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BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Duke Energy Madison II, LLC for a Certificate of Environmental Compatibility and Public Need to Construct 640 MW Peaking Facility in Butler County, Ohio.	)))))	Case No. 00-1566-EL-BGN

RESPONSE OF DUKE ENERGY MADISON II, LLC TO THE STAFF'S FIRST SET OF DATA REQUESTS

Pursuant to Ohio Administrative Code ("OAC") Rule 4906-7-07(D), Applicant, Duke Energy Madison II, LLC ("Duke Energy Madison II"), responds to the following interrogatories and requests for production of documents propounded by the Staff of the Ohio Power Siting Board as follows:

1. **Provide any system impact studies that analyze the effects of adding the proposed generating facility to the regional transmission grid for the year and season in which the proposed facility is scheduled to begin commercial operation. These studies should include the following:**

   (a) **A detail discussion, analysis, graphs, charts, diagrams, summary and data of load flow, stability and short circuit studies with and without the proposed facility.**

   (b) **Discuss testing criteria used for the studies and show any relation to standard industry test criteria used for these studies.**

   (c) **Provide transcription diagrams of load flow base-case and contingency-case conditions studied along with an explanation of what the diagrams show.**

(d) Identify transmission conditions that fail to meet the criteria along with why they fail to meet the criteria.

(e) Discussion of remedies to problems found and studies that specifically identify all system additions, modifications or up-grades required by the transmission system operator prior to the facility being interconnected.

(f) Identify existing or future generating sources modeled in the study. At a minimum, the model should include all existing and planned generating resources for the year and season in which the proposed facility is scheduled to begin commercial operation.

(g) Identify any future system up-grades include in the studies.

(h) Identify the effects of power transfer from the proposed facility to areas beyond the service area of the interconnecting company.

ANSWER:

The Cinergy System Impact Study for the Duke Energy Madison II facility is attached as Exhibit A.

2. **Provide a summary discussion of the typical hours, days, time of day and months of the year when the generating facility is estimated to operate.**

ANSWER:

Duke Energy Madison II anticipates that the facility will operate during peak electric load demand periods. In Ohio and the Midwest, these periods typically occur during the summer months of the year during weekday, daytime hours.

3. **Provide or make available for staff review copies of correspondence, meeting notes or joint study reports provided to and received from neighboring interconnected transmission owner/operators concerning the project.**

ANSWER:

The Cinergy System Impact Study was reviewed by American Electric Power and Dayton Power & Light prior to issuance to Duke Energy Madison II.

4. Provide information on who will construct, own, operate and maintain the interconnection transmission line, substation and associated facilities.

ANSWER:

Duke Energy Madison II will construct, own, operate and maintain the transmission facilities at the plant and the short transmission line between the plant and the Cinergy Woodsdale substation.

5. Describe how generation dispatch will be carried out, its coordination with the regional transmission system and who will be responsible for dispatch of the facility.

ANSWER:

Duke Energy Madison II will be part of a generator-only control area. The generator-only control area for the plant will coordinate generation dispatch and interchange schedules with the Cinergy control area operator.

6. **Provide a list of agreements and/or contracts that the applicant will have to sign with the interconnecting transmission owner before the facility can begin commercial operation.**

ANSWER:

Duke Energy Madison II will enter into a Facilities Construction Agreement and an Interconnection Agreement with Cinergy prior to commercial operation. Duke Energy Madison II will also enter into a Station Service Power Agreement for backfeed power, as well as Test/Commissioning Power Purchase Agreement.

7. **Provide a copy of (or details of) the interconnect agreement between the applicant and the interconnecting transmission owner/operator.**

ANSWER:

The interconnection agreement between Duke Energy Madison II and Cinergy has not been completed as of the date of this filing. A copy of the interconnection agreement can be provided once the agreement is completed.

8. **Provide a discussion of whom or where the applicant plans to sell power to; and how the applicant plans to market its power from the proposed facility.**

ANSWER:

Duke Energy Madison II will enter into an agreement with an affiliate, Duke Energy Trading and Marketing, L.L.C. ("DETM"), to market power from the proposed facility. Power from the proposed facility is expected to be sold by DETM to wholesale electric customers throughout Ohio and the Midwest.

9. **Discuss any firm power contracts for power from the proposed facility that the applicant has committed to.**

ANSWER:

Duke Energy Madison II has no firm power contracts to sell power from the facility at this time.

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing **RESPONSE OF DUKE ENERGY MADISON II, LLC TO THE STAFF'S FIRST SET OF DATA REQUESTS** was served by regular U.S. mail, postage prepaid, or hand-delivered, upon the following parties of record, this 19th day of January 2001.

Sally W. Bloomfield

PARTIES OF RECORD:

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EXHIBIT A

Report

System Impact Study for Madison II Interconnection

Prepared for Cinergy Services, Inc.

Submitted by

Ramon Tapia
Executive Consultant

Paloma de Arizon
Senior Consultant

Consulting Services

January 9, 2001

Report No. R53-00

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Notice

This study addresses the feasibility of integrating the proposed merchant plant into the Cinergy transmission system at the point of receipt and does not address the Availability of Transmission Capacity (ATC) to transfer the output of the proposed plant to specific points of delivery. A Transmission Request Study will be required when a Transmission Service Request is received.

The use of preliminary data for the combustion turbine generating units, scheduling of other proposed merchant plants and system projects on Cinergy and neighboring utility systems could affect the study results. Neighboring utility facilities' limitations, of which Cinergy is not aware, could affect study results.

Cinergy is currently studying other merchant plant requests not included in this study which could affect the study results and ATC for this site.

Cinergy recommends the merchant requestor share these studies with Cinergy's neighboring control areas for a review of the impact on their systems.

Executive Summary

This report summarizes power flow and stability analyses conducted by Power Technologies, Inc. (PTI) for Cinergy Services, Inc (Cinergy) to assess the impact of the proposed Madison II 640 MW generating station. Contingency analysis identified some local transmission loading problems which result from adding the Madison II plant into the system. System upgrades, which will be necessary to integrate the requested 640 MW capacity, were identified. The estimated cost of these upgrades is $33,807,000.

Power transfer capability was estimated from the proposed merchant plant to several neighboring control areas. These estimates are not Available Transfer Capabilities (ATC) or Total Transfer Capability (TTC) as required in FERC Order 888 and 889. Actual ATC's would be determined upon request for transmission service per Cinergy's OATT.

Short circuit calculations show that the addition of 640 MW to the Woodsdale 345 kV Substation bus will increase fault current to several breakers in the area but will not cause any to exceed their fault duty ratings.

Dynamic simulations were performed to assess system performance with and without the plant. Though for all the cases, the system response is stable and positively damped it is noted, damping of oscillations following the disturbance can be fairly low. These results are based on the preliminary dynamic data provided by the merchant plant developer and their equipment vendors. These results could change based on final test data and adjustment of the proposed excitation system parameters. Should the merchant plant developer proceed with the project, Cinergy will work with the merchant plant developer to implement equipment adjustments that will allow the proposed generation to connect to Cinergy's transmission system in a reliable manner. Further stability studies by Cinergy will be required based on the final dynamic data that have been obtained from the original equipment tests and/or settings.

Section 1

Introduction

1.1 Project Description

This report summarizes power flow and stability analyses conducted by Power Technologies, Inc. (PTI) for Cinergy Services, Inc (Cinergy) to assess the impact of the proposed Madison II 640 MW generating station. This new plant will be located near the Woodsdale 345 kV substation in southwest Ohio and will be connected to Cinergy's 345 kV transmission system through this substation.

1.2 Project Tasks

1.2.1 Database Development

Using information provided by Cinergy, power flow and stability models of the proposed plant were developed. The power flow and stability databases were revised to include the proposed generating facility and interconnection.

1.2.2 AC Contingency Analysis

Non-linear ("AC") contingency analysis was conducted to assess post-contingency branch flows and bus voltages in the neighborhood of the proposed plant. This analysis was used to identify local transmission reinforcements required to connect the plant to the transmission system.

1.2.3 Transmission System Reinforcements

With the help of Cinergy's engineering staff, potential transmission reinforcements were identified to rectify circuit overloads attributed to the proposed power plant. A cost estimate was prepared for the reinforcements using typical unit cost data furnished by Cinergy.

1.2.4 Power Transfer Capability

Linear ("DC") transfer analysis was conducted to estimate the power transfer limit between the proposed plant location and several neighboring control areas. These estimates are not Available Transfer Capabilities (ATC) or Total Transfer Capability (TTC) as required in FERC Order 888 and 889. Actual ATC's would be determined upon request for transmission service per Cinergy's OATT.

1.2.5 Stability Analysis

Dynamic simulations were performed for contingencies selected in consultation with Cinergy's engineering staff to compare system performance with and without the plant.

Section
2

Data Preparation

2.1 Madison II Interconnection and Plant Data

The proposed plant interconnection is shown in Appendix A. Plant data provided by the developer is summarized in Appendix B.

The following assumptions were made:

- The Madison II plant is assumed to be interconnected to the power system at the existing 345 kV Woodsdale substation.
- The plant is connected to the transmission system by a short transmission line with negligible impedance.
- The plant is assumed to consist of 8 machines each generating 80 MW.

2.2 Power Flow Cases

2.2.1 Steady State Analyses

Cinergy provided a PSS/E database as a starting point for the AC contingency and power transfer capability analysis. This database included the following merchant plants, Vermillion at 640 MW, Wheatland at 500 MW, Madison at 640 MW and Worthington at 171 MW. The database represents the system in 2002 under summer peak loading conditions.

Starting with the 2002 case provided by Cinergy, "Madison II_base case", the following change was made to develop a new base case "Madison II_Online" with the Madison II plant on-line:

- The 640 MW Madison II plant was added as described in Section 2.1.

To include the 640 MW Madison II plant in the "Madison II_Online" case, an equal amount of generation was displaced in Consumers Power in Michigan.

2.2.2 Stability Analysis

Cinergy provided a PSS/E database as a starting point for the stability analysis. The database represents the system in 2003 under summer peak conditions. Starting with the

2003 case provided by Cinergy, the Madison II plant was added using the assumptions listed in Section 2.1 to develop a new base case "Madison II_Off_DYN_ALL" with the Madison II plant off-line

From the "Madison II_Off_DYN_ALL" case, a case was created with Madison II on-line "Madison II_ON_DYN_ALL" by displacing 640 MW of Consumers Power generation in Michigan.

2.3 Input Data Files

Cinergy provided input data files for the AC contingency analysis and the linear transfer analysis. These files consist of a subsystem file, a monitored element file, and a contingency file.

2.4 Dynamics Data File

The models and parameters for existing generating units in the stability database were provided by Cinergy. Generator, exciter, governor and power system stabilizer (PSS) models for the proposed plant are based on manufacturer information provided by the developer. The models for the proposed plant are listed in Appendix B.

Section
3

AC Contingency Analysis

3.1 Methodology

PTI's MUST (Managing and Utilizing System Transmission) software was used to conduct the AC contingency analysis. The objective of this assessment was to identify any local transmission loading or voltage problems which result from dispatching the Madison II plant. The transmission system was checked in an area bounded approximately by the Miami (DPL) and Bath (DPL) substations to the north, Five Points to the west, Zimmer and E. Bend to the south and Marquis to the east. The critical transmission facilities that were included in this analysis were within five buses of the main 345 kV interconnection point at the Woodsdale substation.

3.2 Disturbance and Performance Criteria

The input data files provided by Cinergy were used for this analysis. The contingency file consists of:

- Generator outages
- Single branch contingencies 138 kV and above and tower and double branch contingencies at the 345 kV level in the Cinergy and neighboring areas.

The contingency file was modified such that an inertial dispatch was simulated for any contingency that resulted in an imbalance between load and generation. The monitored element file consists of lines 69 kV and above in Cinergy's area and lines 138 kV and above in adjacent areas. Branches were monitored for loading above 100% of the long-term emergency rating (Rate B).

Bus voltages in the CG&E subsystem (69 kV and above) were analyzed to identify buses with post-contingency voltages below 92%. Violations with low sensitivity to the Madison II plant (voltage difference of less than 0.5%) were neglected.

3.3 Results

3.3.1 Thermal Assessment

Post-contingency overloads that occur within the area defined in Section 3.1 as a result of the proposed Madison II plant are listed in **Table 3-1**. The details of the worst violation are shown in the table "Frequency of Branch Violations" located in Appendix C.

Table 3-1: Branch Overloads

Elem#	Monitored Branch				Worst Violation %			
	From Bus	**To Bus**	Ckt	Type	Madison II Off-Line	Con # *	Madison II On_Line	Con # *
1	8087 CARL M2 69	8089 CARLISLE69	1	LN	111.6	2	123.1	2
2	8087 CARL M2 69	8090 CARLISLE 138	1	TR	109.4	2	119.2	2
3	8089 CARLISLE69	17060 09OHH W.69	1	LN	107.5	2	127.4	2
4	8464 MILLIKEN 138	8743 TODHUNTR 138	1	LN	110.0	4	172.7	3
5	8052 BETHANY 138	8708 TAP 5485 138	1	LN			110.8	3
6	8411 M. FORT 345	8717 TERMINL 345	1	LN			129.4	1
7	8411 M. FORT 345	8872 WOODSDLE 345	1	LN			136.6	1
8	8464 MILLIKEN 138	8576 P. UN 2 138	1	LN			158.8	3
9	8575 P. UN 1 138	8743 TODHUNTR 138	1	LN			170.6	3
10	8587 PARK 1 138	8589 PARK 2 138	1	LN			111.3	3
11	8708 TAP 5485 138	8743 TODHUNTR 138	1	LN			131.8	3
12	8735 TOD M15 138	8743 TODHUNTR 138	1	LN			126.9	3
13	8735 TOD M15 138	8744 TODHUNTR 345	1	TR			129.6	3
14	8736 TOD M16 138	8743 TODHUNTR 138	1	LN			132.4	3
15	8736 TOD M16 138	8744 TODHUNTR 345	1	TR			135.6	3
16	8737 TOD M17 138	8743 TODHUNTR 138	1	LN			116.7	3
17	8737 TOD M17 138	8744 TODHUNTR 345	1	TR			119.6	3
18	8744 TODHUNTR 345	8872 WOODSDLE 345	1	LN			123.3	5
19	8744 TODHUNTR 345	8872 WOODSDLE 345	2	LN			123.3	6
20	8741 TODHUNTR 69	8792 TX E MNR69 69	1	LN			102.0	7

*** List of Contingencies in Table 3-1**

1. Woodsdle to TodHuntr 345 kV Ckt1 & Woodsdle to TodHuntr 345 kV Ckt2
2. Foster to Sugar Creek 345 kV & Foster to Bath 345 kV
3. Woodsdle to M. Fort 345 kV & TodHuntr to Foster 345 kV
4. Miami Fort to Terminal Fort 345 kV & TodHuntr to Foster 345 kV
5. Woodsdle 345 kV to TodHuntr 345 kV Ckt2
6. Woodsdle 345 kV to TodHuntr 345 kV Ckt1
7. Tap 5485 138 kV Union 138 kV

The analysis indicated that there are overloads under contingency conditions in the neighboring area served by DPL. Additional reinforcements at the West Milton substation may be necessary to eliminate the overloads. Since these facilities are outside of Cinergy's territory, these problems were not pursued further.

3.3.2 Voltage Assessment

In the contingency analysis, the Madison II plant does not cause any bus voltages in the local area to fall below 92%.

Section
4

Reinforcements

The objective of this assessment was to identify possible transmission system reinforcements to rectify the local transmission overloads identified in Section 3.

4.1 Reinforcements

With the help of Cinergy's engineering staff, potential transmission reinforcements were identified to rectify circuit overloads attributed to the proposed power plant. Three reinforcement options were evaluated. Reinforcements for the 138 kV facilities are the same for the three options, but different reinforcement strategies were considered for the 345 kV facilities in each of the three options. Following there is a description of the reinforcements considered for the 345 kV facilities in each one of the aforementioned options.

The first option considers a new Tap on the line from Miami Fort to WMilton 345 kV. The Tap is located at the junction, of the existing Miami Fort to Woodsdale 345 kV and Miami Fort to WMilton 345 kV lines. In addition a line section from Woodsdale to this Tap is considered.

The second option considers the same Tap described in the previous option. In addition it includes a line from Woodsdale to the Tap to West Milton and the rearrangement of the Miami Fort to Woodsdale 345 kV line. The line will be divided into two sections, one section from the Miami Fort 345 kV substation to the Tap and a second section from the Tap to the Woodsdale 345 kV substation.

The third option only considers a line from the Woodsdale 345 kV substation to the WMilton 345 kV substation. There is not Tap considered in this option.

All three options were tested and the second option was chosen, based on the fact that it offers reduced post-contingency flows, increased operating flexibility, and a more robust solution for future developments such as load growth and change in flow patterns. Furthermore for this option peak load losses are 5 MW lower than in option three, though loss savings under other loading conditions will be different. On the other hand the first option still shows overloads as can be seen from Table 4-1.

For the second option four reinforcements are identified:

1) A new Tap on the line from Miami Fort to WMilton 345 kV located at the junction of the existing Miami Fort to Woodsdale 345 kV and Miami Fort to WMilton 345 kV lines
2) A new 345 kV circuit from the Woodsdale 345 kV substation to the Tap and from the Tap to the 09WMiltn 345 kV substation.
3) Rearrangement of the Miami Fort to Woodsdale 345 kV line. The line will be divided into two sections, one section from the Miami Fort 345 kV substation to the Tap and a second section from the Tap to the Woodsdale 345 kV substation.
4) Reconductoring of the 138 kV line between Millikin and Port Union 2
5) Reconductoring of the 138 kV line between Millikin and TodHunter
6) Reconductor of the 138 kV line between TodHunter and Port Union 1

The 138 kV lines between Millikin and Port Union 2, Millikin and TodHunter, and TodHunter and Port Union 1 were modeled as two circuits with bundled 954 ACSR conductors. Impedances were calculated assuming both circuits are on the same tower structure.

The case used for AC contingency analysis in Section 3 with Madison II on-line "Madison II_Online" was modified to incorporate the reinforcements listed in Section 4.1. AC contingency analysis was repeated to assess the impact of the reinforcements on branch loading and the results are summarized in Table 4-1.

Table 4-1: Post-Contingency Branch Loading

Elem#	Monitored Branch	Highest Loading %		
	From Bus **To Bus** Ckt Type	Reinforcemts Option # 1	Reinforcemts Option # 2	Reinforcemts Option # 3
1	8087 CARL M2 69 8089 CARLISLE69 1 LN	103.9	89.4	94.9
2	8087 CARL M2 69 8090 CARLISLE 138 1 TR	105.2	91.7	96.8
3	8089 CARLISLE69 17060 09OHH W.69 1 LN	94.3	68.9	78.8
4	8464 MILLIKEN 138 8743 TODHUNTR 138 1 LN	50.4	43.2	50.4
5	8052 BETHANY 138 8708 TAP 5485 138 1 LN	40.5	34.1	39.5
6	8411 M. FORT 345 8717 TERMINL 345 1 LN	96.5	73.3	75.8
7	8411 M. FORT 345 8872 WOODSDLE 345 1 LN	19.2	—	38.6
8	8464 MILLIKEN 138 8576 P. UN 2 138 1 LN	43.4	36.4	43.4
9	8575 P. UN 1 138 8743 TODHUNTR 138 1 LN	40.5	32.6	41.1
10	8587 PARK 1 138 8589 PARK 2 138 1 LN	26.3	19.7	25.0
11	8708 TAP 5485 138 8743 TODHUNTR 138 1 LN	65.4	57.5	63.0
12	8735 TOD M15 138 8743 TODHUNTR 138 1 LN	70.2	61.3	69.3
13	8735 TOD M15 138 8744 TODHUNTR 345 1 TR	70.2	61.3	69.3
14	8736 TOD M16 138 8743 TODHUNTR 138 1 LN	73.5	64.2	72.5
15	8736 TOD M16 138 8744 TODHUNTR 345 1 TR	73.5	64.2	72.5
16	8737 TOD M17 138 8743 TODHUNTR 138 1 LN	64.8	56.6	64.0
17	8737 TOD M17 138 8744 TODHUNTR 345 1 TR	64.8	56.6	64.0
18	8744 TODHUNTR 345 8872 WOODSDLE 345 1 LN	93.0	76.1	86.5
19	8744 TODHUNTR 345 8872 WOODSDLE 345 2 LN	93.0	76.1	86.5
20	8888 TAP 345 345 8872 WOODSDLE 345 1 LN	117.3	67.3	—
21	8888 TAP 345 345 8872 WOODSDLE 345 2 LN	—	67.3	—
22	8888 TAP 345 345 17090 WMILTON 345 1 LN	115.9	69.4	—
23	8888 TAP 345 345 17090 WMILTON 345 2 LN	—	69.4	—
24	8872 WDSDLE 345 17090 WMILTON 345 1 LN	—	—	97.7
25	8741 TODHUNTR 69 8792 TX E MNR69 69 1 LN	93.5	87.4	89.7

4.2 Estimated Costs

A cost estimate for the reinforcements identified in Section 4.1 is developed below. This estimate was prepared using typical construction costs and are not based on detailed engineering estimates.

Table 4-2: Estimated Reinforcement Costs for Option # 2

Element	Units	Unit Cost	Price
Reconductor MILLIKIN to P. UNION 2 138 kV			
Reconductor MILLIKIN to TODHUNTER 138 kV			
Reconductor P. UNION to TODHUNTER 138 kV	9.69 miles	$300,000/mile	$2,907,000
New–Woodsdale to Tap 345 kV Section	5.0 miles	$300,000/mile	$1,500,000
New– Tap to WMilton 345 kV Section	18.0 miles	$300,000/mile	$5,400,000
New– Tap to WMilton 345 kV Section	18.0 miles	$1,000,000/mile	$18,000,000
New Ring Bus with Six Breakers (At the Tap)	6 breakers	$1,000,000/bkr	$6,000,000
Total			$33,807,000

The above costs do not include the cost to physically connect the proposed generating facility to the transmission system. This cost includes the costs of breakers, transmission facilities from the plant to the Woodsdale 345 kV substation and any other additional equipment needed to accomplish the final interconnection to Cinergy's transmission system.

The cost of additional reinforcement that may be needed in the DPL system is not included in this report.

Section
5

Linear Transfer Analysis

5.1 Methodology

PTI's MUST (Managing and Utilizing System Transmission) software was used to conduct the linear transfer analysis. The objective of this analysis was to estimate the power transfer limit between the proposed plant location and neighboring control areas. These estimates are not Available Transfer Capabilities (ATC) or Total Transfer Capability (TTC) as required in FERC Order 888 and 889. Actual ATC's would be determined upon request for transmission service per Cinergy's OATT.

5.2 Disturbance and Performance Criteria

The input data files provided by Cinergy were used for this analysis. The monitored element file consists of lines 69 kV and above in Cinergy's area and lines 138 kV and above in adjacent areas. Branches were monitored for loading above 100% of the long-term emergency rating (Rate B).

The contingency file consists of:

- Generator outages.
- Single branch contingencies 138 kV and above in the Cinergy and neighboring areas.

The contingency file was modified such that an inertial dispatch was simulated for any contingency that resulted in an imbalance between load and generation.

5.3 Results

In the base case with Madison II off-line "Madison II_basecase" there are several base case and post-contingency overloads in the transmission system. Appendix D contains a list of overloaded branches that are impacted by transfers from Madison II, the number of contingencies for which the element is overloaded with Madison II off-line and the maximum violation with Madison II off-line.

Because the monitored branches listed in Appendix D are overloaded before the Madison II plant is dispatched, Cinergy does not consider them valid limiting branches for transfer analysis. The branches listed in Appendix D were not monitored during the transfer analysis.

The areas listed in Table 5-1 and Table 5-2 were identified by Cinergy for transfer analysis. Transfers were simulated from the proposed plant to each of the indicated areas by scaling generation in that area. The complete MUST report is given in Appendix D, the estimated transfer capability from the proposed plant and first five transfer limits are summarized in Table 5-1 and Table 5-2. Table 5-1 shows transfer limits without reinforcements to the transmission system. Table 5-2 shows transfer limits with the reinforcements to the transmission system considered in option two, as indicated in section 4.1 of this report.

Table 5-1: Madison II Estimated Transfer Capability Without Reinforcement

To	Transfer Capability	Limiting Element	Contingency
AEP	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	363.9	8464 MILLIKIN 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	548.3	8575 P.UN 1 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	618.8	8464 MILLIKIN 138 8576 P.UN 2 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
AMRN	229.9	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	229.9	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	360.9	8464 MILLIKIN 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	539.4	8575 P.UN 1 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	613.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
DPL	113.8	8741 TODHNTR169.0 8792 TX E MNR69.0 1	8708 TAP 5485 138 8797 UNION 138 1
	145.1	8758 TP5666-169.0 8792 TX E MNR69.0 1	8708 TAP 5485 138 8797 UNION 138 1
	149.3	8353 JACKSON 69.0 8758 TP5666-169.0 1	8708 TAP 5485 138 8797 UNION 138 1
	196.8	8741 TODHNTR169.0 8792 TX E MNR69.0 1	8090 CARLISLE 138 8797 UNION 138 1
	215.3	8087 CARL M2 69.0 8089 CARLISLE69.0 1	17079 09SUGRCK 345 8281 FOSTER 345 1
EKPC	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	255.2	6051 11ADAMS 138 6146 11TYRONE 138 1	6126 110C TAP 138 6137 11SCOTT 138 1
	299.2	6064 11BRWN P 138 6087 11FAWKES 138 1	20007 20AVON 138 20027 20BOONST 138 1
	347.8	6064 11BRWN P 138 6087 11FAWKES 138 1	6002 11ALCALD 345 6004 11BRWN N 345 1
HE	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	358.6	8464 MILLIKIN 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	532.8	8575 P.UN 1 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	587.2	4002 16PETE 345 4042 16PETE 138 E	23 GIBSON 345 180 GIBSON 138 1
IPL	230.4	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	230.4	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	358.7	8464 MILLIKIN 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	532.8	8575 P.UN 1 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	610.0	8464 MILLIKIN 138 8576 P.UN 2 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
LGEE	27.9	24 SPEED 345 156 SPEED 138 1	6005 11GHENT 345 6015 11W LEXN 345 1
	112.3	24 SPEED 345 156 SPEED 138 1	7064 05JEFRSO 765 7068 05ROCKPT 765 1
	229.6	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	229.6	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	229.8	24 SPEED 345 156 SPEED 138 1	6007 11MIDDLT 345 6013 11TRIMBL 345 1
NIPS	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	362.7	8464 MILLIKIN 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	543.5	8575 P.UN 1 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	616.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
OVEC	228.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	228.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	359.2	8464 MILLIKIN 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	538.5	8575 P.UN 1 138 8743 TODHUNTR 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
	610.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	8281 FOSTER 345 8744 TODHUNTR 345 1
SIGE	153.7	1064 TETC 12J69.0 1066 PRINCETO69.0 1	175 OAK CITY 138 178 PRINCETO 138 1
	200.5	1058 OAKLAND 69.0 1064 TETC 12J69.0 1	175 OAK CITY 138 178 PRINCETO 138 1
	229.5	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	3251 10TOYOTA 138 175 OAK CITY 138 1
	230	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	230	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1

Table 5-2: Madison II Estimated Transfer Capability With Reinforcements of Option # 2

To	Transfer Capability	Limiting Element	Contingency
AEP	-1476.2	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	544	17047 09MIAMI 345 17090 09WMILTN 345 1	17089 09WMILTN 138 17090 09WMILTN 345 1
	634.8	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	634.8	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	952.8	17047 09MIAMI 345 17090 09WMILTN 345 1	8281 FOSTER 345 8744 TODHUNTR 345 1
AMRN	-1553.9	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	572.8	17047 09MIAMI 345 17090 09WMILTN 345 1	17089 09WMILTN 138 17090 09WMILTN 345 1
	629.7	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	629.7	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	987	17047 09MIAMI 345 17090 09WMILTN 345 1	8281 FOSTER 345 8744 TODHUNTR 345 1
DPL	-1125.8	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	275.3	8741 TODHNTR169.0 8792 TX E MNR69.0 1	8708 TAP 5485 138 8797 UNION 138 1
	308.9	8758 TP5666-169.0 8792 TX E MNR69.0 1	8708 TAP 5485 138 8797 UNION 138 1
	312.9	8353 JACKSON 69.0 8758 TP5666-169.0 1	8708 TAP 5485 138 8797 UNION 138 1
	364.3	8741 TODHNTR169.0 8792 TX E MNR69.0 1	8090 CARLISLE 138 8797 UNION 138 1
EKPC	-1606.8	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	299.8	6064 11BRWN P 138 6087 11FAWKES 138 1	20007 20AVON 138 20027 20BOONST 138 1
	351.6	6064 11BRWN P 138 6087 11FAWKES 138 1	6002 11ALCALD 345 6004 11BRWN N 345 1
	396.8	20007 20AVON 138 20027 20BOONST 138 1	6064 11BRWN P 138 6087 11FAWKES 138 1
	420.6	6064 11BRWN P 138 6087 11FAWKES 138 1	20027 20BOONST 138 20065 20DALE 138 1
HE	-1627.5	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	591.7	4002 16PETE 345 4042 16PETE 138 E	23 GIBSON 345 180 GIBSON 138 1
	595.2	4002 16PETE 345 4042 16PETE 138 E	178 PRINCETO 138 180 GIBSON 138 1
	603.4	17047 09MIAMI 345 17090 09WMILTN 345 1	17089 09WMILTN 138 17090 09WMILTN 345 1
	607	4002 16PETE 345 4042 16PETE 138 E	4002 16PETE 345 4042 16PETE 138 W
IPL	-1642.3	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	609.7	17047 09MIAMI 345 17090 09WMILTN 345 1	17089 09WMILTN 138 17090 09WMILTN 345 1
	624.3	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	624.3	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
LGEE	-1668.4	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	60.2	24 SPEED 345 156 SPEED 138 1	6005 11GHENT 345 6015 11W LEXN 345 1
	232.6	24 SPEED 345 156 SPEED 138 1	6007 11MIDDLT 345 6013 11TRIMBL 345 1
	400.3	6075 11CENTRF 138 6145 11TRIMBL 138 1	6007 11MIDDLT 345 6013 11TRIMBL 345 1
	499.8	6013 11TRIMBL 345 6145 11TRIMBL 138 1	6007 11MIDDLT 345 6013 11TRIMBL 345 1
NIPS	-1500.1	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	550.1	17047 09MIAMI 345 17090 09WMILTN 345 1	17089 09WMILTN 138 17090 09WMILTN 345 1
	636.8	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	636.8	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
	962.7	17047 09MIAMI 345 17090 09WMILTN 345 1	8281 FOSTER 345 8744 TODHUNTR 345 1
OVEC	-1649.6	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	610	17047 09MIAMI 345 17090 09WMILTN 345 1	17089 09WMILTN 138 17090 09WMILTN 345 1
	614.8	8744 TODHUNTR 345 8872 WOODSDLE 345 2	8744 TODHUNTR 345 8872 WOODSDLE 345 1
	614.8	8744 TODHUNTR 345 8872 WOODSDLE 345 1	8744 TODHUNTR 345 8872 WOODSDLE 345 2
SIGE	-1622.9	17089 09WMILTN 138 17090 09WMILTN 345 1	17047 09MIAMI 345 17090 09WMILTN 345 1
	154.9	1064 TETC 12J69.0 1066 PRINCETO69.0 1	175 OAK CITY 138 178 PRINCETO 138 1
	201.8	1058 OAKLAND 69.0 1064 TETC 12J69.0 1	175 OAK CITY 138 178 PRINCETO 138 1
	230.9	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	3251 10TOYOTA 138 175 OAK CITY 138 1
	349.7	178 PRINCETO 138 1066 PRINCETO69.0 1	175 OAK CITY 138 178 PRINCETO 138 1

Section 6

Stability Analysis

PTI's PSS/E (Power System Simulator) software was used to conduct the stability analysis. The objective of this assessment was to compare system performance with and without the Madison II plant.

6.1 Disturbance and Performance Criteria

Cinergy's reliability criteria states that under normal system peak load conditions with full generation output, all generating units must remain stable with the occurrence of a three phase fault accompanied by a single pole circuit breaker failure with operation of back-up circuit breakers. With one component out-of-service, stable operation of all generating units is to be maintained with a line opening without fault or with a subsequent single phase-to-ground fault accompanied by normal clearing of the fault.

The three-phase faults listed in Table 6-1 were simulated with a single-pole breaker failure. At 3.75 cycles the far end of the faulted line was opened and the stuck breaker condition modeled, and at 6 cycles the fault was cleared.

For the single phase to ground fault, with one element out of service, the contingencies listed in Table 6-1 were simulated with normal clearing after 3.75 cycles (345 kV criteria).

The sequence admittance used to simulate the stuck breaker conditions were given by Cinergy and for the Madison II study are:

- At Woodsdale 345 kV bus : 702 – j8570 MVA
- At Miami Fort 345 kV bus : 584 - j8271 MVA
- At Zimmer 345 kV bus : 564 - j9156 MVA

Table 6-1: Contingency List

Fault Location	Type of Fault	Facility out-of-service	Trip to clear	Simulation
At Miami Fort 345 kV on line to Terminal 345 kV	3 –phase-to-ground with stuck breaker	none	Miami Fort 345 kV - Terminal 345 kV Miami Fort unit 7	StabC1
At Miami Fort 345 kV on line to West Milton 345 kV	3 –phase-to-ground with stuck breaker	none	Miami Fort 345 kV – W. Milton 345 kV Miami Fort unit 7	StabC2
At Woodsdale 345 kV on line to Todhunter 2 345 kV	3 –phase-to-ground with stuck breaker	none	Woodsdale - Todhunter 2 345 kV	StabC3
At Miami Fort 345 kV on line to West Milton 345 kV	1-phase-to-ground	Miami Fort 345 kV - Terminal 345 kV	Miami Fort 345 kV – W. Milton 345 kV	StabC4
At Woodsdale 345 kV on line to Todhunter 2 345 kV	1-phase-to-ground	Woodsdale 345 kV - Todhunter 1 345 kV	Woodsdale - Todhunter 2 345 kV	StabC5
At Woodsdale 345 kV on line to Todhunter 2 345 kV	1-phase-to-ground	Miami Fort 345 kV - Terminal 345 kV	Woodsdale - Todhunter 2 345 kV	StabC6
At Zimmer 345 kV on line to Stuart 345 kV	3 –phase-to-ground with stuck breaker	none	Zimmer 345 kV – Stuart 345 kV Zimmer 345 kV – Silver Grove 345 kV	StabC7
Open Line between Woodsdale 345 kV and Todhunter 2 345 kV	Open line	Woodsdale 345 kV - Todhunter 1 345 kV		StabC8

6.2 Results

Appendix E contains stability plots illustrating system response to valid contingencies from Table 6-1 without the Madison II plant. Appendix F contains stability plots illustrating system response to the applied contingencies with Madison II online. Though for all the cases, the system response is stable and positively damped it is noted, damping of oscillations following the disturbance can be fairly low. These results are based on the preliminary dynamic data provided by the merchant plant developer and their equipment vendors. These results could change based on final test data and adjustment of the proposed excitation system parameters. Should the merchant plant developer proceed with the project, Cinergy will work with the merchant plant developer to implement equipment adjustments that will allow the proposed generation to connect to Cinergy's transmission system in a reliable manner. Further stability studies by Cinergy will be required based on the final dynamic data that have been obtained from the original equipment tests and/or settings.

Section

7

Short Circuit Analysis

Fault Current

The addition of 640 MW to the Woodsdale 345 kV Substation bus will increase fault current to several breakers in the area but will not cause any to exceed their fault duty ratings. The following is a breakdown of the fault currents in the immediate area of Cinergy's Woodsdale Generating Station with and without the addition of the merchant plant.

	Symmetrical Rating (MVA)	Without CT's Fault (MVA) 3-Phase		With CT's Fault (MVA)	
		3-Phase	Phase-Grd	3-Phase	Phase-Grd
Foster 138	10,000	6,665	6,209	6,680	6,235
Miami Fort 345	*30,000*	*16,538*	*14,061*	*16,549*	*14,076*
Port Union 138-1	10,000	8,803	7,893	8,812	7,916
Port Union 138-2	10,000	7,245	6,712	7,255	6,735
Port Union 345	25,000	19,112	15,550	19,027	15,552
Todhunter 138	15,000	11,654	11,799	11,570	11,784
Todhunter 345	30,000	17,997	16,288	17,177	15,922
Foster 345	25,000	22,326	17,088	22,075	17,050
Woodsdale	30,000	16,887	16,565	17,912	17,106

Conclusions

This report summarizes power flow and stability analyses conducted by Power Technologies, Inc. (PTI) for Cinergy Services, Inc (Cinergy) to assess the impact of the proposed Madison II 640 MW generating station. Contingency analysis identified some local transmission loading problems which result from adding the Madison II plant into the system. System upgrades, which will be necessary to integrate the requested 640 MW capacity, were identified. The estimated cost of these upgrades is $33,807,000.

Power transfer capability was estimated from the proposed merchant plant to several neighboring control areas. These estimates are not Available Transfer Capabilities (ATC) or Total Transfer Capability (TTC) as required in FERC Order 888 and 889. Actual ATC's would be determined upon request for transmission service per Cinergy's OATT.

Short circuit calculations show that the addition of 640 MW to the Woodsdale 345 kV Substation bus will increase fault current to several breakers in the area but will not cause any to exceed their fault duty ratings.

Dynamic simulations were performed to assess system performance with and without the plant. Though for all the cases, the system response is stable and positively damped it is noted, damping of oscillations following the disturbance can be fairly low. These results are based on the preliminary dynamic data provided by the merchant plant developer and their equipment vendors. These results could change based on final test data and adjustment of the proposed excitation system parameters. Should the merchant plant developer proceed with the project, Cinergy will work with the merchant plant developer to implement equipment adjustments that will allow the proposed generation to connect to Cinergy's transmission system in a reliable manner. Further stability studies by Cinergy will be required based on the final dynamic data that have been obtained from the original equipment tests and/or settings.

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Proposed Interconnection Diagram

To Woodsdale 345 kV Bus

One-Line Diagram of the Madison II 640 MW Merchant Plant Facility
Connected to the Woodsdale 345 kV Substation.

POWER TECHNOLOGIES
A Shaw Group Company

Plant Data Summary

General		**Comments**
Maximum Gross MW Output of Unit	86.5 MW	**Estimated**
Total Plant Aux Power Requirements (MW, MVAr)		
Step-Up Three Winding Transformer		**Similar to Madison transformer**
Rated Voltage on HV side	345 kV	
Rated Voltage on LV side	13.8 kV	
Rated Voltage on TV side	13.8 kV	
Rated Power HV	240	
Rated Power LV	120	
Rated Power TV	120	
Z1(primary – medium point equivalent)	0.00557	
Z2 (secondary – medium point equivalent).)	0.0001	
Z3 (terciary – medium point equivalent).)	0.0001	

GAS GENERATOR DATA

Generator (p. u. reactances are on rated MVA, kV values)		
Model	GENROU	
Rated MVA	101.8	**Estimated**
Rated kV	13.8 kV	**Estimated**
Power factor	0.85	**Estimated**
H (turbine + generator inertia constant)	5.6	
X2 (Unsaturated negative sequence reactance)	0.146	
X0 (Unsaturated zero sequence reactance)	0.074	
Xd (direct axis synchronous reactance (unsaturated))	1.98	
X'd (direct axis transient reactance (unsaturated))	0.208	
X"d (direct axis subtransient reactance (unsaturated))	0.15	
T'do (direct axis open-circuit transient time constant))	12.8	
T"do (direct axis open-circuit sub-transient time constant))	0.05	
Xq (quadrature axis synchronous reactance (unsaturated))	1.81	
X'q quadrature axis transient reactance (unsaturated))	0.30	
X"q (quadrature axis subtransient reactance (unsaturated))	0.15	
T'qo (quadrature axis open-circuit transient time constant)	3.9	
T"qo (quadrature axis open-circuit sub-transient time constant)	0.05	
XL (stator leakage reactance)	0.1	
R1 (positive sequence armature resistance)	0.00303	
R2 (Negative sequence armature resistance)	0.0186	
R0 (Zero sequence armature resistance)	0.0045	
Turbine and Governor		**Estimated**
Model	GAST2A	
Parameters		
W – governor gain (1/droop) (on turbine rating)	25	
X (sec) governor lead time constant	0	

Y (sec) (>0.) governor lag time constant	0.02	
Z – governor mode 1 – Droop 0 - ISO	1	
E_{TD} (sec)	0.04	
T_{CD} (sec)	0.2	
T_{RATE} (MW)	86	
T (sec)	0	
MAX (pu limit (on turbine rating)	1.2	
MIN (pu) limit (on turbine rating)	-0.1	
E_{CR} (sec)	0.01	
K_3	0.77	
A (>0.) valve positioner	1	
B (sec) (> 0.) valve positioner	0.05	
C valve positioner	1	
τ_f(sec) (.0.)	0.4	
K_f	0	
K_5	0.2	
K_4	0.8	
T_3 (sec) (>0.)	15	
T_4 (sec) (>0.)	2.5	
T_t (sec) (>0.)	1650	
T_5 (sec) (>0.)	3.3	
a_{f1}	1075	
b_{f1}	550	
a_{f2}	-0.201	
b_{f2}	1.3	
c_{f2}	0.5	
Rated Temperature T_R (°F)	1100	
Minimum fuel flow K_6 (pu)	0.23	
Temperature control T_C (°F)	1100	
Miscellaneous		
Out-Of Step Relaying		**Not modeled**
Automatic Voltage Regulator and Excitation System		**Provided**
"Type (e.g., static, brushless, etc.)"		
Model	EXAC2	
Parameters		
T_R (sec)	0.01	
T_B (sec)	1	
T_C (sec)	1	
K_A	1000	
T_A (sec)	0.01	
V_{AMAX}	7.3	
V_{AMIN}	-7.3	
K_B	1	
V_{RMAX}	29.8	
V_{RMIN}	-29.8	
T_E >0 (sec)	1.3	

K_L	4	
K_H	0	
K_F	0.05	
T_F >0 (sec)	1	
K_C	0.1	
K_D	0.78	
K_E	1	
V_{LR}	9.47	
E_1	3.06	
SE_1	0.01	
E_2	4.08	
SE_2	0.01	
Power System Stabilizer		**Provided**
Model	PSS2A	
Parameters		
T_{W1} (.>0)	2	
T_{W2}	2	
T_6	0	
T_{W3} (>0)	2	
T_{W4}	0	
T_7	2	
K_{S2}	0.19	
K_{S3}	1	
T_8	0.5	
T_9 (>0)	0.1	
K_{S1}	30	
T_1	0.15	
T_2	0.03	
T_3	0.15	
T4	0.03	
V_{STMAX}	0.1	
V_{STMIN}	-0.1	

Machine Data File

```
90011 'GENROU'  G     12.800       .50000E-01   3.9000       .50000E-01
        5.6000      .00000E+00   1.9800       1.8100       .20800
        .30000      .15000       .10000       .50000E-01   .23000     /
90011 'EXAC2'   G     .10000E-01   1.0000       1.0000       1000.0
        .10000E-01  7.3000       -7.300       1.0000       29.800
        -29.80      1.3000       4.0000       .00000E+00   .50000E-01
        1.0000      .10000       .78000       1.0000       9.4700
        3.0600      .10000E-01   4.0800       .10000E-01   /
90011 'GAST2A'  G     25.000       .00000E+00   .20000E-01   1.0000
        .40000E-01  .20000        86.00       .00000       1.2000
        -.15000     .10000E-01   .77000       1.0000       .50000E-01
        1.0000      .40000       .00000E+00   .20000E+00   .80000
        15.000      2.5000       1650.0       3.3000       1075.0
        550.00      -.20100      1.3000       .50000       1100.0
        .23000      1100.0     /
90011 'PSS2A'   G       2  90000      3      0       5       1
        2.0000      2.0000       .00000E+00   2.0000       .00000E+00
        2.0000      .19000       1.0000       .50000       .10000
        30.000      .15000       .30000E-01   .15000       .30000E-01
        .10000      -.10000    /
```

Appendix
C

AC Contingency Analysis Summary

FREQUENCY OF BRANCH VIOLATIONS

Madison II Off-Line vs Madison II On-Line without Reinforcements

Monitored Branches								Madison II Off-Line			Madison II On-Line No Rein.		
**	From bus	**	**	To bus	**	CKT	TYP	Nviol	WorstHiVio%	Ncon	Nviol	WorstHiVio%	Ncon *
8087	CARL M2	69.0	8089	CARLISLE	69.0	1	LN	1	111.6	2	3	123.1	2
8087	CARL M2	69.0	8090	CARLISLE	138	1	TR	1	109.4	2	3	119.2	2
8089	CARLISLE	69.0	17060	09OHH W.	69.0	1	LN	1	107.5	2	3	127.4	2
8464	MILLIKIN	138	8743	TODHUNTR	138	1	LN	1	110.0	4	2	172.7	3
8052	BETHANY	138	8708	TAP 5485	138	1	LN				1	110.8	3
8411	M.FORT	345	8717	TERMINL	345	1	LN				1	129.4	1
8411	M.FORT	345	8872	WOODSDLE	345	1	LN				1	136.6	1
8464	MILLIKIN	138	8576	P.UN 2	138	1	LN				2	158.8	3
8575	P.UN 1	138	8743	TODHUNTR	138	1	LN				2	170.6	3
8587	PARK 1	138	8589	PARK 2	138	1	LN				1	111.3	3
8708	TAP 5485	138	8743	TODHUNTR	138	1	LN				2	131.8	3
8735	TOD M15	138	8743	TODHUNTR	138	1	TR				2	126.9	3
8735	TOD M15	138	8744	TODHUNTR	345	1	TR				2	129.6	3
8736	TOD M16	138	8743	TODHUNTR	138	1	TR				2	132.4	3
8736	TOD M16	138	8744	TODHUNTR	345	1	TR				2	135.6	3
8737	TOD M17	138	8743	TODHUNTR	138	1	TR				2	116.7	3
8737	TOD M17	138	8744	TODHUNTR	345	1	TR				2	119.6	3
8744	TODHUNTR	345	8872	WOODSDLE	345	1	LN					123.3	5
8744	TODHUNTR	345	8872	WOODSDLE	345	2	LN					123.3	6
8741	TODHUNTR	69	8792	TX E MN69	69	2	LN					102.0	7

*** Following is the list of contingencies used in this analysis**

1. Woodsdale to TodHunter ckt 1 & Woodsdale to TodHunter ckt 2 345 kV
2. Foster to Sugar Creek & Foster to Bath 345 kV
3. Woodsdale to Miami Fort & TodHunter to Foster 345 kV
4. Miami Fort to Terminal & TodHunter to Foster 345 kV
5. Woodsdale to TodHunter 345 kV Ckt 2
6. Woodsdale to TodHunter 345 kV Ckt 1
7. Tap 5485 to Union 138 kV

Appendix
D

Linear Transfer Analysis Summary

Pre-Transfer Overloads

Monitored Branches	Number of Violations	Worst Violation (%)
6007 11MIDDLT 345 6117 11MIDDLT 138 1	1	14.8
6007 11MIDDLT 345 6117 11MIDDLT 138 2	1	11.0
11003 06SARGNT 138 11004 06DOE530 345 1	9	5.4

Transfer Analysis Without Reinforcement

To	FCITC	Limiting Constraint	Contingency	Ncon	PreShift	Rating
AEP	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	363.9	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	548.3	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	618.8	8464 MILLIKIN 138 8576 P.UN 2 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	161.9	246
AMRN	229.9	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	229.9	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	360.9	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	539.4	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	613.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	161.9	246
DPL	113.8	8741 TODHNTR169.0 8792 TX E MNR69.0 1	C: 8708 TAP 5485 138 8797 UNION 138 1	430	95	101
	145.1	8758 TP5666-169.0 8792 TX E MNR69.0 1	C: 8708 TAP 5485 138 8797 UNION 138 1	430	-93.3	-101
	149.3	8353 JACKSON 69.0 8758 TP5666-169.0 1	C: 8708 TAP 5485 138 8797 UNION 138 1	430	-93.1	-101
	196.8	8741 TODHNTR169.0 8792 TX E MNR69.0 1	C: 8090 CARLISLE 138 8797 UNION 138 1	291	90.6	101
	215.3	8087 CARL M2 69.0 8089 CARLISLE69.0 1	C:17079 09SUGRCK 345 8281 FOSTER 345 1	1723	145.6	168
	223.7	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	223.7	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	228.1	8758 TP5666-169.0 8792 TX E MNR69.0 1	C: 8090 CARLISLE 138 8797 UNION 138 1	291	-88.9	-101
	228.3	8087 CARL M2 69.0 8090 CARLISLE 138 1	C:17079 09SUGRCK 345 8281 FOSTER 345 1	1723	-161.2	-185
	232.3	8353 JACKSON 69.0 8758 TP5666-169.0 1	C: 8090 CARLISLE 138 8797 UNION 138 1	291	-88.7	-101
EKPC	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	229.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	255.2	6051 11ADAMS 138 6146 11TYRONE 138 1	C: 6126 11OC TAP 138 6137 11SCOTT 138 1	1639	-91.3	-97
	299.2	6064 11BRWN P 138 6087 11FAWKES 138 1	C:20007 20AVON 138 20027 20BOONST 138 1	146	162.6	219
	347.8	6064 11BRWN P 138 6087 11FAWKES 138 1	C: 6002 11ALCALD 345 6004 11BRWN N 345 1	1450	173.8	219
	359.9	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	404.9	20007 20AVON 138 20027 20BOONST 138 1	C: 6064 11BRWN P 138 6087 11FAWKES 138 1	1562	130.3	222
	419.8	6064 11BRWN P 138 6087 11FAWKES 138 1	C:20027 20BOONST 138 20065 20DALE 138 1	1415	137.5	219
	519.5	6064 11BRWN P 138 6066 11BRWNT2 138 1	C: 6064 11BRWN P 138 6065 11BRWNT1 138 1	1560	-236	-297
	528.1	6064 11BRWN P 138 6087 11FAWKES 138 1	C:20065 20DALE 138 20287 20TFJ 138 1	1423	163.3	219

To	FCITC	Limiting Constraint	Contingency	Ncon	PreShift	Rating
HE	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	358.6	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	532.8	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	587.2	4002 16PETE 345 4042 16PETE 138 E	C: 23 GIBSON 345 180 GIBSON 138 1	43	126.9	180
	590.7	4002 16PETE 345 4042 16PETE 138 E	C: 178 PRINCETO 138 180 GIBSON 138 1	212	126.5	180
	602.6	4002 16PETE 345 4042 16PETE 138 E	C: 4002 16PETE 345 4042 16PETE 138 W	579	116.5	180
	609.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	161.9	246
IPL	230.4	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	230.4	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	358.7	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	532.8	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	610	8464 MILLIKIN 138 8576 P.UN 2 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	161.9	246
LGEE	27.9	24 SPEED 345 156 SPEED 138 1	C: 6005 11GHENT 345 6015 11W LEXN 345 1	1461	477.1	478
	112.3	24 SPEED 345 156 SPEED 138 1	C: 7064 05JEFRSO 765 7068 05ROCKPT 765 1	538	475.1	478
	229.6	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	229.6	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	229.8	24 SPEED 345 156 SPEED 138 1	C: 6007 11MIDDLT 345 6013 11TRIMBL 345 1	1466	461.7	478
	356.9	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	425.8	6075 11CENTRF 138 6145 11TRIMBL 138 1	C: 6007 11MIDDLT 345 6013 11TRIMBL 345 1	1466	-182.3	-215
	525.1	6013 11TRIMBL 345 6145 11TRIMBL 138 1	C: 6007 11MIDDLT 345 6013 11TRIMBL 345 1	1466	183.7	224
	528.4	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	551.9	6064 11BRWN P 138 6154 11WC-DD 138 1	C: 6064 11BRWN P 138 6148 11W CLIF 138 1	1564	162.9	182
NIPS	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	230.2	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	362.7	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	543.5	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	616.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	161.9	246

To	FCITC	Limiting Constraint	Contingency	Ncon	PreShift	Rating
OVEC	228.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	228.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	359.2	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	538.5	8575 P.UN 1 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-161.1	-246
	610.9	8464 MILLIKIN 138 8576 P.UN 2 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	161.9	246
SIGE	153.7	1064 TETC 12J69.0 1066 PRINCETO69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	-37.5	-44
	200.5	1058 OAKLAND 69.0 1064 TETC 12J69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	-35.5	-44
	229.5	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	C: 3251 10TOYOTA 138 175 OAK CITY 138 1	1677	16.9	39
	230	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	442	-1143.5	-1315
	230	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	441	-1143.5	-1315
	348.4	178 PRINCETO 138 1066 PRINCETO69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	54.3	69
	358.5	8464 MILLIKIN 138 8743 TODHUNTR 138 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-196.6	-246
	373.9	4002 16PETE 345 4042 16PETE 138 E	C: 23 GIBSON 345 180 GIBSON 138 1	43	126.9	180
	376.1	4002 16PETE 345 4042 16PETE 138 E	C: 178 PRINCETO 138 180 GIBSON 138 1	212	126.5	180
	383	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	12.4	39

TRANSFER ANALYSIS

Transfer Analysis With Reinforcements

To	FCITC	Limiting Constraint	Contingency	Ncon	PreShift	Rating
AEP	-1476.2	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	544	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176.1	-1315
	634.8	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	634.8	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315
	952.8	17047 09MIAMI 345 17090 09WMILTN 345 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-976.6	-1315
AMRN	-1553.9	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	572.8	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176.1	-1315
	629.7	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	629.7	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315
	987	17047 09MIAMI 345 17090 09WMILTN 345 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-976.6	-1315
DPL	-1125.8	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	275.3	8741 TODHNTR169.0 8792 TX E MNR69.0 1	C: 8708 TAP 5485 138 8797 UNION 138 1	431	87.6	101
	308.9	8758 TP5666-169.0 8792 TX E MNR69.0 1	C: 8708 TAP 5485 138 8797 UNION 138 1	431	-85.9	-101
	312.9	8353 JACKSON 69.0 8758 TP5666-169.0 1	C: 8708 TAP 5485 138 8797 UNION 138 1	431	-85.7	-101
	364.3	8741 TODHNTR169.0 8792 TX E MNR69.0 1	C: 8090 CARLISLE 138 8797 UNION 138 1	291	83.2	101
	397.9	8758 TP5666-169.0 8792 TX E MNR69.0 1	C: 8090 CARLISLE 138 8797 UNION 138 1	291	-81.6	-101
	401.9	8353 JACKSON 69.0 8758 TP5666-169.0 1	C: 8090 CARLISLE 138 8797 UNION 138 1	291	-81.4	-101
	438.6	8087 CARL M2 69.0 8089 CARLISLE69.0 1	C:17079 09SUGRCK 345 8281 FOSTER 345 1	1728	126.5	168
	443.8	8087 CARL M2 69.0 8089 CARLISLE69.0 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	125.7	168
	453.2	8087 CARL M2 69.0 8090 CARLISLE 138 1	C:17079 09SUGRCK 345 8281 FOSTER 345 1	1728	-142.1	-185
EKPC	-1606.8	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	299.8	6064 11BRWN P 138 6087 11FAWKES 138 1	C:20007 20AVON 138 20027 20BOONST 138 1	149	162.5	219
	351.6	6064 11BRWN P 138 6087 11FAWKES 138 1	C: 6002 11ALCALD 345 6004 11BRWN N 345 1	1453	173.4	219
	396.8	20007 20AVON 138 20027 20BOONST 138 1	C: 6064 11BRWN P 138 6087 11FAWKES 138 1	1565	132.2	222
	420.6	6064 11BRWN P 138 6087 11FAWKES 138 1	C:20027 20BOONST 138 20065 20DALE 138 1	1418	137.3	219
	516.9	6064 11BRWN P 138 6066 11BRWNT2 138 1	C: 6064 11BRWN P 138 6065 11BRWNT1 138 1	1563	-236.4	-297
	574.8	6015 11W LEXN 345 6151 11W LEXN 138 1	C: 6004 11BRWN N 345 6015 11W LEXN 345 1	1461	390	448
	606.2	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176.1	-1315
	620.5	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	620.5	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315

LINEAR TRANSFER ANALYSIS SUMMARY

[illegible]	[illegible]	Limiting Constraint	Contingency	Ncon	PreShift	Rating
HE	-1627.5	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	591.7	4002 16PETE 345 4042 16PETE 138 E	C: 23 GIBSON 345 180 GIBSON 138 1	43	126.4	180
	595.2	4002 16PETE 345 4042 16PETE 138 E	C: 178 PRINCETO 138 180 GIBSON 138 1	212	126.1	180
	603.4	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176.1	-1315
	607	4002 16PETE 345 4042 16PETE 138 E	C: 4002 16PETE 345 4042 16PETE 138 W	582	116.1	180
	624.3	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315
	624.3	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	711.5	2020 07VCKSBG69.0 2021 07ESLVIN69.0 1	C: 2006 07RATTS 161 2116 07RATTS8 138 1	561	-10.1	-36
	856.6	2006 07RATTS 161 2116 07RATTS8 138 1	C: 7064 05JEFRSO 765 7068 05ROCKPT 765 1	541	23.4	-225
	876.3	2015 07WRTHG 69.0 2020 07VCKSBG69.0 1	C: 2006 07RATTS 161 2116 07RATTS8 138 1	561	-4.1	-36
IPL	-1642.3	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	609.7	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176.1	-1315
	624.3	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	624.3	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315
LGEE	-1668.4	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	60.2	24 SPEED 345 156 SPEED 138 1	C: 6005 11GHENT 345 6015 11W LEXN 345 1	1464	476	478
	232.6	24 SPEED 345 156 SPEED 138 1	C: 6007 11MIDDLT 345 6013 11TRIMBL 345 1	1469	461.5	478
	400.3	6075 11CENTRF 138 6145 11TRIMBL 138 1	C: 6007 11MIDDLT 345 6013 11TRIMBL 345 1	1469	-184.4	-215
	499.8	6013 11TRIMBL 345 6145 11TRIMBL 138 1	C: 6007 11MIDDLT 345 6013 11TRIMBL 345 1	1469	185.8	224
	549.8	6064 11BRWN P 138 6154 11WC-DD 138 1	C: 6064 11BRWN P 138 6148 11W CLIF 138 1	1567	163	182
	607.6	6028 11GR RV 161 6094 11GR RVR 138 1	C: 6028 11GR RV 161 6094 11GR RVR 138 2	152	81.1	115
	617.9	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	617.9	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315
	620.7	6064 11BRWN P 138 6148 11W CLIF 138 1	C: 6064 11BRWN P 138 6154 11WC-DD 138 1	1568	196.2	222
NIPS	-1500.1	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626.5	-495
	550.1	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176.1	-1315
	636.8	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979.8	-1315
	636.8	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979.8	-1315
	962.7	17047 09MIAMI 345 17090 09WMILTN 345 1	C: 8281 FOSTER 345 8744 TODHUNTR 345 1	352	-976.6	-1315

[illegible]	[illegible]	Limiting Constraint	Contingency	[illegible]	[illegible]	[illegible]	Rating
OVEC	-1649.6	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626	5	-495
	610	17047 09MIAMI 345 17090 09WMILTN 345 1	C:17089 09WMILTN 138 17090 09WMILTN 345 1	1391	-1176	1	-1315
	614.8	8744 TODHUNTR 345 8872 WOODSDLE 345 2	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 1	442	-979	8	-1315
	614.8	8744 TODHUNTR 345 8872 WOODSDLE 345 1	C: 8744 TODHUNTR 345 8872 WOODSDLE 345 2	443	-979	8	-1315
SIGE	-1622.9	17089 09WMILTN 138 17090 09WMILTN 345 1	C:17047 09MIAMI 345 17090 09WMILTN 345 1	1374	-626	5	-495
	154.9	1064 TETC 12J69.0 1066 PRINCETO69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	-37	4	-44
	201.8	1058 OAKLAND 69.0 1064 TETC 12J69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	-35	5	-44
	230.9	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	C: 3251 10TOYOTA 138 175 OAK CITY 138 1	1681	16	8	39
	349.7	178 PRINCETO 138 1066 PRINCETO69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	54	2	69
	376.7	4002 16PETE 345 4042 16PETE 138 E	C: 23 GIBSON 345 180 GIBSON 138 1	43	126	4	180
	379	4002 16PETE 345 4042 16PETE 138 E	C: 178 PRINCETO 138 180 GIBSON 138 1	212	126	1	180
	384.4	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	C: 175 OAK CITY 138 178 PRINCETO 138 1	211	12	3	39
	402.6	1058 OAKLAND 69.0 3247 10OAKCTY69.0 1	C: 2150 07RAMSY5 345 23 GIBSON 345 1	1671	12	7	39
	414.9	174 OLDBENJT 138 4042 16PETE 138 1	C: 23 GIBSON 345 180 GIBSON 138 1	43	-81	1	-146

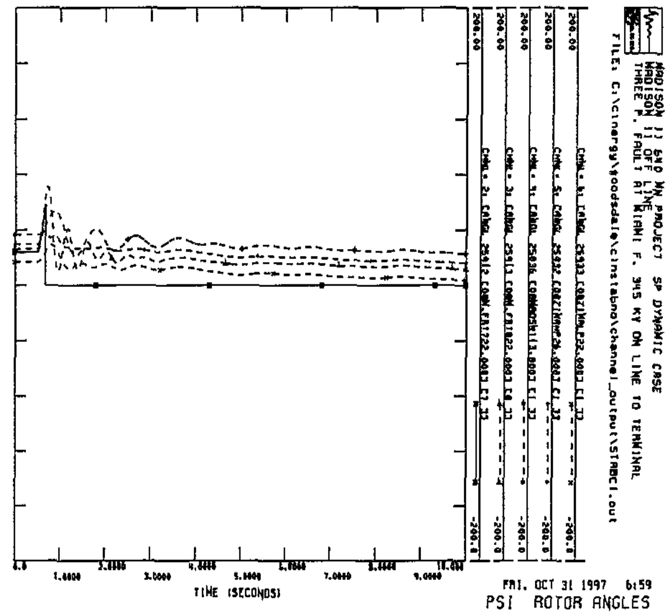
Appendix
E

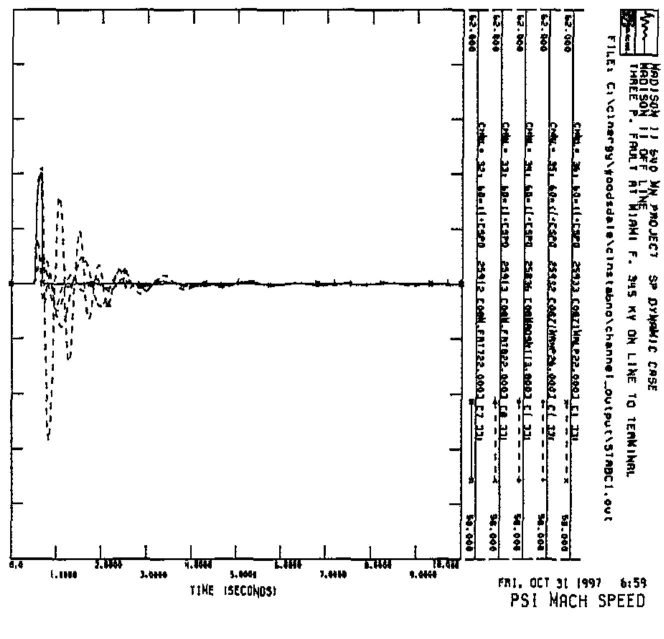
Transient Stability Analysis

Madison II Off line

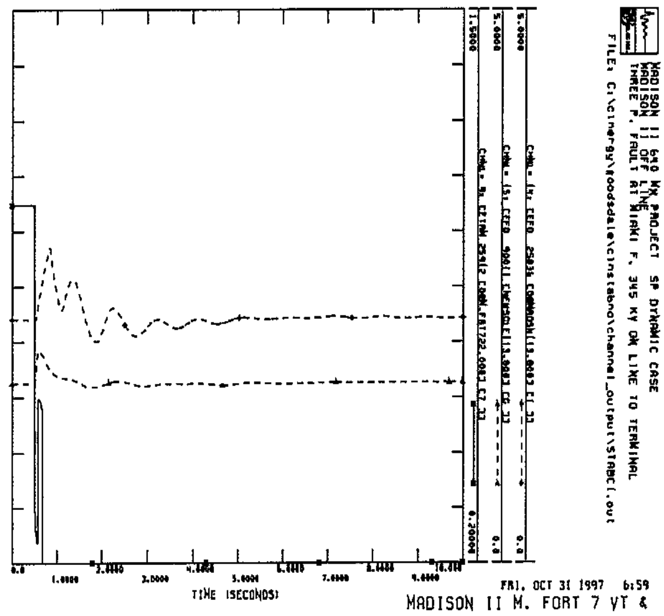
MADISON II OFF LINE : SIMULATION: RUN STABC1

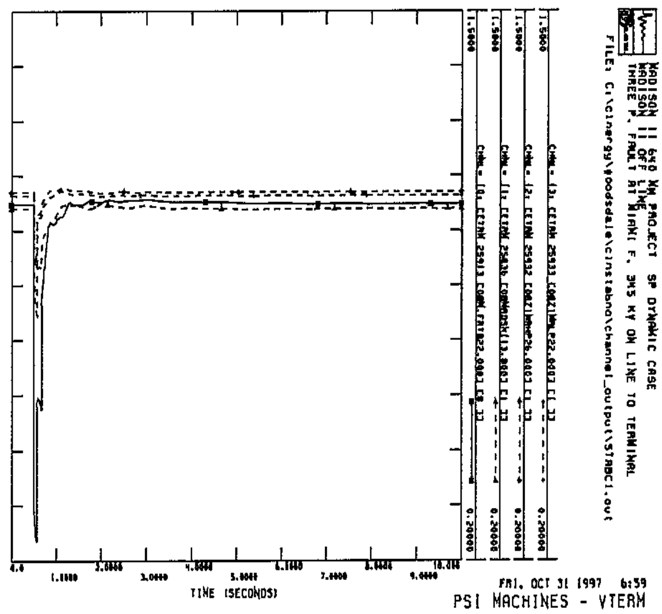
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25577 MIAMI FORT 345 kV      /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25577  MIAMI FORT 345 kV through ADMITTANCE 584.0 -
8271.0 MVA  /STUCK BREAKER
TRIP LINE FROM BUS 25577 MIAMI FORT TO 25736 TERMINAL CIRCUIT 1 /
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
DROP GENERATOR 25912 MIAMI FORT #7    /BACKUP
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



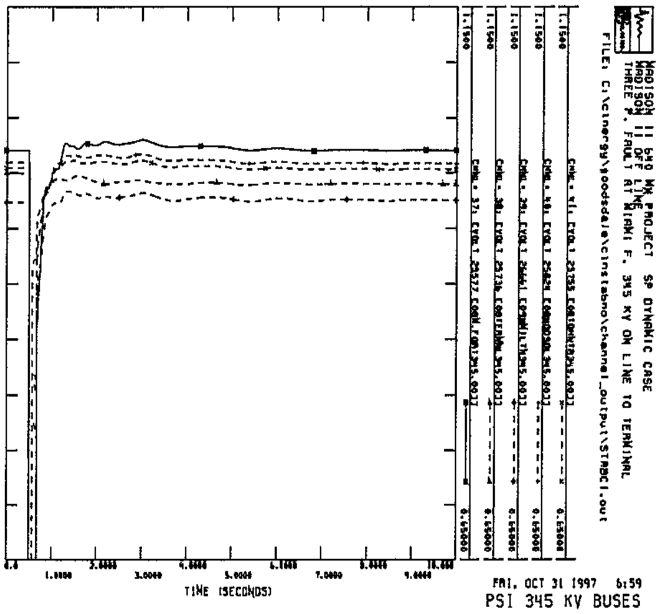


RUN STABC1 PLOT 1





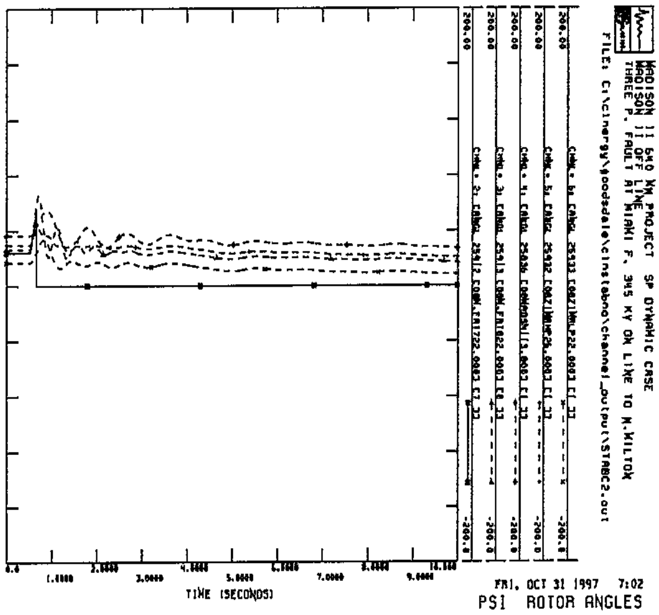
RUN STABC1 PLOT 2

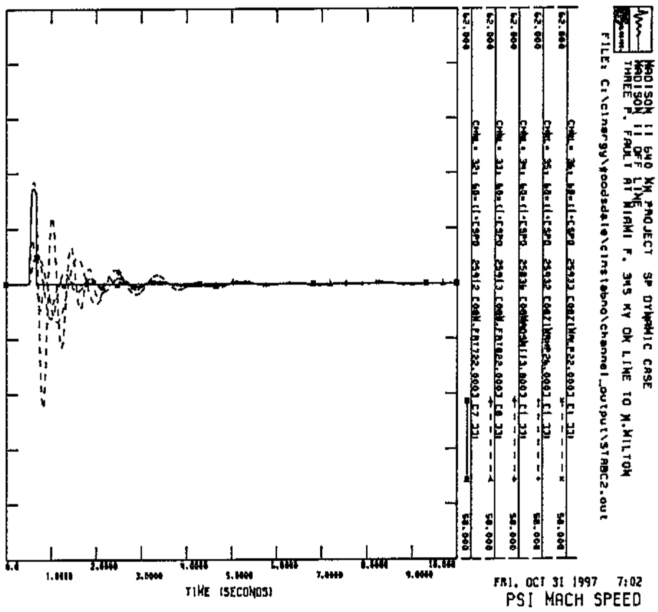


RUN STABC1 PLOT 3

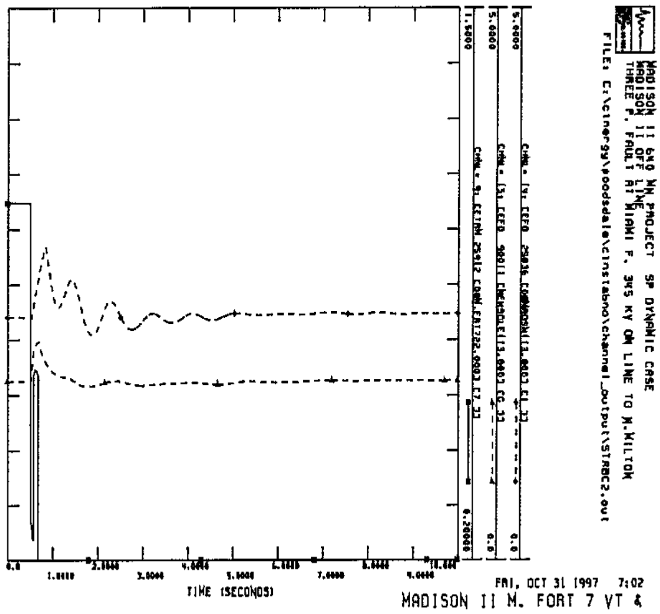
MADISON II OFF LINE : SIMULATION: RUN STABC2

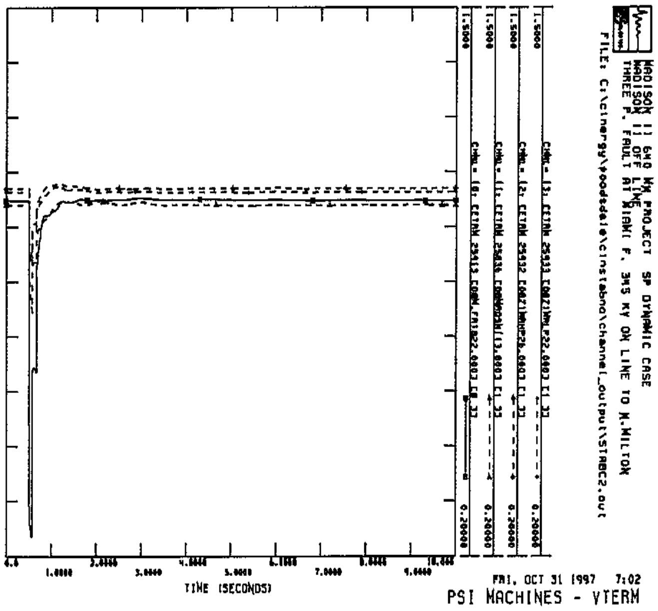
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25577 MIAMI FORT 345 kV   /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25577 MIAMI FORT through ADMITTANCE 584.0 -8271.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25577 MIAMI FORT TO BUS 26661 WEST MILTON CIRCUIT 1
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
DROP GENERATOR BUS 25912 MIAMI FORT #7  /BACKUP
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



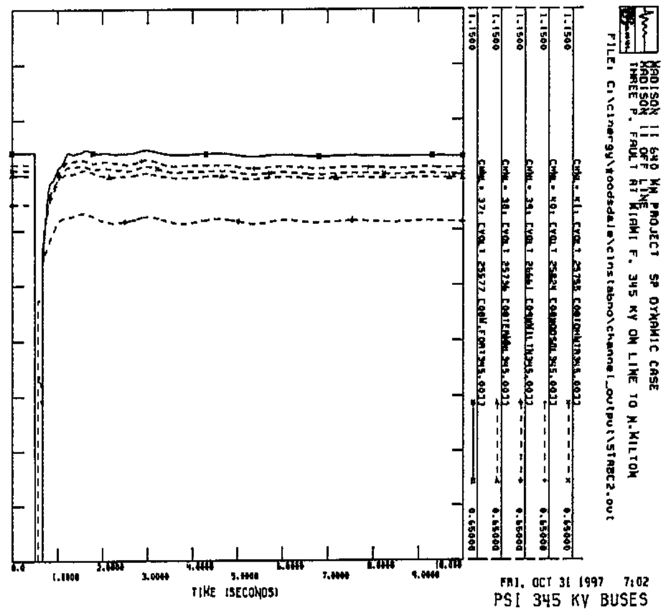


RUN STABC2 PLOT 1





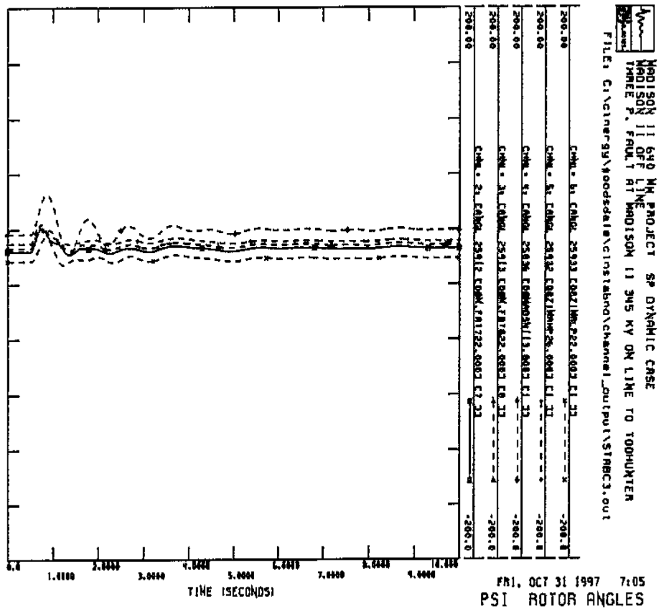
RUN STABC2 PLOT 2

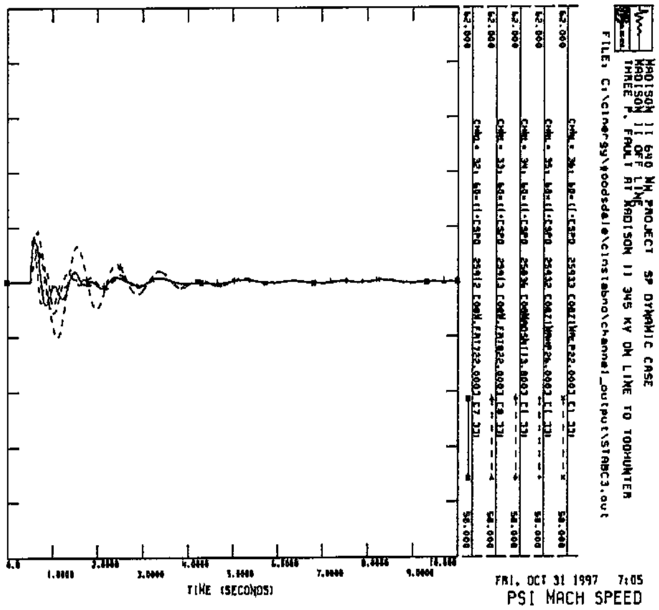


RUN STABC2 PLOT 3

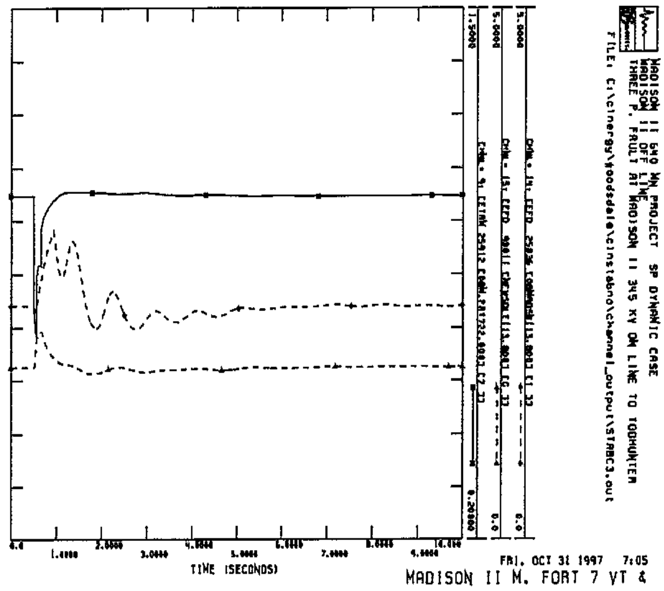
MADISON II OFF LINE : SIMULATION: RUN STABC3

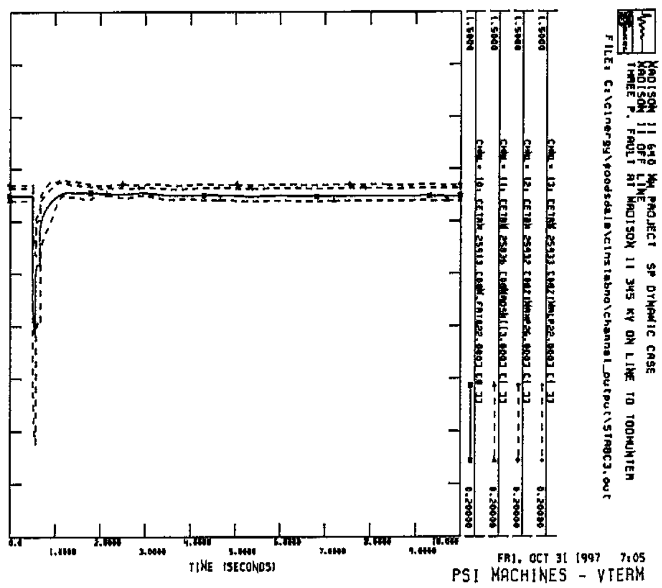
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25824 WOODSDALE 345 kV  /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25824 WOODSDALE through ADMITTANCE 702.0 -8570.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25824 WOODSDALE TO 25755 TODHUNTER CIRCUIT 2 /BACKUP
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



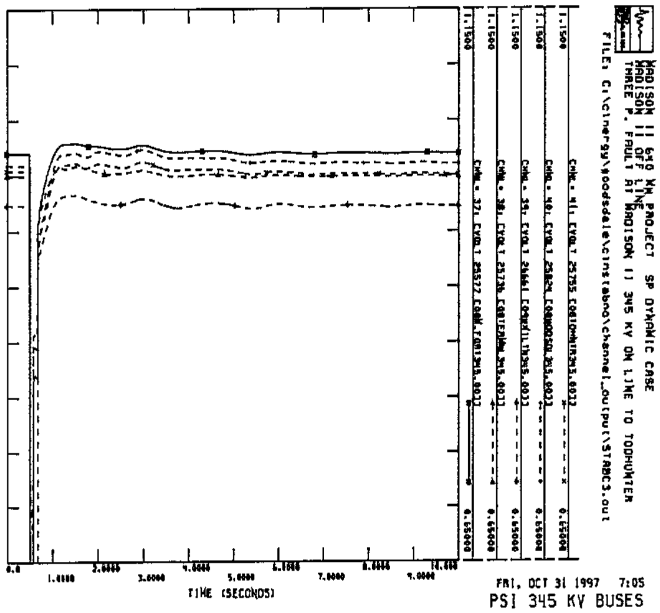


RUN STABC3 PLOT 1





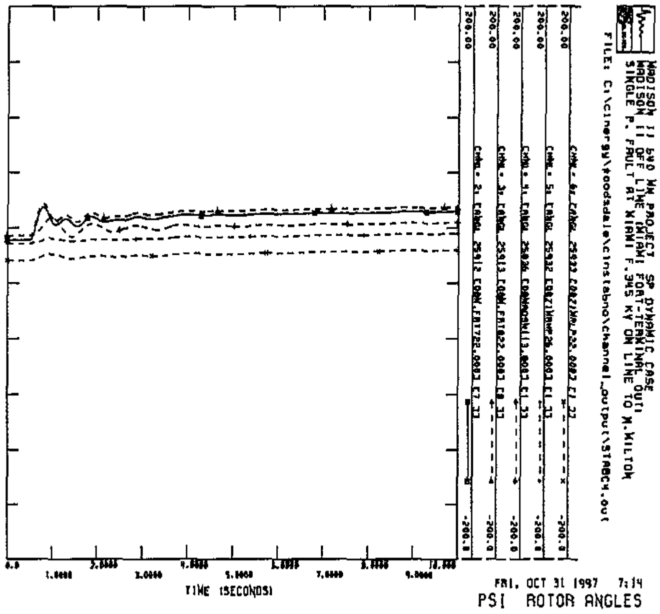
RUN STABC3 PLOT 2

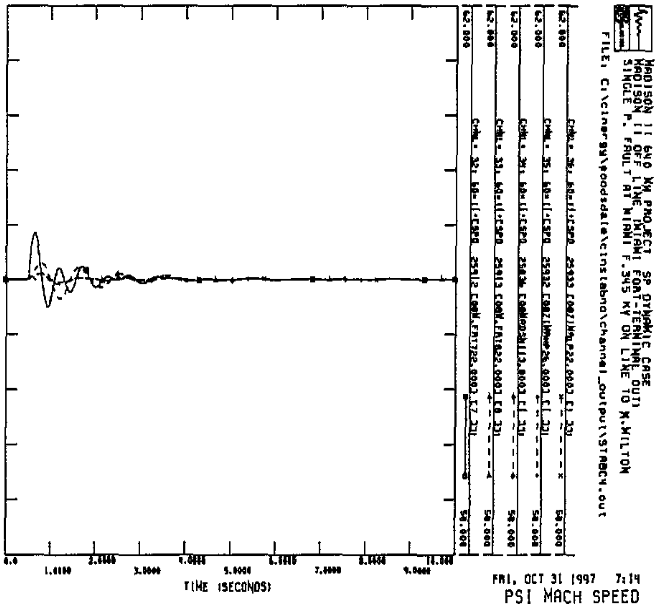


RUN STABC3 PLOT 3

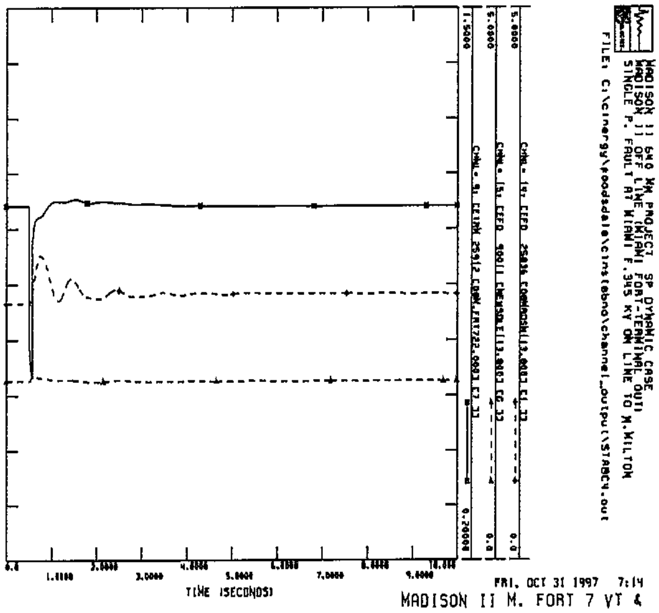
MADISON II OFF LINE : SIMULATION: RUN STABC4

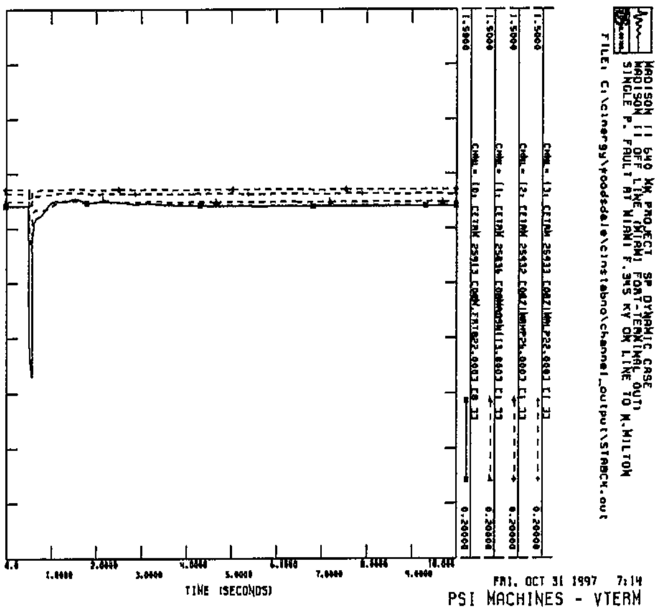
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/MAIMI FORT - TERMINAL OUT OF SERVICE
APPLY FAULT AT BUS 25577 MIAMI FORT through ADMITTANCE 584.0 -8271.0 MVA
/SINGLE PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25577 MIAMI FORT TO BUS 26661 WEST MILTON CIRCUIT 1
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



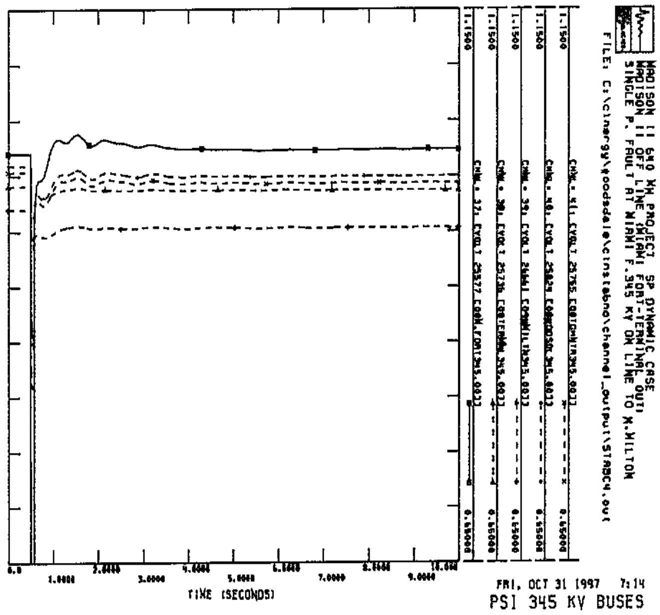


RUN STABC4 PLOT 1





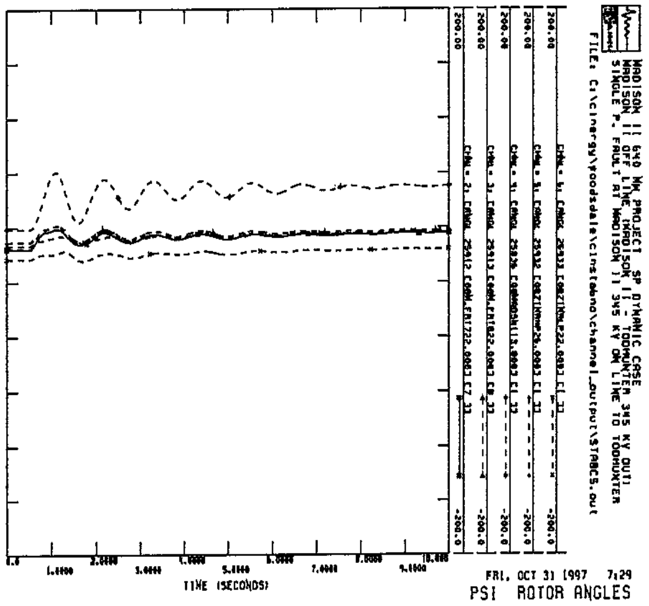
RUN STABC4 PLOT 2

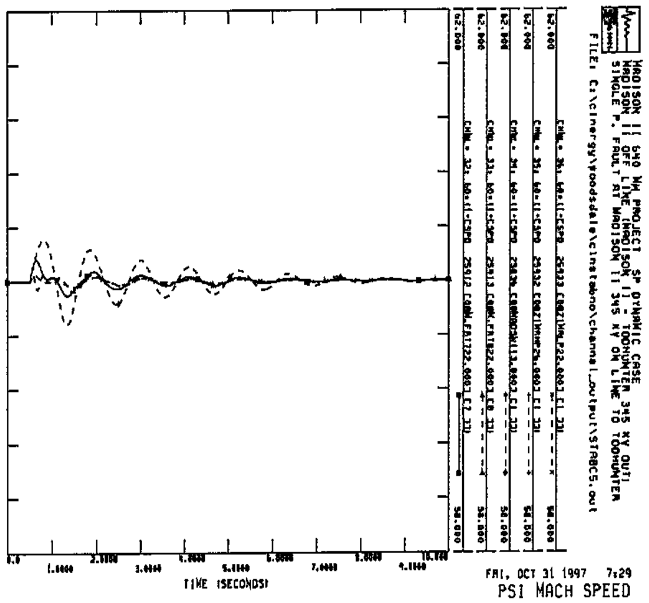


RUN STABC4 PLOT 3

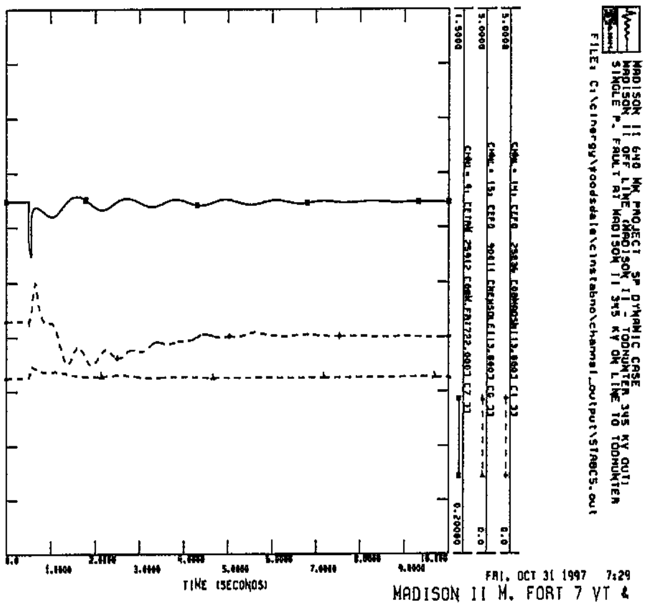
MADISON II OFF LINE : SIMULATION: RUN STABC5

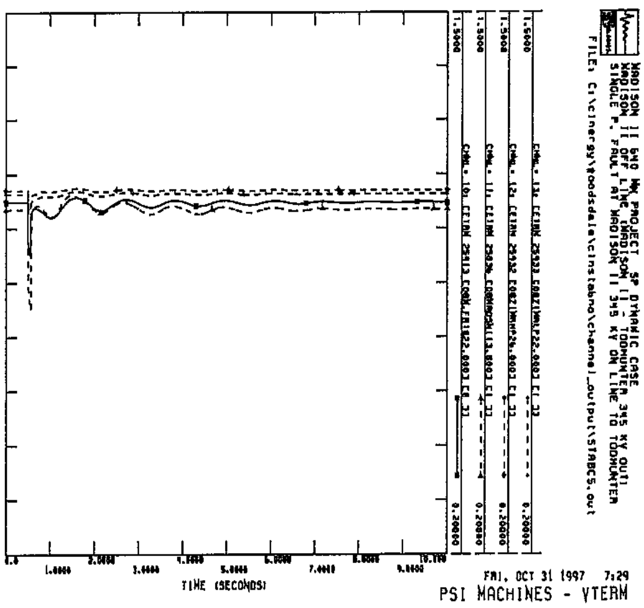
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/WOODSDALE-TODHUNTER CIRCUIT 1 345 kV OUT OF SERVICE
APPLY FAULT AT BUS 25824 WOODSDALE through ADMITTANCE 702.0 -8570.0 MVA
/SINGLE PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25824 WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



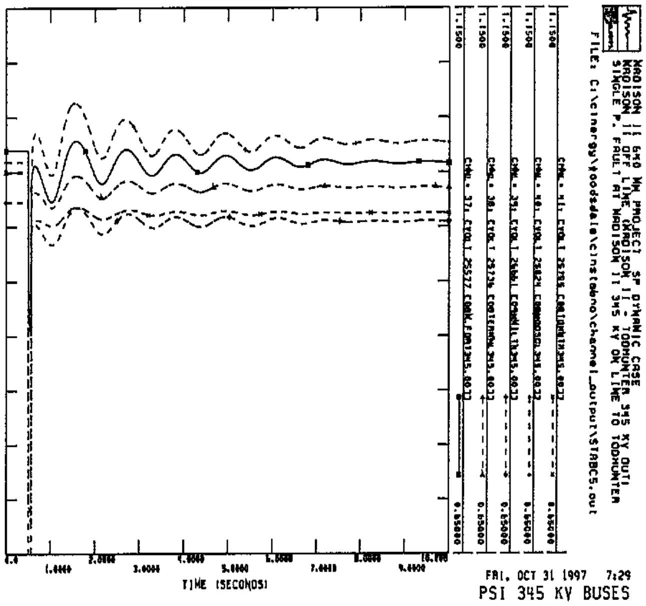


RUN STABC5 PLOT 1





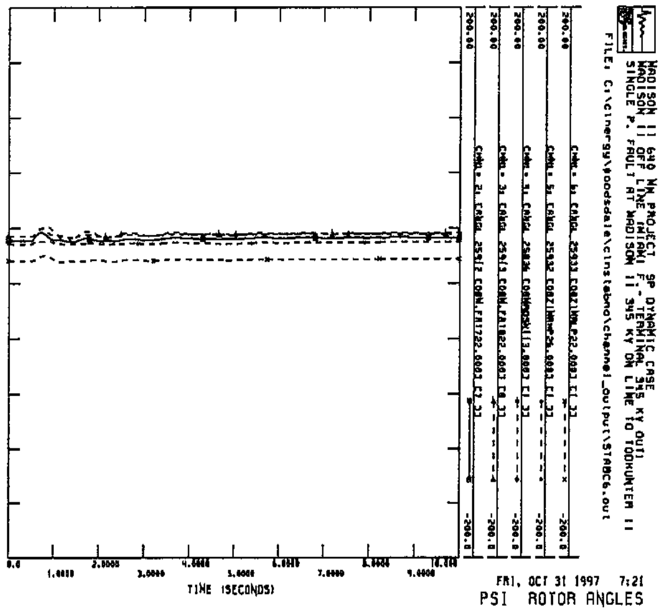
RUN STABC5 PLOT 2

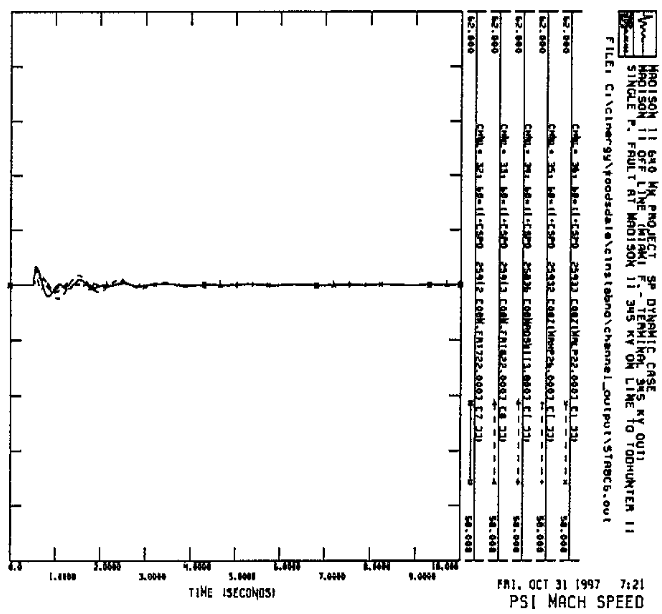


RUN STABC5 PLOT 3

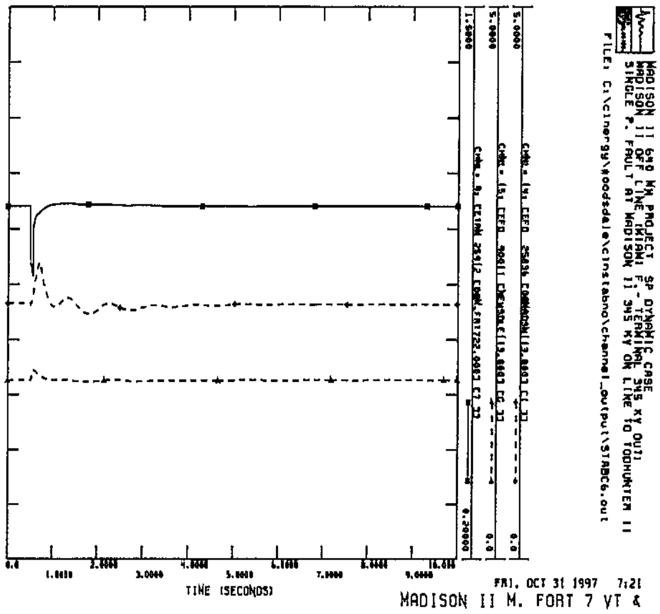
MADISON II OFF LINE : SIMULATION: RUN STABC6

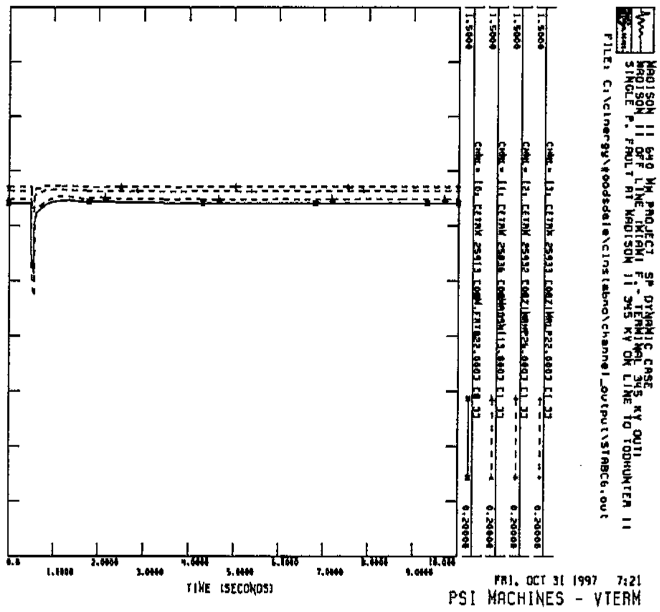
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/MIAMI FORT-TERMINAL 345 kV OUT OF SERVICE
APPLY FAULT AT BUS 25824 WOODSDALE  through ADMITTANCE 702.0 -8570.0 MVA
/SINGLE PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25824 WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



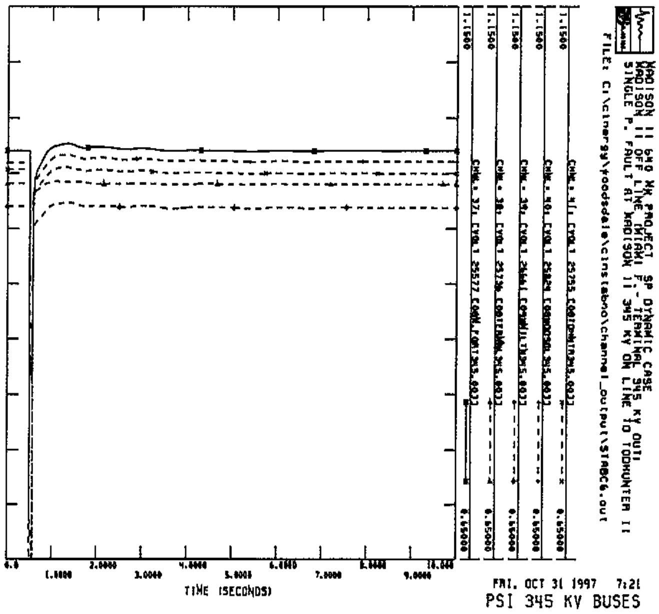


RUN STABC6 PLOT 1





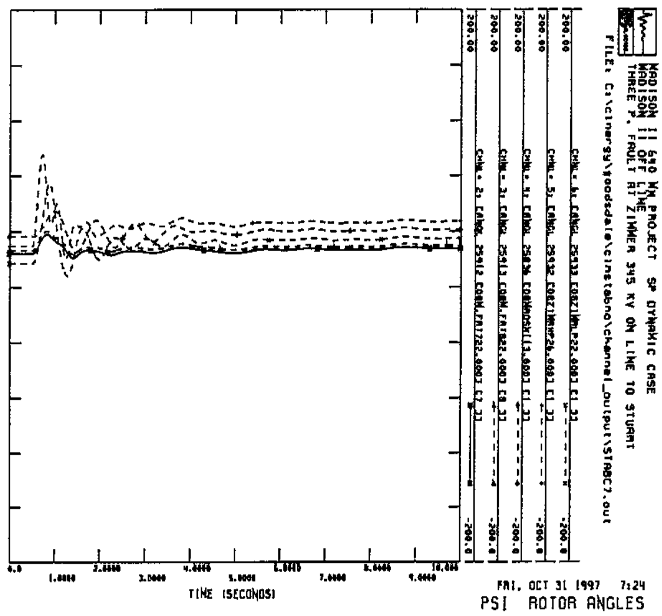
RUN STABC6 PLOT 2

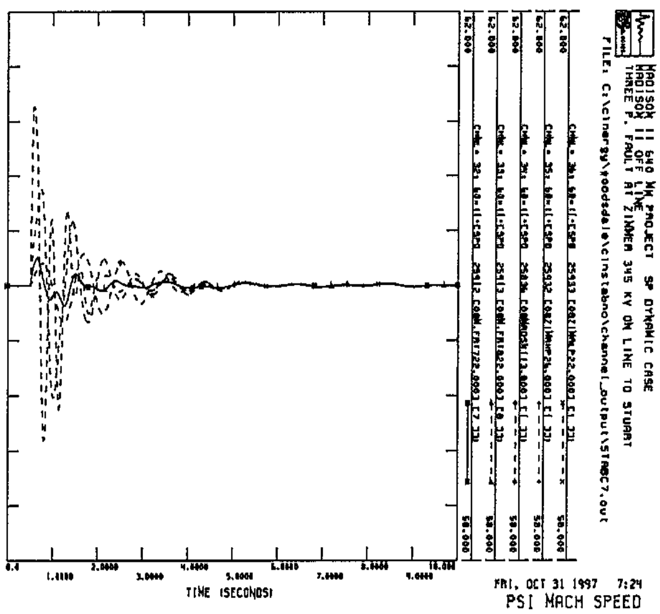


RUN STABC6 PLOT 3

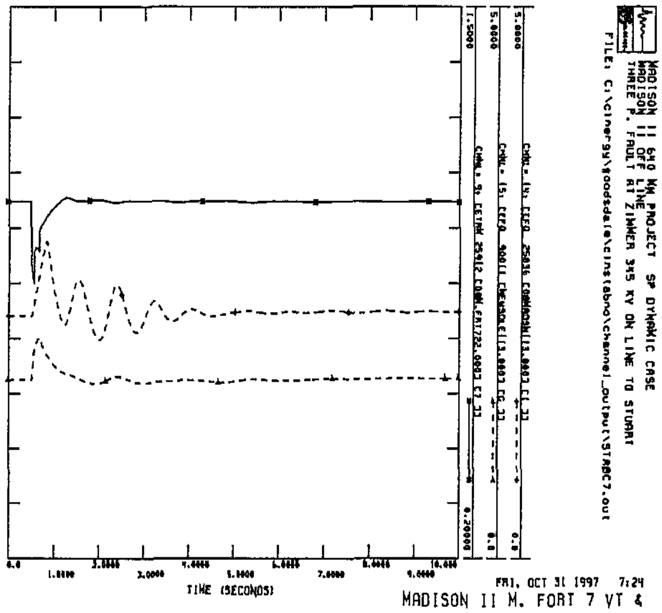
MADISON II OFF LINE : SIMULATION: RUN STABC7

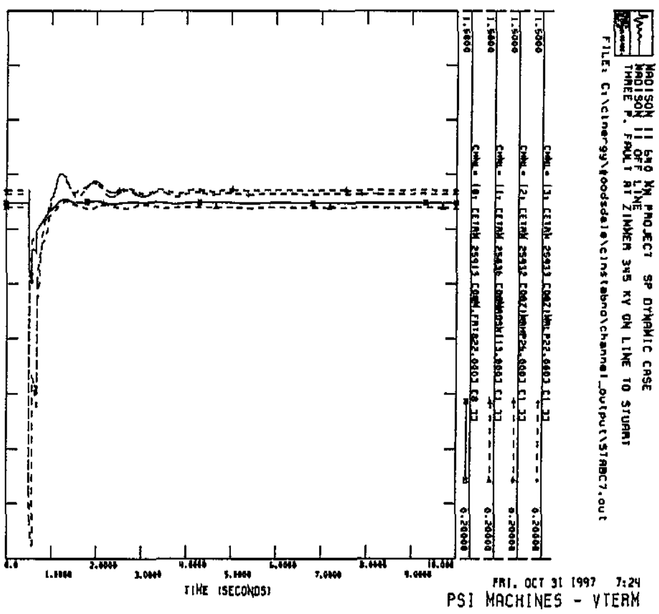
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25830 ZIMMER  /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25830 ZIMMER through ADMITTANCE 564.0 -9156.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25830 ZIMMER TO BUS 26648 STUART CIRCUIT 1
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25830 ZIMMER TO BUS 25692 S. GROVE CIRCUIT 1  /BACK UP
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



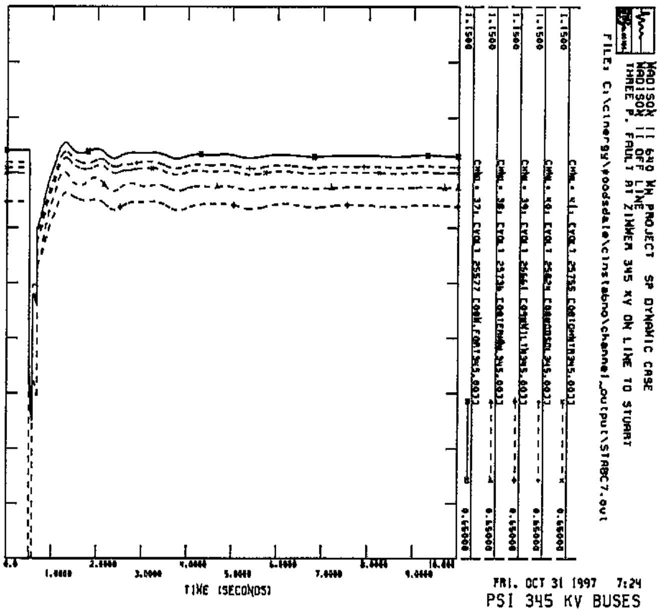


RUN STABC7 PLOT 1

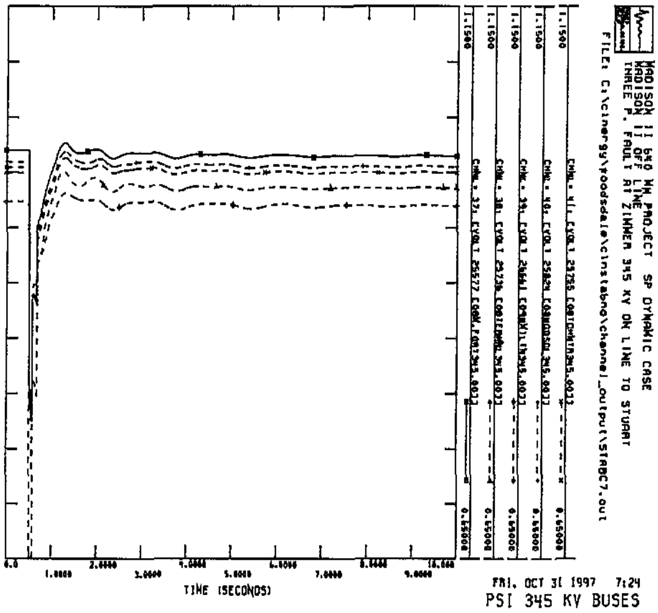




RUN STABC7 PLOT 2



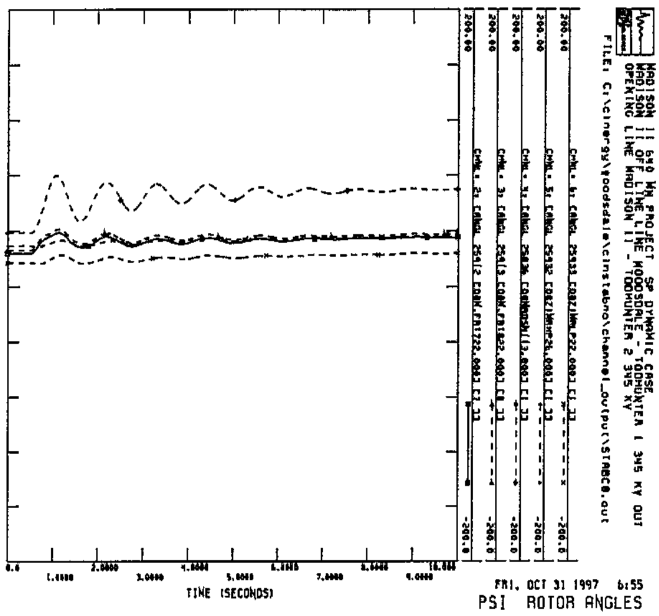
RUN STABC7 PLOT 3

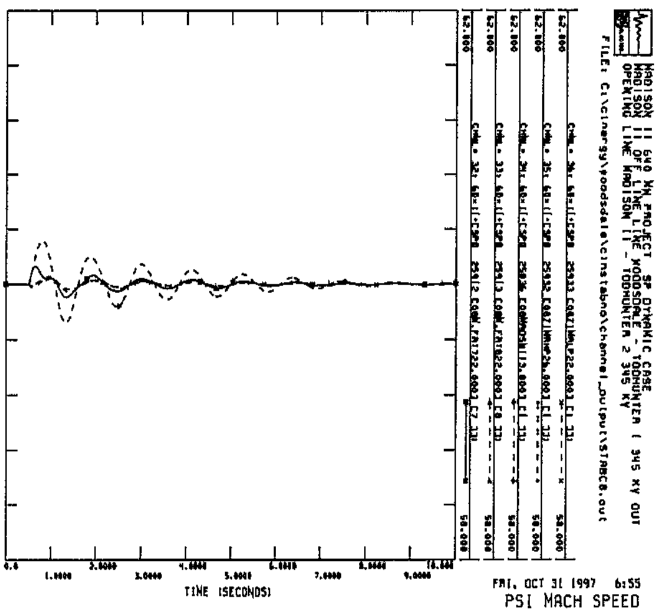


RUN STABC7 PLOT 3

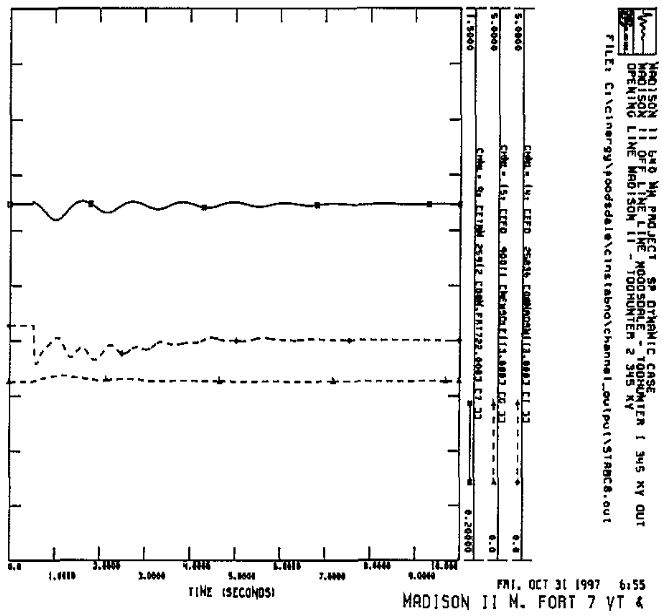
MADISON II OFF LINE : SIMULATION: RUN STABC8

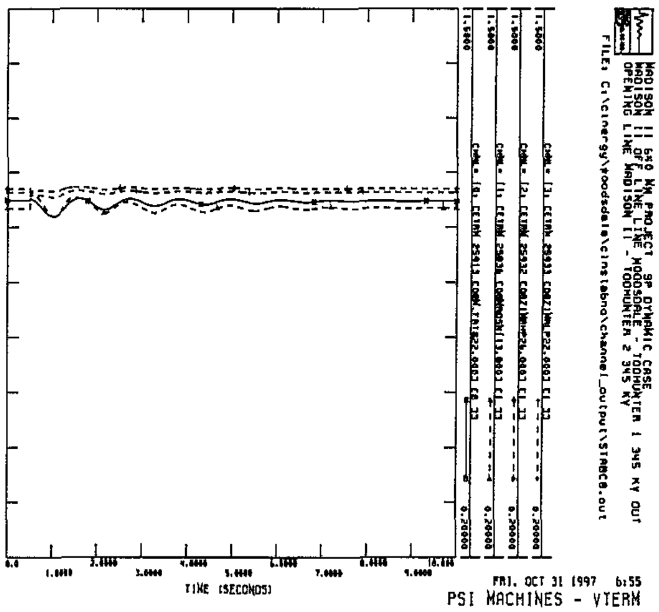
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/WOODSDALE - TODHUNTER OUT OF SERVICE
TRIP LINE FROM  BUS 25824  WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2
/OPEN CIRCUIT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



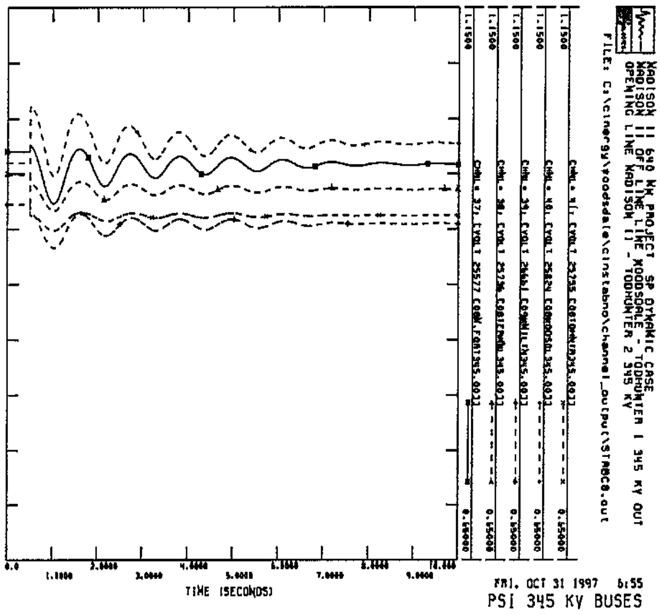


RUN STABC8 PLOT 1





RUN STABC8 PLOT 2



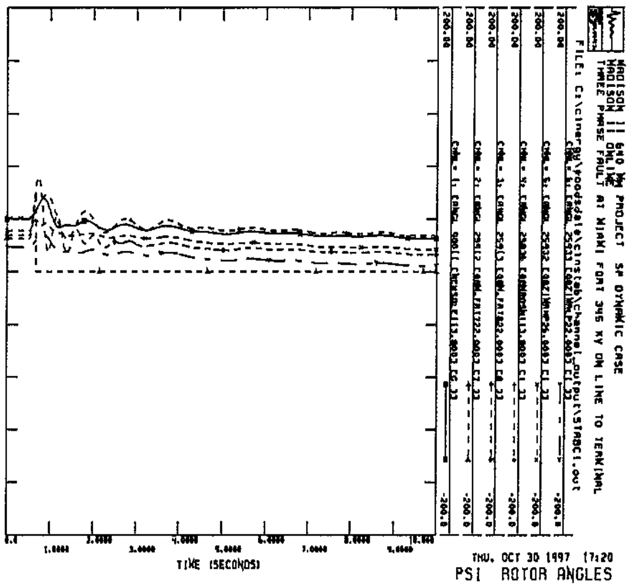
RUN STABC8 PLOT 3

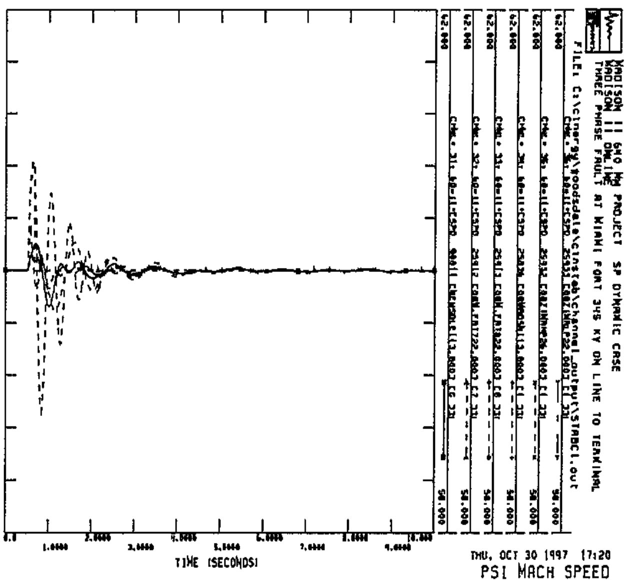
Appendix
F

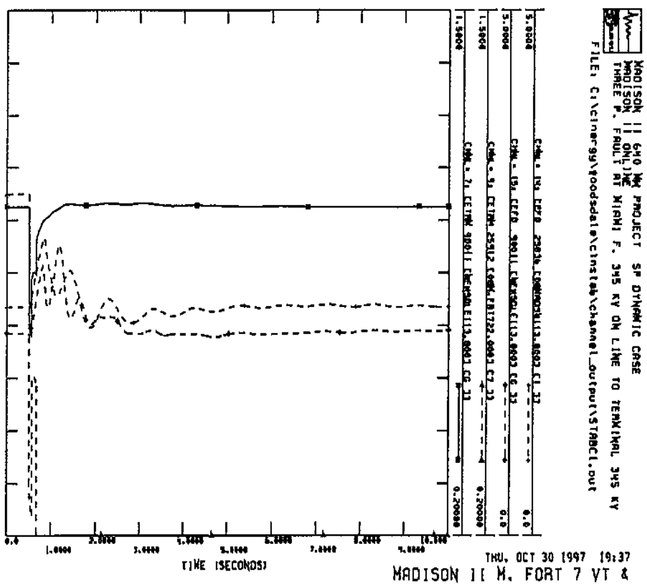
Stability Analysis Simulation Results: Madison II On-Line

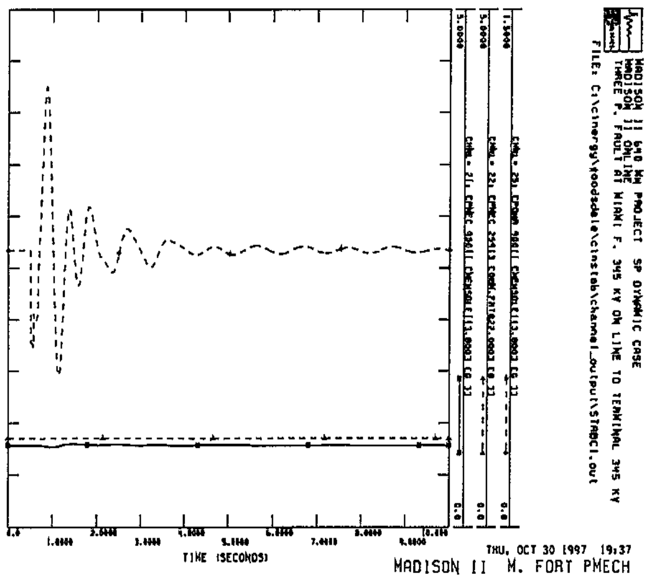
MADISON II ONLINE : SIMULATION: RUN STABC1

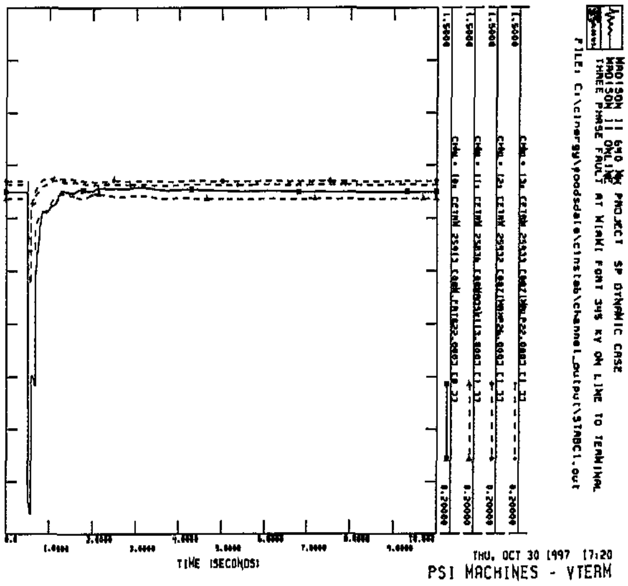
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25577 MIAMI FORT 345 KV      /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25577 MIAMI FORT through ADMITTANCE 584.0 -8271.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25577 MIAMI FORT TO BUS 25736 TERMINAL CIRCUIT 1 /
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
DROP GENERATOR BUS 25912 MIAMI FORT #7    /BACKUP
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```

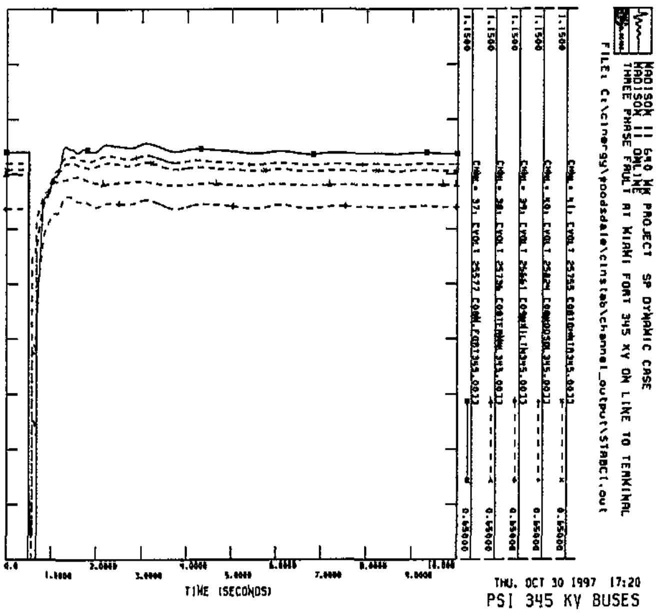

TIME (SECONDS)
THU, OCT 30 1997 17:20
PSI ROTOR ANGLES

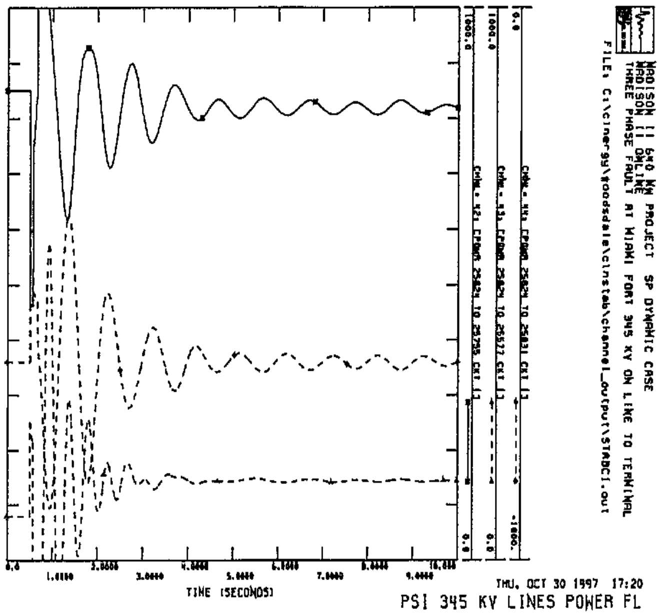

TIME (SECONDS)
THU, OCT 30 1997 17:20
PSI MACH SPEED


MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE P. FAULT AT MIAMI F. 345 KV ON LINE TO TERMINAL 345 KV
TIME (SECONDS)
THU, OCT 30 1997 19:37
MADISON II M. FORT 7 VT &


MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE P. FAULT AT MIAMI F. 345 KV ON LINE TO TERMINAL 345 KV
TIME (SECONDS)
THU, OCT 30 1997 19:37
MADISON II M. FORT PMECH

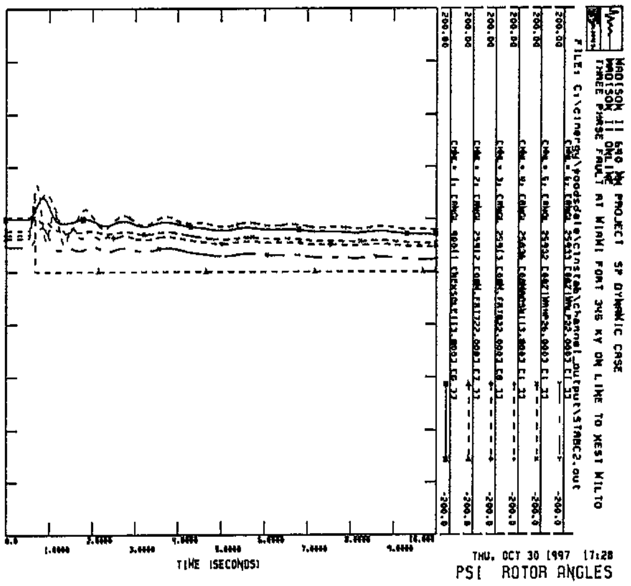

MADISON II 640 MW PROJECT SP DYNAMIC CASE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO TERMINAL
TIME (SECONDS)
THU, OCT 30 1997 17:20
PSI MACHINES - VTERM

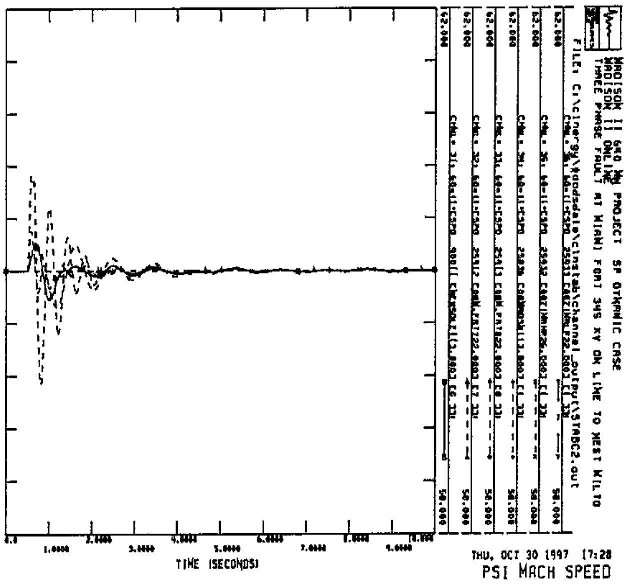

MADISON II 640 MW PROJECT SP DYNAMIC CASE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO TERMINAL
TIME (SECONDS)
THU, OCT 30 1997 17:20
PSI 345 KV BUSES

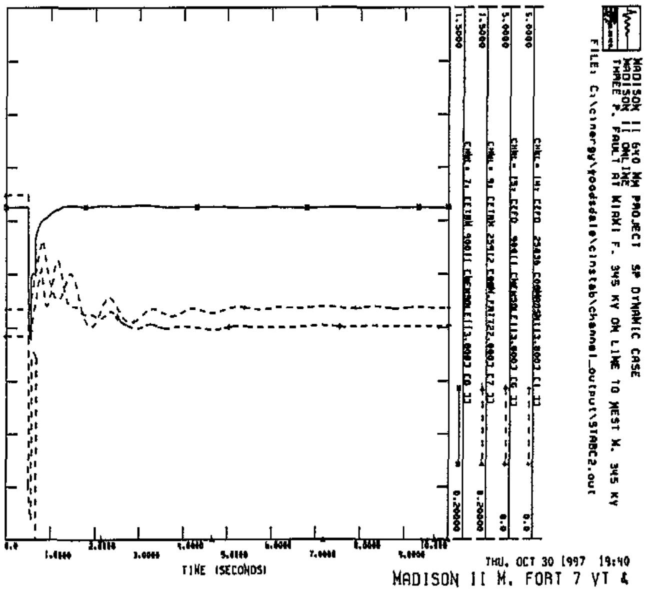

MADISON II 640 MW PROJECT SP DYNAMIC CASE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO TERMINAL
TIME (SECONDS)
THU, OCT 30 1997 17:20
PSI 345 KV LINES POWER FL

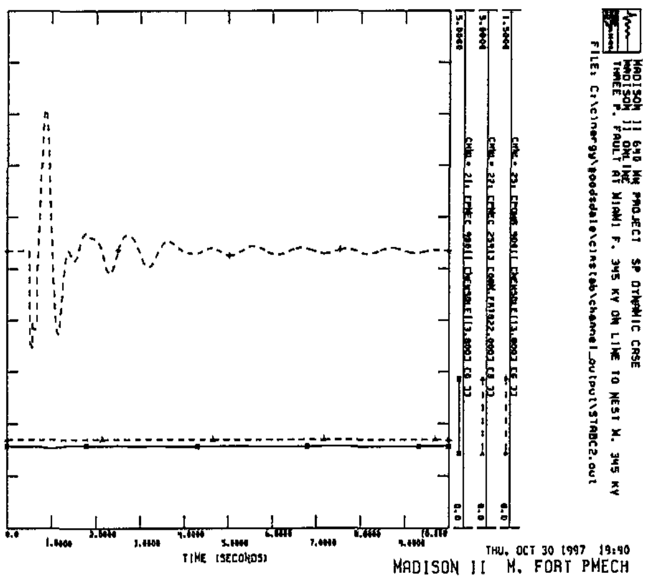
MADISON II ONLINE : SIMULATION: RUN STABC2

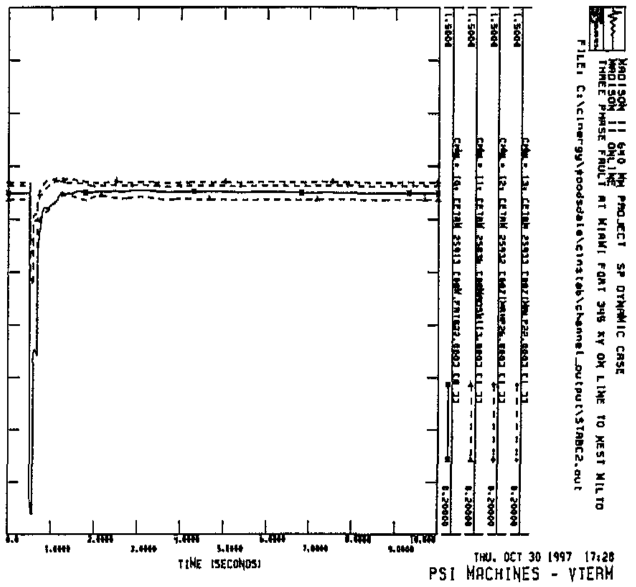
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25577 MIAMI FORT   /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25577 MIAMI FORT through ADMITTANCE 584.0 -8271.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25577 MIAMI FORT TO BUS 26661 WEST MILTON CIRCUIT 1
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
DROP GENERATOR BUS 25912 MIAMI FORT #7   /BACKUP
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```

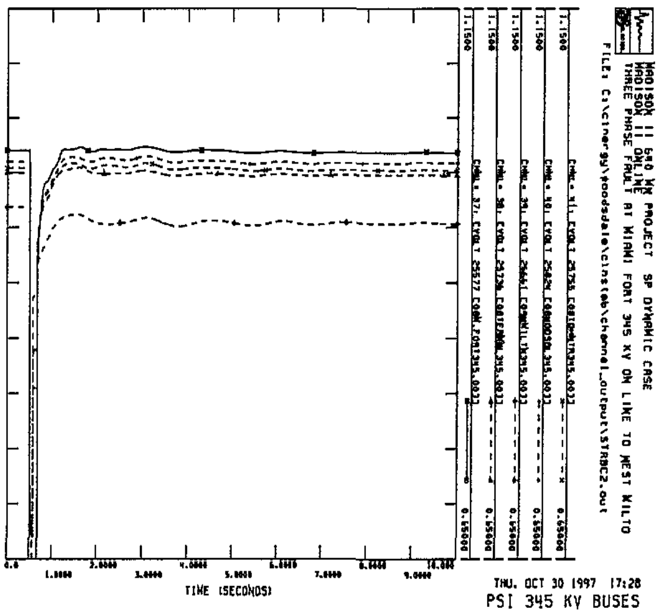

MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO WEST MILTO
FILE: C:\cinergy\woodsdale\cinstab\channel_output\STABC2.out
TIME (SECONDS)
THU, OCT 30 1997 17:28
PSI ROTOR ANGLES

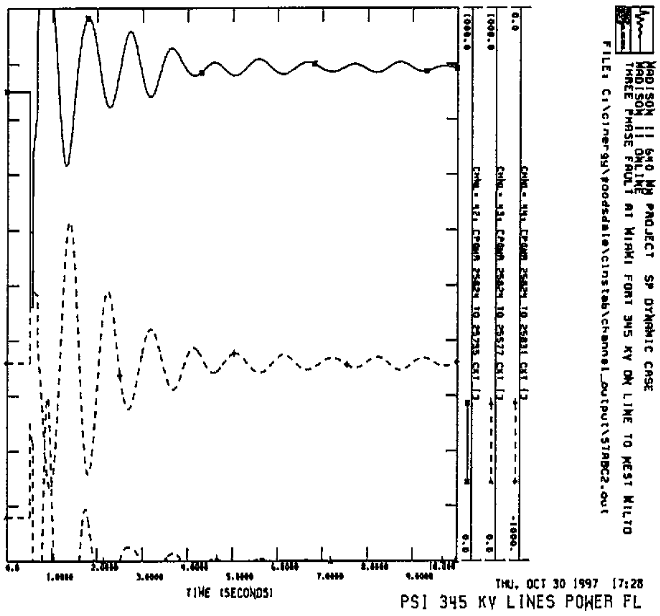

MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO WEST MILTO
FILE: C:\cinergy\woodsdale\cinstab\channel_output\STABC2.out
TIME (SECONDS)
THU, OCT 30 1997 17:28
PSI MACH SPEED


TIME (SECONDS)
THU, OCT 30 1997 19:40
MADISON II M. FORT 7 VT 4


TIME (SECONDS)
THU, OCT 30 1997 19:40
MADISON II M. FORT PMECH

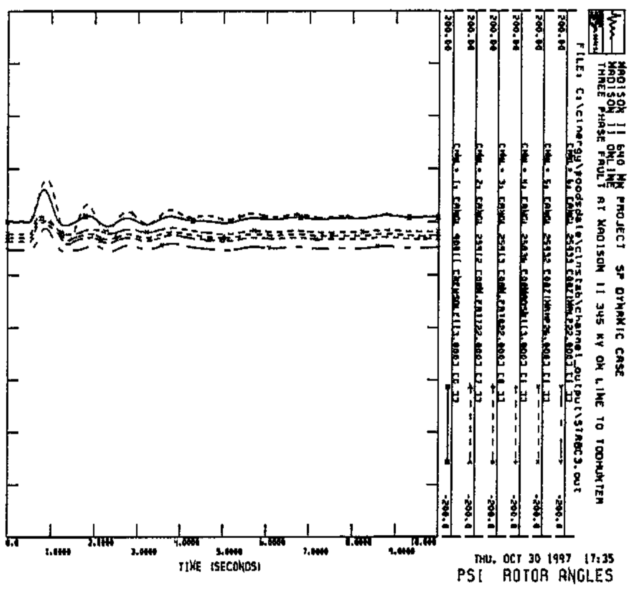

MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO WEST MILTO
FILE: C:\cinergy\woodsdale\cinstab\channel_output\STABC2.out
TIME (SECONDS)
THU, OCT 30 1997 17:28
PSI MACHINES - VTERM

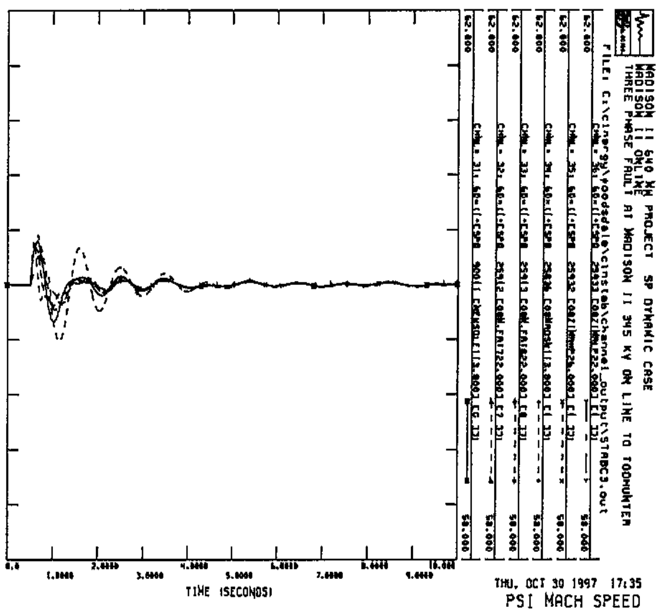

MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO WEST MILTO
FILE: C:\cinergy\woodsdale\cinstab\channel_output\STABC2.out
TIME (SECONDS)
THU, OCT 30 1997 17:28
PSI 345 KV BUSES


MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE PHASE FAULT AT MIAMI FORT 345 KV ON LINE TO WEST MILTO
FILE: C:\cinergy\goodsdale\cinstab\channel_output\STABC2.out
TIME (SECONDS)
THU, OCT 30 1997 17:28
PSI 345 KV LINES POWER FL

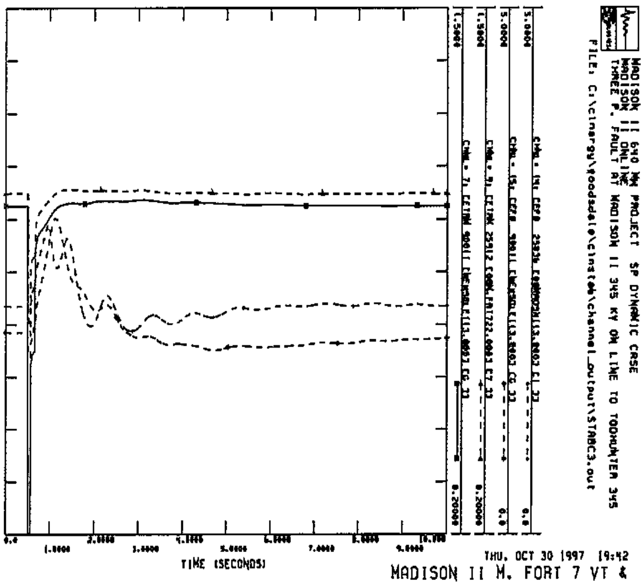
MADISON II ONLINE : SIMULATION: RUN STABC3

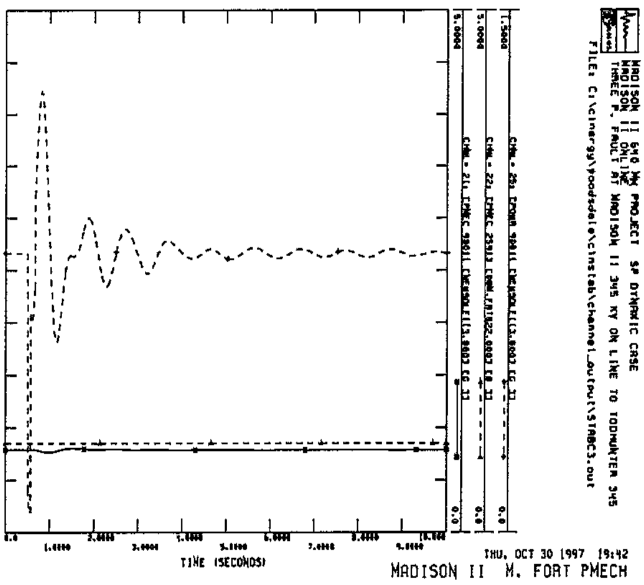
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25824 WOODSDALE  /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25824 WOODSDALE through ADMITTANCE 702.0 -8570.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25824 WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2 /BACKUP
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



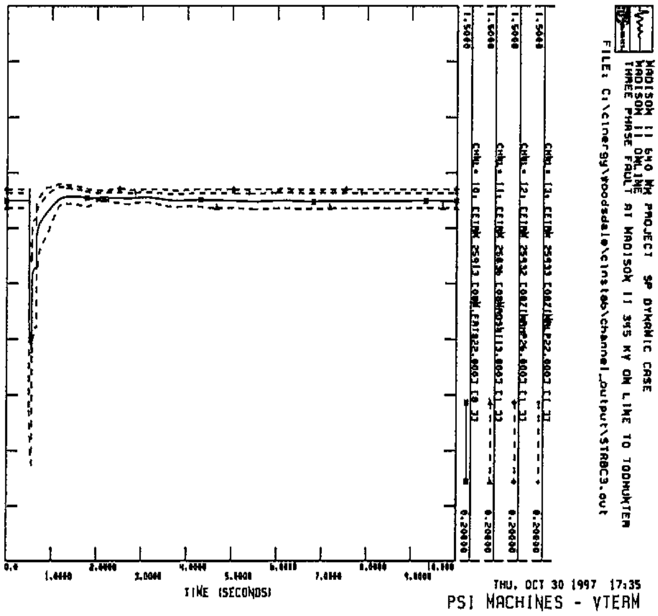


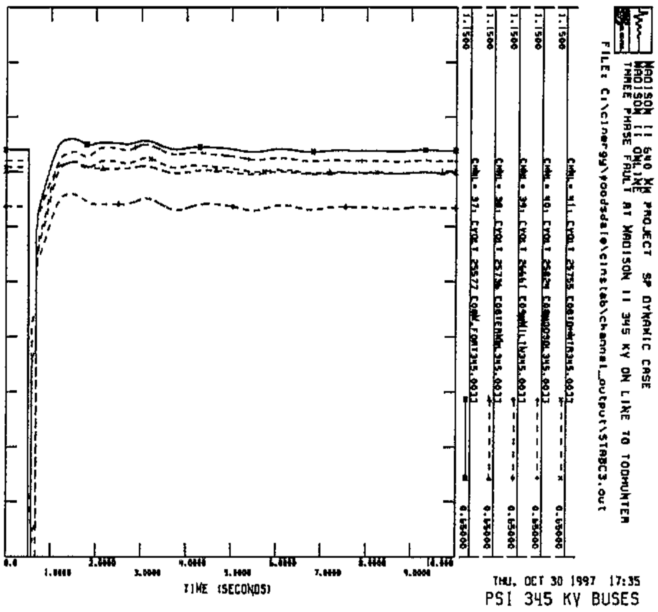
RUN STABC3 PLOT 1



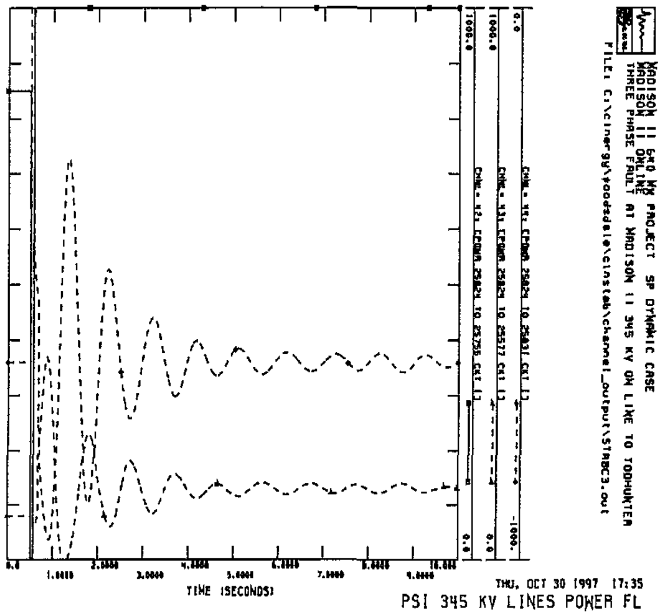


RUN STABC3 PLOT 2



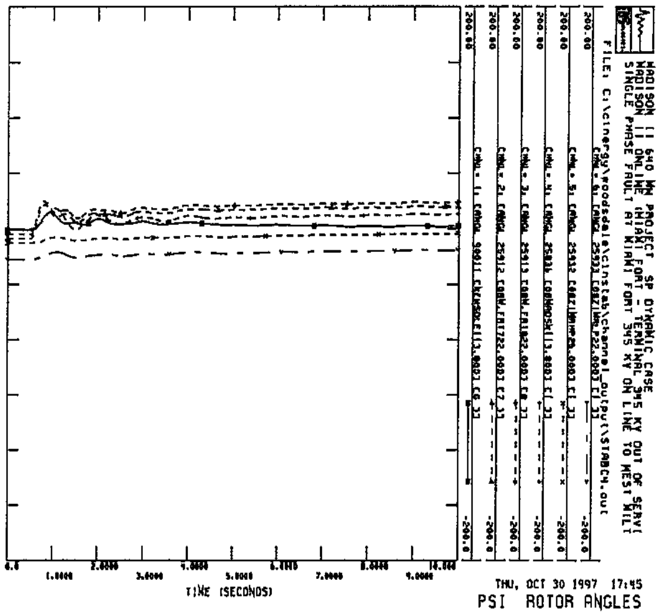


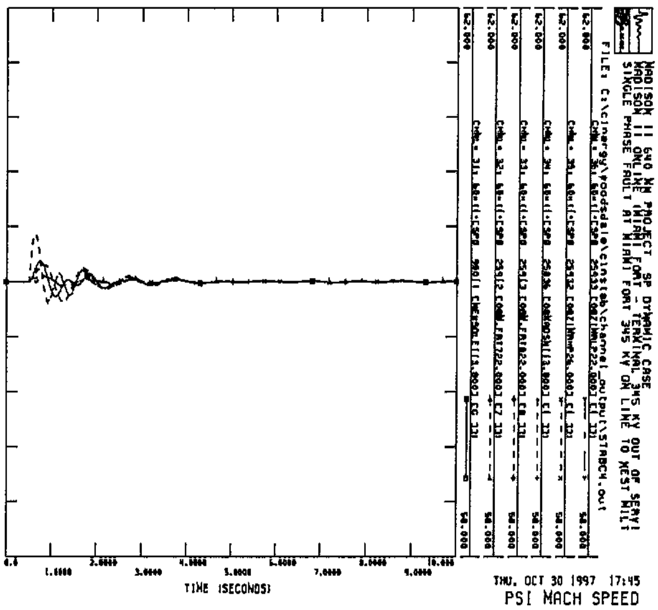
RUN STABC3 PLOT 3


MADISON II 640 MW PROJECT SP DYNAMIC CASE
MADISON II ONLINE
THREE PHASE FAULT AT MADISON II 345 KV ON LINE TO TODHUNTER
FILE: C:\cinergy\woodsdale\cinstab\channel_output\STABC3.out
0.0
-1000.
1000.0
0.0
1000.0
0.0
TIME (SECONDS)
THU, OCT 30 1997 17:35
PSI 345 KV LINES POWER FL

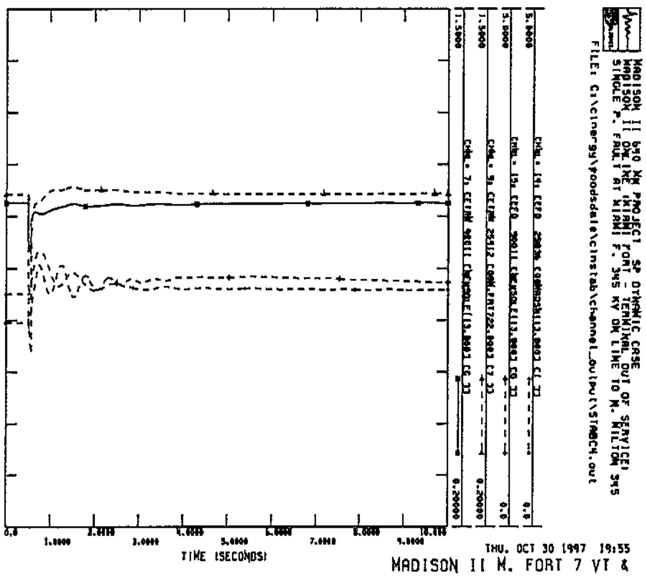
MADISON II ONLINE : SIMULATION: RUN STABC4

```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/MAIMI FORT-TERMINAL OUT OF SERVICE
APPLY FAULT AT BUS 25577 MIAMI FORT through ADMITTANCE 584.0 -8271.0 MVA
/SINGLE PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25577 MIAMI FORT TO BUS 26661 WEST MILTON CIRCUIT 1
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```

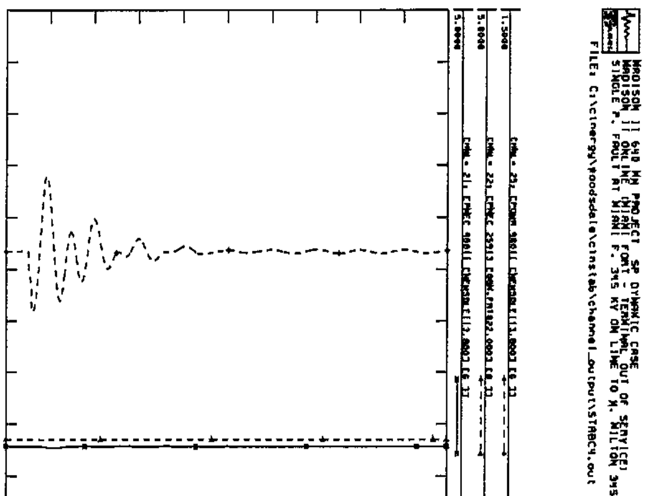




RUN STABC4 PLOT 1

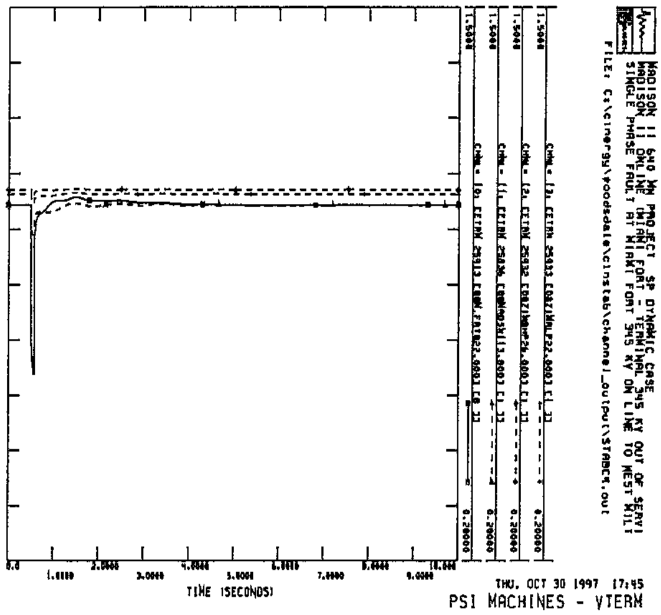


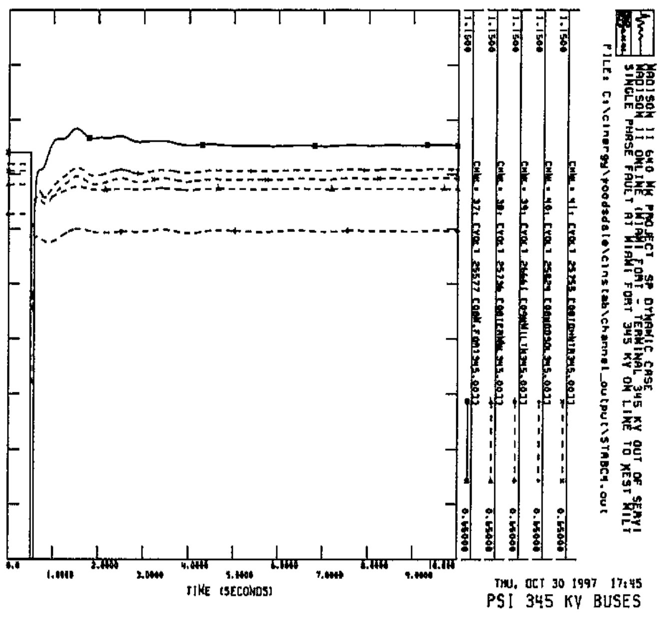
MADISON II M. FORT 7 VT &



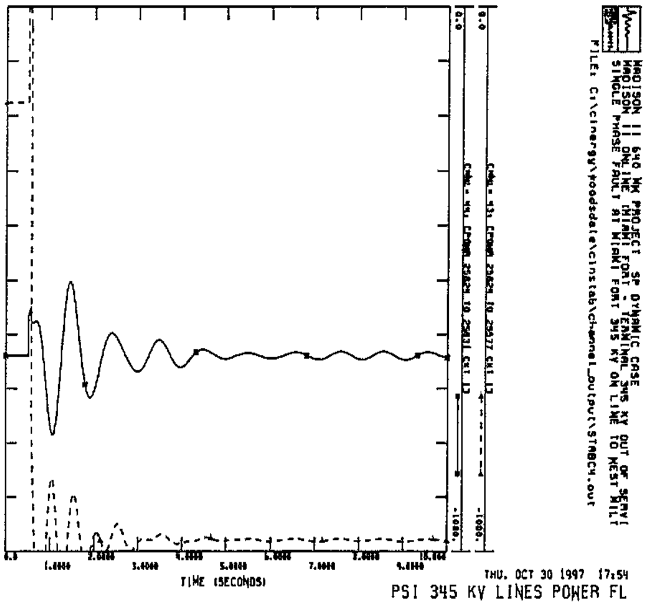
MADISON II M. FORT PMECH

RUN STABC4 PLOT 2





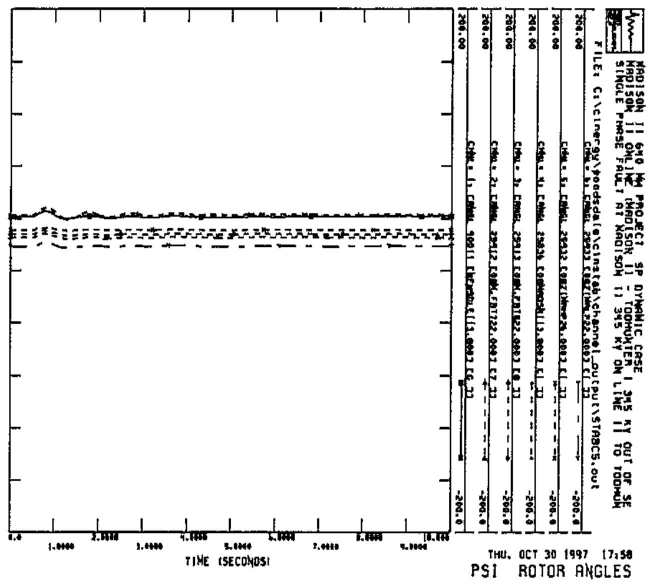
RUN STABC4 PLOT 3

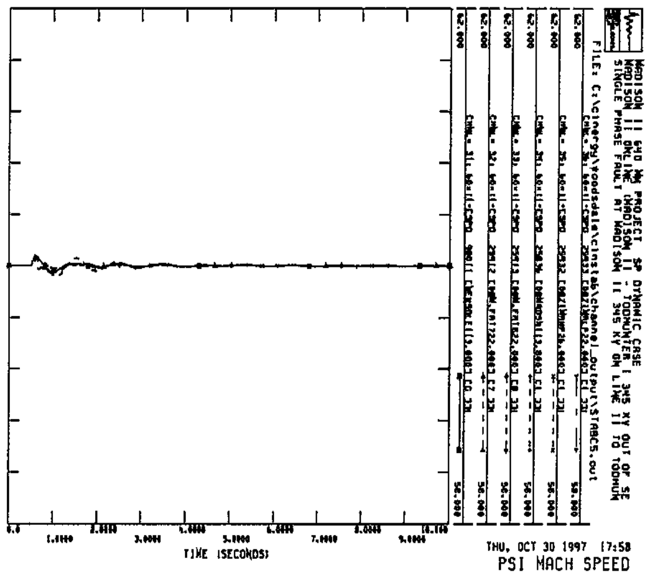


RUN STABC4 PLOT 4

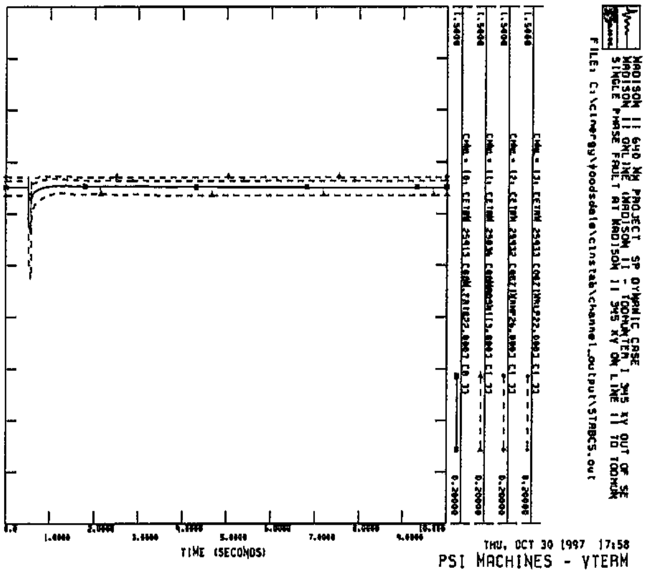
MADISON II ONLINE : SIMULATION: RUN STABC5

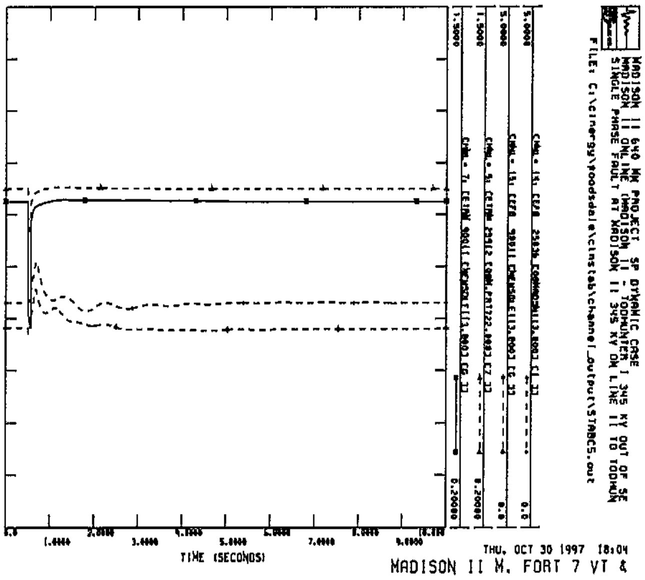
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/WOODSDALE-TODHUNTER CIRCUIT 1 345 KV OUT OF SERVICE
APPLY FAULT AT BUS 25824 WOODSDALE through ADMITTANCE 702.0 -8570.0 MVA
/SINGLE PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25824 WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



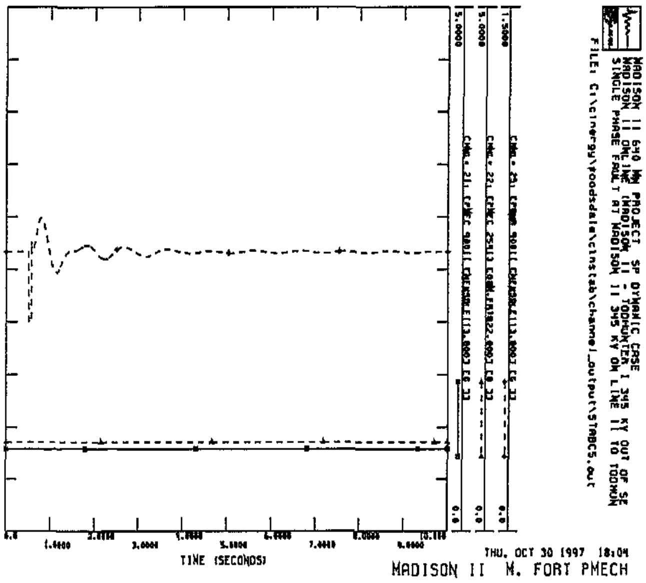


RUN STABC5 PLOT 1

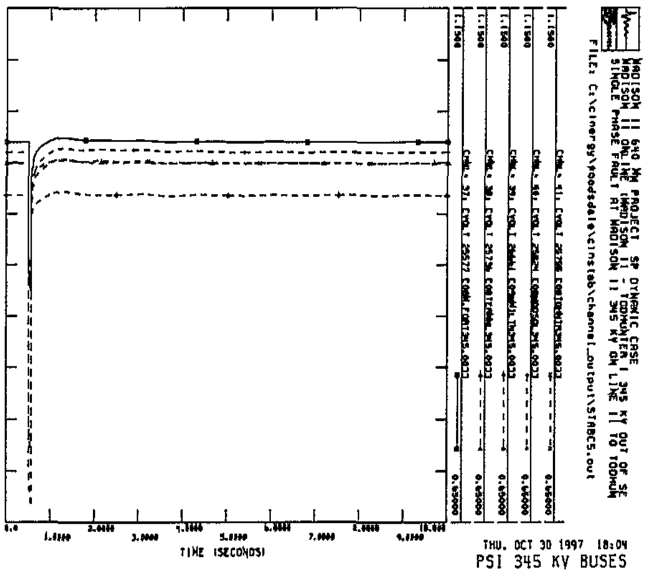




RUN STABC5 PLOT 2

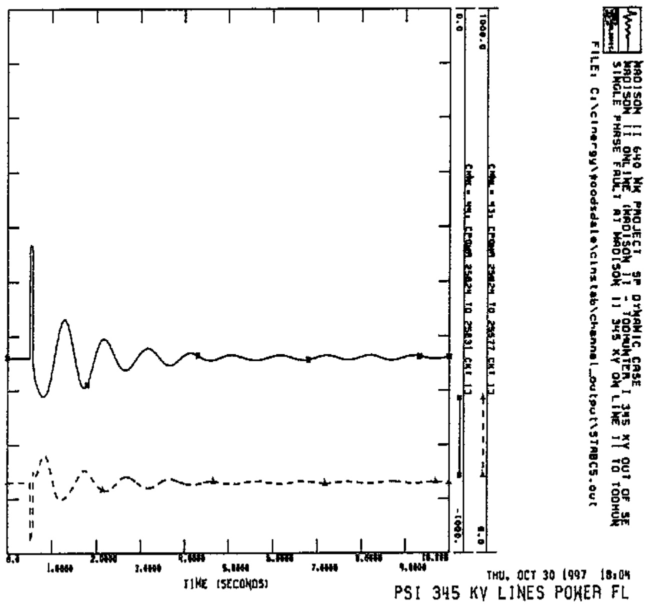


MADISON II M. FORT PMECH



PSI 345 KV BUSES

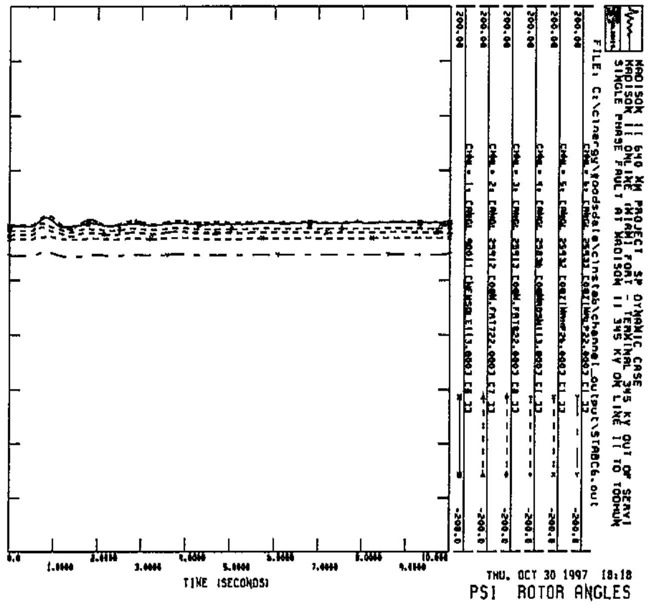
RUN STABC5 PLOT 3

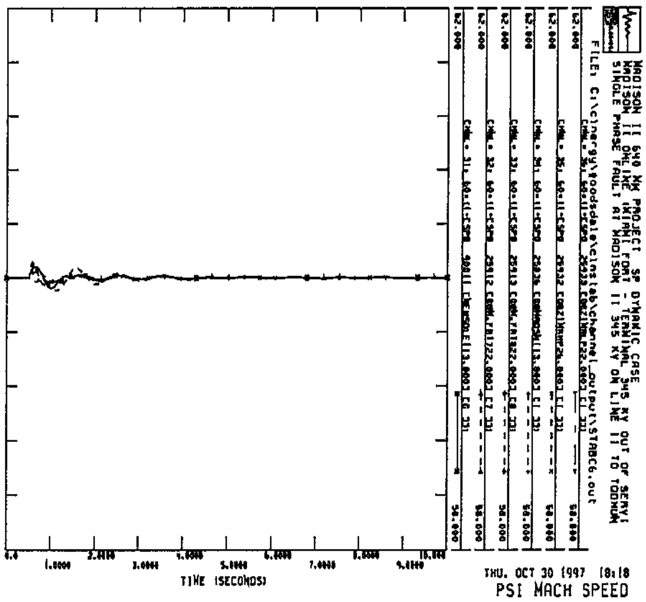


RUN STABC5 PLOT 4

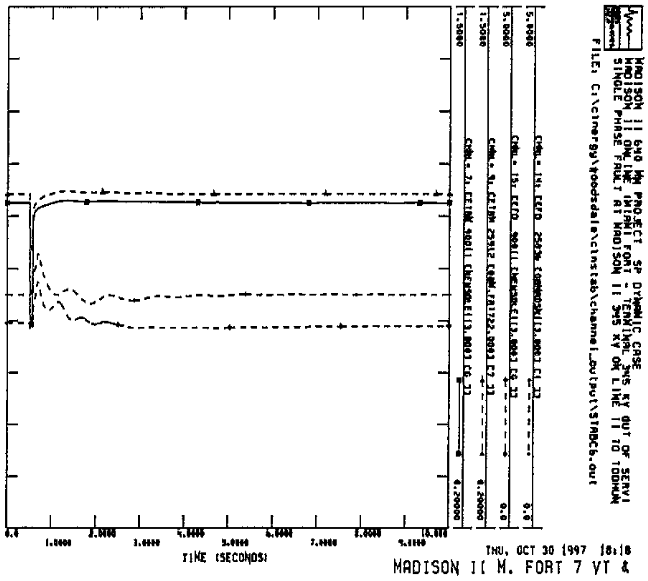
MADISON II ONLINE : SIMULATION: RUN STABC6

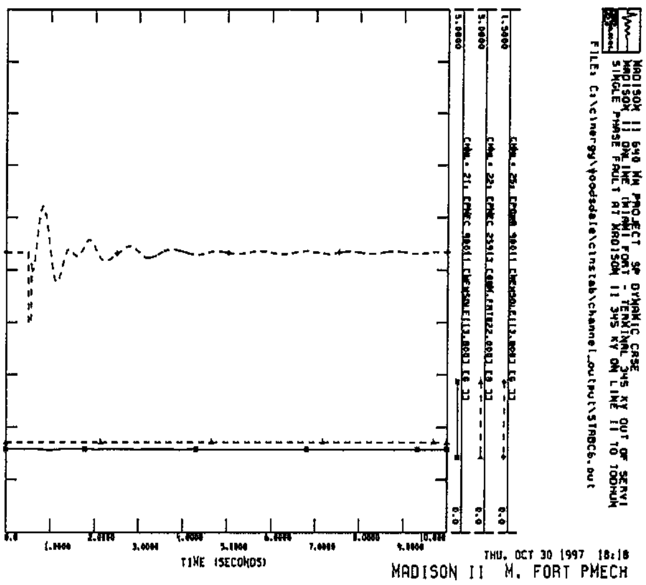
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/MIAMI FORT-TERMINAL 345 KV OUT OF SERVICE
APPLY FAULT AT BUS 25824 WOODSDALE through ADMITTANCE 702.0 -8570.0 MVA
/SINGLE PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25824 WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



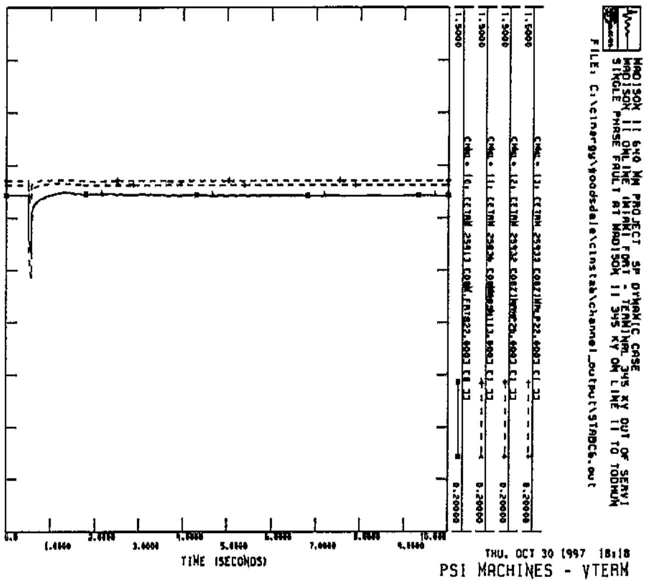


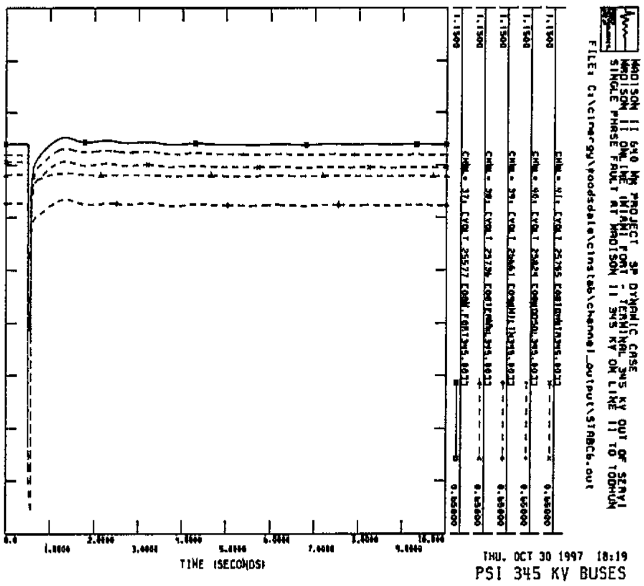
RUN STABC6 PLOT 1



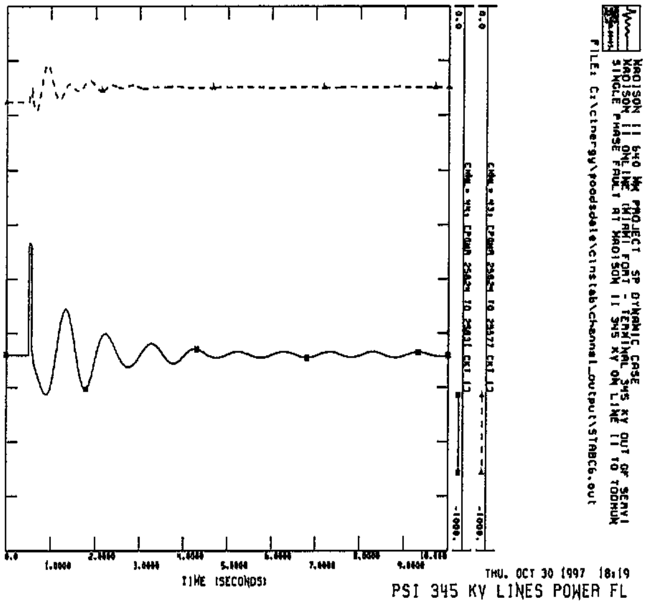


RUN STABC6 PLOT 2





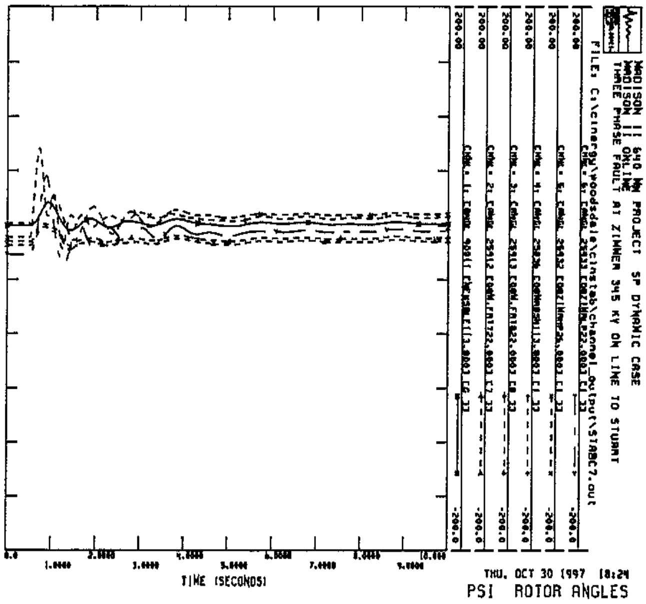
RUN STABC6 PLOT 3

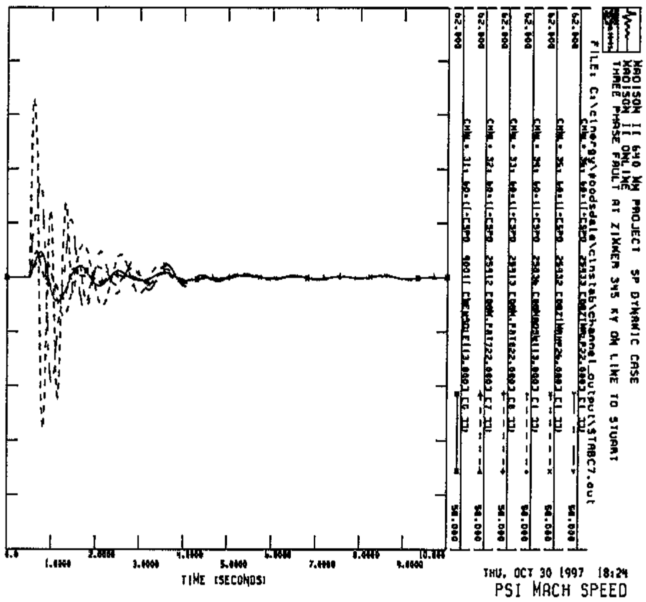


RUN STABC6 PLOT 4

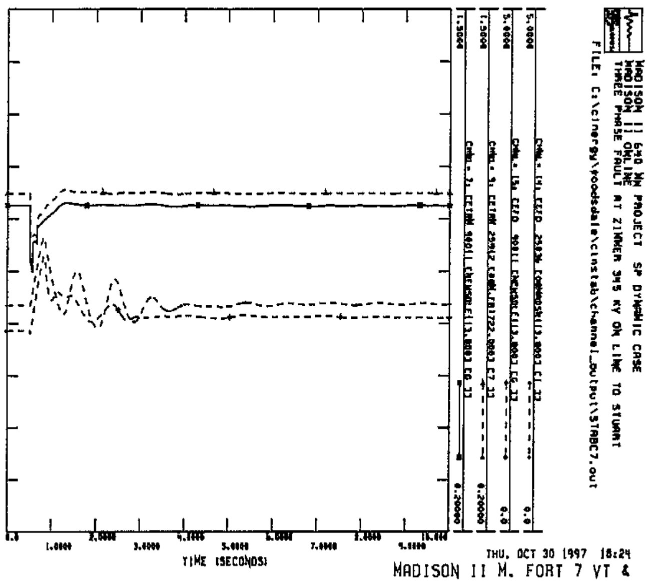
MADISON II ONLINE : SIMULATION: RUN STABC7

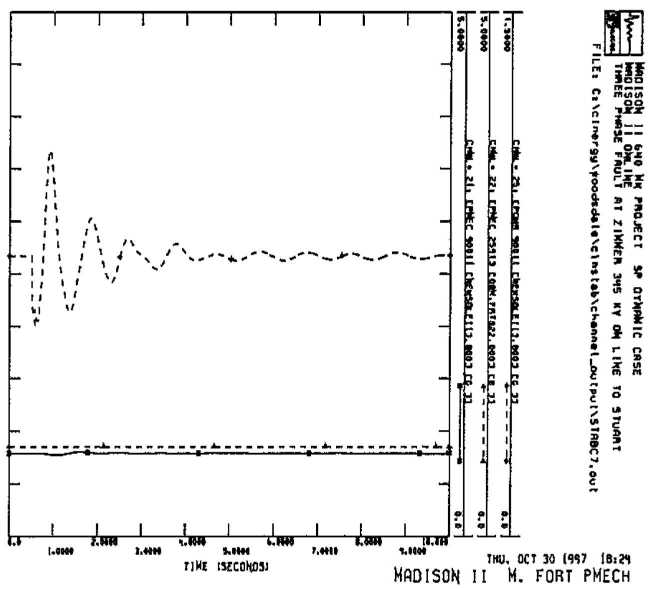
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
APPLY FAULT AT BUS 25830 ZIMMER  /3 PHASE FAULT
RUN FOR 3.75 CYCLES PRINT 0 PLOT 1
CLEAR FAULT
APPLY FAULT AT BUS 25830 ZIMMER through ADMITTANCE 564.0 -9156.0 MVA
/STUCK BREAKER
TRIP LINE FROM BUS 25830 ZIMMER TO BUS 26648 STUART CIRCUIT 1
RUN FOR 6.0 CYCLES PRINT 0 PLOT 1
TRIP LINE FROM BUS 25830 ZIMMER BUS 25692 S.GROVE CIRCUIT 1  /BACK UP
CLEAR FAULT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



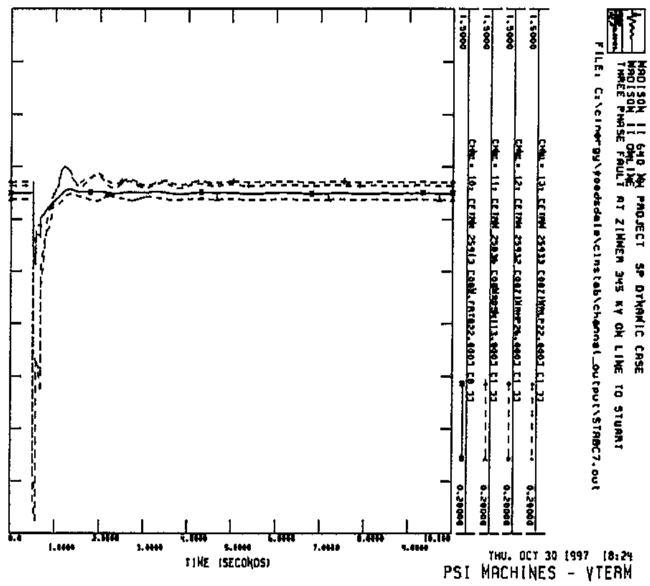


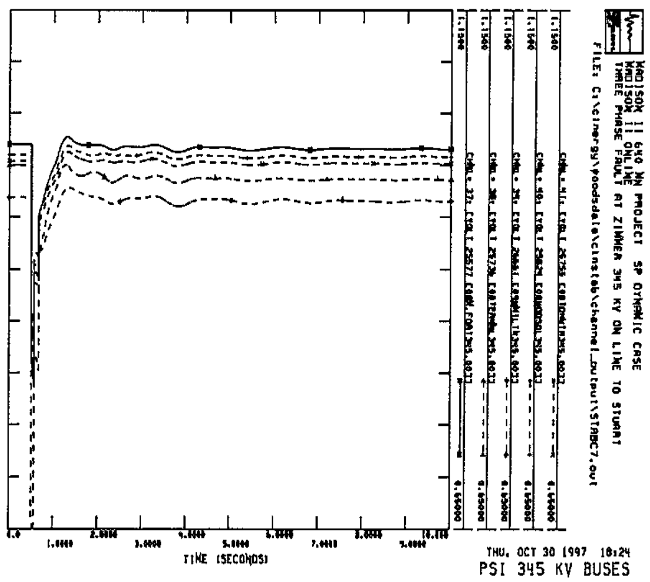
RUN STABC7 PLOT 1



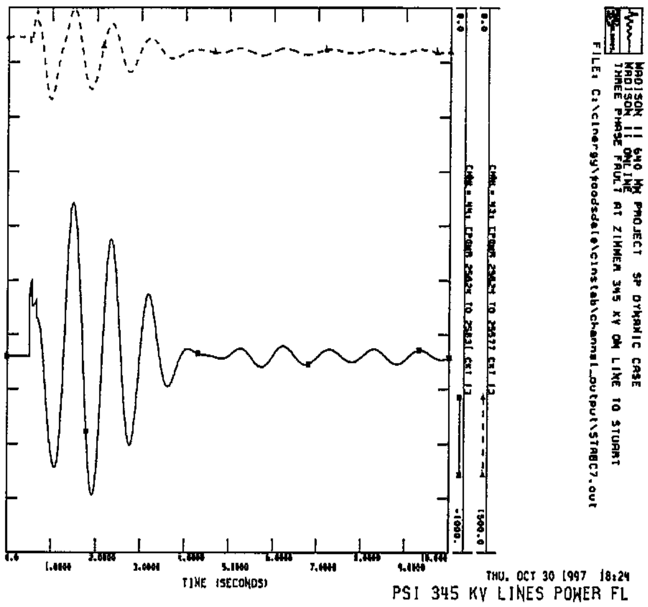


RUN STABC7 PLOT 2





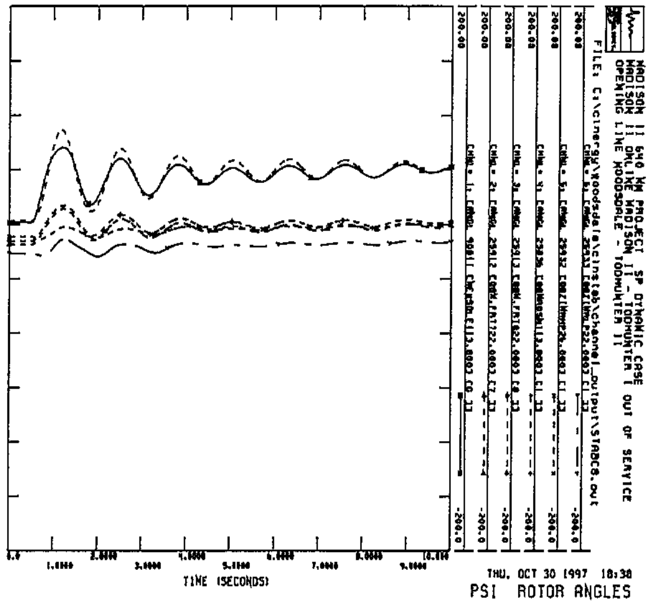
RUN STABC7 PLOT 3

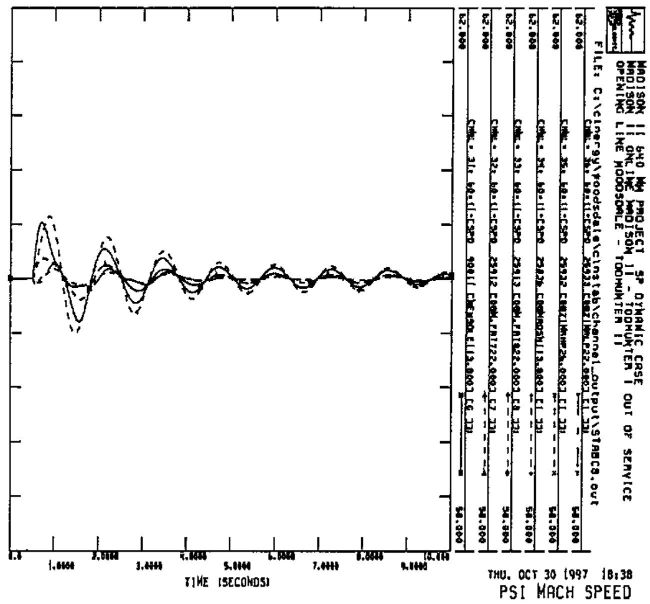


RUN STABC7 PLOT 4

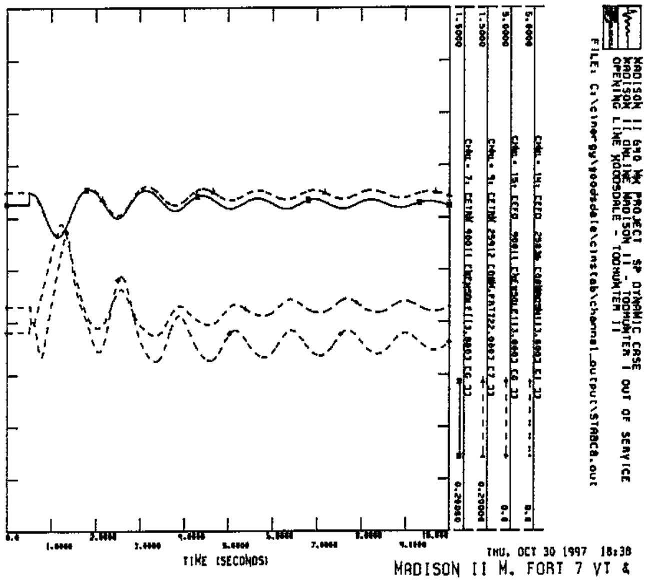
WOODSDALE ONLINE : SIMULATION: RUN STABC8

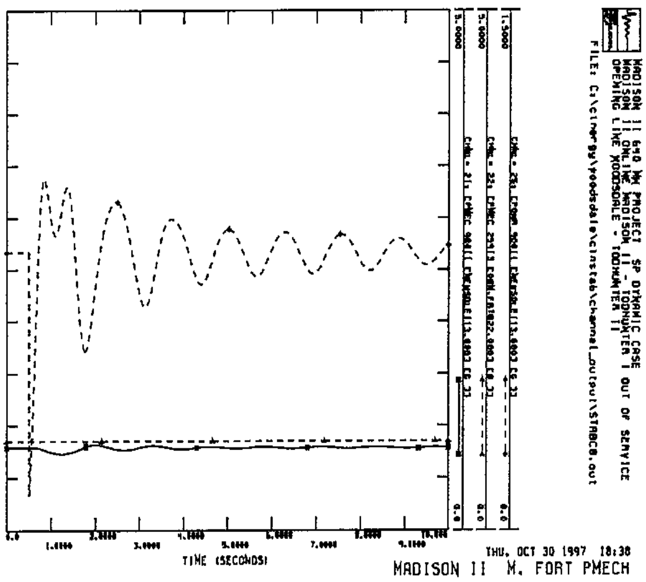
```
RUN TO .5 SECONDS PRINT 0 PLOT 1
/WOODSDALE -TODHUNTER OUT OF SERVICE
TRIP LINE FROM BUS 25824 WOODSDALE TO BUS 25755 TODHUNTER CIRCUIT 2
/OPEN CIRCUIT
RUN TO 5 SECONDS PRINT 0 PLOT 3
RUN TO 10 SECONDS PRINT 0 PLOT 7
END
```



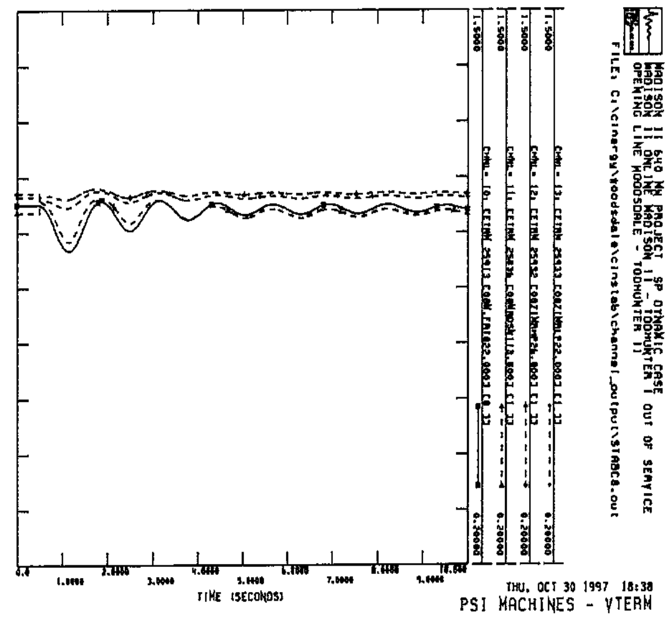


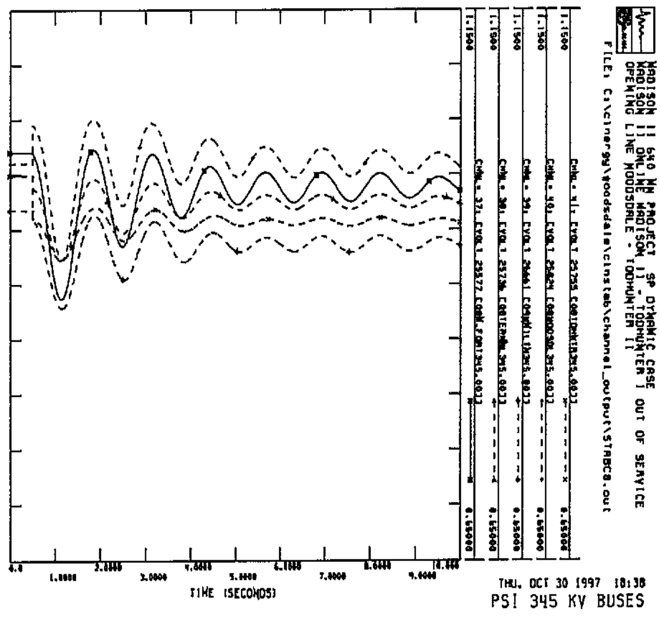
RUN STABC8 PLOT 1



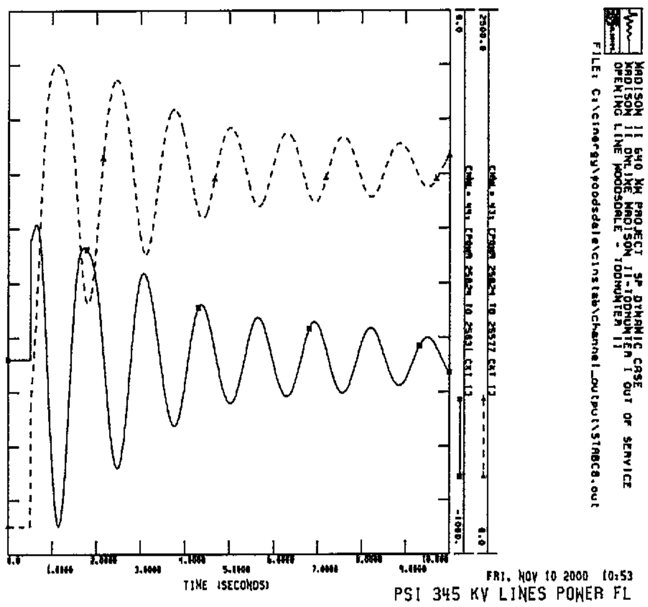


RUN STABC8 PLOT 2





RUN STABC8 PLOT 3


TIME (SECONDS)
FRI, NOV 10 2000 10:53
PSI 345 KV LINES POWER FL