 lead???
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0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

```
TEXT ******************************************************************************
TEXT
TEXT                                                MARSHALL WIND PROJECT
TEXT
TEXT ******************************************************************************
TEXT
TEXT ***********************************************************************
TEXT By: Richard Dahl (MRES), rdahl@mrenergy.com, (605) 330 6999 (Desk)
TEXT Made using and for: PSS/E Rev. 29.5
TEXT Date last revised: 3/5/07  Holli Krizek
TEXT ***********************************************************************
TEXT
TEXT Note: This idev is intended for very specific powerflow models, and
TEXT                    may not work properly with your particular model.
TEXT                    Note that several new bus numbers are utilized.
TEXT      This data is per best knowledge as of 3/5/07.
TEXT                    Contact Richard Dahl if you have questions. (605 330 6999 or rdahl@mrenergy.com).
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TEXT                    This idev will not work if the Marshall Southwest 115 kV sub,
TEXT                    planned to be inservice by summer 2007, is not modeled.
TEXT
TEXT Purpose:
TEXT
TEXT This idev will add in the proposed Marshall Wind Farm as follows:
TEXT
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TEXT            powerfactor at the units assumed to be 1.0. (No reactive output or consumption).
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TEXT            The collector system between this 34.5 kV bus and each units GSU is not known at the time,
TEXT    and is not modeled.
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TEXT  4) A 34.5 kV -> 115 kV xfmr is modeled tying the wind farm in to the Southwest sub.
TEXT      5) 3 of the turbines will be on a 2.0 mile 34.5 kV spur out of the common collector point assumed evenly distributed over the line
TEXT      6) 4 of the turbines will be on a 1.0 mile 34.5 kV spur out of the common collector point assumed evenly distributed over the line
TEXT      7) 2 of the turbines will be on a 0.5 mile 34.5 kV spur out of the common collector point assumed evenly distributed over the line
TEXT
TEXT    NOTE THAT THE WIND TURBINES ARE NOT TURNED ONLINE BY THIS IDEV, NOR IS THE SARATOGA ST. GENERATION
TEXT            ADJUSTED IN ANY WAYS. THE WIND TURBINES AND THE SARATOGA ST. GENERATION WILL BE OPERATED SUCH THAT THE GENERATION MAXIMUM DOES NOT
TEXT            EXCEED AT THE ACCREDITED LEVEL OF THE SARATOGA ST. GENERATION.
TEXT
TEXT ASSUMED BUSNUMBER AVAILABILITY: 67470-67489.
TEXT 67470 - 67478: Turbine 600 V buses. 67479 - 34.5 kV bus @ wind farm. 67480 - 34.5 kV bus @ Southwest sub.
TEXT The remaining are 34.5 kV collector system buses for each of the turbines.
TEXT
TEXT
TEXT ***********************************************************************
TEXT                        DEFINING NEW BUSES AND MACHINES FOR THE WIND FARM
TEXT ***********************************************************************
TEXT Assumes fixed 0 VAR flow
rdch
1
67470,'MSHLWND1',   0.6000,2,    0.000,    0.000, 652, 665,1.05440,  45.1149, 665
67471,'MSHLWND2',   0.6000,2,    0.000,    0.000, 652, 665,1.05675,  45.1423, 665
67472,'MSHLWND3',   0.6000,2,    0.000,    0.000, 652, 665,1.05792,  45.1561, 665
67473,'MSHLWND4',   0.6000,2,    0.000,    0.000, 652, 665,1.05264,  45.0939, 665
67474,'MSHLWND5',   0.6000,2,    0.000,    0.000, 652, 665,1.05397,  45.1090, 665
67475,'MSHLWND6',   0.6000,2,    0.000,    0.000, 652, 665,1.05485,  45.1190, 665
67476,'MSHLWND7',   0.6000,2,    0.000,    0.000, 652, 665,1.05529,  45.1242, 665
67477,'MSHLWND8',   0.5000,2,    0.000,    0.000, 652, 665,1.05177,  45.0822, 665
67478,'MSHLWND9',   0.6000,2,    0.000,    0.000, 652, 665,1.05221,  45.0867, 665
67479,'MSHLWNDC',  34.5000,1,    0.000,    0.000, 652, 665,1.05163,  42.8959, 665
67480,'MSHLSWC ',  34.5000,1,    0.000,    0.000, 652, 665,1.01454,  41.4632, 665
67481,'MSWNDC1 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05866,  43.0070, 665
67482,'MSWNDC2 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05604,  42.9643, 665
67483,'MSWNDC3 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05297,  42.9142, 665
67484,'MSWNDT1 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05749,  42.9884, 665
67485,'MSWNDT2 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05515,  42.9514, 665
67486,'MSWNDT3 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05560,  42.9574, 665
67487,'MSWNDT4 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05472,  42.9437, 665
67488,'MSWNDT5 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05340,  42.9232, 665
67489,'MSWNDT6 ',  34.5000,1,    0.000,    0.000, 652, 665,1.05253,  42.9078, 665
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
67470,'P1',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
67471,'P2',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
67472,'P3',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
```

```
 77  67473,'P4',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
 78  67474,'P5',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
 79  67475,'P6',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
 80  67476,'P7',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
 81  67477,'P8',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
 82  67478,'P9',    2.100,    0.000,    0.300,   -0.300,1.00000,   0,    2.100,  0.00530,  0.21160,  0.00000,  0.00000,1.00000,0,  100.0,    2.100,    0.000, 665,1.0000
 83  60372,'1',    23.000,    0.000,    8.000,   -6.000,1.02000,   0,   25.000,  0.00000,  0.13000,  0.00000,  0.09000,1.00000,1,  100.0,   23.000,    0.000, 665,1.0000
 84  0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
 85  67479,-67480,'P1',   0.20500,   0.14700,   0.01330,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   7.60, 665,1.0000
 86  67479,-67485,'P1',   0.05947,   0.01540,   0.00021,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.67, 665,1.0000
 87  67479,-67488,'P1',   0.02230,   0.00577,   0.00032,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.25, 665,1.0000
 88  67479,-67489,'P1',   0.02230,   0.00577,   0.00126,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.25, 665,1.0000
 89  67481, 67484,'P1',   0.05947,   0.01540,   0.00021,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.67, 665,1.0000
 90  67482, 67486,'P1',   0.02230,   0.00577,   0.00032,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.25, 665,1.0000
 91  67483, 67489,'P1',   0.02230,   0.00577,   0.00126,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.25, 665,1.0000
 92  67484, 67485,'P1',   0.05947,   0.01540,   0.00021,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.67, 665,1.0000
 93  67486, 67487,'P1',   0.02230,   0.00577,   0.00031,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.25, 665,1.0000
 94  67487, 67488,'P1',   0.02230,   0.00577,   0.00032,   0.00,    0.00,    0.00,  0.00000,  0.00000,  0.00000,  0.00000,1,   0.25, 665,1.0000
 95  0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
 96  60370,67480,    0,'P1',1,1,1,   0.00000,   0.00000,2,'        ',1, 605,1.0000
 97    0.00000,   0.56550,  100.00
 98  1.00000,   0.000,   0.000,   16.80,   16.80,   16.80, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
 99  1.00000,   0.000
100  67470,67485,    0,'P1',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
101    0.00000,   2.00000,  100.00
102  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
103  1.00000,   0.000
104  67471,67484,    0,'P2',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
105    0.00000,   2.00000,  100.00
106  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
107  1.00000,   0.000
108  67472,67481,    0,'P3',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
109    0.00000,   2.00000,  100.00
110  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
111  1.00000,   0.000
112  67473,67488,    0,'P4',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
113    0.00000,   2.00000,  100.00
114  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
115  1.00000,   0.000
116  67474,67487,    0,'P5',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
117    0.00000,   2.00000,  100.00
118  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
119  1.00000,   0.000
120  67475,67486,    0,'P6',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
121    0.00000,   2.00000,  100.00
122  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
123  1.00000,   0.000
124  67476,67482,    0,'P7',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
125    0.00000,   2.00000,  100.00
126  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
127  1.00000,   0.000
128  67477,67489,    0,'P8',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
129    0.00000,   2.00000,  100.00
130  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
131  1.00000,   0.000
132  67478,67483,    0,'P9',1,1,1,   0.00000,   0.00000,2,'        ',1, 665,1.0000
133    0.00000,   2.00000,  100.00
134  1.00000,   0.000,   0.000,    2.50,    2.50,    2.50, 0,    0, 1.10000, 0.90000, 1.10000, 0.90000,  33, 0, 0.00000, 0.00000
135  1.00000,   0.000
136  0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
137  0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
138  0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
139  0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
140  0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
141  0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
142  0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
143  0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
144  0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
145  0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
146  0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
147  0 / END OF FACTS DEVICE DATA
148
```

```
MENU,OFF      /* FORCE MENU TO CORRECT STATUS
TEXT ******************************************************************************
TEXT
TEXT                                                MARSHALL AREA - GENERAL UPGRADES
TEXT
TEXT ******************************************************************************
TEXT
TEXT ***********************************************************************
TEXT By: Richard Dahl (MRES), rdahl@mrenergy.com, (605) 330 6999 (Desk)
TEXT Made using and for: PSS/E Rev. 29.5
TEXT Date: 3/5/07   Revised Holli Krizek
TEXT ***********************************************************************
TEXT Note: This idev is intended for very specific powerflow models, and
TEXT                    may not work properly with your particular model.
TEXT                    Note that 2 new bus numbers are utilized.
TEXT      This data is per best knowledge as of 10/30/06.
TEXT                    Contact Richard Dahl if you have questions. (rdahl@mrenergy.com / 605 330 6999)
TEXT                    NOTE IN PARTICULAR THAT LOAD LEVELS ASSUMED IN THIS IDEV LIKELY
TEXT                    WILL HAVE TO BE ALTERED AS DIFFERENT MODELS ARE USED.
TEXT                    (See further information below).
TEXT
TEXT Purpose:
TEXT
TEXT This idev is made for reflecting upgrades that have recently been completed,
TEXT or that will be completed TEXT on MMU's 115 kV system.
TEXT The IDEV will ATTEMPT to do the following:
TEXT
TEXT 1) Marshall Southwest Sub: This new sub is scheduled to be online summer 2007.
TEXT            The bus MMU_SW with bus #60370 will be added
TEXT    by tapping the Saratoga - Southeast 115 kV line. 2x20 MVAR capacitor banks are
TEXT            added to the Southwest sub.
TEXT 2) Marshall North 7th St. Substation: This new sub is already in service, but not
TEXT            reflected in most powerflow models.
TEXT    The bus MMU_N7ST with bus #60375 will be added by taping the Erie Road -
TEXT            Marshall Switching Station 115 kV line.
TEXT 3) Redistribution of load:
TEXT        With the new substations in service, the load as seen on the 115 kV system will be
TEXT        redistributed due to corresponding
TEXT    changes in the distribution system in Marshall.
TEXT            a) A 41.78 MW non scalable load will be added to the North 7th St. Sub, bus #60375
TEXT        b) The total load on all MMU buses (Erie Road, Marshall, Southeast, Saratoga St)
TEXT                    will be added up, and 41.78 MW will be subtracted from this load
TEXT            c) The remaining load should be distributed on Erie Road, Marshall, Southeast,
TEXT                    Saratoga St., and Southwest as follows:
TEXT                    All load with an assumed powerfactor of 0.95 - load consuming VARs:
TEXT                        v)          Marshall - 60170:                5.89% (parameters X1 and Y1 in load adjustment statements below)
TEXT                        i)   Southeast sub - 60373:    22.63% (parameters X2 and Y2 in load adjustment statements below)
TEXT                        ii)  Saratoga St - 60372:          27.52% (parameters X3 and Y3 in load adjustment statements below)
TEXT                        iv)         Southwest - 60370:          16.97% (parameters X4 and Y4 in load adjustment statements below)
TEXT                        iii) Erie Road - 60371:            26.99% (parameters X5 and Y5 in load adjustment statements below)
TEXT
TEXT   Note that in any scenarios where load is scaled, the load on the North 7th St. should be considered
TEXT       non-scalable unless otherwise explicetly stated.
TEXT
TEXT
TEXT      Marshall Wind project: This idev does not include detail to include the proposed Marshall wind project.
TEXT                                                    A separate idev, MARSHALL_WIND_103006.IDV, is available that will do this.
TEXT                                                    This idev must be applied before the wind project idev though, as the wind project
TEXT                                                    idev assumes interconnection to the Southwest 115 kV substation.,
TEXT
TEXT      BUSNUMBER AVAILABILITY: Note that this idev assumes bus #60370, and bus #60375 are available.
TEXT  OTHER ASSUMPTIONS: Some models might already have the Southwest sub included. If this is the case - try to
TEXT                                                simply remove the section that inserts the Southwest sub from this idev.
TEXT
TEXT
TEXT
TEXT ******************************************************************************
TEXT      Purging existing 115 kV from Southeast - Saratoga Street
TEXT ******************************************************************************
purg,si
1
60372 60373
1
0
0
0
```

```
0            / ******************************************************************************
0            /     Inserting Marshall Southwest sub, and 115 kV to Saratoga, and to Southeast
0
/******************************************************************************
rdch
1
60370,'MMU SW 7', 115.0000,1,     0.000,     0.000, 652, 605,1.00700, 36.0000, 605
text 60375 'MMU_N7ST', 115.00000/Inserting the North 7th St Sub
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
60372,-60370,'1 ',   0.00590,   0.01690,   0.00207,  127.90,  127.90,  140.70,  0.00000,  0.00000,  0.00000,  0.00000,1,   2.80, 605,1.0000
60373, 60370,'1 ',   0.00640,   0.01810,   0.00222,  127.90,  127.90,  140.70,  0.00000,  0.00000,  0.00000,  0.00000,1,   3.00, 605,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
60370,1,1.0200,1.0000,    0,'       ',    0.00, 2,  20.00/Inserting the Southwest Sub 2x20 MVAR caps
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
TEXT
TEXT ******************************************************************************
TEXT                                        Inserting the Southwest Sub 2x20 MVAR caps (put in above- hsk)
TEXT ******************************************************************************
TEXT MENU,OFF
TEXT BAT_SWITCHED_SHUNT_DATA, 60370, 2, 0, 0, 0, 0, 0, 0, 0, 1, 0,
TEXT 20.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
TEXT 1.02, 1.0, 0.0, "" ;
TEXT ******************************************************************************
TEXT                                        Inserting the North 7th St Sub
TEXT ******************************************************************************
TEXT BAT_LTAP  60371  60170 '1 ' 0.42110  60375 'MMU_N7ST'   115.00000 (move below- hsk)
TEXT BAT_LOAD_DATA, 60375, "W2", 1, 652, 605, 605, 41.78, 8.48, 0.0, 0.0, 0.0, 0.0 ;(don't use re-distributed MVAR incorrect)
TEXT ******************************************************************************
TEXT
menu,off
ltap
60371 60170 1
60375
MMU_N7ST
0.42110
0
0
0
0            / ******************************************************************************
0            /     Inserting Marshall Southwest sub, and 115 kV to Saratoga, and to Southeast
0  Correcting MMU Load
TEXT ******************************************************************************
TEXT Note:
TEXT For consistency, model reactive load at each bus as: Y = sq.root((X/0.95)^2-X^2)
TEXT (ref load data batch statments below)
TEXT (0.95 PF lagging).
TEXT
TEXT For X1 - X5 values, please see instructions in bullet 3 in the header of the idev
TEXT
menu,off
BAT_LOAD_DATA, 60170, "W0", , , , , 1.72, 0.56, , , ,  ;
BAT_LOAD_DATA, 60373, "W0", , , , , 6.59, 2.17 , , ,  ;
BAT_LOAD_DATA, 60372, "W0", , , , , 8.01, 2.63, , , ,  ;
BAT_LOAD_DATA, 60370, "W0", 1, 652, 605, 605, 4.94, 1.62, 0.0, 0.0, 0.0, 0.0 ;
BAT_LOAD_DATA, 60371, "W0", , , , , 7.86, 2.58, , , ,  ;
BAT_LOAD_DATA, 60375, "W2", 1, 652, 605, 605, 41.78,13.73, 0.0, 0.0, 0.0, 0.0 /from above used 0.95 pf
TEXT ******************************************************************************
TEXT                                        END OF IDEV. CASE NEEDS TO BE SOLVED AND SAVED.
TEXT                                        MRES OR HCPD GENERATION SHOULD BE ALTERED TO MATCH LOAD
TEXT                                        AS APPROPRIATE.
TEXT ******************************************************************************
ECHO
@END
```

# Idev Data Sheet

## North 7th Street Load Distribution

| | | MW | MVAR | PF | |
|---|---|---|---|---|---|
| N 7th ST | 60375 | 41.78 | 41.78 | 13.73 | 0.95 |
| Redistribution of remaining load (70.9 MW-41.78 MW) | | | 29.12 | 9.57 | |
| Erie | 60371 | 0.2699 | 7.86 | 2.58 | |
| Saratoga | 60372 | 0.2752 | 8.01 | 2.63 | |
| Marshall | 60170 | 0.0589 | 1.72 | 0.56 | |
| SE | 60373 | 0.2263 | 6.59 | 2.17 | |
| SW | 60370 | 0.1697 | 4.94 | 1.62 | |
| *check* | | *1* | *29.12* | *9.57* | |

loads from URG-so06aa…..

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACTIV | ITY? | | | | | | | | | | | | | | | | | | | | |
| | PTI INTER | ACTI | | VE P | OWE | R | SYSTEM S | IMULATOR | #NAME? | | FRI, MAR | 09 2 | | 007 | 15:46 | | | | | | |
| URG-S | O06AA.UZV | V454 | | .SAV | ;SU | MM | ER;OP LD | ;SYSTEM | INTACT | | | | | LOAD DATA | | | | | | | |
| ND=19 | 50,MH=217 | 5,MW | | | 148 0,O | HM | H=-195,O | HMP=150, | EWTW=19 | 0,BD=1 | | 65 | | | | | | | | | |
| BUS# | NAME | BSKV | | ID | CD | ST | PSI | MVA-L | OAD | CUR- | LOAD | Y - | | LOAD | AREA | ZONE | OWNER | | | | |
| 60170 | MARSHAL7 | | 115 | W0 | | 1 | 1 | 1 | 11.5 | 2.3 | 0 | 0 | 0 | 0.0 | 652 | 656 | 652 | | | | |
| 60371 | ERIE RD7 | | 115 | W0 | | 1 | 1 | 1 | 34 | 6.9 | 0 | 0 | 0 | 0.0 | 652 | 656 | 652 | | | | |
| 60372 | SARATOG7 | | 115 | W0 | | -2 | 1 | 1 | 15.3 | 3.1 | 0 | 0 | 0 | 0.0 | 652 | 656 | 652 | | | | |
| 60373 | SOUTH E7 | | 115 | W0 | | 1 | 1 | 1 | 10.1 | 2 | 0 | 0 | 0 | 0.0 | 652 | 656 | 652 | | | | |
| TOTAL LOAD in case | | | | | | | | | 70.9 | 14.3 | | | | | | | | | | | |

## Generators MV output

Wind generators, pf .99 lag to .99 lead
w/ built in capacitors

| | |
|---|---|
| pf | 0.99 |

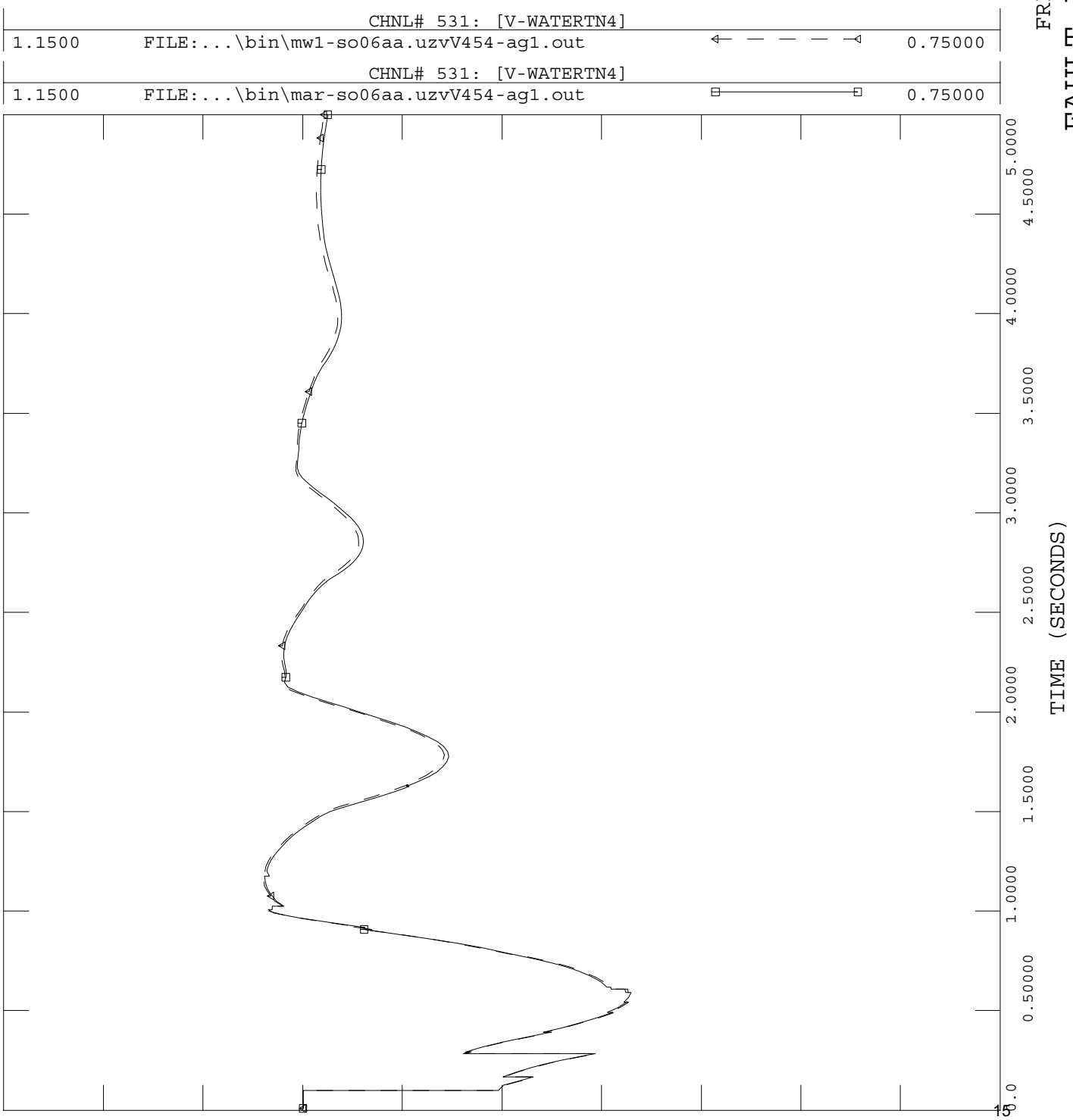
| MW output | MV output |
|---|---|
| 2.1 | 0.30 |

POWER TECHNOLOGIES INC.

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

FRI, APR 20 2007 12:30

FAULT AG1: WATERTOWN

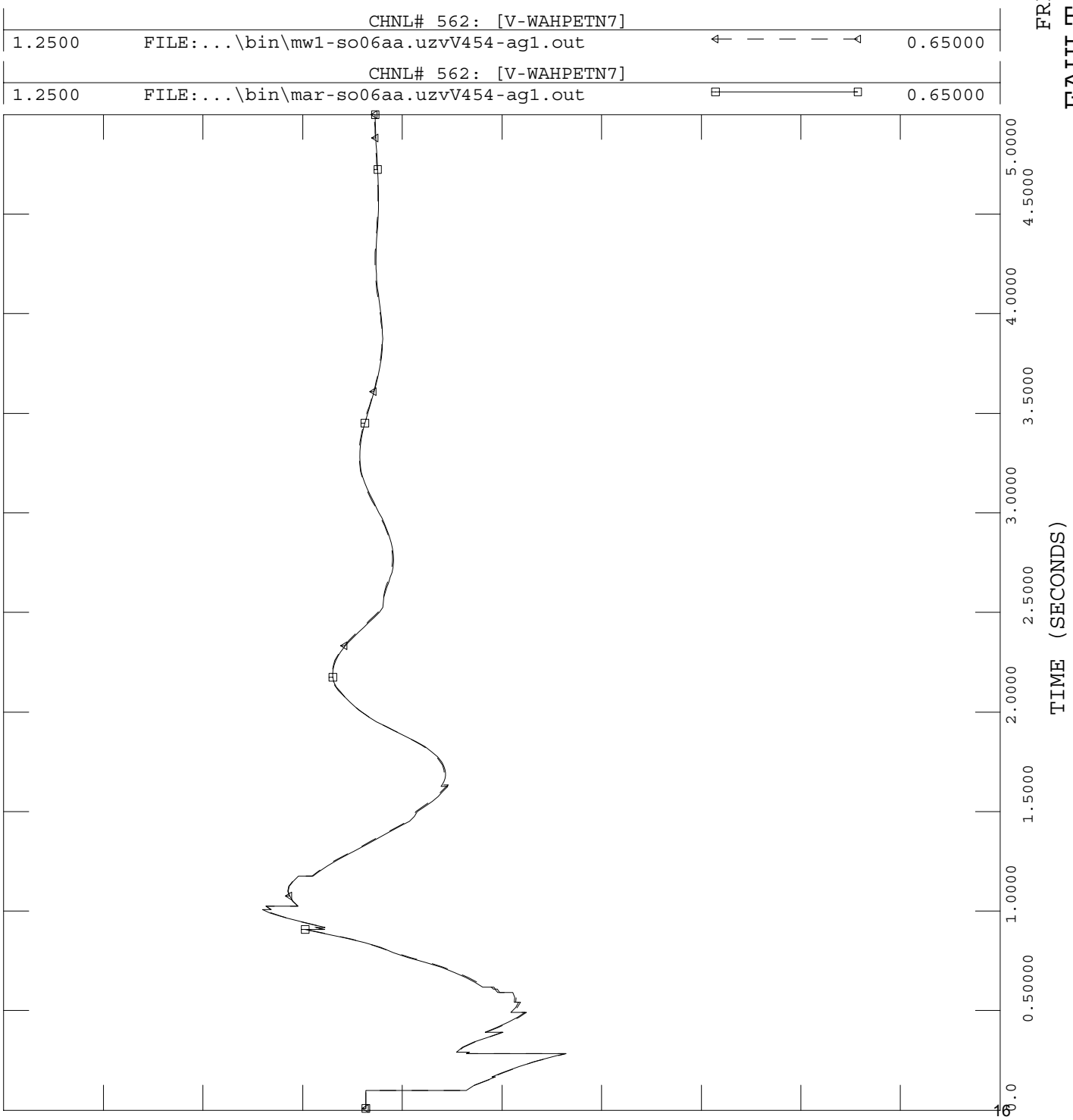


POWER TECHNOLOGIES INC.

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

FRI, APR 20 2007 12:24

FAULT AG1: WAHPETON

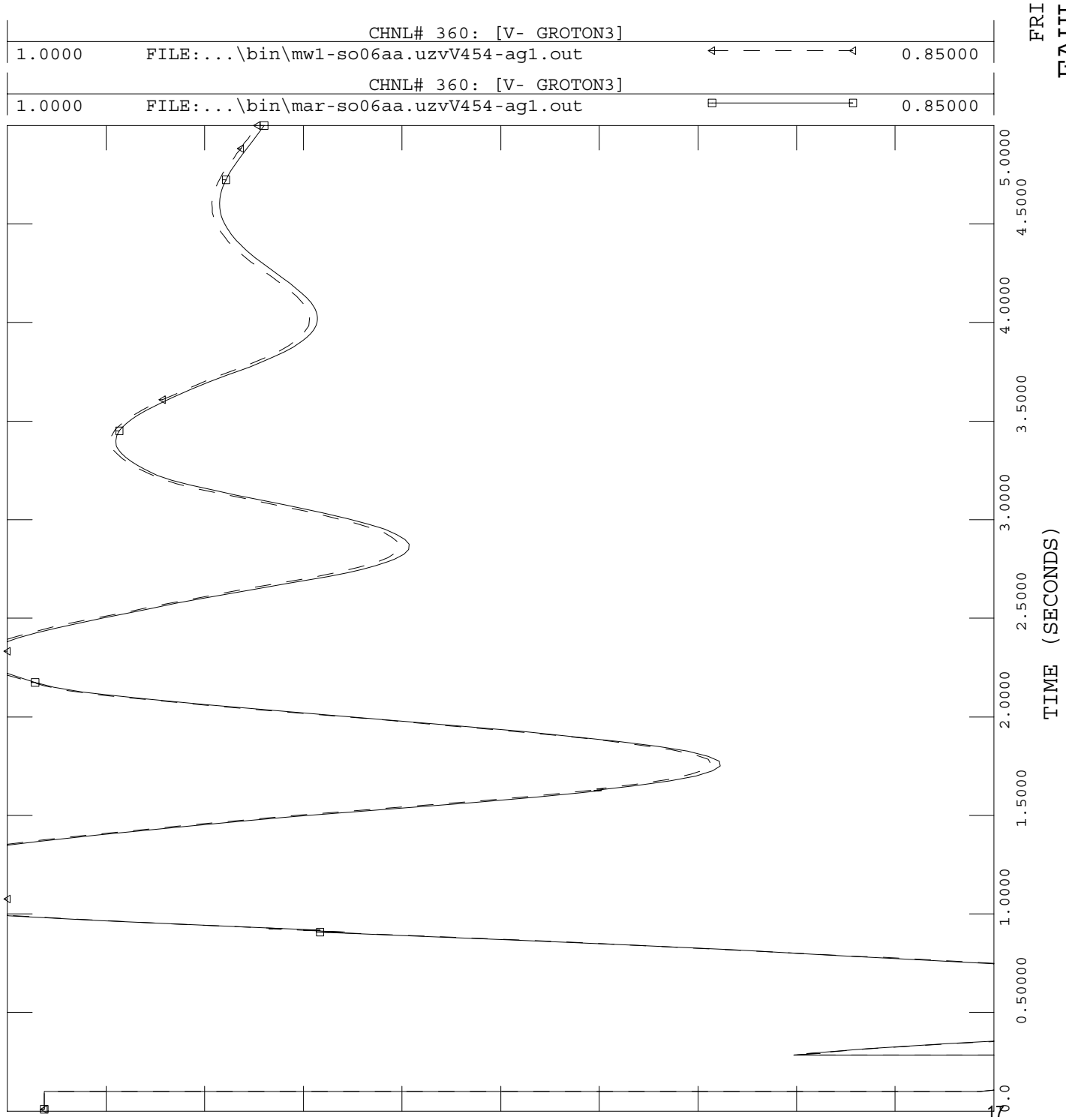


POWER TECHNOLOGIES INC.

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

FRI, APR 20 2007 11:28

FAULT AG1: GROTON

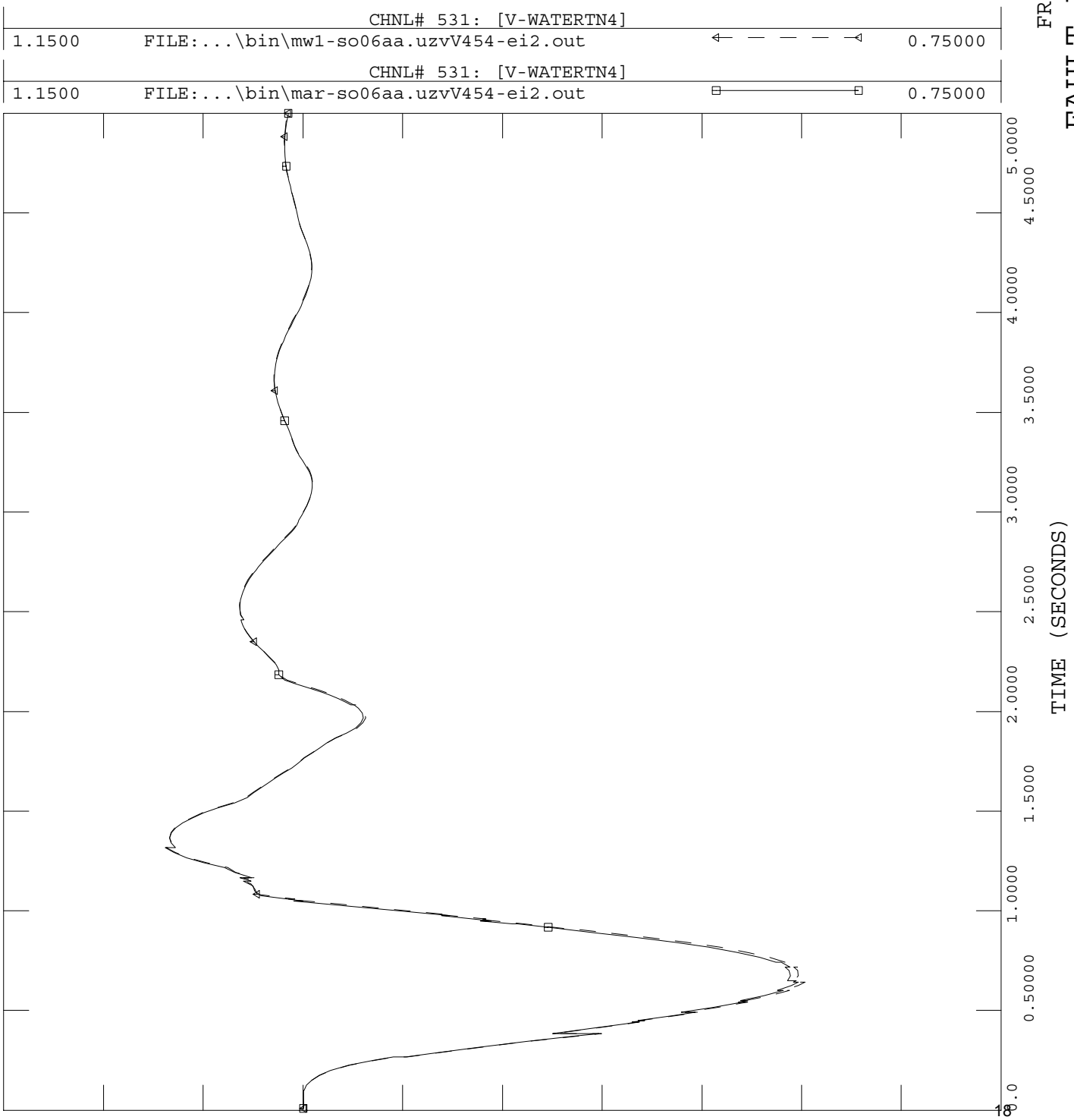


POWER TECHNOLOGIES INC.

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

FRI, APR 20 2007 12:33

FAULT EI2: WATERTOWN

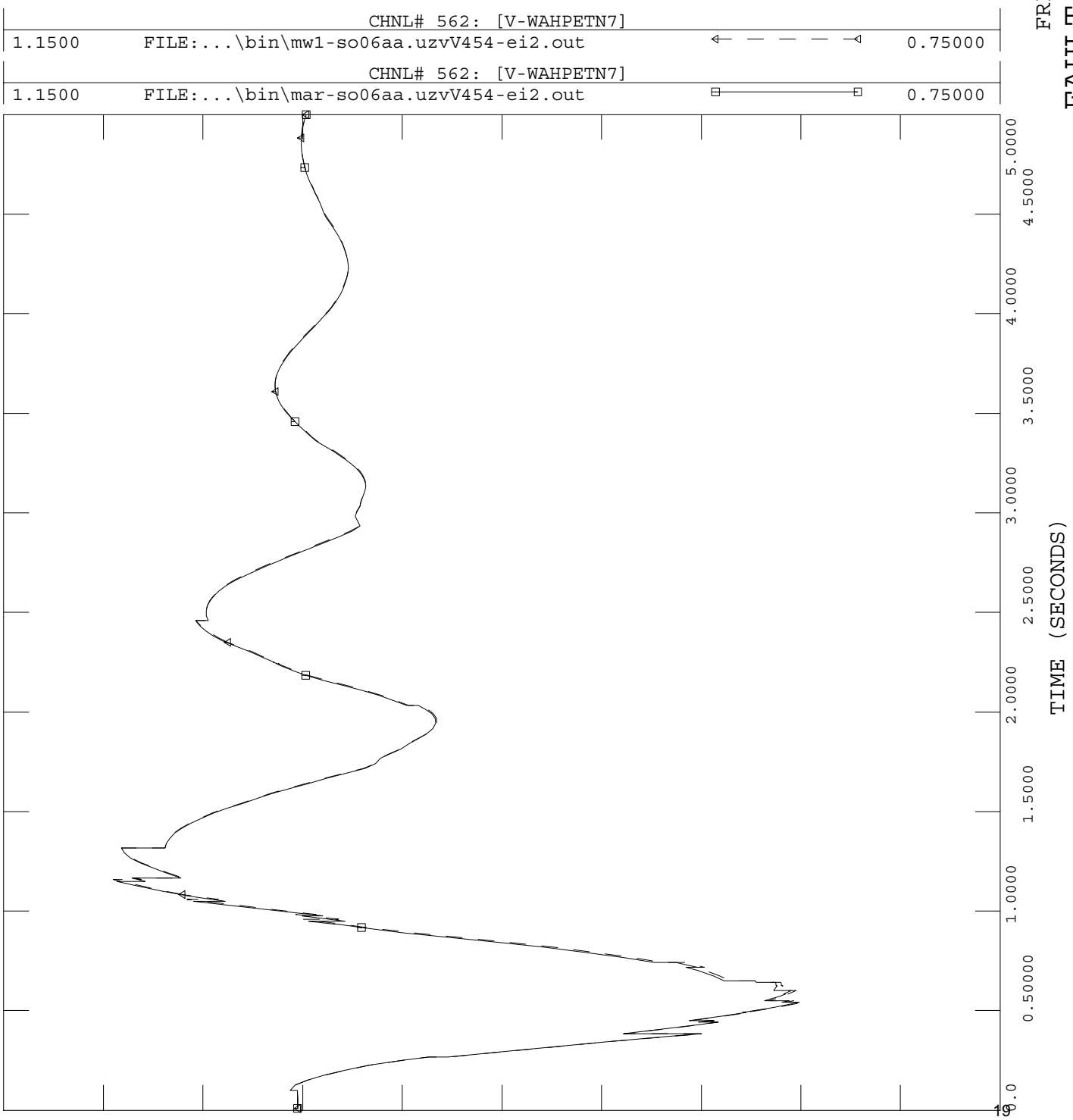


POWER TECHNOLOGIES INC.

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

FRI, APR 20 2007 12:35

FAULT EI2: WAHPETON

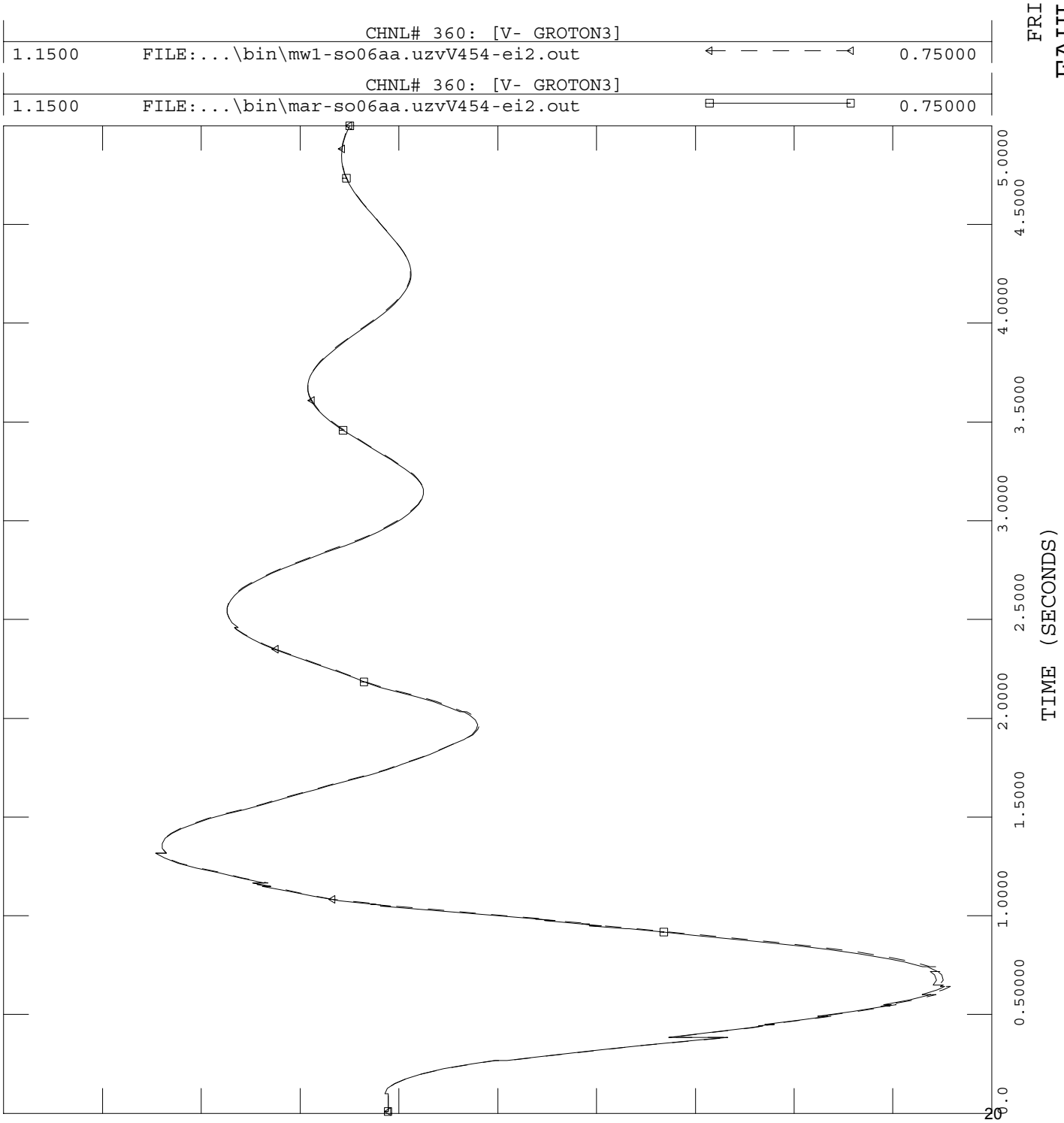


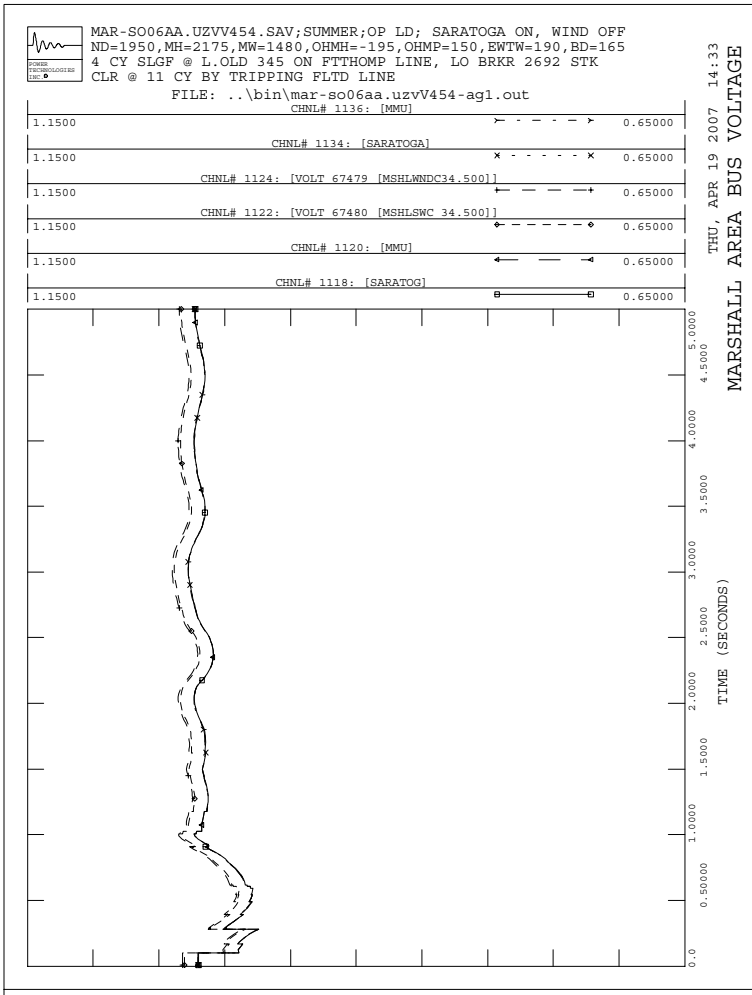
POWER TECHNOLOGIES INC.

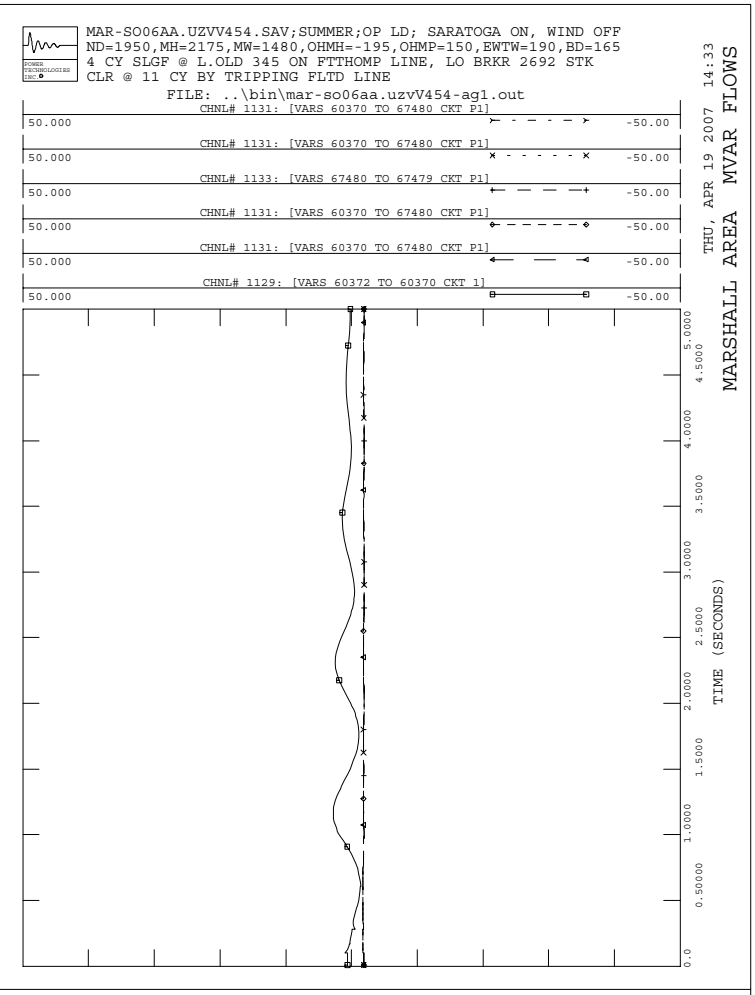
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

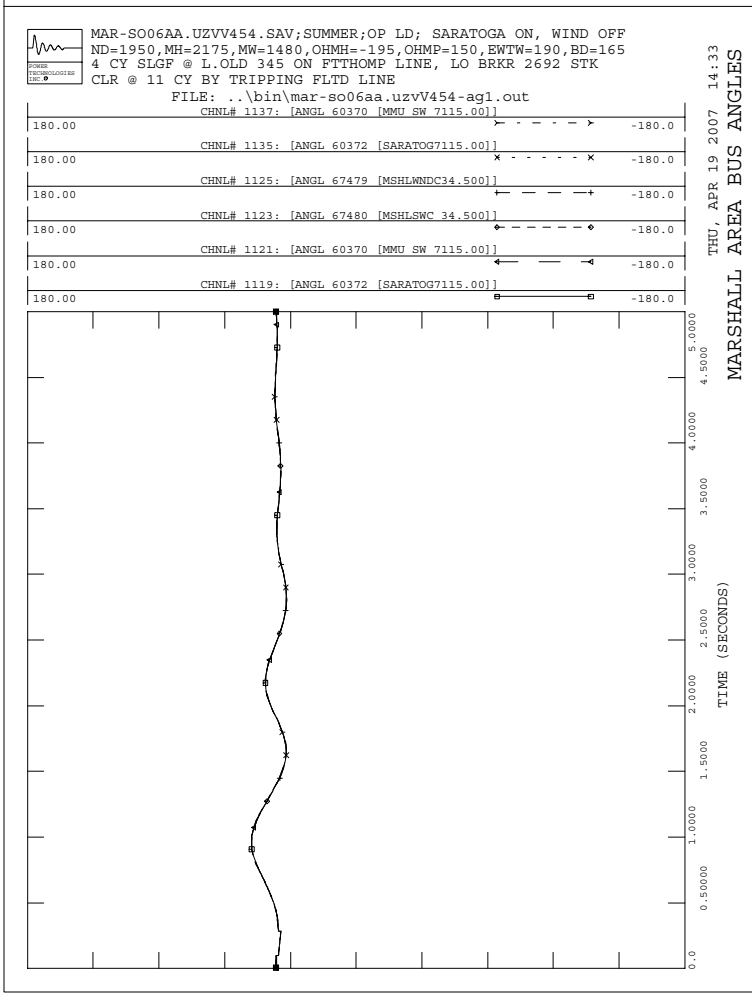
FRI, APR 20 2007 12:36

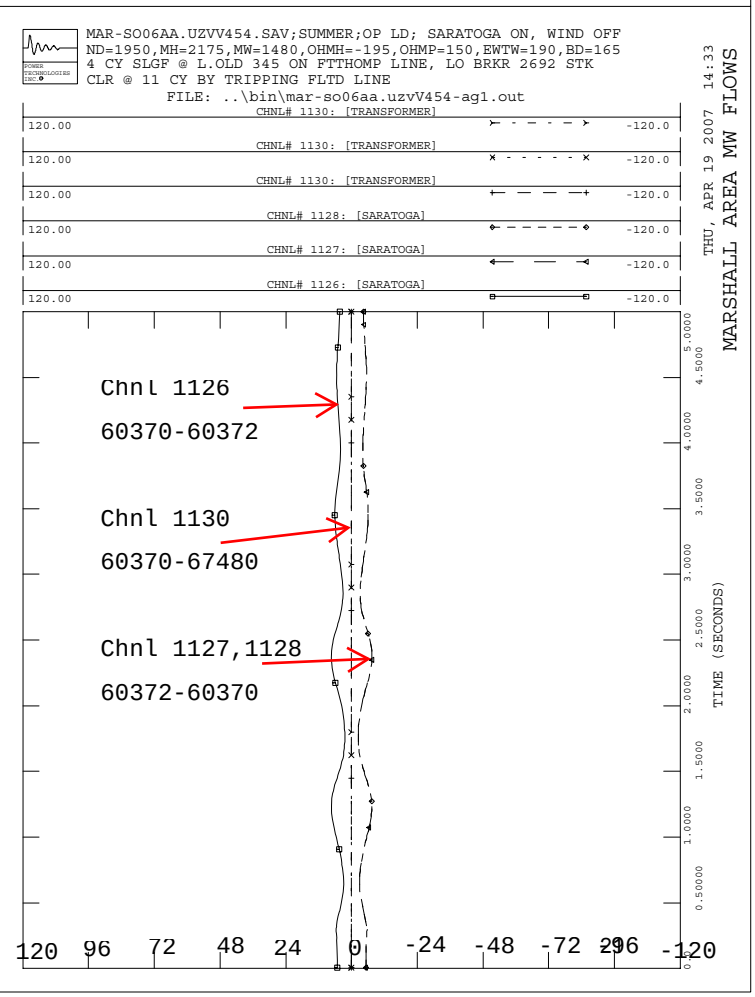
FAULT EI2: GROTON

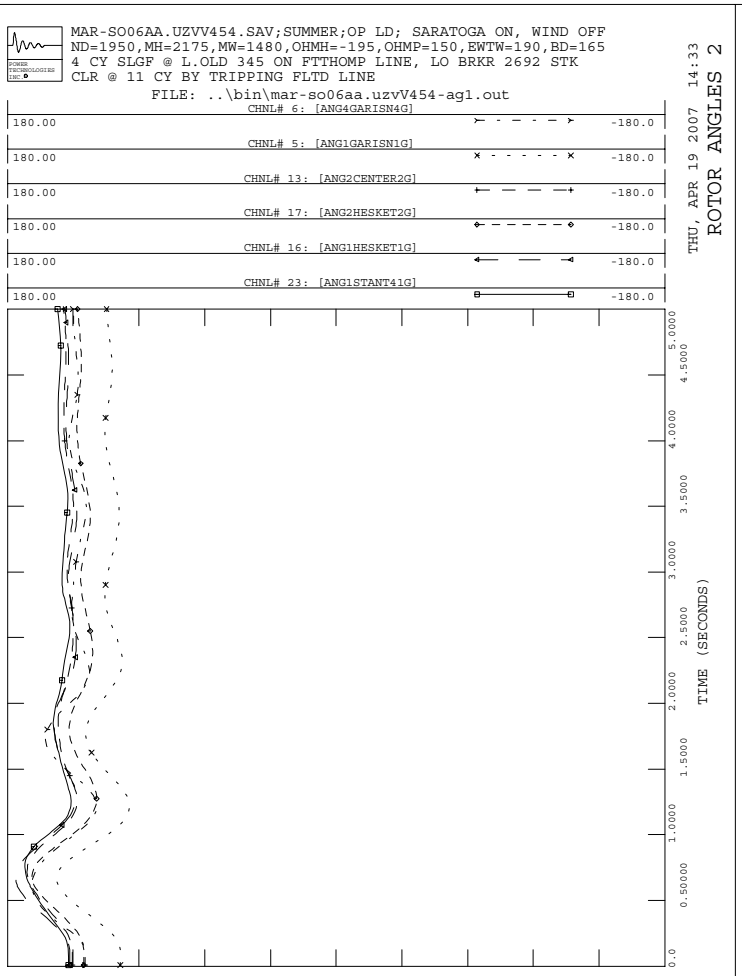


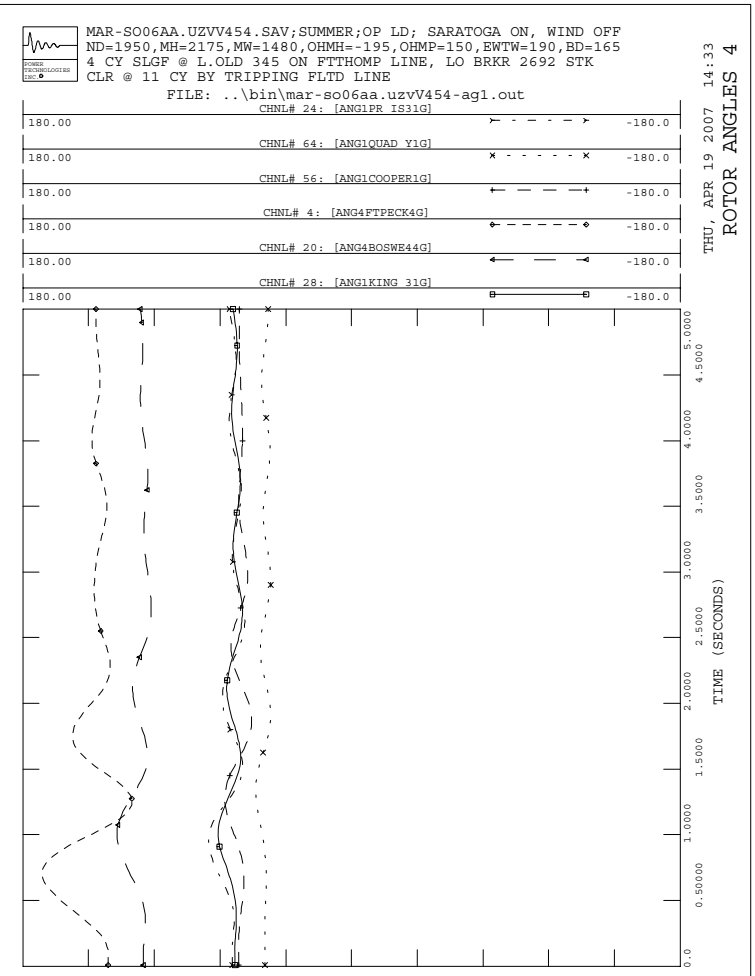

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 1136: [MMU]
CHNL# 1134: [SARATOGA]
CHNL# 1124: [VOLT 67479 [MSHLWNDC34.500]]
CHNL# 1122: [VOLT 67480 [MSHLSWC 34.500]]
CHNL# 1120: [MMU]
CHNL# 1118: [SARATOG]
1.1500
0.65000
THU, APR 19 2007 14:33
MARSHALL AREA BUS VOLTAGE
TIME (SECONDS)

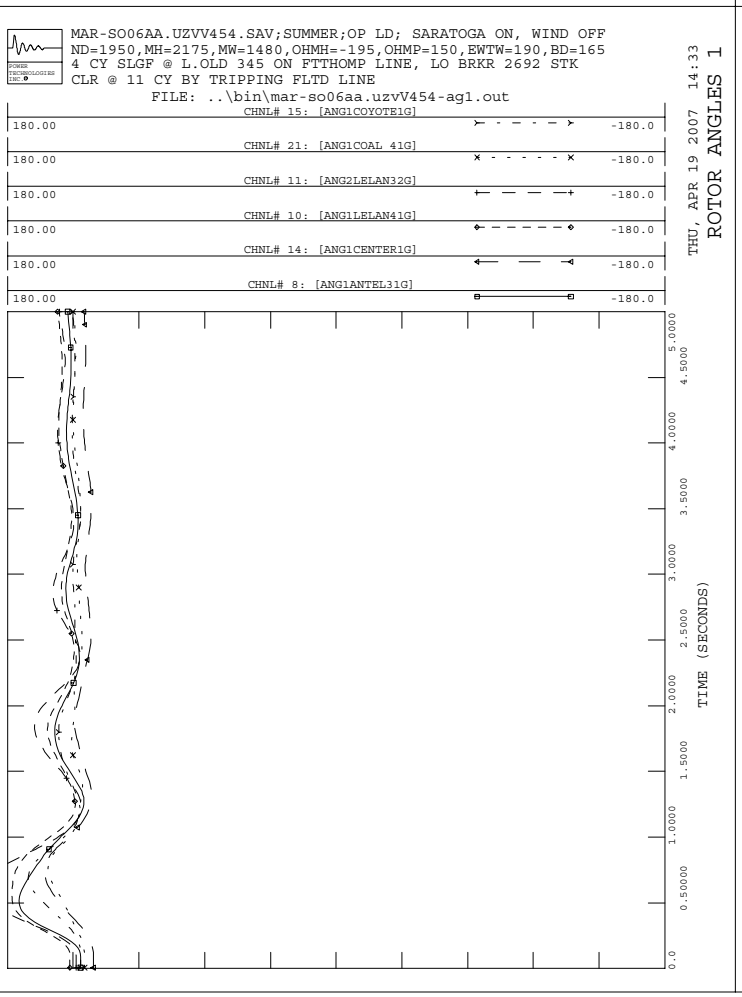

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1133: [VARS 67480 TO 67479 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1129: [VARS 60372 TO 60370 CKT 1]
50.000
-50.00
THU, APR 19 2007 14:33
MARSHALL AREA MVAR FLOWS
TIME (SECONDS)

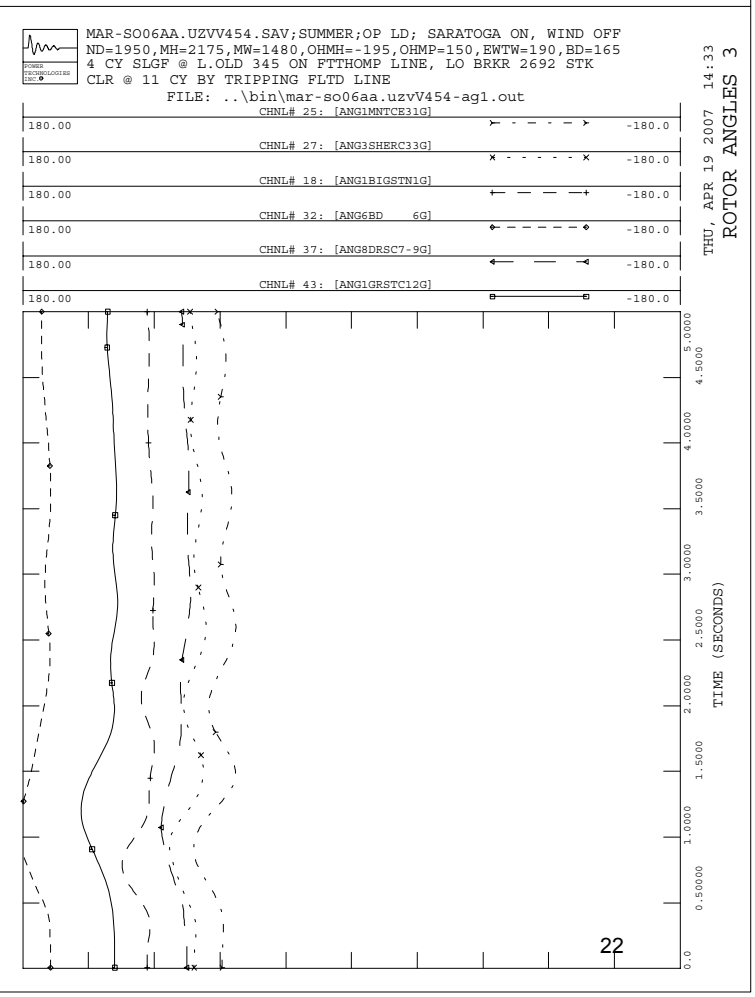

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 1137: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1135: [ANGL 60372 [SARATOG7115.00]]
CHNL# 1125: [ANGL 67479 [MSHLWNDC34.500]]
CHNL# 1123: [ANGL 67480 [MSHLSWC 34.500]]
CHNL# 1121: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1119: [ANGL 60372 [SARATOG7115.00]]
180.00
-180.0
THU, APR 19 2007 14:33
MARSHALL AREA BUS ANGLES
TIME (SECONDS)

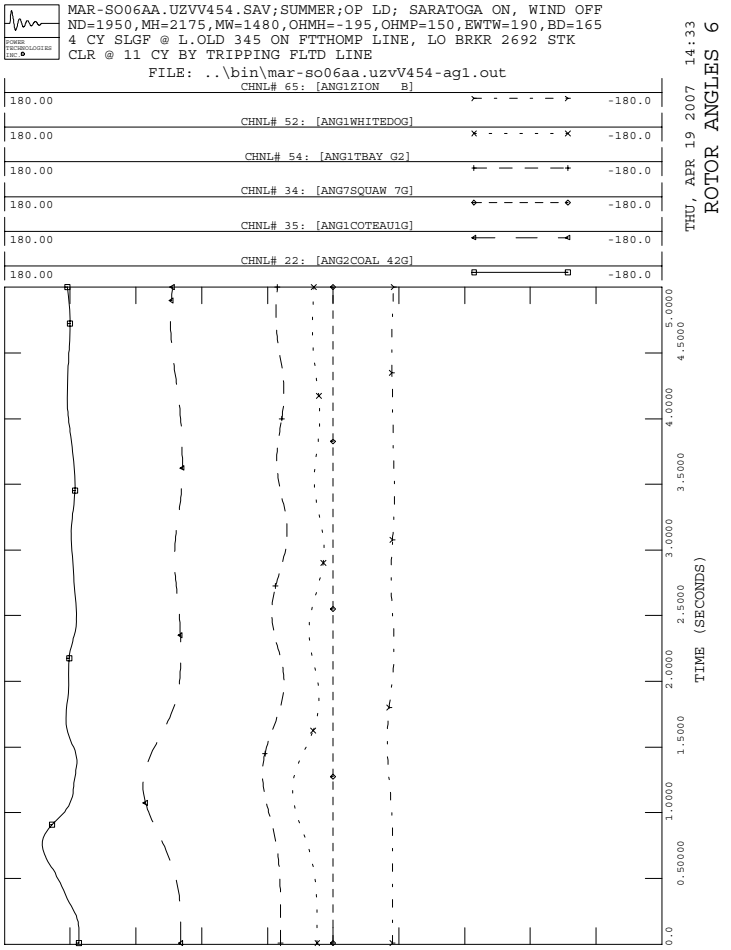

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1128: [SARATOGA]
CHNL# 1127: [SARATOGA]
CHNL# 1126: [SARATOGA]
120.00
-120.0
Chnl 1126
60370-60372
Chnl 1130
60370-67480
Chnl 1127,1128
60372-60370
120 96 72 48 24 0 -24 -48 -72 -96 -120
THU, APR 19 2007 14:33
MARSHALL AREA MW FLOWS
TIME (SECONDS)

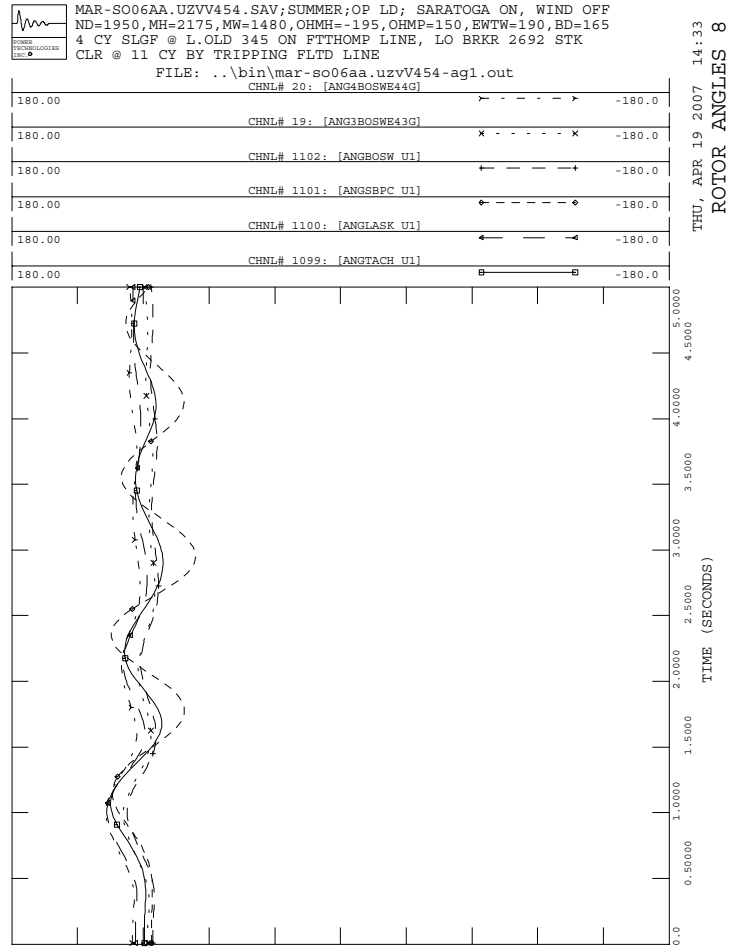

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 6: [ANG4GARISN4G]
CHNL# 5: [ANG1GARISN1G]
CHNL# 13: [ANG2CENTER2G]
CHNL# 17: [ANG2HESKET2G]
CHNL# 16: [ANG1HESKET1G]
CHNL# 23: [ANG1STANT41G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 2
TIME (SECONDS)

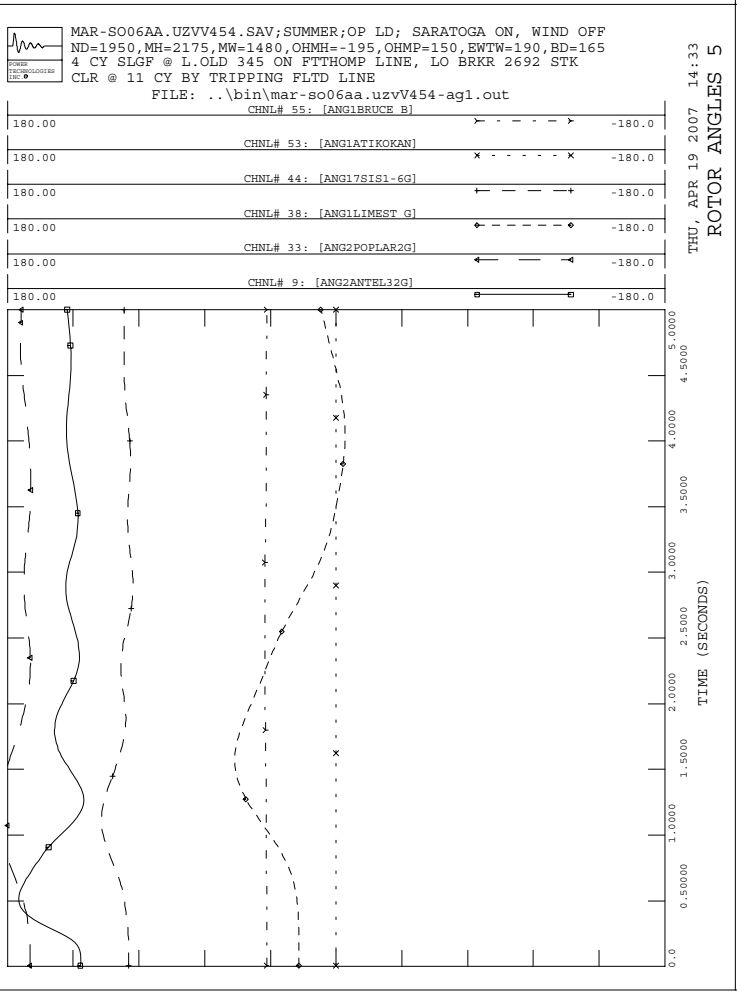

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 24: [ANG1PR IS31G]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 56: [ANG1COOPER1G]
CHNL# 4: [ANG4FTPECK4G]
CHNL# 20: [ANG4BOSWE44G]
CHNL# 28: [ANG1KING 31G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 4
TIME (SECONDS)

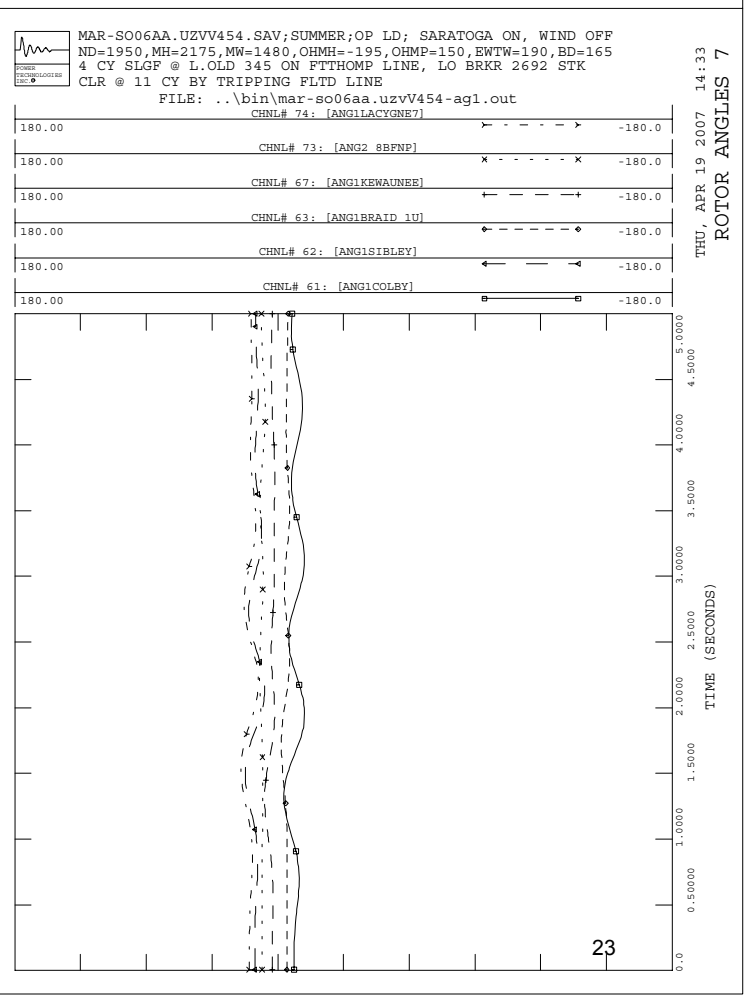

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 15: [ANG1COYOTE1G]
CHNL# 21: [ANG1COAL 41G]
CHNL# 11: [ANG2LELAN32G]
CHNL# 10: [ANG1LELAN41G]
CHNL# 14: [ANG1CENTER1G]
CHNL# 8: [ANG1ANTEL31G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 25: [ANG1MNTCE31G]
CHNL# 27: [ANG3SHERC33G]
CHNL# 18: [ANG1BIGSTN1G]
CHNL# 32: [ANG6BD 6G]
CHNL# 37: [ANG8DRSC7-9G]
CHNL# 43: [ANG1GRSTC12G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 3
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 65: [ANG1ZION B]
CHNL# 52: [ANG1WHITEDOG]
CHNL# 54: [ANG1TBAY G2]
CHNL# 34: [ANG7SQUAW 7G]
CHNL# 35: [ANG1COTEAU1G]
CHNL# 22: [ANG2COAL 42G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 6
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

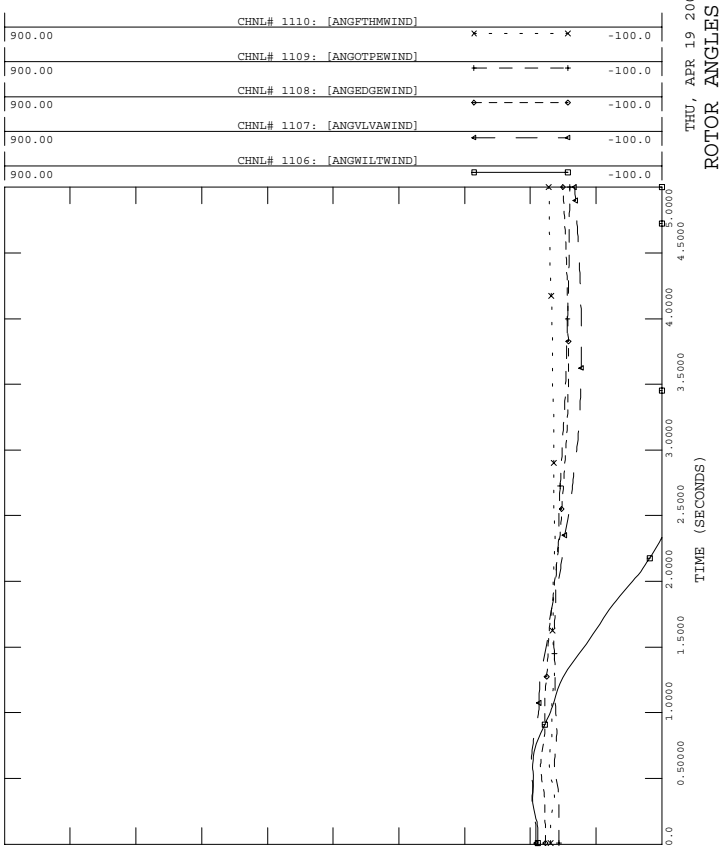

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 20: [ANG4BOSWE44G]
CHNL# 19: [ANG3BOSWE43G]
CHNL# 1102: [ANGBOSW U1]
CHNL# 1101: [ANGSBPC U1]
CHNL# 1100: [ANGLASK U1]
CHNL# 1099: [ANGTACH U1]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 8
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 55: [ANG1BRUCE B]
CHNL# 53: [ANG1ATIKOKAN]
CHNL# 44: [ANG17SIS1-6G]
CHNL# 38: [ANG1LIMEST G]
CHNL# 33: [ANG2POPLAR2G]
CHNL# 9: [ANG2ANTEL32G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 5
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 74: [ANG1LACYGNE7]
CHNL# 73: [ANG2 8BFNP]
CHNL# 67: [ANG1KEWAUNEE]
CHNL# 63: [ANG1BRAID 1U]
CHNL# 62: [ANG1SIBLEY]
CHNL# 61: [ANG1COLBY]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES 7
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

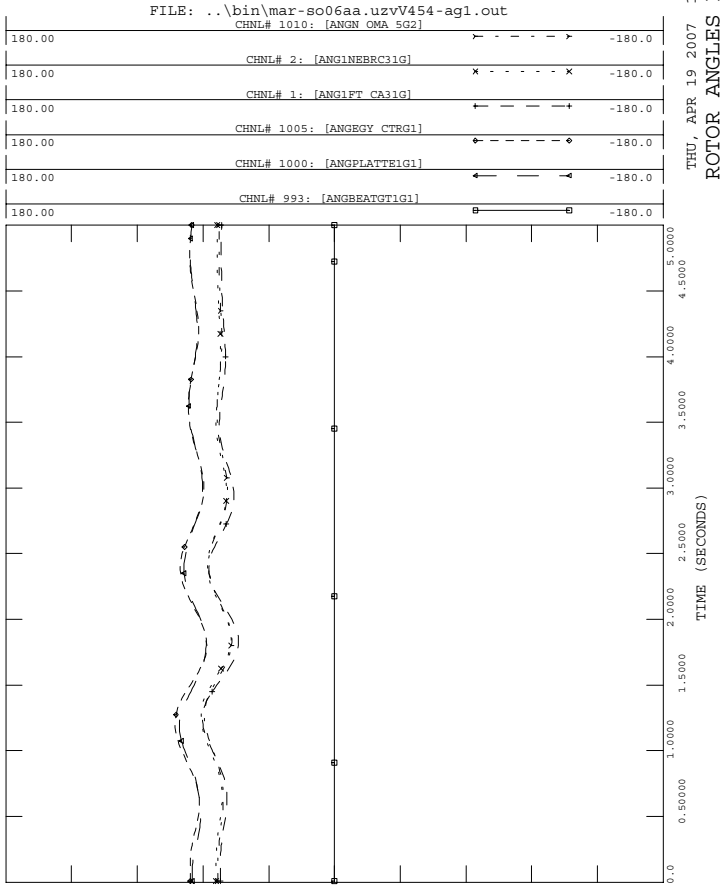
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:33
ROTOR ANGLES WIND2



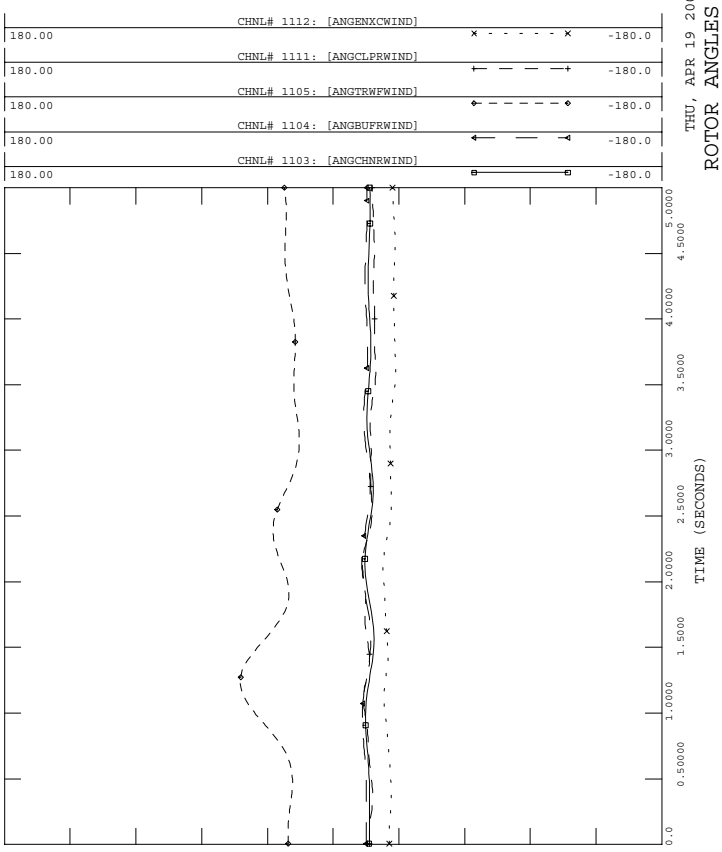

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:33
ROTOR ANGLES NB2



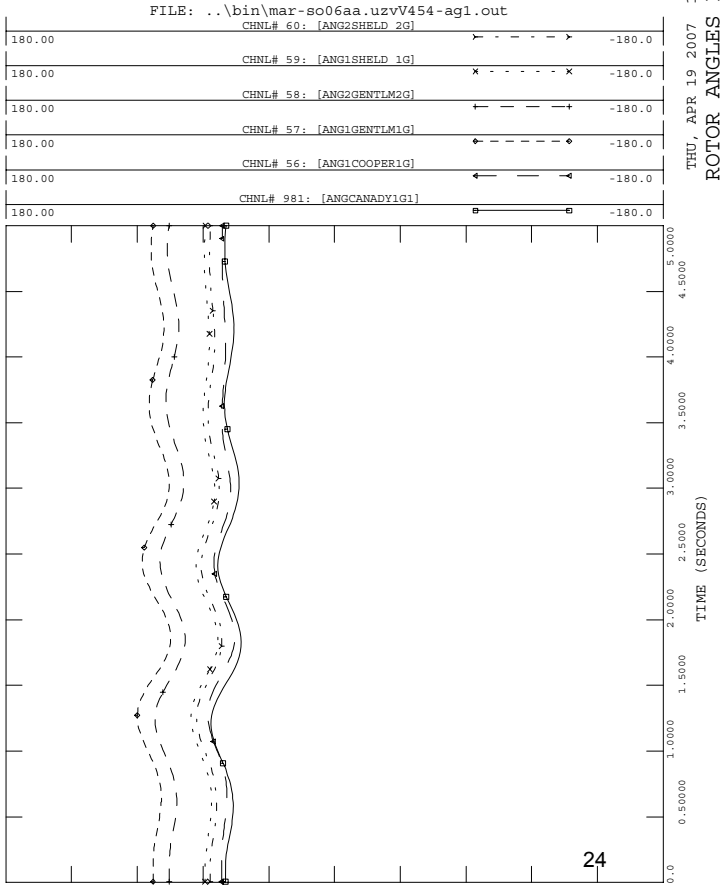

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

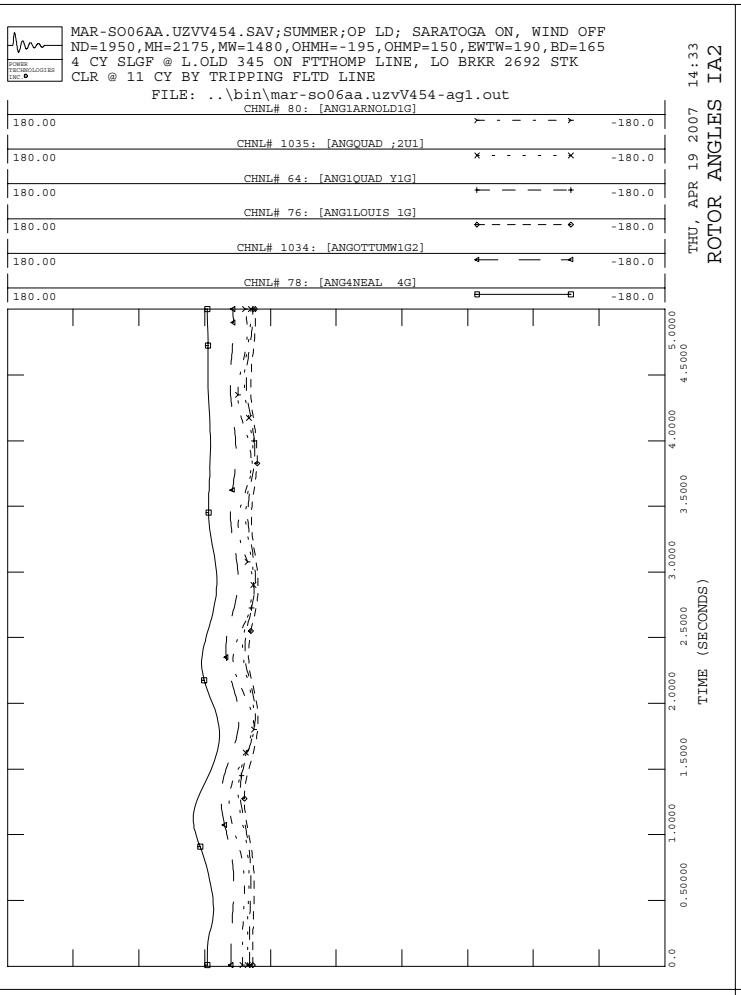
THU, APR 19 2007 14:33
ROTOR ANGLES WIND1

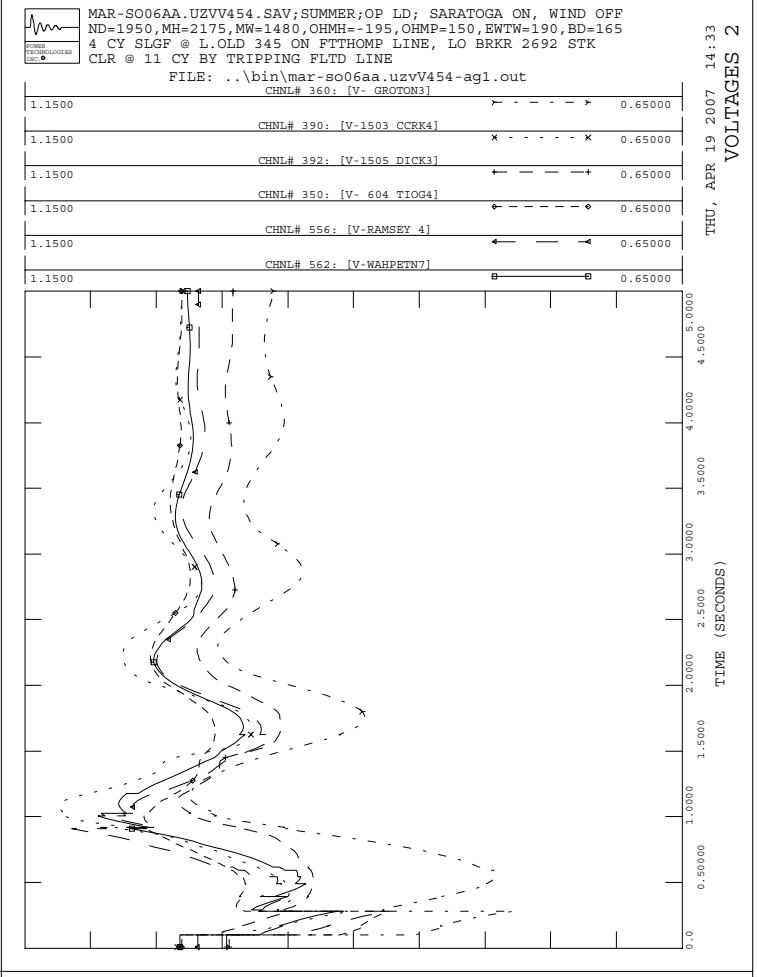


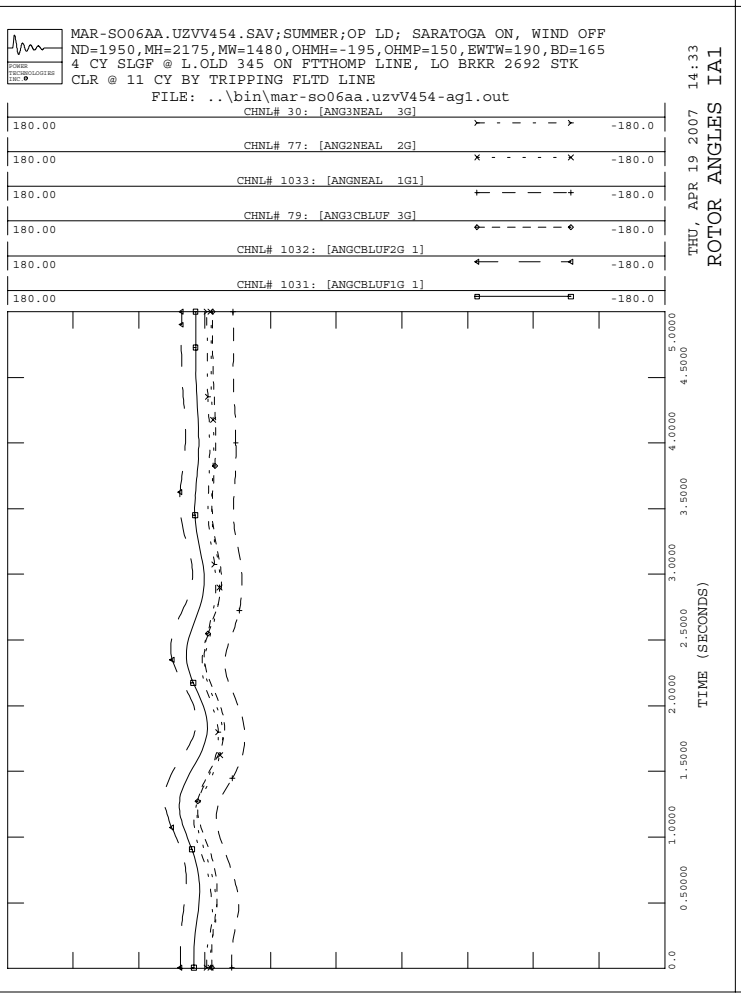

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

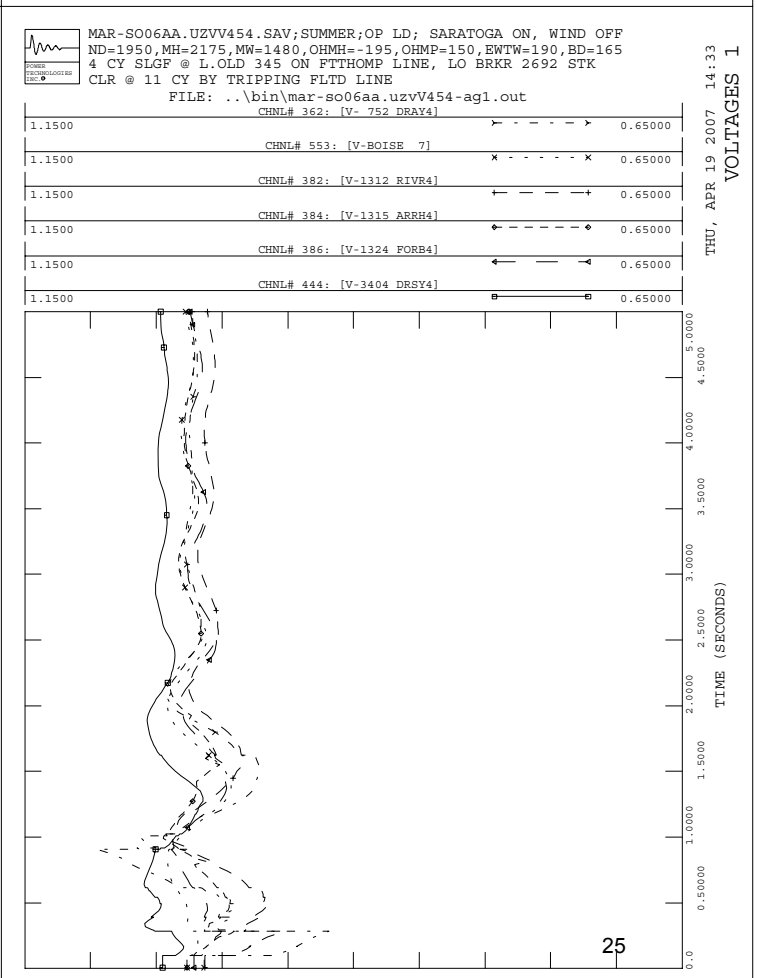
THU, APR 19 2007 14:33
ROTOR ANGLES NB1

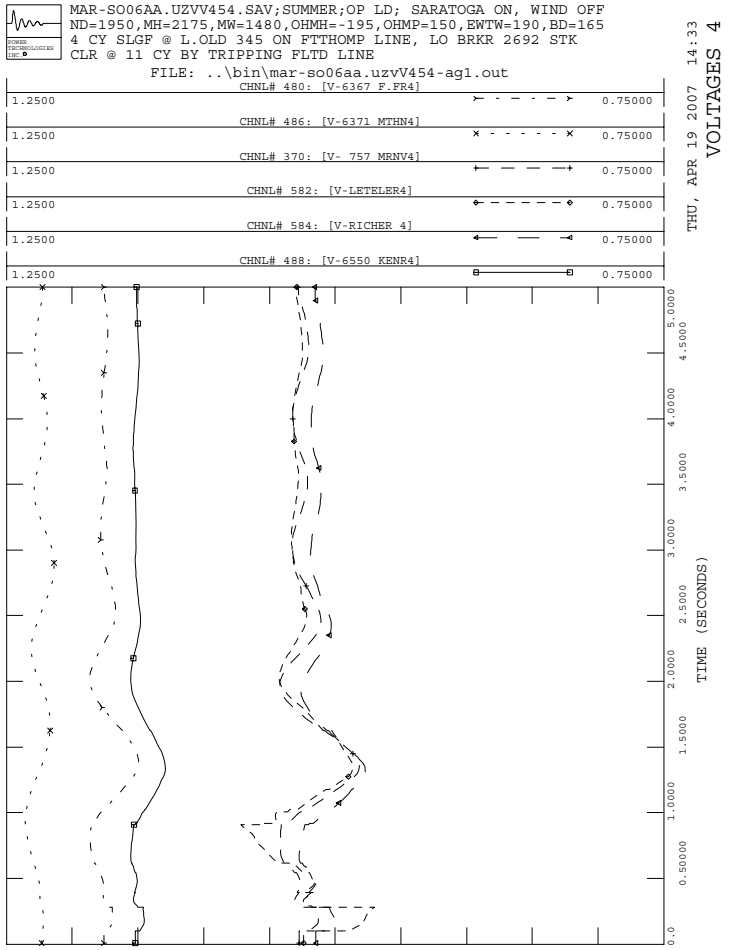


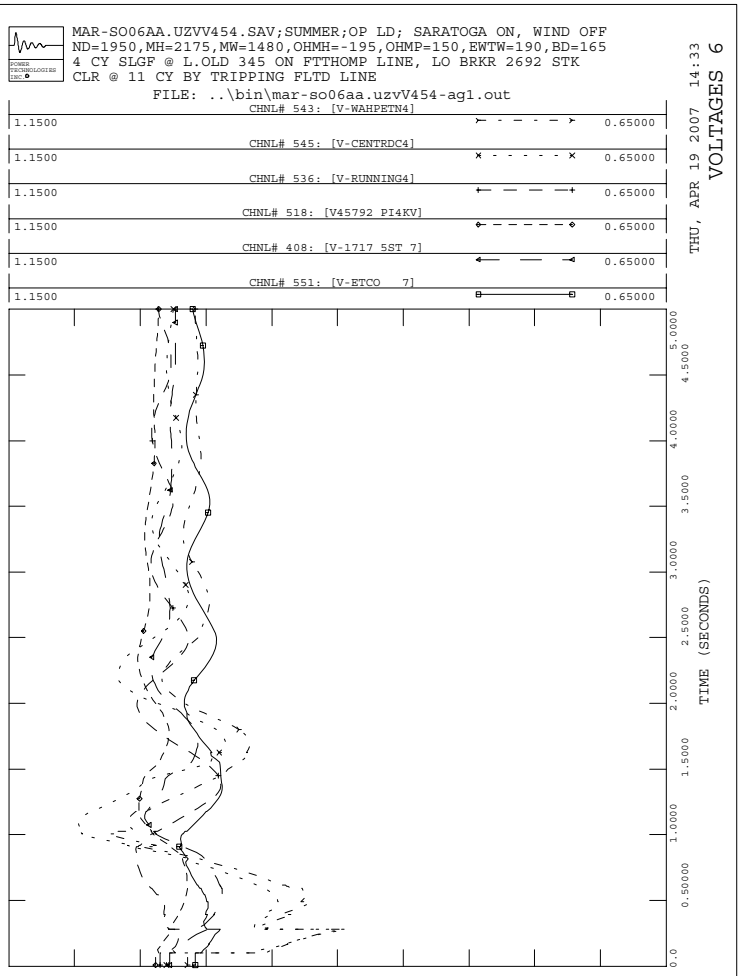

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 80: [ANG1ARNOLD1G]
CHNL# 1035: [ANGQUAD ;2U1]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 76: [ANG1LOUIS 1G]
CHNL# 1034: [ANGOTTUMW1G2]
CHNL# 78: [ANG4NEAL 4G]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES IA2
TIME (SECONDS)

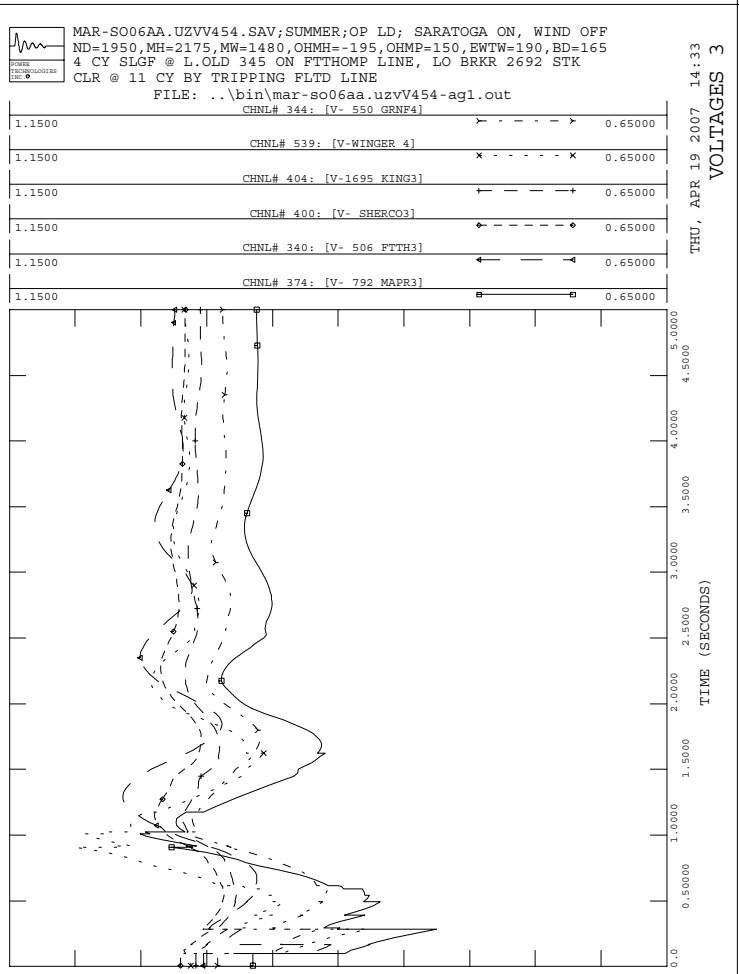

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 360: [V- GROTON3]
CHNL# 390: [V-1503 CCRK4]
CHNL# 392: [V-1505 DICK3]
CHNL# 350: [V- 604 TIOG4]
CHNL# 556: [V-RAMSEY 4]
CHNL# 562: [V-WAHPETN7]
1.1500
0.65000
THU, APR 19 2007 14:33
VOLTAGES 2
TIME (SECONDS)

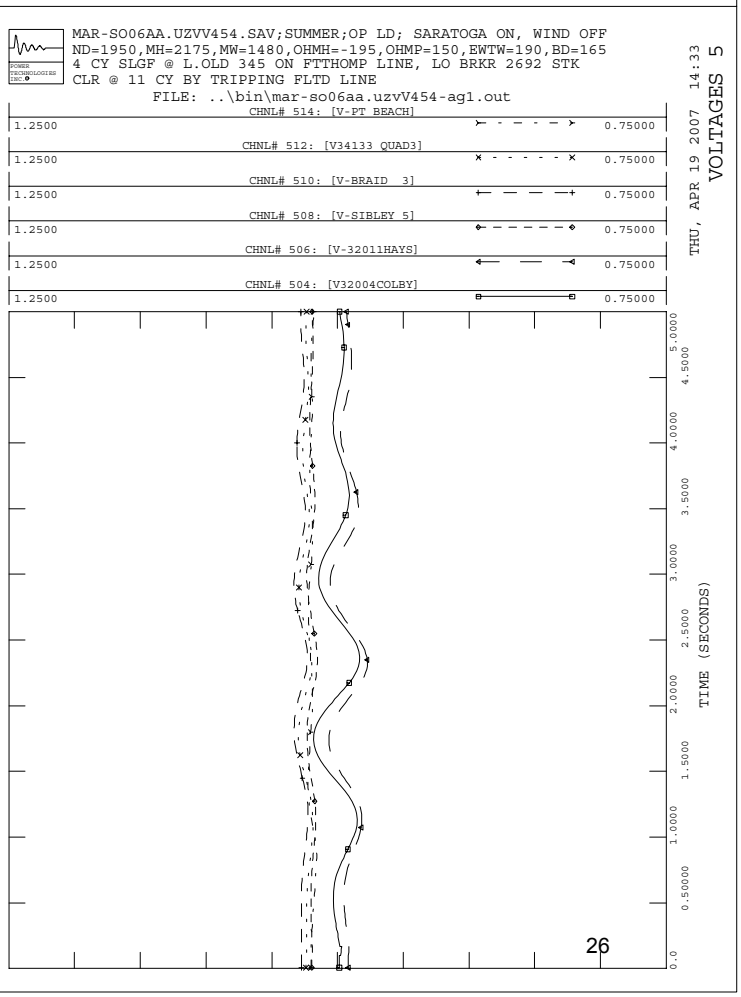

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 30: [ANG3NEAL 3G]
CHNL# 77: [ANG2NEAL 2G]
CHNL# 1033: [ANGNEAL 1G1]
CHNL# 79: [ANG3CBLUF 3G]
CHNL# 1032: [ANGCBLUF2G 1]
CHNL# 1031: [ANGCBLUF1G 1]
180.00
-180.0
THU, APR 19 2007 14:33
ROTOR ANGLES IA1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 362: [V- 752 DRAY4]
CHNL# 553: [V-BOISE 7]
CHNL# 382: [V-1312 RIVR4]
CHNL# 384: [V-1315 ARRH4]
CHNL# 386: [V-1324 FORB4]
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
THU, APR 19 2007 14:33
VOLTAGES 1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 480: [V-6367 F.FR4]
CHNL# 486: [V-6371 MTHN4]
CHNL# 370: [V- 757 MRNV4]
CHNL# 582: [V-LETELER4]
CHNL# 584: [V-RICHER 4]
CHNL# 488: [V-6550 KENR4]
1.2500
0.75000
THU, APR 19 2007 14:33
VOLTAGES 4
TIME (SECONDS)

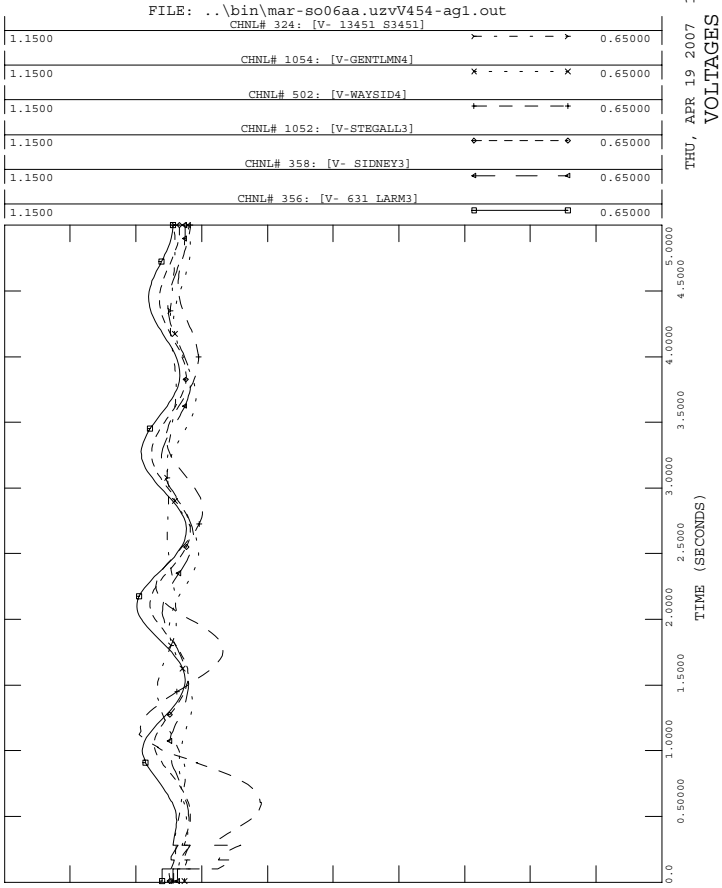

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 543: [V-WAHPETN4]
CHNL# 545: [V-CENTRDC4]
CHNL# 536: [V-RUNNING4]
CHNL# 518: [V45792 PI4KV]
CHNL# 408: [V-1717 5ST 7]
CHNL# 551: [V-ETCO 7]
1.1500
0.65000
THU, APR 19 2007 14:33
VOLTAGES 6
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 344: [V- 550 GRNF4]
CHNL# 539: [V-WINGER 4]
CHNL# 404: [V-1695 KING3]
CHNL# 400: [V- SHERCO3]
CHNL# 340: [V- 506 FTTH3]
CHNL# 374: [V- 792 MAPR3]
1.1500
0.65000
THU, APR 19 2007 14:33
VOLTAGES 3
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 514: [V-PT BEACH]
CHNL# 512: [V34133 QUAD3]
CHNL# 510: [V-BRAID 3]
CHNL# 508: [V-SIBLEY 5]
CHNL# 506: [V-32011HAYS]
CHNL# 504: [V32004COLBY]
1.2500
0.75000
THU, APR 19 2007 14:33
VOLTAGES 5
TIME (SECONDS)

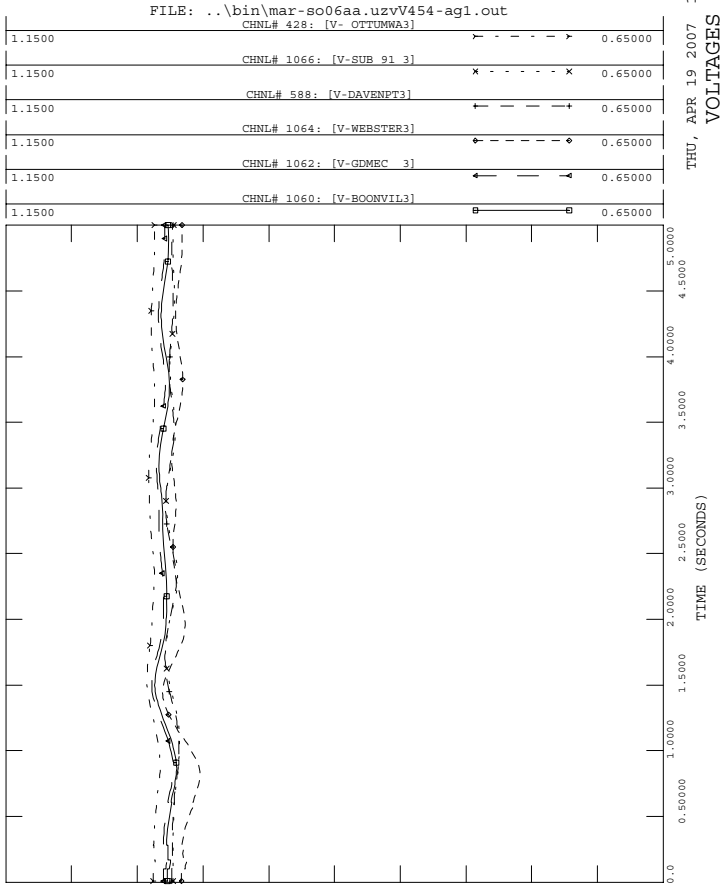
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:33
VOLTAGES NB2



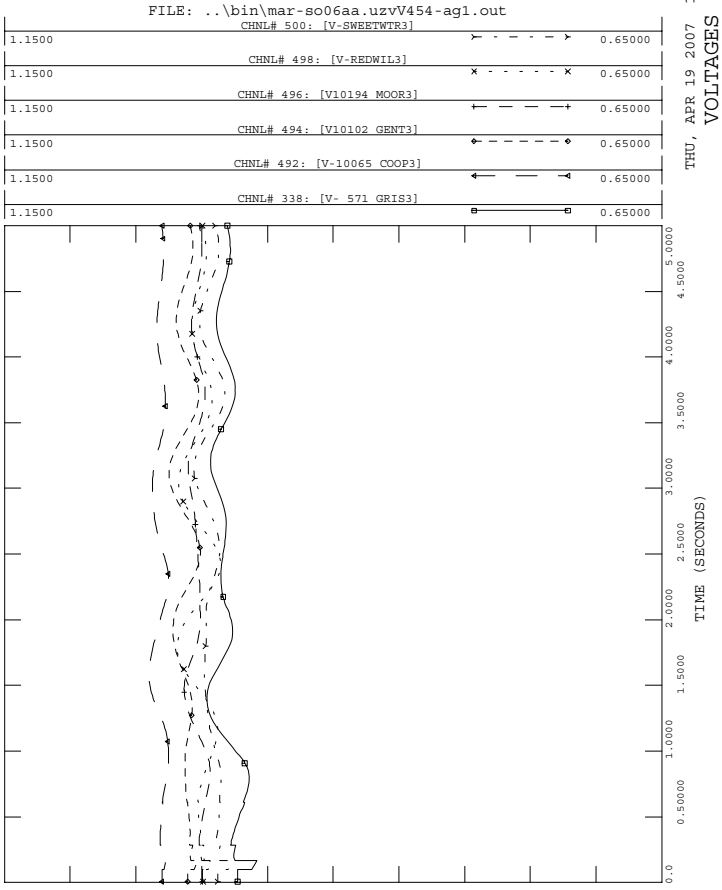

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:33
VOLTAGES IA2



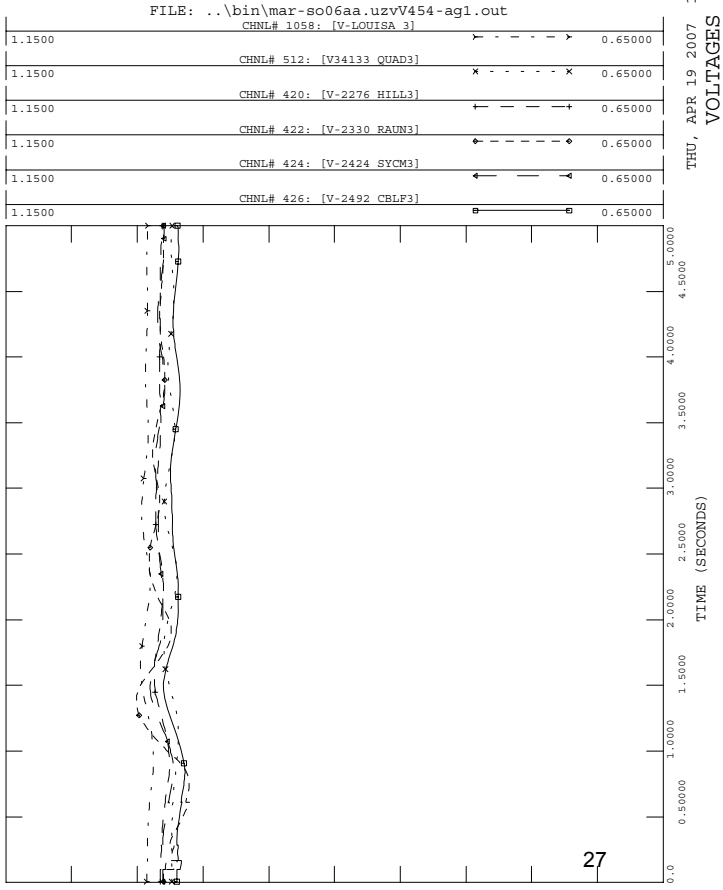

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

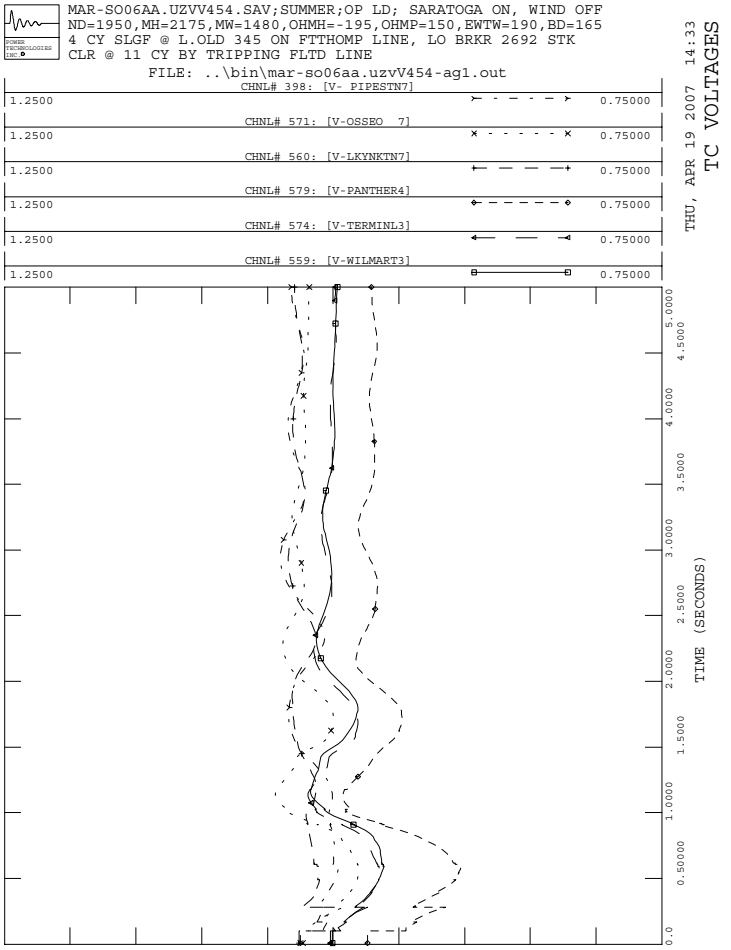
THU, APR 19 2007 14:33
VOLTAGES NB1

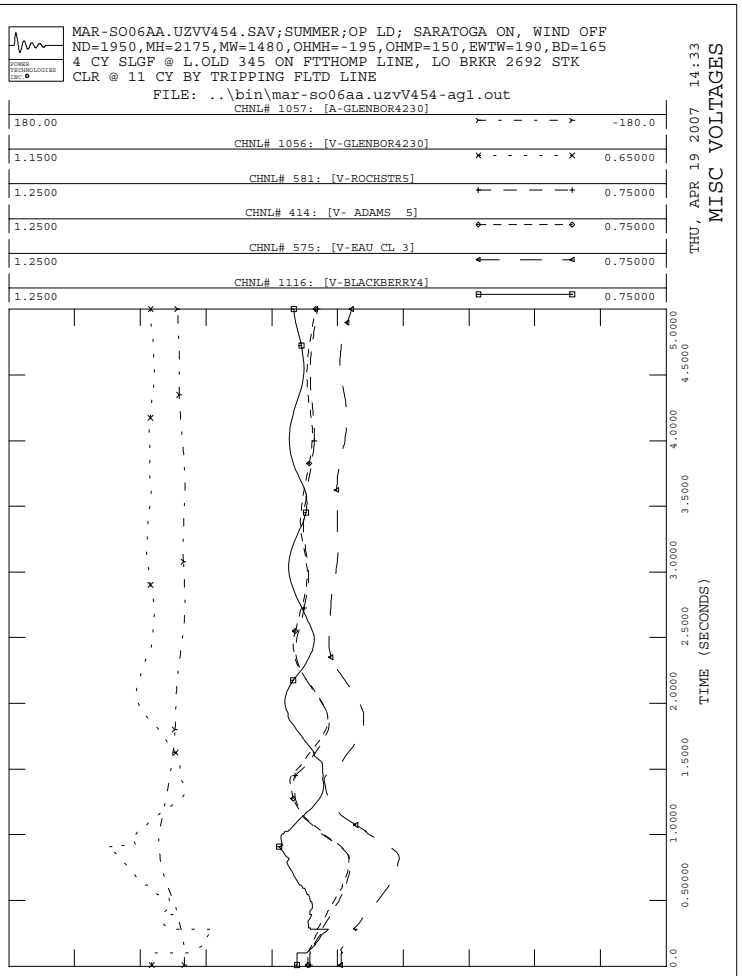


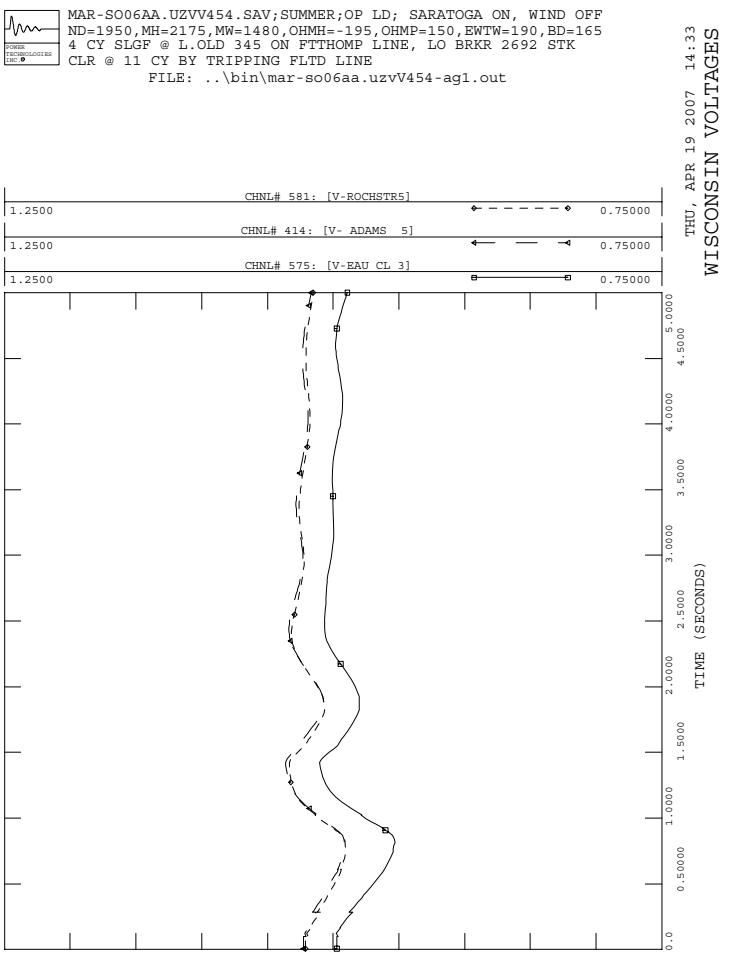

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

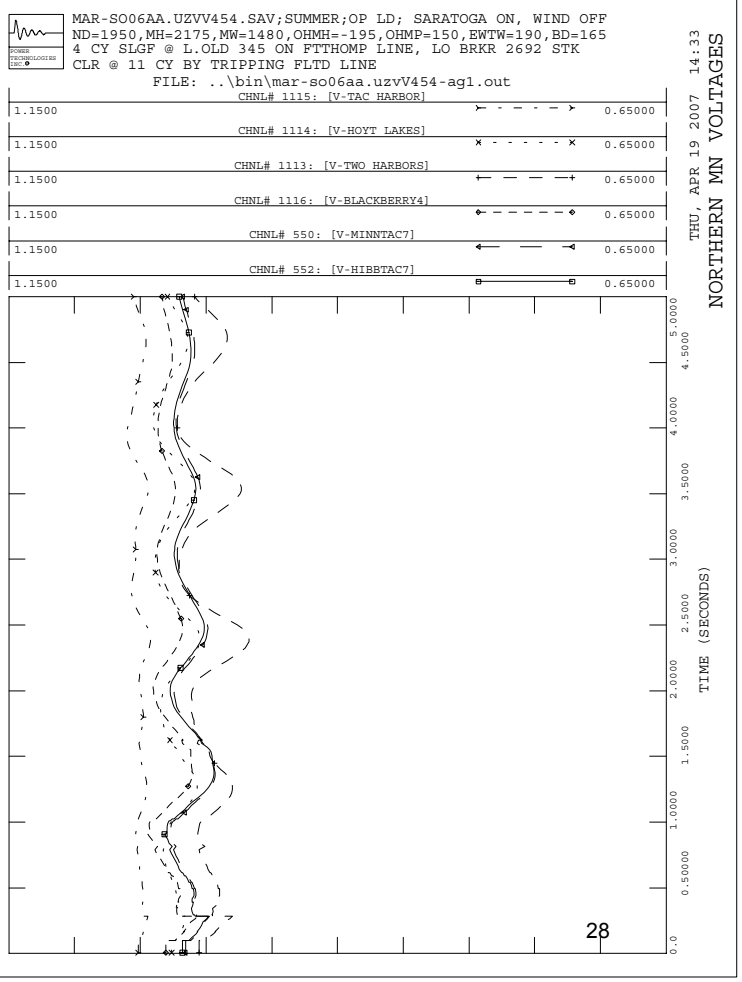
THU, APR 19 2007 14:33
VOLTAGES IA1

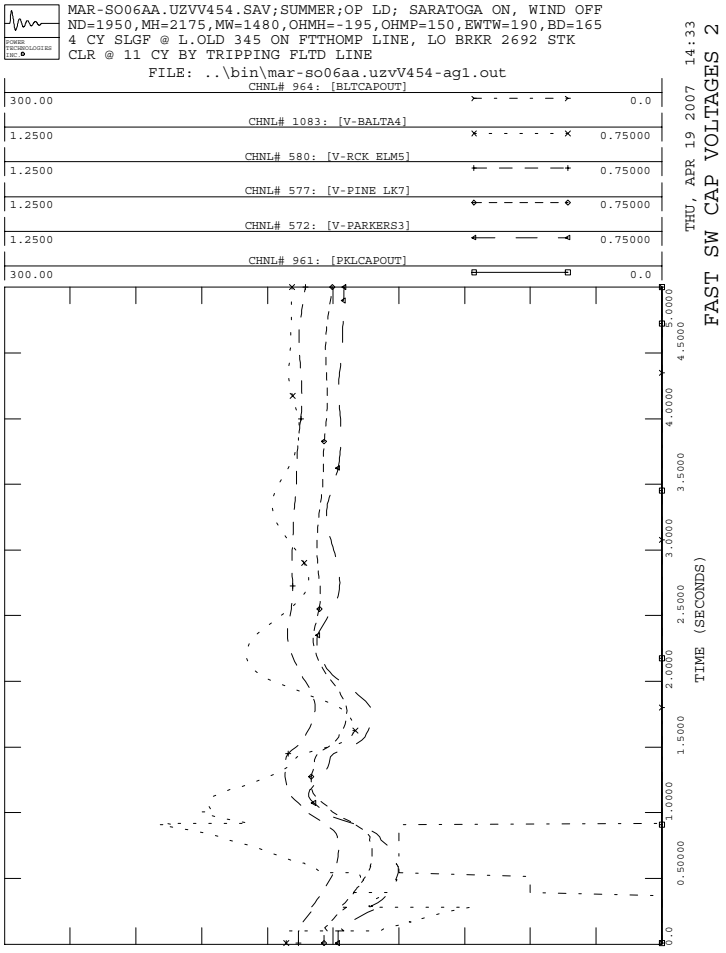


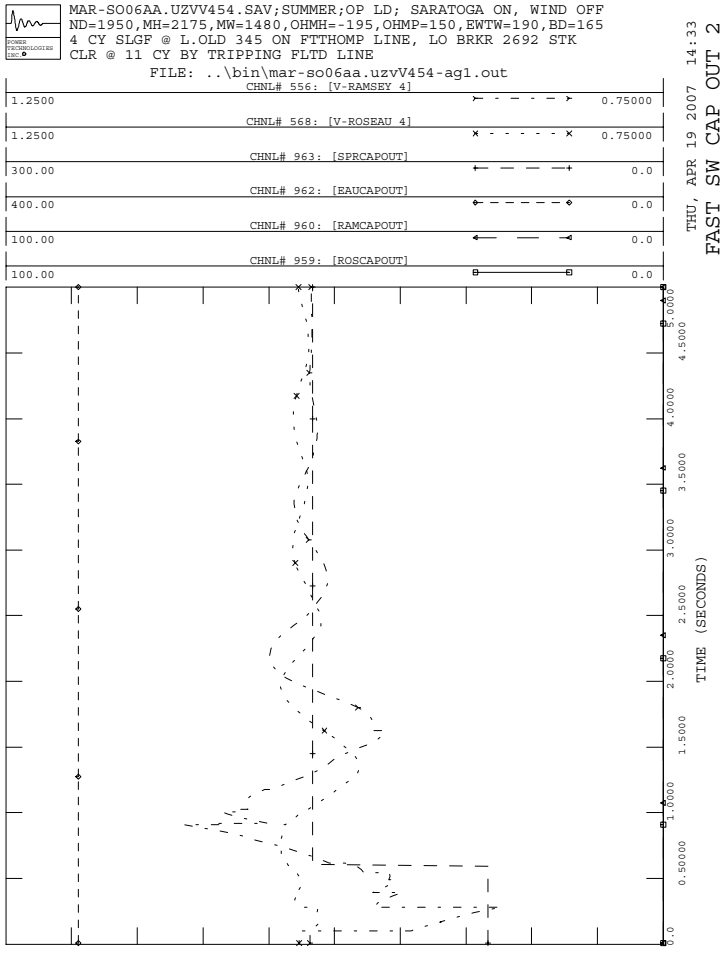

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 398: [V- PIPESTN7]
CHNL# 571: [V-OSSEO 7]
CHNL# 560: [V-LKYNKTN7]
CHNL# 579: [V-PANTHER4]
CHNL# 574: [V-TERMINL3]
CHNL# 559: [V-WILMART3]
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:33
TC VOLTAGES

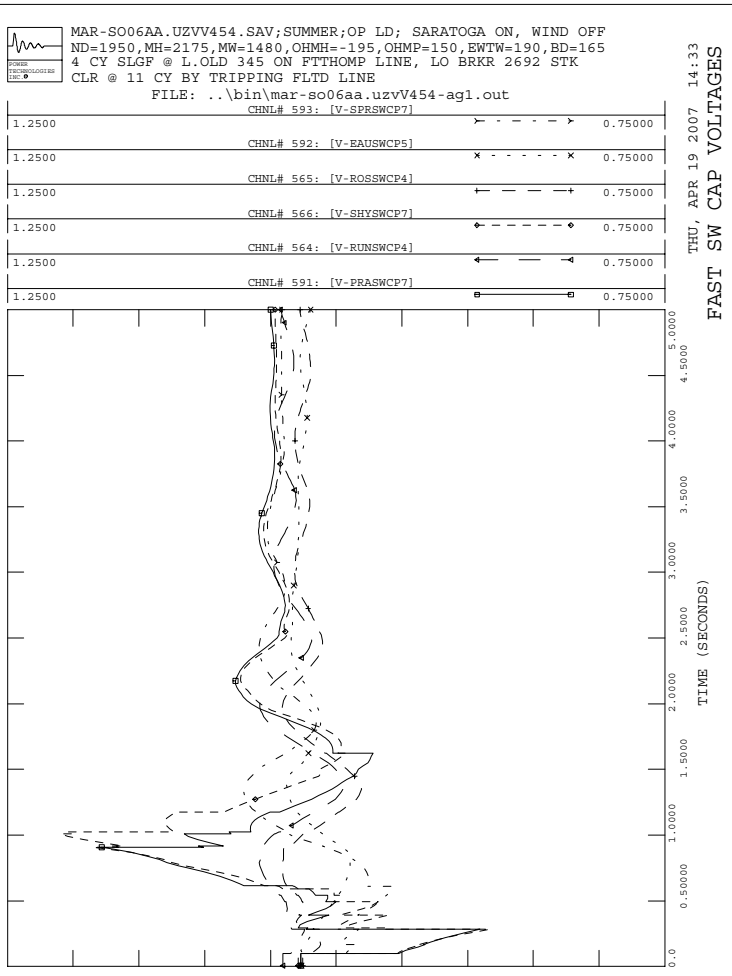

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 1057: [A-GLENBOR4230]
CHNL# 1056: [V-GLENBOR4230]
CHNL# 581: [V-ROCHSTR5]
CHNL# 414: [V- ADAMS 5]
CHNL# 575: [V-EAU CL 3]
CHNL# 1116: [V-BLACKBERRY4]
180.00
-180.0
1.1500
0.65000
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:33
MISC VOLTAGES

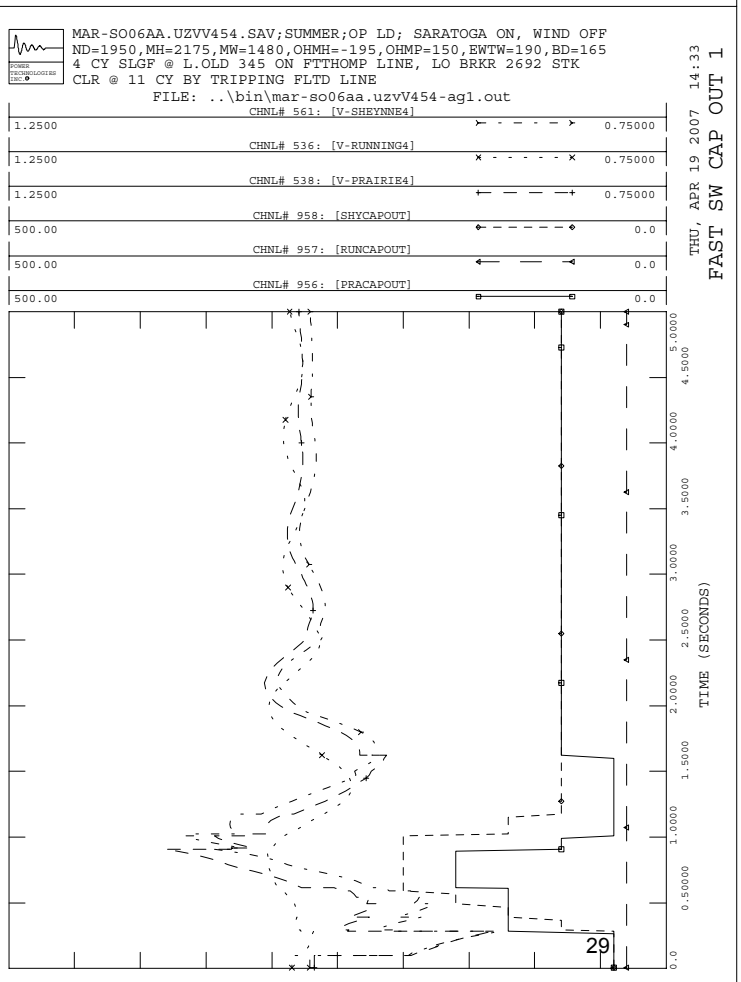

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 581: [V-ROCHSTR5]
CHNL# 414: [V- ADAMS 5]
CHNL# 575: [V-EAU CL 3]
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:33
WISCONSIN VOLTAGES

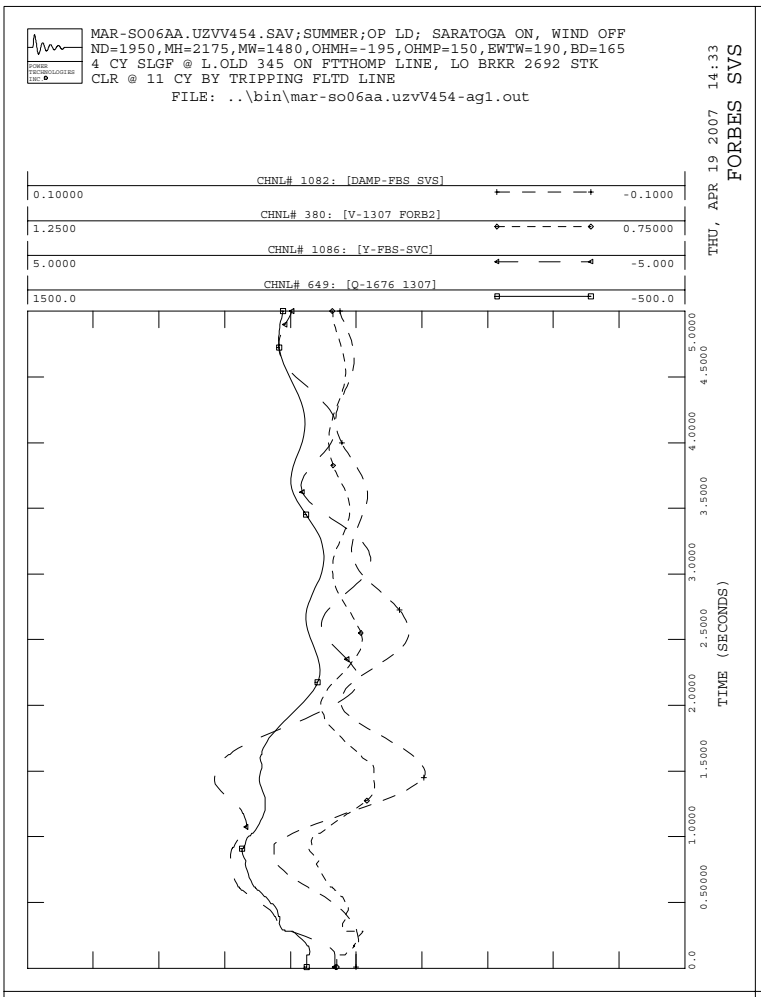

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 1115: [V-TAC HARBOR]
CHNL# 1114: [V-HOYT LAKES]
CHNL# 1113: [V-TWO HARBORS]
CHNL# 1116: [V-BLACKBERRY4]
CHNL# 550: [V-MINNTAC7]
CHNL# 552: [V-HIBBTAC7]
1.1500
0.65000
TIME (SECONDS)
THU, APR 19 2007 14:33
NORTHERN MN VOLTAGES

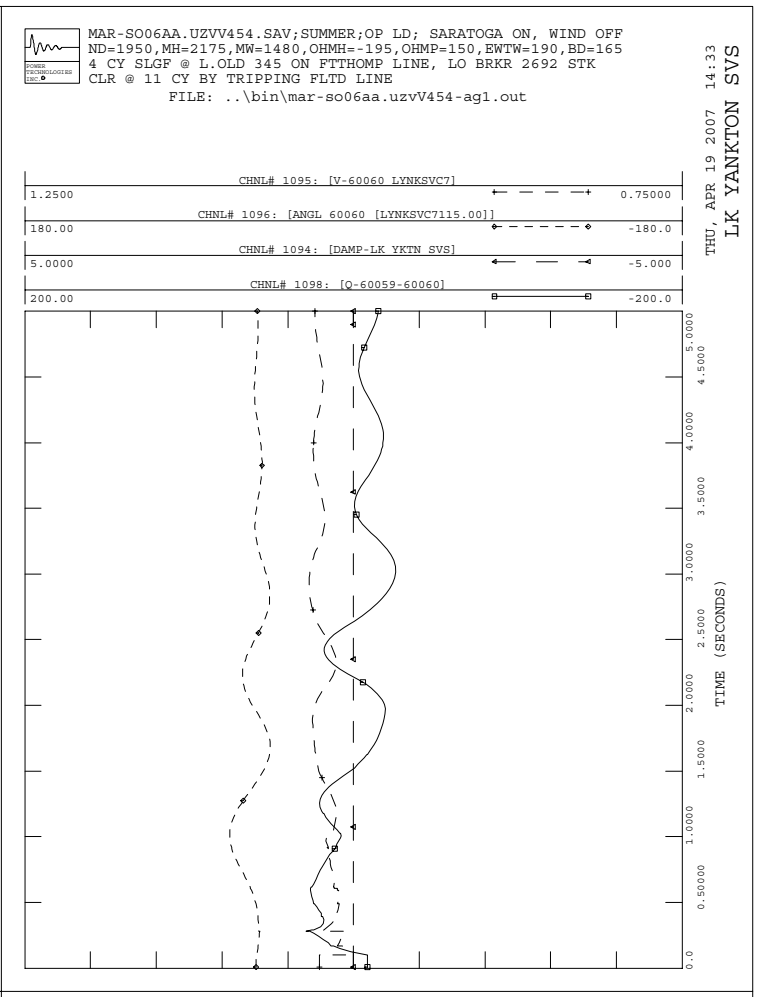

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 964: [BLTCAPOUT]
CHNL# 1083: [V-BALTA4]
CHNL# 580: [V-RCK ELM5]
CHNL# 577: [V-PINE LK7]
CHNL# 572: [V-PARKERS3]
CHNL# 961: [PKLCAPOUT]
THU, APR 19 2007 14:33
FAST SW CAP VOLTAGES 2
TIME (SECONDS)

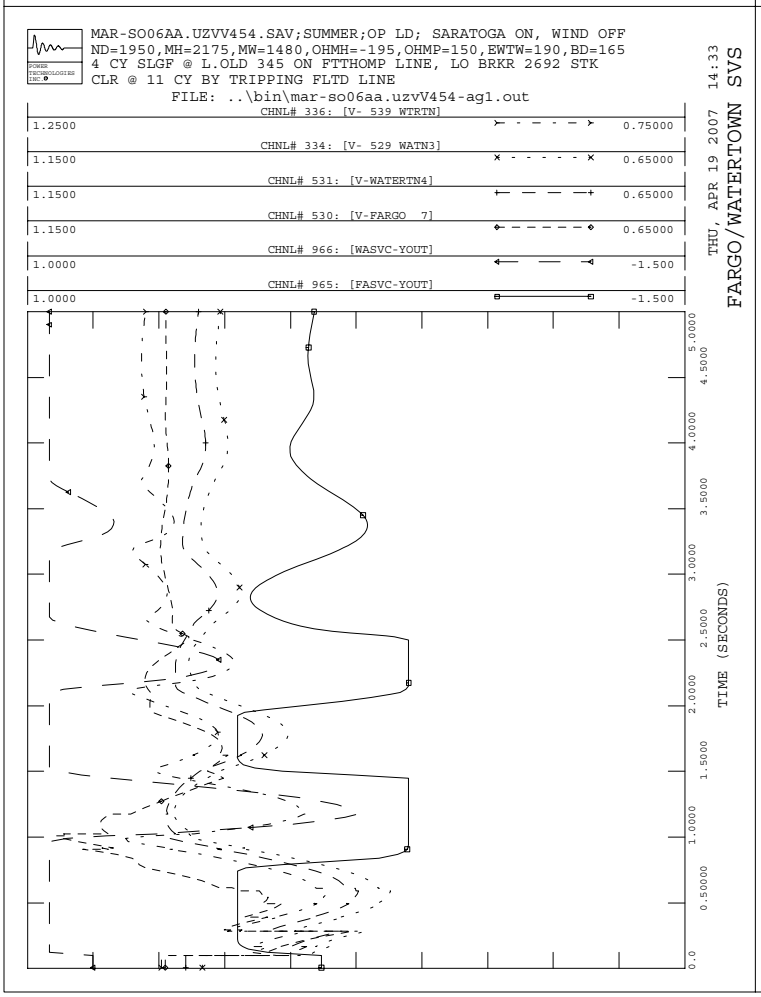

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 556: [V-RAMSEY 4]
CHNL# 568: [V-ROSEAU 4]
CHNL# 963: [SPRCAPOUT]
CHNL# 962: [EAUCAPOUT]
CHNL# 960: [RAMCAPOUT]
CHNL# 959: [ROSCAPOUT]
THU, APR 19 2007 14:33
FAST SW CAP OUT 2
TIME (SECONDS)

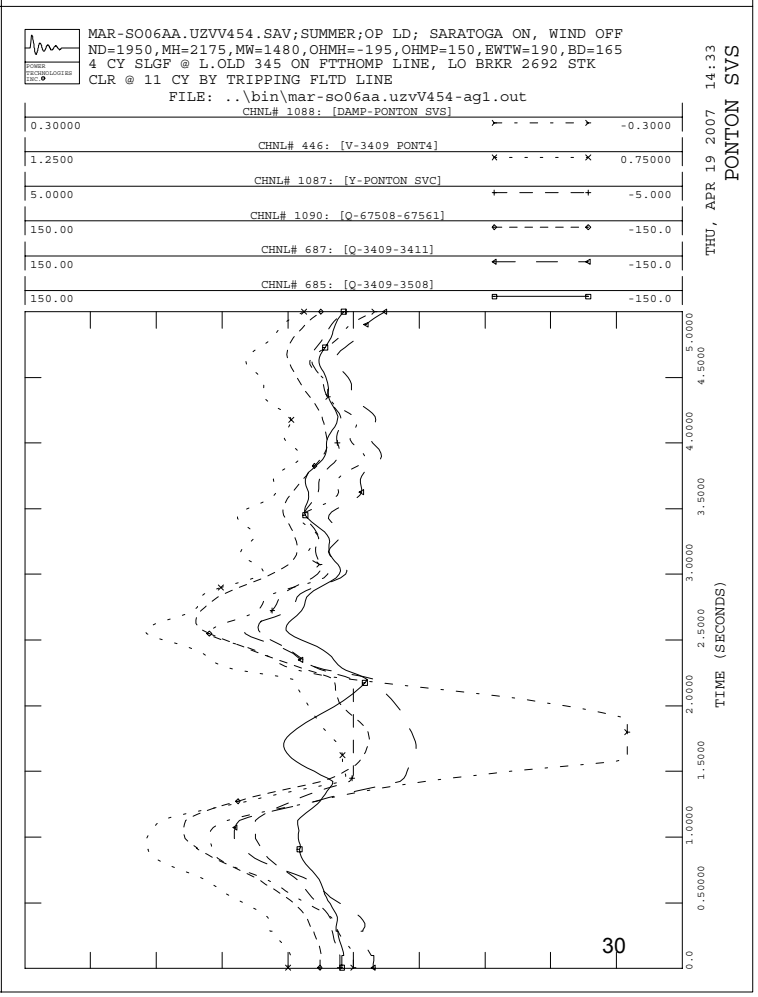

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 593: [V-SPRSWCP7]
CHNL# 592: [V-EAUSWCP5]
CHNL# 565: [V-ROSSWCP4]
CHNL# 566: [V-SHYSWCP7]
CHNL# 564: [V-RUNSWCP4]
CHNL# 591: [V-PRASWCP7]
THU, APR 19 2007 14:33
FAST SW CAP VOLTAGES
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 561: [V-SHEYNNE4]
CHNL# 536: [V-RUNNING4]
CHNL# 538: [V-PRAIRIE4]
CHNL# 958: [SHYCAPOUT]
CHNL# 957: [RUNCAPOUT]
CHNL# 956: [PRACAPOUT]
THU, APR 19 2007 14:33
FAST SW CAP OUT 1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:33
FORBES SVS
CHNL# 1082: [DAMP-FBS SVS]
0.10000
-0.1000
CHNL# 380: [V-1307 FORB2]
1.2500
0.75000
CHNL# 1086: [Y-FBS-SVC]
5.0000
-5.000
CHNL# 649: [Q-1676 1307]
1500.0
-500.0
TIME (SECONDS)

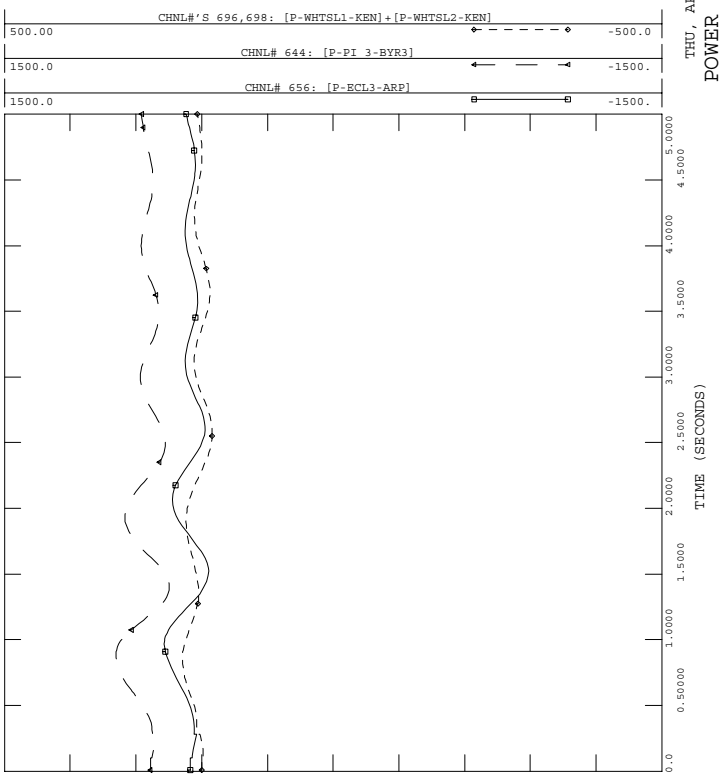

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:33
LK YANKTON SVS
CHNL# 1095: [V-60060 LYNKSVC7]
1.2500
0.75000
CHNL# 1096: [ANGL 60060 [LYNKSVC7115.00]]
180.00
-180.0
CHNL# 1094: [DAMP-LK YKTN SVS]
5.0000
-5.000
CHNL# 1098: [Q-60059-60060]
200.00
-200.0
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:33
FARGO/WATERTOWN SVS
CHNL# 336: [V- 539 WTRTN]
1.2500
0.75000
CHNL# 334: [V- 529 WATN3]
1.1500
0.65000
CHNL# 531: [V-WATERTN4]
1.1500
0.65000
CHNL# 530: [V-FARGO 7]
1.1500
0.65000
CHNL# 966: [WASVC-YOUT]
1.0000
-1.500
CHNL# 965: [FASVC-YOUT]
1.0000
-1.500
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:33
PONTON SVS
CHNL# 1088: [DAMP-PONTON SVS]
0.30000
-0.3000
CHNL# 446: [V-3409 PONT4]
1.2500
0.75000
CHNL# 1087: [Y-PONTON SVC]
5.0000
-5.000
CHNL# 1090: [Q-67508-67561]
150.00
-150.0
CHNL# 687: [Q-3409-3411]
150.00
-150.0
CHNL# 685: [Q-3409-3508]
150.00
-150.0
TIME (SECONDS)

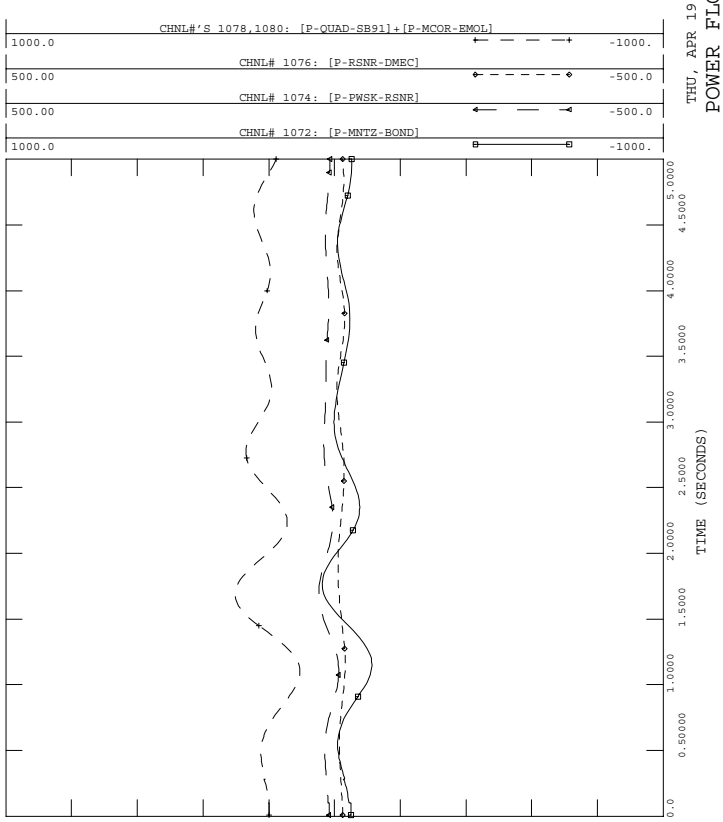
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:33
POWER FLOW SUMS 2



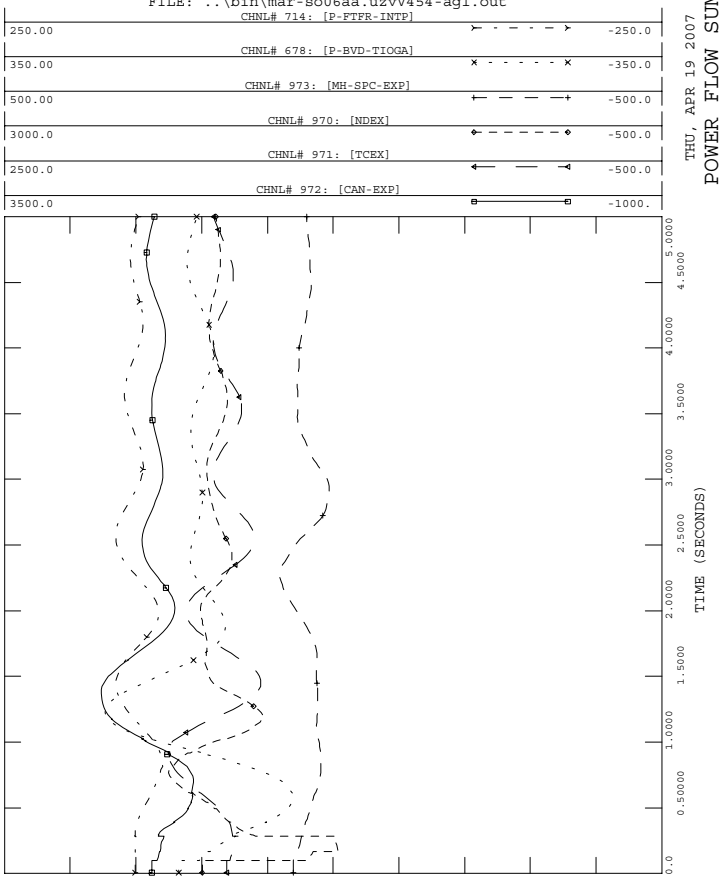

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:33
POWER FLOW SUM 4



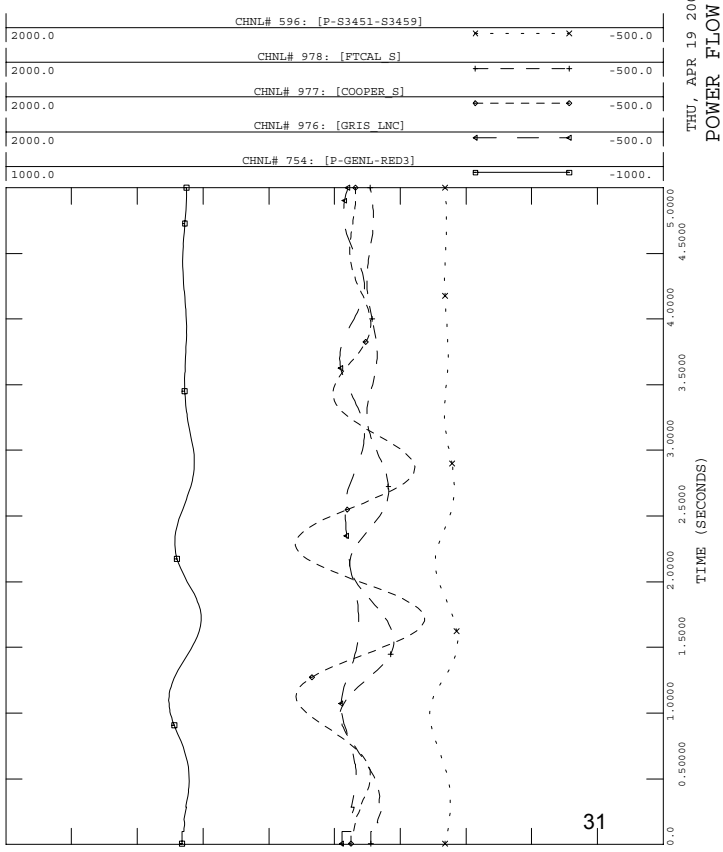

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

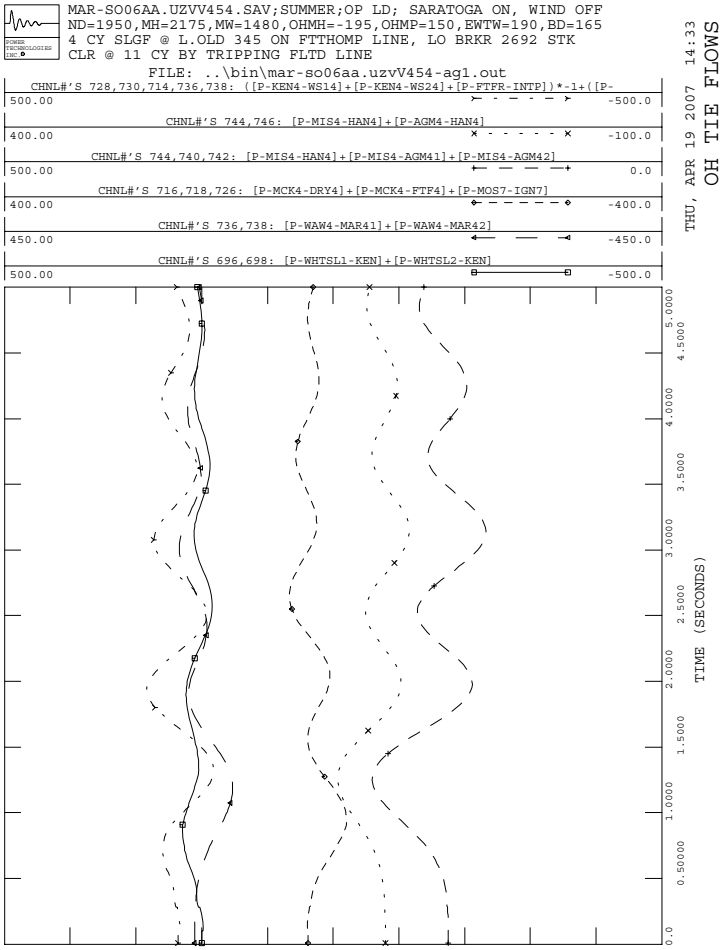
THU, APR 19 2007 14:33
POWER FLOW SUMS 1

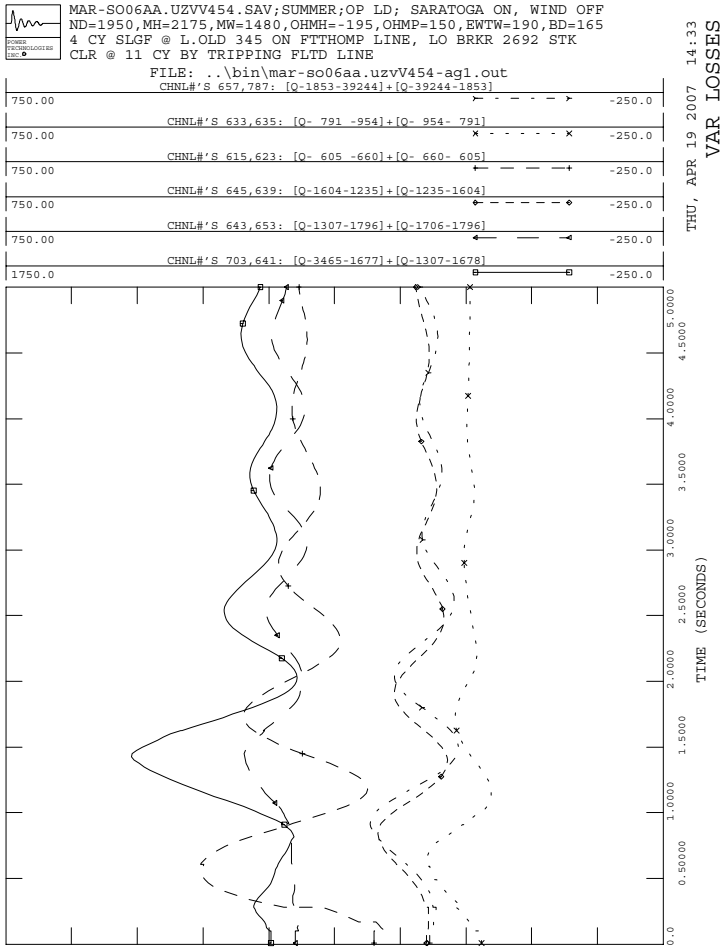


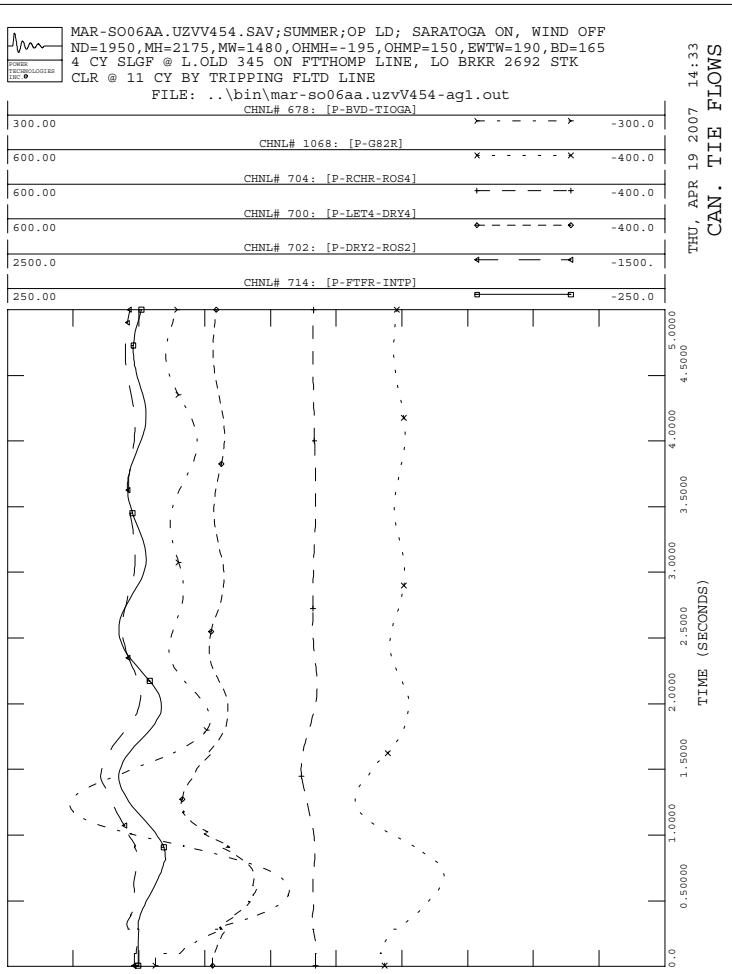

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

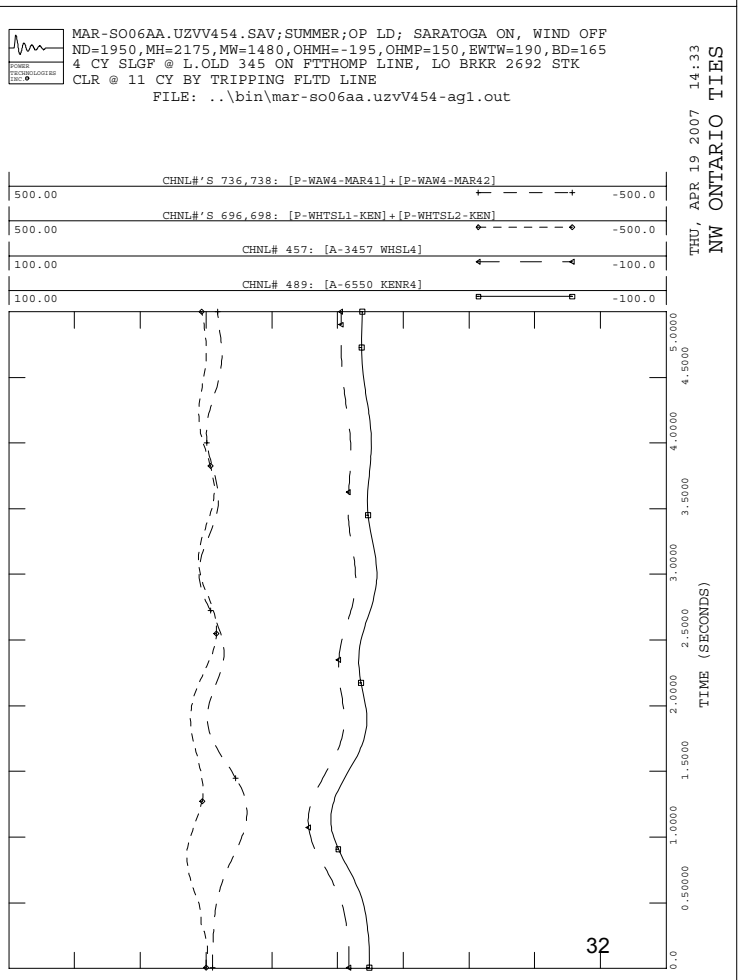
THU, APR 19 2007 14:33
POWER FLOW SUM 3

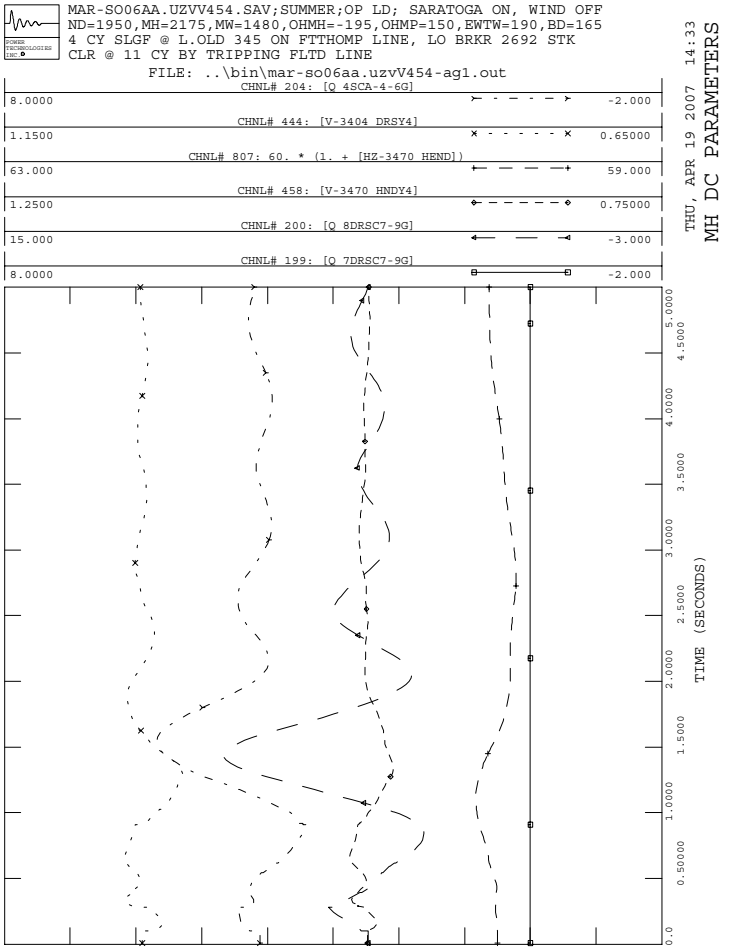


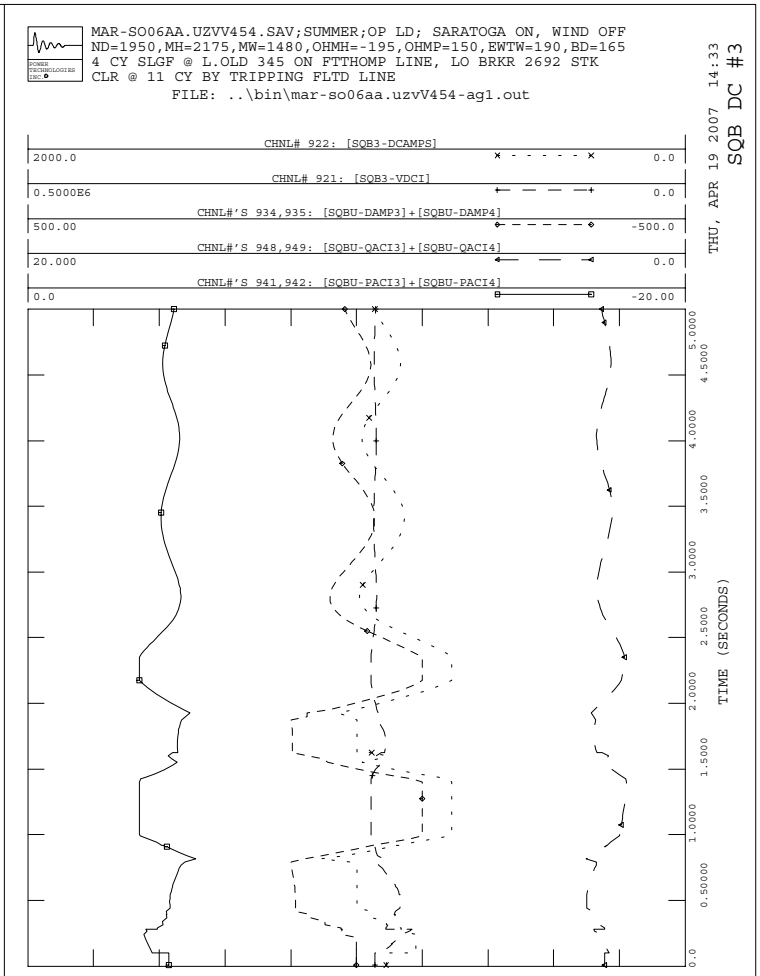

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL#'S 728,730,714,736,738: ((P-KEN4-WS14)+(P-KEN4-WS24)+(P-FTFR-INTP))*-1+((P-
500.00
-500.0
CHNL#'S 744,746: [P-MIS4-HAN4)+(P-AGM4-HAN4]
400.00
-100.0
CHNL#'S 744,740,742: [P-MIS4-HAN4)+(P-MIS4-AGM41)+(P-MIS4-AGM42]
500.00
0.0
CHNL#'S 716,718,726: [P-MCK4-DRY4)+(P-MCK4-FTF4)+(P-MOS7-IGN7]
400.00
-400.0
CHNL#'S 736,738: [P-WAW4-MAR41)+(P-WAW4-MAR42]
450.00
-450.0
CHNL#'S 696,698: [P-WHTSL1-KEN)+(P-WHTSL2-KEN]
500.00
-500.0
THU, APR 19 2007 14:33
OH TIE FLOWS
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

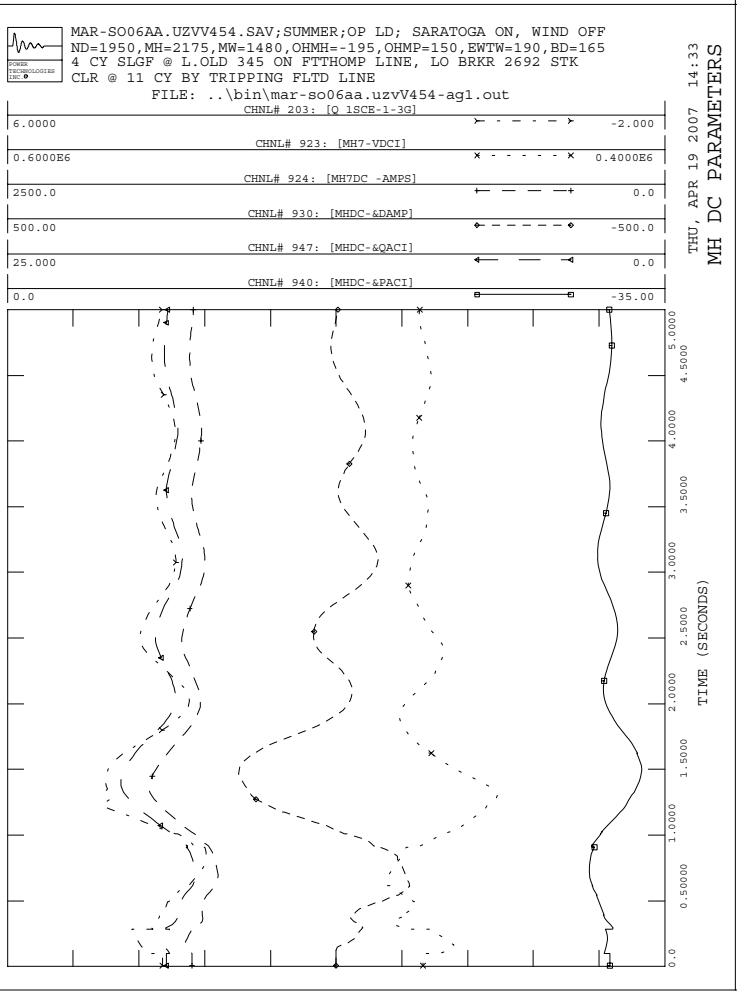

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL#'S 657,787: [Q-1853-39244)+(Q-39244-1853]
750.00
-250.0
CHNL#'S 633,635: [Q- 791 -954)+(Q- 954- 791]
750.00
-250.0
CHNL#'S 615,623: [Q- 605 -660)+(Q- 660- 605]
750.00
-250.0
CHNL#'S 645,639: [Q-1604-1235)+(Q-1235-1604]
750.00
-250.0
CHNL#'S 643,653: [Q-1307-1796)+(Q-1706-1796]
750.00
-250.0
CHNL#'S 703,641: [Q-3465-1677)+(Q-1307-1678]
1750.0
-250.0
THU, APR 19 2007 14:33
VAR LOSSES
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

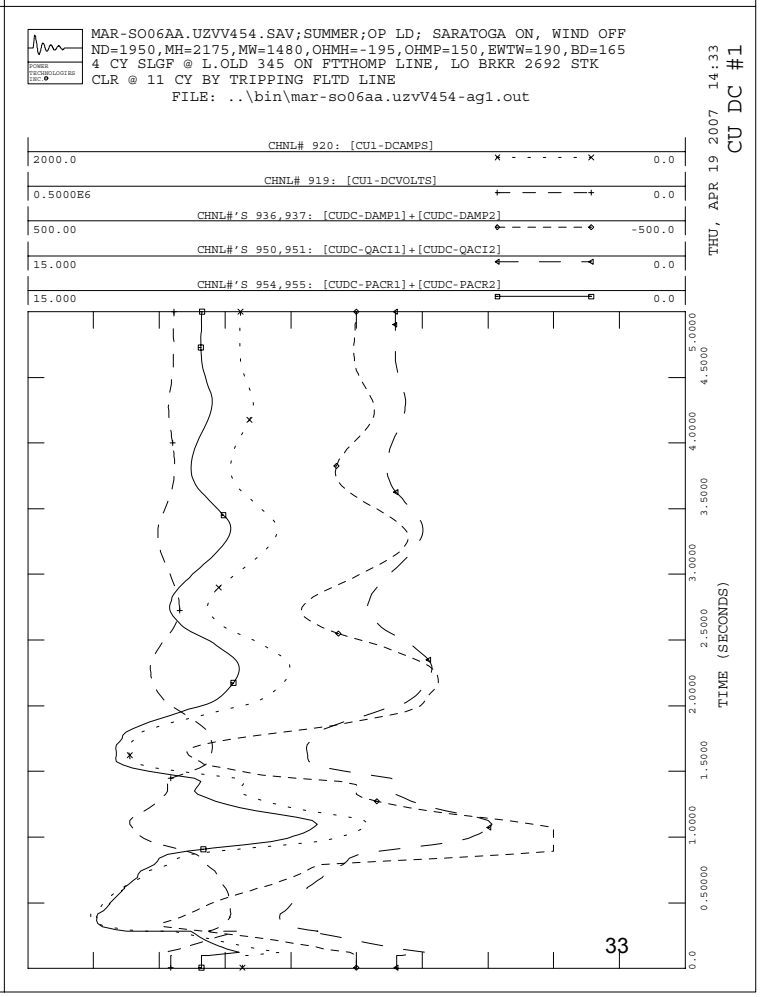

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 678: [P-BVD-TIOGA]
300.00
-300.0
CHNL# 1068: [P-G82R]
600.00
-400.0
CHNL# 704: [P-RCHR-ROS4]
600.00
-400.0
CHNL# 700: [P-LET4-DRY4]
600.00
-400.0
CHNL# 702: [P-DRY2-ROS2]
2500.0
-1500.
CHNL# 714: [P-FTFR-INTP]
250.00
-250.0
THU, APR 19 2007 14:33
CAN. TIE FLOWS
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL#'S 736,738: [P-WAW4-MAR41)+(P-WAW4-MAR42]
500.00
-500.0
CHNL#'S 696,698: [P-WHTSL1-KEN)+(P-WHTSL2-KEN]
500.00
-500.0
CHNL# 457: [A-3457 WHSL4]
100.00
-100.0
CHNL# 489: [A-6550 KENR4]
100.00
-100.0
THU, APR 19 2007 14:33
NW ONTARIO TIES
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 204: [Q 4SCA-4-6G]
8.0000
-2.000
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
CHNL# 807: 60. * (1. + [HZ-3470 HEND])
63.000
59.000
CHNL# 458: [V-3470 HNDY4]
1.2500
0.75000
CHNL# 200: [Q 8DRSC7-9G]
15.000
-3.000
CHNL# 199: [Q 7DRSC7-9G]
8.0000
-2.000
THU, APR 19 2007 14:33
MH DC PARAMETERS
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 922: [SQB3-DCAMPS]
2000.0
0.0
CHNL# 921: [SQB3-VDCI]
0.5000E6
0.0
CHNL#'S 934,935: [SQBU-DAMP3]+[SQBU-DAMP4]
500.00
-500.0
CHNL#'S 948,949: [SQBU-QACI3]+[SQBU-QACI4]
20.000
0.0
CHNL#'S 941,942: [SQBU-PACI3]+[SQBU-PACI4]
0.0
-20.00
THU, APR 19 2007 14:33
SQB DC #3
TIME (SECONDS)

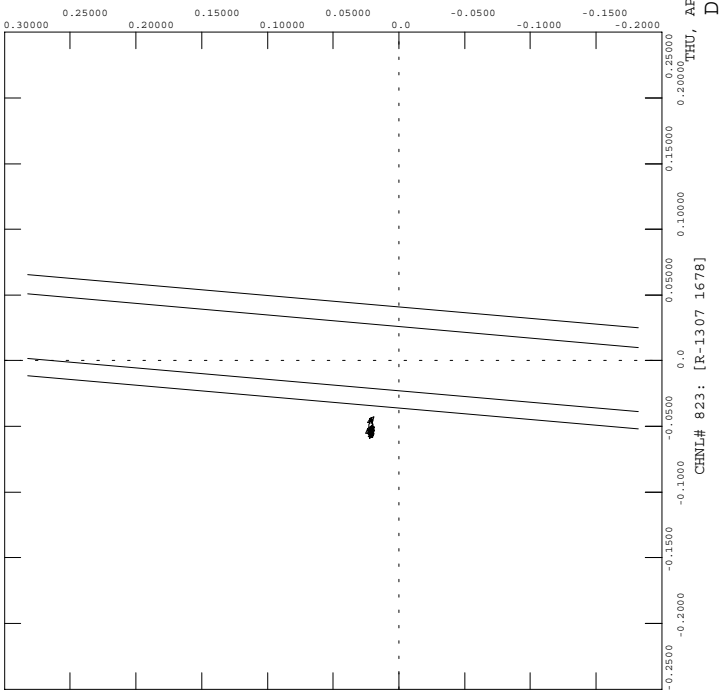

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 203: [Q 1SCE-1-3G]
6.0000
-2.000
CHNL# 923: [MH7-VDCI]
0.6000E6
0.4000E6
CHNL# 924: [MH7DC -AMPS]
2500.0
0.0
CHNL# 930: [MHDC-&DAMP]
500.00
-500.0
CHNL# 947: [MHDC-&QACI]
25.000
0.0
CHNL# 940: [MHDC-&PACI]
0.0
-35.00
THU, APR 19 2007 14:33
MH DC PARAMETERS
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out
CHNL# 920: [CU1-DCAMPS]
2000.0
0.0
CHNL# 919: [CU1-DCVOLTS]
0.5000E6
0.0
CHNL#'S 936,937: [CUDC-DAMP1]+[CUDC-DAMP2]
500.00
-500.0
CHNL#'S 950,951: [CUDC-QACI1]+[CUDC-QACI2]
15.000
0.0
CHNL#'S 954,955: [CUDC-PACR1]+[CUDC-PACR2]
15.000
0.0
THU, APR 19 2007 14:33
CU DC #1
TIME (SECONDS)

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

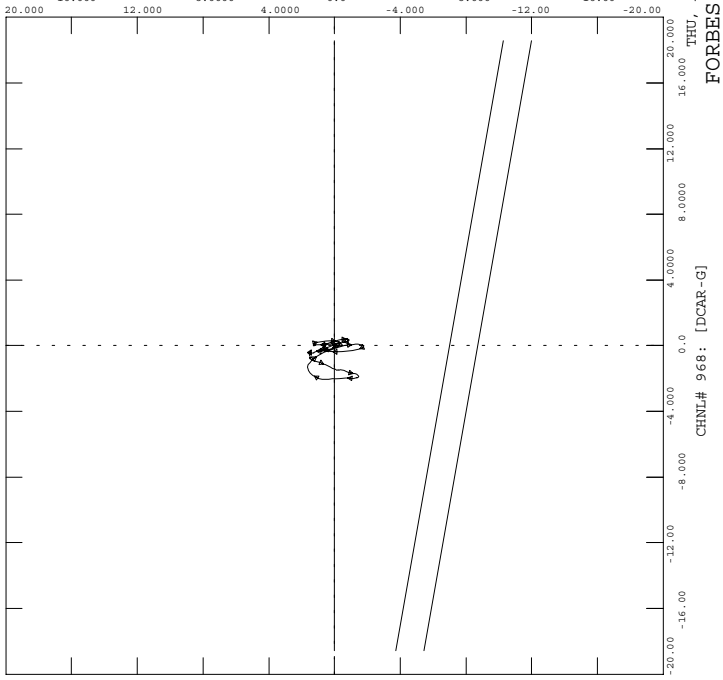
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]



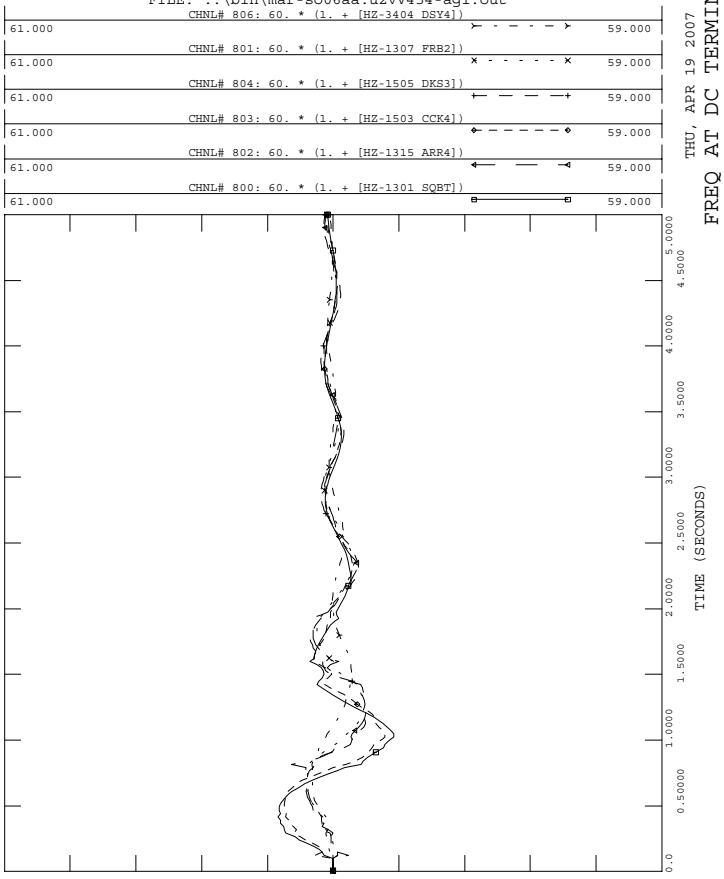

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 969: [DCAR-B]



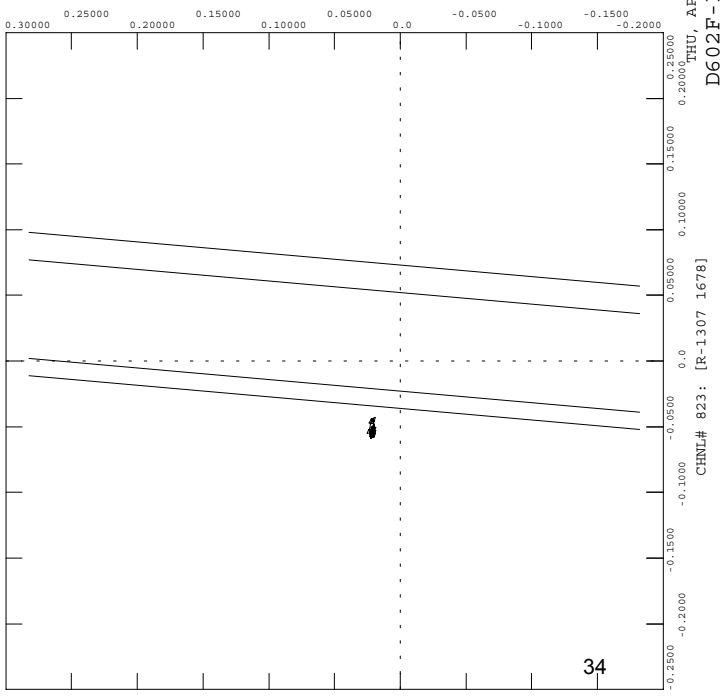

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

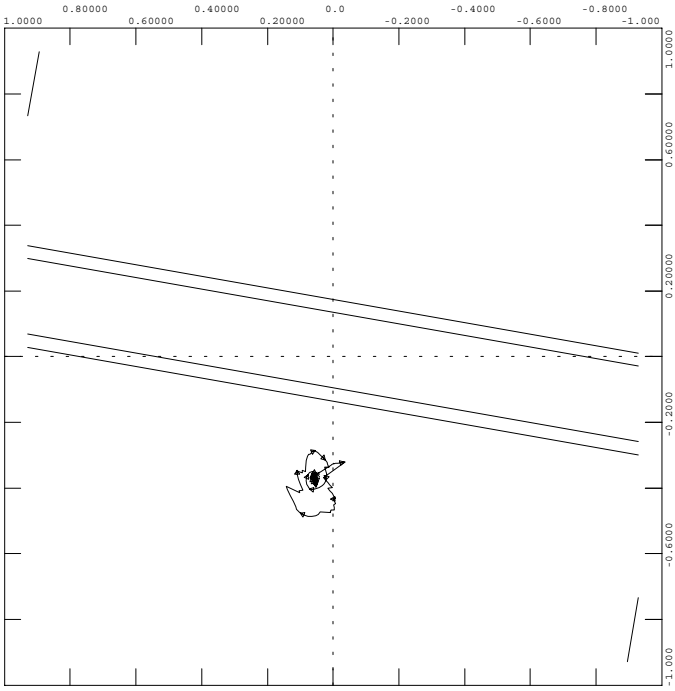
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]



MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

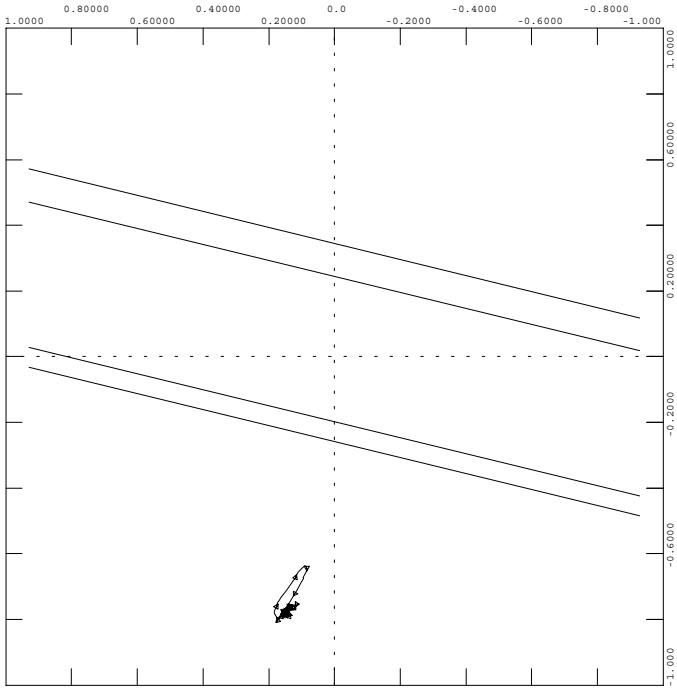
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

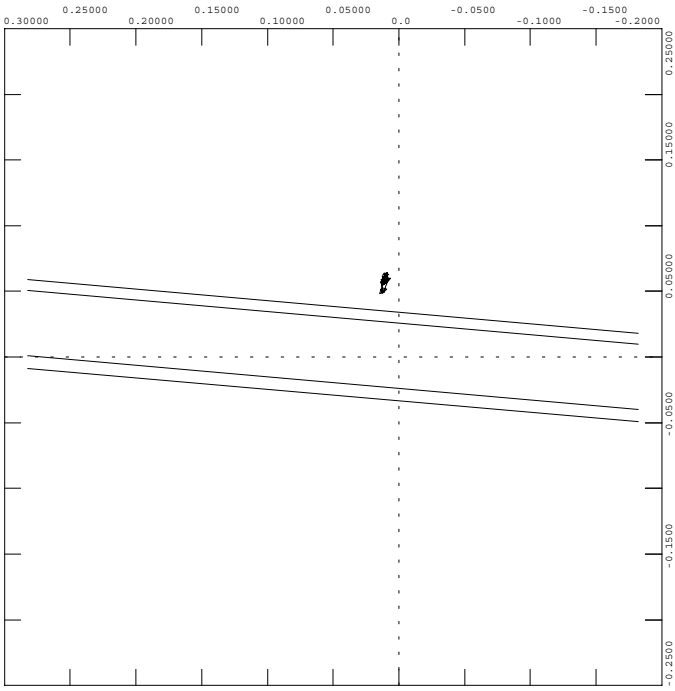
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

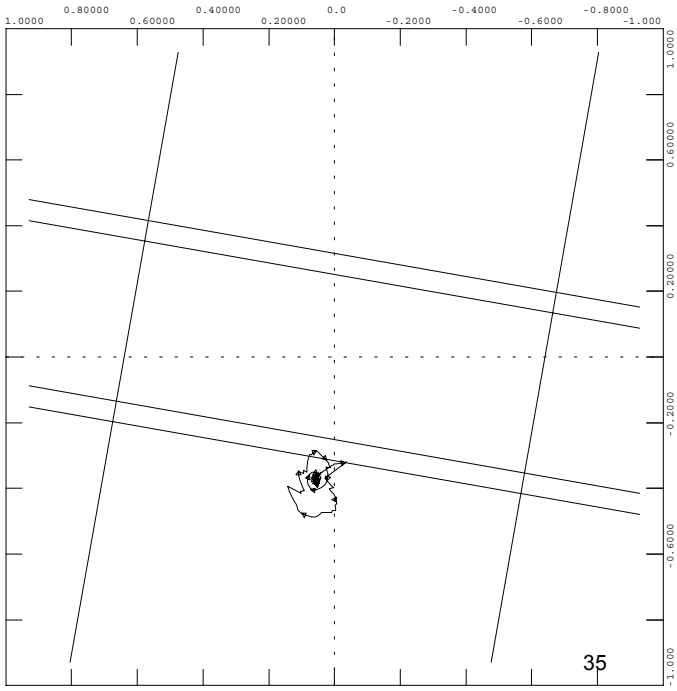
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 856: [X-DSY2-ROS2]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

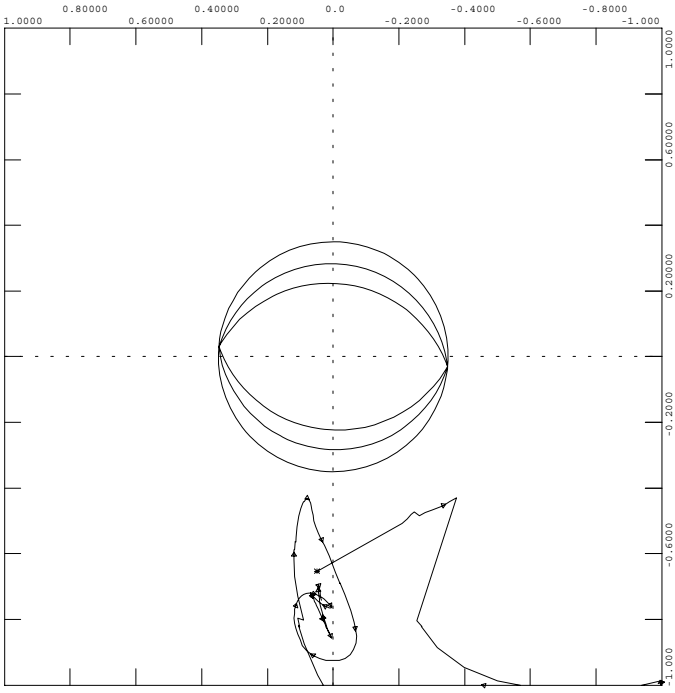
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]



MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

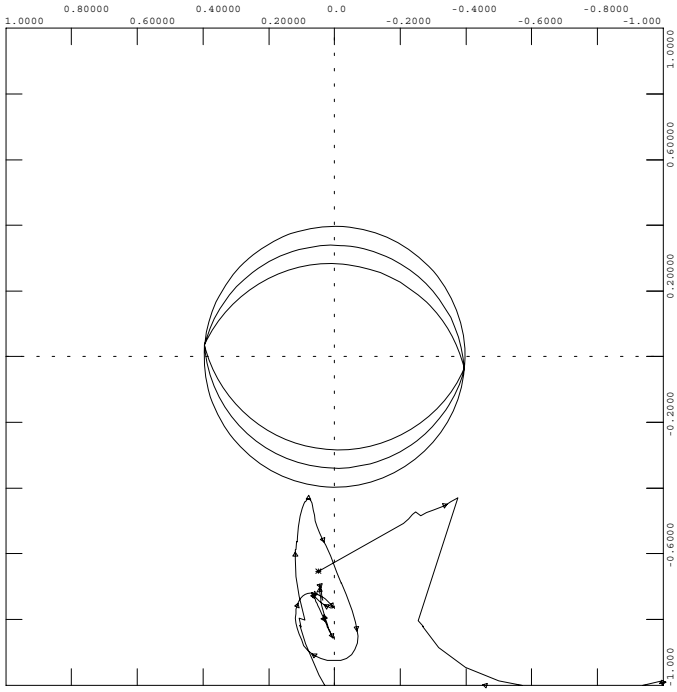
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

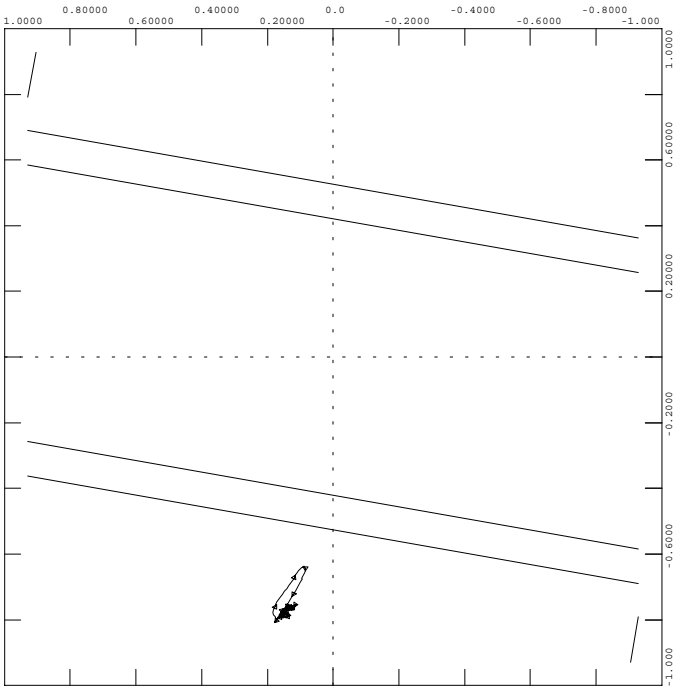
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

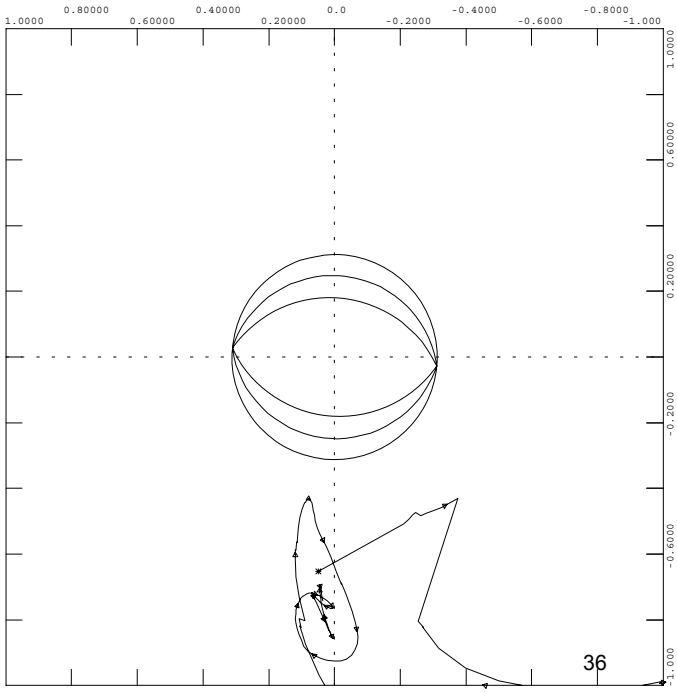
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

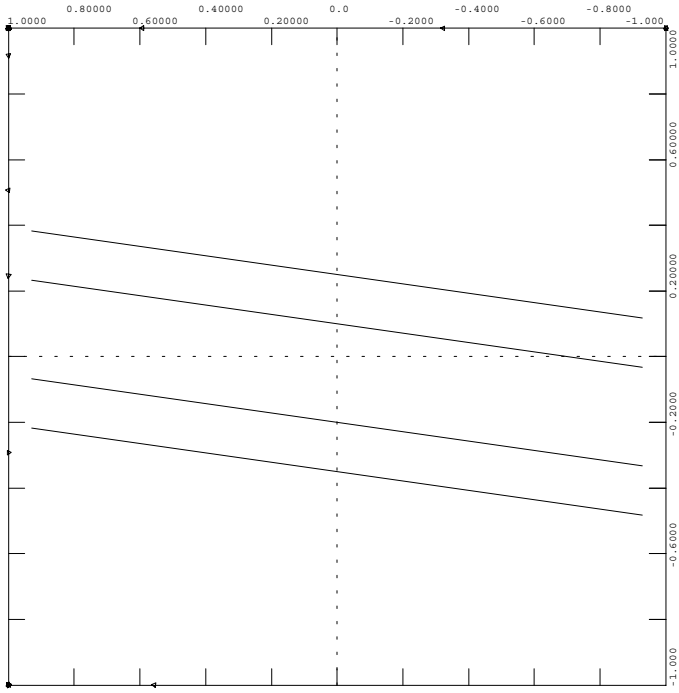
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]



MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 1071: [X-G82R]

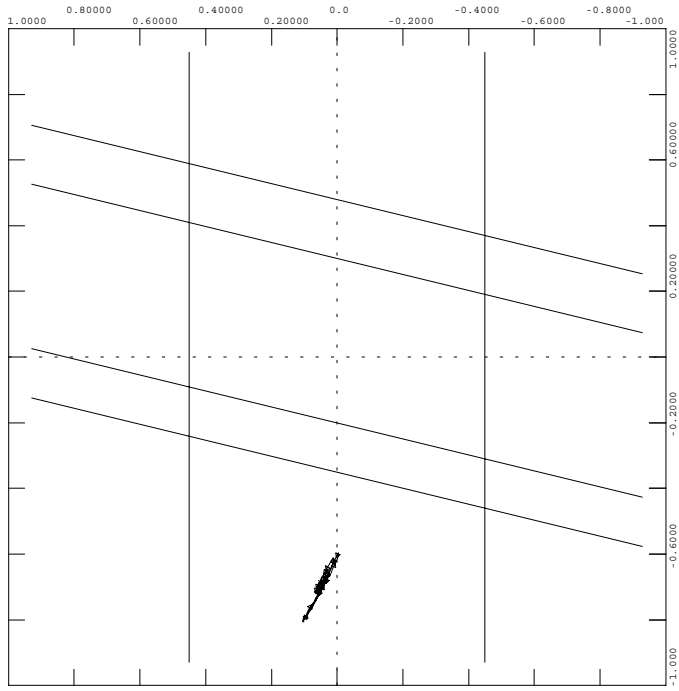



THU, APR 19 2007 14:33
G82R (780)
CHNL# 1070: [R-G82R]

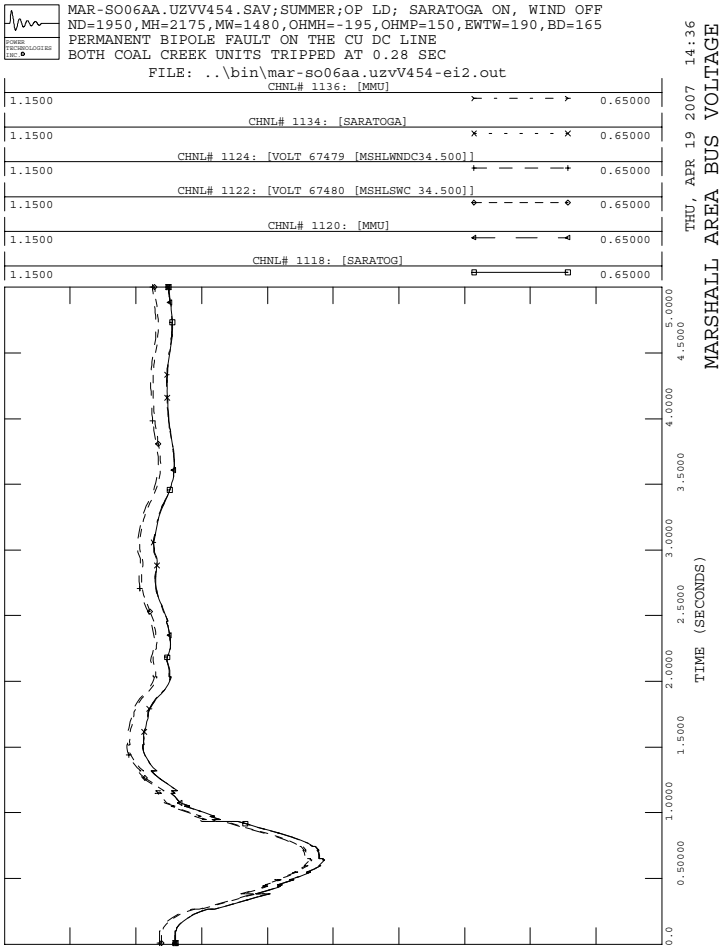
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

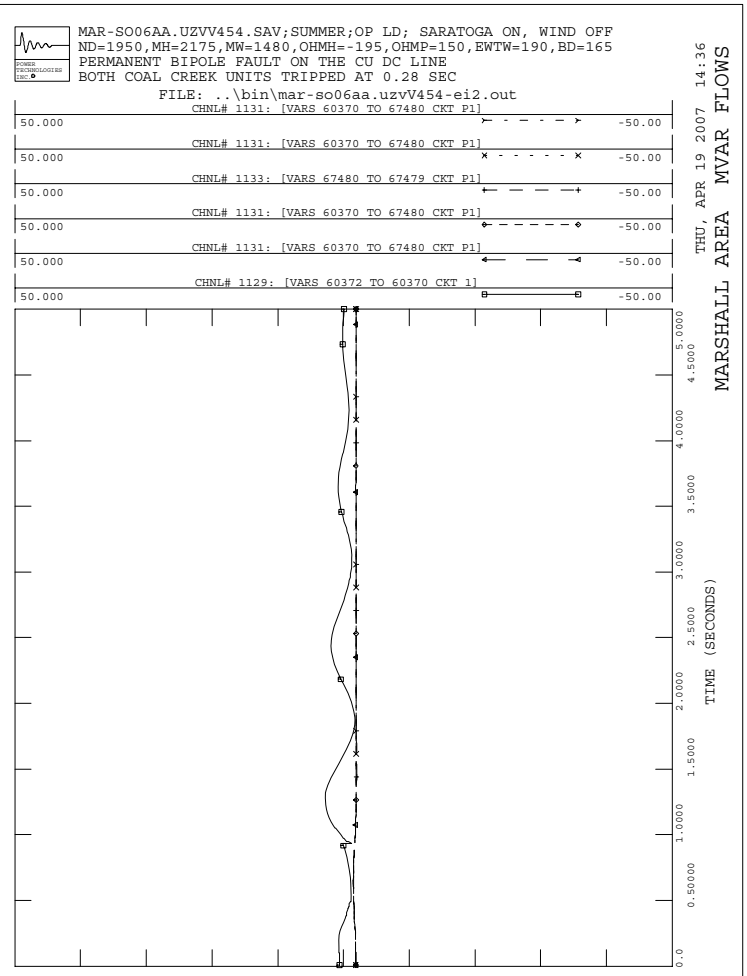
FILE: ..\bin\mar-so06aa.uzvV454-ag1.out

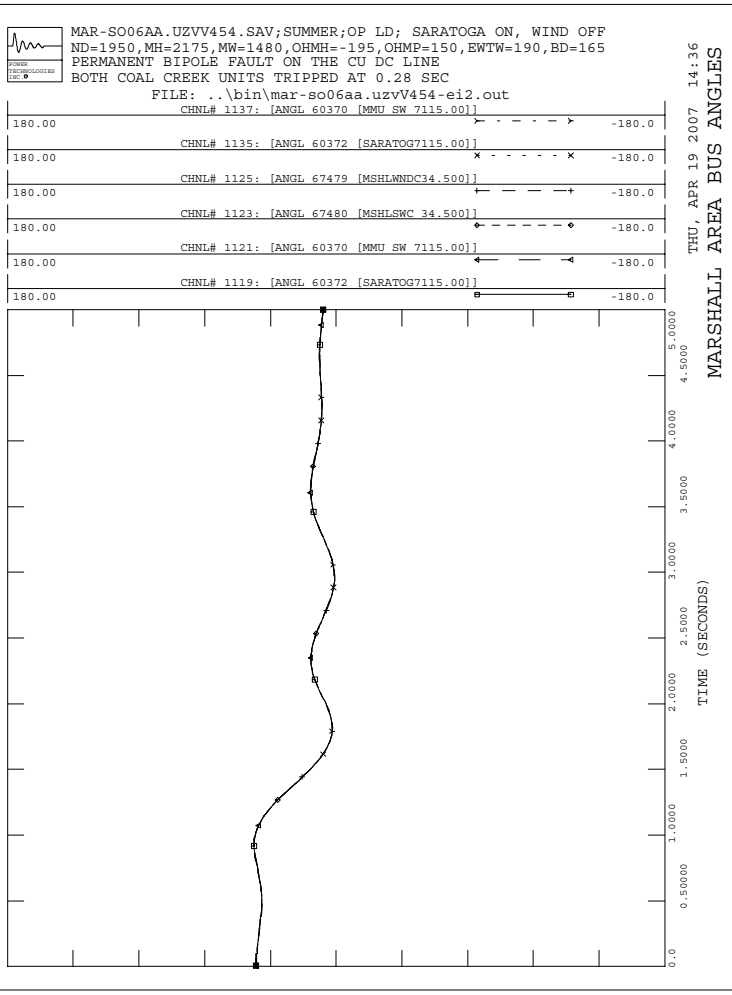
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 848: [X-INT.F-FTF]

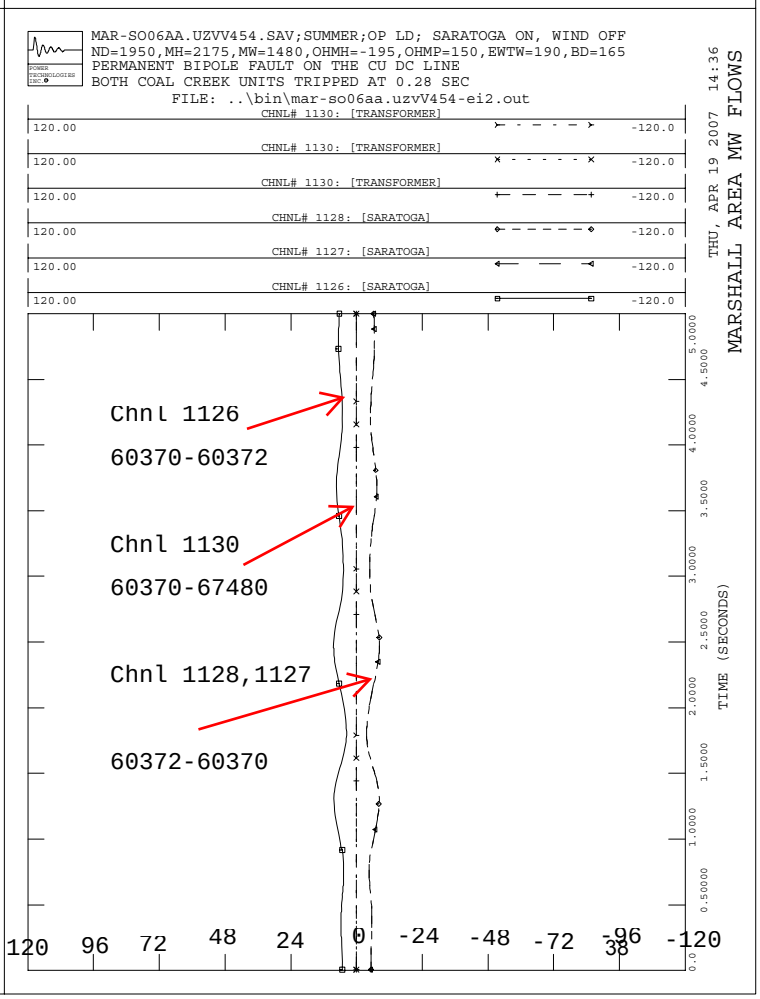


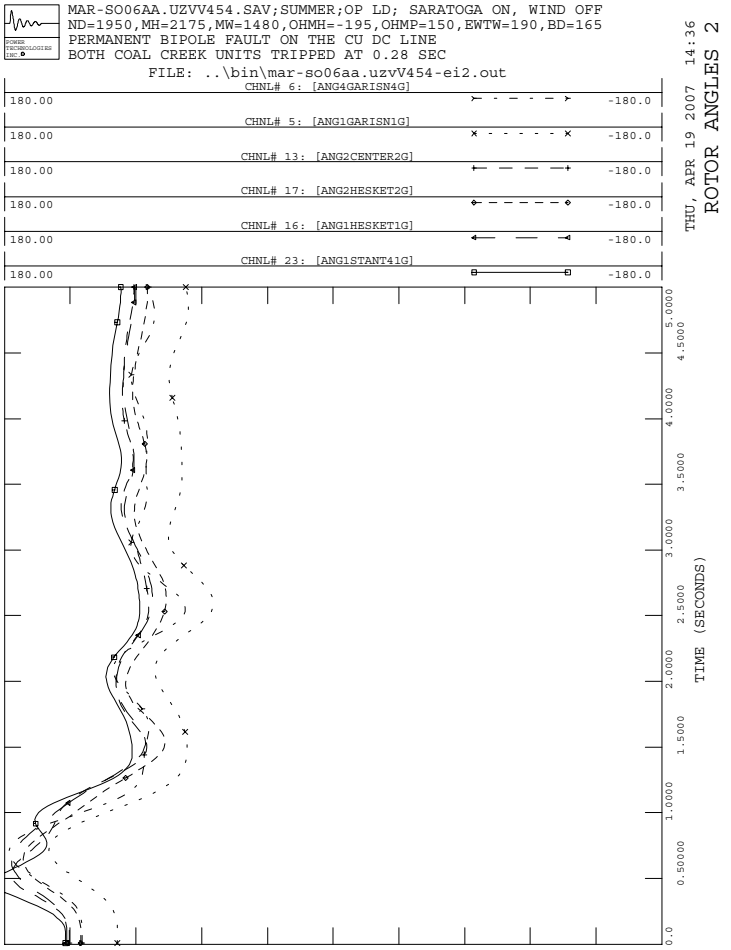

THU, APR 19 2007 14:33
MP-OH I.FALLS (779)
CHNL# 847: [R-1484 6011]

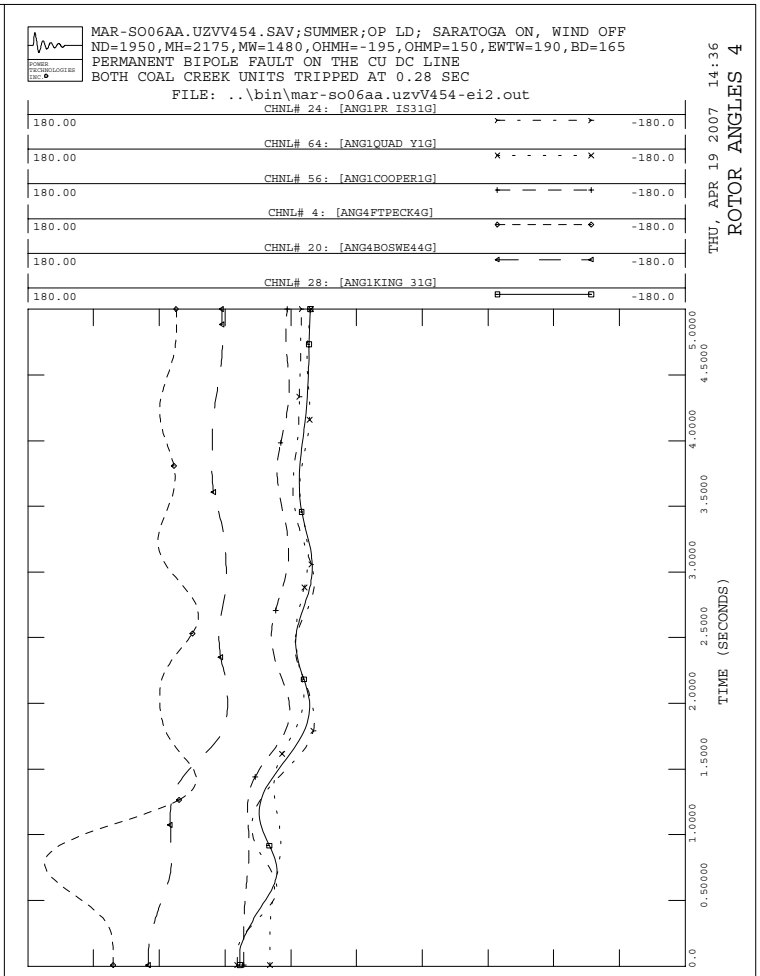

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1136: [MMU]
CHNL# 1134: [SARATOGA]
CHNL# 1124: [VOLT 67479 [MSHLWNDC34.500]]
CHNL# 1122: [VOLT 67480 [MSHLSWC 34.500]]
CHNL# 1120: [MMU]
CHNL# 1118: [SARATOG]
1.1500
0.65000
THU, APR 19 2007 14:36
MARSHALL AREA BUS VOLTAGE
TIME (SECONDS)

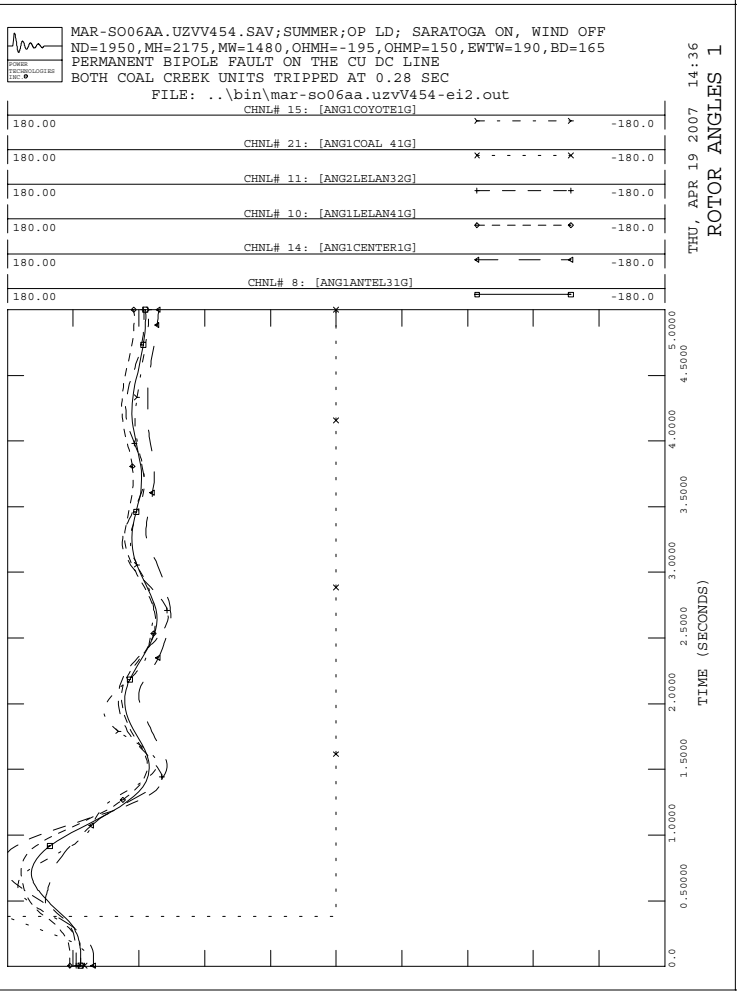

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1133: [VARS 67480 TO 67479 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1129: [VARS 60372 TO 60370 CKT 1]
50.000
-50.00
THU, APR 19 2007 14:36
MARSHALL AREA MVAR FLOWS
TIME (SECONDS)

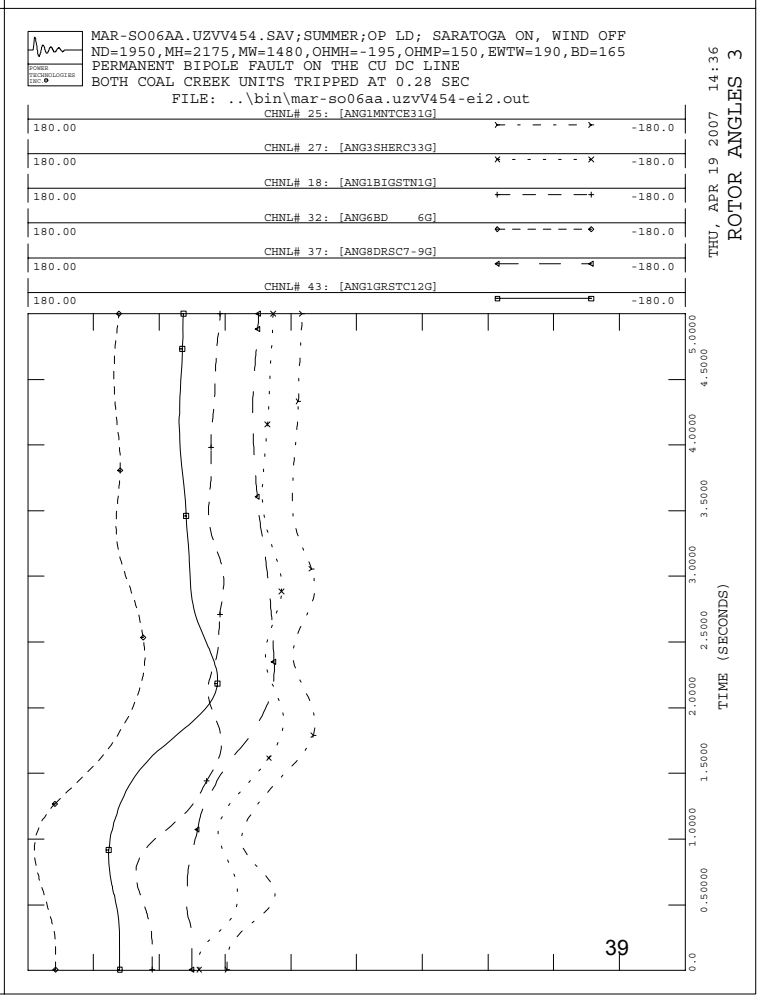

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1137: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1135: [ANGL 60372 [SARATOG7115.00]]
CHNL# 1125: [ANGL 67479 [MSHLWNDC34.500]]
CHNL# 1123: [ANGL 67480 [MSHLSWC 34.500]]
CHNL# 1121: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1119: [ANGL 60372 [SARATOG7115.00]]
180.00
-180.0
THU, APR 19 2007 14:36
MARSHALL AREA BUS ANGLES
TIME (SECONDS)

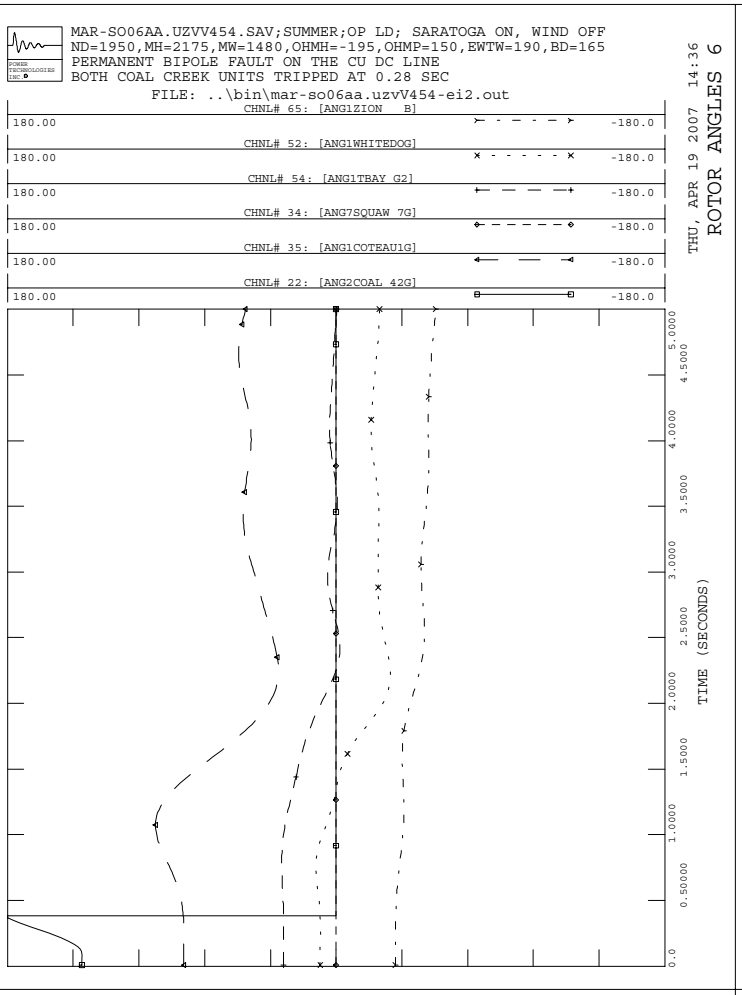

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1128: [SARATOGA]
CHNL# 1127: [SARATOGA]
CHNL# 1126: [SARATOGA]
120.00
-120.0
Chnl 1126
60370-60372
Chnl 1130
60370-67480
Chnl 1128,1127
60372-60370
120 96 72 48 24 0 -24 -48 -72 -96 -120
THU, APR 19 2007 14:36
MARSHALL AREA MW FLOWS
TIME (SECONDS)

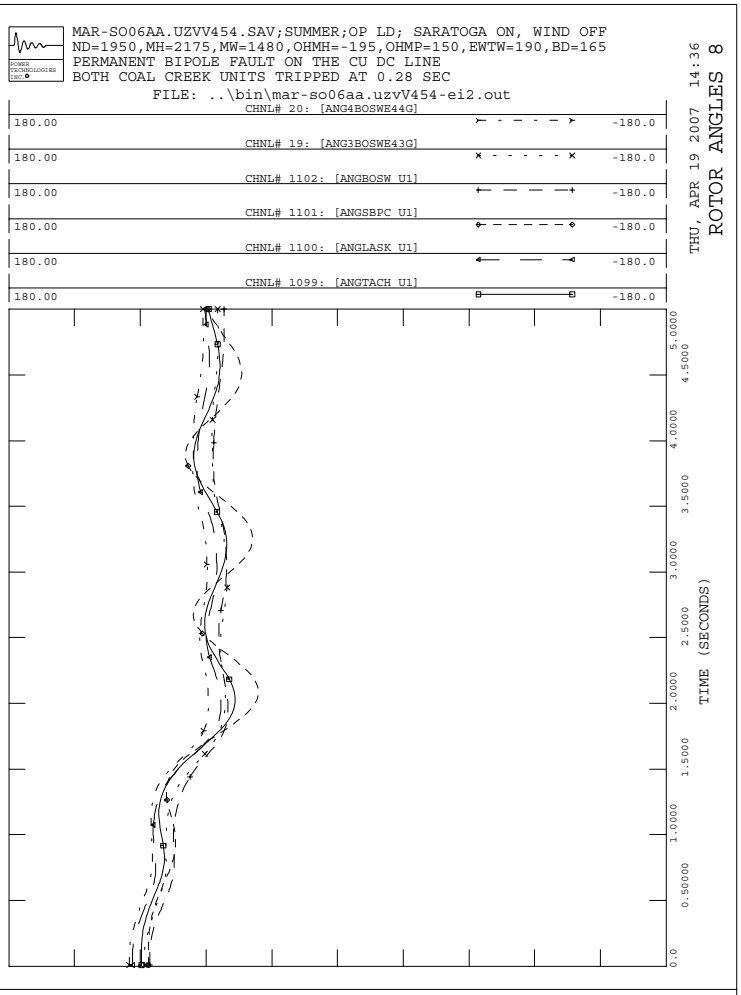

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 6: [ANG4GARISN4G]
CHNL# 5: [ANG1GARISN1G]
CHNL# 13: [ANG2CENTER2G]
CHNL# 17: [ANG2HESKET2G]
CHNL# 16: [ANG1HESKET1G]
CHNL# 23: [ANG1STANT41G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 2
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

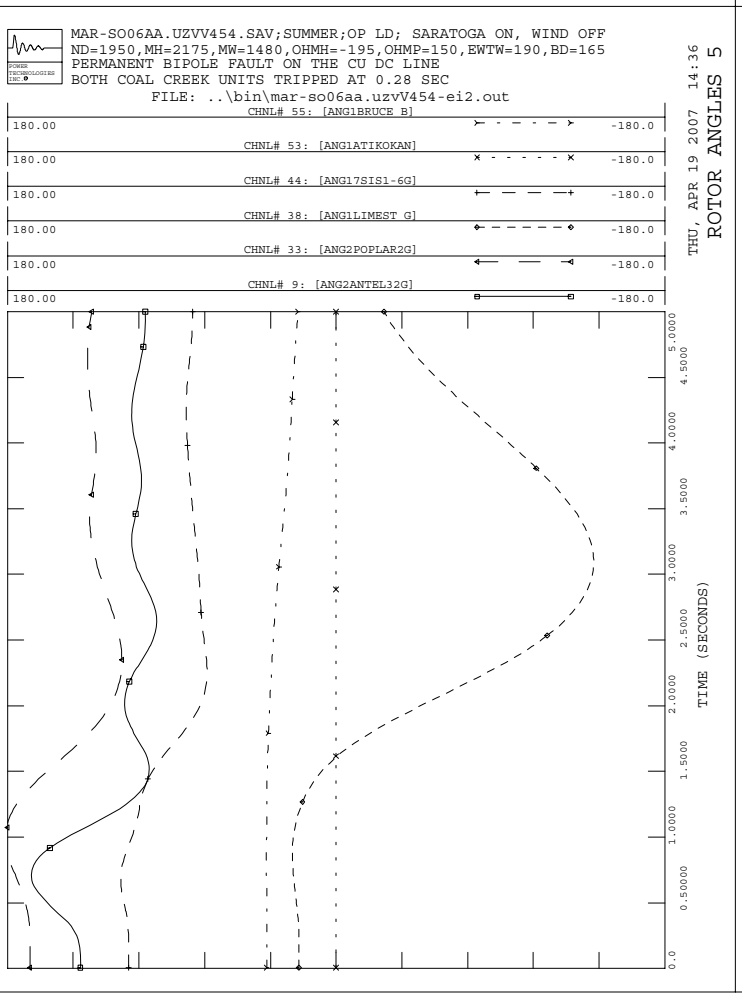

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 24: [ANG1PR IS31G]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 56: [ANG1COOPER1G]
CHNL# 4: [ANG4FTPECK4G]
CHNL# 20: [ANG4BOSWE44G]
CHNL# 28: [ANG1KING 31G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 4
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

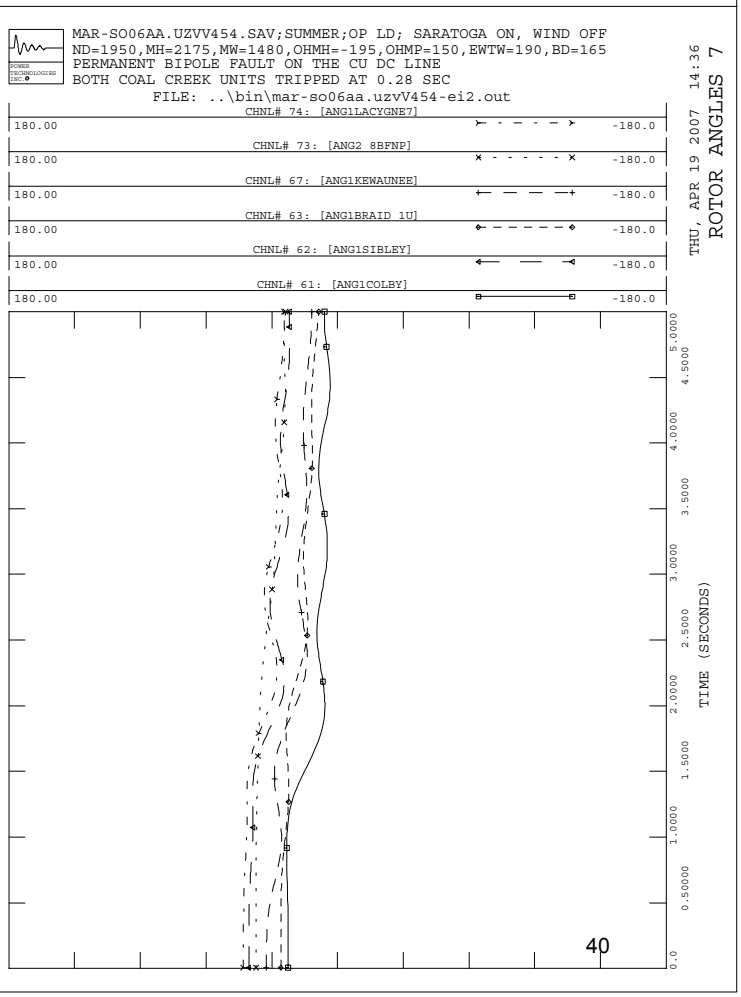

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 15: [ANG1COYOTE1G]
CHNL# 21: [ANG1COAL 41G]
CHNL# 11: [ANG2LELAN32G]
CHNL# 10: [ANG1LELAN41G]
CHNL# 14: [ANG1CENTER1G]
CHNL# 8: [ANG1ANTEL31G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 1
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

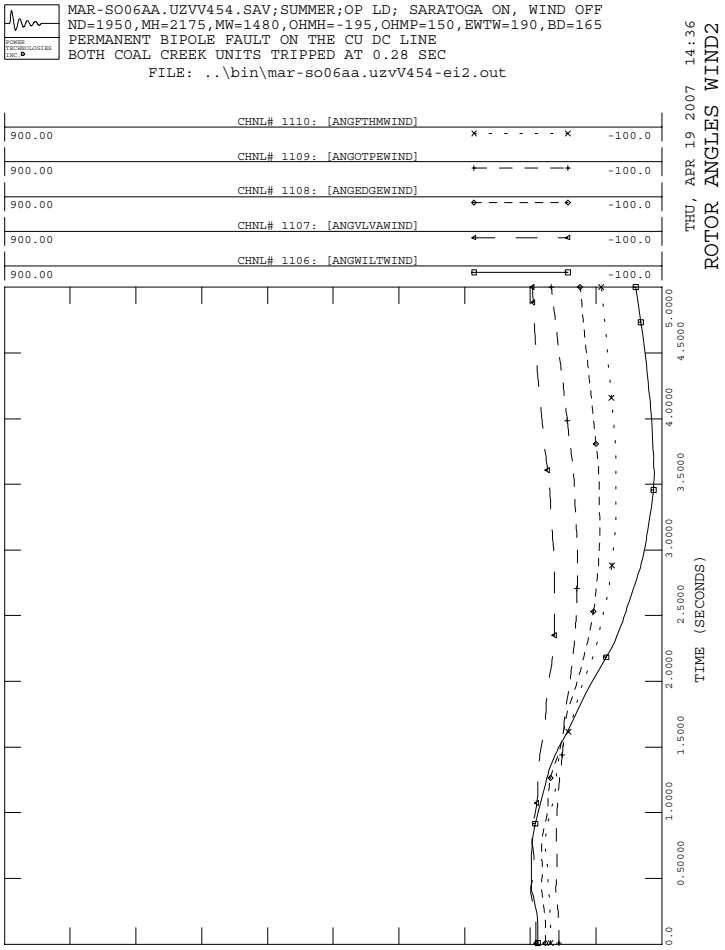

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 25: [ANG1MNTCE31G]
CHNL# 27: [ANG3SHERC33G]
CHNL# 18: [ANG1BIGSTN1G]
CHNL# 32: [ANG6BD 6G]
CHNL# 37: [ANG8DRSC7-9G]
CHNL# 43: [ANG1GRSTC12G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 3
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

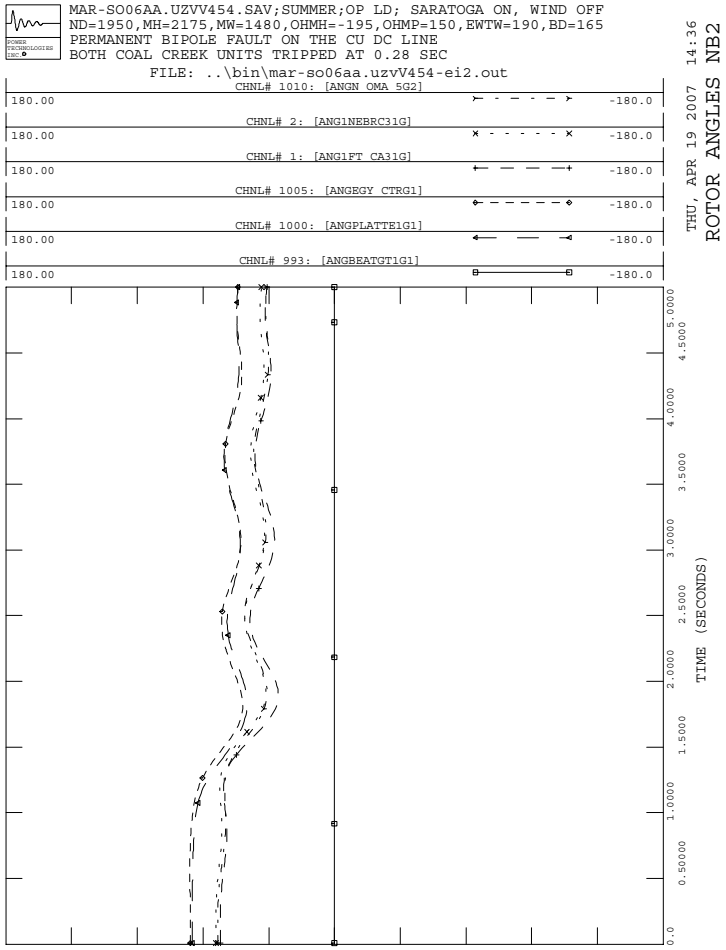

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 65: [ANG1ZION B]
CHNL# 52: [ANG1WHITEDOG]
CHNL# 54: [ANG1TBAY G2]
CHNL# 34: [ANG7SQUAW 7G]
CHNL# 35: [ANG1COTEAU1G]
CHNL# 22: [ANG2COAL 42G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 6
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

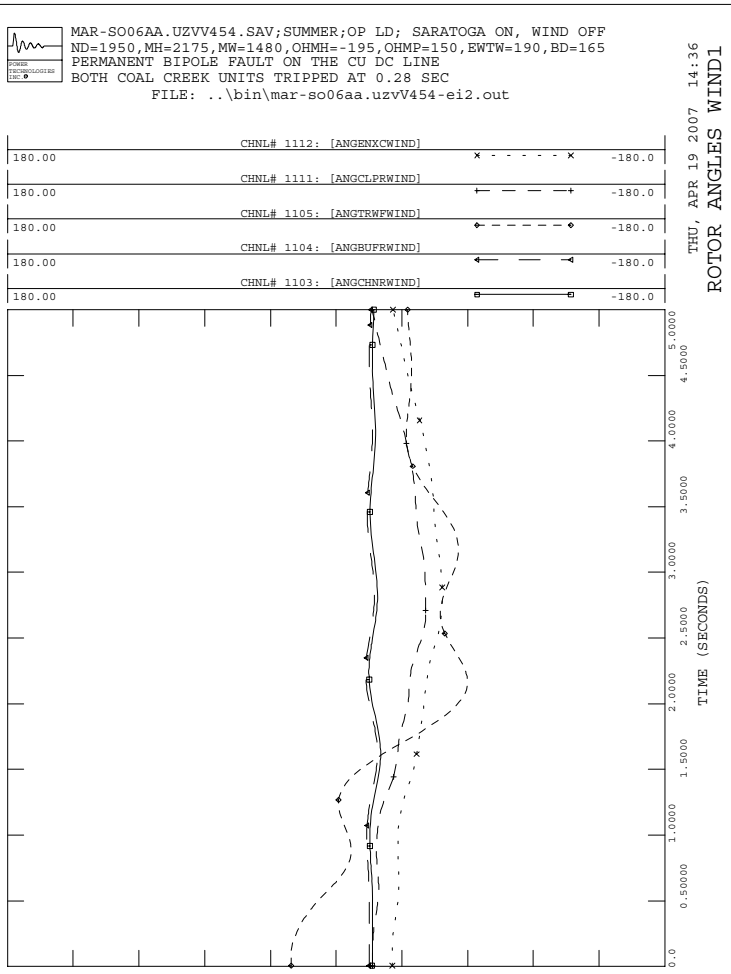

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 20: [ANG4BOSWE44G]
CHNL# 19: [ANG3BOSWE43G]
CHNL# 1102: [ANGBOSW U1]
CHNL# 1101: [ANGSBPC U1]
CHNL# 1100: [ANGLASK U1]
CHNL# 1099: [ANGTACH U1]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 8
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

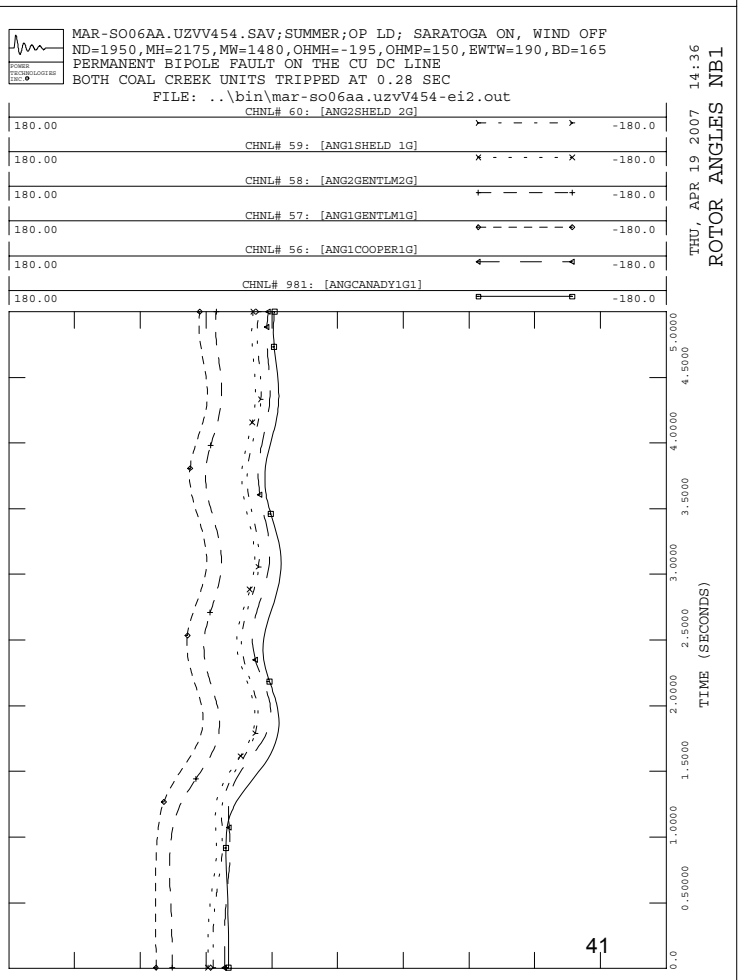

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 55: [ANG1BRUCE B]
CHNL# 53: [ANG1ATIKOKAN]
CHNL# 44: [ANG17SIS1-6G]
CHNL# 38: [ANG1LIMEST G]
CHNL# 33: [ANG2POPLAR2G]
CHNL# 9: [ANG2ANTEL32G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 5
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

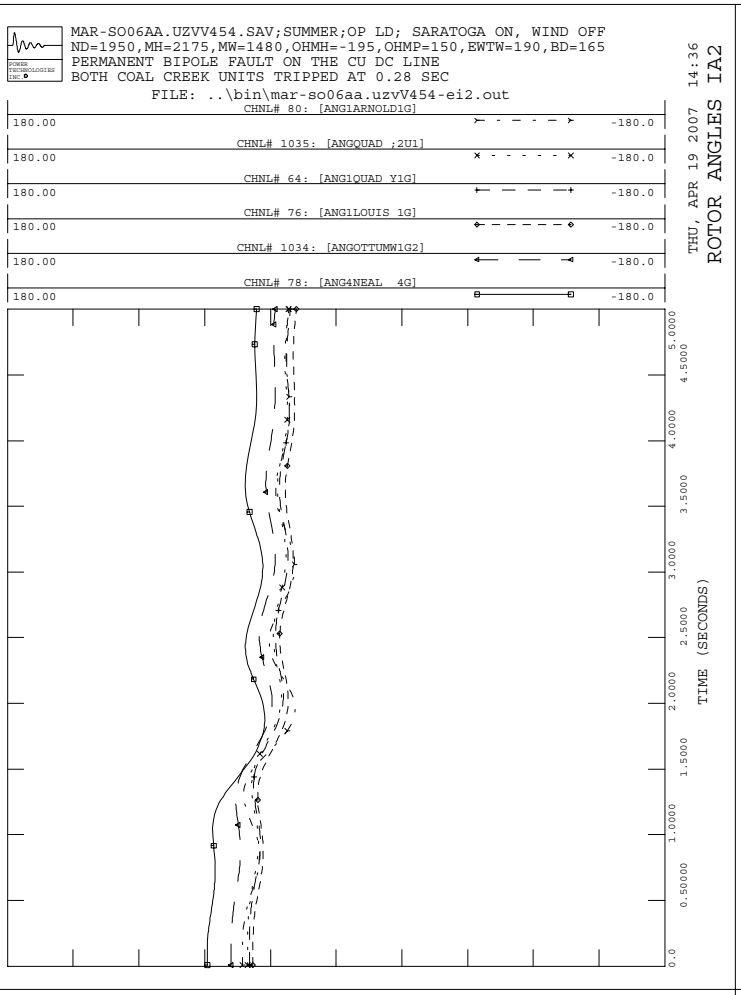

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 74: [ANG1LACYGNE7]
CHNL# 73: [ANG2 8BFNP]
CHNL# 67: [ANG1KEWAUNEE]
CHNL# 63: [ANG1BRAID 1U]
CHNL# 62: [ANG1SIBLEY]
CHNL# 61: [ANG1COLBY]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES 7
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

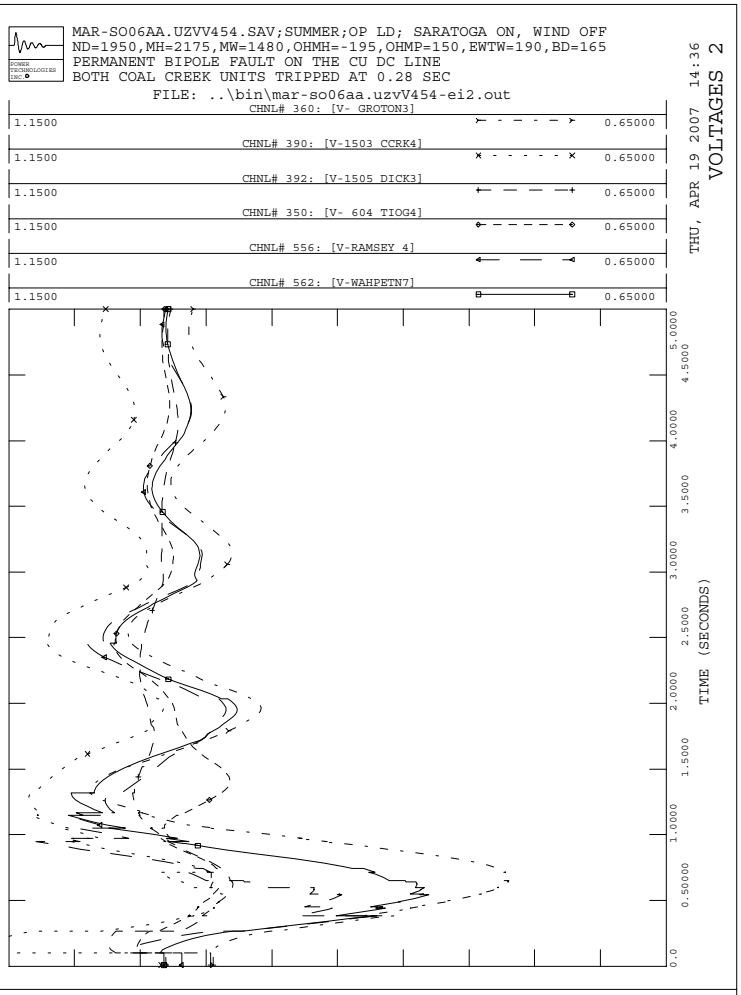

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1110: [ANGFTHMWIND]
CHNL# 1109: [ANGOTPEWIND]
CHNL# 1108: [ANGEDGEWIND]
CHNL# 1107: [ANGVLVAWIND]
CHNL# 1106: [ANGWILTWIND]
900.00
-100.0
THU, APR 19 2007 14:36
ROTOR ANGLES WIND2
TIME (SECONDS)

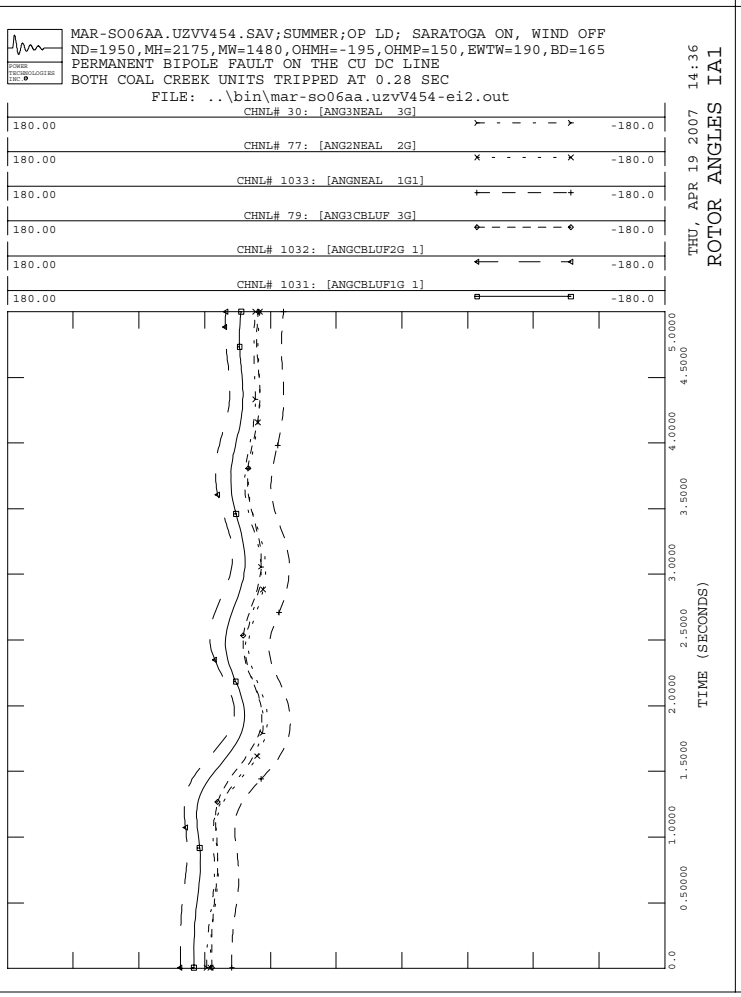

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1010: [ANGN OMA 5G2]
CHNL# 2: [ANG1NEBRC31G]
CHNL# 1: [ANG1FT CA31G]
CHNL# 1005: [ANGEGY CTRG1]
CHNL# 1000: [ANGPLATTE1G1]
CHNL# 993: [ANGBEATGT1G1]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES NB2
TIME (SECONDS)

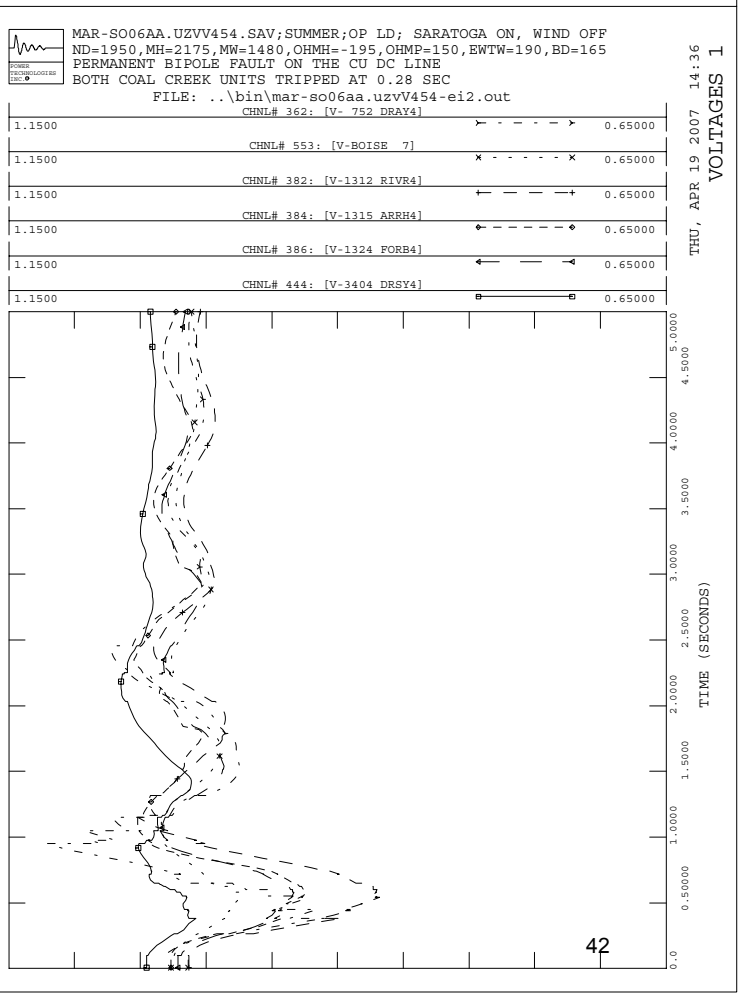

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1112: [ANGENXCWIND]
CHNL# 1111: [ANGCLPRWIND]
CHNL# 1105: [ANGTRWFWIND]
CHNL# 1104: [ANGBUFRWIND]
CHNL# 1103: [ANGCHNRWIND]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES WIND1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 60: [ANG2SHELD 2G]
CHNL# 59: [ANG1SHELD 1G]
CHNL# 58: [ANG2GENTLM2G]
CHNL# 57: [ANG1GENTLM1G]
CHNL# 56: [ANG1COOPER1G]
CHNL# 981: [ANGCANADY1G1]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES NB1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 80: [ANG1ARNOLD1G]
CHNL# 1035: [ANGQUAD ;2U1]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 76: [ANG1LOUIS 1G]
CHNL# 1034: [ANGOTTUMW1G2]
CHNL# 78: [ANG4NEAL 4G]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES IA2
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 360: [V- GROTON3]
CHNL# 390: [V-1503 CCRK4]
CHNL# 392: [V-1505 DICK3]
CHNL# 350: [V- 604 TIOG4]
CHNL# 556: [V-RAMSEY 4]
CHNL# 562: [V-WAHPETN7]
1.1500
0.65000
THU, APR 19 2007 14:36
VOLTAGES 2
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 30: [ANG3NEAL 3G]
CHNL# 77: [ANG2NEAL 2G]
CHNL# 1033: [ANGNEAL 1G1]
CHNL# 79: [ANG3CBLUF 3G]
CHNL# 1032: [ANGCBLUF2G 1]
CHNL# 1031: [ANGCBLUF1G 1]
180.00
-180.0
THU, APR 19 2007 14:36
ROTOR ANGLES IA1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
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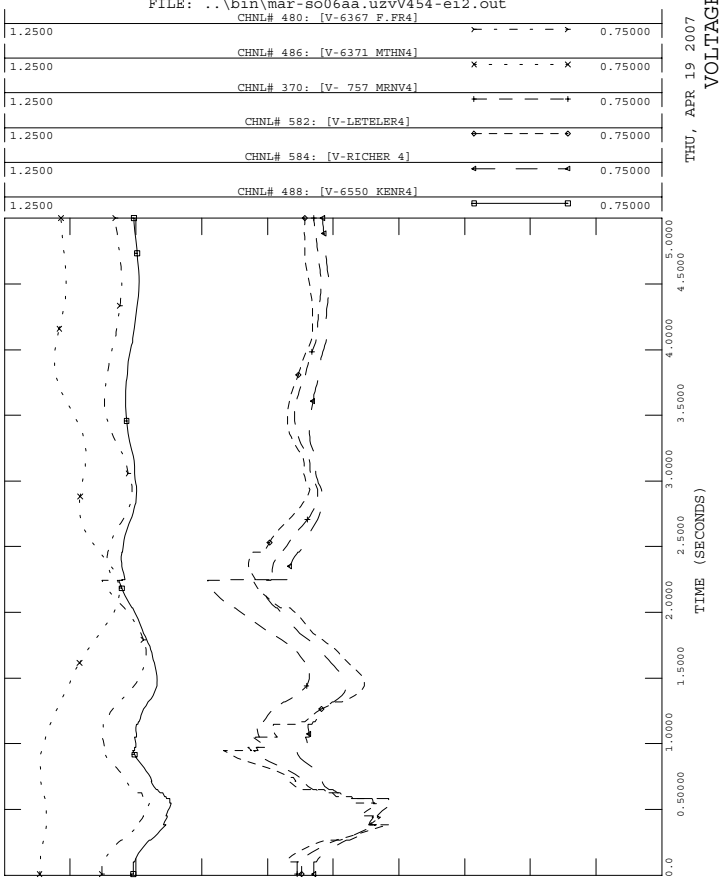
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL COREK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 362: [V- 752 DRAY4]
CHNL# 553: [V-BOISE 7]
CHNL# 382: [V-1312 RIVR4]
CHNL# 384: [V-1315 ARRH4]
CHNL# 386: [V-1324 FORB4]
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
THU, APR 19 2007 14:36
VOLTAGES 1
TIME (SECONDS)

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

THU, APR 19 2007 14:36
VOLTAGES 4




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
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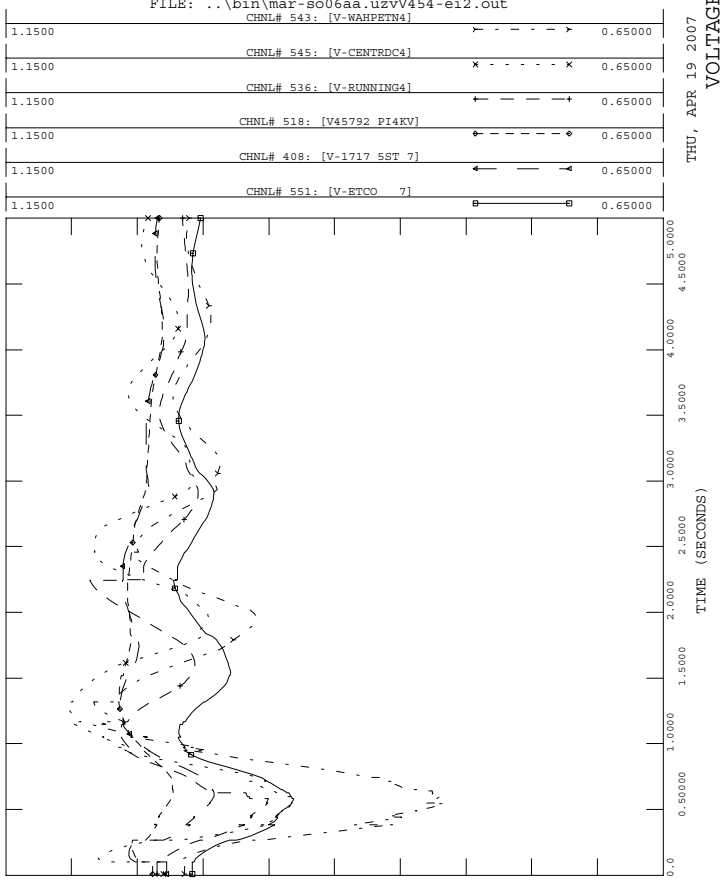
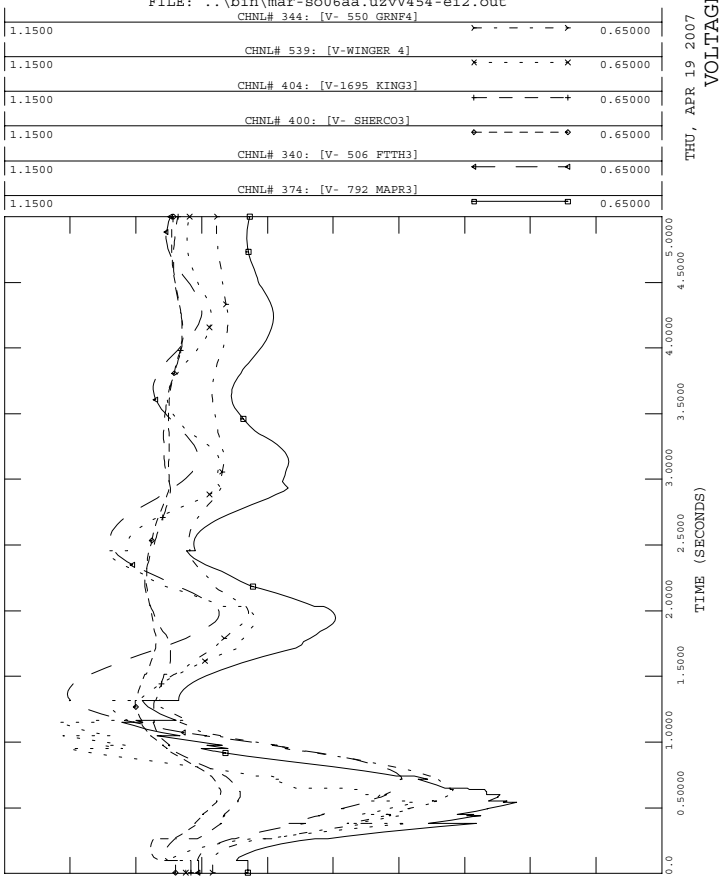
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

THU, APR 19 2007 14:36
VOLTAGES 6



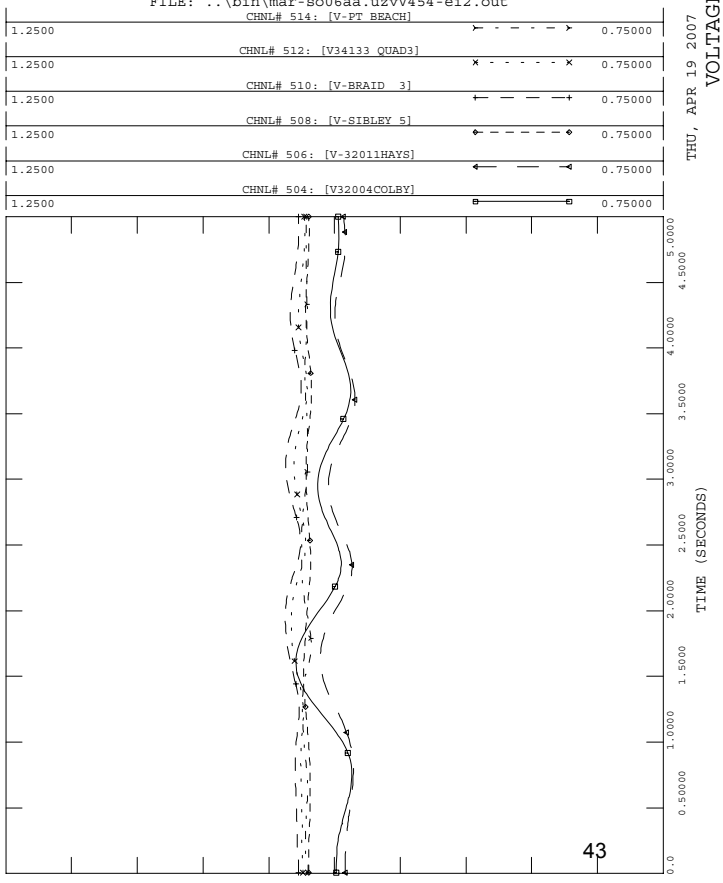

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

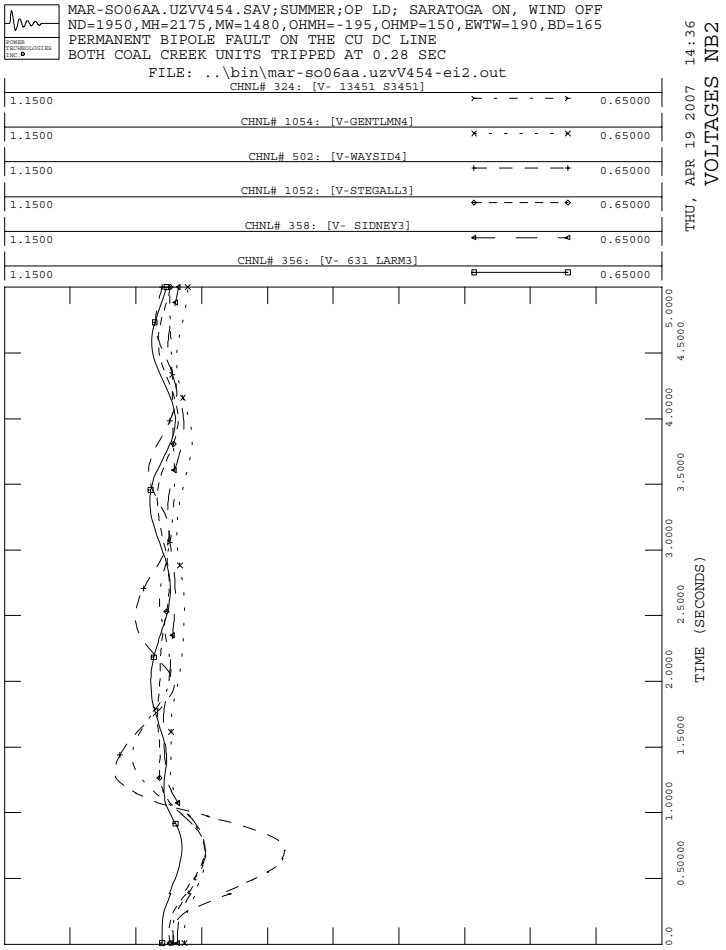
THU, APR 19 2007 14:36
VOLTAGES 3

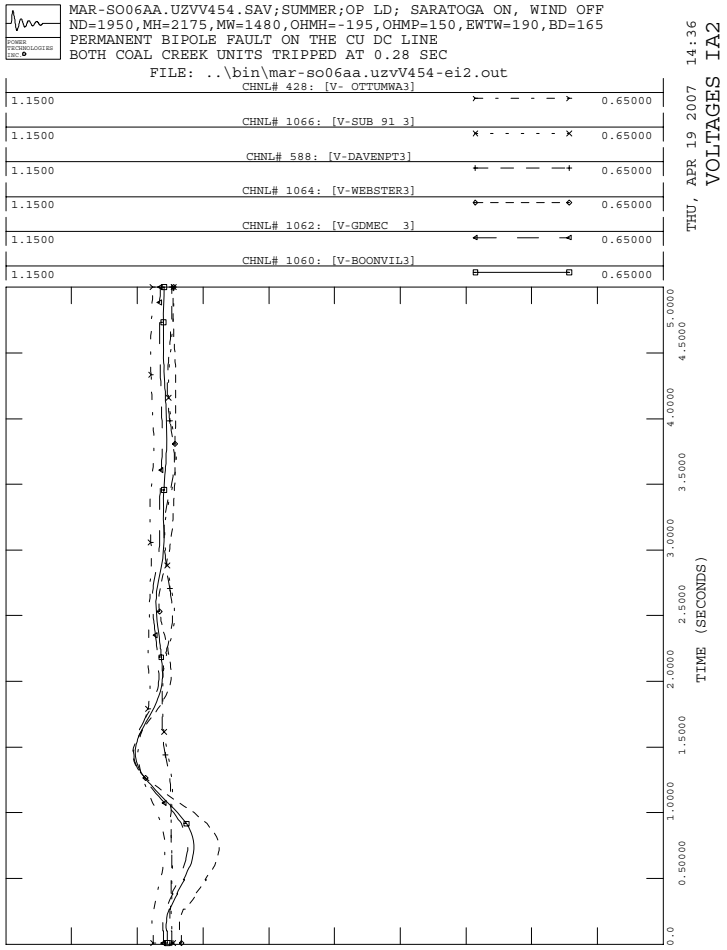


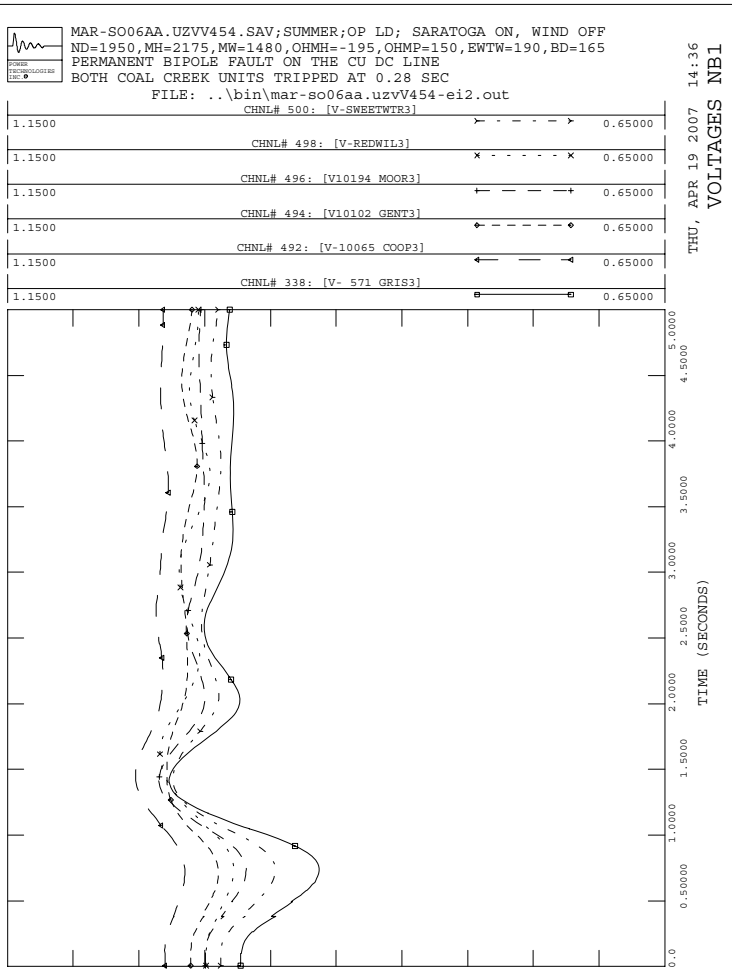

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

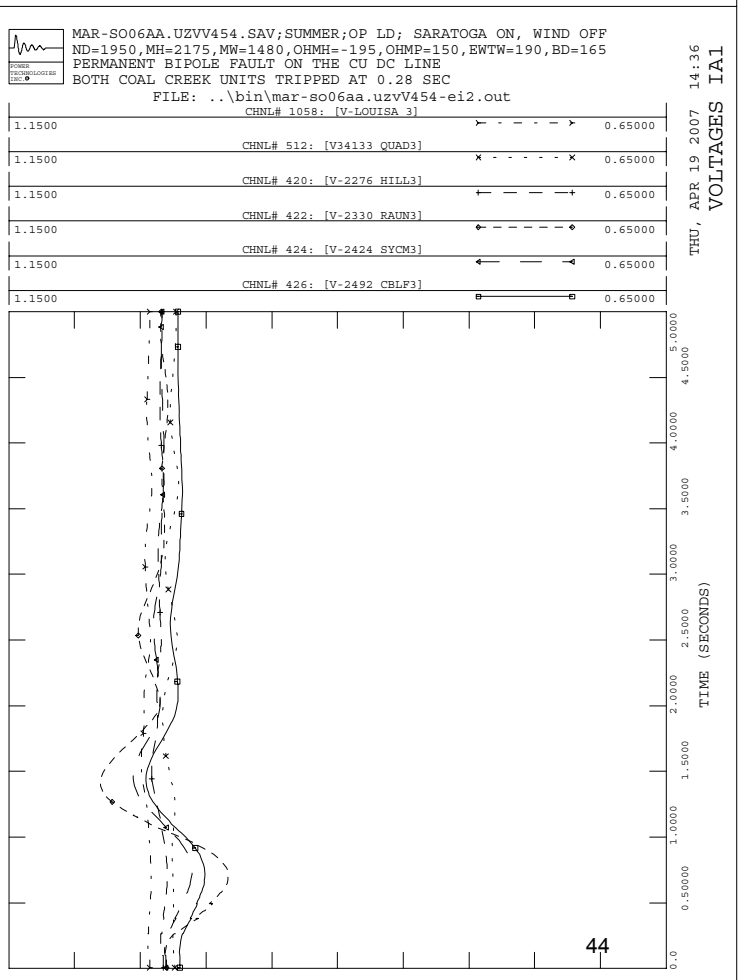
THU, APR 19 2007 14:36
VOLTAGES 5

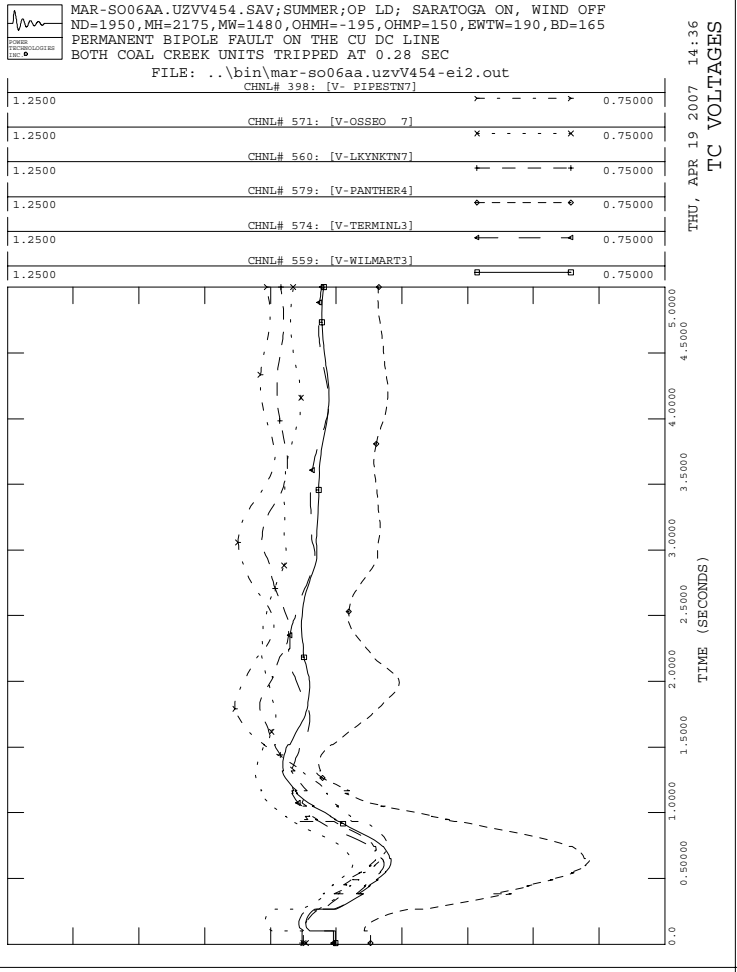


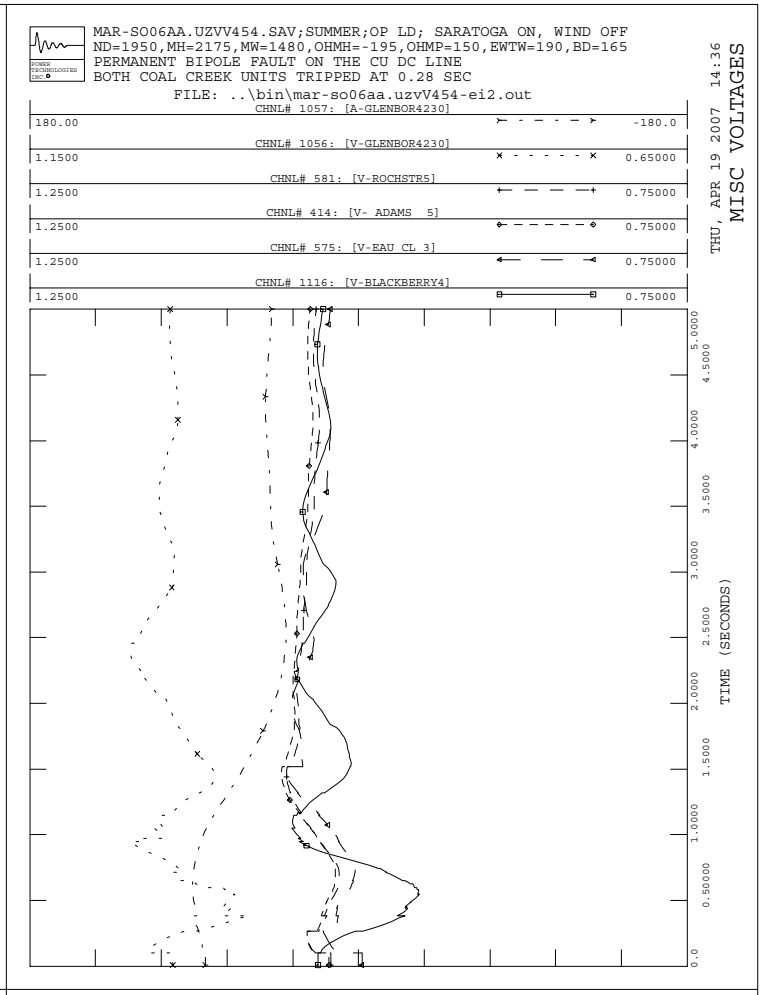

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 324: [V- 13451 S3451]
CHNL# 1054: [V-GENTLMN4]
CHNL# 502: [V-WAYSID4]
CHNL# 1052: [V-STEGALL3]
CHNL# 358: [V- SIDNEY3]
CHNL# 356: [V- 631 LARM3]
1.1500
0.65000
THU, APR 19 2007 14:36
VOLTAGES NB2
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

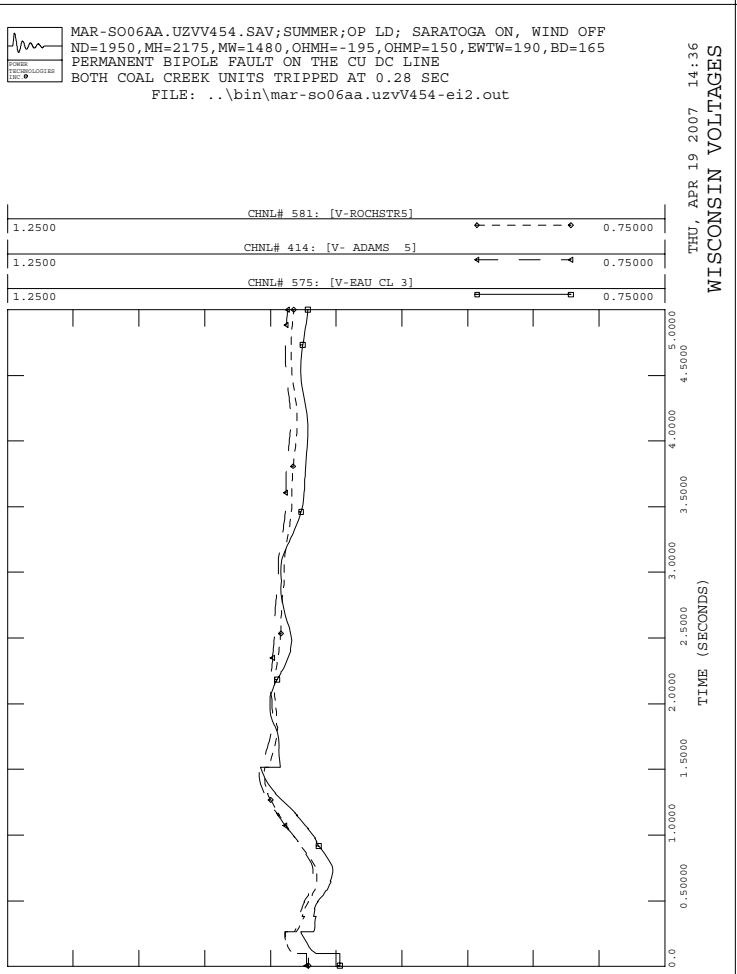

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 428: [V- OTTUMWA3]
CHNL# 1066: [V-SUB 91 3]
CHNL# 588: [V-DAVENPT3]
CHNL# 1064: [V-WEBSTER3]
CHNL# 1062: [V-GDMEC 3]
CHNL# 1060: [V-BOONVIL3]
1.1500
0.65000
THU, APR 19 2007 14:36
VOLTAGES IA2
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

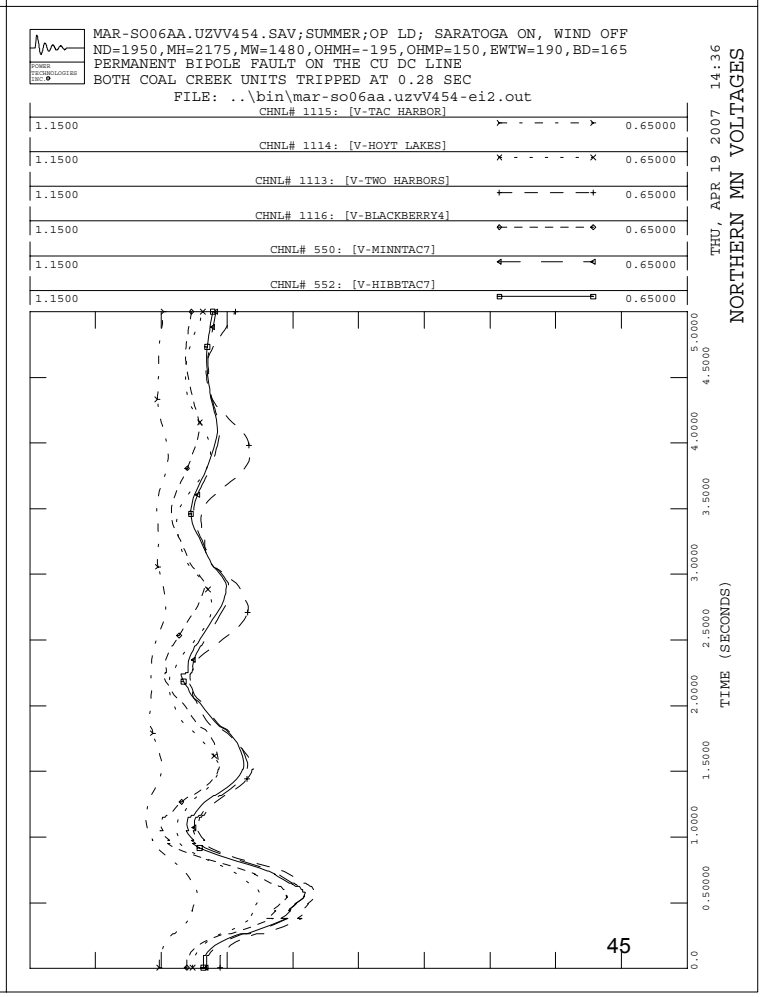

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 500: [V-SWEETWTR3]
CHNL# 498: [V-REDWIL3]
CHNL# 496: [V10194 MOOR3]
CHNL# 494: [V10102 GENT3]
CHNL# 492: [V-10065 COOP3]
CHNL# 338: [V- 571 GRIS3]
1.1500
0.65000
THU, APR 19 2007 14:36
VOLTAGES NB1
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

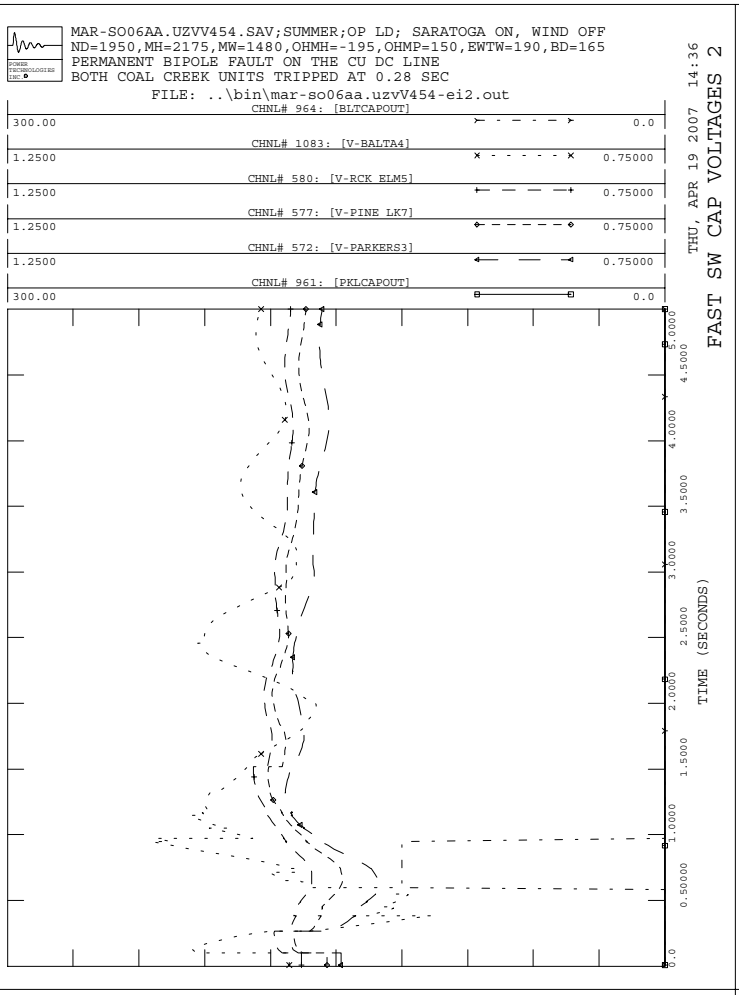

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1058: [V-LOUISA 3]
CHNL# 512: [V34133 QUAD3]
CHNL# 420: [V-2276 HILL3]
CHNL# 422: [V-2330 RAUN3]
CHNL# 424: [V-2424 SYCM3]
CHNL# 426: [V-2492 CBLF3]
1.1500
0.65000
THU, APR 19 2007 14:36
VOLTAGES IA1
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

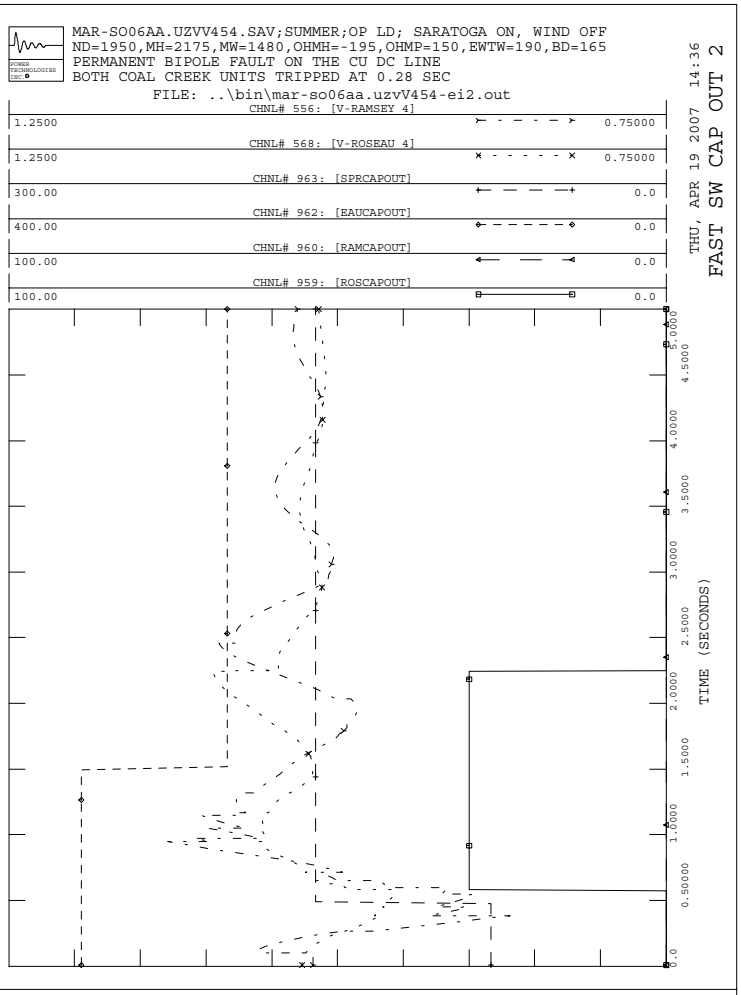

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 398: [V- PIPESTN7]
CHNL# 571: [V-OSSEO 7]
CHNL# 560: [V-LKYNKTN7]
CHNL# 579: [V-PANTHER4]
CHNL# 574: [V-TERMINL3]
CHNL# 559: [V-WILMART3]
THU, APR 19 2007 14:36
TC VOLTAGES
TIME (SECONDS)

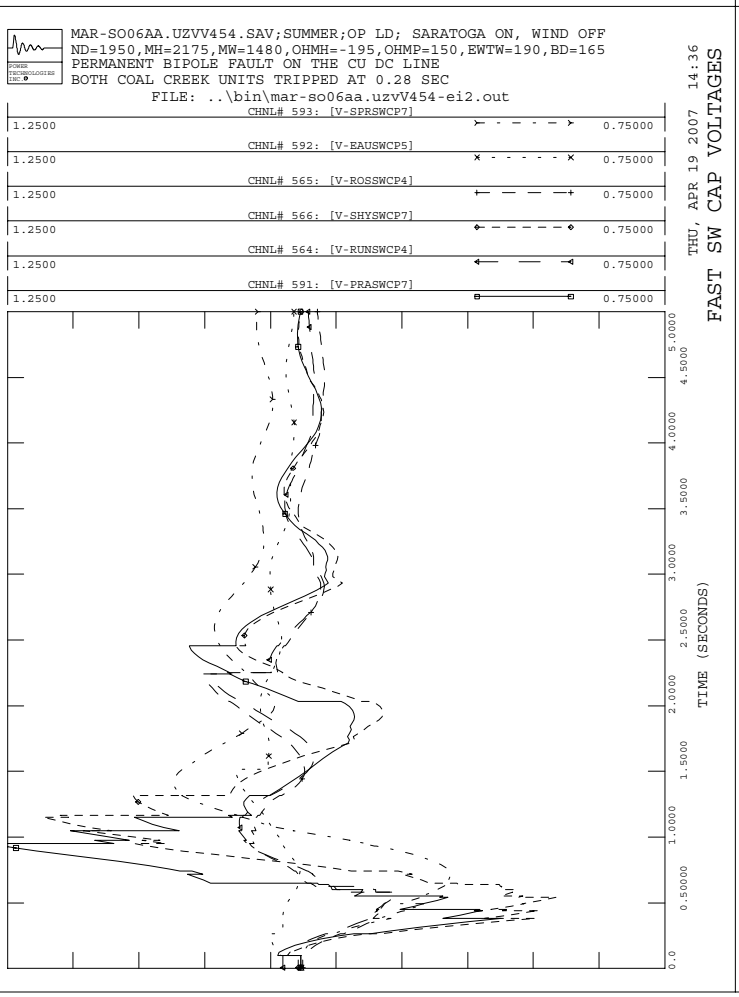

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1057: [A-GLENBOR4230]
CHNL# 1056: [V-GLENBOR4230]
CHNL# 581: [V-ROCHSTR5]
CHNL# 414: [V- ADAMS 5]
CHNL# 575: [V-EAU CL 3]
CHNL# 1116: [V-BLACKBERRY4]
THU, APR 19 2007 14:36
MISC VOLTAGES
TIME (SECONDS)

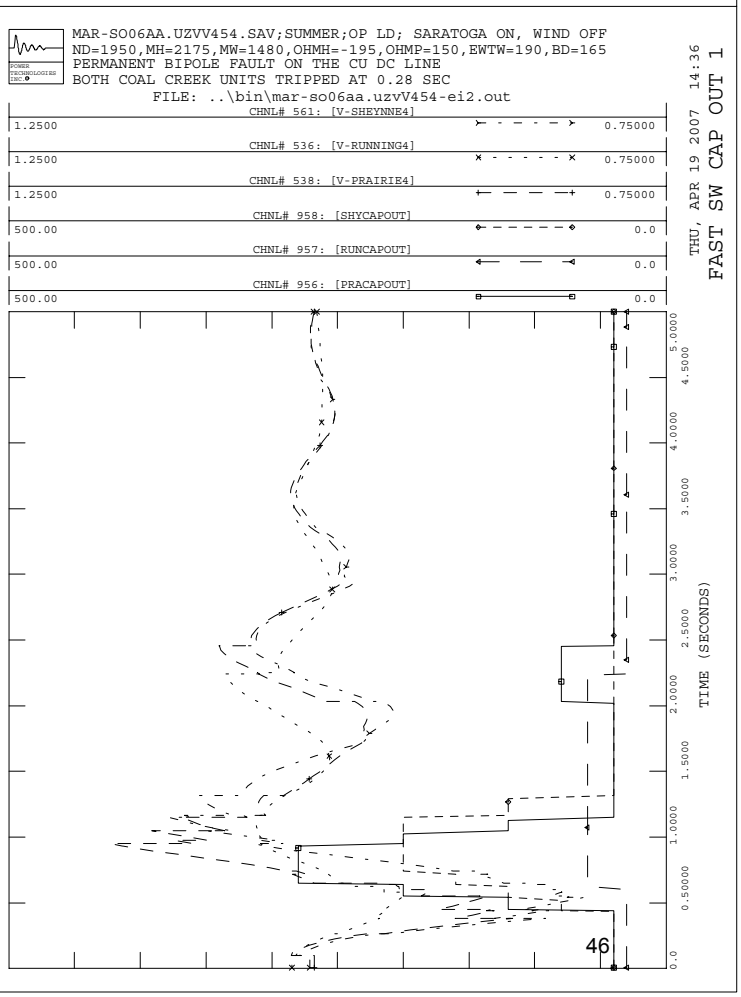

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 581: [V-ROCHSTR5]
CHNL# 414: [V- ADAMS 5]
CHNL# 575: [V-EAU CL 3]
THU, APR 19 2007 14:36
WISCONSIN VOLTAGES
TIME (SECONDS)

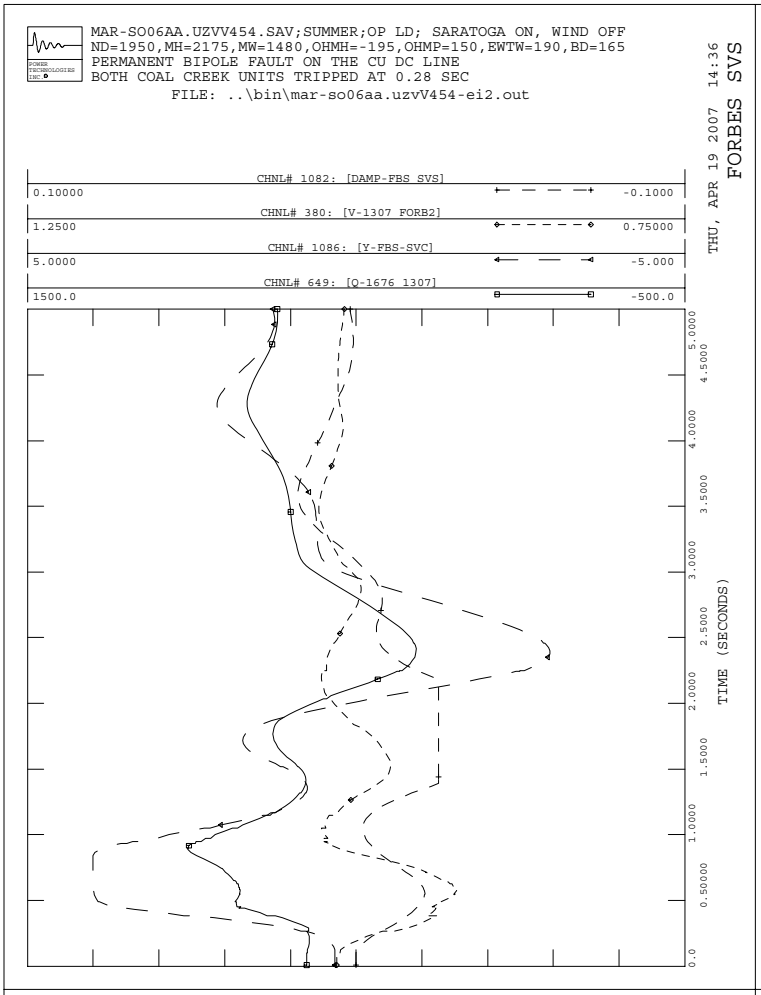

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 1115: [V-TAC HARBOR]
CHNL# 1114: [V-HOYT LAKES]
CHNL# 1113: [V-TWO HARBORS]
CHNL# 1116: [V-BLACKBERRY4]
CHNL# 550: [V-MINNTAC7]
CHNL# 552: [V-HIBBTAC7]
THU, APR 19 2007 14:36
NORTHERN MN VOLTAGES
TIME (SECONDS)

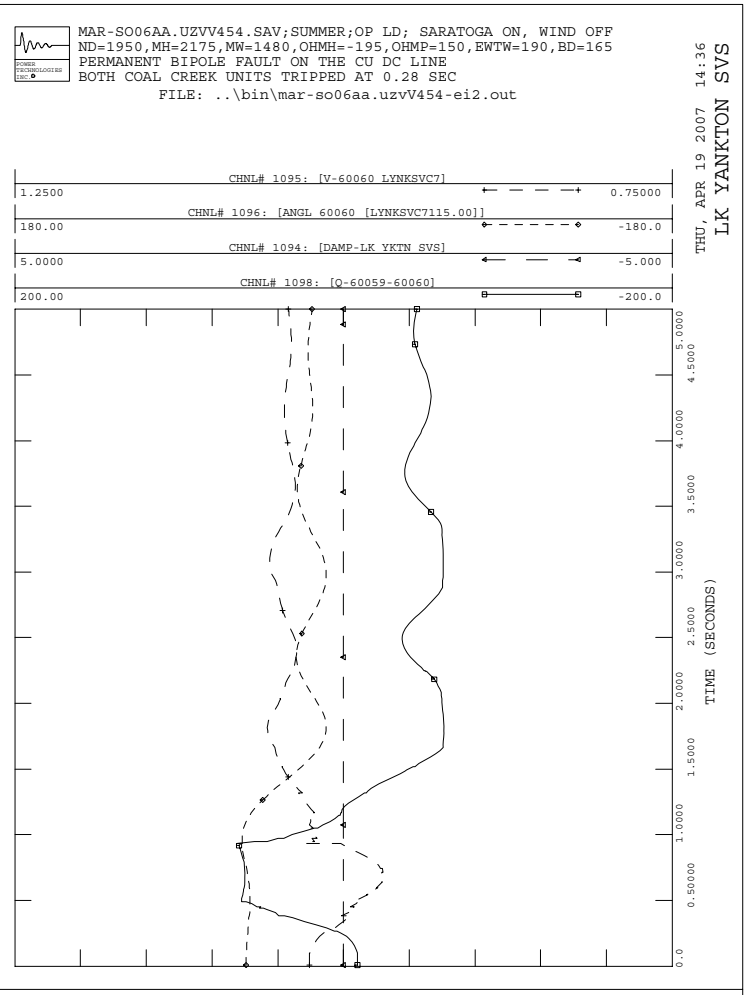

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 964: [BLTCAPOUT]
CHNL# 1083: [V-BALTA4]
CHNL# 580: [V-RCK ELM5]
CHNL# 577: [V-PINE LK7]
CHNL# 572: [V-PARKERS3]
CHNL# 961: [PKLCAPOUT]
THU, APR 19 2007 14:36
FAST SW CAP VOLTAGES 2
TIME (SECONDS)

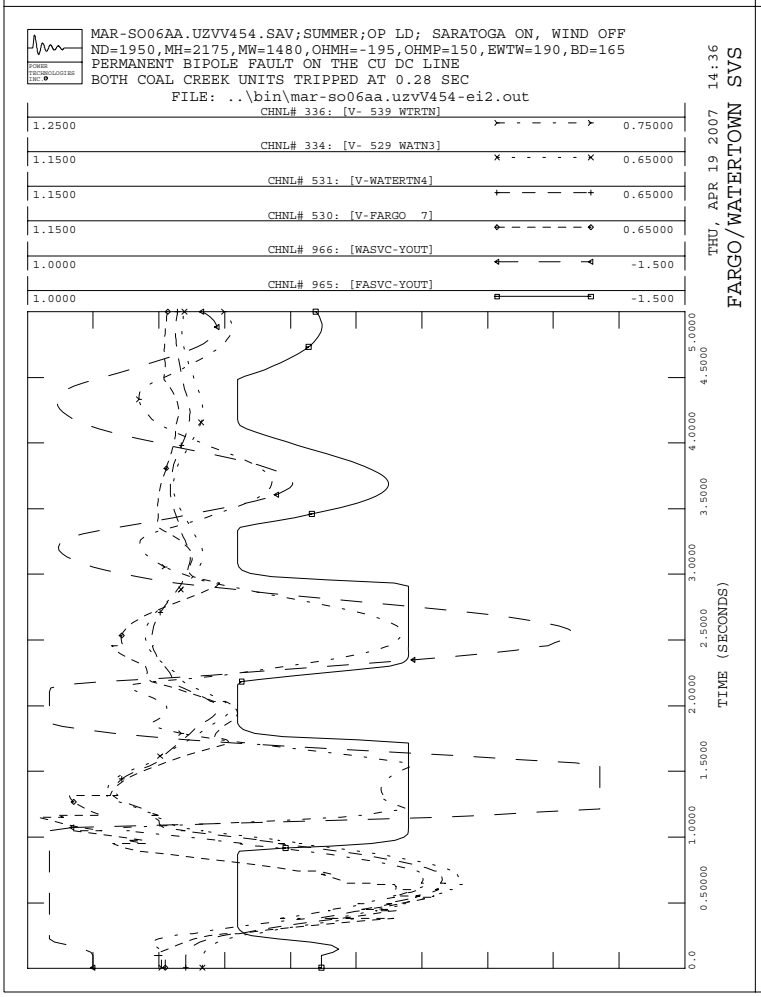

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 556: [V-RAMSEY 4]
CHNL# 568: [V-ROSEAU 4]
CHNL# 963: [SPRCAPOUT]
CHNL# 962: [EAUCAPOUT]
CHNL# 960: [RAMCAPOUT]
CHNL# 959: [ROSCAPOUT]
THU, APR 19 2007 14:36
FAST SW CAP OUT 2
TIME (SECONDS)

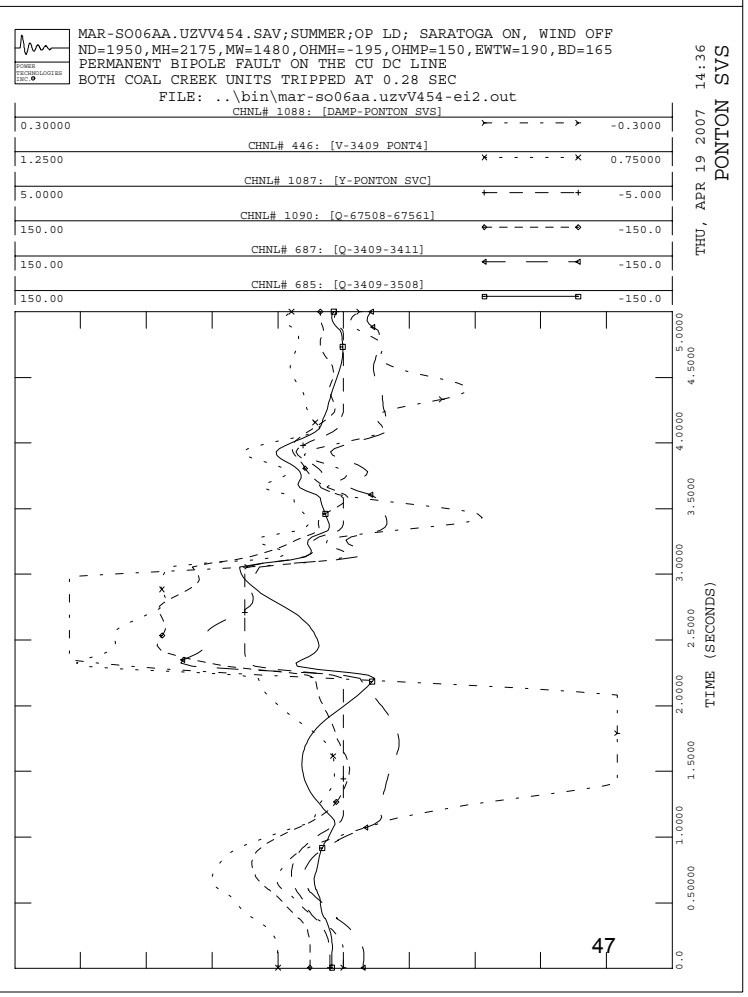

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 593: [V-SPRSWCP7]
CHNL# 592: [V-EAUSWCP5]
CHNL# 565: [V-ROSSWCP4]
CHNL# 566: [V-SHYSWCP7]
CHNL# 564: [V-RUNSWCP4]
CHNL# 591: [V-PRASWCP7]
THU, APR 19 2007 14:36
FAST SW CAP VOLTAGES
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 561: [V-SHEYNNE4]
CHNL# 536: [V-RUNNING4]
CHNL# 538: [V-PRAIRIE4]
CHNL# 958: [SHYCAPOUT]
CHNL# 957: [RUNCAPOUT]
CHNL# 956: [PRACAPOUT]
THU, APR 19 2007 14:36
FAST SW CAP OUT 1
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:36
FORBES SVS
CHNL# 1082: [DAMP-FBS SVS]
0.10000
-0.1000
CHNL# 380: [V-1307 FORB2]
1.2500
0.75000
CHNL# 1086: [Y-FBS-SVC]
5.0000
-5.000
CHNL# 649: [Q-1676 1307]
1500.0
-500.0
TIME (SECONDS)

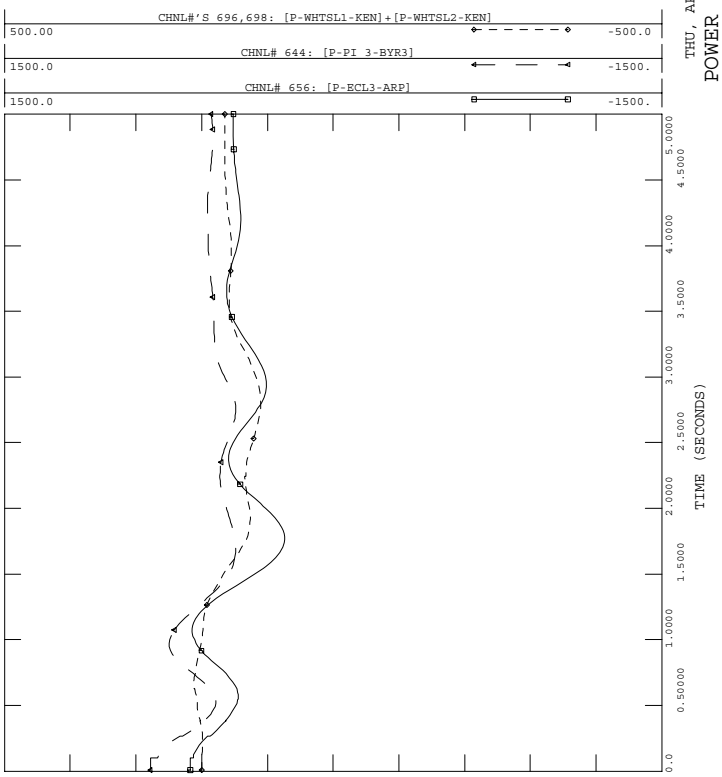

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:36
LK YANKTON SVS
CHNL# 1095: [V-60060 LYNKSVC7]
1.2500
0.75000
CHNL# 1096: [ANGL 60060 [LYNKSVC7115.00]]
180.00
-180.0
CHNL# 1094: [DAMP-LK YKTN SVS]
5.0000
-5.000
CHNL# 1098: [Q-60059-60060]
200.00
-200.0
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:36
FARGO/WATERTOWN SVS
CHNL# 336: [V- 539 WTRTN]
1.2500
0.75000
CHNL# 334: [V- 529 WATN3]
1.1500
0.65000
CHNL# 531: [V-WATERTN4]
1.1500
0.65000
CHNL# 530: [V-FARGO 7]
1.1500
0.65000
CHNL# 966: [WASVC-YOUT]
1.0000
-1.500
CHNL# 965: [FASVC-YOUT]
1.0000
-1.500
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:36
PONTON SVS
CHNL# 1088: [DAMP-PONTON SVS]
0.30000
-0.3000
CHNL# 446: [V-3409 PONT4]
1.2500
0.75000
CHNL# 1087: [Y-PONTON SVC]
5.0000
-5.000
CHNL# 1090: [Q-67508-67561]
150.00
-150.0
CHNL# 687: [Q-3409-3411]
150.00
-150.0
CHNL# 685: [Q-3409-3508]
150.00
-150.0
TIME (SECONDS)

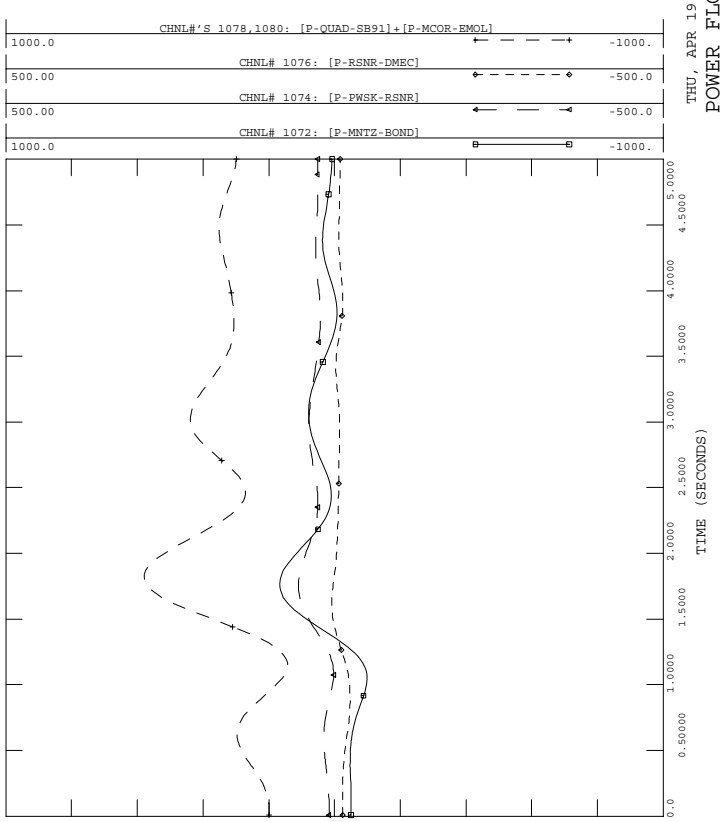
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

THU, APR 19 2007 14:36
POWER FLOW SUMS 2



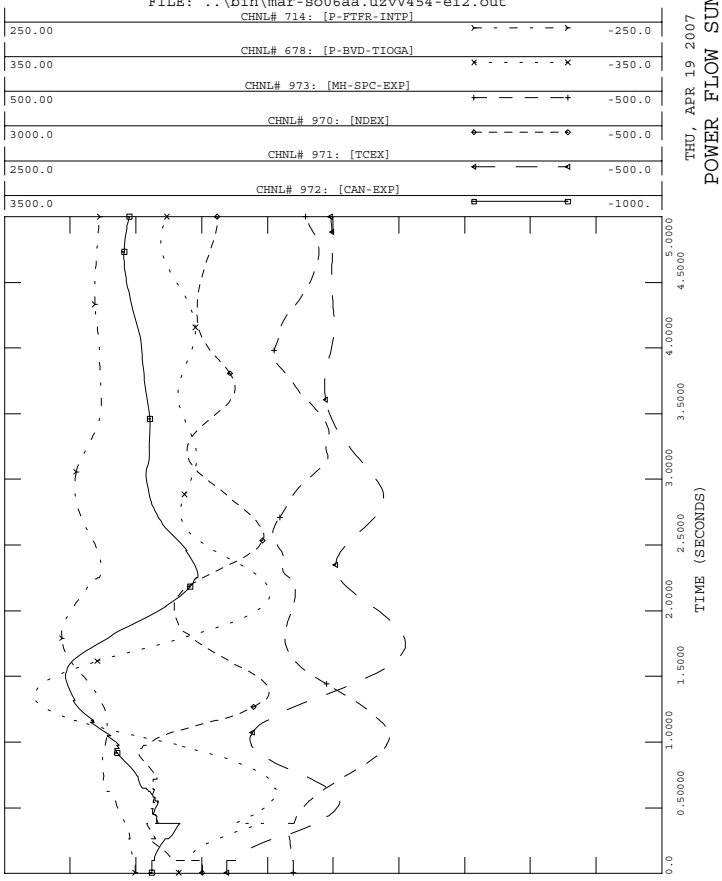

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

THU, APR 19 2007 14:36
POWER FLOW SUM 4



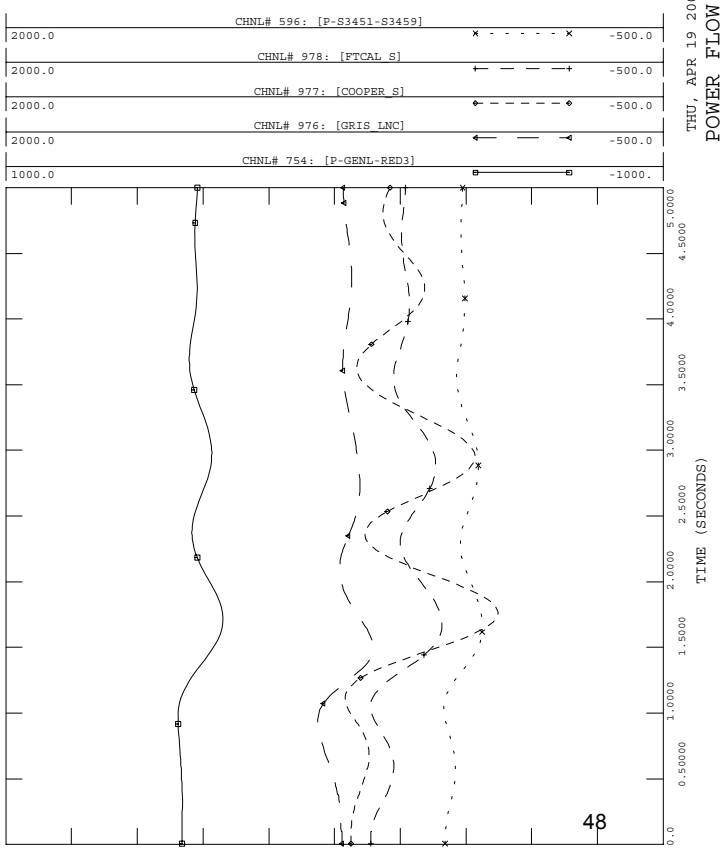

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

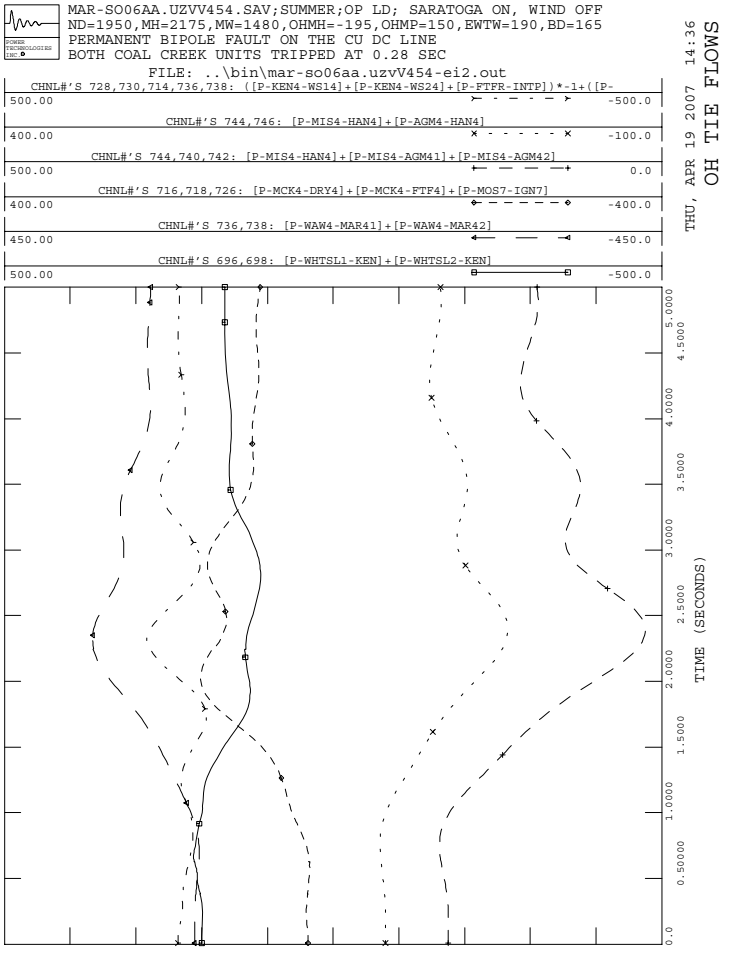
THU, APR 19 2007 14:36
POWER FLOW SUMS 1

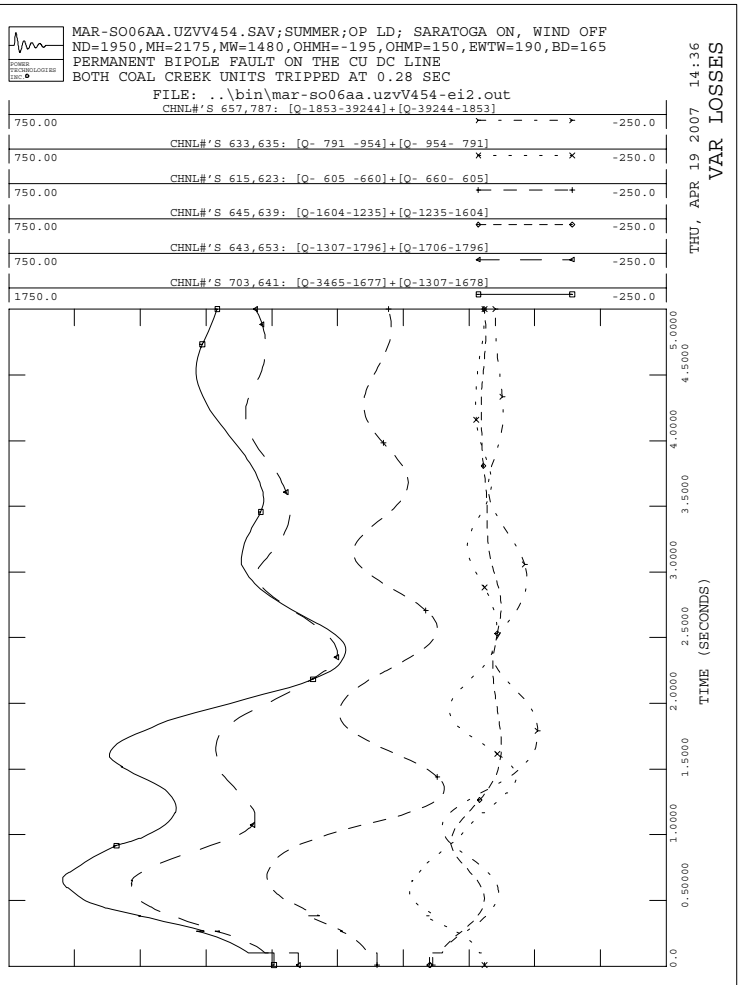


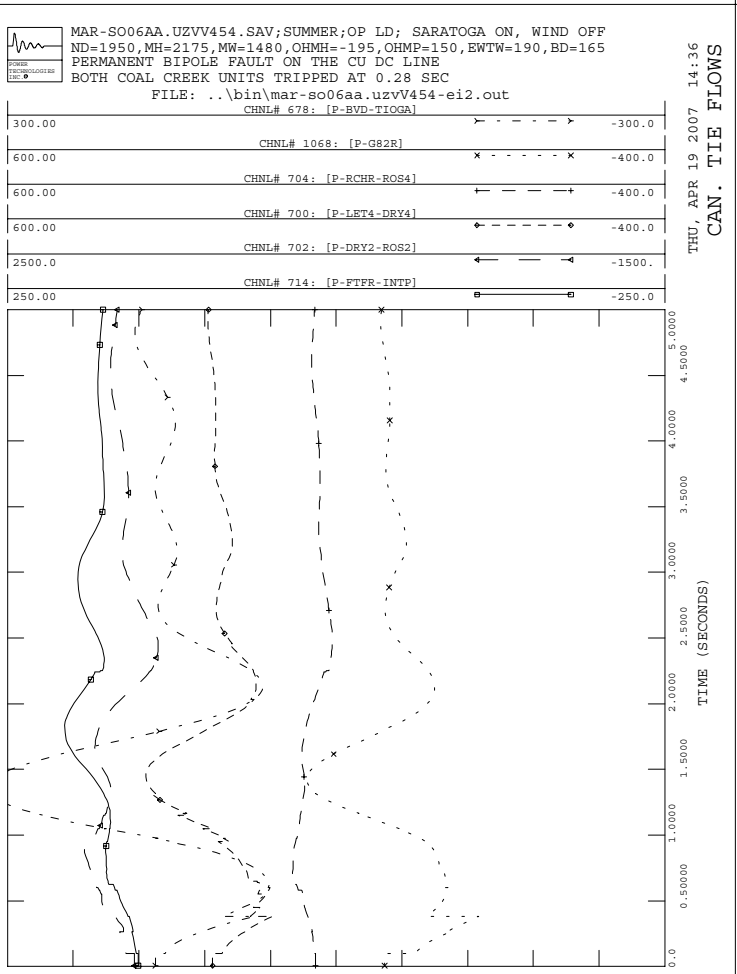

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

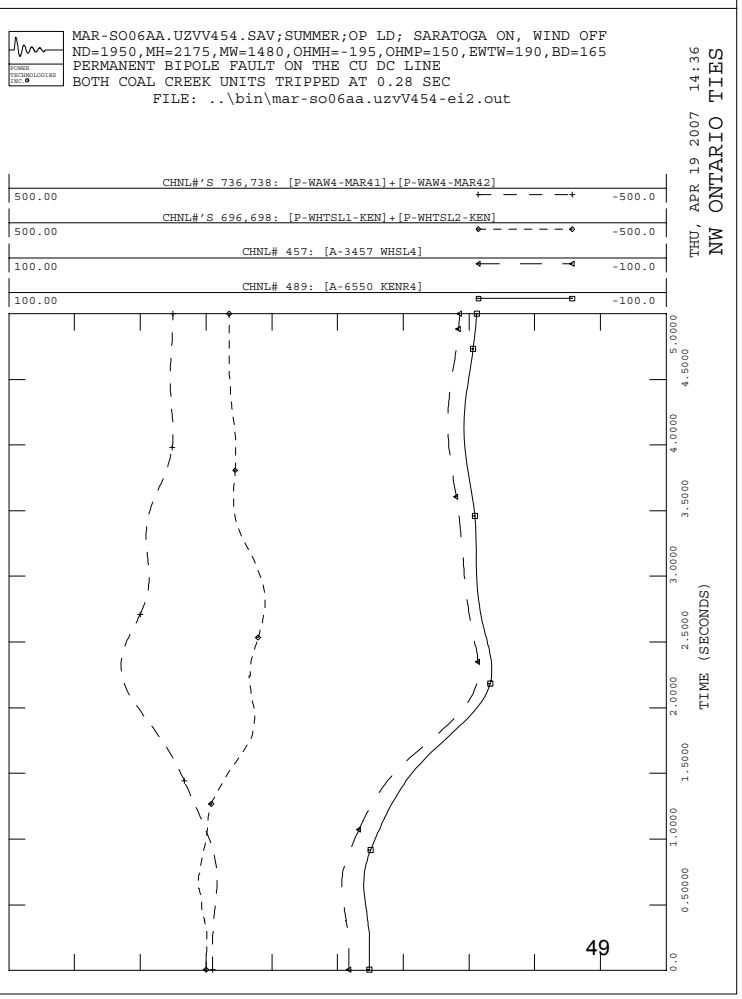
THU, APR 19 2007 14:36
POWER FLOW SUM 3

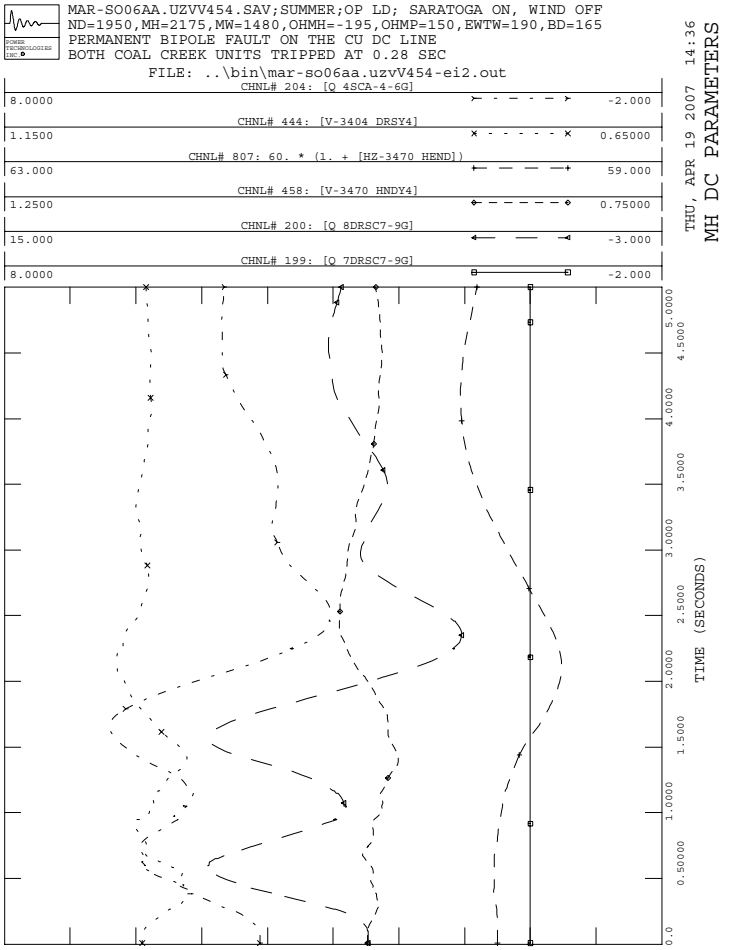


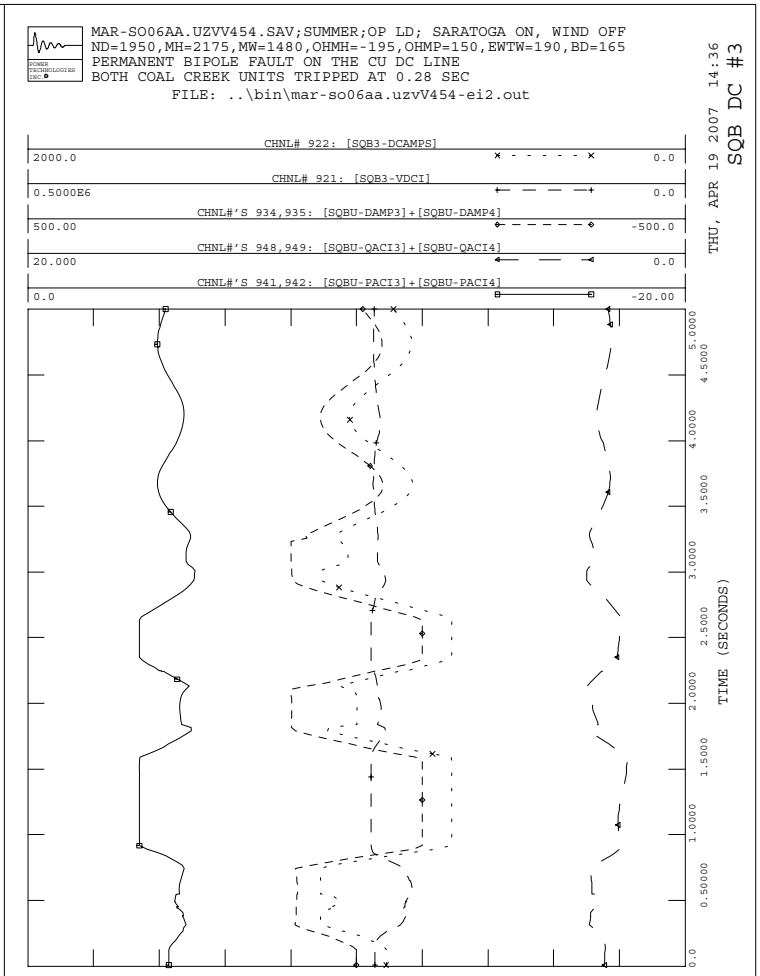

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL#'S 728,730,714,736,738: ((P-KEN4-WS14)+(P-KEN4-WS24)+(P-FTFR-INTP))*-1+((P-
500.00 -500.0
CHNL#'S 744,746: [P-MIS4-HAN4]+[P-AGM4-HAN4]
400.00 -100.0
CHNL#'S 744,740,742: [P-MIS4-HAN4]+[P-MIS4-AGM41]+[P-MIS4-AGM42]
500.00 0.0
CHNL#'S 716,718,726: [P-MCK4-DRY4]+[P-MCK4-FTF4]+[P-MOS7-IGN7]
400.00 -400.0
CHNL#'S 736,738: [P-WAW4-MAR41]+[P-WAW4-MAR42]
450.00 -450.0
CHNL#'S 696,698: [P-WHTSL1-KEN]+[P-WHTSL2-KEN]
500.00 -500.0
THU, APR 19 2007 14:36
OH TIE FLOWS
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

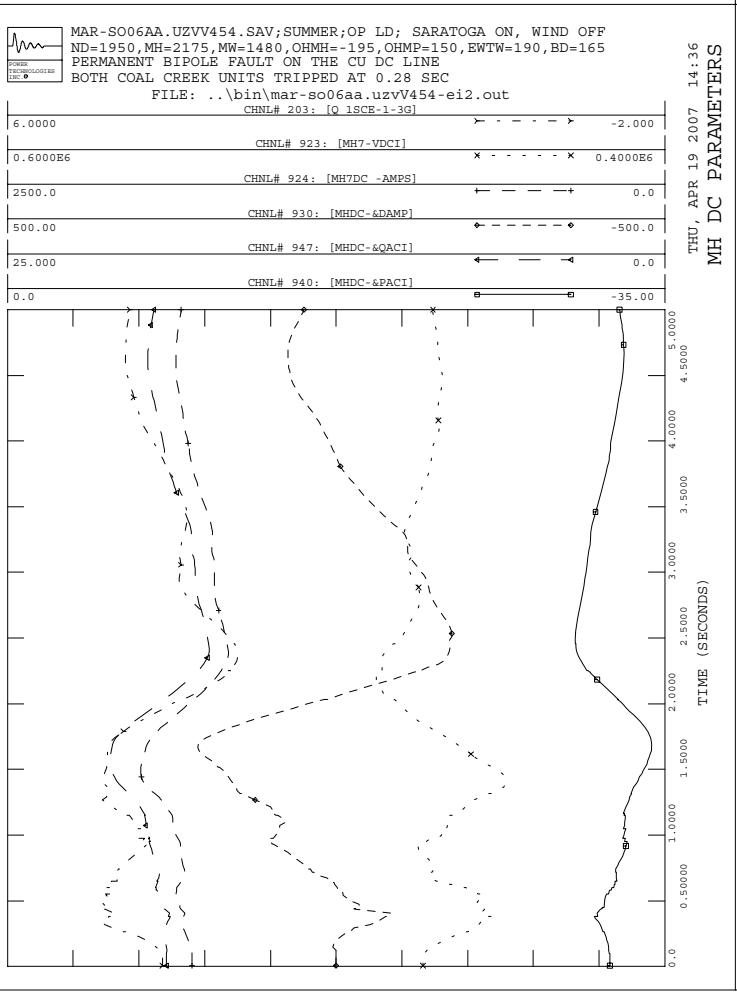

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL#'S 657,787: [Q-1853-39244]+[Q-39244-1853]
750.00 -250.0
CHNL#'S 633,635: [Q- 791 -954]+[Q- 954- 791]
750.00 -250.0
CHNL#'S 615,623: [Q- 605 -660]+[Q- 660- 605]
750.00 -250.0
CHNL#'S 645,639: [Q-1604-1235]+[Q-1235-1604]
750.00 -250.0
CHNL#'S 643,653: [Q-1307-1796]+[Q-1706-1796]
750.00 -250.0
CHNL#'S 703,641: [Q-3465-1677]+[Q-1307-1678]
1750.0 -250.0
THU, APR 19 2007 14:36
VAR LOSSES
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

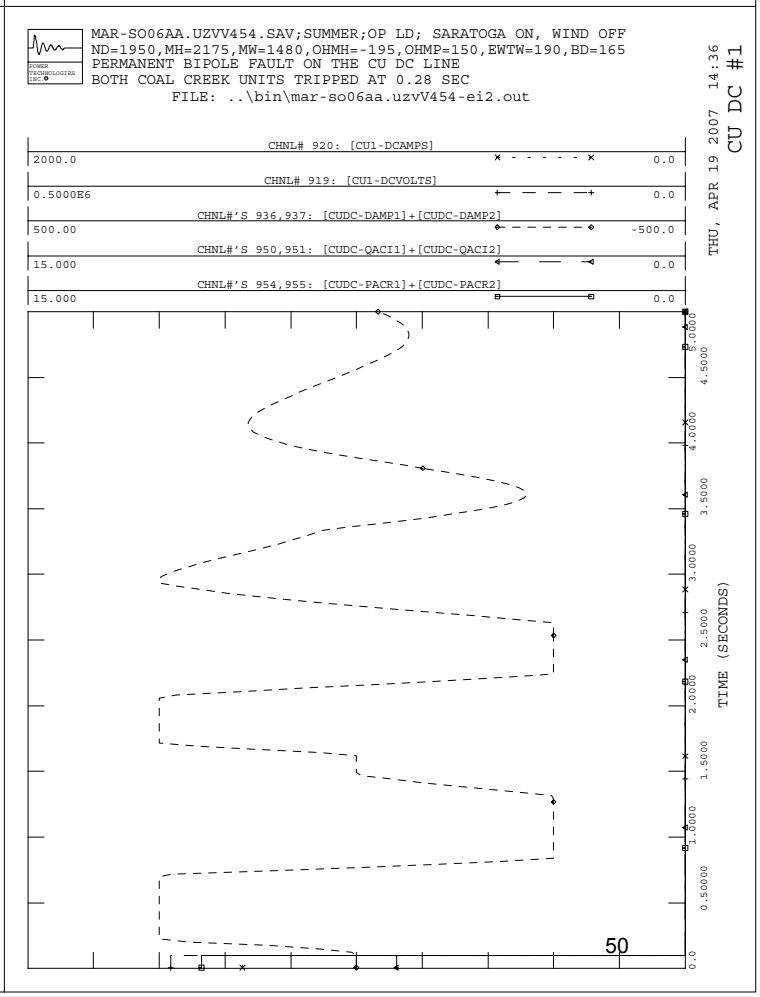

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 678: [P-BVD-TIOGA]
300.00 -300.0
CHNL# 1068: [P-G82R]
600.00 -400.0
CHNL# 704: [P-RCHR-ROS4]
600.00 -400.0
CHNL# 700: [P-LET4-DRY4]
600.00 -400.0
CHNL# 702: [P-DRY2-ROS2]
2500.0 -1500.
CHNL# 714: [P-FTFR-INTP]
250.00 -250.0
THU, APR 19 2007 14:36
CAN. TIE FLOWS
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL#'S 736,738: [P-WAW4-MAR41]+[P-WAW4-MAR42]
500.00 -500.0
CHNL#'S 696,698: [P-WHTSL1-KEN]+[P-WHTSL2-KEN]
500.00 -500.0
CHNL# 457: [A-3457 WHSL4]
100.00 -100.0
CHNL# 489: [A-6550 KENR4]
100.00 -100.0
THU, APR 19 2007 14:36
NW ONTARIO TIES
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 204: [Q 4SCA-4-6G]
8.0000
-2.000
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
CHNL# 807: 60. * (1. + [HZ-3470 HEND])
63.000
59.000
CHNL# 458: [V-3470 HNDY4]
1.2500
0.75000
CHNL# 200: [Q 8DRSC7-9G]
15.000
-3.000
CHNL# 199: [Q 7DRSC7-9G]
8.0000
-2.000
THU, APR 19 2007 14:36
MH DC PARAMETERS
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 922: [SQB3-DCAMPS]
2000.0
0.0
CHNL# 921: [SQB3-VDCI]
0.5000E6
0.0
CHNL#'S 934,935: [SQBU-DAMP3]+[SQBU-DAMP4]
500.00
-500.0
CHNL#'S 948,949: [SQBU-QACI3]+[SQBU-QACI4]
20.000
0.0
CHNL#'S 941,942: [SQBU-PACI3]+[SQBU-PACI4]
0.0
-20.00
THU, APR 19 2007 14:36
SQB DC #3
TIME (SECONDS)

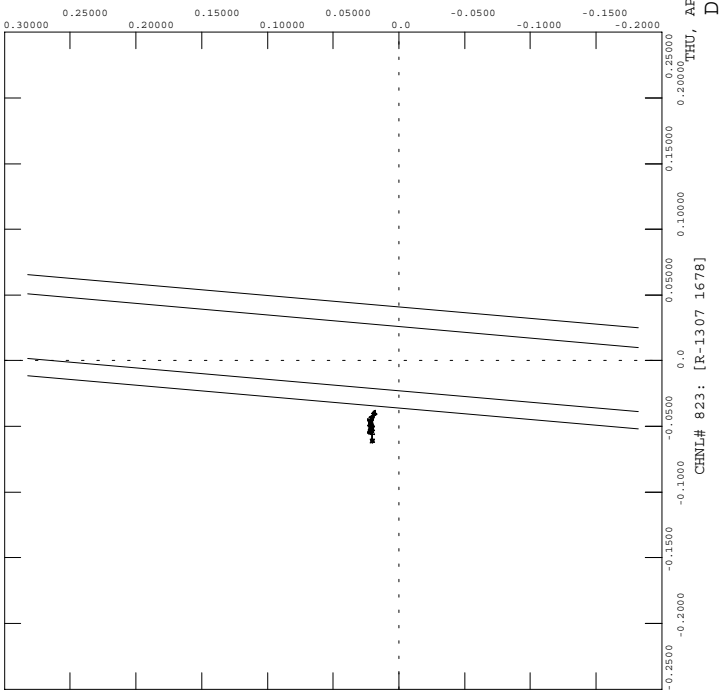

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 203: [Q 1SCE-1-3G]
6.0000
-2.000
CHNL# 923: [MH7-VDCI]
0.6000E6
0.4000E6
CHNL# 924: [MH7DC -AMPS]
2500.0
0.0
CHNL# 930: [MHDC-&DAMP]
500.00
-500.0
CHNL# 947: [MHDC-&QACI]
25.000
0.0
CHNL# 940: [MHDC-&PACI]
0.0
-35.00
THU, APR 19 2007 14:36
MH DC PARAMETERS
TIME (SECONDS)


MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out
CHNL# 920: [CU1-DCAMPS]
2000.0
0.0
CHNL# 919: [CU1-DCVOLTS]
0.5000E6
0.0
CHNL#'S 936,937: [CUDC-DAMP1]+[CUDC-DAMP2]
500.00
-500.0
CHNL#'S 950,951: [CUDC-QACI1]+[CUDC-QACI2]
15.000
0.0
CHNL#'S 954,955: [CUDC-PACR1]+[CUDC-PACR2]
15.000
0.0
THU, APR 19 2007 14:36
CU DC #1
TIME (SECONDS)

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]

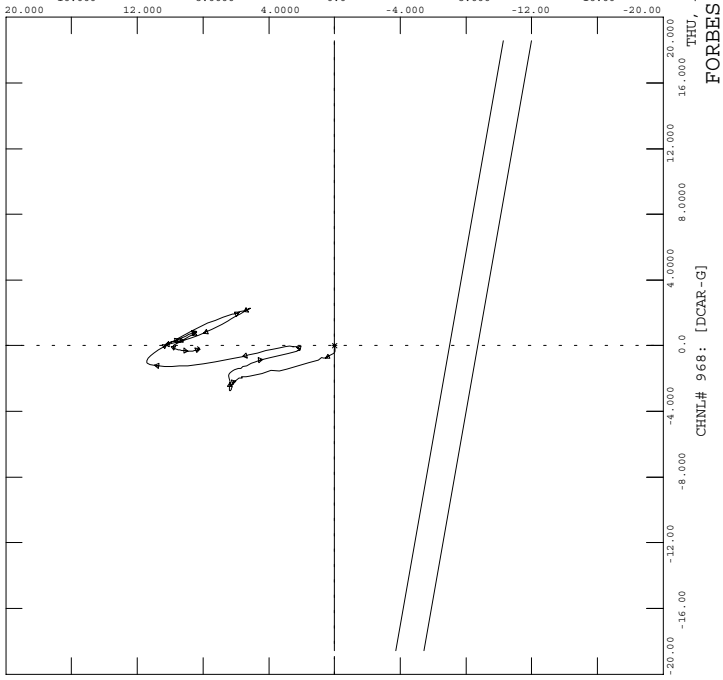



THU, APR 19 2007 14:36
D602F-FORBES (612)

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

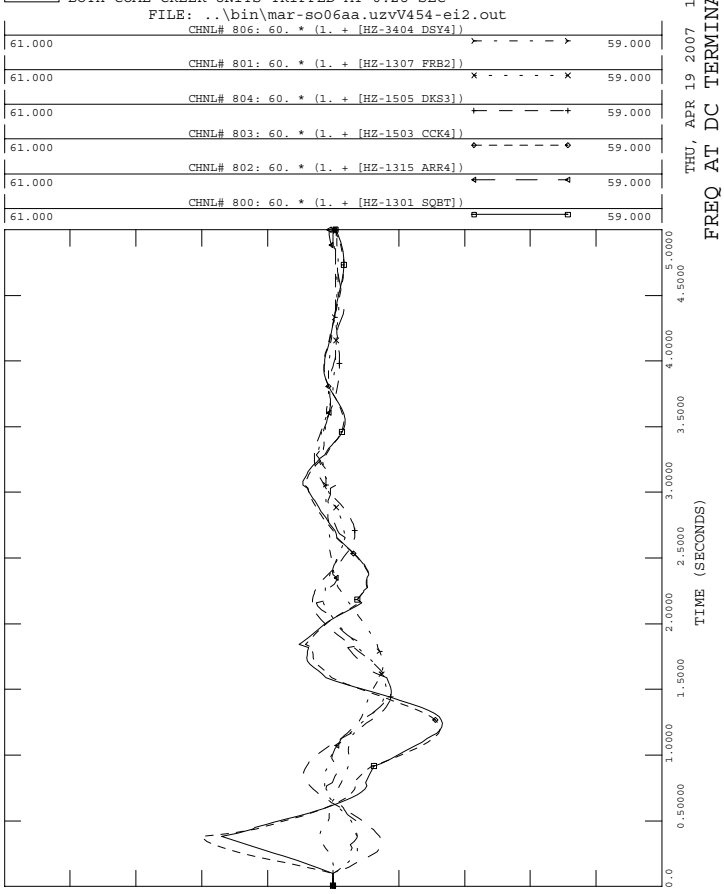
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 969: [DCAR-B]




THU, APR 19 2007 14:36
FORBES DC RED DCAR (679)

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

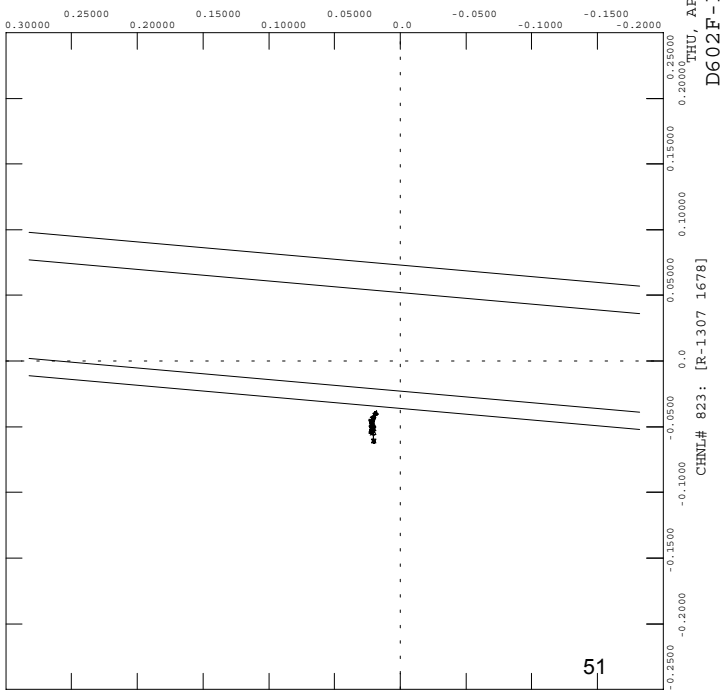



THU, APR 19 2007 14:36
FREQ AT DC TERMINALS

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]

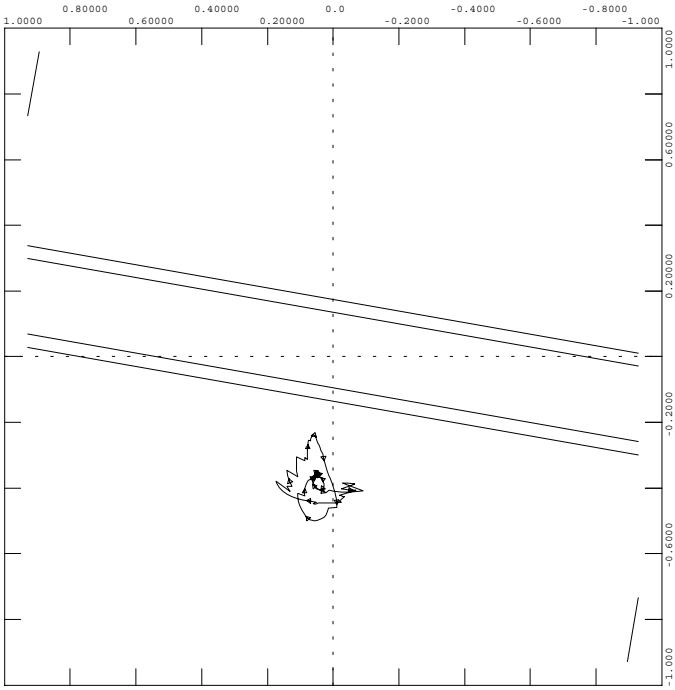



THU, APR 19 2007 14:36
D602F-FORBES-EMRG (778)

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

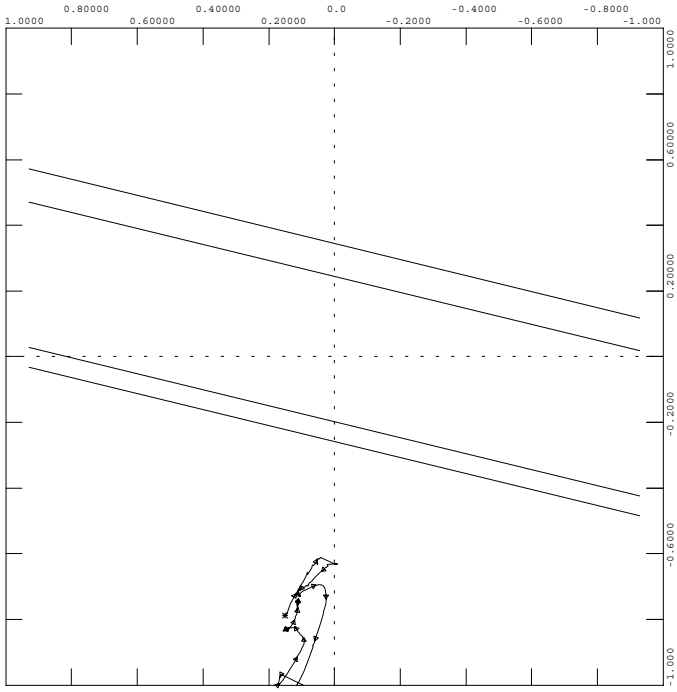
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

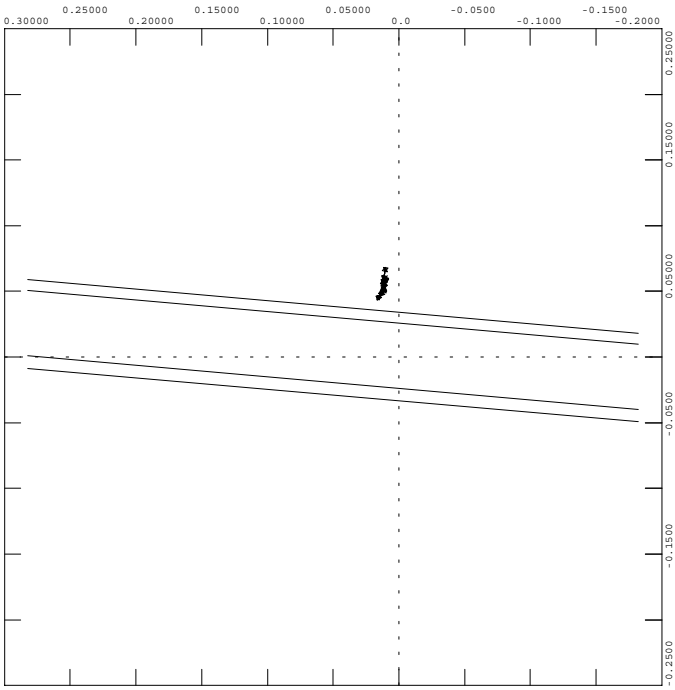
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

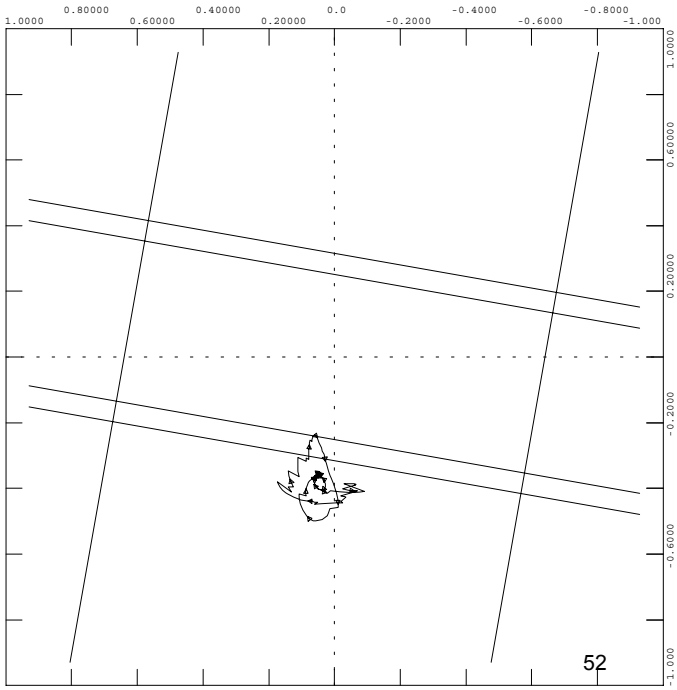
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 856: [X-DSY2-ROS2]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

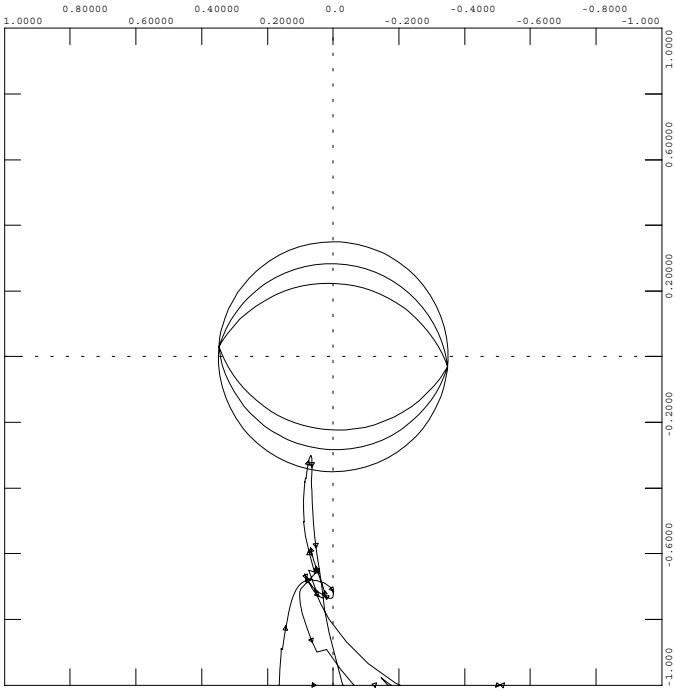
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]



MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

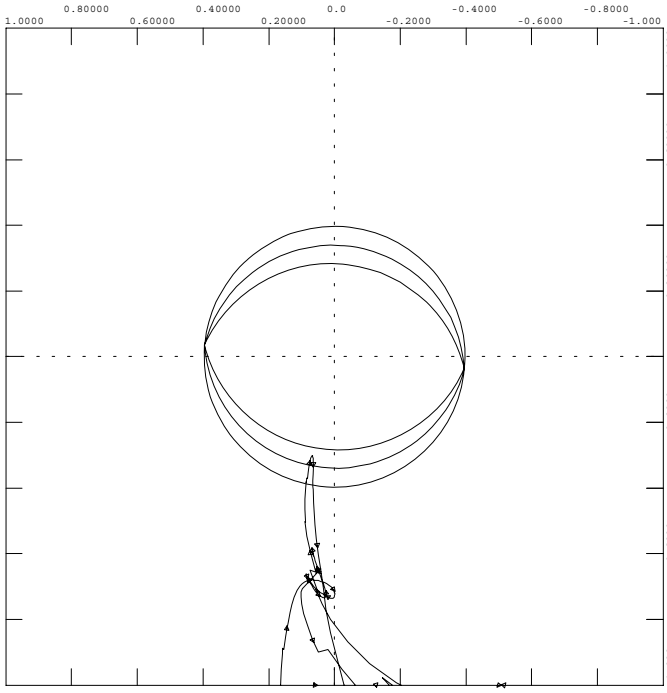
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

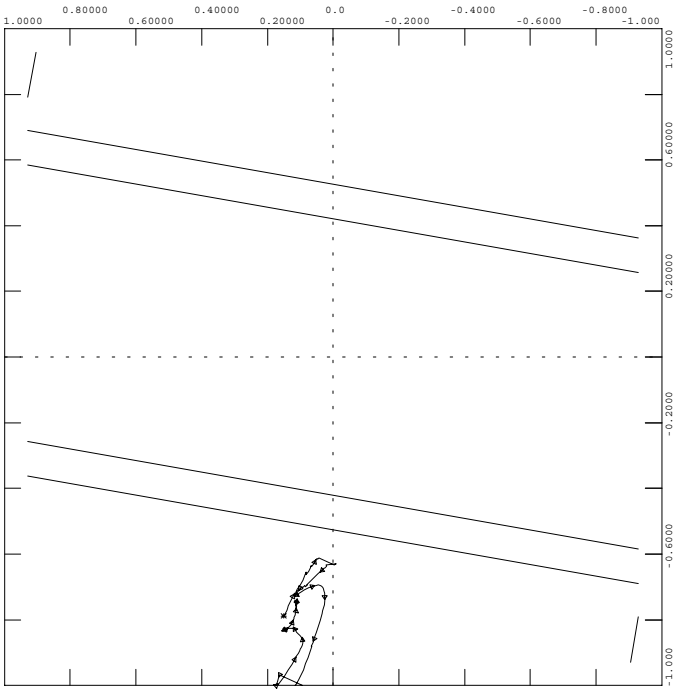
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

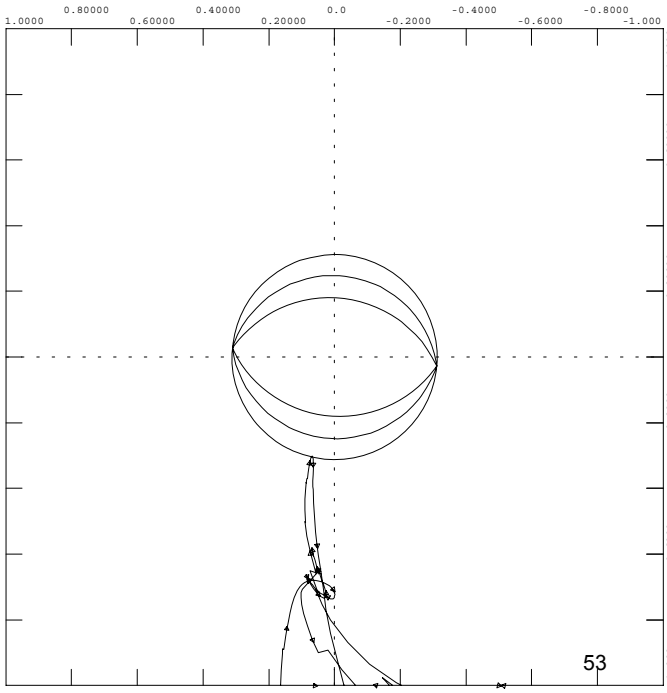
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

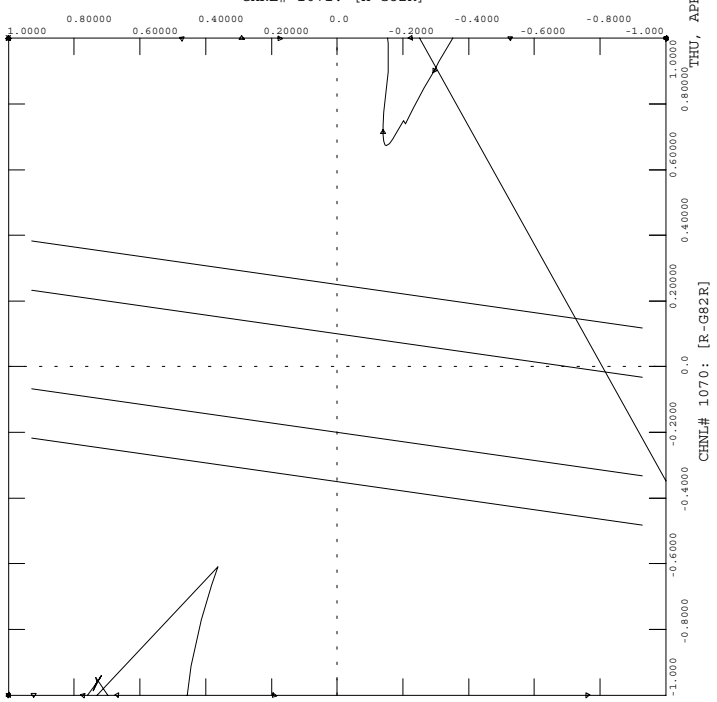
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]



MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

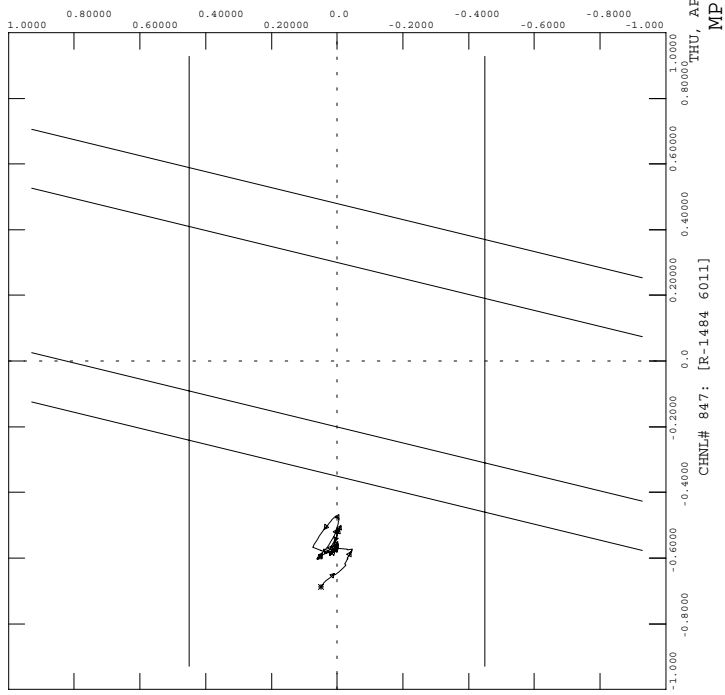
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 1071: [X-G82R]

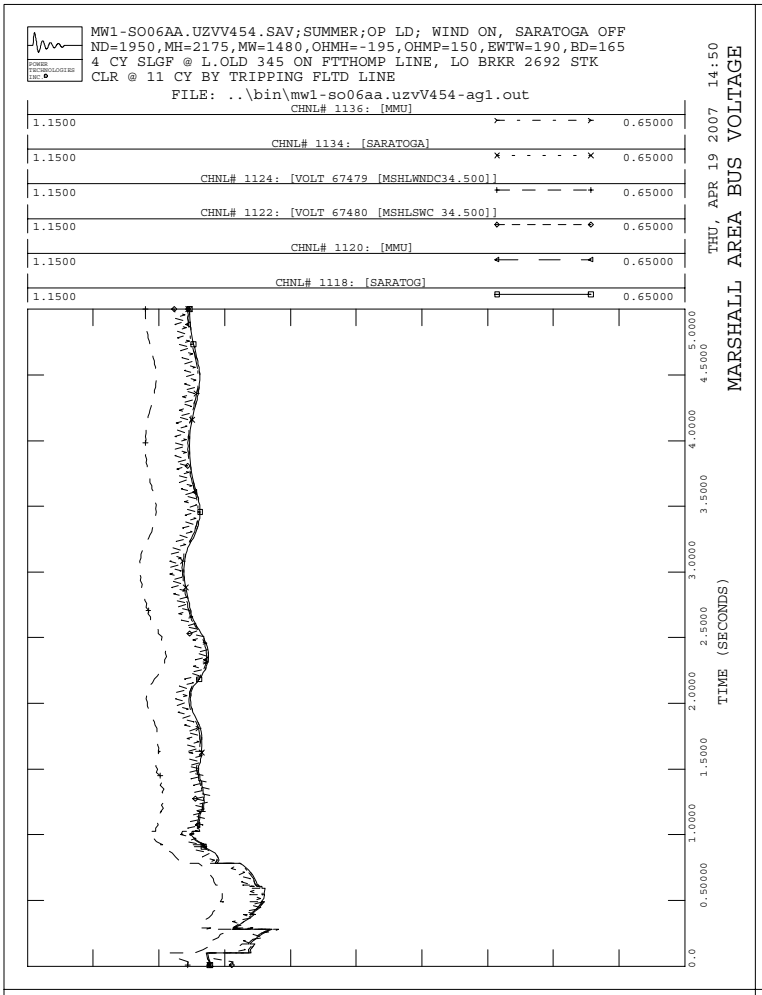


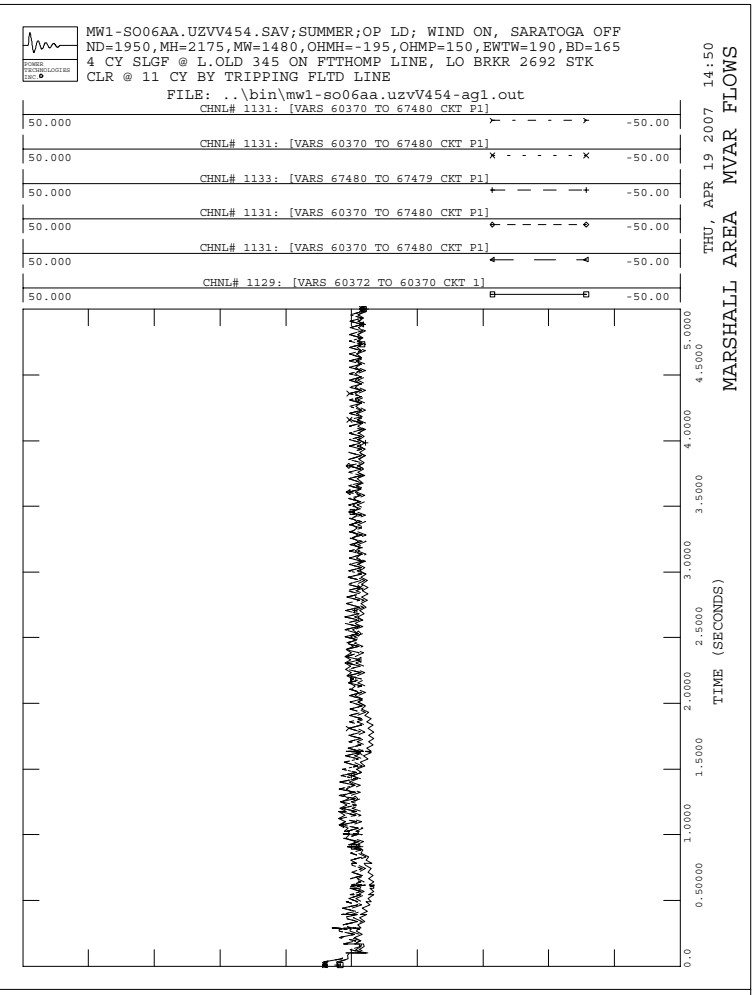

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

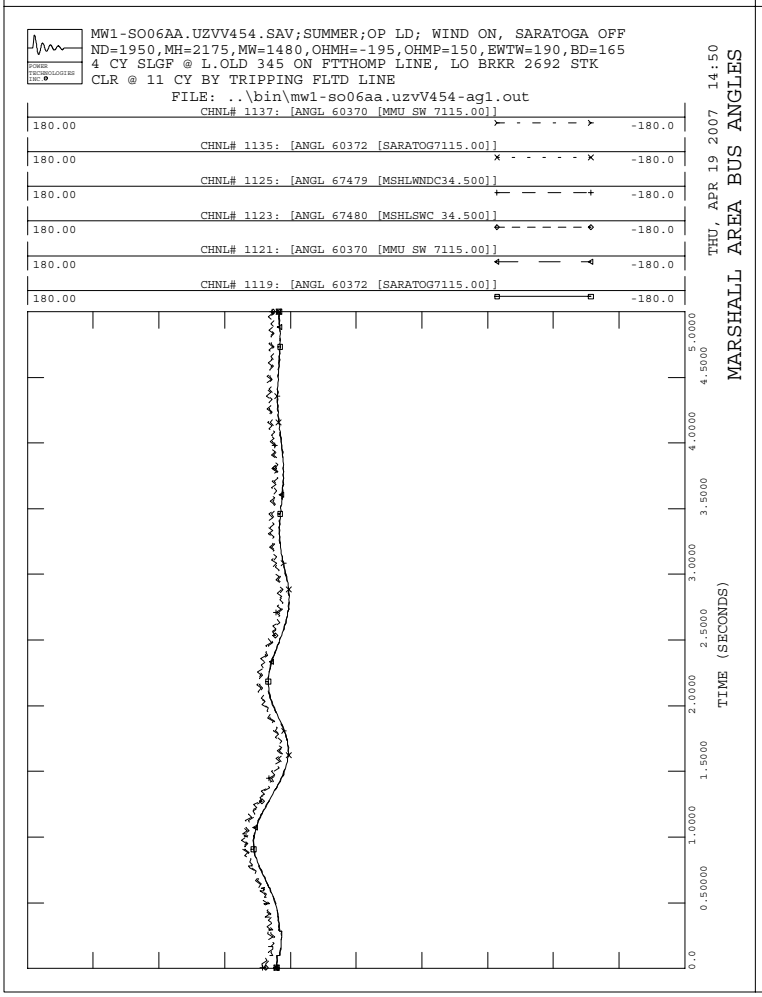
FILE: ..\bin\mar-so06aa.uzvV454-ei2.out

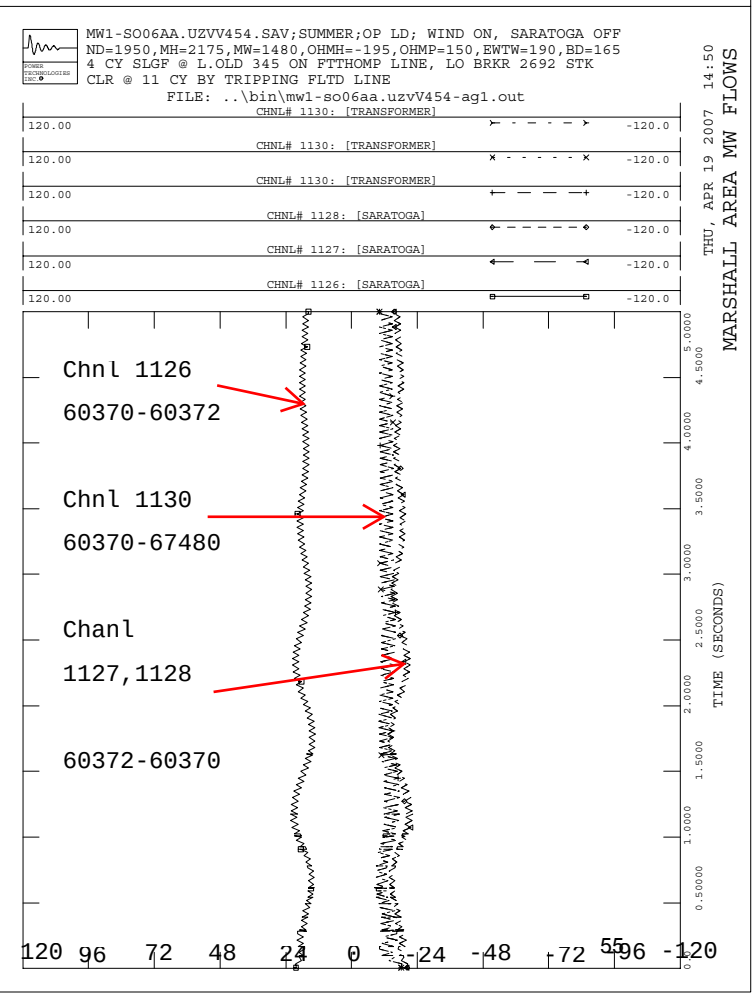
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 848: [X-INT.F-FTF]

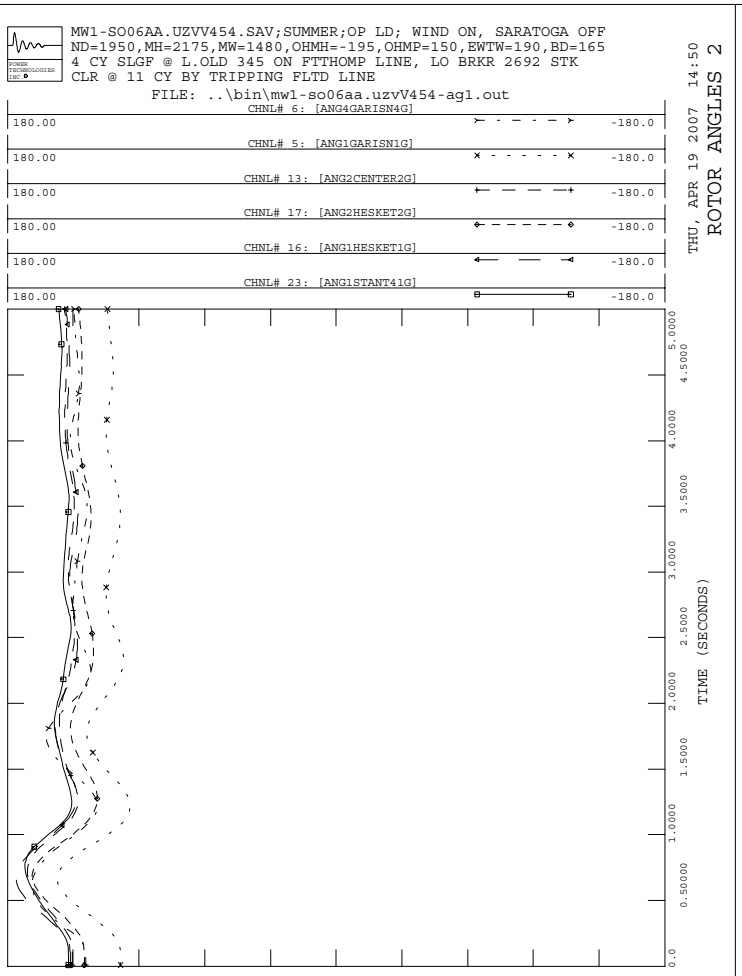


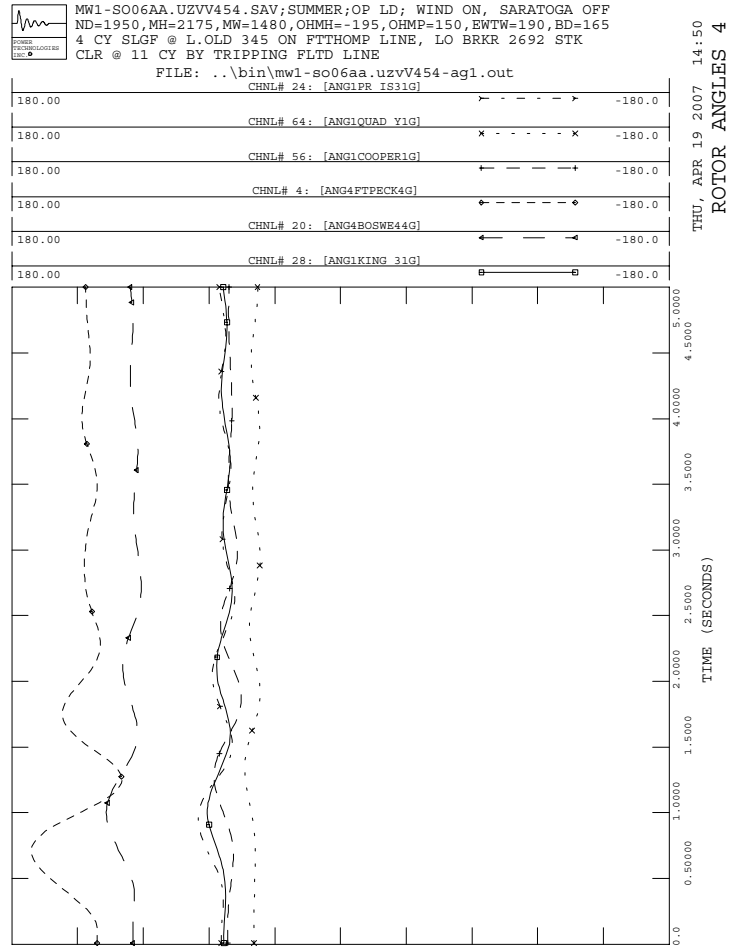

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 1136: [MMU]
CHNL# 1134: [SARATOGA]
CHNL# 1124: [VOLT 67479 [MSHLWNDC34.500]]
CHNL# 1122: [VOLT 67480 [MSHLSWC 34.500]]
CHNL# 1120: [MMU]
CHNL# 1118: [SARATOG]
1.1500
0.65000
THU, APR 19 2007 14:50
MARSHALL AREA BUS VOLTAGE
TIME (SECONDS)

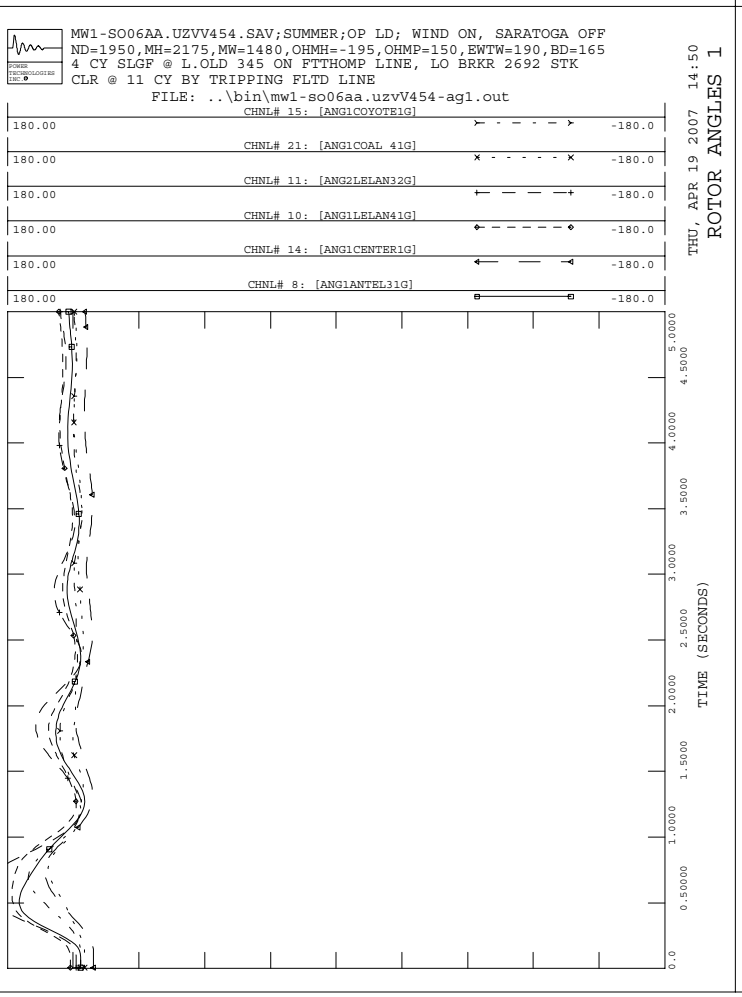

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1133: [VARS 67480 TO 67479 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1129: [VARS 60372 TO 60370 CKT 1]
50.000
-50.00
THU, APR 19 2007 14:50
MARSHALL AREA MVAR FLOWS
TIME (SECONDS)

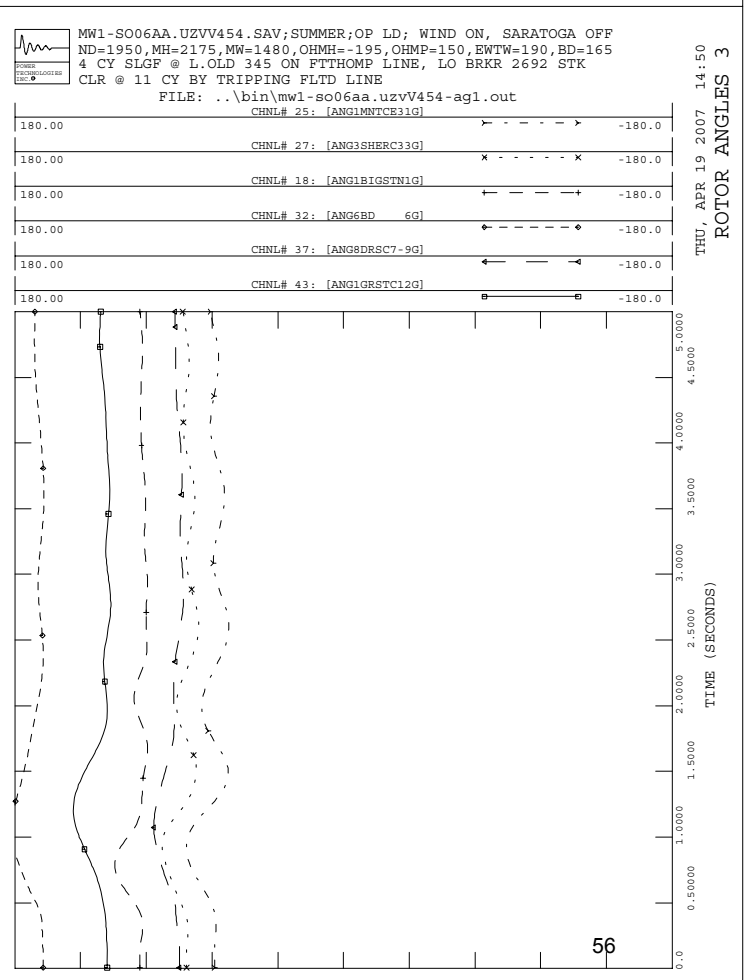

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 1137: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1135: [ANGL 60372 [SARATOG7115.00]]
CHNL# 1125: [ANGL 67479 [MSHLWNDC34.500]]
CHNL# 1123: [ANGL 67480 [MSHLSWC 34.500]]
CHNL# 1121: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1119: [ANGL 60372 [SARATOG7115.00]]
180.00
-180.0
THU, APR 19 2007 14:50
MARSHALL AREA BUS ANGLES
TIME (SECONDS)

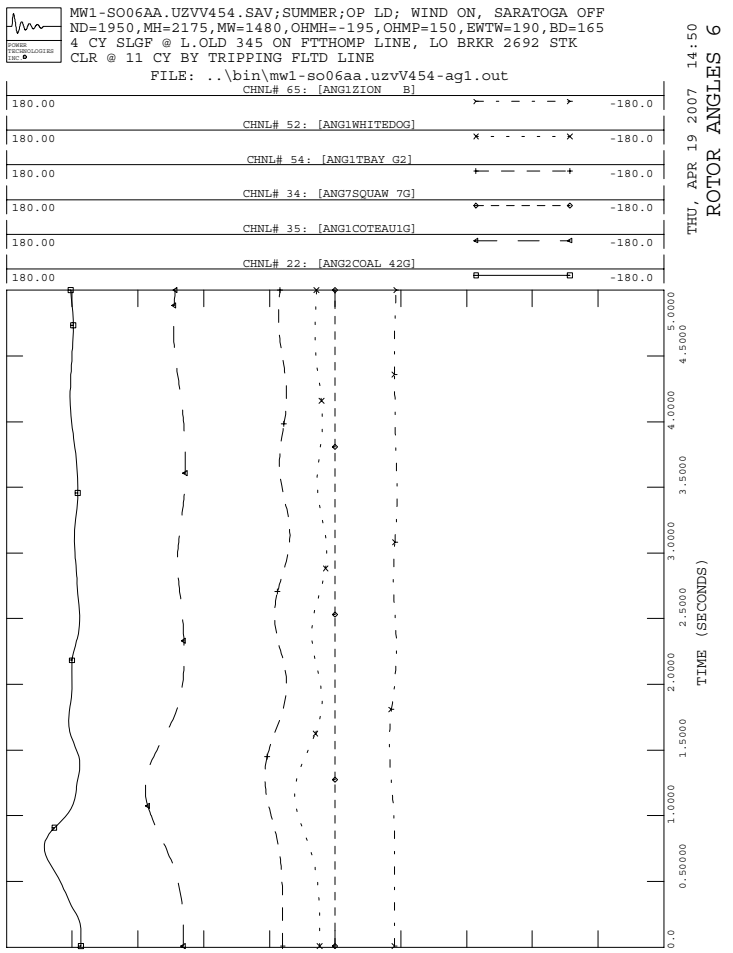

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1128: [SARATOGA]
CHNL# 1127: [SARATOGA]
CHNL# 1126: [SARATOGA]
120.00
-120.0
Chnl 1126
60370-60372
Chnl 1130
60370-67480
Chanl
1127,1128
60372-60370
120 96 72 48 24 0 -24 -48 -72 -96 -120
THU, APR 19 2007 14:50
MARSHALL AREA MW FLOWS
TIME (SECONDS)

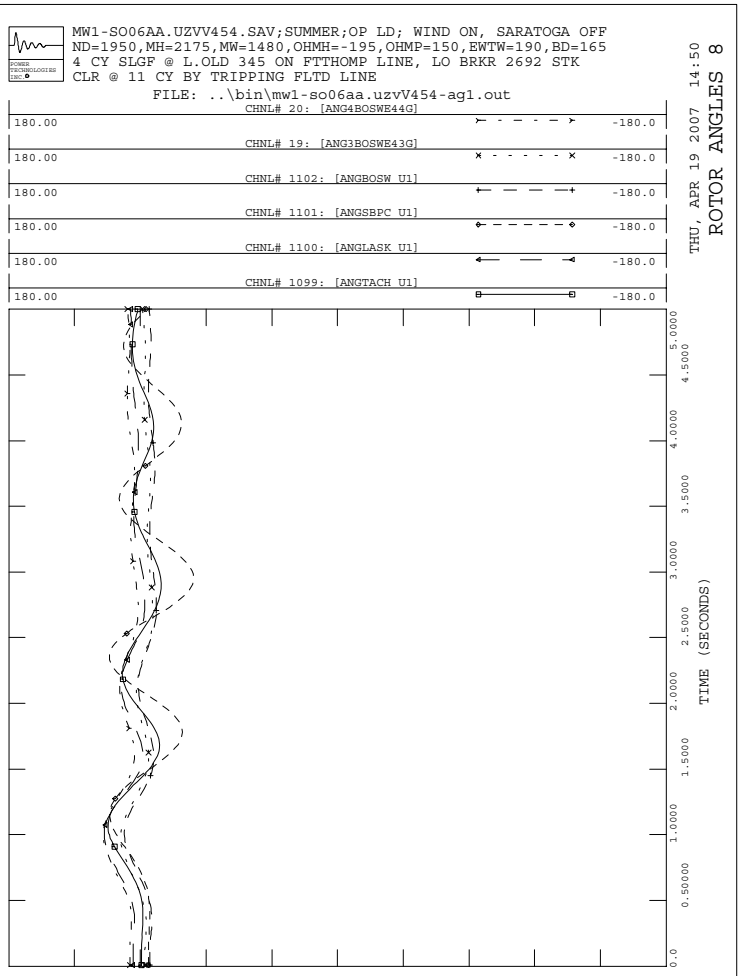

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 6: [ANG4GARISN4G]
CHNL# 5: [ANG1GARISN1G]
CHNL# 13: [ANG2CENTER2G]
CHNL# 17: [ANG2HESKET2G]
CHNL# 16: [ANG1HESKET1G]
CHNL# 23: [ANG1STANT41G]
180.00
-180.0
TIME (SECONDS)
THU, APR 19 2007 14:50
ROTOR ANGLES 2

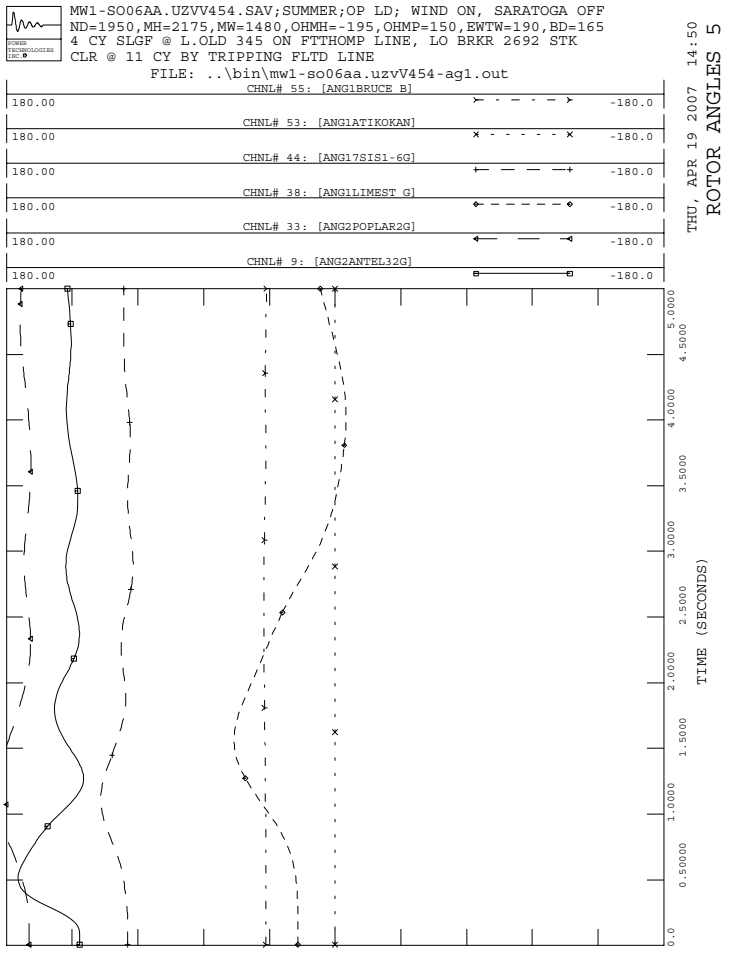

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 24: [ANG1PR IS31G]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 56: [ANG1COOPER1G]
CHNL# 4: [ANG4FTPECK4G]
CHNL# 20: [ANG4BOSWE44G]
CHNL# 28: [ANG1KING 31G]
180.00
-180.0
TIME (SECONDS)
THU, APR 19 2007 14:50
ROTOR ANGLES 4

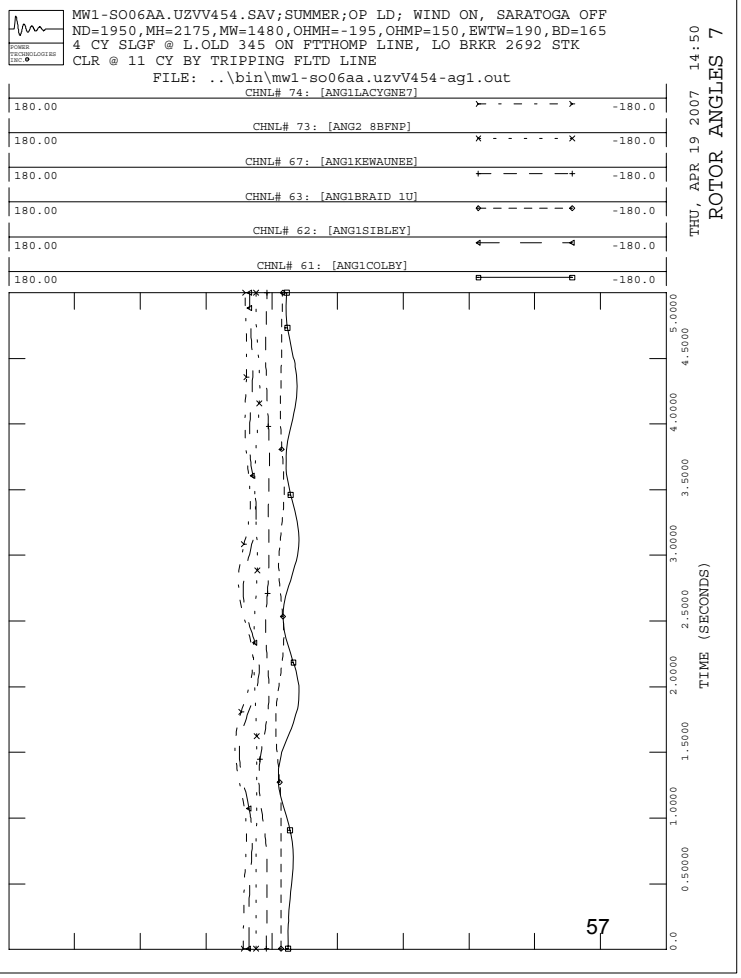

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 15: [ANG1COYOTE1G]
CHNL# 21: [ANG1COAL 41G]
CHNL# 11: [ANG2LELAN32G]
CHNL# 10: [ANG1LELAN41G]
CHNL# 14: [ANG1CENTER1G]
CHNL# 8: [ANG1ANTEL31G]
180.00
-180.0
TIME (SECONDS)
THU, APR 19 2007 14:50
ROTOR ANGLES 1


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 25: [ANG1MNTCE31G]
CHNL# 27: [ANG3SHERC33G]
CHNL# 18: [ANG1BIGSTN1G]
CHNL# 32: [ANG6BD 6G]
CHNL# 37: [ANG8DRSC7-9G]
CHNL# 43: [ANG1GRSTC12G]
180.00
-180.0
TIME (SECONDS)
THU, APR 19 2007 14:50
ROTOR ANGLES 3


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 65: [ANG1ZION B]
CHNL# 52: [ANG1WHITEDOG]
CHNL# 54: [ANG1TBAY G2]
CHNL# 34: [ANG7SQUAW 7G]
CHNL# 35: [ANG1COTEAU1G]
CHNL# 22: [ANG2COAL 42G]
180.00
-180.0
THU, APR 19 2007 14:50
ROTOR ANGLES 6
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

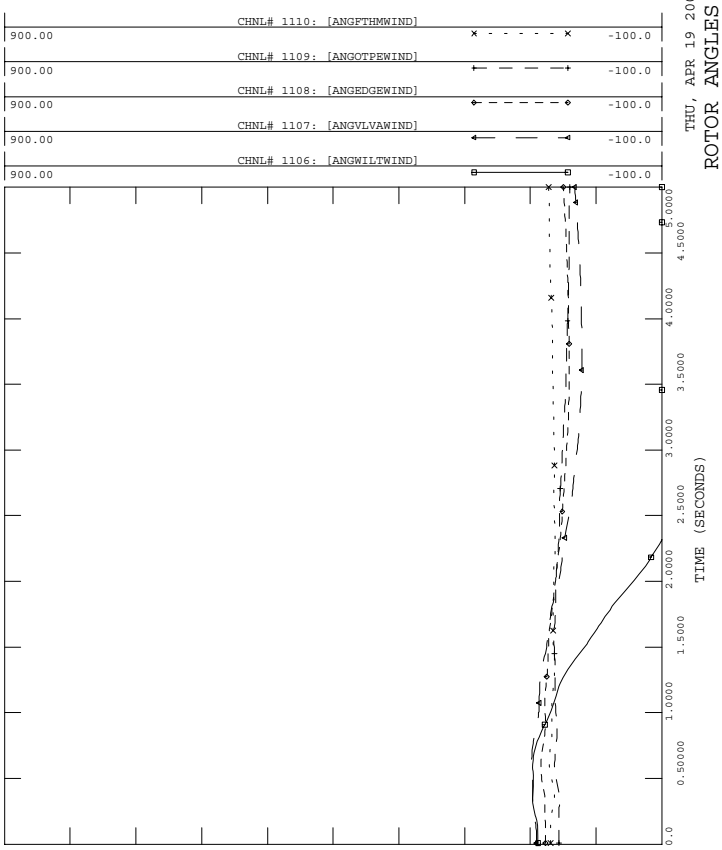

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 20: [ANG4BOSWE44G]
CHNL# 19: [ANG3BOSWE43G]
CHNL# 1102: [ANGBOSW U1]
CHNL# 1101: [ANGSBPC U1]
CHNL# 1100: [ANGLASK U1]
CHNL# 1099: [ANGTACH U1]
180.00
-180.0
THU, APR 19 2007 14:50
ROTOR ANGLES 8
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 55: [ANG1BRUCE B]
CHNL# 53: [ANG1ATIKOKAN]
CHNL# 44: [ANG17SIS1-6G]
CHNL# 38: [ANG1LIMEST G]
CHNL# 33: [ANG2POPLAR2G]
CHNL# 9: [ANG2ANTEL32G]
180.00
-180.0
THU, APR 19 2007 14:50
ROTOR ANGLES 5
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 74: [ANG1LACYGNE7]
CHNL# 73: [ANG2 8BFNP]
CHNL# 67: [ANG1KEWAUNEE]
CHNL# 63: [ANG1BRAID 1U]
CHNL# 62: [ANG1SIBLEY]
CHNL# 61: [ANG1COLBY]
180.00
-180.0
THU, APR 19 2007 14:50
ROTOR ANGLES 7
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

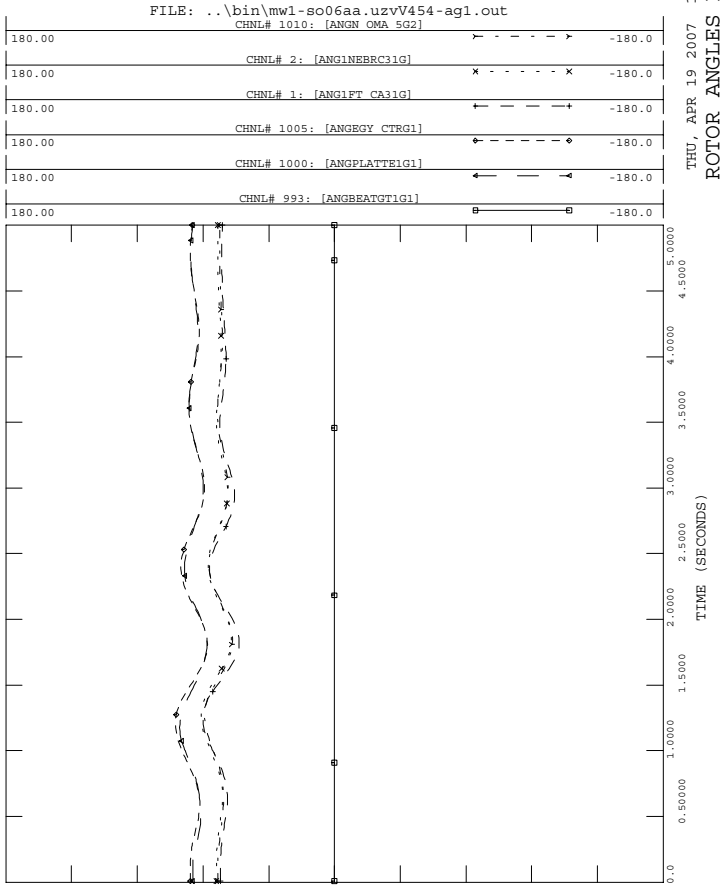
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
ROTOR ANGLES WIND2



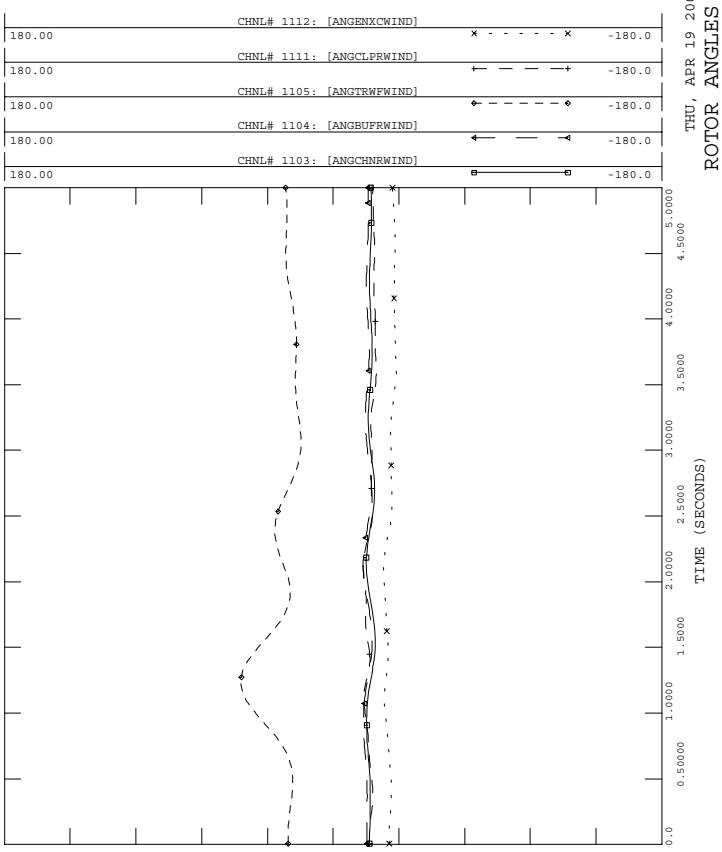

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
ROTOR ANGLES NB2



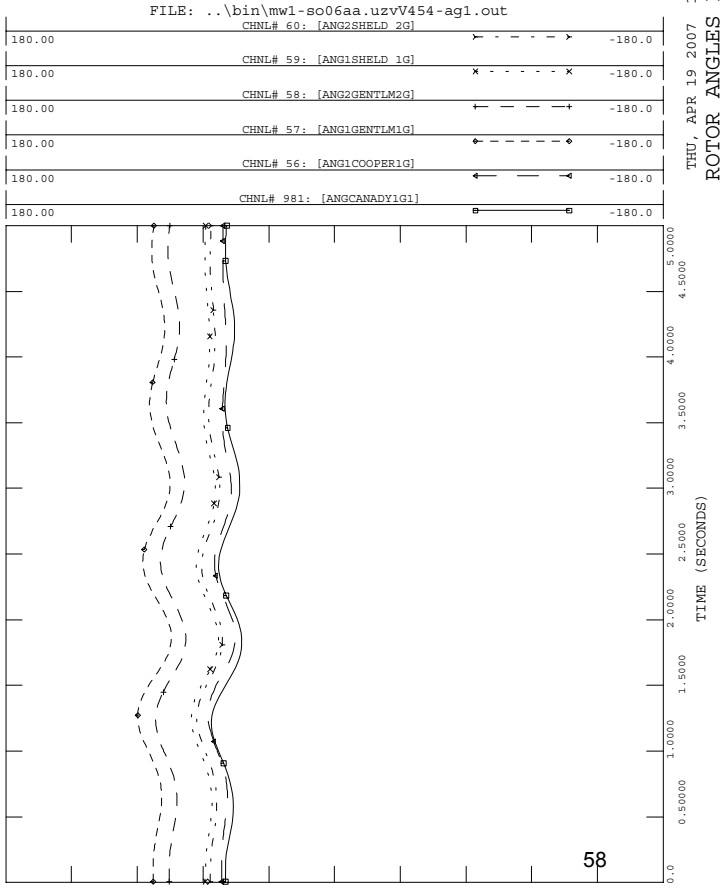

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

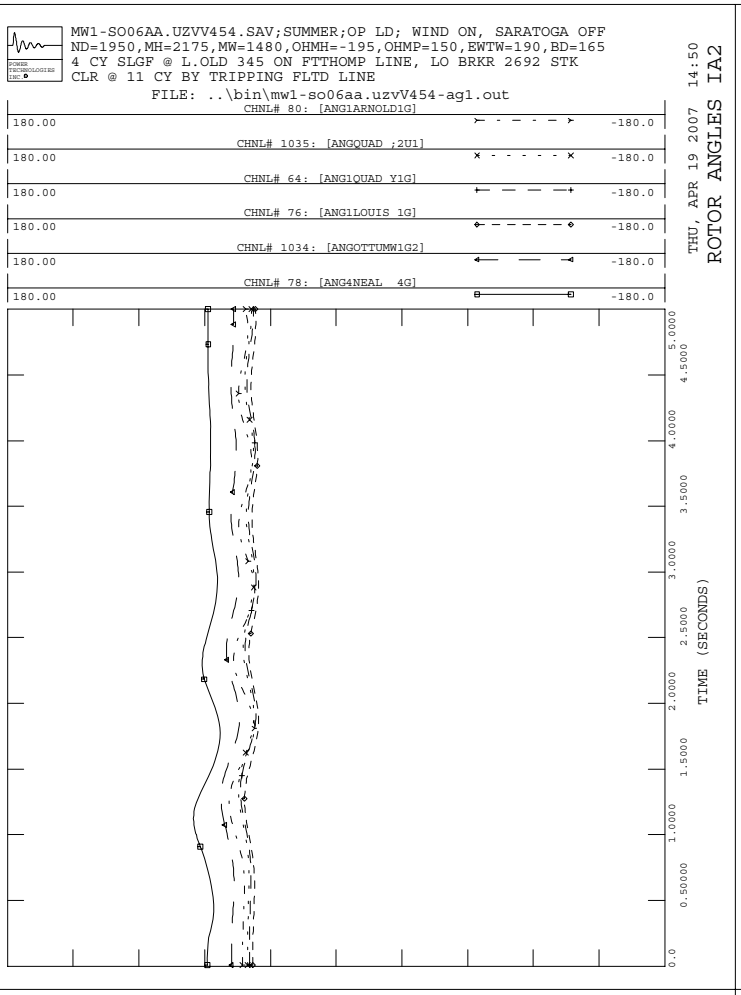
THU, APR 19 2007 14:50
ROTOR ANGLES WIND1

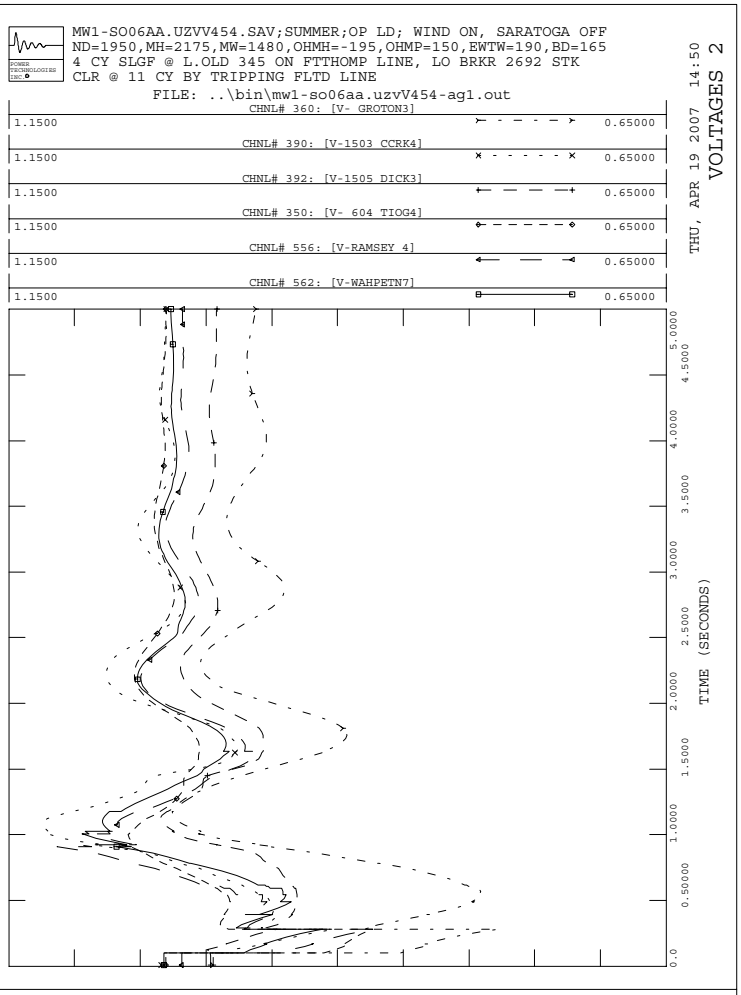



MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
ROTOR ANGLES NB1




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 80: [ANG1ARNOLD1G]
CHNL# 1035: [ANGQUAD ;2U1]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 76: [ANG1LOUIS 1G]
CHNL# 1034: [ANGOTTUMW1G2]
CHNL# 78: [ANG4NEAL 4G]
180.00
-180.0
THU, APR 19 2007 14:50
ROTOR ANGLES IA2
TIME (SECONDS)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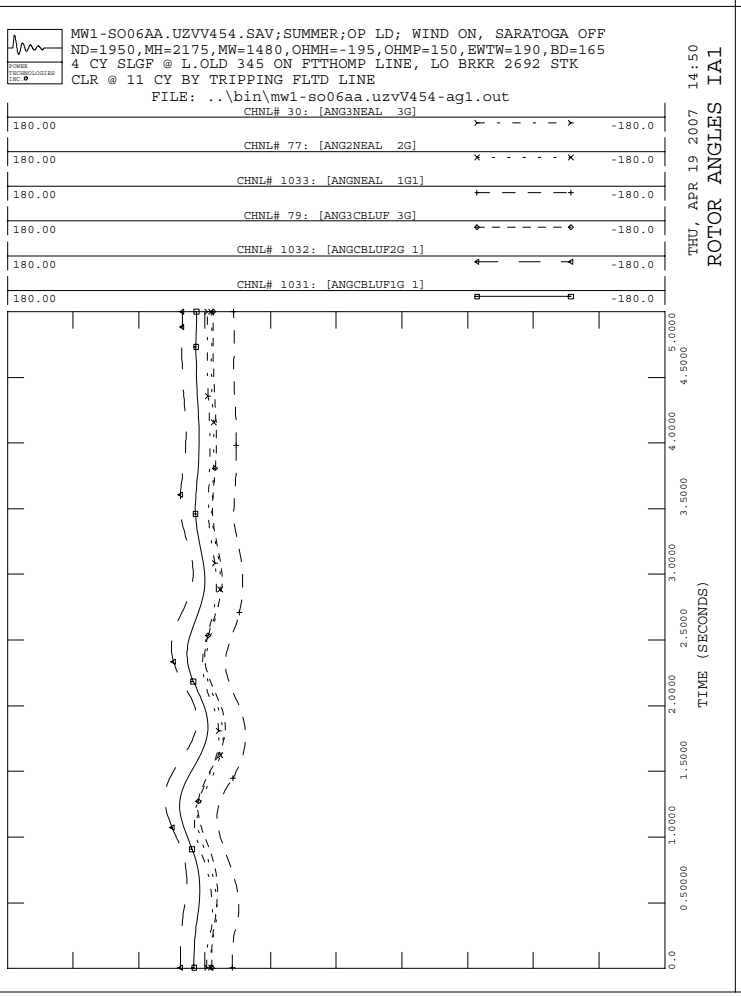
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 360: [V- GROTON3]
CHNL# 390: [V-1503 CCRK4]
CHNL# 392: [V-1505 DICK3]
CHNL# 350: [V- 604 TIOG4]
CHNL# 556: [V-RAMSEY 4]
CHNL# 562: [V-WAHPETN7]
1.1500
0.65000
THU, APR 19 2007 14:50
VOLTAGES 2
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 30: [ANG3NEAL 3G]
CHNL# 77: [ANG2NEAL 2G]
CHNL# 1033: [ANGNEAL 1G1]
CHNL# 79: [ANG3CBLUF 3G]
CHNL# 1032: [ANGCBLUF2G 1]
CHNL# 1031: [ANGCBLUF1G 1]
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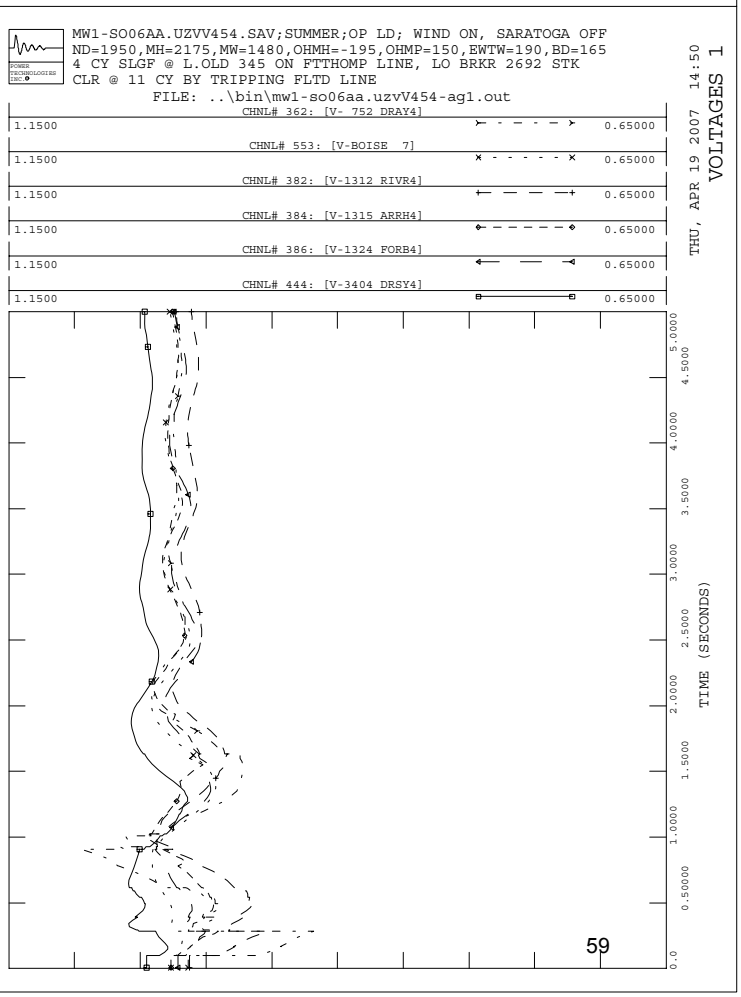
-180.0
THU, APR 19 2007 14:50
ROTOR ANGLES IA1
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 362: [V- 752 DRAY4]
CHNL# 553: [V-BOISE 7]
CHNL# 382: [V-1312 RIVR4]
CHNL# 384: [V-1315 ARRH4]
CHNL# 386: [V-1324 FORB4]
CHNL# 444: [V-3404 DRSY4]
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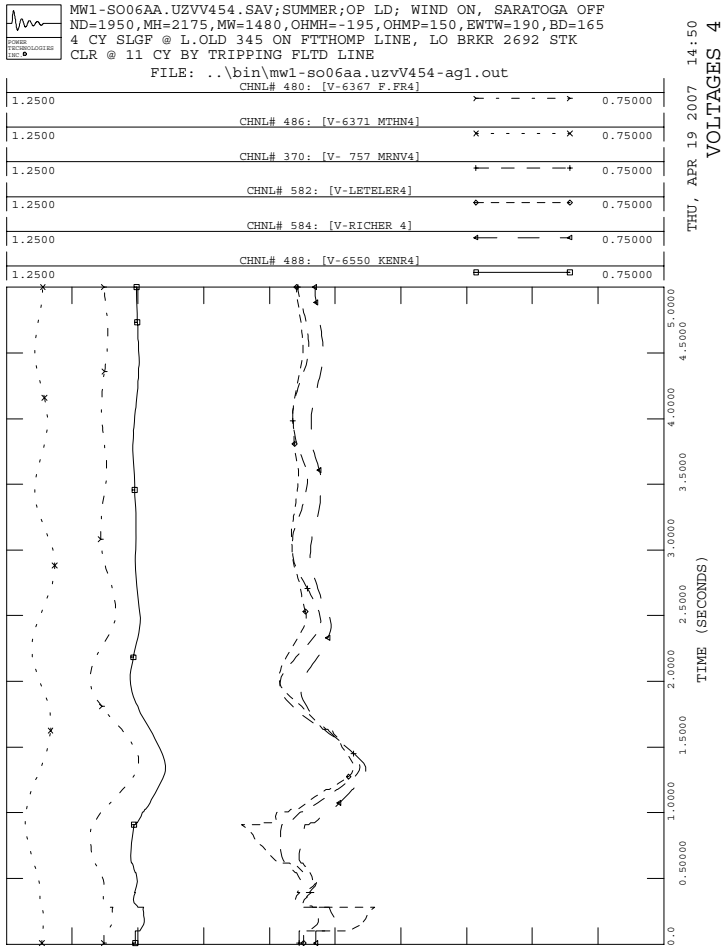
THU, APR 19 2007 14:50
VOLTAGES 1
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 480: [V-6367 F.FR4]
CHNL# 486: [V-6371 MTHN4]
CHNL# 370: [V- 757 MRNV4]
CHNL# 582: [V-LETELER4]
CHNL# 584: [V-RICHER 4]
CHNL# 488: [V-6550 KENR4]
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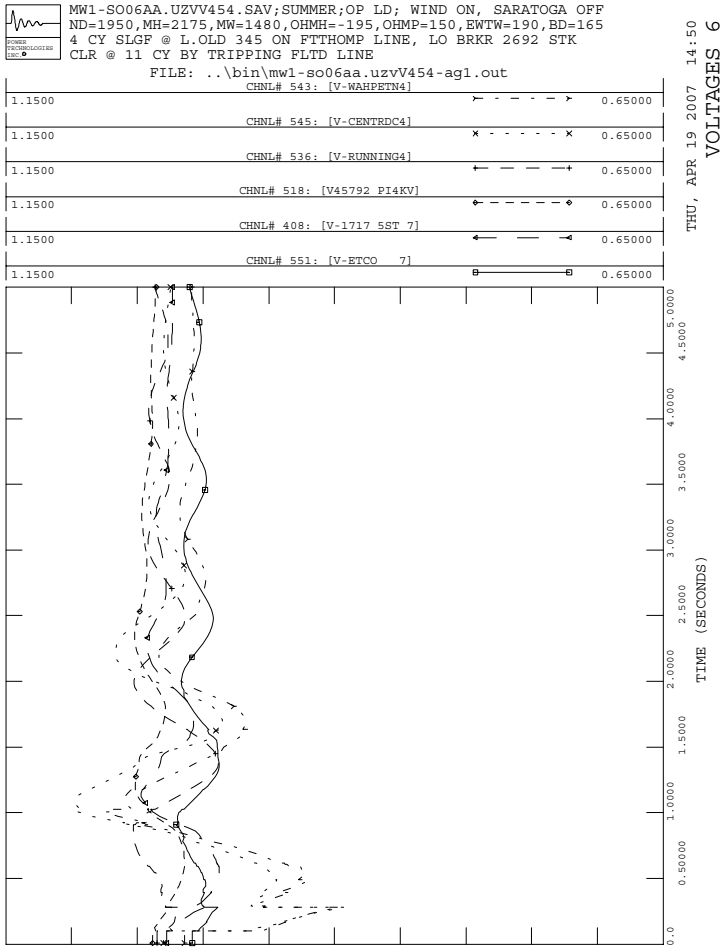
TIME (SECONDS)
THU, APR 19 2007 14:50
VOLTAGES 4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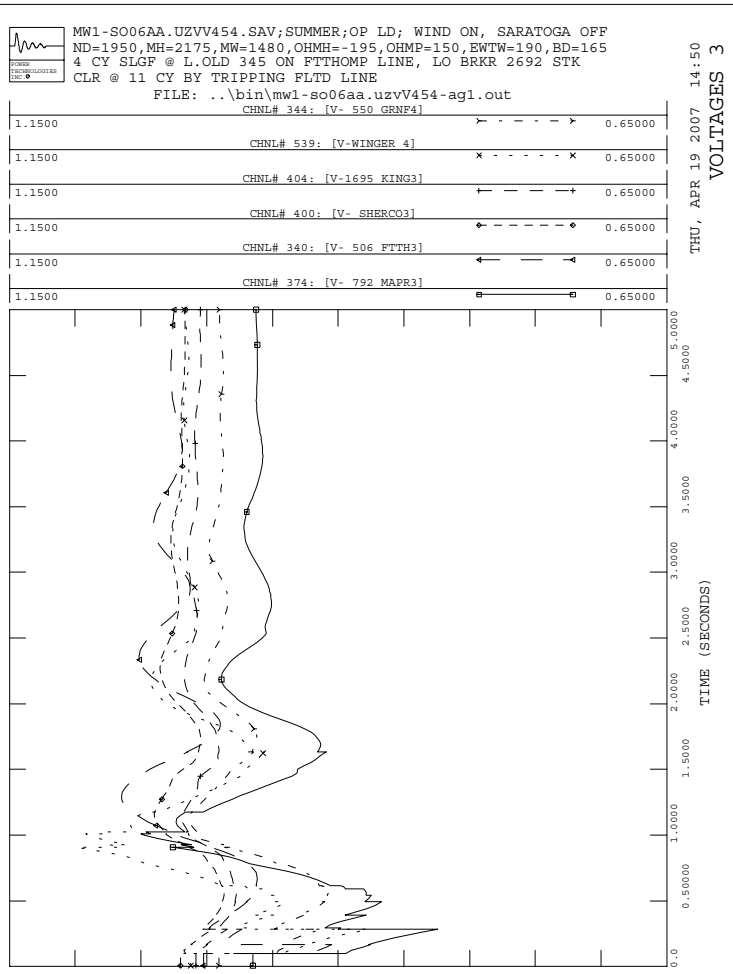
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 543: [V-WAHPETN4]
CHNL# 545: [V-CENTRDC4]
CHNL# 536: [V-RUNNING4]
CHNL# 518: [V45792 PI4KV]
CHNL# 408: [V-1717 5ST 7]
CHNL# 551: [V-ETCO 7]
1.1500
0.65000
TIME (SECONDS)
THU, APR 19 2007 14:50
VOLTAGES 6


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 344: [V- 550 GRNF4]
CHNL# 539: [V-WINGER 4]
CHNL# 404: [V-1695 KING3]
CHNL# 400: [V- SHERCO3]
CHNL# 340: [V- 506 FTTH3]
CHNL# 374: [V- 792 MAPR3]
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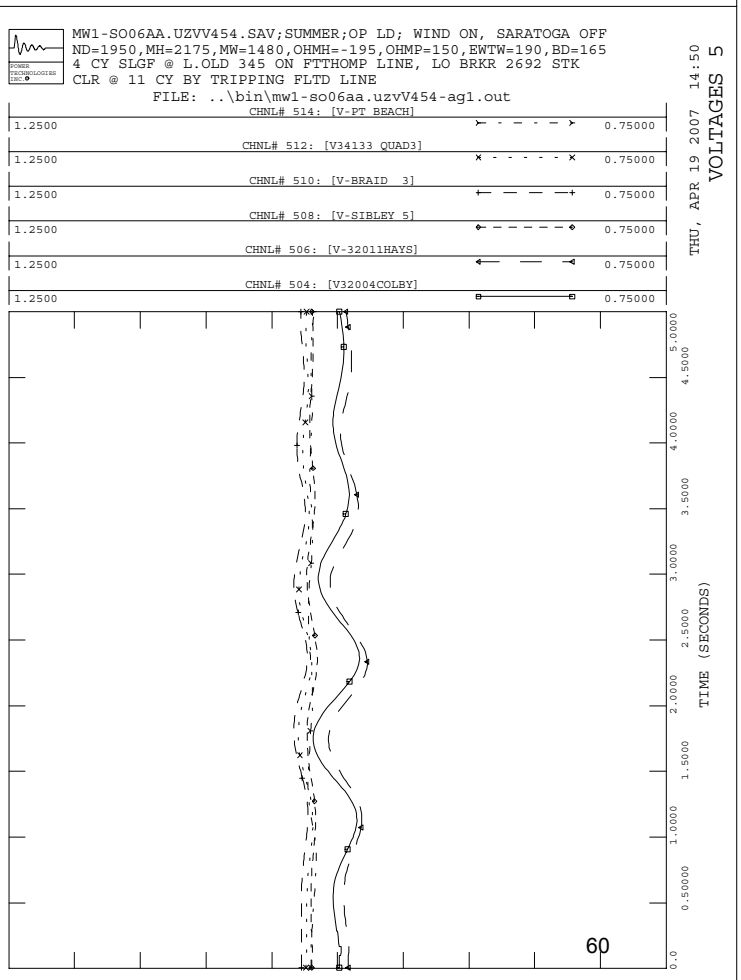
TIME (SECONDS)
THU, APR 19 2007 14:50
VOLTAGES 3


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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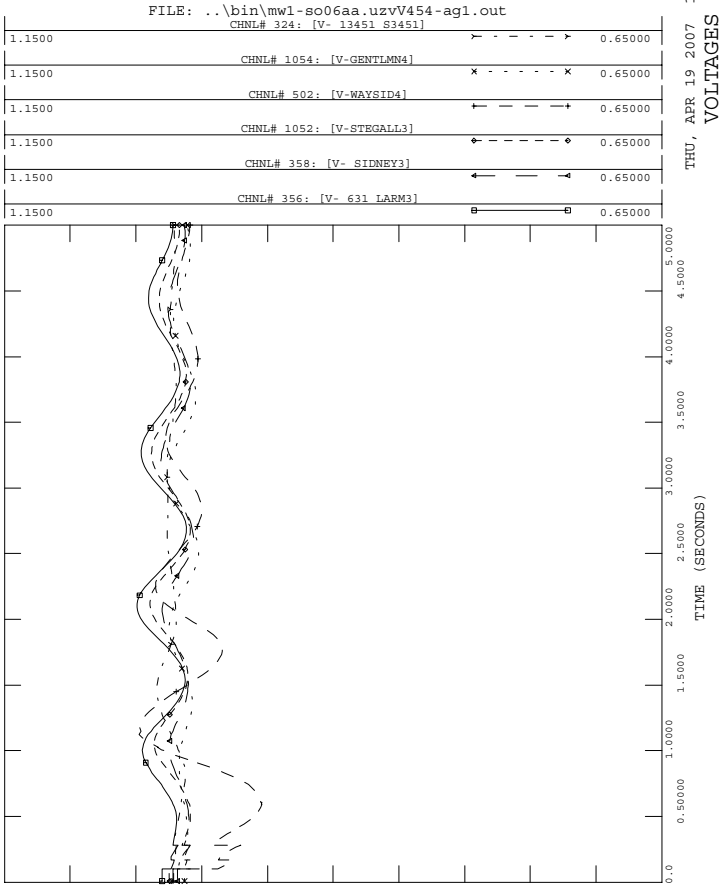
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 514: [V-PT BEACH]
CHNL# 512: [V34133 QUAD3]
CHNL# 510: [V-BRAID 3]
CHNL# 508: [V-SIBLEY 5]
CHNL# 506: [V-32011HAYS]
CHNL# 504: [V32004COLBY]
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:50
VOLTAGES 5

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
VOLTAGES NB2




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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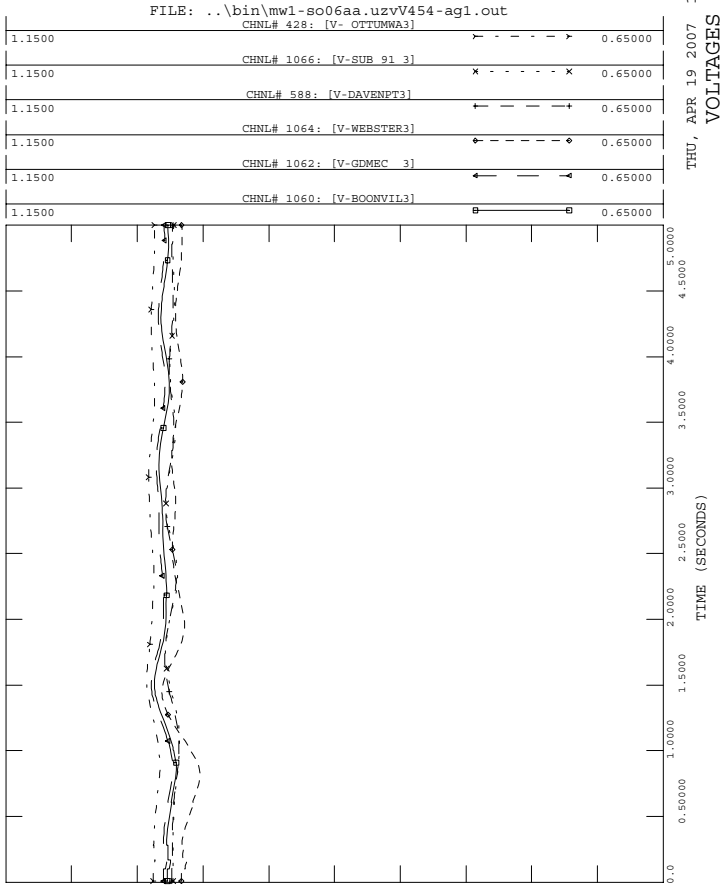
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
VOLTAGES IA2

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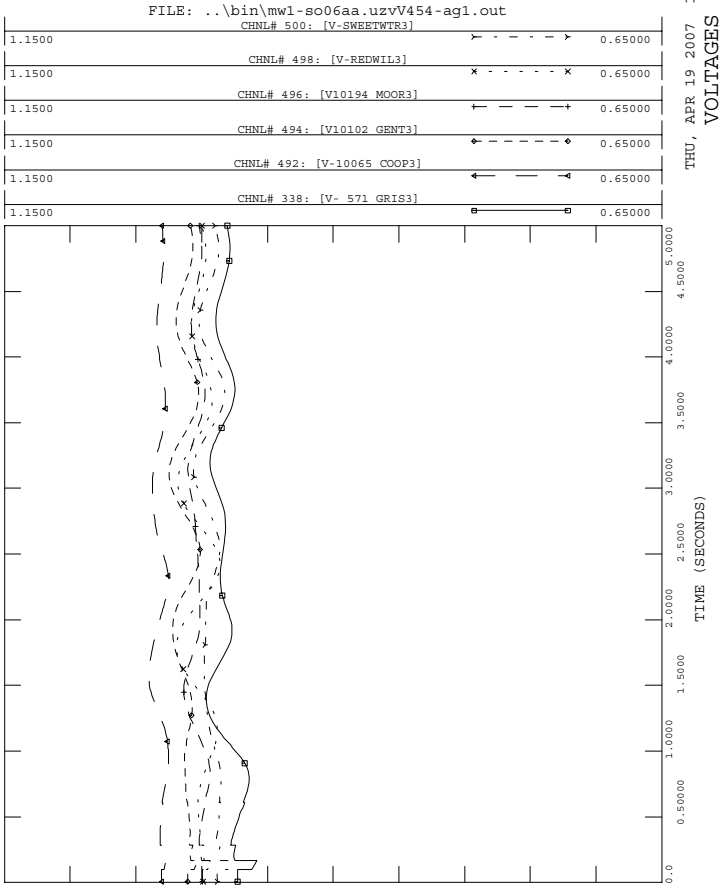
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
VOLTAGES NB1




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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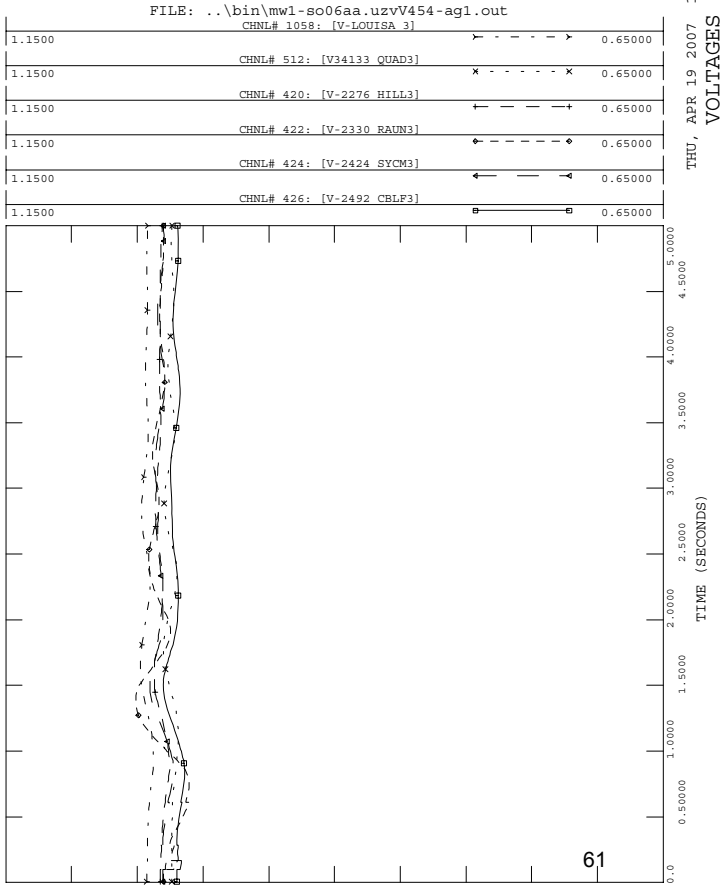
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
VOLTAGES IA1



MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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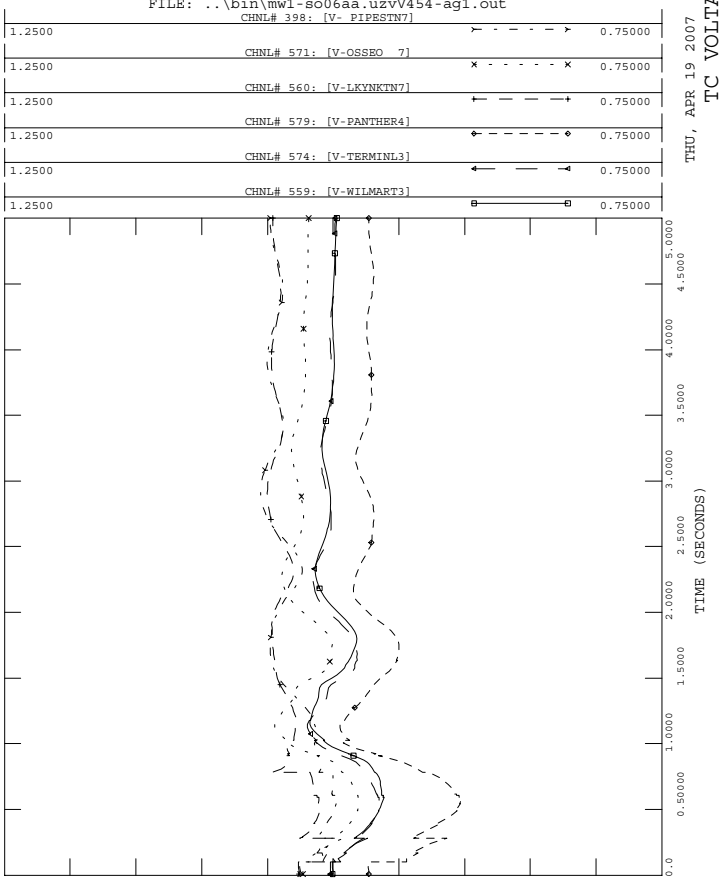
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
TC VOLTAGES




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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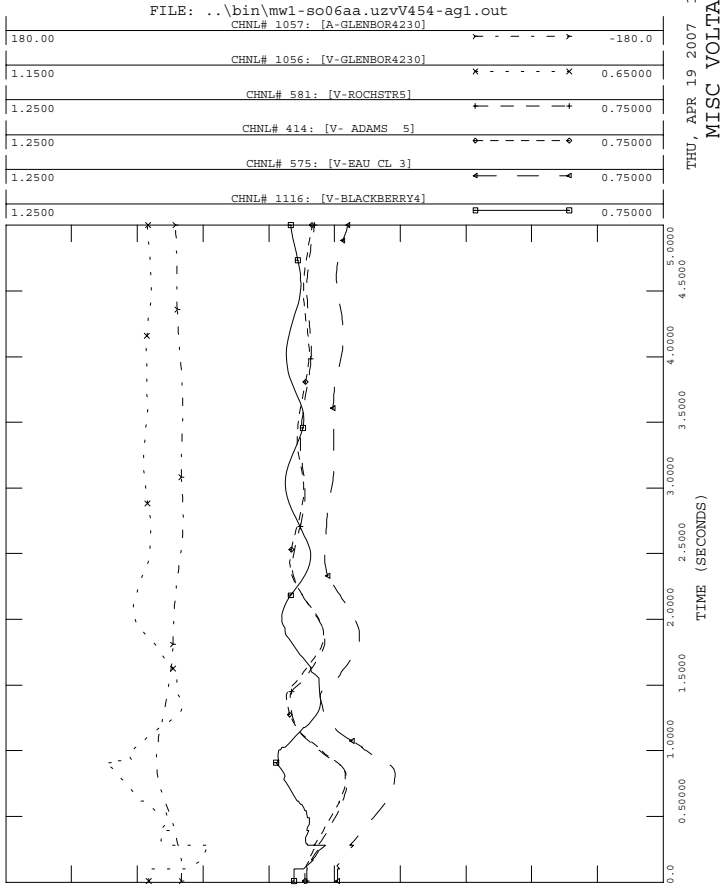
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
MISC VOLTAGES




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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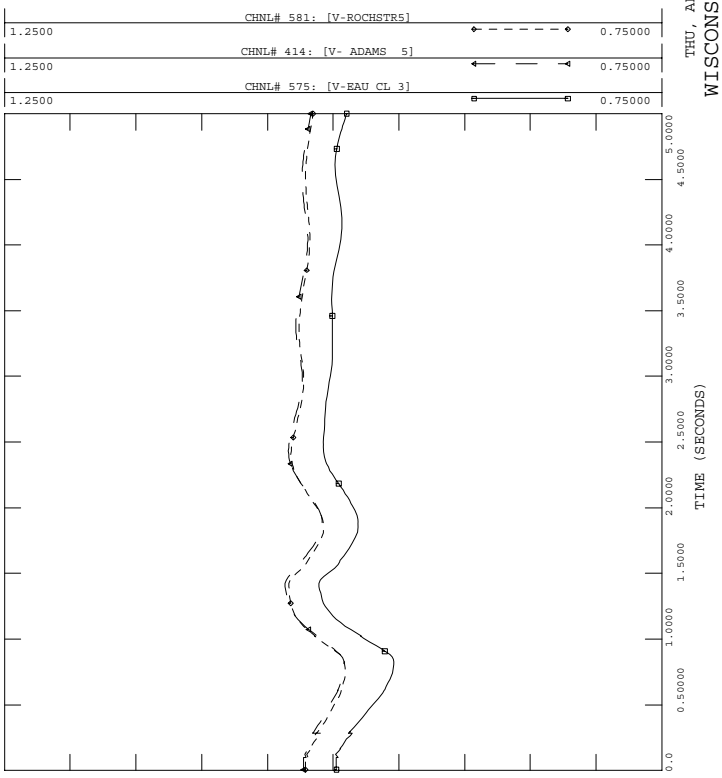
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
WISCONSIN VOLTAGES




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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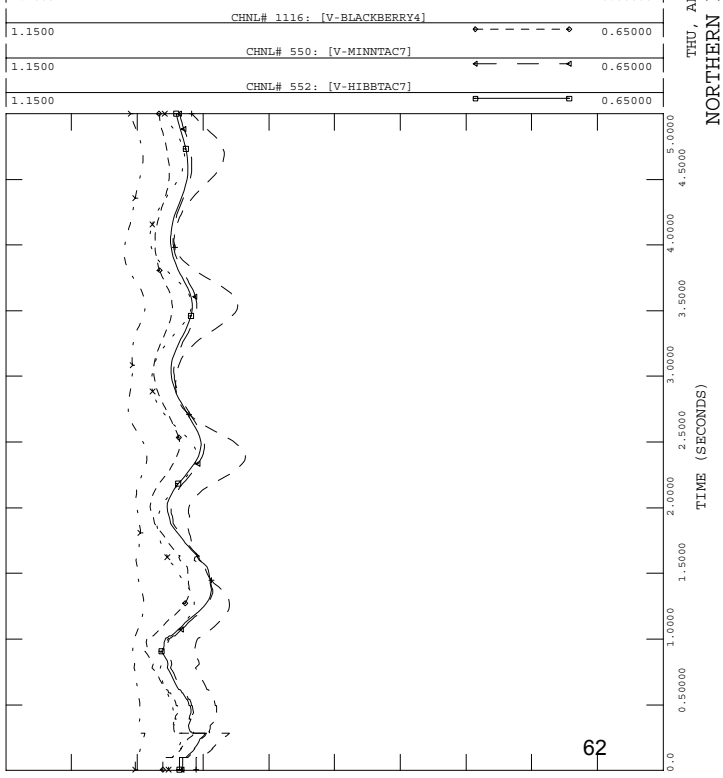
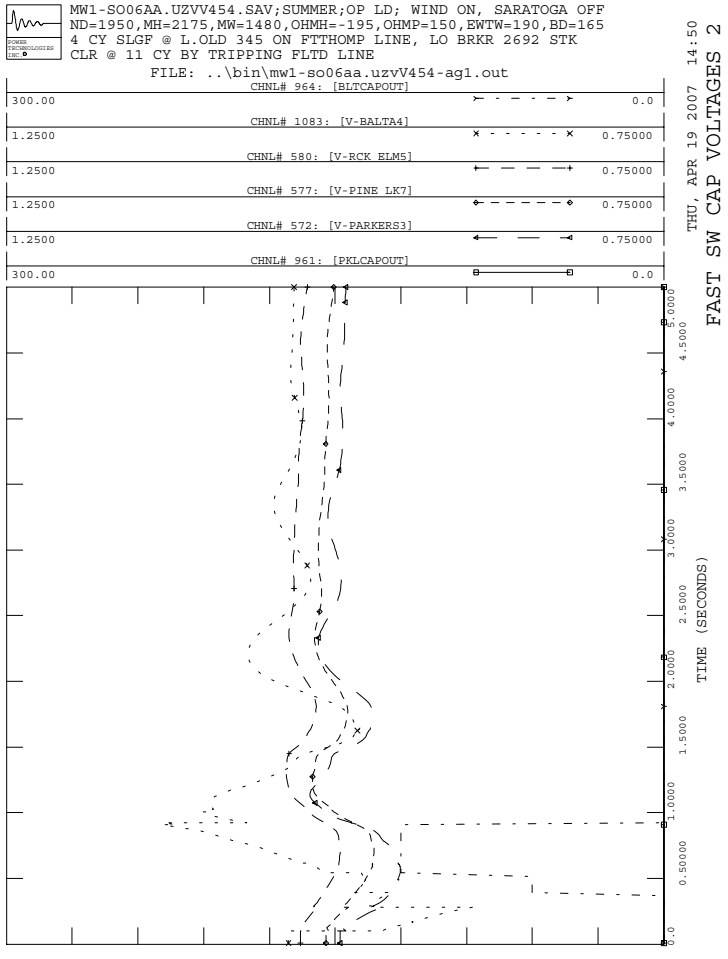
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
NORTHERN MN VOLTAGES

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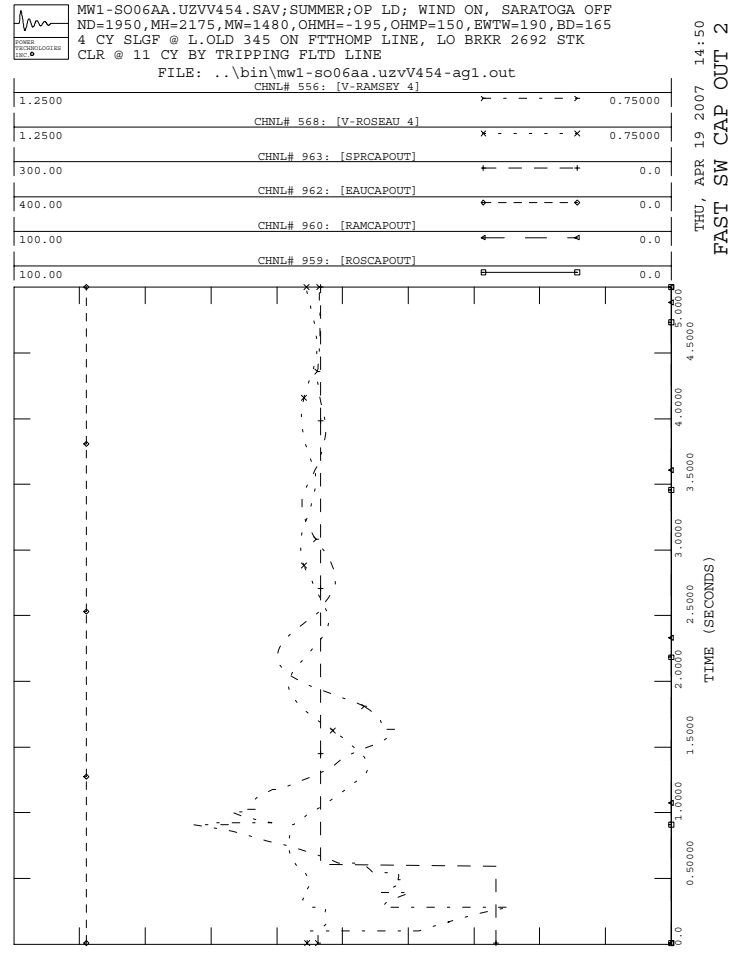
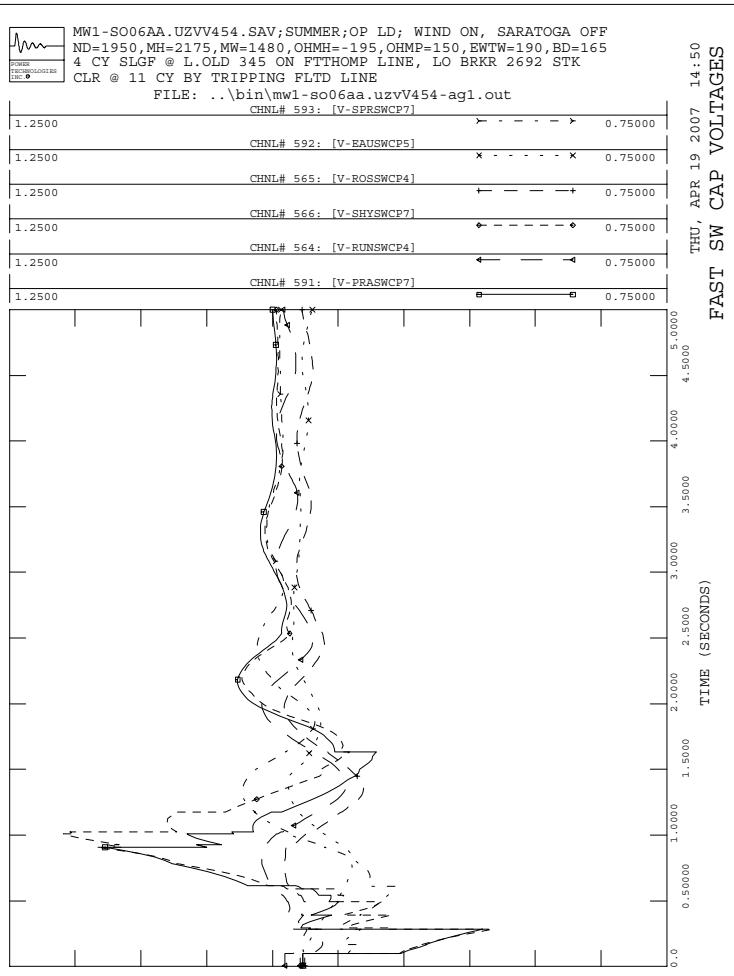
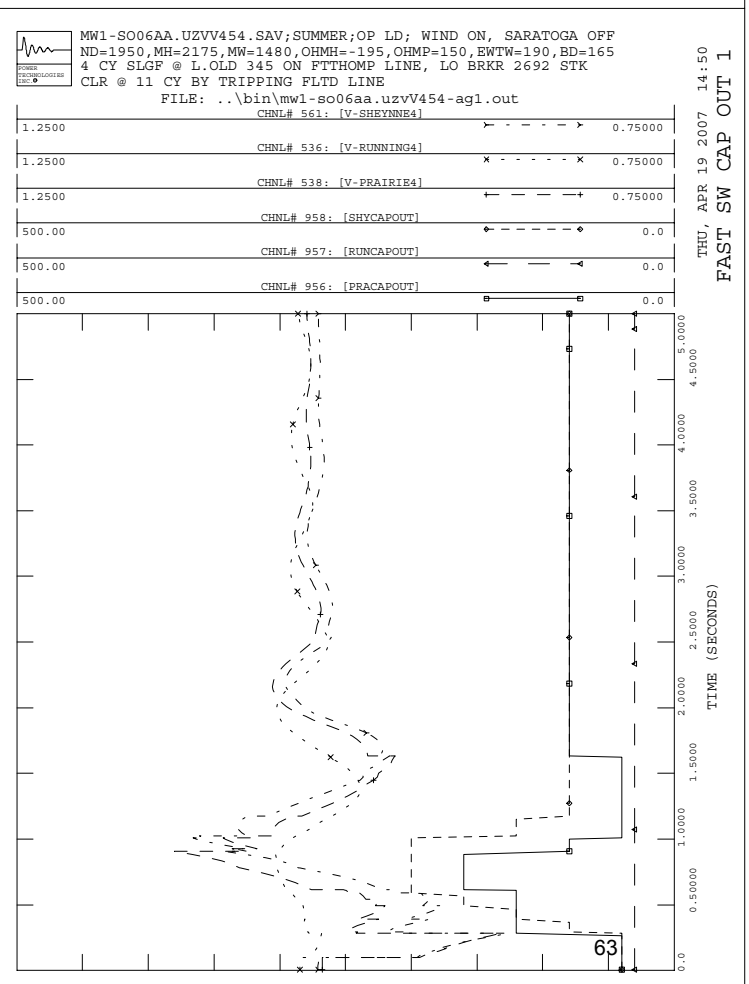
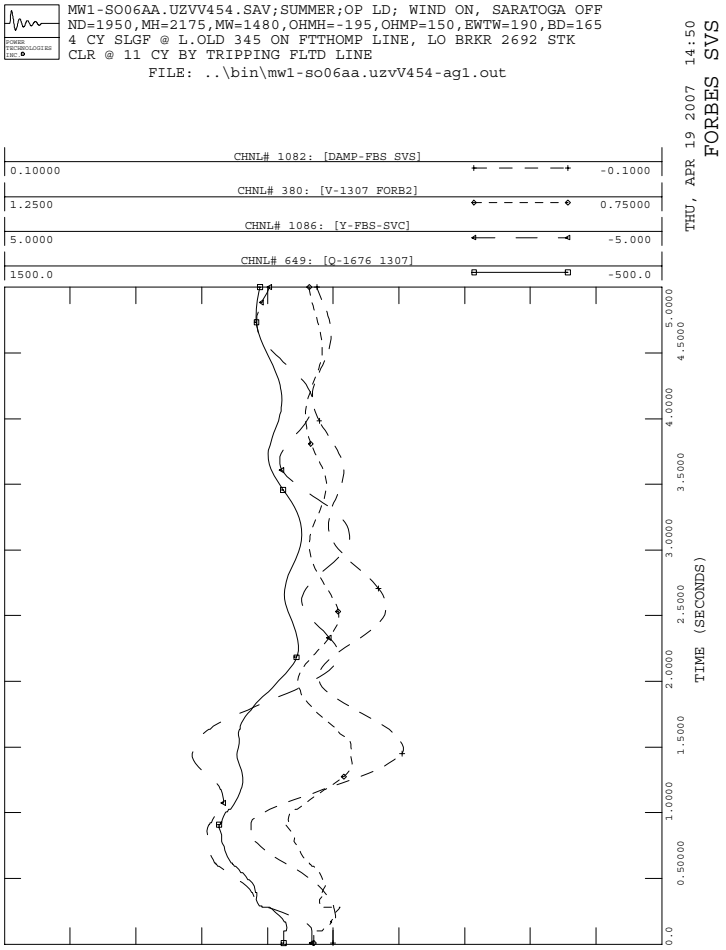
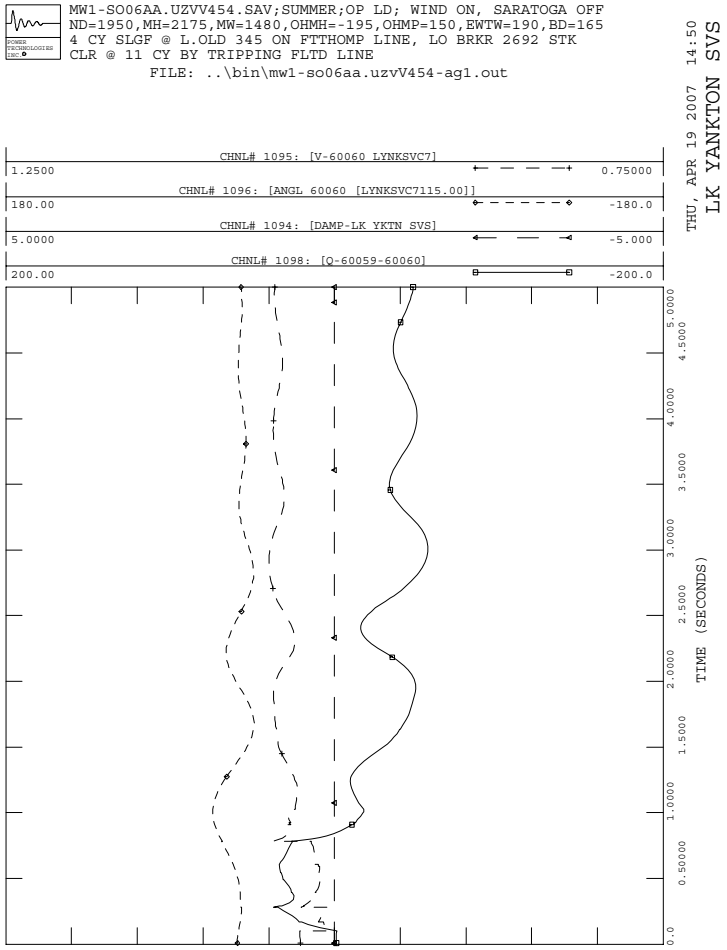
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 964: [BLTCAPOUT]
CHNL# 1083: [V-BALTA4]
CHNL# 580: [V-RCK ELM5]
CHNL# 577: [V-PINE LK7]
CHNL# 572: [V-PARKERS3]
CHNL# 961: [PKLCAPOUT]
THU, APR 19 2007 14:50
FAST SW CAP VOLTAGES 2
TIME (SECONDS)

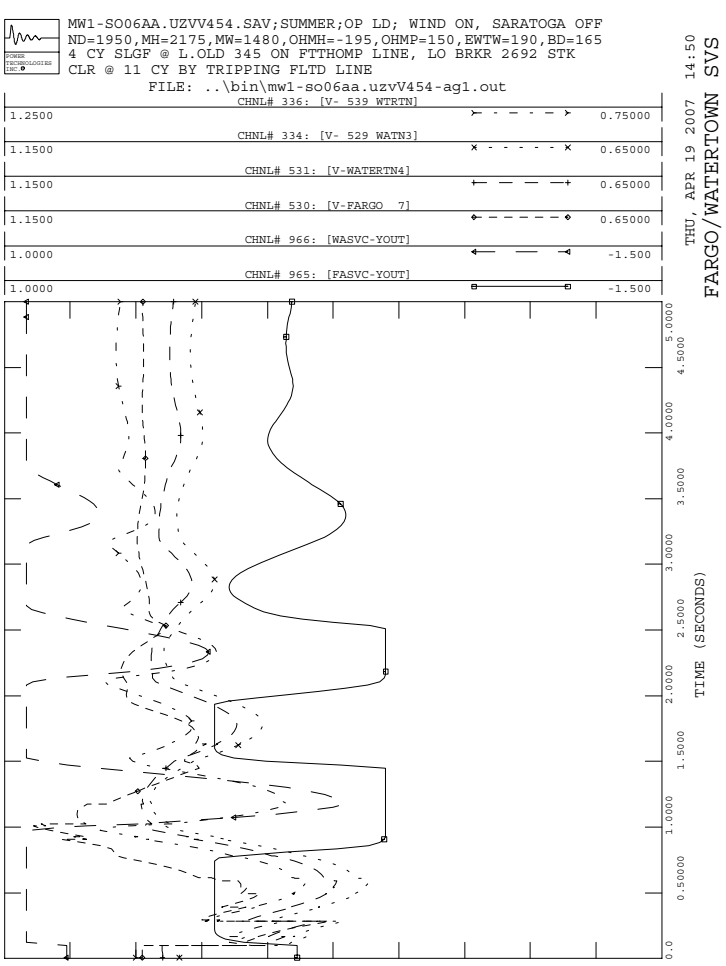

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 556: [V-RAMSEY 4]
CHNL# 568: [V-ROSEAU 4]
CHNL# 963: [SPRCAPOUT]
CHNL# 962: [EAUCAPOUT]
CHNL# 960: [RAMCAPOUT]
CHNL# 959: [ROSCAPOUT]
THU, APR 19 2007 14:50
FAST SW CAP OUT 2
TIME (SECONDS)

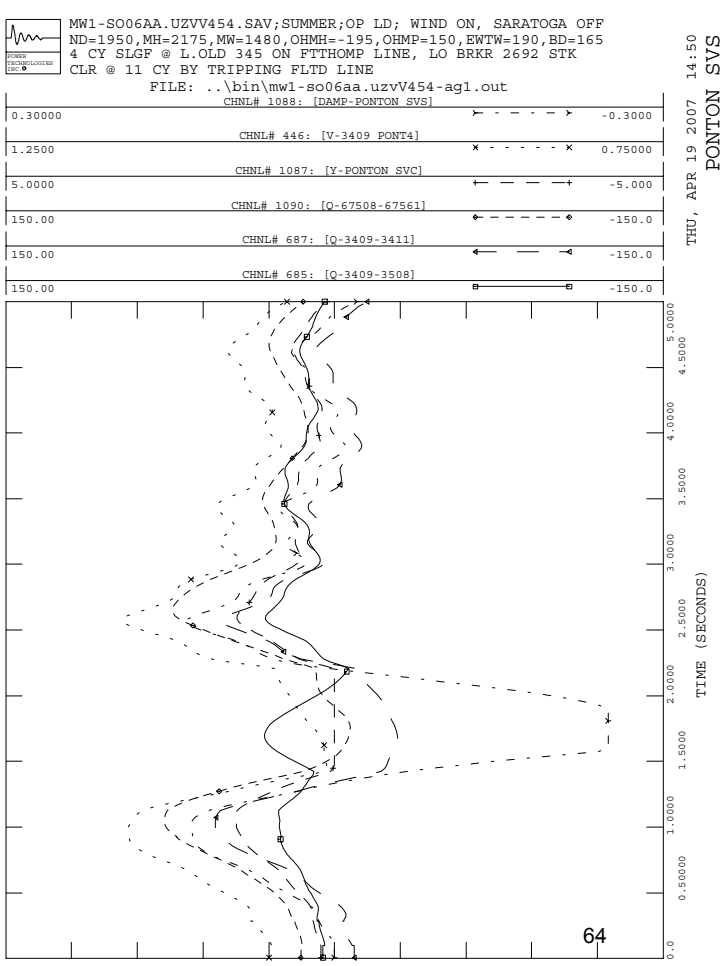

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 593: [V-SPRSWCP7]
CHNL# 592: [V-EAUSWCP5]
CHNL# 565: [V-ROSSWCP4]
CHNL# 566: [V-SHYSWCP7]
CHNL# 564: [V-RUNSWCP4]
CHNL# 591: [V-PRASWCP7]
THU, APR 19 2007 14:50
FAST SW CAP VOLTAGES
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 561: [V-SHEYNNE4]
CHNL# 536: [V-RUNNING4]
CHNL# 538: [V-PRAIRIE4]
CHNL# 958: [SHYCAPOUT]
CHNL# 957: [RUNCAPOUT]
CHNL# 956: [PRACAPOUT]
THU, APR 19 2007 14:50
FAST SW CAP OUT 1
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:50
FORBES SVS
CHNL# 1082: [DAMP-FBS SVS]
0.10000
-0.1000
CHNL# 380: [V-1307 FORB2]
1.2500
0.75000
CHNL# 1086: [Y-FBS-SVC]
5.0000
-5.000
CHNL# 649: [Q-1676 1307]
1500.0
-500.0
TIME (SECONDS)

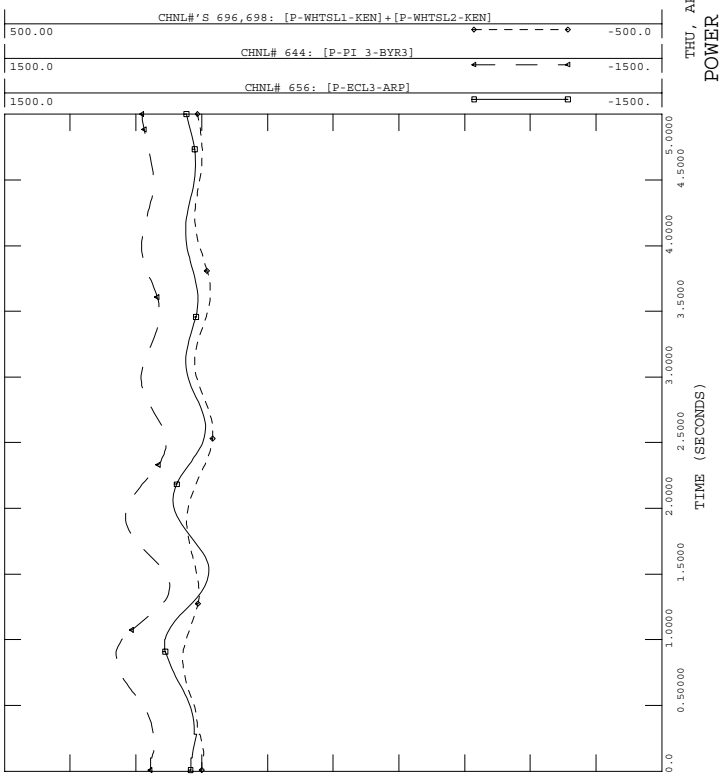

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:50
LK YANKTON SVS
CHNL# 1095: [V-60060 LYNKSVC7]
1.2500
0.75000
CHNL# 1096: [ANGL 60060 [LYNKSVC7115.00]]
180.00
-180.0
CHNL# 1094: [DAMP-LK YKTN SVS]
5.0000
-5.000
CHNL# 1098: [Q-60059-60060]
200.00
-200.0
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:50
FARGO/WATERTOWN SVS
CHNL# 336: [V- 539 WTRTN]
1.2500
0.75000
CHNL# 334: [V- 529 WATN3]
1.1500
0.65000
CHNL# 531: [V-WATERTN4]
1.1500
0.65000
CHNL# 530: [V-FARGO 7]
1.1500
0.65000
CHNL# 966: [WASVC-YOUT]
1.0000
-1.500
CHNL# 965: [FASVC-YOUT]
1.0000
-1.500
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
THU, APR 19 2007 14:50
PONTON SVS
CHNL# 1088: [DAMP-PONTON SVS]
0.30000
-0.3000
CHNL# 446: [V-3409 PONT4]
1.2500
0.75000
CHNL# 1087: [Y-PONTON SVC]
5.0000
-5.000
CHNL# 1090: [Q-67508-67561]
150.00
-150.0
CHNL# 687: [Q-3409-3411]
150.00
-150.0
CHNL# 685: [Q-3409-3508]
150.00
-150.0
TIME (SECONDS)

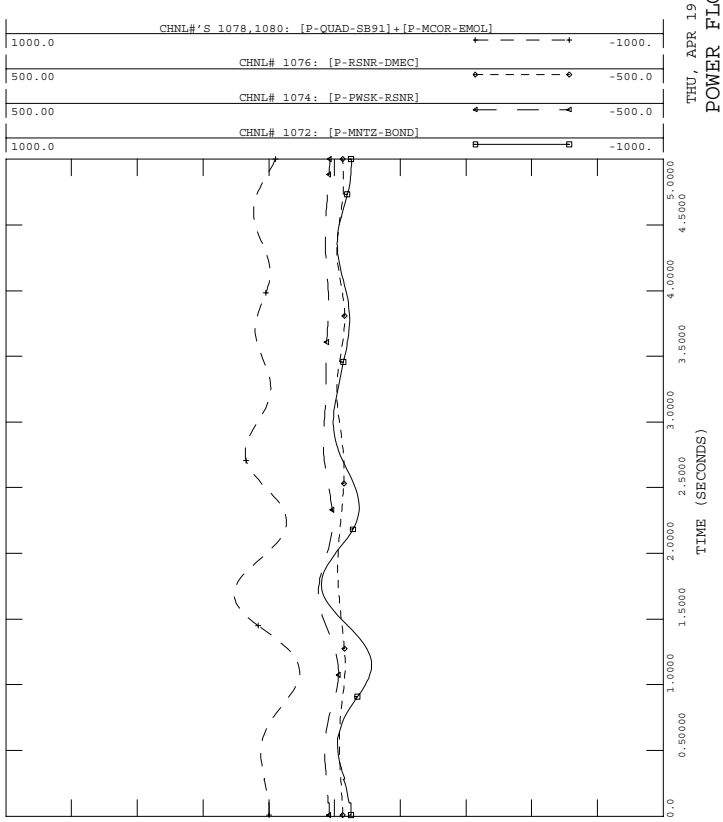
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
POWER FLOW SUMS 2



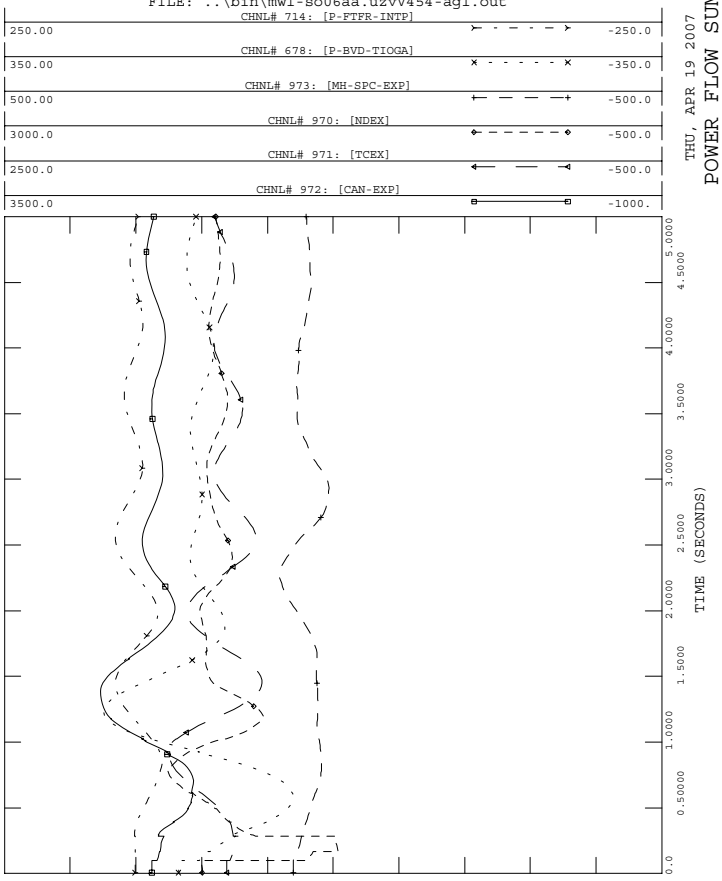

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

THU, APR 19 2007 14:50
POWER FLOW SUM 4



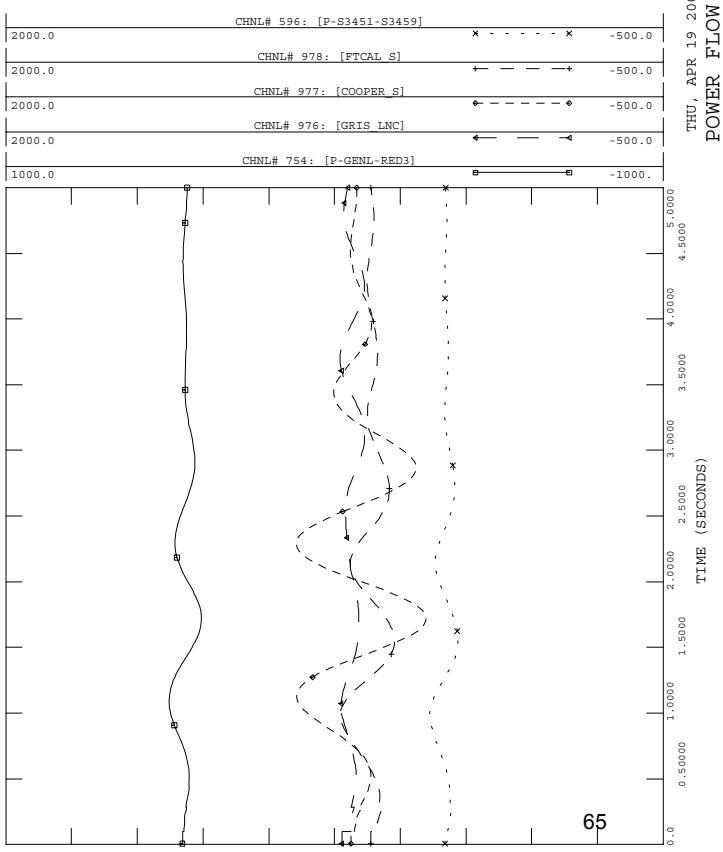

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

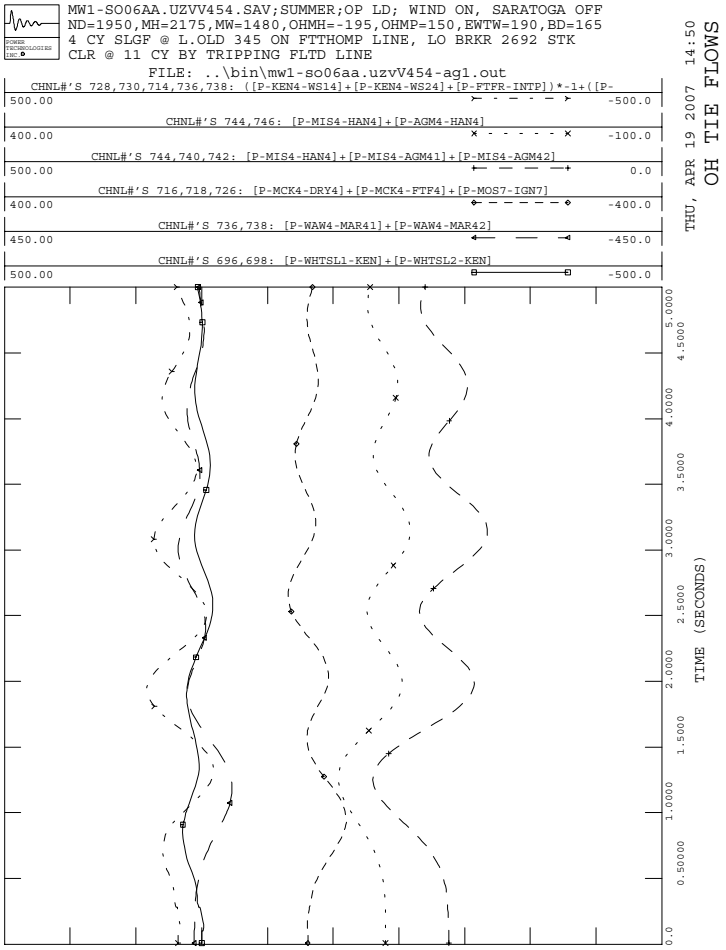
THU, APR 19 2007 14:50
POWER FLOW SUMS 1

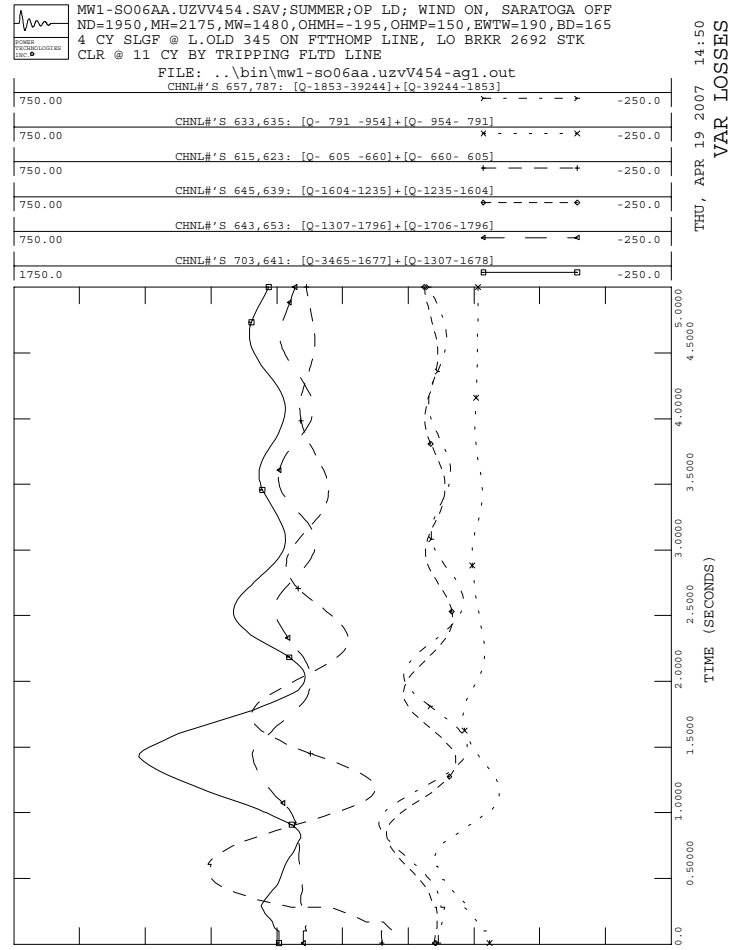


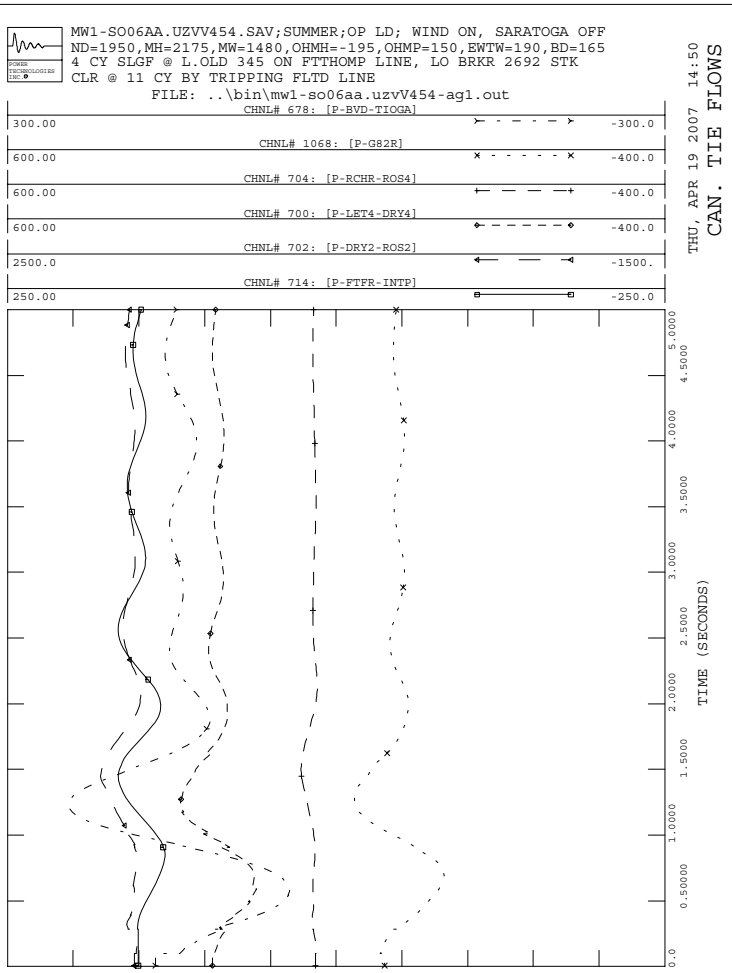

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

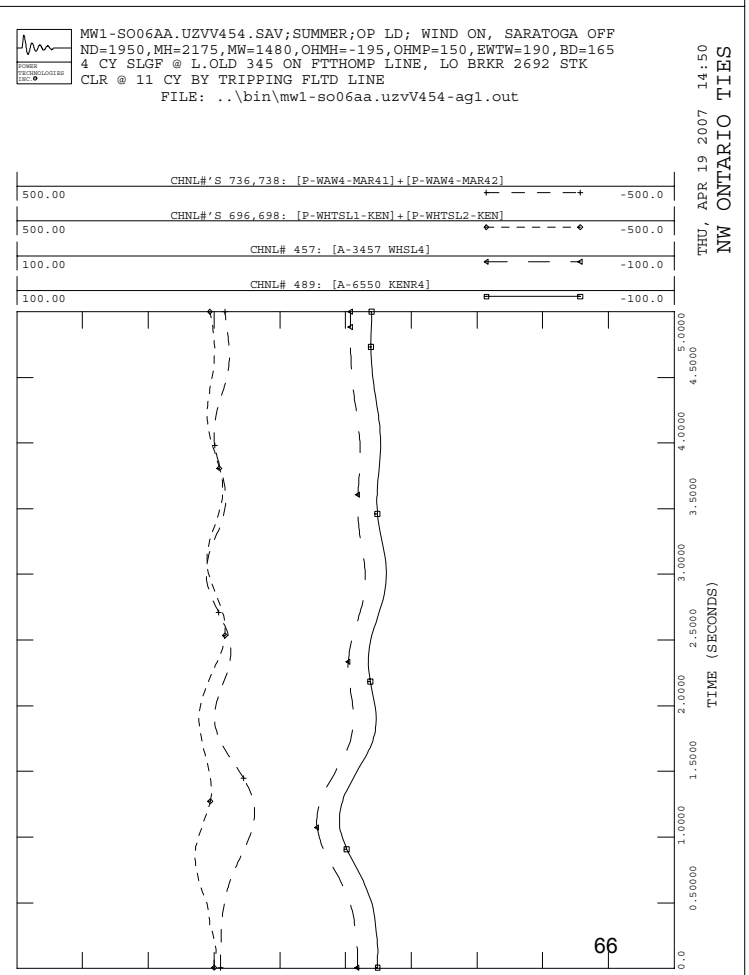
THU, APR 19 2007 14:50
POWER FLOW SUM 3

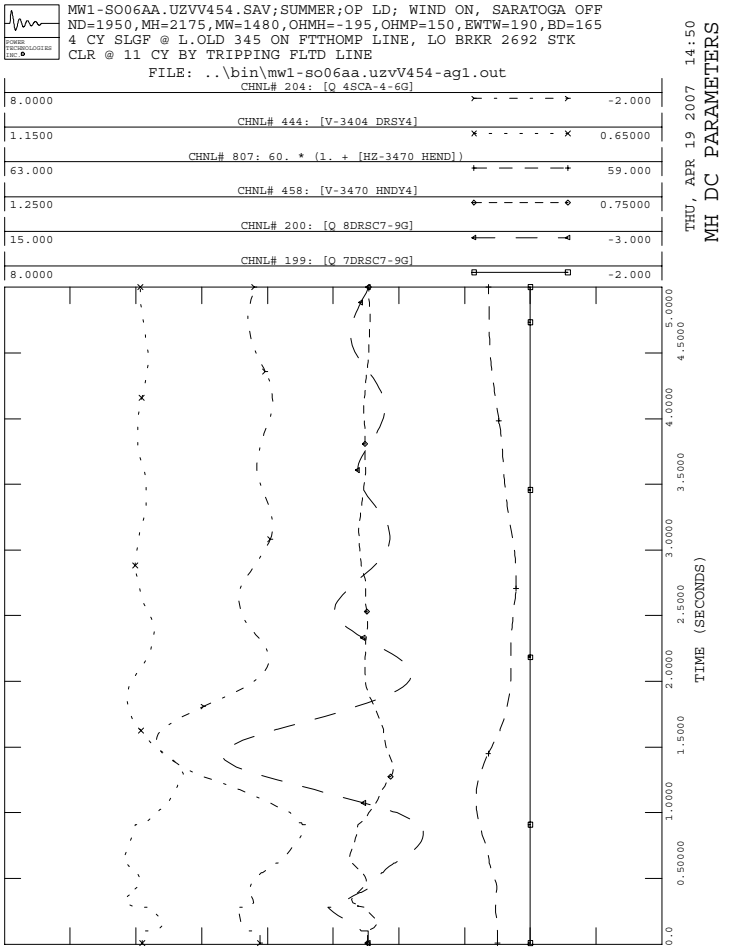


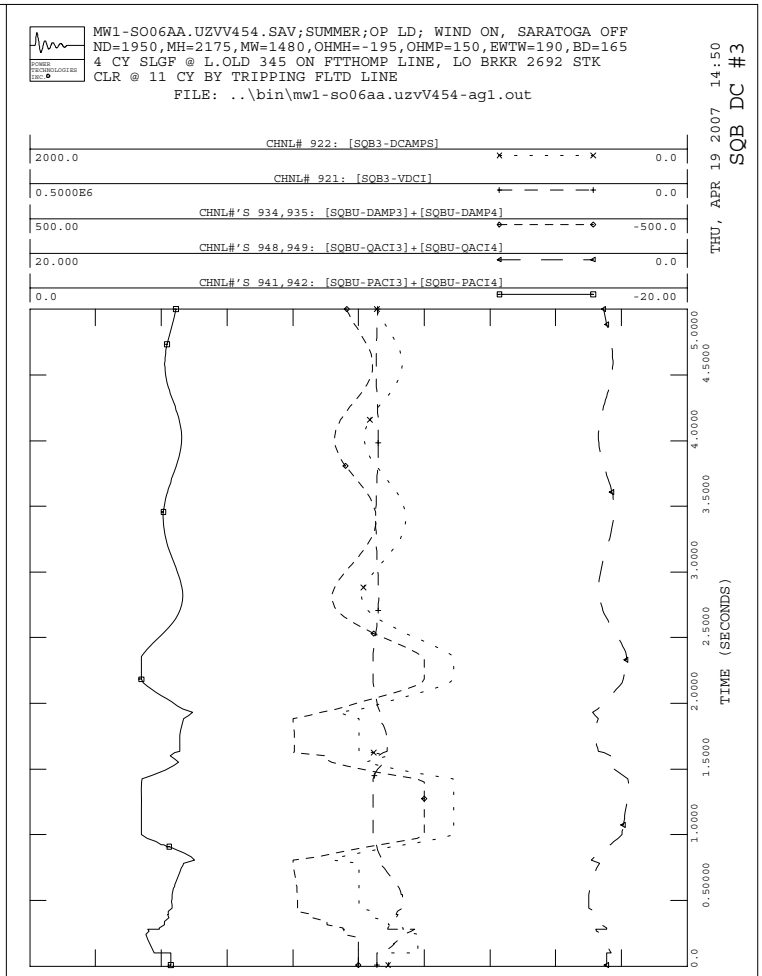

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL#'S 728,730,714,736,738: ((P-KEN4-WS14)+(P-KEN4-WS24)+(P-FTFR-INTP))*-1+((P-
500.00
-500.0
CHNL#'S 744,746: [P-MIS4-HAN4)+(P-AGM4-HAN4]
400.00
-100.0
CHNL#'S 744,740,742: [P-MIS4-HAN4]+[P-MIS4-AGM41]+[P-MIS4-AGM42]
500.00
0.0
CHNL#'S 716,718,726: [P-MCK4-DRY4]+[P-MCK4-FTF4]+[P-MOS7-IGN7]
400.00
-400.0
CHNL#'S 736,738: [P-WAW4-MAR41]+[P-WAW4-MAR42]
450.00
-450.0
CHNL#'S 696,698: [P-WHTSL1-KEN]+[P-WHTSL2-KEN]
500.00
-500.0
THU, APR 19 2007 14:50
OH TIE FLOWS
TIME (SECONDS)

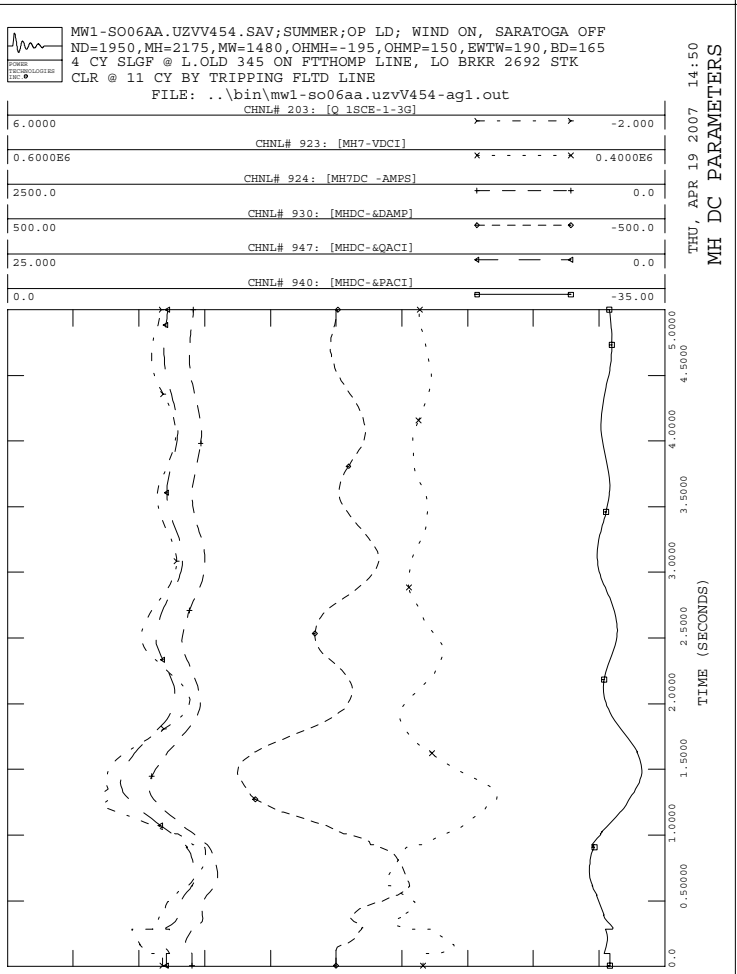

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL#'S 657,787: [Q-1853-39244]+[Q-39244-1853]
750.00
-250.0
CHNL#'S 633,635: [Q- 791 -954]+[Q- 954- 791]
750.00
-250.0
CHNL#'S 615,623: [Q- 605 -660]+[Q- 660- 605]
750.00
-250.0
CHNL#'S 645,639: [Q-1604-1235]+[Q-1235-1604]
750.00
-250.0
CHNL#'S 643,653: [Q-1307-1796]+[Q-1706-1796]
750.00
-250.0
CHNL#'S 703,641: [Q-3465-1677]+[Q-1307-1678]
1750.0
-250.0
THU, APR 19 2007 14:50
VAR LOSSES
TIME (SECONDS)

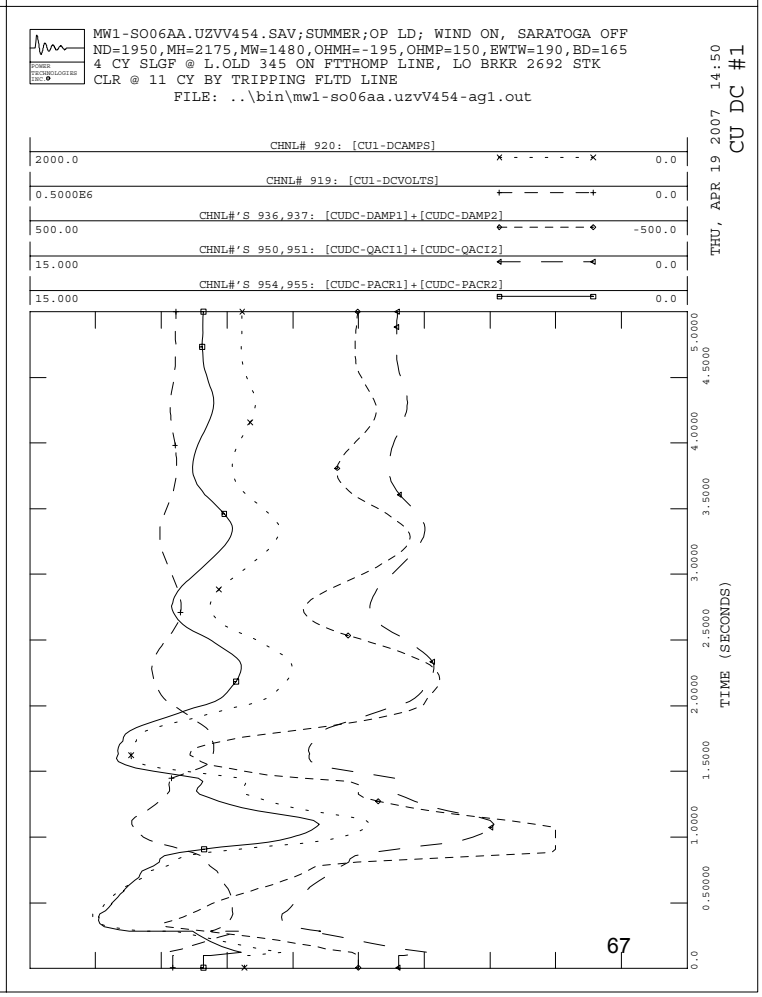

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 678: [P-BVD-TIOGA]
300.00
-300.0
CHNL# 1068: [P-G82R]
600.00
-400.0
CHNL# 704: [P-RCHR-ROS4]
600.00
-400.0
CHNL# 700: [P-LET4-DRY4]
600.00
-400.0
CHNL# 702: [P-DRY2-ROS2]
2500.0
-1500.
CHNL# 714: [P-FTFR-INTP]
250.00
-250.0
THU, APR 19 2007 14:50
CAN. TIE FLOWS
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL#'S 736,738: [P-WAW4-MAR41]+[P-WAW4-MAR42]
500.00
-500.0
CHNL#'S 696,698: [P-WHTSL1-KEN]+[P-WHTSL2-KEN]
500.00
-500.0
CHNL# 457: [A-3457 WHSL4]
100.00
-100.0
CHNL# 489: [A-6550 KENR4]
100.00
-100.0
THU, APR 19 2007 14:50
NW ONTARIO TIES
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 204: [Q 4SCA-4-6G]
8.0000
-2.000
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
CHNL# 807: 60. * (1. + [HZ-3470 HEND])
63.000
59.000
CHNL# 458: [V-3470 HNDY4]
1.2500
0.75000
CHNL# 200: [Q 8DRSC7-9G]
15.000
-3.000
CHNL# 199: [Q 7DRSC7-9G]
8.0000
-2.000
THU, APR 19 2007 14:50
MH DC PARAMETERS
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 922: [SQB3-DCAMPS]
2000.0
0.0
CHNL# 921: [SQB3-VDCI]
0.5000E6
0.0
CHNL#'S 934,935: [SQBU-DAMP3]+[SQBU-DAMP4]
500.00
-500.0
CHNL#'S 948,949: [SQBU-QACI3]+[SQBU-QACI4]
20.000
0.0
CHNL#'S 941,942: [SQBU-PACI3]+[SQBU-PACI4]
0.0
-20.00
THU, APR 19 2007 14:50
SQB DC #3
TIME (SECONDS)

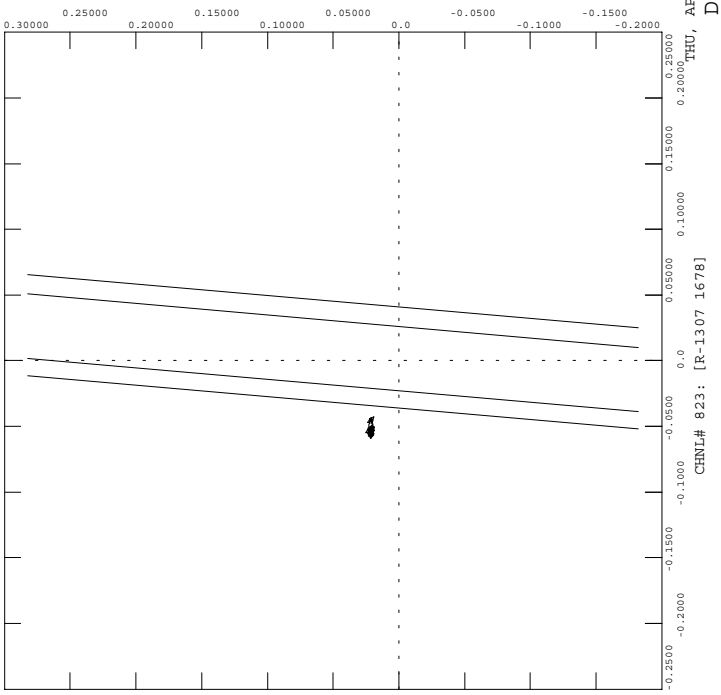

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 203: [Q 1SCE-1-3G]
6.0000
-2.000
CHNL# 923: [MH7-VDCI]
0.6000E6
0.4000E6
CHNL# 924: [MH7DC -AMPS]
2500.0
0.0
CHNL# 930: [MHDC-&DAMP]
500.00
-500.0
CHNL# 947: [MHDC-&QACI]
25.000
0.0
CHNL# 940: [MHDC-&PACI]
0.0
-35.00
THU, APR 19 2007 14:50
MH DC PARAMETERS
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out
CHNL# 920: [CU1-DCAMPS]
2000.0
0.0
CHNL# 919: [CU1-DCVOLTS]
0.5000E6
0.0
CHNL#'S 936,937: [CUDC-DAMP1]+[CUDC-DAMP2]
500.00
-500.0
CHNL#'S 950,951: [CUDC-QACI1]+[CUDC-QACI2]
15.000
0.0
CHNL#'S 954,955: [CUDC-PACR1]+[CUDC-PACR2]
15.000
0.0
THU, APR 19 2007 14:50
CU DC #1
TIME (SECONDS)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]

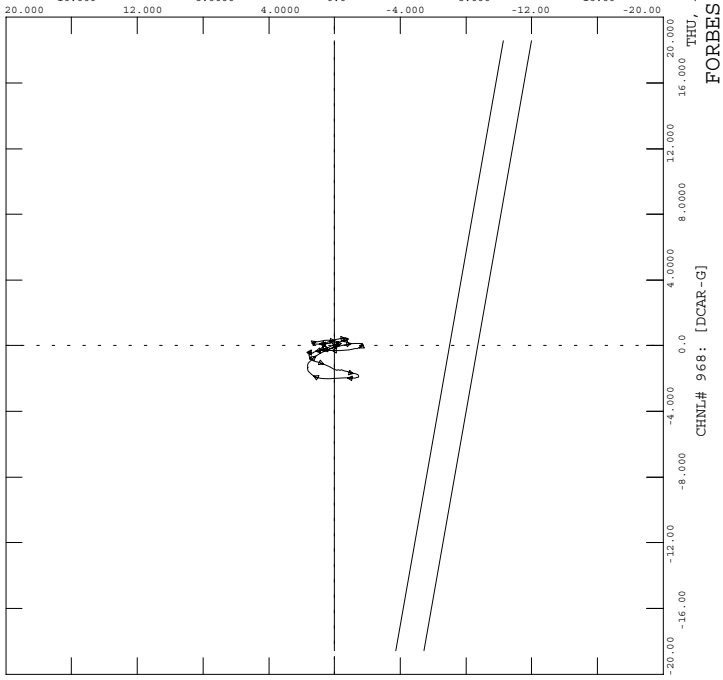



THU, APR 19 2007 14:50
D602F-FORBES (612)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

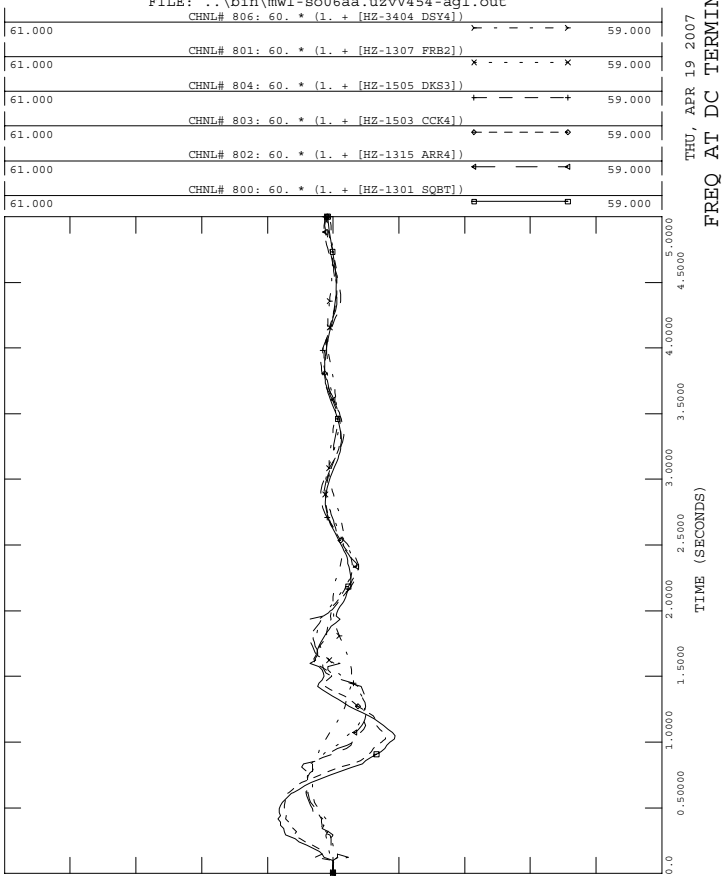
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 969: [DCAR-B]




THU, APR 19 2007 14:50
FORBES DC RED DCAR (679)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

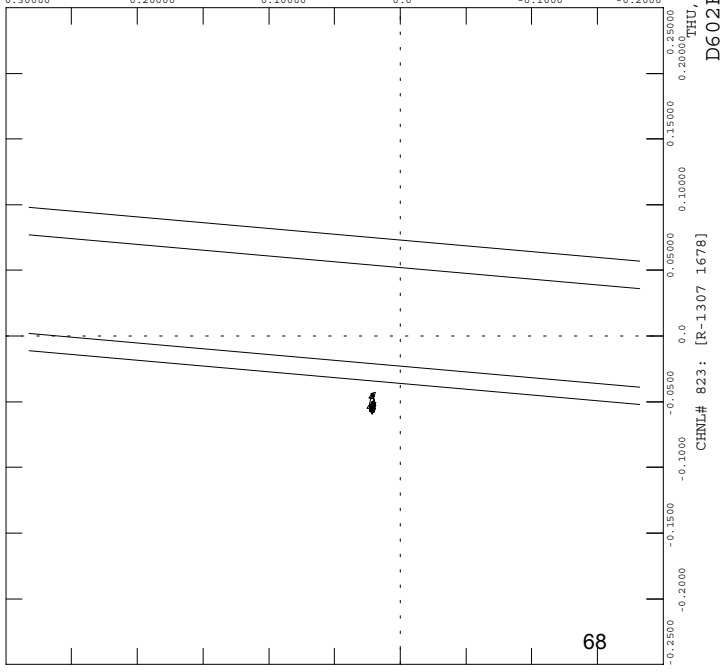



THU, APR 19 2007 14:50
FREQ AT DC TERMINALS

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]

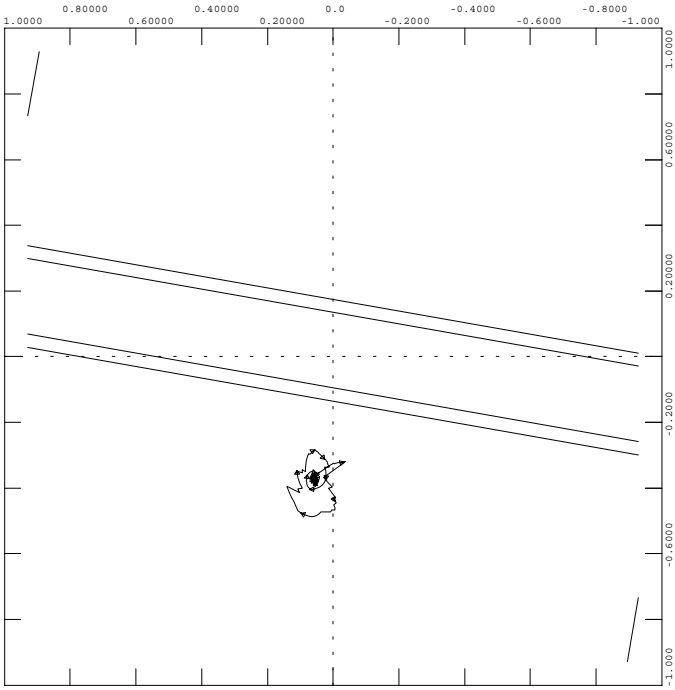



THU, APR 19 2007 14:50
D602F-FORBES-EMRG (778)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

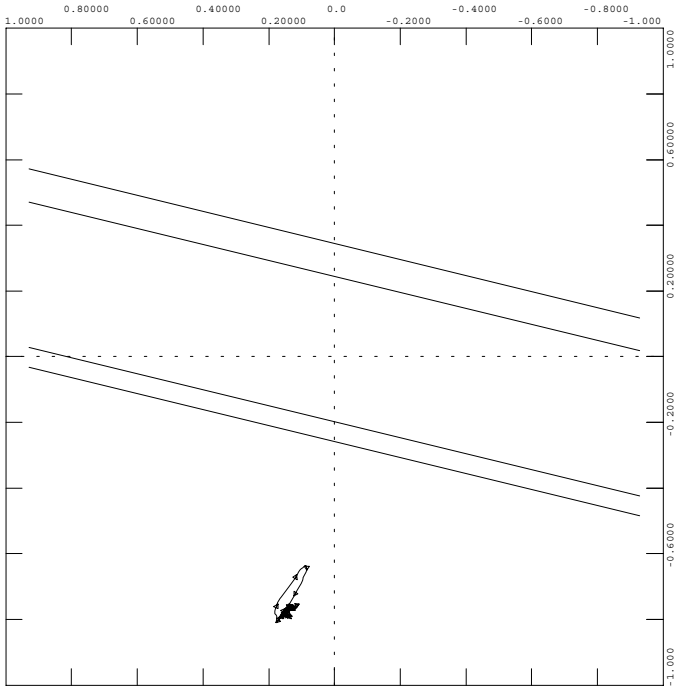
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

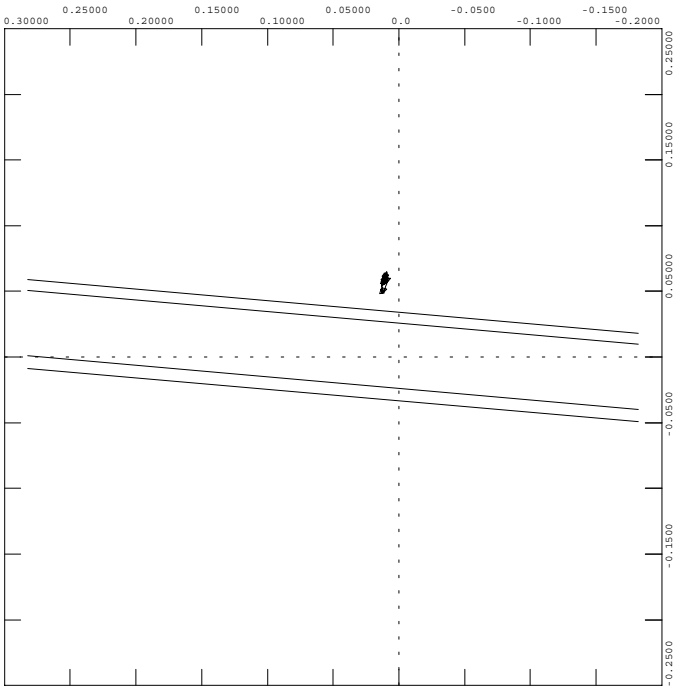
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

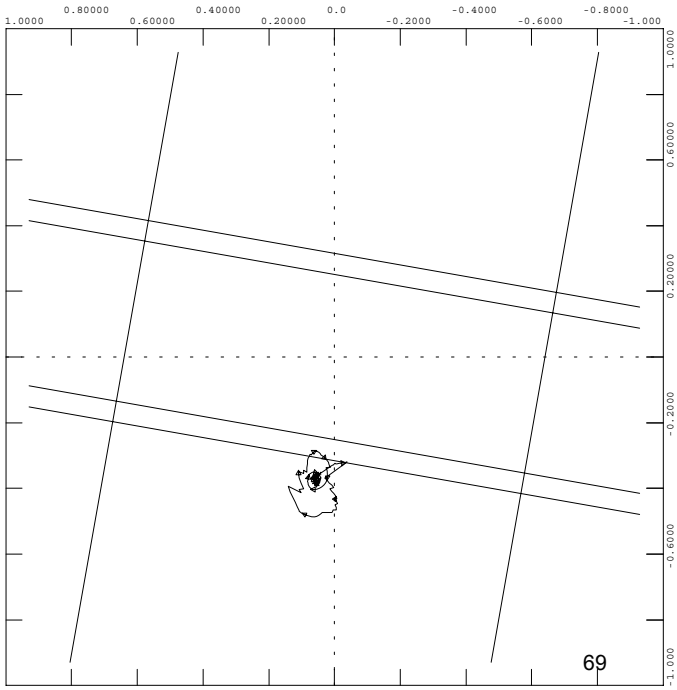
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 856: [X-DSY2-ROS2]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

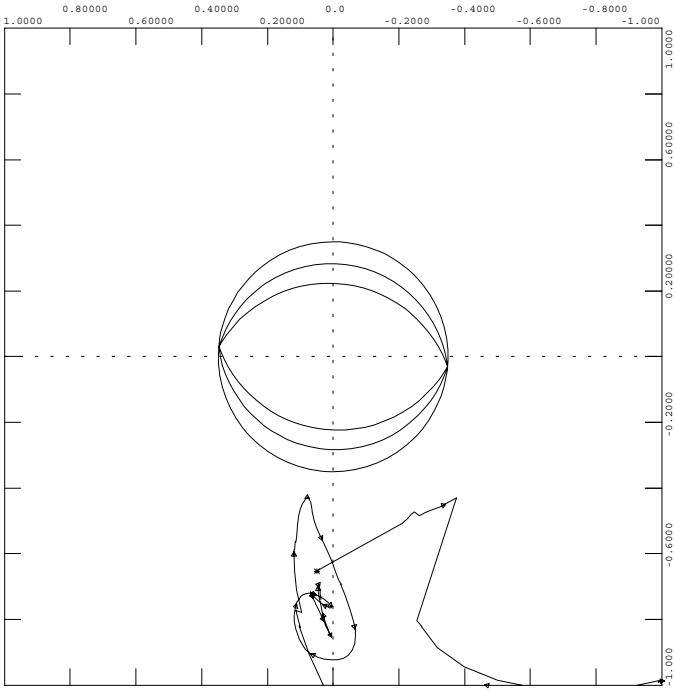
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]



MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

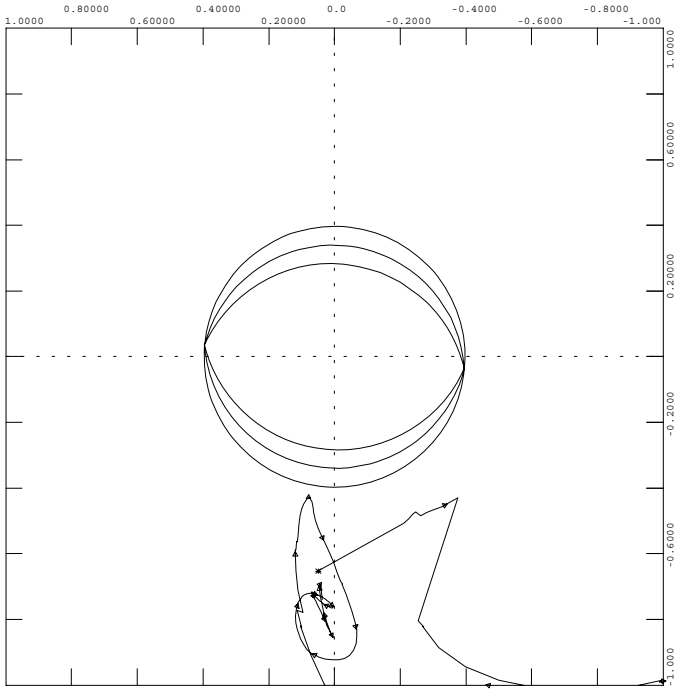
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

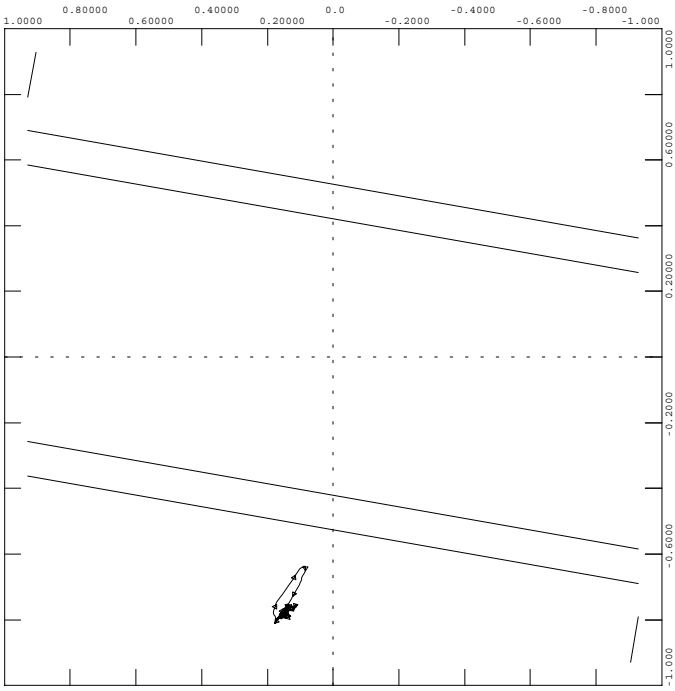
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

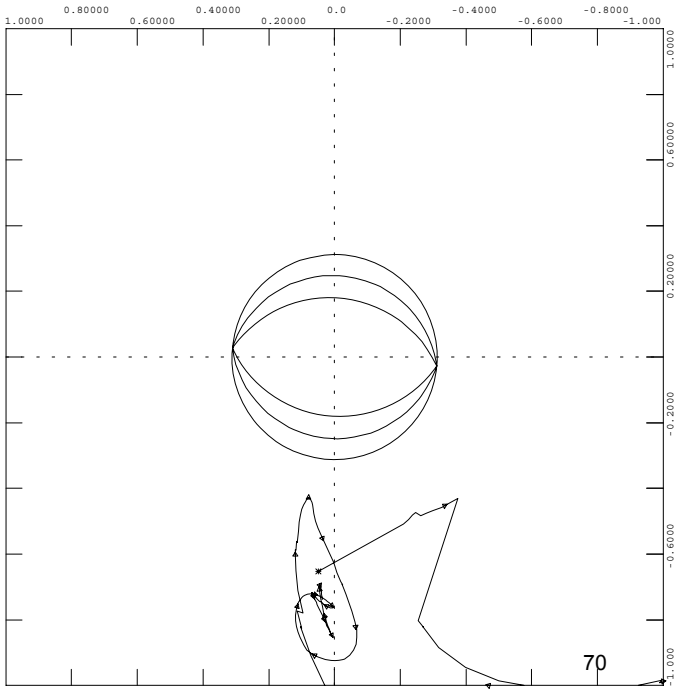
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

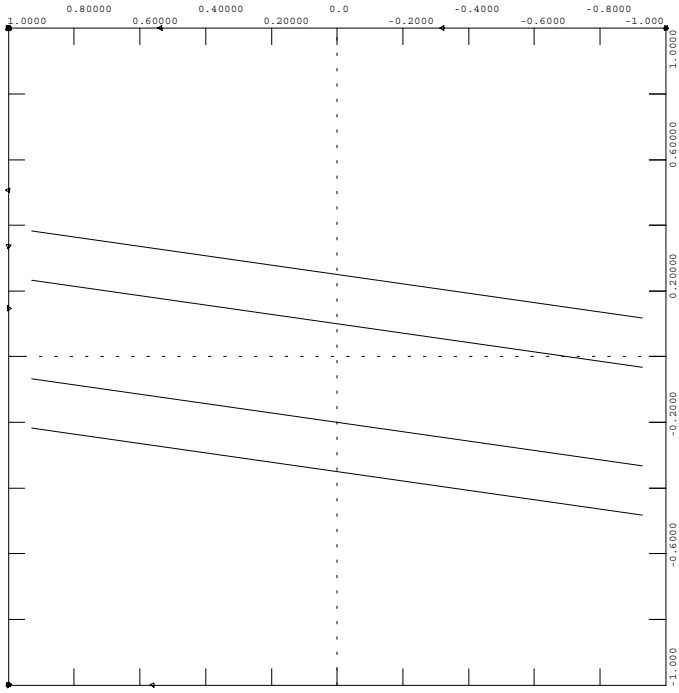
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]



MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 1071: [X-G82R]

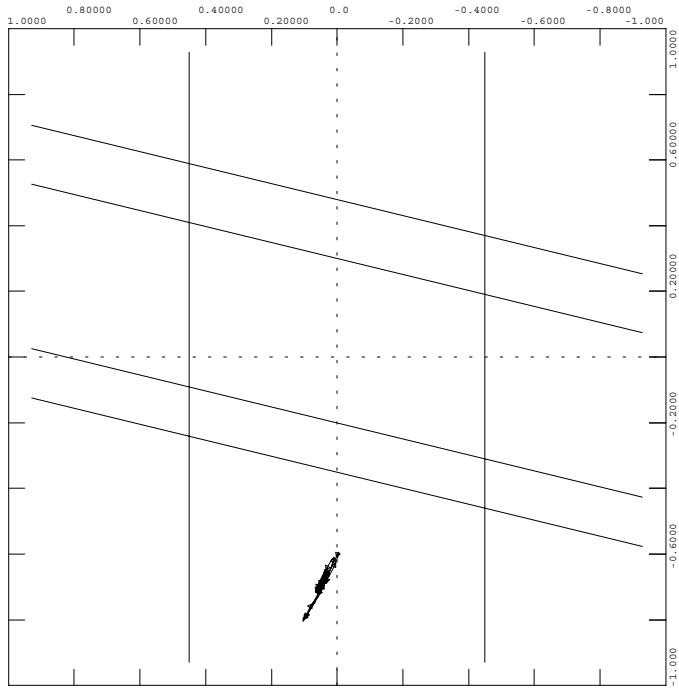



THU, APR 19 2007 14:50
G82R (780)
CHNL# 1070: [R-G82R]

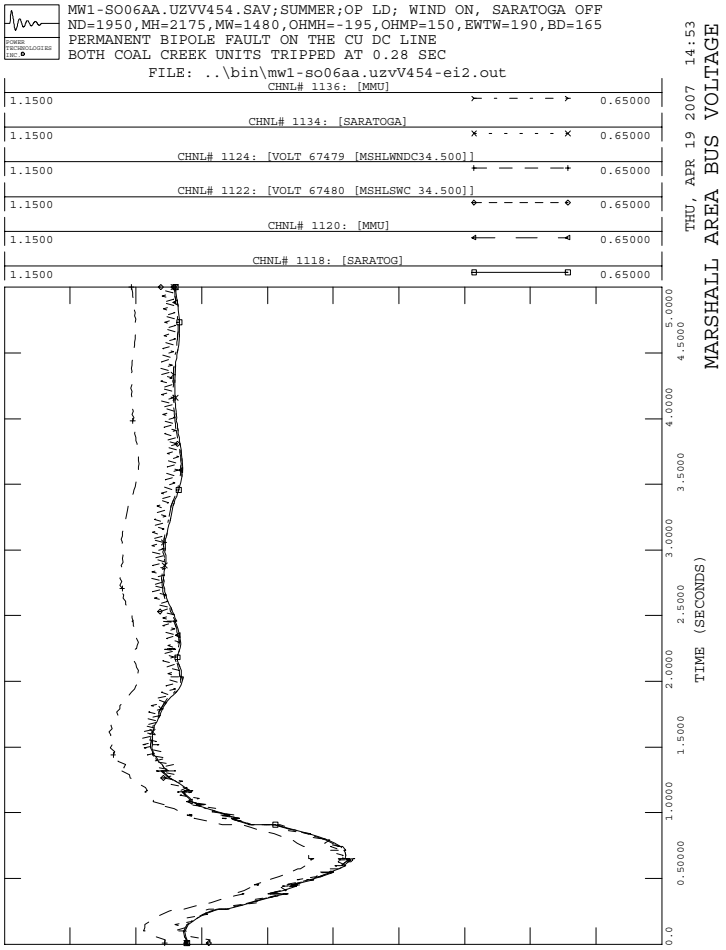
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

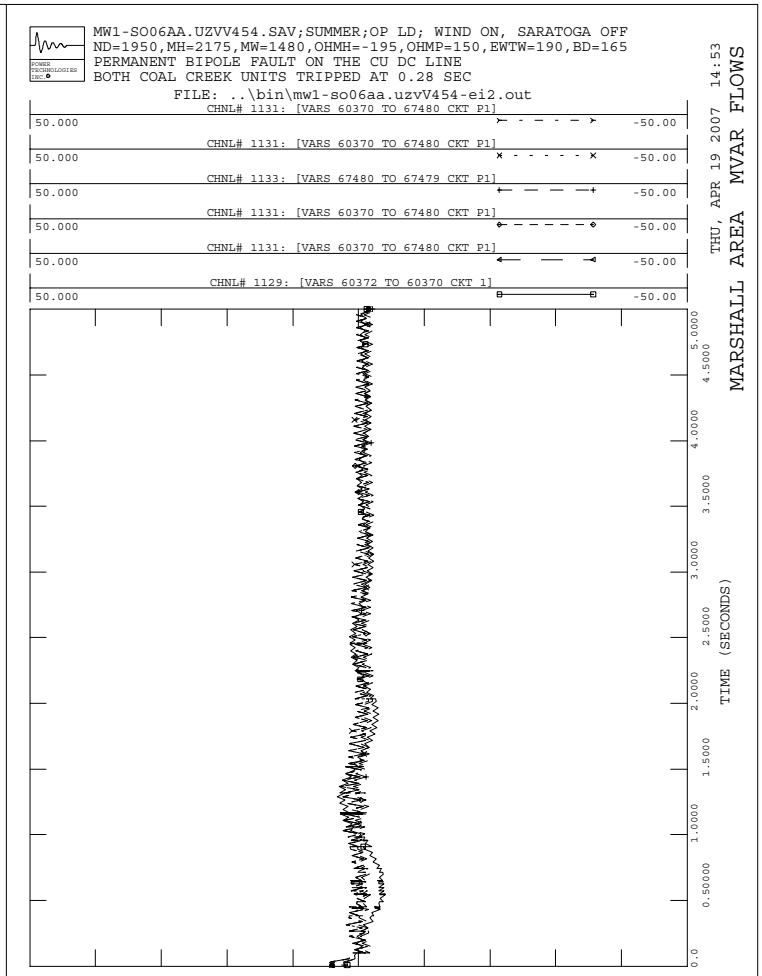
FILE: ..\bin\mw1-so06aa.uzvV454-ag1.out

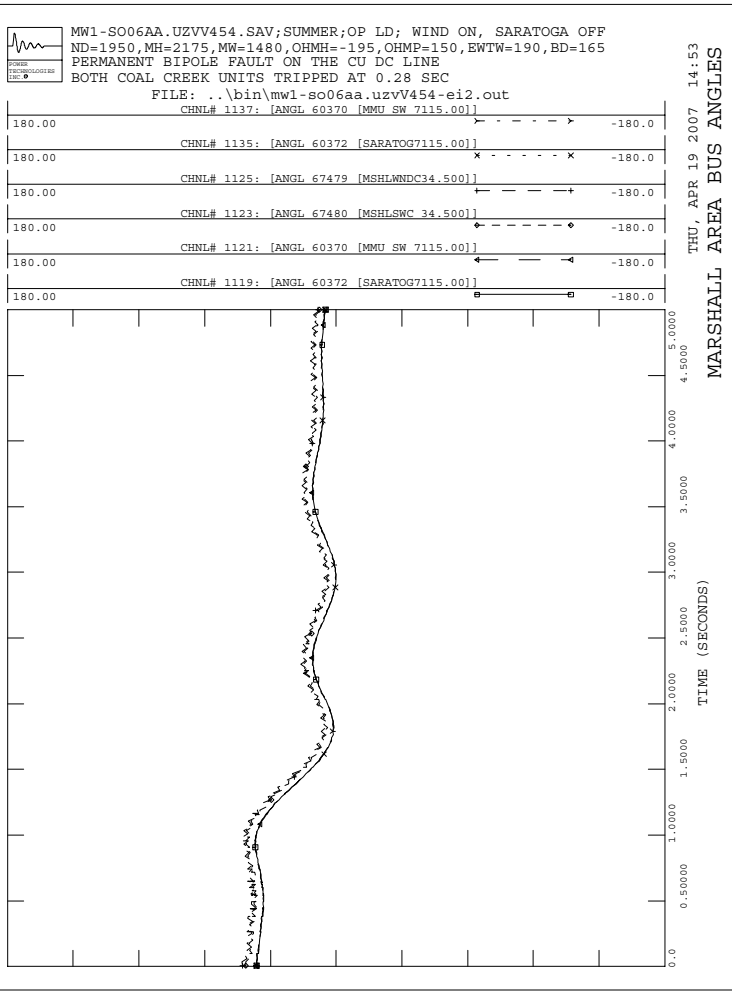
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 848: [X-INT.F-FTF]

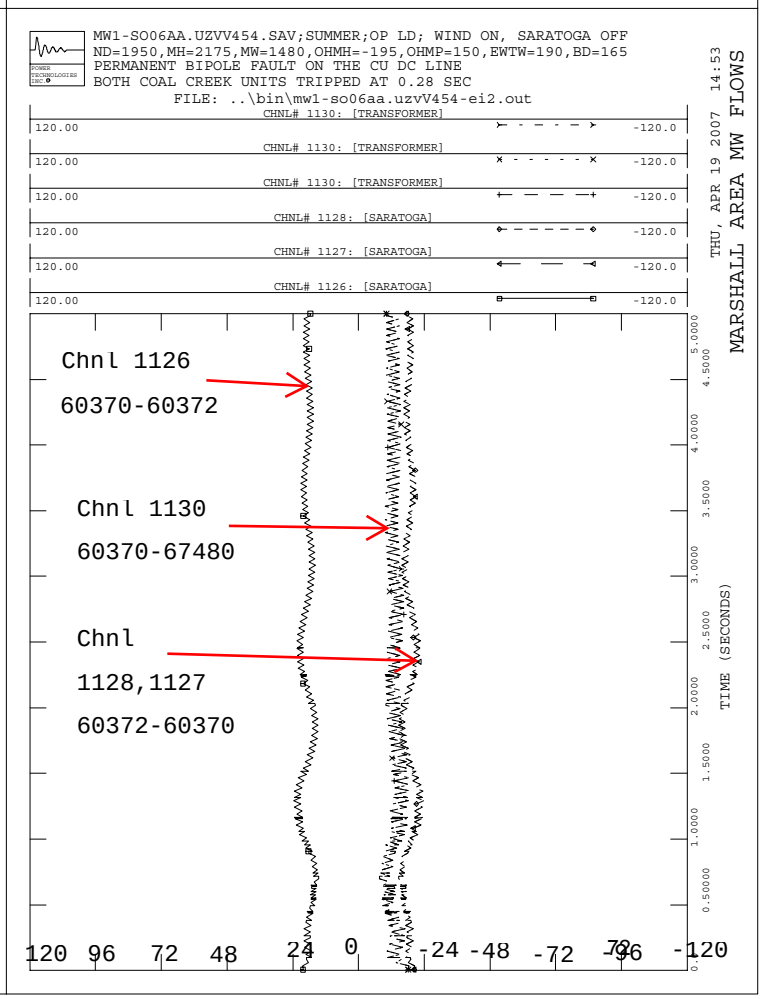


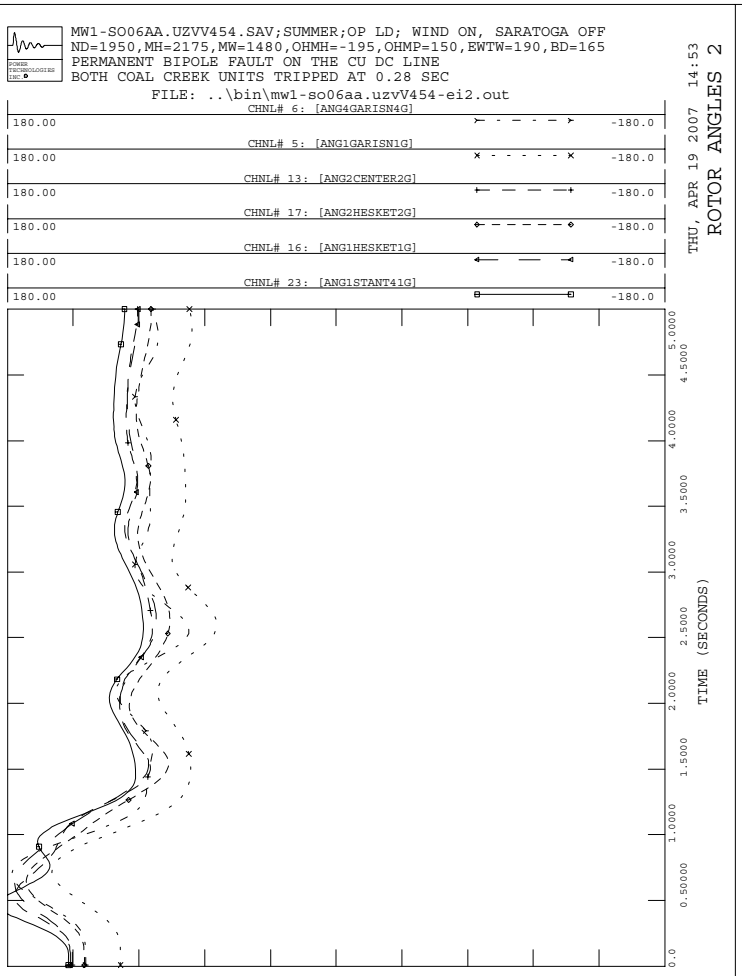

THU, APR 19 2007 14:50
MP-OH I.FALLS (779)
CHNL# 847: [R-1484 6011]

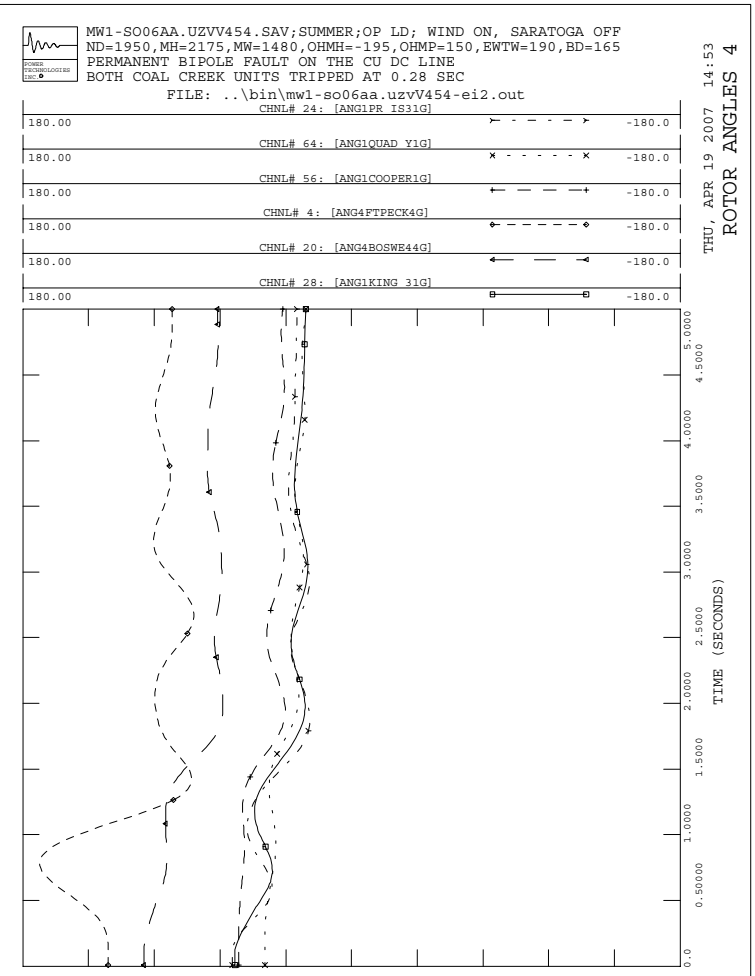

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1136: [MMU]
CHNL# 1134: [SARATOGA]
CHNL# 1124: [VOLT 67479 [MSHLWNDC34.500]]
CHNL# 1122: [VOLT 67480 [MSHLSWC 34.500]]
CHNL# 1120: [MMU]
CHNL# 1118: [SARATOG]
1.1500
0.65000
THU, APR 19 2007 14:53
MARSHALL AREA BUS VOLTAGE
TIME (SECONDS)

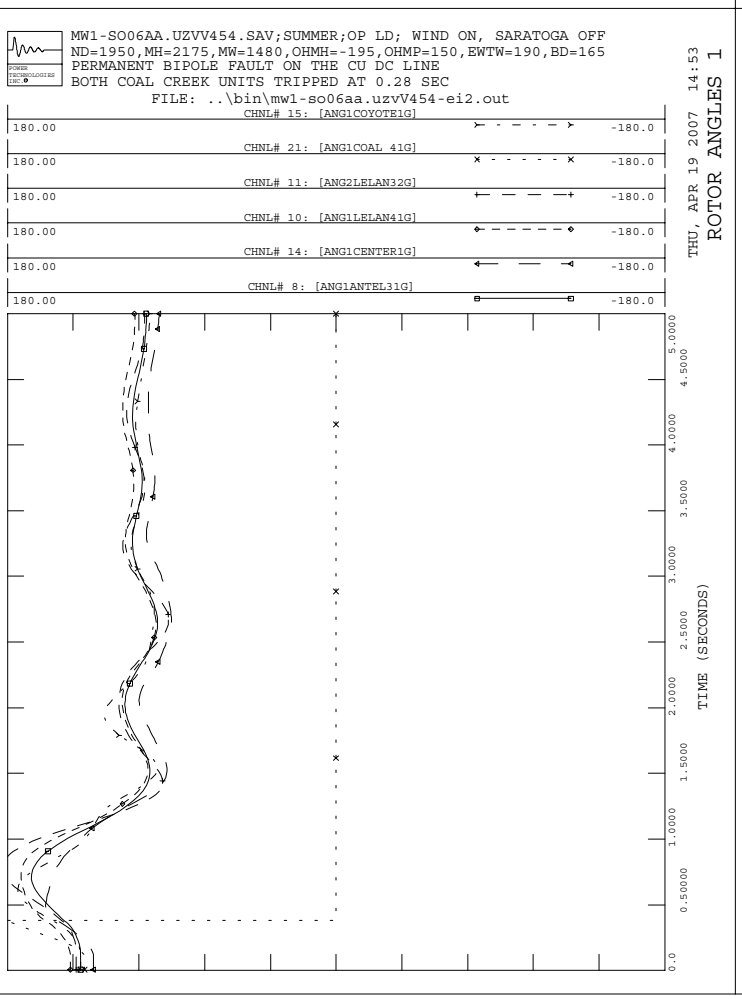

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1133: [VARS 67480 TO 67479 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1131: [VARS 60370 TO 67480 CKT P1]
CHNL# 1129: [VARS 60372 TO 60370 CKT 1]
50.000
-50.00
THU, APR 19 2007 14:53
MARSHALL AREA MVAR FLOWS
TIME (SECONDS)

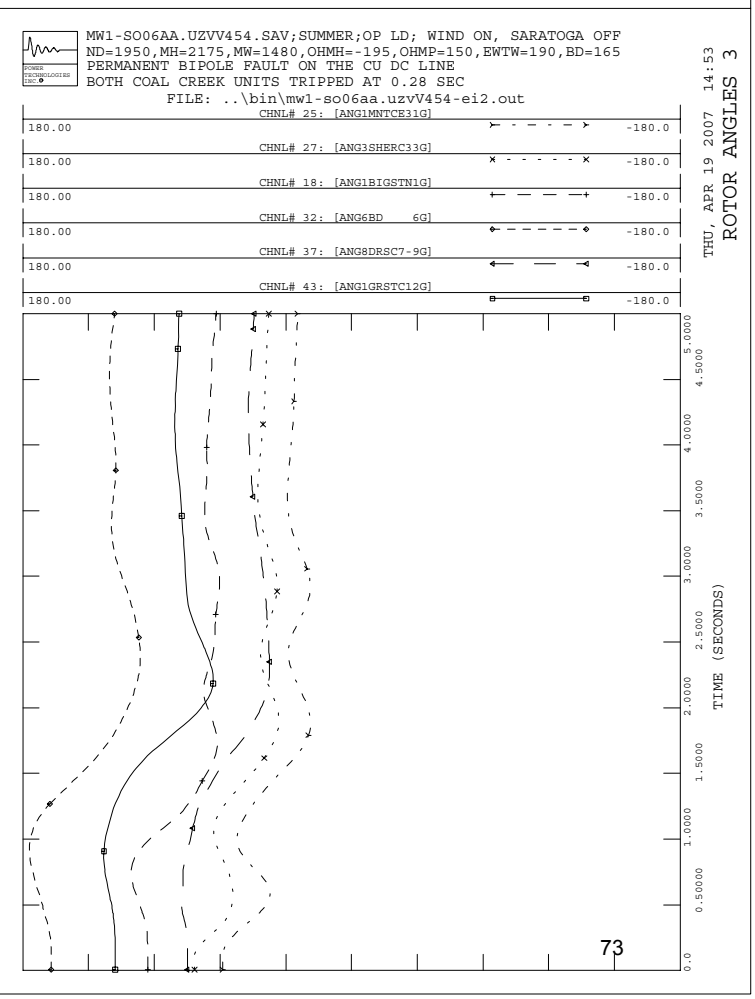

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1137: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1135: [ANGL 60372 [SARATOG7115.00]]
CHNL# 1125: [ANGL 67479 [MSHLWNDC34.500]]
CHNL# 1123: [ANGL 67480 [MSHLSWC 34.500]]
CHNL# 1121: [ANGL 60370 [MMU SW 7115.00]]
CHNL# 1119: [ANGL 60372 [SARATOG7115.00]]
180.00
-180.0
THU, APR 19 2007 14:53
MARSHALL AREA BUS ANGLES
TIME (SECONDS)

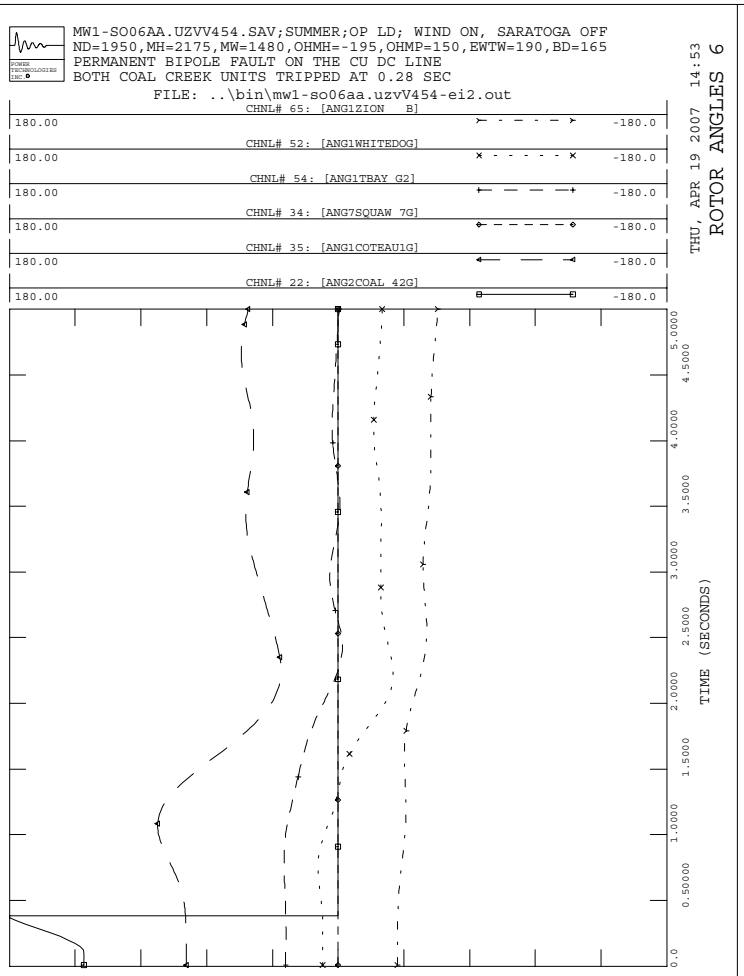

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1130: [TRANSFORMER]
CHNL# 1128: [SARATOGA]
CHNL# 1127: [SARATOGA]
CHNL# 1126: [SARATOGA]
120.00
-120.0
Chnl 1126
60370-60372
Chnl 1130
60370-67480
Chnl
1128,1127
60372-60370
120 96 72 48 24 0 -24 -48 -72 -96 -120
THU, APR 19 2007 14:53
MARSHALL AREA MW FLOWS
TIME (SECONDS)

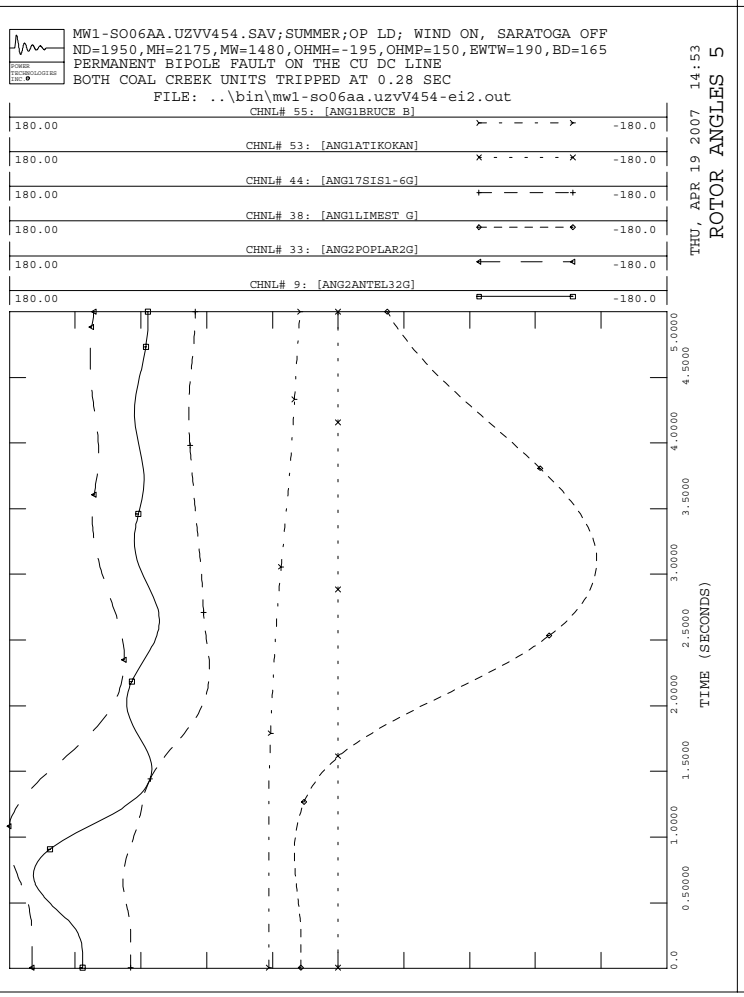

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 6: [ANG4GARISN4G]
CHNL# 5: [ANG1GARISN1G]
CHNL# 13: [ANG2CENTER2G]
CHNL# 17: [ANG2HESKET2G]
CHNL# 16: [ANG1HESKET1G]
CHNL# 23: [ANG1STANT41G]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES 2
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

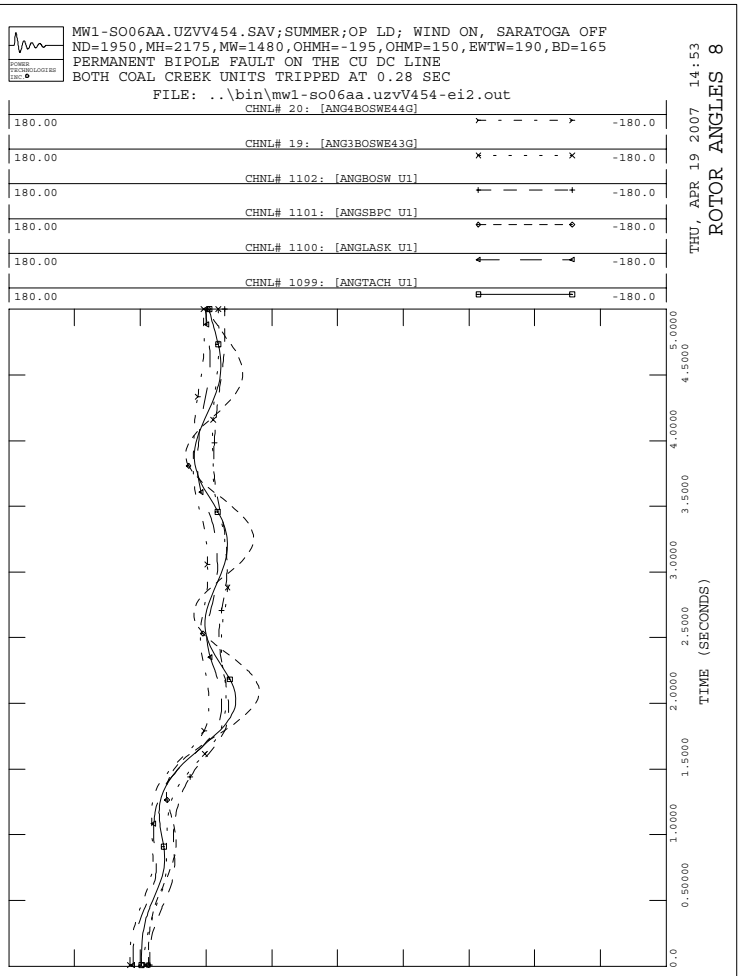

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 24: [ANG1PR IS31G]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 56: [ANG1COOPER1G]
CHNL# 4: [ANG4FTPECK4G]
CHNL# 20: [ANG4BOSWE44G]
CHNL# 28: [ANG1KING 31G]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES 4
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

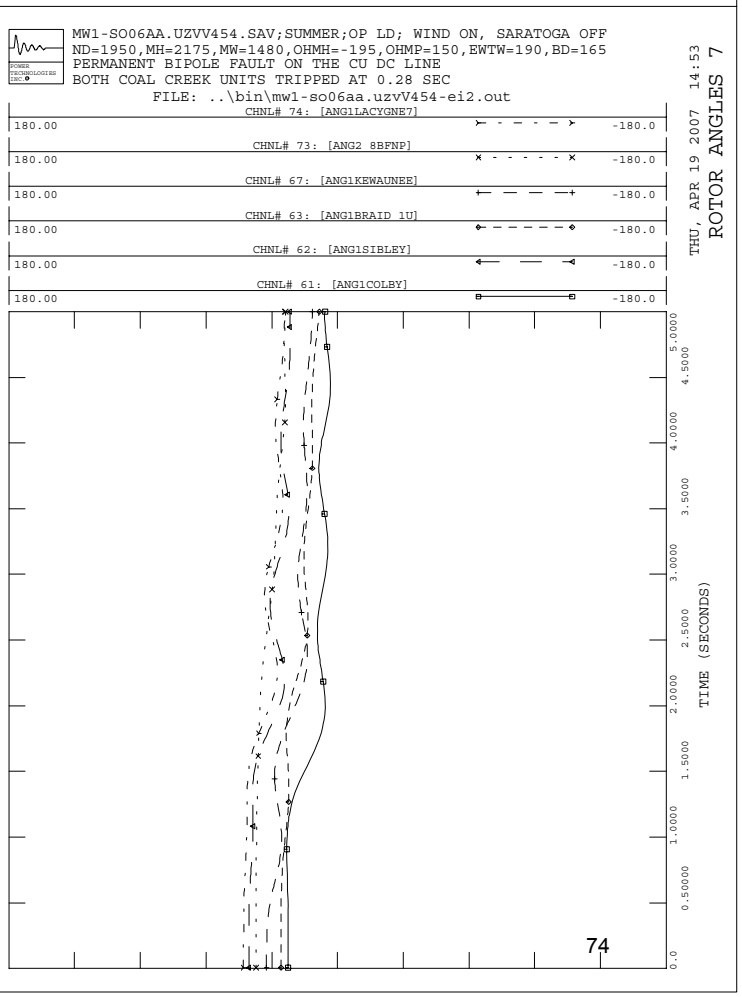

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 15: [ANG1COYOTE1G]
CHNL# 21: [ANG1COAL 41G]
CHNL# 11: [ANG2LELAN32G]
CHNL# 10: [ANG1LELAN41G]
CHNL# 14: [ANG1CENTER1G]
CHNL# 8: [ANG1ANTEL31G]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES 1
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

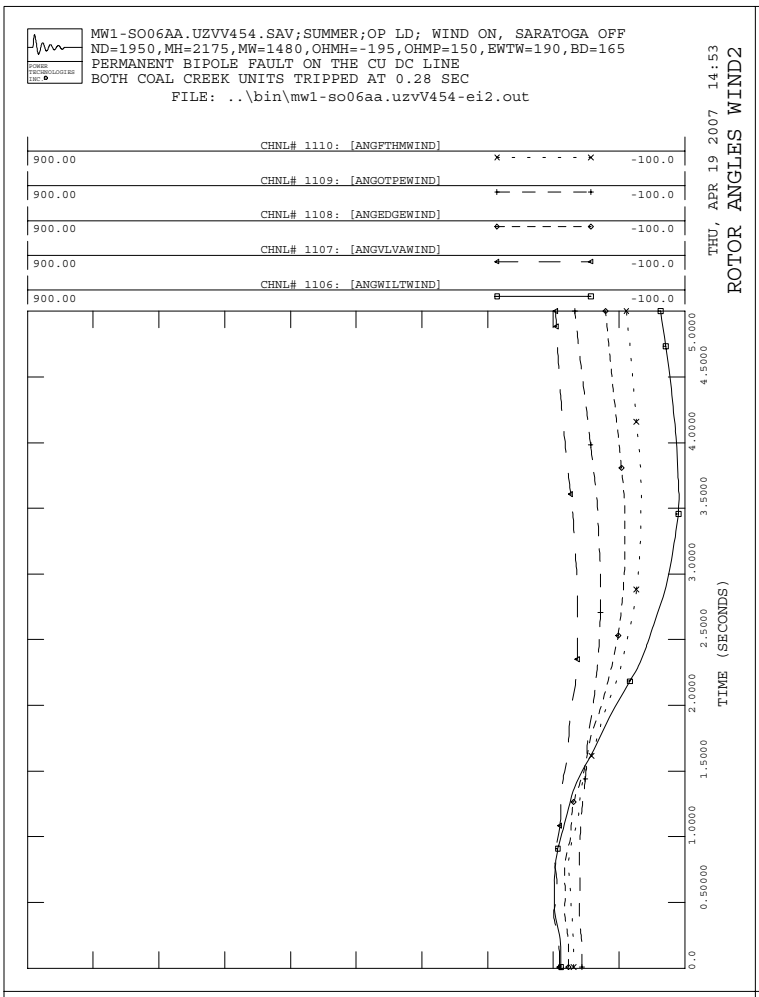

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 25: [ANG1MNTCE31G]
CHNL# 27: [ANG3SHERC33G]
CHNL# 18: [ANG1BIGSTN1G]
CHNL# 32: [ANG6BD 6G]
CHNL# 37: [ANG8DRSC7-9G]
CHNL# 43: [ANG1GRSTC12G]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES 3
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

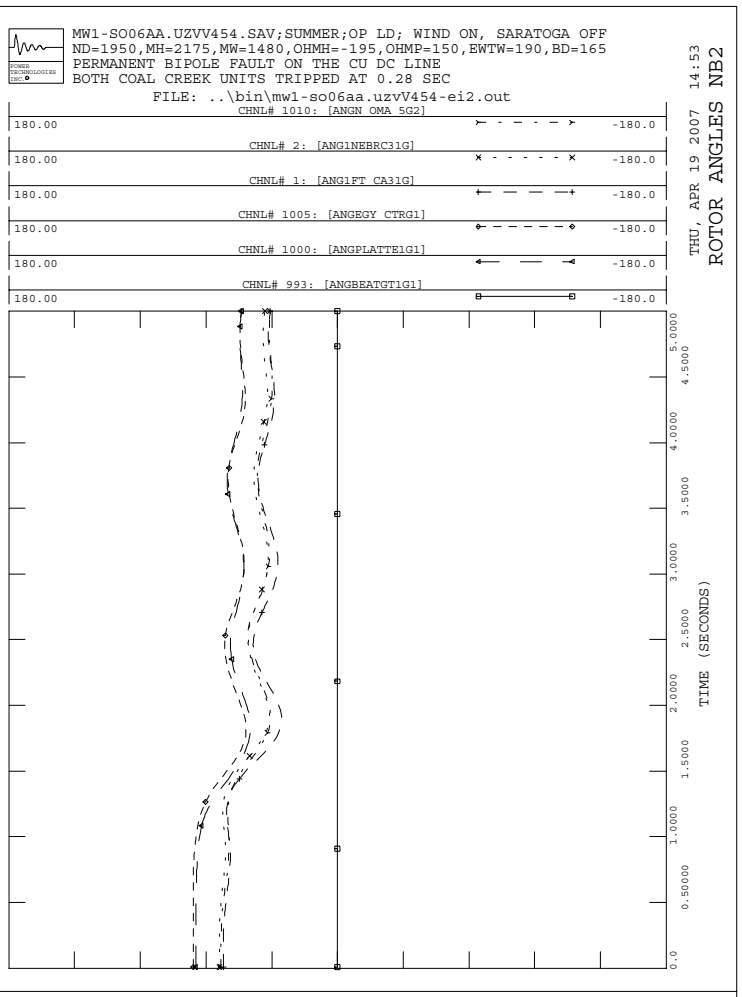

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 65: [ANG1ZION B]
CHNL# 52: [ANG1WHITEDOG]
CHNL# 54: [ANG1TBAY G2]
CHNL# 34: [ANG7SQUAW 7G]
CHNL# 35: [ANG1COTEAU1G]
CHNL# 22: [ANG2COAL 42G]
180.00
-180.0
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000
TIME (SECONDS)
THU, APR 19 2007 14:53
ROTOR ANGLES 6

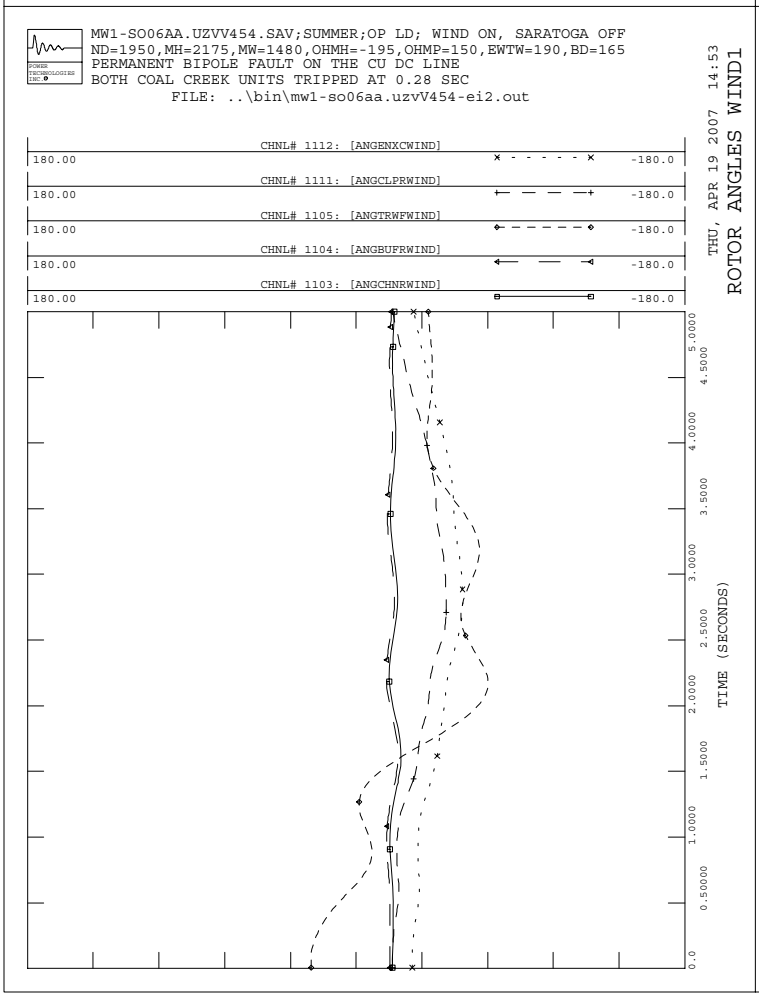

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 55: [ANG1BRUCE B]
CHNL# 53: [ANG1ATIKOKAN]
CHNL# 44: [ANG17SIS1-6G]
CHNL# 38: [ANG1LIMEST G]
CHNL# 33: [ANG2POPLAR2G]
CHNL# 9: [ANG2ANTEL32G]
180.00
-180.0
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000
TIME (SECONDS)
THU, APR 19 2007 14:53
ROTOR ANGLES 5

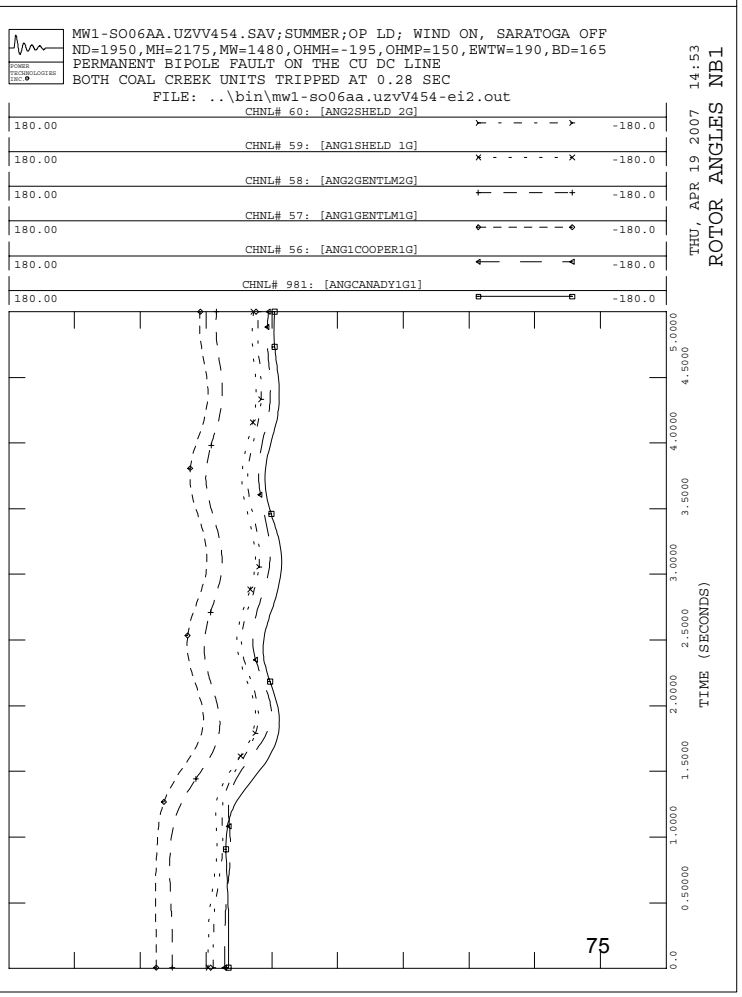

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 20: [ANG4BOSWE44G]
CHNL# 19: [ANG3BOSWE43G]
CHNL# 1102: [ANGBOSW U1]
CHNL# 1101: [ANGSBPC U1]
CHNL# 1100: [ANGLASK U1]
CHNL# 1099: [ANGTACH U1]
180.00
-180.0
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000
TIME (SECONDS)
THU, APR 19 2007 14:53
ROTOR ANGLES 8

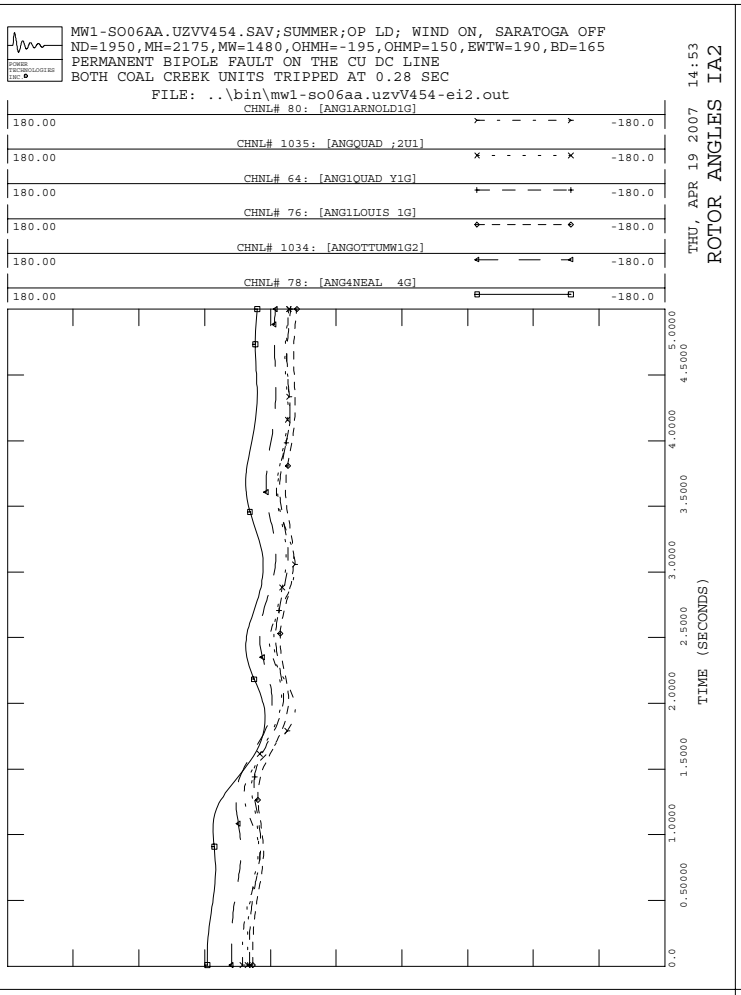

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 74: [ANG1LACYGNE7]
CHNL# 73: [ANG2 8BFNP]
CHNL# 67: [ANG1KEWAUNEE]
CHNL# 63: [ANG1BRAID 1U]
CHNL# 62: [ANG1SIBLEY]
CHNL# 61: [ANG1COLBY]
180.00
-180.0
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000
TIME (SECONDS)
THU, APR 19 2007 14:53
ROTOR ANGLES 7


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1110: [ANGFTHMWIND]
CHNL# 1109: [ANGOTPEWIND]
CHNL# 1108: [ANGEDGEWIND]
CHNL# 1107: [ANGVLVAWIND]
CHNL# 1106: [ANGWILTWIND]
900.00
-100.0
THU, APR 19 2007 14:53
ROTOR ANGLES WIND2
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1010: [ANGN OMA 5G2]
CHNL# 2: [ANG1NEBRC31G]
CHNL# 1: [ANG1FT CA31G]
CHNL# 1005: [ANGEGY CTRG1]
CHNL# 1000: [ANGPLATTE1G1]
CHNL# 993: [ANGBEATGT1G1]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES NB2
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1112: [ANGENXCWIND]
CHNL# 1111: [ANGCLPRWIND]
CHNL# 1105: [ANGTRWFWIND]
CHNL# 1104: [ANGBUFRWIND]
CHNL# 1103: [ANGCHNRWIND]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES WIND1
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 60: [ANG2SHELD 2G]
CHNL# 59: [ANG1SHELD 1G]
CHNL# 58: [ANG2GENTLM2G]
CHNL# 57: [ANG1GENTLM1G]
CHNL# 56: [ANG1COOPER1G]
CHNL# 981: [ANGCANADY1G1]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES NB1
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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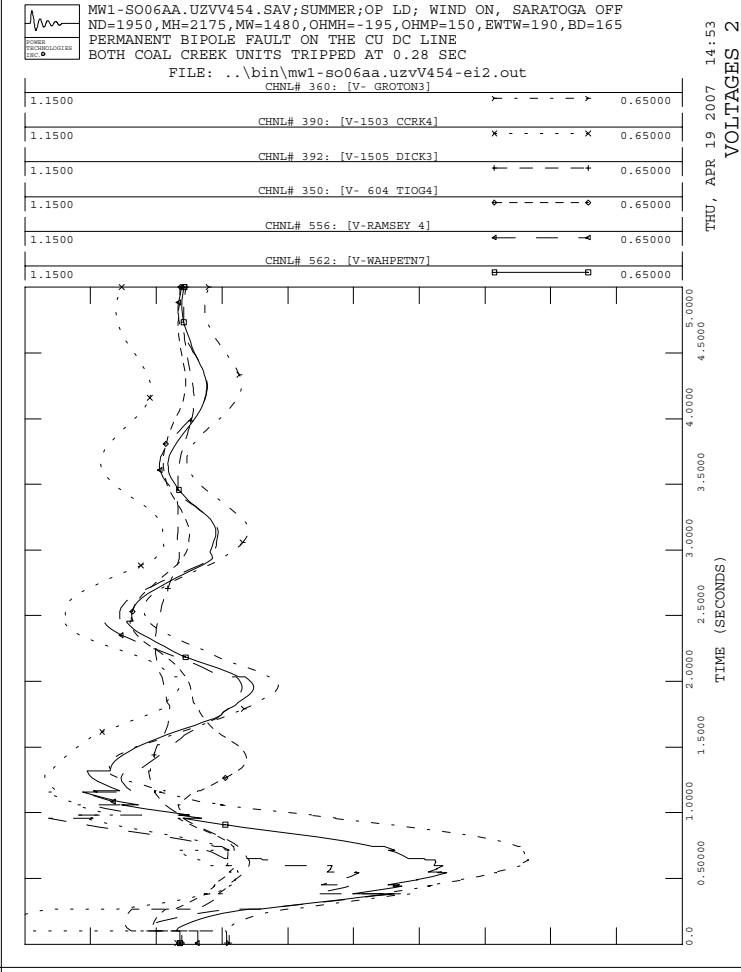
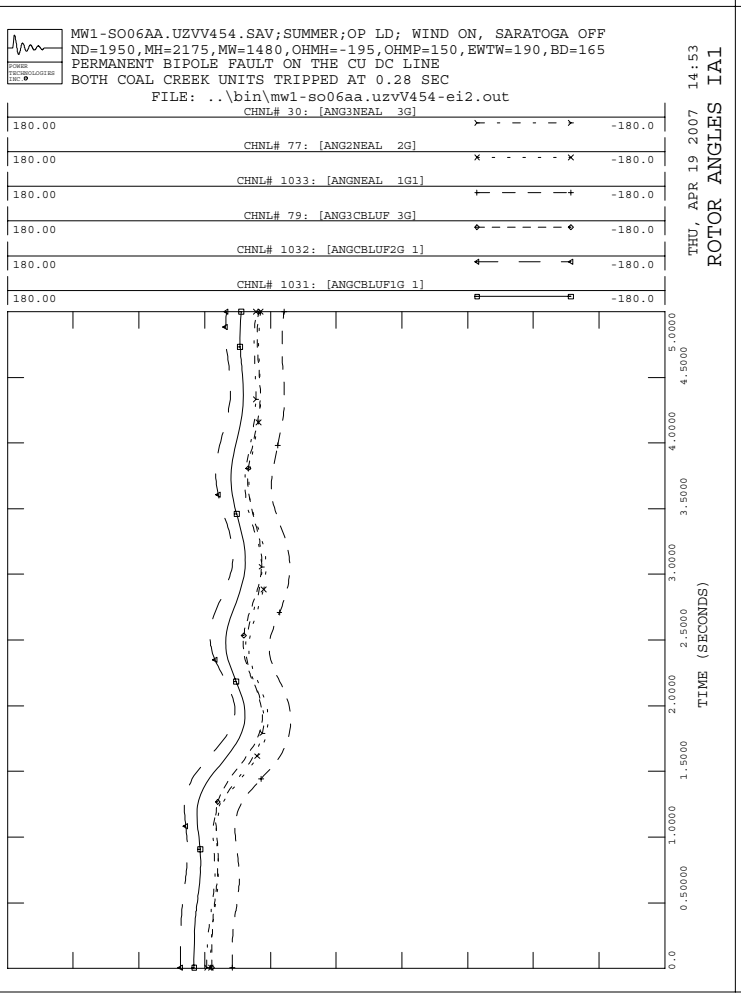
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 80: [ANG1ARNOLD1G]
CHNL# 1035: [ANGQUAD ;2U1]
CHNL# 64: [ANG1QUAD Y1G]
CHNL# 76: [ANG1LOUIS 1G]
CHNL# 1034: [ANGOTTUMW1G2]
CHNL# 78: [ANG4NEAL 4G]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES IA2
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 360: [V- GROTON3]
CHNL# 390: [V-1503 CCRK4]
CHNL# 392: [V-1505 DICK3]
CHNL# 350: [V- 604 TIOG4]
CHNL# 556: [V-RAMSEY 4]
CHNL# 562: [V-WAHPETN7]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES 2
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
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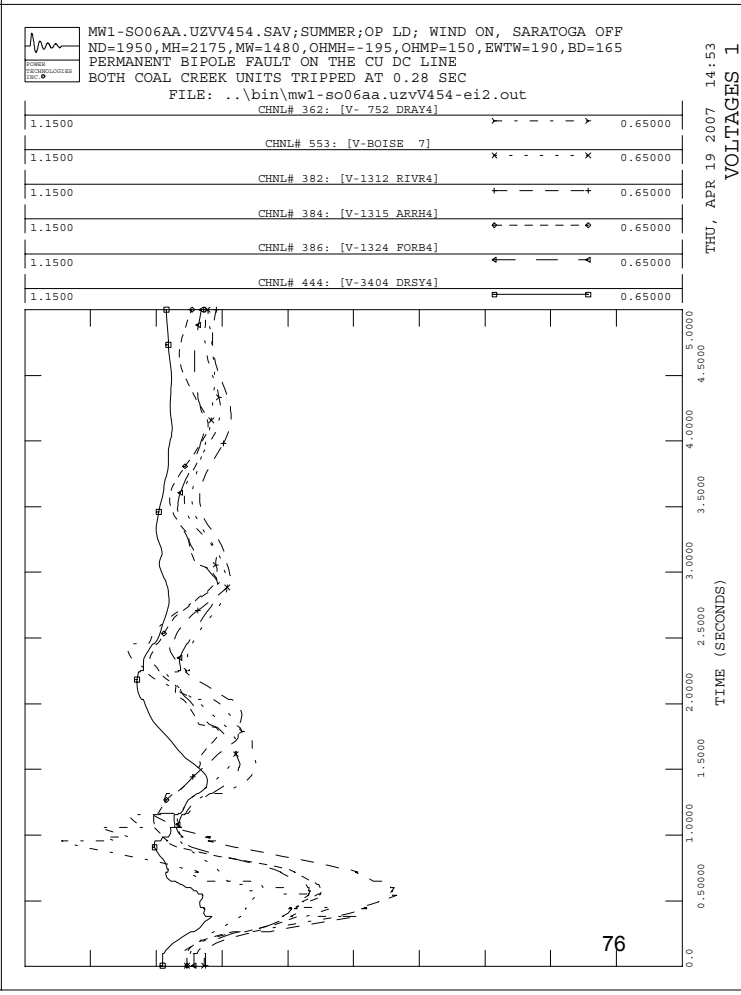
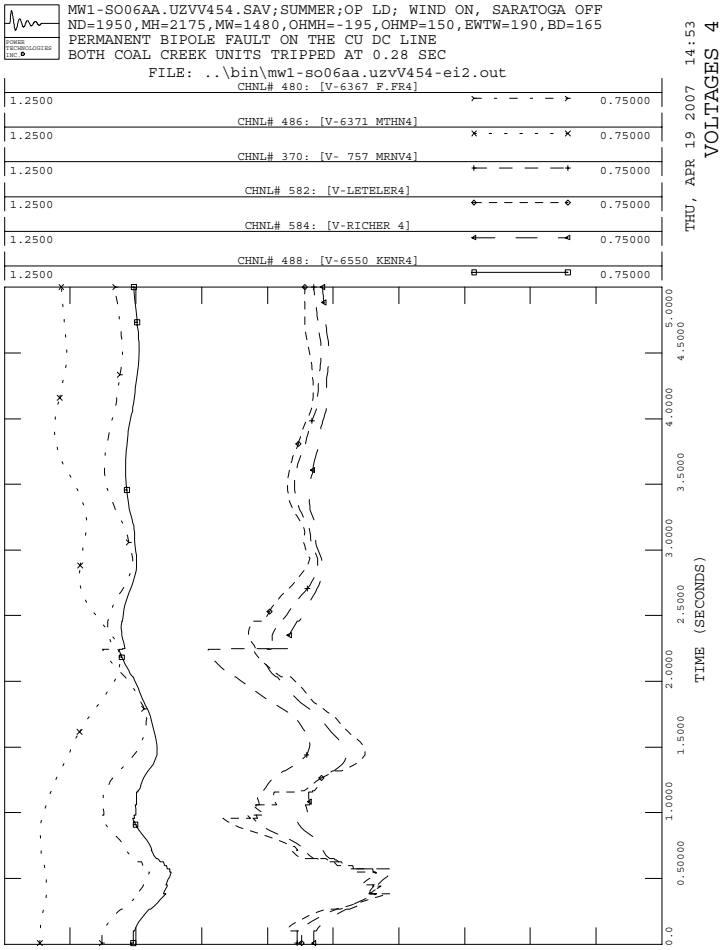
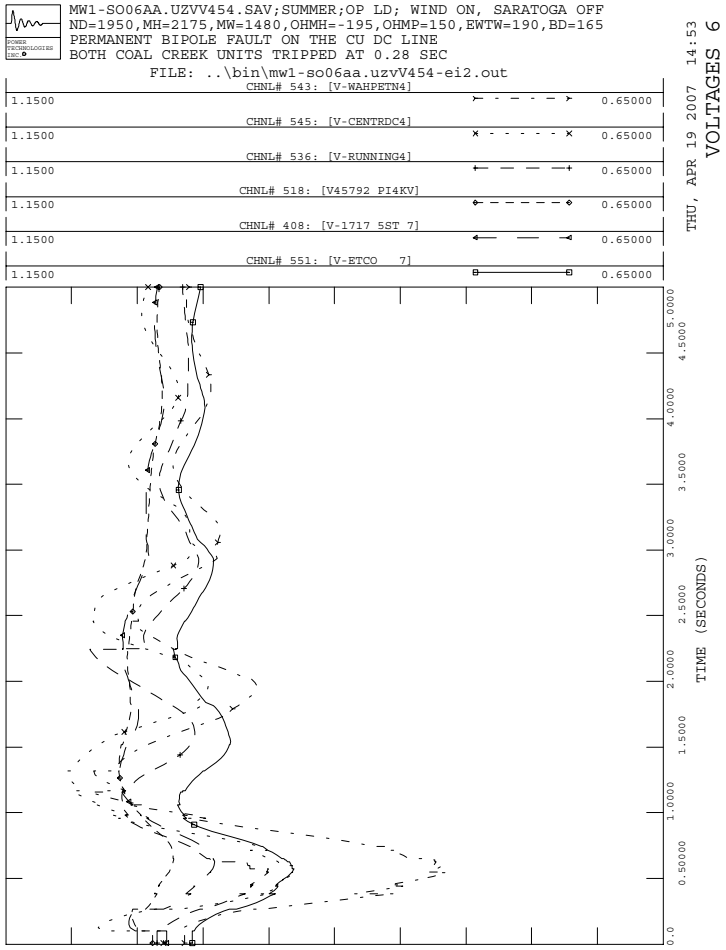
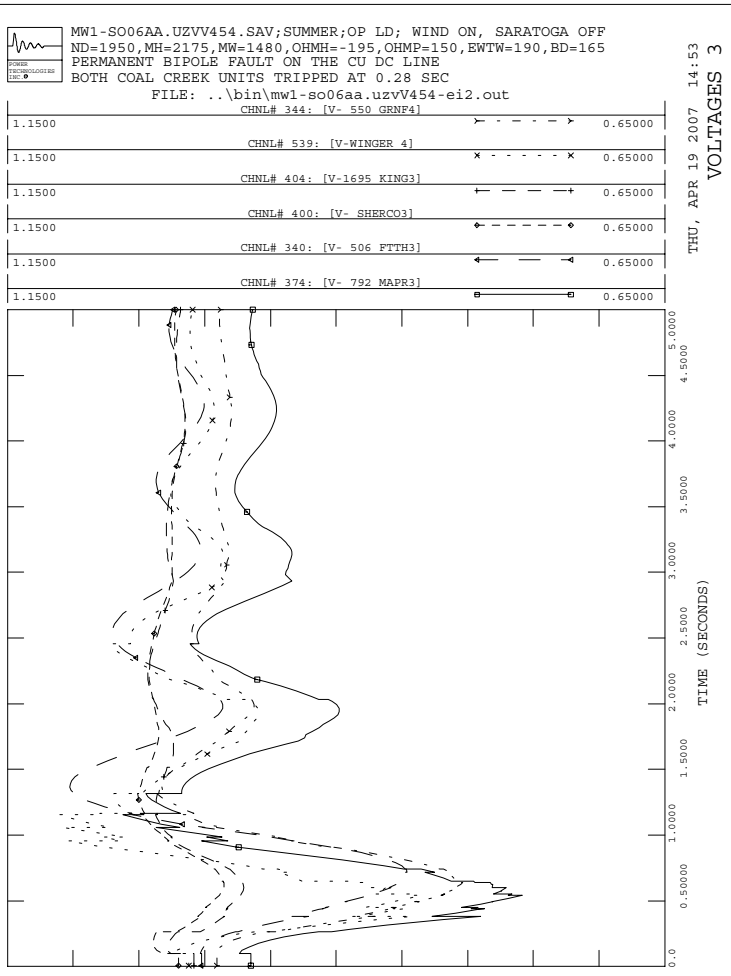
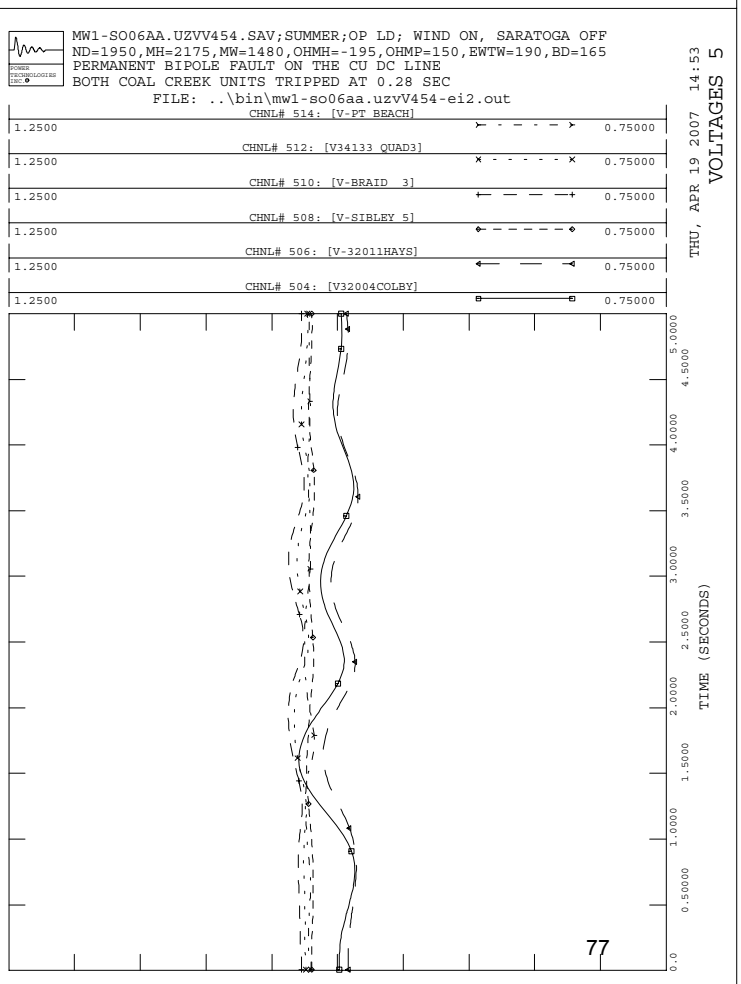
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 30: [ANG3NEAL 3G]
CHNL# 77: [ANG2NEAL 2G]
CHNL# 1033: [ANGNEAL 1G1]
CHNL# 79: [ANG3CBLUF 3G]
CHNL# 1032: [ANGCBLUF2G 1]
CHNL# 1031: [ANGCBLUF1G 1]
180.00
-180.0
THU, APR 19 2007 14:53
ROTOR ANGLES IA1
TIME (SECONDS)

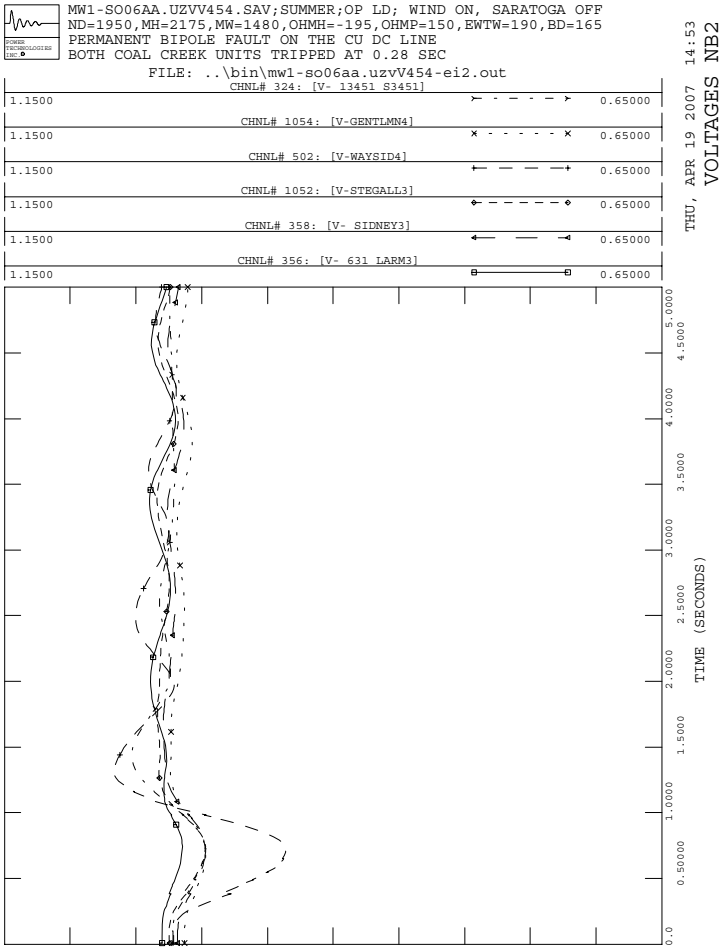

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 362: [V- 752 DRAY4]
CHNL# 553: [V-BOISE 7]
CHNL# 382: [V-1312 RIVR4]
CHNL# 384: [V-1315 ARRH4]
CHNL# 386: [V-1324 FORB4]
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES 1
TIME (SECONDS)

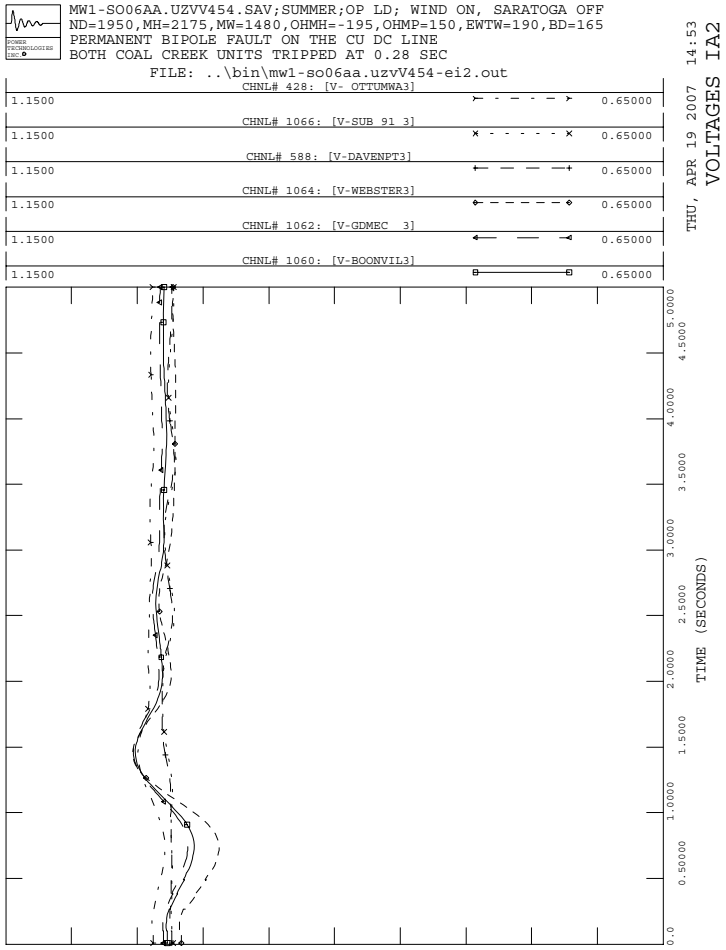

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 480: [V-6367 F.FR4]
CHNL# 486: [V-6371 MTHN4]
CHNL# 370: [V- 757 MRNV4]
CHNL# 582: [V-LETELER4]
CHNL# 584: [V-RICHER 4]
CHNL# 488: [V-6550 KENR4]
1.2500
0.75000
THU, APR 19 2007 14:53
VOLTAGES 4
TIME (SECONDS)

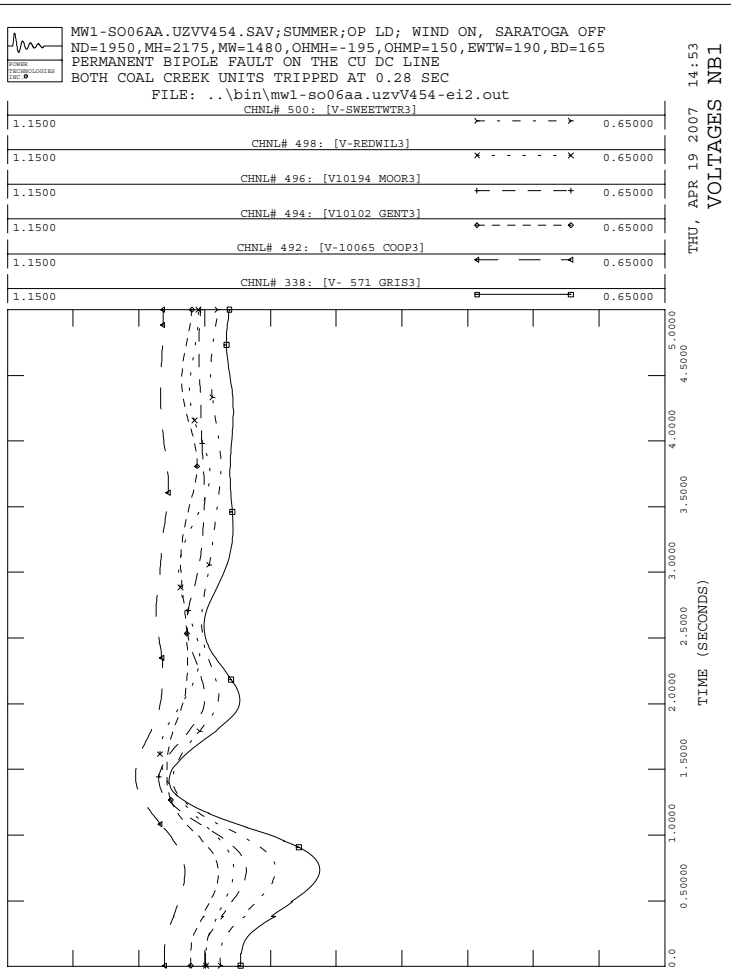

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 543: [V-WAHPETN4]
CHNL# 545: [V-CENTRDC4]
CHNL# 536: [V-RUNNING4]
CHNL# 518: [V45792 PI4KV]
CHNL# 408: [V-1717 5ST 7]
CHNL# 551: [V-ETCO 7]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES 6
TIME (SECONDS)

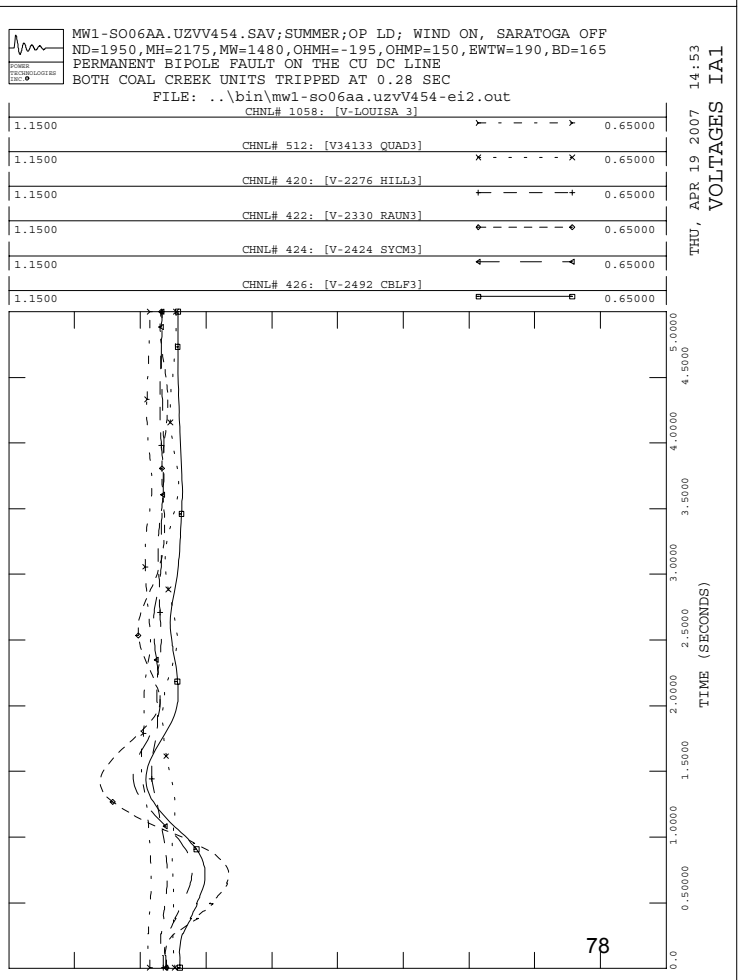

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 344: [V- 550 GRNF4]
CHNL# 539: [V-WINGER 4]
CHNL# 404: [V-1695 KING3]
CHNL# 400: [V- SHERCO3]
CHNL# 340: [V- 506 FTTH3]
CHNL# 374: [V- 792 MAPR3]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES 3
TIME (SECONDS)

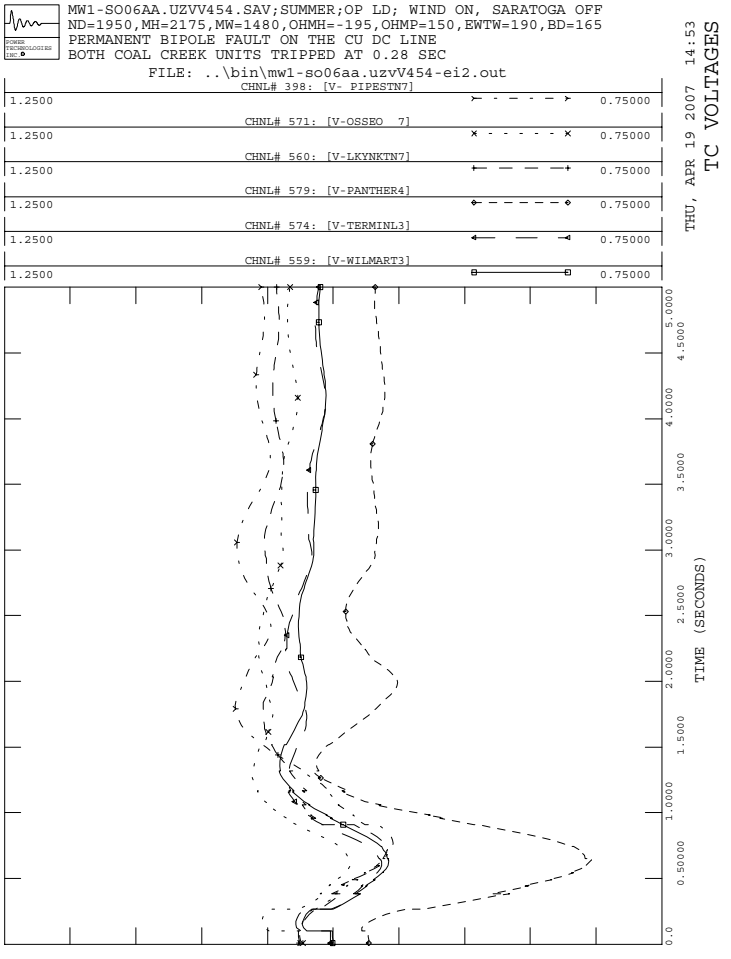

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 514: [V-PT BEACH]
CHNL# 512: [V34133 QUAD3]
CHNL# 510: [V-BRAID 3]
CHNL# 508: [V-SIBLEY 5]
CHNL# 506: [V-32011HAYS]
CHNL# 504: [V32004COLBY]
1.2500
0.75000
THU, APR 19 2007 14:53
VOLTAGES 5
TIME (SECONDS)

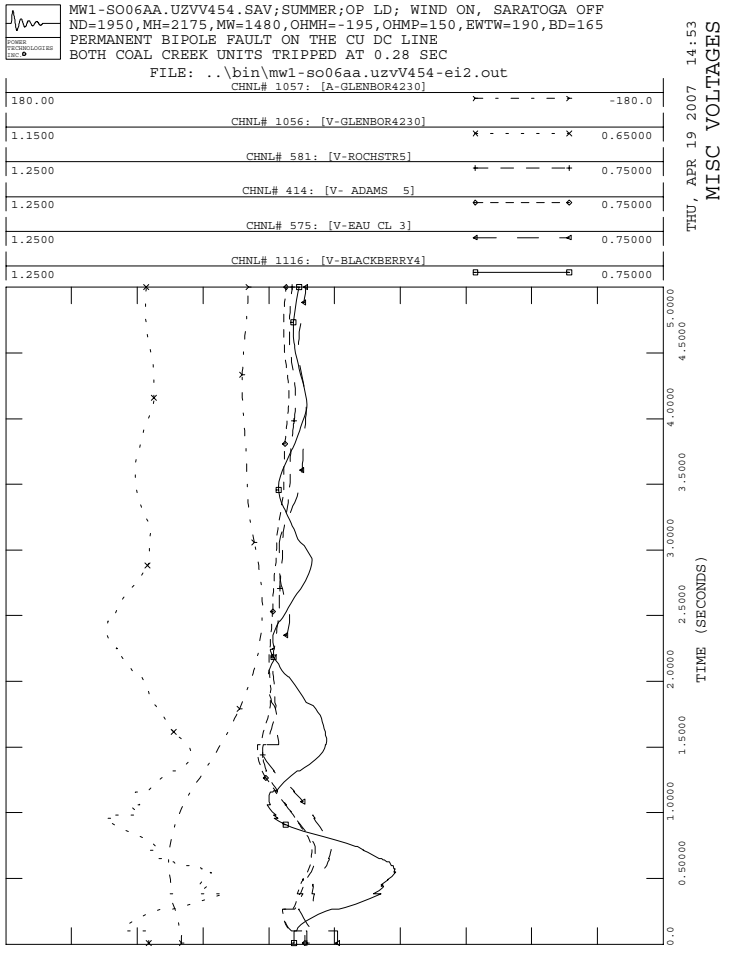

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 324: [V- 13451 S3451]
CHNL# 1054: [V-GENTLMN4]
CHNL# 502: [V-WAYSID4]
CHNL# 1052: [V-STEGALL3]
CHNL# 358: [V- SIDNEY3]
CHNL# 356: [V- 631 LARM3]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES NB2
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

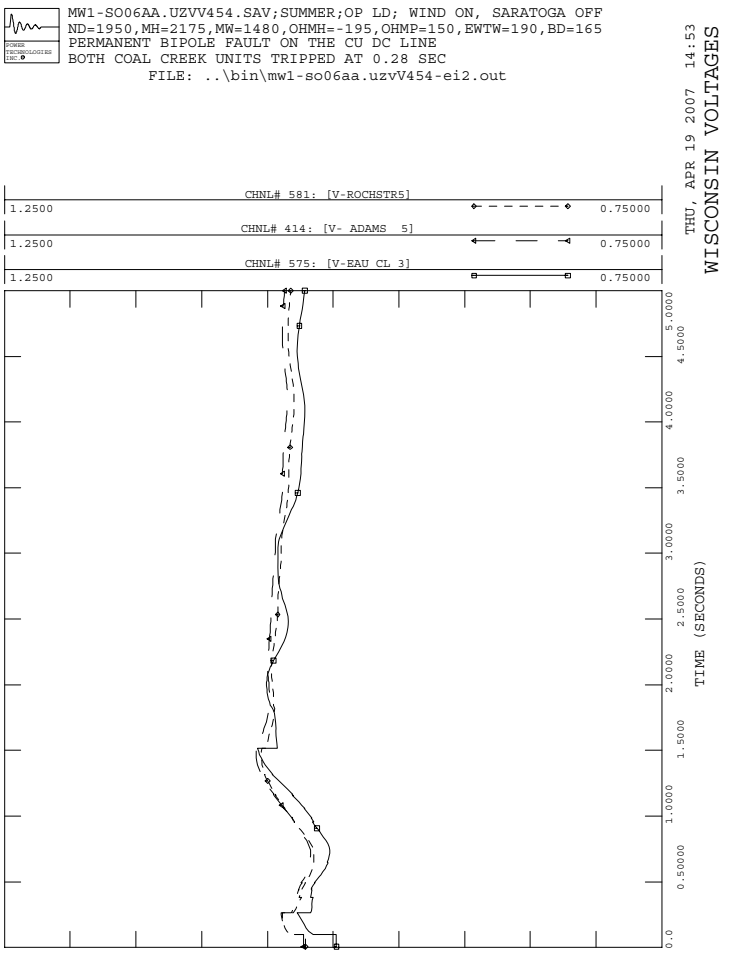

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 428: [V- OTTUMWA3]
CHNL# 1066: [V-SUB 91 3]
CHNL# 588: [V-DAVENPT3]
CHNL# 1064: [V-WEBSTER3]
CHNL# 1062: [V-GDMEC 3]
CHNL# 1060: [V-BOONVIL3]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES IA2
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

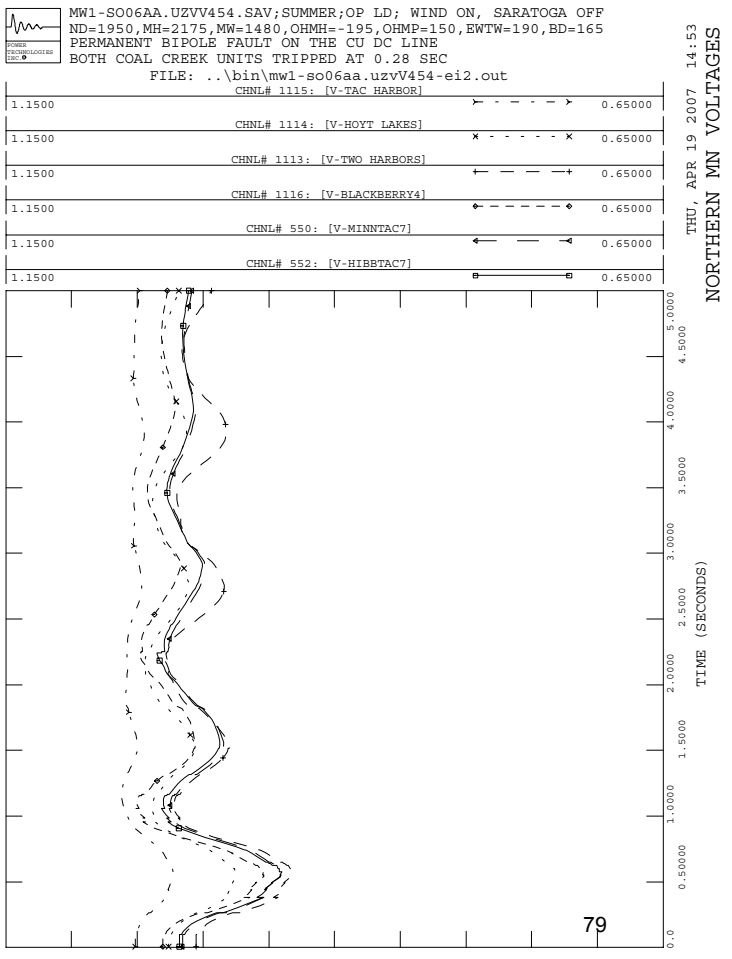

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 500: [V-SWEETWTR3]
CHNL# 498: [V-REDWIL3]
CHNL# 496: [V10194 MOOR3]
CHNL# 494: [V10102 GENT3]
CHNL# 492: [V-10065 COOP3]
CHNL# 338: [V- 571 GRIS3]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES NB1
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

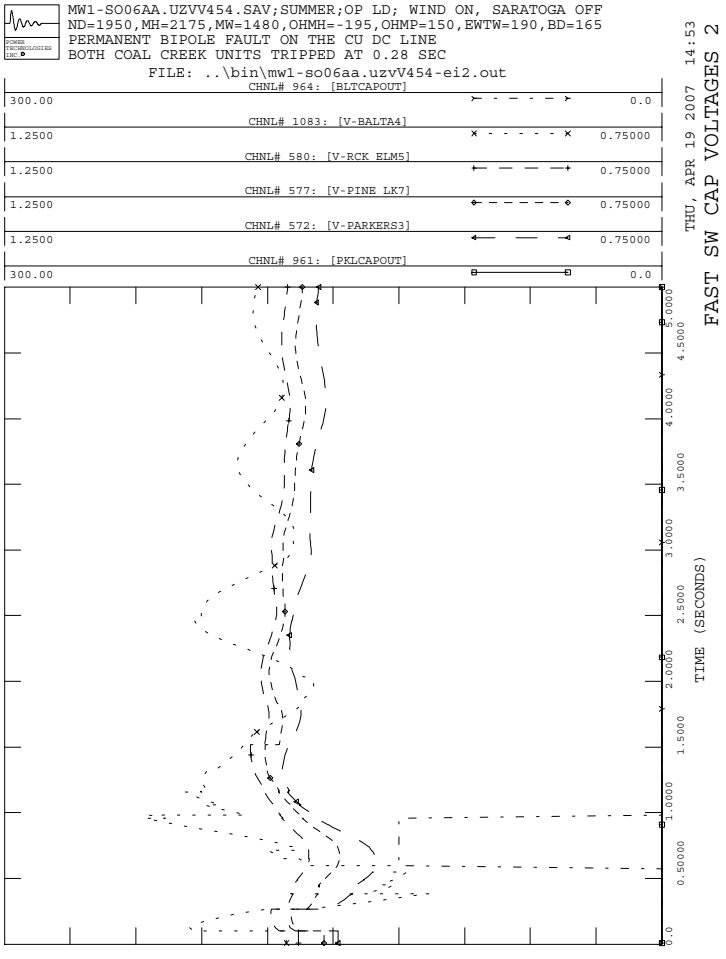

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1058: [V-LOUISA 3]
CHNL# 512: [V34133 QUAD3]
CHNL# 420: [V-2276 HILL3]
CHNL# 422: [V-2330 RAUN3]
CHNL# 424: [V-2424 SYCM3]
CHNL# 426: [V-2492 CBLF3]
1.1500
0.65000
THU, APR 19 2007 14:53
VOLTAGES IA1
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

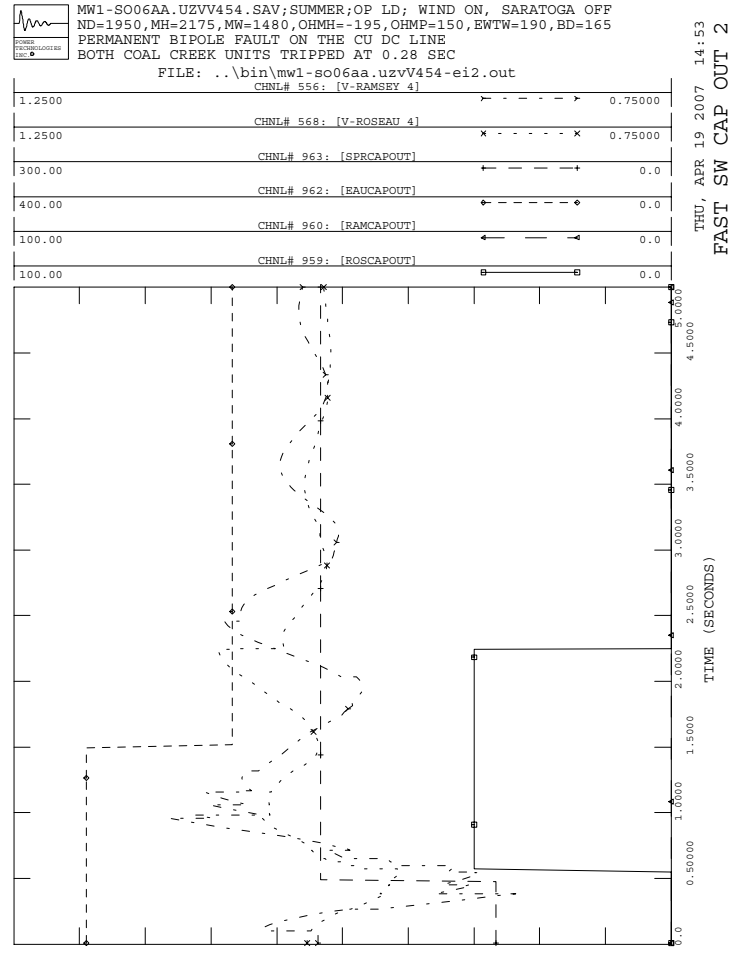

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 398: [V- PIPESTN7]
CHNL# 571: [V-OSSEO 7]
CHNL# 560: [V-LKYNKTN7]
CHNL# 579: [V-PANTHER4]
CHNL# 574: [V-TERMINL3]
CHNL# 559: [V-WILMART3]
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:53
TC VOLTAGES

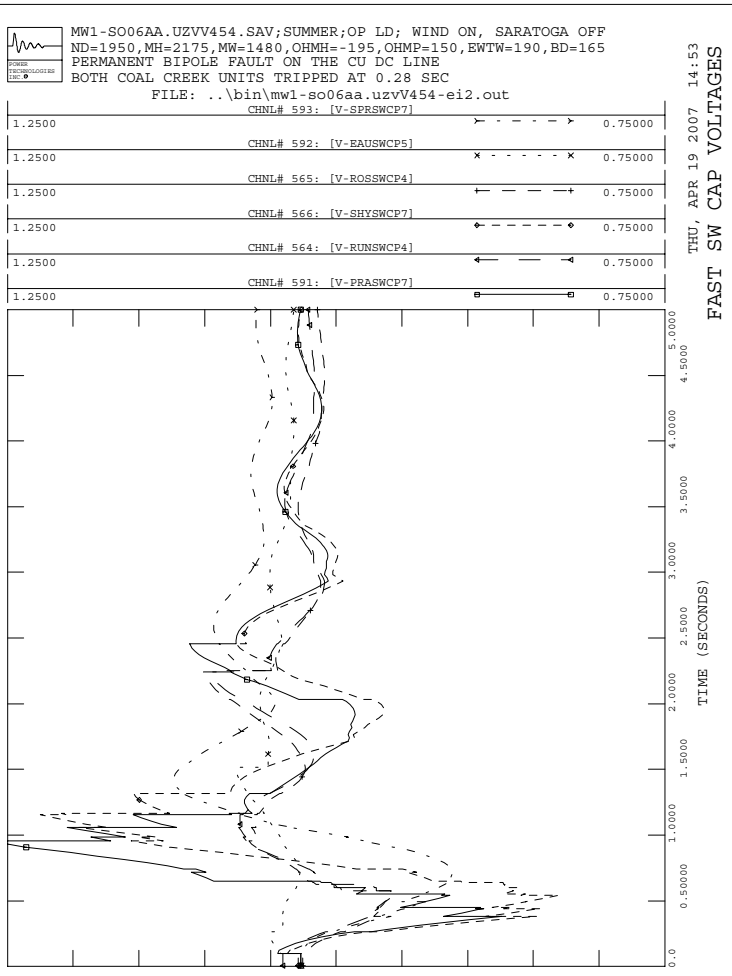

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1057: [A-GLENBOR4230]
CHNL# 1056: [V-GLENBOR4230]
CHNL# 581: [V-ROCHSTR5]
CHNL# 414: [V- ADAMS 5]
CHNL# 575: [V-EAU CL 3]
CHNL# 1116: [V-BLACKBERRY4]
180.00
-180.0
1.1500
0.65000
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:53
MISC VOLTAGES

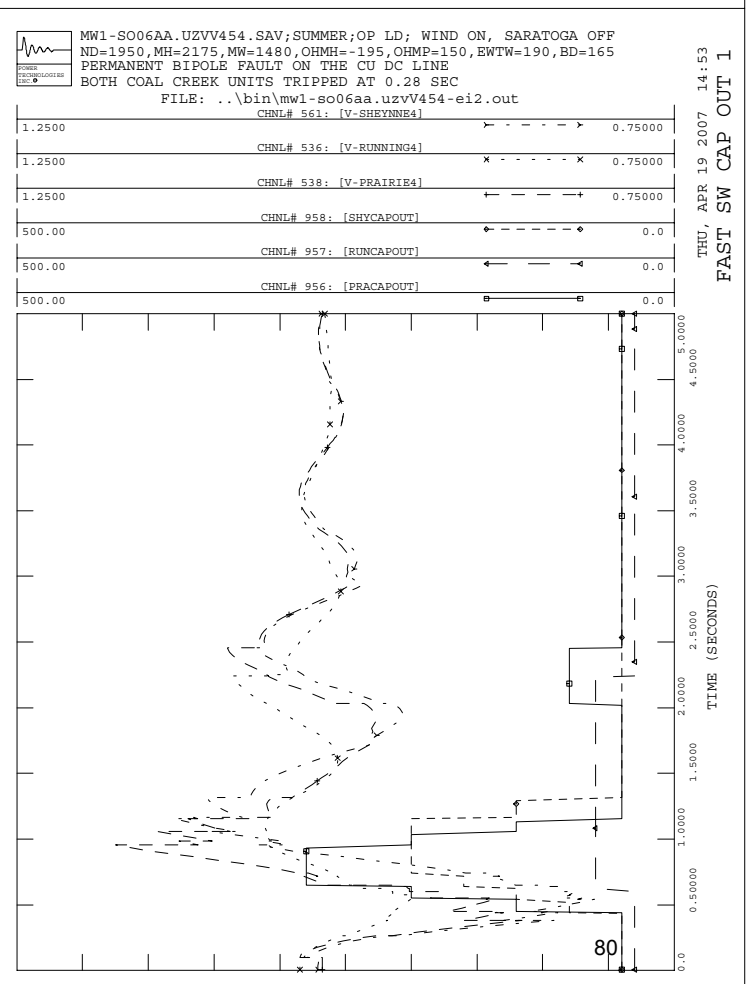

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 581: [V-ROCHSTR5]
CHNL# 414: [V- ADAMS 5]
CHNL# 575: [V-EAU CL 3]
1.2500
0.75000
TIME (SECONDS)
THU, APR 19 2007 14:53
WISCONSIN VOLTAGES

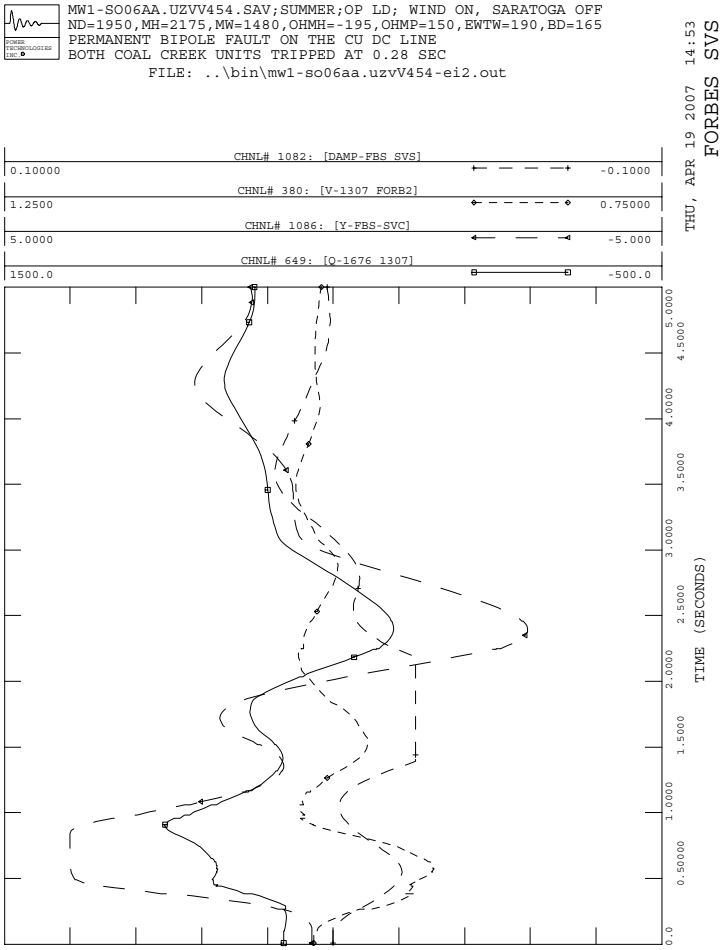

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 1115: [V-TAC HARBOR]
CHNL# 1114: [V-HOYT LAKES]
CHNL# 1113: [V-TWO HARBORS]
CHNL# 1116: [V-BLACKBERRY4]
CHNL# 550: [V-MINNTAC7]
CHNL# 552: [V-HIBBTAC7]
1.1500
0.65000
TIME (SECONDS)
THU, APR 19 2007 14:53
NORTHERN MN VOLTAGES

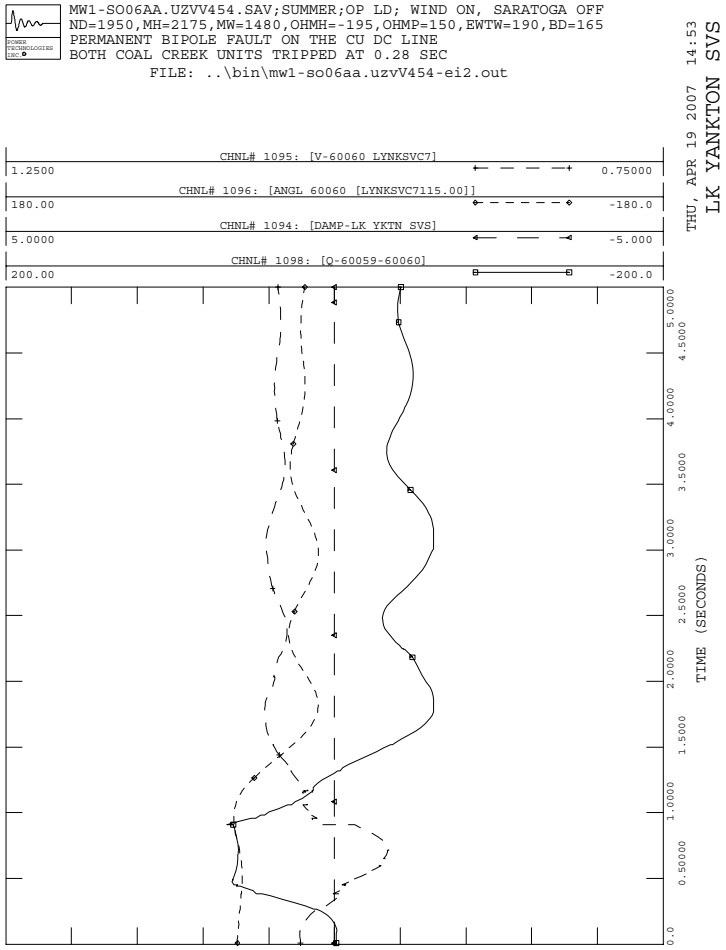

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 964: [BLTCAPOUT]
CHNL# 1083: [V-BALTA4]
CHNL# 580: [V-RCK ELM5]
CHNL# 577: [V-PINE LK7]
CHNL# 572: [V-PARKERS3]
CHNL# 961: [PKLCAPOUT]
THU, APR 19 2007 14:53
FAST SW CAP VOLTAGES 2
TIME (SECONDS)

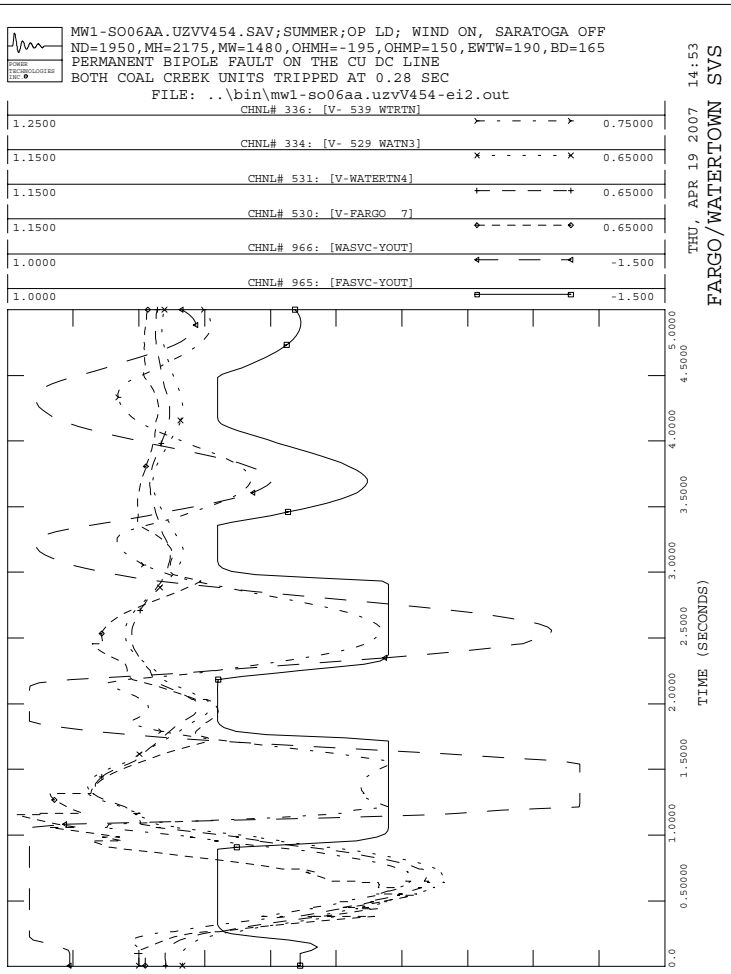

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 556: [V-RAMSEY 4]
CHNL# 568: [V-ROSEAU 4]
CHNL# 963: [SPRCAPOUT]
CHNL# 962: [EAUCAPOUT]
CHNL# 960: [RAMCAPOUT]
CHNL# 959: [ROSCAPOUT]
THU, APR 19 2007 14:53
FAST SW CAP OUT 2
TIME (SECONDS)

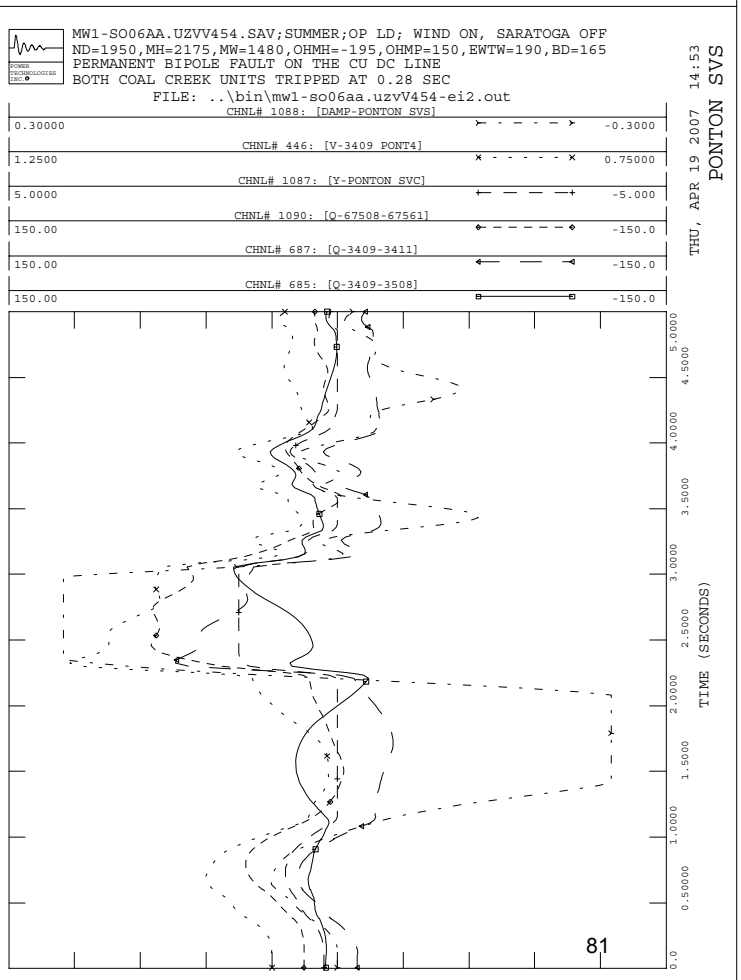

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 593: [V-SPRSWCP7]
CHNL# 592: [V-EAUSWCP5]
CHNL# 565: [V-ROSSWCP4]
CHNL# 566: [V-SHYSWCP7]
CHNL# 564: [V-RUNSWCP4]
CHNL# 591: [V-PRASWCP7]
THU, APR 19 2007 14:53
FAST SW CAP VOLTAGES
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 561: [V-SHEYNNE4]
CHNL# 536: [V-RUNNING4]
CHNL# 538: [V-PRAIRIE4]
CHNL# 958: [SHYCAPOUT]
CHNL# 957: [RUNCAPOUT]
CHNL# 956: [PRACAPOUT]
THU, APR 19 2007 14:53
FAST SW CAP OUT 1
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:53
FORBES SVS
CHNL# 1082: [DAMP-FBS SVS]
0.10000
-0.1000
CHNL# 380: [V-1307 FORB2]
1.2500
0.75000
CHNL# 1086: [Y-FBS-SVC]
5.0000
-5.000
CHNL# 649: [Q-1676 1307]
1500.0
-500.0
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

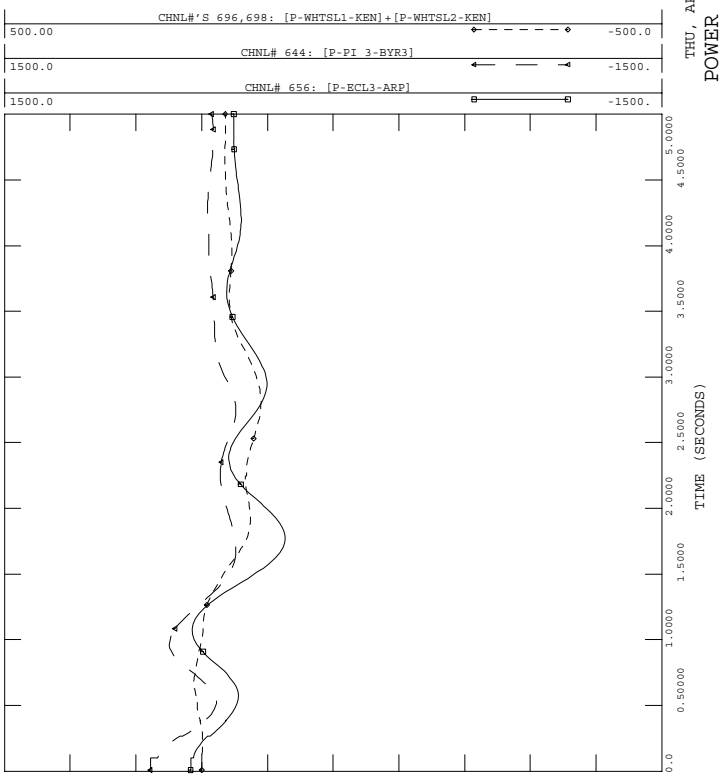

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:53
LK YANKTON SVS
CHNL# 1095: [V-60060 LYNKSVC7]
1.2500
0.75000
CHNL# 1096: [ANGL 60060 [LYNKSVC7115.00]]
180.00
-180.0
CHNL# 1094: [DAMP-LK YKTN SVS]
5.0000
-5.000
CHNL# 1098: [Q-60059-60060]
200.00
-200.0
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:53
FARGO/WATERTOWN SVS
CHNL# 336: [V- 539 WTRTN]
1.2500
0.75000
CHNL# 334: [V- 529 WATN3]
1.1500
0.65000
CHNL# 531: [V-WATERTN4]
1.1500
0.65000
CHNL# 530: [V-FARGO 7]
1.1500
0.65000
CHNL# 966: [WASVC-YOUT]
1.0000
-1.500
CHNL# 965: [FASVC-YOUT]
1.0000
-1.500
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
THU, APR 19 2007 14:53
PONTON SVS
CHNL# 1088: [DAMP-PONTON SVS]
0.30000
-0.3000
CHNL# 446: [V-3409 PONT4]
1.2500
0.75000
CHNL# 1087: [Y-PONTON SVC]
5.0000
-5.000
CHNL# 1090: [Q-67508-67561]
150.00
-150.0
CHNL# 687: [Q-3409-3411]
150.00
-150.0
CHNL# 685: [Q-3409-3508]
150.00
-150.0
TIME (SECONDS)
0.0
0.50000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000

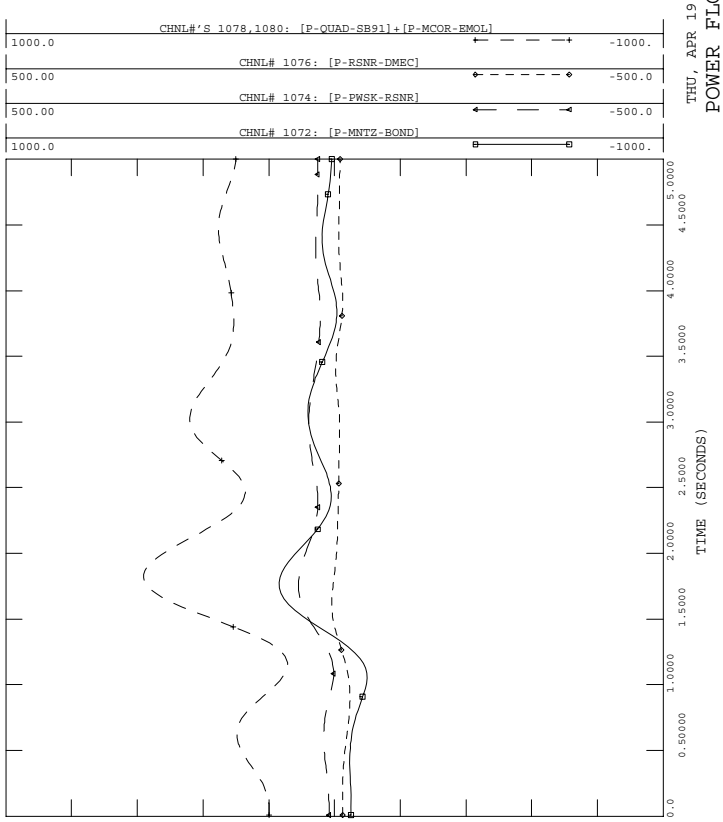
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

THU, APR 19 2007 14:53
POWER FLOW SUMS 2



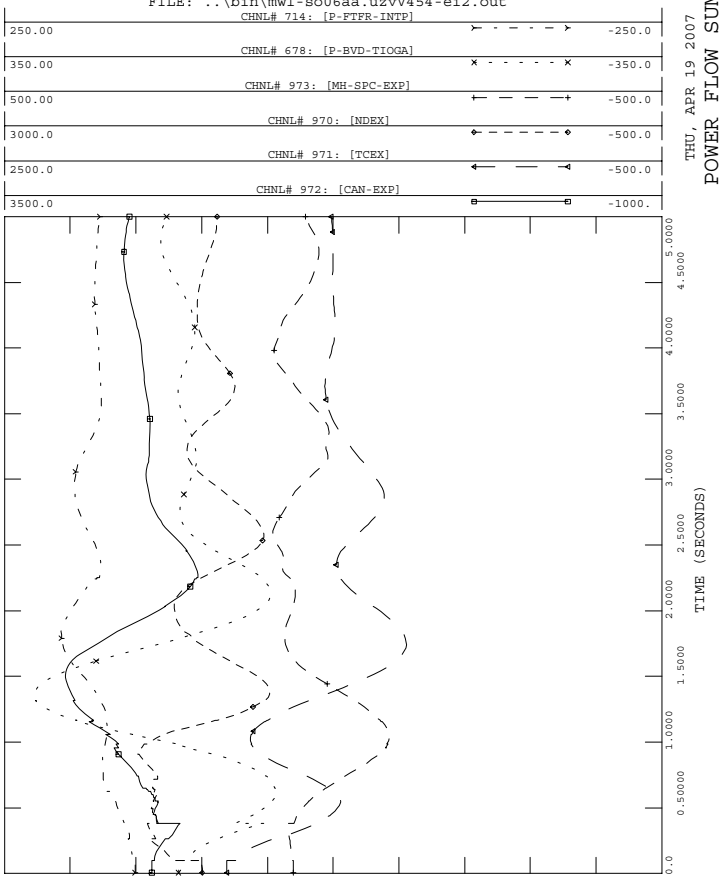

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

THU, APR 19 2007 14:53
POWER FLOW SUM 4



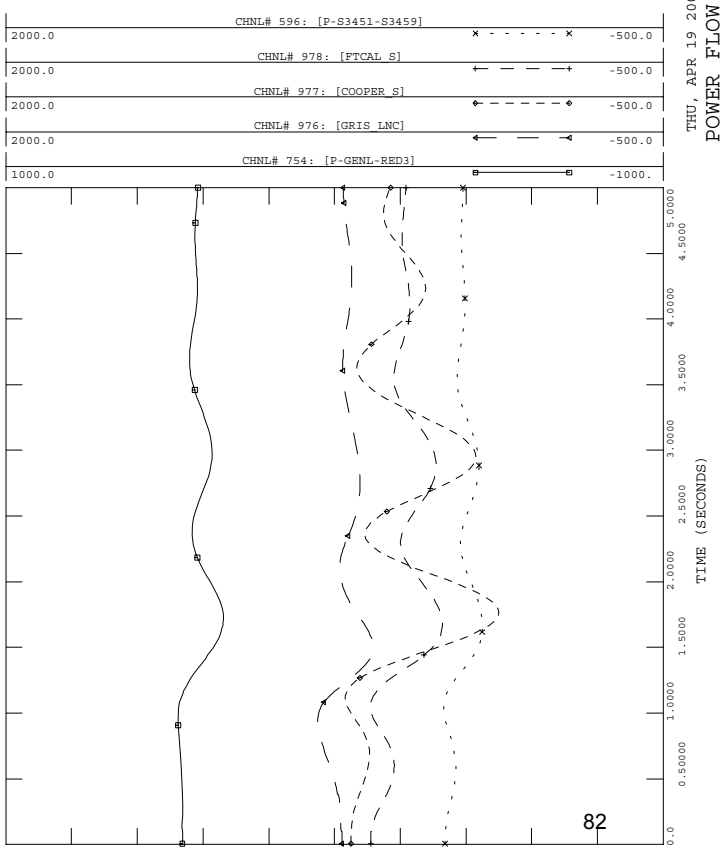

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

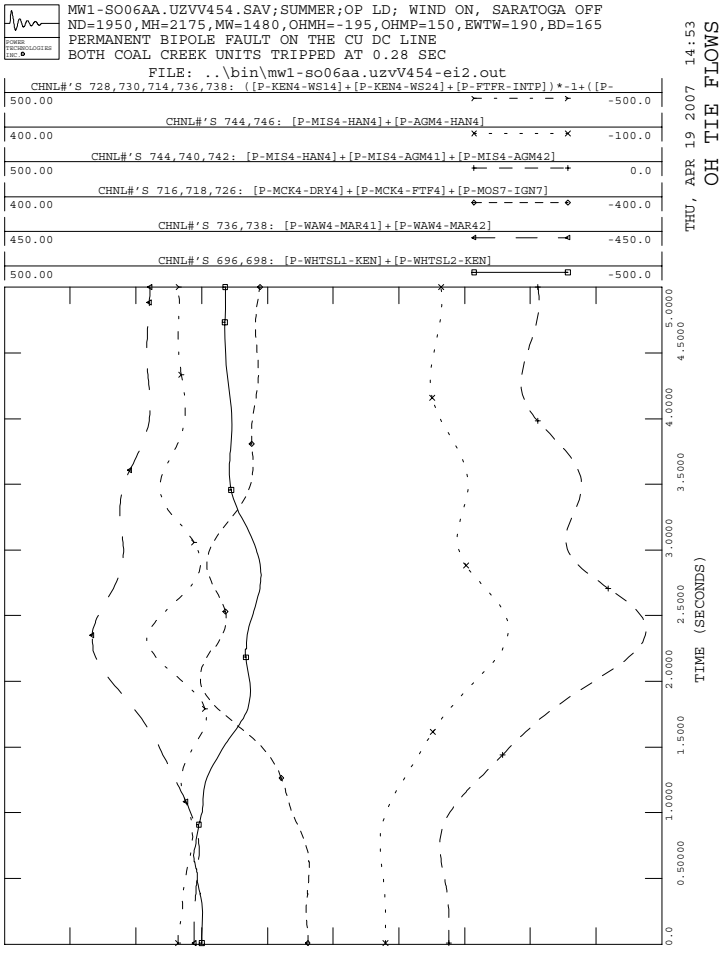
THU, APR 19 2007 14:53
POWER FLOW SUMS 1

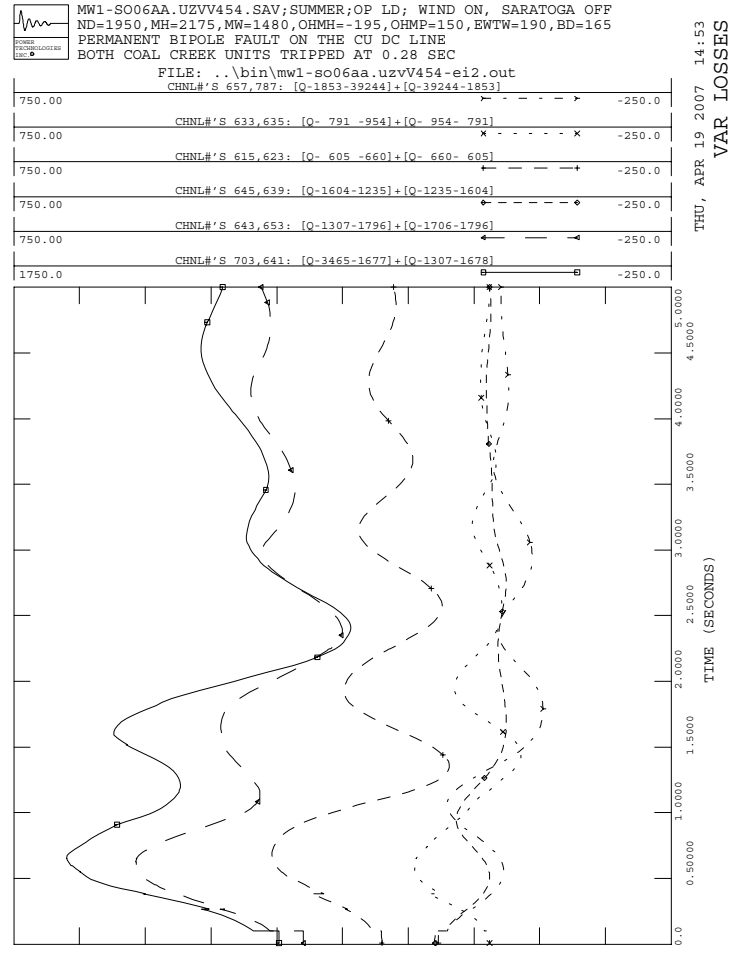


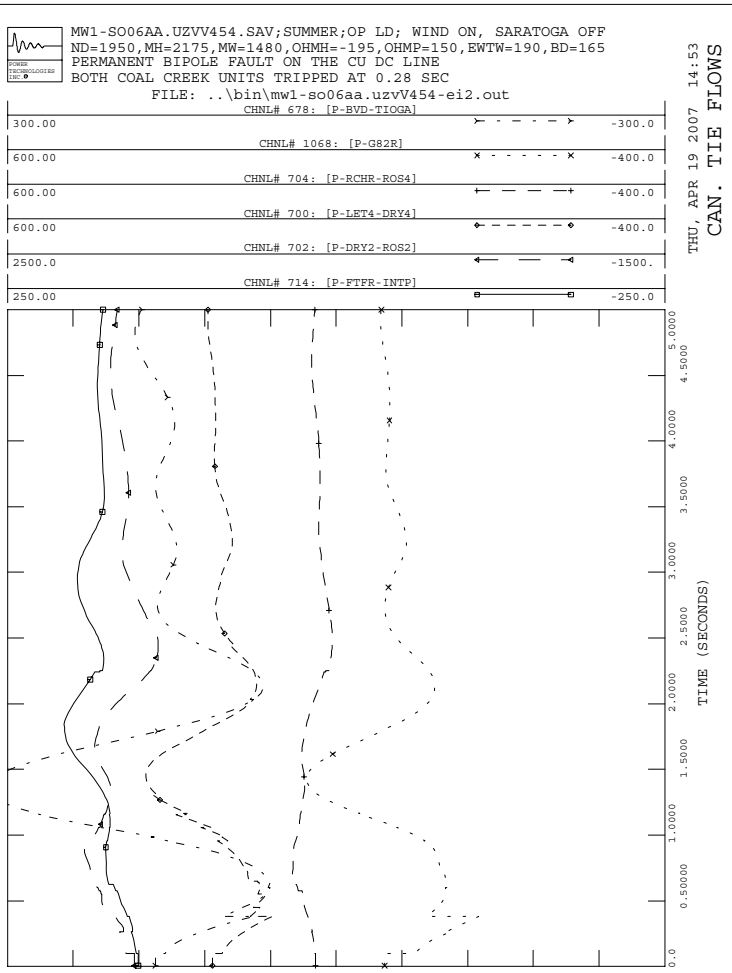

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

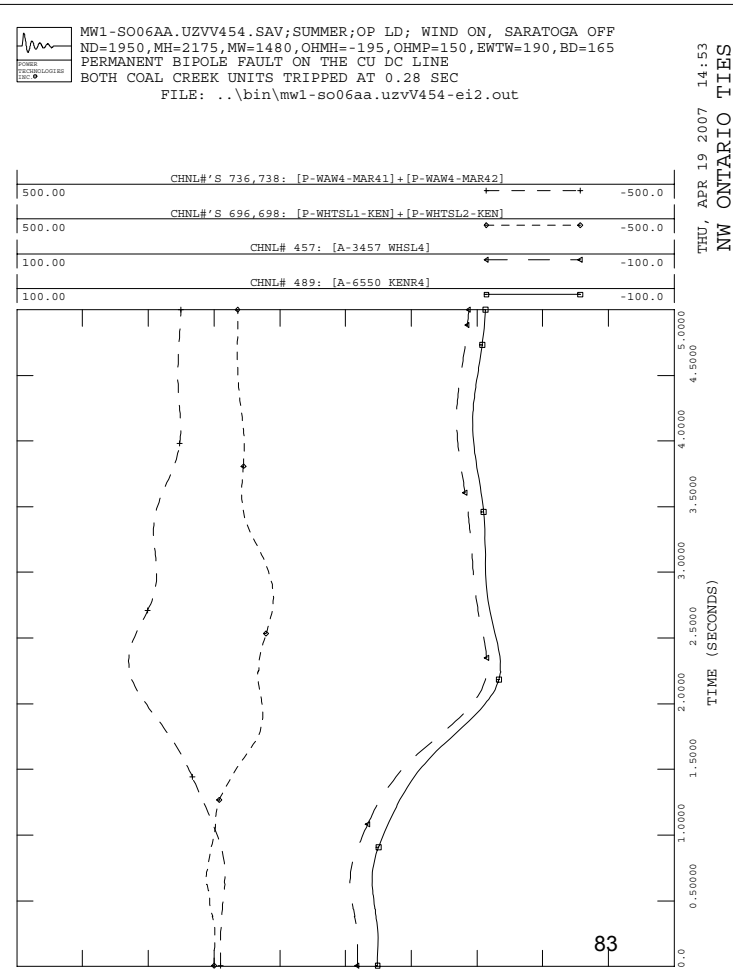
THU, APR 19 2007 14:53
POWER FLOW SUM 3

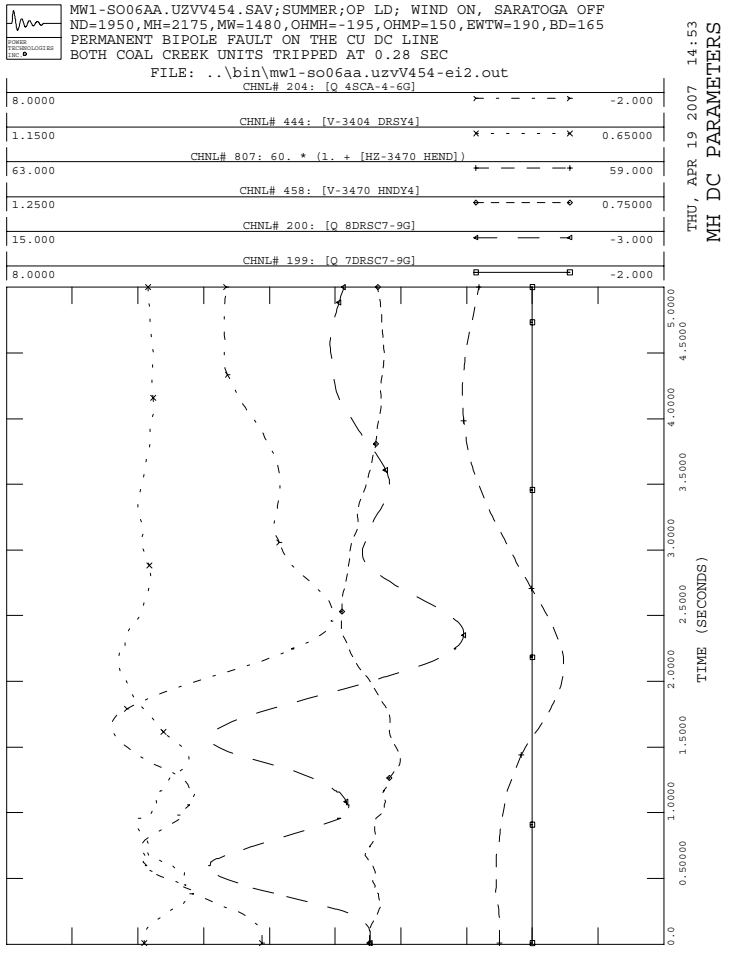


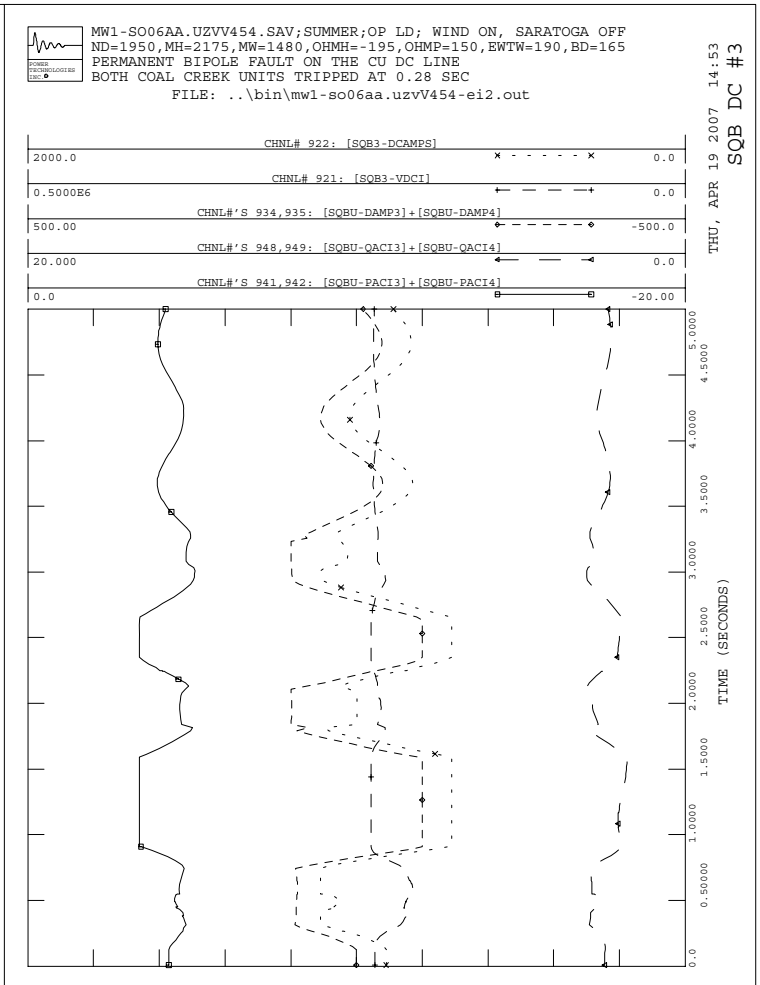

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL#'S 728,730,714,736,738: ((P-KEN4-WS14)+(P-KEN4-WS24)+(P-FTFR-INTP))*-1+((P-
500.00
-500.0
CHNL#'S 744,746: [P-MIS4-HAN4)+(P-AGM4-HAN4]
400.00
-100.0
CHNL#'S 744,740,742: [P-MIS4-HAN4]+[P-MIS4-AGM41]+[P-MIS4-AGM42]
500.00
0.0
CHNL#'S 716,718,726: [P-MCK4-DRY4]+[P-MCK4-FTF4]+[P-MOS7-IGN7]
400.00
-400.0
CHNL#'S 736,738: [P-WAW4-MAR41]+[P-WAW4-MAR42]
450.00
-450.0
CHNL#'S 696,698: [P-WHTSL1-KEN]+[P-WHTSL2-KEN]
500.00
-500.0
TIME (SECONDS)
THU, APR 19 2007 14:53
OH TIE FLOWS

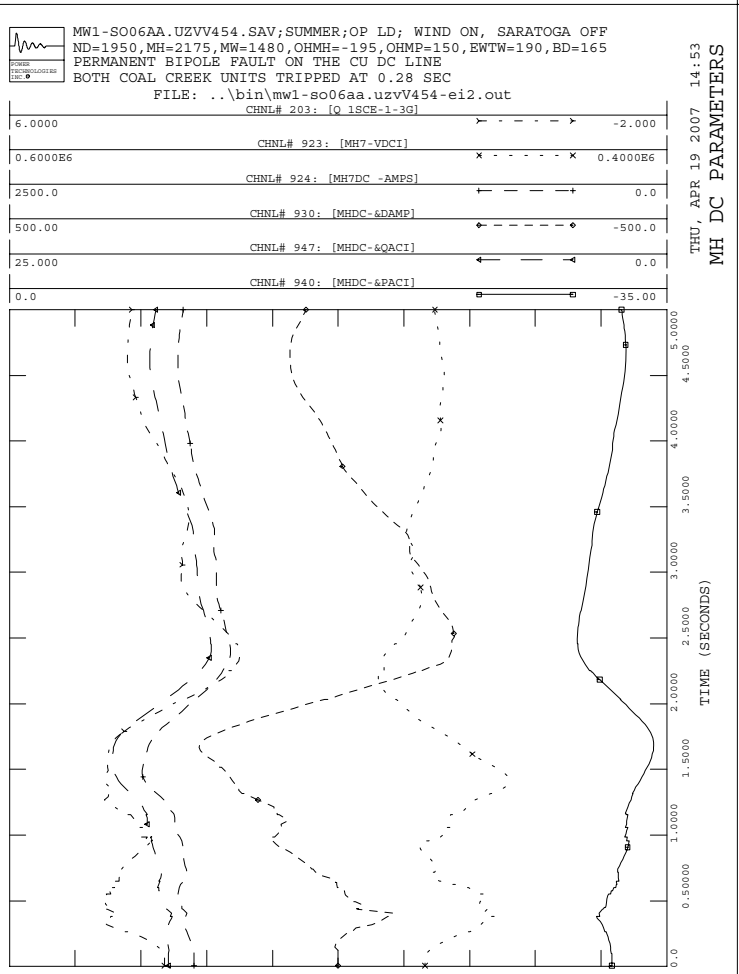

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL#'S 657,787: [Q-1853-39244]+[Q-39244-1853]
750.00
-250.0
CHNL#'S 633,635: [Q- 791 -954]+[Q- 954- 791]
750.00
-250.0
CHNL#'S 615,623: [Q- 605 -660]+[Q- 660- 605]
750.00
-250.0
CHNL#'S 645,639: [Q-1604-1235]+[Q-1235-1604]
750.00
-250.0
CHNL#'S 643,653: [Q-1307-1796]+[Q-1706-1796]
750.00
-250.0
CHNL#'S 703,641: [Q-3465-1677]+[Q-1307-1678]
1750.0
-250.0
TIME (SECONDS)
THU, APR 19 2007 14:53
VAR LOSSES

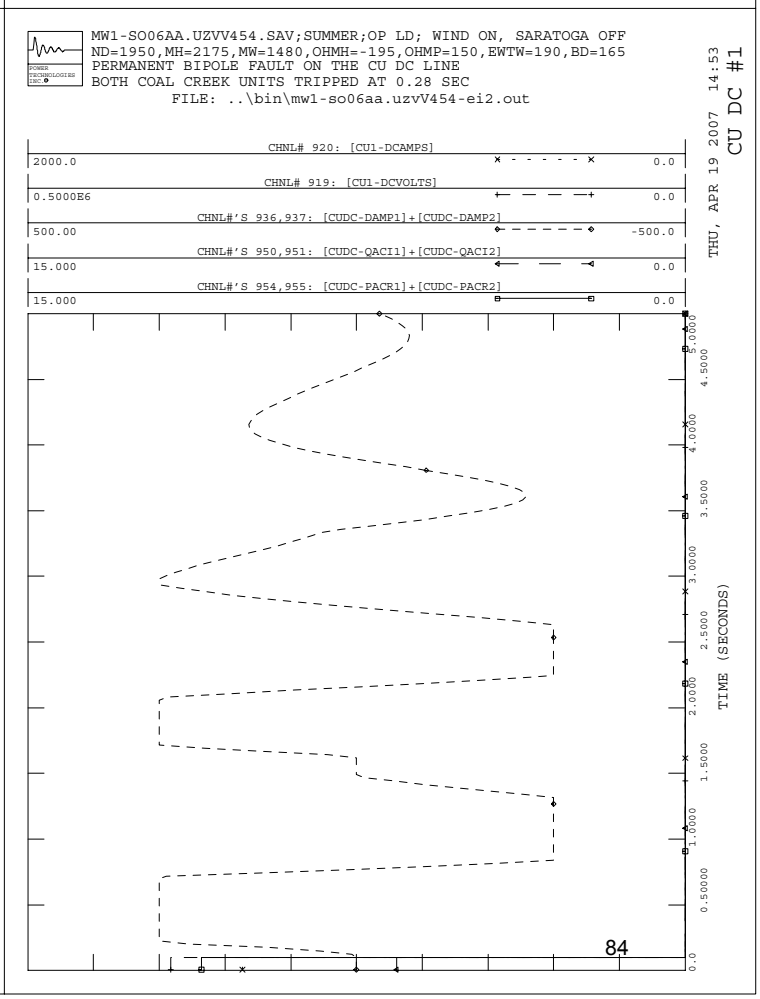

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 678: [P-BVD-TIOGA]
300.00
-300.0
CHNL# 1068: [P-G82R]
600.00
-400.0
CHNL# 704: [P-RCHR-ROS4]
600.00
-400.0
CHNL# 700: [P-LET4-DRY4]
600.00
-400.0
CHNL# 702: [P-DRY2-ROS2]
2500.0
-1500.
CHNL# 714: [P-FTFR-INTP]
250.00
-250.0
TIME (SECONDS)
THU, APR 19 2007 14:53
CAN. TIE FLOWS


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL#'S 736,738: [P-WAW4-MAR41]+[P-WAW4-MAR42]
500.00
-500.0
CHNL#'S 696,698: [P-WHTSL1-KEN]+[P-WHTSL2-KEN]
500.00
-500.0
CHNL# 457: [A-3457 WHSL4]
100.00
-100.0
CHNL# 489: [A-6550 KENR4]
100.00
-100.0
TIME (SECONDS)
THU, APR 19 2007 14:53
NW ONTARIO TIES


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 204: [Q 4SCA-4-6G]
8.0000
-2.000
CHNL# 444: [V-3404 DRSY4]
1.1500
0.65000
CHNL# 807: 60. * (1. + [HZ-3470 HEND])
63.000
59.000
CHNL# 458: [V-3470 HNDY4]
1.2500
0.75000
CHNL# 200: [Q 8DRSC7-9G]
15.000
-3.000
CHNL# 199: [Q 7DRSC7-9G]
8.0000
-2.000
THU, APR 19 2007 14:53
MH DC PARAMETERS
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 922: [SQB3-DCAMPS]
2000.0
0.0
CHNL# 921: [SQB3-VDCI]
0.5000E6
0.0
CHNL#'S 934,935: [SQBU-DAMP3]+[SQBU-DAMP4]
500.00
-500.0
CHNL#'S 948,949: [SQBU-QACI3]+[SQBU-QACI4]
20.000
0.0
CHNL#'S 941,942: [SQBU-PACI3]+[SQBU-PACI4]
0.0
-20.00
THU, APR 19 2007 14:53
SQB DC #3
TIME (SECONDS)

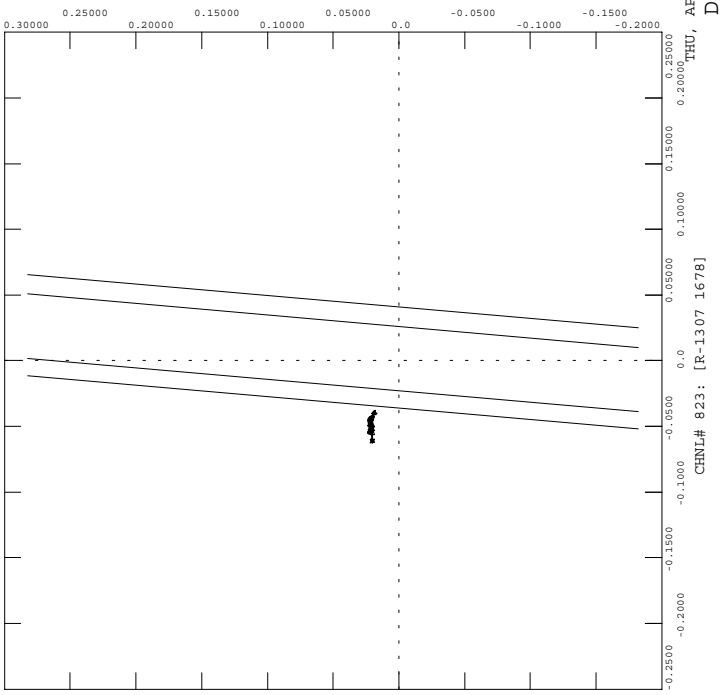

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 203: [Q 1SCE-1-3G]
6.0000
-2.000
CHNL# 923: [MH7-VDCI]
0.6000E6
0.4000E6
CHNL# 924: [MH7DC -AMPS]
2500.0
0.0
CHNL# 930: [MHDC-&DAMP]
500.00
-500.0
CHNL# 947: [MHDC-&QACI]
25.000
0.0
CHNL# 940: [MHDC-&PACI]
0.0
-35.00
THU, APR 19 2007 14:53
MH DC PARAMETERS
TIME (SECONDS)


MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out
CHNL# 920: [CU1-DCAMPS]
2000.0
0.0
CHNL# 919: [CU1-DCVOLTS]
0.5000E6
0.0
CHNL#'S 936,937: [CUDC-DAMP1]+[CUDC-DAMP2]
500.00
-500.0
CHNL#'S 950,951: [CUDC-QACI1]+[CUDC-QACI2]
15.000
0.0
CHNL#'S 954,955: [CUDC-PACR1]+[CUDC-PACR2]
15.000
0.0
THU, APR 19 2007 14:53
CU DC #1
TIME (SECONDS)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]

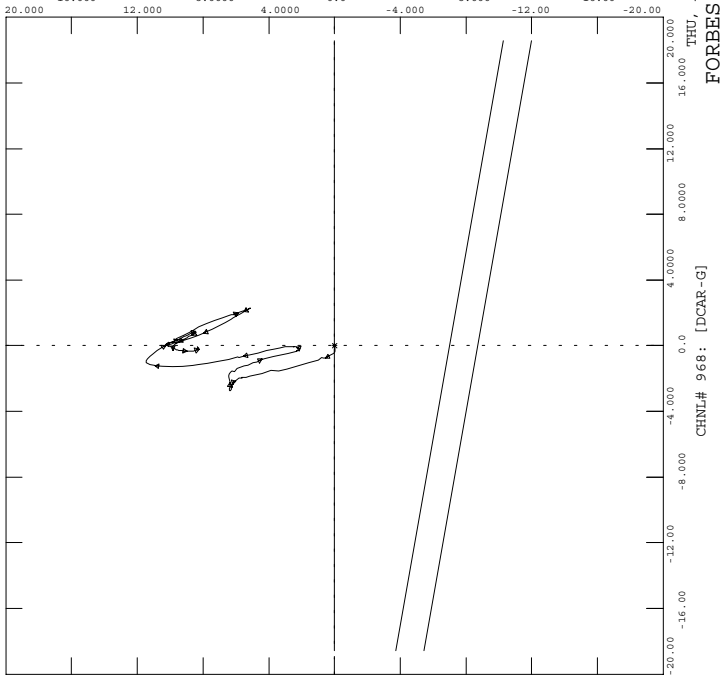



THU, APR 19 2007 14:53
D602F-FORBES (612)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

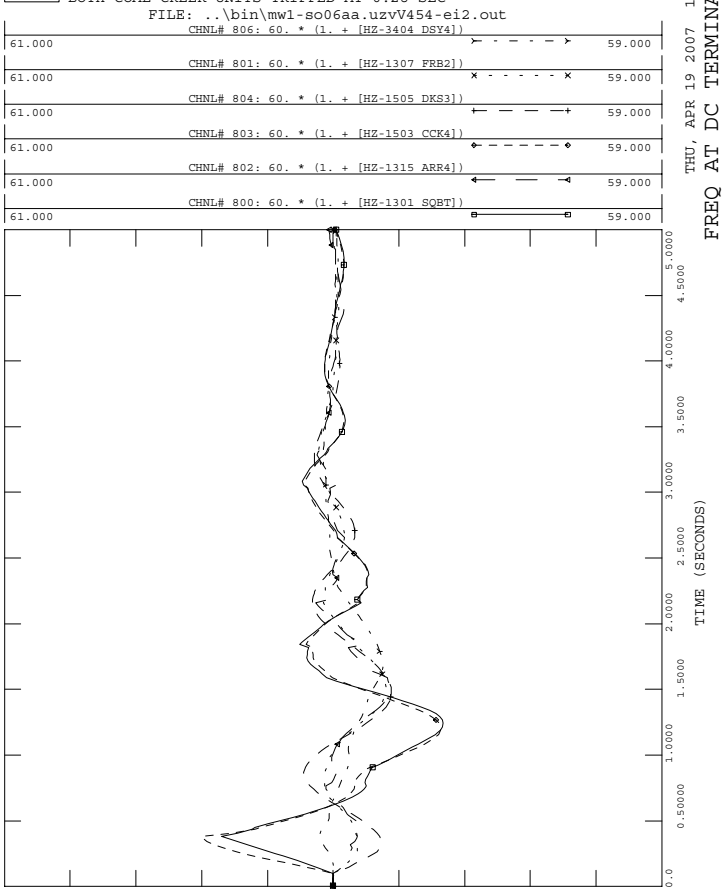
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 969: [DCAR-B]




THU, APR 19 2007 14:53
FORBES DC RED DCAR (679)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC
FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

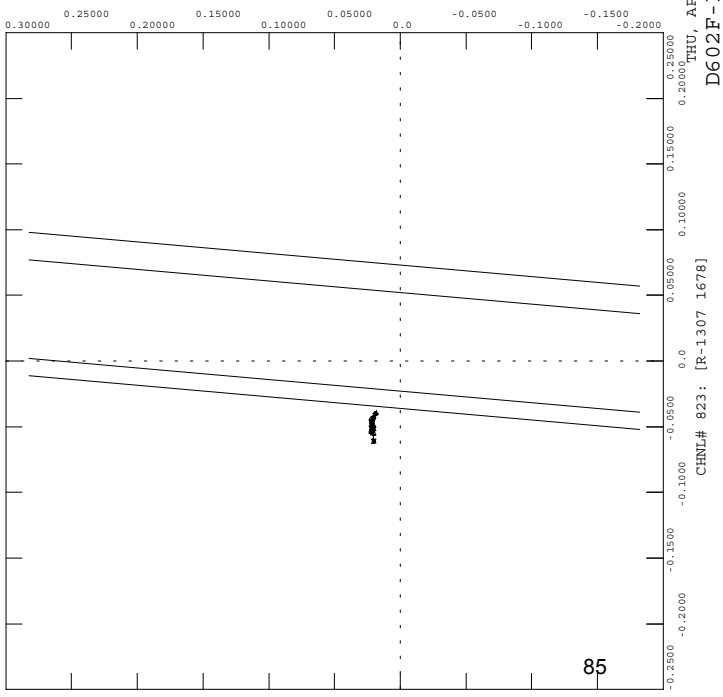



THU, APR 19 2007 14:53
FREQ AT DC TERMINALS

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 824: [X-FRB2-ROS2]

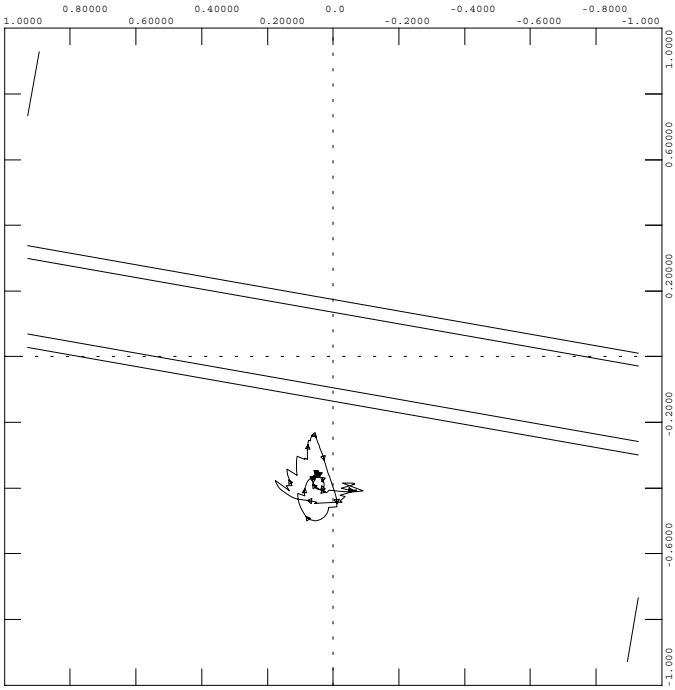



THU, APR 19 2007 14:53
D602F-FORBES-EMRG (778)

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

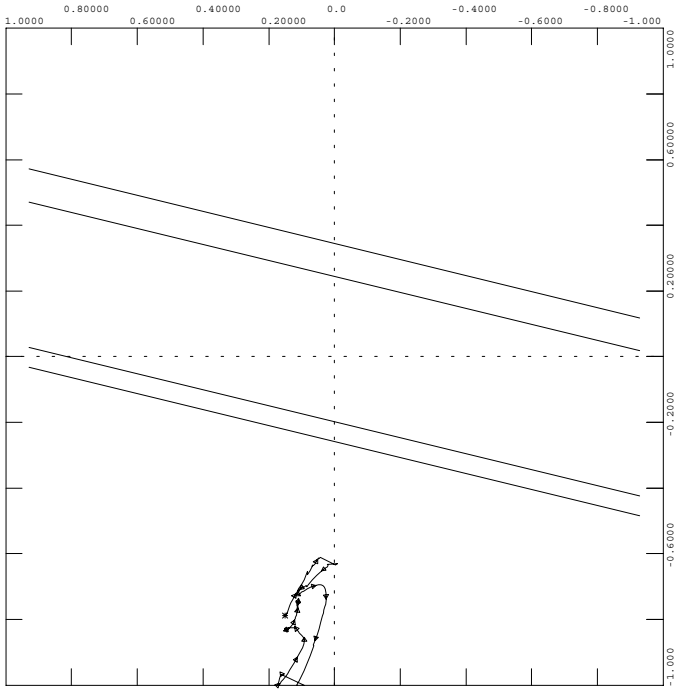
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

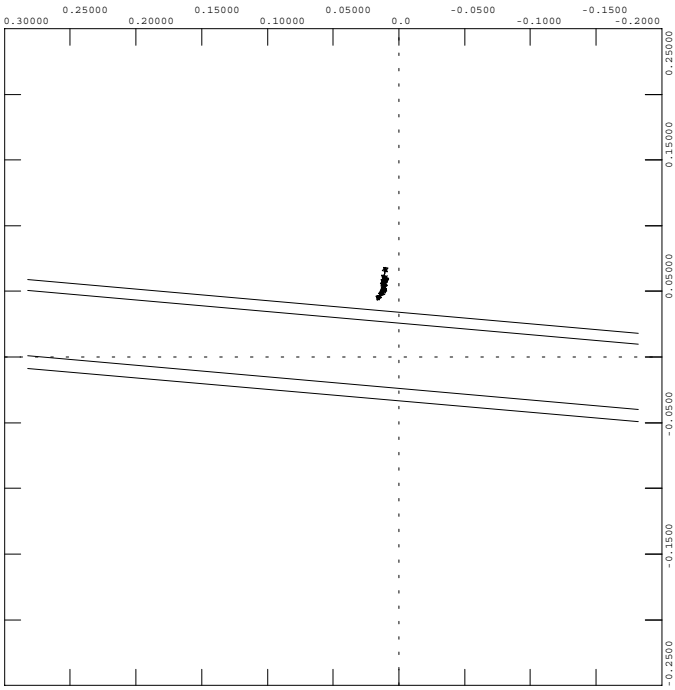
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

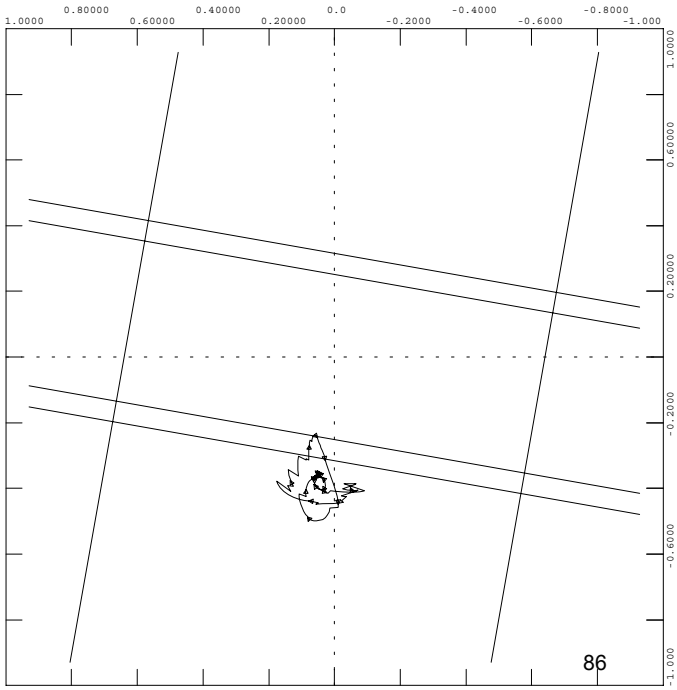
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 856: [X-DSY2-ROS2]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

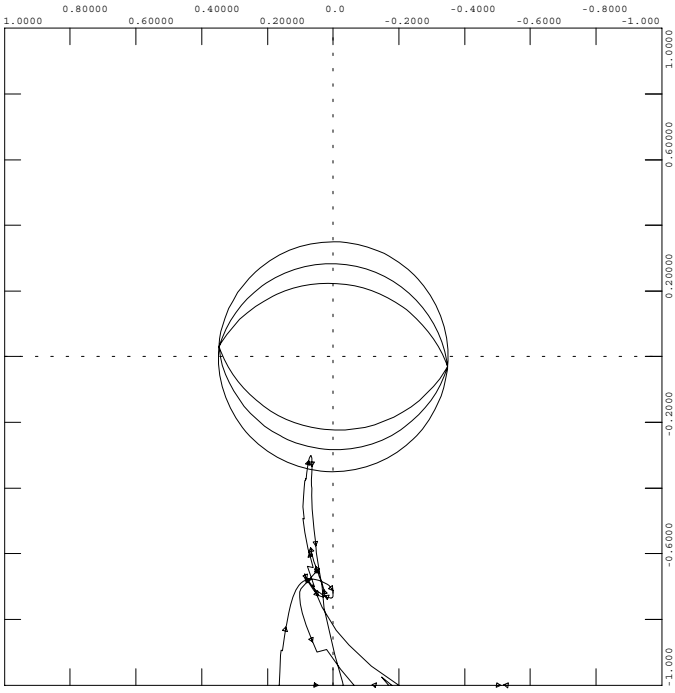
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 816: [X-DRY4-LET4]



MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

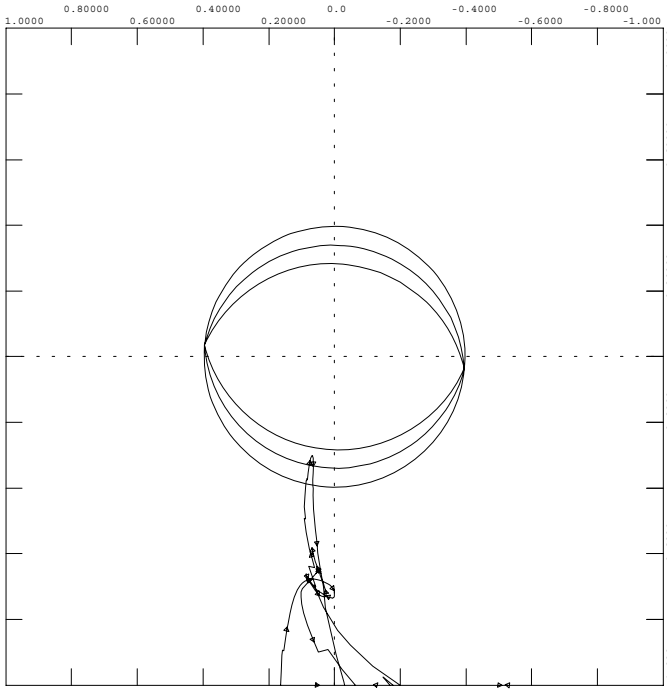
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

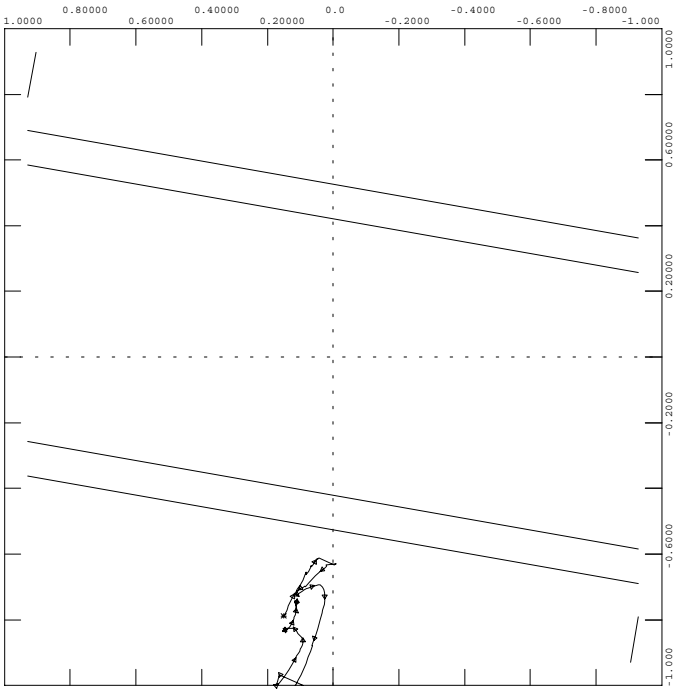
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

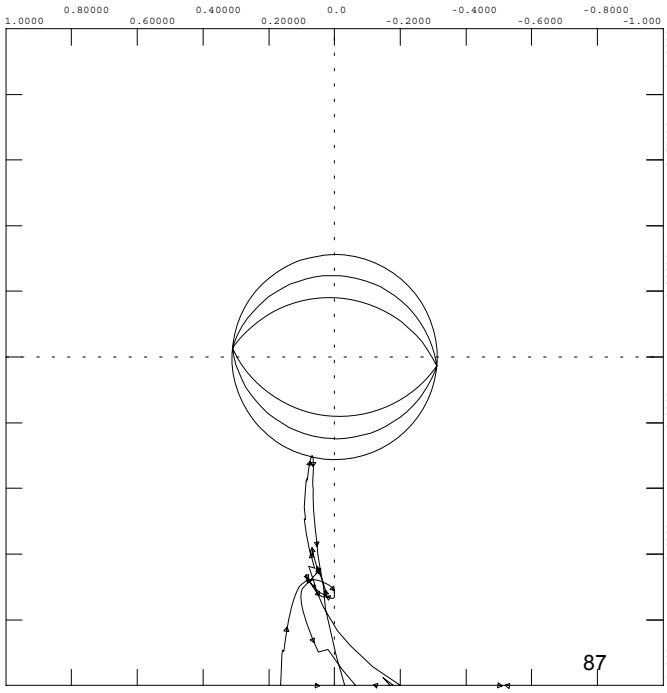
RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 822: [X-MRV4-RCH4]




MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

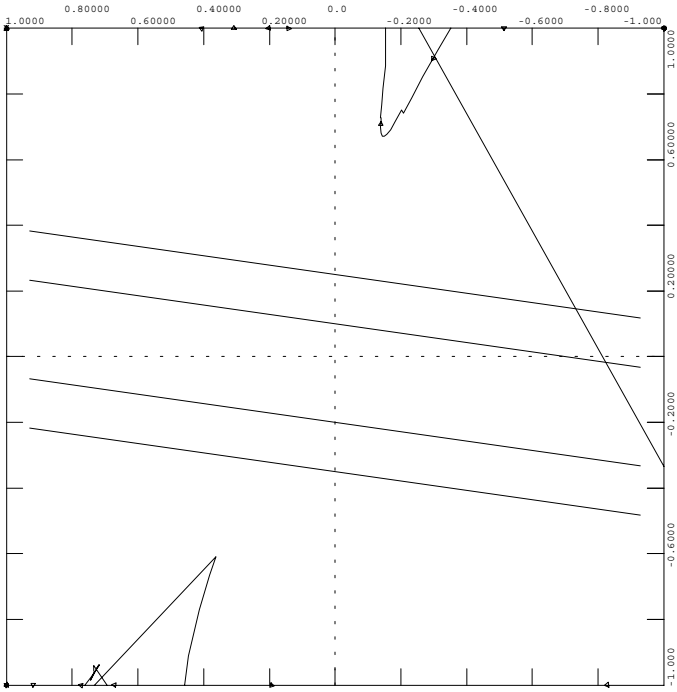
RELAY: SLLP1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 814: [X-TGA4-BD 4]



MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 1071: [X-G82R]

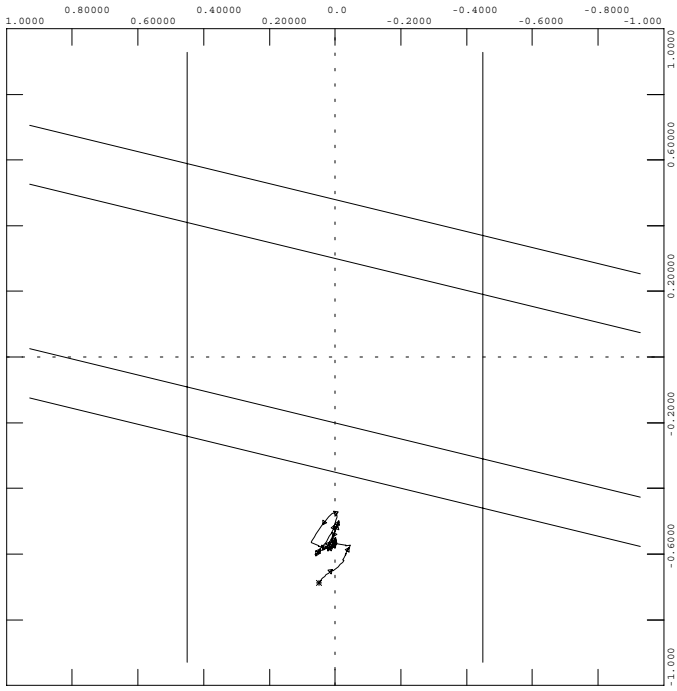



THU, APR 19 2007 14:53
G82R (780)
CHNL# 1070: [R-G82R]

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165
PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

FILE: ..\bin\mw1-so06aa.uzvV454-ei2.out

RELAY: SLNOS1
TSTART: 0.0 TSTOP: 5.0 TIC INCREMENT: 0.25
CHNL# 848: [X-INT.F-FTF]




THU, APR 19 2007 14:53
MP-OH I.FALLS (779)
CHNL# 847: [R-1484 6011]

THU, APR 19 2007 14:31

INITIATED AT LOAD FLOW ENTRY POINT ON THU, APR 19 2007 14:31

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

SPECIAL RESPONSE FILES AND COMMENTS
--- --- --- --- ---

RESPONSE FILES
--- ---
None

COMMENTS
---
None

P O W E R F L O W S U M M A R Y

| | | | |
|---|---|---|---|
| NDEX: | 1950 MW | ECL-ARP: | 651 MW |
| MHEX: | 2175 MW | PRI-BYN: | 834 MW |
| MWSI: | 1485 MW | AHD-GPK: | 0 MW |
| | | NI-WUMS: | 93 MW |
| COOPER S: | 687 MW | WNE-WKS: | 462 MW |
| FTCAL S: | 612 MW | GGS: | 1539 MW |
| GRIS-LNC: | 721 MW | QC WEST: | 198 MW |

LOAD LEVELS AS PERCENT OF 2006 SUMMER PEAK:

| | | | | | |
|---|---|---|---|---|---|
| NORTH DAKOTA | (ZONE 90,990) | 2074.0 MW, | 74.0% | OF | 2803.0 MW |
| NSP | (AREA 600) | 7107.4 MW, | 71.5% | OF | 9947.0 MW |
| MAN HYDRO | (AREA 667) | 2354.4 MW, | 83.1% | OF | 2832.0 MW |

| Load/Losses | MW / MW | Generation | MW | Export | MW |
|---|---|---|---|---|---|
| Manitoba | 2354/ 280 | MH total gross | 5002 | SPARE | 0 |
| Ont. total | 22150/ 478 | Wpg River | 568 | SPARE | 0 |
| NW | 915/ 37 | 7 Sisters | 170 | SPARE | 0 |
| Sask. | 2150/ 82 | OH total gross | 21884 | East Bias | 250 |
| MP | 1997/ 138 | northwest | 717 | SPC>WAPA (B10T) | 164 |
| NSP | 7107/ 530 | SPC total gross | 2406 | MH>SPC (3-230) | 60 |
| N. Dakota | 2073/ 291 | MP total gross | 2161 | MH>SPC (FALLS) | 0 |
| Manitoba | 516 MVARS | ND Cfd AC gross | 3257 | OH>MH @Kenora | -196 |
| Ont. total | 13082 MVARS | net | 3086 | OH>MP @Ft Fran | 150 |
| NW | 489 MVARS | NSP East gross | 1809 | OH E>W @Wawa | 189 |
| Sask. | 502 MVARS | net | 1691 | OH>East USA | 0 |
| MP | 536 MVARS | West gross | 3010 | F601C @Forbes | 1777 |
| NSP | 1505 MVARS | net | 2848 | D602F @Dorsey | 1729 |
| N. Dakota | 434 MVARS | Total net | 5322 | L20D @Letell | 287 |

| | | | |
|---|---|---|---|
| WAPA SD Hydro | 1497 | R50M @Richer | 131 |
| Pleasant Valley | 0 | G82R @Glenboro | 26 |
| LGS/Trimont | 99 | | |
| SW MN Wind | 431 | | |
| Swing Bus | 944 | | |

| Tfmrs | MVA/ | Load | Ph Shifters | Deg/ | MW | DC Lines | MW |
|---|---|---|---|---|---|---|---|
| Wshell #1 7-7 | 112/ | 77% | Stinson | 43/ | 107 | CU (1,2) | 1103 |
| Wshell #2 7-7 | 112/ | 77% | Boundary Dam | 9/ | 165 | SQ BU (3,4) | 455 |
| Drayton#1 4-7 | 52/ | 37% | Whiteshell | 81/ | 200 | MH Bipole 1 | 1504 |
| Drayton#2 4-7 | 66/ | 35% | Int Falls | 101/ | 149 | MH Bipole 2 | 1702 |
| Dorsey #1 2-4 | 820/ | 68% | St. Lawrence | 15/ | 0 | MH (BP1+BP2) | 3206 |
| Dorsey #2 2-4 | 928/ | 77% | | | | Miles City E>W | -150 |
| Forbes 2-4 | 77/ | 11% | | | | RCDC (15) | 0 |
| | | | | | | Stegall (10) | 0 |

| Dorsey SC's | I/S | MVAR | Qmax/ Qmin | SVC's | MVAR | Qmax/ Qmin |
|---|---|---|---|---|---|---|
| 1*** mar-so06aa.uzvV454-ag1 | | | | Page 2 | | |
| MIL 7-9G | 17.0 | 2 504 | 600/ -330 | Forbes | 500 | 33 400/ -450 |
| SCE 1-3G | 18.2 | 3 411 | 480/ -240 | Fargo | 13.2 | -12 20/ -135 |
| SCA 4-6G | 18.2 | 3 411 | 480/ -240 | Watertown | 20.0 | 98 125/ -86 |
| Total | | 1326 | 1560/ -810 | Series Caps | Num In Serv | |
| Margin | | 234 | | Roseau | 500 | 2 of 2 |
| | | | | Chisago | 500 | 1 of 1 |

| Caps/Reactors | | MVAR | Caps/Reactors | | MVAR | Caps/Reactors | | MVAR |
|---|---|---|---|---|---|---|---|---|
| Balta | (FS) 230 | 0 | Arrowhead | 230 | 160 | Chisago T 9 | 34.5 | 51 |
| Drayton | 115 | 20 | Blackberry | 230 | 47 | Chisago T 10 | 34.5 | 51 |
| Drayton | 13.8 | 0 | Minntac | 115 | 45 | Forbes | 230 | 70 |
| Eau Claire(FS) | 161 | 356 | Riverton | 230 | 47 | Forbes | 500 | 600 |
| Kohlman Lake | 115 | 240 | Roseau Co.(FS) | 230 | 0 | | | 0 |
| Parkers Lk(FS) | 115 | 0 | Running (FS) | 230 | 30 | Fargo | 115 | 81 |
| Prairie (FS) | 115 | 40 | Running react | 230 | 0 | Watertown | 20 | 20 |
| Ramsey (FS) | 230 | 0 | Shannon | 230 | 72 | Watertown | 230 | 76 |
| Red Rock | 115 | 240 | | | 0 | | | 0 |
| Rugby | 13.8 | -25 | Glenboro | 230 | 0 | | | 0 |
| Split Rock(FS) | 115 | 80 | Laverendrye | 110 | 98 | | | 0 |
| Sheyenne (FS) | 115 | 40 | Richer react | 230 | 0 | | | 0 |
| Wilton/Bemidji | 115 | 20 | St Vital | 110 | 98 | | | 0 |

| Bus Voltages | | V,pu | Bus Voltages | | V,pu | Bus Voltages | | V,kV |
|---|---|---|---|---|---|---|---|---|
| Adams | 345 | 1.003 | Arrowhead | 230 | 1.026 | Whiteshell | 110 | 119.0 |
| Alexandria | 115 | 1.010 | Badoura | 115 | 1.025 | Kenora | 220 | 253.4 |
| Audubon | 115 | 1.027 | Blackberry | 230 | 1.031 | Dryden | 220 | 261.6 |
| Bemidji | 115 | 1.012 | Boise Cascade | 13.8 | 1.059 | Fort Frances | 220 | 258.7 |
| Byron | 345 | 1.011 | Boise Cascade | 115 | 1.027 | Mackenzie | 220 | 272.9 |
| Chisago Co. | 345 | 1.010 | ETCO | 115 | 1.008 | Lakehead | 220 | 273.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chisago Co. | 500 | 1.005 | Forbes | 230 | 1.021 | Marathon | 220 | 269.1 |
| Drayton | 230 | 1.014 | Forbes | 500 | 1.015 | Wawa | 220 | 262.3 |
| Eau Claire | 345 | 0.997 | Hubbard | 115 | 1.012 | Mississagi | 220 | 252.3 |
| WEST FARIBAULT | 115 | 1.025 | Intl Falls | 115 | 1.027 | Fort Frances | 118 | 120.4 |
| LaPorte | 115 | 1.013 | Minntac | 115 | 1.016 | Lakehead | 118 | 122.8 |
| Maple River | 230 | 1.018 | Moranville | 230 | 1.028 | Birch | 118 | 120.3 |
| Marshall Tap | 115 | 1.024 | Riverton | 230 | 1.013 | Marathon | 118 | 127.5 |
| Owatonna | 161 | 1.004 | Running | 230 | 1.035 | | | 0.0 |
| Prairie | 115 | 1.022 | Shannon | 230 | 1.034 | | | 0.0 |
| Prairie | 230 | 1.017 | | | 0.000 | | | 0.0 |
| Ramsey | 230 | 1.018 | Groton | 345 | 0.994 | | | 0.0 |
| Roseau County | 230 | 1.027 | Watertown | 230 | 1.030 | | | 0.0 |
| Roseau County | 500 | 1.063 | Watertown | 345 | 1.017 | | | 0.0 |
| Sheyenne | 230 | 1.021 | | | 0.000 | | | 0.0 |
| Thief R Falls | 115 | 1.013 | Dorsey | 230 | 1.045 | | | 0.0 |
| Tioga | 230 | 1.030 | Dorsey | 500 | 1.035 | | | 0.0 |
| Wahpeton | 230 | 1.014 | | | 0.000 | | | 0.0 |
| Winger | 115 | 1.030 | | | 0.000 | | | 0.0 |

Steady State Relay Margins (measured from inner blinder)

| Relay Location | Manuf/Type | PSS Model | South | North | Em North |
|---|---|---|---|---|---|
| 1) B10T-Tioga (South) | GE OST | SLLP | 339% | N/A | N/A |
| 2) -Tioga (North) | GE OST | SLLP | 696% | N/A | N/A |
| 3) -Tioga (Em North) | GE OST | SLLP | | N/A | N/A |
| 4) D602F-Dorsey | ATP ??? | SLINOS | 405% | N/A | N/A |
| 5) -Forbes (Normal) | ATP ??? | SLINOS | 255% | N/A | N/A |
| 6) -Forbes (Em Nrth) | APT S-PRO | SLINOS | | N/A | N/A |
| 8) F3M-Intl Falls | APT S-PRO | SLINOS | 333% | N/A | N/A |
| 9) G82R-Rugby | APT | SLINOS | 1835% | N/A | N/A |
| 10) L20D-Drayton (Normal) | APT, ASEA | SLINOS | 663% | N/A | N/A |
| 11) -Drayton (Em Nrth) | ASEA RXZF2 | SLINOS | | N/A | N/A |
| 12) R50M-Moranville (Norm) | APT, West | SLINOS | 1044% | N/A | N/A |
| 13) -Moranville (Em N) | ASEA RXZF2 | SLINOS | | N/A | N/A |

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     SIMULATION CHECKS FOLLOW:
+    _________________________

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 ITER DELTAV/TOL X------ AT BUS ------X  REAL(DELTAV)  IMAG(DELTAV)
    1    84.813  64834 [GORDON 934.500]    0.4166E-05   -0.8471E-04
    2    44.865  64834 [GORDON 934.500]   -0.2043E-05   -0.4482E-04
    3     4.586  64834 [GORDON 934.500]   -0.3964E-05   -0.2306E-05
    4     0.300  66411 [MI CTYE4230.00]   -0.1459E-06    0.2624E-06

 REACHED TOLERANCE IN   4 ITERATIONS

 LARGEST MISMATCH:    0.00 MW    0.00 MVAR     0.00 MVA AT BUS 14276 [6BASIN
230.00]
 SYSTEM TOTAL ABSOLUTE MISMATCH:               0.28 MVA

 ************************************************************************

 IEEEG3 AT BUS  68331 MACHINE 3  INITIALIZED OUT OF LIMITS
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IEEEG3 AT BUS  68332 MACHINE 5  INITIALIZED OUT OF LIMITS

***************************************************************************

INITIAL CONDITION LOAD FLOW USED  6 ITERATIONS

***************************************************************************

INITIAL CONDITIONS SUSPECT:
    I   DSTATE(I)    STATE(I)     MODEL   STATE    BUS  X--- NAME ---X   ID
    9   0.28884E-01  0.10264
   10   -18.468       229.39
   14    898.82       8718.6
26753   0.11185E-02  0.10985      IEEET1   K+1   27065  11BRWN P138.00   1
31428  -0.34344E-01   2.9299      IEEET1   K+1   63315  BIGSTN1G24.000   1
31436  -0.44709E-02  0.29400      IEEET1   K+1   63324  HOOTLK3G13.800   3
31495  -0.12584E-02  0.10000      IEEET1   K+1   63883  NEAL  3G22.000   3
32278   0.71206E-02 -0.30015      SCRX     K     67683  KET1-12G13.800   1
44902  -0.46755E-02  0.38046      CIMTR3   K+1   60136  MAPLE R7115.00   1
44905   0.24215E-03  0.40081E-02  CIMTR3   K+4   60136  MAPLE R7115.00   1
45111   0.82016E-04  0.19407E-02  CIMTR3   K+4   61190  WOODSTK869.000   1
47687   0.88280E-04  0.32487E-02  CIMTR3   K+4   60856  WESTRDG869.000   1
47693   0.14840E-03  0.33629E-02  CIMTR3   K+4   34901  ROCKCO G34.500   1
47720   0.44251E-04  0.34699E-02  CIMTR3   K+4   60708  BUFFRIDG34.500   9
47726   0.46001E-04  0.31905E-02  CIMTR3   K+4   60715  CHANRMB934.500   9
49598  -0.22086E-04  0.11130E-02  IEEET1   K+1   38694  ST.POINT46.000   HY
49955  -0.31963E-02  0.26800      IEEET1   K+1   39591  PUL G5  13.800   5
51176  -0.10431E-01   0.0000      ESAC8B   K+2   61775  BOSWE44G22.800   4
51181  -0.38147E-01   0.0000      ESAC8B   K+2   61776  BOSWE71G14.400   1
51186  -0.76294E-01   0.0000      ESAC8B   K+2   61777  BOSWE72G14.400   2


***************************************************************************

Initial     SLG-BF fault admittance (G + jB):    308.4  -4990.8
Normal time SLG-BF fault admittance (G + jB):    286.7  -4787.1

***************************************************************************


     LINE SWITCHING EVENTS FOLLOW:
+    ____________________________


     MHEB DC REDUCTIONS FOLLOW:
+    __________________________


     NETWORK NOT CONVERGED FOLLOW:
+    _____________________________


     RELOUV AND RELOUF SWITCHING EVENTS FOLLOW:
+    __________________________________________
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     DC SWITCHING EVENTS FOLLOW:
+    ___________________________

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     VSCAN EVENTS FOLLOW:
+    ____________________


     PI 4 KV EVENTS FOLLOW:
+    ______________________


     RELAY SCAN EVENTS FOLLOW:
+    _________________________


     FARGO/WATERTOWN SVS EVENTS FOLLOW:
+    __________________________________


     UDHOLD EVENTS FOLLOW:
+    ____________________


     DYNAMIC VOLTAGE CHECKS FOLLOW:
+    ______________________________

         FROM TIME      0.4000 TO TIME      5.0000

                          PU VOLT                                   VMAX
+                        __________
 CHAN                     MAX   MIN       MINIMUM        MAXIMUM     LESS
+                                         __________     __________
  NO.    DESCRIPTION      .LT.  .GT.     VOLT  TIME     VOLT  TIME    VMIN
+____   _____________   __________     ____  ____     ____  ____    ____
 ----   -------------   ----------     ----  ----     ----  ----    ----
+<<<<   <<<<<<<<<<<<<   <<<<<<<<<<     <<<<  <<<<     <<<<  <<<<    <<<<
  444   67503 DORSEY    1.25  0.70     1.01  1.30     1.06  0.64    0.05
  386   61624 FORBES    1.15  0.82     1.00  1.37     1.04  0.91    0.04
  384   61615 ARROWHD   1.15  0.82     0.99  0.49     1.04  0.99    0.05
  382   61612 RIVERTN   1.15  0.75     0.96  0.49     1.04  1.01    0.08
  362   66752 DRAYTON   1.20  0.80     0.97  1.55     1.10  0.91    0.13
  562   63229 WAHPETN   1.18  0.80     0.94  0.49     1.09  1.01    0.15
  350   67104 TIOGA4    1.15  0.80     0.98  0.49     1.06  0.99    0.08
  392   63030 DICKNSN   1.17  0.70     0.93  0.49     1.03  1.12    0.10
  390   63041 COAL CR   1.18  0.70     0.95  0.44     1.12  1.08    0.17
```

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  334   66529 WATERTN   1.18  0.75     0.87  0.59     1.04  1.17    0.17
  360   67160 GROTON    1.15  0.70     0.79  0.54     1.02  1.17    0.23
  553   61754 BOISE     1.15  0.82     0.99  1.37     1.04  2.00    0.05


     POWERFLOW WARNINGS AT END OF SIMULATION FOLLOW:
+    ____________________________________________________

BUSES WITH VOLTAGE GREATER THAN 1.1000:
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)
67554 SLAVEFL7 121 667 1.1002 133.13    67556 WHTSL1 4 220 667 1.1032 242.71
67589 WHTSL2 4 220 667 1.1032 242.70    67648 POINTD27 121 667 1.1036 133.54
67705 WHSL2PH7 110 667 1.1002 121.02    67751 WHSL1PH7 110 667 1.1002 121.02
67770 SK1 SUB7 110 667 1.1462 126.08    67771 STAR LK7 110 667 1.1436 125.79
67772 BRERTON7 110 667 1.1451 125.96

BUSES WITH VOLTAGE LESS THAN 0.9500:
65025 E.COL. Y 230 640 0.9499 218.48
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

BRANCH LOADINGS ABOVE 100.0 % OF RATING SET A:

X-------FROM BUS-------X  X--------TO BUS--------X       CURRENT(MVA)
  BUS    NAME  BSKV AREA    BUS    NAME  BSKV AREA CKT LOADING  RATING PERCENT
60197* CHIS CO2 500  600  60198  CHIS-N 2 500  600  1   1757.5  1732.0   101.5
66514* HURON  4 230  652  67205  BRDLAND4 230  652  1    459.1   400.0   114.8
67101* ANTELOP3 345  652  67120  BRDLAND3 345  652  1    479.2   478.0   100.2
67120  BRDLAND3 345  652  67204* BRDLNDTY 345  652  1    459.1   400.0   114.8
67204* BRDLNDTY 345  652  67205  BRDLAND4 230  652  1    459.1   400.0   114.8


--------------------------------------------------------------------------------
          FAST SWITCH CAPACITOR PERFORMANCE:

     BUSNUM  BUS NAME    # CAPS   SIZE    SSON    FINAL   AVAIL
      63056  BALTA  4       3      60       0       0       1
      60305  EAU CLA5        4      89       4       4       0
      60234  PARKERS7        3      80       0       0       3
      60116  PRASWCP7       12      40       1       2       6
      63047  RAMSEY 4        0       0       0       0       0
      60168  ROSSWCP4        2      30       0       0       2
      60167  RUNSWCP4        6      30       1       1       5
      60172  SHYSWCP7        5      40       1       2       0
      60129  SPLT RK7        2      80       1       2       0


--------------------------------------------------------------------------------
          INITIAL **NORMAL** RELAY MARGINS/IMPEDENCES (ZRE/ZIM):     VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :    340 %   -0.6530    0.0495 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -3.2120   -1.7653 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    664 %   -0.3584    0.0491 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7881    0.1503 N
     F3M  : RELAY MARGIN AT INT.FALLS IS        :    333 %   -0.6881    0.0494 N
     D602F: RELAY MARGIN AT FORBES IS           :    256 %   -0.0545    0.0212 N
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     D602F: RELAY MARGIN AT DORSEY IS           :    405 %    0.0601    0.0106 N
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    507 %    0.0000    0.0000 N
-------------------------------------------------------------------------------
          MINIMUM TRANSIENT RELAY MARGINS: START TIME:  0.27500 SEC, VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :    169 %  AT TIME=   1.25000 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %  AT TIME=   0.00000 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    492 %  AT TIME=   1.30833 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    768 %  AT TIME=   1.44166 N
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    263 %  AT TIME=   1.42500 N
     D602F: RELAY MARGIN AT FORBES IS           :    173 %  AT TIME=   1.42500 N
     D602F: RELAY MARGIN AT DORSEY IS           :    267 %  AT TIME=   1.42500 N
     D602F: RELAY MARGIN AT FORBES (DCAR)       :    403 %  AT TIME=   2.19166 N
-------------------------------------------------------------------------------
          OH - MH TRANSIENT PERFORMANCE:

     OH-MH: INITIAL OH-MH POWER, KENORA ANGLE   :  -196.2 MW        -9.6 DEG
     OH-MH: MAX +  MW CHANGE @TIME, DLT ANGLE   :    15.1 MW  @  2.57499,    1.7
     OH-MH: MAX -  MW CHANGE @TIME, DLT ANGLE   :    28.4 MW  @  0.86666,    8.6
     OH-MH: MAX ANGLE CHANGE @TIME, DLT POWER   :    11.7 DEG @  1.13333,  -14.6
-------------------------------------------------------------------------------
          RELAY MARGINS/IMPEDANCES (ZRE,ZIM)/FLOWS AT TIME=   4.99995

     B10T : RELAY MARGIN AT TIOGA IS            :    409 %   -0.7421    0.0366
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -1.7573   -4.6493
     L20D : RELAY MARGIN AT DRAYTON IS          :    695 %   -0.3697    0.0571
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7708    0.1477
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    342 %   -0.6990    0.0547
     D602F: RELAY MARGIN AT FORBES IS           :    250 %   -0.0538    0.0214
     D602F: RELAY MARGIN AT DORSEY IS           :    395 %    0.0592    0.0106
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    526 %   -0.2210    0.3658
                         ---------------
     B10T : BOUNDARY DAM PHASE SHIFT FLOW       :   145.4 MVA ( SOUTH )
     F3M  : INTERNATIONAL FALLS PH. SHIFT FLOW  :   148.0 MVA ( SOUTH )
     MH-OH: FINAL OH-MH POWER, KENORA ANGLE     :  -202.9 MW        -7.5 DEG
     EWTW : FINAL OH EAST-WEST TIES FLOW        :   182.8 MW
-------------------------------------------------------------------------------
          USING **NORMAL** RELAYS SETTINGS AS FOLLOWS:

 B10T@TIOGA  : R1= 0.030 X1= 0.348 R2=-0.030 X2=-0.348 P1/2/3=0.223 0.283 0.350
 G82R@RUGBY  : A=  81.9 IN1= 0.250 IN2= 0.100 B=  81.9 IN3= -0.200 IN4= -0.350
 L20D@DRAYTON: A=  80.0 IN1= 0.175 IN2= 0.135 B=  80.0 IN3= -0.095 IN4= -0.136
 R50M@MORANVL: A=  76.3 IN1= 0.345 IN2= 0.245 B=  76.3 IN3= -0.198 IN4= -0.258
 F3M@INT.FALL: A=  76.3 IN1= 0.480 IN2= 0.300 B=  76.3 IN3= -0.200 IN4= -0.350
 D602F@DORSEY: A=  85.0 IN1= 0.041 IN2= 0.026 B=  85.0 IN3= -0.023 IN4= -0.036
 D602F@DORSEY: A=  85.0 IN1= 0.034 IN2= 0.026 B=  85.0 IN3= -0.024 IN4= -0.033
 D602F-DCAR  : ANGLE= 170.0 DCAO= -39.700 DCAI= -49.450
 K21W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
 K22W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
-------------------------------------------------------------------------------
```

THU, APR 19 2007 14:33

INITIATED AT LOAD FLOW ENTRY POINT ON THU, APR 19 2007 14:33

MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

SPECIAL RESPONSE FILES AND COMMENTS
--- --- --- --- ---

RESPONSE FILES
--- ---
None

COMMENTS
---
None

P O W E R F L O W S U M M A R Y

| | | | |
|---|---|---|---|
| NDEX: | 1950 MW | ECL-ARP: | 651 MW |
| MHEX: | 2175 MW | PRI-BYN: | 834 MW |
| MWSI: | 1485 MW | AHD-GPK: | 0 MW |
| | | NI-WUMS: | 93 MW |
| COOPER S: | 687 MW | WNE-WKS: | 462 MW |
| FTCAL S: | 612 MW | GGS: | 1539 MW |
| GRIS-LNC: | 721 MW | QC WEST: | 198 MW |

LOAD LEVELS AS PERCENT OF 2006 SUMMER PEAK:

| | | | | | |
|---|---|---|---|---|---|
| NORTH DAKOTA | (ZONE 90,990) | 2074.0 MW, | 74.0% | OF | 2803.0 MW |
| NSP | (AREA 600) | 7107.4 MW, | 71.5% | OF | 9947.0 MW |
| MAN HYDRO | (AREA 667) | 2354.4 MW, | 83.1% | OF | 2832.0 MW |

| Load/Losses | MW / MW | Generation | MW | Export | MW |
|---|---|---|---|---|---|
| Manitoba | 2354/ 280 | MH total gross | 5002 | SPARE | 0 |
| Ont. total | 22150/ 478 | Wpg River | 568 | SPARE | 0 |
| NW | 915/ 37 | 7 Sisters | 170 | SPARE | 0 |
| Sask. | 2150/ 82 | OH total gross | 21884 | East Bias | 250 |
| MP | 1997/ 138 | northwest | 717 | SPC>WAPA (B10T) | 164 |
| NSP | 7107/ 530 | SPC total gross | 2406 | MH>SPC (3-230) | 60 |
| N. Dakota | 2073/ 291 | MP total gross | 2161 | MH>SPC (FALLS) | 0 |
| Manitoba | 516 MVARS | ND Cfd AC gross | 3257 | OH>MH @Kenora | -196 |
| Ont. total | 13082 MVARS | net | 3086 | OH>MP @Ft Fran | 150 |
| NW | 489 MVARS | NSP East gross | 1809 | OH E>W @Wawa | 189 |
| Sask. | 502 MVARS | net | 1691 | OH>East USA | 0 |
| MP | 536 MVARS | West gross | 3010 | F601C @Forbes | 1777 |
| NSP | 1505 MVARS | net | 2848 | D602F @Dorsey | 1729 |
| N. Dakota | 434 MVARS | Total net | 5322 | L20D @Letell | 287 |

| | | | |
|---|---|---|---|
| WAPA SD Hydro | 1497 | R50M @Richer | 131 |
| Pleasant Valley | 0 | G82R @Glenboro | 26 |
| LGS/Trimont | 99 | | |
| SW MN Wind | 431 | | |
| Swing Bus | 944 | | |

| Tfmrs | MVA/ | Load | Ph Shifters | Deg/ | MW | DC Lines | MW |
|---|---|---|---|---|---|---|---|
| Wshell #1 7-7 | 112/ | 77% | Stinson | 43/ | 107 | CU (1,2) | 1103 |
| Wshell #2 7-7 | 112/ | 77% | Boundary Dam | 9/ | 165 | SQ BU (3,4) | 455 |
| Drayton#1 4-7 | 52/ | 37% | Whiteshell | 81/ | 200 | MH Bipole 1 | 1504 |
| Drayton#2 4-7 | 66/ | 35% | Int Falls | 101/ | 149 | MH Bipole 2 | 1702 |
| Dorsey #1 2-4 | 820/ | 68% | St. Lawrence | 15/ | 0 | MH (BP1+BP2) | 3206 |
| Dorsey #2 2-4 | 928/ | 77% | | | | Miles City E>W | -150 |
| Forbes 2-4 | 77/ | 11% | | | | RCDC (15) | 0 |
| | | | | | | Stegall (10) | 0 |

| Dorsey SC's | I/S | MVAR | Qmax/ Qmin | SVC's | MVAR | Qmax/ Qmin |
|---|---|---|---|---|---|---|
| 1*** mar-so06aa.uzvV454-ei2 | | | | | Page 2 | |
| MIL 7-9G | 17.0 | 2 504 | 600/ -330 | Forbes | 500 | 33 400/ -450 |
| SCE 1-3G | 18.2 | 3 411 | 480/ -240 | Fargo | 13.2 | -12 20/ -135 |
| SCA 4-6G | 18.2 | 3 411 | 480/ -240 | Watertown | 20.0 | 98 125/ -86 |
| Total | | 1326 | 1560/ -810 | Series Caps | | Num In Serv |
| Margin | | 234 | | Roseau | 500 | 2 of 2 |
| | | | | Chisago | 500 | 1 of 1 |

| Caps/Reactors | | MVAR | Caps/Reactors | | MVAR | Caps/Reactors | | MVAR |
|---|---|---|---|---|---|---|---|---|
| Balta (FS) | 230 | 0 | Arrowhead | 230 | 160 | Chisago T 9 | 34.5 | 51 |
| Drayton | 115 | 20 | Blackberry | 230 | 47 | Chisago T 10 | 34.5 | 51 |
| Drayton | 13.8 | 0 | Minntac | 115 | 45 | Forbes | 230 | 70 |
| Eau Claire(FS) | 161 | 356 | Riverton | 230 | 47 | Forbes | 500 | 600 |
| Kohlman Lake | 115 | 240 | Roseau Co.(FS) | 230 | 0 | | | 0 |
| Parkers Lk(FS) | 115 | 0 | Running (FS) | 230 | 30 | Fargo | 115 | 81 |
| Prairie (FS) | 115 | 40 | Running react | 230 | 0 | Watertown | 20 | 20 |
| Ramsey (FS) | 230 | 0 | Shannon | 230 | 72 | Watertown | 230 | 76 |
| Red Rock | 115 | 240 | | | 0 | | | 0 |
| Rugby | 13.8 | -25 | Glenboro | 230 | 0 | | | 0 |
| Split Rock(FS) | 115 | 80 | Laverendrye | 110 | 98 | | | 0 |
| Sheyenne (FS) | 115 | 40 | Richer react | 230 | 0 | | | 0 |
| Wilton/Bemidji | 115 | 20 | St Vital | 110 | 98 | | | 0 |

| Bus Voltages | | V,pu | Bus Voltages | | V,pu | Bus Voltages | | V,kV |
|---|---|---|---|---|---|---|---|---|
| Adams | 345 | 1.003 | Arrowhead | 230 | 1.026 | Whiteshell | 110 | 119.0 |
| Alexandria | 115 | 1.010 | Badoura | 115 | 1.025 | Kenora | 220 | 253.4 |
| Audubon | 115 | 1.027 | Blackberry | 230 | 1.031 | Dryden | 220 | 261.6 |
| Bemidji | 115 | 1.012 | Boise Cascade | 13.8 | 1.059 | Fort Frances | 220 | 258.7 |
| Byron | 345 | 1.011 | Boise Cascade | 115 | 1.027 | Mackenzie | 220 | 272.9 |
| Chisago Co. | 345 | 1.010 | ETCO | 115 | 1.008 | Lakehead | 220 | 273.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chisago Co. | 500 | 1.005 | Forbes | 230 | 1.021 | Marathon | 220 | 269.1 |
| Drayton | 230 | 1.014 | Forbes | 500 | 1.015 | Wawa | 220 | 262.3 |
| Eau Claire | 345 | 0.997 | Hubbard | 115 | 1.012 | Mississagi | 220 | 252.3 |
| WEST FARIBAULT | 115 | 1.025 | Intl Falls | 115 | 1.027 | Fort Frances | 118 | 120.4 |
| LaPorte | 115 | 1.013 | Minntac | 115 | 1.016 | Lakehead | 118 | 122.8 |
| Maple River | 230 | 1.018 | Moranville | 230 | 1.028 | Birch | 118 | 120.3 |
| Marshall Tap | 115 | 1.024 | Riverton | 230 | 1.013 | Marathon | 118 | 127.5 |
| Owatonna | 161 | 1.004 | Running | 230 | 1.035 | | | 0.0 |
| Prairie | 115 | 1.022 | Shannon | 230 | 1.034 | | | 0.0 |
| Prairie | 230 | 1.017 | | | 0.000 | | | 0.0 |
| Ramsey | 230 | 1.018 | Groton | 345 | 0.994 | | | 0.0 |
| Roseau County | 230 | 1.027 | Watertown | 230 | 1.030 | | | 0.0 |
| Roseau County | 500 | 1.063 | Watertown | 345 | 1.017 | | | 0.0 |
| Sheyenne | 230 | 1.021 | | | 0.000 | | | 0.0 |
| Thief R Falls | 115 | 1.013 | Dorsey | 230 | 1.045 | | | 0.0 |
| Tioga | 230 | 1.030 | Dorsey | 500 | 1.035 | | | 0.0 |
| Wahpeton | 230 | 1.014 | | | 0.000 | | | 0.0 |
| Winger | 115 | 1.030 | | | 0.000 | | | 0.0 |

Steady State Relay Margins (measured from inner blinder)

| Relay Location | Manuf/Type | PSS Model | South | North | Em North |
|---|---|---|---|---|---|
| 1) B10T-Tioga (South) | GE OST | SLLP | 339% | N/A | N/A |
| 2) -Tioga (North) | GE OST | SLLP | 696% | N/A | N/A |
| 3) -Tioga (Em North) | GE OST | SLLP | | N/A | N/A |
| 4) D602F-Dorsey | ATP ??? | SLINOS | 405% | N/A | N/A |
| 5) -Forbes (Normal) | ATP ??? | SLINOS | 255% | N/A | N/A |
| 6) -Forbes (Em Nrth) | APT S-PRO | SLINOS | | N/A | N/A |
| 8) F3M-Intl Falls | APT S-PRO | SLINOS | 333% | N/A | N/A |
| 9) G82R-Rugby | APT | SLINOS | 1835% | N/A | N/A |
| 10) L20D-Drayton (Normal) | APT, ASEA | SLINOS | 663% | N/A | N/A |
| 11) -Drayton (Em Nrth) | ASEA RXZF2 | SLINOS | | N/A | N/A |
| 12) R50M-Moranville (Norm) | APT, West | SLINOS | 1044% | N/A | N/A |
| 13) -Moranville (Em N) | ASEA RXZF2 | SLINOS | | N/A | N/A |

SIMULATION CHECKS FOLLOW:
+ _____

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| ITER | DELTAV/TOL | X------ AT BUS ------X | REAL(DELTAV) | IMAG(DELTAV) |
|---|---|---|---|---|
| 1 | 84.813 | 64834 [GORDON 934.500] | 0.4166E-05 | -0.8471E-04 |
| 2 | 44.865 | 64834 [GORDON 934.500] | -0.2043E-05 | -0.4482E-04 |
| 3 | 4.586 | 64834 [GORDON 934.500] | -0.3964E-05 | -0.2306E-05 |
| 4 | 0.300 | 66411 [MI CTYE4230.00] | -0.1459E-06 | 0.2624E-06 |

REACHED TOLERANCE IN 4 ITERATIONS

LARGEST MISMATCH: 0.00 MW 0.00 MVAR 0.00 MVA AT BUS 14276 [6BASIN 230.00]
SYSTEM TOTAL ABSOLUTE MISMATCH: 0.28 MVA

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IEEEG3 AT BUS 68331 MACHINE 3 INITIALIZED OUT OF LIMITS

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IEEEG3 AT BUS  68332 MACHINE 5  INITIALIZED OUT OF LIMITS

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INITIAL CONDITION LOAD FLOW USED  6 ITERATIONS

***************************************************************************

INITIAL CONDITIONS SUSPECT:
    I   DSTATE(I)    STATE(I)     MODEL   STATE    BUS  X--- NAME ---X   ID
    9   0.28884E-01  0.10264
   10   -18.468       229.39
   14    898.82       8718.6
26753   0.11185E-02  0.10985      IEEET1   K+1   27065  11BRWN P138.00   1
31428  -0.34344E-01   2.9299      IEEET1   K+1   63315  BIGSTN1G24.000   1
31436  -0.44709E-02  0.29400      IEEET1   K+1   63324  HOOTLK3G13.800   3
31495  -0.12584E-02  0.10000      IEEET1   K+1   63883  NEAL  3G22.000   3
32278   0.71206E-02 -0.30015      SCRX     K     67683  KET1-12G13.800   1
44902  -0.46755E-02  0.38046      CIMTR3   K+1   60136  MAPLE R7115.00   1
44905   0.24215E-03  0.40081E-02  CIMTR3   K+4   60136  MAPLE R7115.00   1
45111   0.82016E-04  0.19407E-02  CIMTR3   K+4   61190  WOODSTK869.000   1
47687   0.88280E-04  0.32487E-02  CIMTR3   K+4   60856  WESTRDG869.000   1
47693   0.14840E-03  0.33629E-02  CIMTR3   K+4   34901  ROCKCO G34.500   1
47720   0.44251E-04  0.34699E-02  CIMTR3   K+4   60708  BUFFRIDG34.500   9
47726   0.46001E-04  0.31905E-02  CIMTR3   K+4   60715  CHANRMB934.500   9
49598  -0.22086E-04  0.11130E-02  IEEET1   K+1   38694  ST.POINT46.000   HY
49955  -0.31963E-02  0.26800      IEEET1   K+1   39591  PUL G5  13.800   5
51176  -0.10431E-01   0.0000      ESAC8B   K+2   61775  BOSWE44G22.800   4
51181  -0.38147E-01   0.0000      ESAC8B   K+2   61776  BOSWE71G14.400   1
51186  -0.76294E-01   0.0000      ESAC8B   K+2   61777  BOSWE72G14.400   2


***************************************************************************


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     LINE SWITCHING EVENTS FOLLOW:
+    ____________________________


     MHEB DC REDUCTIONS FOLLOW:
+    __________________________


     NETWORK NOT CONVERGED FOLLOW:
+    ____________________________


     RELOUV AND RELOUF SWITCHING EVENTS FOLLOW:
+    __________________________________________
```

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     DC SWITCHING EVENTS FOLLOW:
+    ___________________________

 AT TIME = 0.1000 DC LINE  1 MANUALLY BLOCKED
 AT TIME = 0.1000 DC LINE  2 MANUALLY BLOCKED
1*** mar-so06aa.uzvV454-ei2                                  Page   4


     VSCAN EVENTS FOLLOW:
+    ____________________


 AT TIME =  0.917 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 66712 [PRAIRIE7 115] 1.21   HI

 AT TIME =  0.925 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.21   HI    66712 [PRAIRIE7 115] 1.21   HI

 AT TIME =  0.933 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.21   HI    66712 [PRAIRIE7 115] 1.21   HI

 AT TIME =  0.933 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.21   HI    66712 [PRAIRIE7 115] 1.22   HI

 AT TIME =  0.942 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.22   HI    66712 [PRAIRIE7 115] 1.22   HI

 AT TIME =  0.950 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.22   HI    66712 [PRAIRIE7 115] 1.22   HI


     PI 4 KV EVENTS FOLLOW:
+    ______________________



     RELAY SCAN EVENTS FOLLOW:
+    _________________________



     FARGO/WATERTOWN SVS EVENTS FOLLOW:
+    __________________________________



     UDHOLD EVENTS FOLLOW:
+    _____________________
```

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     DYNAMIC VOLTAGE CHECKS FOLLOW:
+    ______________________________

         FROM TIME      0.4000 TO TIME      5.0000

                          PU VOLT                                    VMAX
+                        __________
 CHAN                     MAX   MIN       MINIMUM        MAXIMUM     LESS
+                                         __________     __________
  NO.    DESCRIPTION      .LT.  .GT.    VOLT  TIME     VOLT  TIME    VMIN
+____   _____________   __________     ____  ____     ____  ____    ____
 ----   -------------   ----------     ----  ----     ----  ----    ----
+<<<<   <<<<<<<<<<<<<   <<<<<<<<<<     <<<<  <<<<     <<<<  <<<<    <<<<
  444   67503 DORSEY    1.25  0.70     1.01  1.42     1.07  2.16    0.06
  386   61624 FORBES    1.15  0.82     0.93  0.58     1.03  2.24    0.10
  384   61615 ARROWHD   1.15  0.82     0.92  0.58     1.05  2.35    0.13
  382   61612 RIVERTN   1.15  0.75     0.87  0.54     1.05  1.15    0.18
  362   66752 DRAYTON   1.20  0.80     0.92  0.44     1.12  0.95    0.20
  562   63229 WAHPETN   1.18  0.80     0.83  0.54     1.11  1.15    0.28
  350   67104 TIOGA4    1.15  0.80     0.98  1.42     1.07  2.46    0.09
  392   63030 DICKNSN   1.17  0.70     0.98  0.62     1.06  1.32    0.08
  390   63041 COAL CR   1.18  0.70     0.99  0.54     1.13  1.27    0.14
  334   66529 WATERTN   1.18  0.75     0.82  0.64     1.09  1.32    0.27
  360   67160 GROTON    1.15  0.70     0.77  0.64     1.09  1.32    0.32
  553   61754 BOISE     1.15  0.82     0.97  0.58     1.04  2.24    0.07


     POWERFLOW WARNINGS AT END OF SIMULATION FOLLOW:
+    ___________________________________________________

BUSES WITH VOLTAGE GREATER THAN 1.1000:
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)
67556 WHTSL1 4 220 667 1.1076 243.66    67589 WHTSL2 4 220 667 1.1075 243.66
67648 POINTD27 121 667 1.1011 133.24    67705 WHSL2PH7 110 667 1.1062 121.69
1*** mar-so06aa.uzvV454-ei2                                  Page   5

67751 WHSL1PH7 110 667 1.1062 121.69    67770 SK1 SUB7 110 667 1.1518 126.70
67771 STAR LK7 110 667 1.1492 126.41    67772 BRERTON7 110 667 1.1508 126.59

BUSES WITH VOLTAGE LESS THAN 0.9500:
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)


 BRANCH CURRENT LOADINGS ABOVE 100.0 % OF RATING SET A
+       _______
X-------FROM BUS-------X  X--------TO BUS--------X       CURRENT(MVA)
  BUS    NAME  BSKV AREA    BUS    NAME  BSKV AREA CKT LOADING  RATING PERCENT
60197* CHIS CO2 500  600  60198  CHIS-N 2 500  600  1   1853.4  1732.0   107.0
61691  SLVRBYH7 115  608  61692* SLVRBAY7 115  608  1    113.8   112.0   101.6
61691* SLVRBYH7 115  608  62170  WALDO  7 115  608  1    112.6   112.0   100.5
61740* GR RPDS7 115  608  62448  HILLCTY7 115  608  1     54.4    53.0   102.7

 TRANSFORMER MVA LOADINGS ABOVE 100.0 % OF RATING SET A
+            ___
```

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-------------------------------------------------------------------------------
          FAST SWITCH CAPACITOR PERFORMANCE:

     BUSNUM  BUS NAME    # CAPS   SIZE    SSON    FINAL   AVAIL
      63056  BALTA  4       3      60       0       0       1
      60305  EAU CLA5       4      89       4       3       0
      60234  PARKERS7       3      80       0       0       3
      60116  PRASWCP7      12      40       1       1       4
      63047  RAMSEY 4       0       0       0       0       0
      60168  ROSSWCP4       2      30       0       0       1
      60167  RUNSWCP4       6      30       1       1       4
      60172  SHYSWCP7       5      40       1       1       0
      60129  SPLT RK7       2      80       1       2       0


-------------------------------------------------------------------------------
          INITIAL **NORMAL** RELAY MARGINS/IMPEDENCES (ZRE/ZIM):     VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :    340 %   -0.6530    0.0495 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -3.2120   -1.7653 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    664 %   -0.3584    0.0491 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7881    0.1503 N
     F3M  : RELAY MARGIN AT INT.FALLS IS        :    333 %   -0.6881    0.0494 N
     D602F: RELAY MARGIN AT FORBES IS           :    256 %   -0.0545    0.0212 N
     D602F: RELAY MARGIN AT DORSEY IS           :    405 %    0.0601    0.0106 N
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    507 %    0.0000    0.0000 N
-------------------------------------------------------------------------------
          MINIMUM TRANSIENT RELAY MARGINS: START TIME:  0.27500 SEC, VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :     67 %  AT TIME=   1.37500 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %  AT TIME=   0.00000 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    375 %  AT TIME=   1.46666 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    706 %  AT TIME=   0.58333 N
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    183 %  AT TIME=   1.74166 N
     D602F: RELAY MARGIN AT FORBES IS           :    133 %  AT TIME=   0.60000 N
     D602F: RELAY MARGIN AT DORSEY IS           :    205 %  AT TIME=   0.60000 N
     D602F: RELAY MARGIN AT FORBES (DCAR)       :    507 %  AT TIME=   0.00000 N
-------------------------------------------------------------------------------
          OH - MH TRANSIENT PERFORMANCE:

     OH-MH: INITIAL OH-MH POWER, KENORA ANGLE   :  -196.2 MW        -9.6 DEG
     OH-MH: MAX +  MW CHANGE @TIME, DLT ANGLE   :    87.2 MW  @  2.80832,  -33.3
     OH-MH: MAX -  MW CHANGE @TIME, DLT ANGLE   :    12.3 MW  @  0.65833,    1.6
     OH-MH: MAX ANGLE CHANGE @TIME, DLT POWER   :   -37.3 DEG @  2.24166,   63.5
-------------------------------------------------------------------------------
          RELAY MARGINS/IMPEDANCES (ZRE,ZIM)/FLOWS AT TIME=   4.99995

     B10T : RELAY MARGIN AT TIOGA IS            :    305 %   -0.6066    0.0645
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -3.5751   -0.3126
     L20D : RELAY MARGIN AT DRAYTON IS          :    640 %   -0.3487    0.0503
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7718    0.1153
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    250 %   -0.5739    0.0052
     D602F: RELAY MARGIN AT FORBES IS           :    220 %   -0.0499    0.0212
     D602F: RELAY MARGIN AT DORSEY IS           :    345 %    0.0552    0.0115
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    991 %   -0.0735    8.3331
                           ---------------
     B10T : BOUNDARY DAM PHASE SHIFT FLOW       :   177.4 MVA ( SOUTH )
```

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     F3M  : INTERNATIONAL FALLS PH. SHIFT FLOW  :   176.5 MVA ( SOUTH )
     MH-OH: FINAL OH-MH POWER, KENORA ANGLE     :  -162.2 MW       -42.3 DEG
     EWTW : FINAL OH EAST-WEST TIES FLOW        :   250.1 MW
-------------------------------------------------------------------------------
          USING **NORMAL** RELAYS SETTINGS AS FOLLOWS:

 B10T@TIOGA  : R1= 0.030 X1= 0.348 R2=-0.030 X2=-0.348 P1/2/3=0.223 0.283 0.350
 G82R@RUGBY  : A=  81.9 IN1= 0.250 IN2= 0.100 B=  81.9 IN3= -0.200 IN4= -0.350
 L20D@DRAYTON: A=  80.0 IN1= 0.175 IN2= 0.135 B=  80.0 IN3= -0.095 IN4= -0.136
 R50M@MORANVL: A=  76.3 IN1= 0.345 IN2= 0.245 B=  76.3 IN3= -0.198 IN4= -0.258
 F3M@INT.FALL: A=  76.3 IN1= 0.480 IN2= 0.300 B=  76.3 IN3= -0.200 IN4= -0.350
 D602F@DORSEY: A=  85.0 IN1= 0.041 IN2= 0.026 B=  85.0 IN3= -0.023 IN4= -0.036
 D602F@DORSEY: A=  85.0 IN1= 0.034 IN2= 0.026 B=  85.0 IN3= -0.024 IN4= -0.033
 D602F-DCAR  : ANGLE= 170.0 DCAO= -39.700 DCAI= -49.450
 K21W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
 K22W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
-------------------------------------------------------------------------------
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THU, APR 19 2007 14:48

INITIATED AT LOAD FLOW ENTRY POINT ON THU, APR 19 2007 14:48

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

4 CY SLGF @ L.OLD 345 ON FTTHOMP LINE, LO BRKR 2692 STK
CLR @ 11 CY BY TRIPPING FLTD LINE

SPECIAL RESPONSE FILES AND COMMENTS
--- --- --- --- ---

RESPONSE FILES
--- ---
None

COMMENTS
---
None

P O W E R F L O W S U M M A R Y

| | | | |
|---|---|---|---|
| NDEX: | 1950 MW | ECL-ARP: | 650 MW |
| MHEX: | 2175 MW | PRI-BYN: | 833 MW |
| MWSI: | 1484 MW | AHD-GPK: | 0 MW |
| | | NI-WUMS: | 93 MW |
| COOPER S: | 686 MW | WNE-WKS: | 462 MW |
| FTCAL S: | 611 MW | GGS: | 1539 MW |
| GRIS-LNC: | 721 MW | QC WEST: | 199 MW |

LOAD LEVELS AS PERCENT OF 2006 SUMMER PEAK:

| | | | | | |
|---|---|---|---|---|---|
| NORTH DAKOTA | (ZONE 90,990) | 2074.0 MW, | 74.0% | OF | 2803.0 MW |
| NSP | (AREA 600) | 7107.4 MW, | 71.5% | OF | 9947.0 MW |
| MAN HYDRO | (AREA 667) | 2354.4 MW, | 83.1% | OF | 2832.0 MW |

| Load/Losses | MW / MW | Generation | MW | Export | MW |
|---|---|---|---|---|---|
| Manitoba | 2354/ 280 | MH total gross | 5002 | SPARE | 0 |
| Ont. total | 22150/ 478 | Wpg River | 568 | SPARE | 0 |
| NW | 915/ 37 | 7 Sisters | 170 | SPARE | 0 |
| Sask. | 2150/ 82 | OH total gross | 21884 | East Bias | 249 |
| MP | 1997/ 138 | northwest | 717 | SPC>WAPA (B10T) | 164 |
| NSP | 7107/ 529 | SPC total gross | 2406 | MH>SPC (3-230) | 60 |
| N. Dakota | 2073/ 291 | MP total gross | 2161 | MH>SPC (FALLS) | 0 |
| Manitoba | 516 MVARS | ND Cfd AC gross | 3257 | OH>MH @Kenora | -196 |
| Ont. total | 13082 MVARS | net | 3086 | OH>MP @Ft Fran | 150 |
| NW | 489 MVARS | NSP East gross | 1809 | OH E>W @Wawa | 189 |
| Sask. | 502 MVARS | net | 1691 | OH>East USA | 0 |
| MP | 536 MVARS | West gross | 3010 | F601C @Forbes | 1777 |
| NSP | 1505 MVARS | net | 2848 | D602F @Dorsey | 1729 |
| N. Dakota | 434 MVARS | Total net | 5322 | L20D @Letell | 287 |

| | | | |
|---|---|---|---|
| WAPA SD Hydro | 1497 | R50M @Richer | 131 |
| Pleasant Valley | 0 | G82R @Glenboro | 26 |
| LGS/Trimont | 99 | | |
| SW MN Wind | 431 | | |
| Swing Bus | 948 | | |

| Tfmrs | MVA/ | Load | Ph Shifters | Deg/ | MW | DC Lines | MW |
|---|---|---|---|---|---|---|---|
| Wshell #1 7-7 | 112/ | 77% | Stinson | 43/ | 107 | CU (1,2) | 1104 |
| Wshell #2 7-7 | 112/ | 77% | Boundary Dam | 9/ | 165 | SQ BU (3,4) | 454 |
| Drayton#1 4-7 | 52/ | 37% | Whiteshell | 81/ | 200 | MH Bipole 1 | 1504 |
| Drayton#2 4-7 | 66/ | 35% | Int Falls | 101/ | 149 | MH Bipole 2 | 1702 |
| Dorsey #1 2-4 | 820/ | 68% | St. Lawrence | 15/ | 0 | MH (BP1+BP2) | 3206 |
| Dorsey #2 2-4 | 928/ | 77% | | | | Miles City E>W | -150 |
| Forbes 2-4 | 77/ | 11% | | | | RCDC (15) | 0 |
| | | | | | | Stegall (10) | 0 |

| Dorsey SC's | I/S | MVAR | Qmax/ Qmin | SVC's | MVAR | Qmax/ Qmin |
|---|---|---|---|---|---|---|
| 1*** mw1-so06aa.uzvV454-ag1 | | | | Page 2 | | |
| MIL 7-9G | 17.0 | 2 504 | 600/ -330 | Forbes | 500 33 | 400/ -450 |
| SCE 1-3G | 18.2 | 3 411 | 480/ -240 | Fargo | 13.2 -11 | 20/ -135 |
| SCA 4-6G | 18.2 | 3 411 | 480/ -240 | Watertown | 20.0 101 | 125/ -86 |
| Total | | 1326 | 1560/ -810 | Series Caps | Num In Serv | |
| Margin | | 234 | | Roseau | 500 | 2 of 2 |
| | | | | Chisago | 500 | 1 of 1 |

| Caps/Reactors | | MVAR | Caps/Reactors | | MVAR | Caps/Reactors | | MVAR |
|---|---|---|---|---|---|---|---|---|
| Balta | (FS) 230 | 0 | Arrowhead | 230 | 160 | Chisago T 9 | 34.5 | 51 |
| Drayton | 115 | 20 | Blackberry | 230 | 47 | Chisago T 10 | 34.5 | 51 |
| Drayton | 13.8 | 0 | Minntac | 115 | 45 | Forbes | 230 | 70 |
| Eau Claire(FS) | 161 | 356 | Riverton | 230 | 47 | Forbes | 500 | 600 |
| Kohlman Lake | 115 | 240 | Roseau Co.(FS) | 230 | 0 | | | 0 |
| Parkers Lk(FS) | 115 | 0 | Running (FS) | 230 | 30 | Fargo | 115 | 81 |
| Prairie (FS) | 115 | 40 | Running react | 230 | 0 | Watertown | 20 | 20 |
| Ramsey (FS) | 230 | 0 | Shannon | 230 | 72 | Watertown | 230 | 76 |
| Red Rock | 115 | 240 | | | 0 | | | 0 |
| Rugby | 13.8 | -25 | Glenboro | 230 | 0 | | | 0 |
| Split Rock(FS) | 115 | 80 | Laverendrye | 110 | 98 | | | 0 |
| Sheyenne (FS) | 115 | 40 | Richer react | 230 | 0 | | | 0 |
| Wilton/Bemidji | 115 | 20 | St Vital | 110 | 98 | | | 0 |

| Bus Voltages | | V,pu | Bus Voltages | | V,pu | Bus Voltages | | V,kV |
|---|---|---|---|---|---|---|---|---|
| Adams | 345 | 1.003 | Arrowhead | 230 | 1.026 | Whiteshell | 110 | 119.0 |
| Alexandria | 115 | 1.009 | Badoura | 115 | 1.025 | Kenora | 220 | 253.4 |
| Audubon | 115 | 1.027 | Blackberry | 230 | 1.031 | Dryden | 220 | 261.6 |
| Bemidji | 115 | 1.012 | Boise Cascade | 13.8 | 1.059 | Fort Frances | 220 | 258.7 |
| Byron | 345 | 1.011 | Boise Cascade | 115 | 1.027 | Mackenzie | 220 | 272.8 |
| Chisago Co. | 345 | 1.010 | ETCO | 115 | 1.008 | Lakehead | 220 | 273.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chisago Co. | 500 | 1.005 | Forbes | 230 | 1.021 | Marathon | 220 | 269.1 |
| Drayton | 230 | 1.014 | Forbes | 500 | 1.015 | Wawa | 220 | 262.3 |
| Eau Claire | 345 | 0.998 | Hubbard | 115 | 1.012 | Mississagi | 220 | 252.3 |
| WEST FARIBAULT | 115 | 1.025 | Intl Falls | 115 | 1.027 | Fort Frances | 118 | 120.4 |
| LaPorte | 115 | 1.012 | Minntac | 115 | 1.016 | Lakehead | 118 | 122.8 |
| Maple River | 230 | 1.018 | Moranville | 230 | 1.028 | Birch | 118 | 120.3 |
| Marshall Tap | 115 | 1.019 | Riverton | 230 | 1.013 | Marathon | 118 | 127.5 |
| Owatonna | 161 | 1.004 | Running | 230 | 1.035 | | | 0.0 |
| Prairie | 115 | 1.022 | Shannon | 230 | 1.034 | | | 0.0 |
| Prairie | 230 | 1.017 | | | 0.000 | | | 0.0 |
| Ramsey | 230 | 1.018 | Groton | 345 | 0.994 | | | 0.0 |
| Roseau County | 230 | 1.027 | Watertown | 230 | 1.030 | | | 0.0 |
| Roseau County | 500 | 1.063 | Watertown | 345 | 1.017 | | | 0.0 |
| Sheyenne | 230 | 1.021 | | | 0.000 | | | 0.0 |
| Thief R Falls | 115 | 1.013 | Dorsey | 230 | 1.045 | | | 0.0 |
| Tioga | 230 | 1.030 | Dorsey | 500 | 1.035 | | | 0.0 |
| Wahpeton | 230 | 1.014 | | | 0.000 | | | 0.0 |
| Winger | 115 | 1.030 | | | 0.000 | | | 0.0 |

Steady State Relay Margins (measured from inner blinder)

| Relay Location | Manuf/Type | PSS Model | South | North | Em North |
|---|---|---|---|---|---|
| 1) B10T-Tioga (South) | GE OST | SLLP | 338% | N/A | N/A |
| 2) -Tioga (North) | GE OST | SLLP | 696% | N/A | N/A |
| 3) -Tioga (Em North) | GE OST | SLLP | | N/A | N/A |
| 4) D602F-Dorsey | ATP ??? | SLINOS | 405% | N/A | N/A |
| 5) -Forbes (Normal) | ATP ??? | SLINOS | 255% | N/A | N/A |
| 6) -Forbes (Em Nrth) | APT S-PRO | SLINOS | | N/A | N/A |
| 8) F3M-Intl Falls | APT S-PRO | SLINOS | 333% | N/A | N/A |
| 9) G82R-Rugby | APT | SLINOS | 1834% | N/A | N/A |
| 10) L20D-Drayton (Normal) | APT, ASEA | SLINOS | 662% | N/A | N/A |
| 11) -Drayton (Em Nrth) | ASEA RXZF2 | SLINOS | | N/A | N/A |
| 12) R50M-Moranville (Norm) | APT, West | SLINOS | 1044% | N/A | N/A |
| 13) -Moranville (Em N) | ASEA RXZF2 | SLINOS | | N/A | N/A |

SIMULATION CHECKS FOLLOW:
+ _____

1*** mw1-so06aa.uzvV454-ag1 Page 3

| ITER | DELTAV/TOL | X------ AT BUS ------X | REAL(DELTAV) | IMAG(DELTAV) |
|---|---|---|---|---|
| 1 | 84.439 | 64834 [GORDON 934.500] | 0.4009E-05 | -0.8434E-04 |
| 2 | 44.658 | 64834 [GORDON 934.500] | -0.2115E-05 | -0.4461E-04 |
| 3 | 4.567 | 64834 [GORDON 934.500] | -0.3949E-05 | -0.2295E-05 |
| 4 | 0.394 | 66411 [MI CTYE4230.00] | -0.1402E-06 | 0.3686E-06 |

REACHED TOLERANCE IN 4 ITERATIONS

LARGEST MISMATCH: 0.00 MW 0.00 MVAR 0.00 MVA AT BUS 14276 [6BASIN 230.00]
SYSTEM TOTAL ABSOLUTE MISMATCH: 0.27 MVA

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IEEEG3 AT BUS 68331 MACHINE 3 INITIALIZED OUT OF LIMITS

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IEEEG3 AT BUS  68332 MACHINE 5  INITIALIZED OUT OF LIMITS

***************************************************************************

INITIAL CONDITION LOAD FLOW USED  6 ITERATIONS

***************************************************************************

INITIAL CONDITIONS SUSPECT:
    I   DSTATE(I)    STATE(I)     MODEL   STATE    BUS  X--- NAME ---X   ID
    9   0.28835E-01  0.10257
   10   -18.446       229.48
   14    897.31       8715.2
26753   0.11049E-02  0.10986      IEEET1   K+1   27065  11BRWN P138.00   1
31428  -0.40138E-01   2.9360      IEEET1   K+1   63315  BIGSTN1G24.000   1
31436  -0.54538E-02  0.29400      IEEET1   K+1   63324  HOOTLK3G13.800   3
31495  -0.12670E-02  0.10000      IEEET1   K+1   63883  NEAL  3G22.000   3
32164  -0.71138E-02  0.66600      IEEET1   K+1   66748  CENTER2G20.000   2
32278   0.70582E-02 -0.30014      SCRX     K     67683  KET1-12G13.800   1
44902  -0.46761E-02  0.38279      CIMTR3   K+1   60136  MAPLE R7115.00   1
44905   0.24279E-03  0.40088E-02  CIMTR3   K+4   60136  MAPLE R7115.00   1
45111   0.84931E-04  0.19439E-02  CIMTR3   K+4   61190  WOODSTK869.000   1
47687   0.91184E-04  0.32531E-02  CIMTR3   K+4   60856  WESTRDG869.000   1
47693   0.14874E-03  0.33628E-02  CIMTR3   K+4   34901  ROCKCO G34.500   1
47720   0.46178E-04  0.34699E-02  CIMTR3   K+4   60708  BUFFRIDG34.500   9
47726   0.47781E-04  0.31905E-02  CIMTR3   K+4   60715  CHANRMB934.500   9
49598   0.20458E-04  0.11568E-02  IEEET1   K+1   38694  ST.POINT46.000   HY
49955  -0.33006E-02  0.26800      IEEET1   K+1   39591  PUL G5  13.800   5
51176  -0.20862E-01   0.0000      ESAC8B   K+2   61775  BOSWE44G22.800   4
51181  -0.38147E-01   0.0000      ESAC8B   K+2   61776  BOSWE71G14.400   1
51186  -0.76294E-01   0.0000      ESAC8B   K+2   61777  BOSWE72G14.400   2


***************************************************************************

Initial     SLG-BF fault admittance (G + jB):    308.4  -4990.8
Normal time SLG-BF fault admittance (G + jB):    286.7  -4787.1

***************************************************************************


     LINE SWITCHING EVENTS FOLLOW:
+    ____________________________


     MHEB DC REDUCTIONS FOLLOW:
+    __________________________


     NETWORK NOT CONVERGED FOLLOW:
+    _____________________________


     RELOUV AND RELOUF SWITCHING EVENTS FOLLOW:
```

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+    ____________________________________________

     DC SWITCHING EVENTS FOLLOW:
+    __________________________
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     VSCAN EVENTS FOLLOW:
+    ___________________

     PI 4 KV EVENTS FOLLOW:
+    ______________________

     RELAY SCAN EVENTS FOLLOW:
+    ________________________

     FARGO/WATERTOWN SVS EVENTS FOLLOW:
+    __________________________________

     UDHOLD EVENTS FOLLOW:
+    ____________________

     DYNAMIC VOLTAGE CHECKS FOLLOW:
+    ______________________________

         FROM TIME      0.4000 TO TIME      5.0000

                          PU VOLT                                   VMAX
+                        __________
 CHAN                     MAX   MIN       MINIMUM        MAXIMUM     LESS
+                                          ___________    ___________
  NO.    DESCRIPTION      .LT.  .GT.     VOLT  TIME     VOLT  TIME    VMIN
+____   _____________   __________     ____  ____     ____  ____    ____
 ----   -------------   ----------     ----  ----     ----  ----    ----
+<<<<   <<<<<<<<<<<<<   <<<<<<<<<<     <<<<  <<<<     <<<<  <<<<    <<<<
  444   67503 DORSEY    1.25  0.70     1.01  1.30     1.06  0.64    0.05
  386   61624 FORBES    1.15  0.82     1.00  1.37     1.04  0.91    0.04
  384   61615 ARROWHD   1.15  0.82     0.99  0.49     1.04  1.00    0.05
  382   61612 RIVERTN   1.15  0.75     0.96  0.49     1.04  1.01    0.08
  362   66752 DRAYTON   1.20  0.80     0.97  1.55     1.10  0.91    0.13
  562   63229 WAHPETN   1.18  0.80     0.94  0.49     1.09  1.01    0.15
  350   67104 TIOGA4    1.15  0.80     0.98  0.49     1.06  1.00    0.08
  392   63030 DICKNSN   1.17  0.70     0.93  0.54     1.03  1.12    0.10
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  390   63041 COAL CR   1.18  0.70     0.95  0.44     1.12  1.08    0.17
  334   66529 WATERTN   1.18  0.75     0.87  0.59     1.04  1.17    0.17
  360   67160 GROTON    1.15  0.70     0.79  0.54     1.03  1.17    0.24
  553   61754 BOISE     1.15  0.82     0.99  1.37     1.04  2.01    0.05


     POWERFLOW WARNINGS AT END OF SIMULATION FOLLOW:
+    ______________________________________________

BUSES WITH VOLTAGE GREATER THAN 1.1000:
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)
67554 SLAVEFL7 121 667 1.1002 133.12    67556 WHTSL1 4 220 667 1.1033 242.73
67589 WHTSL2 4 220 667 1.1033 242.73    67648 POINTD27 121 667 1.1036 133.54
67705 WHSL2PH7 110 667 1.1003 121.04    67751 WHSL1PH7 110 667 1.1003 121.04
67770 SK1 SUB7 110 667 1.1463 126.09    67771 STAR LK7 110 667 1.1437 125.80
67772 BRERTON7 110 667 1.1452 125.98

BUSES WITH VOLTAGE LESS THAN 0.9500:
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)


 BRANCH CURRENT LOADINGS ABOVE 100.0 % OF RATING SET A
+       _______
X-------FROM BUS-------X  X--------TO BUS--------X       CURRENT(MVA)
  BUS    NAME  BSKV AREA    BUS    NAME  BSKV AREA CKT LOADING  RATING PERCENT
60197* CHIS CO2 500  600  60198  CHIS-N 2 500  600  1   1757.3  1732.0   101.5
66514  HURON  4 230  652  67205* BRDLAND4 230  652  1    459.0   400.0   114.8
67101* ANTELOP3 345  652  67120  BRDLAND3 345  652  1    479.4   478.0   100.3
67120  BRDLAND3 345  652  67204* BRDLNDTY 345  652  1    459.0   400.0   114.8
67204  BRDLNDTY 345  652  67205* BRDLAND4 230  652  1    459.0   400.0   114.8

 TRANSFORMER MVA LOADINGS ABOVE 100.0 % OF RATING SET A
+            ___
X-------FROM BUS-------X  X--------TO BUS--------X       MVA      MVA
  BUS    NAME  BSKV AREA    BUS    NAME  BSKV AREA CKT LOADING  RATING PERCENT
67120  BRDLAND3 345  652  67204* BRDLNDTY 345  652  1    466.8   400.0   116.7
67204* BRDLNDTY 345  652  67205  BRDLAND4 230  652  1    466.8   400.0   116.7

--------------------------------------------------------------------------------
          FAST SWITCH CAPACITOR PERFORMANCE:

     BUSNUM  BUS NAME    # CAPS   SIZE    SSON    FINAL   AVAIL
      63056  BALTA  4       3      60       0       0       1
      60305  EAU CLA5       4      89       4       4       0
      60234  PARKERS7       3      80       0       0       3
      60116  PRASWCP7      12      40       1       2       6
      63047  RAMSEY 4       0       0       0       0       0
      60168  ROSSWCP4       2      30       0       0       2
      60167  RUNSWCP4       6      30       1       1       5
      60172  SHYSWCP7       5      40       1       2       0
      60129  SPLT RK7       2      80       1       2       0


--------------------------------------------------------------------------------
          INITIAL **NORMAL** RELAY MARGINS/IMPEDENCES (ZRE/ZIM):     VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :    340 %   -0.6528    0.0495 N
```

```
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -3.2093   -1.7597 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    663 %   -0.3583    0.0491 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7882    0.1502 N
     F3M  : RELAY MARGIN AT INT.FALLS IS        :    333 %   -0.6876    0.0493 N
     D602F: RELAY MARGIN AT FORBES IS           :    256 %   -0.0545    0.0212 N
     D602F: RELAY MARGIN AT DORSEY IS           :    405 %    0.0601    0.0106 N
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    507 %    0.0000    0.0000 N
-------------------------------------------------------------------------------
          MINIMUM TRANSIENT RELAY MARGINS: START TIME:  0.27500 SEC, VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :    167 %  AT TIME=   1.25000 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %  AT TIME=   0.00000 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    489 %  AT TIME=   1.30833 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    767 %  AT TIME=   1.44166 N
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    262 %  AT TIME=   1.42500 N
     D602F: RELAY MARGIN AT FORBES IS           :    173 %  AT TIME=   1.42500 N
     D602F: RELAY MARGIN AT DORSEY IS           :    266 %  AT TIME=   1.42500 N
     D602F: RELAY MARGIN AT FORBES (DCAR)       :    403 %  AT TIME=   1.11666 N
-------------------------------------------------------------------------------
          OH - MH TRANSIENT PERFORMANCE:

     OH-MH: INITIAL OH-MH POWER, KENORA ANGLE   :  -196.0 MW        -9.8 DEG
     OH-MH: MAX +  MW CHANGE @TIME, DLT ANGLE   :    16.0 MW  @  2.57499,    1.3
     OH-MH: MAX -  MW CHANGE @TIME, DLT ANGLE   :    28.4 MW  @  0.86666,    8.6
     OH-MH: MAX ANGLE CHANGE @TIME, DLT POWER   :    11.7 DEG @  1.13333,  -14.5
-------------------------------------------------------------------------------
          RELAY MARGINS/IMPEDANCES (ZRE,ZIM)/FLOWS AT TIME=   4.99995

     B10T : RELAY MARGIN AT TIOGA IS            :    407 %   -0.7387    0.0369
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -1.9098   -4.5549
     L20D : RELAY MARGIN AT DRAYTON IS          :    691 %   -0.3683    0.0570
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7714    0.1476
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    341 %   -0.6977    0.0543
     D602F: RELAY MARGIN AT FORBES IS           :    250 %   -0.0538    0.0214
     D602F: RELAY MARGIN AT DORSEY IS           :    395 %    0.0592    0.0106
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    530 %   -0.1974    0.4230
                         ---------------
     B10T : BOUNDARY DAM PHASE SHIFT FLOW       :   146.1 MVA ( SOUTH )
     F3M  : INTERNATIONAL FALLS PH. SHIFT FLOW  :   148.3 MVA ( SOUTH )
     MH-OH: FINAL OH-MH POWER, KENORA ANGLE     :  -202.4 MW        -7.9 DEG
     EWTW : FINAL OH EAST-WEST TIES FLOW        :   183.5 MW
-------------------------------------------------------------------------------
          USING **NORMAL** RELAYS SETTINGS AS FOLLOWS:

 B10T@TIOGA  : R1= 0.030 X1= 0.348 R2=-0.030 X2=-0.348 P1/2/3=0.223 0.283 0.350
 G82R@RUGBY  : A=  81.9 IN1= 0.250 IN2= 0.100 B=  81.9 IN3= -0.200 IN4= -0.350
 L20D@DRAYTON: A=  80.0 IN1= 0.175 IN2= 0.135 B=  80.0 IN3= -0.095 IN4= -0.136
 R50M@MORANVL: A=  76.3 IN1= 0.345 IN2= 0.245 B=  76.3 IN3= -0.198 IN4= -0.258
 F3M@INT.FALL: A=  76.3 IN1= 0.480 IN2= 0.300 B=  76.3 IN3= -0.200 IN4= -0.350
 D602F@DORSEY: A=  85.0 IN1= 0.041 IN2= 0.026 B=  85.0 IN3= -0.023 IN4= -0.036
 D602F@DORSEY: A=  85.0 IN1= 0.034 IN2= 0.026 B=  85.0 IN3= -0.024 IN4= -0.033
 D602F-DCAR  : ANGLE= 170.0 DCAO= -39.700 DCAI= -49.450
 K21W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
 K22W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
-------------------------------------------------------------------------------
```

THU, APR 19 2007 14:50

INITIATED AT LOAD FLOW ENTRY POINT ON THU, APR 19 2007 14:50

MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

PERMANENT BIPOLE FAULT ON THE CU DC LINE
BOTH COAL CREEK UNITS TRIPPED AT 0.28 SEC

SPECIAL RESPONSE FILES AND COMMENTS
--- --- --- --- ---

RESPONSE FILES
--- ---
None

COMMENTS
---
None

P O W E R F L O W S U M M A R Y

| | | | |
|---|---|---|---|
| NDEX: | 1950 MW | ECL-ARP: | 650 MW |
| MHEX: | 2175 MW | PRI-BYN: | 833 MW |
| MWSI: | 1484 MW | AHD-GPK: | 0 MW |
| | | NI-WUMS: | 93 MW |
| COOPER S: | 686 MW | WNE-WKS: | 462 MW |
| FTCAL S: | 611 MW | GGS: | 1539 MW |
| GRIS-LNC: | 721 MW | QC WEST: | 199 MW |

LOAD LEVELS AS PERCENT OF 2006 SUMMER PEAK:

| | | | | | |
|---|---|---|---|---|---|
| NORTH DAKOTA | (ZONE 90,990) | 2074.0 MW, | 74.0% | OF | 2803.0 MW |
| NSP | (AREA 600) | 7107.4 MW, | 71.5% | OF | 9947.0 MW |
| MAN HYDRO | (AREA 667) | 2354.4 MW, | 83.1% | OF | 2832.0 MW |

| Load/Losses | MW / MW | Generation | MW | Export | MW |
|---|---|---|---|---|---|
| Manitoba | 2354/ 280 | MH total gross | 5002 | SPARE | 0 |
| Ont. total | 22150/ 478 | Wpg River | 568 | SPARE | 0 |
| NW | 915/ 37 | 7 Sisters | 170 | SPARE | 0 |
| Sask. | 2150/ 82 | OH total gross | 21884 | East Bias | 249 |
| MP | 1997/ 138 | northwest | 717 | SPC>WAPA (B10T) | 164 |
| NSP | 7107/ 529 | SPC total gross | 2406 | MH>SPC (3-230) | 60 |
| N. Dakota | 2073/ 291 | MP total gross | 2161 | MH>SPC (FALLS) | 0 |
| Manitoba | 516 MVARS | ND Cfd AC gross | 3257 | OH>MH @Kenora | -196 |
| Ont. total | 13082 MVARS | net | 3086 | OH>MP @Ft Fran | 150 |
| NW | 489 MVARS | NSP East gross | 1809 | OH E>W @Wawa | 189 |
| Sask. | 502 MVARS | net | 1691 | OH>East USA | 0 |
| MP | 536 MVARS | West gross | 3010 | F601C @Forbes | 1777 |
| NSP | 1505 MVARS | net | 2848 | D602F @Dorsey | 1729 |
| N. Dakota | 434 MVARS | Total net | 5322 | L20D @Letell | 287 |

| | | | |
|---|---|---|---|
| WAPA SD Hydro | 1497 | R50M @Richer | 131 |
| Pleasant Valley | 0 | G82R @Glenboro | 26 |
| LGS/Trimont | 99 | | |
| SW MN Wind | 431 | | |
| Swing Bus | 948 | | |

| Tfmrs | MVA/ | Load | Ph Shifters | Deg/ | MW | DC Lines | MW |
|---|---|---|---|---|---|---|---|
| Wshell #1 7-7 | 112/ | 77% | Stinson | 43/ | 107 | CU (1,2) | 1104 |
| Wshell #2 7-7 | 112/ | 77% | Boundary Dam | 9/ | 165 | SQ BU (3,4) | 454 |
| Drayton#1 4-7 | 52/ | 37% | Whiteshell | 81/ | 200 | MH Bipole 1 | 1504 |
| Drayton#2 4-7 | 66/ | 35% | Int Falls | 101/ | 149 | MH Bipole 2 | 1702 |
| Dorsey #1 2-4 | 820/ | 68% | St. Lawrence | 15/ | 0 | MH (BP1+BP2) | 3206 |
| Dorsey #2 2-4 | 928/ | 77% | | | | Miles City E>W | -150 |
| Forbes 2-4 | 77/ | 11% | | | | RCDC (15) | 0 |
| | | | | | | Stegall (10) | 0 |

| Dorsey SC's | I/S | MVAR | Qmax/ Qmin | SVC's | MVAR | Qmax/ Qmin |
|---|---|---|---|---|---|---|
| 1*** mw1-so06aa.uzvV454-ei2 | | | | | Page 2 | |
| MIL 7-9G | 17.0 | 2 504 | 600/ -330 | Forbes | 500 33 | 400/ -450 |
| SCE 1-3G | 18.2 | 3 411 | 480/ -240 | Fargo | 13.2 -11 | 20/ -135 |
| SCA 4-6G | 18.2 | 3 411 | 480/ -240 | Watertown | 20.0 101 | 125/ -86 |
| Total | | 1326 | 1560/ -810 | Series Caps | Num In Serv | |
| Margin | | 234 | | Roseau | 500 | 2 of 2 |
| | | | | Chisago | 500 | 1 of 1 |

| Caps/Reactors | | MVAR | Caps/Reactors | | MVAR | Caps/Reactors | | MVAR |
|---|---|---|---|---|---|---|---|---|
| Balta | (FS) 230 | 0 | Arrowhead | 230 | 160 | Chisago T 9 | 34.5 | 51 |
| Drayton | 115 | 20 | Blackberry | 230 | 47 | Chisago T 10 | 34.5 | 51 |
| Drayton | 13.8 | 0 | Minntac | 115 | 45 | Forbes | 230 | 70 |
| Eau Claire(FS) | 161 | 356 | Riverton | 230 | 47 | Forbes | 500 | 600 |
| Kohlman Lake | 115 | 240 | Roseau Co.(FS) | 230 | 0 | | | 0 |
| Parkers Lk(FS) | 115 | 0 | Running (FS) | 230 | 30 | Fargo | 115 | 81 |
| Prairie (FS) | 115 | 40 | Running react | 230 | 0 | Watertown | 20 | 20 |
| Ramsey (FS) | 230 | 0 | Shannon | 230 | 72 | Watertown | 230 | 76 |
| Red Rock | 115 | 240 | | | 0 | | | 0 |
| Rugby | 13.8 | -25 | Glenboro | 230 | 0 | | | 0 |
| Split Rock(FS) | 115 | 80 | Laverendrye | 110 | 98 | | | 0 |
| Sheyenne (FS) | 115 | 40 | Richer react | 230 | 0 | | | 0 |
| Wilton/Bemidji | 115 | 20 | St Vital | 110 | 98 | | | 0 |

| Bus Voltages | | V,pu | Bus Voltages | | V,pu | Bus Voltages | | V,kV |
|---|---|---|---|---|---|---|---|---|
| Adams | 345 | 1.003 | Arrowhead | 230 | 1.026 | Whiteshell | 110 | 119.0 |
| Alexandria | 115 | 1.009 | Badoura | 115 | 1.025 | Kenora | 220 | 253.4 |
| Audubon | 115 | 1.027 | Blackberry | 230 | 1.031 | Dryden | 220 | 261.6 |
| Bemidji | 115 | 1.012 | Boise Cascade | 13.8 | 1.059 | Fort Frances | 220 | 258.7 |
| Byron | 345 | 1.011 | Boise Cascade | 115 | 1.027 | Mackenzie | 220 | 272.8 |
| Chisago Co. | 345 | 1.010 | ETCO | 115 | 1.008 | Lakehead | 220 | 273.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chisago Co. | 500 | 1.005 | Forbes | 230 | 1.021 | Marathon | 220 | 269.1 |
| Drayton | 230 | 1.014 | Forbes | 500 | 1.015 | Wawa | 220 | 262.3 |
| Eau Claire | 345 | 0.998 | Hubbard | 115 | 1.012 | Mississagi | 220 | 252.3 |
| WEST FARIBAULT | 115 | 1.025 | Intl Falls | 115 | 1.027 | Fort Frances | 118 | 120.4 |
| LaPorte | 115 | 1.012 | Minntac | 115 | 1.016 | Lakehead | 118 | 122.8 |
| Maple River | 230 | 1.018 | Moranville | 230 | 1.028 | Birch | 118 | 120.3 |
| Marshall Tap | 115 | 1.019 | Riverton | 230 | 1.013 | Marathon | 118 | 127.5 |
| Owatonna | 161 | 1.004 | Running | 230 | 1.035 | | | 0.0 |
| Prairie | 115 | 1.022 | Shannon | 230 | 1.034 | | | 0.0 |
| Prairie | 230 | 1.017 | | | 0.000 | | | 0.0 |
| Ramsey | 230 | 1.018 | Groton | 345 | 0.994 | | | 0.0 |
| Roseau County | 230 | 1.027 | Watertown | 230 | 1.030 | | | 0.0 |
| Roseau County | 500 | 1.063 | Watertown | 345 | 1.017 | | | 0.0 |
| Sheyenne | 230 | 1.021 | | | 0.000 | | | 0.0 |
| Thief R Falls | 115 | 1.013 | Dorsey | 230 | 1.045 | | | 0.0 |
| Tioga | 230 | 1.030 | Dorsey | 500 | 1.035 | | | 0.0 |
| Wahpeton | 230 | 1.014 | | | 0.000 | | | 0.0 |
| Winger | 115 | 1.030 | | | 0.000 | | | 0.0 |

Steady State Relay Margins (measured from inner blinder)

| Relay Location | Manuf/Type | PSS Model | South | North | Em North |
|---|---|---|---|---|---|
| 1) B10T-Tioga (South) | GE OST | SLLP | 338% | N/A | N/A |
| 2) -Tioga (North) | GE OST | SLLP | 696% | N/A | N/A |
| 3) -Tioga (Em North) | GE OST | SLLP | | N/A | N/A |
| 4) D602F-Dorsey | ATP ??? | SLINOS | 405% | N/A | N/A |
| 5) -Forbes (Normal) | ATP ??? | SLINOS | 255% | N/A | N/A |
| 6) -Forbes (Em Nrth) | APT S-PRO | SLINOS | | N/A | N/A |
| 8) F3M-Intl Falls | APT S-PRO | SLINOS | 333% | N/A | N/A |
| 9) G82R-Rugby | APT | SLINOS | 1834% | N/A | N/A |
| 10) L20D-Drayton (Normal) | APT, ASEA | SLINOS | 662% | N/A | N/A |
| 11) -Drayton (Em Nrth) | ASEA RXZF2 | SLINOS | | N/A | N/A |
| 12) R50M-Moranville (Norm) | APT, West | SLINOS | 1044% | N/A | N/A |
| 13) -Moranville (Em N) | ASEA RXZF2 | SLINOS | | N/A | N/A |

SIMULATION CHECKS FOLLOW:
+ _____

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| ITER | DELTAV/TOL | X------ AT BUS ------X | REAL(DELTAV) | IMAG(DELTAV) |
|---|---|---|---|---|
| 1 | 84.439 | 64834 [GORDON 934.500] | 0.4009E-05 | -0.8434E-04 |
| 2 | 44.658 | 64834 [GORDON 934.500] | -0.2115E-05 | -0.4461E-04 |
| 3 | 4.567 | 64834 [GORDON 934.500] | -0.3949E-05 | -0.2295E-05 |
| 4 | 0.394 | 66411 [MI CTYE4230.00] | -0.1402E-06 | 0.3686E-06 |

REACHED TOLERANCE IN 4 ITERATIONS

LARGEST MISMATCH: 0.00 MW 0.00 MVAR 0.00 MVA AT BUS 14276 [6BASIN 230.00]
SYSTEM TOTAL ABSOLUTE MISMATCH: 0.27 MVA

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IEEEG3 AT BUS 68331 MACHINE 3 INITIALIZED OUT OF LIMITS

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IEEEG3 AT BUS  68332 MACHINE 5  INITIALIZED OUT OF LIMITS

*************************************************************************

INITIAL CONDITION LOAD FLOW USED  6 ITERATIONS

*************************************************************************

INITIAL CONDITIONS SUSPECT:
    I   DSTATE(I)    STATE(I)     MODEL   STATE    BUS  X--- NAME ---X   ID
    9   0.28835E-01  0.10257
   10   -18.446       229.48
   14    897.31       8715.2
26753   0.11049E-02  0.10986      IEEET1   K+1   27065  11BRWN P138.00   1
31428  -0.40138E-01   2.9360      IEEET1   K+1   63315  BIGSTN1G24.000   1
31436  -0.54538E-02  0.29400      IEEET1   K+1   63324  HOOTLK3G13.800   3
31495  -0.12670E-02  0.10000      IEEET1   K+1   63883  NEAL  3G22.000   3
32164  -0.71138E-02  0.66600      IEEET1   K+1   66748  CENTER2G20.000   2
32278   0.70582E-02 -0.30014      SCRX     K     67683  KET1-12G13.800   1
44902  -0.46761E-02  0.38279      CIMTR3   K+1   60136  MAPLE R7115.00   1
44905   0.24279E-03  0.40088E-02  CIMTR3   K+4   60136  MAPLE R7115.00   1
45111   0.84931E-04  0.19439E-02  CIMTR3   K+4   61190  WOODSTK869.000   1
47687   0.91184E-04  0.32531E-02  CIMTR3   K+4   60856  WESTRDG869.000   1
47693   0.14874E-03  0.33628E-02  CIMTR3   K+4   34901  ROCKCO G34.500   1
47720   0.46178E-04  0.34699E-02  CIMTR3   K+4   60708  BUFFRIDG34.500   9
47726   0.47781E-04  0.31905E-02  CIMTR3   K+4   60715  CHANRMB934.500   9
49598   0.20458E-04  0.11568E-02  IEEET1   K+1   38694  ST.POINT46.000   HY
49955  -0.33006E-02  0.26800      IEEET1   K+1   39591  PUL G5  13.800   5
51176  -0.20862E-01   0.0000      ESAC8B   K+2   61775  BOSWE44G22.800   4
51181  -0.38147E-01   0.0000      ESAC8B   K+2   61776  BOSWE71G14.400   1
51186  -0.76294E-01   0.0000      ESAC8B   K+2   61777  BOSWE72G14.400   2


*************************************************************************


*************************************************************************


     LINE SWITCHING EVENTS FOLLOW:
+    ____________________________


     MHEB DC REDUCTIONS FOLLOW:
+    __________________________


     NETWORK NOT CONVERGED FOLLOW:
+    ____________________________


     RELOUV AND RELOUF SWITCHING EVENTS FOLLOW:
+    __________________________________________
```

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     DC SWITCHING EVENTS FOLLOW:
+    ___________________________

 AT TIME = 0.1000 DC LINE  1 MANUALLY BLOCKED
 AT TIME = 0.1000 DC LINE  2 MANUALLY BLOCKED
1*** mw1-so06aa.uzvV454-ei2                                  Page   4


     VSCAN EVENTS FOLLOW:
+    ____________________


 AT TIME =  0.925 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.21   HI    66712 [PRAIRIE7 115] 1.21   HI

 AT TIME =  0.933 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.21   HI    66712 [PRAIRIE7 115] 1.21   HI

 AT TIME =  0.942 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.22   HI    66712 [PRAIRIE7 115] 1.22   HI

 AT TIME =  0.950 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.22   HI    66712 [PRAIRIE7 115] 1.22   HI

 AT TIME =  0.958 VOLTAGES OUTSIDE OF BAND 0.70000 TO 1.20000:
 X------ BUS -------X VOLTAGE      X------ BUS -------X VOLTAGE
 60141 [NORDIC 7 115] 1.23   HI    66712 [PRAIRIE7 115] 1.23   HI


     PI 4 KV EVENTS FOLLOW:
+    ______________________



     RELAY SCAN EVENTS FOLLOW:
+    _________________________



     FARGO/WATERTOWN SVS EVENTS FOLLOW:
+    __________________________________



     UDHOLD EVENTS FOLLOW:
+    ____________________



     DYNAMIC VOLTAGE CHECKS FOLLOW:
```

```
+    ______________________________

         FROM TIME      0.4000 TO TIME      5.0000

                          PU VOLT                                    VMAX
+                        __________
 CHAN                    MAX   MIN       MINIMUM        MAXIMUM     LESS
+                                        __________     __________
  NO.    DESCRIPTION     .LT.  .GT.    VOLT  TIME     VOLT  TIME    VMIN
+____   _____________   __________     ____  ____     ____  ____    ____
 ----   -------------   ----------     ----  ----     ----  ----    ----
+<<<<   <<<<<<<<<<<<<   <<<<<<<<<<     <<<<  <<<<     <<<<  <<<<    <<<<
  444   67503 DORSEY    1.25  0.70     1.01  1.42     1.07  2.16    0.06
  386   61624 FORBES    1.15  0.82     0.93  0.57     1.03  2.24    0.10
  384   61615 ARROWHD   1.15  0.82     0.92  0.57     1.05  2.35    0.13
  382   61612 RIVERTN   1.15  0.75     0.87  0.54     1.05  1.16    0.18
  362   66752 DRAYTON   1.20  0.80     0.92  0.44     1.12  0.96    0.20
  562   63229 WAHPETN   1.18  0.80     0.83  0.54     1.11  1.16    0.28
  350   67104 TIOGA4    1.15  0.80     0.98  1.42     1.07  2.46    0.09
  392   63030 DICKNSN   1.17  0.70     0.98  0.62     1.06  1.32    0.08
  390   63041 COAL CR   1.18  0.70     0.99  0.54     1.13  1.29    0.14
  334   66529 WATERTN   1.18  0.75     0.82  0.64     1.09  1.32    0.27
  360   67160 GROTON    1.15  0.70     0.77  0.64     1.09  1.32    0.32
  553   61754 BOISE     1.15  0.82     0.97  0.57     1.04  2.24    0.07


     POWERFLOW WARNINGS AT END OF SIMULATION FOLLOW:
+    ____________________________________________________

BUSES WITH VOLTAGE GREATER THAN 1.1000:
X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)
67556 WHTSL1 4 220 667 1.1076 243.67    67589 WHTSL2 4 220 667 1.1076 243.67
67648 POINTD27 121 667 1.1011 133.24    67705 WHSL2PH7 110 667 1.1063 121.69
67751 WHSL1PH7 110 667 1.1063 121.69    67770 SK1 SUB7 110 667 1.1519 126.71
67771 STAR LK7 110 667 1.1493 126.42    67772 BRERTON7 110 667 1.1509 126.59

BUSES WITH VOLTAGE LESS THAN 0.9500:
1*** mw1-so06aa.uzvV454-ei2                                   Page   5

X------ BUS -----X AREA V(PU)  V(KV)    X------ BUS -----X AREA V(PU)  V(KV)


 BRANCH CURRENT LOADINGS ABOVE 100.0 % OF RATING SET A
+       _______
X-------FROM BUS-------X  X--------TO BUS--------X       CURRENT(MVA)
  BUS    NAME  BSKV AREA    BUS    NAME  BSKV AREA CKT LOADING  RATING PERCENT
60197* CHIS CO2 500  600  60198  CHIS-N 2 500  600  1   1852.6  1732.0   107.0
61691  SLVRBYH7 115  608  61692* SLVRBAY7 115  608  1    113.9   112.0   101.7
61691* SLVRBYH7 115  608  62170  WALDO  7 115  608  1    112.7   112.0   100.6
61740* GR RPDS7 115  608  62448  HILLCTY7 115  608  1     54.5    53.0   102.8

 TRANSFORMER MVA LOADINGS ABOVE 100.0 % OF RATING SET A
+            ___

--------------------------------------------------------------------------------
          FAST SWITCH CAPACITOR PERFORMANCE:
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| BUSNUM | BUS NAME | # CAPS | SIZE | SSON | FINAL | AVAIL |
|---|---|---|---|---|---|---|
| 63056 | BALTA 4 | 3 | 60 | 0 | 0 | 1 |
| 60305 | EAU CLA5 | 4 | 89 | 4 | 3 | 0 |
| 60234 | PARKERS7 | 3 | 80 | 0 | 0 | 3 |
| 60116 | PRASWCP7 | 12 | 40 | 1 | 1 | 4 |
| 63047 | RAMSEY 4 | 0 | 0 | 0 | 0 | 0 |
| 60168 | ROSSWCP4 | 2 | 30 | 0 | 0 | 1 |
| 60167 | RUNSWCP4 | 6 | 30 | 1 | 1 | 4 |
| 60172 | SHYSWCP7 | 5 | 40 | 1 | 1 | 0 |
| 60129 | SPLT RK7 | 2 | 80 | 1 | 2 | 0 |

```
-------------------------------------------------------------------------------
          INITIAL **NORMAL** RELAY MARGINS/IMPEDENCES (ZRE/ZIM):     VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :    340 %   -0.6528    0.0495 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -3.2093   -1.7597 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    663 %   -0.3583    0.0491 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7882    0.1502 N
     F3M  : RELAY MARGIN AT INT.FALLS IS        :    333 %   -0.6876    0.0493 N
     D602F: RELAY MARGIN AT FORBES IS           :    256 %   -0.0545    0.0212 N
     D602F: RELAY MARGIN AT DORSEY IS           :    405 %    0.0601    0.0106 N
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    507 %    0.0000    0.0000 N
-------------------------------------------------------------------------------
          MINIMUM TRANSIENT RELAY MARGINS: START TIME:  0.27500 SEC, VIOLATION *

     B10T : RELAY MARGIN AT TIOGA IS            :     66 %  AT TIME=   1.37500 N
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %  AT TIME=   0.00000 N
     L20D : RELAY MARGIN AT DRAYTON IS          :    374 %  AT TIME=   1.46666 N
     R50M : RELAY MARGIN AT MORANVILLE IS       :    708 %  AT TIME=   0.57500 N
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    182 %  AT TIME=   1.75000 N
     D602F: RELAY MARGIN AT FORBES IS           :    133 %  AT TIME=   0.60000 N
     D602F: RELAY MARGIN AT DORSEY IS           :    204 %  AT TIME=   0.60000 N
     D602F: RELAY MARGIN AT FORBES (DCAR)       :    507 %  AT TIME=   0.00000 N
-------------------------------------------------------------------------------
          OH - MH TRANSIENT PERFORMANCE:

     OH-MH: INITIAL OH-MH POWER, KENORA ANGLE   :  -196.0 MW        -9.8 DEG
     OH-MH: MAX +  MW CHANGE @TIME, DLT ANGLE   :    87.6 MW  @  2.80832,  -33.5
     OH-MH: MAX -  MW CHANGE @TIME, DLT ANGLE   :    12.3 MW  @  0.65833,    1.6
     OH-MH: MAX ANGLE CHANGE @TIME, DLT POWER   :   -37.4 DEG @  2.24166,   63.7
-------------------------------------------------------------------------------
          RELAY MARGINS/IMPEDANCES (ZRE,ZIM)/FLOWS AT TIME=   4.99995

     B10T : RELAY MARGIN AT TIOGA IS            :    304 %   -0.6056    0.0646
     G82R : RELAY MARGIN AT RUGBY IS            :    999 %   -3.5465   -0.2961
     L20D : RELAY MARGIN AT DRAYTON IS          :    639 %   -0.3482    0.0502
     R50M : RELAY MARGIN AT MORANVILLE IS       :    999 %   -0.7724    0.1152
     F3M  : RELAY MARGIN AT INT. FALLS IS       :    250 %   -0.5732    0.0050
     D602F: RELAY MARGIN AT FORBES IS           :    220 %   -0.0499    0.0212
     D602F: RELAY MARGIN AT DORSEY IS           :    346 %    0.0552    0.0114
     D602F: RELAY MARGIN AT FORBES (DCAR) IS    :    993 %   -0.0792    8.3612
                         ---------------
     B10T : BOUNDARY DAM PHASE SHIFT FLOW       :   177.7 MVA ( SOUTH )
     F3M  : INTERNATIONAL FALLS PH. SHIFT FLOW  :   176.7 MVA ( SOUTH )
     MH-OH: FINAL OH-MH POWER, KENORA ANGLE     :  -161.8 MW       -42.6 DEG
     EWTW : FINAL OH EAST-WEST TIES FLOW        :   250.8 MW
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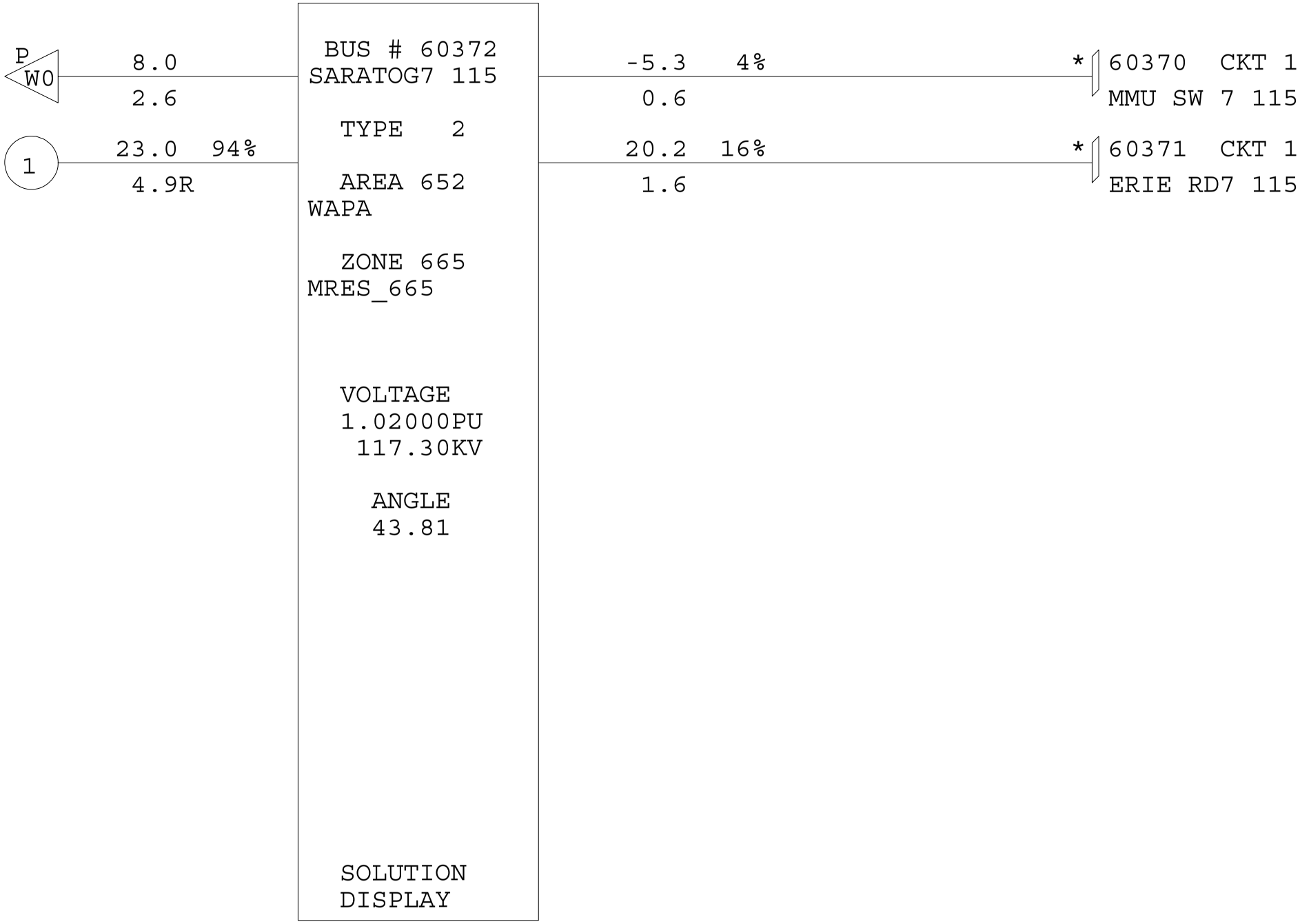
-------------------------------------------------------------------------------
          USING **NORMAL** RELAYS SETTINGS AS FOLLOWS:

 B10T@TIOGA  : R1= 0.030 X1= 0.348 R2=-0.030 X2=-0.348 P1/2/3=0.223 0.283 0.350
 G82R@RUGBY  : A=  81.9 IN1= 0.250 IN2= 0.100 B=  81.9 IN3= -0.200 IN4= -0.350
 L20D@DRAYTON: A=  80.0 IN1= 0.175 IN2= 0.135 B=  80.0 IN3= -0.095 IN4= -0.136
 R50M@MORANVL: A=  76.3 IN1= 0.345 IN2= 0.245 B=  76.3 IN3= -0.198 IN4= -0.258
 F3M@INT.FALL: A=  76.3 IN1= 0.480 IN2= 0.300 B=  76.3 IN3= -0.200 IN4= -0.350
 D602F@DORSEY: A=  85.0 IN1= 0.041 IN2= 0.026 B=  85.0 IN3= -0.023 IN4= -0.036
 D602F@DORSEY: A=  85.0 IN1= 0.034 IN2= 0.026 B=  85.0 IN3= -0.024 IN4= -0.033
 D602F-DCAR  : ANGLE= 170.0 DCAO= -39.700 DCAI= -49.450
 K21W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
 K22W-DPDARE : XPs=  25.0 XPt= 150.0 XAt=   5.0 YPs=  25.0 YPt=  50.0 YAt=  20.0
-------------------------------------------------------------------------------
```

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, APR 19 2007 14:23
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165





PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, APR 19 2007 14:23
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165



BUS # 67480
MSHLSWC 34.5

TYPE 1

AREA 652
WAPA

ZONE 665
MRES_665

VOLTAGE
1.03052PU
35.553KV

ANGLE
43.86

SOLUTION
DISPLAY

0.0 11% 1.000 1.000LK * 60370 CKT P1
1.9 MMU SW 7 115

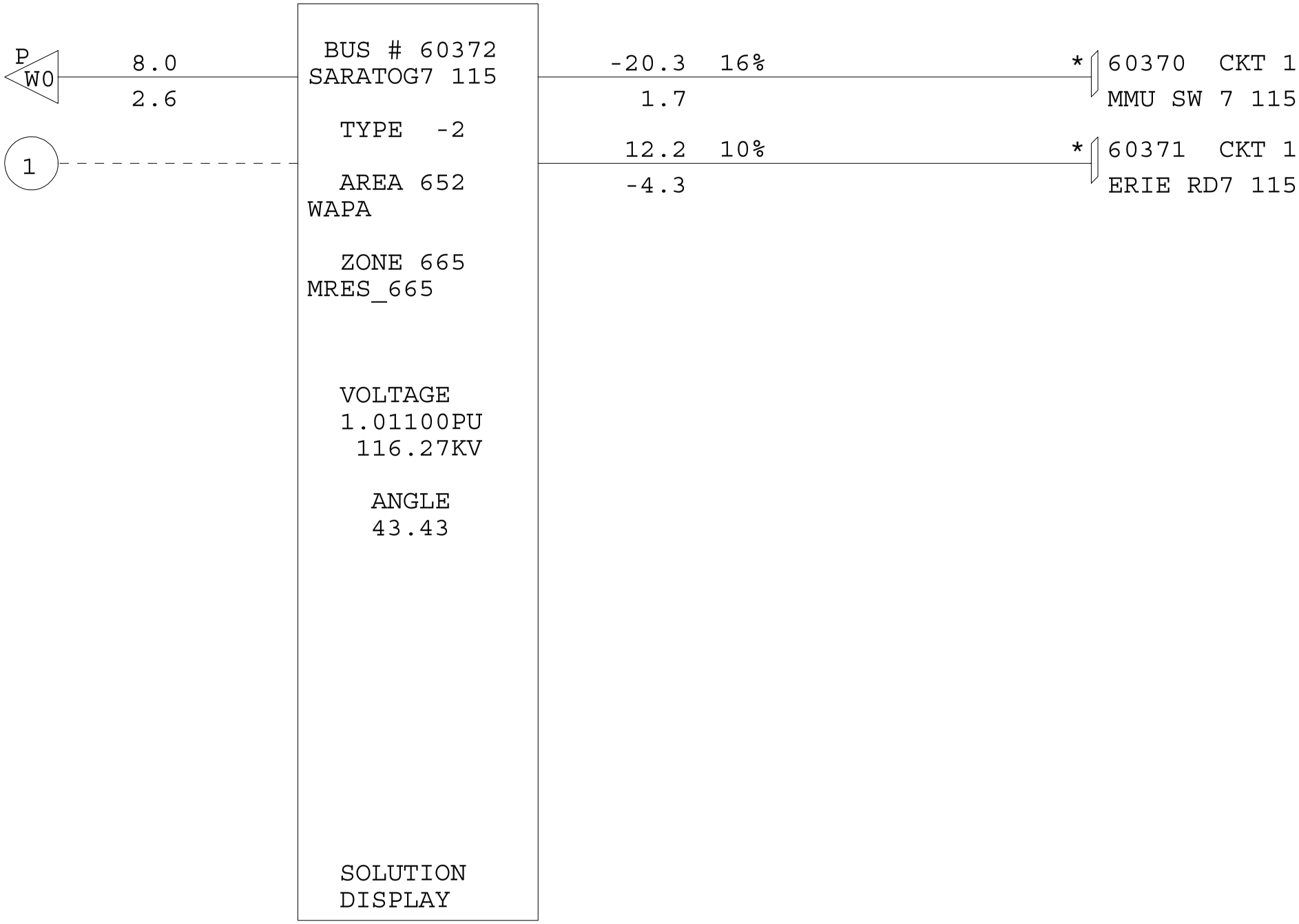
* 0.0 67479 CKT P1
-1.9 MSHLWNDC34.5

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, APR 19 2007 14:23
MAR-SO06AA.UZVV454.SAV;SUMMER;OP LD; SARATOGA ON, WIND OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

| BUS # 60370<br>[MMU SW 7 115]<br>AREA 652<br>ZONE 605 | | BUS # 60372<br>[SARATOG7 115]<br>AREA 652<br>ZONE 665 |
|---|---|---|
| * 5.3P<br>-0.8Q | CIRCUIT 1<br>0.00590+J 0.01690<br>0.00207 | -5.3P<br>0.6Q |

RATEA: 128
RATEB: 128
RATEC: 141

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, APR 19 2007 14:00
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165



PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, APR 19 2007 14:00
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165



BUS # 67480
MSHLSWC 34.5

TYPE 1

AREA 652
WAPA

ZONE 665
MRES_665

VOLTAGE
0.99432PU
34.304KV

ANGLE
49.47

SOLUTION
DISPLAY

18.1 109% 1.000 1.000LK * 60370 CKT P1
-2.2 MMU SW 7 115

* -18.1 67479 CKT P1
2.2 MSHLWNDC34.5

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, APR 19 2007 14:17
MW1-SO06AA.UZVV454.SAV;SUMMER;OP LD; WIND ON, SARATOGA OFF
ND=1950,MH=2175,MW=1480,OHMH=-195,OHMP=150,EWTW=190,BD=165

| BUS # 60370<br>[MMU SW 7 115]<br>AREA 652<br>ZONE 605 | CIRCUIT 1 | BUS # 60372<br>[SARATOG7 115]<br>AREA 652<br>ZONE 665 |
|---|---|---|
| * 20.3P<br>-1.9Q | 0.00590+J 0.01690<br>0.00207 | -20.3P<br>1.7Q |

RATEA: 128
RATEB: 128
RATEC: 141