Montana-Dakotas Regional Study
East Side (MAPP) Studies
Phase 2

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SUMMARY

Western Area Power Administration was directed to conduct a study pursuant to the following language in House Report 107-148, the Conference Report for the Supplemental Appropriation Act, 2001, Pub. L. 107-20:

"Non-reimbursable funding of $250,000 is provided to conduct a planning study of transmission expansion options and projected costs in Western's Upper Great Plains Region (UGPR). Existing Western transmission capacity is insufficient to support the development of known energy resources that could support new electric generation capacity in the Upper Great Plains Region. The directed study will require assumptions as to future generation locations. Western is directed to solicit suggestions from interested parties for the sites that should be studied as potential locations for new generation and to consult with such parties before conducting the study. Western is directed to produce an objective evaluation of options that may be used by all interested parties."

Additionally, House Report 107-258, the Conference Report for the Energy and Water Development Appropriations Act 2002, Public Law 107-66, states: "Within the amount appropriated, not less than $200,000 shall be provided for the Western Area Power Administration to conduct a technical analysis of the costs and feasibility of transmission expansion methods and technologies. These funds shall be non-reimbursable. Western shall publish a study by July 31, 2002 that contains a recommendation of the most cost-effective methods and technologies to enhance electricity transmission from lignite and wind energy. "

In order to fulfill the requirements of the above-referenced Congressional direction, Western conducted a public workshop on October 19, 2001, and also accepted written comments. Based on the Congressional directive and input from all interested parties, a detailed study scope was formulated. By using funds appropriated in Fiscal Year 2001, and some of Fiscal Year 2002, Western was able to expand the study scope.

The UGPR East Side studies were divided into two phases, Phase 1 and Phase 2 (reported here), and were conducted under contract with ABB Inc. A companion report by Peak Power Engineering Inc. summarizes results from UGPR West Side Studies (Montana Transmission Study). A second companion report (Transmission Enhancement Technology Report) by SSR Engineers, Inc. contains a review of the methods and technologies to enhance electricity transmission from lignite and wind energy that Western has considered through various research projects.

This report documents results for Phase 2 of the Western Area Power Administration Upper Great Plains Region "Montana - Dakotas Regional Transmission Study - East Side" (UGPR Transmission Study - East Side). Phase 1 of the East Side portion of the studies identified transmission reinforcements or other power system upgrades necessary to accommodate a new 1000 MW generation development in North or South

Dakota, and transmit its power to the Minneapolis/St. Paul, MN area (Twin Cities). In these Phase 2 East Side analyses transfers of power from the same 1000 MW of generation in the Dakotas are investigated, but the assumption is that this new generation is destined for Eastern Wisconsin and Iowa/Illinois markets instead of the Twin Cities markets assumed in the Phase 1 studies.

The studies were conducted on a group of representative alternatives selected among the scenarios developed in the Phase 1 analyses. These alternatives were redispatched to reflect transfers to Eastern Wisconsin and Iowa/Illinois, and performance with and without additional reinforcements was investigated.

The results show that if the 1000 MW of new generation in the Dakotas is transmitted to the Eastern Wisconsin and Iowa/Illinois systems instead of the Twin Cities, out-bound flows East and South of the northern Mid-Continent Area Power Pool (MAPP) System are likely to increase (as expected).

East-bound flows are likely to stress the Minnesota-Wisconsin Stability Interface (MWSI), an interface that is currently limited to a maximum 1480 MW flow. The results show that, with one exception, these increased MWSI flows lead to unacceptable dynamic behavior if no additional reinforcements (i.e., reinforcements in addition to those determined in the Phase 1 Studies) are assumed.

The one exception is Site 4 (Ft. Thompson) if serving Iowa/Illinois markets, a combination that leads to marginal (although acceptable) dynamic performance without requiring additional reinforcements.

For all other Site/Dispatch combinations, further reinforcements are required in order to meet MAPP dynamic criteria. The results suggest that the best reinforcement alternative for all scenarios is likely to be the construction of a new 200 miles long Prairie Island to Columbia 345 kV transmission (on top of the reinforcements determined in the Phase 1 studies); a reinforcement that leads to the best overall dynamic, thermal, and loss performances of all reinforcement alternatives. It is important to note that the system model employed in these studies already included a model of the Arrowhead-Tripoli-Weston 345 kV transmission, thus, the requirement for the Prairie Island to Columbia 345 kV reinforcement is in addition to the Arrowhead-Weston transmission.

Worth investigating too is the alternative of not constructing additional transmission lines, but instead deploying Static Var Compensators (SVCs) (or other FACTS devices) at critical stations along the MWSI Interface (Arpin and Adams 345 kV Stations in these analyses). The studies show that with this relatively low-cost alternative, with minimal right of way (ROW) and permitting concerns, dynamic performance is comparable to that with the Prairie Island to Columbia 345 kV reinforcement. The thermal and loss impacts of this alternative are however very significant, and should be investigated in detail to establish its feasibility.

As previously indicated, serving the Eastern Wisconsin and Iowa/Illinois markets will also lead to increases in South-bound flows, increases that could result in significant impacts on Southern MAPP Constrained Interfaces. Were those impacts to be of concern, other reinforcements such as the Split-Rock-Adams-Columbia 345 kV and Split Rock-Des Moines-Zion 345 kV reinforcements reviewed in these analyses could be of interest too.

With the Phase 2 reinforcements in place (in addition to those determined in Phase 1 of the UGPR Studies - see companion report) the 1000 MW of new generation would have the flexibility to access any of the Twin Cities, Eastern Wisconsin, or Iowa/Illinois markets, thus enhancing its value and ability to compete. The two-phase approach also allows the flexibility to focus first on the nearby market of the Twin Cities, and later on, if the need arises, further upgrade the system for access to Wisconsin and Iowa/Illinois.

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1. INTRODUCTION

This report documents results for Phase 2 of the UGPR Transmission Study - East Side. Phase 1 of the studies identified transmission reinforcements or other power system upgrades necessary to accommodate a new 1000 MW generation development in North or South Dakota, and transmit its power to the Twin Cities. In these Phase 2 analyses transfers of power from the same 1000 MW of generation in the Dakotas are investigated, but the assumption is that this new generation is destined for Eastern Wisconsin and Iowa/Illinois markets instead of the Twin Cities markets assumed in the Phase 1 studies.

The studies were conducted on a group of representative alternatives selected among the scenarios developed in the Phase 1 analyses. These alternatives were redispatched to reflect transfers to Eastern Wisconsin and Iowa/Illinois, and performance with and without additional reinforcements was investigated.

The following reinforcements were considered:

- Split Rock - Des Moines 345 kV line (Reinforcement "B")
- Split Rock - Adams - Columbia double-circuit 345 kV line (Reinforcement "C")
- Split Rock - Des Moines - Zion 345 kV line (Reinforcement "D")
- Prairie Island - Columbia 345 kV line (Reinforcement "E")

As in the Phase 1 analyses, five generation sites were investigated in these Phase 2 studies:

Site 1 (Hettinger) - 500 MW coal and 500 MW of wind generation centered around Hettinger, ND, with power transfers to Eastern Wisconsin and Iowa/Illinois.
Site 2 (Jamestown) - 1000 MW of wind generation centered around Jamestown, ND, with transfers to Eastern Wisconsin.
Site 3 (Minot) - 1000 MW of wind generation centered around Minot, ND, with power transfers to Eastern Wisconsin.
Site 4 (Ft. Thompson) - 1000 MW of wind generation centered around Ft. Thompson, SD, with power transfers to Eastern Wisconsin and Iowa/Illinois.
Site 5 (Watertown) - 1000 MW of wind generation centered around Watertown, SD, with power transfers to Eastern Wisconsin and Iowa/Illinois.

The investigations included dynamic analyses, voltage stability and thermal analyses, as well as analyses of losses, and constrained interface impact studies.

The analyses were conducted with a single set of off-peak high-transfer conditions (with high simultaneous exports from North Dakota and Manitoba Hydro) that are critical due to limiting stability constraints. In subsequent studies, additional analyses should be conducted, for example, at peak load conditions. Additional issues/upgrades may be identified from those peak load studies.

It is also important to note that future system additions may affect the results from these studies. For example, since the start of these analyses, a new 200 MW HVdc tie at Rapid City, SD (scheduled to enter commercial operation in October 2003) gained approval from MAPP's Design Review Subcommittee (DRS). That converter was not modeled in these studies, and would likely impact some of the conclusions (mainly steady-state contingency results) in this report.

2. CONCLUSIONS AND RECOMMENDATIONS

This report documents results for Phase 2 of the UGPR Transmission Study - East Side. Phase 1 of the studies identified transmission reinforcements or other power system upgrades necessary to accommodate a new 1000 MW generation development in North or South Dakota, and transmit its power to the Twin Cities. In these Phase 2 analyses transfers of power from the same 1000 MW of generation in the Dakotas are investigated, but the assumption is that this new generation is destined for Eastern Wisconsin and Iowa/Illinois markets instead of the Twin Cities markets assumed in the Phase 1 studies.

The studies were conducted for each of the five sites investigated in the Phase 1 analyses:

Site 1: Hettinger
Site 2: Jamestown
Site 3: Minot
Site 4: Ft. Thompson
Site 5: Watertown

Representative transmission alternatives developed in Phase 1 for each of these five sites were redispatched to reflect transfers to Eastern Wisconsin and Iowa/Illinois, and performance with and without additional reinforcements was investigated.

The following additional reinforcements (i.e., reinforcements beyond those already developed in the Phase 1 Studies) were considered:

- Split Rock - Des Moines 345 kV line
- Split Rock - Adams - Columbia double-circuit 345 kV line
- Split Rock - Des Moines - Zion 345 kV line
- Prairie Island - Columbia 345 kV line

2.1 Phase 1 Alternatives

The following Phase 1 alternatives were selected for these Phase 2 investigations. The alternatives are illustrative of some of the key reinforcement options developed in the Phase 1 studies. Preference was also given to lower cost options, and alternatives that were more conducive to transfers with a southern "bias", with less of a focus on the Twin Cities.

2.1.1 Site 1 (Hettinger)

Two alternatives were selected for these Phase 2 analyses: S1C1XXA, and S1C5XXA. Both include a Hettinger - Belfield 345 kV circuit. In addition to this circuit, S1C1XXA includes a Hettinger-Ft.Thompson-Granite Falls-Blue Lake 345 kV path. Case S1C5XXA also includes an additional path to the Twin Cities but at 500 kV instead of

345 kV, and linking the Hettinger-Glenham-Groton-Big Stone and Blue Lake Stations instead. The cases are further described in Table 2.1.

Table 2.1
Site 1 (Hettinger) Viable Alternatives

BASE TRANSMISSION	ADDITIONAL FEATURES
345 kV Upgrades: Hettinger-Belfield 345 kV + Hettinger-Ft. Thompson 345 kV + Ft. Thompson-Blue Lake 345 kV	S1C1XXA - With SVCs @ Wind Generator Terminals
New Hettinger-Glenham-Groton-Big Stone-Blue Lake 500 kV line	S1C5XXA - With Hettinger-Belfield 345 kV + SVCs @ Wind Generator terminals

2.1.2 Site 2 (Jamestown - Table 2.2)

Alternative S2C4XX3 was pursued in these Phase 2 studies for Site 2. In this alternative the Jamestown Site is connected with two 345 kV circuits to the large amounts of existing thermal generation in the Bismarck, ND region, commonly referred to as the "Coalfields", and with two others to the Maple River Station. The Maple River Station, in turn, is connected to the Twin Cities via a 345 kV line to Granite Falls and Blue Lake, as well as a Maple River-Benton Co. 345 kV line.

The alternative includes a phase shifter at the Letellier station, controlling flows along the Drayton-Letellier 230 kV transmission. The purpose of this phase shifter is to limit the detrimental impact the new generation could have on MH-US 500 kV flows and associated dynamics. This phase shifter, however, increases flows through the Prairie area, deteriorating its reactive performance. In order to shore-up voltages switched capacitor banks at Prairie were assumed replaced with an equal-sized SVC. (Note: as indicated in the Phase 1 report, a second, additional phase shifter on the Harvey-Glenboro transmission would likely allow for better balancing of MH to US flows; such an alternative should be investigated in a further, more detailed, stage of the studies).

Table 2.2
Site 2 (Jamestown) Alternative

BASE TRANSMISSION	ADDITIONAL FEATURES
Upgrade of Bismarck-Granite Falls 345 kV + Granite Falls-Blue Lake 345 kV +Bismarck-Leland Olds 345 kV +Maple River-Moorhead 345 kV +Center-Leland Olds 345 kV +Jamestown(N)-Jamestown(S) 345 kV +Maple River - Benton Co. 345 kV	S2C4XX3 - Letellier Phase Shifter + Prairie SVC

2.1.3 Site 3 (Minot - Table 2.3)

Two alternatives were selected for these Phase 2 analyses: S3C3X2A, and S3C4X1A. Both include a Minot-Harvey-Prairie-Maple River-Benton Co. 345 kV line, as well as a 345 kV line from Minot to the Coalfields. In addition to that base transmission, Case S3C3X2A includes a Prairie-Duluth 345 kV circuit, whereas Case S3C4X1A assumes the upgrade to 500 kV and extension to Split Rock of the Antelope Valley to Huron 345 kV circuit, as well as a new Split Rock to Lakefield Junction 345 kV line.

Table 2.3
Site 3 (Minot) Alternatives

BASE TRANSMISSION	ADDITIONAL FEATURES
Minot-Harvey 345 kV + Minot-Leland Olds 345 kV. +Harvey-Prairie-Maple River-Benton Co. 345 kV +Center-Leland Olds 345 kV + Prairie SVC +SVCs at Wind Generation Terminals	S3C3X2A - Prairie-Duluth 345 kV
	S3C4X1A - Antelope Valley-Split Rock 500 kV + S. Rock-Lakefield Junction 345 kV

2.1.4 Site 4 (Ft. Thompson - Table 2.4)

Two alternatives were selected for Site 4: S4C4XXA, and S4C5XXA. Both of these alternatives include an upgraded Ft. Thompson-Sioux Falls 345 kV circuit and a new Split Rock to Lakefield Junction 345 kV circuit. They also include a Ft. Thompson-Huron 345 kV circuit. At Huron, however, S4C4XXA assumes a new 345 kV line to Split Rock, whereas S4C5XXA assumes the upgrade to 345 kV of one of the two 230 kV Huron-Watertown-Granite Falls 230 kV circuits, and a new Granite Falls-Blue Lake 345 kV circuit.

Table 2.4
Site 4 (Ft. Thompson) Alternatives

BASE TRANSMISSION	ADDITIONAL FEATURES
Ft. Thompson-Huron 345 kV Upgrade + Huron-Split Rock 345 kV +Split Rock-Lakefield Junction 345 kV + SVC at Wind Generation Terminals	S4C4XXA - Ft. Thompson-Sioux Falls 345 kV Upgrade
Ft. Thompson-Granite Falls 345 kV Upgrade + Granite Falls-Blue Lake 345 kV + SVC at Wind Generation Terminals	S4C5XXA - Ft. Thompson-Sioux Falls 345 kV Upgrade + Split Rock-Lakefield Junction 345 kV

2.1.5 Site 5 (Watertown - Table 2.5)

The selected Site 5 alternative is S5C3XXX, which assumes the upgrade to 345 kV of one of the two 230 kV Watertown-Granite Falls lines, as well as a new Granite Falls-Blue Lake 345 kV circuit. Also included in this alternative is an upgraded Watertown-Huron 345 kV line, as well as a new Huron-Split Rock-Lakefield Junction 345 kV circuit.

Table 2.5
Summary of Site 5 (Watertown) Selected Alternatives

BASE TRANSMISSION	ADDITIONAL FEATURES
Watertown-Granite Falls 345 kV Upgrade + Granite Falls-Blue Lake 345 kV	S5C3XXX - Watertown-Huron 345 kV Upgrade + Huron-Split Rock 345 kV + Split Rock-Lakefield Junction 345 kV

2.2 Dynamic Analyses

Because of long distances and limited transmission resources, the Northern MAPP System is constrained by several stability-limited interfaces. The three most critical are:

- The North Dakota Export (NDEX) Interface
- The Manitoba Hydro to US (MHEX) Interface
- The Minnesota-Wisconsin Stability Interface (MWSI)

Significant effort was invested in the Phase 1 studies to make sure the new generation would not be detrimental to the performance of the NDEX and MHEX interfaces; a consideration that led to several of the upgrades developed in those studies. In these Phase 2 studies, however, because they build on Phase 1 results, performance of the NDEX and MHEX Interfaces was less of a concern (i.e., it was assumed resolved by the Phase 1 studies). Instead, because in order to serve Eastern Wisconsin and Iowa/Illinois markets it is almost inevitable that additional power will have to flow through the MWSI Interface, the performance of this latter interface became central to these analyses

Consequently, contingencies affecting the MWSI interface, and the Twin Cities in general, were utilized as the first means for selecting a subset of Dispatch/Reinforcement combinations for further, more detailed analyses. The studies were conducted for combinations of:

- The above-described Phase 1 Alternatives.
- Eastern Wisconsin and Iowa/Illinois dispatches.
- Without and With additional reinforcements (i.e., reinforcements in addition to those developed for the Phase 1 analyses).

The results are summarized in Table 2.6, and are categorized as:

- Not Meeting MAPP Dynamic Criteria
- Marginally Meeting Criteria
- Meeting MAPP Criteria

The MAPP criteria being violated is primarily that of minimum damping requirements following contingencies affecting the MWSI Interface (i.e., contingencies leading to the outage of either the Prairie Island-Byron 345 kV line, or of the King-Eau Claire-Arpin 345 kV line). Alternatives not meeting criteria lead to either ever-increasing oscillations and, ultimately, to system breakup, or to oscillations that take an excessive time to damp-out thus potentially affecting system operation and security. The studies also show that these same alternatives could also lead to violations of voltage stability criteria, and thus to potential voltage instability (i.e., a steady, uncontrolled, decline of voltages), and/or voltage collapse. Other potential regional projects may be planned to improve the damping of the MAPP 0.25Hz mode of oscillation (e.g. potential damping of the existing Forbes SVC), but these were not assumed in this analysis.

The results show that of the four reinforcement alternatives studied, Reinforcement "E" (Prairie Island-Columbia 345 kV) is by far the superior one, and would lead to acceptable performances irregardless of dispatch, generation siting, and Phase 1 reinforcement assumptions.

Second in impact on dynamic performance is the siting of the new generation. The results indicate that, of the five sites studied (Hettinger, Jamestown, Minot, Ft. Thompson, and Watertown), Ft. Thompson is the most beneficial in terms of MWSI dynamic performance.

Less important, but still affecting dynamic performance, are the dispatch assumptions (an "Iowa/Illinois" dispatch leads to a better performance than an "Eastern Wisconsin" one) and Phase 1 alternative selection (alternatives emphasizing flows towards Split Rock fare better than those focused on transfers towards the Twin Cities).

Two more cases were investigated. They were based on the Site 2 S2C4XX3 Case, an Eastern Wisconsin dispatch, and no Phase 2 Reinforcements. As shown in Table 2.6, that combination is unstable. Studies were conducted to determine whether application of SVCs would lead to stable solutions. Two such potential SVC solutions were derived:

- Case S2C4WB3 includes a -100/+300 Mvar SVC at the 345 kV Red Rock Station.
- Case S2C4WD3 includes a 0/+400 SVC at the Arpin 345 kV Station, and another 0/+400 SVC at the Adams 345 kV Station.

The results show that the 1-SVC Case S2C4WB3 leads to marginally-stable performances, but that dynamic performance in the 2-SVC Case S2C4WD3 is well

within criteria, particularly if the SVCs are furnished with stabilizing signals (as demonstrated in the analyses reported in Section 4.5.1).

2.3 Selected Alternatives

All of the alternatives labeled as marginally meeting or meeting criteria in Table 2.6 are valid Phase 2 Alternatives. A subset of those alternatives (the non-SVC ones are identified in bold in Table 2.6) was selected for further in-depth analyses. They were:

- S1C1IXE. Site 1 (Hettinger) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of Site 1, as well as of the benefits from such a reinforcement.
- S2C4WXE. Site 2 (Jamestown) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of the benefits from such a reinforcement.
- S2C4WD3. Site 2 (Jamestown) alternative with no Phase 2 reinforcements but for the deployment of SVCs and fixed shunt compensations at the Arpin and Adams 345 kV Stations. Output of the SVCs is modulated by appropriate damping signals to enhance their contribution to system damping. This alternative is representative of FACTS alternatives without transmission reinforcements.
- S3C3W2E. Site 3 (Minot) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of Site 3, and of the benefits from such a reinforcement.
- S4C4IXA. Site 4 (Ft. Thompson) alternative with no Phase 2 reinforcements. This marginal alternative (both from a dynamics and a voltage stability point of view) investigates the additional flexibility in Site 4 of not adding any upgrade whatsoever to Phase 1 alternatives.
- S4C5WXD. Site 4 (Ft. Thompson) alternative with a Split Rock-Des Moines-Zion Reinforcement. This marginal alternative (both from dynamics and voltage stability points of view) investigates the benefits from such a reinforcement.
- S5C3WXE. Site 5 (Watertown) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of Site 5, as well as of the benefits from such a reinforcement.

The above alternatives were selected not because they are the best ones, but because they are representative of the choices the network planner may encounter when considering serving Eastern Wisconsin and Iowa/Illinois markets with the new generation.

2.4 Thermal Analyses

The selected alternatives were subjected to N-1 loadflow contingency analyses to investigate potential overload (thermal) limitations (more in-depth analyses should consider multi-element contingencies, such as double circuit contingencies in Western's South Dakota 230 kV transmission system). As expected, the migration of the markets for the new generation from the Twin Cities to Eastern Wisconsin and Iowa/Illinois was

shown to lead to an increase in thermal violations to the east and south of the Northern MAPP system.

The results showed that overloads on the east-side of the MAPP system are very sensitive to whether or not the Prairie Island-Columbia 345 kV reinforcement is part of the alternative. Cases without such reinforcement exhibit significant overloads on that part of the system. This is particularly true in Case S2C4WD3, where no reinforcement was considered (other than SVCs at the Arpin and Adams 345 kV stations), and which leads to a substantial number of severe overloads, particularly upon 345 kV contingencies affecting lines comprising the MWSI Interface. In contrast, east-side overloads on alternatives including a Prairie Island-Columbia reinforcement are relatively few, and less severe.

The reliance on the Prairie Island-Columbia 345 kV ("E") reinforcement is site-dependent, however, since results for Site 4 (Ft. Thompson) without any reinforcement (S4C4IXA) and with a Split Rock-Des Moines-Zion reinforcement (S4C5WXD) show east-side overloads that although higher than with "E" reinforcement cases, are not as extreme as in the Site 2 S2C4WD3 case.

2.5 Transmission Losses

Transmission losses for each of the seven selected alternatives were compared against those in Case ABBBASE.

The results suggest an increase (with respect to Phase 1) in transmission losses under all alternatives. This is expected since in Phase 2 the new generation is assumed serving loads that are more distant than in the Phase 1 case.

The highest increases (19.1%) were observed in Case S2C4WD3, which assumes no construction of new reinforcements in Phase 2 beyond those developed for Phase 1 of the studies. On the other hand, Case S4C4IXA, which also does not include additional reinforcements, displays an increase of only 11% in losses, slightly lower than the 11.6% increase experienced in Case S2C4WXE, which assumes a Prairie Island to Columbia reinforcement. The remaining four cases experience more moderate increases in transmission losses ranging from 5.3% to 7.4%.

2.6 Constrained Interface Impact Studies

The purpose of these studies was to determine the impact the new generation and associated transmission would have on constrained interfaces throughout the MAPP System. The calculated impacts presented throughout this report are based upon a Power Transfer Distribution Factor (PTDF) assumption. The definition of the flowgates and type of flowgate (PTDF or alternate Outage Transfer Distribution Factor (OTDF) should be confirmed in subsequent detailed studies as they can change and many flowgates are being converted to OTDF type. The present "significant impact" threshold for a PTDF type flowgate is 5.0%. Therefore, if the impact is greater than 5.0% on a

PTDF type flowgate and insufficient Available Transfer Capability (ATC) remains to accommodate the impact of the 1000 MW transfer, mitigation will be required.

The results are in agreement with those from other analyses in these studies regarding the impact of the alternatives on the MWSI (and related) interfaces. They also suggest a general deterioration (with respect to Phase 1 results) in impacts on the following Southern MAPP interfaces:

- Grand Island-Lincoln Interface
- Cooper-South Interface
- Fort Calhoun-South Interface

The one exception to this is Case S4C5WXD, where the Split Rock-Des Moines-Zion 345 kV reinforcement is shown to reduce (as opposed to increase) impacts on Southern MAPP interfaces. Similar benefits should be expected from the Split Rock-Adams-Columbia 345 kV reinforcement.

2.7 Cost Analyses

Capital cost estimates (2001 dollars) were developed on the basis of the Mid-Continent Area Power Pool (MAPP) Transmission Plan Cost Estimator[1] (attached) and ABB's budgetary estimates. The results are summarized in Table 2.7.

Table 2.7
Capital Costs (2001 dollars, in millions) per Reinforcement

REINFORCEMENT	LINES	STATIONS	SVCs	TOTAL
Split Rock-Des Moines 345 kV("B")	86.14	2.2	-	$88.34
Double Circuit Split Rock-Adams-Columbia 345 kV ("C")	202.13	13.63	-	$215.75
Split Rock-Des Moines-Zion 345 kV ("D")	209.18	4.1	-	$213.28
P. Island-Columbia 345 kV ("E")	78.44	1.9	-	$80.34
Split Rock-Lakefield Junction 345 kV (Site 5 Scenarios)	23.87	1.9	-	$25.77
Two 400 Mvar SVCs + Fixed Shunt Comp. @ Arpin and Adams	-	6.24	31.2	$37.44

2.8 Comparison of Alternatives

The selected alternatives are compared in Table 2.8. The following conclusions may be drawn from that table:

[1] Provided by Charles A. Tyson, MAPPCOR, May 9, 2001.

- The least-cost Phase 2 option in Table 2.8 is, of course, the no-reinforcement option that is only available for Site 4 and only when serving Iowa/Illinois markets.
- The second least-cost option of FACTS application (SVCs and fixed shunt compensation - Case S2C4WD4, $37.44 Million) is available to all sites and dispatches, but leads to serious concerns regarding thermal performance and increases in transmission losses.
- Next in cost is Reinforcement "E" (Prairie Island-Columbia 345 kV, $80.34 Million), which is also available to all Site/Dispatch combinations and leads to acceptable performances in all cases.
- Reinforcements "B", "C", and "D", are relatively expensive ($88.34 Million, $215.75 Million, and $213.28 Million, respectively), and lead to less benefits than the less expensive Reinforcement "E".

2.9 Summary

These Phase 2 studies show that if the 1000 MW of new generation in the Dakotas is transmitted to the Eastern Wisconsin and Iowa/Illinois systems instead of the Twin Cities, outbound flows east and south of the Northern MAPP System are likely to increase (as expected).

East-bound flows are likely to increase flows across the Minnesota Wisconsin Stability Interface (MWSI), an interface that is currently limited to a maximum 1480 MW flow.

The results show that, with one exception, these increased MWSI flows lead to unacceptable dynamic behavior if no additional reinforcements (i.e., reinforcements in addition to those determined in the Phase 1 Studies) are assumed.

The one exception is Site 4 (Ft. Thompson) if serving Iowa/Illinois markets, a combination that leads to marginal (although acceptable) dynamic performance without requiring additional reinforcements.

For all other Site/Dispatch combinations, further reinforcements are required in order to meet MAPP dynamic criteria. The results suggest that the best reinforcement alternative for all scenarios is likely to be the construction of a new Prairie Island to Columbia 345 kV transmission; a reinforcement that leads to the best overall dynamic, thermal, and loss performances of all reinforcement alternatives.

This reinforcement is required in addition to reinforcements developed in Phase 1 of the studies, as well as in addition to the Arrowhead-Weston 345 kV transmission.

Worth investigating too is the alternative of not constructing additional transmission lines, but instead deploying Static Var Compensators (or other FACTS devices) at critical stations along the MWSI Interface (Arpin and Adams 345 kV Stations in these analyses). The studies show that with this relatively low-cost alternative, with minimal ROW and permitting concerns, dynamic performance is comparable to that with the Prairie Island to Columbia 345 kV reinforcement. The thermal and loss impacts of this

alternative are however very significant, and should be investigated in detail to establish its feasibility.

As previously indicated, serving the Eastern Wisconsin and Iowa/Illinois markets will also lead to increases in South-bound flows, increases that could result in significant impacts on Southern MAPP Constrained Interfaces. Were those impacts to be of concern, other reinforcements such as the Split-Rock-Adams-Columbia 345 kV, and Split Rock-Des Moines-Zion 345 kV reinforcements reviewed in these analyses could be of interest too.

With the Phase 2 reinforcements in place (in addition to those determined in Phase 1 of the UGPR Studies - see companion report) the 1000 MW of new generation would have the flexibility to access any of the Twin Cities, Eastern Wisconsin, or Iowa/Illinois markets, thus enhancing its value and ability to compete. The two-phase approach also allows the flexibility to focus first on the nearby market of the Twin Cities, and later on, if the need arises, further upgrade the system for access to Wisconsin and Iowa/Illinois.

Table 2.6
Dynamic Performance of Phase 2 Alternatives

Reinforcement (Þ) Case (ß)		No Phase 2 Reinforcements	S.Rock-Des Moines 345 kV ("B")	2xS.Rock-Adms-Clmbia 345 kV ("C")	S.Rock-D.Mnes-Zion 345 kV ("D")	P. Island-Columbia 345 kV ("E")
Phase 1	**Dispatch**					
S1C1	Iowa/Illinois	No	No	No	No	**Yes**
S1C1	E. Wisc.	No	No	No	No	Yes
S1C5	Iowa/Illinois	No	No	Marginal	No	Yes
S1C5	E. Wisc.	No	No	No	No	Yes
S2C4	E. Wisc.	No	No	No	No	**Yes**
S3C3	E. Wisc.	No	No	No	No	**Yes**
S3C4	E. Wisc.	No	No	Marginal	No	Yes
S4C4	Iowa/Illinois	**Marginal**	Yes	Yes	Yes	Yes
S4C4	E. Wisc.	Marginal	Marginal	Yes	Marginal	Yes
S4C5	Iowa/Illinois	Marginal	Marginal	Yes	Yes	Yes
S4C5	E. Wisc.	No	Marginal	Yes	**Marginal**	Yes
S5C3	Iowa/Illinois	No	No	Marginal	No	Yes
S5C3	E. Wisc.	No	No	Marginal	No	**Yes**

Table 2.8
Comparison of Phase 2 Alternatives

CASE	PHASE 2 CAPITAL COSTS (M$)	MEETS DYNAMIC CRITERIA ?	THERMAL IMPACT	INCR. LOSSES (%)			IMPACT ON SOUTHERN MAPP FLOWGATES (%)
				PHASE 2 @ RATED	PHASE 1 @ RATED	DELTA	
S1C1IXE	80.3	Yes	Low	31.4	25.0	6.4	5.3% on Grand Island-Lincoln Interface 8.4% on Cooper-South Interface 5.2% on Ft. Calhoun-South Interface
S2C4WXE	80.3	Yes	Low	24.4	12.8	11.6	None
S2C4WD3	37.4	Yes	High	31.9	12.8	19.1	8.9% on Cooper-South Interface 7.3% on Ft. Calhoun-South Interface
S3C3W2E	80.3	Yes	Low	26.9	19.5	7.4	None
S4C4IXA	0	Marginal	Moderate	25.9	14.9	11.0	18.1% on Cooper-South Interface 17.3% on Ft. Calhoun-South Interface
S4C5WXD	213.3	Marginal	Moderate	18.9	11.7	7.2	5.7% on Cooper-South Interface
S5C3WXE	106.1	Yes	Low	14.6	9.3	5.3	7.1% on Cooper-South Interface 9.3% on Ft. Calhoun-South Interface

3. BASE CASE DEVELOPMENT

3.1 Phase 1 Alternatives

The following transmission alternatives from Phase 1 (i.e., with transfers to the Twin Cities) were used as a starting point for these Phase 2 analyses:

3.1.1 Site 1 (Hettinger)

3.1.1.1 Case S1C1XXA

This case includes the following upgrades:

- Hettinger – Belfield 345 kV line (62 miles)
- One 500 MVA 345/230 kV transformer at Hettinger
- Hettinger – Ft Thompson 345 kV line (200 miles)
- Upgrade one of two circuits from Ft Thompson – Granite Falls 230 kV (206 miles)
- One 500 MVA 345/230 kV transformer at Granite Falls
- Granite Falls – Blue Lake (100 miles)
- SVCs at the wind generator terminals

The above upgrades are highlighted in the Figure 3.1 map. In that map (and others elsewhere in this report), new (or upgraded) 345 kV lines are highlighted in red. New wind and coal generation sites are indicated with a "W" and "C", respectively. Wind generation sites furnished with SVCs are highlighted with a "W" in red.

3.1.1.2 Case S1C5XXA

This alternative includes the following upgrades (See Figure 3.2, where new 500 kV transmission is highlighted in orange):

- Hettinger – Belfield 345 kV line (62 miles)
- One 500 MVA 345/230 kV transformer at Hettinger
- New Hettinger - Glenham - Groton - Big Stone - Blue Lake 500 kV line (438 miles)
- Two 600 MVA 500/345 kV transformers at Hettinger.
- One 800 MVA 500/345 kV transformer at Glenham
- One 500 MVA 500/345 kV transformer at Groton
- One 500 MVA 500/230 kV transformer at Big Stone
- Two 600 MVA 500/345 kV transformers at Blue Lake
- SVCs added at the wind generator terminals

3.1.2 Site 2 (Jamestown)

3.1.2.1 Case S2C4XX3

The alternative comprises the following upgrades (See Figure 3.3):

- Upgrade Bismarck – Granite Falls (350 miles)
- Granite Falls – Blue Lake 345 kV line (100 miles)
- Bismarck – Leland Olds 345 kV line (40 miles)
- Maple River – Moorhead 345 kV line (8 miles)
- Center (Milton Young) – Leland Olds 345 kV line (12 miles)
- Jamestown (N) – Jamestown (S) 345 kV line (5 miles)
- 500 MVA 345/230 kV transformers at Bismarck, Jamestown, Fargo and Granite Falls (total of 4 transformers)
- Two 67 MVA 345/115 kV transformers at Moorhead
- One 250 MVA 345/230 kV transformer at Morris
- Maple River - Benton Co. 345 kV line (180 miles)
- Phase shifter at Letellier controlling Letellier - Drayton power flow
- Prairie switched capacitors replaced with a 480 Mvar SVC.

3.1.3 Site 3 (Minot)

3.1.3.1 Case S3C3X2A.

The transmission upgrades for this alternative were (See Figure 3.4):

- Minot – Harvey 345 kV line (64 miles)
- Minot – Leland Olds 345 kV line (67 miles)
- Harvey – Prairie 345 kV line (125 miles)
- Prairie – Maple River 345 kV line (68 miles)
- Maple River – Benton 345 kV line (180 miles)
- Center – Leland Olds 345 kV line (12 miles)
- 500 MVA 345/230 kV transformer connected to Logan 230 kV
- 500 MVA 345/230 kV transformer at Harvey
- 500 MVA 345/230 kV transformer at Prairie
- Switched capacitors at Prairie replaced with a 480 Mvar SVC
- 700 Mvar SVC at wind generator terminals
- Prairie - Duluth (Arrowhead) 345 kV line (250 miles)

3.1.3.2 Case S3C4X1A.
The transmission upgrades for this alternative were (See Figure 3.5):

- New Minot – Harvey 345 kV line (64 miles)
- New Minot – Leland Olds 345 kV line (67 miles)
- New Harvey – Prairie 345 kV line (125 miles)
- New Prairie – Maple River 345 kV line (68 miles)
- New Maple River – Benton 345 kV line (180 miles)
- New Center – Leland Olds 345 kV line (12 miles)
- 500 MVA 345/230 kV transformer connected to Logan 230 kV
- 500 MVA 345/230 kV transformer at Harvey

- 500 MVA 345/230 kV transformer at Prairie
- Switched capacitors at Prairie replaced with SVC
- SVC at wind generator terminals
- Antelope Valley - Split Rock 500 kV line (409 miles)
- Split Rock - Lakefield Junction 345 kV line (70 miles)
- 1200 MVA 500/345 kV transformers at Antelope Valley and Split Rock (total of 2 transformers)

3.1.4 Site 4 (Ft. Thompson)

3.1.4.1 Case S4C4XXA
The transmission upgrades were (See Figure 3.6):

- Upgrade one of the two Ft Thompson – Huron 230 kV circuits to 345 kV (62 miles)
- New Huron – Split Rock 345 kV line (110 miles)
- New Split Rock – Lakefield Junction 345 kV line (70 miles)
- SVC at generator terminals
- Upgrade one of the two 230 kV circuits between Ft Thompson - Sioux Falls (146 miles).

3.1.4.2 Case S4C5XXA
Transmission upgrades were (See Figure 3.7):

- Upgrade one of the two 230 kV circuits from Ft Thompson through Granite Falls to 345 kV (206 miles).
- 500 MVA 345/230 kV transformer at Granite Falls
- New 345 kV circuit from Granite Falls to Blue Lake (100 miles).
- Upgrade of one of the two 230 kV circuits between Ft Thompson - Sioux Falls to 345 kV (146 miles)
- New Split Rock - Lakefield Junction 345 kV circuit (70 miles)
- SVC at the wind generator terminals

3.1.5 Site 5 (Watertown)

3.1.5.1 Case S5C3XXX
This case is the same as the Phase 1 Selected Alternative S5C5XXX, but including a Split Rock to Lakefield Junction 345 kV circuit; a reinforcement deemed critical when considering transfers to Wisconsin and Iowa/Illinois. The case includes the following upgrades (See Figure 3.8):

- Upgrade Watertown – Granite Falls (75 miles, one of two circuits) from 230 kV to 345 kV.
- New Granite Falls – Blue Lake 345 kV (100 miles)
- 500 MVA 345/230 kV transformer at Granite Falls
- Upgrade Huron - Watertown from 230 kV to 345 kV (71 miles)

- New Huron - Split Rock 345 kV line (110 miles)
- New Split Rock - Lakefield Junction 345 kV line (70 miles)

3.2 Development of Phase 2 Base Cases without Additional Reinforcements

On the basis of the above-listed Phase 1 cases, Phase 2 base cases with no additional reinforcements were developed.

These cases differ from their Phase 1 counterparts in their dispatch. Whereas in the Phase 1 studies the 1000 MW of new generation was dispatched against generation in the Twin Cities, in these studies the new generation was dispatched against the following units:

Eastern Wisconsin Dispatch ("W"). Was developed by reducing generation on the following Eastern Wisconsin Units:

- Bus 94140 - Kewanee Plant Unit 1 - 500 MW Net Generation
- Bus 93535 - Pt. Beach Plant Unit 1 - 495 MW Net
- Bus 93536 - Pt. Beach Plant Unit 2 - 495 MW Net
- Bus 92356 - Edgewater Plant Unit 3 - 71 MW Net
- Bus 92357 - Edgewater Plant Unit 4 - 331 MW Net
- Bus 92358 - Edgewater Plant Unit 5 - 385 MW Net

Iowa/Illinois Dispatch ("I"). Was developed by reducing generation on the following Chicago Units:

- Bus 34628 - Braidwood Plant Unit 1 - 1090 MW Net Generation
- Bus 34629 - Braidwood Plant Unit 2 - 1090 MW Net
- Bus 34648 - Lasalle Plant Unit 1 - 1048 MW Net
- Bus 34649 - Lasalle Plant Unit 2 - 1048 MW Net

The reason Chicago units were redispatched, as opposed to redispatching units or scaling loads in Iowa, was to allow comparisons with other dispatch scenarios without committing to specific assumptions regarding the Iowa system, while at the same time stressing its transmission system by forcing it to serve additional loads in the Chicago area.

Generation at the above plants was scaled down so as to maintain swing bus MW output close to that in the ABBBASE base case without additional generation (See Phase 1 Report for details on this latter base case). No attempt was made to control transfers on neither the NDEX Interface nor the MWSI Interface (as opposed to the Phase 1 studies where MWSI was kept at 1480 MW). Setexports was thus not employed, and load levels were consequently kept equal to those in the ABBBASE Case.

The following Phase 2 cases with no additional reinforcements were thus derived:

"Wisconsin" Dispatch:

1. S1C1WXA (based on S1C1XXA)
2. S1C5WXA (based on S1C5XXA)
3. S2C4WX3 (based on S2C4XX3)
4. S3C3W2A (based on S3C3X2A)
5. S3C4W1A (based on S3C4X1A)
6. S4C4WXA (based on S4C4XXA)
7. S4C5WXA (based on S4C5XXA)
8. S5C3WXX(based on S5C3XXX)

"Iowa/Illinois" Dispatch:

1. S1C1IXA (based on S1C1XXA)
2. S1C5IXA (based on S1C5XXA)
3. S4C4IXA (based on S4C4XXA)
4. S4C5IXA (based on S4C5XXA)
5. S5C3IXX(based on S5C3XXX)

3.3 Base Cases with Additional Reinforcements

The following reinforcements were investigated (in order to avoid conflicts with naming conventions, there is no Reinforcement "A"):

3.3.1 - Reinforcement "B" - Split Rock to Des Moines 345 kV line

The reinforcement is comprised of:

- Split Rock - Des Moines 345 kV line (220 miles)

Modeling details are summarized in Table 3.1.

3.3.2 - Reinforcement "C" - Split Rock - Adams - Columbia double-circuit 345 kV line

The reinforcement is comprised of:

- Split Rock - Lakefield Junction double-circuit 345 kV line (70 miles)
- Lakefield Junction - Adams double-circuit 345 kV line (125 miles)
- Adams - Genoa double-circuit 345 kV line (80 miles)
- Genoa - Columbia double-circuit 345 kV line (100 miles)
- 2 300 MVA 345 kV/161 kV transformers at Genoa

Assumed parameters for these upgrades are summarized in Table 3.2.

3.3.3 - Reinforcement "D" - Split Rock - Des Moines - Zion 345 kV line

The reinforcement is comprised of:

- Split Rock - Des Moines 345 kV line (220 miles)
- Des Moines - Zion 345 kV line (315 miles)

Modeling details are summarized in Table 3.3.

3.3.4 - Reinforcement "E" - Prairie Island - Columbia 345 kV line

The upgrade is comprised of:

- Prairie Island - Columbia 345 kV line (200 miles)

Modeling details are summarized in Table 3.4.

3.3.5 Base Cases with Reinforcements

Combination of the above reinforcements with the Phase 2 "No Reinforcement" cases described in Section 3.2 led to the following "With Reinforcement" base cases:

"Wisconsin" Dispatch:

1. S1C1WXB through S1C1WXE (based on S1C1XXA)
2. S1C5WXB through S1C5WXE (based on S1C5XXA)
3. S2C4WXB through S2C4WXE (based on S2C4XX3)
4. S3C3W2B through S3C3W2E (based on S3C3X2A)
5. S3C4W1B through S3C4W1E (based on S3C4X1A)
6. S4C4WXB through S4C4WXE (based on S4C4XXA)
7. S4C5WXB through S4C5WXE (based on S4C5XXA)
8. S5C3WXB through S5C3WXE (based on S5C3XXX)

"Iowa/Illinois" Dispatch:

1. S1C1IXB through S1C1IXE (based on S1C1XXA)
2. S1C5IXB through S1C5IXE (based on S1C5XXA)
3. S4C4IXB through S4C4IXE (based on S4C4XXA)
4. S5C3IXB through S5C3IXE (based on S5C3XXX)

Case S1C1XXA

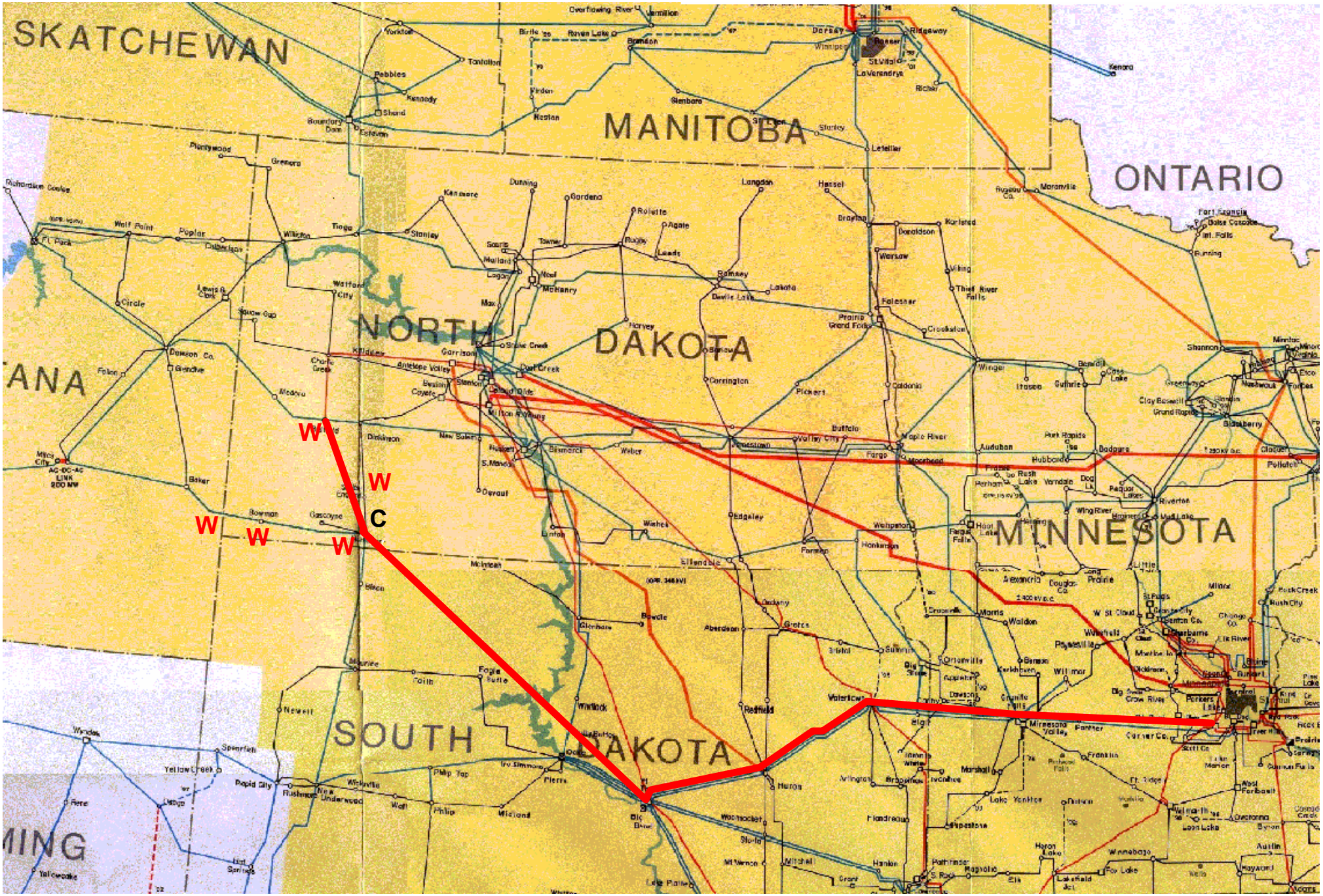


Figure 3.1 - Site 1 (Hettinger) Selected Alternative

Case S1C5XXA

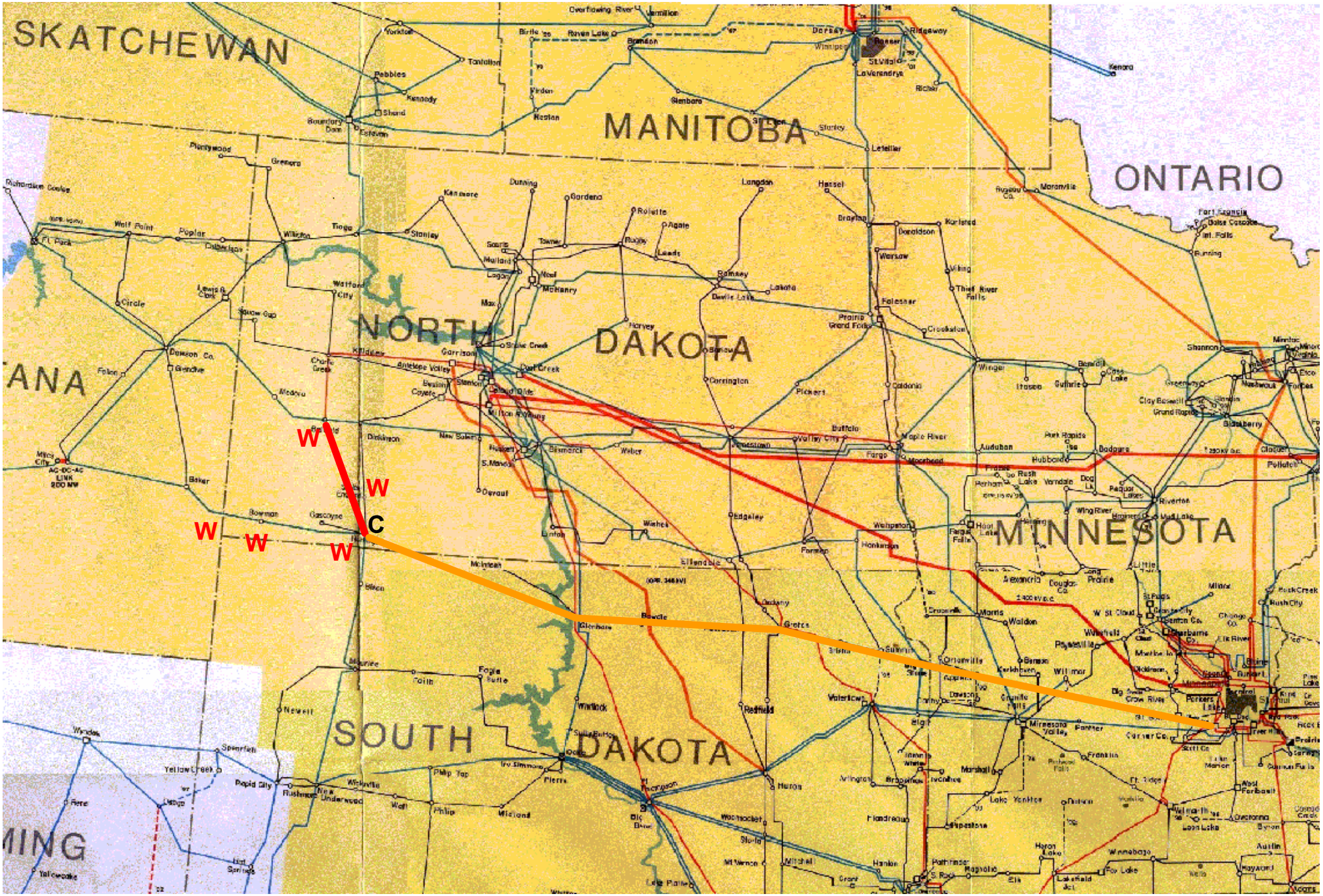


Figure 3.2 - Site 1 (Hettinger) Selected Alternative

Case S2C4XX3

Figure 3.3 - Site 2 (Jamestown) Selected Alternative

Case S3C3X2A

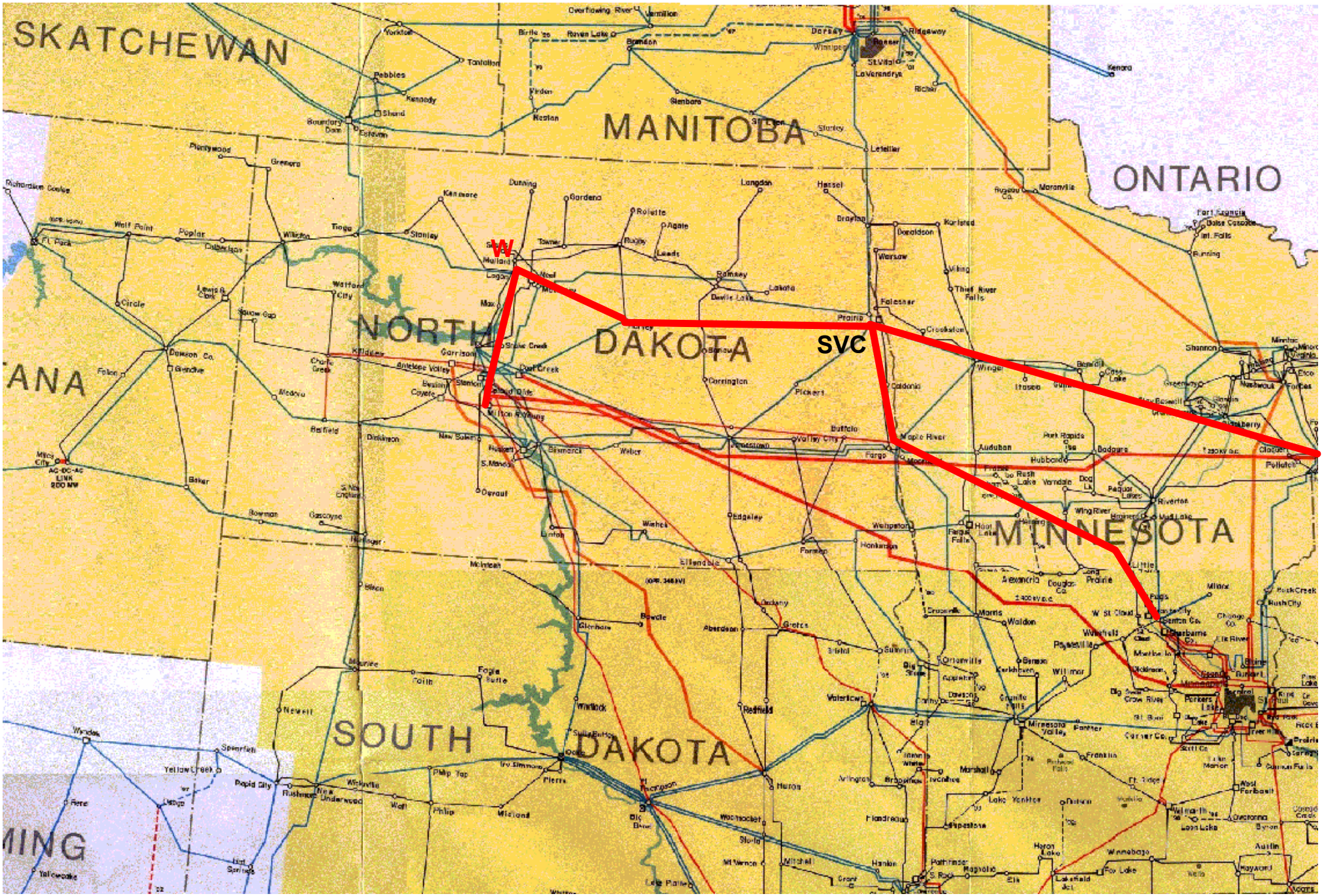


Figure 3.4 - Site 3 (Minot) Selected Alternative

Case S3C4X1A

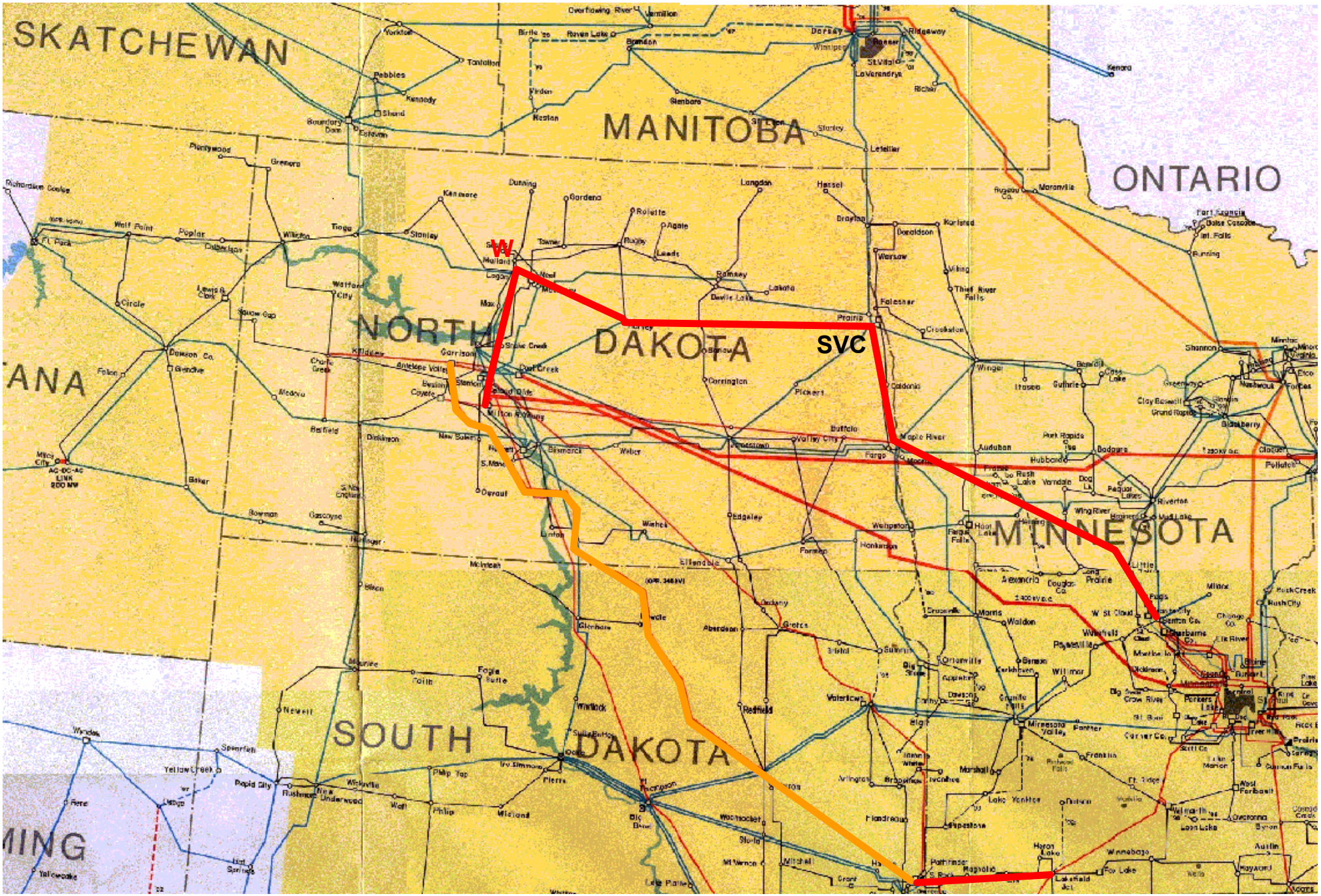


Figure 3.5 - Site 3 (Minot) Selected Alternative

Case S4C4XXA

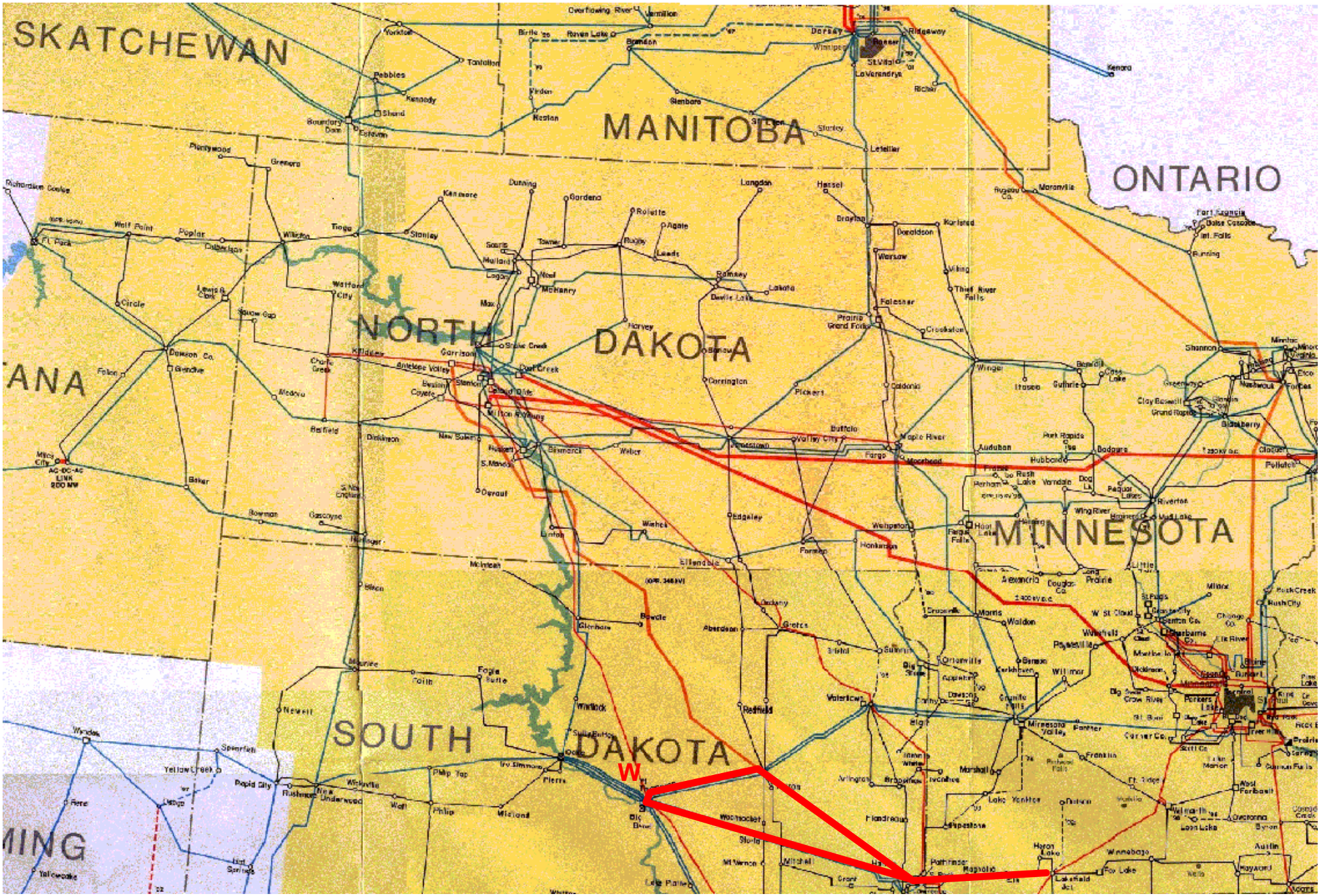


Figure 3.6 - Site 4 (Ft. Thompson) Selected Alternative

Case S4C5XXA

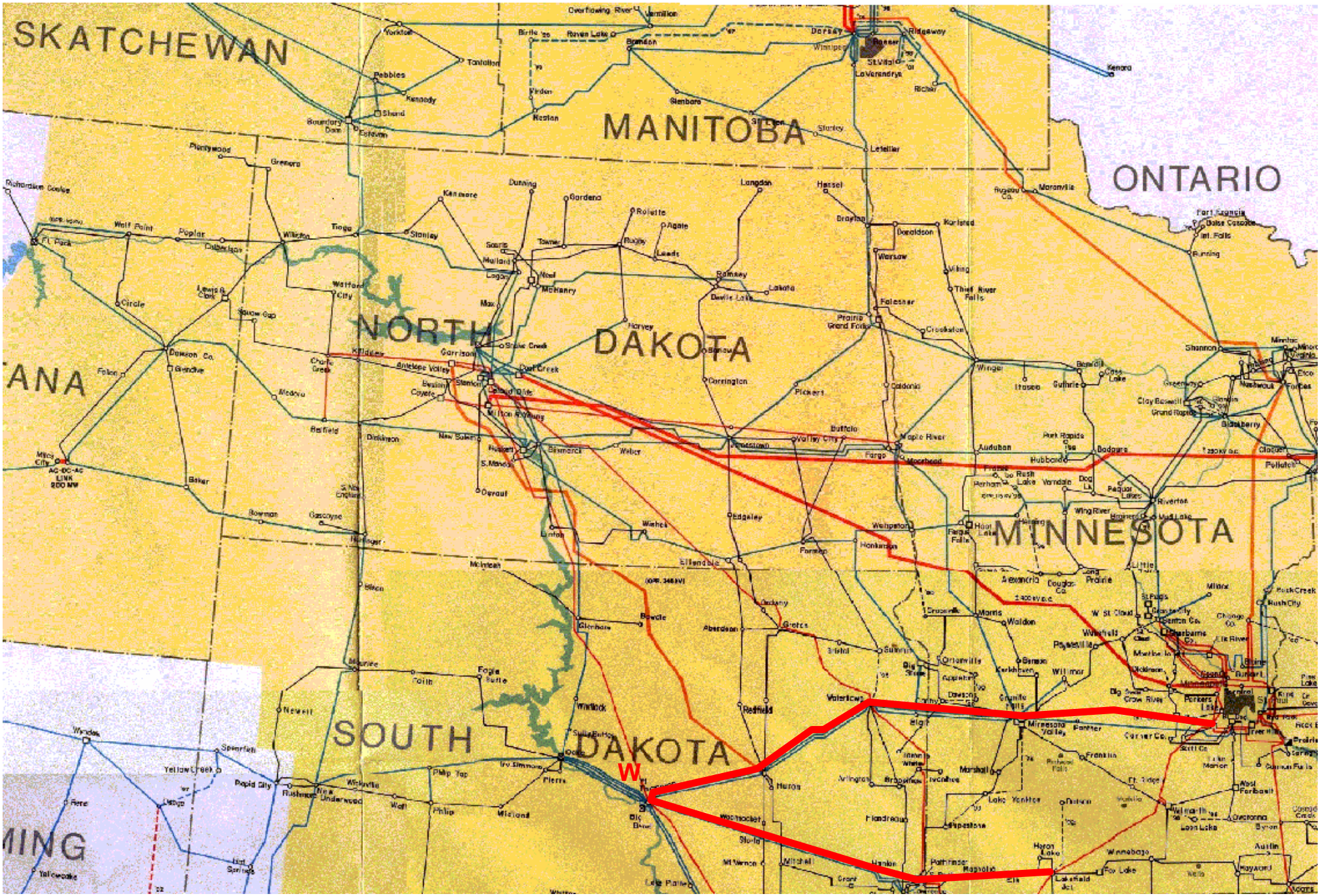


Figure 3.7 - Site 4 (Ft. Thompson) Selected Alternative

Case S5C3XXX

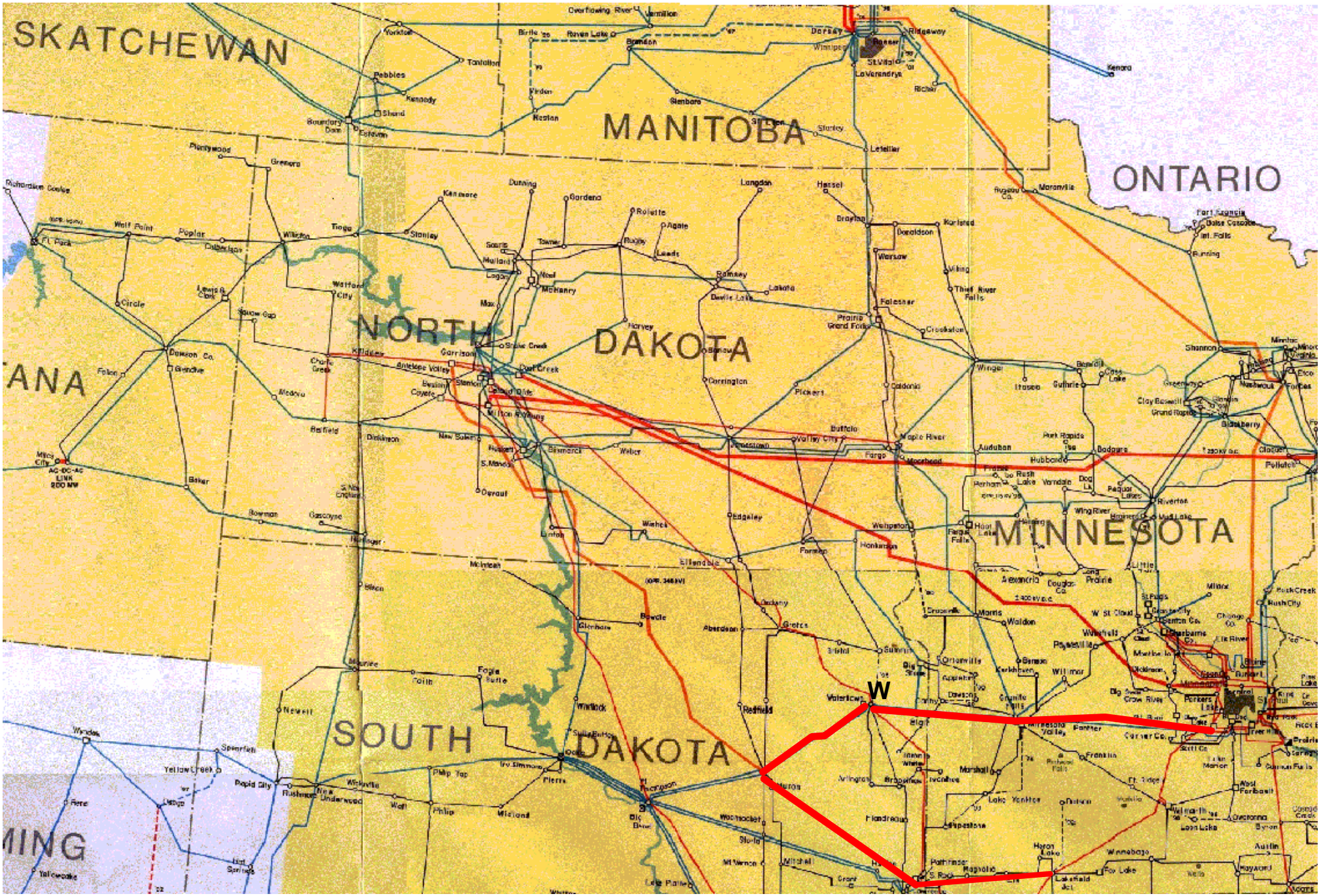


Figure 3.8 - Site 5 (Watertown) Selected Alternative

4. DYNAMIC PERFORMANCE

4.1 Introduction

As illustrated in the Phase 1 studies, because of long distances and limited transmission resources, the Northern MAPP System is constrained by several stability-limited interfaces. The three most critical are:

- The North Dakota Export (NDEX) Interface
- The Manitoba Hydro to US (MHEX) Interface
- The Minnesota-Wisconsin Stability Interface (MWSI)

Significant effort was invested in the Phase 1 of the studies in making sure that, with the proposed upgrades, the 1000 MW of new generation in the Dakotas would not have a detrimental impact on the performance of the first two (NDEX and MHEX) of the above interfaces. Because in the Phase 1 studies the new generation was assumed to serve Twin Cities markets (West of the MWSI Interface), this latter interface was not a concern, and was assumed to always remain within its current 1480 MW operating limitation.

Conversely, because these Phase 2 studies build on Phase 1 results, performance of the NDEX and MHEX is less of a concern (i.e., it was assumed resolved by the Phase 1 studies, although the validity of this assumption was verified). Instead, because in order to serve Eastern Wisconsin and Iowa/Illinois markets it is almost inevitable[2] that additional power will have to flow through the MWSI Interface, the performance of this latter interface became central to these analyses

Consequently, contingencies affecting the MWSI interface, and the Twin Cities in general, were utilized as the first means for selecting a subset of Dispatch/Reinforcement combinations for further, more detailed analyses.

4.2 Base-Case (No-Reinforcement Scenarios) Dynamic Performance (Twin Cities Contingencies)

In order to establish a baseline for comparison, the Phase 2 base-cases without additional reinforcements (See Section 3.2) were subjected to the following MAPP Contingencies that are critical to the MWSI Interface and the Twin Cities in general:

- pcs - Single line to ground fault with breaker fail at King with 8P6 stuck. Trip King - Eau Claire - Arpin 345 kV line and King to Chisago County 345 kV line.

[2] Actually, there are solutions for transferring power from the Dakotas to Wisconsin and Iowa/Illinois without impacting the MWSI Interface, but these solutions were either deemed to be impractical/expensive (extensive application of series compensation and/or phase shifters or other flow-altering FACTS devices) or were outside the scope of these studies (HVdc application).

- pys - Single line to ground fault with breaker fail at Prairie Island with XXX stuck. Trip Prairie Island-Byron 345 kV line and Prairie Island 345/161 kV Xfrmer.
- pyt - Trip of Prairie Island-Byron without a fault
- mts - Single line to ground fault with breaker fail at Monticello with 8N6 stuck. Trip Monticello to Parkers Lake.

Simulation results are summarized in Figure 4.1, which shows angle dynamics for Unit 3 at the Twin Cities Monticello Plant for each of the four contingencies. Also included in the plots for reference purposes are results from Contingencies pys and pyt but for the counterpart Phase 1 cases. Further details on these results may be found in Table 4.1. Comprehensive plots for critical simulations are included in Appendix 1.

The results suggest lightly damped or undamped oscillations in most of Phase 2 scenarios under contingencies pcs, pys and pyt. Phase 1 results, on the other hand, are for the most part well damped under all scenarios.

The deterioration in Phase 2 dynamic performance with respect to Phase 1 is a consequence of the increased MWSI flow levels in the Phase 2 Cases (MWSI levels for each of the cases are noted in Figure 4.1). Not coincidentally, the case exhibiting the least MWSI flow level (S4C4IXA, MWSI: 1653 MW) is the one exhibiting the best damping performance.

4.3 Dynamic Performance With Additional Reinforcements (Twin Cities Contingencies)

The simulations in Section 4.2 were repeated, but with the following reinforcements (As described in Section 3.3):

- Reinforcement "B". Split Rock to Des Moines 345 kV.
- Reinforcement "C". Split Rock-Lakefield Junction-Adams-Genoa-Columbia 345 kV double-circuit line.
- Reinforcement "D". Split Rock - Des Moines - Zion 345 kV line
- Reinforcement "E". Prairie Island-Columbia 345 kV line.

Simulation results are summarized in Figure 4.2. Further details are included in Table 4.2. Comprehensive plots for critical simulations are included in Appendix 2.

A review of the results leads to the following observations:

4.3.1 Comparison of Phase 2 Reinforcement Alternatives

- Of the four reinforcement alternatives studied, Reinforcement "E" (Prairie Island-Columbia 345 kV) leads to consistently better dynamic performance than Reinforcements "B" through "C".
- A distant second is Reinforcement "C" (Split Rock to Columbia double circuit 345 kV line). The least benefits are attained with Reinforcements "B" (Split Rock-Des Moines 345 kV) and "D" (Split Rock-Des Moines-Zion 345 kV)

This is expected since Reinforcement "E" is the only one that directly addresses the main problem with Contingencies pcs, pys and pyt, which is the fact that the bulk of transfers from the Twin Cities towards the East (Wisconsin) and South (Iowa/Illinois and Chicago) is carried over only two long (and thus fairly weak) 345 kV circuits. Outage of any of those two circuits (King-Eau Claire-Arpin in pcs, Prairie Island-Byron in pys and pyt) leads to a severe weakening of the transmission, which in turn results in a deterioration in damping. By adding a third 345 kV path from the Twin Cities to the Wisconsin System, Reinforcement "E" significantly improves performance following these scenarios.

On the other hand, the benefit of Reinforcements "B" through "D" is only an indirect one, in that, by paralleling the transmission from the Dakotas to the Twin Cities, they tend to unload the MWSI interface, and thus improve dynamic performance following scenarios critical to that interface. The effect, however, is much less significant than with Reinforcement "E".

4.3.2 Site Comparison

- Of the five sites studied, Site 4 (Ft. Thompson) leads to the best dynamic performance under Twin Cities Contingencies. For example, when in combination with a dispatch to Iowa/Illinois, and Phase 1 Alternative S4C4 (Case S4C4IXA), dynamic performance could be deemed acceptable even with no additional reinforcements. . No other site leads to acceptable performance without additional reinforcements.

The Ft. Thompson Site is located most to the South and West of all five sites, and, as such, tends to load the MWSI interface the least. This, together with an alternative (S4C4) which emphasizes flows to the South (as opposed to flows to the Twin Cities), and an "Iowa/Illinois" dispatch, which imposes a southern "bias" to West-East flows, explains why Case S4C4IXA exhibits the least MWSI flow levels of all no-reinforcement scenarios (1653 MW), and, consequently, the best performance among such scenarios.

4.3.3 Dispatch Comparison

- Results from cases where both an "Eastern Wisconsin", and an "Iowa/Illinois" dispatch was considered, suggest that the Iowa/Illinois dispatch consistently led to better dynamic performance than the Eastern Wisconsin dispatch.

The Iowa/Illinois dispatch tends to bias East to West flows more to the South, thus reducing MWSI flows and improving dynamic performance. This is illustrated in Table 4.3, which compares MWSI flow levels for the no-reinforcement scenarios S1C1, S1C5, S4C4, and S4C5 under both dispatches.

In all these cases an Eastern Wisconsin dispatch leads to higher MWSI flow levels, and, thus, to a deterioration in dynamic performance.

Table 4.3
No-Reinforcement Scenarios - Comparison of MWSI Flow Levels (MW)

Dispatch	S1C1	S1C5	S4C4	S4C5
Iowa/Illinois	1702	1834	1653	1718
Eastern Wisconsin	1728	1868	1686	1751

4.3.4 Comparison of Phase 1 Reinforcement Alternatives

- Phase 1 alternatives leading to the strengthening of transmission towards the South fare better than those where the reinforcements are mainly towards the Twin Cities.

For example, S4C4 Cases, which include a Ft. Thompson-Huron-Split Rock-Lakefield Junction 345 kV transmission led to consistently better performances than S4C5 Cases, where instead a Ft. Thompson-Huron-Watertown-Granite Falls-Blue Lake 345 kV transmission was considered.

4.4 Prony Analyses

In order to confirm and quantify the above observations, Prony Analyses were conducted on all cases with and without reinforcements. The analyses were limited to the study of the angle trace from Unit 3 at the Monticello Plant between 10 and 20 seconds of simulation time. Only the critical contingencies pcs, pys and pyt were examined. The results are summarized in Table 4.4. Recognizing that Prony techniques are valid only in the linear range, results with negative damping are marked as "Unstable" only (i.e., no attempt was made to quantify their negative damping).

Highlighted in red in Table 4.4 are Case/Dispatch/Reinforcement combinations leading to dynamic performances well within MAPP dynamic criteria[3]. Those highlighted in pink are still within criteria, but only marginally so. Combinations that are not highlighted do not meet MAPP criteria.

These results confirm the observations made in Section 4.3, and suggest that:

- Reinforcement "E" (Prairie Island to Columbia 345 kV) leads to acceptable performances under all combinations of dispatch and Phase 1 Cases.
- Reinforcements "B", "C", and "D" only lead to acceptable performances for some Site 4 (Ft. Thompson) cases, one Site 1 (Hettinger) case, one Site 3 (Minot) case, and two Site 5 (Watertown) cases.
- Cases with no reinforcements lead to unacceptable performances in all cases but three, where damping is marginally within criteria. All of three of these cases correspond to Site 4 (Ft. Thompson) alternatives.

[3] MAPP Criteria requires a minimum 0.016766 pu Damping Ratio for line trips without a fault (pyt, for example), and a minimum 0.008163 Damping Ratio for disturbances with faults (pcs and pys, for example).

4.5 Sensitivity Analyses

4.5.1 SVC Application

The objective of these studies was to determine whether application of SVCs could replace the need for reinforcements. To that end, one of the cases exhibiting worst dynamic performances (S2C4WX3) was selected for SVC application. Four additional cases were developed for these analyses:

- Case S2C4WB3 includes a -100/+300 Mvar SVC at the 345 kV Red Rock Station.
- Case S2C4WC3 is the same as S2C4WB3 but with a damping signal on the SVC. The damping signal uses MWSI flow levels as an input, and is based on Phasor Estimation principles such as those utilized on a recent ABB TCSC (Thyristor-Controlled Series Compensation) installation in Brazil[4].
- Case S2C4WD3 includes a 0/+400 SVC at the Arpin 345 kV Station, and another 0/+400 SVC at the Adams 345 kV Station. These stations are close to the electrical center of oscillations initiated by the pys and pcs contingencies, respectively.
- Case S2C4WE3 is the same as S2C4WD3, but with stabilizing signals on the respective SVCs.

Loadflow and dynamics data for the one- and two- SVC Cases are summarized in Tables 4.5 and 4.6, respectively. It is important to note in Table 4.6 that, in addition to the SVCs at Arpin and Adams, the case includes an additional 150 Mvar and 240 Mvars of fixed shunt compensation at those stations (respectively); compensation that is necessary to maintain pre-contingency voltages close to nominal levels.

Simulation results for these four cases are summarized in Figure 4.3. Further details may be found in Table 4.7. Comprehensive plots for critical simulations are included in Appendix 3. Prony analysis results are summarized in Table 4.8.

The results suggest that:

- It is indeed possible to meet MAPP dynamic criteria by deployment of SVCs instead of network reinforcements.
- Although all SVC cases studied meet criteria, cases with two SVCs (one at Arpin, one at Adams 345 kV) perform better than cases with only one SVC at the Red Rock 345 kV Station.
- The two-SVC case is most benefited by modulation of SVC output with a stabilizing signal (S2C4WE3 vs. S2C4WD3). Little benefit is observed from application of a damping signal on the single Red Rock SVC (S2C4WC3 vs. S2C4WB3).

[4] "Commissioning and Operative Experience of TCSC for Damping Power Oscillation in the Brazilian North-South Interconnection", by C. Gama, L. Angquist, G. Ingestrom, and M. Noroozian, CIGRE Paper 14-104, Session 2000.

4.5.2 Series Compensation

As previously indicated, Reinforcements "B" through "D" improve damping performance by diverting flows away from the MWSI Interface. The purpose of these studies was to investigate how much could this benefit be enhanced by series compensation of such reinforcements.

Case S3C3 with an Eastern Wisconsin dispatch was chosen for these analyses. As indicated in Table 4.4, simulation results for this case were for the most part unstable under reinforcement alternatives B through D. These series compensation analyses were conducted with Reinforcements C and D, which contemplate a new 345 kV path spanning from the Dakotas to Eastern Wisconsin and Chicago, respectively. A 50% series compensation of such reinforcements was investigated. The cases were named S3C3W3C and S3C3W3D, respectively. Their series-compensated line parameters are summarized in Table 4.9.

Simulation results for these four cases are summarized in Figure 4.4. Further details may be found in Table 4.10. Comprehensive plots for critical simulations are included in Appendix 4.

These results, and their comparison against those without series compensation (S3C3W2C and S3C3W2D), suggest that there is indeed a benefit in compensating the reinforcements, but that, even with the significant amount of compensation assumed, the scenarios would still not meet MAPP Criteria.

4.5.3 Activation of Phase Shifter at Arrowhead

All of the loadflow models in these studies include a phase shifter model between the 230 kV and 345 kV Arrowhead buses. In the majority of cases this phase shifting action was disabled by setting its angle to 0 and its PSS/E Control Flag to 0 too (as was the case in the "TIPS" base case that served as starting point for these studies). Had the phase shifter been enabled, however, its impact on base cases would have been minor, since the phase shifter is designed to maintain flows within a 590 to 610 MW range, which is not far from the actual flows in most Phase 1 and 2 base cases.

There are exceptions, however, which are the Site 3 Cases involving a Prairie-Duluth(Arrowhead) 345 kV line. Taking as an example Case S3C3W2A, results in Table 4.11 indicate only a 354 MW flow from the 230 kV system towards the 345 kV Arrowhead busbars. The reduced flow in this case (as well as in others with a Prairie to Duluth 345 kV line) is likely the result of the injection at Arrowhead 345 kV of 331 MW coming from Prairie. The concern therefore is that such a reduced 230/345 kV flow at Arrowhead could lead to an increased MWSI flow level, and thus to a deterioration in dynamic performance upon critical Twin Cities contingencies.

In order to test such a scenario, a new case was developed (Case S3C5W2A); identical to Case S3C3W2A, but with the Arrowhead Phase Shifter enabled. The pre-contingency power flow results in Table 4.11 indicate a 26 degree angle shift leading to

a 602 MW 230/345 kV flow, and an increased 345 kV flow to Tripoli from 685 MW to 813 MW. This, in turn, reduces MWSI flows from 1751 MW in Case S3C3W2A to 1671 MW in Case S3C5W2A. However, simulation results in Figure 4.5 suggest a deterioration instead of an improvement with activation of the Arrowhead phase shifter in Case S3C5W2A. This is because the increased flows to Tripoli and Weston aggravate a reactive deficiency problem in that area (See Voltage Stability Analyses in the next section), thus compounding the dynamic problems.

4.6 Voltage Stability Analyses

One additional constraint on MWSI flows is that of voltage stability following contingencies similar to those critical from a regular stability point of view (i.e., outage of one of the two 345 kV circuits connecting the Twin Cities to the East and South).

In order to verify whether or not cases meeting MAPP damping criteria would also meet voltage stability criteria, two contingencies were examined with load-flow analyses. They were:

- Prairie Island-Byron 345 kV
- King-Eau Claire-Arpin 345 kV

Because MAPP criteria requires that operation of the system should be at 90% or less of the knee point of the PV curve; i.e., of the last stable case, the contingency analyses were conducted at MWSI transfer levels that were at least 11.1% (1.11 is inverse of 0.9) higher than those in the base-cases examined. The increase in MWSI exports was attained by use of the IPLAN Setexports program.

Contingency analysis results are summarized in Table 4.12, which shows voltages at these critical stations:

- T. Corners 115 kV (Bus 1866)
- Stoneman 161 kV (Bus 2103)
- Apple River 161 kV (Bus 2165)
- Rock Elm 161 kV (Bus 2145)
- Adams 345 kV (Bus 1601)
- South Faribault 161 kV (Bus 1244)
- Arrowhead 345 kV (Bus 1318)
- Tripoli 345 kV (Bus 94246)

The analyses were conducted on selected base cases meeting (or marginally meeting) MAPP damping criteria. The following conditions were examined:

- All lines in service @ Base Case MWSI Levels
- At 112% of Base MWSI Levels
  - All lines in service
  - Prairie Island - Byron 345 kV O/S

- King - Eau Claire - Arpin O/S
- King - Eau Claire - Arpin O/S with Phase Shifter at Arrowhead Activated

Cases in Table 4.12 with grayed-out results are cases of marginal convergence, where Optimal Power Flow (OPF) analyses were required in order to activate all of the switched shunt resources in the cases (even those with a Locked Switched Shunt Mode of "0").

The results suggest that all but one of the cases with an "E" reinforcement (Prairie Island-Columbia 345 kV) lead to definite convergence of the post-contingency loadflows, and thus meet MAPP Voltage Stability Criteria.

The one exception is Case S3C3W2E which, upon outage of the King-Eau Claire-Arpin line leads to non-convergence if the Arrowhead Phase Shifter is assumed enabled. This is in line with the stability analyses in Section 4.5.3 which suggested that the phase shifter might be detrimental to performance for cases (such as S3C3W2E) with a Prairie-Duluth 345 kV line. The reason is that in those cases the phase shifter leads to an increase in flows towards the Tripoli/Weston 345 kV Stations. On the other hand, per the results in Table 4.12, the Arrowhead Phase Shifter is beneficial in all other cases, in that it leads to a significant improvement in Arrowhead and Tripoli 345 kV voltages by reducing post-contingency flows along the line between those stations.

Another interesting observation from Table 4.12 is that Site 4 cases that were shown to marginally meet damping criteria (S4C4IXA and S4C5WXD, see Table 4.4) are also marginally meeting voltage stability criteria. This is no coincidence, since lack of damping and voltage instability are usually two symptoms of the same problem: a heavily loaded transmission system.

Finally, Table 4.12 includes results for SVC Cases S2C4WB3 (One SVC at Red Rock 345 kV), and S2C4WD3 (One SVC at Arpin 345 kV and one at Adams 345 kV). The results for the one-SVC case suggest that the base-case would not meet voltage stability criteria. With two SVCs, however, the case does meet voltage stability criteria (albeit marginally following outage of King-Eau Claire-Arpin 345 kV).

4.7 Summary of Analyses of Twin Cities Contingencies

This section's results confirm the key role the MWSI Interface plays in defining the feasibility of transfers from the new generation towards Eastern Wisconsin and Iowa/Illinois. The results show that of the four reinforcement alternatives studied, Reinforcement "E" (Prairie Island-Columbia 345 kV) is by far the superior one, and would lead to acceptable performances irregardless of dispatch, generation siting, and Phase 1 reinforcement assumptions.

Second in impact on dynamic performance is the siting of the new generation. The results indicate that, of the five sites studied (Hettinger, Jamestown, Minot, Ft.

Thompson, and Watertown), Ft. Thompson is the most beneficial in terms of MWSI dynamic performance.

Less important, but still affecting dynamic performance, are the dispatch assumptions (an "Iowa/Illinois" dispatch leads to a better performance than an "Eastern Wisconsin" one) and Phase 1 alternative selection (alternatives emphasizing flows towards Split Rock fare better than those focused on transfers towards the Twin Cities).

The studies also suggest that there are FACTS alternatives to the building of new transmission lines; one of which is the application of SVCs at critical locations in the MWSI interface. Given the weakness of the current system, such alternatives require the deployment of significant fixed and dynamic compensation resources, and will likely lead to increases in losses when compared to alternatives with new transmission resources. As shown in Section 5, they also lead to significant overloading of the underlying system upon outage of the Prairie Island-Byron and King-Eau Claire-Arpin 345 kV transmissions. Right of way and permitting considerations, on the other hand, are factors that could make a FACTS solution more attractive.

Another alternative for improving dynamic performance is the series compensation of lines parallel to the MWSI interface (such as those in Reinforcements B, C and D). The studies suggest, however, that the potential benefit of such compensation is limited, even when high levels of series compensation are assumed. Of more value, instead, would likely be the series compensation of the MWSI lines themselves (King-Eau Claire-Arpin 345 kV, and Prairie Island-Byron 345 kV). Such compensation, however, would lead to the significant overloading of those same lines (by "attracting" additional flows to the MWSI Interface) and is therefore impractical.

4.8 Selected Alternatives

On the basis of the above MWSI investigations, the following alternatives were selected for further in-depth analyses:

- S1C1IXE. Site 1 (Hettinger) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of Site 1, as well as of the benefits from such a reinforcement.
- S2C4WXE. Site 2 (Jamestown) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of the benefits from such a reinforcement.
- S2C4WD3. Site 2 (Jamestown) alternative with no Phase 2 reinforcements but for the deployment of SVCs and fixed shunt compensations at the Arpin and Adams 345 kV Stations. This alternative is representative of FACTS alternatives without transmission reinforcements.
- S3C3W2E. Site 3 (Minot) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of Site 3, and of the benefits from such a reinforcement.

- S4C4IXA. Site 4 (Ft. Thompson) alternative with no Phase 2 reinforcements. This marginal alternative (both from a dynamics and a voltage stability point of view) investigates the additional flexibility in Site 4 of not adding any upgrade whatsoever to Phase 1 alternatives.
- S4C5WXD. Site 4 (Ft. Thompson) alternative with a Split Rock-Des Moines-Zion Reinforcement. This marginal alternative (both from dynamics and voltage stability points of view) investigates the benefits from such a reinforcement.
- S5C3WXE. Site 5 (Watertown) alternative with a Prairie Island-Columbia 345 kV reinforcement. This alternative is representative of Site 5, as well as of the benefits from such a reinforcement.

In summary, the above alternatives were selected not because they are the best ones, but because they are representative of the choices the network planner may encounter when considering serving Eastern Wisconsin and Iowa/Illinois markets with the new generation.

Critical interface flow levels for the selected alternatives are listed in Table 4.13.

4.9 MAPP Dynamic Performance of Selected Alternatives

The purpose of these studies was that of a cursory review to confirm that results from Phase 1 analyses are not unduly affected by the different dispatch and additional network reinforcements in these Phase 2 studies. For that purpose, the Phase 2 selected alternatives were tested with the MAPP regional contingencies listed in Table 4.14. The results from the analyses are summarized in Table 4.15.

The results in Table 4.15 indicate the following violations of criteria:

- Contingency mqs, all Cases. Violations in all cases of relay margin criteria at the Forbes end of the Dorsey-Roseau-Forbes (D602F) 500 kV line. Minimum margin per criteria: 50%. The worst violations are of 37% margins in Cases S1C1IXE and S4C4IXA. However, as indicated in the report on Phase 1 studies, Case ABBBASE, without the additional generation exhibits a 35% relay margin under that same contingency.
- Contingency ch3, Case S4C4IXA exhibits a 46% relay margin at Forbes, in violation of the 50% minimum per criteria, but higher than the 45% relay margin observed when the same contingency was run in Case S4C4XXA, the Phase 1 counterpart of Case C4C4IXA.
- Contingency ch3, Case S4C5WXD exhibits a 47% relay margin at Forbes, in violation of criteria, but higher than the 44% margin observed in Case S4C5XXA, the Phase 1 counterpart of Case S4C5XXA.

It can therefore be concluded that the selected Phase 2 alternatives lead to dynamic performances that are for the most part in compliance with criteria, and, when they are not, are either better that in the base case with no new generation, or better than that observed in the Phase 1 analyses.

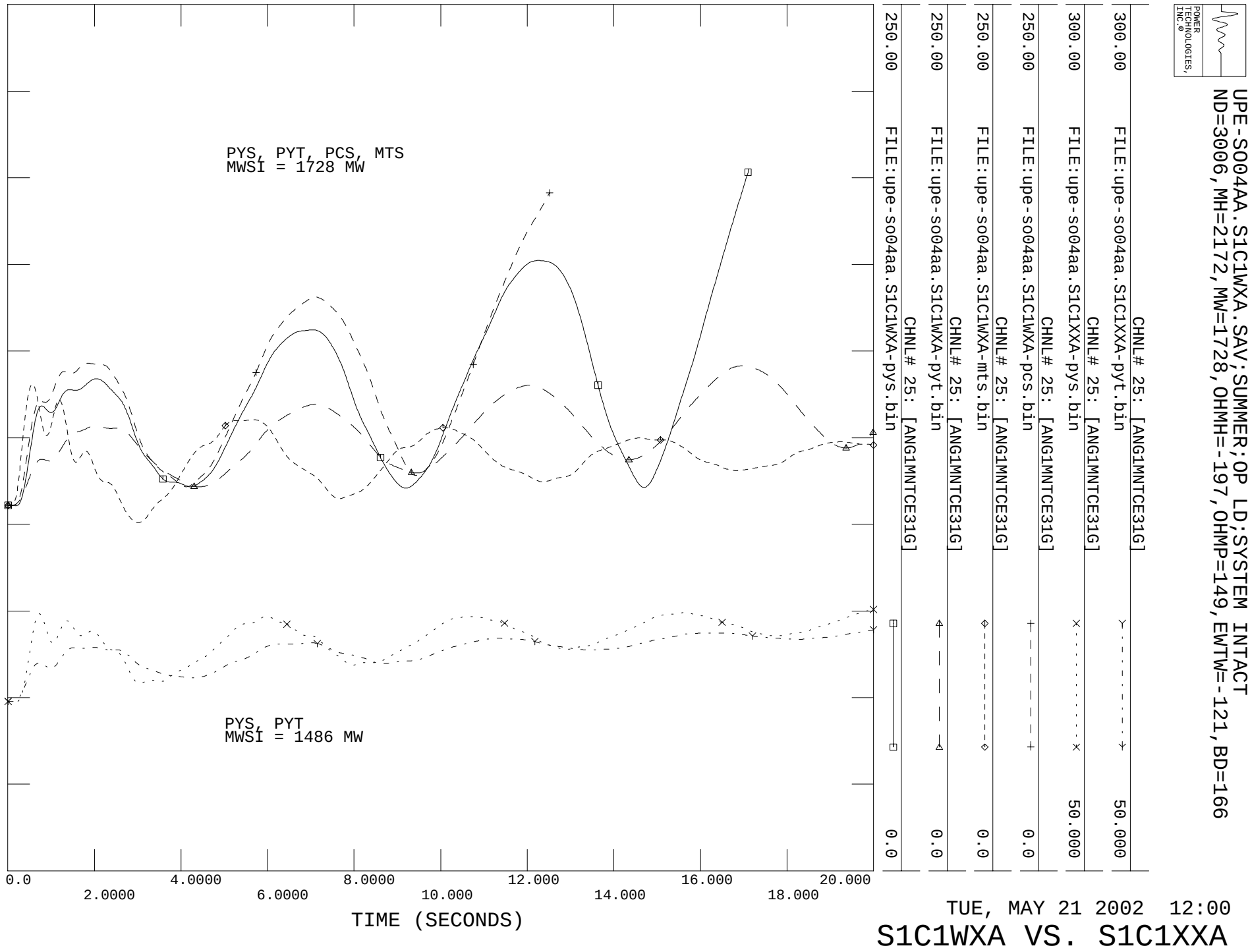
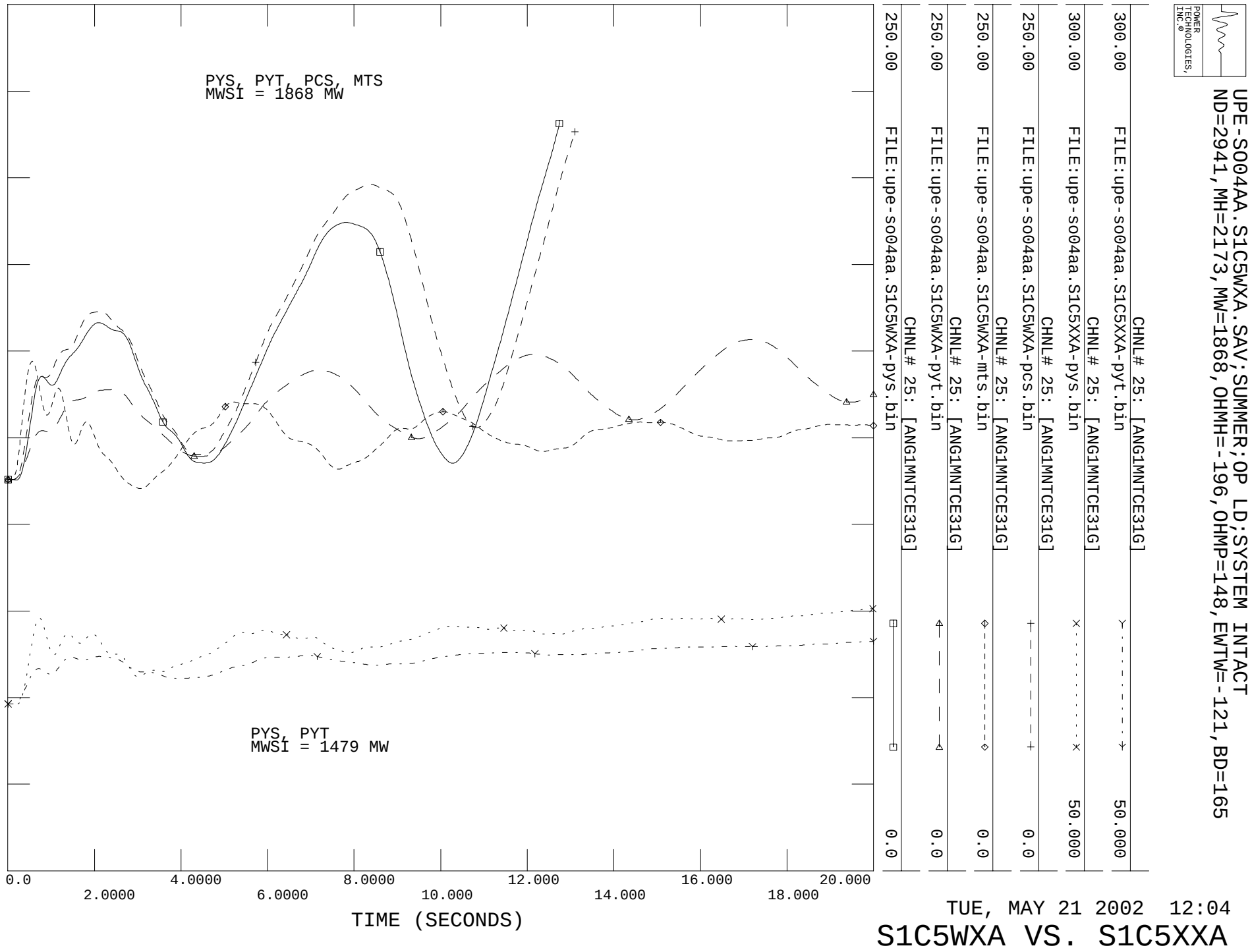


Figure 4.1 - Phase 2 Base Cases without Reinforcements vs. Phase 1 Counterparts



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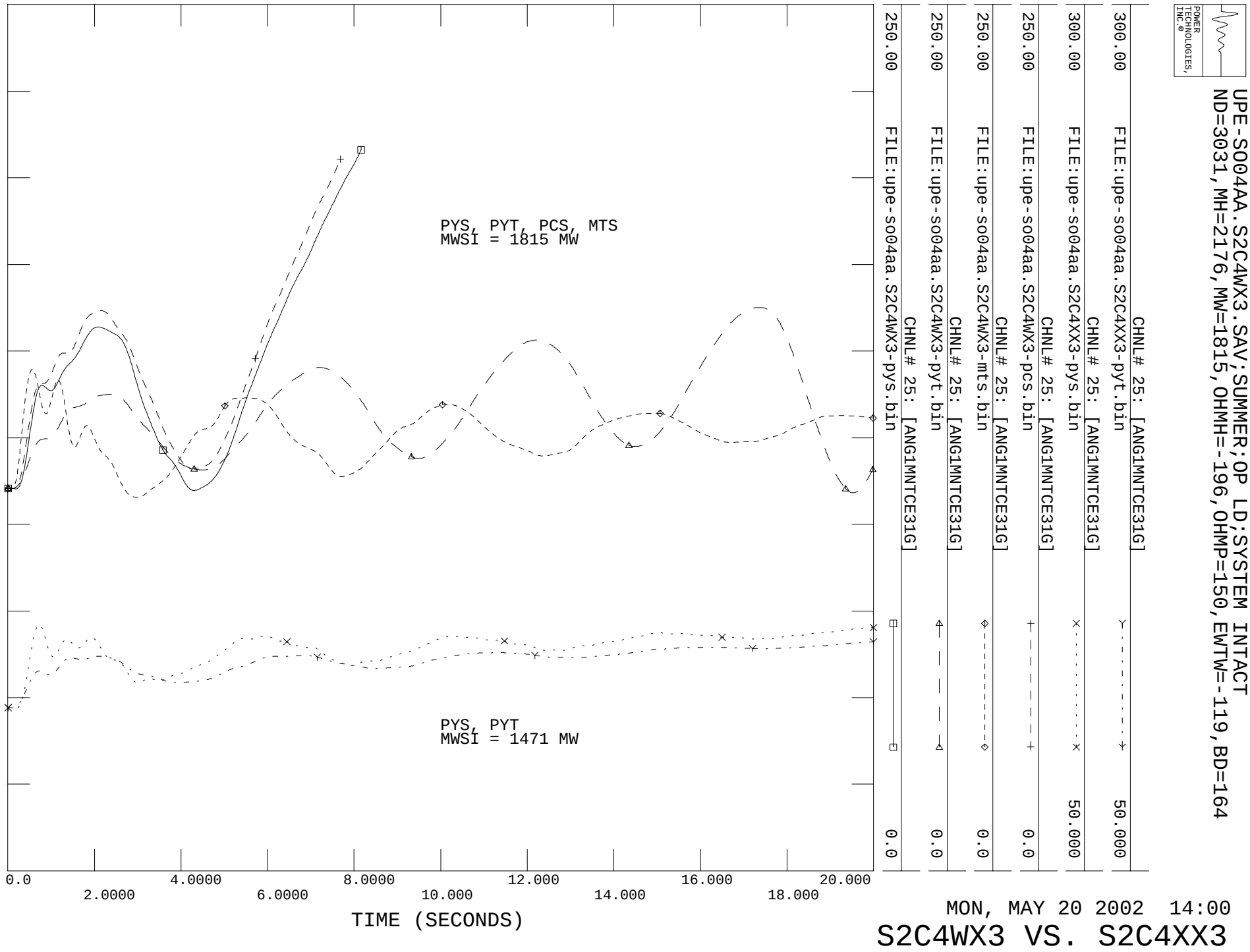

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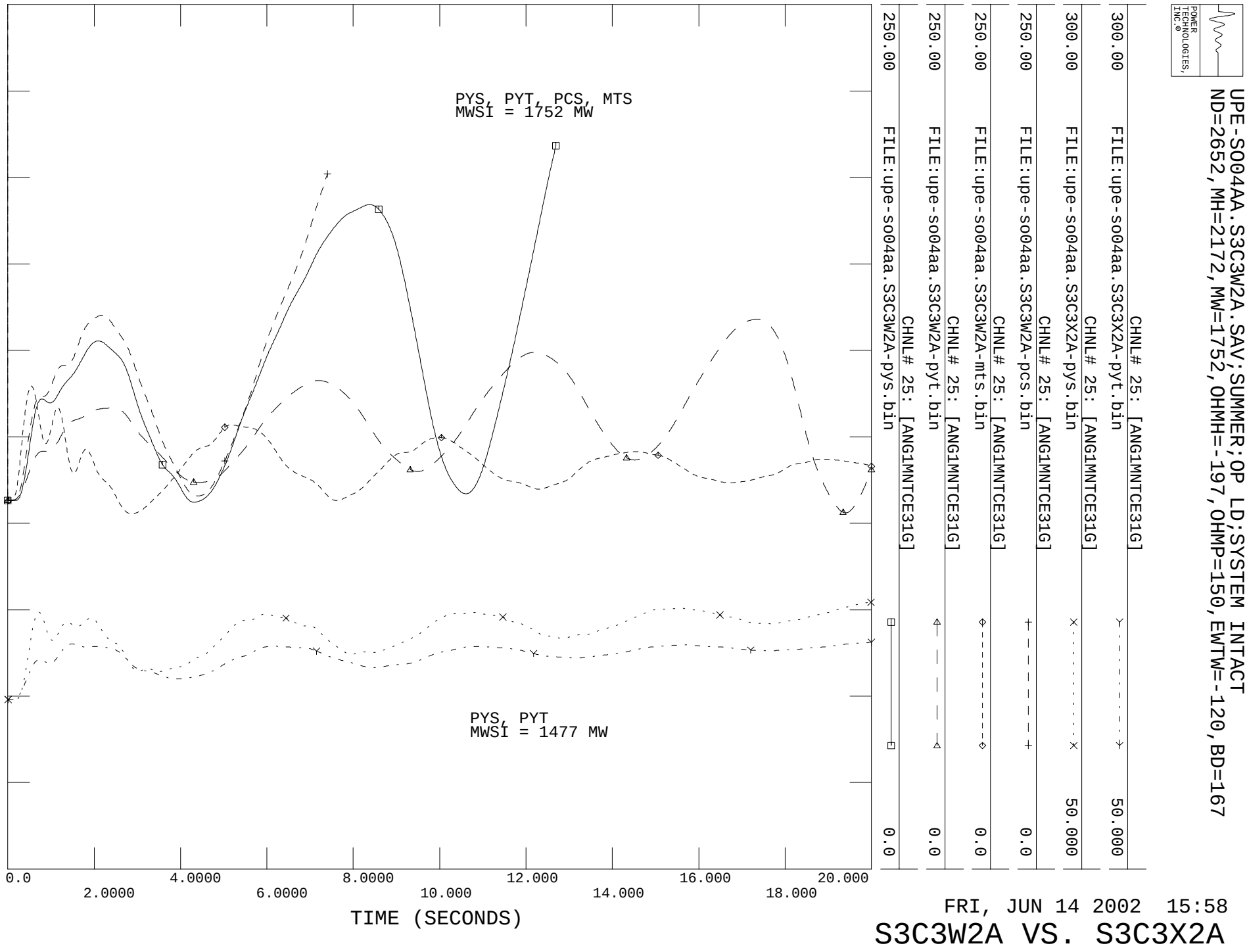

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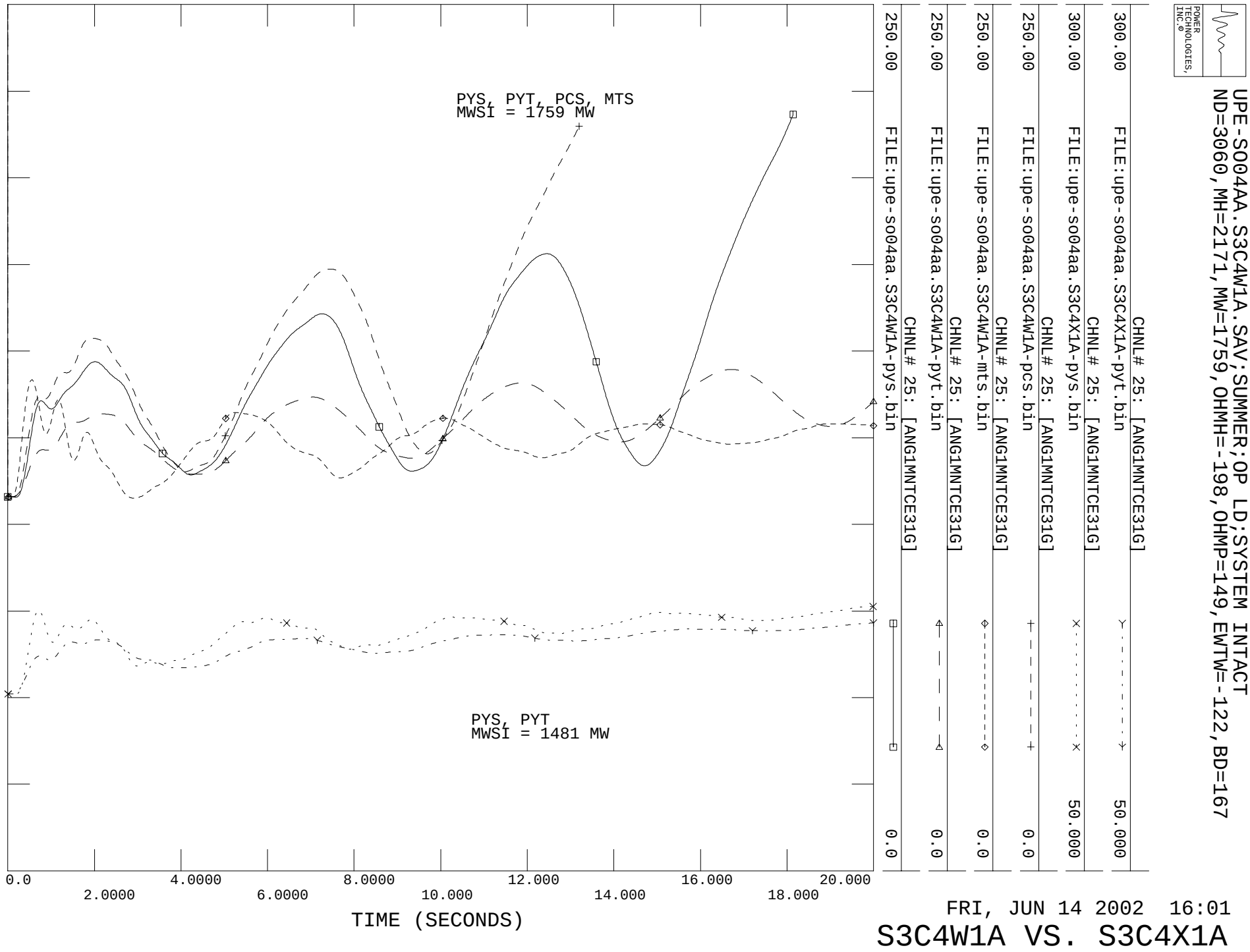

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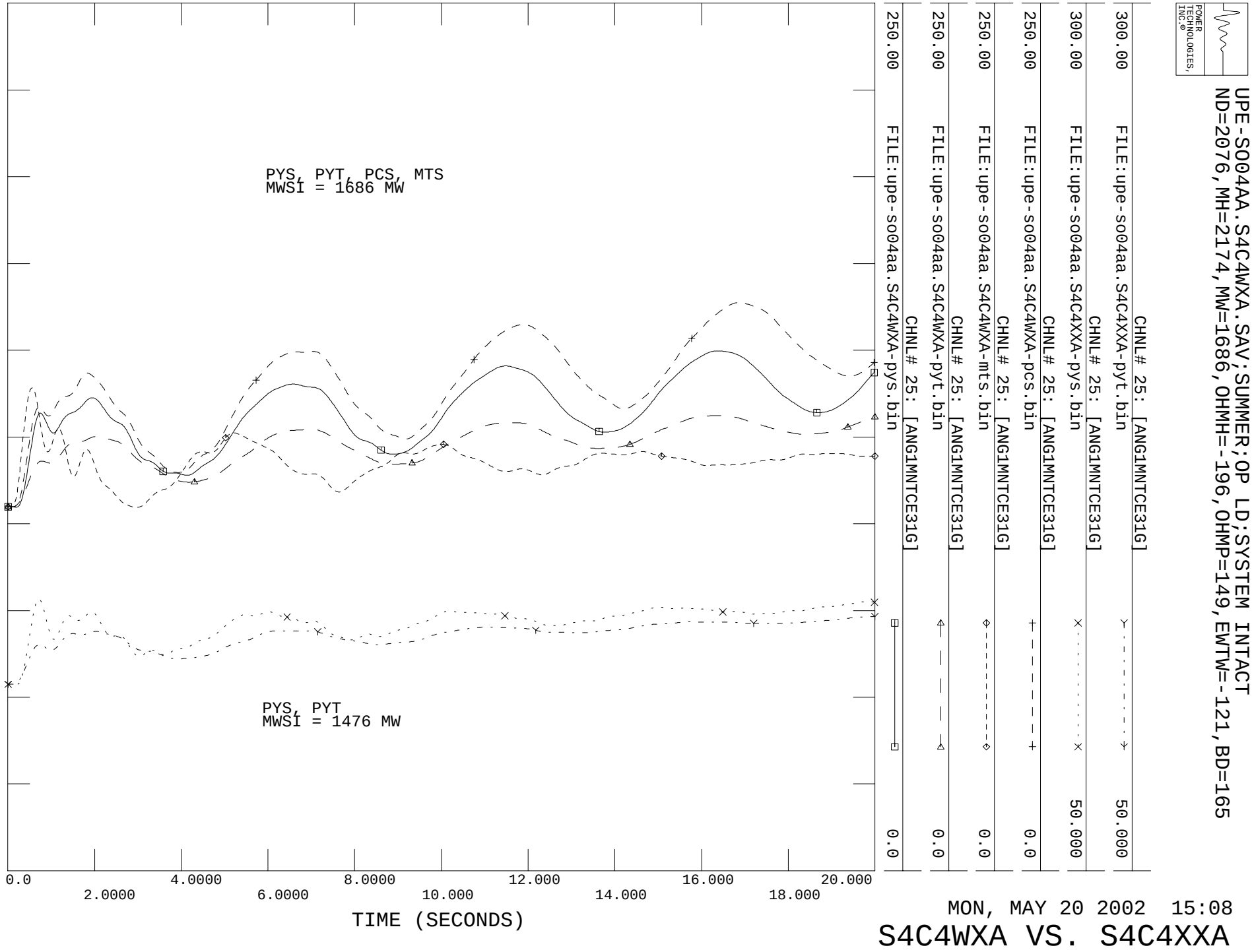

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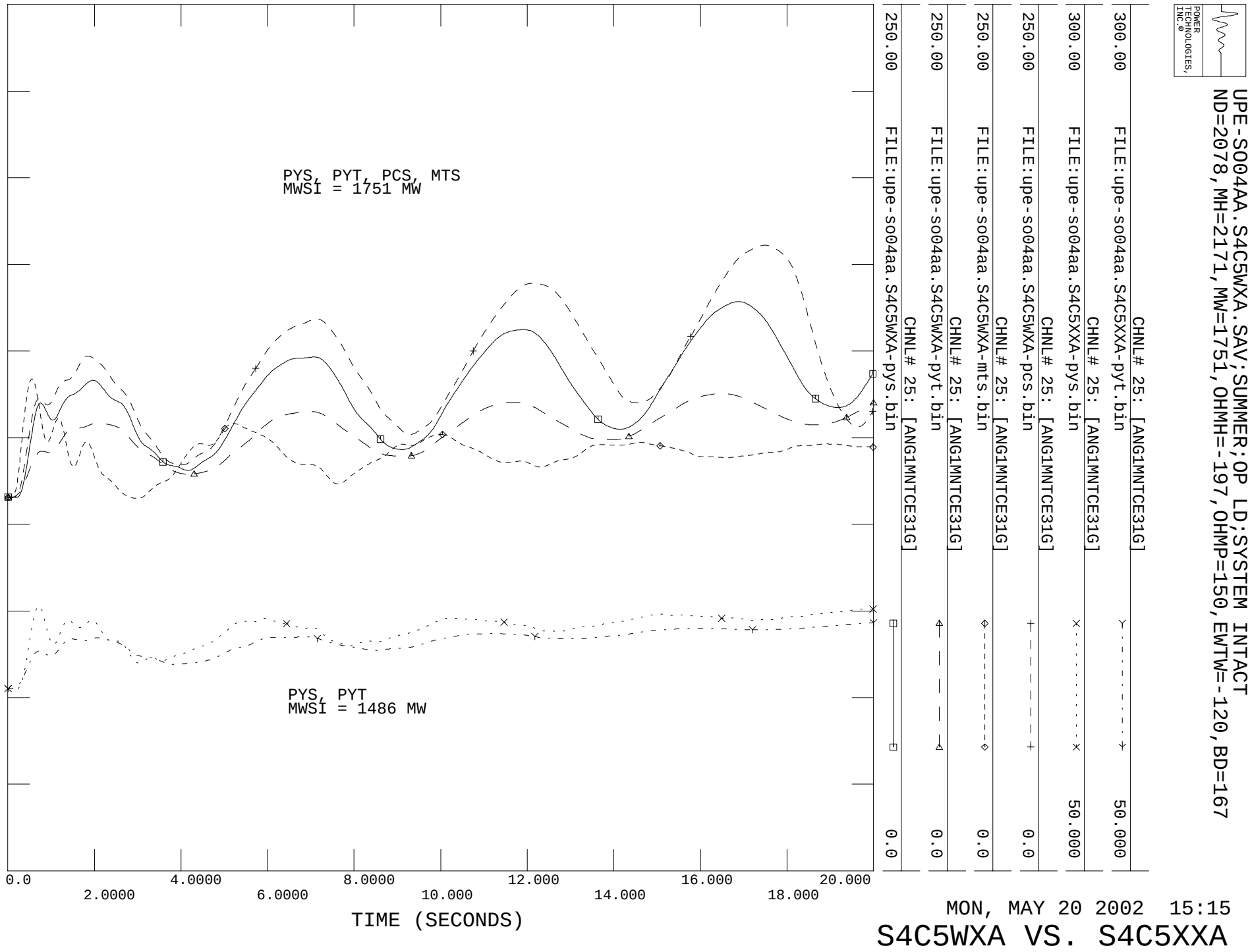

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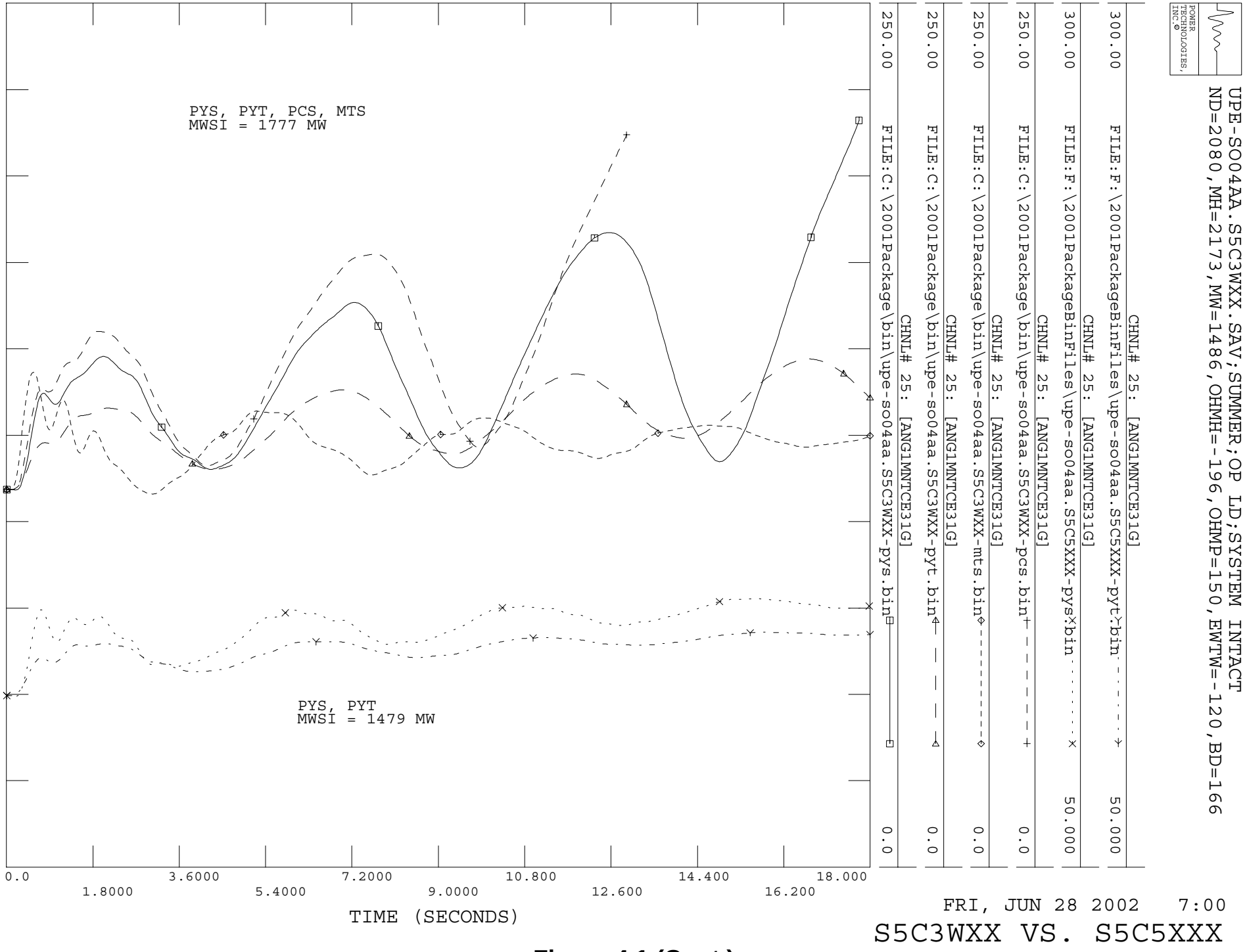

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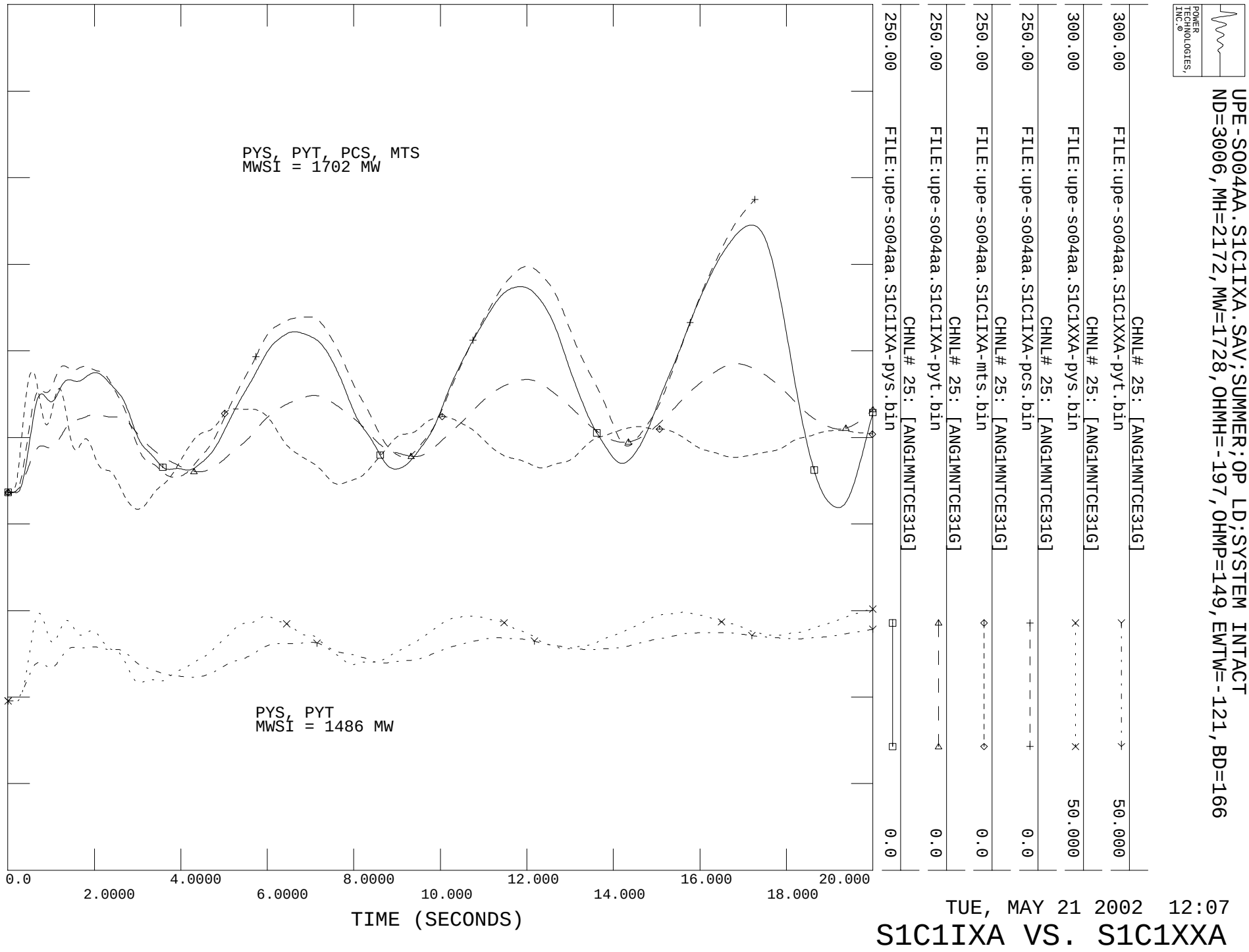

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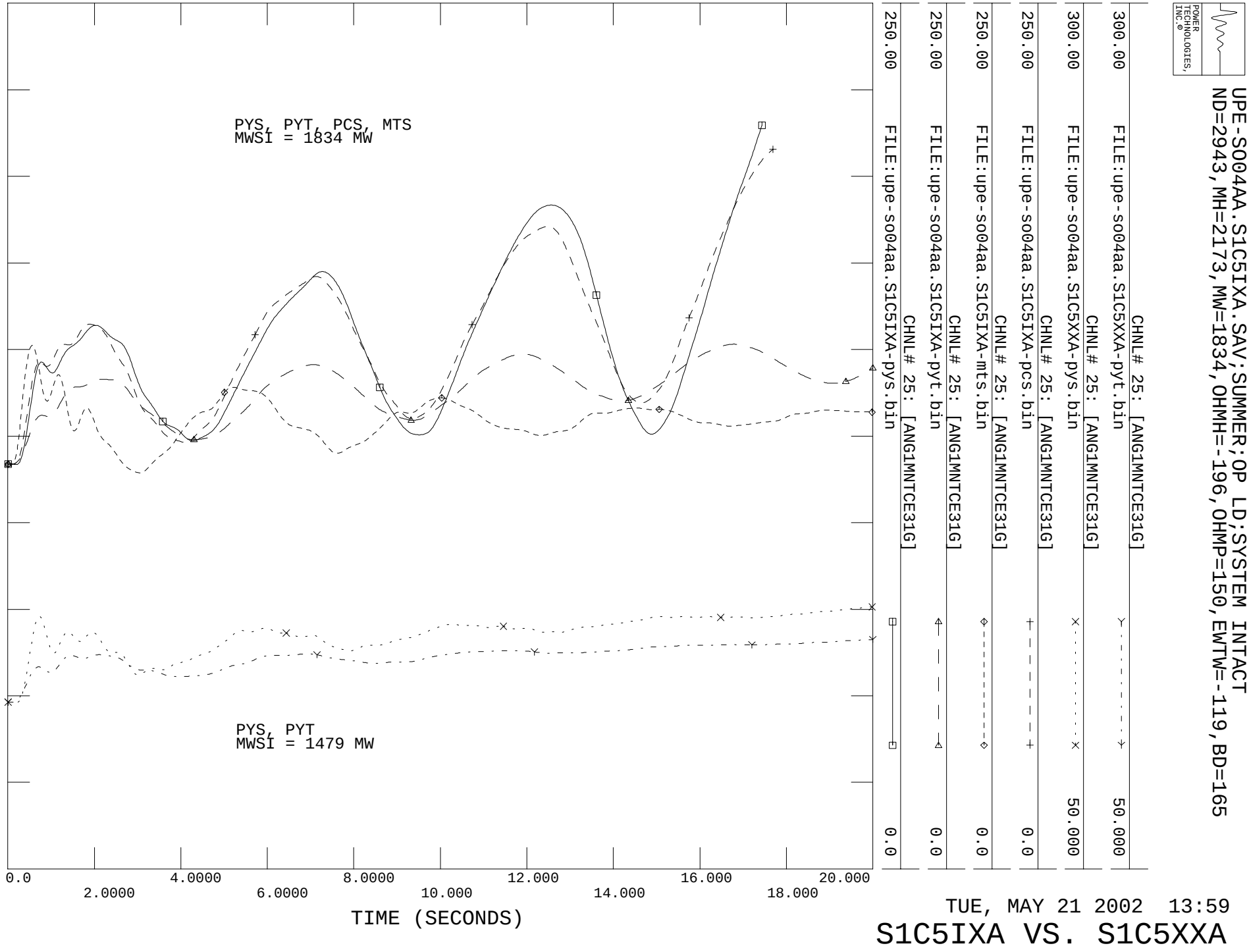

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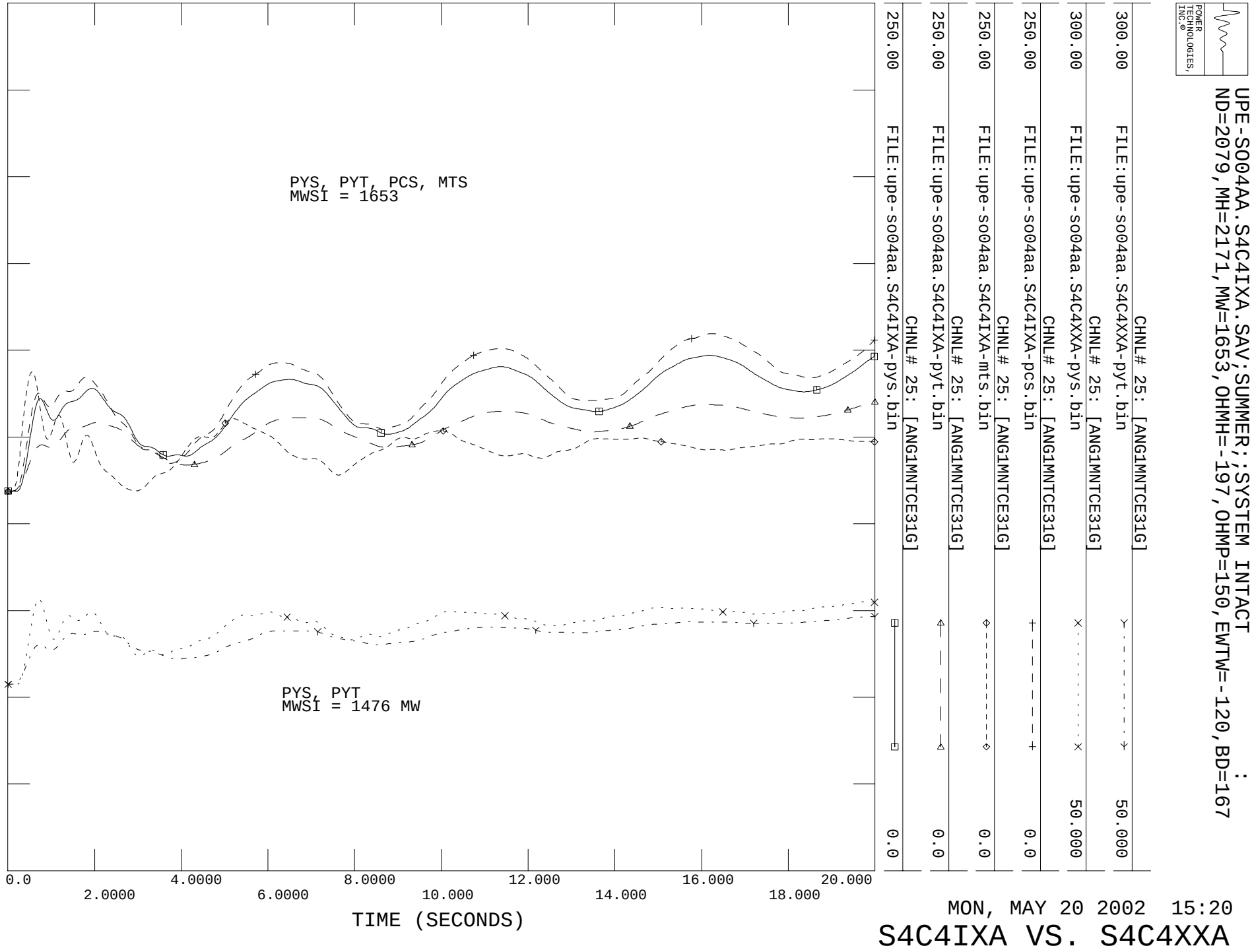

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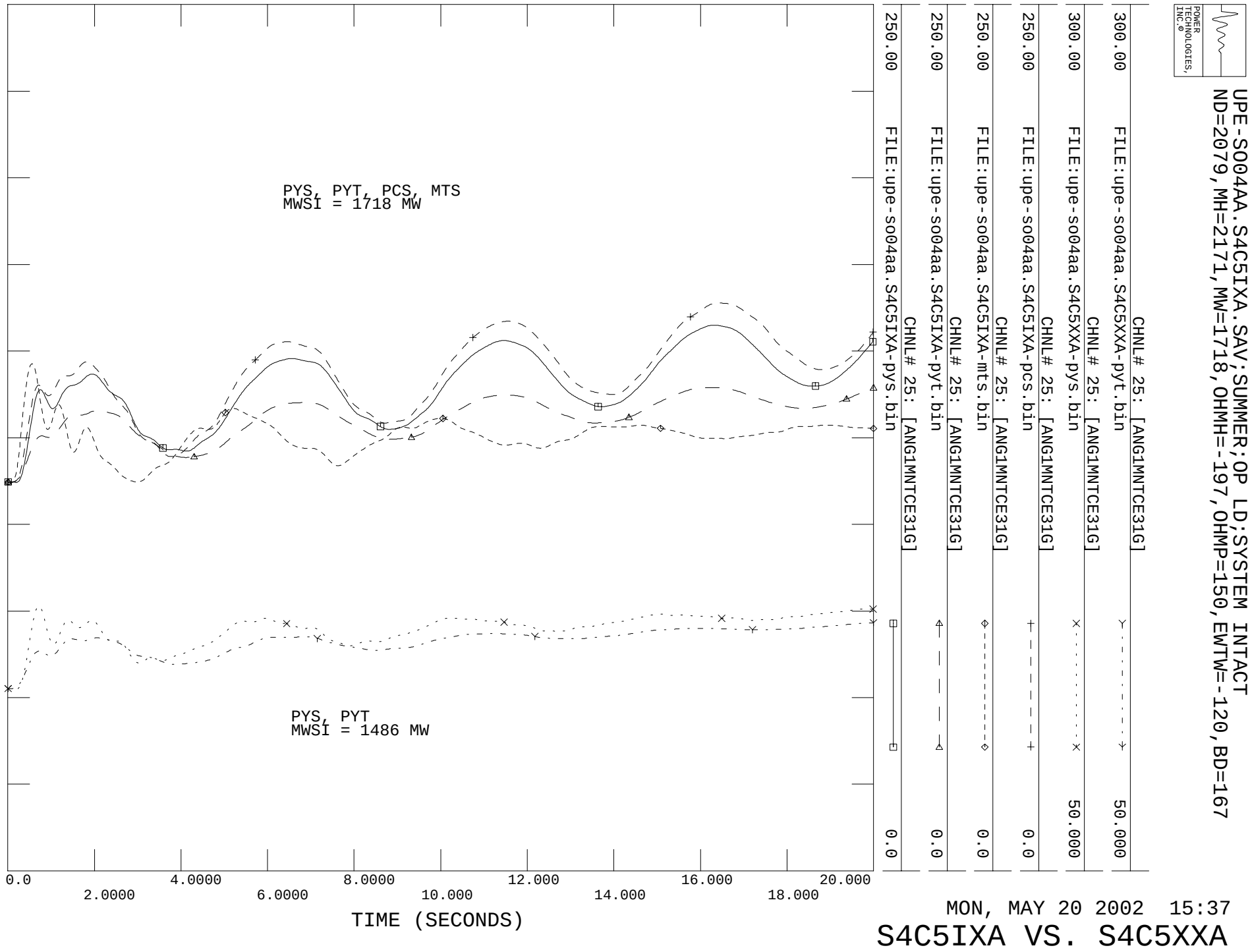

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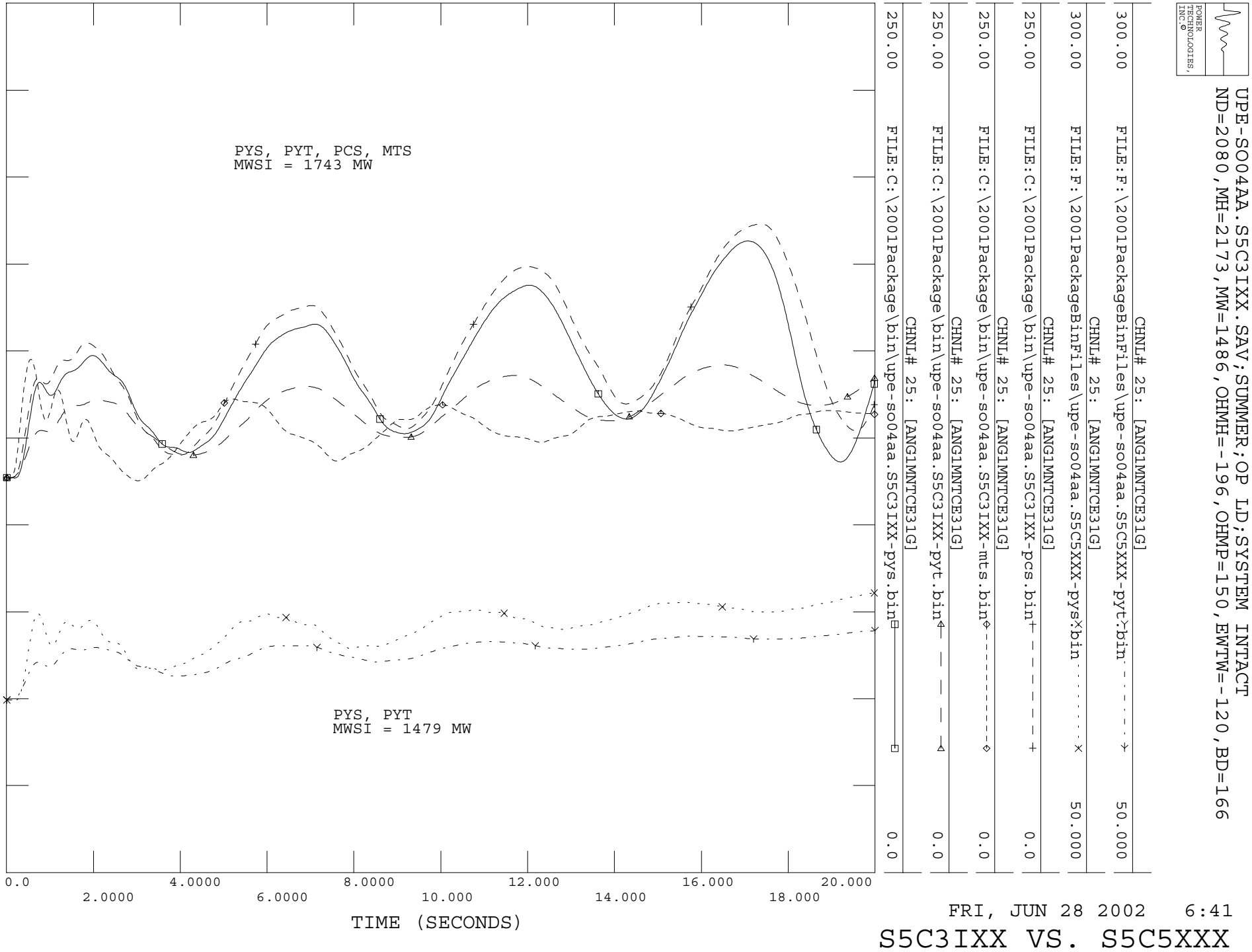

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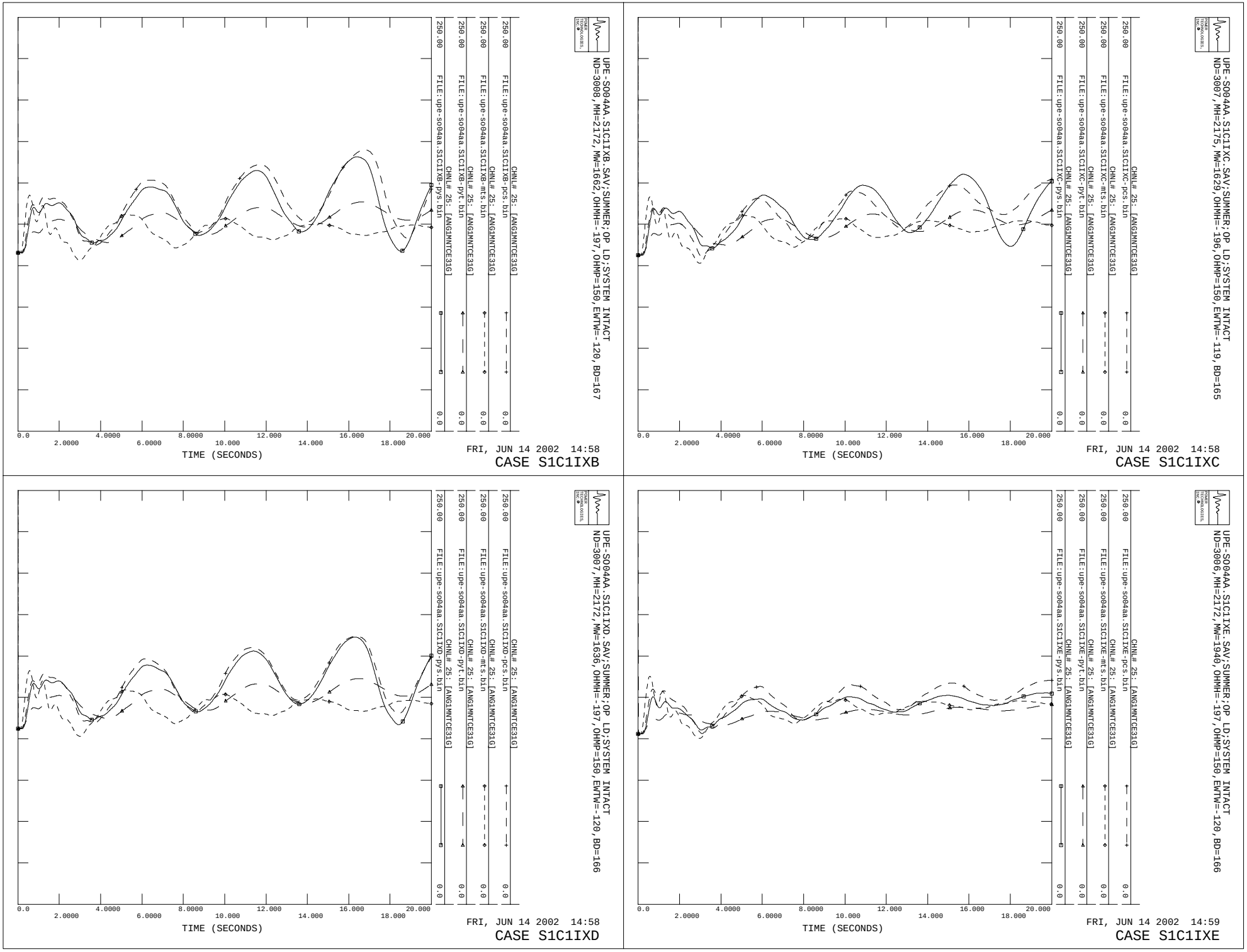
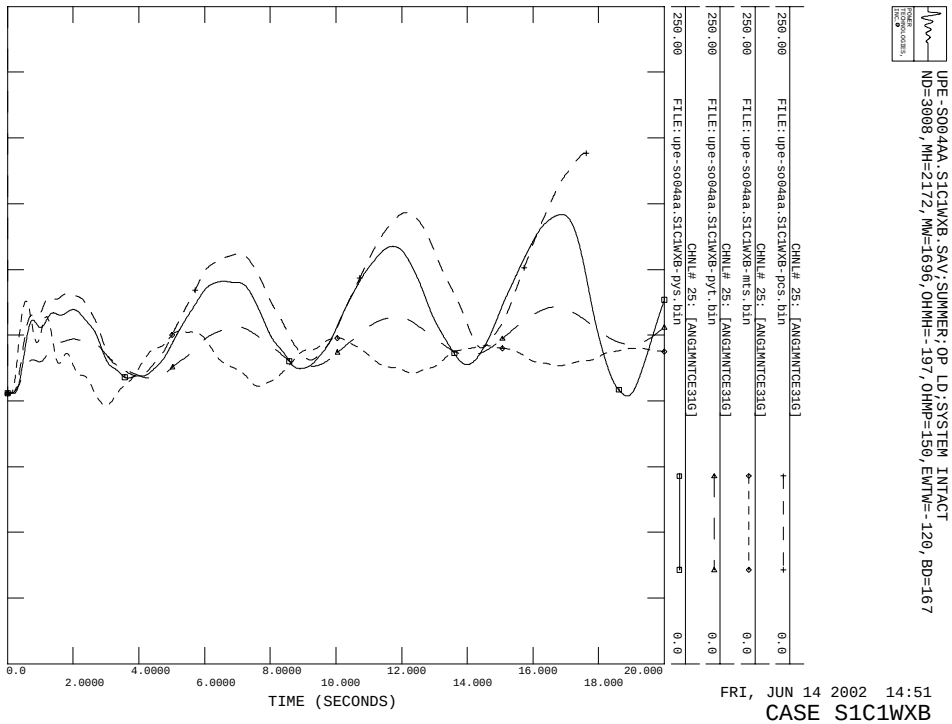
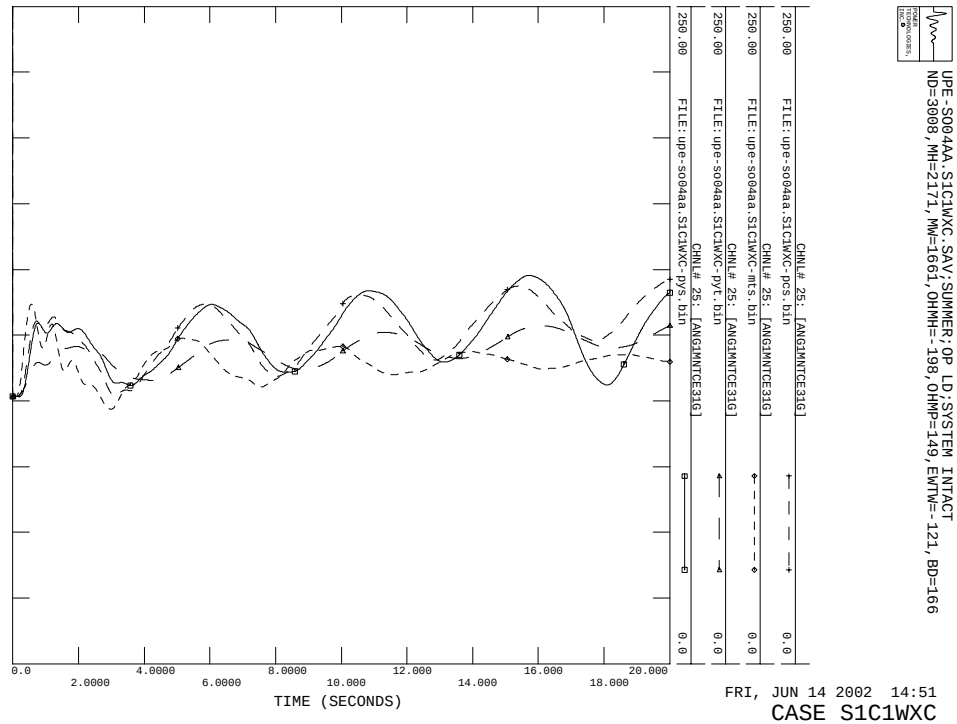
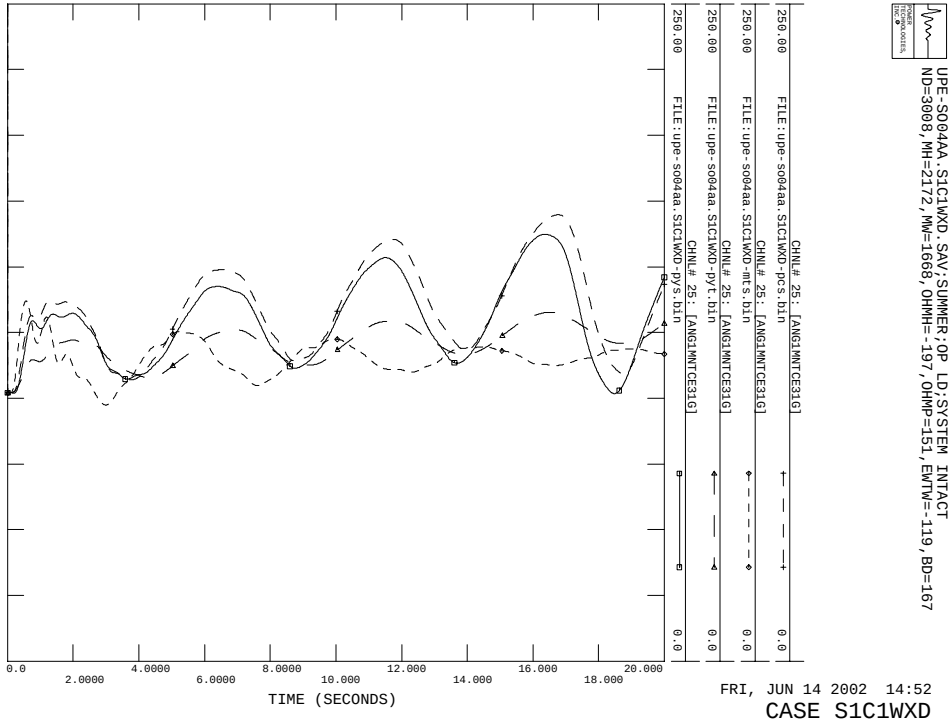
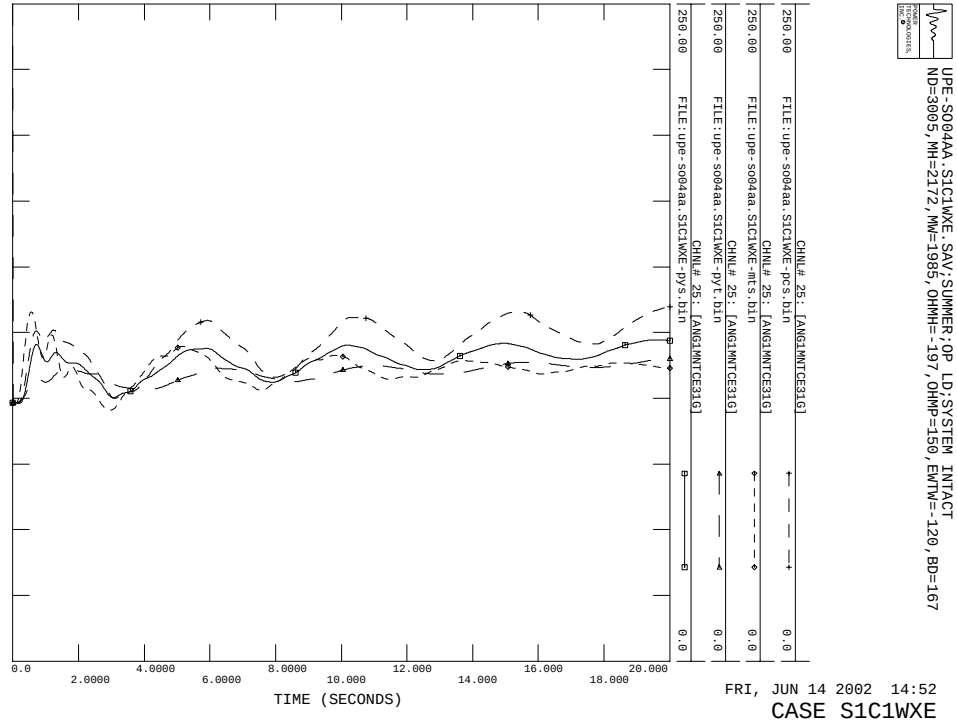


Figure 4.2 - Phase 2 Cases with Reinforcements "B", "C", "D", and "E"









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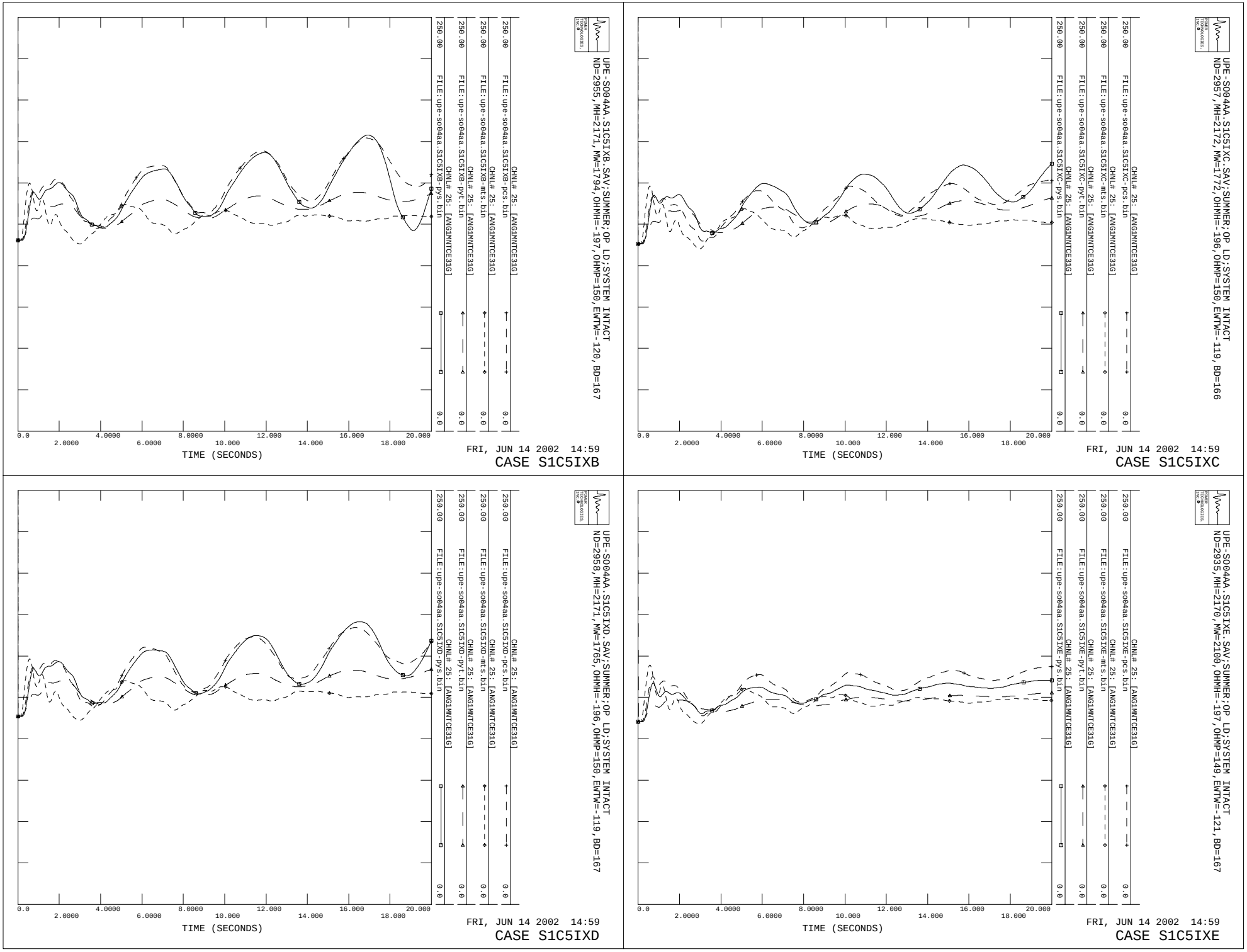

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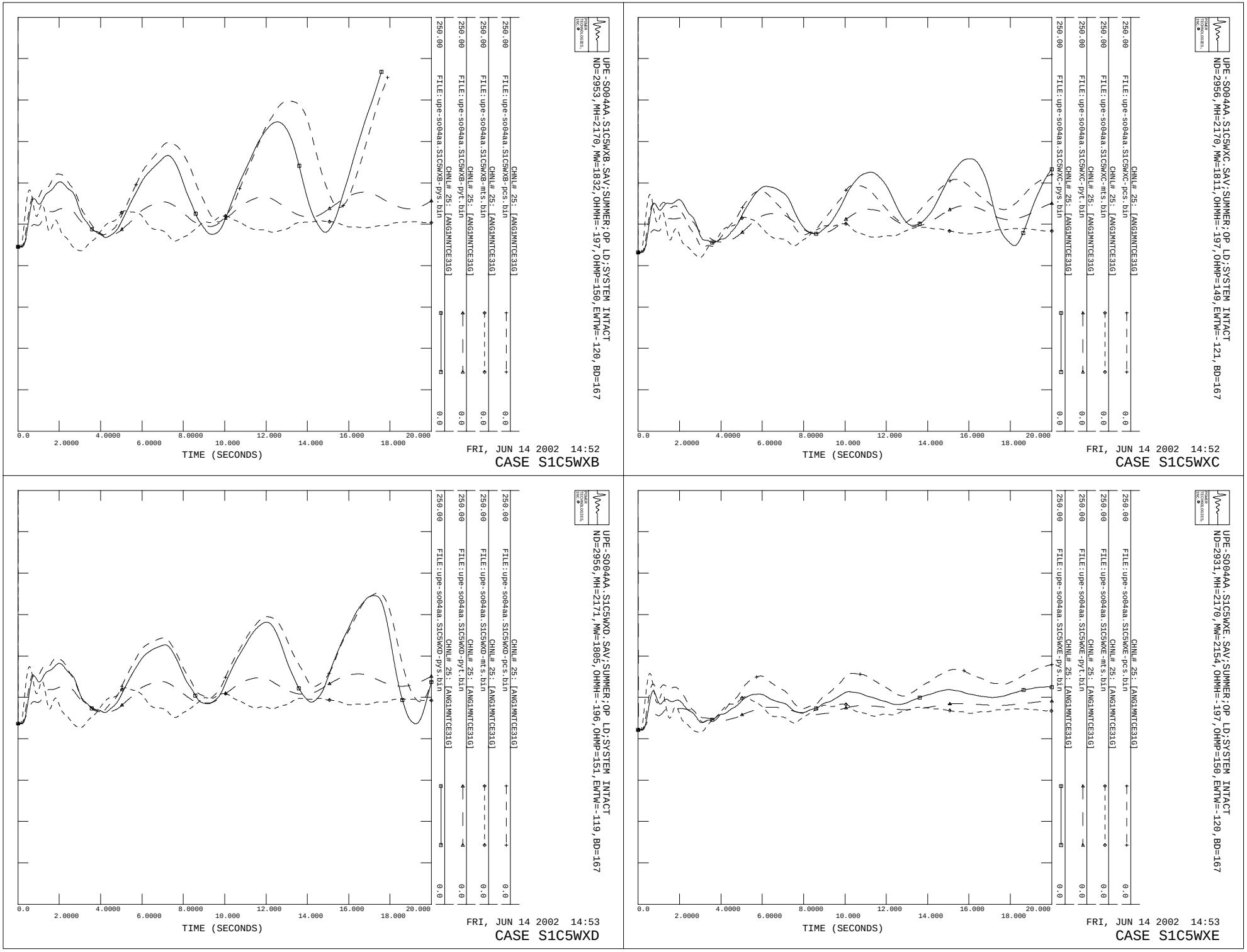

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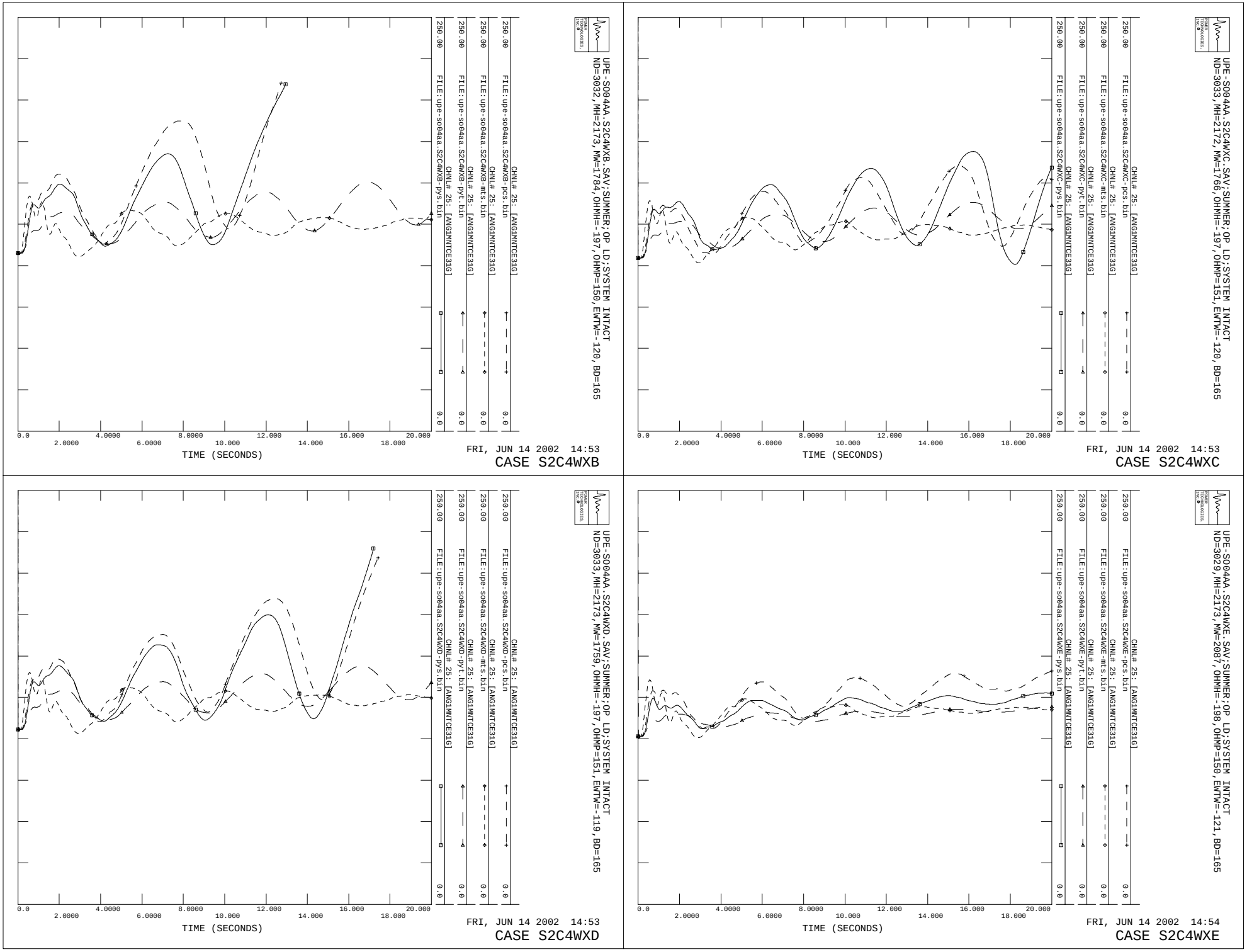

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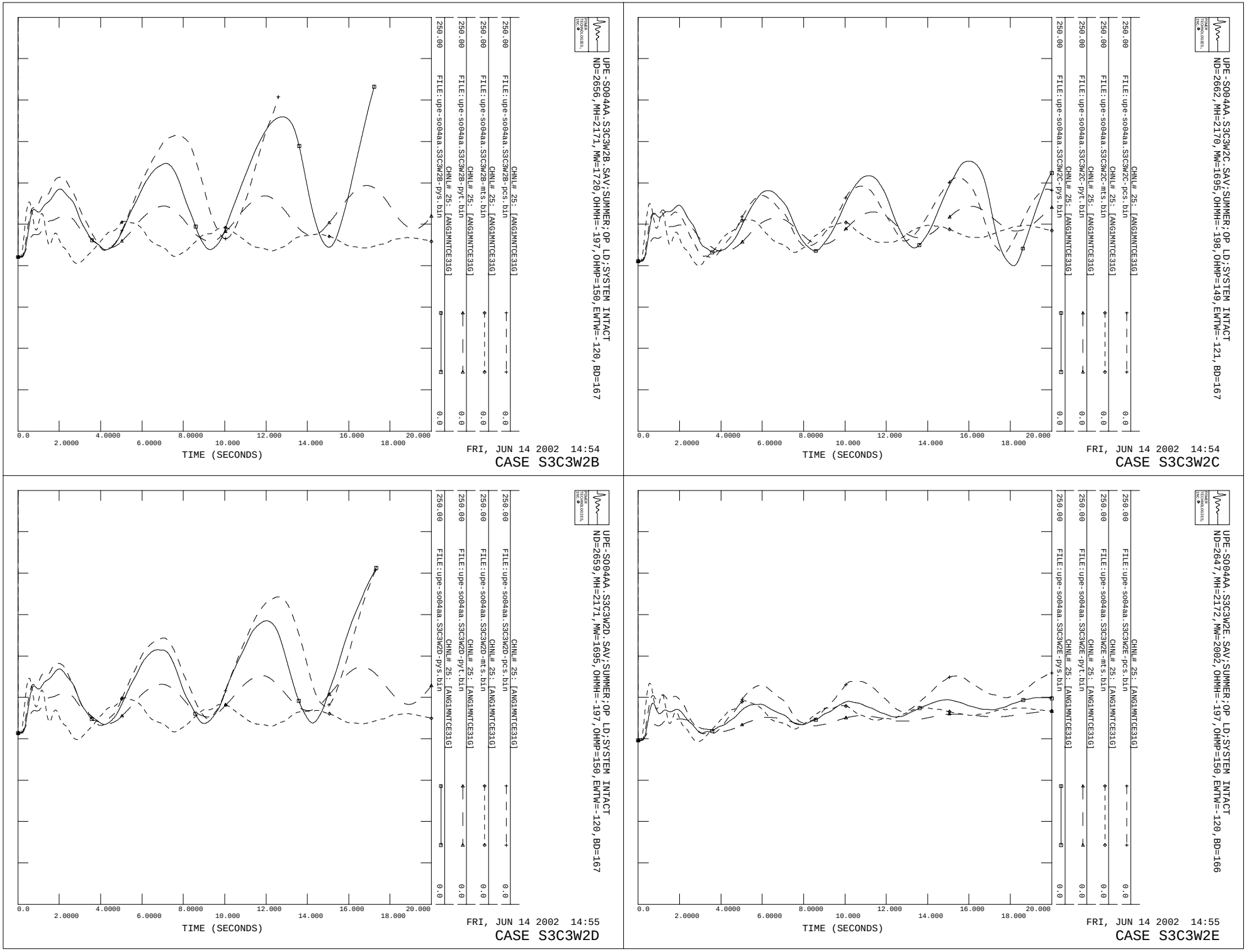

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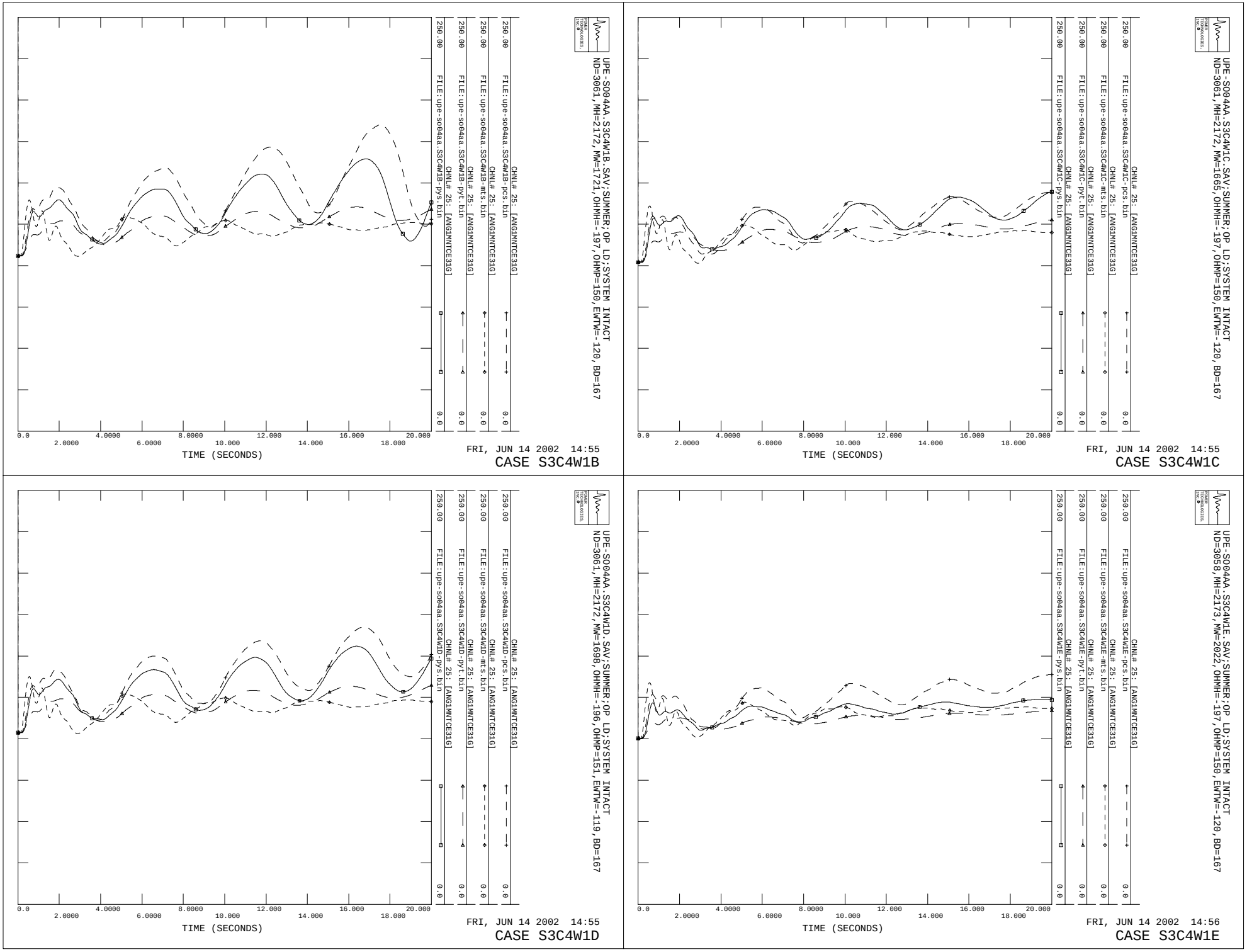

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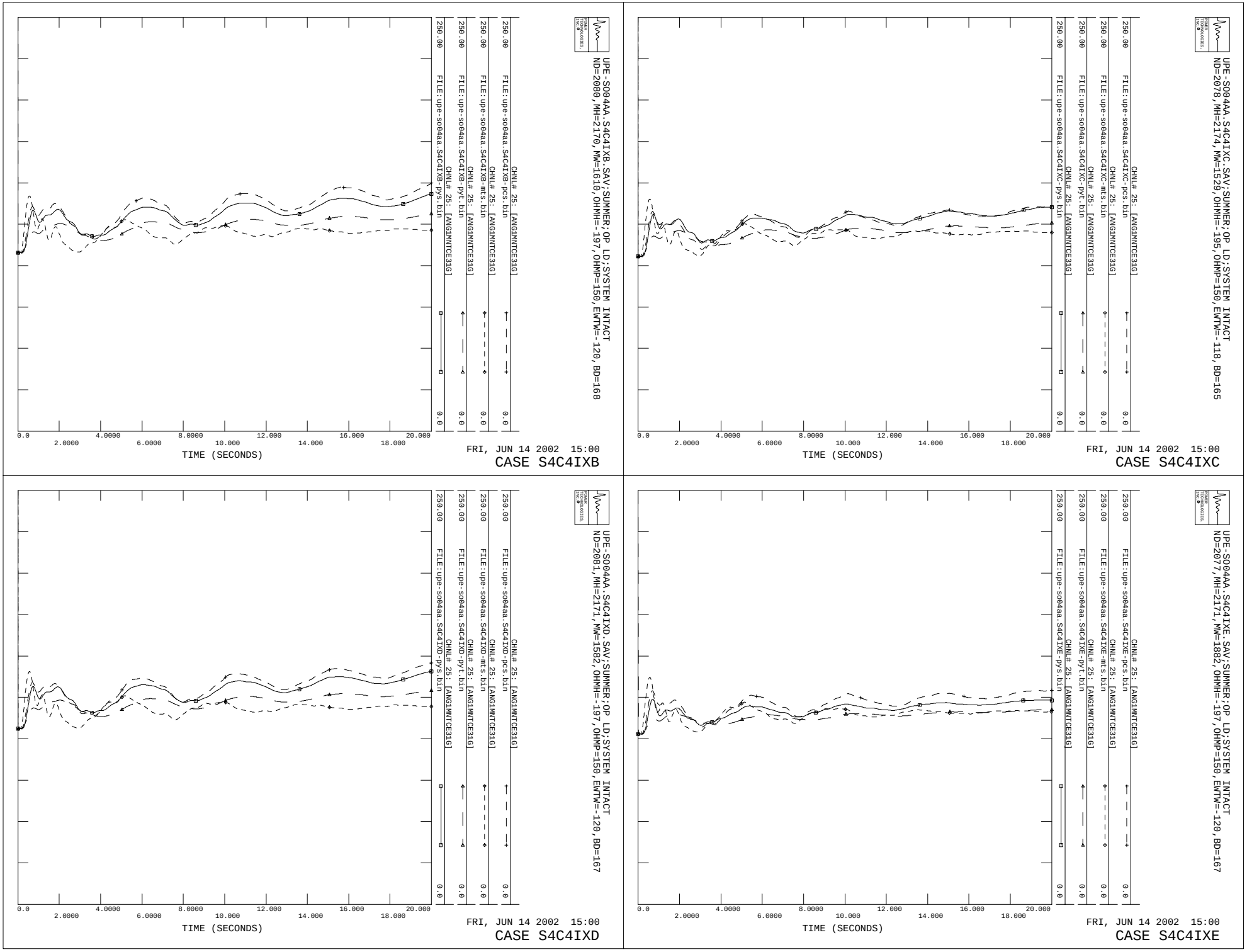

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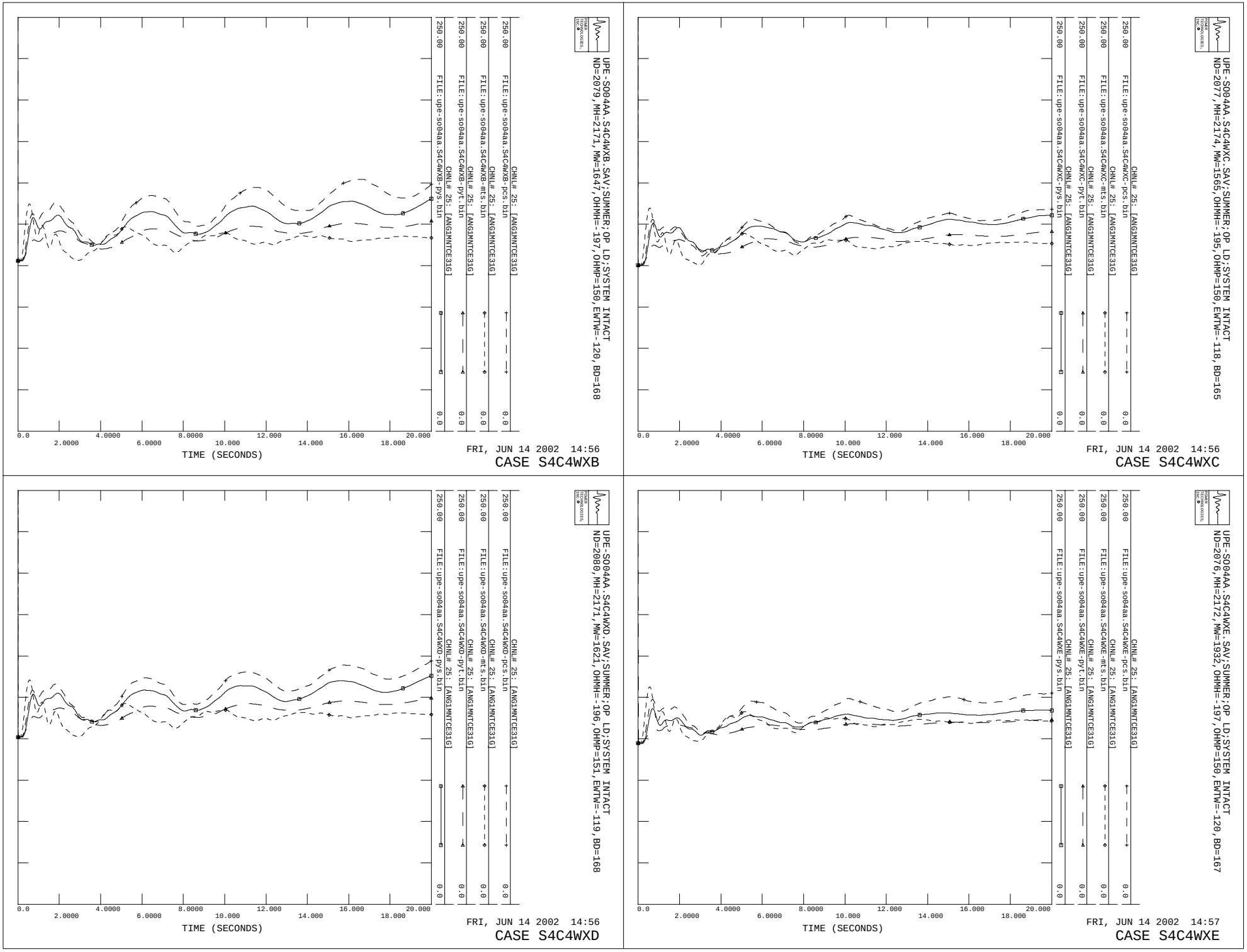

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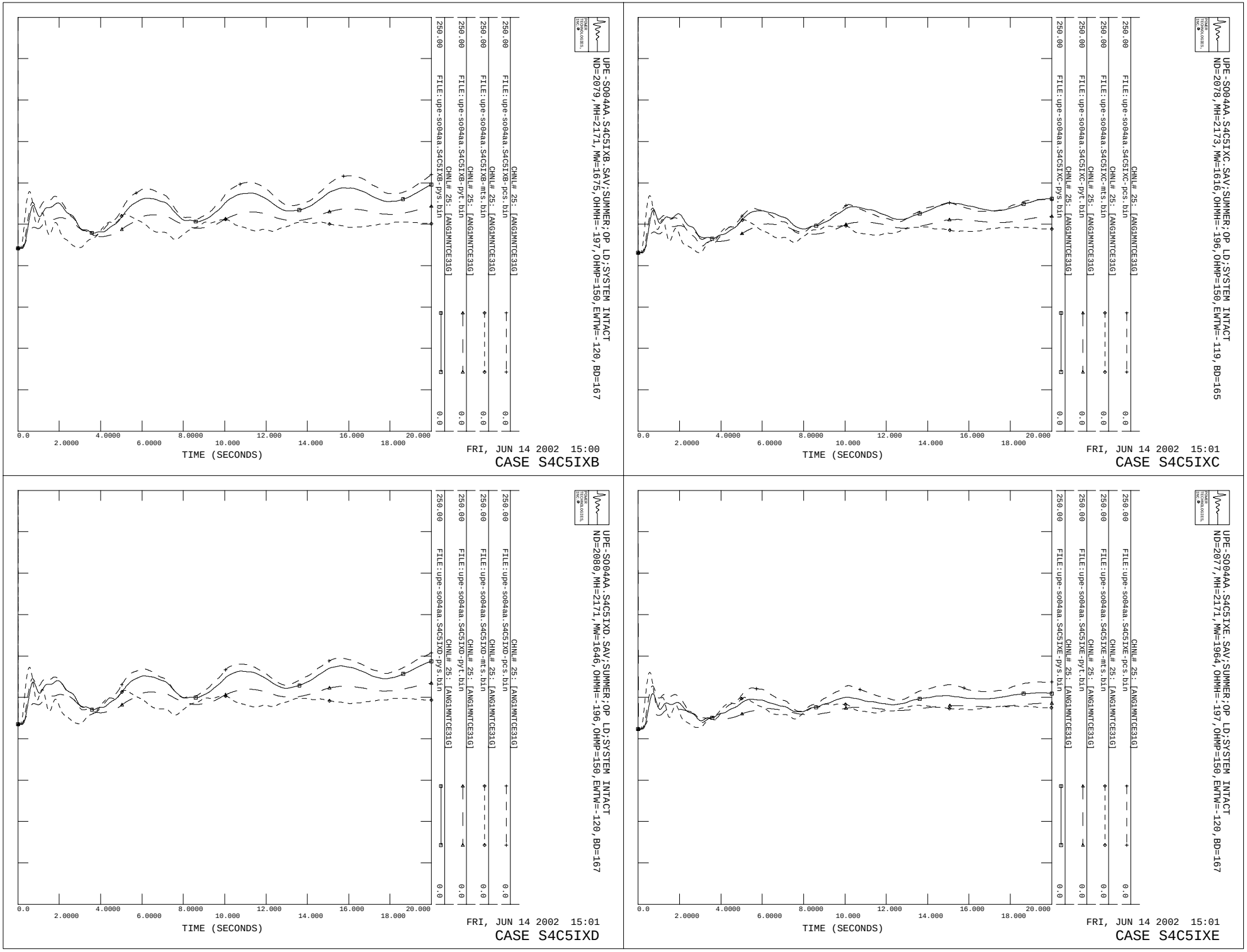

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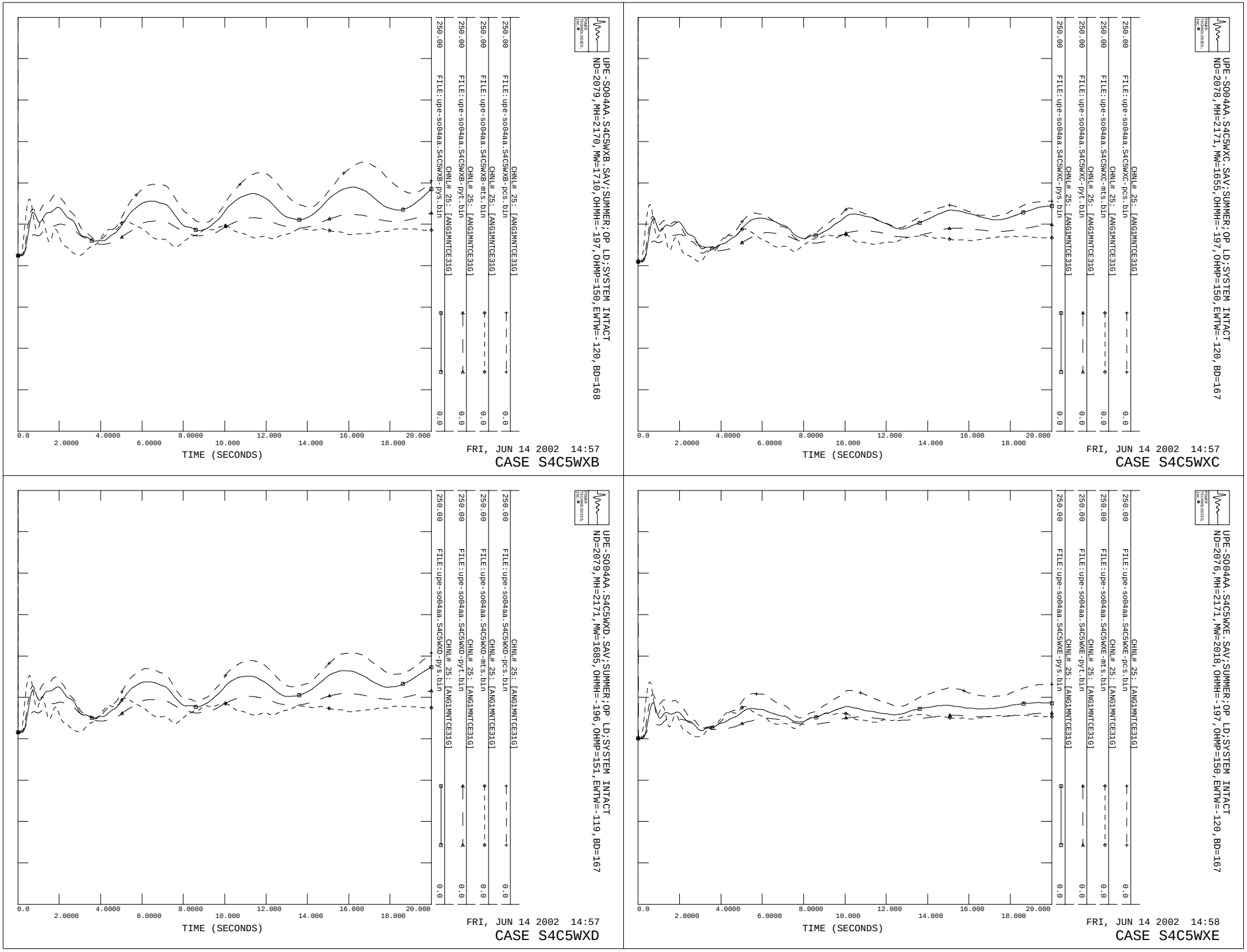

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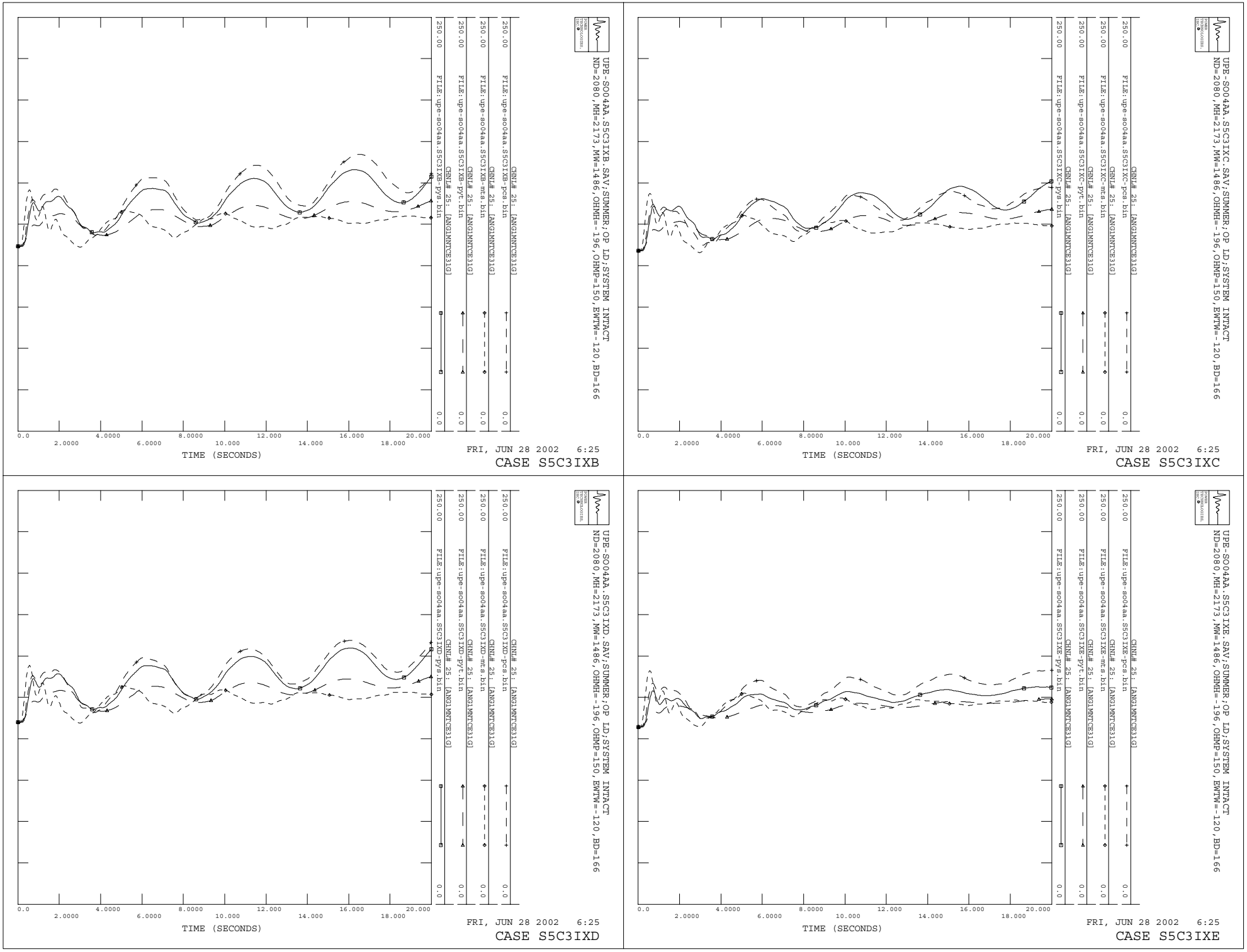

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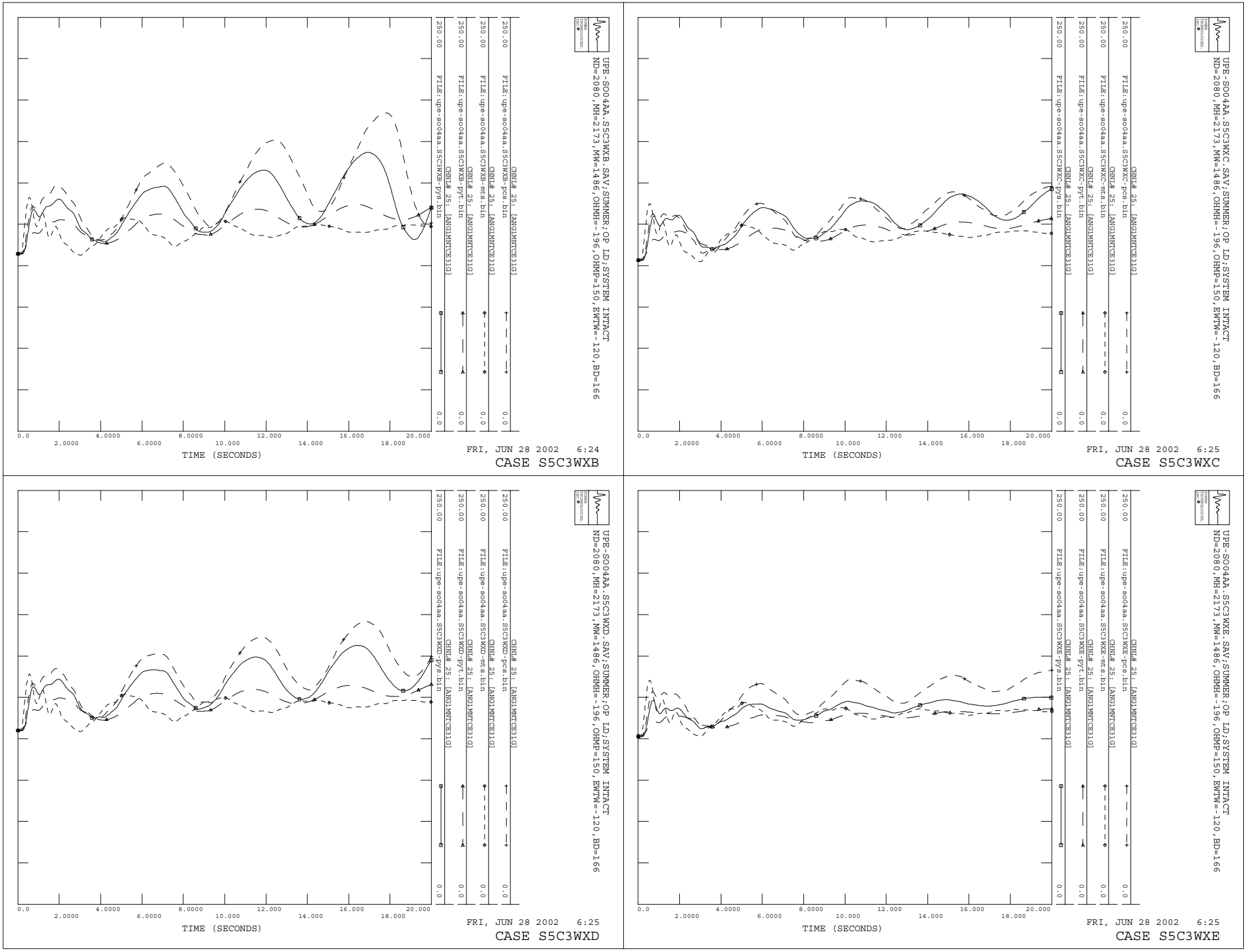

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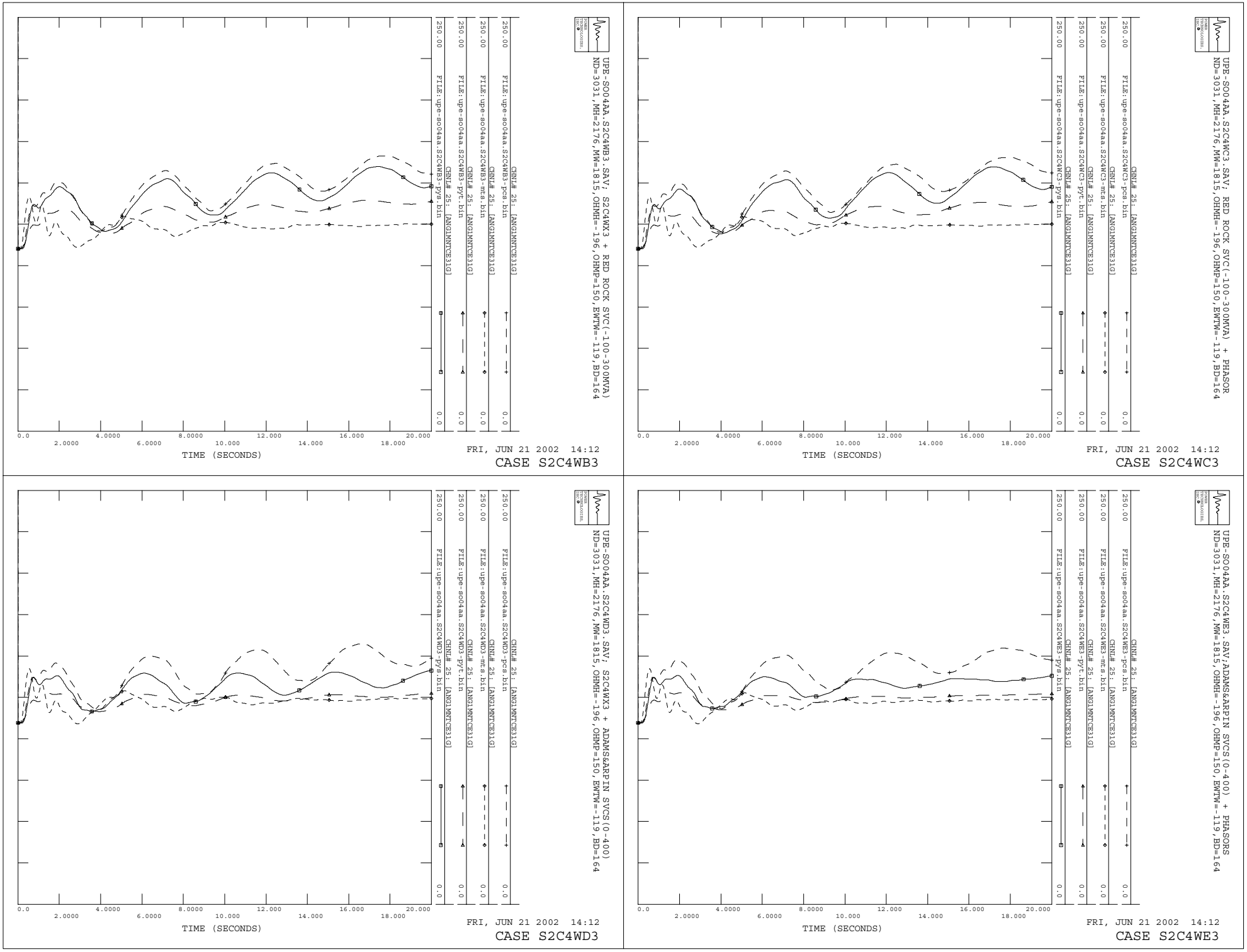


Figure 4.3 - Results from SVC Application Studies

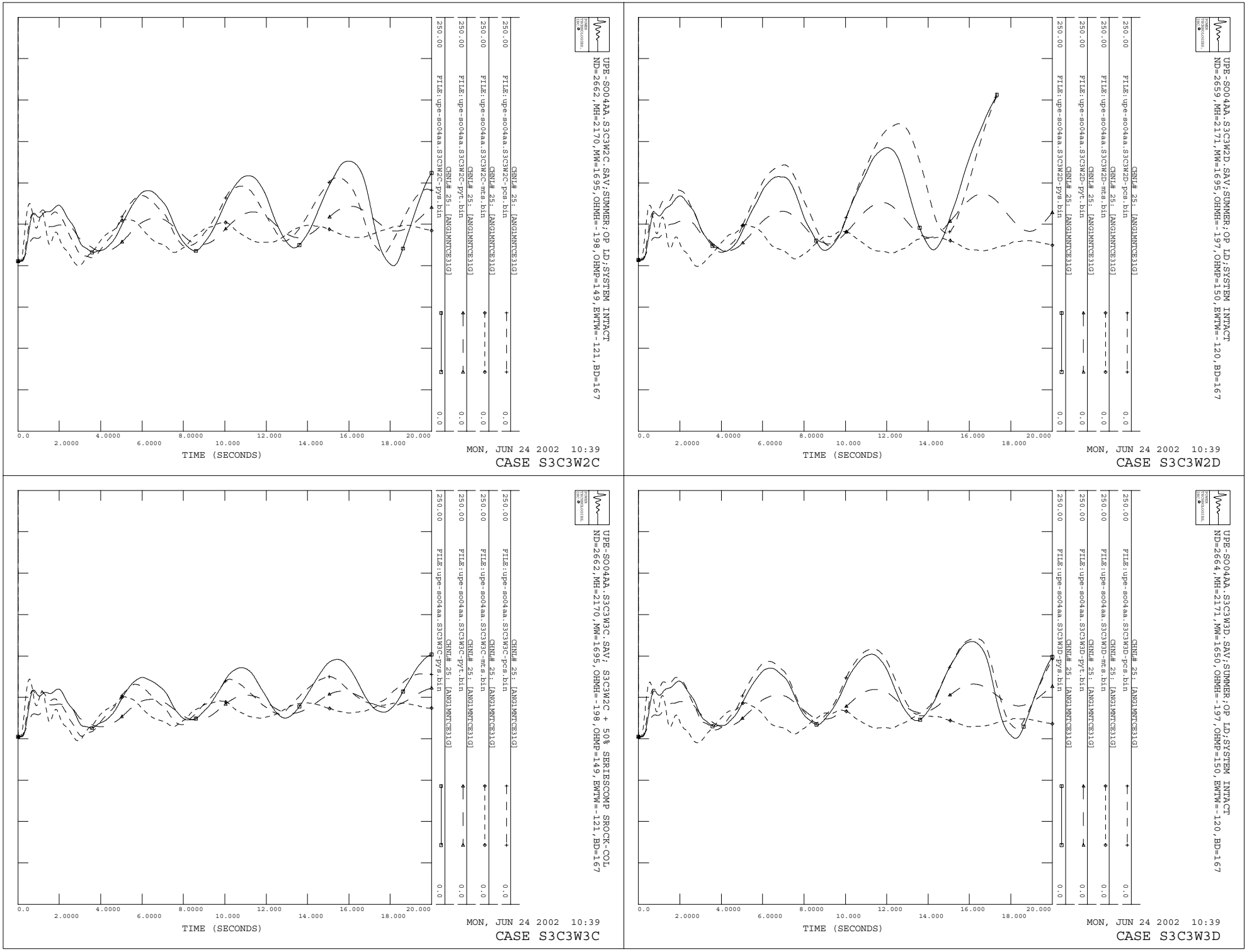
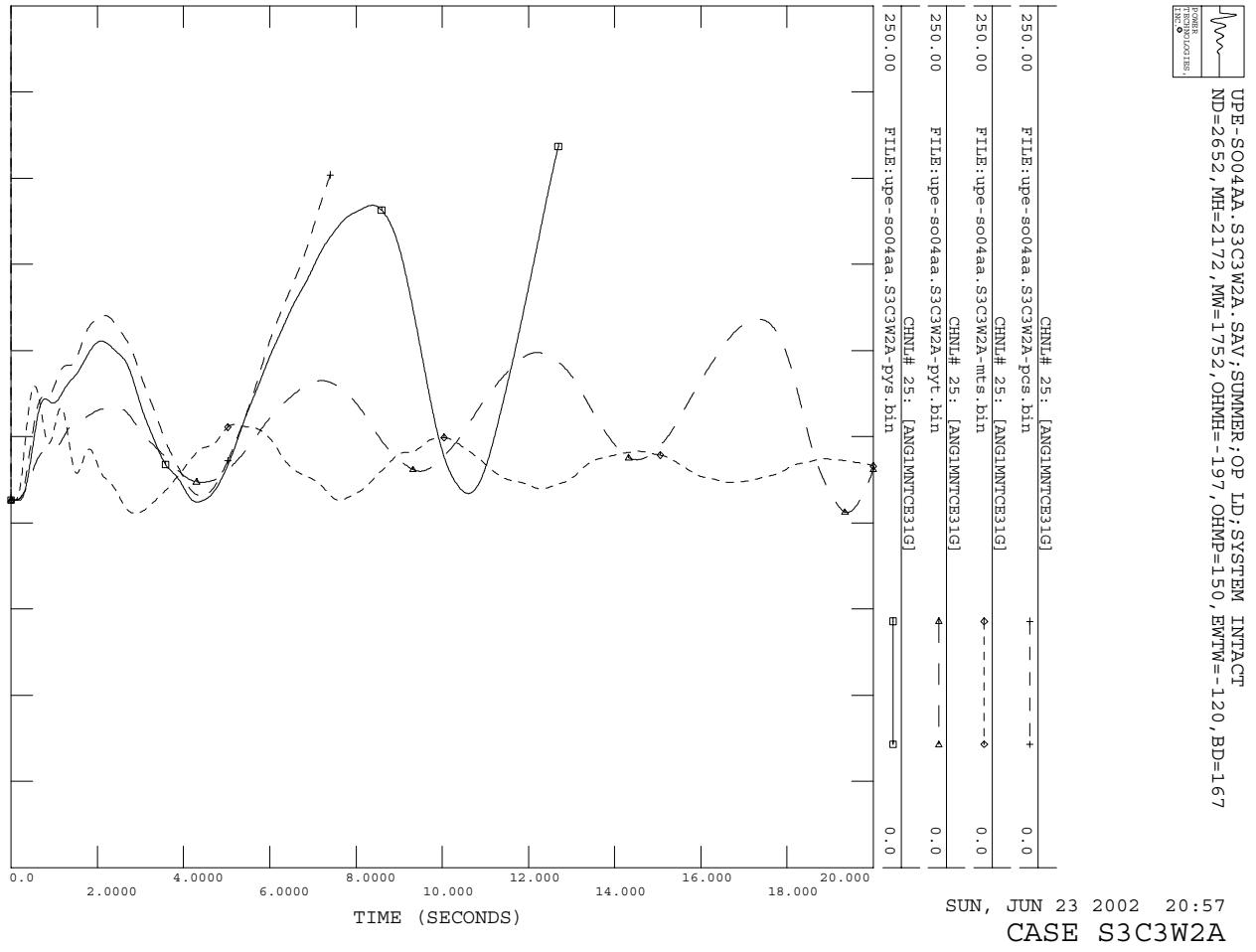


Figure 4.4 - Simulation Results Without ("W2X") and With ("W3X") 50% Series Compensation



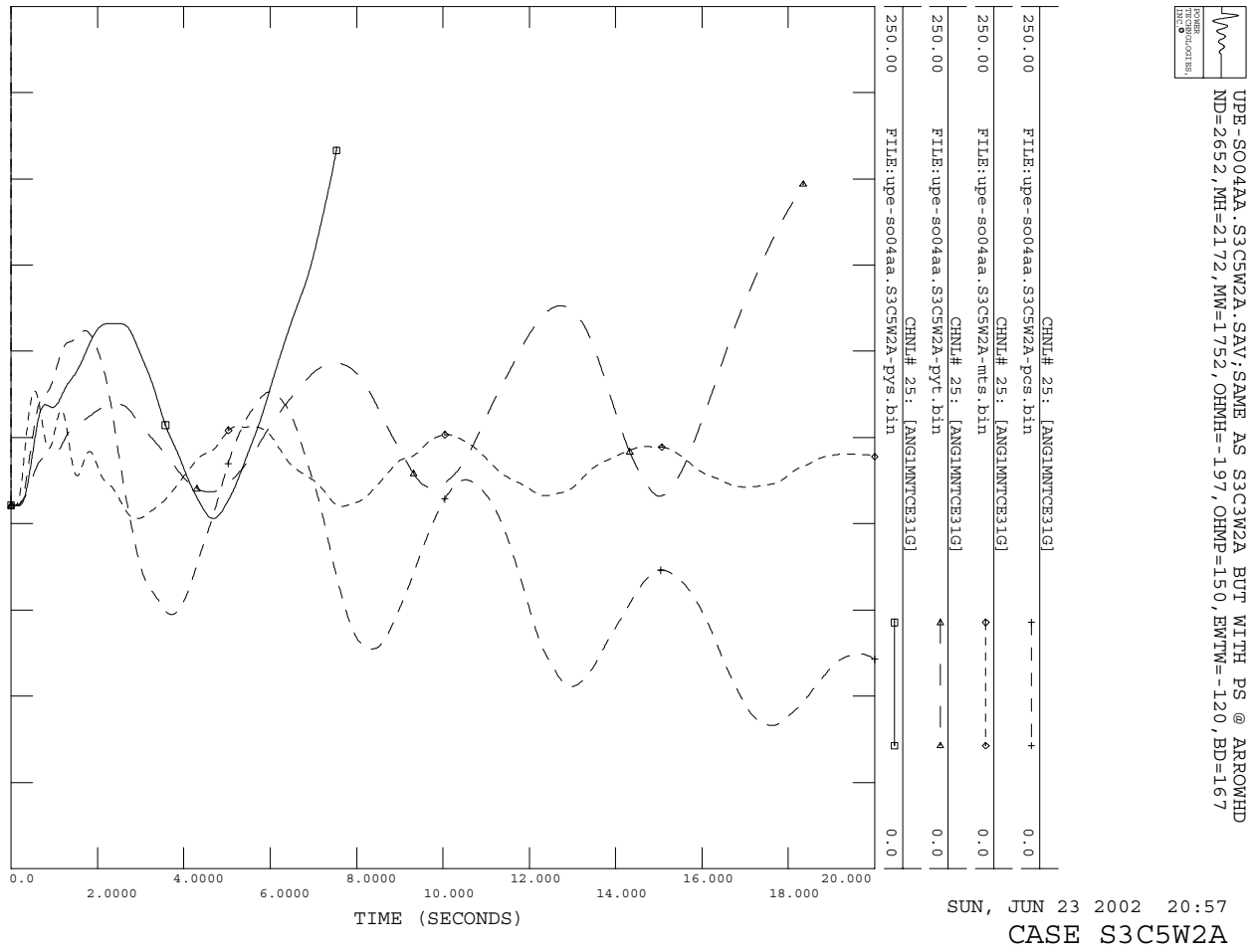


Figure 4.5 - Cases Without (S3C3) and With (S3C5) Phase Shifter @ Arrowhead

5. ANALYSIS OF SELECTED ALTERNATIVES

5.1 Introduction

In Section 4.8, seven Phase 2 Alternatives were selected for further, more detailed analyses. As indicated in that section, the seven alternatives were selected not because they are the best ones, but because they are representative of the choices the network planner might encounter when considering serving Eastern Wisconsin and Iowa/Illinois markets with the new generation.

In these Section 5 studies those alternatives were subjected to the following analyses:

- Thermal performance. Contingency analyses were performed to assess the impact of the new generation and transmission upgrades on the loading of existing transmission following contingencies.
- Transmission losses. Incremental losses (i.e., those resulting from the new generation) were calculated.
- Impact on Constrained Interfaces. The impact of the alternatives on known constrained interfaces (flowgates) was assessed, since an alternative leading to excessive loading of flowgates could incur additional operational (i.e., generation restrictions) and/or capital (share of system upgrades) costs.
- Capital Cost. Cost estimates were developed on the basis of the MAPP Cost Estimator and ABB's budgetary estimates.

5.2 Thermal Analyses

5.2.1 Introduction

Linearized (utilizing the MUST Program) and full AC contingency analyses (PSS/E Activity ACCC) were performed on the seven selected cases. N-1 Contingencies were investigated throughout the MAPP System (more in-depth analyses should consider multi-element contingencies, such as double circuit contingencies in Western's South Dakota 230 kV transmission system). MUST results for each of the selected alternatives are included in Table 5.1. The four right-most columns in that table include the following ACCC results:

- Percent overload (Rate C - Emergency Rating) for the same contingency in Case ABBBASE (i.e., the base-case without the additional generation).
- Maximum percent overload under any contingency in Case ABBBASE.
- Percent overload in the case under consideration.
- Increase in % overloading with respect to Case ABBBASE.

On the basis of the results in Table 5.1, and their comparison against the results from the Phase 1 analyses, Table 5.2 was prepared. Table 5.2 lists thermal constraints in Table 5.1 that are either new, or have significantly increased in severity from their respective Phase 1 cases. In other words, Table 5.2 summarizes thermal overloads

that are attributable to serving the Eastern Wisconsin and Iowa/Illinois markets instead of Twin Cities loads. Table 5.2 includes the following information:

- Limiting Branch.
- Worst Contingency.
- Rates C (Emergency) and B (Conductor) for limiting branch.
- Post-Contingency loading as a % of Emergency Rating.
- In parenthesis, % change with respect to overloading in the base-case ABBBASE.

The right-most column in Table 5.2 shows:

- An "R" (re-conductor) if the branch loading is greater than both emergency and conductor ratings, and if the overload is either new or has been aggravated by the new generation and its transmission.
- A "U" (upgrade) if the branch loading exceeds the emergency, but not the conductor rating. It is therefore likely that the overload can be overcome by the relatively low cost replacement of equipment (current transformers, line wave traps, etc.) that is preventing the full use of conductor thermal capacity.
- None. If the overload is less than the maximum experienced under Case ABBBASE, the condition is deemed a pre-existing one, and no action is recommended.

5.2.2 Case S1C1IXE

The first page in Table 5.2 corresponds to Alternative S1C1IXE; a Site 1 (Hettinger) case (S1), serving Iowa/Illinois markets (I), and with a Prairie Island-Columbia Phase 2 reinforcement (E). The table shows how increased transfers to the East (higher MWSI levels) and South (Iowa/Illinois Dispatch) leads to corresponding thermal violations (in parenthesis, overload as a % of the emergency "C" rating):

<u>East</u> (in most cases as a result of the outage of the Prairie Island-Byron 345 kV line):

- Hibbard-Wntr. St. 7 115 kV (102%)
- Chisago 345/230 kV Transformer (112%)
- Alma-Wabaco 161 kV (121 %)
- Rochester-Wabaco 161 kV (109%)
- Adams-Rochester 161 kV (107%)
- Wilmart 161/115 kV Transformer (109%)

<u>Southeast</u>:

- Davenport-Sub 85 (113%)

South:

- Huron-Woonsocket 115 kV (122%)
- Woonsocket-Storla 115 kV (114%)
- Martin-Vetal Tap 115 kV (117%)
- Sioux City-Plymouth 69 kV (140%)
- Neal-Monona 161 kV (101%)
- Monona-Carroll 161 kV (105%)
- Maurine 230/115 kV Transformer (113%)

5.2.3 Case S2C4WXE

Results from Site 2 (Jamestown) Case S2C4WXE suggest a pattern of thermal violations that is similar to that in the previous case:

East:

- Hibbard-Wntr. St. 7 115 kV (106%)
- Thomson-Hibbard 115 kV (102%)
- Wheaton-Elk Mound 161 kV (124% following outage of AS King-Eau Claire, 78% after cross-tripping of Eau Claire-Arpin)
- Eau Claire-Wheaton 161 kV (124%, 77% after cross-tripping)
- Barron-Apple River 161 kV (110%, 92% after cross-tripping)
- Chisago 345/230 kV Transformer (114%)
- Wilmart 161/115 kV Transformer (111%)
- Hillsboro-T Hlb 69 kV (107%)

Southeast:

- Davenport-Sub 85 161 kV (110%)

South:

- Monona-Carroll 161 kV (102%)
- Huron-Woonsocket 115 kV (125%)
- Woonsocket-Storla 115 kV (117%)
- Sioux City-Plymouth 69 kV (131%)

The case also exhibits increased overloading within Northern MAPP, overloading that can be attributed to the shifting of flow patterns towards the South:

- Baker-Glendive 115 kV (133%)
- Dawson Co.-Glendive 115 kV (111%)
- Dawson Co.-Medora 230 kV (117%)
- Dickinson-New England 115 kV (131%)
- Hettinger-New England 115 kV (127%)

5.2.4 Case S2C4WD3

In this second Site 2 (Jamestown) case, stability was attained by deployment of SVCs at the Arpin and Adams 345 kV stations instead of by reinforcing the network with a new 345 kV line as in the previous S2C4WXE Case. The results in Table 5.2 suggest a significant increase in the number and severity of overloads, many occurring east of the Twin Cities.

For example, the outage of the Lawrence Creek to Apple River 230 kV line leads to the following overloads on underlying 69 kV transmission:

- Scanta-St. Croig 69 kV (124%)
- St. Croig-Oscola 69 kV (194%)
- Oscola-Border 69 kV (181%)
- Border-Sand Lake 69 kV (178%)
- Garfield-Sand Lake 69 kV (159%)
- Apple River-Garfield 69 kV (130%)

The outage of MWSI lines (King-Eau Claire-Arpin, and Prairie Island-Byron-Pleasant Valley and beyond 345 kV) leads to the following overloads:

- Wheaton-Elk Mound 161 kV (142% following outage of AS King-Eau Claire, 89% after cross-tripping of Eau Claire-Arpin)
- Elk Mound-Barron 161 kV (127%, 94% after cross-tripping)
- Eau Claire-Wheaton 161 kV (142%, 89% after cross-tripping)
- Barron-Apple River 161 kV (121%, 100% after cross-tripping)
- Eau Claire-Seven Mile 161 kV (114%, 71% after cross-tripping)
- Wissota G-Wissota B 69 kV (155%, 131% after cross-tripping)
- Wissota-DPC Tap 69 kV (141%, 131% after cross-tripping)
- Cadot-DPC Tap 69 kV (142%, 120% after cross-tripping)
- Alma-Wabaco 161 kV (138 %)
- Rochester-Wabaco 161 kV (126%)
- Adams-Rochester 161 kV (140%)
- Silver Lake-Rochester 161 kV (120%)
- Wilmart 161/115 kV Transformer (124%)
- Hillsboro-T Hlb 69 kV (145%, 140% after cross-tripping)
- West Faribut-Lake Marion 115 kV (109%)
- Maple Leaf-Byron 161 kV (104%)
- Lime Creek-Emery 161 kV (121%)

Other thermal violations to the East are:

- Hibbard-Wntr. St. 7 115 kV (110%)
- Thomson-Hibbard 115 kV (102%)
- Tremval-Alma 161 kV (110%)

- Viroqua-T. Vio 69 kV (109%)
- Lafarge-T. Vio 69 kV (106%)
- Tomah-Sparta 69 kV (115%)
- T TC-Tomah 69 kV (109%)
- Monroe County-Sparta 69 kV (115%)
- Chisago 345/230 KV Transformer (114%)
- Davenport-Sub 85 161 kV (113%)

South of Northern MAPP, the results in Table 5.2 suggest the following overloads:

- Huron-Woonsocket 115 kV (128%)
- Woonsocket-Storla 115 kV (121%)
- Sioux City-Plymouth 69 kV (135%)
- Neal-Monona 161 kV (101%)
- Maurine-Bison 230 kV (103%)
- Brookings-Flandreau 115 kV (105%)
- Summit-Watertown 115 kV (107%)

Also in Table 5.2 are thermal violations within Northern MAPP, violations that can be attributed to the shifting of flow patterns towards the South:

- Baker-Glendive 115 kV (135%)
- Dawson Co.-Glendive 115 kV (114%)
- Dickinson-New England 115 kV (135%)
- Hettinger-New England 115 kV (131%)

5.2.5 Case S3C3W2E

This Site 3 (Minot) case includes a Prairie Island-Columbia 345 kV Circuit (Reinforcement E), which reverts the overloading patterns to those observed in the previous two cases with such a reinforcement (S1C1IXE and S2C4WXE):

East

- Hibbard-Wntr. St. 7 115 kV (117%)
- Chisago 345/230 KV Transformer (112%)
- Wilmart 161/115 kV Transformer (107%)
- Hibridge-Rogers Lake 115 kV (110%)
- Wheaton-Elk Mound 161 kV (116% following outage of AS King-Eau Claire, 75% after cross-tripping of Eau Claire-Arpin)
- Eau Claire-Wheaton 161 kV (115%, 74% after cross-tripping)
- Elk Mound-Barron 161 kV (107%, 79% after cross-tripping)
- Hillsboro-T Hlb 69 kV (104%) Wilmart 161/115 kV Transformer (124%)
- Davenport-Sub 85 161 kV (110%)

South

- Monona-Carroll 161 kV (102%)
- Sioux City-Plymouth 69 kV (133%)

Within Northern MAPP

- Baker-Glendive 115 kV (140%)
- Dickinson-New England 115 kV (139%)
- Hettinger-New England 115 kV (139%)

5.2.6 Case S4C4IXA

As in Case S2C4WD3, no Phase 2 reinforcements are contemplated in this case. This leads to increased overloadings, however, because of the site's location at Ft. Thompson, the overloads are not nearly as severe as those observed in Case S2C4WD3:

East

From outage of MWSI lines:

- Wheaton-Elk Mound 161 kV (128% following outage of AS King-Eau Claire, 81% after cross-tripping of Eau Claire-Arpin)
- Eau Claire-Wheaton 161 kV (127%, 80% after cross-tripping)
- Barron-Apple River 161 kV (112%, 94% after cross-tripping)
- Alma-Wabaco 161 kV (127 %)
- Rochester-Wabaco 161 kV (114%)
- Adams-Rochester 161 kV (126%)
- Silver Lake-Rochester 161 kV (110%)
- Hillsboro-T Hlb 69 kV (132%, 127% after cross-tripping)
- Lime Creek-Emery 161 kV (109%)
- Wilmart 161/115 kV Transformer (126%)

Other East-Side overloads:

- Tremval-Alma 161 kV (104%)
- Viroqua-T. Vio 69 kV (104%)
- Tomah-Sparta 69 kV (105%)
- T TC-Tomah 69 kV (105%)
- Monroe County-Sparta 69 kV (110%)
- Chisago 345/230 KV Transformer (111%)
- Davenport-Sub 85 161 kV (116%)
- Hibbard-Wntr. St. 7 115 kV (106%)

Overloads to the South of Northern MAPP:

- Sioux City-Plymouth 69 kV (140%)
- Plymouth-Little Sioux 161 kV (102%)
- Neal-Monona 161 kV (110%)
- Monona-Carroll 161 kV (116%)
- Ft. Thompson-Lake Platte (102%)
- Spencer-Tribo Jnctn. 161 kV (125%)
- Lakefield-Tribo Jnctn. 161 kV (103%)

Because of the Site's location to the South of Northern MAPP, no increased overloading was observed within that system.

5.2.7 Case S4C5WXD

This Site 4 (Ft. Thompson) case is similar to the previous one (S4C4IXA) except in that it includes a "D" Reinforcement (Split Rock-Des Moines-Zion), and as such is indicative of benefits that could be expected from such a reinforcement.

East

From outage of MWSI lines:

- Wheaton-Elk Mound 161 kV (82% after cross-tripping of Eau Claire-Arpin)
- Elk Mound-Barron 161 kV (83% after cross-tripping)
- Eau Claire-Wheaton 161 kV (81% after cross-tripping)
- Barron-Apple River 161 kV (95% after cross-tripping)
- Adams-Rochester 161 kV (119%)
- Silver Lake-Rochester 161 kV (107%)
- Hillsboro-T Hlb 69 kV (133% after cross-tripping)
- Wilmart 161/115 kV Transformer (120%)

Other East-Side overloads:

- Tremval-Alma 161 kV (105%)
- Tomah-Sparta 69 kV (114%)
- T TC-Tomah 69 kV (112%)
- Monroe County-Sparta 69 kV (116%)
- Chisago 345/230 KV Transformer (111%)
- Davenport-Sub 85 161 kV (111%)
- Hibbard-Wntr. St. 7 115 kV (106%)

Overloads to the South of Northern MAPP:

- Sioux City-Plymouth 69 kV (118%)
- Neal-Monona 161 kV (99%)

- Monona-Carroll 161 kV (102%)
- Spencer-Tribo Jnctn. 161 kV (111%)
- Huron-Woonsocket 115 kV (124%)
- Woonsocket-Storla 115 kV (116%)

Comparison of these results against those from Case S4C4IXA (without reinforcement) suggests that the most benefit of the Split Rock-Des Moines-Zion 345 kV reinforcement is that of a reduction in overloads to the south of Northern MAPP. The benefit on eastern-side overloads is limited.

5.2.8 Case S5C3WXE

This Site 5 (Watertown) alternative includes the Prairie Island-Columbia 345 kV ("E") reinforcement, which limits the number of incremental overloads (i.e., over and above those observed in the Phase 1 studies) to a relative few:

East

From outage of MWSI lines:

- Wheaton-Elk Mound 161 kV (84% after cross-tripping of Eau Claire-Arpin)
- Eau Claire-Wheaton 161 kV (84% after cross-tripping)
- Barron-Apple River 161 kV (99% after cross-tripping)
- Hillsboro-T Hlb 69 kV (113%)
- Wilmart 161/115 kV Transformer (117%)

Other East-Side overloads:

- Hibbard-Wntr. St. 7 115 kV (103%)
- Monroe County-Sparta 69 kV (103%)
- Chisago 345/230 KV Transformer (111%)
- Davenport-Sub 85 161 kV (111%)

Overloads to the South of Northern MAPP:

- Sioux City-Plymouth 69 kV (129%)
- Neal-Monona 161 kV (102%)
- Monona-Carroll 161 kV (107%)
- Spencer-Tribo Jnctn. 161 kV (115%)

5.2.9 Conclusions from Thermal Analyses

As expected, the migration of the markets for the new generation from the Twin Cities to Eastern Wisconsin and Iowa/Illinois leads to an increase in thermal violations to the east and south of the Northern MAPP system. In some cases, it also leads to increased overloads within that system, as flows shift to accommodate the new location of the loads.

Overloads towards the east of the MAPP system are very sensitive to whether or not the Prairie Island-Columbia 345 kV reinforcement is part of the alternative. Cases without such reinforcement exhibit significant overloads on that part of the system. This is particularly true in Case S2C4WD3, where no reinforcement was considered (other than SVCs at the Arpin and Adams 345 kV stations), and which leads to a substantial number of severe overloads, particularly upon 345 kV contingencies affecting lines comprising the MWSI Interface. In contrast, east-side overloads on alternatives including a Prairie Island-Columbia reinforcement are relatively few, and less severe.

It is important once again to note that these results already assume the Arrowhead-Weston 345 kV transmission is in service. In these thermal analyses, the Phase Shifter at Arrowhead was assumed enabled in all cases except in Case S3C3W2E, where it was shown in Section 4.6 the phase shifter would be detrimental to the voltage performance of the system.

The reliance on the Prairie Island-Columbia 345 kV ("E") reinforcement is site-dependent, however, since results for Site 4 (Ft. Thompson) without any reinforcement (S4C4IXA) and with a Split Rock-Des Moines-Zion reinforcement (S4C5WXD) display east-side overloads that although higher than with "E" reinforcement cases, are not as extreme as in the Site 2 S2C4WD3 case.

South-bound overloads are on the other hand more consistent across all alternatives and tend to be more sensitive to site location (for example "Northern" Sites 1 -Hettinger-, 2 -Jamestown-, and 3 -Minot-, tend to show increased overloads on the Baker-Glendive 115 kV, and Dickinson-New England-Hettinger 115 kV lines). Other overloads, on the other hand, are observed consistently in all cases (Monona-Carroll 161 kV and Sioux City-Plymouth 69 kV, for example).

In summary, of most concern in these thermal analysis results is the performance of Alternative S2C4WD3, which assumes the construction of no new lines in Phase 2, and instead the deployment of SVCs for stability reasons. The results suggest a large number of significant overloads to the point of perhaps rendering such an alternative impractical. This, however, should be ascertained only after detailed analyses, since the alternative could otherwise be attractive in terms of capital costs, ROW and permitting requirements. Most of the overloads in that case affect underlying transmission upon outage of bulk transmission elements.

Reconductoring or other means of upgrading overloaded elements in underlying transmission is of course an option, but in some instances there are other less expensive alternatives for improving thermal performance. One such option is repeatedly illustrated in Table 5.2, which is an existing cross-tripping protection scheme between the King-Eau Claire and the Eau Claire-Arpin 345 kV circuits and leads to significant reductions in underlying system overloads. Other alternatives include tripping selected underlying system branches upon bulk system outages, and application of series reactors.

The other important conclusion in these analyses is the effectiveness of the Prairie Island-Columbia 345 kV reinforcement in reducing the number and severity of "east-side" overloads. This benefit is observed in all sites and under both the Eastern Wisconsin and Iowa/Illinois dispatch scenarios.

5.3 Transmission Losses

Transmission losses for each of the seven selected alternatives are compared in Table 5.3 against those in Case ABBBASE. Also listed in Table 5.3 are losses for the Phase 1 counterparts of these cases.

The results suggest an increase in transmission losses under all alternatives. This is expected since in Phase 2 the new generation is assumed serving loads that are more distant than in the Phase 1 case. The highest increase (19.1%) is observed in Case S2C4WD3, which assumes no construction of new reinforcements in Phase 2 beyond those developed for Phase 1 of the studies. On the other hand, Case S4C4IXA, which also does not include additional reinforcements, displays an increase of only 11% in losses, slightly lower than the 11.6% increase experienced in Case S2C4WXE, which assumes a Prairie Island to Columbia reinforcement. The remaining four cases experience more moderate increases in transmission losses ranging from 5.3% to 7.4%.

In absolute terms, the further to the North and West the site is, the larger the losses it experiences in the Phase 2 scenarios (which serve loads to the South and East). Cases S1C1IXE and S2C4WD3, for example, exhibit losses that amount to 31.4% and 31.9%, respectively, of the generated power. Were these losses associated with base-loaded units, levels of 31-32% would be clearly unacceptable. When evaluating these results, however, it is important to take into consideration the inherent variability of wind generation. As shown in the Phase 1 studies, reductions in generation level can lead to dramatic reductions in transmission losses. This is because losses are proportional to the square of currents, and, consequently, proportional to the square of transmitted power. Thus, an assessment of the impact these loss levels could have on project feasibility can only be made after a more comprehensive analysis of losses, including study of a variety of loading and dispatch conditions throughout the year, is conducted. Such an analysis, however, is beyond the scope of these studies.

5.4 Constrained Interface Impact Studies

5.4.1 Introduction

The purpose of these studies was to determine the impact the new generation and associated transmission would have on constrained interfaces throughout the MAPP System. The studies were conducted utilizing the IPLAN Program DFCALC to compare the selected alternatives against Case ABBBASE without the new generation.

DFCALC results comparing interface flows in the selected alternatives against those in Case ABBBASE are summarized in Table 5.4.

5.4.2 Impact on MWSI Interface

As expected, all alternatives display a significant impact on MWSI transfer levels. These values are listed in Table 5.5, in MW, and as a % of the base-case MWSI flow level of 1486 MW (the current operating limit of such interface is 1480 MW).

The largest increases in Table 5.5 are observed for alternatives involving the "E" Prairie Island-Columbia 345 kV reinforcement, which tends to "attract" additional flows towards the interface. This is not a concern, however, since Section 4 results confirm that this reinforcement is particularly effective in increasing MWSI transfer capability.

Instead, results in Section 4 show that alternatives not including such a reinforcement (S2C4WD3, S4C4IXA, and S4C5WXD), which exhibit the least MWSI levels, are of most concern from a dynamic performance point of view.

Table 5.5
Impact of Selected Alternatives on MWSI Flow (Base Level: 1486 MW)

CASE	MWSI (Includes P.Island-Columbia when Applicable)	
	MW	% CHANGE
S1C1IXE	1940.4	30.6
S2C4WXE	2088.0	40.5
S2C4WD3	1843.8	24.1
S3C3W2E	2002.3	34.7
S4C4IXA	1653.4	11.3
S4C5WXD	1685.5	13.4
S5C3WXE	2050.2	38.0

5.4.3 Impact on Other Interfaces

Not counting impacts on the NDEX interface (which are similar to those reported in the Phase 1 studies), other constrained interfaces (disregarding impacts on the now-obsolete MNEX Interface) displaying an impact above the MAPP DRS minimum threshold of 5% are:

Case S1C1IXE

- 5.3% Impact on Grand Island-Lincoln Interface
- 8.4% Impact on the Cooper-South Interface
- 5.2% Impact on the Fort Calhoun-South Interface

"Phase 1" impacts for this alternative (Case S1C1XXA) were:

- 5.0% Impact on Grand Island-Lincoln Interface
- 5.5% Impact on the Cooper-South Interface

These results suggest that, as expected, the shift in transfers from the Twin Cities towards the Iowa/Illinois market leads to higher impacts on interfaces in southern MAPP.

Case S2C4WXE

- 9.6% Impact on Eau Claire-Arpin Interface

Phase 1 impacts for this alternative (Case S2C4XX3) were:

- None

Higher exports to Eastern Wisconsin lead to an increased impact on the Eau Claire-Arpin line. However, because this alternative includes a new circuit between Prairie Island and Columbia, and is thus less susceptible to the outage of Prairie Island to Byron, this may not be a concern.

Case S2C4WD3

- 8.9% Impact on the Cooper-South Interface
- 7.3% Impact on the Fort Calhoun-South Interface
- 19.3% Impact on Eau Claire-Arpin Interface
- 16.5% Impact on Prairie Island-Byron Interface

Phase 1 impacts for this alternative (Case S2C4XX3) were:

- None

Because the alternative does not include any Phase 2 reinforcements, the increased southern and eastern impacts are somewhat expected, and, as illustrated in previous sections, may lead to concerns regarding thermal performance, and transmission losses. The alternative, however, does include 400 Mvar SVCs and fixed shunt compensation at the Arpin and Adams 345 kV Stations, and is shown in Section 4 to meet dynamic and voltage stability criteria.

Case S3C3W2E

- 6.0% Impact on Eau Claire-Arpin Interface

Phase 1 impacts for this alternative (Case S3C3X2A) were:

- No Impacts

Once again, because of the additional Prairie Island to Columbia 345 kV circuit in this alternative, the impact on the Eau Claire-Arpin Interface might not be of concern.

Case S4C4IXA

- 18.1% Impact on the Cooper-South Interface
- 17.3% Impact on the Ft. Calhoun-South Interface
- 10.1% Impact on Eau Claire-Arpin Interface
- 6.6% Impact on Prairie Island-Byron Interface

The corresponding Phase 1 impacts (Case S4C4XXA) were:

- 13.7% Impact on the Cooper-South Interface
- 13.3% Impact on the Ft. Calhoun-South Interface

As in Case S2C4WD3, the lack of Phase 2 reinforcements leads to increased interface impacts. Notice, however, the much lower Eau Claire-Arpin and Prairie Island-Byron impacts than in that latter case (a result of a "better" site location), which helps explain the much better thermal and transmission loss performances in this alternative

Case S4C5WXD

- 5.7% Impact on the Cooper-South Interface
- 14.1% Impact on Eau Claire-Arpin Interface
- 5.8% Impact on Prairie Island-Byron Interface
- 11.1% Impact on NI-WUMS Interface (Wempletown to Paddock 345 kV in Wisconsin)

The corresponding Phase 1 impacts (Case S4C5XXA) were:

- 8.6% Impact on the Cooper-South Interface
- 7.6% Impact on the Ft. Calhoun-South Interface

The Split Rock-Des Moines-Zion 345 kV reinforcement in this case helps improve impacts on the Cooper-South and Ft. Calhoun-South Interfaces. It does not significantly improve the Eau Claire-Arpin and Prairie Island-Byron interfaces, however, and could lead to South to North flow constraints within the Wisconsin system.

Case S5C3WXE

- 7.1% Impact on the Cooper-South Interface
- 9.3% Impact on the Ft. Calhoun-South Interface
- 10.2% Impact on Eau Claire-Arpin Interface

The corresponding Phase 1 impacts (Case S5C5XXX) were:

- 8.0% Impact on the Cooper-South Interface
- 8.5% Impact on the Ft. Calhoun-South Interface

Because of the additional Prairie Island to Columbia 345 kV circuit in this alternative, the impact on the Eau Claire-Arpin Interface might not be of concern. The impact on the Cooper-South and Ft. Calhoun-South interfaces is similar to that observed in the Phase 1 studies.

5.5 New Equipment (Capital) Costs

Costs were developed on the basis of the MAPP Cost Estimator and ABB's budgetary estimates. Costs per reinforcements are summarized in Table 5.6. Phase 2 and Phase 1 costs for each of the selected alternatives are summarized in Table 5.7. For a more in-depth analysis of these calculations, please refer to the spreadsheets attached to this report.

The least-cost Phase 2 option in Table 5.7 is, of course, the no-reinforcement option that is only available for Site 4 and only when serving Iowa/Illinois markets. On the other hand, the second least-cost option of FACTS application (SVCs and fixed shunt compensation - Case S2C4WD4, $37.44 Million) is available to all sites and dispatches, but leads to serious concerns regarding thermal performance and increases in transmission losses. Next in cost is Reinforcement "E" (Prairie Island-Columbia 345 kV, $80.34 Million), which is also available to all Site/Dispatch combinations and leads to acceptable performances in all cases. Finally, Reinforcements "B", "C", and "D", are relatively expensive ($88.34 Million, $215.75 Million, and $213.28 Million, respectively), and the study results suggest lead to less benefits than the less expensive Reinforcement "E".

Table 5.6
Capital Costs (2001 dollars, in millions) per Reinforcement

REINFORCEMENT	LINES	STATIONS	SVCs	TOTAL
Split Rock-Des Moines 345 kV("B")	86.14	2.2	-	$88.34
Double Circuit Split Rock-Adams-Columbia 345 kV ("C")	202.13	13.63	-	$215.75
Split Rock-Des Moines-Zion 345 kV ("D")	209.18	4.1	-	$213.28
P. Island-Columbia 345 kV ("E")	78.44	1.9	-	$80.34
Split Rock-Lakefield Junction 345 kV (Site 5 Scenarios)	23.87	1.9	-	$25.77
Two 400 Mvar SVCs + Fixed Shunt Comp. @ Arpin and Adams	-	6.24	31.2	$37.44

TABLES

Table 3.1
Reinforcement "B" - Split Rock to Des Moines 345 kV line

```
DATA FOR BUS  1634 [SPLT RK3 345] RESIDING IN AREA  23, ZONE 353, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01969  48.88

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1684 SPLTRKY11.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
 1686 SPLTRKY21.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
 2400 SE POLK3 345  1   0.00946  0.13677  1.48995  1  F   680.0 1159.0  748.0    0.0       1 1.000
45641 SPLTRTA3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000
45646 SPLTRTB3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 1684 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
 1686 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
```

Table 3.2
Reinforcement "C" - Split Rock - Adams - Columbia double-circuit 345 kV line

```
DATA FOR BUS  1634 [SPLT RK3 345] RESIDING IN AREA  23, ZONE 353, OWNER   1:

 CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
  1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01046  42.44

 X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
  1684 SPLTRKY11.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
  1686 SPLTRKY21.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
  2010 LAKEFLD3 345  1   0.00301  0.04352  0.47410  1  F   680.0 1159.0  748.0    0.0       1 1.000
  2010 LAKEFLD3 345  2   0.00301  0.04352  0.47410  1  F   680.0 1159.0  748.0    0.0       1 1.000
 45641 SPLTRTA3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000
 45646 SPLTRTB3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000

   TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
  1684 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
  1686 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625

 DATA FOR BUS  2010 [LAKEFLD3 345] RESIDING IN AREA  31, ZONE  25, OWNER   1:

 CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
  1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.00815  35.49

 MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
  1 1.04000 1.02000     0.00  3: -25.00

 X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
  1601 ADAMS  3 345  1   0.00538  0.07771  0.84656  1  F   680.0 1159.0  748.0    0.0       1 1.000
  1601 ADAMS  3 345  2   0.00538  0.07771  0.84656  1  F   680.0 1159.0  748.0    0.0       1 1.000
  1634 SPLT RK3 345  1   0.00301  0.04352  0.47410  1  T   680.0 1159.0  748.0    0.0       1 1.000
  1634 SPLT RK3 345  2   0.00301  0.04352  0.47410  1  T   680.0 1159.0  748.0    0.0       1 1.000
  1889 LKFLDXL3 345  1   0.00100  0.00960  0.15547  1  F  1165.0 1165.0 1281.0    0.0       1 1.000
  2011 LAKEFLD5 161  1   0.00000  0.03400  0.00000  1  T   250.0  250.0  312.0    1.0       1 1.000
  2011 LAKEFLD5 161  2   0.00000  0.02736  0.00000  1  T   336.0  420.0  336.0    0.0       1 1.000
  2330 RAUN   3 345  1   0.00590  0.05830  0.93020  1  F   720.0  720.0  792.0    1.0       1 1.000

 X-------TO-------X CKT    LINE G,B (FROM)     LINE G,B (TO)   STATUS
  2330 RAUN   3 345  1    0.00000 -0.50000   0.00000  0.00000     1

   TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
  2011 1  T 1.03130   0.0 1  -2011 1.0500 0.9500 1.0350 1.0170 0.00313
  2011 2  T 1.03130   0.0 1  -2011 1.0500 0.9500 1.0350 1.0170 0.00313
```

Table 3.2 (Cont.)
Reinforcement "C" - Split Rock - Adams - Columbia double-circuit 345 kV line

```
DATA FOR BUS  1601 [ADAMS  3 345] RESIDING IN AREA  23, ZONE 354, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 0.99500  25.11

MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
 1 1.05000 1.01900     0.00  1: -50.00

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1599 PL VLLY3 345  1   0.00093  0.00865  0.13993  1  T  1165.0 1165.0 1281.5    0.0       1 1.000
 2010 LAKEFLD3 345  1   0.00538  0.07771  0.84656  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2010 LAKEFLD3 345  2   0.00538  0.07771  0.84656  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2022 ADAMS  5 161  1   0.00080  0.04340  0.00000  1  T   300.0  300.0  357.0    0.0       1 1.000
 2022 ADAMS  5 161  2   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
 2050 HAZLTON3 345  1   0.00430  0.03883  0.62000  1  F   720.0 1236.0  792.0    0.0       1 1.000
 2124 GENOA  3 345  1   0.00344  0.04974  0.54180  1  F   680.0 1159.0  748.0    0.0       1 1.000
 2124 GENOA  3 345  2   0.00344  0.04974  0.54180  1  F   680.0 1159.0  748.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 2022 1  F 0.93804   0.0 1   2022 1.0492 0.9010 1.0300 1.0150 0.00463
 2022 2  F 0.93804   0.0 1   2022 1.0492 0.9010 1.0300 1.0150 0.00463

DATA FOR BUS  2124 [GENOA  3 345] RESIDING IN AREA  26, ZONE  26, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01335  17.46

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1601 ADAMS  3 345  1   0.00344  0.04974  0.54180  1  T   680.0 1159.0  748.0    0.0       1 1.000
 1601 ADAMS  3 345  2   0.00344  0.04974  0.54180  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2123 GENOA  5 161  1   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
 2123 GENOA  5 161  2   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
92270 COL 345  345  1   0.00430  0.06217  0.67725  1  F   680.0 1159.0  748.0    0.0       1 1.000
92270 COL 345  345  2   0.00430  0.06217  0.67725  1  F   680.0 1159.0  748.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 2123 1  F 1.00000   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
 2123 2  F 1.00000   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
```

Table 3.3
Reinforcement "D" - Split Rock - Des Moines - Zion 345 kV line

```
DATA FOR BUS  1634 [SPLT RK3 345] RESIDING IN AREA  23, ZONE 353, OWNER   1:

 CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
  1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01287  46.49

 X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
  1684 SPLTRKY11.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
  1686 SPLTRKY21.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
  2400 SE POLK3 345  1   0.00946  0.13677  1.48995  1  F   680.0 1159.0  748.0    0.0       1 1.000
 45641 SPLTRTA3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000
 45646 SPLTRTB3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000

   TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
  1684 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
  1686 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625

 DATA FOR BUS  2400 [SE POLK3 345] RESIDING IN AREA  30, ZONE  50, OWNER   1:

 CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
  1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.02189  18.49

 ID ST   PLOAD   QLOAD     I - L O A D     Y - L O A D  AREA  ZONE OWNER
 M4  1     0.0     0.0     0.0     0.0     0.0     0.0    30    50     1

 X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
  1634 SPLT RK3 345  1   0.00946  0.13677  1.48995  1  T   680.0 1159.0  748.0    0.0       1 1.000
  2406 MADISON3 345  1   0.00108  0.01039  0.16050  1  T   926.0 1270.0  926.0    0.0       1 1.000
  2412 BONDRNT3 345  1   0.00056  0.00541  0.08320  1  F   926.0 1270.0  926.0    0.0       1 1.000
 34152 ZION ; B 345  1   0.01354  0.19584  2.13334  1  F   680.0 1159.0  748.0    0.0       1 1.000
 60412 SE MID 5 161  1   0.00000 -0.00430  0.00000  1  F   560.0  560.0  560.0    0.0       1 1.000

   TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 60412 1  F 1.00000   0.0 0      0 1.5000 0.5000 1.5000 0.5000 0.00000
```

Table 3.4
Reinforcement "E" - Prairie Island - Columbia 345 kV line

DATA FOR BUS 1604 [PR ISLD3 345] RESIDING IN AREA 23, ZONE 354, OWNER 1:

CODE	PLOAD	QLOAD	I - L O A D		Y - L O A D		G-SHUNT	B-SHUNT	VOLTAGE	ANGLE
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.02000	39.05

X-------TO-------X	CKT	LINE R	LINE X	CHARGING	ST	MET	RATE-A	RATE-B	RATE-C	LENGTH	ZI	OWN1	FRAC1	OWN2	FRAC2	OWN3	FRAC3	OWN4	FRAC4
1235 BYRON 3 345	1	0.00240	0.02190	0.35620	1	F	1165.0	1165.0	1281.5	0.0		1	1.000						
1605 PR ISLD5 161	1	0.00040	0.02650	0.00000	1	T	448.0	448.0	560.0	0.0		1	1.000						
1618 PR IS31G20.0	1	0.00040	0.01880	0.00000	1	F	600.0	600.0	660.0	0.0		1	1.000						
1619 PR IS32G20.0	1	0.00040	0.01670	0.00000	1	F	600.0	600.0	660.0	0.0		1	1.000						
1702 BLUE LK3 345	1	0.00260	0.02620	0.43798	1	F	1165.0	1165.0	1281.0	0.0		1	1.000						
1742 REDROCK3 345	1	0.00170	0.01590	0.26996	1	F	1165.0	1165.0	1281.0	0.0		1	1.000						
1742 REDROCK3 345	2	0.00170	0.01560	0.27194	1	F	1165.0	1165.0	1281.0	0.0		1	1.000						
92270 COL 345 345	**1**	**0.00860**	**0.12434**	**1.35450**	**1**	**F**	**680.0**	**1159.0**	**748.0**	**0.0**		**1**	**1.000**						

TO	CKT	TP	RATIO	ANGLE	RG	CONT	RMAX	RMIN	VMAX	VMIN	TSTP	CR	CX	TAB	NOMINAL R,X
1605	1	T	1.03125	0.0	1	-1605	1.0750	0.9250	1.0500	1.0350	0.00625				
1618	1	F	1.02500	0.0	0	0	1.5000	0.5100	1.5000	0.5100	0.00000				
1619	1	F	1.02500	0.0	0	0	1.5000	0.5100	1.5000	0.5100	0.00000				

TABLE 4.1 - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - No Reinforcements - Case S1C1IXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1IXA-pcs	upe-so04aa.S1C1IXA-pys	upe-so04aa.S1C1IXA-pyt	upe-so04aa.S1C1IXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 17 2002 18:10	MAY 31 2002 15:47	MAY 17 2002 18:43	MAY 17 2002 17:54
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3008 / 362	3008 / 362	3008 / 362	3008 / 362
10	MHEX / L20D	2172 / 220	2172 / 220	2172 / 220	2172 / 220
11	ECL-ARP / PRI-BYN	747 / 953	747 / 953	747 / 953	747 / 953
12	MWSI / MNEX	1700 / 3208	1700 / 3208	1700 / 3208	1700 / 3208
13	D602F / F601C	1817 / 1308	1817 / 1308	1817 / 1308	1817 / 1308
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	173 / 150	173 / 150	173 / 150	173 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	247 / 124	247 / 124	247 / 124	247 / 124
19	Forbes SVC / MSC	38 / 600	38 / 600	38 / 600	38 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.020	1.058 / 1.020	1.058 / 1.020	1.058 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 1.002	1.024 / 1.002	1.024 / 1.002	1.024 / 1.002
24	Int Falls 115/Badoura 115	1.049 / 0.996	1.049 / 0.996	1.049 / 0.996	1.049 / 0.996
25	Drayton 230/Groton 345	1.023 / 0.991	1.023 / 0.991	1.023 / 0.991	1.023 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	134% / 224%	134% / 224%	134% / 224%	134% / 224%
28	L20D at Prairie/Drayton	999% / 952%	999% / 952%	999% / 952%	999% / 952%
29	R50M/F3M	722% / 347%	722% / 347%	722% / 347%	722% / 347%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.11)0.76 | 1.03	0.86 | 1.10	0.98 | 1.03	0.96 | 1.06
33	Boise 115	0.99 | 1.07	1.00 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.07	1.03 | 1.05	1.02 | 1.07
35	Forbes 230	0.93 | 1.04	0.96 | 1.06	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.95 | 1.04	0.97 | 1.06	1.00 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.96 | 1.08	0.95 | 1.10	1.00 | 1.04	0.90 | 1.03
39	Drayton 230	0.97 | 1.06	0.96 | 1.07	1.01 | 1.04	0.99 | 1.05
40	Groton 345	0.90 | 1.02	0.90 | 1.05	0.96 | 1.00	0.89 | 1.01
41	Tioga 230	1.00 | 1.06	1.01 | 1.07	1.02 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.07	1.00 | 1.09	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.92 | 1.03	0.91 | 1.06	0.97 | 1.01	0.91 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.64	1318 [ARROWHD3] 0.79	none	none
46		1319 [AHD PST] 0.70			
47		1316 [HILLTOP4] 0.78			
48		1314 [98L TAP4] 0.78			
49		1315 [ARROWHD4] 0.78			
50		1373 [ARROWHD7] 0.80			
51		1374 [HANESRD7] 0.80 +more			
52	Worst Case Angle Damping	SHERC3 / -28.18%	ANTEL3 / -46.81%	SHERC3 / -27.73%	ANTEL3 / 41.59%
53	Dorsey SUVP / UdHold	/ 17.008	/ 16.916		
54	Forbes DC Red (DCAR)	29%	61%	251%	194%
55	K22W (max +dP @ t, d-ang)	42.2@(14.64133,9.9)	105.2@(19.43293,-11.4)	4.9@(19.61626,16.1)	28.1@(3.31653,-9.9)
56	K22W (max -dP @ t, d-ang)	62.1@(12.77470,61.1)	60.5@(17.76628,59.0)	33.4@(17.40796,34.1)	28.4@(1.01663,20.5)
57	K22W (max d-ang @ t, dP)	82.3@(17.12463,-56.9)	74.8@(17.14963,-56.5)	34.6@(17.10796,-30.9)	23.6@(1.29162,-20.2)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	72% / 134%	79% / 149%	117% / 201%	70% / 134%
61	L20D at Prairie/Drayton	999% / 657%	999% / 699%	999% / 823%	999% / 650%
62	R50M / F3M	500% / 319%	526% / 276%	633% / 347%	536% / 303%
63	B10T	173%	186%	265%	142%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 2 | 1)	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - No Reinforcements - Case S1C1WXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1WXA-pcs	upe-so04aa.S1C1WXA-pys	upe-so04aa.S1C1WXA-pyt	upe-so04aa.S1C1WXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 17 2002 17:13	MAY 17 2002 17:24	MAY 31 2002 16:14	MAY 17 2002 16:57
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3007 / 368	3007 / 368	3007 / 368	3007 / 368
10	MHEX / L20D	2172 / 217	2172 / 217	2172 / 217	2172 / 217
11	ECL-ARP / PRI-BYN	794 / 931	794 / 931	794 / 931	794 / 931
12	MWSI / MNEX	1726 / 3178	1726 / 3178	1726 / 3178	1726 / 3178
13	D602F / F601C	1821 / 1302	1821 / 1302	1821 / 1302	1821 / 1302
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	174 / 150	174 / 150	174 / 150	174 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	238 / 124	238 / 124	238 / 124	238 / 124
19	Forbes SVC / MSC	42 / 600	42 / 600	42 / 600	42 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045
22	Roseau 500/Forbes 500	1.057 / 1.018	1.057 / 1.018	1.057 / 1.018	1.057 / 1.018
23	Chisago 500/EauClaire 345	1.023 / 0.989	1.023 / 0.989	1.023 / 0.989	1.023 / 0.989
24	Int Falls 115/Badoura 115	1.049 / 0.994	1.049 / 0.994	1.049 / 0.994	1.049 / 0.994
25	Drayton 230/Groton 345	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	132% / 221%	132% / 221%	132% / 221%	132% / 221%
28	L20D at Prairie/Drayton	999% / 968%	999% / 968%	999% / 968%	999% / 968%
29	R50M/F3M	714% / 348%	714% / 348%	714% / 348%	714% / 348%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.52)0.72 | 1.02	0.82 | 1.08	0.96 | 1.03	0.94 | 1.05
33	Boise 115	1.00 | 1.08	1.00 | 1.08	1.03 | 1.06	1.02 | 1.07
34	Dorsey 230	1.02 | 1.08	1.01 | 1.07	1.03 | 1.05	1.02 | 1.07
35	Forbes 230	0.94 | 1.04	0.96 | 1.05	1.00 | 1.03	1.00 | 1.03
36	Riverton 230	0.96 | 1.04	0.96 | 1.06	1.00 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.06	0.99 | 1.07	1.02 | 1.05	0.96 | 1.06
38	Dickinson 345	0.96 | 1.07	0.93 | 1.09	0.99 | 1.04	0.90 | 1.03
39	Drayton 230	0.99 | 1.06	0.98 | 1.06	1.00 | 1.04	0.99 | 1.05
40	Groton 345	0.90 | 1.02	0.90 | 1.03	0.96 | 1.00	0.89 | 1.01
41	Tioga 230	1.00 | 1.06	1.01 | 1.06	1.02 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.06	1.01 | 1.08	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.91 | 1.02	0.90 | 1.04	0.97 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.53	2494 [ARP 345] 0.61	none	none
46		1319 [AHD PST] 0.62	1853 [EAU CL 3] 0.63		
47		1316 [HILLTOP4] 0.72	4161 [WESTON] 0.66		
48		1314 [98L TAP4] 0.72	4178 [HUME] 0.66		
49		1315 [ARROWHD4] 0.72	4179 [WILDWOOD] 0.66		
50		1372 [HILLTOP7] 0.75	4180 [MCMILLAN] 0.66		
51		1373 [ARROWHD7] 0.75 +mor	2496 [ARP 115] 0.67 +more		
52	Worst Case Angle Damping	ANTEL3 / -47.27%	ANTEL3 / -57.35%	SHERC3 / -35.27%	ANTEL3 / 39.56%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	65%	57%	252%	187%
55	K22W (max +dP @ t, d-ang)	44.3@(9.77474,4.6)	68.6@(14.93300,1.1)	10.7@(19.77459,14.4)	28.2@(3.32486,-10.1)
56	K22W (max -dP @ t, d-ang)	64.3@(7.76644,58.8)	67.6@(12.89136,68.2)	37.1@(17.34129,38.3)	28.5@(1.01663,20.8)
57	K22W (max d-ang @ t, dP)	82.5@(12.24970,-61.8)	70.3@(12.56637,-65.4)	38.3@(17.33296,-36.9)	24.1@(1.29162,-20.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	83% / 149%	61% / 123%	107% / 188%	67% / 129%
61	L20D at Prairie/Drayton	999% / 666%	999% / 702%	999% / 810%	999% / 659%
62	R50M / F3M	516% / 324%	493% / 294%	606% / 348%	526% / 302%
63	B10T	178%	189%	263%	143%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 2 | 1)	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - No Reinforcements - Case S1C5IXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5IXA-pcs	upe-so04aa.S1C5IXA-pys	upe-so04aa.S1C5IXA-pyt	upe-so04aa.S1C5IXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 13:13	MAY 21 2002 12:26	MAY 21 2002 12:42	MAY 21 2002 13:30
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2944 / 292	2944 / 292	2944 / 292	2944 / 292
10	MHEX / L20D	2173 / 254	2173 / 254	2173 / 254	2173 / 254
11	ECL-ARP / PRI-BYN	789 / 1042	789 / 1042	789 / 1042	789 / 1042
12	MWSI / MNEX	1831 / 3607	1831 / 3607	1831 / 3607	1831 / 3607
13	D602F / F601C	1754 / 1227	1754 / 1227	1754 / 1227	1754 / 1227
14	B10T / MH>SPC	166 / 98	166 / 98	166 / 98	166 / 98
15	OH E-W / OH>MH	-118 / -195	-118 / -195	-118 / -195	-118 / -195
16	R50M / OH>MP	160 / 150	160 / 150	160 / 150	160 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	290 / -1	290 / -1	290 / -1	290 / -1
19	Forbes SVC / MSC	24 / 600	24 / 600	24 / 600	24 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.024	1.061 / 1.024	1.061 / 1.024	1.061 / 1.024
23	Chisago 500/EauClaire 345	1.027 / 0.987	1.027 / 0.987	1.027 / 0.987	1.027 / 0.987
24	Int Falls 115/Badoura 115	1.047 / 1.006	1.047 / 1.006	1.047 / 1.006	1.047 / 1.006
25	Drayton 230/Groton 345	1.012 / 1.014	1.012 / 1.014	1.012 / 1.014	1.012 / 1.014
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	152% / 250%	152% / 250%	152% / 250%	152% / 250%
28	L20D at Prairie/Drayton	999% / 776%	999% / 776%	999% / 776%	999% / 776%
29	R50M/F3M	759% / 344%	759% / 344%	759% / 344%	759% / 344%
30	B10T	343%	343%	343%	343%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.69)0.74 | 1.01	0.83 | 1.08	0.97 | 1.02	0.96 | 1.05
33	Boise 115	1.01 | 1.08	1.02 | 1.08	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	0.98 | 1.08	1.02 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.94 | 1.04	0.97 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.97 | 1.04	0.97 | 1.06	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.97 | 1.07	0.93 | 1.09	1.00 | 1.04	0.91 | 1.03
39	Drayton 230	0.95 | 1.04	0.98 | 1.04	1.00 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.04	0.95 | 1.05	1.00 | 1.03	0.94 | 1.02
41	Tioga 230	1.01 | 1.06	1.01 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.07	1.02 | 1.08	1.04 | 1.07	0.99 | 1.06
43	Watertown 345	0.95 | 1.04	0.93 | 1.05	1.00 | 1.03	0.96 | 1.03
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.57	4246 [TRIPOLI3] 0.58	none	none
46		1319 [AHD PST] 0.65	4247 [TRIPOLI7] 0.60		
47		1314 [98L TAP4] 0.74	2494 [ARP 345] 0.62		
48		1315 [ARROWHD4] 0.74	1853 [EAU CL 3] 0.64		
49		1316 [HILLTOP4] 0.75	4195 [ROCKY RN] 0.66		
50		1372 [HILLTOP7] 0.77	4180 [MCMILLAN] 0.67		
51		1373 [ARROWHD7] 0.77 +mor	4161 [WESTON] 0.67 +more		
52	Worst Case Angle Damping	ANTEL3 / -41.64%	ANTEL3 / -55.88%	KING 3 / -17.04%	ANTEL3 / 40.53%
53	Dorsey SUVP / UdHold	/ 17.708			
54	Forbes DC Red (DCAR)	100%	150%	260%	194%
55	K22W (max +dP @ t, d-ang)	34.3@(14.99966,14.0)	58.2@(15.19133,5.0)	0.8@(4.79982,4.8)	18.6@(3.40819,-7.4)
56	K22W (max -dP @ t, d-ang)	64.3@(17.53296,86.8)	68.1@(13.14969,69.2)	32.7@(2.26657,22.2)	26.9@(1.82493,10.7)
57	K22W (max d-ang @ t, dP)	88.0@(17.59129,-63.5)	72.5@(12.77470,-65.7)	31.8@(16.97463,-27.2)	20.9@(1.22495,-17.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	96% / 173%	83% / 157%	139% / 233%	93% / 166%
61	L20D at Prairie/Drayton	999% / 563%	999% / 578%	999% / 677%	999% / 597%
62	R50M / F3M	553% / 336%	533% / 309%	683% / 344%	582% / 304%
63	B10T	199%	197%	268%	172%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - No Reinforcements - Case S1C5WXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5WXA-pcs	upe-so04aa.S1C5WXA-pys	upe-so04aa.S1C5WXA-pyt	upe-so04aa.S1C5WXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 17 2002 20:06	MAY 17 2002 20:18	MAY 17 2002 20:29	MAY 17 2002 19:51
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2941 / 299	2941 / 299	2941 / 299	2941 / 299
10	MHEX / L20D	2173 / 251	2173 / 251	2173 / 251	2173 / 251
11	ECL-ARP / PRI-BYN	843 / 1022	843 / 1022	843 / 1022	843 / 1022
12	MWSI / MNEX	1866 / 3587	1866 / 3587	1866 / 3587	1866 / 3587
13	D602F / F601C	1758 / 1223	1758 / 1223	1758 / 1223	1758 / 1223
14	B10T / MH>SPC	166 / 98	166 / 98	166 / 98	166 / 98
15	OH E-W / OH>MH	-120 / -195	-120 / -195	-120 / -195	-120 / -195
16	R50M / OH>MP	162 / 149	162 / 149	162 / 149	162 / 149
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	278 / -4	278 / -4	278 / -4	278 / -4
19	Forbes SVC / MSC	29 / 600	29 / 600	29 / 600	29 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.021	1.061 / 1.021	1.061 / 1.021	1.061 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 0.967	1.025 / 0.967	1.025 / 0.967	1.025 / 0.967
24	Int Falls 115/Badoura 115	1.048 / 1.004	1.048 / 1.004	1.048 / 1.004	1.048 / 1.004
25	Drayton 230/Groton 345	1.012 / 1.014	1.012 / 1.014	1.012 / 1.014	1.012 / 1.014
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	150% / 247%	150% / 247%	150% / 247%	150% / 247%
28	L20D at Prairie/Drayton	999% / 786%	999% / 786%	999% / 786%	999% / 786%
29	R50M/F3M	747% / 999%	747% / 999%	747% / 999%	747% / 999%
30	B10T	343%	343%	343%	343%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.55)0.73 | 1.02	(2.74)0.80 | 1.07	0.95 | 1.01	0.94 | 1.04
33	Boise 115	1.02 | 1.08	1.02 | 1.08	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.02 | 1.08	1.02 | 1.07	1.03 | 1.05	1.02 | 1.06
35	Forbes 230	0.96 | 1.04	0.96 | 1.05	1.00 | 1.03	1.00 | 1.03
36	Riverton 230	0.97 | 1.05	0.97 | 1.06	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	0.99 | 1.07	1.02 | 1.04	0.96 | 1.07
38	Dickinson 345	0.96 | 1.09	0.92 | 1.09	1.00 | 1.04	0.91 | 1.03
39	Drayton 230	0.98 | 1.05	0.98 | 1.04	1.00 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.05	0.94 | 1.06	1.00 | 1.03	0.94 | 1.02
41	Tioga 230	1.01 | 1.07	1.02 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.08	1.02 | 1.08	1.04 | 1.07	0.99 | 1.06
43	Watertown 345	0.95 | 1.05	0.92 | 1.05	1.00 | 1.03	0.96 | 1.03
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.55	1853 [EAU CL 3] 0.56	none	none
46		1319 [AHD PST] 0.64	1866 [T-CRNRS7] 0.62		
47		1314 [98L TAP4] 0.73	1854 [EAU CLA5] 0.64		
48		1315 [ARROWHD4] 0.73	1870 [WHEATON5] 0.65		
49		1316 [HILLTOP4] 0.74	1871 [WHEATON5] 0.65		
50		1373 [ARROWHD7] 0.76	1869 [WHEATTP5] 0.66		
51		1374 [HANESRD7] 0.76 +mor	318 [ARROWHD3] 0.67 +mo		
52	Worst Case Angle Damping	ANTEL3 / -103.88%	ANTEL3 / -86.35%	KING 3 / -22.35%	ANTEL3 / 38.22%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	72%	93%	247%	186%
55	K22W (max +dP @ t, d-ang)	60.9@(11.08305,9.0)	64.0@(10.59140,0.5)	2.6@(4.87482,4.3)	19.2@(3.44152,-7.6)
56	K22W (max -dP @ t, d-ang)	75.6@(8.60809,87.0)	71.9@(8.30810,72.8)	34.6@(7.58311,28.6)	27.5@(1.82493,11.2)
57	K22W (max d-ang @ t, dP)	87.2@(8.49976,-75.5)	73.7@(8.10810,-69.4)	37.8@(17.37462,-33.0)	21.2@(1.23328,-17.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	92% / 167%	82% / 155%	136% / 227%	92% / 164%
61	L20D at Prairie/Drayton	999% / 562%	999% / 580%	999% / 684%	999% / 605%
62	R50M / F3M	536% / 317%	528% / 310%	666% / 999%	576% / 310%
63	B10T	193%	202%	269%	174%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - No Reinforcements - Case S2C4WX3

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WX3-pcs	upe-so04aa.S2C4WX3-pys	upe-so04aa.S2C4WX3-pyt	upe-so04aa.S2C4WX3-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 17 2002 21:00	MAY 17 2002 21:07	JUN 05 2002 13:14	MAY 17 2002 20:44
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3031 / 345	3031 / 345	3031 / 345	3031 / 345
10	MHEX / L20D	2176 / 240	2176 / 240	2176 / 240	2176 / 240
11	ECL-ARP / PRI-BYN	820 / 993	820 / 993	820 / 993	820 / 993
12	MWSI / MNEX	1813 / 3435	1813 / 3435	1813 / 3435	1813 / 3435
13	D602F / F601C	1814 / 1297	1814 / 1297	1814 / 1297	1814 / 1297
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	229 / 37	229 / 37	230 / 37	229 / 37
19	Forbes SVC / MSC	37 / 600	37 / 600	38 / 600	37 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.036 / 1.045	1.036 / 1.045	1.036 / 1.045	1.036 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.019	1.064 / 1.019	1.064 / 1.019	1.064 / 1.019
23	Chisago 500/EauClaire 345	1.023 / 0.977	1.023 / 0.977	1.023 / 0.977	1.023 / 0.977
24	Int Falls 115/Badoura 115	1.051 / 0.999	1.051 / 0.999	1.051 / 0.999	1.051 / 0.999
25	Drayton 230/Groton 345	1.035 / 1.002	1.035 / 1.002	1.035 / 1.002	1.035 / 1.002
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	138% / 227%	138% / 227%	138% / 227%	138% / 227%
28	L20D at Prairie/Drayton	999% / 859%	999% / 859%	999% / 859%	999% / 859%
29	R50M/F3M	732% / 349%	732% / 349%	732% / 349%	732% / 349%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.51)0.71 | 1.00	(7.96)0.80 | 1.05	0.93 | 1.08	0.94 | 1.05
33	Boise 115	1.02 | 1.07	1.02 | 1.07	1.02 | 1.08	1.02 | 1.07
34	Dorsey 230	1.03 | 1.07	1.03 | 1.06	0.98 | 1.07	1.02 | 1.06
35	Forbes 230	0.95 | 1.03	0.96 | 1.04	0.98 | 1.05	0.99 | 1.03
36	Riverton 230	0.96 | 1.03	0.98 | 1.04	0.99 | 1.04	0.95 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.06	1.01 | 1.06	0.97 | 1.05
38	Dickinson 345	0.95 | 1.06	0.94 | 1.07	0.98 | 1.07	0.90 | 1.03
39	Drayton 230	1.02 | 1.05	1.02 | 1.05	1.00 | 1.05	1.01 | 1.05
40	Groton 345	0.89 | 1.01	0.87 | 1.01	0.95 | 1.02	0.91 | 1.01
41	Tioga 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.05	0.99 | 1.04
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.04 | 1.07	0.98 | 1.07
43	Watertown 345	0.90 | 1.02	0.88 | 1.02	0.97 | 1.03	0.94 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.51	1853 [EAU CL 3] 0.51	none	none
46		1319 [AHD PST] 0.62	1866 [T-CRNRS7] 0.54		
47		1316 [HILLTOP4] 0.72	1854 [EAU CLA5] 0.59		
48		1314 [98L TAP4] 0.72	1857 [JACKSON5] 0.61		
49		1315 [ARROWHD4] 0.72	1318 [ARROWHD3] 0.65		
50		1270 [STINSJCT] 0.75	1802 [REDCDR 5] 0.65		
51		1332 [DAHLBRG7] 0.75 +mor	847 [PRENTCE7] 0.68 +mor		
52	Worst Case Angle Damping	ANTEL3 / 32.96%	ANTEL3 / 32.96%	SHERC3 / -35.13%	ANTEL3 / 32.96%
53	Dorsey SUVP / UdHold			/ 17.458	
54	Forbes DC Red (DCAR)	507%	507%	209%	183%
55	K22W (max +dP @ t, d-ang)	1.9@(0.11666,0.5)	0.6@(0.11666,0.2)	69.4@(19.44126,-7.4)	22.4@(3.35819,-8.6)
56	K22W (max -dP @ t, d-ang)	24.8@(0.34999,5.2)	11.4@(0.30832,2.0)	45.3@(17.63295,50.5)	28.2@(0.95830,19.6)
57	K22W (max d-ang @ t, dP)	5.2@(0.34999,-24.8)	2.0@(0.30832,-11.4)	51.0@(17.56629,-44.6)	24.0@(1.27495,-19.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	138% / 213%	138% / 227%	101% / 186%	69% / 130%
61	L20D at Prairie/Drayton	999% / 859%	999% / 859%	999% / 665%	999% / 634%
62	R50M / F3M	674% / 349%	716% / 349%	583% / 298%	536% / 302%
63	B10T	337%	337%	238%	160%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 2 | 2)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 0) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - No Reinforcements - Case S3C3W2A

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W2A-pcs	upe-so04aa.S3C3W2A-pys	upe-so04aa.S3C3W2A-pyt	upe-so04aa.S3C3W2A-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 18:44	JUN 13 2002 18:51	JUN 13 2002 19:03	JUN 13 2002 19:18
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2653 / 308	2653 / 308	2653 / 308	2653 / 308
10	MHEX / L20D	2172 / 247	2172 / 247	2172 / 247	2172 / 247
11	ECL-ARP / PRI-BYN	791 / 959	791 / 959	791 / 959	791 / 959
12	MWSI / MNEX	1751 / 3261	1751 / 3261	1751 / 3261	1751 / 3261
13	D602F / F601C	1793 / 1397	1793 / 1397	1793 / 1397	1793 / 1397
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -197	-119 / -197	-119 / -197	-119 / -197
16	R50M / OH>MP	161 / 150	161 / 150	161 / 150	161 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	234 / 77	234 / 77	234 / 77	234 / 77
19	Forbes SVC / MSC	43 / 600	43 / 600	43 / 600	43 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016
23	Chisago 500/EauClaire 345	1.019 / 0.981	1.019 / 0.981	1.019 / 0.981	1.019 / 0.981
24	Int Falls 115/Badoura 115	1.046 / 0.998	1.046 / 0.998	1.046 / 0.998	1.046 / 0.998
25	Drayton 230/Groton 345	1.020 / 0.995	1.020 / 0.995	1.020 / 0.995	1.020 / 0.995
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 229%	139% / 229%	139% / 229%	139% / 229%
28	L20D at Prairie/Drayton	999% / 816%	999% / 816%	999% / 816%	999% / 816%
29	R50M/F3M	744% / 341%	744% / 341%	744% / 341%	744% / 341%
30	B10T	331%	331%	331%	331%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.39)0.76 | 1.01	0.85 | 1.09	0.94 | 1.07	0.94 | 1.04
33	Boise 115	1.02 | 1.08	1.01 | 1.09	1.01 | 1.08	1.01 | 1.07
34	Dorsey 230	1.03 | 1.08	1.01 | 1.07	0.98 | 1.07	1.02 | 1.06
35	Forbes 230	0.96 | 1.03	0.97 | 1.05	0.99 | 1.05	0.99 | 1.03
36	Riverton 230	0.96 | 1.04	0.97 | 1.06	1.00 | 1.04	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.07	1.02 | 1.06	0.97 | 1.05
38	Dickinson 345	0.93 | 1.08	0.92 | 1.10	0.98 | 1.08	0.91 | 1.04
39	Drayton 230	1.00 | 1.04	1.00 | 1.05	0.99 | 1.04	1.00 | 1.04
40	Groton 345	0.86 | 1.01	0.86 | 1.04	0.94 | 1.02	0.91 | 1.00
41	Tioga 230	1.01 | 1.05	1.00 | 1.05	1.01 | 1.05	1.00 | 1.04
42	Wahpeton 115	1.01 | 1.06	1.02 | 1.08	1.03 | 1.06	1.00 | 1.05
43	Watertown 345	0.88 | 1.03	0.89 | 1.05	0.97 | 1.03	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.60	2494 [ARP 345] 0.58	none	none
46		1319 [AHD PST] 0.68	4161 [WESTON] 0.61		
47		1315 [ARROWHD4] 0.76	1853 [EAU CL 3] 0.62		
48		1314 [98L TAP4] 0.77	4186 [HODAG] 0.63		
49		1316 [HILLTOP4] 0.77	4179 [WILDWOOD] 0.64		
50		1270 [STINSJCT] 0.78	4178 [HUME] 0.64		
51		1330 [STINSON5] 0.78 +more	2495 [ARP 138] 0.65 +more		
52	Worst Case Angle Damping	/ %	STANT4 / -96.28%	SHERC3 / -35.71%	ANTEL3 / 36.51%
53	Dorsey SUVP / UdHold			/ 17.541	
54	Forbes DC Red (DCAR)	28%	40%	202%	223%
55	K22W (max +dP @ t, d-ang)	34.7@(4.73315,-3.4)	86.9@(10.71639,-4.6)	69.1@(19.44126,-9.7)	20.5@(2.90821,-10.5)
56	K22W (max -dP @ t, d-ang)	64.5@(2.39157,51.0)	78.3@(8.33310,82.0)	46.8@(17.70795,49.9)	24.6@(0.92496,16.8)
57	K22W (max d-ang @ t, dP)	51.3@(2.26657,-63.2)	82.3@(8.48309,-78.0)	50.7@(17.59962,-44.4)	20.1@(1.21662,-16.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	91% / 162%	68% / 134%	99% / 184%	77% / 142%
61	L20D at Prairie/Drayton	999% / 622%	999% / 583%	999% / 614%	999% / 605%
62	R50M / F3M	557% / 341%	526% / 278%	593% / 304%	566% / 296%
63	B10T	194%	160%	227%	167%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 1 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - No Reinforcements - Case S3C4W1A

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C4W1A-pcs	upe-so04aa.S3C4W1A-pys	upe-so04aa.S3C4W1A-pyt	upe-so04aa.S3C4W1A-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 23:31	JUN 13 2002 23:43	JUN 13 2002 23:58	JUN 14 2002 0:12
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3060 / 320	3060 / 320	3060 / 320	3060 / 320
10	MHEX / L20D	2171 / 215	2171 / 215	2171 / 215	2171 / 215
11	ECL-ARP / PRI-BYN	822 / 935	822 / 935	822 / 935	822 / 935
12	MWSI / MNEX	1757 / 2854	1757 / 2854	1757 / 2854	1757 / 2854
13	D602F / F601C	1805 / 1284	1805 / 1284	1805 / 1284	1805 / 1284
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-121 / -198	-121 / -198	-121 / -198	-121 / -198
16	R50M / OH>MP	171 / 150	171 / 150	171 / 150	171 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	236 / 1	236 / 1	236 / 1	236 / 1
19	Forbes SVC / MSC	41 / 600	41 / 600	41 / 600	41 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.017	1.058 / 1.017	1.058 / 1.017	1.058 / 1.017
23	Chisago 500/EauClaire 345	1.022 / 0.976	1.022 / 0.976	1.022 / 0.976	1.022 / 0.976
24	Int Falls 115/Badoura 115	1.051 / 1.001	1.051 / 1.001	1.051 / 1.001	1.051 / 1.001
25	Drayton 230/Groton 345	1.012 / 1.009	1.012 / 1.009	1.012 / 1.009	1.012 / 1.009
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 226%	136% / 226%	136% / 226%	136% / 226%
28	L20D at Prairie/Drayton	999% / 957%	999% / 957%	999% / 957%	999% / 957%
29	R50M/F3M	725% / 351%	725% / 351%	725% / 351%	725% / 351%
30	B10T	331%	331%	331%	331%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.87)0.71 | 1.00	(8.06)0.77 | 1.05	0.96 | 1.01	0.94 | 1.03
33	Boise 115	1.02 | 1.07	1.00 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.02 | 1.08	0.98 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.95 | 1.03	0.94 | 1.04	1.00 | 1.02	0.99 | 1.03
36	Riverton 230	0.97 | 1.04	0.97 | 1.04	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.06	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.96 | 1.08	0.94 | 1.08	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	0.99 | 1.03	0.98 | 1.03	1.01 | 1.02	1.00 | 1.03
40	Groton 345	0.92 | 1.02	0.90 | 1.02	0.99 | 1.01	0.94 | 1.01
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.03 | 1.06	1.03 | 1.06	1.05 | 1.06	1.01 | 1.06
43	Watertown 345	0.94 | 1.03	0.90 | 1.03	1.00 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.52	1318 [ARROWHD3] 0.63	none	none
46		1319 [AHD PST] 0.62	1319 [AHD PST] 0.70		
47		1316 [HILLTOP4] 0.73	1316 [HILLTOP4] 0.78		
48		1314 [98L TAP4] 0.73	1314 [98L TAP4] 0.78		
49		1315 [ARROWHD4] 0.73	1315 [ARROWHD4] 0.78		
50		1270 [STINSJCT] 0.76	1331 [MINONG 5] 0.78		
51		1332 [DAHLBRG7] 0.76 +mor	1330 [STINSON5] 0.79 +more		
52	Worst Case Angle Damping	ANTEL3 / -61.91%	ANTEL3 / -54.51%	KING 3 / -22.73%	ANTEL3 / 37.90%
53	Dorsey SUVP / UdHold		/ 17.591		
54	Forbes DC Red (DCAR)	81%	145%	258%	213%
55	K22W (max +dP @ t, d-ang)	15.1@(4.54149,3.8)	11.8@(4.37482,2.3)	2.6@(9.63308,8.8)	16.5@(3.49985,-4.8)
56	K22W (max -dP @ t, d-ang)	54.0@(2.34990,42.1)	46.8@(2.23324,33.2)	30.6@(7.34145,25.5)	24.8@(0.92496,17.3)
57	K22W (max d-ang @ t, dP)	43.7@(2.03325,-52.1)	33.8@(1.99992,-45.0)	33.7@(16.87463,-29.0)	21.1@(1.23328,-16.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	111% / 190%	116% / 199%	127% / 213%	79% / 144%
61	L20D at Prairie/Drayton	999% / 706%	999% / 742%	999% / 815%	999% / 724%
62	R50M / F3M	586% / 351%	622% / 351%	657% / 351%	558% / 310%
63	B10T	203%	199%	254%	176%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - No Reinforcements - Case S4C4IXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4IXA-pcs	upe-so04aa.S4C4IXA-pys	upe-so04aa.S4C4IXA-pyt	upe-so04aa.S4C4IXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 18 2002 0:39	MAY 18 2002 0:54	MAY 18 2002 1:10	MAY 18 2002 0:24
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 341	2080 / 341	2080 / 341	2080 / 341
10	MHEX / L20D	2171 / 234	2171 / 234	2171 / 234	2171 / 234
11	ECL-ARP / PRI-BYN	747 / 903	747 / 903	747 / 903	747 / 903
12	MWSI / MNEX	1651 / 2558	1651 / 2558	1651 / 2558	1651 / 2558
13	D602F / F601C	1786 / 1281	1786 / 1281	1786 / 1281	1786 / 1281
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	163 / 150	163 / 150	163 / 150	163 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	256 / 19	256 / 19	256 / 19	256 / 19
19	Forbes SVC / MSC	33 / 600	33 / 600	33 / 600	33 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020
23	Chisago 500/EauClaire 345	1.025 / 1.000	1.025 / 1.000	1.025 / 1.000	1.025 / 1.000
24	Int Falls 115/Badoura 115	1.046 / 0.997	1.046 / 0.997	1.046 / 0.997	1.046 / 0.997
25	Drayton 230/Groton 345	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	142% / 235%	142% / 235%	142% / 235%	142% / 235%
28	L20D at Prairie/Drayton	999% / 863%	999% / 863%	999% / 863%	999% / 863%
29	R50M/F3M	734% / 343%	734% / 343%	734% / 343%	734% / 343%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.87 | 0.98	0.96 | 1.02	0.99 | 1.02	0.96 | 1.04
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.04 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.03	1.00 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.03	1.00 | 1.04
40	Groton 345	0.97 | 1.00	0.97 | 1.00	0.99 | 1.00	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.07	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	1.00 | 1.02	1.01 | 1.02	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -1.92%	ANTEL3 / -25.67%	KING 3 / 3.52%	ANTEL3 / 49.95%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	104%	151%	287%	211%
55	K22W (max +dP @ t, d-ang)	3.1@(4.01650,5.1)	3.0@(4.21649,5.5)	0.0@(-0.01667,0.0)	14.4@(3.59151,-3.8)
56	K22W (max -dP @ t, d-ang)	46.1@(1.79993,31.5)	36.7@(1.86659,25.0)	25.2@(2.14991,16.7)	25.7@(1.79993,8.7)
57	K22W (max d-ang @ t, dP)	42.9@(16.39964,-35.0)	35.2@(16.32464,-27.4)	21.9@(20.00792,-12.4)	17.9@(1.17495,-16.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	125% / 209%	132% / 218%	141% / 234%	86% / 154%
61	L20D at Prairie/Drayton	999% / 654%	999% / 672%	999% / 740%	999% / 700%
62	R50M / F3M	621% / 343%	653% / 343%	696% / 343%	564% / 297%
63	B10T	195%	194%	256%	195%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - No Reinforcements - Case S4C4WXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4WXA-pcs	upe-so04aa.S4C4WXA-pys	upe-so04aa.S4C4WXA-pyt	upe-so04aa.S4C4WXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 16 2002 7:59	JUN 16 2002 8:15	MAY 18 2002 0:09	MAY 17 2002 23:24
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2076 / 349	2076 / 349	2077 / 349	2077 / 349
10	MHEX / L20D	2174 / 231	2174 / 231	2174 / 231	2174 / 231
11	ECL-ARP / PRI-BYN	806 / 878	806 / 878	806 / 878	806 / 878
12	MWSI / MNEX	1684 / 2517	1684 / 2517	1684 / 2517	1684 / 2517
13	D602F / F601C	1794 / 1280	1794 / 1280	1794 / 1280	1794 / 1280
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-120 / -196	-120 / -196	-120 / -196	-120 / -196
16	R50M / OH>MP	164 / 149	164 / 149	164 / 149	164 / 149
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	239 / 20	239 / 20	239 / 20	239 / 20
19	Forbes SVC / MSC	37 / 600	37 / 600	38 / 600	38 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.017	1.058 / 1.017	1.058 / 1.017	1.058 / 1.017
23	Chisago 500/EauClaire 345	1.023 / 0.983	1.023 / 0.983	1.023 / 0.983	1.023 / 0.983
24	Int Falls 115/Badoura 115	1.046 / 0.994	1.046 / 0.994	1.046 / 0.994	1.046 / 0.994
25	Drayton 230/Groton 345	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 230%	139% / 230%	139% / 230%	139% / 230%
28	L20D at Prairie/Drayton	999% / 878%	999% / 878%	999% / 878%	999% / 878%
29	R50M/F3M	721% / 344%	721% / 344%	721% / 344%	721% / 344%
30	B10T	346%	346%	346%	346%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.84 | 0.97	0.94 | 1.01	0.97 | 1.01	0.94 | 1.03
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.97 | 1.02	0.99 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.02
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.96 | 1.04	1.00 | 1.04	1.01 | 1.03	0.99 | 1.04
40	Groton 345	0.97 | 1.00	0.97 | 1.00	0.99 | 1.00	0.95 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.04 | 1.06	1.00 | 1.06
43	Watertown 345	1.00 | 1.02	1.01 | 1.02	1.01 | 1.02	0.99 | 1.02
44	**Dynamic Voltage Warnings**				
45		4246 [TRIPOLI3] 0.69	none	none	none
46		1318 [ARROWHD3] 0.76			
47		1319 [AHD PST] 0.81			
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -32.18%	ANTEL3 / -34.15%	KING 3 / -3.23%	ANTEL3 / 47.36%
53	Dorsey SUVP / UdHold	/ 17.658			
54	Forbes DC Red (DCAR)	83%	149%	284%	201%
55	K22W (max +dP @ t, d-ang)	2.8@(4.19983,5.7)	5.1@(4.25816,4.6)	0.0@(0.02500,0.0)	14.9@(3.57485,-4.3)
56	K22W (max -dP @ t, d-ang)	49.2@(1.81659,36.2)	38.2@(1.88326,26.7)	25.7@(2.15824,17.3)	26.3@(1.79993,9.3)
57	K22W (max d-ang @ t, dP)	56.6@(17.14129,-44.3)	41.2@(16.64964,-33.1)	23.2@(16.48297,-18.7)	18.4@(1.18329,-16.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	102% / 190%	128% / 215%	137% / 227%	84% / 150%
61	L20D at Prairie/Drayton	999% / 658%	999% / 681%	999% / 751%	999% / 706%
62	R50M / F3M	582% / 344%	642% / 344%	680% / 344%	555% / 300%
63	B10T	202%	200%	263%	198%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - No Reinforcements - Case S4C5IXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5IXA-pcs	upe-so04aa.S4C5IXA-pys	upe-so04aa.S4C5IXA-pyt	upe-so04aa.S4C5IXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 18 2002 2:41	MAY 18 2002 2:57	MAY 18 2002 3:12	MAY 18 2002 2:27
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2079 / 325	2079 / 325	2079 / 325	2079 / 325
10	MHEX / L20D	2171 / 239	2171 / 239	2171 / 239	2171 / 239
11	ECL-ARP / PRI-BYN	762 / 953	762 / 953	762 / 953	762 / 953
12	MWSI / MNEX	1715 / 2908	1715 / 2908	1715 / 2908	1715 / 2908
13	D602F / F601C	1773 / 1261	1773 / 1261	1773 / 1261	1773 / 1261
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -196	-120 / -196	-120 / -196	-120 / -196
16	R50M / OH>MP	167 / 150	167 / 150	167 / 150	167 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	285 / 33	285 / 33	285 / 33	285 / 33
19	Forbes SVC / MSC	29 / 600	29 / 600	29 / 600	29 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.026 / 0.996	1.026 / 0.996	1.026 / 0.996	1.026 / 0.996
24	Int Falls 115/Badoura 115	1.051 / 1.000	1.051 / 1.000	1.051 / 1.000	1.051 / 1.000
25	Drayton 230/Groton 345	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	146% / 242%	146% / 242%	146% / 242%	146% / 242%
28	L20D at Prairie/Drayton	999% / 839%	999% / 839%	999% / 839%	999% / 839%
29	R50M/F3M	761% / 349%	761% / 349%	761% / 349%	761% / 349%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.86 | 0.99	0.96 | 1.02	0.99 | 1.02	0.96 | 1.04
33	Boise 115	1.03 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.07	1.04 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.03	1.00 | 1.04	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.00 | 1.03	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.04	1.00 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 1.00	0.98 | 1.00	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.79	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -16.63%	ANTEL3 / -28.35%	KING 3 / -5.79%	ANTEL3 / 46.45%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	126%	169%	281%	214%
55	K22W (max +dP @ t, d-ang)	6.1@(4.08316,4.6)	5.0@(4.28316,4.8)	0.0@(0.00000,0.0)	16.5@(3.45819,-4.3)
56	K22W (max -dP @ t, d-ang)	46.4@(1.81659,34.4)	38.9@(1.89159,27.7)	27.2@(2.18324,18.2)	21.7@(1.78326,10.3)
57	K22W (max d-ang @ t, dP)	50.3@(16.65797,-39.7)	42.0@(16.53297,-33.8)	24.5@(16.40797,-20.2)	18.2@(1.18329,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	125% / 212%	132% / 223%	141% / 235%	91% / 162%
61	L20D at Prairie/Drayton	999% / 637%	999% / 668%	999% / 728%	999% / 666%
62	R50M / F3M	621% / 349%	661% / 349%	707% / 349%	588% / 305%
63	B10T	197%	200%	260%	191%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - No Reinforcements - Case S4C5WXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5WXA-pcs	upe-so04aa.S4C5WXA-pys	upe-so04aa.S4C5WXA-pyt	upe-so04aa.S4C5WXA-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 05 2002 13:46	MAY 18 2002 1:56	MAY 18 2002 2:12	MAY 18 2002 1:24
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2078 / 332	2078 / 332	2078 / 332	2078 / 332
10	MHEX / L20D	2171 / 236	2171 / 236	2171 / 236	2171 / 236
11	ECL-ARP / PRI-BYN	818 / 930	818 / 930	818 / 930	818 / 930
12	MWSI / MNEX	1749 / 2877	1749 / 2877	1749 / 2877	1749 / 2877
13	D602F / F601C	1778 / 1259	1778 / 1259	1778 / 1259	1778 / 1259
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	168 / 150	168 / 150	168 / 150	168 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	272 / 34	272 / 34	272 / 34	272 / 34
19	Forbes SVC / MSC	32 / 600	32 / 600	32 / 600	32 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 0.978	1.025 / 0.978	1.025 / 0.978	1.025 / 0.978
24	Int Falls 115/Badoura 115	1.050 / 0.998	1.050 / 0.998	1.050 / 0.998	1.050 / 0.998
25	Drayton 230/Groton 345	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	144% / 239%	144% / 239%	144% / 239%	144% / 239%
28	L20D at Prairie/Drayton	999% / 853%	999% / 853%	999% / 853%	999% / 853%
29	R50M/F3M	753% / 347%	753% / 347%	753% / 347%	753% / 347%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.64)0.81 | 1.01	0.92 | 1.02	0.97 | 1.01	0.94 | 1.03
33	Boise 115	1.01 | 1.08	1.02 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.96 | 1.03	0.99 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.98 | 1.03	1.00 | 1.03	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.99 | 1.06	0.99 | 1.05	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.96 | 1.04	0.97 | 1.04	1.00 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.01	0.97 | 1.00	0.98 | 1.00	0.93 | 1.00
41	Tioga 230	1.01 | 1.06	1.02 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.04 | 1.06	1.00 | 1.07
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		4246 [TRIPOLI3] 0.69	none	none	none
46		1318 [ARROWHD3] 0.75			
47		1319 [AHD PST] 0.80			
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -41.47%	ANTEL3 / -36.97%	KING 3 / -14.21%	ANTEL3 / 44.35%
53	Dorsey SUVP / UdHold	/ 17.641	/ 17.333		
54	Forbes DC Red (DCAR)	105%	167%	278%	201%
55	K22W (max +dP @ t, d-ang)	52.5@(20.00792,16.5)	10.9@(19.64959,24.3)	0.6@(4.71649,4.2)	17.6@(3.44985,-5.0)
56	K22W (max -dP @ t, d-ang)	54.1@(17.82462,72.5)	44.1@(17.41629,52.7)	28.1@(2.19991,19.2)	21.7@(1.79159,10.3)
57	K22W (max d-ang @ t, dP)	73.1@(17.70795,-52.3)	53.7@(17.09963,-43.9)	27.1@(16.62464,-22.8)	18.6@(1.18329,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	111% / 198%	98% / 185%	137% / 229%	89% / 159%
61	L20D at Prairie/Drayton	999% / 609%	999% / 640%	999% / 739%	999% / 670%
62	R50M / F3M	589% / 319%	591% / 347%	694% / 347%	582% / 303%
63	B10T	201%	201%	261%	190%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Iowa/Illinois Dispatch - No Reinforcements - Case S5C3IXX

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3IXX-pcs	upe-so04aa.S5C3IXX-pys	upe-so04aa.S5C3IXX-pyt	upe-so04aa.S5C3IXX-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 20:42	JUN 27 2002 20:59	JUN 27 2002 21:15	JUN 27 2002 21:30
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 322	2080 / 322	2080 / 322	2080 / 322
10	MHEX / L20D	2174 / 244	2174 / 244	2174 / 244	2174 / 244
11	ECL-ARP / PRI-BYN	773 / 967	773 / 967	773 / 967	773 / 967
12	MWSI / MNEX	1741 / 2943	1741 / 2943	1741 / 2943	1741 / 2943
13	D602F / F601C	1763 / 1247	1763 / 1247	1763 / 1247	1763 / 1247
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 150	166 / 150	166 / 150	166 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	304 / 27	304 / 27	304 / 27	304 / 27
19	Forbes SVC / MSC	23 / 600	23 / 600	23 / 600	23 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026
23	Chisago 500/EauClaire 345	1.028 / 0.994	1.028 / 0.994	1.028 / 0.994	1.028 / 0.994
24	Int Falls 115/Badoura 115	1.049 / 1.005	1.049 / 1.005	1.049 / 1.005	1.049 / 1.005
25	Drayton 230/Groton 345	1.015 / 1.003	1.015 / 1.003	1.015 / 1.003	1.015 / 1.003
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	150% / 249%	150% / 249%	150% / 249%	150% / 249%
28	L20D at Prairie/Drayton	999% / 823%	999% / 823%	999% / 823%	999% / 823%
29	R50M/F3M	773% / 346%	773% / 346%	773% / 346%	773% / 346%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.83 | 1.05	0.92 | 1.09	0.99 | 1.03	0.97 | 1.06
33	Boise 115	1.01 | 1.08	1.01 | 1.08	1.04 | 1.06	1.02 | 1.06
34	Dorsey 230	0.98 | 1.07	0.98 | 1.07	1.04 | 1.05	1.03 | 1.06
35	Forbes 230	0.97 | 1.05	0.99 | 1.06	1.01 | 1.03	1.01 | 1.04
36	Riverton 230	0.98 | 1.05	1.00 | 1.05	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.98 | 1.08	0.97 | 1.08	1.01 | 1.04	0.91 | 1.03
39	Drayton 230	0.96 | 1.05	0.96 | 1.05	1.00 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.03	0.95 | 1.03	0.99 | 1.01	0.94 | 1.01
41	Tioga 230	0.99 | 1.05	1.00 | 1.05	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.02 | 1.07	1.04 | 1.07	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.96 | 1.04	0.96 | 1.04	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.79	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -34.96%	ANTEL3 / -41.56%	KING 3 / -14.57%	ANTEL3 / 40.18%
53	Dorsey SUVP / UdHold	/ 17.358	/ 17.333		
54	Forbes DC Red (DCAR)	126%	166%	271%	219%
55	K22W (max +dP @ t, d-ang)	75.3@(19.78292,7.9)	78.9@(19.25793,-1.2)	1.5@(4.69982,3.9)	18.6@(3.42486,-5.4)
56	K22W (max -dP @ t, d-ang)	55.7@(17.47462,73.7)	52.6@(17.19963,65.6)	29.3@(2.20824,20.0)	23.4@(1.79159,12.6)
57	K22W (max d-ang @ t, dP)	73.7@(17.47462,-55.7)	65.9@(17.32463,-50.0)	29.6@(16.62464,-25.4)	19.9@(1.22495,-17.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	91% / 179%	107% / 198%	142% / 237%	96% / 171%
61	L20D at Prairie/Drayton	999% / 599%	999% / 605%	999% / 714%	999% / 648%
62	R50M / F3M	590% / 288%	593% / 290%	706% / 346%	604% / 313%
63	B10T	192%	47%	241%	180%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.1 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Eastern Wisconsin Dispatch - No Reinforcements - Case S5C3WXX

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3WXX-pcs	upe-so04aa.S5C3WXX-pys	upe-so04aa.S5C3WXX-pyt	upe-so04aa.S5C3WXX-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 15:34	JUN 27 2002 15:46	JUN 27 2002 16:01	JUN 27 2002 16:15
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2082 / 330	2082 / 330	2082 / 330	2082 / 330
10	MHEX / L20D	2171 / 240	2171 / 240	2171 / 240	2171 / 240
11	ECL-ARP / PRI-BYN	830 / 945	830 / 945	830 / 945	830 / 945
12	MWSI / MNEX	1775 / 2911	1775 / 2911	1775 / 2911	1775 / 2911
13	D602F / F601C	1767 / 1242	1767 / 1242	1767 / 1242	1767 / 1242
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 150	166 / 150	166 / 150	166 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	293 / 27	293 / 27	293 / 27	293 / 27
19	Forbes SVC / MSC	27 / 600	27 / 600	27 / 600	27 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.026 / 0.975	1.026 / 0.975	1.026 / 0.975	1.026 / 0.975
24	Int Falls 115/Badoura 115	1.051 / 1.002	1.051 / 1.002	1.051 / 1.002	1.051 / 1.002
25	Drayton 230/Groton 345	1.016 / 1.003	1.016 / 1.003	1.016 / 1.003	1.016 / 1.003
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	148% / 245%	148% / 245%	148% / 245%	148% / 245%
28	L20D at Prairie/Drayton	999% / 840%	999% / 840%	999% / 840%	999% / 840%
29	R50M/F3M	764% / 349%	764% / 349%	764% / 349%	764% / 349%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.92)0.72 | 1.02	(7.77)0.79 | 1.08	0.97 | 1.02	0.95 | 1.05
33	Boise 115	1.01 | 1.07	1.00 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.02 | 1.07	1.01 | 1.06	1.04 | 1.05	1.03 | 1.06
35	Forbes 230	0.95 | 1.04	0.95 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.97 | 1.04	0.97 | 1.05	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	0.99 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.96 | 1.08	0.93 | 1.09	1.00 | 1.04	0.91 | 1.03
39	Drayton 230	0.98 | 1.04	0.97 | 1.04	1.01 | 1.03	1.00 | 1.04
40	Groton 345	0.92 | 1.02	0.91 | 1.03	0.98 | 1.01	0.94 | 1.01
41	Tioga 230	1.01 | 1.06	1.02 | 1.07	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.07	1.02 | 1.07	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	0.92 | 1.03	0.90 | 1.04	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.51	1318 [ARROWHD3] 0.66	none	none
46		1319 [AHD PST] 0.61	1319 [AHD PST] 0.73		
47		1316 [HILLTOP4] 0.72	1315 [ARROWHD4] 0.79		
48		1314 [98L TAP4] 0.72	1314 [98L TAP4] 0.80		
49		1315 [ARROWHD4] 0.72	1316 [HILLTOP4] 0.80		
50		1276 [HILTPJCT] 0.75	1331 [MINONG 5] 0.80		
51		1270 [STINSJCT] 0.75 +more	1330 [STINSON5] 0.81 +more		
52	Worst Case Angle Damping	ANTEL3 / -70.73%	ANTEL3 / -61.33%	KING 3 / -24.11%	ANTEL3 / 37.88%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	98%	152%	267%	208%
55	K22W (max +dP @ t, d-ang)	45.6@(10.20807,8.4)	61.3@(15.18299,4.4)	4.1@(19.43293,16.9)	19.8@(3.42486,-6.1)
56	K22W (max -dP @ t, d-ang)	66.2@(7.89144,68.6)	66.1@(12.99969,70.1)	31.6@(17.15796,34.5)	23.5@(1.79993,12.7)
57	K22W (max d-ang @ t, dP)	69.0@(7.74977,-65.8)	71.6@(12.73303,-64.5)	35.1@(16.90796,-30.8)	20.3@(1.23328,-17.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	90% / 164%	80% / 153%	137% / 229%	94% / 168%
61	L20D at Prairie/Drayton	999% / 620%	999% / 627%	999% / 728%	999% / 654%
62	R50M / F3M	542% / 329%	531% / 308%	687% / 349%	598% / 317%
63	B10T	205%	202%	264%	183%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - S.Rock-Des Moines - Case S1C1IXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1IXB-pcs	upe-so04aa.S1C1IXB-pys	upe-so04aa.S1C1IXB-pyt	upe-so04aa.S1C1IXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 16:09	MAY 22 2002 3:08	MAY 21 2002 23:16	MAY 21 2002 18:54
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3009 / 352	3009 / 352	3009 / 352	3009 / 352
10	MHEX / L20D	2172 / 225	2172 / 225	2172 / 225	2172 / 225
11	ECL-ARP / PRI-BYN	737 / 923	737 / 923	737 / 923	737 / 923
12	MWSI / MNEX	1661 / 3158	1661 / 3158	1661 / 3158	1661 / 3158
13	D602F / F601C	1808 / 1300	1808 / 1300	1808 / 1300	1808 / 1300
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -197	-119 / -197	-119 / -197	-119 / -197
16	R50M / OH>MP	172 / 150	172 / 150	172 / 150	172 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	259 / 124	259 / 124	259 / 124	259 / 124
19	Forbes SVC / MSC	31 / 600	31 / 600	31 / 600	31 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.021	1.058 / 1.021	1.058 / 1.021	1.058 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 1.005	1.025 / 1.005	1.025 / 1.005	1.025 / 1.005
24	Int Falls 115/Badoura 115	1.050 / 0.999	1.050 / 0.999	1.050 / 0.999	1.050 / 0.999
25	Drayton 230/Groton 345	1.023 / 0.988	1.023 / 0.988	1.023 / 0.988	1.023 / 0.988
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 228%	136% / 228%	136% / 228%	136% / 228%
28	L20D at Prairie/Drayton	999% / 926%	999% / 926%	999% / 926%	999% / 926%
29	R50M/F3M	731% / 347%	731% / 347%	731% / 347%	731% / 347%
30	B10T	334%	334%	334%	334%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.85 | 1.04	0.93 | 1.08	0.99 | 1.03	0.96 | 1.06
33	Boise 115	1.01 | 1.08	1.01 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.07	1.04 | 1.05	1.02 | 1.07
35	Forbes 230	0.97 | 1.04	0.98 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.98 | 1.05	0.98 | 1.05	1.01 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.97 | 1.07	0.98 | 1.08	1.00 | 1.04	0.90 | 1.03
39	Drayton 230	0.97 | 1.07	0.97 | 1.06	1.01 | 1.04	1.00 | 1.05
40	Groton 345	0.92 | 1.03	0.92 | 1.03	0.96 | 0.99	0.89 | 1.01
41	Tioga 230	1.00 | 1.06	1.01 | 1.06	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.08	1.01 | 1.07	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.94 | 1.03	0.94 | 1.03	0.97 | 1.01	0.91 | 1.01
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.79	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -12.55%	ANTEL3 / -28.53%	SHERC3 / -16.11%	ANTEL3 / 45.38%
53	Dorsey SUVP / UdHold	/ 16.791	/ 16.524		
54	Forbes DC Red (DCAR)	109%	153%	272%	202%
55	K22W (max +dP @ t, d-ang)	62.9@(19.13293,3.8)	67.6@(18.86627,-4.5)	1.6@(4.67482,3.7)	26.0@(3.29986,-9.2)
56	K22W (max -dP @ t, d-ang)	51.2@(12.07471,52.2)	46.9@(16.68297,56.2)	26.7@(2.19158,18.4)	27.6@(0.99996,19.7)
57	K22W (max d-ang @ t, dP)	63.3@(16.90796,-49.0)	56.3@(16.64130,-45.7)	28.2@(16.79130,-24.2)	22.8@(1.26662,-19.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	95% / 168%	93% / 168%	128% / 216%	74% / 140%
61	L20D at Prairie/Drayton	999% / 641%	999% / 692%	999% / 805%	999% / 637%
62	R50M / F3M	549% / 308%	568% / 303%	669% / 347%	551% / 305%
63	B10T	169%	181%	264%	144%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 2 | 2)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - S.Rock-Adams-Columbia - Case S1C1IXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1IXC-pcs	upe-so04aa.S1C1IXC-pys	upe-so04aa.S1C1IXC-pyt	upe-so04aa.S1C1IXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 1:15	JUN 14 2002 1:32	JUN 14 2002 1:50	JUN 14 2002 2:06
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2982 / 335	2982 / 335	2982 / 335	2982 / 335
10	MHEX / L20D	2174 / 232	2174 / 232	2174 / 232	2174 / 232
11	ECL-ARP / PRI-BYN	668 / 955	668 / 955	668 / 955	668 / 955
12	MWSI / MNEX	1623 / 3145	1623 / 3145	1623 / 3145	1623 / 3145
13	D602F / F601C	1798 / 1307	1798 / 1307	1798 / 1307	1798 / 1307
14	B10T / MH>SPC	166 / 99	166 / 99	166 / 99	166 / 99
15	OH E-W / OH>MH	-118 / -195	-118 / -195	-118 / -195	-118 / -195
16	R50M / OH>MP	171 / 150	171 / 150	171 / 150	171 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	272 / 123	272 / 123	272 / 123	272 / 123
19	Forbes SVC / MSC	23 / 600	23 / 600	23 / 600	23 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.023	1.059 / 1.023	1.059 / 1.023	1.059 / 1.023
23	Chisago 500/EauClaire 345	1.026 / 1.021	1.026 / 1.021	1.026 / 1.021	1.026 / 1.021
24	Int Falls 115/Badoura 115	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001
25	Drayton 230/Groton 345	1.020 / 0.983	1.020 / 0.983	1.020 / 0.983	1.020 / 0.983
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	140% / 233%	140% / 233%	140% / 233%	140% / 233%
28	L20D at Prairie/Drayton	999% / 884%	999% / 884%	999% / 884%	999% / 884%
29	R50M/F3M	744% / 349%	744% / 349%	744% / 349%	744% / 349%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.02	0.97 | 1.08	1.00 | 1.03	0.97 | 1.07
33	Boise 115	1.02 | 1.07	1.01 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.99 | 1.08	0.98 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.00 | 1.05	1.02 | 1.03	1.00 | 1.04
36	Riverton 230	0.98 | 1.03	1.00 | 1.04	1.01 | 1.02	0.95 | 1.04
37	Coal Creek 230	0.98 | 1.05	0.99 | 1.06	1.02 | 1.04	0.96 | 1.05
38	Dickinson 345	0.96 | 1.05	0.98 | 1.06	1.00 | 1.03	0.90 | 1.04
39	Drayton 230	0.99 | 1.04	0.97 | 1.06	1.01 | 1.03	0.99 | 1.05
40	Groton 345	0.91 | 1.00	0.92 | 1.01	0.95 | 0.98	0.88 | 1.00
41	Tioga 230	1.00 | 1.05	1.00 | 1.06	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.07	1.00 | 1.07	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.93 | 1.01	0.93 | 1.02	0.97 | 1.00	0.90 | 1.01
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 4.98%	SHERC3 / -19.32%	SHERC3 / -6.84%	ANTEL3 / 49.25%
53	Dorsey SUVP / UdHold	/ 16.358	/ 16.324		
54	Forbes DC Red (DCAR)	145%	163%	279%	219%
55	K22W (max +dP @ t, d-ang)	11.3@(3.88317,1.7)	58.7@(18.16628,-0.9)	1.2@(4.55815,3.5)	27.2@(2.96654,-10.3)
56	K22W (max -dP @ t, d-ang)	39.9@(1.84159,27.8)	39.4@(11.52471,39.1)	25.6@(2.08325,17.6)	27.5@(0.99163,19.4)
57	K22W (max d-ang @ t, dP)	44.1@(20.00792,-28.2)	46.7@(16.03298,-38.8)	25.1@(16.32464,-22.1)	22.4@(1.24995,-20.2)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	83% / 153%	94% / 178%	132% / 222%	77% / 146%
61	L20D at Prairie/Drayton	999% / 595%	999% / 643%	999% / 764%	999% / 610%
62	R50M / F3M	537% / 349%	575% / 321%	683% / 349%	561% / 307%
63	B10T	149%	169%	262%	136%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - S.Rock-Des Moines-Zion - Case S1C1IXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1IXD-pcs	upe-so04aa.S1C1IXD-pys	upe-so04aa.S1C1IXD-pyt	upe-so04aa.S1C1IXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 23 2002 0:29	MAY 22 2002 23:54	MAY 23 2002 0:13	MAY 23 2002 0:47
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2982 / 345	2982 / 345	2982 / 345	2982 / 345
10	MHEX / L20D	2172 / 227	2172 / 227	2172 / 227	2172 / 227
11	ECL-ARP / PRI-BYN	708 / 925	708 / 925	708 / 925	708 / 925
12	MWSI / MNEX	1634 / 3178	1634 / 3178	1634 / 3178	1634 / 3178
13	D602F / F601C	1805 / 1304	1805 / 1304	1805 / 1304	1805 / 1304
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -197	-119 / -197	-119 / -197	-119 / -197
16	R50M / OH>MP	172 / 151	172 / 151	172 / 151	172 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	261 / 123	261 / 123	261 / 123	261 / 123
19	Forbes SVC / MSC	29 / 600	29 / 600	29 / 600	29 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.022	1.058 / 1.022	1.058 / 1.022	1.058 / 1.022
23	Chisago 500/EauClaire 345	1.025 / 1.012	1.025 / 1.012	1.025 / 1.012	1.025 / 1.012
24	Int Falls 115/Badoura 115	1.051 / 0.998	1.051 / 0.998	1.051 / 0.998	1.051 / 0.998
25	Drayton 230/Groton 345	1.019 / 0.984	1.019 / 0.984	1.019 / 0.984	1.019 / 0.984
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	137% / 229%	137% / 229%	137% / 229%	137% / 229%
28	L20D at Prairie/Drayton	999% / 910%	999% / 910%	999% / 910%	999% / 910%
29	R50M/F3M	736% / 347%	736% / 347%	736% / 347%	736% / 347%
30	B10T	336%	336%	336%	336%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.04	0.95 | 1.08	1.00 | 1.03	0.97 | 1.06
33	Boise 115	1.01 | 1.07	1.01 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.07	1.04 | 1.05	1.03 | 1.06
35	Forbes 230	0.98 | 1.04	0.99 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.98 | 1.04	0.99 | 1.05	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.96 | 1.05
38	Dickinson 345	0.97 | 1.06	0.98 | 1.08	1.00 | 1.04	0.90 | 1.03
39	Drayton 230	0.97 | 1.06	0.97 | 1.06	1.01 | 1.03	1.00 | 1.05
40	Groton 345	0.91 | 1.02	0.92 | 1.03	0.95 | 0.99	0.88 | 1.00
41	Tioga 230	1.00 | 1.06	1.01 | 1.06	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.07	1.01 | 1.07	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.93 | 1.03	0.94 | 1.03	0.97 | 1.00	0.90 | 1.01
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.81	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -12.55%	SHERC3 / -22.59%	SHERC3 / -13.90%	ANTEL3 / 46.16%
53	Dorsey SUVP / UdHold	/ 16.441	/ 16.533		
54	Forbes DC Red (DCAR)	115%	153%	272%	206%
55	K22W (max +dP @ t, d-ang)	54.3@(18.41628,3.8)	69.7@(18.45794,-4.1)	1.4@(4.65815,3.7)	26.9@(3.24986,-9.5)
56	K22W (max -dP @ t, d-ang)	48.5@(11.78304,48.1)	44.7@(16.67463,53.7)	26.5@(2.18324,18.3)	28.0@(1.00829,19.9)
57	K22W (max d-ang @ t, dP)	57.1@(16.54964,-45.7)	53.9@(16.59964,-44.4)	27.9@(16.67463,-24.0)	23.0@(1.27495,-20.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	91% / 162%	95% / 180%	129% / 217%	74% / 141%
61	L20D at Prairie/Drayton	999% / 628%	999% / 684%	999% / 793%	999% / 628%
62	R50M / F3M	543% / 321%	570% / 308%	673% / 347%	554% / 305%
63	B10T	165%	180%	266%	140%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - P.Island-Columbia - Case S1C1IXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1IXE-pcs	upe-so04aa.S1C1IXE-pys	upe-so04aa.S1C1IXE-pyt	upe-so04aa.S1C1IXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 16:59	MAY 22 2002 3:58	MAY 22 2002 0:06	MAY 21 2002 19:45
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3006 / 368	3006 / 368	3006 / 368	3006 / 368
10	MHEX / L20D	2172 / 217	2172 / 217	2172 / 217	2172 / 217
11	ECL-ARP / PRI-BYN	656 / 818	656 / 818	656 / 818	656 / 818
12	MWSI / MNEX	1937 / 2853	1937 / 2853	1937 / 2853	1937 / 2853
13	D602F / F601C	1823 / 1341	1823 / 1341	1823 / 1341	1823 / 1341
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	173 / 150	173 / 150	173 / 150	173 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	244 / 124	244 / 124	244 / 124	244 / 124
19	Forbes SVC / MSC	34 / 600	34 / 600	34 / 600	34 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045
22	Roseau 500/Forbes 500	1.057 / 1.020	1.057 / 1.020	1.057 / 1.020	1.057 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 1.026	1.024 / 1.026	1.024 / 1.026	1.024 / 1.026
24	Int Falls 115/Badoura 115	1.051 / 0.994	1.051 / 0.994	1.051 / 0.994	1.051 / 0.994
25	Drayton 230/Groton 345	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	132% / 222%	132% / 222%	132% / 222%	132% / 222%
28	L20D at Prairie/Drayton	999% / 969%	999% / 969%	999% / 969%	999% / 969%
29	R50M/F3M	724% / 348%	724% / 348%	724% / 348%	724% / 348%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.02	0.99 | 1.04	1.02 | 1.03	0.97 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.00 | 1.04
36	Riverton 230	0.97 | 1.03	1.00 | 1.02	1.01 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.05	1.00 | 1.06	1.02 | 1.04	0.96 | 1.05
38	Dickinson 345	0.96 | 1.04	1.00 | 1.04	1.01 | 1.03	0.90 | 1.03
39	Drayton 230	1.00 | 1.05	1.01 | 1.04	1.02 | 1.03	0.99 | 1.05
40	Groton 345	0.93 | 1.01	0.94 | 1.00	0.98 | 1.00	0.89 | 1.01
41	Tioga 230	1.00 | 1.05	1.01 | 1.04	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	0.99 | 1.06	1.00 | 1.05	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.95 | 1.02	0.96 | 1.01	0.99 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 14.15%	SHERC3 / 19.32%	KING 3 / 11.34%	KING 3 / 52.91%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	169%	217%	346%	232%
55	K22W (max +dP @ t, d-ang)	10.5@(3.92483,2.2)	4.9@(4.07483,3.9)	0.0@(0.00000,0.0)	24.1@(2.92488,-9.5)
56	K22W (max -dP @ t, d-ang)	38.1@(1.81659,25.8)	27.1@(1.76659,18.3)	17.2@(2.07491,11.3)	26.3@(0.99996,19.0)
57	K22W (max d-ang @ t, dP)	31.4@(20.00792,-22.6)	22.3@(19.80792,-15.8)	15.4@(20.00792,-10.2)	21.4@(1.24162,-20.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	82% / 150%	100% / 176%	127% / 214%	74% / 139%
61	L20D at Prairie/Drayton	999% / 658%	999% / 735%	999% / 871%	999% / 669%
62	R50M / F3M	536% / 348%	600% / 348%	684% / 348%	547% / 306%
63	B10T	154%	179%	277%	142%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S1C1WXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1WXB-pcs	upe-so04aa.S1C1WXB-pys	upe-so04aa.S1C1WXB-pyt	upe-so04aa.S1C1WXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 20 2002 12:35	MAY 21 2002 20:21	MAY 22 2002 7:14	MAY 20 2002 18:13
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3008 / 359	3008 / 359	3008 / 359	3008 / 359
10	MHEX / L20D	2172 / 221	2172 / 221	2172 / 221	2172 / 221
11	ECL-ARP / PRI-BYN	794 / 899	794 / 899	794 / 899	794 / 899
12	MWSI / MNEX	1694 / 3124	1694 / 3124	1694 / 3124	1694 / 3124
13	D602F / F601C	1814 / 1294	1814 / 1294	1814 / 1294	1814 / 1294
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	173 / 150	173 / 150	173 / 150	173 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	249 / 124	249 / 124	249 / 124	249 / 124
19	Forbes SVC / MSC	39 / 600	39 / 600	39 / 600	39 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.020	1.058 / 1.020	1.058 / 1.020	1.058 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.990	1.024 / 0.990	1.024 / 0.990	1.024 / 0.990
24	Int Falls 115/Badoura 115	1.050 / 0.996	1.050 / 0.996	1.050 / 0.996	1.050 / 0.996
25	Drayton 230/Groton 345	1.023 / 0.990	1.023 / 0.990	1.023 / 0.990	1.023 / 0.990
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	135% / 224%	135% / 224%	135% / 224%	135% / 224%
28	L20D at Prairie/Drayton	999% / 945%	999% / 945%	999% / 945%	999% / 945%
29	R50M/F3M	722% / 346%	722% / 346%	722% / 346%	722% / 346%
30	B10T	334%	334%	334%	334%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.30)0.74 | 1.02	0.89 | 1.09	0.98 | 1.02	0.95 | 1.05
33	Boise 115	0.99 | 1.07	1.01 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.97 | 1.07	1.03 | 1.05	1.02 | 1.07
35	Forbes 230	0.93 | 1.04	0.97 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.96 | 1.04	0.97 | 1.05	1.00 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.96 | 1.07	0.97 | 1.09	1.00 | 1.04	0.90 | 1.03
39	Drayton 230	0.96 | 1.06	0.96 | 1.07	1.01 | 1.04	0.99 | 1.05
40	Groton 345	0.89 | 1.02	0.91 | 1.04	0.96 | 1.00	0.89 | 1.01
41	Tioga 230	1.00 | 1.06	1.01 | 1.06	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.07	1.01 | 1.08	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.91 | 1.03	0.92 | 1.04	0.98 | 1.01	0.91 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.61	none	none	none
46		1866 [T-CRNRS7] 0.66			
47		1319 [AHD PST] 0.69			
48		1314 [98L TAP4] 0.78			
49		1315 [ARROWHD4] 0.78			
50		1316 [HILLTOP4] 0.78			
51		1374 [HANESRD7] 0.80 +mor			
52	Worst Case Angle Damping	ANTEL3 / -32.80%	ANTEL3 / -37.51%	SHERC3 / -23.33%	ANTEL3 / 43.67%
53	Dorsey SUVP / UdHold	/ 17.183	/ 16.699		
54	Forbes DC Red (DCAR)	19%	128%	274%	196%
55	K22W (max +dP @ t, d-ang)	40.5@(14.77466,13.5)	85.3@(19.14126,-6.9)	2.5@(4.69149,3.2)	26.0@(3.29986,-9.4)
56	K22W (max -dP @ t, d-ang)	62.6@(12.88303,64.9)	51.4@(16.89130,66.4)	27.9@(17.37462,29.0)	27.6@(1.00829,20.3)
57	K22W (max d-ang @ t, dP)	88.3@(17.29963,-58.6)	66.4@(16.85797,-51.3)	30.4@(16.89130,-26.6)	23.2@(1.27495,-19.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	74% / 135%	80% / 150%	122% / 208%	71% / 135%
61	L20D at Prairie/Drayton	999% / 652%	999% / 691%	999% / 820%	999% / 648%
62	R50M / F3M	499% / 322%	532% / 288%	650% / 346%	539% / 303%
63	B10T	175%	184%	266%	145%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 2 | 1)	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - S.Rock-Adams-Columbia - Case S1C1WXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1WXC-pcs	upe-so04aa.S1C1WXC-pys	upe-so04aa.S1C1WXC-pyt	upe-so04aa.S1C1WXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 17:26	JUN 13 2002 17:43	JUN 13 2002 18:01	JUN 13 2002 18:18
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2983 / 343	2983 / 343	2983 / 343	2983 / 343
10	MHEX / L20D	2171 / 228	2171 / 228	2171 / 228	2171 / 228
11	ECL-ARP / PRI-BYN	723 / 933	723 / 933	723 / 933	723 / 933
12	MWSI / MNEX	1656 / 3115	1656 / 3115	1656 / 3115	1656 / 3115
13	D602F / F601C	1802 / 1299	1802 / 1299	1802 / 1299	1802 / 1299
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-121 / -197	-121 / -197	-121 / -197	-121 / -197
16	R50M / OH>MP	172 / 149	172 / 149	172 / 149	172 / 149
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	265 / 123	265 / 123	265 / 123	265 / 123
19	Forbes SVC / MSC	28 / 600	28 / 600	28 / 600	28 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.022	1.059 / 1.022	1.059 / 1.022	1.059 / 1.022
23	Chisago 500/EauClaire 345	1.025 / 1.011	1.025 / 1.011	1.025 / 1.011	1.025 / 1.011
24	Int Falls 115/Badoura 115	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998
25	Drayton 230/Groton 345	1.019 / 0.983	1.019 / 0.983	1.019 / 0.983	1.019 / 0.983
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	138% / 231%	138% / 231%	138% / 231%	138% / 231%
28	L20D at Prairie/Drayton	999% / 906%	999% / 906%	999% / 906%	999% / 906%
29	R50M/F3M	736% / 352%	736% / 352%	736% / 352%	736% / 352%
30	B10T	333%	333%	333%	333%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 1.02	0.97 | 1.07	1.00 | 1.03	0.96 | 1.06
33	Boise 115	1.02 | 1.07	1.02 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.00 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.98 | 1.03	1.00 | 1.04	1.01 | 1.02	0.95 | 1.04
37	Coal Creek 230	0.98 | 1.05	0.99 | 1.06	1.02 | 1.04	0.96 | 1.05
38	Dickinson 345	0.97 | 1.05	0.98 | 1.06	1.00 | 1.03	0.90 | 1.04
39	Drayton 230	0.98 | 1.05	0.98 | 1.06	1.01 | 1.03	1.00 | 1.05
40	Groton 345	0.91 | 1.00	0.92 | 1.01	0.95 | 0.98	0.88 | 1.00
41	Tioga 230	1.00 | 1.05	1.00 | 1.06	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.07	1.00 | 1.06	1.03 | 1.05	0.97 | 1.06
43	Watertown 345	0.93 | 1.01	0.94 | 1.02	0.97 | 1.00	0.90 | 1.01
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.81	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 0.16%	SHERC3 / -17.45%	SHERC3 / -5.03%	ANTEL3 / 50.76%
53	Dorsey SUVP / UdHold	/ 16.066	/ 16.399		
54	Forbes DC Red (DCAR)	137%	163%	283%	219%
55	K22W (max +dP @ t, d-ang)	13.6@(3.87484,0.4)	57.5@(18.22461,-1.6)	1.0@(4.55815,3.5)	26.6@(2.98321,-10.3)
56	K22W (max -dP @ t, d-ang)	41.1@(1.84992,30.0)	38.7@(11.53305,36.7)	25.1@(2.08325,17.5)	27.0@(0.99163,19.6)
57	K22W (max d-ang @ t, dP)	42.4@(20.00792,-28.0)	43.6@(16.01631,-37.7)	24.7@(16.31631,-21.1)	22.5@(1.24995,-19.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	84% / 153%	92% / 175%	131% / 219%	75% / 142%
61	L20D at Prairie/Drayton	999% / 609%	999% / 661%	999% / 781%	999% / 623%
62	R50M / F3M	532% / 352%	569% / 323%	676% / 352%	553% / 306%
63	B10T	150%	168%	259%	135%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - S.Rock-Des Moines-Zion - Case S1C1WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1WXD-pcs	upe-so04aa.S1C1WXD-pys	upe-so04aa.S1C1WXD-pyt	upe-so04aa.S1C1WXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 23 2002 1:38	MAY 23 2002 1:06	MAY 23 2002 1:23	MAY 23 2002 1:55
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3009 / 353	3009 / 353	3009 / 353	3009 / 353
10	MHEX / L20D	2172 / 224	2172 / 224	2172 / 224	2172 / 224
11	ECL-ARP / PRI-BYN	764 / 901	764 / 901	764 / 901	764 / 901
12	MWSI / MNEX	1666 / 3145	1666 / 3145	1666 / 3145	1666 / 3145
13	D602F / F601C	1810 / 1295	1810 / 1295	1810 / 1295	1810 / 1295
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	172 / 151	172 / 151	172 / 151	172 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	256 / 124	256 / 124	256 / 124	256 / 124
19	Forbes SVC / MSC	35 / 600	35 / 600	35 / 600	35 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.021	1.058 / 1.021	1.058 / 1.021	1.058 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 0.999	1.025 / 0.999	1.025 / 0.999	1.025 / 0.999
24	Int Falls 115/Badoura 115	1.051 / 0.998	1.051 / 0.998	1.051 / 0.998	1.051 / 0.998
25	Drayton 230/Groton 345	1.023 / 0.988	1.023 / 0.988	1.023 / 0.988	1.023 / 0.988
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 227%	136% / 227%	136% / 227%	136% / 227%
28	L20D at Prairie/Drayton	999% / 930%	999% / 930%	999% / 930%	999% / 930%
29	R50M/F3M	729% / 346%	729% / 346%	729% / 346%	729% / 346%
30	B10T	334%	334%	334%	334%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.82 | 1.05	0.92 | 1.08	0.99 | 1.03	0.96 | 1.06
33	Boise 115	1.00 | 1.08	1.01 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.07	1.04 | 1.05	1.03 | 1.07
35	Forbes 230	0.95 | 1.05	0.98 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.97 | 1.05	0.98 | 1.05	1.01 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.97 | 1.08	0.98 | 1.08	1.00 | 1.04	0.90 | 1.03
39	Drayton 230	0.97 | 1.07	0.97 | 1.06	1.01 | 1.04	1.00 | 1.05
40	Groton 345	0.91 | 1.03	0.91 | 1.03	0.96 | 0.99	0.89 | 1.01
41	Tioga 230	1.00 | 1.06	1.01 | 1.06	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	1.00 | 1.08	1.01 | 1.08	1.03 | 1.05	0.97 | 1.07
43	Watertown 345	0.93 | 1.04	0.93 | 1.04	0.97 | 1.01	0.91 | 1.01
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.78	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -17.66%	SHERC3 / -27.95%	SHERC3 / -17.05%	ANTEL3 / 45.86%
53	Dorsey SUVP / UdHold	/ 16.574	/ 16.449		
54	Forbes DC Red (DCAR)	100%	160%	277%	203%
55	K22W (max +dP @ t, d-ang)	72.8@(19.04127,1.2)	72.4@(18.81627,-5.7)	2.0@(4.65815,3.4)	26.6@(3.24986,-9.7)
56	K22W (max -dP @ t, d-ang)	53.9@(12.02471,58.5)	47.9@(16.60797,58.9)	26.7@(7.25811,21.5)	27.7@(1.00829,20.1)
57	K22W (max d-ang @ t, dP)	68.4@(16.74130,-51.3)	58.9@(16.59130,-46.7)	28.3@(16.70797,-24.7)	23.0@(1.27495,-19.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	83% / 153%	88% / 160%	127% / 214%	73% / 138%
61	L20D at Prairie/Drayton	999% / 642%	999% / 696%	999% / 810%	999% / 641%
62	R50M / F3M	529% / 303%	554% / 300%	665% / 346%	547% / 303%
63	B10T	171%	183%	266%	142%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - P.Island-Columbia - Case S1C1WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1WXE-pcs	upe-so04aa.S1C1WXE-pys	upe-so04aa.S1C1WXE-pyt	upe-so04aa.S1C1WXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 20 2002 13:23	MAY 21 2002 21:09	MAY 22 2002 7:58	MAY 20 2002 19:03
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3005 / 375	3005 / 375	3005 / 375	3005 / 375
10	MHEX / L20D	2173 / 213	2173 / 213	2173 / 213	2173 / 213
11	ECL-ARP / PRI-BYN	714 / 785	714 / 785	714 / 785	714 / 785
12	MWSI / MNEX	1982 / 2805	1982 / 2805	1982 / 2805	1982 / 2805
13	D602F / F601C	1829 / 1335	1829 / 1335	1829 / 1335	1829 / 1335
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	174 / 150	174 / 150	174 / 150	174 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	232 / 124	232 / 124	232 / 124	232 / 124
19	Forbes SVC / MSC	43 / 600	43 / 600	43 / 600	43 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045
22	Roseau 500/Forbes 500	1.057 / 1.018	1.057 / 1.018	1.057 / 1.018	1.057 / 1.018
23	Chisago 500/EauClaire 345	1.023 / 1.013	1.023 / 1.013	1.023 / 1.013	1.023 / 1.013
24	Int Falls 115/Badoura 115	1.050 / 0.991	1.050 / 0.991	1.050 / 0.991	1.050 / 0.991
25	Drayton 230/Groton 345	1.023 / 0.993	1.023 / 0.993	1.023 / 0.993	1.023 / 0.993
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	130% / 218%	130% / 218%	130% / 218%	130% / 218%
28	L20D at Prairie/Drayton	999% / 990%	999% / 990%	999% / 990%	999% / 990%
29	R50M/F3M	715% / 347%	715% / 347%	715% / 347%	715% / 347%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 1.01	0.99 | 1.04	1.01 | 1.03	0.96 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.97 | 1.03	0.99 | 1.02	1.00 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.97 | 1.05	1.00 | 1.04	1.01 | 1.03	0.90 | 1.03
39	Drayton 230	1.00 | 1.05	1.01 | 1.04	1.02 | 1.03	1.00 | 1.05
40	Groton 345	0.93 | 1.01	0.94 | 1.00	0.98 | 1.00	0.90 | 1.01
41	Tioga 230	1.00 | 1.05	1.01 | 1.04	1.03 | 1.04	1.00 | 1.05
42	Wahpeton 115	0.99 | 1.06	1.00 | 1.05	1.03 | 1.04	0.97 | 1.06
43	Watertown 345	0.95 | 1.02	0.96 | 1.01	0.99 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 8.69%	SHERC3 / 20.33%	KING 3 / 12.23%	MNTCE3 / 54.91%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	153%	218%	351%	228%
55	K22W (max +dP @ t, d-ang)	10.6@(3.97483,2.8)	5.3@(4.06650,3.7)	0.0@(0.00000,0.0)	23.8@(2.94154,-9.5)
56	K22W (max -dP @ t, d-ang)	39.7@(1.83326,27.6)	27.0@(1.77493,18.1)	16.6@(2.06658,11.0)	26.1@(1.00829,19.2)
57	K22W (max d-ang @ t, dP)	35.2@(20.00792,-23.5)	21.7@(19.79959,-15.3)	14.8@(20.00792,-9.9)	21.4@(1.24162,-19.8)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	81% / 149%	98% / 173%	125% / 210%	71% / 134%
61	L20D at Prairie/Drayton	999% / 669%	999% / 749%	999% / 889%	999% / 685%
62	R50M / F3M	529% / 347%	592% / 347%	676% / 347%	538% / 303%
63	B10T	158%	179%	278%	144%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - S. Rock-Des Moines - Case S1C5IXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5IXB-pcs	upe-so04aa.S1C5IXB-pys	upe-so04aa.S1C5IXB-pyt	upe-so04aa.S1C5IXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 17:14	MAY 22 2002 4:13	MAY 22 2002 0:21	MAY 21 2002 20:02
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2955 / 284	2955 / 284	2955 / 284	2955 / 284
10	MHEX / L20D	2171 / 257	2171 / 257	2171 / 257	2171 / 257
11	ECL-ARP / PRI-BYN	780 / 1012	780 / 1012	780 / 1012	780 / 1012
12	MWSI / MNEX	1792 / 3555	1792 / 3555	1792 / 3555	1792 / 3555
13	D602F / F601C	1747 / 1220	1747 / 1220	1747 / 1220	1747 / 1220
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	159 / 150	159 / 150	159 / 150	159 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	301 / 20	301 / 20	301 / 20	301 / 20
19	Forbes SVC / MSC	22 / 600	22 / 600	22 / 600	22 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.062 / 1.026	1.062 / 1.026	1.062 / 1.026	1.062 / 1.026
23	Chisago 500/EauClaire 345	1.028 / 0.992	1.028 / 0.992	1.028 / 0.992	1.028 / 0.992
24	Int Falls 115/Badoura 115	1.048 / 1.008	1.048 / 1.008	1.048 / 1.008	1.048 / 1.008
25	Drayton 230/Groton 345	1.011 / 1.013	1.011 / 1.013	1.011 / 1.013	1.011 / 1.013
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	154% / 255%	154% / 255%	154% / 255%	154% / 255%
28	L20D at Prairie/Drayton	999% / 763%	999% / 763%	999% / 763%	999% / 763%
29	R50M/F3M	767% / 344%	767% / 344%	767% / 344%	767% / 344%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.86 | 0.99	0.92 | 1.08	0.98 | 1.02	0.96 | 1.05
33	Boise 115	1.03 | 1.07	1.01 | 1.09	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	0.98 | 1.08	0.97 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.03	0.99 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.99 | 1.03	1.00 | 1.05	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.98 | 1.05	0.98 | 1.08	1.00 | 1.03	0.91 | 1.03
39	Drayton 230	0.96 | 1.03	0.95 | 1.05	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.97 | 1.02	0.97 | 1.05	1.00 | 1.03	0.93 | 1.02
41	Tioga 230	1.01 | 1.05	1.02 | 1.07	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.08	1.04 | 1.07	0.98 | 1.06
43	Watertown 345	0.97 | 1.01	0.96 | 1.04	1.00 | 1.02	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.78	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -23.34%	ANTEL3 / -35.64%	KING 3 / -9.53%	ANTEL3 / 45.28%
53	Dorsey SUVP / UdHold	/ 17.499	/ 17.333		
54	Forbes DC Red (DCAR)	113%	170%	278%	203%
55	K22W (max +dP @ t, d-ang)	9.8@(9.39141,13.9)	72.9@(19.18293,0.2)	0.0@(-0.01667,0.0)	17.9@(2.88321,-7.9)
56	K22W (max -dP @ t, d-ang)	51.9@(7.17478,43.4)	50.7@(17.10796,61.1)	29.6@(2.23324,19.7)	26.2@(1.82493,9.8)
57	K22W (max d-ang @ t, dP)	60.4@(17.09130,-50.1)	61.2@(17.21629,-49.3)	26.4@(16.59964,-21.5)	20.6@(1.21662,-16.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	105% / 198%	103% / 195%	144% / 240%	93% / 168%
61	L20D at Prairie/Drayton	999% / 573%	999% / 572%	999% / 668%	999% / 586%
62	R50M / F3M	596% / 344%	586% / 303%	701% / 344%	586% / 301%
63	B10T	191%	193%	265%	168%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 1 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - S. Rock-Adams-Columbia - Case S1C5IXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5IXC-pcs	upe-so04aa.S1C5IXC-pys	upe-so04aa.S1C5IXC-pyt	upe-so04aa.S1C5IXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 2:23	JUN 14 2002 2:40	JUN 14 2002 2:57	JUN 14 2002 3:13
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3042 / 273	3042 / 273	3042 / 273	3042 / 273
10	MHEX / L20D	2172 / 261	2172 / 261	2172 / 261	2172 / 261
11	ECL-ARP / PRI-BYN	705 / 1061	705 / 1061	705 / 1061	705 / 1061
12	MWSI / MNEX	1766 / 3582	1766 / 3582	1766 / 3582	1766 / 3582
13	D602F / F601C	1740 / 1229	1740 / 1229	1740 / 1229	1740 / 1229
14	B10T / MH>SPC	166 / 99	166 / 99	166 / 99	166 / 99
15	OH E-W / OH>MH	-118 / -195	-118 / -195	-118 / -195	-118 / -195
16	R50M / OH>MP	158 / 151	158 / 151	158 / 151	158 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	313 / 38	313 / 38	313 / 38	313 / 38
19	Forbes SVC / MSC	17 / 600	17 / 600	17 / 600	17 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045
22	Roseau 500/Forbes 500	1.062 / 1.028	1.062 / 1.028	1.062 / 1.028	1.062 / 1.028
23	Chisago 500/EauClaire 345	1.030 / 1.012	1.030 / 1.012	1.030 / 1.012	1.030 / 1.012
24	Int Falls 115/Badoura 115	1.050 / 1.008	1.050 / 1.008	1.050 / 1.008	1.050 / 1.008
25	Drayton 230/Groton 345	1.011 / 1.012	1.011 / 1.012	1.011 / 1.012	1.011 / 1.012
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	156% / 259%	156% / 259%	156% / 259%	156% / 259%
28	L20D at Prairie/Drayton	999% / 744%	999% / 744%	999% / 744%	999% / 744%
29	R50M/F3M	779% / 346%	779% / 346%	779% / 346%	779% / 346%
30	B10T	342%	342%	342%	342%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.01	0.97 | 1.04	1.00 | 1.03	0.97 | 1.06
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	1.01 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.00 | 1.04	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.03	0.96 | 1.04
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.97 | 1.04	0.99 | 1.04	1.00 | 1.03	0.91 | 1.04
39	Drayton 230	0.98 | 1.03	0.98 | 1.03	1.00 | 1.02	0.99 | 1.03
40	Groton 345	0.96 | 1.02	0.97 | 1.02	0.99 | 1.02	0.93 | 1.02
41	Tioga 230	1.00 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.04 | 1.06	0.98 | 1.07
43	Watertown 345	0.96 | 1.01	0.96 | 1.01	0.99 | 1.02	0.94 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 7.99%	ANTEL3 / -8.44%	SHERC3 / 4.46%	ANTEL3 / 50.55%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	154%	176%	280%	221%
55	K22W (max +dP @ t, d-ang)	6.4@(3.75817,2.0)	6.9@(4.19149,4.7)	0.0@(0.01667,0.0)	20.1@(2.86655,-8.3)
56	K22W (max -dP @ t, d-ang)	42.0@(1.81659,27.6)	41.7@(2.11658,26.3)	27.9@(2.17491,18.6)	24.8@(1.81659,8.6)
57	K22W (max d-ang @ t, dP)	36.8@(19.96625,-27.9)	45.1@(16.02464,-37.8)	24.6@(20.00792,-16.3)	20.2@(1.19162,-17.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 190%	121% / 217%	148% / 246%	92% / 167%
61	L20D at Prairie/Drayton	999% / 537%	999% / 569%	999% / 644%	999% / 566%
62	R50M / F3M	599% / 346%	636% / 346%	709% / 346%	588% / 297%
63	B10T	162%	178%	260%	160%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - S. Rock-Des Moines-Zion - Case S1C5IXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5IXD-pcs	upe-so04aa.S1C5IXD-pys	upe-so04aa.S1C5IXD-pyt	upe-so04aa.S1C5IXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 23 2002 1:38	MAY 23 2002 1:04	MAY 23 2002 1:22	MAY 23 2002 1:55
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3043 / 278	3043 / 278	3043 / 278	3043 / 278
10	MHEX / L20D	2171 / 259	2171 / 259	2171 / 259	2171 / 259
11	ECL-ARP / PRI-BYN	752 / 1010	752 / 1010	752 / 1010	752 / 1010
12	MWSI / MNEX	1763 / 3565	1763 / 3565	1763 / 3565	1763 / 3565
13	D602F / F601C	1743 / 1220	1743 / 1220	1743 / 1220	1743 / 1220
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	159 / 151	159 / 151	159 / 151	159 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	309 / 29	309 / 29	309 / 29	309 / 29
19	Forbes SVC / MSC	19 / 600	19 / 600	19 / 600	19 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045
22	Roseau 500/Forbes 500	1.062 / 1.027	1.062 / 1.027	1.062 / 1.027	1.062 / 1.027
23	Chisago 500/EauClaire 345	1.029 / 1.003	1.029 / 1.003	1.029 / 1.003	1.029 / 1.003
24	Int Falls 115/Badoura 115	1.049 / 1.008	1.049 / 1.008	1.049 / 1.008	1.049 / 1.008
25	Drayton 230/Groton 345	1.011 / 1.013	1.011 / 1.013	1.011 / 1.013	1.011 / 1.013
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	155% / 257%	155% / 257%	155% / 257%	155% / 257%
28	L20D at Prairie/Drayton	999% / 754%	999% / 754%	999% / 754%	999% / 754%
29	R50M/F3M	773% / 345%	773% / 345%	773% / 345%	773% / 345%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.00	0.94 | 1.04	0.99 | 1.03	0.97 | 1.06
33	Boise 115	1.03 | 1.07	1.02 | 1.07	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.00 | 1.08	0.98 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.98 | 1.05	0.98 | 1.05	1.00 | 1.03	0.91 | 1.03
39	Drayton 230	0.97 | 1.03	0.96 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.02	0.98 | 1.02	0.99 | 1.02	0.93 | 1.02
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.04 | 1.07	0.98 | 1.07
43	Watertown 345	0.97 | 1.01	0.96 | 1.01	0.99 | 1.02	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -4.69%	ANTEL3 / -30.11%	KING 3 / -4.38%	ANTEL3 / 46.89%
53	Dorsey SUVP / UdHold		/ 16.983		
54	Forbes DC Red (DCAR)	125%	178%	282%	208%
55	K22W (max +dP @ t, d-ang)	9.0@(4.05816,3.1)	14.1@(19.14126,22.3)	0.0@(-0.00833,0.0)	18.8@(2.88321,-8.2)
56	K22W (max -dP @ t, d-ang)	48.4@(1.84992,34.8)	47.3@(17.05796,54.4)	29.2@(2.22491,19.5)	25.9@(1.82493,9.7)
57	K22W (max d-ang @ t, dP)	52.5@(16.55797,-44.7)	55.3@(16.79130,-46.7)	25.5@(16.34964,-21.0)	20.7@(1.20829,-17.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	112% / 207%	102% / 194%	145% / 243%	94% / 169%
61	L20D at Prairie/Drayton	999% / 562%	999% / 586%	999% / 662%	999% / 577%
62	R50M / F3M	614% / 345%	604% / 345%	706% / 345%	589% / 301%
63	B10T	184%	191%	266%	165%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - P. Island-Columbia - Case S1C5IXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5IXE-pcs	upe-so04aa.S1C5IXE-pys	upe-so04aa.S1C5IXE-pyt	upe-so04aa.S1C5IXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 18:04	MAY 22 2002 5:02	MAY 22 2002 1:10	MAY 21 2002 20:51
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2935 / 299	2935 / 299	2935 / 299	2935 / 299
10	MHEX / L20D	2170 / 249	2170 / 249	2170 / 249	2170 / 249
11	ECL-ARP / PRI-BYN	696 / 896	696 / 896	696 / 896	696 / 896
12	MWSI / MNEX	2097 / 3231	2097 / 3231	2097 / 3231	2097 / 3231
13	D602F / F601C	1760 / 1256	1760 / 1256	1760 / 1256	1760 / 1256
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	160 / 150	160 / 150	160 / 150	160 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	295 / -8	295 / -8	295 / -8	295 / -8
19	Forbes SVC / MSC	22 / 600	22 / 600	22 / 600	22 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026
23	Chisago 500/EauClaire 345	1.028 / 1.017	1.028 / 1.017	1.028 / 1.017	1.028 / 1.017
24	Int Falls 115/Badoura 115	1.049 / 1.006	1.049 / 1.006	1.049 / 1.006	1.049 / 1.006
25	Drayton 230/Groton 345	1.012 / 1.013	1.012 / 1.013	1.012 / 1.013	1.012 / 1.013
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	151% / 250%	151% / 250%	151% / 250%	151% / 250%
28	L20D at Prairie/Drayton	999% / 794%	999% / 794%	999% / 794%	999% / 794%
29	R50M/F3M	762% / 348%	762% / 348%	762% / 348%	762% / 348%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.01	0.99 | 1.04	1.01 | 1.03	0.97 | 1.06
33	Boise 115	1.03 | 1.07	1.03 | 1.06	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.98 | 1.03	0.99 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.97 | 1.02	0.99 | 1.02	1.01 | 1.02	0.94 | 1.02
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.03	0.97 | 1.03
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 16.05%	SHERC3 / 30.71%	KING 3 / 17.69%	ANTEL3 / 53.38%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	174%	225%	356%	233%
55	K22W (max +dP @ t, d-ang)	3.1@(3.92483,4.4)	1.0@(4.10816,5.8)	0.0@(0.05833,0.0)	17.3@(2.82488,-7.5)
56	K22W (max -dP @ t, d-ang)	40.3@(1.79993,25.4)	28.8@(1.80826,17.6)	18.7@(2.13325,11.5)	24.7@(1.79993,8.2)
57	K22W (max d-ang @ t, dP)	31.8@(20.00792,-22.9)	22.7@(19.89125,-15.1)	15.5@(20.00792,-10.9)	18.9@(1.17495,-16.3)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 190%	121% / 207%	146% / 242%	89% / 163%
61	L20D at Prairie/Drayton	999% / 585%	999% / 629%	999% / 719%	999% / 617%
62	R50M / F3M	602% / 348%	650% / 348%	717% / 348%	579% / 298%
63	B10T	172%	190%	276%	171%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S1C5WXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5WXB-pcs	upe-so04aa.S1C5WXB-pys	upe-so04aa.S1C5WXB-pyt	upe-so04aa.S1C5WXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 20 2002 13:39	MAY 21 2002 21:24	MAY 22 2002 8:12	MAY 20 2002 19:20
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2953 / 291	2953 / 291	2953 / 291	2953 / 291
10	MHEX / L20D	2170 / 254	2170 / 254	2170 / 254	2170 / 254
11	ECL-ARP / PRI-BYN	838 / 991	838 / 991	838 / 991	838 / 991
12	MWSI / MNEX	1830 / 3534	1830 / 3534	1830 / 3534	1830 / 3534
13	D602F / F601C	1751 / 1216	1751 / 1216	1751 / 1216	1751 / 1216
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	160 / 150	160 / 150	160 / 150	160 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	289 / 14	289 / 14	289 / 14	289 / 14
19	Forbes SVC / MSC	25 / 600	25 / 600	25 / 600	25 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.023	1.061 / 1.023	1.061 / 1.023	1.061 / 1.023
23	Chisago 500/EauClaire 345	1.027 / 0.972	1.027 / 0.972	1.027 / 0.972	1.027 / 0.972
24	Int Falls 115/Badoura 115	1.048 / 1.006	1.048 / 1.006	1.048 / 1.006	1.048 / 1.006
25	Drayton 230/Groton 345	1.012 / 1.013	1.012 / 1.013	1.012 / 1.013	1.012 / 1.013
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	152% / 251%	152% / 251%	152% / 251%	152% / 251%
28	L20D at Prairie/Drayton	999% / 774%	999% / 774%	999% / 774%	999% / 774%
29	R50M/F3M	758% / 344%	758% / 344%	758% / 344%	758% / 344%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.87)0.74 | 1.02	(7.58)0.80 | 1.07	0.96 | 1.01	0.94 | 1.04
33	Boise 115	1.02 | 1.09	1.02 | 1.08	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.02 | 1.08	1.02 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.96 | 1.04	0.96 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.97 | 1.06	0.97 | 1.06	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.96 | 1.09	0.93 | 1.09	1.00 | 1.04	0.91 | 1.03
39	Drayton 230	0.97 | 1.04	0.98 | 1.04	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.06	0.93 | 1.05	0.99 | 1.03	0.94 | 1.02
41	Tioga 230	1.01 | 1.06	1.01 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.08	1.02 | 1.08	1.04 | 1.06	0.99 | 1.06
43	Watertown 345	0.94 | 1.05	0.89 | 1.05	1.00 | 1.02	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.58	1853 [EAU CL 3] 0.57	none	none
46		1319 [AHD PST] 0.66	1866 [T-CRNRS7] 0.62		
47		1314 [98L TAP4] 0.75	1877 [SEVN ML5] 0.64		
48		1315 [ARROWHD4] 0.75	1854 [EAU CLA5] 0.65		
49		1316 [HILLTOP4] 0.76	1870 [WHEATON5] 0.66		
50		1372 [HILLTOP7] 0.78	1871 [WHEATON5] 0.66		
51		1373 [ARROWHD7] 0.78 +mor	869 [WHEATTP5] 0.66 +mor		
52	Worst Case Angle Damping	ANTEL3 / -59.32%	ANTEL3 / -57.28%	KING 3 / -16.27%	ANTEL3 / 42.65%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	85%	135%	275%	195%
55	K22W (max +dP @ t, d-ang)	56.8@(15.88298,18.5)	60.6@(15.17466,5.2)	0.8@(4.74149,4.5)	17.9@(3.40819,-7.1)
56	K22W (max -dP @ t, d-ang)	73.3@(13.59135,89.4)	68.4@(13.04136,71.5)	30.9@(2.25824,21.1)	27.0@(1.82493,10.5)
57	K22W (max d-ang @ t, dP)	91.1@(13.29969,-71.5)	73.5@(12.75803,-65.7)	30.5@(16.89963,-25.4)	21.1@(1.21662,-17.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	88% / 162%	85% / 159%	140% / 234%	92% / 165%
61	L20D at Prairie/Drayton	999% / 544%	999% / 574%	999% / 677%	999% / 593%
62	R50M / F3M	532% / 319%	535% / 307%	685% / 344%	581% / 303%
63	B10T	199%	193%	267%	169%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - S. Rock-Adams-Columbia - Case S1C5WXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5WXC-pcs	upe-so04aa.S1C5WXC-pys	upe-so04aa.S1C5WXC-pyt	upe-so04aa.S1C5WXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 18:34	JUN 13 2002 18:52	JUN 13 2002 19:10	JUN 13 2002 19:27
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3044 / 281	3044 / 281	3044 / 281	3044 / 281
10	MHEX / L20D	2169 / 257	2169 / 257	2169 / 257	2169 / 257
11	ECL-ARP / PRI-BYN	766 / 1038	766 / 1038	766 / 1038	766 / 1038
12	MWSI / MNEX	1805 / 3555	1805 / 3555	1805 / 3555	1805 / 3555
13	D602F / F601C	1744 / 1221	1744 / 1221	1744 / 1221	1744 / 1221
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	159 / 149	159 / 149	159 / 149	159 / 149
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	307 / 34	307 / 34	307 / 34	307 / 34
19	Forbes SVC / MSC	20 / 600	20 / 600	20 / 600	20 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045
22	Roseau 500/Forbes 500	1.062 / 1.027	1.062 / 1.027	1.062 / 1.027	1.062 / 1.027
23	Chisago 500/EauClaire 345	1.029 / 0.999	1.029 / 0.999	1.029 / 0.999	1.029 / 0.999
24	Int Falls 115/Badoura 115	1.050 / 1.007	1.050 / 1.007	1.050 / 1.007	1.050 / 1.007
25	Drayton 230/Groton 345	1.011 / 1.012	1.011 / 1.012	1.011 / 1.012	1.011 / 1.012
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	155% / 256%	155% / 256%	155% / 256%	155% / 256%
28	L20D at Prairie/Drayton	999% / 761%	999% / 761%	999% / 761%	999% / 761%
29	R50M/F3M	770% / 350%	770% / 350%	770% / 350%	770% / 350%
30	B10T	336%	336%	336%	336%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.01	0.94 | 1.08	0.99 | 1.02	0.96 | 1.06
33	Boise 115	1.03 | 1.07	1.01 | 1.09	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.02 | 1.08	0.97 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	0.99 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.99 | 1.03	1.00 | 1.05	1.01 | 1.03	0.96 | 1.04
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.97 | 1.05	0.98 | 1.08	1.00 | 1.03	0.91 | 1.04
39	Drayton 230	0.98 | 1.03	0.96 | 1.05	1.00 | 1.02	0.99 | 1.03
40	Groton 345	0.96 | 1.02	0.97 | 1.04	0.99 | 1.02	0.93 | 1.02
41	Tioga 230	1.00 | 1.05	1.01 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.08	1.04 | 1.06	0.99 | 1.07
43	Watertown 345	0.96 | 1.01	0.95 | 1.03	0.99 | 1.02	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.79	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -2.03%	ANTEL3 / -21.78%	SHERC3 / -2.21%	ANTEL3 / 49.33%
53	Dorsey SUVP / UdHold		/ 16.433		
54	Forbes DC Red (DCAR)	139%	179%	283%	220%
55	K22W (max +dP @ t, d-ang)	8.7@(3.89983,2.2)	66.9@(18.28294,-2.7)	0.4@(4.47482,3.8)	20.0@(2.87488,-8.7)
56	K22W (max -dP @ t, d-ang)	44.7@(1.84159,31.4)	46.2@(16.60797,52.9)	28.4@(2.19158,19.5)	25.3@(1.81659,8.9)
57	K22W (max d-ang @ t, dP)	44.9@(20.00792,-30.9)	55.2@(16.24131,-44.3)	26.4@(20.00792,-16.6)	20.7@(1.19162,-17.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 190%	104% / 195%	145% / 242%	90% / 163%
61	L20D at Prairie/Drayton	999% / 547%	999% / 568%	999% / 657%	999% / 575%
62	R50M / F3M	590% / 350%	591% / 324%	697% / 350%	580% / 298%
63	B10T	163%	178%	257%	156%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 1 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - S. Rock-Des Moines-Zion - Case S1C5WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5WXD-pcs	upe-so04aa.S1C5WXD-pys	upe-so04aa.S1C5WXD-pyt	upe-so04aa.S1C5WXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 23 2002 0:34	MAY 23 2002 0:03	MAY 23 2002 0:20	MAY 23 2002 0:51
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2956 / 286	2956 / 286	2956 / 286	2956 / 286
10	MHEX / L20D	2171 / 256	2171 / 256	2171 / 256	2171 / 256
11	ECL-ARP / PRI-BYN	814 / 988	814 / 988	814 / 988	814 / 988
12	MWSI / MNEX	1803 / 3542	1803 / 3542	1803 / 3542	1803 / 3542
13	D602F / F601C	1748 / 1217	1748 / 1217	1748 / 1217	1748 / 1217
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-118 / -196	-118 / -196	-118 / -196	-118 / -196
16	R50M / OH>MP	160 / 151	160 / 151	160 / 151	160 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	295 / 23	295 / 23	295 / 23	295 / 23
19	Forbes SVC / MSC	23 / 600	23 / 600	23 / 600	23 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.024	1.061 / 1.024	1.061 / 1.024	1.061 / 1.024
23	Chisago 500/EauClaire 345	1.027 / 0.980	1.027 / 0.980	1.027 / 0.980	1.027 / 0.980
24	Int Falls 115/Badoura 115	1.048 / 1.007	1.048 / 1.007	1.048 / 1.007	1.048 / 1.007
25	Drayton 230/Groton 345	1.011 / 1.013	1.011 / 1.013	1.011 / 1.013	1.011 / 1.013
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	153% / 253%	153% / 253%	153% / 253%	153% / 253%
28	L20D at Prairie/Drayton	999% / 766%	999% / 766%	999% / 766%	999% / 766%
29	R50M/F3M	764% / 343%	764% / 343%	764% / 343%	764% / 343%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.47)0.79 | 1.04	0.86 | 1.09	0.97 | 1.01	0.95 | 1.04
33	Boise 115	1.02 | 1.09	1.01 | 1.09	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	0.98 | 1.08	0.97 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.96 | 1.05	0.96 | 1.06	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.98 | 1.05	0.98 | 1.07	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.98 | 1.08	0.97 | 1.10	1.00 | 1.04	0.91 | 1.03
39	Drayton 230	0.95 | 1.05	0.95 | 1.06	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.06	0.95 | 1.07	0.99 | 1.02	0.93 | 1.02
41	Tioga 230	1.01 | 1.07	1.02 | 1.07	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.08	1.02 | 1.09	1.04 | 1.06	0.99 | 1.07
43	Watertown 345	0.96 | 1.05	0.93 | 1.07	0.99 | 1.02	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		4246 [TRIPOLI3] 0.69	1318 [ARROWHD3] 0.79	none	none
46		1318 [ARROWHD3] 0.76			
47		1319 [AHD PST] 0.81			
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -36.70%	ANTEL3 / -43.69%	KING 3 / -11.53%	ANTEL3 / 45.61%
53	Dorsey SUVP / UdHold	/ 17.474	/ 17.158		
54	Forbes DC Red (DCAR)	98%	110%	279%	201%
55	K22W (max +dP @ t, d-ang)	73.4@(19.50793,7.1)	88.5@(19.51626,-5.6)	0.2@(4.65815,4.4)	18.3@(2.88321,-8.2)
56	K22W (max -dP @ t, d-ang)	60.6@(17.64129,79.9)	61.9@(17.32463,76.0)	30.0@(2.23324,20.3)	26.3@(1.82493,10.0)
57	K22W (max d-ang @ t, dP)	80.2@(17.59129,-59.0)	76.0@(17.31629,-61.4)	27.5@(16.58297,-22.8)	20.8@(1.21662,-16.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	114% / 198%	94% / 172%	142% / 237%	93% / 166%
61	L20D at Prairie/Drayton	999% / 551%	999% / 558%	999% / 670%	999% / 586%
62	R50M / F3M	596% / 295%	557% / 288%	695% / 343%	584% / 300%
63	B10T	194%	196%	266%	167%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (0 | 1 | 0)	(0 | 1 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - E. Wisconsin Dispatch - P. Island-Columbia - Case S1C5WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C5WXE-pcs	upe-so04aa.S1C5WXE-pys	upe-so04aa.S1C5WXE-pyt	upe-so04aa.S1C5WXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 11:26	MAY 21 2002 22:07	MAY 22 2002 8:57	MAY 21 2002 11:36
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2931 / 307	2931 / 307	2931 / 307	2931 / 307
10	MHEX / L20D	2170 / 246	2170 / 246	2170 / 246	2170 / 246
11	ECL-ARP / PRI-BYN	759 / 863	759 / 863	759 / 863	759 / 863
12	MWSI / MNEX	2151 / 3185	2151 / 3185	2151 / 3185	2151 / 3185
13	D602F / F601C	1766 / 1251	1766 / 1251	1766 / 1251	1766 / 1251
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	161 / 151	161 / 151	161 / 151	161 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	282 / -11	282 / -11	282 / -11	282 / -11
19	Forbes SVC / MSC	27 / 600	27 / 600	27 / 600	27 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.024	1.060 / 1.024	1.060 / 1.024	1.060 / 1.024
23	Chisago 500/EauClaire 345	1.027 / 0.999	1.027 / 0.999	1.027 / 0.999	1.027 / 0.999
24	Int Falls 115/Badoura 115	1.048 / 1.003	1.048 / 1.003	1.048 / 1.003	1.048 / 1.003
25	Drayton 230/Groton 345	1.012 / 1.013	1.012 / 1.013	1.012 / 1.013	1.012 / 1.013
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	148% / 245%	148% / 245%	148% / 245%	148% / 245%
28	L20D at Prairie/Drayton	999% / 808%	999% / 808%	999% / 808%	999% / 808%
29	R50M/F3M	753% / 344%	753% / 344%	753% / 344%	753% / 344%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.00	0.98 | 1.03	1.00 | 1.02	0.95 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.06	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.00 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.03	0.96 | 1.04
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.96 | 1.07
38	Dickinson 345	0.97 | 1.04	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.98 | 1.03	0.99 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.97 | 1.02	0.99 | 1.02	1.00 | 1.02	0.94 | 1.02
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.04 | 1.06	0.99 | 1.07
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.03	0.97 | 1.03
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 7.76%	SHERC3 / 23.71%	KING 3 / 14.92%	ANTEL3 / 52.65%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	156%	226%	359%	225%
55	K22W (max +dP @ t, d-ang)	4.7@(3.94150,4.1)	2.2@(4.10816,5.3)	0.0@(0.06666,0.0)	18.3@(2.82488,-8.2)
56	K22W (max -dP @ t, d-ang)	43.1@(1.81659,28.8)	29.5@(1.81659,18.1)	18.6@(2.13325,11.7)	24.5@(1.80826,7.8)
57	K22W (max d-ang @ t, dP)	37.6@(20.00792,-25.3)	23.8@(19.87459,-16.1)	15.5@(20.00792,-10.8)	19.1@(1.16662,-16.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 189%	119% / 202%	143% / 238%	86% / 157%
61	L20D at Prairie/Drayton	999% / 593%	999% / 639%	999% / 732%	999% / 623%
62	R50M / F3M	595% / 344%	641% / 344%	708% / 344%	569% / 292%
63	B10T	177%	191%	278%	170%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S2C4WXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WXB-pcs	upe-so04aa.S2C4WXB-pys	upe-so04aa.S2C4WXB-pyt	upe-so04aa.S2C4WXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 8:17	MAY 21 2002 22:22	MAY 22 2002 9:10	MAY 21 2002 11:55
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3033 / 338	3033 / 338	3033 / 338	3033 / 338
10	MHEX / L20D	2173 / 242	2173 / 242	2173 / 242	2173 / 242
11	ECL-ARP / PRI-BYN	820 / 962	820 / 962	820 / 962	820 / 962
12	MWSI / MNEX	1782 / 3387	1782 / 3387	1782 / 3387	1782 / 3387
13	D602F / F601C	1807 / 1289	1807 / 1289	1807 / 1289	1807 / 1289
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	169 / 151	169 / 151	169 / 151	169 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	240 / 68	240 / 68	240 / 68	240 / 68
19	Forbes SVC / MSC	35 / 600	35 / 600	35 / 600	35 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.065 / 1.020	1.065 / 1.020	1.065 / 1.020	1.065 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.978	1.024 / 0.978	1.024 / 0.978	1.024 / 0.978
24	Int Falls 115/Badoura 115	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001
25	Drayton 230/Groton 345	1.035 / 0.998	1.035 / 0.998	1.035 / 0.998	1.035 / 0.998
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	140% / 231%	140% / 231%	140% / 231%	140% / 231%
28	L20D at Prairie/Drayton	999% / 846%	999% / 846%	999% / 846%	999% / 846%
29	R50M/F3M	739% / 349%	739% / 349%	739% / 349%	739% / 349%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.72)0.72 | 1.03	(2.95)0.79 | 1.06	0.96 | 1.03	0.94 | 1.05
33	Boise 115	1.00 | 1.09	1.02 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.02 | 1.08	1.02 | 1.06	1.02 | 1.05	1.02 | 1.06
35	Forbes 230	0.94 | 1.04	0.96 | 1.04	1.00 | 1.03	1.00 | 1.03
36	Riverton 230	0.96 | 1.05	0.97 | 1.04	1.00 | 1.03	0.95 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.06	1.02 | 1.05	0.97 | 1.06
38	Dickinson 345	0.94 | 1.09	0.94 | 1.08	0.99 | 1.04	0.90 | 1.03
39	Drayton 230	1.01 | 1.05	1.01 | 1.05	1.02 | 1.04	1.01 | 1.05
40	Groton 345	0.88 | 1.03	0.84 | 1.01	0.95 | 1.00	0.89 | 1.01
41	Tioga 230	0.99 | 1.05	1.00 | 1.04	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.08	1.02 | 1.07	1.04 | 1.06	0.98 | 1.07
43	Watertown 345	0.90 | 1.04	0.84 | 1.03	0.97 | 1.02	0.93 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.53	1318 [ARROWHD3] 0.65	none	none
46		1319 [AHD PST] 0.63	1319 [AHD PST] 0.72		
47		1314 [98L TAP4] 0.72	1316 [HILLTOP4] 0.79		
48		1315 [ARROWHD4] 0.72	1314 [98L TAP4] 0.79		
49		1316 [HILLTOP4] 0.73	1315 [ARROWHD4] 0.79		
50		1372 [HILLTOP7] 0.75	1331 [MINONG 5] 0.79		
51		1373 [ARROWHD7] 0.75 +mo	1330 [STINSON5] 0.80 +more		
52	Worst Case Angle Damping	ANTEL3 / -90.98%	ANTEL3 / -59.67%	SHERC3 / -29.88%	ANTEL3 / 36.46%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	34%	130%	257%	191%
55	K22W (max +dP @ t, d-ang)	61.2@(10.43306,9.4)	44.7@(9.79141,0.9)	11.8@(19.63292,15.0)	21.1@(3.37486,-7.7)
56	K22W (max -dP @ t, d-ang)	73.3@(8.24976,81.4)	62.8@(12.21637,77.3)	39.2@(17.24963,40.7)	28.1@(0.94996,19.4)
57	K22W (max d-ang @ t, dP)	83.0@(7.93310,-72.0)	77.3@(12.21637,-62.8)	40.7@(17.16629,-38.5)	23.8@(1.26662,-18.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	81% / 147%	82% / 152%	113% / 195%	71% / 133%
61	L20D at Prairie/Drayton	999% / 607%	999% / 642%	999% / 709%	999% / 625%
62	R50M / F3M	507% / 308%	528% / 327%	620% / 349%	542% / 300%
63	B10T	192%	195%	248%	157%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 0) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - S. Rock-Adams-Columbia - Case S2C4WXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WXC-pcs	upe-so04aa.S2C4WXC-pys	upe-so04aa.S2C4WXC-pyt	upe-so04aa.S2C4WXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 19:43	JUN 13 2002 20:01	JUN 13 2002 20:20	JUN 13 2002 20:36
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3022 / 327	3022 / 327	3022 / 327	3022 / 327
10	MHEX / L20D	2172 / 243	2172 / 243	2172 / 243	2172 / 243
11	ECL-ARP / PRI-BYN	752 / 1009	752 / 1009	752 / 1009	752 / 1009
12	MWSI / MNEX	1761 / 3404	1761 / 3404	1761 / 3404	1761 / 3404
13	D602F / F601C	1801 / 1295	1801 / 1295	1801 / 1295	1801 / 1295
14	B10T / MH>SPC	166 / 99	166 / 99	166 / 99	166 / 99
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	168 / 151	168 / 151	168 / 151	168 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	255 / 95	255 / 95	255 / 95	255 / 95
19	Forbes SVC / MSC	31 / 600	31 / 600	31 / 600	31 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.038 / 1.045	1.038 / 1.045	1.038 / 1.045	1.038 / 1.045
22	Roseau 500/Forbes 500	1.065 / 1.023	1.065 / 1.023	1.065 / 1.023	1.065 / 1.023
23	Chisago 500/EauClaire 345	1.026 / 1.000	1.026 / 1.000	1.026 / 1.000	1.026 / 1.000
24	Int Falls 115/Badoura 115	1.051 / 1.003	1.051 / 1.003	1.051 / 1.003	1.051 / 1.003
25	Drayton 230/Groton 345	1.032 / 0.994	1.032 / 0.994	1.032 / 0.994	1.032 / 0.994
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	143% / 235%	143% / 235%	143% / 235%	143% / 235%
28	L20D at Prairie/Drayton	999% / 842%	999% / 842%	999% / 842%	999% / 842%
29	R50M/F3M	750% / 348%	750% / 348%	750% / 348%	750% / 348%
30	B10T	329%	329%	329%	329%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.04	0.91 | 1.09	0.99 | 1.03	0.96 | 1.06
33	Boise 115	1.01 | 1.08	1.01 | 1.08	1.04 | 1.06	1.01 | 1.07
34	Dorsey 230	0.98 | 1.08	0.97 | 1.07	1.03 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.04	0.97 | 1.05	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.98 | 1.04	0.99 | 1.06	1.01 | 1.03	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.97 | 1.07	0.97 | 1.09	1.00 | 1.03	0.90 | 1.04
39	Drayton 230	1.00 | 1.05	0.99 | 1.06	1.02 | 1.04	1.01 | 1.05
40	Groton 345	0.92 | 1.01	0.89 | 1.02	0.95 | 0.99	0.88 | 1.00
41	Tioga 230	0.98 | 1.04	0.99 | 1.05	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.07	1.02 | 1.09	1.04 | 1.06	0.98 | 1.07
43	Watertown 345	0.94 | 1.03	0.91 | 1.04	0.97 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.79	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -9.85%	ANTEL3 / -45.99%	SHERC3 / -17.55%	ANTEL3 / 44.96%
53	Dorsey SUVP / UdHold	/ 15.733	/ 16.299		
54	Forbes DC Red (DCAR)	123%	148%	265%	213%
55	K22W (max +dP @ t, d-ang)	57.8@(17.64129,1.8)	79.9@(18.29128,-10.2)	2.7@(4.54982,2.9)	22.2@(2.90821,-8.6)
56	K22W (max -dP @ t, d-ang)	46.2@(11.29972,47.8)	51.6@(16.17464,61.6)	30.0@(2.19158,20.5)	27.7@(0.92496,18.5)
57	K22W (max d-ang @ t, dP)	55.9@(15.80798,-41.6)	62.9@(16.39964,-48.2)	31.4@(16.36631,-28.4)	23.1@(1.23328,-18.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	96% / 167%	94% / 169%	129% / 218%	71% / 135%
61	L20D at Prairie/Drayton	999% / 615%	999% / 627%	999% / 738%	999% / 614%
62	R50M / F3M	560% / 315%	565% / 299%	672% / 348%	547% / 289%
63	B10T	156%	174%	247%	146%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 0) / (0 | 0 | 0)	(1 | 1 | 0) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - S. Rock-Des Moines-Zion - Case S2C4WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WXD-pcs	upe-so04aa.S2C4WXD-pys	upe-so04aa.S2C4WXD-pyt	upe-so04aa.S2C4WXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 22 2002 23:32	MAY 22 2002 23:03	MAY 22 2002 23:18	MAY 22 2002 23:48
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3033 / 333	3033 / 333	3033 / 333	3033 / 333
10	MHEX / L20D	2173 / 241	2173 / 241	2173 / 241	2173 / 241
11	ECL-ARP / PRI-BYN	798 / 959	798 / 959	798 / 959	798 / 959
12	MWSI / MNEX	1757 / 3399	1757 / 3399	1757 / 3399	1757 / 3399
13	D602F / F601C	1805 / 1289	1805 / 1289	1805 / 1289	1805 / 1289
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	169 / 151	169 / 151	169 / 151	169 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	245 / 78	245 / 78	245 / 78	245 / 78
19	Forbes SVC / MSC	33 / 600	33 / 600	33 / 600	33 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.065 / 1.022	1.065 / 1.022	1.065 / 1.022	1.065 / 1.022
23	Chisago 500/EauClaire 345	1.025 / 0.989	1.025 / 0.989	1.025 / 0.989	1.025 / 0.989
24	Int Falls 115/Badoura 115	1.050 / 1.001	1.050 / 1.001	1.050 / 1.001	1.050 / 1.001
25	Drayton 230/Groton 345	1.031 / 0.997	1.031 / 0.997	1.031 / 0.997	1.031 / 0.997
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	141% / 232%	141% / 232%	141% / 232%	141% / 232%
28	L20D at Prairie/Drayton	999% / 846%	999% / 846%	999% / 846%	999% / 846%
29	R50M/F3M	743% / 346%	743% / 346%	743% / 346%	743% / 346%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.42)0.72 | 1.04	(7.20)0.77 | 1.08	0.97 | 1.03	0.95 | 1.06
33	Boise 115	0.99 | 1.08	0.99 | 1.08	1.04 | 1.06	1.01 | 1.06
34	Dorsey 230	0.99 | 1.08	1.01 | 1.07	1.03 | 1.05	1.02 | 1.06
35	Forbes 230	0.93 | 1.04	0.94 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.95 | 1.05	0.96 | 1.05	1.01 | 1.03	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.06	0.99 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.94 | 1.08	0.91 | 1.08	1.00 | 1.04	0.90 | 1.03
39	Drayton 230	1.00 | 1.05	1.01 | 1.05	1.02 | 1.04	1.01 | 1.05
40	Groton 345	0.88 | 1.02	0.83 | 1.02	0.96 | 1.00	0.89 | 1.00
41	Tioga 230	0.99 | 1.05	1.00 | 1.05	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.07	1.01 | 1.08	1.04 | 1.06	0.98 | 1.07
43	Watertown 345	0.89 | 1.03	0.83 | 1.03	0.98 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.54	1318 [ARROWHD3] 0.64	none	none
46		1319 [AHD PST] 0.63	1319 [AHD PST] 0.70		
47		1316 [HILLTOP4] 0.72	1316 [HILLTOP4] 0.77		
48		1314 [98L TAP4] 0.72	1314 [98L TAP4] 0.77		
49		1315 [ARROWHD4] 0.72	1315 [ARROWHD4] 0.77		
50		1372 [HILLTOP7] 0.75	1331 [MINONG 5] 0.77		
51		1373 [ARROWHD7] 0.75 +mor	1270 [STINSJCT] 0.79 +more		
52	Worst Case Angle Damping	ANTEL3 / -40.59%	ANTEL3 / -54.14%	SHERC3 / -23.63%	ANTEL3 / 39.84%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	44%	84%	265%	197%
55	K22W (max +dP @ t, d-ang)	54.1@(15.08299,14.4)	58.9@(14.60800,2.9)	6.1@(19.28293,15.6)	20.9@(3.32486,-7.9)
56	K22W (max -dP @ t, d-ang)	70.2@(12.91636,79.2)	64.3@(16.92463,89.8)	34.4@(17.24963,34.5)	28.1@(0.94996,19.2)
57	K22W (max d-ang @ t, dP)	90.6@(17.13296,-51.4)	90.9@(16.94963,-64.2)	35.9@(16.81630,-32.6)	23.6@(1.25828,-18.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	83% / 151%	73% / 140%	120% / 205%	71% / 133%
61	L20D at Prairie/Drayton	999% / 598%	999% / 620%	999% / 732%	999% / 624%
62	R50M / F3M	526% / 311%	508% / 306%	643% / 346%	544% / 295%
63	B10T	184%	185%	257%	155%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 2 | 1) / (0 | 0 | 0)	(1 | 2 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - P. Island-Columbia - Case S2C4WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WXE-pcs	upe-so04aa.S2C4WXE-pys	upe-so04aa.S2C4WXE-pyt	upe-so04aa.S2C4WXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 11:53	MAY 21 2002 23:01	MAY 22 2002 9:56	MAY 21 2002 14:22
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3030 / 354	3030 / 354	3030 / 354	3030 / 354
10	MHEX / L20D	2173 / 242	2173 / 242	2173 / 242	2173 / 242
11	ECL-ARP / PRI-BYN	742 / 833	742 / 833	742 / 833	742 / 833
12	MWSI / MNEX	2085 / 3028	2085 / 3028	2085 / 3028	2085 / 3028
13	D602F / F601C	1818 / 1322	1818 / 1322	1818 / 1322	1818 / 1322
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-121 / -197	-121 / -197	-121 / -197	-121 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	227 / 31	227 / 31	227 / 31	227 / 31
19	Forbes SVC / MSC	37 / 600	37 / 600	37 / 600	37 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.021	1.064 / 1.021	1.064 / 1.021	1.064 / 1.021
23	Chisago 500/EauClaire 345	1.024 / 1.005	1.024 / 1.005	1.024 / 1.005	1.024 / 1.005
24	Int Falls 115/Badoura 115	1.050 / 0.994	1.050 / 0.994	1.050 / 0.994	1.050 / 0.994
25	Drayton 230/Groton 345	1.028 / 1.004	1.028 / 1.004	1.028 / 1.004	1.028 / 1.004
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	138% / 227%	138% / 227%	138% / 227%	138% / 227%
28	L20D at Prairie/Drayton	999% / 840%	999% / 840%	999% / 840%	999% / 840%
29	R50M/F3M	735% / 349%	735% / 349%	735% / 349%	735% / 349%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 1.00	0.99 | 1.03	1.01 | 1.03	0.96 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.01 | 1.07
34	Dorsey 230	0.99 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.03	1.01 | 1.04	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.98 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.05	1.00 | 1.06	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.90 | 1.03
39	Drayton 230	1.00 | 1.05	1.02 | 1.04	1.02 | 1.03	1.01 | 1.05
40	Groton 345	0.95 | 1.01	0.96 | 1.00	0.99 | 1.01	0.91 | 1.01
41	Tioga 230	0.99 | 1.04	1.00 | 1.03	1.02 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.05	1.04 | 1.06	0.99 | 1.07
43	Watertown 345	0.97 | 1.02	0.99 | 1.02	1.01 | 1.02	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 3.00%	SHERC3 / 16.70%	KING 3 / 10.68%	SHERC3 / 53.47%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	145%	208%	350%	226%
55	K22W (max +dP @ t, d-ang)	8.7@(3.92483,3.4)	3.6@(4.06650,4.4)	0.0@(0.00000,0.0)	19.4@(2.84988,-7.4)
56	K22W (max -dP @ t, d-ang)	42.6@(1.82493,29.1)	29.8@(1.79993,18.3)	18.8@(2.12491,11.9)	25.0@(0.93330,17.6)
57	K22W (max d-ang @ t, dP)	37.4@(20.00792,-21.5)	23.7@(19.78292,-16.1)	15.8@(20.00792,-11.1)	21.0@(1.20829,-17.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	97% / 167%	109% / 185%	133% / 219%	71% / 134%
61	L20D at Prairie/Drayton	999% / 625%	999% / 681%	999% / 767%	827% / 624%
62	R50M / F3M	567% / 349%	625% / 349%	691% / 349%	544% / 292%
63	B10T	168%	188%	268%	156%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 1 | 1)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 3 | 3)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S3C3W2B

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W2B-pcs	upe-so04aa.S3C3W2B-pys	upe-so04aa.S3C3W2B-pyt	upe-so04aa.S3C3W2B-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 19:33	JUN 13 2002 19:45	JUN 13 2002 20:00	JUN 13 2002 20:15
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2657 / 299	2657 / 299	2657 / 299	2657 / 299
10	MHEX / L20D	2171 / 251	2171 / 251	2171 / 251	2171 / 251
11	ECL-ARP / PRI-BYN	787 / 931	787 / 931	787 / 931	787 / 931
12	MWSI / MNEX	1719 / 3226	1719 / 3226	1719 / 3226	1719 / 3226
13	D602F / F601C	1785 / 1385	1785 / 1385	1785 / 1385	1785 / 1385
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	161 / 150	161 / 150	161 / 150	161 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	250 / 102	250 / 102	250 / 102	250 / 102
19	Forbes SVC / MSC	39 / 600	39 / 600	39 / 600	39 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.018	1.059 / 1.018	1.059 / 1.018	1.059 / 1.018
23	Chisago 500/EauClaire 345	1.021 / 0.984	1.021 / 0.984	1.021 / 0.984	1.021 / 0.984
24	Int Falls 115/Badoura 115	1.047 / 1.001	1.047 / 1.001	1.047 / 1.001	1.047 / 1.001
25	Drayton 230/Groton 345	1.022 / 0.991	1.022 / 0.991	1.022 / 0.991	1.022 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	141% / 234%	141% / 234%	141% / 234%	141% / 234%
28	L20D at Prairie/Drayton	999% / 801%	999% / 801%	999% / 801%	999% / 801%
29	R50M/F3M	753% / 342%	753% / 342%	753% / 342%	753% / 342%
30	B10T	330%	330%	330%	330%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.59)0.78 | 1.03	0.86 | 1.09	0.96 | 1.03	0.95 | 1.04
33	Boise 115	1.01 | 1.08	1.01 | 1.09	1.04 | 1.06	1.01 | 1.08
34	Dorsey 230	1.02 | 1.08	1.01 | 1.07	1.02 | 1.05	1.02 | 1.06
35	Forbes 230	0.95 | 1.04	0.97 | 1.06	1.00 | 1.03	1.00 | 1.03
36	Riverton 230	0.96 | 1.05	0.97 | 1.06	1.00 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.07	1.02 | 1.05	0.97 | 1.05
38	Dickinson 345	0.94 | 1.09	0.93 | 1.10	0.99 | 1.04	0.91 | 1.04
39	Drayton 230	1.00 | 1.04	0.99 | 1.05	1.01 | 1.03	1.00 | 1.04
40	Groton 345	0.86 | 1.02	0.85 | 1.03	0.94 | 0.99	0.90 | 1.00
41	Tioga 230	1.01 | 1.05	1.00 | 1.05	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.01 | 1.07	1.01 | 1.09	1.04 | 1.06	1.00 | 1.06
43	Watertown 345	0.89 | 1.03	0.87 | 1.04	0.97 | 1.01	0.94 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.62	2494 [ARP 345] 0.60	none	none
46		1319 [AHD PST] 0.70	4161 [WESTON] 0.63		
47		1316 [HILLTOP4] 0.78	1853 [EAU CL 3] 0.64		
48		1314 [98L TAP4] 0.78	4186 [HODAG] 0.65		
49		1315 [ARROWHD4] 0.78	4187 [HIWAY 8] 0.65		
50		1276 [HILTPJCT] 0.80	4188 [CLEAR LK] 0.65		
51		1270 [STINSJCT] 0.80 +more	4178 [HUME] 0.66 +more		
52	Worst Case Angle Damping	ANTEL3 / -73.83%	ANTEL3 / -58.27%	SHERC3 / -31.90%	ANTEL3 / 38.33%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	44%	68%	248%	231%
55	K22W (max +dP @ t, d-ang)	52.7@(10.25807,5.4)	81.2@(15.29966,0.5)	11.8@(19.52459,14.3)	20.4@(2.87488,-10.3)
56	K22W (max -dP @ t, d-ang)	74.3@(8.24143,73.4)	75.6@(13.06636,82.2)	38.1@(17.30796,40.0)	24.4@(0.92496,16.8)
57	K22W (max d-ang @ t, dP)	76.6@(7.83310,-72.8)	82.6@(12.92469,-75.0)	40.6@(17.07463,-37.3)	20.0@(1.19995,-17.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	84% / 154%	66% / 131%	118% / 204%	78% / 145%
61	L20D at Prairie/Drayton	999% / 592%	999% / 552%	999% / 678%	999% / 594%
62	R50M / F3M	540% / 326%	510% / 287%	651% / 342%	571% / 295%
63	B10T	205%	165%	257%	164%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 3 | 3)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 1 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - S. Rock-Adams-Columbia - Case S3C3W2C

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W2C-pcs	upe-so04aa.S3C3W2C-pys	upe-so04aa.S3C3W2C-pyt	upe-so04aa.S3C3W2C-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 20:53	JUN 13 2002 21:12	JUN 13 2002 21:30	JUN 13 2002 21:46
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2978 / 288	2978 / 288	2978 / 288	2978 / 288
10	MHEX / L20D	2170 / 256	2170 / 256	2170 / 256	2170 / 256
11	ECL-ARP / PRI-BYN	717 / 974	717 / 974	717 / 974	717 / 974
12	MWSI / MNEX	1692 / 3236	1692 / 3236	1692 / 3236	1692 / 3236
13	D602F / F601C	1775 / 1382	1775 / 1382	1775 / 1382	1775 / 1382
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-121 / -197	-121 / -197	-121 / -197	-121 / -197
16	R50M / OH>MP	160 / 149	160 / 149	160 / 149	160 / 149
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	273 / 124	273 / 124	273 / 124	273 / 124
19	Forbes SVC / MSC	34 / 600	34 / 600	34 / 600	34 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021
23	Chisago 500/EauClaire 345	1.023 / 1.007	1.023 / 1.007	1.023 / 1.007	1.023 / 1.007
24	Int Falls 115/Badoura 115	1.049 / 1.005	1.049 / 1.005	1.049 / 1.005	1.049 / 1.005
25	Drayton 230/Groton 345	1.025 / 0.986	1.025 / 0.986	1.025 / 0.986	1.025 / 0.986
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	145% / 240%	145% / 240%	145% / 240%	145% / 240%
28	L20D at Prairie/Drayton	999% / 785%	999% / 785%	999% / 785%	999% / 785%
29	R50M/F3M	765% / 348%	765% / 348%	765% / 348%	765% / 348%
30	B10T	329%	329%	329%	329%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.04	0.94 | 1.09	0.99 | 1.03	0.96 | 1.06
33	Boise 115	1.02 | 1.09	1.01 | 1.09	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	0.98 | 1.08	0.97 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.04	0.98 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.04	0.99 | 1.06	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.97 | 1.07	0.97 | 1.09	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	0.99 | 1.04	0.98 | 1.05	1.02 | 1.03	1.00 | 1.04
40	Groton 345	0.91 | 1.01	0.88 | 1.02	0.94 | 0.98	0.88 | 0.99
41	Tioga 230	1.00 | 1.05	1.00 | 1.05	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.02 | 1.07	1.02 | 1.08	1.04 | 1.05	1.00 | 1.06
43	Watertown 345	0.94 | 1.03	0.91 | 1.03	0.96 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -11.20%	ANTEL3 / -42.46%	SHERC3 / -16.56%	ANTEL3 / 41.29%
53	Dorsey SUVP / UdHold	/ 15.858	/ 16.299		
54	Forbes DC Red (DCAR)	114%	145%	257%	240%
55	K22W (max +dP @ t, d-ang)	52.1@(17.72462,-1.0)	75.9@(18.20794,-9.4)	2.4@(4.49982,2.8)	18.3@(2.94154,-8.6)
56	K22W (max -dP @ t, d-ang)	46.4@(6.55812,38.1)	50.3@(16.16631,58.2)	29.4@(2.18324,20.0)	28.6@(1.84159,11.4)
57	K22W (max d-ang @ t, dP)	50.0@(15.85798,-39.9)	58.3@(16.24131,-47.3)	30.7@(16.28297,-27.5)	22.8@(1.24162,-17.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	99% / 180%	95% / 181%	135% / 226%	79% / 146%
61	L20D at Prairie/Drayton	999% / 562%	999% / 564%	999% / 678%	999% / 572%
62	R50M / F3M	595% / 338%	583% / 308%	693% / 348%	572% / 301%
63	B10T	167%	179%	246%	155%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 1 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - S. Rock-Des Moines-Zion - Case S3C3W2D

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W2D-pcs	upe-so04aa.S3C3W2D-pys	upe-so04aa.S3C3W2D-pyt	upe-so04aa.S3C3W2D-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 21:33	JUN 13 2002 21:48	JUN 13 2002 22:03	JUN 13 2002 22:18
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2660 / 294	2660 / 294	2660 / 294	2660 / 294
10	MHEX / L20D	2171 / 254	2171 / 254	2171 / 254	2171 / 254
11	ECL-ARP / PRI-BYN	761 / 932	761 / 932	761 / 932	761 / 932
12	MWSI / MNEX	1693 / 3244	1693 / 3244	1693 / 3244	1693 / 3244
13	D602F / F601C	1781 / 1383	1781 / 1383	1781 / 1383	1781 / 1383
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	160 / 151	160 / 151	160 / 151	160 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	260 / 112	260 / 112	260 / 112	260 / 112
19	Forbes SVC / MSC	37 / 600	37 / 600	37 / 600	37 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.019	1.059 / 1.019	1.059 / 1.019	1.059 / 1.019
23	Chisago 500/EauClaire 345	1.022 / 0.990	1.022 / 0.990	1.022 / 0.990	1.022 / 0.990
24	Int Falls 115/Badoura 115	1.047 / 1.003	1.047 / 1.003	1.047 / 1.003	1.047 / 1.003
25	Drayton 230/Groton 345	1.023 / 0.989	1.023 / 0.989	1.023 / 0.989	1.023 / 0.989
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	143% / 236%	143% / 236%	143% / 236%	143% / 236%
28	L20D at Prairie/Drayton	999% / 792%	999% / 792%	999% / 792%	999% / 792%
29	R50M/F3M	759% / 343%	759% / 343%	759% / 343%	759% / 343%
30	B10T	330%	330%	330%	330%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(2.57)0.80 | 1.05	0.83 | 1.07	0.98 | 1.03	0.95 | 1.05
33	Boise 115	1.02 | 1.09	1.00 | 1.09	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.02 | 1.08	0.98 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.96 | 1.05	0.95 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.97 | 1.05	0.97 | 1.05	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.06	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.95 | 1.09	0.92 | 1.08	0.99 | 1.04	0.91 | 1.04
39	Drayton 230	1.00 | 1.04	0.99 | 1.04	1.02 | 1.03	1.00 | 1.04
40	Groton 345	0.86 | 1.02	0.82 | 1.01	0.94 | 0.99	0.89 | 1.00
41	Tioga 230	1.00 | 1.05	1.01 | 1.05	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.01 | 1.07	1.01 | 1.07	1.04 | 1.06	1.00 | 1.06
43	Watertown 345	0.89 | 1.03	0.83 | 1.03	0.97 | 1.01	0.93 | 1.02
44	**Dynamic Voltage Warnings**				
45		4246 [TRIPOLI3] 0.48	2494 [ARP 345] 0.58	none	none
46		4247 [TRIPOLI7] 0.52	1853 [EAU CL 3] 0.61		
47		1866 [T-CRNRS7] 0.64	4161 [WESTON] 0.62		
48		1318 [ARROWHD3] 0.66	4178 [HUME] 0.62		
49		4187 [HIWAY 8] 0.66	4179 [WILDWOOD] 0.62		
50		4188 [CLEAR LK] 0.67	4180 [MCMILLAN] 0.62		
51		4192 [ST GERMA] 0.67 +more	2496 [ARP 115] 0.63 +more		
52	Worst Case Angle Damping	ANTEL3 / -42.27%	ANTEL3 / -51.65%	SHERC3 / -27.70%	ANTEL3 / 40.68%
53	Dorsey SUVP / UdHold		/ 17.149		
54	Forbes DC Red (DCAR)	56%	108%	251%	236%
55	K22W (max +dP @ t, d-ang)	52.1@(14.95800,10.6)	52.2@(14.51634,1.8)	8.0@(19.27460,15.0)	20.8@(2.85821,-10.3)
56	K22W (max -dP @ t, d-ang)	75.0@(12.92469,83.5)	65.3@(16.95796,84.0)	34.7@(17.07463,36.8)	24.3@(0.91663,16.5)
57	K22W (max d-ang @ t, dP)	84.2@(12.71636,-73.9)	84.0@(16.95796,-65.3)	37.4@(16.83297,-34.1)	19.7@(1.19995,-16.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	85% / 155%	82% / 153%	126% / 213%	79% / 146%
61	L20D at Prairie/Drayton	999% / 567%	999% / 571%	999% / 682%	999% / 588%
62	R50M / F3M	538% / 319%	558% / 315%	667% / 343%	576% / 294%
63	B10T	188%	196%	258%	164%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 3 | 3)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - P. Island-Columbia - Case S3C3W2E

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W2E-pcs	upe-so04aa.S3C3W2E-pys	upe-so04aa.S3C3W2E-pyt	upe-so04aa.S3C3W2E-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 22:33	JUN 13 2002 22:48	JUN 13 2002 23:03	JUN 13 2002 23:17
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2648 / 318	2648 / 318	2648 / 318	2648 / 318
10	MHEX / L20D	2172 / 242	2172 / 242	2172 / 242	2172 / 242
11	ECL-ARP / PRI-BYN	706 / 804	706 / 804	706 / 804	706 / 804
12	MWSI / MNEX	1999 / 2858	1999 / 2858	1999 / 2858	1999 / 2858
13	D602F / F601C	1803 / 1426	1803 / 1426	1803 / 1426	1803 / 1426
14	B10T / MH>SPC	167 / 99	167 / 99	167 / 99	167 / 99
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	162 / 150	162 / 150	162 / 150	162 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	229 / 67	229 / 67	229 / 67	229 / 67
19	Forbes SVC / MSC	43 / 600	43 / 600	43 / 600	43 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016
23	Chisago 500/EauClaire 345	1.019 / 1.009	1.019 / 1.009	1.019 / 1.009	1.019 / 1.009
24	Int Falls 115/Badoura 115	1.047 / 0.996	1.047 / 0.996	1.047 / 0.996	1.047 / 0.996
25	Drayton 230/Groton 345	1.021 / 0.998	1.021 / 0.998	1.021 / 0.998	1.021 / 0.998
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 226%	136% / 226%	136% / 226%	136% / 226%
28	L20D at Prairie/Drayton	999% / 838%	999% / 838%	999% / 838%	999% / 838%
29	R50M/F3M	742% / 343%	742% / 343%	742% / 343%	742% / 343%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.00	0.99 | 1.03	1.01 | 1.02	0.95 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.06	1.04 | 1.06	1.01 | 1.08
34	Dorsey 230	1.00 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.02	1.00 | 1.04	1.01 | 1.02	0.99 | 1.03
36	Riverton 230	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.02
37	Coal Creek 230	0.99 | 1.05	1.01 | 1.06	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.89 | 1.03
39	Drayton 230	1.00 | 1.04	1.01 | 1.04	1.02 | 1.03	1.00 | 1.04
40	Groton 345	0.94 | 1.00	0.95 | 1.00	0.98 | 1.00	0.91 | 1.00
41	Tioga 230	1.00 | 1.04	1.01 | 1.04	1.02 | 1.03	1.00 | 1.04
42	Wahpeton 115	1.02 | 1.05	1.03 | 1.05	1.04 | 1.05	0.99 | 1.05
43	Watertown 345	0.97 | 1.02	0.98 | 1.02	1.01 | 1.02	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -0.76%	SHERC3 / 12.23%	KING 3 / 14.21%	ANTEL3 / 48.65%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	131%	207%	344%	250%
55	K22W (max +dP @ t, d-ang)	8.4@(3.90817,2.5)	3.9@(4.03316,3.9)	0.0@(0.04167,0.0)	15.9@(2.89988,-7.7)
56	K22W (max -dP @ t, d-ang)	44.1@(1.81659,29.0)	29.5@(1.78326,18.1)	18.2@(2.12491,11.4)	28.1@(1.81659,11.1)
57	K22W (max d-ang @ t, dP)	38.8@(20.00792,-25.0)	23.4@(19.62459,-16.1)	15.3@(20.00792,-10.9)	21.7@(1.22495,-18.2)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	100% / 172%	109% / 186%	132% / 219%	74% / 138%
61	L20D at Prairie/Drayton	999% / 608%	999% / 664%	999% / 756%	999% / 616%
62	R50M / F3M	592% / 343%	633% / 343%	700% / 343%	558% / 298%
63	B10T	176%	191%	268%	161%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S3C4W1B

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C4W1B-pcs	upe-so04aa.S3C4W1B-pys	upe-so04aa.S3C4W1B-pyt	upe-so04aa.S3C4W1B-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 0:27	JUN 14 2002 0:44	JUN 14 2002 1:00	JUN 14 2002 1:15
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3062 / 313	3062 / 313	3062 / 313	3062 / 313
10	MHEX / L20D	2172 / 219	2172 / 219	2172 / 219	2172 / 219
11	ECL-ARP / PRI-BYN	816 / 903	816 / 903	816 / 903	816 / 903
12	MWSI / MNEX	1720 / 2858	1720 / 2858	1720 / 2858	1720 / 2858
13	D602F / F601C	1798 / 1278	1798 / 1278	1798 / 1278	1798 / 1278
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	246 / 9	246 / 9	246 / 9	246 / 9
19	Forbes SVC / MSC	38 / 600	38 / 600	38 / 600	38 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.018	1.058 / 1.018	1.058 / 1.018	1.058 / 1.018
23	Chisago 500/EauClaire 345	1.023 / 0.979	1.023 / 0.979	1.023 / 0.979	1.023 / 0.979
24	Int Falls 115/Badoura 115	1.052 / 1.003	1.052 / 1.003	1.052 / 1.003	1.052 / 1.003
25	Drayton 230/Groton 345	1.013 / 1.006	1.013 / 1.006	1.013 / 1.006	1.013 / 1.006
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	138% / 229%	138% / 229%	138% / 229%	138% / 229%
28	L20D at Prairie/Drayton	999% / 936%	999% / 936%	999% / 936%	999% / 936%
29	R50M/F3M	732% / 349%	732% / 349%	732% / 349%	732% / 349%
30	B10T	331%	331%	331%	331%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.51)0.79 | 1.03	0.92 | 1.06	0.97 | 1.01	0.94 | 1.03
33	Boise 115	1.01 | 1.08	1.02 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	0.98 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.95 | 1.04	0.99 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.98 | 1.04	1.00 | 1.04	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.06	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.98 | 1.08	0.98 | 1.06	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	0.98 | 1.03	0.98 | 1.03	1.01 | 1.02	1.00 | 1.03
40	Groton 345	0.95 | 1.03	0.96 | 1.02	0.99 | 1.01	0.93 | 1.01
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.03 | 1.07	1.04 | 1.06	1.05 | 1.06	1.01 | 1.06
43	Watertown 345	0.97 | 1.04	0.98 | 1.02	1.00 | 1.02	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		4246 [TRIPOLI3] 0.69	none	none	none
46		1318 [ARROWHD3] 0.74			
47		1319 [AHD PST] 0.80			
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -37.07%	ANTEL3 / -41.03%	KING 3 / -13.36%	ANTEL3 / 44.47%
53	Dorsey SUVP / UdHold	/ 17.508	/ 17.166		
54	Forbes DC Red (DCAR)	95%	164%	281%	221%
55	K22W (max +dP @ t, d-ang)	72.9@(19.84959,12.5)	60.9@(19.04960,4.3)	0.1@(4.66649,4.3)	15.2@(3.46652,-4.3)
56	K22W (max -dP @ t, d-ang)	56.3@(12.74136,62.9)	45.4@(17.31629,54.5)	27.5@(2.19158,18.5)	24.6@(0.91663,16.9)
57	K22W (max d-ang @ t, dP)	79.8@(17.67462,-53.3)	55.7@(17.09130,-44.0)	26.7@(16.51630,-21.8)	20.6@(1.21662,-16.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	95% / 178%	99% / 186%	132% / 220%	79% / 146%
61	L20D at Prairie/Drayton	999% / 640%	999% / 674%	999% / 802%	999% / 707%
62	R50M / F3M	583% / 299%	577% / 313%	679% / 349%	561% / 304%
63	B10T	196%	195%	254%	174%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 0) / (0 | 0 | 0)	(1 | 1 | 0) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - S. Rock-Adams-Columbia - Case S3C4W1C

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C4W1C-pcs	upe-so04aa.S3C4W1C-pys	upe-so04aa.S3C4W1C-pyt	upe-so04aa.S3C4W1C-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 1:29	JUN 14 2002 1:44	JUN 14 2002 1:59	JUN 14 2002 2:13
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3063 / 305	3063 / 305	3063 / 305	3063 / 305
10	MHEX / L20D	2171 / 222	2171 / 222	2171 / 222	2171 / 222
11	ECL-ARP / PRI-BYN	745 / 914	745 / 914	745 / 914	745 / 914
12	MWSI / MNEX	1660 / 2972	1660 / 2972	1660 / 2972	1660 / 2972
13	D602F / F601C	1793 / 1284	1793 / 1284	1793 / 1284	1793 / 1284
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-120 / -196	-120 / -196	-120 / -196	-120 / -196
16	R50M / OH>MP	169 / 150	169 / 150	169 / 150	169 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	263 / 18	263 / 18	263 / 18	263 / 18
19	Forbes SVC / MSC	33 / 600	33 / 600	33 / 600	33 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.021	1.059 / 1.021	1.059 / 1.021	1.059 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 1.004	1.025 / 1.004	1.025 / 1.004	1.025 / 1.004
24	Int Falls 115/Badoura 115	1.051 / 1.005	1.051 / 1.005	1.051 / 1.005	1.051 / 1.005
25	Drayton 230/Groton 345	1.013 / 1.005	1.013 / 1.005	1.013 / 1.005	1.013 / 1.005
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	141% / 234%	141% / 234%	141% / 234%	141% / 234%
28	L20D at Prairie/Drayton	999% / 920%	999% / 920%	999% / 920%	999% / 920%
29	R50M/F3M	744% / 349%	744% / 349%	744% / 349%	744% / 349%
30	B10T	327%	327%	327%	327%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.00	0.97 | 1.03	0.99 | 1.02	0.96 | 1.05
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.06
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.05	1.00 | 1.06	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.97 | 1.04	0.99 | 1.04	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.03	1.01 | 1.02	1.00 | 1.03
40	Groton 345	0.95 | 1.01	0.96 | 1.00	0.98 | 1.00	0.93 | 1.01
41	Tioga 230	1.00 | 1.04	1.01 | 1.04	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.03 | 1.06	1.04 | 1.06	1.05 | 1.06	1.01 | 1.06
43	Watertown 345	0.98 | 1.02	0.98 | 1.01	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 3.01%	ANTEL3 / -0.16%	KING 3 / 5.93%	ANTEL3 / 54.32%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	146%	172%	298%	242%
55	K22W (max +dP @ t, d-ang)	8.2@(3.87484,3.8)	5.7@(4.11649,4.6)	0.0@(-0.01667,0.0)	15.7@(2.81655,-5.7)
56	K22W (max -dP @ t, d-ang)	42.3@(1.82493,28.6)	37.2@(1.92492,24.7)	24.3@(2.13325,16.0)	24.4@(0.89163,16.2)
57	K22W (max d-ang @ t, dP)	40.9@(20.00792,-26.9)	38.4@(20.00792,-23.6)	22.5@(20.00792,-14.3)	20.0@(1.19162,-16.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	103% / 179%	121% / 203%	138% / 230%	78% / 145%
61	L20D at Prairie/Drayton	999% / 652%	999% / 698%	999% / 780%	999% / 685%
62	R50M / F3M	585% / 349%	641% / 349%	694% / 349%	561% / 295%
63	B10T	167%	181%	244%	163%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - S. Rock-Des Moines-Zion - Case S3C4W1D

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C4W1D-pcs	upe-so04aa.S3C4W1D-pys	upe-so04aa.S3C4W1D-pyt	upe-so04aa.S3C4W1D-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 2:28	JUN 14 2002 2:44	JUN 14 2002 2:59	JUN 14 2002 3:14
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3062 / 308	3062 / 308	3062 / 308	3062 / 308
10	MHEX / L20D	2172 / 221	2172 / 221	2172 / 221	2172 / 221
11	ECL-ARP / PRI-BYN	794 / 901	794 / 901	794 / 901	794 / 901
12	MWSI / MNEX	1696 / 2880	1696 / 2880	1696 / 2880	1696 / 2880
13	D602F / F601C	1795 / 1277	1795 / 1277	1795 / 1277	1795 / 1277
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-118 / -196	-118 / -196	-118 / -196	-118 / -196
16	R50M / OH>MP	169 / 151	169 / 151	169 / 151	169 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	255 / 14	255 / 14	255 / 14	255 / 14
19	Forbes SVC / MSC	35 / 600	35 / 600	35 / 600	35 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.989	1.024 / 0.989	1.024 / 0.989	1.024 / 0.989
24	Int Falls 115/Badoura 115	1.052 / 1.004	1.052 / 1.004	1.052 / 1.004	1.052 / 1.004
25	Drayton 230/Groton 345	1.013 / 1.005	1.013 / 1.005	1.013 / 1.005	1.013 / 1.005
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 231%	139% / 231%	139% / 231%	139% / 231%
28	L20D at Prairie/Drayton	999% / 923%	999% / 923%	999% / 923%	999% / 923%
29	R50M/F3M	739% / 348%	739% / 348%	739% / 348%	739% / 348%
30	B10T	331%	331%	331%	331%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.84 | 0.98	0.94 | 1.02	0.98 | 1.02	0.95 | 1.04
33	Boise 115	1.02 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.97 | 1.02	1.00 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.05	1.00 | 1.06	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.98 | 1.05	0.99 | 1.04	1.01 | 1.03	0.90 | 1.03
39	Drayton 230	0.98 | 1.03	1.00 | 1.03	1.01 | 1.02	1.00 | 1.03
40	Groton 345	0.96 | 1.01	0.97 | 1.00	0.98 | 1.00	0.93 | 1.01
41	Tioga 230	1.00 | 1.04	1.01 | 1.04	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.03 | 1.06	1.04 | 1.06	1.05 | 1.06	1.01 | 1.06
43	Watertown 345	0.98 | 1.02	0.98 | 1.01	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.76	none	none	none
46		1319 [AHD PST] 0.81			
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -19.70%	ANTEL3 / -32.71%	KING 3 / -7.93%	ANTEL3 / 46.47%
53	Dorsey SUVP / UdHold	/ 17.008			
54	Forbes DC Red (DCAR)	107%	173%	287%	228%
55	K22W (max +dP @ t, d-ang)	10.4@(9.29975,15.2)	11.3@(18.98293,21.7)	0.0@(0.02500,0.0)	15.0@(3.39986,-4.7)
56	K22W (max -dP @ t, d-ang)	49.2@(1.85826,37.1)	42.6@(16.60797,49.4)	27.0@(2.18324,18.0)	24.7@(0.91663,16.9)
57	K22W (max d-ang @ t, dP)	63.2@(17.00796,-45.6)	49.5@(16.58297,-42.2)	25.3@(16.24964,-20.7)	20.6@(1.21662,-16.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	97% / 184%	115% / 200%	133% / 223%	80% / 146%
61	L20D at Prairie/Drayton	999% / 666%	999% / 717%	999% / 793%	999% / 696%
62	R50M / F3M	583% / 348%	625% / 348%	687% / 348%	565% / 302%
63	B10T	192%	194%	255%	171%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - Case S3C4W1E

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C4W1E-pcs	upe-so04aa.S3C4W1E-pys	upe-so04aa.S3C4W1E-pyt	upe-so04aa.S3C4W1E-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 3:28	JUN 14 2002 3:43	JUN 14 2002 3:58	JUN 14 2002 4:11
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3059 / 330	3059 / 330	3059 / 330	3059 / 330
10	MHEX / L20D	2173 / 209	2173 / 209	2173 / 209	2173 / 209
11	ECL-ARP / PRI-BYN	740 / 778	740 / 778	740 / 778	740 / 778
12	MWSI / MNEX	2019 / 2437	2019 / 2437	2019 / 2437	2019 / 2437
13	D602F / F601C	1817 / 1315	1817 / 1315	1817 / 1315	1817 / 1315
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	171 / 150	171 / 150	171 / 150	171 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	228 / 0	228 / 0	228 / 0	228 / 0
19	Forbes SVC / MSC	41 / 600	41 / 600	41 / 600	41 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045
22	Roseau 500/Forbes 500	1.057 / 1.018	1.057 / 1.018	1.057 / 1.018	1.057 / 1.018
23	Chisago 500/EauClaire 345	1.023 / 1.006	1.023 / 1.006	1.023 / 1.006	1.023 / 1.006
24	Int Falls 115/Badoura 115	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998
25	Drayton 230/Groton 345	1.011 / 1.010	1.011 / 1.010	1.011 / 1.010	1.011 / 1.010
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	133% / 222%	133% / 222%	133% / 222%	133% / 222%
28	L20D at Prairie/Drayton	999% / 987%	999% / 987%	999% / 987%	999% / 987%
29	R50M/F3M	723% / 349%	723% / 349%	723% / 349%	723% / 349%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 0.99	0.98 | 1.03	1.00 | 1.02	0.95 | 1.04
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.05 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.02	1.01 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.01 | 1.02	1.01 | 1.02	0.96 | 1.02
37	Coal Creek 230	0.99 | 1.05	1.01 | 1.06	1.03 | 1.04	0.97 | 1.05
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.90 | 1.02
39	Drayton 230	1.00 | 1.03	1.00 | 1.02	1.01 | 1.02	1.00 | 1.03
40	Groton 345	0.97 | 1.01	0.98 | 1.01	1.00 | 1.01	0.94 | 1.01
41	Tioga 230	1.00 | 1.04	1.01 | 1.04	1.03 | 1.04	1.01 | 1.04
42	Wahpeton 115	1.03 | 1.05	1.04 | 1.05	1.05 | 1.06	1.01 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.81	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 6.86%	SHERC3 / 21.84%	KING 3 / 15.68%	ANTEL3 / 55.84%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	162%	217%	359%	252%
55	K22W (max +dP @ t, d-ang)	5.9@(3.89983,4.7)	2.4@(4.04150,4.7)	0.0@(0.00833,0.0)	13.7@(2.79155,-5.0)
56	K22W (max -dP @ t, d-ang)	41.0@(1.80826,27.0)	27.3@(1.77493,15.9)	16.9@(2.10825,10.6)	22.9@(0.89997,15.8)
57	K22W (max d-ang @ t, dP)	37.2@(20.00792,-24.0)	21.2@(19.59126,-13.6)	14.6@(20.00792,-9.8)	19.0@(1.18329,-16.3)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	100% / 173%	106% / 182%	131% / 218%	74% / 138%
61	L20D at Prairie/Drayton	999% / 710%	999% / 776%	999% / 881%	999% / 745%
62	R50M / F3M	578% / 349%	618% / 342%	687% / 349%	549% / 297%
63	B10T	179%	196%	271%	173%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - S. Rock-Des Moines - Case S4C4IXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4IXB-pcs	upe-so04aa.S4C4IXB-pys	upe-so04aa.S4C4IXB-pyt	upe-so04aa.S4C4IXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 18:20	MAY 22 2002 5:17	MAY 22 2002 1:25	MAY 21 2002 21:07
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 329	2081 / 329	2081 / 329	2081 / 329
10	MHEX / L20D	2170 / 240	2170 / 240	2170 / 240	2170 / 240
11	ECL-ARP / PRI-BYN	736 / 872	736 / 872	736 / 872	736 / 872
12	MWSI / MNEX	1609 / 2566	1609 / 2566	1609 / 2566	1609 / 2566
13	D602F / F601C	1776 / 1273	1776 / 1273	1776 / 1273	1776 / 1273
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	162 / 150	162 / 150	162 / 150	162 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	270 / 24	270 / 24	270 / 24	270 / 24
19	Forbes SVC / MSC	30 / 600	30 / 600	30 / 600	30 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.022	1.060 / 1.022	1.060 / 1.022	1.060 / 1.022
23	Chisago 500/EauClaire 345	1.026 / 1.004	1.026 / 1.004	1.026 / 1.004	1.026 / 1.004
24	Int Falls 115/Badoura 115	1.047 / 1.000	1.047 / 1.000	1.047 / 1.000	1.047 / 1.000
25	Drayton 230/Groton 345	1.014 / 0.994	1.014 / 0.994	1.014 / 0.994	1.014 / 0.994
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	145% / 240%	145% / 240%	145% / 240%	145% / 240%
28	L20D at Prairie/Drayton	999% / 838%	999% / 838%	999% / 838%	999% / 838%
29	R50M/F3M	745% / 343%	745% / 343%	745% / 343%	745% / 343%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 0.98	0.98 | 1.02	1.00 | 1.02	0.97 | 1.04
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.01 | 1.03	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 0.99	0.98 | 1.00	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	1.00 | 1.02	1.00 | 1.02	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.81	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / 15.83%	ANTEL3 / -1.32%	KING 3 / 10.99%	ANTEL3 / 54.36%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	114%	165%	309%	221%
55	K22W (max +dP @ t, d-ang)	1.7@(0.11666,0.5)	1.6@(4.15816,6.1)	0.0@(0.04167,0.0)	13.9@(2.79988,-6.3)
56	K22W (max -dP @ t, d-ang)	44.2@(1.79159,28.6)	34.1@(1.84159,21.9)	22.9@(2.11658,14.8)	25.3@(1.79159,7.9)
57	K22W (max d-ang @ t, dP)	38.3@(20.00792,-22.4)	31.2@(20.00792,-17.2)	20.4@(20.00792,-12.3)	17.3@(1.15829,-15.5)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	125% / 209%	129% / 216%	145% / 240%	87% / 157%
61	L20D at Prairie/Drayton	999% / 639%	999% / 656%	999% / 725%	999% / 682%
62	R50M / F3M	633% / 343%	659% / 343%	710% / 343%	571% / 294%
63	B10T	194%	195%	257%	197%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - S. Rock-Adams-Columbia - Case S4C4IXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4IXC-pcs	upe-so04aa.S4C4IXC-pys	upe-so04aa.S4C4IXC-pyt	upe-so04aa.S4C4IXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 3:29	JUN 14 2002 3:45	JUN 14 2002 4:01	JUN 14 2002 4:17
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 316	2081 / 316	2081 / 316	2081 / 316
10	MHEX / L20D	2172 / 246	2172 / 246	2172 / 246	2172 / 246
11	ECL-ARP / PRI-BYN	661 / 863	661 / 863	661 / 863	661 / 863
12	MWSI / MNEX	1524 / 2690	1524 / 2690	1524 / 2690	1524 / 2690
13	D602F / F601C	1767 / 1277	1767 / 1277	1767 / 1277	1767 / 1277
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-118 / -195	-118 / -195	-118 / -195	-118 / -195
16	R50M / OH>MP	161 / 150	161 / 150	161 / 150	161 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	287 / 31	287 / 31	287 / 31	287 / 31
19	Forbes SVC / MSC	26 / 600	26 / 600	26 / 600	26 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.025	1.061 / 1.025	1.061 / 1.025	1.061 / 1.025
23	Chisago 500/EauClaire 345	1.028 / 1.022	1.028 / 1.022	1.028 / 1.022	1.028 / 1.022
24	Int Falls 115/Badoura 115	1.049 / 1.003	1.049 / 1.003	1.049 / 1.003	1.049 / 1.003
25	Drayton 230/Groton 345	1.013 / 0.993	1.013 / 0.993	1.013 / 0.993	1.013 / 0.993
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	148% / 246%	148% / 246%	148% / 246%	148% / 246%
28	L20D at Prairie/Drayton	999% / 811%	999% / 811%	999% / 811%	999% / 811%
29	R50M/F3M	759% / 346%	759% / 346%	759% / 346%	759% / 346%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.92 | 1.01	1.00 | 1.03	1.01 | 1.03	0.98 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.01 | 1.02	0.99 | 1.03
40	Groton 345	0.95 | 1.00	0.96 | 0.99	0.98 | 0.99	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	0.99 | 1.01	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 20.42%	ANTEL3 / 30.54%	KING 3 / 20.74%	ANTEL3 / 60.28%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	148%	173%	326%	240%
55	K22W (max +dP @ t, d-ang)	2.9@(3.84984,4.7)	0.9@(4.07483,6.3)	0.0@(0.05833,0.0)	14.0@(2.79988,-6.2)
56	K22W (max -dP @ t, d-ang)	39.3@(1.78326,21.8)	31.4@(1.83326,18.5)	20.4@(2.04158,13.0)	25.2@(1.79159,7.3)
57	K22W (max d-ang @ t, dP)	28.3@(19.48293,-19.2)	26.2@(19.97458,-16.3)	17.3@(20.00792,-11.7)	17.2@(1.14162,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	112% / 192%	125% / 212%	148% / 246%	88% / 159%
61	L20D at Prairie/Drayton	999% / 610%	999% / 627%	999% / 699%	999% / 657%
62	R50M / F3M	616% / 346%	657% / 346%	727% / 346%	576% / 292%
63	B10T	178%	188%	253%	190%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE

Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - S. Rock-Des Moines-Zion - Case S4C4IXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4IXD-pcs	upe-so04aa.S4C4IXD-pys	upe-so04aa.S4C4IXD-pyt	upe-so04aa.S4C4IXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 23 2002 2:43	MAY 23 2002 2:11	MAY 23 2002 2:27	MAY 23 2002 2:59
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 322	2081 / 322	2081 / 322	2081 / 322
10	MHEX / L20D	2171 / 243	2171 / 243	2171 / 243	2171 / 243
11	ECL-ARP / PRI-BYN	707 / 873	707 / 873	707 / 873	707 / 873
12	MWSI / MNEX	1580 / 2595	1580 / 2595	1580 / 2595	1580 / 2595
13	D602F / F601C	1771 / 1271	1771 / 1271	1771 / 1271	1771 / 1271
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	161 / 151	161 / 151	161 / 151	161 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	281 / 28	281 / 28	281 / 28	281 / 28
19	Forbes SVC / MSC	27 / 600	27 / 600	27 / 600	27 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.024	1.060 / 1.024	1.060 / 1.024	1.060 / 1.024
23	Chisago 500/EauClaire 345	1.027 / 1.015	1.027 / 1.015	1.027 / 1.015	1.027 / 1.015
24	Int Falls 115/Badoura 115	1.048 / 1.002	1.048 / 1.002	1.048 / 1.002	1.048 / 1.002
25	Drayton 230/Groton 345	1.014 / 0.993	1.014 / 0.993	1.014 / 0.993	1.014 / 0.993
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	147% / 244%	147% / 244%	147% / 244%	147% / 244%
28	L20D at Prairie/Drayton	999% / 825%	999% / 825%	999% / 825%	999% / 825%
29	R50M/F3M	753% / 344%	753% / 344%	753% / 344%	753% / 344%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.00	0.99 | 1.02	1.00 | 1.03	0.97 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.00	0.96 | 0.99	0.98 | 0.99	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 18.52%	ANTEL3 / 11.11%	KING 3 / 13.55%	ANTEL3 / 56.87%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	123%	172%	314%	226%
55	K22W (max +dP @ t, d-ang)	1.8@(0.11666,0.5)	1.3@(4.13316,6.2)	0.0@(0.08333,0.0)	14.3@(2.79988,-6.4)
56	K22W (max -dP @ t, d-ang)	42.9@(1.78326,27.0)	33.5@(1.83326,21.3)	22.5@(2.09991,14.5)	25.0@(1.79159,7.6)
57	K22W (max d-ang @ t, dP)	36.6@(20.00792,-23.3)	30.4@(20.00792,-17.9)	19.9@(20.00792,-12.5)	17.3@(1.14995,-15.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	122% / 205%	130% / 217%	147% / 244%	88% / 159%
61	L20D at Prairie/Drayton	999% / 628%	999% / 647%	999% / 714%	999% / 670%
62	R50M / F3M	632% / 344%	662% / 344%	716% / 344%	576% / 294%
63	B10T	191%	194%	258%	195%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - P. Island-Columbia - Case S4C4IXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4IXE-pcs	upe-so04aa.S4C4IXE-pys	upe-so04aa.S4C4IXE-pyt	upe-so04aa.S4C4IXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 19:06	MAY 22 2002 6:01	MAY 22 2002 2:12	MAY 21 2002 21:56
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2078 / 350	2078 / 350	2078 / 350	2078 / 350
10	MHEX / L20D	2171 / 229	2171 / 229	2171 / 229	2171 / 229
11	ECL-ARP / PRI-BYN	653 / 764	653 / 764	653 / 764	653 / 764
12	MWSI / MNEX	1880 / 2175	1880 / 2175	1880 / 2175	1880 / 2175
13	D602F / F601C	1796 / 1315	1796 / 1315	1796 / 1315	1796 / 1315
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	163 / 150	163 / 150	163 / 150	163 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	250 / 21	250 / 21	250 / 21	250 / 21
19	Forbes SVC / MSC	34 / 600	34 / 600	34 / 600	34 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.021	1.059 / 1.021	1.059 / 1.021	1.059 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 1.023	1.025 / 1.023	1.025 / 1.023	1.025 / 1.023
24	Int Falls 115/Badoura 115	1.047 / 0.994	1.047 / 0.994	1.047 / 0.994	1.047 / 0.994
25	Drayton 230/Groton 345	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 232%	139% / 232%	139% / 232%	139% / 232%
28	L20D at Prairie/Drayton	999% / 887%	999% / 887%	999% / 887%	999% / 887%
29	R50M/F3M	733% / 343%	733% / 343%	733% / 343%	733% / 343%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.92 | 1.01	1.01 | 1.03	1.02 | 1.03	0.98 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.06	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.02	1.00 | 1.03
36	Riverton 230	0.98 | 1.02	1.00 | 1.02	1.01 | 1.02	0.96 | 1.02
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.03 | 1.04	0.97 | 1.07
38	Dickinson 345	0.97 | 1.04	1.01 | 1.04	1.02 | 1.03	0.91 | 1.03
39	Drayton 230	1.00 | 1.04	1.00 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 1.00	0.99 | 1.00	0.95 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.04 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.02 | 1.05	1.04 | 1.05	1.00 | 1.06
43	Watertown 345	1.00 | 1.02	1.01 | 1.02	1.02 | 1.02	0.99 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 23.46%	SHERC3 / 38.22%	KING 3 / 25.49%	MNTCE3 / 61.29%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	155%	211%	368%	243%
55	K22W (max +dP @ t, d-ang)	3.4@(3.84984,4.2)	0.9@(4.03316,5.0)	0.0@(0.05833,0.0)	13.6@(2.78322,-6.2)
56	K22W (max -dP @ t, d-ang)	37.9@(1.77493,20.6)	25.1@(1.75826,13.7)	15.2@(2.04158,9.5)	24.6@(1.78326,7.2)
57	K22W (max d-ang @ t, dP)	24.6@(19.49959,-17.6)	17.8@(19.59959,-11.3)	12.5@(20.00792,-8.4)	16.6@(1.13329,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	106% / 182%	111% / 191%	139% / 232%	81% / 149%
61	L20D at Prairie/Drayton	999% / 682%	999% / 717%	999% / 799%	999% / 723%
62	R50M / F3M	599% / 343%	626% / 331%	707% / 343%	558% / 290%
63	B10T	191%	207%	276%	197%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S4C4WXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4WXB-pcs	upe-so04aa.S4C4WXB-pys	upe-so04aa.S4C4WXB-pyt	upe-so04aa.S4C4WXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 14:07	MAY 22 2002 1:09	MAY 22 2002 9:00	MAY 21 2002 16:43
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 338	2080 / 338	2080 / 338	2080 / 338
10	MHEX / L20D	2171 / 235	2171 / 235	2171 / 235	2171 / 235
11	ECL-ARP / PRI-BYN	800 / 845	800 / 845	800 / 845	800 / 845
12	MWSI / MNEX	1645 / 2521	1645 / 2521	1645 / 2521	1645 / 2521
13	D602F / F601C	1784 / 1270	1784 / 1270	1784 / 1270	1784 / 1270
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	163 / 150	163 / 150	163 / 150	163 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	254 / 23	254 / 23	254 / 23	254 / 23
19	Forbes SVC / MSC	34 / 600	34 / 600	34 / 600	34 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.019	1.059 / 1.019	1.059 / 1.019	1.059 / 1.019
23	Chisago 500/EauClaire 345	1.024 / 0.987	1.024 / 0.987	1.024 / 0.987	1.024 / 0.987
24	Int Falls 115/Badoura 115	1.047 / 0.997	1.047 / 0.997	1.047 / 0.997	1.047 / 0.997
25	Drayton 230/Groton 345	1.014 / 0.995	1.014 / 0.995	1.014 / 0.995	1.014 / 0.995
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	142% / 235%	142% / 235%	142% / 235%	142% / 235%
28	L20D at Prairie/Drayton	999% / 857%	999% / 857%	999% / 857%	999% / 857%
29	R50M/F3M	734% / 342%	734% / 342%	734% / 342%	734% / 342%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.85 | 0.97	0.96 | 1.01	0.98 | 1.01	0.95 | 1.04
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.02	1.00 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.04	0.99 | 1.04	1.01 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 1.00	0.98 | 1.00	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	1.00 | 1.02	1.00 | 1.02	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.77	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -15.09%	ANTEL3 / -15.02%	KING 3 / 9.06%	ANTEL3 / 53.11%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	95%	164%	307%	211%
55	K22W (max +dP @ t, d-ang)	1.7@(0.11666,0.5)	3.1@(4.17483,5.4)	0.0@(0.05833,0.0)	13.9@(2.80822,-6.5)
56	K22W (max -dP @ t, d-ang)	47.3@(1.79993,33.0)	35.2@(1.84992,23.2)	23.1@(2.12491,15.2)	25.8@(1.79993,8.3)
57	K22W (max d-ang @ t, dP)	46.7@(16.59130,-35.5)	32.5@(20.00792,-16.2)	20.6@(20.00792,-11.8)	17.9@(1.16662,-15.8)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	130% / 214%	129% / 214%	142% / 235%	85% / 153%
61	L20D at Prairie/Drayton	999% / 646%	999% / 669%	999% / 739%	999% / 692%
62	R50M / F3M	629% / 342%	653% / 342%	700% / 342%	561% / 294%
63	B10T	197%	196%	259%	196%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisc.Disp. - S. Rock-Adams-Columbia - Case S4C4WXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4WXC-pcs	upe-so04aa.S4C4WXC-pys	upe-so04aa.S4C4WXC-pyt	upe-so04aa.S4C4WXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 13 2002 23:08	JUN 13 2002 23:24	JUN 13 2002 23:40	JUN 13 2002 23:55
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 326	2081 / 326	2081 / 326	2081 / 326
10	MHEX / L20D	2172 / 241	2172 / 241	2172 / 241	2172 / 241
11	ECL-ARP / PRI-BYN	725 / 835	725 / 835	725 / 835	725 / 835
12	MWSI / MNEX	1560 / 2645	1560 / 2645	1560 / 2645	1560 / 2645
13	D602F / F601C	1775 / 1271	1775 / 1271	1775 / 1271	1775 / 1271
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-118 / -195	-118 / -195	-118 / -195	-118 / -195
16	R50M / OH>MP	162 / 150	162 / 150	162 / 150	162 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	274 / 31	274 / 31	274 / 31	274 / 31
19	Forbes SVC / MSC	28 / 600	28 / 600	28 / 600	28 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.027 / 1.011	1.027 / 1.011	1.027 / 1.011	1.027 / 1.011
24	Int Falls 115/Badoura 115	1.049 / 1.001	1.049 / 1.001	1.049 / 1.001	1.049 / 1.001
25	Drayton 230/Groton 345	1.014 / 0.993	1.014 / 0.993	1.014 / 0.993	1.014 / 0.993
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	146% / 242%	146% / 242%	146% / 242%	146% / 242%
28	L20D at Prairie/Drayton	999% / 831%	999% / 831%	999% / 831%	999% / 831%
29	R50M/F3M	747% / 345%	747% / 345%	747% / 345%	747% / 345%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.00	0.99 | 1.03	1.00 | 1.02	0.97 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.98 | 1.03	0.99 | 1.03	1.01 | 1.02	0.99 | 1.04
40	Groton 345	0.95 | 1.00	0.96 | 0.99	0.98 | 0.99	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	0.99 | 1.01	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 14.58%	ANTEL3 / 29.84%	KING 3 / 19.99%	ANTEL3 / 61.80%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	137%	173%	329%	233%
55	K22W (max +dP @ t, d-ang)	1.8@(3.88317,5.6)	1.4@(4.06650,6.1)	0.0@(0.10000,0.0)	15.0@(2.79155,-6.7)
56	K22W (max -dP @ t, d-ang)	40.5@(1.79159,23.9)	31.6@(1.84159,18.8)	20.2@(2.04158,12.9)	24.7@(1.79159,6.9)
57	K22W (max d-ang @ t, dP)	31.7@(19.70792,-21.2)	26.7@(20.00792,-16.3)	17.5@(20.00792,-11.4)	17.3@(1.14162,-15.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	111% / 191%	123% / 207%	146% / 242%	84% / 153%
61	L20D at Prairie/Drayton	999% / 618%	999% / 641%	999% / 716%	999% / 667%
62	R50M / F3M	611% / 345%	647% / 345%	716% / 345%	565% / 289%
63	B10T	177%	188%	255%	188%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - S.Rock-D.Moines-Zion - Case S4C4WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4WXD-pcs	upe-so04aa.S4C4WXD-pys	upe-so04aa.S4C4WXD-pyt	upe-so04aa.S4C4WXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 22 2002 22:17	MAY 22 2002 21:45	MAY 22 2002 22:02	MAY 22 2002 22:34
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 331	2080 / 331	2080 / 331	2080 / 331
10	MHEX / L20D	2171 / 239	2171 / 239	2171 / 239	2171 / 239
11	ECL-ARP / PRI-BYN	774 / 845	774 / 845	774 / 845	774 / 845
12	MWSI / MNEX	1619 / 2549	1619 / 2549	1619 / 2549	1619 / 2549
13	D602F / F601C	1779 / 1269	1779 / 1269	1779 / 1269	1779 / 1269
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-118 / -196	-118 / -196	-118 / -196	-118 / -196
16	R50M / OH>MP	162 / 151	162 / 151	162 / 151	162 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	264 / 27	264 / 27	264 / 27	264 / 27
19	Forbes SVC / MSC	31 / 600	31 / 600	31 / 600	31 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021
23	Chisago 500/EauClaire 345	1.025 / 0.994	1.025 / 0.994	1.025 / 0.994	1.025 / 0.994
24	Int Falls 115/Badoura 115	1.047 / 0.999	1.047 / 0.999	1.047 / 0.999	1.047 / 0.999
25	Drayton 230/Groton 345	1.014 / 0.994	1.014 / 0.994	1.014 / 0.994	1.014 / 0.994
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	144% / 239%	144% / 239%	144% / 239%	144% / 239%
28	L20D at Prairie/Drayton	999% / 843%	999% / 843%	999% / 843%	999% / 843%
29	R50M/F3M	742% / 342%	742% / 342%	742% / 342%	742% / 342%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.87 | 0.97	0.96 | 1.01	0.99 | 1.02	0.95 | 1.04
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.03	1.00 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.01 | 1.02	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.01 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 0.99	0.98 | 1.00	0.94 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	1.00 | 1.02	1.00 | 1.02	1.01 | 1.02	0.98 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.79	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / 9.84%	ANTEL3 / -0.26%	KING 3 / 11.49%	ANTEL3 / 55.75%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	105%	171%	312%	216%
55	K22W (max +dP @ t, d-ang)	1.8@(3.99983,6.4)	2.7@(4.14983,5.6)	0.0@(0.10000,0.0)	14.5@(2.79988,-6.6)
56	K22W (max -dP @ t, d-ang)	45.7@(1.79159,30.7)	34.6@(1.84159,22.5)	22.8@(2.11658,14.9)	25.5@(1.79993,7.9)
57	K22W (max d-ang @ t, dP)	42.1@(20.00792,-23.0)	32.4@(20.00792,-18.3)	20.3@(20.00792,-12.3)	17.8@(1.15829,-16.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	126% / 209%	129% / 214%	144% / 239%	86% / 154%
61	L20D at Prairie/Drayton	999% / 636%	999% / 659%	999% / 728%	999% / 681%
62	R50M / F3M	627% / 342%	656% / 342%	704% / 342%	566% / 292%
63	B10T	193%	195%	259%	194%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - P. Island-Columbia - Case S4C4WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4WXE-pcs	upe-so04aa.S4C4WXE-pys	upe-so04aa.S4C4WXE-pyt	upe-so04aa.S4C4WXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 14:52	MAY 22 2002 1:54	MAY 22 2002 9:51	MAY 21 2002 17:33
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2076 / 361	2076 / 361	2076 / 361	2076 / 361
10	MHEX / L20D	2172 / 224	2172 / 224	2172 / 224	2172 / 224
11	ECL-ARP / PRI-BYN	722 / 723	722 / 723	722 / 723	722 / 723
12	MWSI / MNEX	1930 / 2104	1930 / 2104	1930 / 2104	1930 / 2104
13	D602F / F601C	1805 / 1309	1805 / 1309	1805 / 1309	1805 / 1309
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -197	-119 / -197	-119 / -197	-119 / -197
16	R50M / OH>MP	165 / 151	165 / 151	165 / 151	165 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	235 / 11	235 / 11	235 / 11	235 / 11
19	Forbes SVC / MSC	38 / 600	38 / 600	38 / 600	38 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.019	1.058 / 1.019	1.058 / 1.019	1.058 / 1.019
23	Chisago 500/EauClaire 345	1.024 / 1.012	1.024 / 1.012	1.024 / 1.012	1.024 / 1.012
24	Int Falls 115/Badoura 115	1.047 / 0.992	1.047 / 0.992	1.047 / 0.992	1.047 / 0.992
25	Drayton 230/Groton 345	1.014 / 0.997	1.014 / 0.997	1.014 / 0.997	1.014 / 0.997
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 227%	136% / 227%	136% / 227%	136% / 227%
28	L20D at Prairie/Drayton	999% / 912%	999% / 912%	999% / 912%	999% / 912%
29	R50M/F3M	721% / 342%	721% / 342%	721% / 342%	721% / 342%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.00	1.00 | 1.03	1.01 | 1.02	0.96 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.06	1.04 | 1.05	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.02	1.01 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.98 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.02
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.03 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.04	1.02 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.04	1.00 | 1.03	1.01 | 1.02	0.99 | 1.04
40	Groton 345	0.97 | 1.00	0.97 | 1.00	0.99 | 1.00	0.95 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.04 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.02 | 1.05	1.04 | 1.05	1.00 | 1.05
43	Watertown 345	1.01 | 1.02	1.01 | 1.02	1.02 | 1.02	0.99 | 1.03
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 17.10%	SHERC3 / 39.54%	KING 3 / 25.99%	MNTCE3 / 61.63%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	145%	213%	374%	236%
55	K22W (max +dP @ t, d-ang)	2.0@(3.90817,5.4)	1.1@(4.02483,4.9)	0.0@(0.05833,0.0)	13.7@(2.78322,-6.4)
56	K22W (max -dP @ t, d-ang)	39.0@(1.77493,22.6)	24.8@(1.76659,13.5)	14.6@(2.04158,9.1)	24.7@(1.78326,7.2)
57	K22W (max d-ang @ t, dP)	28.2@(19.75792,-19.7)	17.4@(19.45793,-10.9)	12.1@(20.00792,-8.2)	16.9@(1.14162,-15.8)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	105% / 180%	108% / 185%	136% / 227%	78% / 143%
61	L20D at Prairie/Drayton	999% / 691%	999% / 734%	999% / 822%	999% / 736%
62	R50M / F3M	594% / 342%	614% / 328%	697% / 342%	546% / 287%
63	B10T	189%	207%	279%	196%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - S. Rock-Des Moines - Case S4C5IXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5IXB-pcs	upe-so04aa.S4C5IXB-pys	upe-so04aa.S4C5IXB-pyt	upe-so04aa.S4C5IXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 19:20	MAY 22 2002 6:15	MAY 22 2002 2:27	MAY 21 2002 22:12
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 317	2080 / 317	2080 / 317	2080 / 317
10	MHEX / L20D	2171 / 243	2171 / 243	2171 / 243	2171 / 243
11	ECL-ARP / PRI-BYN	751 / 921	751 / 921	751 / 921	751 / 921
12	MWSI / MNEX	1673 / 2903	1673 / 2903	1673 / 2903	1673 / 2903
13	D602F / F601C	1767 / 1257	1767 / 1257	1767 / 1257	1767 / 1257
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 150	166 / 150	166 / 150	166 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	294 / 36	294 / 36	294 / 36	294 / 36
19	Forbes SVC / MSC	27 / 600	27 / 600	27 / 600	27 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.024	1.061 / 1.024	1.061 / 1.024	1.061 / 1.024
23	Chisago 500/EauClaire 345	1.027 / 1.000	1.027 / 1.000	1.027 / 1.000	1.027 / 1.000
24	Int Falls 115/Badoura 115	1.051 / 1.002	1.051 / 1.002	1.051 / 1.002	1.051 / 1.002
25	Drayton 230/Groton 345	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	148% / 246%	148% / 246%	148% / 246%	148% / 246%
28	L20D at Prairie/Drayton	999% / 823%	999% / 823%	999% / 823%	999% / 823%
29	R50M/F3M	768% / 349%	768% / 349%	768% / 349%	768% / 349%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 0.99	0.97 | 1.02	0.99 | 1.02	0.97 | 1.04
33	Boise 115	1.03 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	1.01 | 1.03
36	Riverton 230	0.99 | 1.02	1.01 | 1.03	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 0.99	0.98 | 1.00	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / 2.60%	ANTEL3 / -14.37%	KING 3 / 2.68%	ANTEL3 / 51.29%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	136%	181%	303%	223%
55	K22W (max +dP @ t, d-ang)	4.4@(4.00816,5.5)	2.8@(4.19983,5.6)	0.0@(0.02500,0.0)	15.3@(3.45819,-3.6)
56	K22W (max -dP @ t, d-ang)	44.4@(1.79993,31.3)	36.0@(1.84992,24.2)	24.7@(2.14991,16.2)	21.4@(1.78326,9.5)
57	K22W (max d-ang @ t, dP)	42.3@(16.19964,-32.0)	34.0@(20.00792,-17.8)	22.2@(20.00792,-13.0)	17.8@(1.15829,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	126% / 213%	134% / 223%	145% / 242%	91% / 163%
61	L20D at Prairie/Drayton	999% / 627%	999% / 657%	999% / 720%	999% / 656%
62	R50M / F3M	629% / 349%	671% / 349%	719% / 349%	591% / 301%
63	B10T	196%	199%	262%	191%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - S. Rock-Adams-Columbia - Case S4C5IXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5IXC-pcs	upe-so04aa.S4C5IXC-pys	upe-so04aa.S4C5IXC-pyt	upe-so04aa.S4C5IXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 4:33	JUN 14 2002 4:49	JUN 14 2002 5:05	JUN 14 2002 5:20
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2079 / 309	2079 / 309	2079 / 309	2079 / 309
10	MHEX / L20D	2172 / 247	2172 / 247	2172 / 247	2172 / 247
11	ECL-ARP / PRI-BYN	676 / 933	676 / 933	676 / 933	676 / 933
12	MWSI / MNEX	1609 / 3015	1609 / 3015	1609 / 3015	1609 / 3015
13	D602F / F601C	1761 / 1268	1761 / 1268	1761 / 1268	1761 / 1268
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-118 / -195	-118 / -195	-118 / -195	-118 / -195
16	R50M / OH>MP	165 / 150	165 / 150	165 / 150	165 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	306 / 43	306 / 43	306 / 43	306 / 43
19	Forbes SVC / MSC	21 / 600	21 / 600	21 / 600	21 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.027	1.061 / 1.027	1.061 / 1.027	1.061 / 1.027
23	Chisago 500/EauClaire 345	1.029 / 1.020	1.029 / 1.020	1.029 / 1.020	1.029 / 1.020
24	Int Falls 115/Badoura 115	1.054 / 1.004	1.054 / 1.004	1.054 / 1.004	1.054 / 1.004
25	Drayton 230/Groton 345	1.013 / 0.990	1.013 / 0.990	1.013 / 0.990	1.013 / 0.990
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	150% / 250%	150% / 250%	150% / 250%	150% / 250%
28	L20D at Prairie/Drayton	999% / 805%	999% / 805%	999% / 805%	999% / 805%
29	R50M/F3M	779% / 351%	779% / 351%	779% / 351%	779% / 351%
30	B10T	340%	340%	340%	340%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.01	0.99 | 1.03	1.01 | 1.03	0.98 | 1.06
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.05 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.98 | 1.03	0.99 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.95 | 0.99	0.96 | 0.99	0.98 | 0.99	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	0.98 | 1.02	0.99 | 1.01	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 15.80%	ANTEL3 / 21.26%	KING 3 / 16.74%	ANTEL3 / 58.65%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	168%	185%	317%	239%
55	K22W (max +dP @ t, d-ang)	3.9@(3.87484,5.0)	1.4@(4.10816,6.1)	0.0@(0.00000,0.0)	16.1@(2.79988,-5.7)
56	K22W (max -dP @ t, d-ang)	38.4@(1.79159,23.5)	33.4@(1.84159,20.8)	22.3@(2.08325,14.4)	20.6@(1.77493,8.6)
57	K22W (max d-ang @ t, dP)	31.0@(19.61626,-19.3)	29.5@(20.00792,-18.6)	19.4@(20.00792,-13.1)	17.5@(1.14162,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	112% / 194%	128% / 216%	148% / 246%	90% / 163%
61	L20D at Prairie/Drayton	999% / 600%	999% / 631%	999% / 700%	999% / 638%
62	R50M / F3M	622% / 351%	676% / 351%	731% / 351%	594% / 297%
63	B10T	176%	191%	257%	185%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - S. Rock-Des Moines-Zion - Case S4C5IXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5IXD-pcs	upe-so04aa.S4C5IXD-pys	upe-so04aa.S4C5IXD-pyt	upe-so04aa.S4C5IXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 23 2002 3:47	MAY 23 2002 3:15	MAY 23 2002 3:32	MAY 23 2002 4:04
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 311	2080 / 311	2080 / 311	2080 / 311
10	MHEX / L20D	2171 / 245	2171 / 245	2171 / 245	2171 / 245
11	ECL-ARP / PRI-BYN	722 / 922	722 / 922	722 / 922	722 / 922
12	MWSI / MNEX	1644 / 2926	1644 / 2926	1644 / 2926	1644 / 2926
13	D602F / F601C	1762 / 1259	1762 / 1259	1762 / 1259	1762 / 1259
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	165 / 151	165 / 151	165 / 151	165 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	303 / 40	303 / 40	303 / 40	303 / 40
19	Forbes SVC / MSC	23 / 600	23 / 600	23 / 600	23 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026
23	Chisago 500/EauClaire 345	1.028 / 1.009	1.028 / 1.009	1.028 / 1.009	1.028 / 1.009
24	Int Falls 115/Badoura 115	1.052 / 1.004	1.052 / 1.004	1.052 / 1.004	1.052 / 1.004
25	Drayton 230/Groton 345	1.013 / 0.990	1.013 / 0.990	1.013 / 0.990	1.013 / 0.990
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	150% / 249%	150% / 249%	150% / 249%	150% / 249%
28	L20D at Prairie/Drayton	999% / 812%	999% / 812%	999% / 812%	999% / 812%
29	R50M/F3M	775% / 350%	775% / 350%	775% / 350%	775% / 350%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 0.99	0.98 | 1.02	1.00 | 1.03	0.97 | 1.05
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.95 | 1.00	0.96 | 0.99	0.98 | 0.99	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 16.97%	ANTEL3 / -3.49%	KING 3 / 6.89%	ANTEL3 / 53.72%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	144%	186%	307%	226%
55	K22W (max +dP @ t, d-ang)	4.7@(3.94983,5.3)	2.5@(4.17483,5.8)	0.0@(0.07500,0.0)	15.5@(2.79988,-5.7)
56	K22W (max -dP @ t, d-ang)	43.0@(1.79159,29.5)	35.4@(1.83326,23.7)	24.2@(2.14158,15.8)	21.1@(1.78326,9.3)
57	K22W (max d-ang @ t, dP)	40.4@(20.00792,-23.0)	34.0@(20.00792,-19.5)	21.9@(20.00792,-13.6)	17.8@(1.15829,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	123% / 209%	134% / 224%	147% / 244%	92% / 165%
61	L20D at Prairie/Drayton	999% / 617%	999% / 649%	999% / 711%	999% / 646%
62	R50M / F3M	627% / 350%	675% / 350%	724% / 350%	596% / 301%
63	B10T	192%	199%	262%	189%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - P. Island-Columbia - Case S4C5IXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5IXE-pcs	upe-so04aa.S4C5IXE-pys	upe-so04aa.S4C5IXE-pyt	upe-so04aa.S4C5IXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 20:06	MAY 22 2002 7:00	MAY 22 2002 3:15	MAY 21 2002 23:00
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2077 / 332	2077 / 332	2077 / 332	2077 / 332
10	MHEX / L20D	2171 / 236	2171 / 236	2171 / 236	2171 / 236
11	ECL-ARP / PRI-BYN	670 / 812	670 / 812	670 / 812	670 / 812
12	MWSI / MNEX	1962 / 2535	1962 / 2535	1962 / 2535	1962 / 2535
13	D602F / F601C	1781 / 1293	1781 / 1293	1781 / 1293	1781 / 1293
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	167 / 150	167 / 150	167 / 150	167 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	284 / 38	284 / 38	284 / 38	284 / 38
19	Forbes SVC / MSC	27 / 600	27 / 600	27 / 600	27 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.024	1.060 / 1.024	1.060 / 1.024	1.060 / 1.024
23	Chisago 500/EauClaire 345	1.027 / 1.022	1.027 / 1.022	1.027 / 1.022	1.027 / 1.022
24	Int Falls 115/Badoura 115	1.052 / 0.999	1.052 / 0.999	1.052 / 0.999	1.052 / 0.999
25	Drayton 230/Groton 345	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	144% / 240%	144% / 240%	144% / 240%	144% / 240%
28	L20D at Prairie/Drayton	999% / 856%	999% / 856%	999% / 856%	999% / 856%
29	R50M/F3M	762% / 350%	762% / 350%	762% / 350%	762% / 350%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.01	1.00 | 1.04	1.02 | 1.03	0.97 | 1.05
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.05 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.03
36	Riverton 230	0.98 | 1.03	1.01 | 1.02	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.03 | 1.04	0.97 | 1.07
38	Dickinson 345	0.97 | 1.04	1.01 | 1.03	1.02 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.04	1.00 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 1.00	0.99 | 1.00	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.04 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.05	1.04 | 1.05	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 17.90%	SHERC3 / 33.06%	KING 3 / 22.21%	ANTEL3 / 60.56%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	181%	224%	365%	241%
55	K22W (max +dP @ t, d-ang)	4.9@(3.88317,4.4)	1.1@(4.05816,5.1)	0.0@(0.07500,0.0)	15.8@(2.77488,-5.9)
56	K22W (max -dP @ t, d-ang)	37.5@(1.77493,22.6)	26.3@(1.76659,15.0)	16.4@(2.07491,10.3)	19.9@(1.76659,8.2)
57	K22W (max d-ang @ t, dP)	27.3@(19.58292,-17.5)	19.4@(19.56626,-12.5)	13.5@(20.00792,-9.3)	16.9@(1.13329,-15.5)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 188%	116% / 200%	142% / 236%	86% / 157%
61	L20D at Prairie/Drayton	999% / 651%	999% / 696%	999% / 776%	999% / 680%
62	R50M / F3M	611% / 350%	652% / 343%	725% / 350%	583% / 296%
63	B10T	187%	207%	278%	191%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - S. Rock-Des Moines - Case S4C5WXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5WXB-pcs	upe-so04aa.S4C5WXB-pys	upe-so04aa.S4C5WXB-pyt	upe-so04aa.S4C5WXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 15:07	MAY 22 2002 2:08	MAY 22 2002 10:07	MAY 21 2002 17:49
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2079 / 325	2079 / 325	2079 / 325	2079 / 325
10	MHEX / L20D	2170 / 239	2170 / 239	2170 / 239	2170 / 239
11	ECL-ARP / PRI-BYN	810 / 898	810 / 898	810 / 898	810 / 898
12	MWSI / MNEX	1708 / 2869	1708 / 2869	1708 / 2869	1708 / 2869
13	D602F / F601C	1772 / 1253	1772 / 1253	1772 / 1253	1772 / 1253
14	B10T / MH>SPC	168 / 101	168 / 101	168 / 101	168 / 101
15	OH E-W / OH>MH	-119 / -197	-119 / -197	-119 / -197	-119 / -197
16	R50M / OH>MP	167 / 150	167 / 150	167 / 150	167 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	281 / 37	281 / 37	281 / 37	281 / 37
19	Forbes SVC / MSC	30 / 600	30 / 600	30 / 600	30 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.022	1.060 / 1.022	1.060 / 1.022	1.060 / 1.022
23	Chisago 500/EauClaire 345	1.026 / 0.982	1.026 / 0.982	1.026 / 0.982	1.026 / 0.982
24	Int Falls 115/Badoura 115	1.051 / 1.000	1.051 / 1.000	1.051 / 1.000	1.051 / 1.000
25	Drayton 230/Groton 345	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	146% / 242%	146% / 242%	146% / 242%	146% / 242%
28	L20D at Prairie/Drayton	999% / 838%	999% / 838%	999% / 838%	999% / 838%
29	R50M/F3M	759% / 348%	759% / 348%	759% / 348%	759% / 348%
30	B10T	337%	337%	337%	337%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.84 | 0.97	0.95 | 1.01	0.98 | 1.01	0.95 | 1.04
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.04 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.02	1.00 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.00 | 1.03	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.04	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 1.00	0.98 | 1.00	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.76	none	none	none
46		1319 [AHD PST] 0.81			
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -27.86%	ANTEL3 / -25.72%	KING 3 / -1.35%	ANTEL3 / 49.46%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	118%	180%	301%	214%
55	K22W (max +dP @ t, d-ang)	4.6@(4.17483,6.2)	4.7@(4.23316,4.9)	0.0@(0.08333,0.0)	15.8@(3.45819,-3.9)
56	K22W (max -dP @ t, d-ang)	47.6@(1.81659,35.8)	37.4@(1.86659,25.8)	25.1@(2.15824,16.7)	21.9@(1.79159,9.9)
57	K22W (max d-ang @ t, dP)	54.8@(16.88297,-40.6)	38.3@(16.34964,-30.0)	22.5@(20.00792,-12.2)	18.3@(1.16662,-16.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	126% / 213%	134% / 222%	142% / 236%	89% / 160%
61	L20D at Prairie/Drayton	999% / 634%	999% / 667%	999% / 732%	999% / 664%
62	R50M / F3M	628% / 348%	663% / 348%	710% / 348%	585% / 301%
63	B10T	199%	200%	262%	191%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisc.Disp. - S. Rock-Adams-Columbia - Case S4C5WXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5WXC-pcs	upe-so04aa.S4C5WXC-pys	upe-so04aa.S4C5WXC-pyt	upe-so04aa.S4C5WXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 0:11	JUN 14 2002 0:28	JUN 14 2002 0:44	JUN 14 2002 0:59
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 317	2080 / 317	2080 / 317	2080 / 317
10	MHEX / L20D	2170 / 242	2170 / 242	2170 / 242	2170 / 242
11	ECL-ARP / PRI-BYN	738 / 909	738 / 909	738 / 909	738 / 909
12	MWSI / MNEX	1648 / 2981	1648 / 2981	1648 / 2981	1648 / 2981
13	D602F / F601C	1767 / 1260	1767 / 1260	1767 / 1260	1767 / 1260
14	B10T / MH>SPC	169 / 101	169 / 101	169 / 101	169 / 101
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 150	166 / 150	166 / 150	166 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	297 / 44	297 / 44	297 / 44	297 / 44
19	Forbes SVC / MSC	25 / 600	25 / 600	25 / 600	25 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.025	1.061 / 1.025	1.061 / 1.025	1.061 / 1.025
23	Chisago 500/EauClaire 345	1.028 / 1.007	1.028 / 1.007	1.028 / 1.007	1.028 / 1.007
24	Int Falls 115/Badoura 115	1.053 / 1.002	1.053 / 1.002	1.053 / 1.002	1.053 / 1.002
25	Drayton 230/Groton 345	1.013 / 0.990	1.013 / 0.990	1.013 / 0.990	1.013 / 0.990
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	148% / 246%	148% / 246%	148% / 246%	148% / 246%
28	L20D at Prairie/Drayton	999% / 825%	999% / 825%	999% / 825%	999% / 825%
29	R50M/F3M	770% / 352%	770% / 352%	770% / 352%	770% / 352%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 1.00	0.98 | 1.03	1.00 | 1.02	0.97 | 1.05
33	Boise 115	1.02 | 1.07	1.03 | 1.07	1.05 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.98 | 1.03	0.99 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.95 | 0.99	0.96 | 0.99	0.98 | 0.99	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.01 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	0.99 | 1.01	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 9.86%	SHERC3 / 18.30%	KING 3 / 15.48%	ANTEL3 / 58.97%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	157%	185%	318%	234%
55	K22W (max +dP @ t, d-ang)	4.0@(3.86650,5.1)	2.3@(4.10816,5.8)	0.0@(0.00000,0.0)	16.0@(2.79155,-5.9)
56	K22W (max -dP @ t, d-ang)	40.2@(1.79159,26.3)	33.8@(1.84159,21.6)	22.2@(2.08325,14.5)	20.6@(1.78326,8.5)
57	K22W (max d-ang @ t, dP)	35.2@(19.84125,-22.2)	30.5@(20.00792,-19.1)	19.6@(20.00792,-13.0)	17.7@(1.14162,-15.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	113% / 194%	127% / 214%	146% / 242%	88% / 159%
61	L20D at Prairie/Drayton	999% / 609%	999% / 644%	999% / 715%	999% / 649%
62	R50M / F3M	612% / 352%	669% / 352%	722% / 352%	585% / 296%
63	B10T	175%	188%	253%	182%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisc.Disp. - S. Rock-Des Moines-Zion - Case S4C5WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5WXD-pcs	upe-so04aa.S4C5WXD-pys	upe-so04aa.S4C5WXD-pyt	upe-so04aa.S4C5WXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 22 2002 23:21	MAY 22 2002 22:49	MAY 22 2002 23:06	MAY 22 2002 23:38
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2079 / 320	2079 / 320	2079 / 320	2079 / 320
10	MHEX / L20D	2171 / 242	2171 / 242	2171 / 242	2171 / 242
11	ECL-ARP / PRI-BYN	788 / 895	788 / 895	788 / 895	788 / 895
12	MWSI / MNEX	1683 / 2888	1683 / 2888	1683 / 2888	1683 / 2888
13	D602F / F601C	1769 / 1253	1769 / 1253	1769 / 1253	1769 / 1253
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 151	166 / 151	166 / 151	166 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	288 / 39	288 / 39	288 / 39	288 / 39
19	Forbes SVC / MSC	28 / 600	28 / 600	28 / 600	28 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.027 / 0.991	1.027 / 0.991	1.027 / 0.991	1.027 / 0.991
24	Int Falls 115/Badoura 115	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001
25	Drayton 230/Groton 345	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	147% / 244%	147% / 244%	147% / 244%	147% / 244%
28	L20D at Prairie/Drayton	999% / 828%	999% / 828%	999% / 828%	999% / 828%
29	R50M/F3M	765% / 348%	765% / 348%	765% / 348%	765% / 348%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.86 | 0.98	0.96 | 1.01	0.99 | 1.02	0.96 | 1.04
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.04 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.98 | 1.03	1.00 | 1.04	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.02	1.01 | 1.03	1.01 | 1.02	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 0.99	0.98 | 0.99	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.78	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -4.54%	ANTEL3 / -13.51%	KING 3 / 3.78%	ANTEL3 / 52.77%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	125%	184%	306%	220%
55	K22W (max +dP @ t, d-ang)	4.9@(4.04983,5.9)	3.7@(4.19983,5.3)	0.0@(-0.01667,0.0)	15.2@(2.81655,-5.8)
56	K22W (max -dP @ t, d-ang)	45.6@(1.80826,33.2)	36.2@(1.84159,24.7)	24.3@(2.14158,16.1)	21.2@(1.78326,9.5)
57	K22W (max d-ang @ t, dP)	46.7@(16.25797,-34.2)	35.0@(20.00792,-18.6)	22.1@(20.00792,-13.2)	18.0@(1.16662,-15.8)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	125% / 212%	134% / 222%	144% / 239%	90% / 161%
61	L20D at Prairie/Drayton	999% / 625%	999% / 659%	999% / 723%	999% / 657%
62	R50M / F3M	625% / 348%	666% / 348%	715% / 348%	588% / 300%
63	B10T	195%	199%	262%	190%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E. Wisconsin Dispatch - P. Island-Columbia - Case S4C5WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5WXE-pcs	upe-so04aa.S4C5WXE-pys	upe-so04aa.S4C5WXE-pyt	upe-so04aa.S4C5WXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	MAY 21 2002 15:54	MAY 22 2002 2:53	MAY 22 2002 10:56	MAY 21 2002 18:38
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2077 / 341	2077 / 341	2077 / 341	2077 / 341
10	MHEX / L20D	2171 / 231	2171 / 231	2171 / 231	2171 / 231
11	ECL-ARP / PRI-BYN	737 / 776	737 / 776	737 / 776	737 / 776
12	MWSI / MNEX	2015 / 2475	2015 / 2475	2015 / 2475	2015 / 2475
13	D602F / F601C	1788 / 1288	1788 / 1288	1788 / 1288	1788 / 1288
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	168 / 150	168 / 150	168 / 150	168 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	269 / 40	269 / 40	269 / 40	269 / 40
19	Forbes SVC / MSC	32 / 600	32 / 600	32 / 600	32 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.022	1.059 / 1.022	1.059 / 1.022	1.059 / 1.022
23	Chisago 500/EauClaire 345	1.026 / 1.006	1.026 / 1.006	1.026 / 1.006	1.026 / 1.006
24	Int Falls 115/Badoura 115	1.052 / 0.996	1.052 / 0.996	1.052 / 0.996	1.052 / 0.996
25	Drayton 230/Groton 345	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992	1.013 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	142% / 236%	142% / 236%	142% / 236%	142% / 236%
28	L20D at Prairie/Drayton	999% / 876%	999% / 876%	999% / 876%	999% / 876%
29	R50M/F3M	751% / 349%	751% / 349%	751% / 349%	751% / 349%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.89 | 0.99	0.99 | 1.03	1.01 | 1.02	0.96 | 1.05
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.05 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.02	1.01 | 1.04	1.02 | 1.03	1.00 | 1.03
36	Riverton 230	0.98 | 1.02	1.00 | 1.02	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.98 | 1.07	1.00 | 1.07	1.03 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.04	1.00 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.00	0.97 | 1.00	0.99 | 1.00	0.93 | 1.00
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.04 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.01 | 1.06	1.02 | 1.05	1.04 | 1.05	0.99 | 1.06
43	Watertown 345	0.99 | 1.02	1.00 | 1.02	1.01 | 1.02	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 10.40%	SHERC3 / 33.04%	KING 3 / 20.28%	MNTCE3 / 60.06%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	164%	225%	369%	236%
55	K22W (max +dP @ t, d-ang)	3.9@(3.93317,5.3)	1.5@(4.05816,4.9)	0.0@(0.04167,0.0)	15.8@(2.78322,-6.1)
56	K22W (max -dP @ t, d-ang)	38.7@(1.78326,24.8)	26.3@(1.76659,15.1)	16.0@(2.07491,10.1)	20.0@(1.77493,8.2)
57	K22W (max d-ang @ t, dP)	31.2@(19.93292,-20.3)	19.2@(19.56626,-12.3)	13.2@(20.00792,-9.1)	17.1@(1.13329,-15.8)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	110% / 188%	113% / 195%	139% / 231%	83% / 152%
61	L20D at Prairie/Drayton	999% / 658%	999% / 708%	999% / 794%	999% / 691%
62	R50M / F3M	608% / 349%	642% / 341%	715% / 349%	572% / 294%
63	B10T	186%	205%	279%	189%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 1 | 1) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Iowa/Illinois Dispatch - S. Rock-Des Moines - Case S5C3IXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3IXB-pcs	upe-so04aa.S5C3IXB-pys	upe-so04aa.S5C3IXB-pyt	upe-so04aa.S5C3IXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 21:44	JUN 27 2002 22:00	JUN 27 2002 22:15	JUN 27 2002 22:30
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 314	2080 / 314	2080 / 314	2080 / 314
10	MHEX / L20D	2173 / 247	2173 / 247	2173 / 247	2173 / 247
11	ECL-ARP / PRI-BYN	762 / 933	762 / 933	762 / 933	762 / 933
12	MWSI / MNEX	1695 / 2933	1695 / 2933	1695 / 2933	1695 / 2933
13	D602F / F601C	1757 / 1241	1757 / 1241	1757 / 1241	1757 / 1241
14	B10T / MH>SPC	165 / 97	165 / 97	165 / 97	165 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	165 / 151	165 / 151	165 / 151	165 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	314 / 33	314 / 33	314 / 33	314 / 33
19	Forbes SVC / MSC	19 / 600	19 / 600	19 / 600	19 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.027	1.061 / 1.027	1.061 / 1.027	1.061 / 1.027
23	Chisago 500/EauClaire 345	1.029 / 1.000	1.029 / 1.000	1.029 / 1.000	1.029 / 1.000
24	Int Falls 115/Badoura 115	1.050 / 1.007	1.050 / 1.007	1.050 / 1.007	1.050 / 1.007
25	Drayton 230/Groton 345	1.015 / 1.001	1.015 / 1.001	1.015 / 1.001	1.015 / 1.001
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	152% / 252%	152% / 252%	152% / 252%	152% / 252%
28	L20D at Prairie/Drayton	999% / 808%	999% / 808%	999% / 808%	999% / 808%
29	R50M/F3M	780% / 346%	780% / 346%	780% / 346%	780% / 346%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.88 | 1.00	0.97 | 1.04	1.00 | 1.03	0.98 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.01 | 1.07	1.04 | 1.06	1.04 | 1.05	1.03 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.05	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.98 | 1.05	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	1.00 | 1.04
40	Groton 345	0.96 | 1.01	0.97 | 1.01	0.98 | 1.00	0.94 | 1.01
41	Tioga 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.03	1.00 | 1.04
42	Wahpeton 115	1.02 | 1.06	1.04 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.97 | 1.02	0.98 | 1.01	1.00 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.80	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -14.60%	ANTEL3 / -27.67%	KING 3 / -5.07%	ANTEL3 / 45.07%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	141%	188%	295%	229%
55	K22W (max +dP @ t, d-ang)	8.9@(4.10816,4.0)	6.6@(4.25816,4.4)	0.0@(0.10000,0.0)	17.3@(3.42486,-4.7)
56	K22W (max -dP @ t, d-ang)	46.8@(1.83326,34.7)	38.6@(2.10825,25.7)	26.2@(2.16658,17.4)	22.8@(1.79159,11.6)
57	K22W (max d-ang @ t, dP)	54.4@(16.69963,-43.8)	43.3@(16.47464,-35.1)	24.4@(16.30797,-19.8)	19.2@(1.20829,-16.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	117% / 210%	136% / 231%	147% / 245%	97% / 173%
61	L20D at Prairie/Drayton	999% / 611%	999% / 641%	999% / 706%	999% / 641%
62	R50M / F3M	628% / 346%	671% / 346%	726% / 346%	608% / 309%
63	B10T	188%	194%	258%	71%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Iowa/Illinois Dispatch - S.Rock-Adams-Columbia - Case S5C3IXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3IXC-pcs	upe-so04aa.S5C3IXC-pys	upe-so04aa.S5C3IXC-pyt	upe-so04aa.S5C3IXC-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 22:44	JUN 27 2002 22:59	JUN 27 2002 23:14	JUN 27 2002 23:29
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 305	2080 / 305	2080 / 305	2080 / 305
10	MHEX / L20D	2174 / 252	2174 / 252	2174 / 252	2174 / 252
11	ECL-ARP / PRI-BYN	687 / 946	687 / 946	687 / 946	687 / 946
12	MWSI / MNEX	1633 / 3049	1633 / 3049	1633 / 3049	1633 / 3049
13	D602F / F601C	1749 / 1254	1749 / 1254	1749 / 1254	1749 / 1254
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	164 / 151	164 / 151	164 / 151	164 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	325 / 43	325 / 43	325 / 43	325 / 43
19	Forbes SVC / MSC	14 / 600	14 / 600	14 / 600	14 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045
22	Roseau 500/Forbes 500	1.062 / 1.029	1.062 / 1.029	1.062 / 1.029	1.062 / 1.029
23	Chisago 500/EauClaire 345	1.030 / 1.020	1.030 / 1.020	1.030 / 1.020	1.030 / 1.020
24	Int Falls 115/Badoura 115	1.052 / 1.008	1.052 / 1.008	1.052 / 1.008	1.052 / 1.008
25	Drayton 230/Groton 345	1.014 / 1.000	1.014 / 1.000	1.014 / 1.000	1.014 / 1.000
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	154% / 256%	154% / 256%	154% / 256%	154% / 256%
28	L20D at Prairie/Drayton	999% / 788%	999% / 788%	999% / 788%	999% / 788%
29	R50M/F3M	793% / 348%	793% / 348%	793% / 348%	793% / 348%
30	B10T	336%	336%	336%	336%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.02	0.98 | 1.04	1.01 | 1.04	0.97 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.07	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.01 | 1.05	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.04
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.97 | 1.04	0.99 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.98 | 1.03	0.99 | 1.04	1.00 | 1.02	0.99 | 1.04
40	Groton 345	0.95 | 1.01	0.95 | 1.00	0.98 | 1.00	0.93 | 1.01
41	Tioga 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.05 | 1.06	0.99 | 1.07
43	Watertown 345	0.96 | 1.02	0.96 | 1.01	0.99 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 6.51%	ANTEL3 / 1.21%	KING 3 / 8.26%	ANTEL3 / 51.55%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	175%	197%	307%	241%
55	K22W (max +dP @ t, d-ang)	7.4@(3.88317,3.5)	6.0@(4.14983,4.6)	0.0@(-0.01667,0.0)	17.7@(2.84988,-6.7)
56	K22W (max -dP @ t, d-ang)	40.8@(1.80826,27.4)	36.8@(1.89159,24.5)	24.0@(2.11658,15.8)	22.5@(0.94163,16.8)
57	K22W (max d-ang @ t, dP)	37.2@(19.92459,-24.4)	37.8@(20.00792,-22.9)	22.1@(20.00792,-14.5)	19.2@(1.18329,-17.0)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	111% / 194%	133% / 224%	150% / 249%	94% / 171%
61	L20D at Prairie/Drayton	999% / 580%	999% / 616%	999% / 684%	999% / 615%
62	R50M / F3M	610% / 348%	671% / 348%	736% / 348%	609% / 304%
63	B10T	168%	-366%	254%	149%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE

Site 5 (Watertown) - Iowa/Illinois Dispatch - S. Rock-Des Moines-Zion - Case S5C3IXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3IXD-pcs	upe-so04aa.S5C3IXD-pys	upe-so04aa.S5C3IXD-pyt	upe-so04aa.S5C3IXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 23:43	JUN 27 2002 23:59	JUN 28 2002 0:13	JUN 28 2002 0:28
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 308	2080 / 308	2080 / 308	2080 / 308
10	MHEX / L20D	2174 / 250	2174 / 250	2174 / 250	2174 / 250
11	ECL-ARP / PRI-BYN	732 / 934	732 / 934	732 / 934	732 / 934
12	MWSI / MNEX	1666 / 2955	1666 / 2955	1666 / 2955	1666 / 2955
13	D602F / F601C	1752 / 1242	1752 / 1242	1752 / 1242	1752 / 1242
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	165 / 150	165 / 150	165 / 150	165 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	323 / 39	323 / 39	323 / 39	323 / 39
19	Forbes SVC / MSC	14 / 600	14 / 600	14 / 600	14 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045	1.035 / 1.045
22	Roseau 500/Forbes 500	1.062 / 1.029	1.062 / 1.029	1.062 / 1.029	1.062 / 1.029
23	Chisago 500/EauClaire 345	1.030 / 1.009	1.030 / 1.009	1.030 / 1.009	1.030 / 1.009
24	Int Falls 115/Badoura 115	1.051 / 1.008	1.051 / 1.008	1.051 / 1.008	1.051 / 1.008
25	Drayton 230/Groton 345	1.015 / 1.000	1.015 / 1.000	1.015 / 1.000	1.015 / 1.000
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	154% / 255%	154% / 255%	154% / 255%	154% / 255%
28	L20D at Prairie/Drayton	999% / 796%	999% / 796%	999% / 796%	999% / 796%
29	R50M/F3M	787% / 349%	787% / 349%	787% / 349%	787% / 349%
30	B10T	336%	336%	336%	336%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.01	0.98 | 1.04	1.01 | 1.04	0.98 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.07	1.04 | 1.06	1.04 | 1.05	1.03 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.05	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.98 | 1.05	1.00 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.04	1.00 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.01	0.97 | 1.00	0.98 | 1.00	0.93 | 1.01
41	Tioga 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.03	1.00 | 1.04
42	Wahpeton 115	1.02 | 1.06	1.04 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.97 | 1.02	0.98 | 1.01	0.99 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / 0.94%	ANTEL3 / -22.16%	KING 3 / -1.21%	ANTEL3 / 46.67%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	149%	193%	297%	233%
55	K22W (max +dP @ t, d-ang)	9.1@(4.03316,3.7)	6.5@(4.23316,4.5)	0.0@(0.00000,0.0)	17.2@(3.39986,-4.8)
56	K22W (max -dP @ t, d-ang)	45.3@(1.82493,32.8)	38.0@(1.89992,26.5)	25.8@(2.16658,17.1)	22.6@(1.78326,11.6)
57	K22W (max d-ang @ t, dP)	48.4@(16.24964,-37.9)	42.0@(16.26631,-34.0)	24.2@(20.00792,-13.9)	19.2@(1.19995,-16.8)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	123% / 211%	137% / 231%	149% / 249%	98% / 175%
61	L20D at Prairie/Drayton	999% / 602%	999% / 634%	999% / 696%	999% / 631%
62	R50M / F3M	624% / 349%	673% / 349%	730% / 349%	613% / 311%
63	B10T	186%	194%	250%	180%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Iowa/Illinois Dispatch - P. Island-Columbia - Case S5C3IXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3IXE-pcs	upe-so04aa.S5C3IXE-pys	upe-so04aa.S5C3IXE-pyt	upe-so04aa.S5C3IXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 28 2002 0:43	JUN 28 2002 0:58	JUN 28 2002 1:12	JUN 28 2002 1:25
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 330	2081 / 330	2081 / 330	2081 / 330
10	MHEX / L20D	2172 / 240	2172 / 240	2172 / 240	2172 / 240
11	ECL-ARP / PRI-BYN	681 / 825	681 / 825	681 / 825	681 / 825
12	MWSI / MNEX	1995 / 2566	1995 / 2566	1995 / 2566	1995 / 2566
13	D602F / F601C	1769 / 1282	1769 / 1282	1769 / 1282	1769 / 1282
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 150	166 / 150	166 / 150	166 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	301 / 30	301 / 30	301 / 30	301 / 30
19	Forbes SVC / MSC	22 / 600	22 / 600	22 / 600	22 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026
23	Chisago 500/EauClaire 345	1.028 / 1.021	1.028 / 1.021	1.028 / 1.021	1.028 / 1.021
24	Int Falls 115/Badoura 115	1.050 / 1.002	1.050 / 1.002	1.050 / 1.002	1.050 / 1.002
25	Drayton 230/Groton 345	1.015 / 1.002	1.015 / 1.002	1.015 / 1.002	1.015 / 1.002
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	148% / 246%	148% / 246%	148% / 246%	148% / 246%
28	L20D at Prairie/Drayton	999% / 842%	999% / 842%	999% / 842%	999% / 842%
29	R50M/F3M	775% / 347%	775% / 347%	775% / 347%	775% / 347%
30	B10T	341%	341%	341%	341%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.91 | 1.01	1.00 | 1.04	1.02 | 1.04	0.97 | 1.06
33	Boise 115	1.02 | 1.06	1.03 | 1.07	1.04 | 1.06	1.02 | 1.06
34	Dorsey 230	1.03 | 1.07	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.97 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.01	0.97 | 1.01	0.99 | 1.00	0.94 | 1.01
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.04 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.05	1.03 | 1.06	1.05 | 1.06	0.99 | 1.06
43	Watertown 345	0.97 | 1.02	0.99 | 1.01	1.00 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 11.24%	SHERC3 / 22.11%	KING 3 / 18.75%	ANTEL3 / 54.11%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	192%	232%	358%	251%
55	K22W (max +dP @ t, d-ang)	5.0@(3.92483,4.7)	2.4@(4.06650,4.8)	0.0@(0.01667,0.0)	15.9@(2.81655,-6.1)
56	K22W (max -dP @ t, d-ang)	39.3@(1.79993,25.4)	27.7@(1.77493,16.7)	17.4@(2.09158,11.0)	21.4@(1.77493,10.1)
57	K22W (max d-ang @ t, dP)	33.3@(19.84959,-21.3)	21.8@(19.54959,-13.9)	14.9@(20.00792,-10.1)	18.3@(1.17495,-16.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 190%	121% / 207%	145% / 240%	91% / 164%
61	L20D at Prairie/Drayton	999% / 628%	999% / 680%	999% / 762%	999% / 664%
62	R50M / F3M	608% / 347%	667% / 347%	734% / 347%	598% / 303%
63	B10T	182%	204%	279%	184%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Eastern Wisconsin Dispatch - S.Rock-Des Moines - Case S5C3WXB

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3WXB-pcs	upe-so04aa.S5C3WXB-pys	upe-so04aa.S5C3WXB-pyt	upe-so04aa.S5C3WXB-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 16:31	JUN 27 2002 16:48	JUN 27 2002 17:03	JUN 27 2002 17:18
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2082 / 322	2082 / 322	2082 / 322	2082 / 322
10	MHEX / L20D	2171 / 243	2171 / 243	2171 / 243	2171 / 243
11	ECL-ARP / PRI-BYN	824 / 910	824 / 910	824 / 910	824 / 910
12	MWSI / MNEX	1734 / 2899	1734 / 2899	1734 / 2899	1734 / 2899
13	D602F / F601C	1762 / 1238	1762 / 1238	1762 / 1238	1762 / 1238
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-118 / -196	-118 / -196	-118 / -196	-118 / -196
16	R50M / OH>MP	166 / 151	166 / 151	166 / 151	166 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	300 / 31	300 / 31	300 / 31	300 / 31
19	Forbes SVC / MSC	25 / 600	25 / 600	25 / 600	25 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.025	1.061 / 1.025	1.061 / 1.025	1.061 / 1.025
23	Chisago 500/EauClaire 345	1.027 / 0.977	1.027 / 0.977	1.027 / 0.977	1.027 / 0.977
24	Int Falls 115/Badoura 115	1.052 / 1.004	1.052 / 1.004	1.052 / 1.004	1.052 / 1.004
25	Drayton 230/Groton 345	1.015 / 1.001	1.015 / 1.001	1.015 / 1.001	1.015 / 1.001
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	150% / 248%	150% / 248%	150% / 248%	150% / 248%
28	L20D at Prairie/Drayton	999% / 824%	999% / 824%	999% / 824%	999% / 824%
29	R50M/F3M	771% / 348%	771% / 348%	771% / 348%	771% / 348%
30	B10T	339%	339%	339%	339%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	(7.71)0.78 | 1.05	0.93 | 1.08	0.98 | 1.02	0.95 | 1.05
33	Boise 115	1.01 | 1.08	1.02 | 1.08	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.07	0.99 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.95 | 1.05	0.99 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.97 | 1.05	1.00 | 1.05	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.07	1.00 | 1.07	1.02 | 1.04	0.97 | 1.07
38	Dickinson 345	0.98 | 1.08	0.98 | 1.07	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.95 | 1.05	0.97 | 1.04	1.01 | 1.03	1.00 | 1.04
40	Groton 345	0.94 | 1.04	0.96 | 1.02	0.98 | 1.00	0.94 | 1.01
41	Tioga 230	1.01 | 1.07	1.02 | 1.06	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.08	1.03 | 1.07	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.95 | 1.05	0.96 | 1.03	1.00 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		4246 [TRIPOLI3] 0.69	none	none	none
46		1318 [ARROWHD3] 0.76			
47		1319 [AHD PST] 0.81			
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -46.72%	ANTEL3 / -40.23%	KING 3 / -13.43%	ANTEL3 / 42.73%
53	Dorsey SUVP / UdHold	/ 17.716	/ 17.349		
54	Forbes DC Red (DCAR)	78%	186%	291%	216%
55	K22W (max +dP @ t, d-ang)	76.1@(20.00792,10.8)	64.8@(19.26626,3.9)	1.0@(4.62482,3.7)	18.5@(3.41652,-5.4)
56	K22W (max -dP @ t, d-ang)	61.6@(17.89962,86.8)	48.8@(17.09963,58.8)	27.2@(2.18324,18.4)	23.0@(1.79159,11.9)
57	K22W (max d-ang @ t, dP)	86.9@(17.85795,-60.4)	58.9@(17.16629,-48.6)	27.2@(16.52464,-22.5)	19.6@(1.20829,-16.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	116% / 200%	106% / 197%	143% / 238%	95% / 169%
61	L20D at Prairie/Drayton	999% / 571%	999% / 615%	999% / 719%	999% / 647%
62	R50M / F3M	597% / 290%	595% / 306%	712% / 348%	601% / 311%
63	B10T	202%	202%	265%	185%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 0)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - E. Wisconsin Dispatch - S. Rock-Adams-Columbia - Case S5C3WXC

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3WXC-pys	upe-so04aa.S5C3WXC-pys	upe-so04aa.S5C3WXC-pyt	upe-so04aa.S5C3WXC-mts
3	**Disturbance**	pys	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 17:48	JUN 27 2002 17:48	JUN 27 2002 18:03	JUN 27 2002 18:17
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 314	2080 / 314	2080 / 314	2080 / 314
10	MHEX / L20D	2174 / 247	2174 / 247	2174 / 247	2174 / 247
11	ECL-ARP / PRI-BYN	751 / 920	751 / 920	751 / 920	751 / 920
12	MWSI / MNEX	1672 / 3012	1672 / 3012	1672 / 3012	1672 / 3012
13	D602F / F601C	1757 / 1245	1757 / 1245	1757 / 1245	1757 / 1245
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	165 / 150	165 / 150	165 / 150	165 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	315 / 41	315 / 41	315 / 41	315 / 41
19	Forbes SVC / MSC	18 / 600	18 / 600	18 / 600	18 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.028	1.061 / 1.028	1.061 / 1.028	1.061 / 1.028
23	Chisago 500/EauClaire 345	1.029 / 1.005	1.029 / 1.005	1.029 / 1.005	1.029 / 1.005
24	Int Falls 115/Badoura 115	1.054 / 1.007	1.054 / 1.007	1.054 / 1.007	1.054 / 1.007
25	Drayton 230/Groton 345	1.015 / 1.000	1.015 / 1.000	1.015 / 1.000	1.015 / 1.000
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	152% / 252%	152% / 252%	152% / 252%	152% / 252%
28	L20D at Prairie/Drayton	999% / 808%	999% / 808%	999% / 808%	999% / 808%
29	R50M/F3M	781% / 353%	781% / 353%	781% / 353%	781% / 353%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.98 | 1.04	0.98 | 1.04	1.01 | 1.03	0.98 | 1.06
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.05 | 1.07	1.02 | 1.07
34	Dorsey 230	1.03 | 1.06	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.01 | 1.05	1.01 | 1.05	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	1.01 | 1.03	1.01 | 1.03	1.02 | 1.03	0.96 | 1.03
37	Coal Creek 230	1.00 | 1.06	1.00 | 1.06	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.99 | 1.04	0.99 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	0.99 | 1.03	1.00 | 1.03	0.99 | 1.03
40	Groton 345	0.96 | 1.00	0.96 | 1.00	0.98 | 1.00	0.93 | 1.01
41	Tioga 230	1.00 | 1.04	1.00 | 1.04	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.03 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.97 | 1.01	0.97 | 1.01	0.99 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -2.27%	ANTEL3 / -2.27%	KING 3 / 8.06%	ANTEL3 / 52.23%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	192%	192%	308%	240%
55	K22W (max +dP @ t, d-ang)	6.6@(4.14983,4.2)	6.6@(4.14983,4.2)	0.0@(-0.00833,0.0)	16.5@(2.85821,-6.5)
56	K22W (max -dP @ t, d-ang)	36.7@(1.89992,24.8)	36.7@(1.89992,24.8)	23.7@(2.10825,15.8)	22.3@(0.94163,16.7)
57	K22W (max d-ang @ t, dP)	38.7@(20.00792,-22.5)	38.7@(20.00792,-22.5)	22.4@(20.00792,-14.2)	19.2@(1.19162,-16.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	132% / 223%	132% / 223%	148% / 246%	93% / 167%
61	L20D at Prairie/Drayton	999% / 630%	999% / 630%	999% / 699%	999% / 633%
62	R50M / F3M	663% / 353%	663% / 353%	727% / 353%	600% / 308%
63	B10T	185%	185%	253%	174%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - E. Wisconsin Dispatch - S. Rock-Des Moines-Zion - Case S5C3WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3WXD-pcs	upe-so04aa.S5C3WXD-pys	upe-so04aa.S5C3WXD-pyt	upe-so04aa.S5C3WXD-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 18:32	JUN 27 2002 18:51	JUN 27 2002 19:09	JUN 27 2002 19:27
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2083 / 317	2083 / 317	2083 / 317	2083 / 317
10	MHEX / L20D	2172 / 246	2172 / 246	2172 / 246	2172 / 246
11	ECL-ARP / PRI-BYN	801 / 907	801 / 907	801 / 907	801 / 907
12	MWSI / MNEX	1708 / 2916	1708 / 2916	1708 / 2916	1708 / 2916
13	D602F / F601C	1758 / 1237	1758 / 1237	1758 / 1237	1758 / 1237
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-118 / -196	-118 / -196	-118 / -196	-118 / -196
16	R50M / OH>MP	165 / 151	165 / 151	165 / 151	165 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	309 / 36	309 / 36	309 / 36	309 / 36
19	Forbes SVC / MSC	21 / 600	21 / 600	21 / 600	21 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045	1.034 / 1.045
22	Roseau 500/Forbes 500	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026	1.061 / 1.026
23	Chisago 500/EauClaire 345	1.028 / 0.987	1.028 / 0.987	1.028 / 0.987	1.028 / 0.987
24	Int Falls 115/Badoura 115	1.053 / 1.006	1.053 / 1.006	1.053 / 1.006	1.053 / 1.006
25	Drayton 230/Groton 345	1.015 / 1.001	1.015 / 1.001	1.015 / 1.001	1.015 / 1.001
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	151% / 251%	151% / 251%	151% / 251%	151% / 251%
28	L20D at Prairie/Drayton	999% / 815%	999% / 815%	999% / 815%	999% / 815%
29	R50M/F3M	777% / 348%	777% / 348%	777% / 348%	777% / 348%
30	B10T	340%	340%	340%	340%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.85 | 1.00	0.95 | 1.04	0.99 | 1.03	0.97 | 1.05
33	Boise 115	1.02 | 1.07	1.04 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.98 | 1.07	1.03 | 1.06	1.04 | 1.05	1.03 | 1.06
35	Forbes 230	0.98 | 1.03	1.00 | 1.04	1.02 | 1.03	1.01 | 1.03
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.02 | 1.04	0.97 | 1.06
38	Dickinson 345	0.98 | 1.05	0.99 | 1.04	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.96 | 1.03	1.00 | 1.04	1.01 | 1.03	0.99 | 1.04
40	Groton 345	0.96 | 1.01	0.96 | 1.01	0.98 | 1.00	0.93 | 1.01
41	Tioga 230	1.01 | 1.06	1.02 | 1.05	1.03 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06	1.00 | 1.06
43	Watertown 345	0.97 | 1.02	0.97 | 1.02	1.00 | 1.01	0.95 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.78	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -27.08%	ANTEL3 / -31.85%	KING 3 / -5.88%	ANTEL3 / 45.47%
53	Dorsey SUVP / UdHold	/ 17.224			
54	Forbes DC Red (DCAR)	126%	191%	296%	226%
55	K22W (max +dP @ t, d-ang)	13.0@(19.56626,31.7)	11.9@(19.09960,21.6)	0.2@(4.59982,4.0)	17.7@(3.39986,-5.1)
56	K22W (max -dP @ t, d-ang)	50.4@(17.29963,65.0)	42.7@(16.79130,48.7)	26.2@(2.16658,17.6)	23.0@(1.79159,11.9)
57	K22W (max d-ang @ t, dP)	65.6@(17.04963,-49.8)	48.9@(16.65797,-41.7)	24.7@(16.26631,-20.1)	19.6@(1.20829,-17.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	103% / 194%	130% / 221%	145% / 243%	96% / 171%
61	L20D at Prairie/Drayton	999% / 601%	999% / 648%	999% / 711%	999% / 642%
62	R50M / F3M	592% / 348%	665% / 348%	722% / 348%	605% / 311%
63	B10T	197%	201%	265%	185%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.2 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Eastern Wisconsin Dispatch - P. Island-Columbia - Case S5C3WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3WXE-pcs	upe-so04aa.S5C3WXE-pys	upe-so04aa.S5C3WXE-pyt	upe-so04aa.S5C3WXE-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 27 2002 19:44	JUN 27 2002 19:59	JUN 27 2002 20:14	JUN 27 2002 20:27
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 339	2081 / 339	2081 / 339	2081 / 339
10	MHEX / L20D	2172 / 234	2172 / 234	2172 / 234	2172 / 234
11	ECL-ARP / PRI-BYN	748 / 787	748 / 787	748 / 787	748 / 787
12	MWSI / MNEX	2047 / 2503	2047 / 2503	2047 / 2503	2047 / 2503
13	D602F / F601C	1778 / 1273	1778 / 1273	1778 / 1273	1778 / 1273
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	167 / 150	167 / 150	167 / 150	167 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	290 / 30	290 / 30	290 / 30	290 / 30
19	Forbes SVC / MSC	26 / 600	26 / 600	26 / 600	26 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.025	1.060 / 1.025	1.060 / 1.025	1.060 / 1.025
23	Chisago 500/EauClaire 345	1.027 / 1.005	1.027 / 1.005	1.027 / 1.005	1.027 / 1.005
24	Int Falls 115/Badoura 115	1.053 / 1.000	1.053 / 1.000	1.053 / 1.000	1.053 / 1.000
25	Drayton 230/Groton 345	1.016 / 1.002	1.016 / 1.002	1.016 / 1.002	1.016 / 1.002
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	145% / 242%	145% / 242%	145% / 242%	145% / 242%
28	L20D at Prairie/Drayton	999% / 865%	999% / 865%	999% / 865%	999% / 865%
29	R50M/F3M	762% / 351%	762% / 351%	762% / 351%	762% / 351%
30	B10T	340%	340%	340%	340%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.90 | 1.01	1.00 | 1.04	1.02 | 1.03	0.97 | 1.06
33	Boise 115	1.03 | 1.06	1.03 | 1.07	1.05 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.07	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.99 | 1.03	1.01 | 1.04	1.02 | 1.03	1.01 | 1.04
36	Riverton 230	0.99 | 1.03	1.01 | 1.03	1.01 | 1.02	0.95 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.07	1.03 | 1.04	0.97 | 1.06
38	Dickinson 345	0.98 | 1.04	1.00 | 1.03	1.01 | 1.03	0.91 | 1.03
39	Drayton 230	0.99 | 1.03	1.00 | 1.03	1.01 | 1.02	1.00 | 1.04
40	Groton 345	0.96 | 1.01	0.97 | 1.01	0.99 | 1.00	0.94 | 1.01
41	Tioga 230	1.01 | 1.05	1.02 | 1.05	1.04 | 1.05	1.01 | 1.05
42	Wahpeton 115	1.02 | 1.05	1.03 | 1.05	1.05 | 1.05	0.99 | 1.06
43	Watertown 345	0.98 | 1.02	0.99 | 1.01	1.00 | 1.01	0.96 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 4.95%	SHERC3 / 22.72%	KING 3 / 17.82%	ANTEL3 / 54.83%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	172%	231%	364%	244%
55	K22W (max +dP @ t, d-ang)	6.8@(3.92483,4.2)	2.9@(4.06650,4.5)	0.0@(0.00000,0.0)	16.1@(2.82488,-6.3)
56	K22W (max -dP @ t, d-ang)	41.4@(1.79993,28.3)	27.4@(1.78326,16.4)	16.8@(2.08325,10.8)	21.4@(1.78326,10.0)
57	K22W (max d-ang @ t, dP)	38.5@(20.00792,-24.9)	21.4@(19.59126,-13.8)	14.6@(20.00792,-9.9)	18.5@(1.17495,-16.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	109% / 190%	118% / 202%	142% / 237%	88% / 160%
61	L20D at Prairie/Drayton	999% / 641%	999% / 696%	999% / 783%	999% / 679%
62	R50M / F3M	599% / 351%	655% / 351%	724% / 351%	586% / 304%
63	B10T	184%	203%	280%	184%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 1 | 1) / (2 | 2 | 2)

Table 4.4 - Results from Prony Analyses Without and With Reinforcements

S1C1 Cases - Transfer to Iowa/Illinois - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]		0.203	0.207	0.204	0.213
Damping [pu.]	(unstable)	(unstable)	0.024	(unstable)	0.044

S1C1 Cases - Transfer to Iowa/Illinois - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.196	0.207	0.206	0.208	0.216
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.050

S1C1 Cases - Transfer to Iowa/Illinois - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.203	0.206	0.211	0.207	0.218
Damping [pu.]	(unstable)	0.015	0.019	0.013	0.053

S1C1 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.209	0.204	0.210
Damping [pu.]	(unstable)	(unstable)	0.023	(unstable)	0.040

S1C1 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]		0.203	0.208	0.207	0.216
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.051

S1C1 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.200	0.205	0.211	0.207	0.217
Damping [pu.]	(unstable)	0.003	0.023	0.009	0.057

S1C5 Cases - Transfer to Iowa/Illinois - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]		0.195	0.215	0.199	0.215
Damping [pu.]	(unstable)	0.002	0.043	0.034	0.066

S1C5 Cases - Transfer to Iowa/Illinois - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]		0.199	0.206	0.202	0.218
Damping [pu.]	(unstable)	(unstable)	0.010	(unstable)	0.077

S1C5 Cases - Transfer to Iowa/Illinois - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.204	0.209	0.216	0.211	0.221
Damping [pu.]	0.024	0.048	0.044	0.050	0.087

Table 4.4 (Cont.)

S1C5 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.210	0.197	0.211
Damping [pu.]	(unstable)	(unstable)	0.030	(unstable)	0.053

S1C5 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.212	0.198	0.218
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.060

S1C5 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.200	0.206	0.215	0.209	0.220
Damping [pu.]	0.003	0.025	0.030	0.039	0.084

S2C4 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.212		0.207
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.054

S2C4 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.208		0.219
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.056

S2C4 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.197	0.201	0.210	0.205	0.221
Damping [pu.]	(unstable)	(unstable)	0.003	(unstable)	0.069

S3C3 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.214		0.206
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.047

S3C3 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.209		0.220
Damping [pu.]	(unstable)	(unstable)	(unstable)	(unstable)	0.054

S3C3 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.203	0.202	0.212	0.205	0.222
Damping [pu.]	(unstable)	(unstable)	0.006	(unstable)	0.071

Table 4.4 (Cont.)

S3C4 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]		0.194	0.215	0.199	0.215
Damping [pu.]	(unstable)	(unstable)	0.040	(unstable)	0.052

S3C4 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]		0.201	0.213	0.203	0.221
Damping [pu.]	(unstable)	(unstable)	0.022	(unstable)	0.071

S3C4 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.205	0.209	0.218	0.212	0.223
Damping [pu.]	0.004	0.029	0.058	0.033	0.080

S4C4 Cases - Transfer to Iowa/Illinois - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.204	0.207	0.220	0.210	0.220
Damping [pu.]	0.032	0.046	0.076	0.058	0.085

S4C4 Cases - Transfer to Iowa/Illinois - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.208	0.211	0.218	0.213	0.222
Damping [pu.]	0.029	0.050	0.072	0.057	0.092

S4C4 Cases - Transfer to Iowa/Illinois - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.212	0.215	0.221	0.217	0.227
Damping [pu.]	0.053	0.069	0.083	0.074	0.104

S4C4 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.195	0.201	0.219	0.207	0.218
Damping [pu.]	0.018	0.030	0.075	0.042	0.082

S4C4 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.204	0.208	0.217	0.212	0.223
Damping [pu.]	0.011	0.034	0.074	0.039	0.093

S4C4 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.210	0.213	0.221	0.215	0.225
Damping [pu.]	0.042	0.062	0.084	0.067	0.103

Table 4.4 (Cont.)

S4C5 Cases - Transfer to Iowa/Illinois - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.199	0.205	0.219	0.209	0.219
Damping [pu.]	0.014	0.032	0.068	0.044	0.076

S4C5 Cases - Transfer to Iowa/Illinois - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.205	0.209	0.217	0.212	0.222
Damping [pu.]	0.013	0.037	0.060	0.041	0.084

S4C5 Cases - Transfer to Iowa/Illinois - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.211	0.214	0.220	0.216	0.224
Damping [pu.]	0.040	0.056	0.072	0.060	0.093

S4C5 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.195	0.198	0.217	0.205	0.217
Damping [pu.]	(unstable)	0.014	0.060	0.028	0.065

S4C5 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.200	0.207	0.217	0.210	0.222
Damping [pu.]	(unstable)	0.018	0.054	0.030	0.081

S4C5 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.208	0.212	0.220	0.214	0.224
Damping [pu.]	0.029	0.050	0.071	0.054	0.091

S5C3 Cases - Transfer to Iowa/Illinois - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.217	0.205	0.218
Damping [pu.]	(unstable)	(unstable)	0.047	0.021	0.061

S5C3 Cases - Transfer to Iowa/Illinois - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.214	0.207	0.222
Damping [pu.]	(unstable)	(unstable)	0.019	0.007	0.067

S5C3 Cases - Transfer to Iowa/Illinois - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.209	0.212	0.219	0.215	0.223
Damping [pu.]	0.020	0.039	0.054	0.040	0.082

Table 4.4 (Cont.)

S5C3 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.214		0.215
Damping [pu.]	(unstable)	(unstable)	0.035	(unstable)	0.046

S5C3 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]			0.213		0.221
Damping [pu.]	(unstable)	(unstable)	0.019	(unstable)	0.067

S5C3 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	S. Rock-Des Moines 345 kV	2xS.Rock-Adms-Clmbia 345 kV	S.Rock-D.Mnes-Zion 345 kV	P.Island-Columbia 345 kV
Frequency [Hz]	0.205	0.209	0.218	0.213	0.223
Damping [pu.]	(unstable)	0.025	0.053	0.034	0.074

Table 4.5
Loadflow and Dynamic Models for -100/+300 Mvar SVC at Red Rock 345 kV

```
UPE-SO04AA.S2C4WB3.SAV; S2C4WX3 + RED ROCK SVC(-100-300MVA)
ND=3031,MH=2176,MW=1815,OHMH=-196,OHMP=150,EWTW=-119,BD=164

DATA FOR BUS  1742 [REDROCK3 345] RESIDING IN AREA  23, ZONE 325, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.02264  52.91

MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
 2 1.02264 1.02264     0.00  1:-100.00 1: 300.00

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1604 PR ISLD3 345  1   0.00170  0.01590  0.26996  1  T  1165.0 1165.0 1281.0    0.0       1 1.000
 1604 PR ISLD3 345  2   0.00170  0.01560  0.27194  1  T  1165.0 1165.0 1281.0    0.0       1 1.000
 1695 AS KING3 345  1   0.00140  0.01230  0.21292  1  T  1165.0 1165.0 1281.0    0.0       1 1.000
 1724 INVRHLS3 345  1   0.00050  0.00430  0.07107  1  T  1165.0 1165.0 1281.0    0.0       1 1.000
 1743 REDROCK4 230  1   0.00060  0.03020  0.00000  1  F   336.0  336.0  436.0    0.0       1 1.000
 1744 REDROCK7 115  1   0.00050  0.02390  0.00000  1  F   448.0  448.0  582.0    0.0       1 1.000
 1744 REDROCK7 115  2   0.00170  0.02760  0.00000  1  F   448.0  448.0  582.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 1743 1  F 1.00000   0.0 0      0 1.5000 0.5100 1.5000 0.5100 0.00000
 1744 1  F 1.00000   0.0 0      0 1.5000 0.5100 1.5000 0.5100 0.00000
 1744 2  F 1.00000   0.0 0      0 1.5000 0.5100 1.5000 0.5100 0.00000

            *** CALL PHASOR(  6413, 40197, 14998,  5467) ***

  FROM     TO    CKT   I C O N S      C O N S     S T A T E S      V A R S
  1604   1235      1   6413-  6420  40197- 40202  14998- 15001   5467-  5471
  1853  92494      1

             WPLL     TM     T2AV    T2DP  ALPHA    GAIN
             0.197  0.020    3.37    3.37   0.00   0.0050


               *** CALL CSSCS1(  6410, 40188, 14995,  5462) ***

      BUS   NAME  BSKV   I C O N S      C O N S     S T A T E S     V A R S
     1742 REDROCK3 345   6410-6411    40188-40196   14995-14997    5462-5465

REMOTE BUS     K       T1      T2      T3      T4      T5    VMAX   VMIN   VOV
      0    40000.0   0.000   0.000   0.126   0.000   0.025    0.0    0.0  0.150
```

Table 4.6
Loadflow and Dynamic Models for 0/+400 Mvar SVCs at Arpin and Adams 345 kV Stations

```
UPE-SO04AA.S2C4WD3.SAV; S2C4WX3 + ADAMS&ARPIN SVCS(0-400)
 ND=3031,MH=2176,MW=1815,OHMH=-196,OHMP=150,EWTW=-119,BD=164

 DATA FOR BUS 92494 [ARP 345  345] RESIDING IN AREA 100, ZONE 141, OWNER   1:

 CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
  1     0.0     0.0    0.0    0.0     0.0     0.0     0.0   150.0 1.00000  11.20

 MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
  2 1.00000 1.00000     5.97  1: 400.00

 X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
  1853 EAU CL 3 345  1   0.00380  0.04040  0.68410  1  T  1195.0 1195.0 1195.0    0.0       1 1.000
 92495 ARP 138  138  1   0.00037  0.03616 -0.00150  1  T   336.0  336.0  336.0    0.0       1 1.000
 94195 ROCKY RN 345  1   0.00114  0.01068  0.17301  1  T   717.0  717.0 1895.0    0.0       1 1.000

   TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 92495 1  T 1.01278   0.0 1 -92495 1.1239 0.9196 1.0220 1.0040 0.00639

DATA FOR BUS  1601 [ADAMS  3 345] RESIDING IN AREA  23, ZONE 354, OWNER   1:

 CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
  1     0.0     0.0    0.0    0.0     0.0     0.0     0.0   240.0 1.00000  31.81

 MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
  2 1.00000 1.00000     5.27  1: 400.00

 X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
  1599 PL VLLY3 345  1   0.00093  0.00865  0.13993  1  T  1165.0 1165.0 1281.5    0.0       1 1.000
  2022 ADAMS  5 161  1   0.00080  0.04340  0.00000  1  T   300.0  300.0  357.0    0.0       1 1.000
  2022 ADAMS  5 161  2   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
  2050 HAZLTON3 345  1   0.00430  0.03883  0.62000  1  F   720.0 1236.0  792.0    0.0       1 1.000

   TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
  2022 1  F 0.94267   0.0 1   2022 1.0492 0.9010 1.0300 1.0150 0.00463
  2022 2  F 0.94267   0.0 1   2022 1.0492 0.9010 1.0300 1.0150 0.00463
```

Table 4.6 (Cont.)

```
             *** CALL PHASOR(  6417, 40206, 15001,  5473) ***

  FROM     TO    CKT   I C O N S      C O N S     S T A T E S      V A R S
  1604   1235      1   6417-  6424  40206- 40211  15001- 15004   5473-  5477
     0      0      0

            WPLL     TM     T2AV    T2DP  ALPHA   GAIN
            0.197  0.020    3.37    3.37   0.00   0.04


              *** CALL PHASOR(  6425, 40212, 15005,  5478) ***

  FROM     TO    CKT   I C O N S      C O N S     S T A T E S      V A R S
  1853  92494      1   6425-  6432  40212- 40217  15005- 15008   5478-  5482
     0      0      0

            WPLL     TM     T2AV    T2DP  ALPHA   GAIN
            0.197  0.020    3.37    3.37   0.00   0.04


              *** CALL CSSCS1(  6410, 40188, 14995,  5462) ***

     BUS   NAME  BSKV   I C O N S      C O N S     S T A T E S     V A R S
    1601 ADAMS  3 345   6410-6411    40188-40196   14995-14997    5462-5465

REMOTE BUS     K       T1      T2      T3      T4      T5    VMAX   VMIN   VOV
      0    40000.0   0.000   0.000   0.314   0.000   0.025    0.0    0.0  0.150


              *** CALL CSSCS1(  6414, 40197, 14998,  5468) ***

     BUS   NAME  BSKV   I C O N S      C O N S     S T A T E S     V A R S
   92494 ARP 345  345   6414-6415    40197-40205   14998-15000    5468-5471

REMOTE BUS     K       T1      T2      T3      T4      T5    VMAX   VMIN   VOV
      0    40000.0   0.000   0.000   0.370   0.000   0.025    0.0    0.0  0.150
```

TABLE 4.7 - POWER FLOW AND STABILITY SUMMARY TABLE

Site 2 (Jamestown) - E. Wisconsin Dispatch - -100/300 SVC @ Red Rock - Case S2C4WB3

1	**Case No.**	1	2	3
2	**Case Name**	upe-so04aa.S2C4WB3-pcs	upe-so04aa.S2C4WB3-pys	upe-so04aa.S2C4WB3-pyt
3	**Disturbance**	pcs	pys	pyt
4	**Prior Outage**	None	None	None
5	**Date/Time**	JUN 13 2002 17:56	JUN 14 2002 7:33	JUN 14 2002 7:58
6	**Comments**			
7				
8	**Steady State Flows**			
9	NDEX / EAST BIAS	3031 / 345	3031 / 345	3031 / 345
10	MHEX / L20D	2176 / 240	2176 / 240	2176 / 240
11	ECL-ARP / PRI-BYN	820 / 993	820 / 993	820 / 993
12	MWSI / MNEX	1813 / 3435	1813 / 3435	1813 / 3435
13	D602F / F601C	1814 / 1297	1814 / 1297	1814 / 1297
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	230 / 37	230 / 37	230 / 37
19	Forbes SVC / MSC	38 / 600	38 / 600	38 / 600
20	**Steady State Vltgs**			
21	Dorsey 500/Dorsey 230	1.036 / 1.045	1.036 / 1.045	1.036 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.019	1.064 / 1.019	1.064 / 1.019
23	Chisago 500/EauClaire 345	1.023 / 0.977	1.023 / 0.977	1.023 / 0.977
24	Int Falls 115/Badoura 115	1.051 / 0.999	1.051 / 0.999	1.051 / 0.999
25	Drayton 230/Groton 345	1.035 / 1.002	1.035 / 1.002	1.035 / 1.002
26	**SS OS Relay Margins**			
27	D602F at Forbes/Dorsey	138% / 227%	138% / 227%	138% / 227%
28	L20D at Prairie/Drayton	999% / 859%	999% / 859%	999% / 859%
29	R50M/F3M	732% / 349%	732% / 349%	732% / 349%
30	B10T	337%	337%	337%
31	**Min/MaxTransientVltg**			
32	Arrowhd 230	0.83 | 0.97	0.93 | 1.02	0.97 | 1.01
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05
35	Forbes 230	0.97 | 1.03	0.99 | 1.04	1.01 | 1.02
36	Riverton 230	0.99 | 1.02	1.00 | 1.03	1.01 | 1.02
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.06	1.02 | 1.04
38	Dickinson 345	0.99 | 1.04	0.99 | 1.03	1.00 | 1.03
39	Drayton 230	1.02 | 1.05	1.02 | 1.05	1.03 | 1.04
40	Groton 345	0.95 | 1.00	0.96 | 1.00	0.97 | 1.00
41	Tioga 230	1.00 | 1.04	1.00 | 1.04	1.01 | 1.03
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.04 | 1.06
43	Watertown 345	0.97 | 1.02	0.98 | 1.01	1.00 | 1.02
44	**Dynamic Voltage Warnings**			
45		4246 [TRIPOLI3] 0.69	none	none
46		1318 [ARROWHD3] 0.75		
47		1319 [AHD PST] 0.80		
48				
49				
50				
51				
52	Worst Case Angle Damping	ANTEL3 / -22.27%	ANTEL3 / -24.99%	KING 3 / 3.00%
53	Dorsey SUVP / UdHold			
54	Forbes DC Red (DCAR)	102%	138%	251%
55	K22W (max +dP @ t, d-ang)	5.8@(4.68315,9.5)	5.0@(4.66649,7.0)	0.0@(-0.01667,0.0)
56	K22W (max -dP @ t, d-ang)	51.4@(2.35824,36.0)	46.7@(2.24991,32.1)	31.3@(2.21657,20.8)
57	K22W (max d-ang @ t, dP)	54.0@(17.90795,-39.6)	45.9@(17.57462,-34.7)	26.1@(17.00796,-19.9)
58	**OS Rel Trip / Marg**			
59	MH - OH			
60	D602F at Forbes/Dorsey	120% / 200%	122% / 204%	131% / 218%
61	L20D at Prairie/Drayton	999% / 677%	999% / 712%	999% / 754%
62	R50M / F3M	605% / 349%	629% / 349%	669% / 349%
63	B10T	209%	207%	251%
64	**FSCAPS (SS/Unav/Final)**			
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.7 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jmstwn) - E.Wisc.Disp. - -100/300 SVC @ Red Rock + Stabilizer - Case S2C4WC3

1	**Case No.**	1	2	3
2	**Case Name**	upe-so04aa.S2C4WC3-pcs	upe-so04aa.S2C4WC3-pys	upe-so04aa.S2C4WC3-pyt
3	**Disturbance**	pcs	pys	pyt
4	**Prior Outage**	None	None	None
5	**Date/Time**	JUN 18 2002 10:01	JUN 18 2002 10:17	JUN 18 2002 10:33
6	**Comments**			
7				
8	**Steady State Flows**			
9	NDEX / EAST BIAS	3031 / 345	3031 / 345	3031 / 345
10	MHEX / L20D	2176 / 240	2176 / 240	2176 / 240
11	ECL-ARP / PRI-BYN	820 / 993	820 / 993	820 / 993
12	MWSI / MNEX	1813 / 3435	1813 / 3435	1813 / 3435
13	D602F / F601C	1814 / 1297	1814 / 1297	1814 / 1297
14	B10T / MH>SPC	164 / 97	164 / 97	164 / 97
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	230 / 37	230 / 37	230 / 37
19	Forbes SVC / MSC	38 / 600	38 / 600	38 / 600
20	**Steady State Vltgs**			
21	Dorsey 500/Dorsey 230	1.036 / 1.045	1.036 / 1.045	1.036 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.019	1.064 / 1.019	1.064 / 1.019
23	Chisago 500/EauClaire 345	1.023 / 0.977	1.023 / 0.977	1.023 / 0.977
24	Int Falls 115/Badoura 115	1.051 / 0.999	1.051 / 0.999	1.051 / 0.999
25	Drayton 230/Groton 345	1.035 / 1.002	1.035 / 1.002	1.035 / 1.002
26	**SS OS Relay Margins**			
27	D602F at Forbes/Dorsey	138% / 227%	138% / 227%	138% / 227%
28	L20D at Prairie/Drayton	999% / 859%	999% / 859%	999% / 859%
29	R50M/F3M	732% / 349%	732% / 349%	732% / 349%
30	B10T	337%	337%	337%
31	**Min/MaxTransientVltg**			
32	Arrowhd 230	0.83 | 0.97	0.94 | 1.02	0.98 | 1.01
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05
35	Forbes 230	0.97 | 1.03	0.99 | 1.04	1.01 | 1.02
36	Riverton 230	0.99 | 1.02	1.00 | 1.03	1.01 | 1.02
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.06	1.02 | 1.04
38	Dickinson 345	0.99 | 1.04	0.99 | 1.03	1.01 | 1.03
39	Drayton 230	1.02 | 1.05	1.02 | 1.05	1.03 | 1.04
40	Groton 345	0.95 | 1.00	0.96 | 1.00	0.98 | 1.00
41	Tioga 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.03
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.05 | 1.06
43	Watertown 345	0.97 | 1.02	0.98 | 1.02	1.00 | 1.02
44	**Dynamic Voltage Warnings**			
45		4246 [TRIPOLI3] 0.69	none	none
46		1318 [ARROWHD3] 0.75		
47		1319 [AHD PST] 0.80		
48				
49				
50				
51				
52	Worst Case Angle Damping	ANTEL3 / -23.16%	ANTEL3 / -28.05%	KING 3 / 11.82%
53	Dorsey SUVP / UdHold			
54	Forbes DC Red (DCAR)	98%	131%	251%
55	K22W (max +dP @ t, d-ang)	5.7@(4.61649,8.5)	6.1@(4.48316,4.9)	0.0@(-0.01667,0.0)
56	K22W (max -dP @ t, d-ang)	50.5@(2.34157,35.2)	45.4@(2.24157,30.3)	28.4@(2.19158,18.1)
57	K22W (max d-ang @ t, dP)	53.0@(17.99128,-38.8)	45.6@(17.41629,-35.3)	24.9@(20.00792,-14.3)
58	**OS Rel Trip / Marg**			
59	MH - OH			
60	D602F at Forbes/Dorsey	118% / 198%	120% / 201%	129% / 214%
61	L20D at Prairie/Drayton	999% / 674%	999% / 710%	999% / 749%
62	R50M / F3M	604% / 349%	627% / 349%	664% / 349%
63	B10T	206%	204%	246%
64	**FSCAPS (SS/Unav/Final)**			
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.7 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jmstwn) - E.Wisc.Disp. - 0/400 SVCs @ Adams and Arpin - Case S2C4WD3

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WD3-pcs	upe-so04aa.S2C4WD3-pys	upe-so04aa.S2C4WD3-pyt	upe-so04aa.S2C4WD3-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 17 2002 9:18	JUN 17 2002 9:34	JUN 17 2002 9:49	JUN 17 2002 10:03
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3031 / 347	3031 / 347	3031 / 347	3031 / 347
10	MHEX / L20D	2173 / 241	2173 / 241	2173 / 241	2173 / 241
11	ECL-ARP / PRI-BYN	839 / 1002	839 / 1002	839 / 1002	839 / 1002
12	MWSI / MNEX	1841 / 3434	1841 / 3434	1841 / 3434	1841 / 3434
13	D602F / F601C	1813 / 1292	1813 / 1292	1813 / 1292	1813 / 1292
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	233 / 35	233 / 35	233 / 35	233 / 35
19	Forbes SVC / MSC	36 / 600	36 / 600	36 / 600	36 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999
24	Int Falls 115/Badoura 115	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998
25	Drayton 230/Groton 345	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 228%	139% / 228%	139% / 228%	139% / 228%
28	L20D at Prairie/Drayton	999% / 848%	999% / 848%	999% / 848%	999% / 848%
29	R50M/F3M	734% / 349%	734% / 349%	734% / 349%	734% / 349%
30	B10T	333%	333%	333%	333%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.83 | 0.97	0.95 | 1.02	0.99 | 1.02	0.95 | 1.05
33	Boise 115	1.02 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	0.99 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.97 | 1.02	0.99 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.98 | 1.02	1.00 | 1.03	1.01 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.98 | 1.04	0.99 | 1.03	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	1.01 | 1.05	1.02 | 1.05	1.03 | 1.04	1.02 | 1.05
40	Groton 345	0.94 | 1.00	0.96 | 1.00	0.98 | 1.00	0.91 | 1.01
41	Tioga 230	0.99 | 1.04	0.99 | 1.04	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.04 | 1.06	0.98 | 1.06
43	Watertown 345	0.97 | 1.02	0.98 | 1.01	1.00 | 1.02	0.94 | 1.03
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.74	none	none	none
46		1319 [AHD PST] 0.79			
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -4.86%	SHERC3 / 13.91%	KING 3 / 25.24%	KING 3 / 61.05%
53	Dorsey SUVP / UdHold	/ 17.266			
54	Forbes DC Red (DCAR)	160%	204%	311%	266%
55	K22W (max +dP @ t, d-ang)	5.5@(4.10816,4.4)	4.7@(4.12483,3.6)	0.0@(-0.01667,0.0)	17.0@(2.82488,-6.5)
56	K22W (max -dP @ t, d-ang)	48.7@(1.85826,36.5)	39.2@(1.89159,27.3)	25.6@(2.13325,16.1)	23.0@(0.94163,16.0)
57	K22W (max d-ang @ t, dP)	46.9@(16.72463,-40.0)	28.2@(1.65827,-36.2)	16.6@(1.89992,-24.3)	18.3@(1.18329,-17.2)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	103% / 189%	114% / 193%	129% / 213%	76% / 141%
61	L20D at Prairie/Drayton	999% / 650%	999% / 681%	999% / 746%	873% / 641%
62	R50M / F3M	588% / 349%	607% / 349%	666% / 349%	549% / 292%
63	B10T	189%	183%	245%	160%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 1 | 1)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.7 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jmstwn) - E.Wisc.Disp. - 0/400 SVCs @ Adams/Arpin + Stabilizer - Case S2C4WE3

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WE3-pcs	upe-so04aa.S2C4WE3-pys	upe-so04aa.S2C4WE3-pyt	upe-so04aa.S2C4WE3-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 18 2002 7:49	JUN 18 2002 8:04	JUN 18 2002 8:19	JUN 18 2002 8:33
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3031 / 347	3031 / 347	3031 / 347	3031 / 347
10	MHEX / L20D	2173 / 241	2173 / 241	2173 / 241	2173 / 241
11	ECL-ARP / PRI-BYN	839 / 1002	839 / 1002	839 / 1002	839 / 1002
12	MWSI / MNEX	1841 / 3434	1841 / 3434	1841 / 3434	1841 / 3434
13	D602F / F601C	1813 / 1292	1813 / 1292	1813 / 1292	1813 / 1292
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	233 / 35	233 / 35	233 / 35	233 / 35
19	Forbes SVC / MSC	36 / 600	36 / 600	36 / 600	36 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999
24	Int Falls 115/Badoura 115	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998
25	Drayton 230/Groton 345	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 228%	139% / 228%	139% / 228%	139% / 228%
28	L20D at Prairie/Drayton	999% / 848%	999% / 848%	999% / 848%	999% / 848%
29	R50M/F3M	734% / 349%	734% / 349%	734% / 349%	734% / 349%
30	B10T	333%	333%	333%	333%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.83 | 0.98	0.95 | 1.02	0.98 | 1.02	0.95 | 1.04
33	Boise 115	1.02 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.07
34	Dorsey 230	1.03 | 1.08	1.03 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.97 | 1.02	0.99 | 1.04	1.01 | 1.02	1.00 | 1.03
36	Riverton 230	0.98 | 1.02	1.00 | 1.02	1.01 | 1.02	0.94 | 1.03
37	Coal Creek 230	0.98 | 1.06	1.00 | 1.06	1.02 | 1.04	0.96 | 1.06
38	Dickinson 345	0.98 | 1.04	0.99 | 1.03	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	1.02 | 1.05	1.02 | 1.05	1.03 | 1.04	1.02 | 1.05
40	Groton 345	0.94 | 1.00	0.96 | 1.00	0.98 | 1.00	0.91 | 1.01
41	Tioga 230	0.99 | 1.04	1.00 | 1.04	1.01 | 1.03	0.99 | 1.04
42	Wahpeton 115	1.01 | 1.06	1.03 | 1.06	1.04 | 1.06	0.98 | 1.06
43	Watertown 345	0.97 | 1.02	0.98 | 1.01	1.00 | 1.02	0.94 | 1.03
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.74	none	none	none
46		1319 [AHD PST] 0.79			
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	ANTEL3 / -7.72%	ANTEL3 / 22.08%	KING 3 / 27.59%	KING 3 / 67.52%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	161%	204%	307%	268%
55	K22W (max +dP @ t, d-ang)	5.7@(4.63315,7.7)	2.5@(4.15816,5.1)	0.0@(-0.01667,0.0)	16.7@(2.82488,-6.3)
56	K22W (max -dP @ t, d-ang)	50.0@(1.86659,37.4)	39.3@(1.90825,27.2)	26.3@(2.15824,16.5)	22.9@(0.94163,15.9)
57	K22W (max d-ang @ t, dP)	43.2@(17.94962,-33.8)	28.2@(1.65827,-36.2)	16.9@(1.93325,-25.1)	18.2@(1.18329,-17.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	118% / 195%	114% / 193%	130% / 216%	76% / 141%
61	L20D at Prairie/Drayton	999% / 654%	999% / 681%	999% / 747%	873% / 642%
62	R50M / F3M	599% / 349%	608% / 349%	669% / 349%	550% / 292%
63	B10T	192%	183%	217%	161%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 1 | 1)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 2 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

Table 4.8
SVC Application Studies - Prony Analysis Results

S2C4 Cases - Transfer to Eastern Wisconsin - Contingency PCS (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	R.Rock SVC	R.Rock SVC With Stabilizer	Arpin & Adams SVCs	Arpin & Adams SVCs With PSS
Frequency (Hz)		0.189	0.185	0.199	0.184
Damping (pu)	(unstable)	0.048	0.060	0.049	0.065

S2C4 Cases - Transfer to Eastern Wisconsin - Contingency PYS (Minimum Damping Ratio = 0.016766)

Transmission Reinforcement	None	R.Rock SVC	R.Rock SVC With Stabilizer	Arpin & Adams SVCs	Arpin & Adams SVCs With PSS
Frequency (Hz)		0.195	0.194	0.215	0.213
Damping (pu)	(unstable)	0.035	0.039	0.052	0.138

S2C4 Cases - Transfer to Eastern Wisconsin - Contingency PYT (Minimum Damping Ratio = 0.0081633)

Transmission Reinforcement	None	R.Rock SVC	R.Rock SVC With Stabilizer	Arpin & Adams SVCs	Arpin & Adams SVCs With PSS
Frequency (Hz)		0.204	0.202	0.220	0.219
Damping (pu)	(unstable)	0.075	0.074	0.103	0.271

Table 4.9
Application of Series Compensation - 50% SC of Reinforcement "C" (S.Rock-Columbia 345 kV dbl-ckt) - Case S3C3W3C

```
UPE-SO04AA.S3C3W3C.SAV; S3C3W2C + 50% SERIESCOMP SROCK-COL
ND=2662,MH=2170,MW=1695,OHMH=-198,OHMP=149,EWTW=-121,BD=167

DATA FOR BUS  1634 [SPLT RK3 345] RESIDING IN AREA  23, ZONE 353, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.02206  36.30

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1684 SPLTRKY11.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
 1686 SPLTRKY21.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
 2010 LAKEFLD3 345  1   0.00301  0.02176  0.47410  1  F   680.0 1159.0  748.0    0.0       1 1.000
 2010 LAKEFLD3 345  2   0.00301  0.02176  0.47410  1  F   680.0 1159.0  748.0    0.0       1 1.000
45641 SPLTRTA3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000
45646 SPLTRTB3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 1684 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
 1686 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625

DATA FOR BUS  2010 [LAKEFLD3 345] RESIDING IN AREA  31, ZONE  25, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01493  32.17

MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
 1 1.04000 1.02000     0.00  3: -25.00

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1601 ADAMS  3 345  1   0.00538  0.03886  0.84656  1  F   680.0 1159.0  748.0    0.0       1 1.000
 1601 ADAMS  3 345  2   0.00538  0.03886  0.84656  1  F   680.0 1159.0  748.0    0.0       1 1.000
 1634 SPLT RK3 345  1   0.00301  0.02176  0.47410  1  T   680.0 1159.0  748.0    0.0       1 1.000
 1634 SPLT RK3 345  2   0.00301  0.02176  0.47410  1  T   680.0 1159.0  748.0    0.0       1 1.000
 1889 LKFLDXL3 345  1   0.00100  0.00960  0.15547  1  F  1165.0 1165.0 1281.0    0.0       1 1.000
 2011 LAKEFLD5 161  1   0.00000  0.03400  0.00000  1  T   250.0  250.0  312.0    1.0       1 1.000
 2011 LAKEFLD5 161  2   0.00000  0.02736  0.00000  1  T   336.0  420.0  336.0    0.0       1 1.000
 2330 RAUN   3 345  1   0.00590  0.05830  0.93020  1  F   720.0  720.0  792.0    1.0       1 1.000

X-------TO-------X CKT    LINE G,B (FROM)     LINE G,B (TO)   STATUS
 2330 RAUN   3 345  1    0.00000 -0.50000   0.00000  0.00000     1

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 2011 1  T 1.02817   0.0 1  -2011 1.0500 0.9500 1.0350 1.0170 0.00313
 2011 2  T 1.02817   0.0 1  -2011 1.0500 0.9500 1.0350 1.0170 0.00313
```

Table 4.9 (Cont.)

```
DATA FOR BUS  1601 [ADAMS  3 345] RESIDING IN AREA  23, ZONE 354, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.00239  24.78

MOD  VHI     VLO      SHUNT  X-------X X-------X X-------X X-------X X---- REMOTE ----X
 1 1.05000 1.01900     0.00  1: -50.00

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1599 PL VLLY3 345  1   0.00093  0.00865  0.13993  1  T  1165.0 1165.0 1281.5    0.0       1 1.000
 2010 LAKEFLD3 345  1   0.00538  0.03886  0.84656  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2010 LAKEFLD3 345  2   0.00538  0.03886  0.84656  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2022 ADAMS  5 161  1   0.00080  0.04340  0.00000  1  T   300.0  300.0  357.0    0.0       1 1.000
 2022 ADAMS  5 161  2   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
 2050 HAZLTON3 345  1   0.00430  0.03883  0.62000  1  F   720.0 1236.0  792.0    0.0       1 1.000
 2124 GENOA  3 345  1   0.00344  0.02487  0.54180  1  F   680.0 1159.0  748.0    0.0       1 1.000
 2124 GENOA  3 345  2   0.00344  0.02487  0.54180  1  F   680.0 1159.0  748.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 2022 1  F 0.94730   0.0 1   2022 1.0492 0.9010 1.0300 1.0150 0.00463
 2022 2  F 0.94730   0.0 1   2022 1.0492 0.9010 1.0300 1.0150 0.00463

DATA FOR BUS  2124 [GENOA  3 345] RESIDING IN AREA  26, ZONE  26, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01154  19.19

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1601 ADAMS  3 345  1   0.00344  0.02487  0.54180  1  T   680.0 1159.0  748.0    0.0       1 1.000
 1601 ADAMS  3 345  2   0.00344  0.02487  0.54180  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2123 GENOA  5 161  1   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
 2123 GENOA  5 161  2   0.00080  0.04340  0.00000  1  F   300.0  300.0  357.0    0.0       1 1.000
92270 COL 345  345  1   0.00430  0.03108  0.67725  1  F   680.0 1159.0  748.0    0.0       1 1.000
92270 COL 345  345  2   0.00430  0.03108  0.67725  1  F   680.0 1159.0  748.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 2123 1  F 1.00000   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
 2123 2  F 1.00000   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
```

Table 4.9 (Cont.)
Application of Series Compensation - 50% SC of Reinforcement "D" (S.Rock-Des Moines-Zion 345 kV) - Case S3C3W3D

```
UPE-SO04AA.S3C3W3D.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2664,MH=2171,MW=1650,OHMH=-197,OHMP=150,EWTW=-120,BD=167

DATA FOR BUS  1634 [SPLT RK3 345] RESIDING IN AREA  23, ZONE 353, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.02171  38.22

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1684 SPLTRKY11.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
 1686 SPLTRKY21.00  1   0.00031  0.03588  0.00000  1  F   450.0  450.0  585.0    0.0       1 1.000
 2400 SE POLK3 345  1   0.00946  0.06840  1.48995  1  F   680.0 1159.0  748.0    0.0       1 1.000
45641 SPLTRTA3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000
45646 SPLTRTB3 345  1   0.00020  0.00250  0.04329  1  T   717.0 1308.0  789.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 1684 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625
 1686 1  F 1.02600   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625

DATA FOR BUS  2400 [SE POLK3 345] RESIDING IN AREA  30, ZONE  50, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.01587  15.76

ID ST   PLOAD   QLOAD     I - L O A D     Y - L O A D  AREA  ZONE OWNER
M4  1     0.0     0.0     0.0     0.0     0.0     0.0    30    50     1

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1634 SPLT RK3 345  1   0.00946  0.06840  1.48995  1  T   680.0 1159.0  748.0    0.0       1 1.000
 2406 MADISON3 345  1   0.00108  0.01039  0.16050  1  T   926.0 1270.0  926.0    0.0       1 1.000
 2412 BONDRNT3 345  1   0.00056  0.00541  0.08320  1  F   926.0 1270.0  926.0    0.0       1 1.000
34152 ZION ; B 345  1   0.01354  0.09790  2.13334  1  F   680.0 1159.0  748.0    0.0       1 1.000
60412 SE MID 5 161  1   0.00000 -0.00430  0.00000  1  F   560.0  560.0  560.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
60412 1  F 1.00000   0.0 0      0 1.5000 0.5000 1.5000 0.5000 0.00000
```

TABLE 4.10 - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E.Wisc.Disp. - S. Rock-Adams-Columbia With 50% SC - Case S3C3W3C

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W3C-pcs	upe-so04aa.S3C3W3C-pys	upe-so04aa.S3C3W3C-pyt	upe-so04aa.S3C3W3C-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 14 2002 16:38	JUN 14 2002 16:54	JUN 14 2002 17:10	JUN 14 2002 17:25
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2668 / 279	2668 / 279	2668 / 279	2668 / 279
10	MHEX / L20D	2171 / 261	2171 / 261	2171 / 261	2171 / 261
11	ECL-ARP / PRI-BYN	683 / 962	683 / 962	683 / 962	683 / 962
12	MWSI / MNEX	1646 / 3264	1646 / 3264	1646 / 3264	1646 / 3264
13	D602F / F601C	1769 / 1378	1769 / 1378	1769 / 1378	1769 / 1378
14	B10T / MH>SPC	167 / 99	167 / 99	167 / 99	167 / 99
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	159 / 150	159 / 150	159 / 150	159 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	288 / 124	288 / 124	288 / 124	288 / 124
19	Forbes SVC / MSC	31 / 600	31 / 600	31 / 600	31 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.024 / 1.017	1.024 / 1.017	1.024 / 1.017	1.024 / 1.017
24	Int Falls 115/Badoura 115	1.050 / 1.008	1.050 / 1.008	1.050 / 1.008	1.050 / 1.008
25	Drayton 230/Groton 345	1.027 / 0.981	1.027 / 0.981	1.027 / 0.981	1.027 / 0.981
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	147% / 244%	147% / 244%	147% / 244%	147% / 244%
28	L20D at Prairie/Drayton	999% / 769%	999% / 769%	999% / 769%	999% / 769%
29	R50M/F3M	775% / 347%	775% / 347%	775% / 347%	775% / 347%
30	B10T	333%	333%	333%	333%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.92 | 1.02	0.98 | 1.05	1.00 | 1.03	0.97 | 1.06
33	Boise 115	1.03 | 1.07	1.03 | 1.07	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	1.03 | 1.08	0.98 | 1.06	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	1.00 | 1.03	1.00 | 1.04	1.01 | 1.03	1.00 | 1.04
36	Riverton 230	0.99 | 1.03	1.00 | 1.04	1.01 | 1.03	0.96 | 1.03
37	Coal Creek 230	0.99 | 1.05	1.00 | 1.05	1.02 | 1.04	0.97 | 1.05
38	Dickinson 345	0.97 | 1.04	0.98 | 1.06	1.00 | 1.03	0.90 | 1.03
39	Drayton 230	1.01 | 1.05	0.99 | 1.04	1.02 | 1.03	1.01 | 1.04
40	Groton 345	0.90 | 0.99	0.90 | 0.98	0.93 | 0.97	0.88 | 0.99
41	Tioga 230	1.00 | 1.04	1.00 | 1.04	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.02 | 1.06	1.03 | 1.06	1.04 | 1.06	1.00 | 1.06
43	Watertown 345	0.93 | 1.01	0.93 | 1.01	0.96 | 1.00	0.92 | 1.01
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 6.08%	SHERC3 / -11.14%	SHERC3 / -3.63%	ANTEL3 / 48.02%
53	Dorsey SUVP / UdHold		/ 16.341		
54	Forbes DC Red (DCAR)	139%	161%	276%	255%
55	K22W (max +dP @ t, d-ang)	7.8@(3.83317,1.7)	17.0@(18.04961,11.0)	0.9@(4.37482,3.1)	18.4@(2.88321,-8.3)
56	K22W (max -dP @ t, d-ang)	41.1@(1.80826,26.7)	39.3@(15.97465,41.7)	26.9@(2.14991,17.9)	27.0@(0.89997,17.3)
57	K22W (max d-ang @ t, dP)	37.6@(19.79125,-29.6)	44.4@(20.00792,-34.6)	26.1@(20.00792,-18.1)	21.8@(1.21662,-17.5)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	100% / 176%	96% / 185%	141% / 233%	81% / 150%
61	L20D at Prairie/Drayton	999% / 537%	999% / 567%	999% / 663%	999% / 560%
62	R50M / F3M	599% / 347%	611% / 347%	708% / 347%	579% / 297%
63	B10T	157%	174%	247%	154%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.10 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisc.Disp. - S. Rock-Des Moines-Zion With 50% SC - Case S3C3W3D

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W3D-pcs	upe-so04aa.S3C3W3D-pys	upe-so04aa.S3C3W3D-pyt	upe-so04aa.S3C3W3D-mts
3	**Disturbance**	pcs	pys	pyt	mts
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 8:22	JUN 24 2002 8:39	JUN 24 2002 8:57	JUN 24 2002 9:12
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2977 / 283	2977 / 283	2977 / 283	2977 / 283
10	MHEX / L20D	2171 / 259	2171 / 259	2171 / 259	2171 / 259
11	ECL-ARP / PRI-BYN	733 / 915	733 / 915	733 / 915	733 / 915
12	MWSI / MNEX	1648 / 3237	1648 / 3237	1648 / 3237	1648 / 3237
13	D602F / F601C	1772 / 1374	1772 / 1374	1772 / 1374	1772 / 1374
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -197	-119 / -197	-119 / -197	-119 / -197
16	R50M / OH>MP	159 / 151	159 / 151	159 / 151	159 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	277 / 124	277 / 124	277 / 124	277 / 124
19	Forbes SVC / MSC	33 / 600	33 / 600	33 / 600	33 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021	1.060 / 1.021
23	Chisago 500/EauClaire 345	1.023 / 1.001	1.023 / 1.001	1.023 / 1.001	1.023 / 1.001
24	Int Falls 115/Badoura 115	1.049 / 1.006	1.049 / 1.006	1.049 / 1.006	1.049 / 1.006
25	Drayton 230/Groton 345	1.025 / 0.983	1.025 / 0.983	1.025 / 0.983	1.025 / 0.983
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	146% / 241%	146% / 241%	146% / 241%	146% / 241%
28	L20D at Prairie/Drayton	999% / 775%	999% / 775%	999% / 775%	999% / 775%
29	R50M/F3M	769% / 344%	769% / 344%	769% / 344%	769% / 344%
30	B10T	331%	331%	331%	331%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.87 | 1.05	0.94 | 1.08	0.99 | 1.03	0.97 | 1.05
33	Boise 115	1.02 | 1.09	1.01 | 1.09	1.04 | 1.06	1.02 | 1.08
34	Dorsey 230	0.98 | 1.08	0.97 | 1.07	1.04 | 1.05	1.02 | 1.06
35	Forbes 230	0.97 | 1.04	0.98 | 1.05	1.01 | 1.03	1.00 | 1.03
36	Riverton 230	0.99 | 1.05	0.99 | 1.05	1.01 | 1.03	0.97 | 1.03
37	Coal Creek 230	0.99 | 1.06	1.00 | 1.06	1.02 | 1.04	0.98 | 1.05
38	Dickinson 345	0.97 | 1.07	0.98 | 1.08	1.00 | 1.03	0.91 | 1.04
39	Drayton 230	0.99 | 1.05	0.99 | 1.05	1.02 | 1.03	1.01 | 1.04
40	Groton 345	0.89 | 1.01	0.89 | 1.02	0.94 | 0.98	0.88 | 0.99
41	Tioga 230	1.00 | 1.05	1.01 | 1.05	1.02 | 1.04	1.00 | 1.04
42	Wahpeton 115	1.02 | 1.07	1.02 | 1.08	1.04 | 1.06	1.00 | 1.06
43	Watertown 345	0.92 | 1.03	0.91 | 1.03	0.96 | 1.01	0.92 | 1.02
44	**Dynamic Voltage Warnings**				
45		1318 [ARROWHD3] 0.81	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / -21.07%	ANTEL3 / -39.22%	SHERC3 / -13.39%	KING 3 / 45.09%
53	Dorsey SUVP / UdHold	/ 16.324	/ 16.383		
54	Forbes DC Red (DCAR)	87%	158%	269%	248%
55	K22W (max +dP @ t, d-ang)	54.0@(18.69960,0.9)	69.9@(18.28294,-7.7)	1.7@(4.54982,3.1)	20.9@(2.83321,-10.0)
56	K22W (max -dP @ t, d-ang)	53.6@(11.73304,51.4)	50.8@(16.55797,53.8)	28.8@(2.20824,19.2)	23.9@(0.90830,15.9)
57	K22W (max d-ang @ t, dP)	60.1@(16.44131,-50.5)	54.9@(16.37464,-44.4)	29.3@(16.35797,-26.0)	19.0@(1.18329,-16.3)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	106% / 193%	98% / 185%	136% / 228%	81% / 150%
61	L20D at Prairie/Drayton	999% / 572%	999% / 561%	999% / 680%	999% / 576%
62	R50M / F3M	602% / 331%	590% / 311%	701% / 344%	584% / 292%
63	B10T	185%	190%	256%	161%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 3 | 3)
67	Prairie 115 / Ramsey 230	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 0 | 0)	(0 | 1 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

Table 4.11
Cases Without (S3C3W2A) and With (S3C5W2A) Phase Shifter at Arrowhead

```
UPE-SO04AA.S3C3W2A.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2652,MH=2172,MW=1752,OHMH=-197,OHMP=150,EWTW=-120,BD=167

DATA FOR BUS  1319 [AHD PST  230] RESIDING IN AREA  21, ZONE  21, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 0.99656  58.39

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1315 ARROWHD4 230  1   0.00035  0.01000  0.00000  1  T   750.0  750.0  750.0    0.0       1 1.000
 1318 ARROWHD3 345  1   0.00020  0.01000  0.00000  1  F   750.0  750.0  750.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 1315 1  T 1.00000   0.0 0      0   70.0  -70.0  610.0  590.0 0.00000                 2 0.00070 0.02000
 1318 1  F 1.00000   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625

IMPEDANCE CORRECTION TABLE  2 IS A FUNCTION OF TRANSFORMER PHASE SHIFT ANGLE
ENTRY 1      2      3      4      5      6      7
AN  -70.0  -43.0  -32.0    0.0   32.0   43.0   70.0
*F 1.0000 0.7800 0.8500 0.5000 0.8500 0.7800 1.0000

BUS  1318 ARROWHD3 345 AREA CKT    MW     MVAR     MVA  %I 0.9823PU  56.33 1318
                       21                                 338.90KV
 TO  1319 AHD PST  230  21  1   -353.9  -126.5   375.8  51 1.0000UN
 TO 94246 TRIPOLI3 345  83  1    684.5    93.5   690.8  59
 TO 99755 PRAIRIE5 345  14  1   -330.6    33.0   332.2  29
```

Table 4.11 (Cont.)

```
UPE-SO04AA.S3C5W2A.SAV;SAME AS S3C3W2A BUT WITH PS @ ARROWHD
ND=2652,MH=2172,MW=1752,OHMH=-197,OHMP=150,EWTW=-120,BD=167

DATA FOR BUS  1319 [AHD PST  230] RESIDING IN AREA  21, ZONE  21, OWNER   1:

CODE PLOAD   QLOAD   I - L O A D     Y - L O A D G-SHUNT B-SHUNT VOLTAGE  ANGLE
 1     0.0     0.0    0.0    0.0     0.0     0.0     0.0     0.0 1.00242  74.48

X-------TO-------X CKT   LINE R   LINE X CHARGING ST MET RATE-A RATE-B RATE-C LENGTH ZI OWN1 FRAC1 OWN2 FRAC2 OWN3 FRAC3 OWN4 FRAC4
 1315 ARROWHD4 230  1   0.00055  0.01569  0.00000  1  T   750.0  750.0  750.0    0.0       1 1.000
 1318 ARROWHD3 345  1   0.00020  0.01000  0.00000  1  F   750.0  750.0  750.0    0.0       1 1.000

  TO CKT TP RATIO  ANGLE RG  CONT   RMAX   RMIN   VMAX   VMIN   TSTP     CR      CX  TAB   NOMINAL R,X
 1315 1  T 1.00000 -26.0 1      0   70.0  -70.0  610.0  590.0 0.00000                 2 0.00070 0.02000
 1318 1  F 1.00000   0.0 1      0 1.5000 0.5100 1.5000 0.5100 0.00625

IMPEDANCE CORRECTION TABLE  2 IS A FUNCTION OF TRANSFORMER PHASE SHIFT ANGLE
ENTRY 1      2      3      4      5      6      7
AN  -70.0  -43.0  -32.0    0.0   32.0   43.0   70.0
*F 1.0000 0.7800 0.8500 0.5000 0.8500 0.7800 1.0000

BUS  1318 ARROWHD3 345 AREA CKT    MW     MVAR     MVA  %I 0.9960PU  71.03 1318
                       21                                  343.61KV
 TO SHUNT                          0.0  -188.5   188.5
 TO  1319 AHD PST  230  21  1   -601.8   -34.1   602.8  81 1.0000UN
 TO 94246 TRIPOLI3 345  83  1    812.8   267.9   855.8  72
 TO 99755 PRAIRIE5 345  14  1   -211.0   -45.3   215.8  19
```

Table 4.12
Results from Voltage Stability Analyses

CASE	S1C1IXE	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.	S2C4WXE	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.
MWSI	1940	2173	2173	2173	2173	2088	2338	2338	2338	2338
T Corners 115 kV	1.0403	1.027606	1.041904	1.030157	1.034701	1.025475	1.038882	1.02593	1.026666	0.995118
Stoneman 161 kV	1.011581	1.010186	1.011699	1.009155	1.008511	1.01093	1.009443	1.010921	1.004306	1.001779
Apple River 161 kV	1.015769	1.009809	0.999606	0.993371	0.989966	1.011361	1.004824	0.990098	0.978711	0.980834
Rock Elm 161 kV	1.007132	1.001714	0.986922	0.990611	0.985477	1.002403	0.996538	0.97366	0.976199	0.970971
Adams 345 kV	0.963027	0.954379	0.924088	0.934054	0.926727	0.962627	0.952834	0.920759	0.921565	0.915818
South Faribault 161 kV	1.005261	1.001874	0.943356	0.995797	0.994146	1.004258	1.000888	0.93872	0.990868	0.989299
Arrowhead 345 kV	1.028944	1.014707	1.000356	0.939444	1.010076	1.018583	1.001016	0.980836	0.862983	1.004379
Tripoli 345 kV	1.033988	1.013953	0.994885	0.976942	1.029878	1.024351	0.999656	0.971932	0.898279	1.032113

CASE	S3C3W2E	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.	S4C4IXA	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.
MWSI	2002	2243	2243	2243	2243	1653	1853	2338	2338	2338
T Corners 115 kV	1.04317	1.032556	1.02422	1.025898	Not Conv.	1.033362	1.048353	1.034958	1.024282	0.986235
Stoneman 161 kV	1.011433	1.00983	1.011548	1.007867	Not Conv.	1.008942	1.007541	1.007631	0.984826	0.975806
Apple River 161 kV	1.007405	1.000573	0.988753	0.98263	Not Conv.	1.011009	1.003697	0.985451	0.983419	0.988097
Rock Elm 161 kV	1.001811	0.995992	0.977006	0.980009	Not Conv.	1.001513	0.994929	0.960166	0.983281	0.978239
Adams 345 kV	0.966691	0.95774	0.922753	0.930569	Not Conv.	0.957249	0.936531	0.889761	0.902475	0.891052
South Faribault 161 kV	1.005697	1.002173	0.936659	0.994365	Not Conv.	1.003	1.001371	0.908131	0.995413	0.989692
Arrowhead 345 kV	1.003304	0.989516	0.978086	0.876845	Not Conv.	1.007544	0.987151	0.972566	0.840213	1.001197
Tripoli 345 kV	1.017008	0.991088	0.976681	0.869328	Not Conv.	1.007705	0.978538	0.970959	0.870938	1.032094

CASE	S4C5WXD	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.	S4C5WXE	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.
MWSI	1685	1889	1889	1889	1889	2018	2260	2260	2260	2260
T Corners 115 kV	1.050524	1.029964	1.02632	1.002692	0.961069	1.027751	1.043192	1.033952	1.02905	1.01254
Stoneman 161 kV	1.009106	1.007583	1.007831	0.976148	0.974337	1.010743	1.009458	1.010868	1.00586	1.002063
Apple River 161 kV	1.010545	1.001337	0.983439	0.972701	0.975067	1.013035	1.007725	0.996336	0.985381	0.986308
Rock Elm 161 kV	0.999248	0.990313	0.957332	0.967972	0.958212	1.002916	0.997618	0.981588	0.983517	0.977841
Adams 345 kV	0.960831	0.939944	0.901765	0.898141	0.890355	0.967729	0.959068	0.924064	0.932379	0.926194
South Faribault 161 kV	1.005409	1.003696	0.919064	0.992033	0.987273	1.005797	1.003726	0.944894	0.998435	0.997274
Arrowhead 345 kV	1.004099	0.983128	0.96162	0.801399	0.996275	1.015266	0.999326	0.981882	0.887204	1.006229
Tripoli 345 kV	1.005782	0.981547	0.952762	0.832501	1.000921	1.021036	0.998233	0.974271	0.922389	1.03064

CASE	S5C3WXE	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.
MWSI	2050	2297	2297	2297	2297
T Corners 115 kV	1.026433	1.044356	1.035109	1.030634	1.001269
Stoneman 161 kV	1.011014	1.009567	1.010992	1.007257	1.005239
Apple River 161 kV	1.011941	1.005401	0.99314	0.984991	0.985846
Rock Elm 161 kV	1.001684	0.996088	0.976877	0.97934	0.972937
Adams 345 kV	0.964498	0.95533	0.922906	0.930488	0.923763
South Faribault 161 kV	1.007056	1.004801	0.94111	0.998246	0.99563
Arrowhead 345 kV	1.025179	1.007466	0.990376	0.884739	1.007433
Tripoli 345 kV	1.028987	1.004388	0.979786	0.932248	1.030258

Table 4.12 (Cont.)
Results from Voltage Stability Analyses - SVC Application Studies

CASE	S2C4WB3	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp		S2C4WD3	All Lines In	Pr.Isl-Byrn	Kng-Eau-Arp	W/Ph.Shft.
MWSI	1815	2036	2036	2036		1843	2064	2064	2064	2064
T Corners 115 kV	1.03737	1.029298	Not Conv.	Not Conv.		1.046685	1.031803	1.043772	0.96762	0.935805
Stoneman 161 kV	1.008541	1.002052	Not Conv.	Not Conv.		1.008785	1.006614	1.008193	0.984395	0.972295
Apple River 161 kV	1.004057	0.990014	Not Conv.	Not Conv.		1.008314	1.001328	0.979916	0.974169	0.98059
Rock Elm 161 kV	0.995022	0.978705	Not Conv.	Not Conv.		0.998991	0.993255	0.962797	0.979912	0.979439
Adams 345 kV	0.950631	0.926369	Not Conv.	Not Conv.		1	1	1	1	1
South Faribault 161 kV	1.001043	0.996508	Not Conv.	Not Conv.		1.005846	1.002879	0.928456	0.999445	0.99737
Arrowhead 345 kV	0.996398	0.964292	Not Conv.	Not Conv.		1.009306	0.990559	0.957105	0.776243	1.001898
Tripoli 345 kV	0.988519	0.953731	Not Conv.	Not Conv.		1.024631	1.002805	0.972729	0.832616	1.025666

Table 4.13
Interface Flows for Site 5 (Watertown) Selected Alternatives

ALTERNATIVE	MHEX	NDEX	MWSI	PI-BYN	EAU-ARP	PI-CLMBIA
S1C1IXE	2172.9	2980.8	1940.4	838.6	657.4	464.1
S2C4WXE	2173.1	3015.3	2088.0	834.1	743.9	510.0
S2C4WD3	2173.6	3017.9	1843.8	1003.3	840.5	N/A
S3C3W2E	2172.4	2972.8	2002.3	805.4	707.7	489.1
S4C4IXA	2171.4	2079.6	1653.4	904.7	748.7	N/A
S4C5WXD	2171.4	2079.6	1685.5	896.5	789.0	N/A
S5C3WXE	2172.0	2080.8	2050.2	788.0	749.6	512.7

Table 4.14
Dynamic Testing Scenarios for Selected Alternatives

FAULT	DESCRIPTION
ag1	Single line to ground fault with breaker fail at Leland Olds on the Ft. Thompson 345 kV line.
ag3	Three phase fault at Leland Olds on the Ft. Thompson 345 kV line.
ei2	CU DC Permanent Bipole Fault with tripping of both Coal Creek units.
eq1	Single line to ground fault with breaker fail at Coal Creek on pole 1 with cross-trip of Coal Creek unit #2.
nbz	4 Cycle 3 phase fault on the Chisago County to Forbes 500 kV line D601C at Chisago County.
mqs	Single line to ground fault with breaker fail at Sherco with 8N28 stuck. Trip Sherco generator 3.
ch3	4 cycle 3 phase fault at Ft Thompson 345 kV. Clear the Ft Thompson – Grand Island 345 kV line
cs3	4 cycle 3 phase fault at Split Rock 345 kV. Clear the Split Rock – Sioux City 345 kV line

TABLE 4.15 - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - P. Island-Columbia - Case S1C1IXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S1C1IXE-ag1	upe-so04aa.S1C1IXE-ag3	upe-so04aa.S1C1IXE-ei2	upe-so04aa.S4C5WXD-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 12:10	JUN 24 2002 12:24	JUN 24 2002 12:38	JUN 24 2002 23:12
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2981 / 368	2981 / 368	2981 / 368	2079 / 320
10	MHEX / L20D	2172 / 217	2172 / 217	2172 / 217	2171 / 242
11	ECL-ARP / PRI-BYN	656 / 818	656 / 818	656 / 818	788 / 895
12	MWSI / MNEX	1937 / 2853	1937 / 2853	1937 / 2853	1683 / 2888
13	D602F / F601C	1823 / 1341	1823 / 1341	1823 / 1341	1769 / 1253
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-119 / -196
16	R50M / OH>MP	173 / 150	173 / 150	173 / 150	166 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	244 / 124	244 / 124	244 / 124	288 / 39
19	Forbes SVC / MSC	34 / 600	34 / 600	34 / 600	28 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.057 / 1.020	1.057 / 1.020	1.057 / 1.020	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.024 / 1.026	1.024 / 1.026	1.024 / 1.026	1.027 / 0.991
24	Int Falls 115/Badoura 115	1.051 / 0.994	1.051 / 0.994	1.051 / 0.994	1.052 / 1.001
25	Drayton 230/Groton 345	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992	1.013 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	132% / 222%	132% / 222%	132% / 222%	147% / 244%
28	L20D at Prairie/Drayton	999% / 969%	999% / 969%	999% / 969%	999% / 828%
29	R50M/F3M	724% / 348%	724% / 348%	724% / 348%	765% / 348%
30	B10T	335%	335%	335%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	1.00 | 1.05	1.00 | 1.05	1.00 | 1.08	1.00 | 1.05
33	Boise 115	1.02 | 1.07	1.02 | 1.07	1.01 | 1.07	1.03 | 1.07
34	Dorsey 230	1.02 | 1.06	1.02 | 1.06	1.02 | 1.06	1.03 | 1.06
35	Forbes 230	1.01 | 1.03	1.00 | 1.03	0.98 | 1.04	1.01 | 1.04
36	Riverton 230	0.97 | 1.04	0.96 | 1.04	0.91 | 1.06	0.97 | 1.05
37	Coal Creek 230	0.96 | 1.11	0.95 | 1.11	1.00 | 1.13	0.97 | 1.14
38	Dickinson 345	0.97 | 1.06	0.96 | 1.06	1.01 | 1.07	1.03 | 1.08
39	Drayton 230	0.99 | 1.09	0.98 | 1.09	0.94 | 1.10	1.00 | 1.07
40	Groton 345	0.84 | 1.03	0.82 | 1.02	0.78 | 1.08	0.90 | 1.03
41	Tioga 230	1.00 | 1.06	1.00 | 1.06	1.00 | 1.06	1.03 | 1.07
42	Wahpeton 115	0.96 | 1.10	0.94 | 1.10	0.88 | 1.12	0.97 | 1.11
43	Watertown 345	0.91 | 1.04	0.90 | 1.04	0.83 | 1.08	0.96 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	761 [MODEROW7] 1.21	none
46				1638 [SHEYNNE7] 1.21	
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 64.58%	SHERC3 / 59.89%	SHERC3 / -38.73%	SHERC3 / -65.34%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	313%	294%	498%	507%
55	K22W (max +dP @ t, d-ang)	10.2@(2.76655,-0.4)	13.4@(2.76655,-2.6)	58.5@(2.99987,-29.7)	36.4@(2.49990,-20.6)
56	K22W (max -dP @ t, d-ang)	18.8@(0.85830,6.3)	21.1@(0.84163,7.9)	5.5@(0.49165,0.4)	6.0@(0.32499,0.4)
57	K22W (max d-ang @ t, dP)	9.7@(1.18329,-7.3)	11.8@(1.17495,-9.7)	-141.2@(20.00792,24.1)	-83.2@(20.00792,16.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	77% / 142%	70% / 133%	55% / 107%	103% / 179%
61	L20D at Prairie/Drayton	999% / 753%	999% / 738%	564% / 568%	157% / 600%
62	R50M / F3M	573% / 271%	557% / 267%	524% / 223%	660% / 265%
63	B10T	211%	200%	109%	168%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 1 | 0)	(0 | 1 | 0)	(0 | 1 | 0)	(0 | 2 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 4 | 2) / (0 | 1 | 0)	(2 | 4 | 2) / (0 | 2 | 1)	(2 | 6 | 2) / (0 | 2 | 0)	(2 | 4 | 2) / (0 | 1 | 0)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 1 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 5 | 2) / (2 | 2 | 2)	(0 | 5 | 2) / (2 | 2 | 2)	(0 | 5 | 0) / (2 | 2 | 2)	(0 | 4 | 1) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 1 (Hettinger) - Iowa/Illinois Dispatch - P. Island-Columbia - Case S1C1IXE

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S1C1IXE-nbz	upe-so04aa.S1C1IXE-mqs	upe-so04aa.S1C1IXE-ch3	upe-so04aa.S1C1IXE-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 13:08	JUN 24 2002 13:55	JUN 24 2002 13:27	JUN 24 2002 13:42
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2981 / 368	2981 / 368	2981 / 368	2981 / 368
10	MHEX / L20D	2172 / 217	2172 / 217	2172 / 217	2172 / 217
11	ECL-ARP / PRI-BYN	656 / 818	656 / 818	656 / 818	656 / 818
12	MWSI / MNEX	1937 / 2853	1937 / 2853	1937 / 2853	1937 / 2853
13	D602F / F601C	1823 / 1341	1823 / 1341	1823 / 1341	1823 / 1341
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	173 / 150	173 / 150	173 / 150	173 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	244 / 124	244 / 124	244 / 124	244 / 124
19	Forbes SVC / MSC	34 / 600	34 / 600	34 / 600	34 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045	1.030 / 1.045
22	Roseau 500/Forbes 500	1.057 / 1.020	1.057 / 1.020	1.057 / 1.020	1.057 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 1.026	1.024 / 1.026	1.024 / 1.026	1.024 / 1.026
24	Int Falls 115/Badoura 115	1.051 / 0.994	1.051 / 0.994	1.051 / 0.994	1.051 / 0.994
25	Drayton 230/Groton 345	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992	1.023 / 0.992
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	132% / 222%	132% / 222%	132% / 222%	132% / 222%
28	L20D at Prairie/Drayton	999% / 969%	999% / 969%	999% / 969%	999% / 969%
29	R50M/F3M	724% / 348%	724% / 348%	724% / 348%	724% / 348%
30	B10T	335%	335%	335%	335%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.98 | 1.14	0.98 | 1.08	0.99 | 1.05	1.02 | 1.04
33	Boise 115	0.96 | 1.08	1.00 | 1.08	1.01 | 1.07	1.04 | 1.06
34	Dorsey 230	1.04 | 1.15	1.01 | 1.06	1.02 | 1.05	1.04 | 1.05
35	Forbes 230	0.96 | 1.08	0.99 | 1.05	1.00 | 1.03	1.01 | 1.02
36	Riverton 230	0.88 | 1.07	0.93 | 1.04	0.96 | 1.02	1.00 | 1.01
37	Coal Creek 230	0.96 | 1.11	0.97 | 1.08	0.98 | 1.07	1.02 | 1.04
38	Dickinson 345	0.97 | 1.10	0.95 | 1.09	0.97 | 1.04	1.00 | 1.03
39	Drayton 230	0.95 | 1.12	0.97 | 1.06	0.99 | 1.04	1.01 | 1.03
40	Groton 345	0.75 | 1.06	0.84 | 1.04	0.88 | 0.99	0.98 | 1.00
41	Tioga 230	0.98 | 1.07	1.00 | 1.07	1.01 | 1.05	1.03 | 1.04
42	Wahpeton 115	0.83 | 1.11	0.95 | 1.10	0.96 | 1.05	1.02 | 1.04
43	Watertown 345	0.80 | 1.07	0.88 | 1.05	0.89 | 1.00	0.99 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -53.07%	KING 3 / 2.96%	ANTEL3 / 36.76%	ANTEL3 / 40.49%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	507%	236%	384%
55	K22W (max +dP @ t, d-ang)	143.2@(2.69155,-73.0)	74.1@(2.77488,-36.9)	7.8@(4.04983,-0.3)	2.5@(3.98316,1.3)
56	K22W (max -dP @ t, d-ang)	101.9@(0.26666,11.0)	20.8@(0.34165,4.2)	28.3@(2.14991,8.0)	14.0@(1.95825,5.5)
57	K22W (max d-ang @ t, dP)	-267.3@(20.00792,47.2)	-125.8@(20.00792,22.6)	20.1@(1.36661,-16.9)	9.1@(1.26662,-8.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	37% / 84%	60% / 117%	102% / 178%
61	L20D at Prairie/Drayton	745% / 516%	999% / 593%	999% / 781%	999% / 893%
62	R50M / F3M	260% / 131%	458% / 227%	516% / 280%	632% / 325%
63	B10T	142%	104%	219%	271%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 2 | 0)	(0 | 1 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 1) / (0 | 0 | 0)	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 7 | 2) / (0 | 1 | 0)	(2 | 3 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(0 | 2 | 0) / (1 | 6 | 2)	(0 | 1 | 0) / (1 | 2 | 1)	(0 | 1 | 1) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 5 | 0) / (2 | 2 | 2)	(0 | 5 | 2) / (2 | 2 | 2)	(0 | 3 | 3) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - P. Island-Columbia - Case S2C4WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WXE-ag1	upe-so04aa.S2C4WXE-ag3	upe-so04aa.S2C4WXE-ei2	upe-so04aa.S2C4WXE-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 14:11	JUN 24 2002 14:28	JUN 24 2002 14:44	JUN 24 2002 14:59
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3015 / 354	3015 / 354	3015 / 354	3015 / 354
10	MHEX / L20D	2173 / 242	2173 / 242	2173 / 242	2173 / 242
11	ECL-ARP / PRI-BYN	742 / 833	742 / 833	742 / 833	742 / 833
12	MWSI / MNEX	2085 / 3028	2085 / 3028	2085 / 3028	2085 / 3028
13	D602F / F601C	1818 / 1322	1818 / 1322	1818 / 1322	1818 / 1322
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-121 / -197	-121 / -197	-121 / -197	-121 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	227 / 31	227 / 31	227 / 31	227 / 31
19	Forbes SVC / MSC	37 / 600	37 / 600	37 / 600	37 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.021	1.064 / 1.021	1.064 / 1.021	1.064 / 1.021
23	Chisago 500/EauClaire 345	1.024 / 1.005	1.024 / 1.005	1.024 / 1.005	1.024 / 1.005
24	Int Falls 115/Badoura 115	1.050 / 0.994	1.050 / 0.994	1.050 / 0.994	1.050 / 0.994
25	Drayton 230/Groton 345	1.028 / 1.004	1.028 / 1.004	1.028 / 1.004	1.028 / 1.004
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	138% / 227%	138% / 227%	138% / 227%	138% / 227%
28	L20D at Prairie/Drayton	999% / 840%	999% / 840%	999% / 840%	999% / 840%
29	R50M/F3M	735% / 349%	735% / 349%	735% / 349%	735% / 349%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.98 | 1.05	0.96 | 1.05	1.00 | 1.07	1.01 | 1.07
33	Boise 115	1.01 | 1.07	1.01 | 1.08	1.02 | 1.07	1.03 | 1.07
34	Dorsey 230	1.01 | 1.05	1.00 | 1.06	1.03 | 1.06	1.03 | 1.06
35	Forbes 230	1.00 | 1.03	0.99 | 1.04	0.99 | 1.04	1.00 | 1.04
36	Riverton 230	0.94 | 1.04	0.92 | 1.03	0.93 | 1.05	0.96 | 1.04
37	Coal Creek 230	0.94 | 1.11	0.94 | 1.11	1.03 | 1.12	0.97 | 1.12
38	Dickinson 345	0.94 | 1.06	0.93 | 1.06	1.02 | 1.07	1.02 | 1.09
39	Drayton 230	1.00 | 1.05	1.00 | 1.05	1.01 | 1.04	1.01 | 1.04
40	Groton 345	0.81 | 1.03	0.77 | 1.02	0.89 | 1.06	0.90 | 1.04
41	Tioga 230	0.98 | 1.05	0.96 | 1.05	1.00 | 1.05	1.00 | 1.05
42	Wahpeton 115	0.92 | 1.09	0.88 | 1.08	0.93 | 1.10	0.96 | 1.09
43	Watertown 345	0.90 | 1.05	0.87 | 1.04	0.94 | 1.06	0.95 | 1.05
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 56.76%	SHERC3 / 51.01%	KING 3 / -68.82%	SHERC3 / -66.96%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	253%	220%	501%	507%
55	K22W (max +dP @ t, d-ang)	15.8@(2.74988,-5.7)	20.6@(2.79988,-8.7)	55.8@(2.69989,-32.0)	35.4@(2.53323,-19.6)
56	K22W (max -dP @ t, d-ang)	27.3@(0.85830,9.6)	32.9@(0.84997,11.8)	3.2@(0.47498,-0.1)	2.5@(0.31665,0.0)
57	K22W (max d-ang @ t, dP)	15.2@(1.20829,-10.5)	19.5@(1.24162,-14.4)	-149.2@(20.00792,26.9)	-78.7@(20.00792,14.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	62% / 120%	50% / 104%	70% / 128%	95% / 166%
61	L20D at Prairie/Drayton	660% / 617%	513% / 578%	570% / 582%	330% / 655%
62	R50M / F3M	530% / 255%	500% / 247%	567% / 229%	631% / 260%
63	B10T	176%	162%	138%	185%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 1 | 0)	(0 | 2 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 5 | 3)	(1 | 1 | 1) / (0 | 5 | 4)	(1 | 1 | 1) / (0 | 5 | 2)	(1 | 1 | 1) / (0 | 5 | 3)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jamestown) - E. Wisconsin Dispatch - P. Island-Columbia - Case S2C4WXE

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S2C4WXE-nbz	upe-so04aa.S2C4WXE-mqs	upe-so04aa.S2C4WXE-ch3	upe-so04aa.S2C4WXE-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 15:12	JUN 24 2002 15:58	JUN 24 2002 15:31	JUN 24 2002 15:44
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3015 / 354	3015 / 354	3015 / 354	3015 / 354
10	MHEX / L20D	2173 / 242	2173 / 242	2173 / 242	2173 / 242
11	ECL-ARP / PRI-BYN	742 / 833	742 / 833	742 / 833	742 / 833
12	MWSI / MNEX	2085 / 3028	2085 / 3028	2085 / 3028	2085 / 3028
13	D602F / F601C	1818 / 1322	1818 / 1322	1818 / 1322	1818 / 1322
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-121 / -197	-121 / -197	-121 / -197	-121 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	227 / 31	227 / 31	227 / 31	227 / 31
19	Forbes SVC / MSC	37 / 600	37 / 600	37 / 600	37 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.021	1.064 / 1.021	1.064 / 1.021	1.064 / 1.021
23	Chisago 500/EauClaire 345	1.024 / 1.005	1.024 / 1.005	1.024 / 1.005	1.024 / 1.005
24	Int Falls 115/Badoura 115	1.050 / 0.994	1.050 / 0.994	1.050 / 0.994	1.050 / 0.994
25	Drayton 230/Groton 345	1.028 / 1.004	1.028 / 1.004	1.028 / 1.004	1.028 / 1.004
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	138% / 227%	138% / 227%	138% / 227%	138% / 227%
28	L20D at Prairie/Drayton	999% / 840%	999% / 840%	999% / 840%	999% / 840%
29	R50M/F3M	735% / 349%	735% / 349%	735% / 349%	735% / 349%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.97 | 1.14	0.98 | 1.08	1.01 | 1.04	1.01 | 1.04
33	Boise 115	0.97 | 1.08	1.00 | 1.08	1.03 | 1.06	1.04 | 1.06
34	Dorsey 230	1.05 | 1.16	1.01 | 1.06	1.03 | 1.05	1.04 | 1.05
35	Forbes 230	0.95 | 1.07	0.99 | 1.05	1.01 | 1.02	1.01 | 1.02
36	Riverton 230	0.91 | 1.07	0.94 | 1.04	0.99 | 1.01	1.00 | 1.01
37	Coal Creek 230	0.96 | 1.08	0.98 | 1.07	1.01 | 1.04	1.02 | 1.04
38	Dickinson 345	0.97 | 1.09	0.95 | 1.09	0.99 | 1.03	1.00 | 1.03
39	Drayton 230	1.02 | 1.09	1.00 | 1.04	1.02 | 1.04	1.02 | 1.03
40	Groton 345	0.87 | 1.07	0.90 | 1.04	0.97 | 0.99	1.00 | 1.02
41	Tioga 230	0.98 | 1.06	0.98 | 1.05	1.01 | 1.03	1.02 | 1.03
42	Wahpeton 115	0.89 | 1.10	0.96 | 1.09	1.02 | 1.04	1.03 | 1.05
43	Watertown 345	0.92 | 1.07	0.94 | 1.05	0.98 | 1.01	1.01 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -40.52%	KING 3 / -0.22%	ANTEL3 / 25.79%	ANTEL3 / 36.26%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	507%	348%	396%
55	K22W (max +dP @ t, d-ang)	152.0@(2.12491,-68.9)	73.8@(2.63322,-36.9)	1.7@(4.06650,2.0)	2.5@(3.93317,1.0)
56	K22W (max -dP @ t, d-ang)	101.0@(0.26666,10.9)	20.0@(0.33332,3.7)	21.2@(2.03325,9.4)	12.4@(1.91659,5.3)
57	K22W (max d-ang @ t, dP)	-269.6@(20.00792,49.6)	-127.0@(20.00792,23.1)	12.7@(1.39994,-12.1)	8.2@(1.25828,-7.3)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	41% / 92%	98% / 170%	111% / 189%
61	L20D at Prairie/Drayton	624% / 532%	795% / 535%	999% / 791%	999% / 789%
62	R50M / F3M	294% / 141%	481% / 224%	615% / 325%	655% / 331%
63	B10T	130%	94%	276%	272%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 1) / (0 | 0 | 0)	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 2 | 0)	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 6 | 2) / (0 | 5 | 1)	(1 | 2 | 1) / (0 | 5 | 3)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jmstwn) - E.Wisc.Disp. - 0/400 SVCs @ Adams and Arpin - Case S2C4WD3

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S2C4WD3-ag1	upe-so04aa.S2C4WD3-ag3	upe-so04aa.S2C4WD3-ei2	upe-so04aa.S2C4WD3-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 16:13	JUN 24 2002 16:29	JUN 24 2002 16:46	JUN 24 2002 17:00
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3018 / 347	3018 / 347	3018 / 347	3018 / 347
10	MHEX / L20D	2173 / 241	2173 / 241	2173 / 241	2173 / 241
11	ECL-ARP / PRI-BYN	839 / 1002	839 / 1002	839 / 1002	839 / 1002
12	MWSI / MNEX	1841 / 3434	1841 / 3434	1841 / 3434	1841 / 3434
13	D602F / F601C	1813 / 1292	1813 / 1292	1813 / 1292	1813 / 1292
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	233 / 35	233 / 35	233 / 35	233 / 35
19	Forbes SVC / MSC	36 / 600	36 / 600	36 / 600	36 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999
24	Int Falls 115/Badoura 115	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998
25	Drayton 230/Groton 345	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 228%	139% / 228%	139% / 228%	139% / 228%
28	L20D at Prairie/Drayton	999% / 848%	999% / 848%	999% / 848%	999% / 848%
29	R50M/F3M	734% / 349%	734% / 349%	734% / 349%	734% / 349%
30	B10T	333%	333%	333%	333%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.97 | 1.04	0.96 | 1.05	1.00 | 1.07	1.00 | 1.06
33	Boise 115	1.01 | 1.08	1.01 | 1.08	1.02 | 1.07	1.03 | 1.07
34	Dorsey 230	1.01 | 1.06	1.01 | 1.06	1.03 | 1.06	1.03 | 1.06
35	Forbes 230	1.00 | 1.03	0.99 | 1.04	0.99 | 1.04	1.00 | 1.04
36	Riverton 230	0.94 | 1.04	0.92 | 1.03	0.94 | 1.05	0.96 | 1.05
37	Coal Creek 230	0.94 | 1.11	0.94 | 1.11	1.03 | 1.12	0.96 | 1.12
38	Dickinson 345	0.94 | 1.06	0.94 | 1.06	1.02 | 1.07	1.02 | 1.09
39	Drayton 230	1.01 | 1.05	1.00 | 1.05	1.01 | 1.05	1.02 | 1.05
40	Groton 345	0.81 | 1.03	0.77 | 1.01	0.89 | 1.06	0.90 | 1.04
41	Tioga 230	0.98 | 1.05	0.96 | 1.05	1.00 | 1.05	1.00 | 1.05
42	Wahpeton 115	0.92 | 1.09	0.89 | 1.08	0.93 | 1.11	0.96 | 1.09
43	Watertown 345	0.89 | 1.04	0.86 | 1.04	0.93 | 1.06	0.95 | 1.05
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 61.37%	SHERC3 / 55.86%	SHERC3 / -57.01%	SHERC3 / -61.34%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	277%	252%	499%	507%
55	K22W (max +dP @ t, d-ang)	16.1@(2.73322,-6.1)	20.7@(2.78322,-9.0)	59.9@(2.70822,-34.0)	38.8@(2.56656,-21.4)
56	K22W (max -dP @ t, d-ang)	26.6@(0.84997,9.1)	32.0@(0.84163,11.2)	2.7@(0.46665,-0.2)	2.5@(0.30832,0.0)
57	K22W (max d-ang @ t, dP)	14.1@(1.19162,-10.1)	18.2@(1.22495,-13.9)	-149.3@(20.00792,28.8)	-80.9@(20.00792,16.6)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	64% / 123%	53% / 107%	67% / 124%	94% / 164%
61	L20D at Prairie/Drayton	699% / 617%	538% / 578%	603% / 583%	336% / 662%
62	R50M / F3M	532% / 254%	506% / 247%	558% / 222%	624% / 255%
63	B10T	174%	156%	134%	185%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 1 | 0)	(0 | 2 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 1 | 1) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 1 | 1) / (0 | 5 | 3)	(1 | 1 | 1) / (0 | 5 | 4)	(1 | 1 | 1) / (0 | 5 | 1)	(1 | 1 | 1) / (0 | 4 | 2)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 2 (Jmstwn) - E.Wisc.Disp. - 0/400 SVCs @ Adams and Arpin - Case S2C4WD3

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S2C4WD3-nbz	upe-so04aa.S2C4WD3-mqs	upe-so04aa.S2C4WD3-ch3	upe-so04aa.S2C4WD3-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 17:14	JUN 24 2002 17:59	JUN 24 2002 17:33	JUN 24 2002 17:46
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	3018 / 347	3018 / 347	3018 / 347	3018 / 347
10	MHEX / L20D	2173 / 241	2173 / 241	2173 / 241	2173 / 241
11	ECL-ARP / PRI-BYN	839 / 1002	839 / 1002	839 / 1002	839 / 1002
12	MWSI / MNEX	1841 / 3434	1841 / 3434	1841 / 3434	1841 / 3434
13	D602F / F601C	1813 / 1292	1813 / 1292	1813 / 1292	1813 / 1292
14	B10T / MH>SPC	165 / 98	165 / 98	165 / 98	165 / 98
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	170 / 150	170 / 150	170 / 150	170 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	233 / 35	233 / 35	233 / 35	233 / 35
19	Forbes SVC / MSC	36 / 600	36 / 600	36 / 600	36 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045	1.037 / 1.045
22	Roseau 500/Forbes 500	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020	1.064 / 1.020
23	Chisago 500/EauClaire 345	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999	1.024 / 0.999
24	Int Falls 115/Badoura 115	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998	1.052 / 0.998
25	Drayton 230/Groton 345	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003	1.033 / 1.003
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	139% / 228%	139% / 228%	139% / 228%	139% / 228%
28	L20D at Prairie/Drayton	999% / 848%	999% / 848%	999% / 848%	999% / 848%
29	R50M/F3M	734% / 349%	734% / 349%	734% / 349%	734% / 349%
30	B10T	333%	333%	333%	333%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.97 | 1.15	0.97 | 1.09	1.00 | 1.03	1.01 | 1.03
33	Boise 115	0.98 | 1.07	1.01 | 1.08	1.03 | 1.06	1.04 | 1.06
34	Dorsey 230	1.04 | 1.16	1.01 | 1.06	1.03 | 1.05	1.04 | 1.05
35	Forbes 230	0.94 | 1.08	1.00 | 1.05	1.01 | 1.02	1.01 | 1.02
36	Riverton 230	0.91 | 1.07	0.95 | 1.05	1.00 | 1.01	1.00 | 1.01
37	Coal Creek 230	0.96 | 1.08	0.98 | 1.07	1.01 | 1.04	1.02 | 1.04
38	Dickinson 345	0.97 | 1.09	0.95 | 1.09	1.00 | 1.03	1.00 | 1.03
39	Drayton 230	1.02 | 1.09	1.01 | 1.05	1.02 | 1.04	1.03 | 1.04
40	Groton 345	0.87 | 1.07	0.90 | 1.04	0.97 | 0.99	1.00 | 1.02
41	Tioga 230	0.98 | 1.06	0.98 | 1.06	1.02 | 1.03	1.02 | 1.03
42	Wahpeton 115	0.89 | 1.11	0.96 | 1.10	1.02 | 1.04	1.04 | 1.05
43	Watertown 345	0.92 | 1.08	0.94 | 1.05	0.98 | 1.01	1.01 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -44.44%	KING 3 / 2.94%	ANTEL3 / 41.58%	ANTEL3 / 49.43%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	507%	359%	403%
55	K22W (max +dP @ t, d-ang)	159.2@(2.12491,-73.1)	80.2@(2.64156,-39.9)	0.4@(0.11666,0.0)	1.3@(3.93317,1.3)
56	K22W (max -dP @ t, d-ang)	100.6@(0.26666,10.8)	19.4@(0.33332,3.6)	20.3@(2.02492,8.5)	12.1@(1.91659,4.9)
57	K22W (max d-ang @ t, dP)	-275.6@(20.00792,52.3)	-132.8@(20.00792,26.2)	11.9@(1.36661,-11.2)	7.7@(1.24995,-6.9)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	43% / 95%	99% / 171%	112% / 190%
61	L20D at Prairie/Drayton	652% / 538%	841% / 537%	999% / 799%	999% / 800%
62	R50M / F3M	276% / 136%	486% / 225%	615% / 322%	655% / 330%
63	B10T	122%	94%	171%	276%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 1) / (0 | 0 | 0)	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 1 | 0)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(1 | 6 | 2) / (0 | 5 | 0)	(1 | 2 | 1) / (0 | 5 | 3)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - P. Island-Columbia - Case S3C3W2E

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S3C3W2E-ag1	upe-so04aa.S3C3W2E-ag3	upe-so04aa.S3C3W2E-ei2	upe-so04aa.S3C3W2E-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 18:15	JUN 24 2002 18:31	JUN 24 2002 18:47	JUN 24 2002 19:02
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2973 / 318	2973 / 318	2973 / 318	2973 / 318
10	MHEX / L20D	2172 / 242	2172 / 242	2172 / 242	2172 / 242
11	ECL-ARP / PRI-BYN	706 / 804	706 / 804	706 / 804	706 / 804
12	MWSI / MNEX	1999 / 2858	1999 / 2858	1999 / 2858	1999 / 2858
13	D602F / F601C	1803 / 1426	1803 / 1426	1803 / 1426	1803 / 1426
14	B10T / MH>SPC	167 / 99	167 / 99	167 / 99	167 / 99
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	162 / 150	162 / 150	162 / 150	162 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	229 / 67	229 / 67	229 / 67	229 / 67
19	Forbes SVC / MSC	43 / 600	43 / 600	43 / 600	43 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016
23	Chisago 500/EauClaire 345	1.019 / 1.009	1.019 / 1.009	1.019 / 1.009	1.019 / 1.009
24	Int Falls 115/Badoura 115	1.047 / 0.996	1.047 / 0.996	1.047 / 0.996	1.047 / 0.996
25	Drayton 230/Groton 345	1.021 / 0.998	1.021 / 0.998	1.021 / 0.998	1.021 / 0.998
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 226%	136% / 226%	136% / 226%	136% / 226%
28	L20D at Prairie/Drayton	999% / 838%	999% / 838%	999% / 838%	999% / 838%
29	R50M/F3M	742% / 343%	742% / 343%	742% / 343%	742% / 343%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.97 | 1.04	0.96 | 1.04	0.98 | 1.07	0.99 | 1.06
33	Boise 115	1.01 | 1.08	1.01 | 1.08	1.02 | 1.08	1.03 | 1.06
34	Dorsey 230	1.01 | 1.06	1.01 | 1.06	1.02 | 1.06	1.03 | 1.06
35	Forbes 230	1.00 | 1.03	0.99 | 1.03	0.98 | 1.04	1.00 | 1.03
36	Riverton 230	0.96 | 1.04	0.94 | 1.04	0.94 | 1.05	0.97 | 1.04
37	Coal Creek 230	0.95 | 1.11	0.95 | 1.11	1.01 | 1.11	0.98 | 1.12
38	Dickinson 345	0.95 | 1.06	0.95 | 1.06	1.02 | 1.07	1.03 | 1.08
39	Drayton 230	0.99 | 1.04	0.98 | 1.04	0.99 | 1.04	1.00 | 1.04
40	Groton 345	0.82 | 1.03	0.78 | 1.02	0.87 | 1.06	0.89 | 1.03
41	Tioga 230	1.00 | 1.05	0.99 | 1.05	1.01 | 1.05	1.01 | 1.05
42	Wahpeton 115	0.94 | 1.10	0.92 | 1.09	0.93 | 1.10	0.96 | 1.08
43	Watertown 345	0.91 | 1.05	0.88 | 1.04	0.93 | 1.06	0.94 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 57.46%	SHERC3 / 52.15%	KING 3 / -63.30%	SHERC3 / -73.73%
53	Dorsey SUVP / UdHold		/ 0.166		
54	Forbes DC Red (DCAR)	288%	257%	507%	507%
55	K22W (max +dP @ t, d-ang)	11.5@(2.67489,-3.9)	16.1@(2.70822,-6.9)	55.3@(2.71655,-32.2)	35.3@(2.56656,-19.4)
56	K22W (max -dP @ t, d-ang)	25.4@(0.83330,8.4)	30.2@(0.81663,11.0)	2.7@(0.73330,-1.5)	1.5@(0.29999,-0.1)
57	K22W (max d-ang @ t, dP)	13.0@(1.15829,-8.0)	17.2@(1.17495,-12.4)	-149.7@(20.00792,25.1)	-78.7@(20.00792,15.5)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	68% / 128%	58% / 115%	69% / 126%	97% / 168%
61	L20D at Prairie/Drayton	816% / 587%	673% / 549%	790% / 560%	999% / 655%
62	R50M / F3M	554% / 255%	529% / 251%	579% / 240%	646% / 258%
63	B10T	164%	147%	120%	186%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 3 | 0)	(0 | 3 | 1)	(0 | 1 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(1 | 2 | 2) / (0 | 1 | 1)	(1 | 2 | 2) / (0 | 1 | 1)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(0 | 1 | 1) / (0 | 5 | 3)	(0 | 1 | 1) / (0 | 5 | 4)	(0 | 2 | 1) / (0 | 4 | 2)	(0 | 0 | 0) / (0 | 3 | 3)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 3 (Minot) - E. Wisconsin Dispatch - P. Island-Columbia - Case S3C3W2E

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S3C3W2E-nbz	upe-so04aa.S3C3W2E-mqs	upe-so04aa.S3C3W2E-ch3	upe-so04aa.S3C3W2E-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 19:16	JUN 24 2002 20:05	JUN 24 2002 19:34	JUN 24 2002 19:52
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2973 / 318	2973 / 318	2973 / 318	2973 / 318
10	MHEX / L20D	2172 / 242	2172 / 242	2172 / 242	2172 / 242
11	ECL-ARP / PRI-BYN	706 / 804	706 / 804	706 / 804	706 / 804
12	MWSI / MNEX	1999 / 2858	1999 / 2858	1999 / 2858	1999 / 2858
13	D602F / F601C	1803 / 1426	1803 / 1426	1803 / 1426	1803 / 1426
14	B10T / MH>SPC	167 / 99	167 / 99	167 / 99	167 / 99
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	162 / 150	162 / 150	162 / 150	162 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	229 / 67	229 / 67	229 / 67	229 / 67
19	Forbes SVC / MSC	43 / 600	43 / 600	43 / 600	43 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045	1.031 / 1.045
22	Roseau 500/Forbes 500	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016	1.058 / 1.016
23	Chisago 500/EauClaire 345	1.019 / 1.009	1.019 / 1.009	1.019 / 1.009	1.019 / 1.009
24	Int Falls 115/Badoura 115	1.047 / 0.996	1.047 / 0.996	1.047 / 0.996	1.047 / 0.996
25	Drayton 230/Groton 345	1.021 / 0.998	1.021 / 0.998	1.021 / 0.998	1.021 / 0.998
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	136% / 226%	136% / 226%	136% / 226%	136% / 226%
28	L20D at Prairie/Drayton	999% / 838%	999% / 838%	999% / 838%	999% / 838%
29	R50M/F3M	742% / 343%	742% / 343%	742% / 343%	742% / 343%
30	B10T	332%	332%	332%	332%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.94 | 1.12	0.97 | 1.08	1.00 | 1.03	1.01 | 1.03
33	Boise 115	1.00 | 1.08	1.00 | 1.09	1.03 | 1.05	1.03 | 1.05
34	Dorsey 230	1.04 | 1.15	1.01 | 1.06	1.03 | 1.05	1.04 | 1.05
35	Forbes 230	0.94 | 1.07	0.99 | 1.04	1.00 | 1.02	1.01 | 1.02
36	Riverton 230	0.93 | 1.07	0.96 | 1.04	1.00 | 1.01	1.00 | 1.01
37	Coal Creek 230	0.97 | 1.09	0.98 | 1.07	1.01 | 1.04	1.02 | 1.04
38	Dickinson 345	0.98 | 1.09	0.95 | 1.09	0.99 | 1.03	1.00 | 1.03
39	Drayton 230	0.99 | 1.07	1.00 | 1.04	1.01 | 1.03	1.01 | 1.03
40	Groton 345	0.87 | 1.07	0.90 | 1.03	0.96 | 0.99	0.99 | 1.02
41	Tioga 230	1.00 | 1.06	0.99 | 1.05	1.02 | 1.04	1.02 | 1.04
42	Wahpeton 115	0.92 | 1.11	0.98 | 1.08	1.02 | 1.04	1.03 | 1.04
43	Watertown 345	0.92 | 1.07	0.94 | 1.04	0.98 | 1.01	1.01 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -35.73%	KING 3 / -1.06%	ANTEL3 / 22.55%	ANTEL3 / 37.88%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	507%	355%	402%
55	K22W (max +dP @ t, d-ang)	150.4@(2.09158,-67.7)	72.4@(2.59989,-37.0)	2.4@(4.04983,1.2)	2.3@(3.92483,1.0)
56	K22W (max -dP @ t, d-ang)	97.8@(0.26666,10.7)	20.5@(0.31665,3.7)	20.2@(2.03325,8.7)	12.4@(1.92492,5.3)
57	K22W (max d-ang @ t, dP)	-268.4@(20.00792,52.9)	-129.1@(20.00792,22.0)	12.4@(1.38328,-11.5)	8.2@(1.27495,-7.5)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	45% / 97%	97% / 169%	110% / 188%
61	L20D at Prairie/Drayton	754% / 433%	999% / 536%	999% / 762%	999% / 776%
62	R50M / F3M	346% / 169%	510% / 234%	623% / 319%	662% / 327%
63	B10T	112%	93%	273%	274%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 2 | 0)	(0 | 1 | 1)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 1) / (0 | 0 | 0)	(4 | 4 | 2) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(1 | 2 | 2) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 1 | 0)	(1 | 1 | 1) / (0 | 0 | 0)	(1 | 1 | 1) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(0 | 4 | 1) / (0 | 5 | 2)	(0 | 2 | 1) / (0 | 4 | 4)	(0 | 0 | 0) / (0 | 0 | 0)	(0 | 0 | 0) / (0 | 0 | 0)
69	Shey 115 / Split Rock 115	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)	(2 | 2 | 2) / (| 0 |)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - No Reinforcements - Case S4C4IXA

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C4IXA-ag1	upe-so04aa.S4C4IXA-ag3	upe-so04aa.S4C4IXA-ei2	upe-so04aa.S4C4IXA-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 20:21	JUN 24 2002 20:37	JUN 24 2002 20:53	JUN 24 2002 21:08
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 341	2080 / 341	2080 / 341	2080 / 341
10	MHEX / L20D	2171 / 234	2171 / 234	2171 / 234	2171 / 234
11	ECL-ARP / PRI-BYN	747 / 903	747 / 903	747 / 903	747 / 903
12	MWSI / MNEX	1651 / 2558	1651 / 2558	1651 / 2558	1651 / 2558
13	D602F / F601C	1786 / 1281	1786 / 1281	1786 / 1281	1786 / 1281
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	163 / 150	163 / 150	163 / 150	163 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	256 / 19	256 / 19	256 / 19	256 / 19
19	Forbes SVC / MSC	33 / 600	33 / 600	33 / 600	33 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020
23	Chisago 500/EauClaire 345	1.025 / 1.000	1.025 / 1.000	1.025 / 1.000	1.025 / 1.000
24	Int Falls 115/Badoura 115	1.046 / 0.997	1.046 / 0.997	1.046 / 0.997	1.046 / 0.997
25	Drayton 230/Groton 345	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	142% / 235%	142% / 235%	142% / 235%	142% / 235%
28	L20D at Prairie/Drayton	999% / 863%	999% / 863%	999% / 863%	999% / 863%
29	R50M/F3M	734% / 343%	734% / 343%	734% / 343%	734% / 343%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.99 | 1.03	0.99 | 1.03	0.99 | 1.07	1.00 | 1.06
33	Boise 115	1.02 | 1.07	1.02 | 1.07	1.01 | 1.07	1.03 | 1.07
34	Dorsey 230	1.03 | 1.06	1.03 | 1.06	1.02 | 1.06	1.03 | 1.06
35	Forbes 230	1.00 | 1.03	1.00 | 1.03	0.98 | 1.04	1.00 | 1.04
36	Riverton 230	0.98 | 1.04	0.98 | 1.04	0.93 | 1.04	0.97 | 1.04
37	Coal Creek 230	0.97 | 1.11	0.97 | 1.10	1.03 | 1.12	0.97 | 1.14
38	Dickinson 345	0.98 | 1.06	0.98 | 1.06	1.03 | 1.06	1.03 | 1.08
39	Drayton 230	0.98 | 1.07	0.98 | 1.07	0.95 | 1.07	1.01 | 1.07
40	Groton 345	0.88 | 1.03	0.88 | 1.03	0.90 | 1.04	0.91 | 1.03
41	Tioga 230	1.00 | 1.07	1.00 | 1.07	1.02 | 1.07	1.03 | 1.07
42	Wahpeton 115	0.98 | 1.10	0.98 | 1.10	0.93 | 1.10	0.96 | 1.10
43	Watertown 345	0.97 | 1.05	0.96 | 1.05	0.95 | 1.05	0.97 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 67.61%	SHERC3 / 62.07%	KING 3 / -54.63%	SHERC3 / -83.33%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	364%	351%	494%	507%
55	K22W (max +dP @ t, d-ang)	6.2@(2.64156,-1.5)	7.3@(2.60822,-1.8)	57.4@(2.18324,-36.2)	33.7@(2.48323,-21.1)
56	K22W (max -dP @ t, d-ang)	14.8@(0.77497,4.1)	15.5@(0.72497,4.8)	4.5@(0.58331,-0.3)	5.7@(0.32499,0.4)
57	K22W (max d-ang @ t, dP)	6.7@(1.09162,-4.7)	7.7@(1.05829,-6.2)	-153.5@(20.00792,26.2)	-81.0@(20.00792,14.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	95% / 167%	92% / 162%	61% / 117%	94% / 166%
61	L20D at Prairie/Drayton	999% / 690%	999% / 702%	748% / 651%	170% / 618%
62	R50M / F3M	607% / 279%	598% / 278%	538% / 244%	622% / 278%
63	B10T	214%	214%	138%	176%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 1 | 0)	(0 | 0 | 0)	(0 | 2 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 5 | 2) / (0 | 1 | 0)	(2 | 4 | 3) / (0 | 2 | 0)	(2 | 4 | 2) / (0 | 1 | 0)	(2 | 4 | 2) / (0 | 1 | 1)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 1 | 1)	(0 | 1 | 1) / (0 | 1 | 1)	(0 | 0 | 0) / (0 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 3 | 1) / (2 | 2 | 2)	(0 | 3 | 1) / (2 | 2 | 2)	(0 | 4 | 0) / (2 | 2 | 2)	(0 | 4 | 1) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - Iowa/Illinois Dispatch - No Reinforcements - Case S4C4IXA

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S4C4IXA-nbz	upe-so04aa.S4C4IXA-mqs	upe-so04aa.S4C4IXA-ch3	upe-so04aa.S4C4IXA-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 21:22	JUN 24 2002 22:09	JUN 24 2002 21:41	JUN 24 2002 21:56
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2080 / 341	2080 / 341	2080 / 341	2080 / 341
10	MHEX / L20D	2171 / 234	2171 / 234	2171 / 234	2171 / 234
11	ECL-ARP / PRI-BYN	747 / 903	747 / 903	747 / 903	747 / 903
12	MWSI / MNEX	1651 / 2558	1651 / 2558	1651 / 2558	1651 / 2558
13	D602F / F601C	1786 / 1281	1786 / 1281	1786 / 1281	1786 / 1281
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-120 / -197	-120 / -197	-120 / -197	-120 / -197
16	R50M / OH>MP	163 / 150	163 / 150	163 / 150	163 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	256 / 19	256 / 19	256 / 19	256 / 19
19	Forbes SVC / MSC	33 / 600	33 / 600	33 / 600	33 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045	1.032 / 1.045
22	Roseau 500/Forbes 500	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020	1.059 / 1.020
23	Chisago 500/EauClaire 345	1.025 / 1.000	1.025 / 1.000	1.025 / 1.000	1.025 / 1.000
24	Int Falls 115/Badoura 115	1.046 / 0.997	1.046 / 0.997	1.046 / 0.997	1.046 / 0.997
25	Drayton 230/Groton 345	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996	1.014 / 0.996
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	142% / 235%	142% / 235%	142% / 235%	142% / 235%
28	L20D at Prairie/Drayton	999% / 863%	999% / 863%	999% / 863%	999% / 863%
29	R50M/F3M	734% / 343%	734% / 343%	734% / 343%	734% / 343%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.97 | 1.12	0.97 | 1.07	0.97 | 1.05	1.00 | 1.03
33	Boise 115	0.97 | 1.09	1.00 | 1.08	0.99 | 1.09	1.03 | 1.05
34	Dorsey 230	1.04 | 1.14	1.00 | 1.06	1.00 | 1.06	1.03 | 1.05
35	Forbes 230	0.95 | 1.07	0.99 | 1.04	0.99 | 1.03	1.01 | 1.02
36	Riverton 230	0.92 | 1.05	0.95 | 1.02	0.97 | 1.03	1.00 | 1.02
37	Coal Creek 230	0.97 | 1.08	0.97 | 1.06	0.98 | 1.09	1.01 | 1.05
38	Dickinson 345	0.98 | 1.08	0.95 | 1.09	0.97 | 1.05	1.00 | 1.03
39	Drayton 230	0.97 | 1.07	0.97 | 1.04	0.97 | 1.05	1.00 | 1.02
40	Groton 345	0.90 | 1.04	0.94 | 1.01	0.88 | 1.00	0.98 | 1.00
41	Tioga 230	1.00 | 1.08	1.01 | 1.07	1.01 | 1.07	1.03 | 1.05
42	Wahpeton 115	0.92 | 1.09	0.99 | 1.06	0.97 | 1.08	1.03 | 1.05
43	Watertown 345	0.95 | 1.04	0.99 | 1.03	0.89 | 1.03	0.99 | 1.03
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -30.95%	KING 3 / 3.55%	SHERC3 / 43.70%	ANTEL3 / 39.64%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	452%	113%	331%
55	K22W (max +dP @ t, d-ang)	147.2@(2.10825,-67.9)	72.7@(2.58323,-38.6)	16.9@(2.97487,-4.3)	3.2@(3.97483,1.7)
56	K22W (max -dP @ t, d-ang)	99.3@(0.26666,10.7)	21.0@(0.35832,4.2)	35.0@(2.22491,5.0)	15.9@(1.95825,5.8)
57	K22W (max d-ang @ t, dP)	-278.5@(20.00792,50.3)	-136.4@(20.00792,24.7)	24.7@(1.39161,-15.6)	11.1@(1.24162,-8.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	37% / 87%	46% / 98%	103% / 179%
61	L20D at Prairie/Drayton	999% / 484%	999% / 662%	999% / 608%	999% / 772%
62	R50M / F3M	276% / 133%	467% / 211%	490% / 258%	622% / 312%
63	B10T	142%	145%	171%	263%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 4 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 3 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(0 | 2 | 0) / (0 | 6 | 2)	(0 | 1 | 0) / (0 | 2 | 1)	(0 | 1 | 1) / (0 | 2 | 1)	(0 | 0 | 0) / (0 | 0 | 0)
69	Shey 115 / Split Rock 115	(0 | 5 | 2) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E.Wisc.Disp. - S.Rock-Des Moines-Zion - Case S4C5WXD

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S4C5WXD-ag1	upe-so04aa.S4C5WXD-ag3	upe-so04aa.S4C5WXD-ei2	upe-so04aa.S4C5WXD-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 22:25	JUN 24 2002 22:41	JUN 24 2002 22:57	JUN 24 2002 23:12
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2079 / 320	2079 / 320	2079 / 320	2079 / 320
10	MHEX / L20D	2171 / 242	2171 / 242	2171 / 242	2171 / 242
11	ECL-ARP / PRI-BYN	788 / 895	788 / 895	788 / 895	788 / 895
12	MWSI / MNEX	1683 / 2888	1683 / 2888	1683 / 2888	1683 / 2888
13	D602F / F601C	1769 / 1253	1769 / 1253	1769 / 1253	1769 / 1253
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 151	166 / 151	166 / 151	166 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	288 / 39	288 / 39	288 / 39	288 / 39
19	Forbes SVC / MSC	28 / 600	28 / 600	28 / 600	28 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.027 / 0.991	1.027 / 0.991	1.027 / 0.991	1.027 / 0.991
24	Int Falls 115/Badoura 115	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001
25	Drayton 230/Groton 345	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	147% / 244%	147% / 244%	147% / 244%	147% / 244%
28	L20D at Prairie/Drayton	999% / 828%	999% / 828%	999% / 828%	999% / 828%
29	R50M/F3M	765% / 348%	765% / 348%	765% / 348%	765% / 348%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.99 | 1.03	0.99 | 1.03	0.99 | 1.06	1.00 | 1.05
33	Boise 115	1.03 | 1.06	1.03 | 1.06	1.02 | 1.07	1.03 | 1.07
34	Dorsey 230	1.03 | 1.06	1.03 | 1.06	1.02 | 1.06	1.03 | 1.06
35	Forbes 230	1.01 | 1.03	1.01 | 1.03	0.99 | 1.04	1.01 | 1.04
36	Riverton 230	0.98 | 1.05	0.98 | 1.04	0.95 | 1.05	0.97 | 1.05
37	Coal Creek 230	0.97 | 1.11	0.97 | 1.11	1.03 | 1.12	0.97 | 1.14
38	Dickinson 345	0.98 | 1.06	0.98 | 1.06	1.03 | 1.06	1.03 | 1.08
39	Drayton 230	0.98 | 1.07	0.98 | 1.07	0.95 | 1.06	1.00 | 1.07
40	Groton 345	0.88 | 1.02	0.88 | 1.02	0.88 | 1.04	0.90 | 1.03
41	Tioga 230	1.01 | 1.07	1.00 | 1.07	1.02 | 1.07	1.03 | 1.07
42	Wahpeton 115	0.99 | 1.10	0.99 | 1.10	0.94 | 1.11	0.97 | 1.11
43	Watertown 345	0.96 | 1.04	0.96 | 1.04	0.94 | 1.05	0.96 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 66.90%	SHERC3 / 62.69%	KING 3 / -61.41%	SHERC3 / -65.34%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	363%	351%	491%	507%
55	K22W (max +dP @ t, d-ang)	6.4@(2.62489,-0.4)	8.2@(2.59989,-1.3)	54.8@(2.28324,-34.2)	36.4@(2.49990,-20.6)
56	K22W (max -dP @ t, d-ang)	14.9@(0.78330,4.3)	15.6@(0.72497,4.8)	4.1@(0.48331,0.1)	6.0@(0.32499,0.4)
57	K22W (max d-ang @ t, dP)	6.9@(1.09996,-4.7)	7.9@(1.06663,-6.2)	-150.7@(20.00792,27.5)	-83.2@(20.00792,16.4)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	98% / 172%	95% / 168%	72% / 133%	103% / 179%
61	L20D at Prairie/Drayton	999% / 671%	999% / 676%	799% / 604%	157% / 600%
62	R50M / F3M	630% / 281%	621% / 279%	578% / 235%	660% / 265%
63	B10T	217%	215%	131%	168%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 1 | 0)	(0 | 0 | 0)	(0 | 2 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 5 | 2) / (0 | 1 | 0)	(2 | 4 | 3) / (0 | 2 | 0)	(2 | 4 | 2) / (0 | 1 | 0)	(2 | 4 | 2) / (0 | 1 | 0)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 3 | 1) / (2 | 2 | 2)	(0 | 3 | 1) / (2 | 2 | 2)	(0 | 3 | 0) / (2 | 2 | 2)	(0 | 4 | 1) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 4 (Ft. Thompson) - E.Wisc.Disp. - S.Rock-Des Moines-Zion - Case S4C5WXD

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S4C5WXD-nbz	upe-so04aa.S4C5WXD-mqs	upe-so04aa.S4C5WXD-ch3	upe-so04aa.S4C5WXD-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 24 2002 23:26	JUN 25 2002 0:13	JUN 24 2002 23:45	JUN 25 2002 0:00
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2079 / 320	2079 / 320	2079 / 320	2079 / 320
10	MHEX / L20D	2171 / 242	2171 / 242	2171 / 242	2171 / 242
11	ECL-ARP / PRI-BYN	788 / 895	788 / 895	788 / 895	788 / 895
12	MWSI / MNEX	1683 / 2888	1683 / 2888	1683 / 2888	1683 / 2888
13	D602F / F601C	1769 / 1253	1769 / 1253	1769 / 1253	1769 / 1253
14	B10T / MH>SPC	168 / 100	168 / 100	168 / 100	168 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	166 / 151	166 / 151	166 / 151	166 / 151
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	288 / 39	288 / 39	288 / 39	288 / 39
19	Forbes SVC / MSC	28 / 600	28 / 600	28 / 600	28 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023	1.060 / 1.023
23	Chisago 500/EauClaire 345	1.027 / 0.991	1.027 / 0.991	1.027 / 0.991	1.027 / 0.991
24	Int Falls 115/Badoura 115	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001	1.052 / 1.001
25	Drayton 230/Groton 345	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991	1.013 / 0.991
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	147% / 244%	147% / 244%	147% / 244%	147% / 244%
28	L20D at Prairie/Drayton	999% / 828%	999% / 828%	999% / 828%	999% / 828%
29	R50M/F3M	765% / 348%	765% / 348%	765% / 348%	765% / 348%
30	B10T	338%	338%	338%	338%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.97 | 1.12	0.97 | 1.07	0.96 | 1.05	1.00 | 1.03
33	Boise 115	0.97 | 1.07	1.00 | 1.08	1.00 | 1.08	1.04 | 1.06
34	Dorsey 230	1.04 | 1.14	1.00 | 1.06	1.00 | 1.06	1.03 | 1.05
35	Forbes 230	0.95 | 1.07	1.00 | 1.04	0.99 | 1.04	1.01 | 1.03
36	Riverton 230	0.93 | 1.06	0.96 | 1.03	0.97 | 1.04	1.01 | 1.02
37	Coal Creek 230	0.97 | 1.08	0.98 | 1.06	0.98 | 1.09	1.02 | 1.04
38	Dickinson 345	0.98 | 1.08	0.96 | 1.08	0.97 | 1.05	1.01 | 1.03
39	Drayton 230	0.96 | 1.07	0.97 | 1.04	0.96 | 1.05	1.00 | 1.02
40	Groton 345	0.88 | 1.04	0.93 | 1.01	0.86 | 1.00	0.98 | 1.00
41	Tioga 230	1.00 | 1.08	1.01 | 1.07	1.01 | 1.07	1.03 | 1.05
42	Wahpeton 115	0.92 | 1.10	0.99 | 1.07	0.97 | 1.08	1.04 | 1.05
43	Watertown 345	0.93 | 1.04	0.97 | 1.03	0.86 | 1.02	1.00 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -28.23%	KING 3 / 1.41%	SHERC3 / 43.58%	SHERC3 / 48.85%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	456%	120%	368%
55	K22W (max +dP @ t, d-ang)	148.4@(2.10825,-67.6)	73.7@(2.58323,-37.5)	18.3@(2.91654,-4.5)	4.6@(2.71655,-0.9)
56	K22W (max -dP @ t, d-ang)	98.3@(0.26666,10.7)	20.2@(0.34165,3.9)	33.4@(0.94996,16.0)	11.4@(0.77497,5.7)
57	K22W (max d-ang @ t, dP)	-273.6@(20.00792,50.8)	-134.9@(20.00792,25.7)	24.9@(1.36661,-14.8)	8.3@(1.13329,-5.7)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	44% / 99%	47% / 101%	116% / 198%
61	L20D at Prairie/Drayton	999% / 470%	999% / 603%	999% / 577%	999% / 740%
62	R50M / F3M	301% / 134%	492% / 211%	485% / 246%	673% / 318%
63	B10T	121%	128%	167%	262%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 5 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 3 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(0 | 1 | 0) / (1 | 5 | 2)	(0 | 1 | 0) / (1 | 2 | 1)	(0 | 1 | 1) / (1 | 2 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 5 | 2) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Eastern Wisconsin Dispatch - P. Island-Columbia - Case S5C3WXE

1	**Case No.**	1	2	3	4
2	**Case Name**	upe-so04aa.S5C3WXE-ag1	upe-so04aa.S5C3WXE-ag3	upe-so04aa.S5C3WXE-ei2	upe-so04aa.S5C3WXE-eq1
3	**Disturbance**	ag1	ag3	ei2	eq1
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 28 2002 8:40	JUN 28 2002 10:57	JUN 28 2002 11:14	JUN 28 2002 11:30
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 339	2081 / 339	2081 / 339	2081 / 339
10	MHEX / L20D	2172 / 234	2172 / 234	2172 / 234	2172 / 234
11	ECL-ARP / PRI-BYN	748 / 787	748 / 787	748 / 787	748 / 787
12	MWSI / MNEX	2047 / 2503	2047 / 2503	2047 / 2503	2047 / 2503
13	D602F / F601C	1778 / 1273	1778 / 1273	1778 / 1273	1778 / 1273
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	167 / 150	167 / 150	167 / 150	167 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	290 / 30	290 / 30	290 / 30	290 / 30
19	Forbes SVC / MSC	26 / 600	26 / 600	26 / 600	26 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.025	1.060 / 1.025	1.060 / 1.025	1.060 / 1.025
23	Chisago 500/EauClaire 345	1.027 / 1.005	1.027 / 1.005	1.027 / 1.005	1.027 / 1.005
24	Int Falls 115/Badoura 115	1.053 / 1.000	1.053 / 1.000	1.053 / 1.000	1.053 / 1.000
25	Drayton 230/Groton 345	1.016 / 1.002	1.016 / 1.002	1.016 / 1.002	1.016 / 1.002
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	145% / 242%	145% / 242%	145% / 242%	145% / 242%
28	L20D at Prairie/Drayton	999% / 865%	999% / 865%	999% / 865%	999% / 865%
29	R50M/F3M	762% / 351%	762% / 351%	762% / 351%	762% / 351%
30	B10T	340%	340%	340%	340%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	1.00 | 1.05	1.00 | 1.04	1.01 | 1.08	1.01 | 1.07
33	Boise 115	1.03 | 1.06	1.03 | 1.06	1.02 | 1.07	1.04 | 1.07
34	Dorsey 230	1.03 | 1.05	1.02 | 1.06	1.02 | 1.06	1.03 | 1.06
35	Forbes 230	1.01 | 1.03	1.01 | 1.03	0.99 | 1.04	1.01 | 1.04
36	Riverton 230	0.98 | 1.04	0.98 | 1.04	0.95 | 1.05	0.97 | 1.05
37	Coal Creek 230	0.96 | 1.11	0.96 | 1.10	1.03 | 1.12	0.96 | 1.14
38	Dickinson 345	0.97 | 1.06	0.97 | 1.06	1.02 | 1.06	1.03 | 1.08
39	Drayton 230	0.98 | 1.07	0.99 | 1.07	0.95 | 1.07	1.00 | 1.08
40	Groton 345	0.88 | 1.03	0.88 | 1.02	0.90 | 1.04	0.91 | 1.04
41	Tioga 230	1.01 | 1.07	1.00 | 1.07	1.02 | 1.07	1.02 | 1.07
42	Wahpeton 115	0.98 | 1.10	0.98 | 1.09	0.94 | 1.10	0.96 | 1.10
43	Watertown 345	0.94 | 1.03	0.94 | 1.03	0.93 | 1.04	0.94 | 1.04
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	SHERC3 / 64.39%	SHERC3 / 62.92%	KING 3 / -64.54%	SHERC3 / -63.03%
53	Dorsey SUVP / UdHold				
54	Forbes DC Red (DCAR)	353%	344%	491%	507%
55	K22W (max +dP @ t, d-ang)	5.9@(2.64989,-0.4)	7.7@(2.62489,-1.6)	50.9@(2.34157,-32.2)	33.3@(2.54156,-18.5)
56	K22W (max -dP @ t, d-ang)	16.8@(0.80830,5.2)	17.5@(0.77497,6.2)	4.4@(0.49165,0.1)	6.0@(0.32499,0.4)
57	K22W (max d-ang @ t, dP)	8.4@(1.14162,-5.8)	9.4@(1.09996,-7.8)	-146.4@(20.00792,25.3)	-75.7@(20.00792,14.1)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	92% / 164%	89% / 160%	73% / 134%	102% / 177%
61	L20D at Prairie/Drayton	999% / 707%	999% / 718%	790% / 641%	164% / 630%
62	R50M / F3M	614% / 281%	606% / 280%	582% / 240%	656% / 268%
63	B10T	227%	226%	145%	180%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 1 | 0)	(0 | 0 | 0)	(0 | 1 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 4 | 2) / (0 | 1 | 0)	(2 | 3 | 2) / (0 | 2 | 1)	(2 | 4 | 2) / (0 | 1 | 0)	(2 | 4 | 2) / (0 | 1 | 0)
68	Roseau 230 / Running 230	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 2 | 1) / (2 | 2 | 2)	(0 | 3 | 1) / (2 | 2 | 2)	(0 | 3 | 0) / (2 | 2 | 2)	(0 | 4 | 1) / (2 | 2 | 2)

TABLE 4.15 (Cont.) - POWER FLOW AND STABILITY SUMMARY TABLE
Site 5 (Watertown) - Eastern Wisconsin Dispatch - P. Island-Columbia - Case S5C3WXE

1	**Case No.**	5	6	7	8
2	**Case Name**	upe-so04aa.S5C3WXE-nbz	upe-so04aa.S5C3WXE-mqs	upe-so04aa.S5C3WXE-ch3	upe-so04aa.S5C3WXE-cs3
3	**Disturbance**	nbz	mqs	ch3	cs3
4	**Prior Outage**	None	None	None	None
5	**Date/Time**	JUN 28 2002 11:43	JUN 28 2002 12:29	JUN 28 2002 12:02	JUN 28 2002 12:15
6	**Comments**				
7					
8	**Steady State Flows**				
9	NDEX / EAST BIAS	2081 / 339	2081 / 339	2081 / 339	2081 / 339
10	MHEX / L20D	2172 / 234	2172 / 234	2172 / 234	2172 / 234
11	ECL-ARP / PRI-BYN	748 / 787	748 / 787	748 / 787	748 / 787
12	MWSI / MNEX	2047 / 2503	2047 / 2503	2047 / 2503	2047 / 2503
13	D602F / F601C	1778 / 1273	1778 / 1273	1778 / 1273	1778 / 1273
14	B10T / MH>SPC	167 / 100	167 / 100	167 / 100	167 / 100
15	OH E-W / OH>MH	-119 / -196	-119 / -196	-119 / -196	-119 / -196
16	R50M / OH>MP	167 / 150	167 / 150	167 / 150	167 / 150
17	Dorsey BP1 / BP2	1493 / 1690	1493 / 1690	1493 / 1690	1493 / 1690
18	Dorsey Reserve / Wtrtn SVC	290 / 30	290 / 30	290 / 30	290 / 30
19	Forbes SVC / MSC	26 / 600	26 / 600	26 / 600	26 / 600
20	**Steady State Vltgs**				
21	Dorsey 500/Dorsey 230	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045	1.033 / 1.045
22	Roseau 500/Forbes 500	1.060 / 1.025	1.060 / 1.025	1.060 / 1.025	1.060 / 1.025
23	Chisago 500/EauClaire 345	1.027 / 1.005	1.027 / 1.005	1.027 / 1.005	1.027 / 1.005
24	Int Falls 115/Badoura 115	1.053 / 1.000	1.053 / 1.000	1.053 / 1.000	1.053 / 1.000
25	Drayton 230/Groton 345	1.016 / 1.002	1.016 / 1.002	1.016 / 1.002	1.016 / 1.002
26	**SS OS Relay Margins**				
27	D602F at Forbes/Dorsey	145% / 242%	145% / 242%	145% / 242%	145% / 242%
28	L20D at Prairie/Drayton	999% / 865%	999% / 865%	999% / 865%	999% / 865%
29	R50M/F3M	762% / 351%	762% / 351%	762% / 351%	762% / 351%
30	B10T	340%	340%	340%	340%
31	**Min/MaxTransientVltg**				
32	Arrowhd 230	0.98 | 1.14	0.98 | 1.09	1.01 | 1.04	1.02 | 1.05
33	Boise 115	0.97 | 1.08	1.01 | 1.07	1.04 | 1.06	1.04 | 1.06
34	Dorsey 230	1.04 | 1.14	1.01 | 1.06	1.03 | 1.05	1.03 | 1.05
35	Forbes 230	0.95 | 1.08	1.00 | 1.05	1.01 | 1.03	1.02 | 1.03
36	Riverton 230	0.93 | 1.06	0.95 | 1.03	1.00 | 1.02	1.00 | 1.02
37	Coal Creek 230	0.97 | 1.08	0.97 | 1.07	1.01 | 1.04	1.01 | 1.04
38	Dickinson 345	0.98 | 1.08	0.95 | 1.09	1.00 | 1.03	1.00 | 1.03
39	Drayton 230	0.97 | 1.07	0.97 | 1.04	1.00 | 1.02	1.00 | 1.02
40	Groton 345	0.88 | 1.04	0.93 | 1.02	0.97 | 0.99	0.97 | 1.01
41	Tioga 230	1.00 | 1.08	1.01 | 1.07	1.03 | 1.05	1.03 | 1.05
42	Wahpeton 115	0.92 | 1.10	0.99 | 1.07	1.03 | 1.04	1.03 | 1.05
43	Watertown 345	0.91 | 1.04	0.95 | 1.03	0.97 | 1.00	0.97 | 1.02
44	**Dynamic Voltage Warnings**				
45		none	none	none	none
46					
47					
48					
49					
50					
51					
52	Worst Case Angle Damping	KING 3 / -33.54%	KING 3 / -5.92%	STANT4 / 31.20%	ANTEL3 / 41.15%
53	Dorsey SUVP / UdHold	/ 0.133			
54	Forbes DC Red (DCAR)	507%	479%	359%	353%
55	K22W (max +dP @ t, d-ang)	142.0@(2.10825,-64.6)	68.4@(2.62489,-36.4)	1.0@(4.08316,2.4)	3.5@(2.77488,-0.7)
56	K22W (max -dP @ t, d-ang)	98.8@(0.26666,10.7)	19.8@(0.34165,3.9)	19.7@(2.02492,8.7)	13.7@(0.79164,6.6)
57	K22W (max d-ang @ t, dP)	-267.0@(20.00792,47.2)	-131.1@(20.00792,23.9)	11.5@(1.38328,-10.9)	10.1@(1.19162,-7.5)
58	**OS Rel Trip / Marg**				
59	MH - OH				
60	D602F at Forbes/Dorsey	0.16666 sec / 0.16666 sec	49% / 106%	109% / 188%	110% / 191%
61	L20D at Prairie/Drayton	999% / 488%	999% / 629%	999% / 818%	999% / 773%
62	R50M / F3M	297% / 140%	504% / 222%	649% / 329%	658% / 321%
63	B10T	140%	133%	296%	258%
64	**FSCAPS (SS/Unav/Final)**				
65	Balta 230	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)	(0 | 0 | 0)
66	Eau Cl 345 / Park Lk 115	(4 | 4 | 2) / (0 | 0 | 0)	(4 | 4 | 3) / (0 | 3 | 3)	(4 | 4 | 4) / (0 | 0 | 0)	(4 | 4 | 4) / (0 | 0 | 0)
67	Prairie 115 / Ramsey 230	(2 | 4 | 2) / (0 | 1 | 0)	(2 | 2 | 2) / (0 | 1 | 1)	(2 | 2 | 2) / (0 | 0 | 0)	(2 | 2 | 2) / (0 | 0 | 0)
68	Roseau 230 / Running 230	(0 | 2 | 0) / (1 | 5 | 2)	(0 | 1 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)	(0 | 0 | 0) / (1 | 1 | 1)
69	Shey 115 / Split Rock 115	(0 | 5 | 1) / (2 | 2 | 2)	(0 | 2 | 2) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)	(0 | 0 | 0) / (2 | 2 | 2)

Table 5.1
MUST Results Case S1C1IXE

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FCITC Single Study

  *** MUST 4.01.07 ***  WED, JUN 19 2002  16:46 ***
      UPE-SO04AA.S1C1IXE.SAV;SUMMER;OP LD;SYSTEM INTACT
      ND=3006,MH=2172,MW=1940,OHMH=-197,OHMP=150,EWTW=-120,BD=166
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE1      To DISPATCH_I    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total 35541 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow= ACCC BASE ACCC   Delta
                C: Contingency description                   Ncon   Flow  Rating             LODF             Init   Final  CNT% MAX% S1C1IXE  %
     3  -2636.7 L: 2143 ALMA   5 161  2149 WABACO 5 161 1         269.8   221.1  0.01849         -0.00021   102.7   103.3  123  123  121     -2
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     886
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                          -0.20536 -0.09104  -813.7  -573.7
     4  -2351.3 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1971.2 -1732.0 -0.10172         -0.09658 -1825.4 -1598.3  111  111  116      5
                C:  753 RUNNING4 230  1327 SHANNON4 230 1     662
                  Open   753 RUNNING4 230  1327 SHANNON4 230 1                          -0.65339  0.00787   223.1   204.6
    17  -1435.3 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         496.0   448.0  0.03346          0.01987   397.2   368.7  111  111  117      6
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1414
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12267  0.11076   805.8   646.8
    23  -1336.3 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          70.1    50.0  0.01504          0.00210    12.5     9.7  126  126  140     14
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     489
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27946  0.04630   206.2   144.3
    27  -1304.2 L:  911 BIGSTON7 115   948 HIWY12 7 115 1         189.1   176.0  0.01006          0.00611   104.0    96.0  104  104  102     -2
                C:  503 BLAIR  4 230   910 BIGSTON4 230 1     310
                  Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          -0.29689 -0.01329  -286.7  -269.4
    69  -1117.9 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         483.5   448.0  0.03179          0.01987   397.2   375.0  109  109  112      3
                C: 1695 AS KING3 345  1707 CHIS CO3 345 1    1411
                  Open  1695 AS KING3 345  1707 CHIS CO3 345 1                          -0.20364 -0.05852  -424.1  -358.7
   167  -1018.4 L: 2147 ROCHSTR5 161  2149 WABACO 5 161 1        -239.3  -221.1 -0.01784          0.00146   -66.7   -68.2  110  110  109     -1
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     886
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.21208 -0.09104  -813.7  -721.0
  2871   -967.4 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1825.4 -1732.0 -0.09658
                  Base Case
  5727   -949.1 L:  515 HURON  7 115   528 WOONSKT7 115 1         106.8    88.0  0.01981          0.00863    42.6    34.4  119  119  122      3
                C:  507 FTTHOMP4 230   622 STORLA 4 230 1     334
                  Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25125  0.04451   255.7   213.4
  5826   -900.1 L:  497 MAURINE4 230   470 BISON  4 230 1        -383.4  -176.0 -0.23044         -0.15551  -256.4  -116.4  N/A  NONE 231    NEW
                C:  506 FTTHOMP3 345  9847 HETINGR3 345 1     321
                  Open   506 FTTHOMP3 345  9847 HETINGR3 345 1                           0.24310 -0.30824  -522.6  -245.2
  5876   -762.3 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         388.9   352.0  0.04837          0.01682   144.6   131.7  101  101  112     11
                C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     582
                  Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                           0.59696  0.05284   409.2   369.0
  5877   -761.3 L:  847 HETINGR4 230   470 BISON  4 230 1         391.5   216.1  0.23044          0.15551   264.5   146.1  N/A  NONE 189    NEW
                C:  506 FTTHOMP3 345  9847 HETINGR3 345 1     321
                  Open   506 FTTHOMP3 345  9847 HETINGR3 345 1                          -0.24310 -0.30824  -522.6  -288.0
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Table 5.1 (Cont.)
MUST Results Case S1C1IXE

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 5884   -711.0 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         238.4   223.0  0.02167          0.02197   163.3   147.7  109  109  113   4
               C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1932
                 Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                           0.20291 -0.00149   370.1   371.1
 5887   -706.3 L:  479 MARTIN 7 115   653 VETALTP7 115 1          73.4    66.0  0.01043          0.01304    62.3    53.1  101  101  117  16
               C:  475 BONESTL7 115   510 FTRANDL7 115 1     247
                 Open   475 BONESTL7 115   510 FTRANDL7 115 1                          -0.58242  0.00449   -19.1   -22.2
 5895   -672.8 L: 1609 WILMART5 161  1610 WILMART7 115 1        -224.8  -205.7 -0.02844         -0.01839  -135.1  -122.7  108  108  109   1
               C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     886
                 Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.11033 -0.09104  -813.7  -752.5
 5899   -657.1 L:  810 BOWMAN 4 230   847 HETINGR4 230 1         311.1   216.1  0.14454          0.12574   229.9   147.3 NONE NONE  143  NEW
               C:  403 DAWSONC4 230   413 MEDORA 4 230 1     110
                 Open   403 DAWSONC4 230   413 MEDORA 4 230 1                            0.57483  0.03271   141.2   119.7
 5910   -619.6 L:  497 MAURINE4 230   470 BISON  4 230 1        -256.4  -160.0 -0.15551
                 Base Case
 5926   -587.5 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -119.3  -106.0 -0.02267         -0.01262   -79.8   -72.4  115  115  125  10
               C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     953
                 Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           0.21848 -0.04598  -180.9  -153.9
 5930   -574.1 L:  528 WOONSKT7 115   623 STORLA 7 115 1          99.4    88.0  0.01981          0.00863    35.1    30.2  112  112  114   2
               C:  507 FTTHOMP4 230   622 STORLA 4 230 1     334
                 Open   507 FTTHOMP4 230   622 STORLA 4 230 1                            0.25125  0.04451   255.7   230.1
 5939   -569.2 L:  484 NUNDRWD4 230   497 MAURINE4 230 1        -274.1  -176.0 -0.17229         -0.11771  -181.5  -114.5 N/A   101  172  71
               C:  506 FTTHOMP3 345  9847 HETINGR3 345 1     321
                 Open   506 FTTHOMP3 345  9847 HETINGR3 345 1                           0.17708 -0.30824  -522.6  -347.2
 6180   -520.0 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1782.2  1732.0  0.09658
                 Base Case
 6182   -520.0 L: 1307 FORBES 2 500  1678 ROSEAUS2 500 1       -1782.2 -1732.0 -0.09658
                 Base Case
11782   -473.5 L:  827 ELLENDL7 115  1001 ABDNJCT7 115 1          95.8    88.0  0.01655          0.00522    51.0    48.5  103  103  112   9
               C:  826 ELLENDL4 230   994 OAKES  4 230 1     709
                 Open   826 ELLENDL4 230   994 OAKES  4 230 1                            0.32546  0.03480   137.8   121.3
11824   -442.6 L:  480 MAURINE7 115   483 NEWELL 7 115 1          87.4    66.0  0.04833          0.01745    39.8    32.1   92   92  137  45
               C:  484 NUNDRWD4 230   497 MAURINE4 230 1     272
                 Open   484 NUNDRWD4 230   497 MAURINE4 230 1                           -0.26226 -0.11771  -181.5  -129.4
11850   -384.3 L:  948 HIWY12 7 115   970 ORTONVL7 115 1         179.9   176.0  0.01006          0.00611    94.7    92.4   98   98   98   0
               C:  503 BLAIR  4 230   910 BIGSTON4 230 1     310
                 Open   503 BLAIR  4 230   910 BIGSTON4 230 1                           -0.29689 -0.01329  -286.7  -281.6
11852   -381.1 L:  902 ALEXAND7 115  1649 DGLASCO7 115 1          96.6    88.0  0.02267          0.01262    57.1    52.3  106  106  117   9
               C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     953
                 Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           -0.21848 -0.04598  -180.9  -163.4
11860   -374.9 L:  507 FTTHOMP4 230   516 LAKPLAT4 230 1         345.2   316.0  0.07777          0.05710   254.9   233.5   94   94  112  18
               C:  507 FTTHOMP4 230   509 FTRANDL4 230 1     324
                 Open   507 FTTHOMP4 230   509 FTRANDL4 230 1                            0.35519  0.05819   254.1   232.2
11872   -361.9 L:  404 DAWSONC7 115   856 LEWIS  7 115 1          80.6    61.6  0.05247          0.02660    33.3    23.6 NONE NONE 131 NEW
               C:  810 BOWMAN 4 230   847 HETINGR4 230 1     700
                 Open   810 BOWMAN 4 230   847 HETINGR4 230 1                            0.20567  0.12574   229.9   184.4
11903   -333.3 L:  483 NEWELL 7 115   490 RAPIDCY7 115 1          82.1    66.0  0.04833          0.01745    34.5    28.7 NONE NONE  130  NEW
               C:  484 NUNDRWD4 230   497 MAURINE4 230 1     272
                 Open   484 NUNDRWD4 230   497 MAURINE4 230 1                           -0.26226 -0.11771  -181.5  -142.3
11907   -331.0 L:  418 DKSN-ND7 115   870 N ENGLN7 115 1        -104.7   -67.7 -0.11197         -0.09524   -76.4   -44.8  N/A  123  159  36
               C:  506 FTTHOMP3 345  9847 HETINGR3 345 1     321
                 Open   506 FTTHOMP3 345  9847 HETINGR3 345 1                            0.05426 -0.30824  -522.6  -420.6
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Table 5.1 (Cont.)
MUST Results Case S1C1IXE

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11942   -322.8 L:  403 DAWSONC4 230   413 MEDORA 4 230 1         301.9   263.0  0.12061          0.03271   141.2   130.6 NONE NONE  112   NEW
               C:  810 BOWMAN 4 230   847 HETINGR4 230 1     700
                 Open   810 BOWMAN 4 230   847 HETINGR4 230 1                           0.69908  0.12574   229.9   189.4
15661   -311.1 L:  847 HETINGR4 230   470 BISON  4 230 1         264.5   216.1  0.15551
                 Base Case
17657   -296.1 L:  848 HETINGR7 115   870 N ENGLN7 115 1         -97.3   -67.7 -0.10000         -0.00476   -20.9   -19.5 NONE  119  141  NEW
               C:  418 DKSN-ND7 115   870 N ENGLN7 115 1     140
                 Open   418 DKSN-ND7 115   870 N ENGLN7 115 1                           1.00000 -0.09524   -76.4   -48.2
17661   -295.7 L:  792 MAPLE R3 345 79824 MAPLER1Y 345 1         440.8   420.0  0.07037          0.03679   230.5   219.6   96   96   96   0
               C:  754 MAPLE R4 230 79825 MAPLER2Y 345 1     671
                 Open   754 MAPLE R4 230 79825 MAPLER2Y 345 1                          -0.91305 -0.03679  -230.4  -219.5
17667   -295.5 L:  754 MAPLE R4 230 79825 MAPLER2Y 345 1        -440.8  -420.0 -0.07037         -0.03679  -230.4  -219.5   96   96   95  -1
               C:  792 MAPLE R3 345 79824 MAPLER1Y 345 1     689
                 Open   792 MAPLE R3 345 79824 MAPLER1Y 345 1                          -0.91305  0.03679   230.5   219.6
17668   -295.5 L:  792 MAPLE R3 345 79825 MAPLER2Y 345 1         440.8   420.0  0.07037          0.03679   230.4   219.5   96   96   96   0
               C:  792 MAPLE R3 345 79824 MAPLER1Y 345 1     689
                 Open   792 MAPLE R3 345 79824 MAPLER1Y 345 1                           0.91305  0.03679   230.5   219.6
17680   -292.6 L:  754 MAPLE R4 230 79824 MAPLER1Y 345 1        -440.6  -420.0 -0.07037         -0.03679  -230.3  -219.5   96   96   95  -1
               C:  754 MAPLE R4 230 79825 MAPLER2Y 345 1     671
                 Open   754 MAPLE R4 230 79825 MAPLER2Y 345 1                           0.91305 -0.03679  -230.4  -219.6
17711   -277.1 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         139.3   134.0  0.01924          0.01592   117.6   113.2   99   99  105   6
               C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2072
                 Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                           0.04174  0.07956   520.8   498.7
17716   -274.2 L:  424 BELFELD3 345   683 CHAR.CK3 345 1         384.7   263.0  0.44380          0.29362   130.0    49.5  N/A  NONE  151 NEW
               C:  506 FTTHOMP3 345  9847 HETINGR3 345 1     321
                 Open   506 FTTHOMP3 345  9847 HETINGR3 345 1                          -0.48722 -0.30824  -522.6  -438.1
17736   -264.4 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         188.9   185.0  0.01469          0.01001   118.4   115.7  105  105  102  -3
               C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1031
                 Open  1373 ARROWHD7 115  1379 GARY   7 115 1                           0.82248  0.00569    85.7    84.2
17757   -251.6 L:  810 BOWMAN 4 230   803 MARMARTH 230 1        -227.3  -216.1 -0.04454         -0.02574  -146.2  -139.7  NONE NONE 103  NEW
               C:  403 DAWSONC4 230   413 MEDORA 4 230 1     110
                 Open   403 DAWSONC4 230   413 MEDORA 4 230 1                          -0.57483  0.03271   141.2   133.0
17764   -246.6 L:  413 MEDORA 4 230   425 BELFELD4 230 1         292.7   263.0  0.12061          0.03271   132.0   123.9  NONE NONE 109  NEW
               C:  810 BOWMAN 4 230   847 HETINGR4 230 1     700
                 Open   810 BOWMAN 4 230   847 HETINGR4 230 1                           0.69908  0.12574   229.9   198.9
17777   -225.8 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1928.0  1905.0  0.10172          0.09658  1782.2  1760.4   98   98  101   3
               C:  753 RUNNING4 230  1327 SHANNON4 230 1     662
                 Open   753 RUNNING4 230  1327 SHANNON4 230 1                           0.65339  0.00787   223.1   221.3
17796   -202.1 L:  880 STANLEY7 115   885 TIOGA4 7 115 1         -64.5   -61.6 -0.01468         -0.00892   -32.4   -30.6  120  120  140  20
               C:  604 TIOGA4 4 230   608 LOGAN  4 230 1     549
                 Open   604 TIOGA4 4 230   608 LOGAN  4 230 1                          -0.25851  0.02230   124.5   120.0
17798   -197.7 L:  404 DAWSONC7 115   832 GLENDCT7 115 1         -78.9   -67.7 -0.05679         -0.02144   -14.2   -10.0 NONE  108  118  NEW
               C:  810 BOWMAN 4 230   847 HETINGR4 230 1     700
                 Open   810 BOWMAN 4 230   847 HETINGR4 230 1                          -0.28117  0.12574   229.9   205.1
17808   -182.8 L:  484 NUNDRWD4 230   497 MAURINE4 230 1        -181.5  -160.0 -0.11771
                 Base Case
17813   -173.7 L:  479 MARTIN 7 115   653 VETALTP7 115 1          62.3    60.0  0.01304
                 Base Case
17823   -162.7 L:  482 MISSION7 115   653 VETALTP7 115 1         -68.4   -66.0 -0.01460         -0.01304   -56.3   -54.2   93   98  113  19
               C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     582
                 Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                          -0.02942  0.05284   409.2   400.6
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Table 5.1 (Cont.)
MUST Results Case S1C1IXE

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17826   -162.1 L:  601 ANTELOP3 345   620 HURON  3 345 1         543.0   526.0  0.10514          0.08738   446.7   432.6   90   90  111  21
               C:  605 LELANDO3 345   660 GROTON 3 345 1     552
                 Open   605 LELANDO3 345   660 GROTON 3 345 1                           0.21684  0.08190   444.2   430.9
17838   -154.4 L:  497 MAURINE4 230 19088 MAURIN1T 230 1         137.7   125.0  0.08206          0.03780    69.4    63.6  NONE NONE 113  NEW
               C:  484 NUNDRWD4 230   497 MAURINE4 230 1     272
                 Open   484 NUNDRWD4 230   497 MAURINE4 230 1                          -0.37606 -0.11771  -181.5  -163.4
17847   -148.2 L: 2329 NEAL 4 5 161  2351 MONONA 5 161 1         165.9   163.0  0.01948          0.01531   140.8   138.5   95   95   101   6
               C:  565 SIOUXCY4 230   567 DENISON4 230 1     482
                 Open   565 SIOUXCY4 230   567 DENISON4 230 1                           0.13797  0.03028   181.8   177.4
21227   -110.0 L:  810 BOWMAN 4 230   847 HETINGR4 230 1         229.9   216.1  0.12574
                 Base Case
23755    -99.7 L: 2022 ADAMS  5 161  2147 ROCHSTR5 161 1        -225.0  -221.1 -0.03890         -0.01100   -46.2   -45.1 NONE NONE  107  NEW
               C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     885
                 Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                          -0.28264  0.09870   632.7   622.8
23928    -92.9 L:  509 FTRANDL4 230   516 LAKPLAT4 230 1        -323.2  -316.0 -0.07777         -0.05710  -233.0  -227.7   90   90  108  18
               C:  507 FTTHOMP4 230   509 FTRANDL4 230 1     324
                 Open   507 FTTHOMP4 230   509 FTRANDL4 230 1                          -0.35519  0.05819   254.1   248.6
26282    -91.4 L:  418 DKSN-ND7 115   870 N ENGLN7 115 1         -76.4   -67.7 -0.09524
                 Base Case
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Table 5.1 (Cont.)
MUST Results Case S2C4WXE

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FCITC Single Study

  *** MUST 4.01.07 ***  THU, JUN 20 2002  11:18 ***
      UPE-SO04AA.S2C4WXE.SAV;SUMMER;OP LD;SYSTEM INTACT
      ND=3029,MH=2173,MW=2087,OHMH=-198,OHMP=150,EWTW=-121,BD=165
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE2      To DISPATCH_W    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total 35603 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow= ACCC  BASE   ACCC    Delta
                C: Contingency description                   Ncon   Flow  Rating             LODF             Init   Final   CNT%  MAX% S2C4WXE   %

     1  -2729.1 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1973.4 -1732.0 -0.08845         -0.08845 -1822.3 -1580.9   N/A   111    115     4
                C: 3458 LETELER4 230  9458 LETLRPHS     1    2945
                  Open  3458 LETELER4 230  9458 LETLRPHS     1                           0.54937  0.00000  -275.0  -275.0
     2  -2533.5 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1966.1 -1732.0 -0.09240         -0.08845 -1822.3 -1598.2   111   111    116     5
                C:  753 RUNNING4 230  1327 SHANNON4 230 1     666
                  Open   753 RUNNING4 230  1327 SHANNON4 230 1                          -0.65358  0.00605   220.0   204.7
     4  -2351.5 L:  805 BAKER  7 115   832 GLENDCT7 115 1         -91.7   -67.7 -0.01022         -0.00466   -29.9   -18.9   129   129    133     4
                C:  411 MI CTYE4 230   804 BAKER  4 230 1     129
                  Open   411 MI CTYE4 230   804 BAKER  4 230 1                          -0.47209  0.01178   131.0   103.3
    15  -1521.2 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          66.3    50.0  0.01074          0.00155    12.0     9.6   126   126    131     5
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     488
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27951  0.03285   194.4   144.4
    28  -1337.3 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         511.7   448.0  0.04763          0.02334   402.8   371.6   111   111    121    10
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12296  0.19749   885.5   621.4
    32  -1316.9 L:  515 HURON  7 115   528 WOONSKT7 115 1         111.7    88.0  0.01799          0.01422    56.2    37.5   119   119    125     6
                C:  507 FTTHOMP4 230   622 STORLA 4 230 1     337
                  Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25340  0.01490   219.0   199.4
    71  -1187.3 L:  970 ORTONVL7 115  1935 GRACEVT7 115 1         118.9   105.0  0.01172         -0.00041    43.2    43.7   105   105    107     2
                C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                  Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          -0.23605 -0.05141  -320.8  -259.7
    92  -1143.4 L:  418 DKSN-ND7 115   870 N ENGLN7 115 1          87.6    67.7  0.01747          0.01122    33.2    20.4   123   123    131     8
                C:  804 BAKER  4 230   810 BOWMAN 4 230 1     699
                  Open   804 BAKER  4 230   810 BOWMAN 4 230 1                           0.37989  0.01644   143.3   124.5
   107  -1122.5 L:  435 FARGO  4 230  1637 SHEYNNE4 230 1         519.9   391.0  0.11483          0.04067   269.7   224.0   N/A  NONE    134   NEW
                C:99553 MOORHED3 345 99435 FARGO  3 345 1    5828
                  Open 99553 MOORHED3 345 99435 FARGO  3 345 1                          -0.61558 -0.12048  -406.5  -271.3
  2629  -1020.9 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1822.3 -1732.0 -0.08845
                  Base Case
  5753  -1000.0 L:  848 HETINGR7 115   870 N ENGLN7 115 1         -85.1   -67.7 -0.01747         -0.01122   -30.7   -19.5   119   119    127     8
                C:  804 BAKER  4 230   810 BOWMAN 4 230 1     699
                  Open   804 BAKER  4 230   810 BOWMAN 4 230 1                          -0.37989  0.01644   143.3   126.9
  5851   -913.2 L:  911 BIGSTON7 115   948 HIWY12 7 115 1         194.8   176.0  0.02058          0.00477    96.1    91.8   104   104    105     1
                C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                  Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          -0.30760 -0.05141  -320.8  -273.8
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Table 5.1 (Cont.)
MUST Results Case S2C4WXE

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5876   -869.1 L:  528 WOONSKT7 115   623 STORLA 7 115 1         103.6    88.0  0.01799          0.01422    48.1    35.8   112   112    117     5
              C:  507 FTTHOMP4 230   622 STORLA 4 230 1     337
                Open   507 FTTHOMP4 230   622 STORLA 4 230 1                          0.25340  0.01490   219.0   206.1
5879   -848.7 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         232.6   223.0  0.01136          0.01201   157.9   147.7   109   109    110     1
              C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1936
                Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                          0.20291 -0.00320   368.5   371.2
5885   -828.1 L: 1609 WILMART5 161  1610 WILMART7 115 1        -229.7  -205.7 -0.02899         -0.01952  -137.4  -121.2   108   108    111     3
              C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     890
                Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                          0.11077 -0.08544  -833.6  -762.8
5889   -793.2 L:  404 DAWSONC7 115   832 GLENDCT7 115 1          75.8    67.7  0.01022          0.00466    13.9    10.2   108   108    111     3
              C:  411 MI CTYE4 230   804 BAKER  4 230 1     129
                Open   411 MI CTYE4 230   804 BAKER  4 230 1                          0.47209  0.01178   131.0   121.6
5901   -716.5 L:  555 MORRIS 7 115  1935 GRACEVT7 115 1        -113.4  -105.0 -0.01172          0.00041   -37.7   -38.0    96    96    103     7
              C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          0.23605 -0.05141  -320.8  -283.9   N/A   NONE   125   NEW
5916   -598.7 L:  555 MORRIS 7 115  1911 WALDON 7 115 1          95.4    80.0  0.02578          0.01017    49.4    43.3
              C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                          0.10811  0.14445   425.5   339.0
5918   -577.0 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         363.2   352.0  0.01948          0.00667   134.4   130.5   101   101    103     2
              C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     585
                Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                          0.60105  0.02132   380.7   368.4
5921   -563.3 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         197.4   185.0  0.02196          0.01504   124.1   115.6   105   105    106     1
              C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1035
                Open  1373 ARROWHD7 115  1379 GARY   7 115 1                          0.82243  0.00841    89.1    84.4
5923   -539.5 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1779.7  1732.0  0.08845
                Base Case
5924   -539.4 L: 1307 FORBES 2 500  1678 ROSEAUS2 500 1       -1779.7 -1732.0 -0.08845
                Base Case
5931   -465.6 L:  948 HIWY12 7 115   970 ORTONVL7 115 1         185.6   176.0  0.02058          0.00477    86.9    84.7    98    98    105     7
              C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                Open   503 BLAIR  4 230   910 BIGSTON4 230 1                         -0.30760 -0.05141  -320.8  -296.8
5933   -445.7 L: 1905 BENSON 7 115  1911 WALDON 7 115 1         -91.5   -80.0 -0.02578         -0.01017   -45.5   -41.0   N/A   NONE   121   NEW
              C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                         -0.10811  0.14445   425.5   361.1
5935   -431.1 L:  705 DRAYTON7 115   930 DONALDS7 115 1         197.3   171.0  0.06105          0.03451   117.0   102.1    81    81    115(N/C) 34
              C:  752 DRAYTON4 230   755 PRAIRIE4 230 1     661
                Open   752 DRAYTON4 230   755 PRAIRIE4 230 1                          0.40523  0.06549   198.2   170.0
5936   -410.9 L:  977 RAMSEY 7 115 42012 RAMSEY Y1.00 1         184.7   105.0  0.19397          0.13193   119.8    65.6  NONE   NONE   176(N/C) NEW
              C:  428 CARNGTN7 115   445 JAMESTN7 115 1     165
                Open   428 CARNGTN7 115   445 JAMESTN7 115 1                          0.68203  0.09097    95.2    57.8
5937   -406.8 L: 1512 RAMSEY 4 230 42012 RAMSEY Y1.00 1        -183.9  -105.0 -0.19397         -0.13193  -119.0   -65.3  NONE   NONE   175(N/C) NEW
              C:  428 CARNGTN7 115   445 JAMESTN7 115 1     165
                Open   428 CARNGTN7 115   445 JAMESTN7 115 1                         -0.68203  0.09097    95.2    58.2
5941   -385.4 L: 1870 WHEATON5 161  2151 ELK MND5 161 1        -327.0  -294.0 -0.08550         -0.03992  -122.6  -107.2   109   109    124    15
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                         -0.23080  0.19749   885.5   809.4
5942   -381.1 L: 1854 EAU CLA5 161  1870 WHEATON5 161 1        -326.6  -294.0 -0.08550         -0.03992  -122.2  -107.0   109   109    124    15
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                         -0.23080  0.19749   885.5   810.3
5943   -373.1 L:  428 CARNGTN7 115   445 JAMESTN7 115 1         140.6    88.0  0.14098          0.09097    95.2    61.2  NONE   NONE   159(N/C) NEW
              C:  977 RAMSEY 7 115 42012 RAMSEY Y1.00 1     835
                Open   977 RAMSEY 7 115 42012 RAMSEY Y1.00 1                          0.37912  0.13193   119.8    70.6
5946   -357.2 L:  432 EDGELEY7 115   534 ORDWAY 7 115 1         145.0   116.0  0.08130          0.07685   104.0    76.5    70    70    125    55
              C:  605 LELANDO3 345   660 GROTON 3 345 1     553
                Open   605 LELANDO3 345   660 GROTON 3 345 1                          0.10448  0.04256   393.1   377.9
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Table 5.1 (Cont.)
MUST Results Case S2C4WXE

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 5947   -329.0 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -116.4  -106.0 -0.03176         -0.01770   -79.0   -73.2   115    115   122     7
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     957
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                          0.20751 -0.06772  -180.3  -158.0
 5948   -328.6 L:  432 EDGELEY7 115   433 EDGELEY869.0 1          31.3    25.0  0.01928          0.00834    16.5    13.8  NONE  NONE   124   NEW
              C:  432 EDGELEY7 115   534 ORDWAY 7 115 1     179
                Open   432 EDGELEY7 115   534 ORDWAY 7 115 1                          0.14238  0.07685   104.0    78.7
 5953   -313.3 L: 2157 BARRON 5 161  2165 APL RVR5 161 1        -242.2  -229.9 -0.03942         -0.02052  -157.5  -151.1   101    101   110     9
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                         -0.09572  0.19749   885.5   823.6
 5954   -301.5 L: 1353 RIVERTN7 115 44250 RIVTON 869.0 1          47.3    44.0  0.01086          0.00754    43.1    40.8   N/C    138   105
              C: 1317 MUDLAKE4 230  1508 BENTON 4 230 1     970
                Open  1317 MUDLAKE4 230  1508 BENTON 4 230 1                          0.05576  0.05948    74.6    56.7
 5955   -296.0 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          68.1    62.7  0.01817          0.01380    54.3    50.3   N/A     98   107     9
              C: 1604 PR ISLD3 345 92270 COL 345  345 1    5939
                Open  1604 PR ISLD3 345 92270 COL 345  345 1                          0.02696  0.16188   509.3   461.4
 5957   -291.7 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1930.8  1905.0  0.08845          0.08845  1779.7  1753.9   N/A     98  101(N/C) 3
              C: 3458 LETELER4 230  9458 LETLRPHS     1    2945
                Open  3458 LETELER4 230  9458 LETLRPHS     1                         -0.54937  0.00000  -275.0  -275.0
 5958   -271.7 L:  976 DEVILSE7 115   977 RAMSEY 7 115 1         184.7   132.0  0.19397          0.13193   119.8    83.9   NONE  NONE 140(N/C) NEW
              C:  428 CARNGTN7 115   445 JAMESTN7 115 1     165
                Open   428 CARNGTN7 115   445 JAMESTN7 115 1                          0.68203  0.09097    95.2    70.5
 5959   -271.3 L:  977 RAMSEY 7 115 42012 RAMSEY Y1.00 1         119.8    84.0  0.13193
                Base Case
 5960   -265.2 L: 1512 RAMSEY 4 230 42012 RAMSEY Y1.00 1        -119.0   -84.0 -0.13193
                Base Case
 5961   -257.7 L: 2022 ADAMS  5 161  2147 ROCHSTR5 161 1        -229.6  -221.1 -0.03281         -0.00781   -46.3   -44.3   110    110   110     0
              C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     889
                Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                         -0.28328  0.08824   646.8   624.1
 5974   -212.4 L:  906 BAGLEY 7 115   990 WINGER 7 115 1        -110.4  -105.0 -0.02554         -0.01284   -52.5   -49.8    93     93   108    15
              C:  758 WINGER 4 230   986 WILTON 4 230 1     685
                Open   758 WINGER 4 230   986 WILTON 4 230 1                         -0.52659  0.02412   110.0   104.9
 5978   -193.3 L:  714 WARSAW 7 115   930 DONALDS7 115 1         -97.4   -90.4 -0.03614         -0.01781   -41.9   -38.5    69     69   137    68
              C:  752 DRAYTON4 230   755 PRAIRIE4 230 1     661
                Open   752 DRAYTON4 230   755 PRAIRIE4 230 1                         -0.27988  0.06549   198.2   185.5
 5979   -188.0 L:  705 DRAYTON7 115   992 HENSEL 7 115 1         -99.8   -81.0 -0.10000         -0.10000   -83.8   -65.0   NONE  NONE   113   NEW
              C:  992 HENSEL 7 115 79851 HENSEL Y 115 1     853
                Open   992 HENSEL 7 115 79851 HENSEL Y 115 1                         -1.00000  0.00000    16.0    16.0
 5980   -187.4 L:  940 GRANTCO7 115   950 HOOT LK7 115 1        -111.0  -105.0 -0.03178         -0.01753   -65.6   -62.3    N/A  NONE   105  NEW
              C:99553 MOORHED3 345 99554 MORRIS 3 345 1    5830
                Open 99553 MOORHED3 345 99554 MORRIS 3 345 1                         -0.09855  0.14464   460.6   433.5
 5992   -167.0 L:  428 CARNGTN7 115   445 JAMESTN7 115 1          95.2    80.0  0.09097
                Base Case
 5997   -157.5 L: 1905 BENSON 7 115  1946 KERKHO 7 115 1          84.1    80.0  0.02578          0.01017    38.1    36.5     N/A  NONE  104  NEW
              C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                          0.10811  0.14445   425.5   402.8
 6038   -129.8 L: 1365 THOMSON7 115  1376 HIBBARD7 115 1          74.4    73.0  0.01042          0.00701    57.9    57.0   NONE  NONE   102   NEW
              C: 1368 CLOQUET7 115  1373 ARROWHD7 115 1    1028
                Open  1368 CLOQUET7 115  1373 ARROWHD7 115 1                          0.63195  0.00540    26.0    25.3
 6118   -115.6 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         135.7   134.0  0.01436          0.01185   114.6   113.2    99     99   102     3
              C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2076
                Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                          0.04188  0.05988   503.7   496.7
17734   -101.9 L:  551 GRANITF7 115   920 CANBY  7 115 1        -107.2  -105.0 -0.02152         -0.01167   -45.8   -44.6    95     95   105   10
              C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          0.19144 -0.05141  -320.8  -315.5
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Table 5.1 (Cont.)
MUST Results Case S2C4WXE

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17790    -98.2 L:  705 DRAYTON7 115   992 HENSEL 7 115 1         -83.8   -74.0 -0.10000
                Base Case
17887    -84.6 L:  720 SWEETWA7 115   976 DEVILSE7 115 1          96.5    88.0  0.10000          0.10000    85.8    77.4  NONE   NONE  104   NEW
              C:  709 LANGDON7 115 29832 LANGDONT 115 1     626
                Open   709 LANGDON7 115 29832 LANGDONT 115 1                           1.00000  0.00000    10.6    10.6
23690    -58.5 L:  720 SWEETWA7 115   976 DEVILSE7 115 1          85.8    80.0  0.10000
                Base Case
23718    -37.4 L: 1945 KERKHOT7 115  1946 KERKHO 7 115 1         -81.0   -80.0 -0.02578         -0.01017   -35.0   -34.6   N/A   NONE  101   NEW
              C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                          -0.10811  0.14445   425.5   420.1
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Table 5.1 (Cont.)
MUST Results Case S2C4WD3

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FCITC Single Study

  *** MUST 4.01.07 ***  THU, JUN 20 2002  11:07 ***
      UPE-SO04AA.S2C4WD3.SAV; S2C4WX3 + ADAMS&ARPIN SVCS(0-400)
      ND=3031,MH=2176,MW=1815,OHMH=-196,OHMP=150,EWTW=-119,BD=164
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE2      To DISPATCH_W    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total 41540 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow=
                C: Contingency description                   Ncon   Flow  Rating             LODF             Init   Final
     1  -4795.5 L:47626 ST CROIG69.0 57251 T OSCOLA69.0 1         103.3    52.8  0.01054          0.00441    58.3    37.2  178  178  194  16
                C: 1804 LAW CRK4 230  1809 APPLRV 4 230 1    1603
                  Open  1804 LAW CRK4 230  1809 APPLRV 4 230 1                           0.12698  0.04828   354.7   123.2
     2  -4794.5 L: 2143 ALMA   5 161  2149 WABACO 5 161 1         304.7   221.1  0.01744         -0.01110    91.3   144.5  123  123  138  15
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     890
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                          -0.21178 -0.13477 -1007.9  -361.7
     3  -3729.1 L:57251 T OSCOLA69.0 57262 BORDER  69.0 1          87.7    48.4  0.01054          0.00441    42.7    26.2  164  164  181  17
                C: 1804 LAW CRK4 230  1809 APPLRV 4 230 1    1603
                  Open  1804 LAW CRK4 230  1809 APPLRV 4 230 1                           0.12698  0.04828   354.7   174.7
     4  -3470.0 L:57262 BORDER  69.0 57312 SAND LK 69.0 1          85.0    48.4  0.01054          0.00441    39.9    24.6  161  161  178  17
                C: 1804 LAW CRK4 230  1809 APPLRV 4 230 1    1603
                  Open  1804 LAW CRK4 230  1809 APPLRV 4 230 1                           0.12698  0.04828   354.7   187.2
     5  -3249.6 L: 2147 ROCHSTR5 161  2149 WABACO 5 161 1        -273.8  -221.1 -0.01623          0.01320   -53.8   -96.7  110  110  126  16
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     890
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.21836 -0.13477 -1007.9  -569.9
     6  -2693.8 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1965.5 -1732.0 -0.08667         -0.08667 -1813.2 -1579.7  N/A  111  115   4
                C: 3458 LETELER4 230  9458 LETLRPHS     1    2945
                  Open  3458 LETELER4 230  9458 LETLRPHS     1                           0.54928  0.00000  -277.2  -277.2
     7  -2650.5 L:57311 GARFIELD69.0 57312 SAND LK 69.0 1         -79.6   -51.7 -0.01054         -0.00441   -34.6   -22.9  143  143  159  16
                C: 1804 LAW CRK4 230  1809 APPLRV 4 230 1    1603
                  Open  1804 LAW CRK4 230  1809 APPLRV 4 230 1                          -0.12698  0.04828   354.7   226.8
    10  -2391.1 L:  805 BAKER  7 115   832 GLENDCT7 115 1         -93.3   -67.7 -0.01073         -0.00490   -30.6   -18.9  129  129  135   6
                C:  411 MI CTYE4 230   804 BAKER  4 230 1     129
                  Open   411 MI CTYE4 230   804 BAKER  4 230 1                          -0.47211  0.01236   132.8   103.2
    20  -1595.0 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          68.3    50.0  0.01146          0.00163    12.1     9.5  126  126  135   9
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     488
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27953  0.03516   200.8   144.7
    21  -1541.4 L:46837 SCANTAP869.0 47626 ST CROIG69.0 1          84.4    68.2  0.01054          0.00441    39.4    32.6  111  111  124  13
                C: 1804 LAW CRK4 230  1809 APPLRV 4 230 1    1603
                  Open  1804 LAW CRK4 230  1809 APPLRV 4 230 1                           0.12698  0.04828   354.7   280.3
    22  -1507.7 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         528.4   448.0  0.05333          0.02414   405.3   368.9  111  111  126  15
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12541  0.23273   981.4   630.5
    24  -1445.2 L: 1609 WILMART5 161  1610 WILMART7 115 1        -258.5  -205.7 -0.03653         -0.02094  -141.9  -111.7  108  108  124  16
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     890
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.11565 -0.13477 -1007.9  -813.1
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Table 5.1 (Cont.)
MUST Results Case S2C4WD3

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  25  -1425.4 L: 2022 ADAMS  5 161  2147 ROCHSTR5 161 1        -293.1  -221.1 -0.05051         -0.01177   -59.7   -42.9  110  110  140  30
             C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     889
               Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                          -0.29376  0.13189   794.4   606.5
  26  -1406.4 L:  515 HURON  7 115   528 WOONSKT7 115 1         114.6    88.0  0.01890          0.01508    59.0    37.8  119  119  128   9
             C:  507 FTTHOMP4 230   622 STORLA 4 230 1     337
               Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25340  0.01508   219.5   198.3
  43  -1243.9 L:47581 WISSOTAG69.0 47583 WISOTBC869.0 1          55.2    40.7  0.01162          0.00507    36.8    30.5   74   74  155  81
             C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5846
               Open  1853 EAU CL 3 345 92494 ARP 345  345 1                           0.02156  0.30414   852.2   473.9
  44  -1238.3 L:  418 DKSN-ND7 115   870 N ENGLN7 115 1          90.4    67.7  0.01834          0.01178    35.0    20.4  123  123  135  12
             C:  804 BAKER  4 230   810 BOWMAN 4 230 1     699
               Open   804 BAKER  4 230   810 BOWMAN 4 230 1                           0.37996  0.01726   145.7   124.3
  75  -1141.0 L:57307 APLRVR 869.0 57311 GARFIELD69.0 1         -63.6   -51.7 -0.01047         -0.00441   -19.1   -14.1  115  115  130  15
             C: 1804 LAW CRK4 230  1809 APPLRV 4 230 1    1603
               Open  1804 LAW CRK4 230  1809 APPLRV 4 230 1                          -0.12553  0.04828   354.7   299.6
  78  -1130.9 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         238.2   223.0  0.01346          0.01429   163.9   147.7  109  109  113   4
             C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1936
               Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                           0.20289 -0.00407   366.6   371.2
  79  -1130.2 L:  970 ORTONVL7 115  1935 GRACEVT7 115 1         117.9   105.0  0.01144         -0.00103    40.9    42.0  105  105  106   1
             C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
               Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          -0.23604 -0.05284  -326.5  -266.8
  88  -1101.7 L:  848 HETINGR7 115   870 N ENGLN7 115 1         -87.9   -67.7 -0.01834         -0.01178   -32.5   -19.5  119  119  131  12
             C:  804 BAKER  4 230   810 BOWMAN 4 230 1     699
               Open   804 BAKER  4 230   810 BOWMAN 4 230 1                          -0.37996  0.01726   145.7   126.7
  98  -1083.8 L:  435 FARGO  4 230  1637 SHEYNNE4 230 1         512.3   391.0  0.11188          0.03933   265.7   223.1  N/A NONE  132 NEW
             C:99553 MOORHED3 345 99435 FARGO  3 345 1    5828
               Open 99553 MOORHED3 345 99435 FARGO  3 345 1                          -0.61563 -0.11785  -400.5  -272.8
 100  -1079.6 L: 2041 LIME CK5 161  2042 EMERY  5 161 1         200.3   167.0  0.03087          0.01010   118.8   107.9   95   95  121  26
             C: 1601 ADAMS  3 345  2050 HAZLTON3 345 1    1242
               Open  1601 ADAMS  3 345  2050 HAZLTON3 345 1                           0.17734  0.11715   459.5   333.1
 262   -971.7 L:  528 WOONSKT7 115   623 STORLA 7 115 1         106.4    88.0  0.01890          0.01508    50.7    36.1  112  112  121   9
             C:  507 FTTHOMP4 230   622 STORLA 4 230 1     337
               Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25340  0.01508   219.5   204.8
2691   -937.0 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1813.2 -1732.0 -0.08667
               Base Case
5799   -906.7 L:  404 DAWSONC7 115   832 GLENDCT7 115 1          77.4    67.7  0.01073          0.00490    14.7    10.3  108  108  114   6
             C:  411 MI CTYE4 230   804 BAKER  4 230 1     129
               Open   411 MI CTYE4 230   804 BAKER  4 230 1                           0.47211  0.01236   132.8   121.6
5822   -889.4 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          85.5    62.7  0.02563          0.01886    66.5    49.8   98   98  145  47
             C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5846
               Open  1853 EAU CL 3 345 92494 ARP 345  345 1                           0.02225  0.30414   852.2   581.7
5847   -876.3 L:  911 BIGSTON7 115   948 HIWY12 7 115 1         193.8   176.0  0.02028          0.00402    93.3    89.8  104  104  104   0
             C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
               Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          -0.30758 -0.05284  -326.5  -280.2
5893   -790.5 L: 1870 WHEATON5 161  2151 ELK MND5 161 1        -375.0  -294.0 -0.10246         -0.04708  -141.5  -104.2  109  109  142  33
             C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
               Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23797  0.23273   981.4   797.4
5895   -786.1 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         203.7   185.0  0.02385          0.01629   128.3   115.5  105  105  110   5
             C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1035
               Open  1373 ARROWHD7 115  1379 GARY   7 115 1                           0.82243  0.00918    91.8    84.6
5896   -785.7 L: 1854 EAU CLA5 161  1870 WHEATON5 161 1        -374.5  -294.0 -0.10246         -0.04708  -141.0  -104.0  109  109  142  33
             C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
               Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23797  0.23273   981.4   798.5
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Table 5.1 (Cont.)
MUST Results Case S2C4WD3

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5897   -770.2 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         368.1   352.0  0.02090          0.00714   136.1   130.6  101  101  105   4
              C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     585
                Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                          0.60111  0.02288   386.0   368.3
5898   -759.7 L: 2157 BARRON 5 161  2165 APL RVR5 161 1        -265.9  -229.9 -0.04734         -0.02423  -168.4  -150.0  101  101  121  20
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                         -0.09933  0.23273   981.4   804.6
5913   -665.8 L:  555 MORRIS 7 115  1935 GRACEVT7 115 1        -112.6  -105.0 -0.01144          0.00103   -35.5   -36.2   96   96  102   6
              C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          0.23604 -0.05284  -326.5  -291.4
5924   -610.8 L:47583 WISOTBC869.0 56014 DPC TAP869.0 1          47.8    40.7  0.01162          0.00507    29.4    26.3   62   62  142  80
              C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5846
                Open  1853 EAU CL 3 345 92494 ARP 345  345 1                          0.02156  0.30414   852.2   666.4   62   62  142  80
5925   -610.8 L:47585 CADOTT 869.0 56014 DPC TAP869.0 1         -47.8   -40.7 -0.01162         -0.00507   -29.4   -26.3
              C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5846
                Open  1853 EAU CL 3 345 92494 ARP 345  345 1                         -0.02156  0.30414   852.2   666.4
5928   -595.8 L:  555 MORRIS 7 115  1911 WALDON 7 115 1          95.2    80.0  0.02549          0.01014    49.7    43.6  N/A NONE  124 NEW
              C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                          0.10814  0.14194   420.9   336.3
5933   -572.8 L: 1219 SILVER L 161  2147 ROCHSTR5 161 1         233.6   204.6  0.05061          0.01936    45.4    34.3   93   93  120  27
              C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     889
                Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                          0.23691  0.13189   794.4   718.9
5942   -505.5 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          66.5    57.0  0.01886
                Base Case
5951   -451.7 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1771.2  1732.0  0.08667
                Base Case
5952   -451.7 L: 1307 FORBES 2 500  1678 ROSEAUS2 500 1       -1771.2 -1732.0 -0.08667
                Base Case
5953   -448.3 L:  705 DRAYTON7 115   930 DONALDS7 115 1         198.3   171.0  0.06100          0.03446   117.3   101.9   81   81 116(N/C) 35
              C:  752 DRAYTON4 230   755 PRAIRIE4 230 1     661
                Open   752 DRAYTON4 230   755 PRAIRIE4 230 1                          0.40499  0.06554   200.0   170.6
5956   -441.0 L: 1905 BENSON 7 115  1911 WALDON 7 115 1         -91.2   -80.0 -0.02549         -0.01014   -45.7   -41.3  N/A NONE  120  NEW
              C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                         -0.10814  0.14194   420.9   358.3
5958   -432.1 L: 2151 ELK MND5 161  2157 BARRON 5 161 1        -218.7  -190.3 -0.06579         -0.03672   -96.1   -80.3   48   48  127  79
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                         -0.12491  0.23273   981.4   880.8
5959   -422.8 L:  948 HIWY12 7 115   970 ORTONVL7 115 1         184.6   176.0  0.02028          0.00402    84.1    82.4   98   98  100   2
              C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                Open   503 BLAIR  4 230   910 BIGSTON4 230 1                         -0.30758 -0.05284  -326.5  -304.2
5960   -421.2 L: 1868 TREMVAL5 161  2143 ALMA   5 161 1        -261.2  -245.3 -0.03780         -0.02787  -191.7  -179.9   96   96  110  14
              C: 1860 MRSHLND5 161  2143 ALMA   5 161 1    1681
                Open  1860 MRSHLND5 161  2143 ALMA   5 161 1                          0.28855 -0.03443  -241.1  -226.6
5962   -417.4 L:47519 MONROCO869.0 57147 SPARTA  69.0 1          60.4    51.7  0.02088          0.00953    27.2    23.2   95   95  119  24
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5847
                Open  1861 MONROCO5 161 92548 COC 161  161 1                          0.31403  0.03615   105.8    90.7
5963   -410.4 L:  977 RAMSEY 7 115 42012 RAMSEY Y1.00 1         184.6   105.0  0.19392          0.13183   119.3    65.2 NONE NONE 175(N/C) NEW
              C:  428 CARNGTN7 115   445 JAMESTN7 115 1     165
                Open   428 CARNGTN7 115   445 JAMESTN7 115 1                          0.68203  0.09104    95.6    58.3
5964   -407.7 L:  827 ELLENDL7 115  1001 ABDNJCT7 115 1          92.1    88.0  0.01006          0.01304    60.7    55.3   99   98  105   6
              C:  826 ELLENDL4 230   994 OAKES  4 230 1     713
                Open   826 ELLENDL4 230   994 OAKES  4 230 1                          0.32304 -0.00921    97.4   101.1
5967   -385.4 L:  432 EDGELEY7 115   534 ORDWAY 7 115 1         147.6   116.0  0.08199          0.07745   106.3    76.4   70   70  127  57
              C:  605 LELANDO3 345   660 GROTON 3 345 1     553
                Open   605 LELANDO3 345   660 GROTON 3 345 1                          0.10449  0.04350   395.6   378.9
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Table 5.1 (Cont.)
MUST Results Case S2C4WD3

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 5968   -381.4 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         140.1   134.0  0.01601          0.01323   118.2   113.1   99   99  106   7
              C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2076
                Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                           0.04207  0.06622   521.7   496.5
 5970   -375.0 L:  428 CARNGTN7 115   445 JAMESTN7 115 1         140.9    88.0  0.14102          0.09104    95.6    61.5 NONE NONE 160(N/C) NEW
              C:  977 RAMSEY 7 115 42012 RAMSEY Y1.00 1     835
                Open   977 RAMSEY 7 115 42012 RAMSEY Y1.00 1                           0.37912  0.13183   119.3    69.9
 5975   -335.1 L:  432 EDGELEY7 115   433 EDGELEY869.0 1          31.5    25.0  0.01931          0.00828    16.3    13.6 NONE NONE 126  NEW
              C:  432 EDGELEY7 115   534 ORDWAY 7 115 1     179
                Open   432 EDGELEY7 115   534 ORDWAY 7 115 1                           0.14238  0.07745   106.3    80.3
 5979   -321.6 L:57145 TOMAH   69.0 57147 SPARTA  69.0 1         -58.4   -51.7 -0.02088         -0.00953   -25.2   -22.1   91   91  115  24
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5847
                Open  1861 MONROCO5 161 92548 COC 161  161 1                          -0.31403  0.03615   105.8    94.2
 5995   -273.7 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -114.5  -106.0 -0.03096         -0.01725   -78.1   -73.3  115  115  119   4
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     957
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           0.20753 -0.06604  -175.4  -157.4
 5996   -271.0 L:  976 DEVILSE7 115   977 RAMSEY 7 115 1         184.6   132.0  0.19392          0.13183   119.3    83.6 NONE NONE 140(N/C) NEW
              C:  428 CARNGTN7 115   445 JAMESTN7 115 1     165
                Open   428 CARNGTN7 115   445 JAMESTN7 115 1                           0.68203  0.09104    95.6    71.0
 5997   -268.1 L:  977 RAMSEY 7 115 42012 RAMSEY Y1.00 1         119.3    84.0  0.13183
                Base Case
 5999   -262.1 L: 1512 RAMSEY 4 230 42012 RAMSEY Y1.00 1        -118.6   -84.0 -0.13183
                Base Case
 6001   -260.5 L: 1868 TREMVAL5 161  2143 ALMA   5 161 1        -256.6  -245.3 -0.04326         -0.02787  -191.7  -184.4   92   92  110  18
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1418
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.06615  0.23273   981.4   920.7
 6005   -251.9 L:57143 T TC    69.0 57145 TOMAH   69.0 1         -57.0   -51.7 -0.02088         -0.00953   -23.7   -21.3   91   91  115  24
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5847
                Open  1861 MONROCO5 161 92548 COC 161  161 1                          -0.31403  0.03615   105.8    96.7
 6011   -245.8 L: 1353 RIVERTN7 115 44250 RIVTON 869.0 1          46.6    44.0  0.01055          0.00734    42.7    40.9  107  138  105   2
              C: 1317 MUDLAKE4 230  1508 BENTON 4 230 1     970
                Open  1317 MUDLAKE4 230  1508 BENTON 4 230 1                           0.05580  0.05754    69.0    54.9
 6030   -234.6 L: 2329 NEAL 4 5 161  2351 MONONA 5 161 1         166.8   163.0  0.01615          0.01275   141.4   138.4   95   95  101   6
              C:  565 SIOUXCY4 230   567 DENISON4 230 1     481
                Open   565 SIOUXCY4 230   567 DENISON4 230 1                           0.13828  0.02452   183.8   178.1
 6124   -218.4 L:47513 VIROQUA869.0 57100 T VIO   69.0 1          54.7    51.7  0.01368          0.00814    25.4    23.7   89   89  109  20
              C: 2107 SENECA 5 161  2123 GENOA  5 161 1    1890
                Open  2107 SENECA 5 161  2123 GENOA  5 161 1                          -0.12239 -0.04529  -239.0  -229.1
 6201   -214.3 L:  714 WARSAW 7 115   930 DONALDS7 115 1         -98.1   -90.4 -0.03614         -0.01781   -42.2   -38.4   69   69 109(N/C) 40
              C:  752 DRAYTON4 230   755 PRAIRIE4 230 1     661
                Open   752 DRAYTON4 230   755 PRAIRIE4 230 1                          -0.27972  0.06554   200.0   186.0
 6251   -212.6 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1923.4  1905.0  0.08667          0.08667  1771.2  1752.7   N/A  98  101  NEW
              C: 3458 LETELER4 230  9458 LETLRPHS     1    2945
                Open  3458 LETELER4 230  9458 LETLRPHS     1                          -0.54928  0.00000  -277.2  -277.2
11647   -190.9 L:  906 BAGLEY 7 115   990 WINGER 7 115 1        -109.8  -105.0 -0.02523         -0.01271   -52.3   -49.8   93   93  107  14
              C:  758 WINGER 4 230   986 WILTON 4 230 1     685
                Open   758 WINGER 4 230   986 WILTON 4 230 1                          -0.52659  0.02379   109.3   104.8
11672   -188.0 L:  705 DRAYTON7 115   992 HENSEL 7 115 1         -99.8   -81.0 -0.10000         -0.10000   -83.8   -65.0 NONE NONE  112 NEW
              C:  992 HENSEL 7 115 79851 HENSEL Y 115 1     853
                Open   992 HENSEL 7 115 79851 HENSEL Y 115 1                          -1.00000  0.00000    16.0    16.0
11732   -179.3 L: 1365 THOMSON7 115  1376 HIBBARD7 115 1          74.9    73.0  0.01057          0.00718    58.5    57.2 NONE NONE  102 NEW
              C: 1368 CLOQUET7 115  1373 ARROWHD7 115 1    1028
                Open  1368 CLOQUET7 115  1373 ARROWHD7 115 1                           0.63199  0.00536    26.0    25.0
11797   -168.0 L:  940 GRANTCO7 115   950 HOOT LK7 115 1        -110.3  -105.0 -0.03140         -0.01734   -65.2   -62.2 N/A  NONE  104  NEW
              C:99553 MOORHED3 345 99554 MORRIS 3 345 1    5830
                Open 99553 MOORHED3 345 99554 MORRIS 3 345 1                          -0.09858  0.14261   457.7   433.7
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Table 5.1 (Cont.)
MUST Results Case S2C4WD3

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11851   -149.2 L: 1905 BENSON 7 115  1946 KERKHO 7 115 1          83.8    80.0  0.02549          0.01014    38.3    36.8  N/A NONE  104  NEW
               C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                 Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                          0.10814  0.14194   420.9   399.7

11896   -131.2 L: 1854 EAU CLA5 161  1877 SEVN ML5 161 1         226.1   221.0  0.03858          0.00243   124.8   124.4   66   66  114  48
               C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5846
                 Open  1853 EAU CL 3 345 92494 ARP 345  345 1                          0.11888  0.30414   852.2   812.3
11920   -125.3 L:  902 ALEXAND7 115  1649 DGLASCO7 115 1          91.9    88.0  0.03096          0.01725    55.5    53.3  106  106  111   5
               C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     957
                 Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                         -0.20753 -0.06604  -175.4  -167.2
12052   -110.8 L:  497 MAURINE4 230   470 BISON  4 230 1        -179.2  -176.0 -0.02904         -0.02904  -150.3  -147.1 NONE NONE  103  NEW
               C:  618 LARAM31G24.0   631 LARAMIE3 345 1     570
                 Open   618 LARAM31G24.0   631 LARAMIE3 345 1                          0.05171  0.00000  -558.5  -558.5
17766   -106.4 L:  551 GRANITF7 115   920 CANBY  7 115 1        -107.3  -105.0 -0.02142         -0.01131   -44.8   -43.6   95   95  105  10
               C:  503 BLAIR  4 230   910 BIGSTON4 230 1     314
                 Open   503 BLAIR  4 230   910 BIGSTON4 230 1                          0.19143 -0.05284  -326.5  -320.9
23652    -98.2 L:  705 DRAYTON7 115   992 HENSEL 7 115 1         -83.8   -74.0 -0.10000
                 Base Case
23953    -85.0 L:  720 SWEETWA7 115   976 DEVILSE7 115 1          96.5    88.0  0.10000          0.10000    85.9    77.4 NONE NONE  103  NEW
               C:  709 LANGDON7 115 29832 LANGDONT 115 1     626
                 Open   709 LANGDON7 115 29832 LANGDONT 115 1                          1.00000  0.00000    10.6    10.6
29391    -83.0 L:  827 ELLENDL7 115  1001 ABDNJCT7 115 1          89.3    88.0  0.01619          0.01304    60.7    59.6   90   90  105  15
               C:  605 LELANDO3 345   660 GROTON 3 345 1     553
                 Open   605 LELANDO3 345   660 GROTON 3 345 1                          0.07252  0.04350   395.6   392.0
29607    -60.2 L: 1606 W FARIB7 115  1970 LKMARN 7 115 1        -153.1  -152.0 -0.01896         -0.00947   -82.1   -81.6   91   91  109  18
               C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     890
                 Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                          0.07046 -0.13477 -1007.9  -999.7
29608    -58.9 L:  720 SWEETWA7 115   976 DEVILSE7 115 1          85.9    80.0  0.10000
                 Base Case
29617    -56.5 L: 1228 MAPLE LF 161  1230 BYRON  5 161 1        -412.9  -409.2 -0.06526         -0.02497  -170.2  -168.8   86   86  104  18
               C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     889
                 Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                         -0.30550  0.13189   794.4   787.0
29643    -32.7 L:  504 BROOKNG7 115   505 FLANDRU7 115 1         133.0   132.0  0.03126          0.01270    57.0    56.6 NONE NONE  105 NEW
               C:  537 WHITE  3 345 45641 SPLTRTA3 345 1     435
                 Open   537 WHITE  3 345 45641 SPLTRTA3 345 1                          0.15265  0.12158   498.0   494.0
29647    -29.4 L:57097 LAFARGE 69.0 57100 T VIO   69.0 1         -52.1   -51.7 -0.01368         -0.00814   -22.9   -22.6 NONE NONE  106 NEW
               C: 2107 SENECA 5 161  2123 GENOA  5 161 1    1890
                 Open  2107 SENECA 5 161  2123 GENOA  5 161 1                          0.12239 -0.04529  -239.0  -237.6
35568    -27.6 L: 1945 KERKHOT7 115  1946 KERKHO 7 115 1         -80.7   -80.0 -0.02549         -0.01014   -35.2   -34.9 N/A  NONE  100 NEW
               C:99554 MORRIS 3 345 99550 GRANFLS3 345 1    5829
                 Open 99554 MORRIS 3 345 99550 GRANFLS3 345 1                         -0.10814  0.14194   420.9   417.0
35574    -23.1 L:  522 SUMMIT-7 115   531 WATERTN7 115 1         110.9   110.0  0.04086          0.02574    52.3    51.7   86   86  107  21
               C:  529 WATERTN3 345   660 GROTON 3 345 1     417
                 Open   529 WATERTN3 345   660 GROTON 3 345 1                         -0.14671 -0.10305  -399.6  -397.2
35582    -13.2 L:  423 BARLOW 7 115   428 CARNGTN7 115 1         -89.3   -88.0 -0.10000         -0.00896     6.3     6.4 NONE NONE  101(N/C) NEW
               C:  428 CARNGTN7 115   445 JAMESTN7 115 1     165
                 Open   428 CARNGTN7 115   445 JAMESTN7 115 1                         -1.00000  0.09104    95.6    94.4
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Table 5.1 (Cont.)
MUST Results Case S3C3W2E

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FCITC Single Study

  *** MUST 4.01.07 ***  THU, JUN 20 2002  11:33 ***
      UPE-SO04AA.S3C3W2E.SAV;SUMMER;OP LD;SYSTEM INTACT
      ND=2647,MH=2172,MW=2002,OHMH=-197,OHMP=150,EWTW=-120,BD=166
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE3      To DISPATCH_W    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total  5962 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow= ACCC  BASE  ACCC   Delta
                C: Contingency description                   Ncon   Flow  Rating             LODF             Init   Final  CNT%  MAX% S3C3W2E   %
     1  -2110.7 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1939.9 -1732.0 -0.09848         -0.13050 -1804.2 -1528.8  111   111   112      1
                C:  752 DRAYTON4 230  3458 LETELER4 230 1     657
                  Open   752 DRAYTON4 230  3458 LETELER4 230 1                           0.55962  0.05722  -242.3  -363.1
     2  -2020.2 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         217.8   185.0  0.01626          0.01112   137.2   114.7  105   105   117     12
                C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1029
                  Open  1373 ARROWHD7 115  1379 GARY   7 115 1                           0.82162  0.00625    98.1    85.5
     3  -1915.2 L:  805 BAKER  7 115   832 GLENDCT7 115 1         -96.4   -67.7 -0.01500         -0.00699   -32.1   -18.7  129   129   140     11
                C:  411 MI CTYE4 230   804 BAKER  4 230 1     129
                  Open   411 MI CTYE4 230   804 BAKER  4 230 1                          -0.47200  0.01698   136.2   103.6
     4  -1535.7 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          67.2    50.0  0.01119          0.00163    12.2     9.7  126   126   133      7
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     485
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27957  0.03418   196.8   144.3
     6  -1369.8 L:  515 HURON  7 115   528 WOONSKT7 115 1         114.2    88.0  0.01913          0.01365    57.1    38.4  119   119   128      9
                C:  507 FTTHOMP4 230   622 STORLA 4 230 1     331
                  Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25336  0.02163   225.6   195.9
    11  -1137.0 L:  418 DKSN-ND7 115   870 N ENGLN7 115 1          93.2    67.7  0.02251          0.01340    36.2    21.0  123   123   139     16
                C:  804 BAKER  4 230   810 BOWMAN 4 230 1     694
                  Open   804 BAKER  4 230   810 BOWMAN 4 230 1                           0.37982  0.02397   150.2   122.9
    19  -1025.7 L:  848 HETINGR7 115   870 N ENGLN7 115 1         -90.7   -67.7 -0.02251         -0.01340   -33.7   -20.0  119   119   139     20
                C:  804 BAKER  4 230   810 BOWMAN 4 230 1     694
                  Open   804 BAKER  4 230   810 BOWMAN 4 230 1                          -0.37982  0.02397   150.2   125.6
    20  -1000.2 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         491.5   448.0  0.04344          0.02562   387.8   362.2  111   111   117      6
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1412
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12114  0.14713   855.4   708.2
    23   -945.6 L:  528 WOONSKT7 115   623 STORLA 7 115 1         106.1    88.0  0.01913          0.01365    48.9    36.0  112   112   121      9
                C:  507 FTTHOMP4 230   622 STORLA 4 230 1     331
                  Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25336  0.02163   225.6   205.1
    26   -853.3 L:  404 DAWSONC7 115   832 GLENDCT7 115 1          80.5    67.7  0.01500          0.00699    16.2    10.2  108   108   118     10
                C:  411 MI CTYE4 230   804 BAKER  4 230 1     129
                  Open   411 MI CTYE4 230   804 BAKER  4 230 1                           0.47200  0.01698   136.2   121.7
    31   -846.1 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         231.8   223.0  0.01038          0.01097   157.0   147.7  109   109   110      1
                C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1929
                  Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                           0.20291 -0.00292   368.7   371.1
    65   -696.1 L: 1609 WILMART5 161  1610 WILMART7 115 1        -221.1  -205.7 -0.02206         -0.01541  -131.3  -120.6  108   108   107     -1
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     883
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.11143 -0.05967  -805.4  -763.9
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Table 5.1 (Cont.)
MUST Results Case S3C3W2E

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  81   -665.0 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         366.8   352.0  0.02223          0.00764   135.7   130.6  101   101   104       3
              C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     581
                Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                           0.60108  0.02428   384.4   368.3
 101   -638.1 L: 1721 HIBRDGE7 115  1745 ROGRSLK7 115 1         253.2   240.0  0.02070          0.01606   198.5   188.2   91    91   110       9
              C: 1695 AS KING3 345  1742 REDROCK3 345 1    1411
                Open  1695 AS KING3 345  1742 REDROCK3 345 1                           0.11870  0.03910   461.1   436.2
2683   -553.6 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1804.2 -1732.0 -0.13050
                Base Case
5876   -427.0 L:  827 ELLENDL7 115  1001 ABDNJCT7 115 1          95.5    88.0  0.01756          0.00689    51.9    48.9  103   103   111       8
              C:  826 ELLENDL4 230   994 OAKES  4 230 1     708
                Open   826 ELLENDL4 230   994 OAKES  4 230 1                           0.32573  0.03276   134.0   120.0
5889   -384.5 L: 1870 WHEATON5 161  2151 ELK MND5 161 1        -318.2  -294.0 -0.06286         -0.02896  -121.1  -110.0  109   109   116       7
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1412
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23038  0.14713   855.4   798.8
5891   -378.5 L: 1854 EAU CLA5 161  1870 WHEATON5 161 1        -317.8  -294.0 -0.06286         -0.02896  -120.7  -109.8  109   109   115       6
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1412
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23038  0.14713   855.4   799.7
5916   -235.1 L:  497 MAURINE4 230   470 BISON  4 230 1        -184.8  -176.0 -0.03737         -0.03737  -155.6  -146.8  NONE NONE   107     NEW
              C:  618 LARAM31G24.0   631 LARAMIE3 345 1     566
                Open   618 LARAM31G24.0   631 LARAMIE3 345 1                           0.05233  0.00000  -558.5  -558.5
5918   -230.5 L: 1307 FORBES 2 500  1678 ROSEAUS2 500 1       -1762.1 -1732.0 -0.13050
                Base Case
5919   -230.5 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1762.1  1732.0  0.13050
                Base Case
5925   -210.5 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          66.1    62.7  0.01594          0.01220    52.9    50.3   N/A    98   104    NEW
              C: 1604 PR ISLD3 345 92270 COL 345  345 1    5929
                Open  1604 PR ISLD3 345 92270 COL 345  345 1                           0.02699  0.13875   489.1   459.9
5934   -115.6 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         135.6   134.0  0.01405          0.01158   114.5   113.1   99    99   102     NEW
                Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                           0.04196  0.05884   503.8   497.0
5937    -84.7 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -107.9  -106.0 -0.02225         -0.01261   -75.3   -74.2  115   115   112      -2
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     950
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           0.21104 -0.04567  -154.6  -150.7
5938    -65.2 L:  497 MAURINE4 230   470 BISON  4 230 1        -178.8  -176.0 -0.04281         -0.03737  -155.6  -153.1  NONE NONE   107     NEW
              C:  601 ANTELOP3 345   620 HURON  3 345 1     540
                Open   601 ANTELOP3 345   620 HURON  3 345 1                          -0.05858  0.09290   396.5   390.4
5947    -34.2 L: 2151 ELK MND5 161  2157 BARRON 5 161 1        -191.8  -190.3 -0.04261         -0.02478   -88.1   -87.2   48    48   107     NEW
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1412
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.12119  0.14713   855.4   850.3
5948    -34.2 L:  507 FTTHOMP4 230   516 LAKPLAT4 230 1         317.7   316.0  0.04922          0.03602   233.9   232.7   94    94   100       6
              C:  507 FTTHOMP4 230   509 FTRANDL4 230 1     320
                Open   507 FTTHOMP4 230   509 FTRANDL4 230 1                           0.35954  0.03671   233.0   231.8
```

Table 5.1 (Cont.)
MUST Results Case S4C4IXA

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FCITC Single Study

  *** MUST 4.01.07 ***  THU, JUN 20 2002  11:51 ***
      UPE-SO04AA.S4C4IXA.SAV;SUMMER;;SYSTEM INTACT           :
      ND=2079,MH=2171,MW=1653,OHMH=-197,OHMP=150,EWTW=-120,BD=167
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE4      To DISPATCH_I    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total 17337 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow= ACCC  BASE   ACCC  Delta
                C: Contingency description                   Ncon   Flow  Rating             LODF             Init   Final  CNT%  MAX% S4C4IXA   %
     1  -4669.4 L: 2143 ALMA   5 161  2149 WABACO 5 161 1         280.9   221.1  0.01281         -0.00619    88.0   116.9  123   123    127     4
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     878
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                          -0.21382 -0.08889  -902.4  -487.4
     3  -3311.2 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1927.0 -1732.0 -0.05890         -0.05601 -1787.2 -1601.8  111   111    113     2
                C:  753 RUNNING4 230  1327 SHANNON4 230 1     660
                  Open   753 RUNNING4 230  1327 SHANNON4 230 1                          -0.65660  0.00440   212.9   198.4
     8  -2421.0 L: 2147 ROCHSTR5 161  2149 WABACO 5 161 1        -249.9  -221.1 -0.01188          0.00771   -51.0   -69.6  110   110    114     4
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     878
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.22041 -0.08889  -902.4  -687.2
    14  -2045.8 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         507.5   448.0  0.02907          0.01413   396.5   367.6  111   111    120     9
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1407
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12504  0.11950   887.5   643.1
    21  -1710.4 L: 1609 WILMART5 161  1610 WILMART7 115 1        -260.8  -205.7 -0.03220         -0.02184  -155.5  -118.2  108   108    126    18
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     878
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.11662 -0.08889  -902.4  -750.4
    53  -1343.9 L:  563 SPENCER5 161  2597 TRIBOJI5 161 1        -193.1  -162.0 -0.02313         -0.02208  -161.6  -131.9  NONE  NONE   125    NEW
                C: 2371 WEBSTER5 161 60320 WEB MID5 161 1    2114
                  Open  2371 WEBSTER5 161 60320 WEB MID5 161 1                           0.10622 -0.00990  -296.5  -283.2
    63  -1294.1 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          70.7    50.0  0.01601          0.00194    11.6     9.1  126   126    140    14
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     486
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27872  0.05046   212.1   146.8
    93  -1204.2 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          79.1    62.7  0.01361          0.01025    62.5    50.2   98    98    132    34
                C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5828
                  Open  1853 EAU CL 3 345 92494 ARP 345  345 1                           0.02233  0.15051   741.0   559.8
   147  -1110.4 L: 2022 ADAMS  5 161  2147 ROCHSTR5 161 1        -262.5  -221.1 -0.03729         -0.00869   -50.9   -41.3  110   110    126    16
                C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     877
                  Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                          -0.29637  0.09651   714.0   606.8
   753   -993.1 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         246.2   223.0  0.02338          0.02380   171.6   148.0  109   109    116     7
                C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1924
                  Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                           0.20289 -0.00207   367.8   369.9
  2884   -985.8 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1787.2 -1732.0 -0.05601
                  Base Case
  5836   -832.8 L: 1870 WHEATON5 161  2151 ELK MND5 161 1        -336.6  -294.0 -0.05112         -0.02264  -125.0  -106.2  109   109    128    19
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1407
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23837  0.11950   887.5   788.0
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Table 5.1 (Cont.)
MUST Results Case S4C4IXA

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5839   -825.3 L: 1854 EAU CLA5 161  1870 WHEATON5 161 1        -336.2  -294.0 -0.05112         -0.02264  -124.6  -105.9  109   109    127    18
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1407
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23837  0.11950   887.5   788.9
5843   -812.7 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         153.2   134.0  0.02363          0.01948   128.7   112.9   99    99    116    17
              C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2064
                Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                           0.04197  0.09868   583.0   502.8
5857   -767.3 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         370.3   352.0  0.02387          0.00809   136.9   130.6  101   101    105     4
              C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     580
                Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                            0.60101  0.02626   388.5   368.3
5869   -721.3 L: 2329 NEAL 4 5 161  2351 MONONA 5 161 1         180.1   163.0  0.02375          0.01883   152.6   139.0   95    95    110    15
              C:  565 SIOUXCY4 230   567 DENISON4 230 1     479
                Open   565 SIOUXCY4 230   567 DENISON4 230 1                            0.13799  0.03566   199.6   173.9
5881   -676.9 L: 2157 BARRON 5 161  2165 APL RVR5 161 1        -246.7  -229.9 -0.02478         -0.01287  -158.2  -149.4  101   101    112    11
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1407
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.09974  0.11950   887.5   806.6
5882   -668.1 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         193.3   185.0  0.01237          0.00841   121.3   115.7  105   105    105     0
              C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1023
                Open  1373 ARROWHD7 115  1379 GARY   7 115 1                            0.82247  0.00481    87.5    84.3
5897   -564.7 L: 2041 LIME CK5 161  2042 EMERY  5 161 1         178.9   167.0  0.02112          0.00158   103.2   102.3   95    95    109    14
              C: 1601 ADAMS  3 345  2050 HAZLTON3 345 1    1230
                Open  1601 ADAMS  3 345  2050 HAZLTON3 345 1                            0.17861  0.10944   424.1   362.3
5899   -540.7 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          62.5    57.0  0.01025
                Base Case
5915   -482.3 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -113.6  -106.0 -0.01577         -0.00847   -76.5   -72.4  115   115    118     3
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     945
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                            0.22103 -0.03300  -168.0  -152.1
5938   -359.2 L:47519 MONROCO869.0 57147 SPARTA  69.0 1          55.7    51.7  0.01116          0.00557    25.3    23.3   95    95    110    15
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5829
                Open  1861 MONROCO5 161 92548 COC 161  161 1                            0.31404  0.01780    96.7    90.4
5954   -265.8 L: 1868 TREMVAL5 161  2143 ALMA   5 161 1        -251.6  -245.3 -0.02359         -0.01666  -184.4  -180.0   96    96    104     8
              C: 1860 MRSHLND5 161  2143 ALMA   5 161 1    1669
                Open  1860 MRSHLND5 161  2143 ALMA   5 161 1                            0.28871 -0.02400  -232.6  -226.2
5961   -250.9 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1746.1  1732.0  0.05601
                Base Case
5962   -250.9 L: 1307 FORBES 2 500  1678 ROSEAUS2 500 1       -1746.1 -1732.0 -0.05601
                Base Case
5971   -196.4 L:  902 ALEXAND7 115  1649 DGLASCO7 115 1          91.1    88.0  0.01577          0.00847    54.0    52.3  106   106    109     3
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     945
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           -0.22103 -0.03300  -168.0  -161.6
5976   -191.3 L:57145 TOMAH   69.0 57147 SPARTA  69.0 1         -53.8   -51.7 -0.01116         -0.00557   -23.5   -22.4   91    91    105    14
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5829
                Open  1861 MONROCO5 161 92548 COC 161  161 1                           -0.31404  0.01780    96.7    93.3
5983   -175.4 L: 1219 SILVER L 161  2147 ROCHSTR5 161 1         210.9   204.6  0.03575          0.01272    40.5    38.2   93    93    110    17
              C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     877
                Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                            0.23867  0.09651   714.0   697.0
5990   -150.5 L:47513 VIROQUA869.0 57100 T VIO   69.0 1          53.2    51.7  0.01024          0.00553    24.5    23.7   89    89    104    15
              C: 2107 SENECA 5 161  2123 GENOA  5 161 1    1878
                Open  2107 SENECA 5 161  2123 GENOA  5 161 1                           -0.12243 -0.03844  -234.9  -229.1
5992   -150.2 L:  507 FTTHOMP4 230   516 LAKPLAT4 230 1         329.3   316.0  0.08831          0.06513   244.3   234.5   94    94    102     8
              C:  507 FTTHOMP4 230   509 FTRANDL4 230 1     323
                Open   507 FTTHOMP4 230   509 FTRANDL4 230 1                            0.34917  0.06638   243.3   233.4
6000   -130.4 L:  515 HURON  7 115   528 WOONSKT7 115 1          89.9    88.0  0.01434          0.00060    28.5    28.4  119   119    100    -9
              C:  507 FTTHOMP4 230   622 STORLA 4 230 1     332
                Open   507 FTTHOMP4 230   622 STORLA 4 230 1                            0.24832  0.05532   247.3   240.1
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Table 5.1 (Cont.)
MUST Results Case S4C4IXA

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6001   -128.8 L: 2337 PLYMOTH5 161  2348 LIT SX 5 161 1         166.0   163.0  0.02303          0.01586   123.6   121.6   94    94    102     8
              C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2064
                Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                          0.07267  0.09868   583.0   570.3
6069    -62.2 L:57143 T TC    69.0 57145 TOMAH   69.0 1         -52.4   -51.7 -0.01116         -0.00557   -22.0   -21.7   91    91    105    14
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5829
                Open  1861 MONROCO5 161 92548 COC 161  161 1                         -0.31404  0.01780    96.7    95.6
6134    -42.1 L: 2011 LAKEFLD5 161  2597 TRIBOJI5 161 1         247.3   246.0  0.03181          0.02208   211.2   210.3 NONE  NONE    103   NEW
              C: 1634 SPLT RK3 345 45646 SPLTRTB3 345 1    1310
                Open  1634 SPLT RK3 345 45646 SPLTRTB3 345 1                          0.06794  0.14321   532.0   526.0
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Table 5.1 (Cont.)
MUST Results Case S4C5WXD

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FCITC Single Study

  *** MUST 4.01.07 ***  THU, JUN 20 2002  12:18 ***
      UPE-SO04AA.S4C5WXD.SAV;SUMMER;OP LD;SYSTEM INTACT
      ND=2079,MH=2171,MW=1685,OHMH=-196,OHMP=151,EWTW=-119,BD=167
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE4      To DISPATCH_W    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total 11813 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow= ACCC  BASE   ACCC    Delta
                C: Contingency description                   Ncon   Flow  Rating             LODF              Init   Final  CNT%  MAX% S4C5WXD     %

     2  -3066.0 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1911.3 -1732.0 -0.05849         -0.05561 -1769.7 -1599.2  111   111     111      0
                C:  753 RUNNING4 230  1327 SHANNON4 230 1     660
                  Open   753 RUNNING4 230  1327 SHANNON4 230 1                          -0.65335  0.00441   216.7   203.2
    13  -1601.2 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         510.9   448.0  0.03929          0.01587   396.6   371.2  111   111     121     10
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12444  0.18818   918.8   617.5
    14  -1553.4 L: 1609 WILMART5 161  1610 WILMART7 115 1        -247.9  -205.7 -0.02714         -0.01949  -145.6  -115.3  108   108     120     12
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     878
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.11406 -0.06699  -896.5  -792.4
    23  -1334.6 L: 2022 ADAMS  5 161  2147 ROCHSTR5 161 1        -250.2  -221.1 -0.02182         -0.00239   -47.4   -44.2  110   110     119      9
                C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     877
                  Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                          -0.29122  0.06669   696.3   607.3
    28  -1271.5 L:  515 HURON  7 115   528 WOONSKT7 115 1         110.3    88.0  0.01757          0.00277    42.3    38.8  119   119     124      5
                C:  507 FTTHOMP4 230   622 STORLA 4 230 1     332
                  Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25251  0.05862   269.4   194.8
   101   -877.8 L:  563 SPENCER5 161  2597 TRIBOJI5 161 1        -174.3  -162.0 -0.01402         -0.01251  -142.6  -131.6 NONE  NONE    111    NEW
                C: 2367 LEHIGH 3 345  2370 WEBSTER3 345 1    2111
                  Open  2367 LEHIGH 3 345  2370 WEBSTER3 345 1                          -0.10815  0.01390   293.2   281.0
   105   -876.6 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          82.2    62.7  0.02225          0.01679    65.2    50.5   98    98     138     40
                C: 1853 EAU CL 3 345 92494 ARP 345  345 1    5830
                  Open  1853 EAU CL 3 345 92494 ARP 345  345 1                           0.02153  0.25387   789.0   566.4
   106   -876.2 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         233.3   223.0  0.01174          0.01246   158.8   147.9  109   109     111      2
                C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1926
                  Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                           0.20291 -0.00357   367.2   370.3
   115   -851.1 L:  528 WOONSKT7 115   623 STORLA 7 115 1         103.0    88.0  0.01757          0.00277    34.9    32.6  112   112     116      4
                C:  507 FTTHOMP4 230   622 STORLA 4 230 1     332
                  Open   507 FTTHOMP4 230   622 STORLA 4 230 1                           0.25251  0.05862   269.4   219.5
   147   -800.6 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          59.6    50.0  0.01201          0.00136    10.0     8.9  126   126     118      8
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     487
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27826  0.03828   178.2   147.5
   640   -688.2 L: 1870 WHEATON5 161  2151 ELK MND5 161 1        -352.7  -294.0 -0.08527         -0.04076  -135.4  -107.3  109   109     133     24
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23652  0.18818   918.8   789.3
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Table 5.1 (Cont.)
MUST Results Case S4C5WXD

```
  890   -683.1 L: 1854 EAU CLA5 161  1870 WHEATON5 161 1        -352.3  -294.0 -0.08527         -0.04076  -134.9  -107.1  109   109     133     24
               C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                 Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23652  0.18818   918.8   790.3
 2729   -678.8 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1769.7 -1732.0 -0.05561
                 Base Case
 5766   -634.6 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         364.5   352.0  0.01977          0.00674   134.9   130.6  101   101     103      2
               C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     580
                 Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                           0.60090  0.02169   382.1   368.4
 5814   -596.2 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         194.5   185.0  0.01600          0.01084   122.1   115.6  105   105     106      1
               C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1023
                 Open  1373 ARROWHD7 115  1379 GARY   7 115 1                           0.82244  0.00627    88.1    84.3
 5815   -593.3 L: 2157 BARRON 5 161  2165 APL RVR5 161 1        -252.3  -229.9 -0.03775         -0.01918  -161.6  -150.3  101   101     114     13
               C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                 Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.09866  0.18818   918.8   807.2
 5859   -489.7 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          65.2    57.0  0.01679
                 Base Case
 5873   -398.6 L:47519 MONROCO869.0 57147 SPARTA  69.0 1          58.9    51.7  0.01818          0.00805    26.3    23.1   95    95     116     21
               C: 1861 MONROCO5 161 92548 COC 161  161 1    5831
                 Open  1861 MONROCO5 161 92548 COC 161  161 1                           0.31382  0.03228   104.0    91.1
 5889   -296.3 L:  507 FTTHOMP4 230   516 LAKPLAT4 230 1         341.4   316.0  0.08561          0.06297   252.5   233.9   94    94     107     13
               C:  507 FTTHOMP4 230   509 FTRANDL4 230 1     323
                 Open   507 FTTHOMP4 230   509 FTRANDL4 230 1                           0.35290  0.06417   251.7   232.7
 5890   -292.3 L:57145 TOMAH   69.0 57147 SPARTA  69.0 1         -57.0   -51.7 -0.01818         -0.00805   -24.4   -22.0   91    91     114     23
               C: 1861 MONROCO5 161 92548 COC 161  161 1    5831
                 Open  1861 MONROCO5 161 92548 COC 161  161 1                          -0.31382  0.03228   104.0    94.5
 5898   -266.8 L: 1868 TREMVAL5 161  2143 ALMA   5 161 1        -253.4  -245.3 -0.03048         -0.02336  -187.1  -180.9   96    96     105      9
               C: 1860 MRSHLND5 161  2143 ALMA   5 161 1    1671
                 Open  1860 MRSHLND5 161  2143 ALMA   5 161 1                           0.28816 -0.02472  -230.2  -223.6
 5913   -212.7 L:57143 T TC    69.0 57145 TOMAH   69.0 1         -55.6   -51.7 -0.01818         -0.00805   -22.9   -21.2   91    91     112     21
               C: 1861 MONROCO5 161 92548 COC 161  161 1    5831
                 Open  1861 MONROCO5 161 92548 COC 161  161 1                          -0.31382  0.03228   104.0    97.1
 5925   -194.9 L: 2151 ELK MND5 161  2157 BARRON 5 161 1        -200.1  -190.3 -0.05038         -0.02704   -86.1   -80.9   96    96     116     20
               C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                 Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.12404  0.18818   918.8   882.2
11704   -101.3 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -107.5  -106.0 -0.01501         -0.00807   -73.7   -72.9  115   115     111     -4
               C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     945
                 Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           0.21784 -0.03183  -155.1  -151.9
11717    -95.0 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         135.7   134.0  0.01747          0.01463   116.2   114.8   99    99     102      3
               C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2066
                 Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                           0.03806  0.07464   510.6   503.5
11778    -16.0 L: 2329 NEAL 4 5 161  2351 MONONA 5 161 1         163.3   163.0  0.01757          0.01406   139.5   139.3   95    95      99      4
               C:  565 SIOUXCY4 230   567 DENISON4 230 1     480
                 Open   565 SIOUXCY4 230   567 DENISON4 230 1                           0.13554  0.02585   175.3   174.9
11782    -11.7 L: 1219 SILVER L 161  2147 ROCHSTR5 161 1         205.0   204.6  0.03239          0.01671    41.3    41.1   93    93     107     14
               C: 1235 BYRON  3 345  1599 PL VLLY3 345 1     877
                 Open  1235 BYRON  3 345  1599 PL VLLY3 345 1                           0.23502  0.06669   696.3   695.6
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Table 5.1 (Cont.)
MUST Results Case S5C3WXE

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FCITC Single Study

  *** MUST 4.01.07 ***  FRI, JUN 28 2002  11:31 ***
      UPE-SO04AA.S5C3WXE.SAV;SUMMER;OP LD;SYSTEM INTACT
      ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166
 Subsys.File C:\WapaStudies-Seshu\mapp.sys
 Monit.File  C:\WapaStudies-Seshu\mapp.mon
 Contin.File C:\WapaStudies-Seshu\mapp.con
 Exclud.File C:\WapaStudies-Seshu\excldcont.exc

 Study transfer. From WAPASITE5      To DISPATCH_W    . Transfer level -     50.0 MW


  Violations report ordered by transfer capability. Total  5937 violations


     N    FCITC L: Limiting constraint                          PreShift    MW       TDF             PTDF =Base Case Flow=  ACCC  BASE   ACCC   Delta
                C: Contingency description                   Ncon   Flow  Rating             LODF             Init   Final   CNT%  MAX%  S5C3WXE   %
     2  -3454.6 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1920.5 -1732.0 -0.05458         -0.05206 -1779.0 -1599.2   111   111    112      1
                C:  753 RUNNING4 230  1327 SHANNON4 230 1     661
                  Open   753 RUNNING4 230  1327 SHANNON4 230 1                          -0.65251  0.00387   216.9   203.6
    27  -1451.0 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         504.4   448.0  0.03890          0.01648   396.3   372.4   111   111    119      8
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                           0.12270  0.18275   881.2   616.1
    48  -1277.4 L:  574 SIOUXCY869.0  2338 PLYMOTH869.0 1          64.9    50.0  0.01168          0.00168    11.6     9.5   126   126    129      3
                C:  566 SIOUXCY5 161  2337 PLYMOTH5 161 1     487
                  Open   566 SIOUXCY5 161  2337 PLYMOTH5 161 1                           0.27856  0.03588   191.4   145.6
    57  -1240.0 L: 1707 CHIS CO3 345  1894 CHIS CO4 230 1         479.3   448.0  0.02525          0.01648   396.3   375.9   111   111    111      0
                C: 1695 AS KING3 345  1707 CHIS CO3 345 1    1405
                  Open  1695 AS KING3 345  1707 CHIS CO3 345 1                          -0.20356 -0.04312  -407.7  -354.3
    77  -1153.7 L: 1609 WILMART5 161  1610 WILMART7 115 1        -240.7  -205.7 -0.03033         -0.02405  -153.7  -125.9   108   108    117      9
                C: 1235 BYRON  3 345  1604 PR ISLD3 345 1     879
                  Open  1235 BYRON  3 345  1604 PR ISLD3 345 1                           0.11059 -0.05676  -786.9  -721.4
   165   -992.9 L: 2211 DAVNPRT5 161  2220 SB 85 5  161 1         234.7   223.0  0.01176          0.01241   160.0   147.6   109   109    111      2
                C: 2204 E MOLIN3 345  2217 E MOLINE 161 1    1926
                  Open  2204 E MOLIN3 345  2217 E MOLINE 161 1                           0.20291 -0.00323   368.1   371.4
  3004   -902.6 L: 1677 ROSEAUN2 500  3465 DORSEY 2 500 1       -1779.0 -1732.0 -0.05206
                  Base Case
  5786   -815.2 L:  563 SPENCER5 161  2597 TRIBOJI5 161 1        -181.4  -162.0 -0.02386         -0.02122  -147.8  -130.5  NONE  NONE    115    NEW
                C:  563 SPENCER5 161   566 SIOUXCY5 161 1     470
                  Open   563 SPENCER5 161   566 SIOUXCY5 161 1                           0.44913 -0.00588   -74.8   -70.0
  5875   -467.5 L: 2351 MONONA 5 161  2355 CARROLL5 161 1         142.3   134.0  0.01765          0.01454   120.0   113.3    99    99    107      8
                C: 2330 RAUN   3 345  2367 LEHIGH 3 345 1    2066
                  Open  2330 RAUN   3 345  2367 LEHIGH 3 345 1                           0.04145  0.07507   535.6   500.5
  5877   -461.4 L: 1376 HIBBARD7 115  1380 WNTR ST7 115 1         192.5   185.0  0.01620          0.01101   120.7   115.6   105   105    103     -2
                C: 1373 ARROWHD7 115  1379 GARY   7 115 1    1024
                  Open  1373 ARROWHD7 115  1379 GARY   7 115 1                           0.82245  0.00632    87.2    84.3
  5880   -442.3 L: 1517 WILLMAR7 115  1945 KERKHOT7 115 1         -81.9   -77.0 -0.01114         -0.00275   -44.4   -43.2   112   112    114      2
                C:  550 GRANITF4 230  1516 WILLMAR4 230 1     438
                  Open   550 GRANITF4 230  1516 WILLMAR4 230 1                          -0.22870  0.03671   164.0   147.7
  5882   -434.3 L: 1870 WHEATON5 161  2151 ELK MND5 161 1        -328.9  -294.0 -0.08040         -0.03823  -125.5  -108.9   109   109    125     16
                C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                  Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23079  0.18275   881.2   801.9
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Table 5.1 (Cont.)
MUST Results Case S5C3WXE

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5883   -429.4 L: 1854 EAU CLA5 161  1870 WHEATON5 161 1        -328.5  -294.0 -0.08040         -0.03823  -125.1  -108.7   109   109    124     15
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.23079  0.18275   881.2   802.7
5888   -411.1 L:  902 ALEXAND7 115 87901 ALEXSS   115 1        -113.2  -106.0 -0.01752         -0.00921   -76.4   -72.6   115   115    117      2
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     946
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                           0.21776 -0.03815  -169.1  -153.4
5891   -377.1 L:57095 HILLSBOR69.0 57116 T HLB   69.0 1          69.5    62.7  0.01793          0.01379    55.7    50.5   N/A    98    113    NEW
              C: 1604 PR ISLD3 345 92270 COL 345  345 1    5923
                Open  1604 PR ISLD3 345 92270 COL 345  345 1                           0.02693  0.15383   511.6   453.5
5896   -326.1 L: 2329 NEAL 4 5 161  2351 MONONA 5 161 1         168.8   163.0  0.01768          0.01408   143.4   138.8    95    95    102      7
              C:  565 SIOUXCY4 230   567 DENISON4 230 1     480
                Open   565 SIOUXCY4 230   567 DENISON4 230 1                           0.13754  0.02617   184.3   175.7
5898   -304.4 L:  634 SIDNEY 4 230 10218 OGALALA4 230 1         356.3   352.0  0.01399          0.00472   131.8   130.4   101   101   NONE    N/A
              C:  633 SIDNEY 3 345 10166 KEYSTON3 345 1     581
                Open   633 SIDNEY 3 345 10166 KEYSTON3 345 1                           0.60088  0.01543   373.5   368.8
5904   -292.6 L: 2157 BARRON 5 161  2165 APL RVR5 161 1        -240.5  -229.9 -0.03633         -0.01883  -156.1  -150.6   101   101    109      8
              C: 1695 AS KING3 345  1853 EAU CL 3 345 1    1408
                Open  1695 AS KING3 345  1853 EAU CL 3 345 1                          -0.09578  0.18275   881.2   827.8
5917   -154.0 L:  902 ALEXAND7 115  1649 DGLASCO7 115 1          90.7    88.0  0.01752          0.00921    53.9    52.5   106   106    108      2
              C: 1311 WINGRIV4 230  1955 INMAN  4 230 1     946
                Open  1311 WINGRIV4 230  1955 INMAN  4 230 1                          -0.21776 -0.03815  -169.1  -163.3
5919   -122.9 L: 1677 ROSEAUN2 500  1678 ROSEAUS2 500 1        1738.4  1732.0  0.05206
                Base Case
5920   -122.9 L: 1307 FORBES 2 500  1678 ROSEAUS2 500 1       -1738.4 -1732.0 -0.05206
                Base Case
5923    -59.0 L:47519 MONROCO869.0 57147 SPARTA  69.0 1          52.7    51.7  0.01632          0.00711    23.3    22.9    95    95    103      8
              C: 1861 MONROCO5 161 92548 COC 161  161 1    5831
                Open  1861 MONROCO5 161 92548 COC 161  161 1                           0.31272  0.02946    93.8    92.1
5925    -51.9 L:  529 WATERTN3 345   537 WHITE  3 345 1         807.1   792.0  0.29122          0.24462   583.8   571.1   N/A  NONE   101    NEW
              C:  620 HURON  3 345  1634 SPLT RK3 345 1     566
                Open   620 HURON  3 345  1634 SPLT RK3 345 1                           0.40968  0.11374   545.1   539.2
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Table 5.2
Summary of Contingency Analysis Results
Case S1C1IXE

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
2143	ALMA	161	2149	WABACO	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221.1	201	121 (-2)	NONE (PRE-EXISTING MAX 123%)
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	112 (3)	RT
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	140 (14)	R
2147	ROCHSTR	161	2149	WABACO	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221.1	201	109 (-1)	NONE (PRE-EXISTING MAX 110%)
515	HURON	115	528	WOONSCKT	115	507	FT.THOMP	230	622	STORLA	230	88	128	122 (3)	U
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	113 (4)	R
479	MARTIN	115	653	VETAL TAP	115	475	BONESTEEL	115	510	FT.RANDAL	115	66	128	117 (16)	U
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	109 (1)	RT
528	WOONSKT	115	622	STORLA	115	507	FTTHOMP	230	622	STORLA	230	88	128	114 (2)	U
2351	MONONA	161	2355	CARROLL	161	2330	RAUN	345	2367	LEHIGH	2367	134	134	105 (6)	R
1376	HIBBARD	115	1380	WNTR ST7	115	1373	ARROWHD	115	1379	GARY THM	115	185	169	102 (-3)	NONE (PRE-EXISTING MAX 105%)
497	MAURINE	230	19088	MAURINE T	230	484	NW.UNDRWD	230	497	MAURINE	230	125	100	113 (NEW)	RT
2329	NEAL	161	2351	MONONA	161	565	SIOUX.CTY	230	567	DENISON	230	163	163	101 (6)	R
2022	ADAMS	161	2147	ROCHESTER	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221	201	107 (NEW)	R

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S2C4WXE

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
805	BAKER	115	832	GLENDIVE	115	411	M.CITY	230	804	BAKER	230	67.7	67.7	133 (4)	R
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	131 (5)	R
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	114 (5)	RT
515	HURON	115	528	WOONSKT	115	507	FTTHOMP	230	622	STORLA	230	88	128	125 (6)	U
418	DKSN-ND7	115	870	N ENGLN7	115	804	BAKER	230	810	BOWMAN	230	67.7	67.7	131(8)	R
848	HETINGR	115	870	N ENGLN	115	804	BAKER	230	810	BOWMAN	230	67.7	67.7	127(8)	R
528	WOONSKT	115	622	STORLA	115	507	FTTHOMP	230	622	STORLA	230	88	128	117 (5)	U
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	110 (1)	U
403	DAWSONC	230	413	MEDORA	230	810	BOWMAN	230	847	HETINGR4	230	263	398	117 (NEW)	U
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	111 (3)	RT
403	DAWSONC	115	832	GLENDCT7	115	411	M.CITY	230	804	BAKER	230	67.7	67.7	111 (3)	R
1376	HIBBARD	115	1380	WNTR ST7	115	1373	ARROWHD	115	1379	GARY THM	115	185	169	106 (1)	R
1870	WHEATON	161	2151	ELK MOUND	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	78 (11)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1854	EAU CLAIRE	161	1870	WHEATON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	77 (10)	NOT AN OVERLOAD WITH CROSS-TRIPPING
2157	BARRON	161	2165	APPLE RVR	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	229.9	279	92 (7)	NOT AN OVERLOAD WITH CROSS-TRIPPING
57095	HILLSBORO	69	57116	T HLB	69	1604	PR. ISLAND	345	92270	COLUMBIA	345	62.7	57	107 (9)	R
1365	THOMSON	115	1376	HIBBARD	115	1368	CLOQUET	115	1373	ARROWHD	115	73	67	102 (NEW)	R
2351	MONONA	161	2355	CARROLL	161	2330	RAUN	345	2367	LEHIGH	2367	134	134	102 (3)	R

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S2C4WD3

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
47626	ST. CROIG	69	57251	OSCOLA	69	1804	LAWRNC CR	230	1809	APPLE RVR	230	52.8	48	194 (16)	R
2143	ALMA	161	2149	WABACO	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221.1	201	138 (15)	R
57251	OSCOLA	69	57262	BORDER	69	1804	LAWRNC CR	230	1809	APPLE RVR	230	48.4	44	181 (17)	R
57262	BORDER	69	57312	SAND LAKE	69	1804	LAWRNC CR	230	1809	APPLE RVR	230	48.4	44	178 (17)	R
2147	ROCHSTR	161	2149	WABACO	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221.1	201	126 (16)	R
57311	GARFIELD	69	57312	SAND LAKE	69	1804	LAWRNC CR	230	1809	APPLE RVR	230	51.7	47	159 (16)	R
805	BAKER	115	832	GLENDIVE	115	411	M.CITY	230	804	BAKER	230	67.7	67.7	135 (6)	R
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	135 (9)	R
46837	SCANTA	69	47626	ST. CROIG	69	1804	LAWRNC CR	230	1809	APPLE RVR	230	68.2	62	124 (13)	R
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	114 (5)	RT
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	124 (16)	RT
2022	ADAMS	161	2147	ROCHESTER	161	1235	BYRON	345	1599	PL.VALLEY	345	221	201	140 (30)	R
515	HURON	115	528	WOONSKT	115	507	FTTHOMP	230	622	STORLA	230	88	128	128 (9)	U
47581	WISSOTA G	69	47583	WISSOTA B	69	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	40.7	37	131 (30)	R
418	DKSN-ND7	115	870	N ENGLN7	115	804	BAKER	230	810	BOWMAN	230	67.7	67.7	135 (12)	R
57307	APPLE RVR.	69	57311	GARFIELD	69	1804	LAWRNC CR	230	1809	APPLE RVR	230	51.7	47	130 (15)	R
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	113 (4)	R
848	HETINGR	115	870	N ENGLN	115	804	BAKER	230	810	BOWMAN	230	67.7	67.7	131(12)	R
2041	LIME CRK	161	2042	EMERY	161	1601	ADAMS	345	2050	HAZELTON	345	167	202	121 (26)	U
528	WOONSKT	115	622	STORLA	115	507	FTTHOMP	230	622	STORLA	230	88	128	121 (9)	U
403	DAWSONC	115	832	GLENDCT7	115	411	M.CITY	230	804	BAKER	230	67.7	67.7	114 (6)	R
57095	HILLSBORO	69	57116	T HLB	69	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	62.7	57	140 (35)	R
1870	WHEATON	161	2151	ELK MOUND	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	89 (22)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1376	HIBBARD	115	1380	WNTR ST7	115	1373	ARROWHD	115	1379	GARY THM	115	185	169	110 (5)	R
1854	EAU CLAIRE	161	1870	WHEATON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	89 (22)	NOT AN OVERLOAD WITH CROSS-TRIPPING

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S2C4WD3

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
2157	BARRON	161	2165	APPLE RVR	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	229.9	279	100 (15)	NOT AN OVERLOAD WITH CROSS-TRIPPING
47583	WISSOTA	69	56014	DPC TAP	69	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	40.7	37	131 (30)	R
47585	CADOT	69	56014	DPC TAP	69	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	40.7	37	120 (30)	R
1219	SILVER LK	161	2147	ROCHESTER	161	1235	BYRON	345	1599	PL.VALLEY	345	204.6	186	120 (27)	R
2151	ELK MOUND	161	2157	BARRON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	190.3	173	94 (27)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1868	TREMVAL	161	2143	ALMA	161	1860	MRSHLND	161	2143	ALMA	161	245.3	223	110 (14)	R
47519	MONR.CO.	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	115 (24)	R
827	ELLENDL	115	1001	ABDNJCT	115	826	ELLENDL	230	994	OAKES	230	88	128	105(6)	U
57145	TOMAH	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	115 (24)	R
57143	T TC	69	57145	TOMAH	69	1861	MONR.CO	161	92548	CONCL.CRK	161	263	398	109(NEW)	U
2329	NEAL	161	2351	MONONA	161	565	SIOUX.CTY	230	567	DENISON	230	163	163	101 (6)	R
47513	VIROQUA	69	57100	T VIO	69	2107	SENECA	161	2123	GENOA	161	51.7	47	109 (20)	R
1365	THOMSON	115	1376	HIBBARD	115	1368	CLOQUET	115	1373	ARROWHD	115	73	67	102 (NEW)	R
1854	EAU CLAIRE	161	1877	SEVEN ML	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	221	201	71 (17)	NOT AN OVERLOAD WITH CROSS-TRIPPING
497	MAURINE	230	470	BISON	230	618	LARAMIEG	24	618	LARAMIE	345	176	440	103 (NEW)	U
1606	W.FARIBUT	115	1970	LK.MARION	115	1235	BYRON	345	1604	PRAIRIE ISL	345	152	139	109(18)	R
1228	MAPLE LF	161	1230	BYRON	161	1235	BYRON	345	1599	PL.VALLEY	345	409.2	372	104 (18)	R
504	BROOKNGS	115	505	FLANDREAU	115	537	WHITE	345	45641	SPLIT ROCK	345	132	128	105 (NEW)	R
57097	LAFARGE	69	57100	T VIO	69	2107	SENECA	161	2123	GENOA	161	51.7	47	106 (NEW)	R
522	SUMMIT	115	531	WATERTOWN	115	529	WATERTOWN	345	660	GROTON	345	110	128	107 (21)	U

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S3C3W2E

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
1376	HIBBARD	115	1380	WNTR ST7	115	1373	ARROWHD	115	1379	GARY THM	115	185	169	117 (12)	R
805	BAKER	115	832	GLENDIVE	115	411	M.CITY	230	804	BAKER	230	67.7	67.7	140 (11)	R
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	133 (7)	R
418	DKSN-ND7	115	870	N ENGLN7	115	804	BAKER	230	810	BOWMAN	230	67.7	67.7	139 (16)	R
848	HETINGR	115	870	N ENGLN	115	804	BAKER	230	810	BOWMAN	230	67.7	67.7	139 (20)	R
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	112 (3)	RT
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	110 (1)	U
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	107 (-1)	NONE (PRE-EXISTING MAX 108%)
1721	HIBRIDGE	115	1745	ROGERS LAKE	115	1695	AS KING	345	1742	RED ROCK	345	240	219	110 (9)	R
1870	WHEATON	161	2151	ELK MOUND	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	75 (8)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1854	EAU CLAIRE	161	1870	WHEATON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	74 (7)	NOT AN OVERLOAD WITH CROSS-TRIPPING
57095	HILLSBORO	69	57116	T HLB	69	1604	PR. ISLAND	345	92270	COLUMBIA	345	62.7	57	104 (6)	R
2351	MONONA	161	2355	CARROLL	161	2330	RAUN	345	2367	LEHIGH	2367	134	134	102 (3)	R
2151	ELK MOUND	161	2157	BARRON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	190.3	173	79 (12)	NOT AN OVERLOAD WITH CROSS-TRIPPING

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S4C4IXA

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
2143	ALMA	161	2149	WABACO	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221.1	201	127 (4)	R
2147	ROCHSTR	161	2149	WABACO	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221.1	201	114 (4)	R
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	111 (2)	RT
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	126 (18)	RT
563	SPENCER	161	2597	TRIBO JNCT	161	2371	WEBSTER	161	60320	WEB MID	161	162	225	125 (NEW)	U
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	140 (14)	R
57095	HILLSBORO	69	57116	T HLB	69	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	62.7	57	127 (22)	R
2022	ADAMS	161	2147	ROCHESTER	161	1235	BYRON	345	1599	PL.VALLEY	345	221	201	126 (16)	R
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	116 (7)	R
1870	WHEATON	161	2151	ELK MOUND	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	81 (14)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1854	EAU CLAIRE	161	1870	WHEATON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	80 (13)	NOT AN OVERLOAD WITH CROSS-TRIPPING
2351	MONONA	161	2355	CARROLL	161	2330	RAUN	345	2367	LEHIGH	2367	134	134	116 (17)	R
2329	NEAL	161	2351	MONONA	161	565	SIOUX.CTY	230	567	DENISON	230	163	163	110 (15)	R
2157	BARRON	161	2165	APPLE RVR	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	229.9	279	94 (9)	NOT AN OVERLOAD WITH CROSS-TRIPPING
2041	LIME CRK	161	2042	EMERY	161	1601	ADAMS	345	2050	HAZELTON	345	167	202	109 (14)	U
47519	MONR.CO.	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	110 (15)	R
1868	TREMVAL	161	2143	ALMA	161	1860	MRSHLND	161	2143	ALMA	161	245.3	223	104 (8)	R
57145	TOMAH	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	105 (14)	R
1219	SILVER LK	161	2147	ROCHESTER	161	1235	BYRON	345	1599	PL.VALLEY	345	204.6	186	110 (17)	R
47513	VIROQUA	69	57100	T VIO	69	2107	SENECA	161	2123	GENOA	161	51.7	47	104 (15)	R
507	FTTHOMP	230	516	LAKPLAT	230	507	FTTHOMP	230	509	FTRANDL	230	316	398	102 (8)	U
2337	PLYMOTH	161	2348	LITL SIOUX	161	2330	RAUN	345	2367	LEHIGH	345	163	163	102 (8)	R
57143	T TC	69	57145	TOMAH	69	1861	MONR.CO	161	92548	CONCL.CRK	161	263	398	105 (14)	U
2011	LAKEFIELD	161	2597	TRIBO JNCT	161	1634	SPLT ROCK	345	45646	SPLT ROCK	345	246	240	103 (NEW)	R

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S4C5WXD

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	111 (2)	RT
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	120 (12)	RT
2022	ADAMS	161	2147	ROCHESTER	161	1235	BYRON	345	1604	PRAIRIE ISL	345	221	201	119 (9)	R
515	HURON	115	528	WOONSCKT	115	507	FT.THOMP	230	622	STORLA	230	88	128	124 (5)	U
563	SPENCER	161	2597	TRIBO JNCT	161	2367	LEHIGH	345	2370	WEBSTER	345	162	225	111 (NEW)	U
57095	HILLSBORO	69	57116	T HLB	69	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	62.7	57	133 (28)	R
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	111 (2)	R
528	WOONSKT	115	622	STORLA	115	507	FTTHOMP	230	622	STORLA	230	88	128	116 (4)	U
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	118 (8)	R
1870	WHEATON	161	2151	ELK MOUND	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	82 (15)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1854	EAU CLAIRE	161	1870	WHEATON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	81 (14)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1376	HIBBARD	115	1380	WNTR ST7	115	1373	ARROWHD	115	1379	GARY THM	115	185	169	106 (1)	R
2157	BARRON	161	2165	APPLE RVR	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	229.9	279	95 (10)	NOT AN OVERLOAD WITH CROSS-TRIPPING
47519	MONR.CO.	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	116 (21)	R
57145	TOMAH	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	114 (23)	R
1868	TREMVAL	161	2143	ALMA	161	1860	MRSHLND	161	2143	ALMA	161	245.3	223	105 (9)	R
57143	T TC	69	57145	TOMAH	69	1861	MONR.CO	161	92548	CONCL.CRK	161	263	398	112 (21)	U
2151	ELK MOUND	161	2157	BARRON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	190.3	173	83 (16)	NOT AN OVERLOAD WITH CROSS-TRIPPING
2351	MONONA	161	2355	CARROLL	161	2330	RAUN	345	2367	LEHIGH	2367	134	134	102 (3)	R
2329	NEAL	161	2351	MONONA	161	565	SIOUX.CTY	230	567	DENISON	230	163	163	99 (4)	NONE (NOT AN OVERLOAD)
1219	SILVER LK	161	2147	ROCHESTER	161	1235	BYRON	345	1599	PL.VALLEY	345	204.6	186	107 (14)	R

Table 5.2 (Cont.)
Summary of Contingency Analysis Results
Case S5C3WXE

LIMITING CONSTRAINT						CONTINGENCY						RATE C	RATE B	%LOADING ON RATEC	RECOMMENDATION
F BUS			T BUS			F BUS			T BUS						
#	NAME	KV	#	NAME	KV	#	NAME	KV	#	NAME	KV				
1707	CHISAGO	345	1894	CHISAGO	230	1695	AS KING	345	1707	CHISAGO	345	582	448	111 (2)	RT
574	SIOUX CTY	69	2338	PLYMOUTH	69	566	SIOUX CTY	161	2337	PLYMOUTH	161	50	64	129 (3)	R
1609	WILMART	161	1610	WILMART	115	1235	BYRON	345	1604	PRAIRIE ISL	345	205.7	187	117 (9)	RT
2211	DAVENPRT	161	2220	SUB 85	161	2204	E MOLIN	345	2217	E MOLIN	161	223	225	111 (2)	R
563	SPENCER	161	2597	TRIBO JNCT	161	563	SPENCER	161	566	SIOUX CITY	161	162	225	115 (NEW)	U
2351	MONONA	161	2355	CARROLL	161	2330	RAUN	345	2367	LEHIGH	2367	134	134	107 (8)	R
1376	HIBBARD	115	1380	WNTR ST7	115	1373	ARROWHD	115	1379	GARY THM	115	185	169	103 (-2)	NONE (PRE-EXISTING MAX 105%)
1870	WHEATON	161	2151	ELK MOUND	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	84 (17)	NOT AN OVERLOAD WITH CROSS-TRIPPING
1854	EAU CLAIRE	161	1870	WHEATON	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	294	268	84 (17)	NOT AN OVERLOAD WITH CROSS-TRIPPING
902	ALEXAND	115	87901	ALEXSS	115	1311	WINGRIV	230	1955	INMAN	230	88	96	117 (2)	R
57095	HILLSBORO	69	57116	T HLB	69	1604	PR. ISLAND	345	92270	COLUMBIA	345	62.7	57	113 (NEW)	R
2329	NEAL	161	2351	MONONA	161	565	SIOUX.CTY	230	567	DENISON	230	163	163	102 (7)	R
2157	BARRON	161	2165	APPLE RVR	161	1695 1853	AS KING EAU CLAIRE	345 345	1853 92494	EAU CLAIRE ARPIN	345 345	229.9	279	99 (14)	NOT AN OVERLOAD WITH CROSS-TRIPPING
47519	MONR.CO.	69	57147	SPARTA	69	1861	MONR.CO	161	92548	CONCL.CRK	161	51.7	47	103 (8)	R

Table 5.3
Incremental Phase 2 Transmission Losses

PHASE 2			PHASE 1		
CASE	**LOSSES (MW)**	**LOSSES (%)**	**CASE**	**LOSSES (MW)**	**LOSSES (%)**
S1C1IXE	313.6	31.4	S1C1XXA	250.3	25.0
S2C4WXE	243.7	24.4	S2C4XX3	127.8	12.8
S2C4WD3	318.9	31.9	S2C4XX3	127.8	12.8
S3C3W2E	269.4	26.9	S3C3X2A	195.1	19.5
S4C4IXA	259.1	25.9	S4C4XXA	149.4	14.9
S4C5WXD	189.4	18.9	S4C5XXA	117.0	11.7
S5C3WXE	145.5	14.6	S5C5XXX	93.2	9.3

Table 5.4
Constrained Interface Impact Analyses - Case S1C1IXE

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***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S1C1IXE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=3006,MH=2172,MW=1940,OHMH=-197,OHMP=150,EWTW=-120,BD=166


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   334.5 DIFF:    -4.5%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   444.4 DIFF:    10.2%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   447.1 DIFF:    23.8%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   287.7 DIFF:     2.1%
0554  MORRIS 4  - 0550  GRANITF4   BASE:   106.1 CHNG:   130.9 DIFF:    23.4%
99554 --------  - 99550 GRANFLS3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   188.6 DIFF:    14.6%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:    93.3 DIFF:    -4.0%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   180.7 DIFF:    15.5%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   256.7 DIFF:    83.5%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    35.6 DIFF:    39.8%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    57.1 DIFF:     9.2%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    52.7 DIFF:     4.6%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:    39.2 DIFF:     9.5%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    31.0 DIFF:     3.7%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    46.2 DIFF:    15.4%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    32.3 DIFF:    14.0%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -216.7 DIFF:   -11.8%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  HETINGR3  - 0506  FTTHOMP3   BASE:     0.0 CHNG:   497.5 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99755 --------  - 1318  ARROWHD3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    42.1 DIFF:   999.0%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  2980.8 DIFF:    43.3%
                                                 DIFF:   900.4   DF:    90.0%
*******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   173.9 DIFF:     7.8%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1824.4 DIFF:     3.1%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   216.7 DIFF:   -11.8%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -42.1 DIFF:   999.0%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2172.9 DIFF:     0.0%
                                                 DIFF:    -0.1   DF:     0.0%
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Table 5.4 (Cont.)

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1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -170.5 DIFF:     7.7%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1781.3 DIFF:     3.0%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -213.2 DIFF:   -11.6%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    42.5 DIFF:   999.0%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2122.5 DIFF:    -0.1%
                                                 DIFF:     2.7   DF:     0.3%
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10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   157.1 DIFF:     1.9%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   157.6 DIFF:     1.9%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   162.1 DIFF:     1.9%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   358.2 DIFF:     0.2%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   430.5 DIFF:     0.3%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   469.7 DIFF:     8.1%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1735.3 DIFF:     2.7%
                                                 DIFF:    46.0   DF:     4.6%
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10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   469.7 DIFF:     8.1%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   469.7 DIFF:     8.1%
                                                 DIFF:    35.2   DF:     3.5%
*******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   268.3 DIFF:     5.7%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:   107.3 DIFF:    -4.2%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   529.5 DIFF:     8.8%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   905.1 DIFF:     6.2%
                                                 DIFF:    52.6   DF:     5.3%
*******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   332.7 DIFF:    17.6%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   278.4 DIFF:    14.1%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   611.0 DIFF:    16.0%
                                                 DIFF:    84.1   DF:     8.4%
*******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   160.1 DIFF:    11.9%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   312.0 DIFF:    10.3%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:   100.5 DIFF:     5.8%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   572.6 DIFF:     9.9%
                                                 DIFF:    51.6   DF:     5.2%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   657.4 DIFF:     1.5%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   657.4 DIFF:     1.5%
                                                 DIFF:     9.9   DF:     1.0%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   818.9 DIFF:    -2.4%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:   818.9 DIFF:    -2.4%
                                                 DIFF:   -19.7   DF:    -2.0%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   822.1 DIFF:     2.4%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   818.9 DIFF:    -2.4%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   389.4 DIFF:     2.2%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   172.1 DIFF:     1.0%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   111.3 DIFF:     0.2%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    75.9 DIFF:     4.5%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2389.7 DIFF:     0.6%
                                                 DIFF:    13.3   DF:     1.3%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   657.4 DIFF:     1.5%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   818.9 DIFF:    -2.4%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:   464.1 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  1940.4 DIFF:    30.6%
                                                 DIFF:   454.3   DF:    45.4%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:   -98.7 DIFF:    29.6%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:   -98.7 DIFF:    29.6%
                                                 DIFF:   -22.6   DF:    -2.3%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   478.6 DIFF:    -3.1%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   613.2 DIFF:    -1.6%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1091.8 DIFF:    -2.3%
                                                 DIFF:   -25.3   DF:    -2.5%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    75.9 DIFF:     4.5%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    75.9 DIFF:     4.5%
                                                 DIFF:     3.3   DF:     0.3%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    61.7 DIFF:    -2.9%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -89.4 DIFF:    -0.7%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -69.8 DIFF:    -1.1%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -97.5 DIFF:     0.5%
                                                 DIFF:    -0.4   DF:     0.0%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -61.4 DIFF:    -2.8%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    90.2 DIFF:    -0.7%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    70.8 DIFF:    -1.1%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:    99.6 DIFF:     0.4%
                                                DIFF:     0.4   DF:     0.0%
*******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:   -91.0 DIFF:   140.7%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:   -91.0 DIFF:   140.7%
                                                DIFF:   -53.2   DF:    -5.3%
*******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:   -78.2 DIFF:  -178.0%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:   -78.2 DIFF:  -178.0%
                                                DIFF:  -178.4   DF:   -17.8%
*******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   337.4 DIFF:    -5.9%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   337.4 DIFF:    -5.9%
                                                DIFF:   -21.1   DF:    -2.1%
*******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   202.3 DIFF:   -10.5%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:    63.0 DIFF:   -21.5%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   265.3 DIFF:   -13.4%
                                                DIFF:   -41.1   DF:    -4.1%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   469.7 DIFF:     8.1%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   469.7 DIFF:     8.1%
                                                DIFF:    35.2   DF:     3.5%
*******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -42.1 DIFF:   999.0%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:   -42.1 DIFF:   999.0%
                                                DIFF:   -38.6   DF:    -3.9%
*******************************************************************************
```

Table 5.4 (Cont.)
Constrained Interface Impact Analyses - Case S2C4WXE

```
***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S2C4WXE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=3029,MH=2173,MW=2087,OHMH=-198,OHMP=150,EWTW=-121,BD=165


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   351.7 DIFF:     0.4%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   393.3 DIFF:    -2.5%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   360.5 DIFF:    -0.1%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   320.9 DIFF:    13.9%
0554  --------  - 0550  GRANITF4   BASE:   106.1 CHNG:     0.0 DIFF:  -100.0%
99554 MORRIS 3  - 99550 GRANFLS3   BASE:     0.0 CHNG:   420.8 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   173.1 DIFF:     5.2%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:   121.6 DIFF:    25.2%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   181.5 DIFF:    16.0%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   146.6 DIFF:     4.8%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    45.5 DIFF:    78.5%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    56.4 DIFF:     7.9%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    60.5 DIFF:    20.1%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:   104.0 DIFF:   190.8%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    45.8 DIFF:    53.1%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    45.8 DIFF:    14.3%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    35.0 DIFF:    23.6%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -241.9 DIFF:    -1.6%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:   335.7 DIFF:   999.0%
99755 --------  - 1318  ARROWHD3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    58.5 DIFF:   999.0%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  3015.3 DIFF:    44.9%
                                                 DIFF:   934.9   DF:    93.5%
*******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   170.7 DIFF:     5.8%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1819.0 DIFF:     2.8%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   241.9 DIFF:    -1.6%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -58.5 DIFF:   999.0%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2173.1 DIFF:     0.0%
                                                 DIFF:     0.0   DF:     0.0%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -167.4 DIFF:     5.8%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1776.6 DIFF:     2.7%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -237.4 DIFF:    -1.6%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    59.3 DIFF:   999.0%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2122.1 DIFF:    -0.1%
                                                 DIFF:     3.1   DF:     0.3%
*******************************************************************************

10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   154.4 DIFF:     0.1%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   154.9 DIFF:     0.1%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   159.3 DIFF:     0.1%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   356.3 DIFF:    -0.4%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   427.6 DIFF:    -0.3%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   444.9 DIFF:     2.4%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1697.3 DIFF:     0.5%
                                                 DIFF:     8.0   DF:     0.8%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   444.9 DIFF:     2.4%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   444.9 DIFF:     2.4%
                                                 DIFF:    10.4   DF:     1.0%
*******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   257.2 DIFF:     1.3%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:   107.6 DIFF:    -3.9%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   498.8 DIFF:     2.5%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   863.6 DIFF:     1.3%
                                                 DIFF:    11.1   DF:     1.1%
*******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   304.6 DIFF:     7.7%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   259.0 DIFF:     6.2%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   563.6 DIFF:     7.0%
                                                 DIFF:    36.7   DF:     3.7%
*******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   154.6 DIFF:     8.0%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   299.2 DIFF:     5.7%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:    98.0 DIFF:     3.2%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   551.7 DIFF:     5.9%
                                                 DIFF:    30.7   DF:     3.1%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   743.9 DIFF:    14.9%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   743.9 DIFF:    14.9%
                                                 DIFF:    96.4   DF:     9.6%
  ******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   834.1 DIFF:    -0.5%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:   834.1 DIFF:    -0.5%
                                                 DIFF:    -4.5   DF:    -0.5%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   888.4 DIFF:    10.7%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   834.1 DIFF:    -0.5%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   424.1 DIFF:    11.3%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   180.5 DIFF:     5.9%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   118.2 DIFF:     6.4%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    79.5 DIFF:     9.5%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2524.9 DIFF:     6.2%
                                                 DIFF:   148.4   DF:    14.8%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   743.9 DIFF:    14.9%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   834.1 DIFF:    -0.5%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:   510.0 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  2088.0 DIFF:    40.5%
                                                 DIFF:   601.9   DF:    60.2%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:   -89.2 DIFF:    17.2%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:   -89.2 DIFF:    17.2%
                                                 DIFF:   -13.1   DF:    -1.3%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   487.4 DIFF:    -1.3%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   618.8 DIFF:    -0.7%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1106.2 DIFF:    -1.0%
                                                 DIFF:   -10.9   DF:    -1.1%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    79.5 DIFF:     9.5%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    79.5 DIFF:     9.5%
                                                 DIFF:     6.9   DF:     0.7%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    62.2 DIFF:    -2.1%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -88.9 DIFF:    -1.2%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -69.4 DIFF:    -1.7%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -96.1 DIFF:    -1.0%
                                                 DIFF:     1.0   DF:     0.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -61.9 DIFF:    -2.1%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    89.7 DIFF:    -1.3%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    70.4 DIFF:    -1.8%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:    98.2 DIFF:    -1.1%
                                                DIFF:    -1.1   DF:    -0.1%
*******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:   -66.5 DIFF:    75.9%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:   -66.5 DIFF:    75.9%
                                                DIFF:   -28.7   DF:    -2.9%
*******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:    45.3 DIFF:   -54.8%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:    45.3 DIFF:   -54.8%
                                                DIFF:   -54.9   DF:    -5.5%
*******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   349.0 DIFF:    -2.7%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   349.0 DIFF:    -2.7%
                                                DIFF:    -9.5   DF:    -1.0%
*******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   207.5 DIFF:    -8.2%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:    66.0 DIFF:   -17.8%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   273.5 DIFF:   -10.7%
                                                DIFF:   -32.8   DF:    -3.3%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   444.9 DIFF:     2.4%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   444.9 DIFF:     2.4%
                                                DIFF:    10.4   DF:     1.0%
*******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -58.5 DIFF:   999.0%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:   -58.5 DIFF:   999.0%
                                                DIFF:   -55.1   DF:    -5.5%
*******************************************************************************
```

Table 5.4 (Cont.)
Constrained Interface Impact Analyses - Case S2C4WD3

```
***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S2C4WD3.SAV; S2C4WX3 + ADAMS&ARPIN SVCS(0-400)
ND=3031,MH=2176,MW=1815,OHMH=-196,OHMP=150,EWTW=-119,BD=164


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   359.1 DIFF:     2.6%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   395.3 DIFF:    -2.0%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   364.6 DIFF:     1.0%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   326.0 DIFF:    15.7%
0554  --------  - 0550  GRANITF4   BASE:   106.1 CHNG:     0.0 DIFF:  -100.0%
99554 MORRIS 3  - 99550 GRANFLS3   BASE:     0.0 CHNG:   415.4 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   170.7 DIFF:     3.7%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:   127.3 DIFF:    31.1%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   177.8 DIFF:    13.6%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   150.1 DIFF:     7.3%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    45.0 DIFF:    76.6%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    55.5 DIFF:     6.3%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    62.5 DIFF:    24.1%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:   106.1 DIFF:   196.6%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    47.6 DIFF:    59.2%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    44.8 DIFF:    11.7%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    35.1 DIFF:    24.2%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -241.6 DIFF:    -1.7%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:   323.9 DIFF:   999.0%
99755 --------  - 1318  ARROWHD3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    52.6 DIFF:   999.0%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  3017.9 DIFF:    45.1%
                                                 DIFF:   937.6   DF:    93.8%
*******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   170.4 DIFF:     5.6%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1814.3 DIFF:     2.5%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   241.6 DIFF:    -1.7%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -52.6 DIFF:   999.0%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2173.6 DIFF:     0.0%
                                                 DIFF:     0.6   DF:     0.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -167.1 DIFF:     5.6%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1772.1 DIFF:     2.5%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -237.0 DIFF:    -1.7%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    53.2 DIFF:   999.0%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2123.1 DIFF:    -0.1%
                                                 DIFF:     2.1   DF:     0.2%
******************************************************************************

10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   154.0 DIFF:    -0.2%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   154.4 DIFF:    -0.2%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   158.9 DIFF:    -0.2%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   354.1 DIFF:    -1.0%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   425.1 DIFF:    -0.9%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   456.8 DIFF:     5.1%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1703.2 DIFF:     0.8%
                                                 DIFF:    13.9   DF:     1.4%
******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   456.8 DIFF:     5.1%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   456.8 DIFF:     5.1%
                                                 DIFF:    22.4   DF:     2.2%
******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   260.8 DIFF:     2.8%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:   101.5 DIFF:    -9.3%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   508.5 DIFF:     4.5%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   870.8 DIFF:     2.1%
                                                 DIFF:    18.3   DF:     1.8%
******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   335.5 DIFF:    18.6%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   280.1 DIFF:    14.8%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   615.5 DIFF:    16.8%
                                                 DIFF:    88.6   DF:     8.9%
******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   171.1 DIFF:    19.6%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   320.5 DIFF:    13.3%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:   101.9 DIFF:     7.3%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   593.5 DIFF:    13.9%
                                                 DIFF:    72.6   DF:     7.3%
******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   840.5 DIFF:    29.8%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   840.5 DIFF:    29.8%
                                                 DIFF:   193.0   DF:    19.3%
******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:  1003.3 DIFF:    19.6%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:  1003.3 DIFF:    19.6%
                                                 DIFF:   164.7   DF:    16.5%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   972.6 DIFF:    21.2%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:  1003.3 DIFF:    19.6%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   485.0 DIFF:    27.3%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   190.7 DIFF:    11.9%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   129.8 DIFF:    16.8%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    84.8 DIFF:    16.7%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2866.3 DIFF:    20.6%
                                                 DIFF:   489.8   DF:    49.0%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   840.5 DIFF:    29.8%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:  1003.3 DIFF:    19.6%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  1843.8 DIFF:    24.1%
                                                 DIFF:   357.7   DF:    35.8%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:  -175.7 DIFF:   130.8%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:  -175.7 DIFF:   130.8%
                                                 DIFF:   -99.6   DF:   -10.0%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   477.1 DIFF:    -3.4%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   611.4 DIFF:    -1.9%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1088.6 DIFF:    -2.6%
                                                 DIFF:   -28.6   DF:    -2.9%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    84.8 DIFF:    16.7%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    84.8 DIFF:    16.7%
                                                 DIFF:    12.1   DF:     1.2%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    62.6 DIFF:    -1.5%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -88.9 DIFF:    -1.2%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -69.4 DIFF:    -1.7%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -95.7 DIFF:    -1.4%
                                                 DIFF:     1.3   DF:     0.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -62.2 DIFF:    -1.5%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    89.7 DIFF:    -1.2%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    70.4 DIFF:    -1.7%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:    97.8 DIFF:    -1.4%
                                                DIFF:    -1.4   DF:    -0.1%
*******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:   -97.2 DIFF:   156.9%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:   -97.2 DIFF:   156.9%
                                                DIFF:   -59.3   DF:    -5.9%
*******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:   161.1 DIFF:    60.8%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:   161.1 DIFF:    60.8%
                                                DIFF:    60.9   DF:     6.1%
*******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   334.5 DIFF:    -6.7%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   334.5 DIFF:    -6.7%
                                                DIFF:   -24.0   DF:    -2.4%
*******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   160.2 DIFF:   -29.1%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:    30.0 DIFF:   -62.6%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   190.3 DIFF:   -37.9%
                                                DIFF:  -116.1   DF:   -11.6%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   456.8 DIFF:     5.1%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   456.8 DIFF:     5.1%
                                                DIFF:    22.4   DF:     2.2%
*******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -52.6 DIFF:   999.0%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:   -52.6 DIFF:   999.0%
                                                DIFF:   -49.1   DF:    -4.9%
*******************************************************************************
```

Table 5.4 (Cont.)
Constrained Interface Impact Analyses - Case S3C3W2E

```
***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S3C3W2E.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2647,MH=2172,MW=2002,OHMH=-197,OHMP=150,EWTW=-120,BD=166


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   389.2 DIFF:    11.1%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   449.1 DIFF:    11.3%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   396.5 DIFF:     9.8%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   286.6 DIFF:     1.7%
0554  MORRIS 4  - 0550  GRANITF4   BASE:   106.1 CHNG:   111.5 DIFF:     5.1%
99554 --------  - 99550 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   163.1 DIFF:    -0.9%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:   120.8 DIFF:    24.4%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   155.6 DIFF:    -0.6%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   155.6 DIFF:    11.2%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    26.6 DIFF:     4.2%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    52.8 DIFF:     1.0%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    53.4 DIFF:     5.9%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:    38.0 DIFF:     6.2%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    31.7 DIFF:     6.2%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    42.1 DIFF:     5.0%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    29.8 DIFF:     5.2%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -242.3 DIFF:    -1.4%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:   341.2 DIFF:   999.0%
99755 PRAIRIE5  - 1318  ARROWHD3   BASE:     0.0 CHNG:   335.1 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    36.7 DIFF:   967.2%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  2972.8 DIFF:    42.9%
                                                 DIFF:   892.5   DF:    89.2%
******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   162.5 DIFF:     0.8%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1804.3 DIFF:     2.0%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   242.3 DIFF:    -1.4%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -36.7 DIFF:   967.2%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2172.4 DIFF:     0.0%
                                                 DIFF:    -0.6   DF:    -0.1%
******************************************************************************
```

Table 5.4 (Cont.)

```
1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -159.5 DIFF:     0.7%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1762.1 DIFF:     1.9%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -237.8 DIFF:    -1.4%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    37.0 DIFF:   974.7%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2122.4 DIFF:    -0.1%
                                                 DIFF:     2.8   DF:     0.3%
*******************************************************************************

10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   154.8 DIFF:     0.3%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   155.3 DIFF:     0.3%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   159.7 DIFF:     0.3%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   357.0 DIFF:    -0.2%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   428.6 DIFF:    -0.1%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   446.8 DIFF:     2.9%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1702.1 DIFF:     0.8%
                                                 DIFF:    12.8   DF:     1.3%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   446.8 DIFF:     2.9%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   446.8 DIFF:     2.9%
                                                 DIFF:    12.4   DF:     1.2%
*******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   259.1 DIFF:     2.1%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:   108.8 DIFF:    -2.8%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   503.3 DIFF:     3.4%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   871.2 DIFF:     2.2%
                                                 DIFF:    18.7   DF:     1.9%
*******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   302.3 DIFF:     6.8%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   257.4 DIFF:     5.5%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   559.7 DIFF:     6.2%
                                                 DIFF:    32.8   DF:     3.3%
*******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   151.3 DIFF:     5.8%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   296.4 DIFF:     4.8%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:    97.5 DIFF:     2.7%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   545.3 DIFF:     4.7%
                                                 DIFF:    24.3   DF:     2.4%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   707.7 DIFF:     9.3%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   707.7 DIFF:     9.3%
                                                 DIFF:    60.2   DF:     6.0%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   805.4 DIFF:    -4.0%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:   805.4 DIFF:    -4.0%
                                                 DIFF:   -33.2   DF:    -3.3%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   855.4 DIFF:     6.6%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   805.4 DIFF:    -4.0%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   379.1 DIFF:    -0.5%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   174.2 DIFF:     2.2%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   111.0 DIFF:    -0.1%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    77.2 DIFF:     6.3%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2402.4 DIFF:     1.1%
                                                 DIFF:    25.9   DF:     2.6%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   707.7 DIFF:     9.3%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   805.4 DIFF:    -4.0%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:   489.1 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  2002.3 DIFF:    34.7%
                                                 DIFF:   516.1   DF:    51.6%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:   -74.8 DIFF:    -1.8%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:   -74.8 DIFF:    -1.8%
                                                 DIFF:     1.4   DF:     0.1%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   488.2 DIFF:    -1.2%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   619.5 DIFF:    -0.6%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1107.7 DIFF:    -0.8%
                                                 DIFF:    -9.4   DF:    -0.9%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    77.2 DIFF:     6.3%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    77.2 DIFF:     6.3%
                                                 DIFF:     4.6   DF:     0.5%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    62.2 DIFF:    -2.2%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -89.6 DIFF:    -0.5%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -70.0 DIFF:    -0.8%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -97.5 DIFF:     0.4%
                                                 DIFF:    -0.4   DF:     0.0%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -61.8 DIFF:    -2.2%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    90.4 DIFF:    -0.5%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    71.1 DIFF:    -0.8%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:    99.6 DIFF:     0.4%
                                                DIFF:     0.4   DF:     0.0%
******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:   -65.2 DIFF:    72.3%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:   -65.2 DIFF:    72.3%
                                                DIFF:   -27.3   DF:    -2.7%
******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:    42.1 DIFF:   -58.0%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:    42.1 DIFF:   -58.0%
                                                DIFF:   -58.1   DF:    -5.8%
******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   352.1 DIFF:    -1.8%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   352.1 DIFF:    -1.8%
                                                DIFF:    -6.4   DF:    -0.6%
******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   213.1 DIFF:    -5.7%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:    70.2 DIFF:   -12.6%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   283.3 DIFF:    -7.5%
                                                DIFF:   -23.0   DF:    -2.3%
******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   446.8 DIFF:     2.9%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   446.8 DIFF:     2.9%
                                                DIFF:    12.4   DF:     1.2%
******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -36.7 DIFF:   967.2%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:   -36.7 DIFF:   967.2%
                                                DIFF:   -33.3   DF:    -3.3%
******************************************************************************
```

Table 5.4 (Cont.)
Constrained Interface Impact Analyses - Case S4C4IXA

```
***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S4C4IXA.SAV;SUMMER;;SYSTEM INTACT           :
ND=2079,MH=2171,MW=1653,OHMH=-197,OHMP=150,EWTW=-120,BD=167


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   307.6 DIFF:   -12.2%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   395.0 DIFF:    -2.1%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   415.9 DIFF:    15.2%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   273.0 DIFF:    -3.1%
0554  MORRIS 4  - 0550  GRANITF4   BASE:   106.1 CHNG:   101.4 DIFF:    -4.4%
99554 --------  - 99550 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   173.1 DIFF:     5.2%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:    74.3 DIFF:   -23.5%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   168.6 DIFF:     7.7%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   133.5 DIFF:    -4.5%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    27.5 DIFF:     7.8%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    53.9 DIFF:     3.2%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    49.5 DIFF:    -1.8%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:    32.9 DIFF:    -8.1%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    26.7 DIFF:   -10.6%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    39.8 DIFF:    -0.5%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    27.3 DIFF:    -3.4%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -234.3 DIFF:    -4.7%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99755 --------  - 1318  ARROWHD3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    13.7 DIFF:   297.3%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  2079.6 DIFF:     0.0%
                                                 DIFF:    -0.8   DF:    -0.1%
*******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   163.6 DIFF:     1.5%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1787.1 DIFF:     1.0%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   234.3 DIFF:    -4.7%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -13.7 DIFF:   297.3%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2171.4 DIFF:    -0.1%
                                                 DIFF:    -1.7   DF:    -0.2%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -160.6 DIFF:     1.4%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1746.0 DIFF:     1.0%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -230.1 DIFF:    -4.6%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:    13.7 DIFF:   297.9%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2122.9 DIFF:    -0.1%
                                                 DIFF:     2.3   DF:     0.2%
*******************************************************************************

10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   152.8 DIFF:    -0.9%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   153.3 DIFF:    -0.9%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   157.7 DIFF:    -0.9%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   347.8 DIFF:    -2.7%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   417.6 DIFF:    -2.7%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   477.0 DIFF:     9.8%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1706.2 DIFF:     1.0%
                                                 DIFF:    16.9   DF:     1.7%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   477.0 DIFF:     9.8%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   477.0 DIFF:     9.8%
                                                 DIFF:    42.5   DF:     4.3%
*******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   267.5 DIFF:     5.4%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:    90.1 DIFF:   -19.5%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   530.7 DIFF:     9.0%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   888.3 DIFF:     4.2%
                                                 DIFF:    35.8   DF:     3.6%
*******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   390.2 DIFF:    37.9%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   317.9 DIFF:    30.3%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   708.1 DIFF:    34.4%
                                                 DIFF:   181.2   DF:    18.1%
*******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   209.8 DIFF:    46.7%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   372.3 DIFF:    31.6%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:   111.6 DIFF:    17.5%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   693.8 DIFF:    33.2%
                                                 DIFF:   172.8   DF:    17.3%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   748.7 DIFF:    15.6%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   748.7 DIFF:    15.6%
                                                 DIFF:   101.2   DF:    10.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   904.7 DIFF:     7.9%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:   904.7 DIFF:     7.9%
                                                 DIFF:    66.1   DF:     6.6%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   893.1 DIFF:    11.3%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   904.7 DIFF:     7.9%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   160.7 DIFF:   -57.8%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   181.8 DIFF:     6.7%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   122.5 DIFF:    10.3%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    67.4 DIFF:    -7.2%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2330.3 DIFF:    -1.9%
                                                 DIFF:   -46.2   DF:    -4.6%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   748.7 DIFF:    15.6%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   904.7 DIFF:     7.9%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  1653.4 DIFF:    11.3%
                                                 DIFF:   167.2   DF:    16.7%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:  -164.7 DIFF:   116.4%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:  -164.7 DIFF:   116.4%
                                                 DIFF:   -88.6   DF:    -8.9%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   461.3 DIFF:    -6.6%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   602.0 DIFF:    -3.4%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1063.3 DIFF:    -4.8%
                                                 DIFF:   -53.8   DF:    -5.4%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    67.4 DIFF:    -7.2%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    67.4 DIFF:    -7.2%
                                                 DIFF:    -5.2   DF:    -0.5%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    62.4 DIFF:    -1.9%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -90.2 DIFF:     0.1%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -70.6 DIFF:     0.0%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -98.4 DIFF:     1.4%
                                                 DIFF:    -1.3   DF:    -0.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -62.0 DIFF:    -1.8%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    90.9 DIFF:     0.1%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    71.6 DIFF:     0.0%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:   100.6 DIFF:     1.3%
                                                DIFF:     1.3   DF:     0.1%
******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:  -175.0 DIFF:   362.9%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:  -175.0 DIFF:   362.9%
                                                DIFF:  -137.2   DF:   -13.7%
******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:    63.0 DIFF:   -37.1%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:    63.0 DIFF:   -37.1%
                                                DIFF:   -37.2   DF:    -3.7%
******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   323.3 DIFF:    -9.8%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   323.3 DIFF:    -9.8%
                                                DIFF:   -35.2   DF:    -3.5%
******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   131.0 DIFF:   -42.0%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:     7.7 DIFF:   -90.5%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   138.7 DIFF:   -54.7%
                                                DIFF:  -167.7   DF:   -16.8%
******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   477.0 DIFF:     9.8%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   477.0 DIFF:     9.8%
                                                DIFF:    42.5   DF:     4.3%
******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:   -13.7 DIFF:   297.3%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:   -13.7 DIFF:   297.3%
                                                DIFF:   -10.2   DF:    -1.0%
******************************************************************************
```

Table 5.4 (Cont.)
Constrained Interface Impact Analyses - Case S4C5WXD

```
***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S4C5WXD.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2079,MH=2171,MW=1685,OHMH=-196,OHMP=151,EWTW=-119,BD=167


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   315.0 DIFF:   -10.0%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   399.2 DIFF:    -1.1%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   410.0 DIFF:    13.6%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   281.6 DIFF:    -0.1%
0554  MORRIS 4  - 0550  GRANITF4   BASE:   106.1 CHNG:   113.5 DIFF:     7.0%
99554 --------  - 99550 GRANFLS3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   164.6 DIFF:     0.1%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:    78.4 DIFF:   -19.3%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   156.1 DIFF:    -0.3%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   133.7 DIFF:    -4.4%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    25.5 DIFF:    -0.1%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    51.3 DIFF:    -1.8%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    50.3 DIFF:    -0.2%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:    34.9 DIFF:    -2.4%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    29.3 DIFF:    -1.9%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    41.8 DIFF:     4.2%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    29.0 DIFF:     2.4%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -241.9 DIFF:    -1.6%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99755 --------  - 1318  ARROWHD3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:     7.2 DIFF:   110.2%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  2079.6 DIFF:     0.0%
                                                 DIFF:    -0.7   DF:    -0.1%
*******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   166.9 DIFF:     3.5%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1769.7 DIFF:     0.0%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   241.9 DIFF:    -1.6%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:    -7.2 DIFF:   110.2%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2171.4 DIFF:    -0.1%
                                                 DIFF:    -1.7   DF:    -0.2%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -163.8 DIFF:     3.5%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1729.6 DIFF:     0.0%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -237.4 DIFF:    -1.6%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:     7.2 DIFF:   110.2%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2123.6 DIFF:    -0.1%
                                                 DIFF:     1.6   DF:     0.2%
*******************************************************************************

10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   154.5 DIFF:     0.1%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   155.0 DIFF:     0.1%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   159.4 DIFF:     0.1%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   354.0 DIFF:    -1.0%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   425.0 DIFF:    -1.0%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   450.9 DIFF:     3.8%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1698.7 DIFF:     0.6%
                                                 DIFF:     9.4   DF:     0.9%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   450.9 DIFF:     3.8%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   450.9 DIFF:     3.8%
                                                 DIFF:    16.5   DF:     1.6%
*******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   260.0 DIFF:     2.4%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:   110.2 DIFF:    -1.6%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   509.9 DIFF:     4.7%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   880.1 DIFF:     3.2%
                                                 DIFF:    27.5   DF:     2.8%
*******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   316.4 DIFF:    11.8%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   267.3 DIFF:     9.5%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   583.7 DIFF:    10.8%
                                                 DIFF:    56.8   DF:     5.7%
*******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   159.5 DIFF:    11.5%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   307.1 DIFF:     8.5%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:    99.4 DIFF:     4.7%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   566.1 DIFF:     8.7%
                                                 DIFF:    45.1   DF:     4.5%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   789.0 DIFF:    21.8%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   789.0 DIFF:    21.8%
                                                 DIFF:   141.5   DF:    14.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   896.5 DIFF:     6.9%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:   896.5 DIFF:     6.9%
                                                 DIFF:    57.9   DF:     5.8%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   918.9 DIFF:    14.5%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   896.5 DIFF:     6.9%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   310.0 DIFF:   -18.6%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   185.2 DIFF:     8.6%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   125.6 DIFF:    13.0%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    71.5 DIFF:    -1.6%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2507.6 DIFF:     5.5%
                                                 DIFF:   131.1   DF:    13.1%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   789.0 DIFF:    21.8%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   896.5 DIFF:     6.9%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:     0.0 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  1685.5 DIFF:    13.4%
                                                 DIFF:   199.3   DF:    19.9%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:  -116.4 DIFF:    52.9%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:  -116.4 DIFF:    52.9%
                                                 DIFF:   -40.3   DF:    -4.0%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   484.1 DIFF:    -2.0%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   616.9 DIFF:    -1.0%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1101.1 DIFF:    -1.4%
                                                 DIFF:   -16.1   DF:    -1.6%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    71.5 DIFF:    -1.6%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    71.5 DIFF:    -1.6%
                                                 DIFF:    -1.1   DF:    -0.1%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    62.7 DIFF:    -1.4%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -90.3 DIFF:     0.3%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -70.7 DIFF:     0.2%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -98.4 DIFF:     1.4%
                                                 DIFF:    -1.3   DF:    -0.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -62.3 DIFF:    -1.4%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    91.1 DIFF:     0.3%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    71.8 DIFF:     0.2%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:   100.6 DIFF:     1.3%
                                                DIFF:     1.3   DF:     0.1%
******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:   -91.3 DIFF:   141.4%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:   -91.3 DIFF:   141.4%
                                                DIFF:   -53.5   DF:    -5.3%
******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:   211.5 DIFF:   111.1%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:   211.5 DIFF:   111.1%
                                                DIFF:   111.3   DF:    11.1%
******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   351.2 DIFF:    -2.1%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   351.2 DIFF:    -2.1%
                                                DIFF:    -7.4   DF:    -0.7%
******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   179.1 DIFF:   -20.8%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:    43.4 DIFF:   -45.9%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   222.5 DIFF:   -27.4%
                                                DIFF:   -83.9   DF:    -8.4%
******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   450.9 DIFF:     3.8%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   450.9 DIFF:     3.8%
                                                DIFF:    16.5   DF:     1.6%
******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:    -7.2 DIFF:   110.2%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:    -7.2 DIFF:   110.2%
                                                DIFF:    -3.8   DF:    -0.4%
******************************************************************************
```

Table 5.4 (Cont.)
Constrained Interface Impact Analyses - Case S5C3WXE

```
***** BASE CASE:
UPE-SO04AA.ABBBASE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** CHNG CASE:
UPE-SO04AA.S5C3WXE.SAV;SUMMER;OP LD;SYSTEM INTACT
ND=2080,MH=2173,MW=1486,OHMH=-196,OHMP=150,EWTW=-120,BD=166


***** BASE TRANSACTION AMOUNT FOR DF CALCULATION:  1000.000


0605  LELANDO3  - 0506  FTTHOMP3   BASE:   350.2 CHNG:   346.4 DIFF:    -1.1%
0605  LELANDO3  - 0660  GROTON 3   BASE:   403.4 CHNG:   351.2 DIFF:   -13.0%
0601  ANTELOP3  - 0620  HURON  3   BASE:   361.1 CHNG:   444.5 DIFF:    23.1%
0910  BIGSTON4  - 0503  BLAIR  4   BASE:   281.8 CHNG:   249.9 DIFF:   -11.3%
0554  MORRIS 4  - 0550  GRANITF4   BASE:   106.1 CHNG:    98.4 DIFF:    -7.2%
99554 --------  - 99550 GRANFLS3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0903  AUDUBON4  - 1980  HUBBARD4   BASE:   164.5 CHNG:   170.9 DIFF:     3.9%
0521  SULLYBT4  - 0519  OAHE   4   BASE:    97.1 CHNG:    97.4 DIFF:     0.3%
1955  INMAN  4  - 1311  WINGRIV4   BASE:   156.5 CHNG:   169.7 DIFF:     8.4%
0470  BISON  4  - 0497  MAURINE4   BASE:   139.9 CHNG:   138.3 DIFF:    -1.1%
0716  LAPORTE7  - 1340  BADOURA7   BASE:    25.5 CHNG:    26.4 DIFF:     3.6%
0902  ALEXAND7  - 1649  DGLASCO7   BASE:    52.3 CHNG:    53.8 DIFF:     2.9%
0827  ELLENDL7  - 1001  ABDNJCT7   BASE:    50.4 CHNG:    44.9 DIFF:   -10.9%
0432  EDGELEY7  - 0534  ORDWAY 7   BASE:    35.8 CHNG:    24.7 DIFF:   -31.0%
0438  FORMAN 7  - 0522  SUMMIT-7   BASE:    29.9 CHNG:    19.6 DIFF:   -34.4%
0920  CANBY  7  - 0551  GRANITF7   BASE:    40.1 CHNG:    42.4 DIFF:     5.9%
1946  KERKHO 7  - 1945  KERKHOT7   BASE:    28.3 CHNG:    27.4 DIFF:    -3.3%
0752  DRAYTON4  - 3458  LETELER4   BASE:  -245.8 CHNG:  -234.6 DIFF:    -4.6%
9838  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
5601  --------  - 5634  --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99838 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 99660 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99910 --------  - 91702 --------   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
9847  --------  - 0506  FTTHOMP3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0792  MAPLE R3  - 1667  BENTON 3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
99755 --------  - 1318  ARROWHD3   BASE:     0.0 CHNG:     0.0 DIFF:   999.0%
0925  RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:     9.6 DIFF:   177.9%

SUBTOTALS FOR: NDEX                BASE:  2080.3 CHNG:  2080.8 DIFF:     0.0%
                                                 DIFF:     0.5   DF:     0.1%
******************************************************************************

3477  RICHER 4  - 1679  ROSEAU 4   BASE:   161.3 CHNG:   167.7 DIFF:     4.0%
3465  DORSEY 2  - 1677  ROSEAUN2   BASE:  1769.4 CHNG:  1779.3 DIFF:     0.6%
3458  LETELER4  - 752   DRAYTON4   BASE:   245.8 CHNG:   234.6 DIFF:    -4.6%
3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:    -9.6 DIFF:   177.9%

SUBTOTALS FOR: MHEX_S              BASE:  2173.1 CHNG:  2172.0 DIFF:     0.0%
                                                 DIFF:    -1.1   DF:    -0.1%
******************************************************************************
```

Table 5.4 (Cont.)

```
1679  ROSEAU 4  - 3477  RICHER 4   BASE:  -158.3 CHNG:  -164.5 DIFF:     3.9%
1677  ROSEAUN2  - 3465  DORSEY 2   BASE: -1729.1 CHNG: -1738.7 DIFF:     0.6%
752   DRAYTON4  - 3458  LETELER4   BASE:  -241.2 CHNG:  -230.4 DIFF:    -4.5%
925   RUGBY  4  - 3424  GLENBOR4   BASE:     3.4 CHNG:     9.6 DIFF:   178.0%

SUBTOTALS FOR: MHEX_N              BASE: -2125.2 CHNG: -2124.0 DIFF:    -0.1%
                                                 DIFF:     1.2   DF:     0.1%
*******************************************************************************

10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.3 CHNG:   153.0 DIFF:    -0.8%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   154.7 CHNG:   153.5 DIFF:    -0.8%
10103 GENTLMN4  - 10203 N.PLATT4   BASE:   159.2 CHNG:   157.9 DIFF:    -0.8%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   357.6 CHNG:   353.2 DIFF:    -1.2%
10102 GENTLMN3  - 10282 SWEET W3   BASE:   429.1 CHNG:   423.8 DIFF:    -1.2%
10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   446.1 DIFF:     2.7%

SUBTOTALS FOR: GGS                 BASE:  1689.3 CHNG:  1687.7 DIFF:    -0.1%
                                                 DIFF:    -1.7   DF:    -0.2%
*******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   446.1 DIFF:     2.7%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   446.1 DIFF:     2.7%
                                                 DIFF:    11.7   DF:     1.2%
*******************************************************************************

10229 PAULINE3  - 10194 MOORE  3   BASE:   253.8 CHNG:   252.0 DIFF:    -0.7%
10118 GR ISLD4  - 10055 COLMB.W4   BASE:   112.0 CHNG:    98.7 DIFF:   -11.9%
571   GR ISLD3  - 10186 MCCOOL 3   BASE:   486.8 CHNG:   486.1 DIFF:    -0.1%

SUBTOTALS FOR: GRIS_LNC            BASE:   852.5 CHNG:   836.9 DIFF:    -1.8%
                                                 DIFF:   -15.7   DF:    -1.6%
*******************************************************************************

10065 COOPER 3  - 91002 ST JOE 3   BASE:   282.9 CHNG:   325.2 DIFF:    14.9%
10065 COOPER 3  - 86022 FAIRPT 7   BASE:   244.0 CHNG:   273.1 DIFF:    11.9%

SUBTOTALS FOR: COOPER_S            BASE:   526.9 CHNG:   598.3 DIFF:    13.6%
                                                 DIFF:    71.4   DF:     7.1%
*******************************************************************************

13451 S3451  3  - 13454 S3454  3   BASE:   143.1 CHNG:   181.1 DIFF:    26.6%
13451 S3451  3  - 13459 S3459  3   BASE:   282.9 CHNG:   329.2 DIFF:    16.4%
13251 S1251  5  - 13297 S1297  5   BASE:    95.0 CHNG:   103.5 DIFF:     8.9%

SUBTOTALS FOR: FTCAL_S             BASE:   521.0 CHNG:   613.7 DIFF:    17.8%
                                                 DIFF:    92.8   DF:     9.3%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   749.6 DIFF:    15.8%

SUBTOTALS FOR: ECL-ARP             BASE:   647.5 CHNG:   749.6 DIFF:    15.8%
                                                 DIFF:   102.1   DF:    10.2%
*******************************************************************************
```

Table 5.4 (Cont.)

```
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   788.0 DIFF:    -6.0%

SUBTOTALS FOR: PRI-BYN             BASE:   838.6 CHNG:   788.0 DIFF:    -6.0%
                                                 DIFF:   -50.6   DF:    -5.1%
*******************************************************************************

1695  AS KING3  - 1853  EAU CL 3   BASE:   802.7 CHNG:   884.8 DIFF:    10.2%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   788.0 DIFF:    -6.0%
1702  BLUE LK3  - 1608  WILMART3   BASE:   380.9 CHNG:   198.9 DIFF:   -47.8%
1697  AS KING7  - 1878  WIL R T7   BASE:   170.4 CHNG:   179.7 DIFF:     5.4%
1744  REDROCK7  - 57266 GLENMONT   BASE:   111.1 CHNG:   119.3 DIFF:     7.4%
1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    66.9 DIFF:    -8.0%

SUBTOTALS FOR: OLD_MNEX            BASE:  2376.4 CHNG:  2237.6 DIFF:    -5.8%
                                                 DIFF:  -138.9   DF:   -13.9%
*******************************************************************************

1853  EAU CL 3  - 92494 ARP 345    BASE:   647.5 CHNG:   749.6 DIFF:    15.8%
1604  PR ISLD3  - 1235  BYRON  3   BASE:   838.6 CHNG:   788.0 DIFF:    -6.0%
1604  PR ISLD3  - 92270 COL 345    BASE:     0.0 CHNG:   512.7 DIFF:   999.0%

SUBTOTALS FOR: MWSI                BASE:  1486.1 CHNG:  2050.2 DIFF:    38.0%
                                                 DIFF:   564.1   DF:    56.4%
*******************************************************************************

2549  ARNOLD 3  - 2050  HAZLTON3   BASE:   -76.1 CHNG:   -83.0 DIFF:     9.1%

SUBTOTALS FOR: ARN-HAZLTN          BASE:   -76.1 CHNG:   -83.0 DIFF:     9.1%
                                                 DIFF:    -6.9   DF:    -0.7%
*******************************************************************************

80021 LACYGNE7  - 80012 W.GRDNR7   BASE:   494.1 CHNG:   481.3 DIFF:    -2.6%
80021 LACYGNE7  - 80014 STILWEL7   BASE:   623.1 CHNG:   614.9 DIFF:    -1.3%

SUBTOTALS FOR: LACYGNE_N           BASE:  1117.1 CHNG:  1096.2 DIFF:    -1.9%
                                                 DIFF:   -20.9   DF:    -2.1%
*******************************************************************************

1970  LKMARN 7  - 1606  W FARIB7   BASE:    72.7 CHNG:    66.9 DIFF:    -8.0%

SUBTOTALS FOR: LKM-WFB             BASE:    72.7 CHNG:    66.9 DIFF:    -8.0%
                                                 DIFF:    -5.8   DF:    -0.6%
*******************************************************************************

3213  AUBURNT4  - 3426  RESTON 4   BASE:    63.6 CHNG:    62.8 DIFF:    -1.1%
3215  YORKTON4  - 3415  ROBLIN 4   BASE:   -90.0 CHNG:   -90.1 DIFF:     0.0%
3230  EBCAMPB4  - 3416  RALL   4   BASE:   -70.6 CHNG:   -70.5 DIFF:    -0.1%

SUBTOTALS FOR: MH_SPC_E            BASE:   -97.1 CHNG:   -97.8 DIFF:     0.7%
                                                 DIFF:    -0.7   DF:    -0.1%
*******************************************************************************
```

Table 5.4 (Cont.)

```
3426  RESTON 4  - 3213  AUBURNT4   BASE:   -63.2 CHNG:   -62.5 DIFF:    -1.1%
3415  ROBLIN 4  - 3215  YORKTON4   BASE:    90.8 CHNG:    90.8 DIFF:     0.0%
3416  RALL   4  - 3230  EBCAMPB4   BASE:    71.6 CHNG:    71.6 DIFF:    -0.1%

SUBTOTALS FOR: MH_SPC_W            BASE:    99.2 CHNG:    99.9 DIFF:     0.7%
                                                DIFF:     0.7   DF:     0.1%
******************************************************************************

2455  MNTZUMA3  - 2412  BONDRNT3   BASE:   -37.8 CHNG:  -103.9 DIFF:   174.8%

SUBTOTALS FOR: MNTZUMA_W           BASE:   -37.8 CHNG:  -103.9 DIFF:   174.8%
                                                DIFF:   -66.1   DF:    -6.6%
******************************************************************************

34147 WEMPL; B  - 92085 PAD 345    BASE:   100.2 CHNG:    66.9 DIFF:   -33.2%

SUBTOTALS FOR: NI_WUMS             BASE:   100.2 CHNG:    66.9 DIFF:   -33.2%
                                                DIFF:   -33.3   DF:    -3.3%
******************************************************************************

34133 QUAD ;    - 2082  ROCK CK3   BASE:   358.5 CHNG:   348.8 DIFF:    -2.7%

SUBTOTALS FOR: QUAD-ROCKC          BASE:   358.5 CHNG:   348.8 DIFF:    -2.7%
                                                DIFF:    -9.7   DF:    -1.0%
******************************************************************************

34133 QUAD ;    - 2202  SUB 91 3   BASE:   226.1 CHNG:   189.4 DIFF:   -16.2%
60000 CORDOVA   - 2204  E MOLIN3   BASE:    80.3 CHNG:    51.7 DIFF:   -35.6%

SUBTOTALS FOR: QUADCITY_W          BASE:   306.4 CHNG:   241.1 DIFF:   -21.3%
                                                DIFF:   -65.3   DF:    -6.5%
******************************************************************************

10102 GENTLMN3  - 10238 REDWILO3   BASE:   434.5 CHNG:   446.1 DIFF:     2.7%

SUBTOTALS FOR: WNE_WKS             BASE:   434.5 CHNG:   446.1 DIFF:     2.7%
                                                DIFF:    11.7   DF:     1.2%
******************************************************************************

3424  GLENBOR4  - 925   RUGBY  4   BASE:    -3.4 CHNG:    -9.6 DIFF:   177.9%

SUBTOTALS FOR: G82R-INFO-          BASE:    -3.4 CHNG:    -9.6 DIFF:   177.9%
                                                DIFF:    -6.1   DF:    -0.6%
******************************************************************************
```

Table 5.7
Phase 2 and Phase 1 Capital Costs

PHASE 2		PHASE 1		TOTAL COST (M$)
CASE	COST (M$)	CASE	COST (M$)	
S1C1IXE	80.34	S1C1XXA	240.08	320.42
S2C4WXE	80.34	S2C4XX3	249.44	329.78
S2C4WD3	37.44	S2C4XX3	249.44	286.88
S3C3W2E	80.34	S3C3X2A	399.25	479.59
S4C4IXA	0	S4C4XXA	178.09	178.09
S4C5WXD	213.28	S4C5XXA	219.10	397.19
S5C3WXE	106.11	S5C5XXX	130.29	236.40