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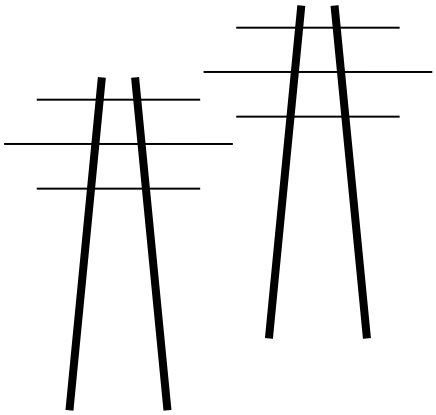


March 8, 2024

Will Seuffert
Executive Secretary
Public Utilities Commission
121 – 7th Place East, Suite 350
St. Paul, MN 55101

via eDockets only

RE: Initial Comment - Completeness
Xcel Application for Certificate of Need for Additional Dry Cask Storage at PINGP Spent Fuel Storage Installation - PUC Docket E002/CN-24-68

Dear Mr. Seuffert:

Thank you for the opportunity to file Completeness Comments on this request for additional dry cask storage at the Prairie Island Nuclear Generating Plant Spent Fuel Storage Installation, an important docket at this juncture as the company prepares for relicensing of PINGP. I am filing this comment on behalf of Communities United for Responsible Energy (CURE), based in communities within roughly a 20 mile radius of the plant, and active in nuclear proceedings before the Commission and the NRC since 1995 when Xcel proposed 5 sites for 10 CFR Part 72 away-from-reactor storage of nuclear waste from Prairie Island in Florence Township.

Despite the typical dearth of substantive comments in so many dockets, it's our hope that in this docket, the public, organizations, tribes and in particular the Prairie Island Indian Community, and affected city and county governments, will weigh in with substantive comments, something more than often seen form comments or petitions taking up space in other dockets, and not comments obviously distributed by Xcel for adoption. This docket admittedly represents a difficult position for everyone, the Commission, Minnesota ratepayers, nearby residents, and also for Xcel Energy, the only nuclear utility in Minnesota.

Generally, this application is incomplete and should not be accepted at this time. There are too many conclusory statements with missing details, lack of content, and circular arguments. This application is misleading as well as incomplete, and the Commission should return it to Xcel for another chance to justify this project – to show their work. If some sections are not addressed in this comment, it should not be inferred that those sections are deemed complete.

This application also has the obvious connection with license renewal of PINGP, but there is insufficient basis, justification, for an application for additional casks at this time. **Xcel states in the application that additional casks are not needed until 2033.** Given that admission, there's no need for an application until 2031, or 2030 if the project would be extremely contentious.

Before digging into the many topics that the Commission suggested for Comment, I want to note that Xcel is heavily reliant on the Minnesota 100% by 2040 in its assumptions. Claims in the application are substituting the policy aspects of Minnesota's legislative plan to lower CO2emissions in Minnesota for a demonstration of need. Policy is not need.

Another general point for consideration is that Xcel Energy is reaping profits from this plant, and as the recipient of this benefit, the utility needs to factor into this application projected costs for long term storage under the established scenarios, and clarify exactly where the funds will come from to cover these costs once the plant is closed. The excellent attachment from the Decommissioning filing acknowledges multiple cost factors, including contingency, risk (not factored in), and cask and facility replacement. It also lists multiple types of decommissioning and cask replacement waste under 3.5 SITE-SPECIFIC CONSIDERATIONS, that will have to be accommodated on Prairie Island, should the stalemate in permanent/interim storage fail to be resolved. – Nuclear waste is a cost of doing business.[1] These costs as well as expansion of storage pads must be factored into considerations of need, size, type and timing of alternatives -- and the standard of prudence with which the PUC is entrusted.

Xcel should take a more proactive stance in dealing with nuclear waste consistent with the Nuclear Waste Policy Act – nuclear waste is a cost of doing business. Xcel has receive many benefits, including Red Wing annexation of tribal land on which to build the project; "no-fault" Price-Anderson limitation of liability; repeated reductions in utility personal property tax; settlements and agreements with local governments that induce acquiescence; extensive successful lobbying efforts by their 64[2] registered lobbyists; intense public relations campaigns, and the best (for corporate purposes) planning in the industry. Xcel turns a profit despite all these expenses, expenses which collectively allow Xcel to continue nuclear generation with limited responsibility for impacts and consequences. This trade off, cost/benefit if you will, should be considered by the Commission.

Much more information and data need to be provided in the application, relative to claims made in the application, to provide for rigorous agency analysis of the factors. The burden is on the company to provide information required outright for efficiency and transparency in processing

[1] Online at: https://www.energy.gov/articles/nuclear-waste-policy-act

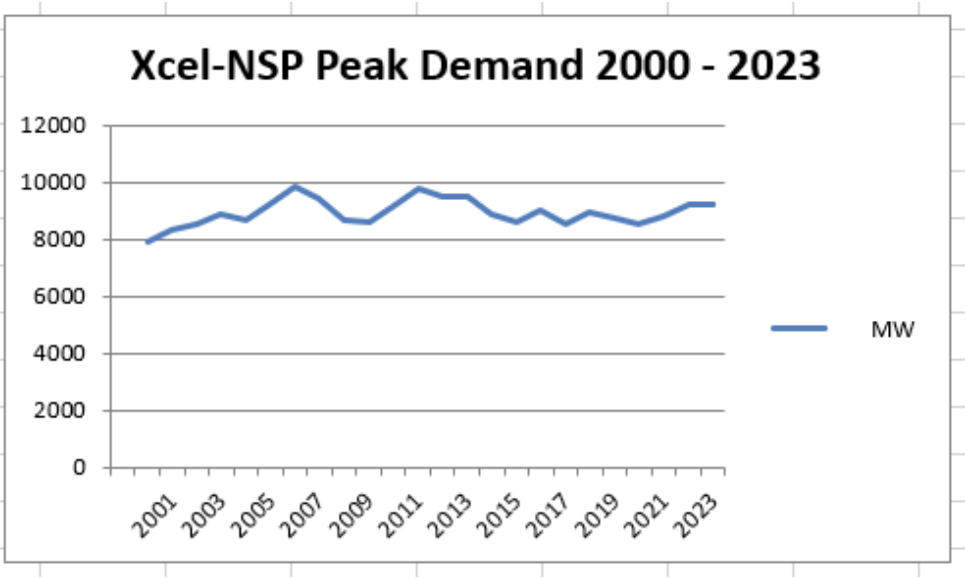
NUCLEAR WASTE POLICY ACT (1982) SUBTITLE A 111 a) Findings
(4) while the Federal Government has the responsibility to provide for the permanent disposal of high-level radioactive waste and such spent nuclear fuel as may be disposed of in order to protect the public health and safety and the environment, the costs of such disposal should be the responsibility of the generators and owners of such waste and spent fuel;
(5) the generators and owners of high-level radioactive waste and spent nuclear fuel have the primary responsibility to provide for, and the responsibility to pay the costs of, the interim storage of such waste and spent fuel until such waste and spent fuel is accepted by the Secretary of Energy in accordance with the provisions of this Act [42 U.S.C. 10101 et seq.];

[2] Xcel Energy Services, Inc. https://cfb.mn.gov/reports-and-data/viewers/lobbying/lobbying-organizations/660/2024.1/

of the application. Public interests should not have to track the information through information requests, or discovery in which they cannot participate.[3]

As with transmission and other utility infrastructure, for a utility to be granted a Certificate of Need for increased dry cask storage of spent nuclear fuel, the utility must demonstrate that there is a "need" as set out in Minn. Stat. §216B.243, Subd. 3, Showing Required for Construction, applicable to new construction and additional pads, and also in compliance with Subd. 3a, Use of Renewable Resource.

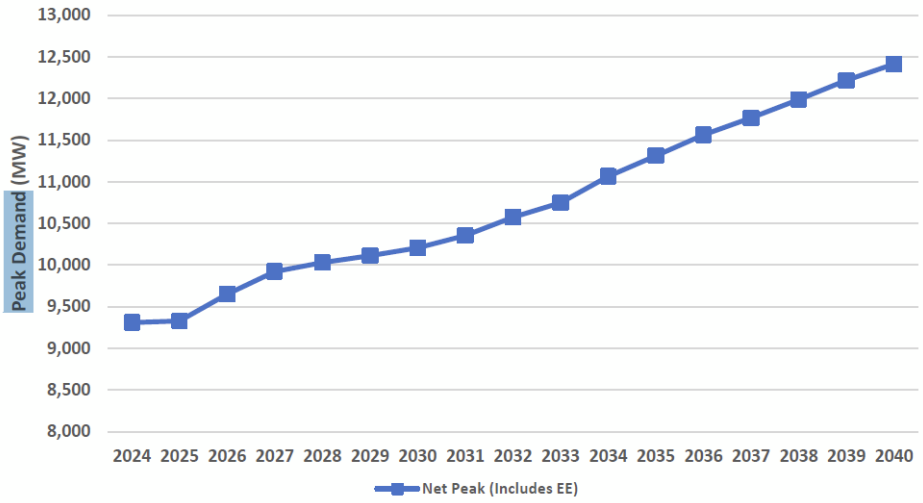
- Before the Commission grants any Certificate of Need, the utility should do all that it can to implement significant amounts of distributed generation to analyze need in accordance with Commission requirements in Minn. Stat. §216B.2426.
- Before the Commission grants a Certificate of Need, the Commission should consider Xcel's 2022 SEC 10-K filing that stated that Xcel is selling 1,500MW of "excess capacity" into the market. The 2023 was just filed, and if that number is different Xcel must explain that difference, and its ongoing plans.
- Before the Commission grants a Certificate of Need, the Commission must evaluate the NERC Long Term Reliability Assessment projections for our region, based on its use of information provided by utilities, and in particular the dramatic increase in available energy above and beyond the required reserve margin, mindful of the report's many MW/GW of probable and potential generation (mindful that much but not all will be built) v. existing generation.
- Xcel's claims of need for additional casks and the PINGP plant are dependent in large part on peak demand, and uses much information from its recently filed IRP. Before the Commission grants a Certificate of Need, the Commission should balance its IRP filing projecting a 1.8% annual increase in demand, and compare with the last 24 years of essentially flat peak demand. Peak demand 2000 – 2023 from SEC 10-K filings:



[3] Information requests and responses are not public until and unless they are entered in the record, and only parties may participate in discovery, which is also not public.

From Xcel's IRP, Chapter 3, page 3 of 29:

Figure 3-2: NSP System Median Base Summer Peak Demand (MW)
(Includes modeled EE Adjustment)



Recent Commerce-DER comments have reminded the Commission that Xcel has exaggerated its demand projections in the past. Any Certificate or permit granted by the Commission should carefully vet all demand claims.

Topics open for Comment

The Commission has provided multiple "Topics Open for Comment," and these will be addressed one by one.

DOES THE CERTIFICATE OF NEED APPLICATION CONTAIN THE INFORMATION REQUIRED UNDER MINNESOTA RULES 7855.0230 TO 7855.0280 AND 7855.0600 TO 7855.0670?

Provision of the information required by the rules in the application is important, because as the Commission knows, delay is often caused by failure to provide the necessary information, and the Commission is often prematurely declaring an application complete with a contemporaneous request for additional information. The Completeness decision sets the clock ticking, but without the necessary information, there will inevitably be delay.

Minn. R. 7855.0230 and **7855.0240** appear to have sufficient responses. Application, Chapters 2 & 3.

Minn. R. 7855.0250 – Xcel's "Need Summary" is incomplete, insufficient, inadequate, etc.. Xcel begins with a cut and paste of **Minn. R .7855.0120**, criteria under which, if met by the applicant, a Certificate of Need shall be issued, and then states, "The project satisfies all the criteria." No. This filing is an Application -- Xcel must address the requirements of an

application in the application. The section starting on page 4-1 is "Chapter 4: Need Summary (Minn. R. 7855.0250, and this is not the time or place for statements focused on Minn. R. 7855.0120. Chapter 4 of the Application is sufficiently insufficient to declare the application incomplete.

In this section Xcel also states that "Alternatives to the continued operation of the Plant do not better meet Xcel Energy's and the State's capacity and energy needs." The issue isn't whether it's better, but whether an alternative is a more reasonable and prudent alternative.

Minn. R. 7855.0250 NEED SUMMARY – Application Chapter 4, pps.4-1 to 4-21.. This rule states that "Each application shall contain a summary of the major factors that justify the need for the proposed facility. Except upon prior approval of the commission, this summary shall not exceed 15 pages, including text, tables, graphs, and figures."

Structurally, Chapter 4 is a convoluted mess, jumping from one rule to another, addressing content requirements in Minn. R. 7855.0120 rather than 7855.0250, and in no particular order. Because there is storage capacity until 2033, Xcel has time to whip this application into shape. :

- The obvious part is that Xcel's Chapter 4: Need Summary (Minn. R. 7855.0250) is just over 20 pages, and the Commission must direct Xcel to do some editing and deletions to get it to 15 pages, and then return for review. At this point, it is incomplete, not in compliance with the Rules. The Commission should not declare it complete prior to reviewing the revised version.
- The first page and a half of Chapter 4 relates the requirements of Minn. R. 7855.0120 of criteria under which the Commission SHALL grant a Certificate of Need, and does not address a summary of the major factors of justification. Minn. R. 7855.0250. Instead, Xcel pastes Minn. R.7855.0120 of criteria under which the Commission SHALL grant a Certificate of Need, and does not address a summary of the major factors of justification. Instead, Xcel pastes Minn. R. 7855.0120's criteria that must be satisfied for a Certificate of Need, and then simply states that "**The Project satisfies all of the criteria."** Then Xcel follows with unsupported conclusory statements A-D. Again, the criteria of Minn. R. 7855.0120 are not the application requirement of Minn. R. 7855.0250. The application is incomplete -- statements are not proof that the various criteria has been satisfied.
- Chapter 4 is labeled "Need Summary." Section 4.1 begins for the need of the dry cask storage to continue operation of PINGP. **The first paragraph states that "… Xcel Energy will be forced to shut down the Plant beginning in 2033 if additional storage capacity for spent nuclear fuel is not authorized. If we presume that a dry cask certification proceeding, if significantly contentious, could take three years, there is no basis for an application at this time, no basis for an application before 2030.**
- Xcel states in section 4.1.1, Carbon-Free Benefits that "this translates into over 405 million metric tons of carbon dioxide emissions avoided since the Plant bean operations." Avoidance is not reduction. This section is misleading and incomplete.
- Xcel states on page 4-3, p. 4-2, that "… the Plant is critical to Xcel Energy's ability to meet the ongoing, steady or base demand for electrical power and is a cornerstone of Xcel Energy's vision to achieve an 80 percent reduction in carbon emissions by 2030." This is irrelevant to this cask application as cask capacity is sufficient to 2033, and the plant is licensed through 2033/2034.

- In section 4.1.2, p. 4-3, Xcel touts its reliability history. On thing Xcel does not mention is that on October 19, 2023, due to "an electrical problem between the generator and substation activated safety equipment that stopped the fission process. Unit 1 tripped off just after crews had shut down Unit 2 for scheduled refueling and maintenance.[4] This was not reported in the media until a month later. With the plants shut down, the Mississippi River froze for the first time since the plant began operation. It is not know when, or if, the two reactors restarted.
- 4.1.3 Safety, p. 4-4, discusses the plant's safety record with the NRC, which is undeniably acceptable. When the PINGP Emergency Plan was approved on February 12, 2024 by the Red Wing City Council in the consent agenda, with no discussion, and the Emergency Plan was deemed "Confidential," and it was not included in the agenda packet, only the signature page. The PINGP Emergency Plan should be accessible, particularly to those living nearby. Review of an Emergency Plan is particularly important in light of the absurd and bizarre "Emergency Plan" in the withdrawn "Site P" application in Florence Township. Without the Emergency Plan, the application is incomplete.
- 4.1.4 Efficiency, p. 4-4; See also 4.1.9 The Project Makes Efficient Use of Resources." In my experience in all things utility, efficiency is meant in an energy context, not the efficiency of the Maintenance and Operations! The application is incomplete as it does not address "efficiency."
- 4.1.5, p. 4-6 Continued Need for Baseload Power. Baseload Power is… archaic[5]… a myth[6]… a fallacy[7]… outdated[8],[9]…not needed,[10] etc. See [/ 4-5. This section cites several statutes, but it's not clear to what rule it's responsive. This is a new world for energy,[11] that was apparent when former FERC Chair Wellinghoff testified in the Cardinal-Hickory Creek Wisconsin evidentiary hearing that storage is a reasonable substitute for transmission! "Do we really need nuclear power for "baseload electricity?"[12]

Minn. R. 7855.0270, Section 4.1.6 Conservation Cannot Eliminate This Need, p. 4-6. he application is incomplete because Xcel simply states that "Conservation Cannot Eliminate This Need. 4.1.6, page 4-6. Conservation could even stretch that deadline out further if less power were generated, a lower burnup of fuel. But this is irrelevant as there's a 2033 deadline, it is not imminent, and the "need" for additional storage comes with either relicensing or decommissioning. This section with its statement that "Conservation Cannot Eliminate This Need" does not address the points in the rule and the application is incomplete. See below for more on **Minn. R. 7855.0270.**

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[4] https://www.mprnews.org/story/2023/11/22/prairie-island-reactor-shut-down-electrical-trouble
[55] https://theecologist.org/2015/sep/07/archaic-nature-baseload-power
[66] https://theconversation.com/baseload-power-is-a-myth-even-intermittent-renewables-will-work-1321
[7] https://www.energyglobal.com/special-reports/02082023/the-baseload-fallacy/
[8] https://energypost.eu/interview-steve-holliday-ceo-national-grid-idea-large-power-stations-baseload-power-outdated/
[9] https://reneweconomy.com.au/baseload-an-outdated-term-that-should-not-be-confused-with-reliability-34961/
[10] https://energypost.eu/dispelling-nuclear-baseload-myth-nothing-renewables-cant-better/
[11] https://www.e3g.org/news/e3g-expert-interview-shifting-paradigms-in-electricity-systems-from-baseload-to-flexible-generation/
[12] https://frontiergroup.org/articles/do-we-really-need-nuclear-power-baseload-electricity/

Minn. R. 7855.0260(b) Promotional Activities – pps. 4-6 to 4-7 (and see below, Section 5.2 and 9.3.2).

- 4.1.7 What is lobbying but promotion, is that not what those 63 Xcel lobbyists are doing, promoting the agenda of Xcel? Why would Xcel have media ads, if not to promote their product and viewpoints? Xcel routinely makes presentations in host communities, such as the one in February to the Red Wing City Council regarding the Integrated Resource Plan. The application is incomplete as Xcel has not itemized its extensive promotional activity.
- 4.1.8 "Current and Planned Facilities Not Requiring a Certificate of Need Cannot Provide the Needed Storage Capacity or Replace Prairie Island. Again, as above, the ISFSI has adequate capacity until 2033. This application is premature.
- 4.1.9 The Project Makes Efficient Use of Resources. It seems inefficient to move forward with this application nine or more years before additional dry cask storage capacity is needed. This notion of "efficiency" is not consistent with that used in relation to energy projects.

Minn. R. 7855.0260 Additional Considerations, Chapter 5 (see above)

- **5.1 Socially Beneficial Uses of the Output of the Facility. Minn. R. 7855.0260 (a),** p. 5-1 to 5.3. This discussion addresses output of the PINGP. The application is for additional cask storage. It's a stretch to imagine socially beneficial uses of the output of the facility, as the point of the facility is input. However, the application is incomplete as it is discussing PINGP. The application must also be amended to include compliance with IRP Order Point 23E, Docket E002/RP-19/368 (see p. 5-3, first complete paragraph).
- **5.2 Promotional activities. Minn. R. 7855.0260 (b)** p. 5-3. Section 5.2 uses identical language as in 4.1.7. As above, Xcel is heavily engaged in promotion. Xcel's 63 lobbyists promoting the agenda of Xcel. Xcel spends on media ads, promoting its image, product, and viewpoints. Xcel makes presentations in host communities, such as the one in February to the Red Wing City Council regarding the Integrated Resource Plan. This answer also conflicts with reality. The application is incomplete as Xcel has not itemized its extensive promotional activity in the sections regarding promotional activity. Xcel does address its promotional activities in greater detail in 9.3.2, pages 9-29 to 9-30, discussing charitable and volunteer activities, working with host communities Prairie Island Indian Community, City of Red Wing, and Goodhue County, supporting local nonprofits, meeting regularly with local officials, hosting Red Wing community breakfasts[13], meeting with community groups, leaders, and stakeholders.
- **5.2 Induced Development. Minn. R. 7855.0260 (c).** It's hard to tell if inducing development is a good or bad thing. The application is incomplete because this section should include an interpretation of the issue to address.

Minn. R. 7855.0270 Conservation Programs – Chapter 6. Where Xcel stated above, 4.1.6 on page 4-6, that "**Conservation Cannot Eliminate This Need**" and responds to that rule in one concise paragraph. However, in Chapter 6, Xcel is bragging bout its "achievements in energy efficiency and demand side management" and goes on at length in its ongoing and planned DSM efforts, though stats that "the level of additional energy and capacity savings necessary to replace

[13] This writer did attend one community breakfast, but for some reason I've never been invited! Breakfast on Xcel https://legalectric.org/weblog/2233/

the Prairie Island Plant through DSM is not a reasonable or prudent alternative to the Project and the continued operation of the Prairie Island Plant." Application , p. 6-1.

Minn. R. 7855.0280 Other Data – Chapter 7, p. 7-1. The application overall is incomplete. Xcel simply states "The Company believes this application is complete and no additional data is required." The Commission hopefully will let Xcel know that this application is premature, and set aside this application as incomplete with a detailed list of this application's deficiencies.

Minn. R. 7855.0600 – See Chapter 9 comments below.

Minn. R. 7855.0610 Alternatives.(p. 4-7 to 4-11) Xcel presents "alternatives," and states that "We conclude that none of the four represent a viable alternative to support continued operation of the Plant Units 1 and 2…

Where Xcel says "alternatives are not viable," not only do Xcel's conclusory statements not prove that they're not viable, but that does not prove that Xcel's proposal is viable. Xcel also presumes that any alternative must address all of Xcel's needs, which is not how alternatives are considered – instead, alternatives can be grouped together to meet need. The application is incomplete because it rejects alternatives out of hand.

- **The Alternatives, Chapter 4** (see also Chapter 9), "Alternatives" are misleading because it lists ones that are not really alternatives. The application is incomplete to the extent that it eliminates alternatives with out any demonstration that an alternative is unsuitable. For example:
  - 4.2.1.2 lists the GE facility which does not accept waste from any reactor, and never accepted waste from Prairie Island, only from GE's reactor in Monticello. This should not be listed as an "alternative."
  - 4.2.1.3.1 lists Private Fuel Storage , which is admittedly not an alternative under consideration, and should be removed.
  - 4.2.1.3.2.The Andres County, Texas facility is not considered by Xcel to be viable. More information is needed.
  - 4.2.1.3.3 The Holtec HI-STORE facility in New Mexico is moving forward, as Xcel noted, oral arguments were heard[14] and when the opinion is released, it should be added to this docket for consideration of timing. Again, more information is needed…
  - Etc, etc., etc.,
  - **4.2.4 No Action Alternative – The No Action Alternative is the reasonable choice at this time. Xcel states repeatedly that additional storage capacity is not needed until 2033. Postponement of the application until closer to 2033 is a reasonable alternative.**
- **Generation Alternatives.** This is ostensibly an application for additional storage and the "Generation Alternatives" section, pages 4-11 to 4-16 should be deleted. On the other hand, if Xcel wants to discuss "Generation Alternatives," the Prairie Island natural gas replacement plan should be entered into the record.

[14] See https://www.alamogordonews.com/story/news/politics/2024/03/06/holtecs-new-mexico-nuclear-waste-proposal-chided-at-court-hearing/72804203007/ ; https://www.eenews.net/articles/judges-lean-toward-nuclear-regulators-in-waste-storage-fight/ ;

- **Prairie Island Conversion Appendix B 2002 Resource Plan**[15] (also attached)
- **Prairie Island Replacement Study SS01_Report**[16] (also attached)

We don't need to reinvent the wheel. Although natural gas is a fossil fuel, Xcel has proposed two natural gas plants[17], conveniently near its Lyon Co. substation, designed to interconnect at that Lyon Co. substation and head on up to the Sherco substation.[18] Given that, proposal of a natural gas plant to replace Prairie Island should be considered. See Attached Exhibit A.

At this point, beginning with Chapter 8, the narrative is much more professional, well written, and easy to track, not jumbled as with the earlier part of the application. The earlier part of this application should be rewritten to the standards of Chapter 8 to the end.

Minn. R. 7855.0600 Nuclear Waste, Disposal Facility; Description The application is incomplete as some of the information required is not disclosed. The following are not in compliance:

- A(2) height of tallest structures not found;
- A(3) cubic meters of casks not found;
- A(4) Schematic not found, though there is a drawing of the pad, and drawing of fuel assembly;
- B(1) which requires identification of the engineering firm and address responsible for the design of the facility;
- B(2) which requires identification of the construction company and address.
- B(3) construction commencement and in-service date is vague, could be better. Most applications contain a GANTT chart.
- C(3) attempted, but the claim of "temporary" is not demonstrated. There is no statement as to the length of time material would be stored there as there is no disposal site.
- C(4) maintenance requirements not found.

Minn. R. 7855.0610 Alternatives – Chapter 9 – This chapter is very strange, as if the material was either taken from the Chapter 4 "Need Summary," and more carefully and informatively written, or on the other hand, in producing the document, Chapter 9 was handed off and edited down for much of Chapter 4. Chapter 4 is incomplete and requires a rewrite. The material in both Chapters 4 and 9 needs a reworking with distinct coverage of application content requirements. If I were grading this Application, it'd receive no credit, and I wonder if Chapter 4 or 9is an AI experiment.

This chapter contains a more detailed and artful version of much of section 4.2, beginning on page 4-7. 9.1.1.1 expands on 4.2.1.1; 9.1.1.2 is exactly the same as 4.2.1.2; 9.1.1.3 equals 4.2.1.3 with additional language regarding "judicial and legislative challenges" I the third sentence; 9.1.1.3.1 expands on 4.2.1.3.1; 9.1.1.3.2 expands on 4.2.1.3.2; 9.1.1.
3.3 expands on 4.2.1.3.3; 9.1.1.4 expands on 4.2.1.4; 9.1.1.5 expands on 4.2.1.5; 9.1.2's sections

[15] See Attached Exhibit B 1 - Prairie Island Conversion – online at Legalectric: https://legalectric.org/f/2018/01/PI-Conversion-Appendix-B-2002-Resource-Plan.pdf
[16] See Attached Exhibit B 2 - Prairie Island Replacement Study – MISO – online at Legalectric: https://legalectric.org/f/2018/01/Prairie-Island-Replacement-Study-SS01_report.pdf
[17] See PUC Docket CN-23-212
[18] See E002/CN-22-131 and E002/TL-22-132.

9.1.2.1, 9.1.2.2 and 9.1.2.3 are expansions of 4.2.1.6; 9.1.3 and 9.1.3.1 begins as 4.2.18, and then…

Chapter 9 moves on to a comparison of cask systems with first additional specifics of what's proposed, fresh content from page 9-11 to 9-14; 9.1.3.2 discusses the VSC storage and overpack systems pages 9-14 to 9-16; and 9.1.3.3's Non-Canister Storage Systems includes the early TN casks, from pages 9-16 to 9-19.

Then Chapter 9 at 9.2 then goes back to rehash and expansion of Chapter 4, with 9.2 from 4.2.1.7 and 9.3, "Generation Alternatives," from 4.2.2 with IRP information on pages 9-21 to 9-28. Then it inexplicably jumps to 9.3.2 Natural and Socioeconomic Environment, not a "generation alternative," and 9.3.3 Reliability, also not a "generation alternative," and which is a redo of 4.1.2 Reliability with additional information, and an end with 9.3.4 Conclusion, which has no relation to the Chapter topic of "Alternatives."

The application is incomplete due to misplaced focus in Chapter 4 and Chapter 9.

Minn. R. 7855.0620 Historical and Forecast Data- Chapter 10 – this chapter seems to be a reasonable response to the multiple sections of the rule. Each section quotes the rule and proceeds to provide some of the information requested. For 7855.0620(C) the number of assemblies increases significantly, from 48 in 2024 to 60 from 2027 and 2039, and there is no explanation for this increase. Perhaps Xcel is planning an uprate with relicensing? The application is incomplete without explanation of that increase. For 7855.0620 (D), Table 4, the fact of Xcel's contracting with Orano for casks should be disclosed, and the application is incomplete without that disclosure. Orano is mentioned elsewhere in the Application as Xcel's cask contractor, but as Orano is named in this chart as developer of storage facility, it should be stated here as well to disclose the connection. 7855.620(F) is vague. It appears that assemblies to be removed and stored is variable, dependent on many factors, with an indication that cycle length can be changed, held off until a more favorable replacement power cost approaches, and I'd think the somewhat variable energy output would also have an impact on fuel useful life. 7855.0620(G) is also vague, and a 5-10% range over 16 years of refueling could mean more or fewer casks would be needed. A major assumption inherent in Xcel's responses to this rule is that decommissioning casks are not included. There should be a separate accounting where applicable for casks needed for decommissioning, and the decommissioning treatment of equipment other than assemblies. The application is incomplete, more information is needed.

In Chapter 10, as with Chapter 9, Xcel also uses much information from its recent IRP filing. As that information is reviewed, the Commission should require updates to IRP sections of this application. Information requests related to the portions of the IRP application copied here should also be entered in this docket.

Minn. R. 7855.0630 Environmental Information Required and Minn. R. 0640 Alternative Sites; Description – Chapter 11 – The "Environmental Information Required" rule gives little guidance for content, though the "Alternative Sites; Description" is detailed. Apparently, Xcel has used Minn. R. 0640 for guidance on provision of information for the project. Xcel has provided 47 pages of detailed information, charts, and maps for its dry cask application. There is

no information for any alternative, no alternative sites or descriptions of alternative sites, likely because Xcel has all alternatives. See 11.0. The application is incomplete as it does not present alternatives, which is odd in that Orano, Xcel's contracted cask provider, is developer of one of the alternatives cited by Xcel.

11.5 Land Use p. 11-16 to 11-25. The Land Use is important due to Prairie Island Indian Community immediately adjacent to the plant and ISFSI, and the City of Red Wing, initially southeast of the plant, when proposed, The land was annexed by the City to take advantage of the utility personal property tax offered to infrastructure hosts The application notes that Burnside was annexed in 1971, but does not state that the area annexed includes the area on which the plant was built. This factoid needs to be included with an explanation as to why that annexation ocurred and what it meant for the plant and for Red Wing.

The Application is incomplete as the maps in this section are limited to 1 and 5 mile radii, until the final map, p. 11-47, which shows the 50 mile area. Each map subject should have 1, 5, and 50 mile maps.

The project notes rail lines and states that "No impacts to the railway will occur as a result of the ISFSI Project." The project is incomplete as it does not address potential for impacts to the ISFSI from the rail traffic. This area is heavily traversed by Bakken BOOM! Trains, and there have been derailments in the area of the CP line in the past. This scenario should be considered in the application.

11.6 Water Resources. 11.6.1 and 11.6.2. "The groundwater table is within 5 to 20 feet of the ground surface…" Xcel also states the pad area is impervious, and there are outfall structures outside of the berm. Xcel should disclose whether the pad has a liner. Although Xcel has NPDES permit, it is not stated whether it will need a revision. Mindful that this project is very near the Mississippi River, and the wide and extreme contamination by 3M of waters to the north, the Commission should be extraordinarily cautious in siting any project in this area. Xcel closes stating "the ISFSI Project would not have impacts to surface waters or wetlands and groundwater hydrology. The application is incomplete as these sections are missing information and do not include sufficient preventive measures.

11.8 Recreational and Visual Resources The application states that the Mississippi River from Hastings to Iowa is a state water trail, and then concludes on page 11-36 with:

> No state critical areas, state parks, state scenic wayside parks, state recreational areas, state trails, state zoos, designated trout streams, or designated trout lakes are located within five miles of the Project site. Due to the Project's distance from state parks and management areas in the vicinity, no impacts are anticipated.

The application is incomplete – the water trail should at least be mentioned.

11.9 Historic and Archeological Resources. The narrative focuses on "recorded" historical and archeological sites. In a rather bizarre statement, Xcel states:

> SHPO noted that there may be sites within this review area that have not yet been identified and noted that **the Prairie Island Plant itself is nearing the age where it could be considered for listing in the NRHP (50 years).**

The application is incomplete without a review by the SHPO and the State Archeologist, particularly in light of the statement that there may be sites that have not yet been identified. SHPO's letter should also be included in an appendix.

11.9.1 Prairie Island Indian Community and Additional Studies. The application has details of several rounds of archeological surveys as a part of several agreements with PIIC, and additional archeological work is pending. A primary issue is that the area of the plant was disturbed decades ago without archeological studies or apparent regard for the damage done, and particular care should be taken with yet another disruption, and best efforts made to work with PIIC and comply with agreements to PIIC's satisfaction. This writer is mindful of Red Wing's lax archeological practices, for example, failure to proactively consult with the State Archeologist about the "ash mine" and lay down yard near the Water Tank Mounds, and the blatant disrespect toward the mound behind the Goodhue County Historical Society where people often move the picnic table over the mound, and the City's reluctance to survey the Central Research property prior to making a request for proposals. It's crucial with every project in the area to respect sovereignty and history – this nuclear plant is an excellent prospect for recognition of harms, with amends and reparations incorporated into agreements. The application is incomplete without the final results of the archeological work to be completed.

11.10 Demographics p. 11-43. The demographic information should include whether the area, or parts of the area, are declared "Environmental Justice" areas, where heightened review is necessary. The application is incomplete without this information.

Minn. R. 7855.0650 Wastes and Emissions- Chapter 12

12.8 Noise The application has a thorough acknowledgement of potential noise, Minnesota's noise standards found in Minn. R. 7030.0040, and a general explanation of potential noise. It appears that there will be no work on the project at night, and a commitment to that limitation is needed. Also, this section provides "predicted sound levels," but no modeling or report is included. Noise modeling results have been presented with assumptions used that include the garbage in-garbage out ground factor of 9.5 and even 0.7. On an alluvial area such as Prairie Island, the appropriate ground factor would be 0.0, and consideration should be mad of "receptors" up on the surrounding bluffs on both sides of the river, as sound does travel far over water, and also to elevated receptors. The sound modeling study results should be included as an appendix.

12.2.1 On-site Radiation Doses and 12.2.2 Off-site Radiation Doses. Calculation of radiation doses should also include calculations based on Datesman's "shot noise" theory of exposures.[19]

12.2.4 Emergency Plan – The language in this section has a vague description of requirements of an emergency plan, but no Emergency Plan, and no reference to an Appendix with the

[19] See attached Exhibit B, *Radiobiological shot noise explains Three Mile Island biodosimetry indicating nearly 1,000 mSv exposures*, Aaron Datesman, Scientific Reports,10-10933 (2020).

emergency plan. Where is it? The application is incomplete without an Emergency Plan. Given the severely flawed Emergency Plan for the Florence Township "in Goodhue County" nuclear waste site[20], and the issues raised by potential first responders to nuclear waste storage[21], and approval of the PINGP Emergency Plan in its 2/12/2024 consent agenda without the Emergency Plan in the packet only the signature page, which noted that the plan was labeled "CONFIDENTIAL." The Commission must have the proposed Emergency Plan filed in the docket before the application can be declared complete.

Minn. R. 7855.0660 Pollution Control and Safeguards Equipment – Chapter 13
13.2 – Contingency Plans in the Event of an Accidental Release. Xcel does it again, a description of the Emergency Plan, but no Emergency Plan.

> **13.2 CONTINGENCY PLANS IN THE EVENT OF AN ACCIDENTAL RELEASE**
>
> An emergency plan is required for the Prairie Island Plant spent fuel storage facility, in accordance with 10 CFR 72.32(c). The 10 CFR 50.47 emergency plan already in effect for the Prairie Island Plant is applied to the ISFSI. The Plant's emergency plan describes the organization, assessment actions, activation of the emergency organization, notification procedures, emergency facilities, training, provisions for maintaining emergency preparedness, and recovery criteria for off-normal and accident conditions.

The application is incomplete without an Emergency Plan as an Appendix or a link to the Emergency Plan:
13.5 Water Pollution Control Equipment and Runoff Control Measures. Xcel again discloses drainage through a swale into a "landlock ditch." The application is incomplete without a plan to keep discharge from flowing through the impervious surface and draining downward.
13.9.1 Radiation Monitoring System and 13.9.2 Temperature Monitoring. Although the rule only requires a description, there is an available source of historic data. Xcel states that there is monitoring equipment is not required but TLDs will monitor direct radiation levels, to be read quarterly to provide a record of ISFI boundary dose. Xcel also states it records temperature which is connected to an electronic data collection system at the ISFSI. The application is incomplete without inclusion of ISFSI TLD and temperature and other reports collected in the electronic data collection system at the ISFSI from the time of installation.

Minn. R. 7855.0670 Estimates of Induced Development. Xcel does address the six points of this rule arguably sufficiently.

APPENDICES TO THE APPLICATION

Appendices B-E are dose calculations and information, beyond this writer's expertise other than the large black squares and rectangles, recognizable as redactions. However, there are others with

[20] The NSP Goodhue County/Florence Township Emergency Plan was famous for its notion that Lake City, with a volunteer fire department and only a pumper and pick-up truck, would be the first responder responder. The state's regional HazMat center in Rochester had just purchased an expensive helicopter, and the head of that HazMat office declared that they would not be bringing their new response helicopter into a nuclear waste site.
[21] See e.g., *Willingness to Respond to Radiological Disasters Among First Responders in St. Louis, Missouri,* online at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7482107/ regarding other first responders and the St. Louis West Lake Landfill, a long term radioactive underground fire.

a firm understanding who we'll consult. In the meantime, due to redactions, there's really nothing to say, other than that too much of this information is deemed "non-public."

Appendix F-H Prairie Island ISFSI Risk Assessment. Similarly, much of this is beyond this writer's expertise. Radiation and risk is typically understated, and though the increase in radiation exposure for this particular project may be regarded as small, there are cumulative impacts of the plant, the current ISFSI, and the proposed addition to the ISFSI to consider. Datesman's shot noise theory and calculations should be reviewed, both for impacts of this specific project and for cumulative effects. See attached Exhibit B, *Radiobiological shot noise explains Three Mile Island biodosimetry indicating nearly 1,000 mSv exposures*, Aaron Datesman, Scientific Reports,10-10933 (2020).

Appendix I – Nuclear Leave Behind Study Report is a fascinating study of transmission issues related to shutdown of Sherco, King, Monticello, and PINGP. This study should be accessible.

ARE THERE ANY CONTESTED ISSUES OF FACT WITH RESPECT TO THE REPRESENTATIONS MADE IN THE APPLICATION?

There are many issues of fact which require this Application be handled through a contested case proceedings. To name a few, beginning with the first page:

- Does PINGP provide "critical capacity" as Xcel claims? See NERC Long Term Reliability Assessment for MISO area for generation, planned generation, potential generation, and projected reserve margins over the planning cycle.
- Is nuclear generation "carbon-free" when considering the entire nuclear cycle?
- Despite "consistently maintained production costs" only considering "between 2019 and 2023," projected increase is expected, due to costs including projected dry cask expansion, relicensing, age-related rehab and needed upgrades (see e.g. PUC Docket 08-510 for prior costs and estimates), and increased decommissioning costs. To what extent will costs rise to keep plant operational and decommission after generation so much more nuclear waste?
- Is there a more reasonable and prudent alternative? Xcel claims there is none, but this is only the application, and the Certificate of Need must include investigation and consideration of alternatives. For example, due to timing, the No-Action Alternative seems the most timely and cost-saving option – Xcel's application is premature.
- Does PINGP provide "highly reliable baseload power?" PINGP was offline this winter long enough for the Mississippi River to freeze over for the first time in history since the plant has been operational.
- The application states that there is room on the pad for the additional casks, but that must be demonstrated, as it is not apparent that there is room for the additional 20 years of casks, decommission for 50 or 70 years, the radioactive parts of casks reloaded into other casks for transport, and the leftover radioactive parts.
- Timing of CoN application – cart before the horse, when there is sufficient capacity to 2033. This application is only for "enough casks to store 20 additional operating years of used fuel assemblies," and there is no provision for the logical consequences of another 20 years of waste, and decommissioning at the ultimate shut down of PINGP.

- If demand drops, or if for some other reason the output of PINGP was lower, would that not extend the cask capacity beyond 2033?
- Assembly life is variable. Could assembly life extension be accomplished with focused planning and the cask limitation of 2033 be extended?
- Because decommissioning casks are not included in any permit, or this application, should Xcel add decommissioning casks and treatment of other decommissioning of contaminated equipment or structures to this application, or pursue a Certificate of Need for the decommissioning casks and decommission of other equipment?
- Other issues will be raised going forward.

SHOULD THE APPLICATION BE EVALUATED USING THE COMMISSION'S INFORMAL PROCESS OR REFERRED TO THE OFFICE OF ADMINISTRATIVE HEARINGS FOR CONTESTED CASE PROCEEDINGS?

Due to the many contested issues of fact, and the magnitude of Xcel's request, the application must be referred to the Office of Administrative Hearings for a contested case proceeding. The "informal process" was designed for small uncontested projects with very little interest if any, and is inappropriate for this docket..

WHAT ARE THE IMPLICATIONS, IF ANY, ON THE TIMING AND PROCEDURES TO BE USED IN PROCESSING THIS APPLICATION IN RELATION TO XCEL ENERGY'S PENDING 2024-2054 UPPER MIDWEST INTEGRATED RESOURCE PLAN IN DOCKET E002/RP-24-67?

Timing – the application should be rejected as untimely. The cask capacity is sufficient until 2033, and this application is premature. If the Commission is not willing to put the application on hold or reject it, then the No-Action Alternative is the most reasonable option for the Commission.

There are also timing implications in relation to Xcel Energy's plan to apply for a 20 year license extension in 2030 or later to continue operation beyond 2033/2034. Some of the information in the IRP is also in this record, in particular Appendix I, the "Nuclear Leave Behind Study Report." This addresses transmission issues with the closure of Sherco, King, Monticello, and PINGP. The reality of production v. MISO production should be incorporated into the next iteration.

The IRP raises issues of future load uncertainty, which has direct relationship to "need" for casks, and which may enable extension of the renewal of the PINGP license. Xcel's peak demand has been essentially flat for 20 years, and as recently as 2022, Xcel marketed 1,500 MW of "excess capacity" in the MISO market, roughly 400MW more than the capacity of PINGP.

Xcel has linked the IRP with this application, not just with the simultaneous filing, but by using IRP information extensively in this cask application. Procedures used in this application should include filing of all nuclear related Information Requests and Responses, revisions, amendments, testimony, briefs, exceptions, and OAH Orders (pre and post hearing). Because of the linkage of

this docket to the proposed PINGP relicensing application, it's crucial to have the big picture in mind.

The IRP and this docket should also reject Xcel's claim that nuclear power is "carbon-free," when the nuclear cycle is demonstrably not.

SHOULD THE COMMISSION DIRECT THE EXECUTIVE SECRETARY TO ISSUE AN AUTHORIZATION TO THE APPLICANT TO INITIATE CONSULTATION WITH THE MINNESOTA STATE HISTORIC PRESERVATION OFFICE (SHPO) AS REFLECTED IN ATTACHMENT A HERETO?

Absolutely. The Commission should also direct Xcel to initiate and continue consultation with the Prairie Island Indian Community as the community most directly affected. Because Xcel plans to build additional pads, there should be an archeological survey in that area. In my work in Red Wing regarding the "ash mining" permit near Xcel's ash dump on Co. Rd. 1, and observing the fish farm development, archeological surveys have not been performed, and there are sites in those areas. In the most recent Commission Planning Meeting, it was stated that developers and regulatory agencies should be aware that just because there is existing infrastructure in a location, it should not be assumed that it's safe to expand that infrastructure, as often archeological surveys were not performed decades ago when that infrastructure was built. Were archeological surveys were performed when the Prairie Island plant was built, and was an archeological survey completed when the first ISFSI was built. Yes, absolutely initiate consultation with the Minnesota State Historic Preservation Office and the State Archeologist.

Regarding consultation, Xcel and the Commission should also be in consultation with local governments including the City of Red Wing and Goodhue County, which have significant revenues from Xcel as its host community.

ARE THERE OTHER ISSUES OR CONCERNS RELATED TO THIS MATTER?

Yes, there are several other concerns.

Certificate of Need – Size, Type, and Timing

Size: The Application is incomplete as the size proposed is not sufficient to 1) decommission fuel needed for the planned operation, 2) decommissioning of old casks to be transferred to new casks and storage of the remnants of that decommissioning, and 3) decommission all the equipment and infrastructure that is radiation contaminated. Xcel states that it will be seeking relicensing through 2053/3054. Xcel also states "Xcel Energy would still require additional spent fuel storage capacity in order to decommission the Plant, meaning a future CN would be required. " and "Spent fuel pool storage capacity will not be able to meet dual-unit offload capability beyond 2033." Putting off this planning and action will not make these issues go away.

The size is a critical consideration. A nuclear plant should not be allowed to operate if there is not sufficient capacity for decommissioning. Lack of planning and forethought has been a

consistent problem in the nuclear/utility industry. When the Elk River demonstration plant was built in the 60s, there was no discussion during planning and construction of nuclear waste, a problem evident when that plant was closed and decommissioned shortly after put in service..

The physical size is also an issue – is there room for more pads – how large are these pads, how many, what is the weight? What are the categories of waste, itemized by type and amounts.

Type of facility: The Application is incomplete to the extent that it does not address this Part 72 ISFSI in comparison with a Part 50 nuclear waste storage associated with a particular plant.

Xcel opted to change casks and utilize the NHOMS EOS 37PTH DFS system[22], instead of the TN-40 and TN-40HT. The NRC now allows generic casks, essentially it has licensed a variety of casks for use and, utilities may take one from Column A, or one from Column B.

An INDEPENDENT SFSI is separate from a Part 50 nuclear generating plant. Xcel's application is incomplete in that it should address, and the Commission should consider, issues of long term (whether deemed temporary or permanent) control and responsibility if the ISFSI remains "independent" under Part 72. In the application.

Xcel's section 9.1.1 "Alternatives to On-Site Storage" is misleading, because as a 10 CFR Part 72 facility, it's technically NOT "On-Site Storage." The NRC's 10 CFR Part 72 is for nuclear waste stored off the site of a nuclear plant. For Prairie Island, it may be close, but it's off-site.

Timing: As above, there's no rush. Chapter 4 is labeled "Need Summary." Section 4.1 begins for the need of the dry cask storage to continue operation of PINGP. **The first paragraph states that "… Xcel Energy will be forced to shut down the Plant beginning in 2033 if additional storage capacity for spent nuclear fuel is not authorized. If we presume that a dry cask certification proceeding, if significantly contentious, could take three years, there is no basis for an application at this time, no basis for an application before 2030.**

It is our hope that the Commission will take to heart the at least thirty-six (36) points where the application is incomplete, and direct the applicant Xcel to revise it and resubmit, so that the clock will not start ticking on the time for review.

Thank you for the opportunity to provide this Initial Completeness Comment.

Very truly yours,

Carol A. Overland
Attorney for Communities United for Responsible Energy.

[22] See https://public-inspection.federalregister.gov/2023-21827.pdf

Appendix B

Feasibility Study for Conversion of Prairie Island to Natural Gas Fired Generation

Feasibility Study for Conversion of Prairie Island to Natural Gas Fired Generation

November 20, 2002

Table of Contents

Abstract

This report documents a general feasibility study that examines the conversion of the Prairie Island site from nuclear to natural gas generation. A number of plausible alternatives were investigated. These alternatives involve the replacement or repowering of nuclear capacity with natural gas combustion turbine platforms.

Although all of the scenarios involve some use of existing plant and equipment, the repowering option uses the most existing plant and equipment and in particular employs the existing steam turbine generators. The generation alternatives investigated include simple cycle capacity replacement, combined cycle capacity replacement, and combined cycle repowering. These alternatives are detailed below.

1. Replace the nuclear capacity with gas turbine generators running in simple cycle mode
2. Replace the nuclear capacity with two standard natural gas combined cycle plants
3. Repower one nuclear unit with steam from a combined cycle plant and retire the other nuclear unit
4. Repower both nuclear units with steam from two separate combined cycle plants

Budgetary capital and Operation and Maintenance (O&M) cost estimates for each generation scenario are provided. The study provides brief discussions of significant technical and licensing issues that introduce project risk and influence feasibility. The study also includes discussions of key advantages and disadvantages of the various generation alternatives. For each alternative, a complementary real-life example is presented to show a known commercial implementation of a similar project. Supporting data is provided in the appendices.

For reasons identified herein, the combined cycle replacement option (2) and the repower one nuclear unit option (3) provide the most effective alternatives to replace the Prairie Island generating capacity. Accordingly, more detailed information regarding the implementation, construction, and scheduling of these particular alternatives is provided. Option (4) is not a practical engineering solution and is not treated in detail beyond the necessary discussion of the constraints that restrict feasibility. Although the simple cycle option (1) is not nearly as favorable a replacement for the Prairie Island capacity as options (2) and (3), plant cost and other relevant data for simple cycle are provided at certain points for comparison purposes.

Table 1 below, Summary of Prairie Island Natural Gas Generation Alternatives, shows the salient results of this analysis.

Table 1
Summary of Prairie Island Natural Gas Generation Alternatives

Generation Alternative	Net Plant Output (MW)	Unit Net Heat Rate at ISO Conditions (BTU/kwh LHV)	Total Capital Requirement ($1000)	Normalized Capital Cost ($/kw)
1) Simple Cycle Replacement of Both Nuclear Units	999	10539	571,645	572
2) Combined Cycle Replacement of Both Nuclear Units	1036	6366	643,812	597
3) Repower One Nuclear Unit (4x1)	943	6815	510,921*	542*
* Duct Burners Included	1063*	7298*		
4) Repower Both Nuclear Units (4x1)	1886	6815	NA	NA
5) Present Plant - Nuclear Units	1070	10470 (9783 design)		

Analysis Approach and Key Assumptions

The feasibility study employed EPRI's State of the Art Power Plant (SOAPP) CT workstation to develop the plant financial models. For the repowering case, the GE Gate Cycle workstation was used to determine a plant heat balance and a viable conceptual design. The following list shows significant assumptions and inputs used in the analysis.

- Plant heat rate results are given at the performance point using natural gas as the primary fuel.
- Natural gas supply costs, project development and management costs, and other soft costs such as interest during construction that add to capital cost are included in addition to process capital costs.
- Environmental externalities have not been quantified or monetized.
- The results are presented in 2002 dollars.
- Existing equipment not used in the scenarios was assumed to be abandoned-in-place, decommissioning costs were assumed to be unaffected, and demolition costs are excluded.
- Offsite transmission costs such as those that may be needed to preserve system stability are not included. These costs may have a material effect and should be investigated further if a more detailed study is contemplated. A brief discussion of transmission issues is included herein.
- Because this study concerns general feasibility, the plant configurations have not been economically optimized. The costs presented herein reflect approximate costs associated with reasonable and viable plant designs.
- The physical characteristics of the site are deemed adequate for the scenarios. Additional site restrictions such as underground obstacles, barriers to construction, or contaminated soils are not contemplated.
- Environmental costs to support BACT controls for NOx are included.
- The repowering analysis is limited to replacing the reactor steam with that from a natural gas CT/HRSG combination. Other forms of repowering such as coal boiler or gasification are not considered herein.
- Existing plant equipment reused in the natural gas generation scenarios is assumed to be in good working order.

Simple Cycle Capacity Replacement

Scenario

The simple cycle capacity replacement scenario involves installation of twelve combustion gas turbines at the PI site operating in simple cycle mode to replace the nuclear capacity.

Description

A simple cycle plant consists of a combustion gas turbine operating in open cycle mode. A simple cycle plant is run intermittently and is principally used for peak shaving. The plant heat rates are less efficient than combined cycle plants, but the plant response time to serve load is faster. Typical startup times are on the order of 20 minutes. Because of their higher heat rates and associated higher variable operating costs, these plants are higher up in the dispatch order and would not be expected to operate more than 15% of the time. A total of 12 units are assumed, with each 6-unit block producing approximately 500 MW. Turbine inlet air fogging was assumed as a performance enhancement. A General Electric 7EA combustion gas turbine with Dry Low Nitrogen (DLN) combustors was chosen as the base unit for this study. The 7EA machine is a typical base unit for large peaking plants. Great River Energy has a six unit peaking plant (Lakefield Junction) in Trimont, MN, which is based on the 7EA platform. The 7EA is also the platform used at Duke's Vermillion Plant in Lincoln County, NC. At 1200 MW, this 16-unit plant is the largest peaking plant in the United States.

Major Retained Equipment and Facilities

For this scenario, the following existing equipment was assumed to be available and incorporated into the cost model: Switchyard and Administration Buildings.

Key Advantages

- The large turbine order (12 units) may allow for some savings on price. Turbine availability concerns have been obviated by recent plant cancellations and reduced order flow to suppliers.
- A simple cycle is an uncomplicated and modular design with the fastest construction schedule, which allows for quick asset mobilization.
- Can be installed with relatively little disruption to the operation of nuclear units

Key Disadvantages

- The simple cycle peaking capacity does not replace the baseload capacity lost with the nuclear unit shutdown. The ability to control system voltage and frequency within the transmission system may be adversely affected. This may degrade transmission system reliability. See Transmission Issues section below.

Combined Cycle Capacity Replacement

Scenario

The combined cycle capacity replacement scenario involves the installation of two standard 2x1 natural gas combined cycle plants, each with new steam turbine generators, to replace the nuclear capacity at Prairie Island.

Description

A typical combined cycle plant consists of a combustion gas turbine (CTG), matched with an unfired Heat Recovery Steam Generator (HRSG), providing steam to a steam turbine generator (STG). For this analysis, the industry standard 2x1 plant configuration was assumed. That is, two CTGs, each with a matched HRSG, providing steam to a single steam turbine generator was assumed for the base plant. In a combined cycle plant, the gas turbine generators contribute approximately two-thirds of the total plant power. A typical output for this configuration is 500 MW per plant. In order to fully replace the PI generation capacity and utilize the existing transmission capacity, two standard plants are needed.

Combined cycle plants are highly efficient units that are suitable for base load and mid-range dispatch. Net thermal efficiencies for these plants are on the order of 53% LHV. The plant is assumed to operate in baseload mode, although it is well suited for cycling duty of approximately 16 hours a day. Combined cycle plants are usually shutdown during weekends and evenings when the spark spread for non-peak power makes these units unprofitable.

The gas turbine platform for this analysis is the Seimens -Westinghouse 501 FD. For these analyses, the gas turbines are assumed to be equipped with Dry Low NOx (DLN) combustors, and each HRSG has an integral Selective Catalytic Reduction (SCR) unit to reduce stack gas NOx emissions.

The Sacramento Municipal Utility District (SMUD) is currently engaged in the design and licensing of a natural gas combined cycle plant at the decommissioned Rancho Seco nuclear power plant facility. This project is known as the Cosumnes Power Plant Project - CPP. According to their submittals to the California Energy Commission (Docket 01-AFC-19), a total of 1000MW of combined cycle replacement power is planned for this project. The proposed plant uses the existing switchyard and some other facilities. The plants are scheduled for construction in two phases consisting of 500 MW each. The first phase is scheduled for commercial operation in 2005 and the second phase, if completed, is scheduled for 2008.

Florida Power and Light (FPL) is currently engaged in the early stages of the siting process for a stand alone combined cycle 550 MW plant to be located adjacent to Exelon Nuclear's Limerick Generating Station. This project is an example of constructing a

natural gas plant at an operating nuclear generation site. Although limited public information has been provided, it appears that there are no plans to shutdown the nuclear units as part of this project or to share any significant equipment. As of June 2002, the NRC was preparing to review the impacts on nuclear operations with input from Exelon, which is a requirement of the Limerick operating license. The siting process has, however, been halted as the township's decision to allow the plant construction has recently been overturned. The following is an excerpt of an article that appeared in the October 3, 2002 edition of the Philadelphia Inquirer.

> A three-judge panel in Montgomery County Court on Tuesday overturned an unpopular decision by township officials to allow the plant to be built in the Linfield section. The movement against the gas-powered plant, which opponents argued did not belong in a light-industrial zone, also helped topple the political careers of four township supervisors who backed it. The $300 million plant was slated to be running at a site near Peco's nuclear power plant by next summer. It would have employed 20 to 25 full-time workers and contributed about $3 million a year to the tax rolls of Limerick Township, Montgomery County, and the Spring-Ford Area School District. FPL Energy and its local subsidiary, Limerick Partners L.L.C., could not be reached for comment. They have 30 days to appeal the decision to Commonwealth Court.

Major Retained Equipment and Facilities

For this scenario, the following existing equipment was assumed to be available and incorporated into the cost model: Water Treatment System, Switchyard, Circulating Water System, Cooling Tower, Administration Buildings.

Key Advantages

- High thermal plant efficiencies
- Relatively short starting times for a baseload unit
- Excellent part-load operating performance and flexible duty cycle
- Standardized design and construction
- Modular design and construction reduces AFUDC
- Fewer design compromises needed to match new equipment with older existing equipment
- Gas turbines can be installed in simple cycle mode prior to full combined cycle mode to reduce the impact of the lost capacity

Key Disadvantages

- Higher initial capital costs

Repowering

Discussion

The attractiveness of repowering is usually due to savings from the use of existing equipment permits and public acceptance of the existing site as a generating facility. Repowering projects avoid the cost and uncertainty of siting a new facility while the plant heat rate is typically improved over the existing unit and the capacity of the existing plant increases. In the case of replacing existing fossil-fueled boilers, repowering also can significantly reduce plant emissions. Most repowering projects in the United States have involved replacing a fossil-fueled heat source.

The performance improvements coupled with the reduction in emissions make repowering an efficient choice where capacity additions are needed. A typical increase in repowered output (MW) is triple the original plant output. The concept of repowering involves replacing the original steam generation source with more efficient equipment that is thermally matched to the existing steam turbine generator. A repowering option retains as much auxiliary equipment as possible. Repowering is designed to improve the overall thermal efficiency of the plant while keeping site development costs low and while keeping capital costs low by using existing equipment. Because nuclear fuel costs are much lower than fossil fuels improving the plant heat rate is less of an economic incentive for repowering at Prairie Island.

Because of the optimization engineered into the greenfield combined cycle design equipped with integral steam turbine generators, a repowered plant will not be as thermally efficient as a new combined cycle plant. In order for a repowering project to be an efficient use of capital compared to a greenfield generation alternative, the equipment cost savings derived from repowering need to exceed the inherent efficiency advantages of the greenfield alternative for a given amount of deployable MW to the grid. That is, the efficiency difference should not be so great as to result in a material shifting of the dispatch order of the repowered plant over a greenfield alternative. In deregulated markets, an investment in repowering option is not typically warranted if the end result is to simply displace an existing unit in the dispatch order.

Repowering of steam power plants with gas turbine generators and HRSGs is being accomplished in various applications. Colorado Public Service repowered the existing steam turbines at the previously decommissioned Fort St. Vrain nuclear facility in 1999. This plant was originally rated at 330 MW and has been repowered to approximately 720 MW with the installation of three GE 7FA gas turbines and three HRSGs. While there is considerable experience with repowering to replace fossil fueled boilers with gas turbine exhaust (dating to approximately 1960), there have been no nuclear repowering projects other than Fort St. Vrain in the United States.

Florida Power & Light (FP&L) is repowering the 540 MW oil-fired Fort Myers plant with combined cycle technology to ultimately increase plant capacity to approximately 1440 MW. This project provides an example of repowering a steam turbine generator

that is very similar in capacity to the existing Prairie Island steam turbines. Thermal efficiency is expected to increase from approximately 39.6% to 53.7% LHV at ISO load conditions. Six GE Frame 7FA combustion gas turbines and six Foster Wheeler HRSGs with triple pressure and reheat are being installed to replace the oil-fired boiler. The six gas turbines were initially installed in a simple cycle configuration and provided an additional 912 MW from the Fort Myers site. Full combined cycle repowered operation is scheduled for fall of 2002. The cost of this single-unit repowering project was approximately $450 to 500 million.

Scenarios

The PI repowering scenarios involve installation of combustion turbine generators running in combined cycle using the existing steam turbine generators. The design parameters for the existing steam turbine generators were used in the model. Two scenarios were examined: 1) repower a single unit and, 2) repower both units.

Description

The GE Frame 7FA unit with Dry Low Nitrogen (DLN) combustors was used as the base CTG in the simulation because it provides sufficiently high gas exhaust temperature for the reheat cycle. The efficiency and output of a steam turbine is a function of the gas turbine exhaust temperature. The 7FA is the most widely used unit in modern combined cycle applications. It has an extensive operating history and proven reliability. Siemens-Westinghouse has installed a G class machine with slightly higher efficiencies at a few locations, but these machines do not yet have a detailed history of reliability.

According to the heat balance model, six gas turbines are needed to efficiently repower an existing steam turbine at Prairie Island. The performance of one repowered plant in a 6x1 configuration is estimated as follows.

Net Plant Output - 1418.2 MW
Net Plant Heat Rate - 6599 Btu/kWh LHV
Repowered ST Generator Output – 446.6 MWW (of 535 MW available)

To efficiently operate the existing STGs, six CTGs are needed to replace the steam flow formerly provided by the nuclear reactor. Repowering one nuclear STG results with a more efficient 6x1 configuration results in a site output of approximately 1412 MW, which is approximately 352 MW above current output. Repowering both plants in a 6x1 configuration would result in a site output of 2836 MW, which is 1700 MW above current output. Since these results exceed equipment limits, the 6x1 configuration was not further analyzed. See Transmission Issues section below.

Four CTGs in a 4x1 configuration were used so that current site capacity was matched and output was within known switchyard equipment and transmission limits. Repowering a single nuclear STG with a 4x1 configuration would result in a site output of 943 MW and 1060 MW with a duct burner performance enhancement. Since a duct

burner equipped configuration matches the current nuclear output well, it was used in as the base repowering scenario. Repowering both plants in a 4x1 configuration results in a site output of 1886 MW, which is 826 MW above current output and above known equipment and transmission limits. A 4x1 configuration also allows for future conversion to a 6x1 configuration with an increase from 943 MW to 1412 MW if dictated by system load.

Engineering Issues and the Heat Balance Model

A heat recovery steam generator is most efficient when steam is generated at multiple pressure levels. This contradicts the conventional boiler method of using steam turbine extractions to heat the feedwater. Instead, steam is introduced into the steam turbine at different points, with the steam turbine designed to handle the additional flow at lower pressures. Given the above, the use of the existing feedwater heaters at Prairie Island would rob the HRSGs of heat absorption capability, so the feedwater heaters have been removed from the conceptual design. Since the PI turbines were designed to operate in a saturated steam nuclear cycle, the blades have moisture separation features. The ability to drain the separated moisture has been retained in the model, assuming that the extraction points would be converted into level controlled drip legs of sufficient size to handle the drain capacity.

When a conventional plant steam turbine is repowered with combined cycle steam, the turbine is typically restricted to a maximum amount of exhaust flow. The result of the Low Pressure (LP) steam flow limitation is that the bowl pressure after the throttling valves drops to the point that continuing to use the steam chest costs performance. Most combined cycle steam turbines are designed without a control stage and operate with valves wide open to accommodate rapid fluctuations in heat input to the HRSG, due to a number of variables affecting the gas turbine performance. Load is controlled by changing the load point of the gas turbines. In order to allow the HRSGs to dampen thermal changes, the control stage and steam chest can be removed, but for the purpose of the model, the steam turbine is assumed to operate with the steam chest valves wide open.

The LP steam flow limitation also constrains the output capability of the repowered steam turbine. This is shown in the decrease in STG output from approximately 535 MW (nuclear) to 447 MW (repowered 6x1). Depending on the actual design of the steam turbine, it is possible that additional flow could be forced through the exhaust to allow more output, but this model uses the steam turbine heat balance exhaust flow as the limit. Capacity for a seventh CTG-HRSG train may be available. This would involve additional design work and an extensive evaluation of the PI steam turbine design.

Configuration Efficiencies

Trial performance runs of 2x1, 4x1, 4x1 with duct burners, and 6x1 configurations were made in the heat balance model. The results are presented in Table 2 below, Configuration Efficiencies of a Single Repowered Unit.

Table 2

Configuration Efficiencies of a Single Repowered Unit

Configuration	Net Plant Output (MW)	Net Plant Heat Rate (BTU/kwh, LHV)	STG Output (MW) (535 MW avail.)
2x1	450	6939	127
4x1	943	6815	280
4x1 with duct burners	1060	7310	401
6x1	1418	6599	447

Major Retained Equipment and Facilities

For the PI repower scenario, the following existing equipment and facilities were assumed to be available and incorporated into the cost model: STG, Condenser and Condensate System, Water Treatment System, Switchyard, Circulating Water System, Cooling Tower, Turbine Building, Administration Buildings.

Key Advantages

- Lower initial capital costs. The repowering option uses the most existing plant equipment. The repower option saves the process cost of a new STG, which according to the manufacturer is approximately $35M FOB per STG at Prairie Island. With engineering and other costs, approximately $100M in capital cost savings could be realized over a combined cycle plant.
- Replaces baseload duty cycle of existing plant
- A repowered plant provides relatively efficient power if the conceptual design heat rate can be achieved. Note, however, that the existing steam turbine generators will not be optimized within a repowered steam cycle.
- If justifiable, an option exists to increase current site capacity by adding additional gas turbine generators from 4x1 to 6x1 or repowering the other plant.
- Gas turbines can be installed in simple cycle mode prior to full combined cycle mode to provide excess power or reduce the impact of the lost capacity.

Key Disadvantages

- Non-standardized design introduces uncertainties and longer installation cycles. These risks will be monetized by higher engineering fees, higher project contingency costs, and higher financing costs. For example, the Mystic project in Massachusetts, which is a first of a kind design in that it is the largest combined cycle plant in the US, is behind schedule and as of July 1, 2002, is experiencing hundreds of millions of dollars in cost overruns.
- Large natural gas capacity requirements and modifications.
- The attendant poorer reliability of older existing equipment retained in a repowered plant will likely result in higher maintenance costs over new equipment.

- The most optimal 6x1 repower configuration is not practical as it results in a plant output that will require switchyard modifications, cooling tower upgrades, and may require significant transmission system upgrades.
- Repowering in a phased construction approach to maintain continuity of site power output introduces significant regulatory uncertainty and risk if one nuclear unit is maintained operational. See Nuclear Issues section below.
- The repowered plant's duty cycle is not as flexible as that for a combined cycle unit.

Natural Gas Requirements

Discussion

Each scenario relies on a combustion turbine for power conversion. Consequently, the project must have access to a reliable high-pressure supply of natural gas. The combined cycle CTs will require significant volumes of gas provided on a 24-hour firm basis that will require capacity additions for the natural gas supplier. This involves a firm design load of approximately 200,000 mcf/day of natural gas for the combined cycle and single repower alternatives depending on the configuration and dispatch characteristics.

The simple cycle plants were assumed to require gas on a 5x16 summer operation protocol. Although gas pressures within interstate gas transmission lines are typically maintained above 1000 psig, the pressure levels maintained within the LDC's system are substantially lower (<100 psig) and are insufficient for proper operation of a large CT. Gas pressure within a distribution system is typically increased by adding compressor facilities, by enlarging or paralleling with existing high-pressure mains, and by constructing new supply mains. This results in significant additions to capital costs. For the purposes of this study, it was assumed that natural gas would be available at the site at sufficient pressure to eliminate the need for an onsite gas compressor.

In addition to equipment costs, the large gas loads associated with CT operation will require the supplier or a third party to actively manage the gas supply to maintain capacity and system integrity, which will tend to increase the plant O&M costs.

The two potential natural gas suppliers for the Red Wing Station are Viking Gas Transmission Company (Viking), an Xcel subsidiary, and Northern Natural Gas Company (Northern), formerly an Enron subsidiary now owned by Dynegy. On August 19th, Dynegy sold the Northern pipeline to MidAmerican Energy Holdings.

Viking

In order to supply gas to the PI site, Viking will need to install a 47-mile lateral line and a metering station. In addition, the mainline will have to be expanded to accommodate the high gas throughputs of the various plants. The capacity of the existing mainline is insufficient to supply the large gas load and this requires significant infrastructure modifications to increase system capacity. The mainline cost shown below is the up front

capital required to expand Viking's mainline to move the additional volumes from Emerson to the proposed lateral. Table 3 below shows a summary of Viking gas costs to support the various scenarios.

Table 3
Viking Gas Capital Costs (000s)

Plant Configuration	Lateral	Metering Station	Compression and Mainline Improvements	Total
Two Simple Cycle Replacement Units	$29,870	$430	$262,000	$292,300
Two Combined Cycle Replacement Units	$25,620	$275	$176,000	$201,895
One Repowered Unit (6x1)	$29,870	$350	$220,000	$250,220
Two Repowered Units	$29,870	$480	$289,225	$319,575

Northern Natural Gas

The Northern Natural Gas (NNG) system is physically closer to the PI site than the Viking system. The length of the lateral would be approximately 28 miles and would originate from the NNG Farmington compressor site. The NNG system is not as capacity constrained as the Viking pipeline and requires less mainline modifications to accommodate the proposed PI load. Table 4 below shows the Northern Natural Gas costs to support the various scenarios. Given the clear cost advantages, it was assumed that NNG would act as the project gas supplier.

Table 4
Northern Natural Gas Capital Costs (000s)

Plant Configuration	Lateral	Metering Station	Compression and Mainline Improvements	Total
Two Simple Cycle Units (interruptible)	$28,000	$600	NA	$28,600
Two Simple Cycle Units	$28,000	$600	$4100	$32,700
Two Combined Cycle Units	$22,700	$600	$4100	$27,400
One Repowered Unit	$28,000	$600	$4100	$32,700
Two Repowered Units	$34,600	$800	$5500	$40,900

Water and Cooling Requirements

The Prairie Island Circulating Water System is appropriated 615 million gal/day of surface (river) water by DNR permit #69-072. The well water permits for PI allow consumption of approximately 470 gpm. This allotment is well in excess of the makeup and cooling water requirements of any of the above scenarios. A typical combined cycle plant uses on the order of 3 to 5 million gal/day.

A simple cycle plant does not require significant amounts of makeup water. The maximum consumption would be approximately 750 gpm (per 6 unit block) if the gas turbines were operated on fuel oil. This consumption rate is well within the existing water permit. With onsite storage tanks, the simple cycle plants could feasibly operate within the capacity provided by the well water only. If only natural gas is used fuel, only insignificant amounts of water would be required as water or steam injection for NOx control would not be necessary.

The existing circulating water system and associated cooling towers can be used as heat sinks for the proposed alternatives. Cooling towers are not required for the simple cycle plants.

Transmission Issues

The MW outputs of the power block configurations used in this study were chosen to match and fully utilize the existing transmission capability of the site. If the new generating equipment supplies power in excess of the capability and ratings of the existing switchyard and transmission system, such as in the 6x1 repower case, switchyard and transmission modifications will be needed. For the simple and combined cycle cases and the 4x1 single repower case, the output of the new units is within the existing switchyard ratings, and no significant switchyard modifications were assumed.

An interconnection study is necessary to determine the transmission system impact of the alternative generation. As part of the siting process, all new generation facilities are analyzed to determine the impact on the reliability of the associated electrical transmission study. These studies include analyses of fault duty, stability, and system voltage support. Usually fault duty studies are undertaken first. If these results are favorable, additional studies are conducted. An interconnection study must be requested through the Midwest ISO or developed by a third party. Generally ISO studies are undertaken when a certain project is likely to be developed, and the generation is likely to eventually become part of the system model. An ISO study cost is approximately $40,000, depending on complexity. Since this feasibility study is preliminary and somewhat prospective in nature, interconnection studies were not performed.

NSP has examined thermal limitations for substation capacity increases for the 2001 All-Source Request for Supply Proposals. This indicative finding showed that approximately 800 MW could be added on the 345 KV bus at Prairie Island without exceeding loadings

on transmission elements. Given this finding, all cases except the double repower case would not require mitigation for this particular facet of an interconnection study. It is very important to note, however, that the Prairie Island output is presently constrained by a flowgate on the Prairie Island-Byron interface such that *no* increases in capacity above the present capacity could be undertaken without system modifications.

Given these constraints and the increase in capacity above existing, the 6x1 repower configuration will require transmission and switchyard modifications and the double repower case will likely require transmission and switchyard modifications and additional modifications to demonstrate fault duty compliance. A full interconnection study is necessary to further evaluate feasibility and to determine more detailed cost estimates.

Nuclear Regulatory Issues

Natural Gas and Spent Fuel Interaction

There are two natural gas powered generation projects at former nuclear plant sites in the United States. These projects provide some insight into natural gas generation projects at Prairie Island. A repowering project at Fort St. Vrain (FSV) is complete and operational. A capacity replacement project at Rancho Seco is in the siting phase. Both of these projects involved previously decommissioned reactors with spent nuclear fuel completely transferred to an Independent Spent Fuel Storage Installation (ISFSI) prior to construction of the natural gas fired units. The repowering options at Prairie Island would involve evaluating the impact of large quantities of natural gas on site with spent nuclear fuel still located in the reactor or spent fuel storage pool.

Each of these projects was required to examine nuclear impacts to the spent fuel stored in the ISFSI. The NRC regards nuclear impacts as minimal as long as the new plant is greater than one half mile from the nuclear fuel and the new plant has been sufficiently isolated and secured from the existing nuclear plant. Gas and oil installations within ½ mile of an ISFSI require specific evaluations of the possible impacts to the nuclear fuel and prior NRC approval. This spatial isolation is a requirement of the ISFSI license at FSV. SMUD controls a large plat of land at the Rancho Seco site, and they were able to use the existing switchyard while locating the plant sufficiently far from the nuclear unit and the ISFSI. The SMUD project does not involve gas or oil impacts within ½ mile of the fuel. As of August 23, 2002, all of the Rancho Seco fuel was transferred to dry storage.

The ISFSI at FSV is located 1400 ft away from the nearest gas line. The NRC determined that this arrangement was satisfactory from a safety standpoint (FSV safety evaluation). This required examinations of the effects of postulated natural gas accidents. At FSV, the effects of a service line rupture, a main supply line rupture and a turbine building detonation were reviewed and found not to impact the safety function of the ISFSI.

Given the above, it would be in the nuclear safety and economic interests of a PI project to locate a natural gas power plant and supporting gas infrastructure at least one half mile from the fuel, whether the fuel is located in the spent fuel pool, the reactor, or the ISFSI. By examining the PI site layout, this appears at least geographically possible for the simple and combined cycle capacity replacement scenarios by locating these plants at the far northern boundary of the site. (Other analysis such as soil mechanics would have to be accomplished.) A gas line that is within ½ mile of an ISFI or a spent fuel pool does not, of itself, disqualify a project, but such a location will entail detailed failure mode and effects analyses for nuclear safety concerns.

The PI repower scenario that contemplates continued operation of one of the nuclear units during construction of a repowered unit entails significant regulatory uncertainty because of the safety ramifications of a failure mode and effects analyses. Repowering cannot be accomplished outside of the standard ½ mile interface area established by the NRC. The pressure drop between the HRSG superheater discharge and the existing steam turbine nozzle, which is a strong function of the length of the steam pipe run, should be minimized for plant efficiency.

There is no precedent that contemplates construction of a repowered plant that uses one of the two existing STGs at an operating nuclear power plant in the United States. High volume natural gas facilities introduce explosion hazards and safety concerns to an operating nuclear plant that would be hard to justify on a basis that repowering may have economic advantages over alternative generation. For instance, natural gas from a pipe failure could enter a structure through ventilation systems and be ignited and affect operators and nuclear safety equipment. Explosions have occurred at natural gas fired power plants. In 1999, a natural gas explosion destroyed a boiler at a KCPL coal plant. An explosion and large fire occurred at Sithe's South Boston 700 MW natural gas power plant on October 1, 2002.

Nuclear Safety and Project Reviews

It is estimated that from the time of a decision to pursue the repowering option that it would take approximately two years to complete the nuclear regulatory (NRC) review process. This two years includes 6 months for the licensee to prepare the required safety analyses for submittal, an estimated 6 months for review by the Nuclear Regulatory Commission and 1 year for public hearings should they be requested.

As part of the siting process, a repowering project would be subject to an analysis of feasible generation alternatives, which is required as part of the state's review to determine a given project's environmental impact. This would involve a review of the comparative merits of other reasonable alternatives to the repowering project that could satisfy the project objectives but may avoid or lessen the effects of the project. A competent reviewer would certainly need to examine the relative risks of repowering due to the proximity of nuclear fuel over other plausible alternatives such as siting replacement generation elsewhere. Because of the nuclear safety impacts, a favorable ruling for the repowering alternative, especially on a site with an operating nuclear plant,

over other generation alternatives may be difficult to obtain regardless of an NRC approval. For these and other reasons, a repowering project would likely be the subject of legal challenges from interveners. There are no industry precedents for siting a natural gas power plant on a nuclear site where the reactor has not been decommissioned. The ability to successfully license a repowered plant at Prairie Island cannot be predicted with any certainty. These feasibility risks should be well understood prior to undertaking a repowering project.

Environmental Considerations

For the purposes of this study, it was assumed that Best Available Control Technology (BACT) environmental controls are installed consistent with recent MPCA requirements for similar plants in attainment areas. For the combined cycle and repowering cases, it was assumed that dry low NOx combustion turbines and SCRs were installed.

The specific environmental impacts of routing the gas line or constructing and operating the plant have not been identified. The cost of the environmental surveys and consulting work has been included in the model. Environmental externalities were not monetized for this analysis. There are no cost provisions for environmental mitigation measures, such as purchasing wetlands for the purpose of set asides for compensatory habitat. These issues would be addressed in a more detailed study.

Continuity of Site Capacity

Transition Time

The scenarios addressed herein postulate a simultaneous shutdown of both nuclear units in the last quarter of 2006 followed by operation of the replacement or repowered units on or about January 2007. Current planning indicates a shutdown of Unit One in mid 2006 and Unit Two in late 2006 if additional spent fuel casks are not installed. For simplification purposes, the analysis assumes a simultaneous shutdown of both nuclear units such that the commercial operation of the gas-fired units is assumed to approximately coincide with the nuclear shutdown.

These cases, however, are somewhat hypothetical with regard to complete continuity of site power in that the integration and operation of the gas-fired units for continuous service would involve some modification and preparation of equipment formerly used by the nuclear unit(s) presumed to shutdown. Depending on regulatory requirements, the final routing of the gas pipeline onto the site may be scheduled subsequent to the nuclear plant shutdown. First fire of associated plant equipment would occur after the gas line had been installed. In addition, system and integrated plant testing would also need to be accomplished. For the purposes of this report this time will be referred to as the transition time. Transition time should be scheduled to occur when the impact to the grid is minimized much like a planned outage is scheduled. In general, the transition time would be a function of how much equipment is retained from the existing plant to the new plant. Detailed planning and staging equipment can minimize transition time. There

are, however, practical limits to optimizing this process because of the number of plant systems that need to be tested and certified for insurance, warranties, contractual requirements and other purposes.

Because of the uniqueness of this project, there are no direct examples available of transition time for a project of this type, but a reasonable estimate can be made from similar projects. A repower of a similar steam turbine at a fossil fueled plant (Ft. Myers) is expected to have a transition time of approximately 6 months. According to the EPRI model used for this study, the full testing phase of a typical combined cycle plant without nuclear complications is on the order of 7 months. Recent combined cycle projects have executed the testing phase in 4 to 6 months. Some have taken much longer. Given this information and allowing for nuclear-related contingencies, a reasonable estimate for transition time would be six months for a combined cycle replacement project and nine months for a repower of one unit. This estimate assumes that the NRC does not require any other additional testing or special requirements for nuclear safety purposes. If this occurs, which is not unlikely, the transition time will be extended, perhaps significantly.

Siting, Design, and Construction Times

Because of design standardization, combined cycle plants are being designed and constructed well within 3 years of a notice to proceed. Some combined cycle projects have been completed in 24 months or less. Simple cycle plants are less complex and can be completed in less time than combined cycle plants. The PI site has inherent advantages such as existing administrative buildings and other infrastructure that would contribute to a reduction in the construction time. The supporting off site natural gas infrastructure can be designed and constructed in 2 years and can be done in parallel with the power block design and construction. Allowing six months for up front siting work, no delays in regulatory approvals, and reasonable transition times (as defined above), the combined cycle and single unit repower generation alternatives could feasibly be completed by late 2006 if a decision is made by the second quarter 2003.

The timing of regulatory approvals for the repower cases, however, is subject to potentially lengthy delays due to siting issues and licensing uncertainty. A replacement simple or combined cycle plant that cannot be located outside of ½ mile from the area would also be subject to more detailed nuclear safety requirements and more uncertain regulatory approval times. See Nuclear Regulatory Issues above.

Phased Construction to Support an Extended Service Life of Nuclear Unit 2

The phased approach would involve a replacement of the retired capacity associated with the shutdown of one nuclear unit followed later by a replacement of the retired capacity associated with the shutdown of the second nuclear unit when the spent fuel pool is full. At the end of Phase 1, a gas-fired unit and a nuclear unit are providing power. At the end of Phase 2, two matching gas-fired units are providing power, and the nuclear units are retired. For the PI site this would involve an earlier shutdown of Unit One in fall of 2004 without initiation of its last fuel cycle in order to extend the service life of the Unit Two

by approximately 18 months to mid 2008 (depending on the fuel burnup rate). This is not considered feasible or desirable for reasons discussed below.

It is not realistic to assume that a combined cycle or repowered plant can be fully completed by the fall of 2004. A simple cycle plant or the simple cycle portion of a combined cycle plant could possibly be completed if the project is authorized and notice to proceeds for various contracts are issued by early 2003 and no delays in siting, design, procurement, and construction, including natural gas infrastructure, are experienced. The combined cycle portion could be finished by early 2006. Given the unique nature of this project where the siting and construction necessarily involves a first-of-a-kind review of the impacts to an operating nuclear power plant (Unit Two), a streamlined fast track process with no delays is considered extremely unlikely.

A phased approach will cost more (estimate 30%-50%) because: 1) the Engineer Procure and Construct (EPC) contractor will require contingencies and incentives to complete the complex project on an abbreviated schedule, and 2) resources are mobilized at two different times as the second natural gas generation unit is completed years later from the first plant. This approach does provide some flexibility in that it sets up an option to cancel construction of the second unit if system load decreases or if other substitute generation capacity is added. If a phased construction approach for repowering were undertaken, the combustion turbines could be installed in increments, however the work available from the turbine would not be as efficiently utilized until all six CTs were installed. As discussed above, at interim gas turbine configurations the net plant output will decrease and the plant heat rate will degrade somewhat at configurations less than a 6x1 (2x1, 4x1). This approach would also cost more than an uninterrupted project.

Another consideration is that the cost to maintain a nuclear plant shutdown without a possession only license (which can be obtained from the NRC post decommissioning) can easily be as much or more as that needed to maintain it operating. Because of relatively inexpensive fuel costs, the variable operating costs at nuclear units are much less than those of a fossil unit. Because of higher labor, shutdown maintenance, and insurance costs, the fixed costs for a shutdown nuclear unit are significant. Finally, the economies of scale that are realized with both units operating would be lost.

Stand Alone Construction

In order to minimize impacts to the existing nuclear plant, the simple and combined cycle plants could be designed and built without the use of any existing site power equipment. Administrative buildings and non-safety related infrastructure could still be used. This would add approximately $20 million of equipment costs to the simple cycle plant and $50 million to the combined cycle plants. Of course this is not an option for the repowering alternatives. One potential feasibility risk element with this approach is that it would involve changes to the surface water appropriation and the existing circulating water system. These changes engender a much more expensive and less streamlined approach to the siting process due to the necessity to obtain changes in the plant water permits.

In addition, once stand-alone construction is contemplated, a competent generation planner would compare the costs of stand alone construction at PI with a greenfield generation project at carefully chosen offsite location. It is altogether likely that the greenfield site offsite would pose significantly less risk and also be price competitive with a stand alone project at PI.

Schedule

A representative Level 1 schedule has been provided in the appendix that shows an estimate of the power plant development and construction cycle to satisfy a 2007 startup. It was assumed the gas pipeline projects could be completed in parallel with the design and construct power plant tasks without affecting the critical path elements. According to Northern Natural Gas, a general time estimate for the design and FERC filing requirements for a project of this scope is one year. An in-service construction timeframe estimate for a project of this scope would also be approximately one year. There likely would be some overlap in these time horizons such that a reasonable project timeline estimate to complete the gas pipeline project would be 1.75 years.

Operations and Maintenance (O&M) Costs

The fixed and variable O&M costs for each practical scenario is given in Table 5, Alternatives Operations and Maintenance Costs below. Gas costs, which are highly volatile, were not included in the O&M estimates. The fixed O&M costs do not include any future capital upgrades. The variable costs assume 10% capacity factor for simple cycle and a 92% capacity factor for combined cycle and repower. These costs also do not include any costs to operate, maintain, demolish, or provide security for any of the PI nuclear facilities.

Table 5
Alternatives Operations and Maintenance Costs

Alternative	Fixed O&M ($/kw-yr)	Non-gas Variable O&M ($/MWh)
Simple Cycle Capacity Replacement	2.37	2.67*
Combined Cycle Capacity Replacement	3.23	1.79**
Repower One Unit with Duct Burners	3.15	1.68**
* 10% capacity factor ** 92% capacity factor		

Appendix

Schedule
Combined Cycle or Repower Plant

Schedule	Planned Start	Planned End	Planned Duration (Days)
Design, Procurement and Delivery	1/1/2004	9/1/2006	974
Engineering	1/1/2004	3/1/2006	790
Permitting	1/1/2004	6/1/2005	517
Procurement, Fabrication and Delivery	4/1/2004	9/1/2006	883
Construction	4/15/2005	11/1/2006	565
Mobilization and Site Preparation	4/15/2005	6/1/2005	47
Underground Piping, Elec and Misc Facilities	6/15/2005	3/15/2006	273
Field Erected Tanks	10/1/2005	2/1/2006	123
Substructure Work	5/15/2005	10/15/2005	153
Superstructure Work	1/1/2006	6/1/2006	151
HRSGs and Aux Installation	6/15/2005	8/1/2006	412
Combustion Turbine Installation	11/1/2005	9/1/2006	304
Steam Turbine Installation*	1/1/2006	6/1/2006	151
Balance Of Plant (BOP) Equip Installation	12/15/2005	10/15/2006	304
BOP Electrical Sys Installation	12/15/2005	10/15/2006	304
BOP Control and Instrumentation Installation	1/1/2006	11/1/2006	304
Final Site and Finish Architectural Work	8/1/2006	11/1/2006	92
Testing	4/1/2006	1/1/2007	275
Plant Startup	4/1/2006	12/1/2006	244
Combustion Turbine Startup	5/1/2006	10/1/2006	153
HRSG Startup	5/15/2006	11/1/2006	170
Steam Turbine Startup	4/15/2006	12/1/2006	230
Plant Performance Testing	12/1/2006	1/1/2007	31
Commercial Operating Date	1/1/2007	1/1/2007	

* Steam turbine integration for repower case

Cost and Emission Data

SIMPLE CYCLE

SIMPLE CYCLE COSTS

TOTAL PROCESS CAPITAL	364,105,984	
General Facilities	14,564,240	
Engineering and Home Office Fees	25,487,420	
Project Contingency	36,410,600	
Process Contingency	0	
TOTAL PLANT COST	440,568,256	
AFUDC or IDC		
See Capital Outlay Table		
TOTAL PLANT INVESTMENT	440,568,256	
Prepaid Royalties	0	
Preproduction Costs	18,875,486	
Inventory Capital	2,202,841	
Initial Cost - Catalyst and Chemicals	0	
Land	0	
Capital Cost Adders	32,700,000	
TOTAL CAPITAL REQUIREMENT	494,346,592	
TOTAL CAPITAL REQUIREMENT (Currency/net kW)		494.8
O + M and Fuel Costs		
(in Base Year (2002) Currency)		
Fixed O + M		
Direct Operating Labor	406,140	
- Number of Operating Staff	5	
Direct Maintenance Labor	519,770	
- Number of Maintenance Staff	9	
Annual Services, Materials, & Purchased Power		
- Annual O&M Services & Materials	552,259	
- Non-operating Purchased Power	397,264	
Indirect Labor Costs		
- Benefits	273,404	
- Home Office Costs	216,486	
TOTAL FIXED O+M	2,365,325	

SIMPLE CYCLE COSTS (Continued)

Variable O+M		
Scheduled Maintenance Parts & Materials		
- CT Inspection/Overhaul	1,998,717	
- HRSG Inspection/Refurbish	0	
- ST Inspection/Overhaul	0	
- BOP Refurbish	20,876	
Scheduled Maintenance Labor		
- CT Inspection/Overhaul	139,910	
- HRSG Inspection/Refurbish	0	
- ST Inspection/Overhaul	0	
- BOP Refurbish	32,861	
Unscheduled Maintenance Allowance	109,618	
Catalyst Replacement		
- SCR Catalyst Materials & Labor	0	
- CO Catalyst Materials & Labor	0	
Other Consumables		
- Raw water	11,830	
- Circulating water	0	
- NH3	0	
- H2SO4	12,979	
- NaOH	15,673	
- Misc	15,968	
Disposal Charges		
- Spent SCR catalyst	0	
- Spent CO catalyst	0	
- Other disposal	75	
Byproduct Credit	0	
Total Variable O+M	2,358,510	
Total Variable O+M (Currency/MWh)		2.67
Total Fixed and Variable O+M	4,723,835	
Fuel Cost		
Fuel Cost	31,934,028	
Fuel Cost (Currency/MWh)		36.17

SIMPLE CYCLE CAPITAL OUTLAY

Category	Total	1	2	3
Calendar Year (Jan 1 - Dec 31)		2004	2005	2006
Total Plant Cost				
In Base Year (2002) Currency	440,568,256	9,862,531	162,282,496	268,423,232
Amount of Escalation	32,458,140	398,446	9,932,987	22,126,706
Escalated Total Plant Cost	473,026,432	10,260,977	172,215,488	290,549,952
Other Outlays(*)	23,042,888	0	0	23,042,888
Gross Outlay	496,069,312	10,260,977	172,215,488	313,592,832
Investment Tax Credits	0	0	0	0
Other Income Tax Offsets	0	0	0	0
Net Total Capital Requirement				
Net Cash Outlay	496,069,312	10,260,977	172,215,488	313,592,832
AFUDC - Equity(**)	26,179,826			
AFUDC - Interest	16,696,738			
Total (Excluding capital cost adders)	538,945,856			

Gross Depreciable Investment		510,357,920
Non-Depreciable Net Plant Outlay(***)	2,408,152	
Equity AFUDC	26,179,826	
Total Non-Depreciable Investment		28,587,978
Capital Cost Adders	32,700,000	
Total Capital Requirement		571,645,888
Less Investment Tax Credit		0
Net Total Capital Requirement		571,645,888

(*) Consists Of	
Land	0
Preproduction Costs	20,634,736
Prepaid Royalties	0
Inventory Cap + Init Cat/Chem	2,408,152
Total	23,042,888
(**) Consists of:	
Preferred Stock AFUDC	0
Common Equity AFUDC	26,179,826
Total	26,179,826
(***) Consists of:	
Land	0
Inventory Cap + Init Cat/Chem	2,408,152
Total	2,408,152

SIMPLE CYCLE EMISSIONS

Variable	Value	Units
PLANT DESIGN BASIS		
Ambient Air Temperature	59	F
Site Elevation Above MSL	695	ft
Cycle Type	Simple Cycle	
Number of Combustion Turbines Operating	12	
CT Primary Fuel Type	Natural Gas	
CT NOx Control Type - Primary Fuel	Dry Low NOx Combustors	
Inlet Air Cooling	Fogging	
CT Air Precooler Discharge Temperature	52	F
AIR EMISSIONS - COMBUSTION TURBINES		
Firing Primary Fuel		
CO2 Mass Flow Per CT Stack	113,904.96	lb/h
CO Mass Flow Per CT Stack	53.27	lb/h
NOx (As NO2) Mass Flow Per CT Stack	31.51	lb/h
SO2 Mass Flow Per CT Stack	0	lb/h
CO Concentration	25	ppmvd @ 15% O2
NOx Concentration	9	ppmvd @ 15% O2
SO2 Concentration	0	ppmvd @ 15% O2
Volumetric Flow Rate Per CT Stack	1,483,875	ft3/min-act
CO2 Mass Flow Total Plant	1,366,859.50	lb/h
CO Mass Flow Total Plant	639.24	lb/h
NOx (As NO2) Mass Flow Total Plant	378.07	lb/h
SO2 Mass Flow Total Plant	0	lb/h
LIQUID DISCHARGES		
Total Waste Water Discharge Peak Flow	962	gpm
Total Waste Water Discharge Average Flow	29	gpm

COMBINED CYCLE

COMBINED CYCLE COSTS

TOTAL PROCESS CAPITAL	452,102,016	
General Facilities	13,563,060	
Engineering and Home Office Fees	31,647,140	
Project Contingency	45,210,200	
Process Contingency	0	
TOTAL PLANT COST	542,522,368	
AFUDC or IDC		
See Capital Outlay Table		
TOTAL PLANT INVESTMENT	542,522,368	
TOTAL PLANT INVESTMENT ($/kW)		515.02
Prepaid Royalties	0	
Preproduction Costs	17,795,884	
Inventory Capital	2,712,611	
Land	0	
Capital Cost Adders	27,400,000	
TOTAL CAPITAL REQUIREMENT	590,430,848	
O + M and Fuel Costs		
(in Base Year (2002) $)		
Fixed O + M		
Direct Operating Labor	1,069,159	
- Number of Operating Staff	17	
Direct Maintenance Labor	901,818	
- Number of Maintenance Staff	15	
Annual Services, Materials, & Purchased Power		
- Annual O&M Services & Materials	348,525	
- Non-operating Purchased Power	115,347	
Indirect Labor Costs		
- Benefits	616,896	
- Home Office Costs	294,421	
TOTAL FIXED O+M	3,346,168	

COMBINED CYCLE COSTS (continued)

Variable O+M		
Scheduled Maintenance Parts & Materials		
- CT Inspection/Overhaul	9,312,600	
- HRSG Inspection/Refurbish	592,303	
- ST Inspection/Overhaul	744,000	
- BOP Refurbish	500,000	
Scheduled Maintenance Labor		
- CT Inspection/Overhaul	651,882	
- HRSG Inspection/Refurbish	177,691	
- ST Inspection/Overhaul	111,000	
- BOP Refurbish	85,199	
Unscheduled Maintenance Allowance	582,049	
Catalyst Replacement		
- SCR Catalyst Materials & Labor	177,024	
- CO Catalyst Materials & Labor	0	
Other Consumables		
- Raw water	1,831,258	
- Circulating water	0	
- NH3	50,773	
- H2SO4	39,568	
- NaOH	47,780	
- Misc	44,655	
Disposal Charges		
- Spent SCR catalyst	11,064	
- Spent CO catalyst	0	
- Other disposal	3,875	
Byproduct Credit	0	
Total Non Gas Variable O+M	14,962,721	
Total Non Gas Variable O+M ($/MWh) 92% CF		1.83
Total Fixed and Variable O+M	18,308,889	

COMBINED CYCLE CAPITAL OUTLAY

Category	Total	1	2	3
Calendar Year (Jan 1 - Dec 31)		2004	2005	2006
Total Plant Cost				
In Base Year (2002) Currency	516,219,648	21,360,704	57,966,872	436,892,064
Amount of Escalation	40,424,964	862,972	3,548,036	36,013,956
Escalated Total Plant Cost	556,644,608	22,223,676	61,514,908	472,906,016
Other Outlays(*)	21,705,646	0	0	21,705,646
Gross Outlay	578,350,208	22,223,676	61,514,908	494,611,648
Investment Tax Credits	0	0	0	0
Other Income Tax Offsets	0	0	0	0
Net Total Capital Requirement				
Net Cash Outlay	578,350,208	22,223,676	61,514,908	494,611,648
AFUDC - Equity(**)	23,202,630			
AFUDC - Interest	14,858,861			
Total (Excluding capital cost adders)	616,411,712			

Gross Depreciable Investment		590,387,456
Non-Depreciable Net Plant Outlay(***)	2,821,663	
Equity AFUDC	23,202,630	
Total Non-Depreciable Investment		26,024,294
Capital Cost Adders	27,400,000	
Total Capital Requirement		643,811,776
Less Investment Tax Credit		0
Net Total Capital Requirement		643,811,776

(*) Consists Of	
Land	0
Preproduction Costs	18,883,982
Prepaid Royalties	0
Inventory Cap + Init Cat/Chem	2,821,663
Total	21,705,646
(**) Consists of:	
Preferred Stock AFUDC	0
Common Equity AFUDC	23,202,630
Total	23,202,630
(***) Consists of:	
Land	0
Inventory Cap + Init Cat/Chem	2,821,663
Total	2,821,663

COMBINED CYCLE EMISSIONS

Variable	Value	Units
PLANT DESIGN BASIS		
Ambient Air Temperature	59	F
Site Elevation Above MSL	695	ft
Cycle Type	Combined Cycle Cogeneration	
Number of Combustion Turbines Operating	4	
CT Primary Fuel Type	Natural Gas	
CT NOx Control Type - Primary Fuel	Dry Low NOx Combustors	
CT Air Precooler Discharge Temperature	59	F
Cooling System Type	Wet Mech Draft Cooling Twr	
SCR Configuration	Anhydrous Ammonia Injection	
NOx Conversion Efficiency (%), Primary Fuel	45	%
AIR EMISSIONS - HRSG's		
Firing Primary Fuel		
CO2 Mass Flow Per HRSG Stack	213,608.19	lb/h
CO Mass Flow Per HRSG Stack	40.42	lb/h
NOx (As NO2) Mass Flow Per HRSG Stack	33.2	lb/h
NH3 Mass Flow Per HRSG Stack	12.27	lb/h
SO2 Mass Flow Per HRSG Stack	0	lb/h
CO Concentration	10	ppmvd @ 15% O2
NOx Concentration	5	ppmvd @ 15% O2
NH3 Concentration	5	ppmvd @ 15% O2
SO2 Concentration	0	ppmvd @ 15% O2
Volumetric Flow Rate Per HRSG Stack	1,045,319	ft3/min-act
CO2 Mass Flow Total Plant	854,432.75	lb/h
CO Mass Flow Total Plant	161.68	lb/h
NOx (As NO2) Mass Flow Total Plant	132.81	lb/h
NH3 Mass Flow Total Plant	49.08	lb/h
SO2 Mass Flow Total Plant	0	lb/h
LIQUID DISCHARGES		
Raw Cycle Water Make-up Peak Flow	147	gpm
Raw Cycle Water Make-up Average Flow	98	gpm
Cooling Tower Make-up Peak Flow	7,319	gpm
Cooling Tower Make-up Average Flow	4,879	gpm
Cooling Tower Blowdown Peak Flow	1,403	gpm
Cooling Tower Blowdown Average Flow	936	gpm
Total Waste Water Discharge Peak Flow	18,747	gpm
Total Waste Water Discharge Average Flow	1,036	gpm
SOLID WASTES		
SCR Catalyst Material	Vanadium Pentoxide/Zeolite	
SCR Catalyst Volume	922	ft3
SCR Catalyst Replacement Frequency	5 to 10	years

REPOWER

REPOWER ONE UNIT 4X1 Costs

TOTAL PROCESS CAPITAL	342,284,992	
General Facilities	10,268,550	
Engineering and Home Office Fees	23,959,950	
Project Contingency	34,228,500	
Process Contingency	0	
TOTAL PLANT COST	410,742,016	
AFUDC or IDC		
See Capital Outlay Table		
TOTAL PLANT INVESTMENT	410,742,016	
TOTAL PLANT INVESTMENT ($/kW)		386
Prepaid Royalties	0	
Preproduction Costs	15,530,286	
Inventory Capital	2,053,709	
Initial Cost - Catalyst and Chemicals	0	
Land	0	
Capital Cost Adders	37,400,000	
TOTAL CAPITAL REQUIREMENT	465,725,984	
O + M and Fuel Costs		
(in Base Year (2002) $)		
Fixed O + M		
Direct Operating Labor	1,069,159	
- Number of Operating Staff	17	
Direct Maintenance Labor	901,818	
- Number of Maintenance Staff	15	
Annual Services, Materials, & Purchased Power		
- Annual O&M Services & Materials	374,337	
- Non-operating Purchased Power	120,404	
Indirect Labor Costs		
- Benefits	616,896	
- Home Office Costs	294,421	
TOTAL FIXED O+M		

REPOWER ONE UNIT Costs (Continued)

Variable O+M		
Scheduled Maintenance Parts & Materials		
- CT Inspection/Overhaul	8,863,800	
- HRSG Inspection/Refurbish	582,614	
- ST Inspection/Overhaul	744,000	
- BOP Refurbish	500,000	
Scheduled Maintenance Labor		
- CT Inspection/Overhaul	620,466	
- HRSG Inspection/Refurbish	174,784	
- ST Inspection/Overhaul	111000	
- BOP Refurbish	85,199	
Unscheduled Maintenance Allowance	529,098	
Catalyst Replacement		
- SCR Catalyst Materials & Labor	172,608	
- CO Catalyst Materials & Labor	0	
Other Consumables		
- Raw water	1,843,527	
- Circulating water	0	
- NH3	46,357	
- H2SO4	39,547	
- NaOH	47,755	
- Misc	44,781	
Disposal Charges		
- Spent SCR catalyst	10,788	
- Spent CO catalyst	0	
- Other disposal	3,698	
Byproduct Credit	0	
Total Non Gas Variable O+M	14,420,022	
Total Non Gas Variable O+M ($/MWh)		1.68
Total Fixed and Variable O+M	14,420,022	

REPOWER ONE UNIT Capital Outlay

Category	Total	1	2	3
Calendar Year (Jan 1 - Dec 31)		2004	2005	2006
Total Plant Cost				
in Base Year (2002) Currency	394,110,016	16,382,303	53,702,056	324,025,664
Amount of Escalation	30,658,974	661,845	3,286,995	26,710,134
Escalated Total Plant Cost	424,769,024	17,044,148	56,989,052	350,735,808
Other Outlays(*)	18,576,800	0	0	18,576,800
Gross Outlay	443,345,792	17,044,148	56,989,052	369,312,608
Investment Tax Credits	0	0	0	0
Other Income Tax Offsets	0	0	0	0
Net Total Capital Requirement				
Net Cash Outlay	443,345,792	17,044,148	56,989,052	369,312,608
AFUDC - Equity(**)	18,400,370			
AFUDC – Interest	11,775,106			
Total (Excluding capital cost adders)	473,521,280			
Gross Depreciable Investment		452,966,720		
Non-Depreciable Net Plant Outlay(***)	2,154,211			
Equity AFUDC	18,400,370			
Total Non-Depreciable Investment		20,554,580		
Capital Cost Adders	37,400,000			
Total Capital Requirement		510,921,312		
Less Investment Tax Credit		0		
Net Total Capital Requirement		510,921,312		
(*) Consists Of				
Land	0			
Preproduction Costs	16,422,588			
Prepaid Royalties	0			
Inventory Cap + Init Cat/Chem	2,154,211			
Total	18,576,800			
(**) Consists of:				
Preferred Stock AFUDC	0			
Common Equity AFUDC	18,400,370			
Total	18,400,370			
(***) Consists of:				
Land	0			
Inventory Cap + Init Cat/Chem	2,154,211			
Total	2,154,211			

REPOWER ONE UNIT 4X1 Emissions

Variable	Value	Units
PLANT DESIGN BASIS		
Ambient Air Temperature	59	F
Site Elevation Above MSL	695	ft
Cycle Type	Combined Cycle Cogeneration	
Number of Combustion Turbines Operating	4	
CT Primary Fuel Type	Natural Gas	
CT NOx Control Type - Primary Fuel	Dry Low NOx Combustors	
CT Air Precooler Discharge Temperature	59	F
Cooling System Type	Wet Mech Draft Cooling Twr	
SCR Configuration	Anhydrous Ammonia Injection	
NOx Conversion Efficiency (%), Primary Fuel	51	%
Include Duct Burners	Yes	
Duct Burner Use	Full-Time	
DB Primary Fuel Type	Natural Gas	
AIR EMISSIONS - HRSG's		
Firing Primary Fuel		
CO2 Mass Flow Per HRSG Stack	225,714.88	lb/h
CO Mass Flow Per HRSG Stack	57.35	lb/h
NOx (As NO2) Mass Flow Per HRSG Stack	34.77	lb/h
NH3 Mass Flow Per HRSG Stack	12.85	lb/h
SO2 Mass Flow Per HRSG Stack	0	lb/h
CO Concentration	14	ppmvd @ 15% O2
NOx Concentration	5	ppmvd @ 15% O2
NH3 Concentration	5	ppmvd @ 15% O2
SO2 Concentration	0	ppmvd @ 15% O2
Volumetric Flow Rate Per HRSG Stack	979,280	ft3/min-act
CO2 Mass Flow Total Plant	902,859.50	lb/h
CO Mass Flow Total Plant	229	lb/h
NOx (As NO2) Mass Flow Total Plant	139.07	lb/h
NH3 Mass Flow Total Plant	51.4	lb/h
SO2 Mass Flow Total Plant	0	lb/h
LIQUID DISCHARGES		
Raw Cycle Water Make-up Peak Flow	179	gpm
Raw Cycle Water Make-up Average Flow	119	gpm
Cooling Tower Make-up Peak Flow	8,681	gpm
Cooling Tower Make-up Average Flow	5,787	gpm
Cooling Tower Blowdown Peak Flow	1,664	gpm
Cooling Tower Blowdown Average Flow	1,110	gpm
Total Waste Water Discharge Peak Flow	21,951	gpm
Total Waste Water Discharge Average Flow	1,231	gpm

REPOWER ONE UNIT 4X1 Emissions (Cont.)

SOLID WASTES		
SCR Catalyst Material	Vanadium Pentoxide/Zeolite	
SCR Catalyst Volume	1,039	ft3
SCR Catalyst Replacement Frequency	37,386	years

XCEL RFP
INITIAL SCREENING REVIEW

Prepared for

Prepared by

XCEL RFP
INITIAL SCREENING REVIEW

Prepared for

Midwest Independent System Operator

Prepared by:
Frank M. Currie
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August 30, 2002

Executive Summary

The Midwest Independent System Operator (MISO) requested that Commonwealth Associates, Inc. (CAI) perform a Special Study for the initial screening of entries into the Xcel Request for Proposals to replace approximately 1100 MW of generation currently supplied from the Prairie Island Nuclear Generating Plant (PI). This study was performed as a screening of the six proposals submitted to Xcel.

This study shows that bids 2, 5, and 6 have minor impacts on the system and will most likely result in few to no upgrades of the system. This result is intuitive since these bids are relatively close to the existing Prairie Island site in particular and also lie in the generation-rich Twin Cities area in general. The transmission system has, therefore, been designed and modified over the years to handle moving power around and out of this area. Bid 1 has the same locational benefit as bids 2, 5, and 6 but suffers from one common mode contingency problem – the simultaneous loss of the Invers Hills to Redrock and Invers Hills to Blue Lake 345 kV lines. It is likely that this deficiency can be resolved with a minimum of upgrade ranging from a special protection scheme to the separation of the 345 kV lines to avoid any credible possibility of common mode outage.

Bid 3 appears to have the greatest number of potential problems, primarily in the transmission system in the relative vicinity of the bid 3 site.

Bid 4 is an interesting case in that it creates some overload problems, but also alleviates other existing problems since it tends to reduce flows that otherwise would come from the north and west. Depending on how bid 4 is dealt with, it could conceivably be regarded as having a net transmission benefit since it can relieve more existing overloads than it causes.

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APPENDICES

1.0 Introduction

CAI was asked to determine the probable impacts of six proposed generating units (or combinations of smaller units) on transmission facilities primarily in the MAPP Reliability Region. Table 1 lists the main features of the six projects.

Table 1. List of Bidders into Xcel RFP

Bidder	Location	Interconnect Voltage (kV)	Bus Number	Summer Capacity (MW)
1	Rosemount, MN	345	60217	1,100
2	Redwing, MN	345	60105	998
3	Lee County, IL	345	35975	1,100
4	Cass County, MO	161	59225	585
5	Mankato, MN	345	60108	565
6	Rosemount, MN	345	69999	550

MISO requested that bids 4, 5, and 6 be paired up for the study so that their combined outputs would be approximately 1,100 MW. Table 2 lists the units/pairs of units that were included in the study.

Table 2. Bids and Bid Groups Studied

Bid(s)	Combined Output (MW)
Bid 1	1,100
Bid 2	998
Bid 3	1,100
Bids 4 and 5	1,150
Bids 4 and 6	1,135
Bids 5 and 6	1,115

The study used a MAPP 2004 summer peak loading power flow case as its base. From the base, six further cases were developed, one corresponding to each of the bids or bid pairs of table 2. The generation modeled in the six cases was balanced by turning off PI. The study cases were then used to determine:

- The Power Transfer Distribution Factor (PTDF) for each of the bids or bid pairs on MAPP Constrained Interfaces;
- The normal incremental transfer capability (NITC) from each of the bids or bid pairs to the PI sink;
- A list of constraints to the NITC from each bus;
- A list of constraints from each of the bids or bid pairs to the PI sink;
- A preliminary determination of electric system components needing to be upgraded to accommodate the desired MW output level for the project;
- A planning cost estimate of the transmission facility additions and modifications necessary, using typical dollar amounts for line and station upgrades, and for impacts on constrained interfaces, if any, the dollar value from the last MAPP study. (Costs will not include local, state, and federal permitting process costs.)

2.0 Model Development

Six transfer scenario cases were developed using the MAPP power flow model provided by MISO for the study, one case for each of the transfers described in table 2. In each case, the existing 1104 MW of PI generation was turned off, and the generation was replaced by one of the RFP bids. With the exception of bid 2, discussed below, any mismatch between the level of generation being turned off and the bid generation was automatically compensated by the NSP slack bus, SHERCO G32, so that the area interchange schedule would be maintained and consistent for all of the transfer scenarios.

For the bid 2 scenario, the 1104 MW of existing PI generation was replaced with 998 MW of bid 2 generation. Therefore, the output of SHERCO G32 would have had to be increased approximately 100 MW to maintain the scheduled area interchange. Since the slack bus generator was already within 50 MW of its maximum output, however, there was not enough capacity to compensate the bid 2 generation. Instead, the bid 2 case was created by adding the bid 2 generation at the PI 345 kV bus to the solved base case, turning off the old PI generation, and turning off the area interchange control. The result was that the generation disparity between bid 2 and the existing PI generation was picked up by the reference bus.

The transfer scenarios consisting of generation from bids 4, 5, and 6 also cause changes in the NSP slack bus output, but for these cases, the proposed generation level is higher than the existing generation, so the slack bus output is reduced. The reduction in generation was small (ranging from 10 to 40 MW), and results were carefully screened to filter any results that were obviously due to changes in slack bus generation.

3.0 Study Scope

A contingency list (Appendix B) was generated from the list provided by the MISO in pi_rfp.txt. The list also includes all contingencies in the monitored files 'pi_rfp.mon' and 'MAPP_constr_ifaces.mon'. Appendix B also includes the files provided by the MISO. In translating the list from PTI format to a format usable by our TRANSMISSION 2000® software, most of the commentary in the MISO file was lost. However, the contingency identification numbers in our contingency list correspond to those in the MISO files so that cross-referencing between files can be done easily.

The study monitored all facilities with a base voltage above 100 kV in: MAPP and the control areas containing bids 3 and 4; any control area that contained at least one end of a MAPP constrained interface or; any control area that contained at least one end of a facility included in the pi_rfp.mon (monitored file) or pi_rfp.txt (contingency file).

4.0 Constrained Interface Results

Appendix A shows the PTDF's of each of the source/sink pairs on the MAPP Constrained Interfaces. PTDF's that represent an *increase* in flow of three or more percent are in bold red text. If the effect of any source/sink pair was to cause flow in a

direction opposite the base case flow, the PTDF is negative. Negative PTDF's that have a magnitude of three or more percent are in bold blue text, but with the caveat that the PTDF on an interface is ambiguous[1] for flow reversal on some but not all of the elements.[2]

The following is a brief discussion of each of the transfer scenarios followed by several observations that apply to all transfers:

Bid 1
There is only one PTDF greater than three percent for this scenario – the Byron to PL Valley 345 kV line, which is a component of the Twin Cities Export Interface (TCEX). This impact is misleading, however, because the base flow on this line is negative with respect to the direction implied by the interface definition. The base flow is from the south up to PL Valley, and since bid 1 generation serves to slightly increase this northward flow, the PTDF is positive. The net effect of the transfer however, which is to reduce loading from the north to the south, should not be overlooked.

Bid 2
There is no significant effect on any of the MAPP Constrained Interfaces since this bid essentially represents a small decrease in generation at an existing source point, PI.

Bid 3
This transfer causes the most, and most significant, impacts to MAPP Constrained Interfaces. The largest impacts are on the Quad Cities West Interface, located near the bid 3 generation. Other increased loadings are the Montezuma to Bondurant and Rock Creek interfaces, although none of the interfaces exceeds its stated rating. As with bid 1, effects are also seen on TCEX (particularly the lines from Byron and Wilmarth), but once again, the effects are the result of the base flow pattern being counter to the interface definition-implied flow. Despite the positive distribution factors, the effect is actually to decrease loading from the Twin Cities area to points south and east.

Bids 4, 5 and 6
All combinations of these bids tend to show similar (beneficial) impacts on TCEX components as discussed for bids 1 and 3, above.

General
It must be reiterated that many of the impacts of Appendix A are due to reversal of flow and are not necessarily negative impacts despite the fact they are greater than three percent. For example, it can be seen in the table that the flows on the RFPBID6 to PR ISLD3 345 kV line reverses for the scenarios that include generation outside of MAPP

[1] See Cooper_S for an example.
[2] While interfaces accurately predict behavior for a wide range of cases for a particular set of on-line generators, introducing significant new generation may introduce new interfaces and eliminate the significance of old ones. For an interface consisting of multiple facilities, a change that causes each of the interface elements to experience power flow changes in opposite directions suggests that the interface may no longer be a relevant predictor of system behavior.

(bids 3 and 4). Interface definitions for the system operating as it presently is should be revisited and, possibly, redefined/re-evaluated for a system that no longer includes PI. One obvious example of the effect of reversal of flow is that it is no longer meaningful to simply sum flows on the elements of an interface to see if the interface is overloaded.

Additionally, the characteristics of voltage stability in the region will be affected by a permanent and large redistribution of generation resources.

None of the transfers that have a distribution factor greater than three percent was normally overloaded or showed any overload problems in contingency analyses, as discussed below.

5.0 Power Flow Results

5.1 Normal System Constraints

We found that there are existing normal overloads in the study's monitored set. Existing overloads make the Normal Incremental Transfer Capability (NITC) of all of the source/sink pairs, strictly speaking, zero since any transfer starts in an already-stressed system. We compensated for the existing normal overloads by taking the approach that the base case system represents the 'zero' case, and that system operators and planners are aware of the existing overload conditions. We then concentrated on what new lines might be overloaded by simply filtering out all pre-existing overloaded facilities. Using this methodology we found that several of the proposed source/sink pairs will cause new normal overloads in the system. Appendix C contains reports listing all existing overloads in the monitored set as well as normal overloads associated with each of the transfers. Table 3 summarizes the NITC of each source/sink pair, as well as the elements limiting each NITC.

Table 3. Normal Constraint Summary

Bid	Max Output (MW)	Constraining Facility	Rating (MVA)	NITC (MW)	Max Overload at Full Transfer
Bid 1	1,100	None	N/A	1,100	N/A
Bid 2	998	None	N/A	998	N/A
Bid 3	1,100	LORE 5 to 8TH ST.5 161 kV	84	940	107%
Bids 4 and 5	1,150	PRALEE 5 to BLSPS 5 161 kV	223	910	109%
Bids 4 and 6	1,135	PRALEE 5 to BLSPS 5 161 kV	223	1,010	104%
Bids 5 and 6	1,115	None	N/A	1,115	N/A

According to the owner, the LORE 5 - 8TH ST.5 161 kV line is good for 167 MVA and the conductor is good for 202 MVA.[3] The normal loading caused by bid 3 is only 91 MVA. Therefore, there are no normal system constraints for bid 3. It should be noted that the constraint to the NITC for source/sink pairs that include bid 4 is due primarily to the

[3] See discussion of in Section 6 - Economic Results.

bid 4 generation. The PRALEE 5 to BLSPS 5 161 kV line is near the bid 4 site in Missouri.

5.2 Constraint Results Under Contingency Conditions

CAI's Contingency Processor (CP) was used to find all overloaded facilities in the base case as well as all overloads associated with each of the transfer pairs (overloads are greater than 100 percent of rating 2). Comparison reports for each of the transfer scenarios with respect to the base case can be found in Appendix D. The comparison reports filter any overloads that exist in the base and in a bid scenario. Impacts associated with each transfer pair are listed in group 1. Impacts are defined as facilities that were not overloaded in the base but became so in the new generation scenario. Group 2 in the comparison report lists overloads that got worse from the base to the new transfer, and group 3 lists the overloads that were lessened by the new generation with respect to the base. The entries with an 'E' preceding them are existing overloads that changed by less than three percent. Finally, the comparison reports list any benefits created by the new generation. Benefits are defined as facilities whose base case overloads were eliminated by the proposed new generation. The spreadsheet of Appendix D titled "Summary of Potential Impacts" summarizes all potentially affected facilities in the study and indicates which transfers are involved.

Detailed power flow reports for each of the transfer scenarios can also be found in Appendix D. There are four reports for each scenario, including: a case summary giving basic information such as the power flow case used and the solve parameters; a report listing normal system overloads; an overload summary report listing all facilities that experienced overloads and the maximum overload level; and a detailed overload report listing every contingency that caused each facility to overload, ranked by overload level from worst to best.

Below is a brief discussion of the comparison results found for each transfer scenario:

Bid 1 v Base Case
Bid 1 impacts are caused by the injection of 1100 MW into the 115 kV system for the loss of the Inver Hills to Redrock and Inver Hills to Blue Lake 345 kV lines, which leaves only the Inver Hills 345/115 kV transformer and the 115 kV system connected to it to evacuate the output of the bid 1 generation.

Bid 2 v Base Case
All bid 2 impacts appear to be due to a change in output from the NSP (area 600) slack bus, Sherco.

Bid 3 v Base Case
It is assumed that all of these overloads are real since the 1100 MW of bid 3 generation is essentially identical to the 1104 MW reduction at PI. This is not to say that placing 1100 MW of generation at the Lee County bus would not practically result in a change in

generation dispatch in the real system, but such speculations are beyond the scope of this study.

Bids 4 and 5 v Base Case
The overloads in the scenarios with bid 4 generation appear to be due primarily to bid 4. There may be an alternative interconnection option that utilizes one or more 161 kV lines in the relative vicinity of the proposed site that would alleviate these overloads, but we did not commit time to finding such an option.

Bid 4 and 6 v Base Case
Same as above.

Bid 5 and 6 v Base Case
For this scenario, the slack bus output had to be reduced by approximately 10 MW to meet the scheduled interchange. Since all overloads reported in the bid 5 and 6 comparison that might feel some of this effect represented fairly large changes (greater than 3 percent), it is assumed that the minor change in slack bus generation was not enough to account for them and the overloads are real effects of the transfer. In any case, according to Xcel, the one new overload of WINBAGO5 to RUTLAND5 161 kV will be corrected by a planned upgrade.[4]

6.0 Economic Results

Cost estimates for each of the bids were determined primarily according to the introduction of new overloads caused by any bid. That is, only facilities that overloaded for a particular transfer that were not overloaded in the base case are included in the estimate. Pre-existing overloads that were eliminated by a transfer are also reported here since they have the potential to obviate planned upgrades, thereby effectively having a positive economic impact.

Some of the facilities identified as being overloaded by a transfer will be fixed by planned upgrades, the details of which are confidential at this time. Xcel has provided comments about which impacted lines are affected without any specific information about the projects that will provide mitigation. The comments are located in Table 1 of Appendix E. Any facility that Xcel has indicated can or will be upgraded is not included in the cost estimates developed for the six transfer scenarios.

A summary of the results is displayed in Table 4. Appendix E also contains a detailed breakdown of the impacts of each bid by facility, including such information as facility type, base voltage, length, and unit cost. The results of Table 4 are divided into two categories. The first category displays the total estimated cost of facilities that would be negatively impacted by a transfer, i.e., the cost to upgrade the system; the second category lists the total estimated avoidable costs, i.e., the savings from not having to upgrade the system. The analysis also showed that some pre-existing overloads were either exacerbated or improved by some transfers. These facilities are included for

[4] See discussion in Section 6 - Economic Results.

informational purposes as the 'Increased Existing Overloads' and 'Decreased Existing Overloads' tables of Appendix D.

One note of caution is that we had no accurate way to determine whether a facility identified as being overloaded would require rebuilding or just a relatively minor reconductoring or rerating. Such a determination requires detailed plan and profile information, and we did not have access to this type of information. We therefore assumed that any line overload could be mitigated by a replacement of the line's conductors. It was also assumed that overloaded transformers would have to be replaced.

These cost estimates were based on the contingency analysis, but include upgrades to increase NITC, where necessary, since all NITC-constrained facilities showed up in the contingency analysis.

Table 4. Transmission Cost Estimates

Bid	Upgrade Cost ($ x 1000)	Avoided Cost ($ x 1000)	Net Impact ($ x 1000)
1	26,804	0	**26,804**[5]
2	0	0	**0**
3	47,686	6,128	**41,558**
4 and 5	9,094	7,320	**1,774**
4 and 6	3,309	6,128	**(2,819)**
5 and 6	0	0	**0**

7.0 Conclusions

This study shows that bids 2, 5, and 6 have minor impacts on the system and will most likely result in few to no upgrades of the system. This result is intuitive since these bids are relatively close to the existing Prairie Island site in particular and also lie in the generation rich Twin Cities area in general. The transmission system has, therefore, been designed and modified over the years to handle moving power around and out of this area.

Bid 1 has the same locational benefit as bids 2, 5, and 6 but potentially causes 115 kV numerous overloads for the simultaneous loss of the Invers Hills to Redrock and Invers Hills to Blue Lake 345 kV lines. Due to the simplicity of the overload mechanism (a single known event), it is likely that this problem can be mitigated with a minimal of upgrade ranging from a special protection scheme to the separation of the 345 kV lines to avoid any credible possibility of common mode outage. Other alternatives short of upgrading the 115 kV system also exist.

Bid 3 appears to have the greatest number of potential problems, primarily in the transmission system in the relative vicinity of the bid 3 site.

[5] Assumes that the all affected 115 kV lines are upgraded. It is unlikely that this is the most cost-effective mitigation plan for this scenario.

Bid 4 is an interesting case in that it creates some overload problems, but also alleviates other existing problems since it tends to reduce flows that otherwise would come from the north and west. Depending on how bid 4 is dealt with, it could be conceivably be regarded as having a net transmission benefit since it can relieve more existing overloads than it causes.

Finally, this study must be concluded with a caveat: while the study is accurate within the bounds of the model provided, the study scope and budget allowed for only a general picture of the proposed bids. For example, the study looked only at the forecast 2004 peak summer condition while the proposed bids would not deliver power to PI until 2007. As such, any transmission or generation projects that are built before 2007 will affect how each of the proposed projects would interact with the grid. Additionally, all bids were essentially traded one-for-one with the existing PI generation without regard for the possible necessity of further generation dispatch, voltage profile changes, or interchange schedule adjustments that a redistribution of generation assets might entail (economic dispatch). We did not review the Xcel RFP or the responding bids. Consequently, we did not evaluate any commercial solutions that may be inherent in a bid. For example, as far as we know, it is possible that a bidder guarantees firm transmission and internalizes the cost of transmission improvements in the bid itself. Given the above-mentioned items, great care should be given to endorsing or rejecting one bid over another based solely on this study.

APPENDIX A

PTDF DATA

APPENDIX A
PTDF DATA

MAPP Interface	Interface Description	Interface Rating (MW)	Interface Elements			Flow on Path (MW)							PTDF (%)					
			From	To	Ckt	Base MW	Bid 1 MW	Bid 2 MW	Bid 3 MW	Bids 4&5 MW	Bids 4&6 MW	Bids 5&6 MW	Bid 1 (1100 MW)	Bid 2 (998 MW)	Bid 3 (1100 MW)	Bids 4&5 (1150 MW)	Bids 4&6 (1135 MW)	Bids 5&6 (1115 MW)
Rock Creek 345/161 TR for Quad-Sub 91 345		448	ROCK CK3	ROCK CK5	1	240.7	241.5	240.8	298.9	246.7	246.2	240.5	0.08	0.01	5.29	0.52	0.49	(0.01)
Cascade_Creek_Crosstown 161 (FLO) King_Eau Claire		1153	CROSSTWN	CASCADE	1	4.3	10.1	5.3	48.0	27.8	20.8	6.9	0.53	0.10	3.98	2.04	1.45	0.23
EAU_CLAIRE_ARPIN 345 KV		760	EAU CL 3	ARP 345	1	272.2	281.4	273.3	19.4	158.6	169.9	254.1	0.83	0.11	(22.99)	(9.88)	(9.02)	(1.62)
ADAMS XFMR / ADAMS_HAZLTON		300	ADAMS 3	ADAMS 5	1	104.0	91.1	102.0	25.1	46.4	69.4	90.1	(1.17)	(0.20)	(7.17)	(5.01)	(3.05)	(1.24)
NDEX	North Dakota Export	1788	LELANDO3	GROTON 3	1	247.7	248.0	247.9	244.1	243.1	245.2	245.4	0.03	0.02	(0.33)	(0.40)	(0.22)	(0.21)
			LELANDO3	FTTHOMP3	1	118.7	120.4	119.3	93.7	95.1	98.3	114.2	0.15	0.06	(2.27)	(2.05)	(1.80)	(0.40)
			BIGSTON4	BLAIR 4	1	168.0	168.9	168.4	155.9	155.0	158.5	163.7	0.08	0.05	(1.10)	(1.13)	(0.84)	(0.38)
			ANTELOP3	HURON 3	1	185.4	186.1	185.7	175.0	174.9	177.2	182.5	0.07	0.03	(0.94)	(0.91)	(0.72)	(0.26)
			DRAYTON4	LETELER4	1	(262.1)	(263.4)	(262.2)	(243.2)	(241.7)	(246.7)	(256.1)	0.12	0.01	(1.72)	(1.78)	(1.36)	(0.54)
			AUDUBON4	HUBBARD4	1	52.4	51.1	51.6	69.6	70.0	66.1	57.2	(0.12)	(0.08)	1.56	1.53	1.21	0.43
			INMAN 4	WINGRIV4	1	37.5	35.8	36.4	59.5	60.4	55.1	44.0	(0.15)	(0.10)	2.00	2.00	1.56	0.59
			SULLYBT4	OAHE 4	1	(62.1)	(61.0)	(61.7)	(79.0)	(78.4)	(75.9)	(65.4)	(0.10)	(0.04)	1.54	1.41	1.21	0.30
			MORRIS 4	GRANITF4	1	14.2	14.2	14.5	13.2	10.3	13.1	11.3	0.01	0.04	(0.09)	(0.34)	(0.09)	(0.26)
			BISON 4	MAURINE4	1	14.1	14.8	14.4	3.6	4.1	5.2	12.6	0.06	0.02	(0.96)	(0.87)	(0.79)	(0.14)
			EDGELEY7	ORDWAY 7	1	(4.0)	(3.6)	(3.9)	(8.9)	(9.0)	(7.8)	(5.5)	(0.03)	(0.02)	0.45	0.43	0.33	0.13
			KERKHO 7	KERKHOT7	1	20.6	20.6	20.7	21.3	20.5	21.1	20.0	(0.00)	0.01	0.07	(0.01)	0.04	(0.05)
			LAPORTE7	BADOURA7	1	(21.2)	(21.5)	(21.4)	(16.6)	(16.6)	(17.5)	(20.0)	0.03	0.02	(0.42)	(0.40)	(0.32)	(0.11)
			CANBY 7	GRANITF7	1	15.2	15.1	15.2	17.2	16.5	16.7	15.1	(0.01)	0.00	0.18	0.11	0.13	(0.01)
			ELLENDL7	ABDNJCT7	1	8.7	9.0	8.8	3.4	3.5	4.6	7.3	0.04	0.02	(0.48)	(0.45)	(0.36)	(0.12)
			FORMAN 7	SUMMIT-7	1	(4.7)	(4.3)	(4.5)	(9.2)	(9.3)	(8.2)	(6.0)	(0.03)	(0.02)	0.42	0.40	0.31	0.12
			ALEXAND7	DGLASCO7	1	12.4	12.1	12.2	17.1	17.0	16.1	13.7	(0.03)	(0.03)	0.43	0.40	0.32	0.11
					Total	540.7	542.3	541.5	516.6	515.5	521.0	534.2	0.14	0.08	(2.20)	(2.19)	(1.74)	(0.59)
MHEX_S	Manitoba Hydro Export - South	1843	DORSEY 2	ROSEAUN2	1	942.9	940.5	942.7	977.9	980.1	971.3	953.6	(0.22)	(0.02)	3.18	3.23	2.50	0.96
			LETELER4	DRAYTON4	1	262.1	263.4	262.2	243.2	241.7	246.7	256.1	0.12	0.01	(1.72)	(1.78)	(1.36)	(0.54)
			RICHER 4	ROSEAU 4	1	103.1	102.9	103.0	105.9	106.1	105.4	103.9	(0.02)	(0.01)	0.25	0.26	0.20	0.07
					Total	1308.1	1306.8	1308.0	1327.0	1327.8	1323.4	1313.6	(0.12)	(0.02)	1.71	1.71	1.35	0.49
MHEX_N	Manitoba Hydro Export - North	50	ROSEAUN2	DORSEY 2	1	(942.9)	(940.5)	(942.7)	(977.9)	(980.1)	(971.3)	(953.6)	(0.22)	(0.02)	3.18	3.23	2.50	0.96
			DRAYTON4	LETELER4	1	(262.1)	(263.4)	(262.2)	(243.2)	(241.7)	(246.7)	(256.1)	0.12	0.01	(1.72)	(1.78)	(1.36)	(0.54)
			ROSEAU 4	RICHER 4	1	(103.1)	(102.9)	(103.0)	(105.9)	(106.1)	(105.4)	(103.9)	(0.02)	(0.01)	0.25	0.26	0.20	0.07
					Total	(1308.1)	(1306.8)	(1308.0)	(1327.0)	(1327.8)	(1323.4)	(1313.6)	(0.12)	(0.02)	1.71	1.71	1.35	0.49
Minnesota-Wisconsin Stability Interface		1280	EAU CL 3	ARP 345	1	272.2	281.4	273.3	19.4	158.6	169.8	254.1	0.83	0.11	(22.98)	(9.88)	(9.02)	(1.63)
			PR ISLD3	RFPBID6	1	187.9	112.1	177.8	(218.3)	(111.5)	(534.5)	(435.2)	(6.89)	(1.01)	(36.93)	(26.03)	(63.64)	(55.88)
					Total	460.1	393.5	451.1	(198.9)	47.0	(364.6)	(181.1)	(6.05)	(0.90)	(59.91)	(35.92)	(72.66)	(57.51)
GGS	Gerald Gentleman Station Stability Interface	1625	GENTLMN3	SWEET W3	2	309.8	309.8	309.8	314.4	315.6	316.5	308.9	0.00	0.00	0.42	0.50	0.59	(0.08)
			GENTLMN3	SWEET W3	1	371.2	371.2	371.2	376.7	378.1	379.2	370.0	0.00	0.00	0.50	0.60	0.71	(0.10)
			GENTLMN3	REDWILO3	1	333.9	334.9	334.2	308.0	309.4	307.2	335.6	0.09	0.02	(2.35)	(2.13)	(2.36)	0.15
			GENTLMN4	N.PLATT4	3	155.0	155.0	155.0	156.3	156.4	156.7	154.7	(0.00)	0.00	0.12	0.13	0.15	(0.02)
			GENTLMN4	N.PLATT4	2	155.4	155.4	155.4	156.7	156.9	157.2	155.2	(0.00)	0.00	0.12	0.13	0.15	(0.02)
			GENTLMN4	N.PLATT4	1	159.9	159.9	159.9	161.2	161.4	161.7	159.6	(0.00)	0.00	0.12	0.13	0.16	(0.02)
					Total	1485.2	1486.2	1485.5	1473.3	1477.8	1478.5	1484.0	0.09	0.03	(1.08)	(0.64)	(0.60)	(0.11)
GRIS_LNC	Grand Island to Lincoln Interface	985	MOORE 3	PAULINE3	1	(117.0)	(118.5)	(117.3)	(105.1)	(108.2)	(108.1)	(116.5)	0.13	0.02	(1.09)	(0.76)	(0.78)	(0.05)
			MCCOOL 3	GR ISLD3	1	(223.4)	(225.6)	(224.0)	(190.4)	(196.5)	(195.6)	(222.8)	0.20	0.06	(3.00)	(2.34)	(2.45)	(0.06)
			COLMB.W4	GR ISLD4	1	(141.2)	(140.7)	(141.1)	(156.0)	(154.5)	(157.4)	(138.6)	(0.05)	(0.01)	1.35	1.15	1.43	(0.24)
					Total	(481.7)	(484.7)	(482.4)	(451.5)	(459.2)	(461.2)	(477.9)	0.28	0.07	(2.74)	(1.96)	(1.80)	(0.34)
COOPER_S	Cooper South Interface	965	COOPER 3	7FAIRPT	1	94.1	95.4	94.4	44.2	17.3	11.7	99.1	0.12	0.03	(4.54)	(6.68)	(7.27)	0.44
			COOPER 3	ST JOE 3	1	81.2	83.1	81.6	9.7	(38.1)	(46.2)	88.3	0.16	0.04	(6.51)	(10.37)	(11.23)	0.64
					Total	175.4	178.5	176.0	53.9	(20.7)	(34.6)	187.4	0.28	0.06	(11.05)	(17.05)	(18.50)	1.08
WNE_WKS	Western Nebraska-Western Kansas Interface	385	GENTLMN3	REDWILO3	1	333.9	334.9	334.2	308.0	309.4	307.2	335.6	0.09	0.02	(2.35)	(2.13)	(2.36)	0.15
PRI_BYN	Prairie Island to Byron	628	PR ISLD3	RFPBID6	1	187.9	112.1	177.8	(218.3)	(111.5)	(534.5)	(435.2)	(6.89)	(1.01)	(36.93)	(26.03)	(63.64)	(55.88)
LKM_WFB		118	AIRTECH7	W FARIB7	1	2.3	11.8	3.0	(10.2)	(17.7)	(7.0)	(12.8)	0.86	0.06	(1.14)	(1.75)	(0.82)	(1.35)
FTCAL_S	Fort Calhoun South	451	S3451 3	S3459 3	1	136.6	139.4	137.0	81.1	98.1	86.1	146.9	0.25	0.04	(5.04)	(3.35)	(4.45)	0.92
			S3451 3	S3454 3	1	28.2	29.9	28.5	(11.8)	(4.8)	(14.1)	36.5	0.16	0.02	(3.64)	(2.88)	(3.73)	0.74
			S1251 5	S1297 5	1	82.1	82.6	82.2	72.1	75.2	73.1	83.9	0.05	0.01	(0.91)	(0.60)	(0.79)	0.16
					Total	246.9	251.9	247.7	141.4	168.4	145.0	267.3	0.45	0.08	(9.59)	(6.82)	(8.98)	1.83
ROCHESTER_SILVER LAKE/PRI_BYRON		186	SILVER L	ROCHSTR5	1	(7.6)	(7.3)	(7.7)	(0.2)	3.2	(2.7)	(2.4)	(0.03)	0.01	(0.68)	(0.94)	(0.43)	(0.47)
QUADCITY_W	Quad Cities West	1142	MECCORD3	E MOLIN3	1	155.4	157.4	155.6	334.4	153.9	155.6	152.2	0.17	0.02	16.26	(0.13)	0.01	(0.29)
			QUAD ;	SUB 91 3	1	367.9	370.6	368.2	592.5	372.0	373.6	364.1	0.24	0.03	20.42	0.35	0.50	(0.35)
					Total	523.4	527.9	523.8	926.8	525.9	529.2	516.2	0.42	0.05	36.68	0.22	0.51	(0.64)
Montezuma_Bondurant 345kV		505	MNTZUMA3	BONDRNT3	1	196.5	190.5	195.5	321.3	163.0	183.4	180.2	(0.54)	(0.10)	11.35	(2.91)	(1.15)	(1.46)
St. Joe _ Midway 161kV		185	ST JOE 5	MIDWAY 5	1	83.5	83.5	83.5	92.5	105.2	106.1	82.7	(0.00)	(0.00)	0.82	1.88	1.99	(0.07)
EAST_BIAS_TIES	?		INMAN 4	WINGRIV4	1	37.4	35.8	36.4	59.5	60.4	55.2	44.0	(0.15)	(0.10)	2.00	2.00	1.56	0.59
			SHEYNNE4	AUDUBON4	1	108.9	107.6	108.1	126.7	127.0	123.4	113.8	(0.12)	(0.08)	1.62	1.57	1.28	0.44
					Total	146.4	143.3	144.6	186.2	187.4	178.6	157.8	(0.27)	(0.18)	3.62	3.57	2.84	1.02
MHSPC_NORTH_TIES	Manitoba Hydro - Saskatchewan Power - North Tie Lines	?	ISLAND 7	LINE2TP7	1	37.2	37.2	37.2	37.2	37.2	37.2	37.2	-	-	-	-	-	-
			ISLAND 7	LINE1TP7	1	37.2	37.2	37.2	37.2	37.2	37.2	37.2	-	-	-	-	-	-
					Total	74.4	74.4	74.4	74.4	74.4	74.4	74.4	-	-	-	-	-	-
MHSPC_SOUTH_TIES	Manitoba Hydro - Saskatchewan Power - South Tie Lines	?	RALL 4	EBCAMPB4	1	29.8	29.8	29.8	29.2	29.1	29.3	29.6	0.00	0.00	(0.06)	(0.06)	(0.04)	(0.02)
			RESTON 4	AUBURNT4	1	(44.9)	(45.0)	(44.9)	(43.8)	(43.8)	(44.0)	(44.6)	0.01	0.00	(0.10)	(0.10)	(0.08)	(0.03)
			ROBLIN 4	YORKTON4	1	87.1	87.1	87.1	86.7	86.7	86.8	87.0	0.00	0.00	(0.04)	(0.04)	(0.03)	(0.01)
					Total	72.0	72.0	72.0	72.0	72.0	72.0	72.0	(0.00)	(0.00)	0.00	0.00	0.00	0.00
TCEX	Twin Cities Export	1350	EAU CL 3	ARP 345	1	272.2	281.4	273.3	19.5	158.5	169.9	254.0	0.84	0.11	(22.98)	(9.88)	(9.01)	(1.63)
			BYRON 3	PL VLLY3	1	(29.7)	(77.7)	(36.5)	(393.6)	(278.4)	(190.1)	(82.8)	4.36	0.68	33.08	21.62	14.14	4.76
			WILMART3	LKFLDXL3	1	(310.0)	(296.6)	(309.2)	(473.3)	(327.2)	(428.6)	(214.9)	(1.22)	(0.08)	14.85	1.50	10.45	(8.53)
					Total	(67.5)	(92.9)	(72.4)	(847.5)	(447.0)	(448.9)	(43.7)	2.30	0.49	70.90	33.00	33.60	(2.14)
MNEX	Minnesota Export	?	BLUE LK3	WILMART3	1	13.2	36.3	14.6	(159.1)	(467.4)	(110.0)	(358.7)	2.10	0.14	(15.67)	(41.79)	(10.86)	(33.35)
			AS KING3	EAU CL 3	1	296.9	313.9	299.3	71.0	193.3	199.9	277.3	1.55	0.24	(20.53)	(9.01)	(8.54)	(1.76)
			AS KING7	WILOWRV7	1	99.5	102.2	99.8	74.8	87.5	87.9	96.8	0.25	0.02	(2.25)	(1.04)	(1.02)	(0.24)
			BYRON 3	RFPBID6	1	(187.7)	(111.7)	(177.1)	218.8	111.8	(15.0)	(114.5)	(6.91)	(1.06)	(36.96)	(26.04)	(15.21)	(6.57)
			RFPBID6	PR ISLD3	1	(187.9)	(111.8)	(177.3)	218.6	111.7	535.0	435.5	(6.92)	(1.06)	(36.95)	(26.05)	(63.69)	(55.91)
			REDROCK7	GLENMONT	1	45.2	49.3	44.7	11.3	27.4	29.0	40.2	0.38	(0.05)	(3.08)	(1.55)	(1.43)	(0.45)
			AIRTECH7	W FARIB7	1	2.6	11.8	3.0	(10.5)	(17.8)	(7.2)	(12.8)	0.83	0.04	(1.19)	(1.78)	(0.86)	(1.39)
					Total	81.8	290.1	106.9	424.8	46.5	719.5	363.8	18.94	2.52	31.19	(3.07)	56.19	25.29

60217		1,100	1. Bidder 1
60105		998	2. Bidder 2
35975		1,100	3. Bidder 3
59225		585	4. Bidder 4 and Bidder 5
60108		565	5. Bidder 4 and Bidder 6
69999		550	6. Bidder 5 and Bidder 6

1,100	1. Bidder 1	1,100
998	2. Bidder 2	998
1,100	3. Bidder 3	1,100
585	4. Bidder 4 and Bidder 5	1,150
565	5. Bidder 4 and Bidder 6	1,135
550	6. Bidder 5 and Bidder 6	1,115

APPENDIX B

CONTINGENCY LIST AND UNDERLYING DATA

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Base Case

7/23/2002

No.	Contingency		Ckt	Base kV	Area	Zone
10	005				608	657
	obranch 66780 66779 1	TRIP LINE FROM BUS 'RUNNINU869.0' TO BUS 'RUNNINST 230' CK	1	69-230	608	657
	obranch 66764 66779 1	TRIP LINE FROM BUS 'RUNNINS913.2' TO BUS 'RUNNINST 230' CK	1	13.2-230	608	657
	obranch 66753 66779 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'RUNNINST 230' CK	1	230	608	657
13	001			230		
	obranch 60175 67576 1	TRIP LINE FROM BUS 'ROSEAU 4 230' TO BUS 'RICHER 4 230' CKT	1	230	600-667	601-668
	obranch 66757 60175 1	TRIP LINE FROM BUS 'MORANVI4 230' TO BUS 'ROSEAU 4 230' CK	1	230	600-608	601-657
15	003					
	obranch 66753 66757 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'MORANVI4 230' CK	1	230	608	657
	obranch 66769 66793 1	TRIP LINE FROM BUS 'MORANV2913.8' TO BUS 'MORANV2T 230' C	1	13.8-230	608	657
	obranch 66757 66793 1	TRIP LINE FROM BUS 'MORANVI4 230' TO BUS 'MORANV2T 230' C	1	230	608	657
	obranch 66719 66793 1	TRIP LINE FROM BUS 'MORANVI7 115' TO BUS 'MORANV2T 230' C	1	115-230	608	657
	obranch 60175 67576 1	TRIP LINE FROM BUS 'ROSEAU 4 230' TO BUS 'RICHER 4 230' CKT	1	230	600-667	601-668
	obranch 66757 60175 1	TRIP LINE FROM BUS 'MORANVI4 230' TO BUS 'ROSEAU 4 230' CK	1	230	600-608	601-657
18	007				608	657-608
	obranch 66753 66778 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'RUNNINNT 230' CK	1	230	608	657
	obranch 66753 66757 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'MORANVI4 230' CK	1	230	608	657
	obranch 66753 61627 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'SHANNON4 230' C	1	230	608	608-657
	obranch 66764 66779 1	TRIP LINE FROM BUS 'RUNNINS913.2' TO BUS 'RUNNINST 230' CK	1	13.2-230	608	657
	obranch 66753 66779 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'RUNNINST 230' CK	1	230	608	657
	obranch 66780 66778 1	TRIP LINE FROM BUS 'RUNNINU869.0' TO BUS 'RUNNINNT 230' CK	1	69-230	608	657
	obranch 66765 66778 1	TRIP LINE FROM BUS 'RUNNINN913.2' TO BUS 'RUNNINNT 230' CK	1	13.2-230	608	657
	obranch 66780 66779 1	TRIP LINE FROM BUS 'RUNNINU869.0' TO BUS 'RUNNINST 230' CK	1	69-230	608	657
20	009 1				600	601
	obranch 60202 61488 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID1Y 345' CK	1	345	600	601
	obranch 60151 60160 1	TRIP LINE FROM BUS 'MNTCELO3 345' TO BUS 'SHERCO 3 345' CK	1	345	600	601
	obranch 60160 60272 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'MPLEGV23 345' CK	1	345	600	601
	obranch 61488 60656 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'CNCTER1934.5' CK	1	345-34.5	600	601
	obranch 61488 60203 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 60272 60202 1	TRIP LINE FROM BUS 'MPLEGV23 345' TO BUS 'COON CK3 345' CK	1	345	600	601
23	009 2				600	601
	obranch 61488 60656 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'CNCTER1934.5' CK	1	345-34.5	600	601
	obranch 60151 60114 1	TRIP LINE FROM BUS 'MNTCELO3 345' TO BUS 'ELM CRK3 345' CK	1	345	600	601
	obranch 60272 60202 1	TRIP LINE FROM BUS 'MPLEGV23 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 60114 60233 1	TRIP LINE FROM BUS 'ELM CRK3 345' TO BUS 'PARKERS3 345' CK	1	345	600	601
	obranch 60160 60272 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'MPLEGV23 345' CK	1	345	600	601
	obranch 61488 60203 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 60202 61488 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID1Y 345' CK	1	345	600	601
25	009 3			345	600-618	601-618
	setpload 63030: 0.0	SET BUS 'DICKNSN3 345' LOAD TO 0.0 MW				
	obranch 63030 60270 1	TRIP LINE FROM BUS 'DICKNSN3 345' TO BUS 'MPLEGV13 345' CK	1	345	600-618	601-618
	setpload 63041: 0.0	SET BUS 'COAL CR4 230' LOAD TO 0.0 MW				
	setpload 63001: 604.	SET BUS 'COAL 42G22.0' LOAD TO 604.0 MW				
	setpload 63000: 338.	SET BUS 'COAL 41G22.0' LOAD TO 338.0 MW				
	obranch 63030 60202 1	TRIP LINE FROM BUS 'DICKNSN3 345' TO BUS 'COON CK3 345' CK	1	345	600-618	601-618
	obranch 60270 60233 1	TRIP LINE FROM BUS 'MPLEGV13 345' TO BUS 'PARKERS3 345' CK	1	345	600	601
28	009 4				600-618	601-618
	obranch 60272 60202 1	TRIP LINE FROM BUS 'MPLEGV23 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 60160 60272 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'MPLEGV23 345' CK	1	345	600	601

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 61488 60656 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'CNCTER1934.5' CK	1	345-34.5	600	601
	obranch 60202 61488 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID1Y 345' CK	1	345	600	601
	obranch 61488 60203 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 63030 60202 1	TRIP LINE FROM BUS 'DICKNSN3 345' TO BUS 'COON CK3 345' CK	1	345	600-618	601-618
30	009 5			345	600-618	601-618
	obranch 60270 60233 1	TRIP LINE FROM BUS 'MPLEGV13 345' TO BUS 'PARKERS3 345' CK	1	345	600	601
	obranch 60114 60233 1	TRIP LINE FROM BUS 'ELM CRK3 345' TO BUS 'PARKERS3 345' CK	1	345	600	601
	obranch 63030 60270 1	TRIP LINE FROM BUS 'DICKNSN3 345' TO BUS 'MPLEGV13 345' CK	1	345	600-618	601-618
33	009 6				600	601
	obranch 61488 60203 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 60202 61488 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID1Y 345' CK	1	345	600	601
	obranch 61488 60656 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'CNCTER1934.5' CK	1	345-34.5	600	601
	obranch 60160 60272 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'MPLEGV23 345' CK	1	345	600	601
	obranch 60272 60202 1	TRIP LINE FROM BUS 'MPLEGV23 345' TO BUS 'COON CK3 345' CK	1	345	600	601
35	009 7				600	601
	obranch 61488 60656 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'CNCTER1934.5' CK	1	345-34.5	600	601
	obranch 60202 61488 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID1Y 345' CK	1	345	600	601
	obranch 60160 60272 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'MPLEGV23 345' CK	1	345	600	601
	obranch 60272 60202 1	TRIP LINE FROM BUS 'MPLEGV23 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 61488 60203 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 60114 60233 1	TRIP LINE FROM BUS 'ELM CRK3 345' TO BUS 'PARKERS3 345' CK	1	345	600	601
38	009 8				600-618	601-618
	obranch 61488 60656 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'CNCTER1934.5' CK	1	345-34.5	600	601
	obranch 60160 60272 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'MPLEGV23 345' CK	1	345	600	601
	obranch 61488 60203 1	TRIP LINE FROM BUS 'CNCMID1Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 63030 60202 1	TRIP LINE FROM BUS 'DICKNSN3 345' TO BUS 'COON CK3 345' CK	1	345	600-618	601-618
	obranch 60114 60233 1	TRIP LINE FROM BUS 'ELM CRK3 345' TO BUS 'PARKERS3 345' CK	1	345	600	601
	obranch 60272 60202 1	TRIP LINE FROM BUS 'MPLEGV23 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 60202 61488 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID1Y 345' CK	1	345	600	601
40	015 2			500	600	601
	obranch 60101 60198 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'CHIS-N 2 500' CKT	1	500	600	601
	obranch 60197 60198 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS-N 2 500' CKT 1	1	500	600	601
43	015 1					
	obranch 61550 61624 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608
	obranch 60174 60101 1	TRIP LINE FROM BUS 'ROSEAUS2 500' TO BUS 'FORBES 2 500' CK	1	500	600	601
	obranch 61552 61624 1	TRIP LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608
	obranch 60173 60174 1	TRIP LINE FROM BUS 'ROSEAUN2 500' TO BUS 'ROSEAUS2 500' C	1	500	600	601
	obranch 60101 61552 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'FORB2JCT 230' CK	1	500-230	600-608	601-608
	obranch 61552 61553 1	TRIP LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORB2TR934.5' CK	1	230-34.5	608	608
	obranch 60101 61550 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'FORB1JCT 230' CK	1	500-230	600-608	601-608
	obranch 61550 61551 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORB1TR934.5' CK	1	230-34.5	608	608
	obranch 67564 60173 1	TRIP LINE FROM BUS 'DORSEY 2 500' TO BUS 'ROSEAUN2 500' CK	1	500	600-667	601-668
	obranch 60101 60198 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'CHIS-N 2 500' CKT	1	500	600	601
45	020			500-115	600	601
	obranch 60197 61494 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D2Y 115' CKT	1	500-115	600	601
	obranch 60101 60198 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'CHIS-N 2 500' CKT	1	500	600	601
	obranch 60197 61493 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D1Y 115' CKT	1	500-115	600	601
48	022 1				600	601
	obranch 60202 60251 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 60221 60251 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 60251 61491 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID2Y 345' CKT	1	345	600	601
	obranch 61492 60252 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 61491 60252 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 61492 61187 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERTER1934.5' CK	1	345-34.5	600	601
	obranch 60251 61492 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID1Y 345' CKT	1	345	600	601

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 60202 60221 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'KOLMNLK3 345' CK	1	345	600	601
	obranch 60221 60222 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	1	345-115	600	601
	obranch 61491 61188 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERTER2934.5' CK	1	345-34.5	600	601
50	022 2				600	601
	obranch 60199 61493 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'CHIS D1Y 115' CKT	1	345-115	600	601
	obranch 60197 60198 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS-N 2 500' CKT 1	1	500	600	601
	obranch 60198 60101 1	TRIP LINE FROM BUS 'CHIS-N 2 500' TO BUS 'FORBES 2 500' CKT	1	500	600	601
	obranch 60199 61494 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'CHIS D2Y 115' CKT	1	345-115	600	601
	obranch 60197 61493 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D1Y 115' CKT	1	500-115	600	601
	obranch 60186 60199 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'CHIS CO3 345' CKT	1	345	600	601
	obranch 60199 60221 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601
	obranch 60197 61494 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D2Y 115' CKT	1	500-115	600	601
	obranch 60221 60222 2	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	2	345-115	600	601
	obranch 60186 60221 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601
53	022 3				600	601
	obranch 61491 61188 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERTER2934.5' CK	1	345-34.5	600	601
	obranch 60202 60221 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'KOLMNLK3 345' CK	1	345	600	601
	obranch 60251 61491 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID2Y 345' CKT	1	345	600	601
	obranch 60202 60251 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 61491 60252 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 60221 60222 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	1	345-115	600	601
55	022 4				600	601
	obranch 60202 60221 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'KOLMNLK3 345' CK	1	345	600	601
	obranch 60221 60251 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 61492 61187 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERTER1934.5' CK	1	345-34.5	600	601
	obranch 60221 60222 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	1	345-115	600	601
	obranch 61492 60252 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 60251 61492 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID1Y 345' CKT	1	345	600	601
58	022 5				600	601
	obranch 60251 61491 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID2Y 345' CKT	1	345	600	601
	obranch 61491 60252 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 60251 61492 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID1Y 345' CKT	1	345	600	601
	obranch 61492 61187 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERTER1934.5' CK	1	345-34.5	600	601
	obranch 61491 61188 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERTER2934.5' CK	1	345-34.5	600	601
	obranch 60221 60251 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 60202 60251 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 61492 60252 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
60	022 6			345	600	601
	obranch 60186 60199 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'CHIS CO3 345' CKT	1	345	600	601
	obranch 60186 60221 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601
63	022 7				600	601
	obranch 60653 61493 1	TRIP LINE FROM BUS 'CHIS T1934.5' TO BUS 'CHIS D1Y 115' CKT 1	1	115-34.5	600	601
	obranch 60199 61494 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'CHIS D2Y 115' CKT	1	345-115	600	601
	obranch 60186 60199 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'CHIS CO3 345' CKT	1	345	600	601
	obranch 60221 60222 2	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	2	345-115	600	601
	obranch 60197 60198 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS-N 2 500' CKT 1	1	500	600	601
	obranch 60199 60221 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601
	obranch 60654 61494 1	TRIP LINE FROM BUS 'CHIS T2934.5' TO BUS 'CHIS D2Y 115' CKT 1	1	115-34.5	600	601
	obranch 60199 61493 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'CHIS D1Y 115' CKT	1	345-115	600	601
	obranch 60198 60101 1	TRIP LINE FROM BUS 'CHIS-N 2 500' TO BUS 'FORBES 2 500' CKT	1	500	600	601
	obranch 60197 61493 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D1Y 115' CKT	1	500-115	600	601
	obranch 60197 61494 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D2Y 115' CKT	1	500-115	600	601
65	022 8			345-115	600	601
	obranch 60221 60222 2	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	2	345-115	600	601
	obranch 60199 60221 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 60186 60221 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601
68	022 9			345-115	600	601
	obranch 60221 60222 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	1	345-115	600	601
	obranch 60202 60221 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'KOLMNLK3 345' CK	1	345	600	601
70	022 10				600	601
	obranch 60202 60251 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 61491 60252 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 60251 61491 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID2Y 345' CKT	1	345	600	601
	obranch 61491 61188 1	TRIP LINE FROM BUS 'TERMID2Y 345' TO BUS 'TERTER2934.5' CK	1	345-34.5	600	601
73	022 11			345-115	600	601
	obranch 60221 60222 2	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'KOLMNLK7 115' CK	2	345-115	600	601
	obranch 60199 60221 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'KOLMNLK3 345' CKT	1	345	600	601
75	022 12				600	601
	obranch 60221 60251 1	TRIP LINE FROM BUS 'KOLMNLK3 345' TO BUS 'TERMINL3 345' CK	1	345	600	601
	obranch 61492 60252 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERMINL7 115' CKT	1	345-115	600	601
	obranch 61492 61187 1	TRIP LINE FROM BUS 'TERMID1Y 345' TO BUS 'TERTER1934.5' CK	1	345-34.5	600	601
	obranch 60251 61492 1	TRIP LINE FROM BUS 'TERMINL3 345' TO BUS 'TERMID1Y 345' CKT	1	345	600	601
78	022 13				600	601
	obranch 60199 61493 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'CHIS D1Y 115' CKT	1	345-115	600	601
	obranch 60653 61493 1	TRIP LINE FROM BUS 'CHIS T1934.5' TO BUS 'CHIS D1Y 115' CKT 1	1	115-34.5	600	601
	obranch 60197 61493 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D1Y 115' CKT	1	500-115	600	601
80	022 14				600	601
	obranch 60199 61494 1	TRIP LINE FROM BUS 'CHIS CO3 345' TO BUS 'CHIS D2Y 115' CKT	1	345-115	600	601
	obranch 60654 61494 1	TRIP LINE FROM BUS 'CHIS T2934.5' TO BUS 'CHIS D2Y 115' CKT 1	1	115-34.5	600	601
	obranch 60197 61494 1	TRIP LINE FROM BUS 'CHIS CO2 500' TO BUS 'CHIS D2Y 115' CKT	1	500-115	600	601
83	050 2			345/115		
	setpgen 60001: pgen+ -1	CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				
	setpgen 60002: pgen+ -1	CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	setpgen 60000: pgen+ -1	CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	setpgen 39680: pgen+ 1	CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
	setpgen 39679: pgen+ 1	CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	obranch 60304 39244 1	TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	obranch 60315 39706 1	TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	setpgen 39678: pgen+ 1	CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
85	050 3			345-161	600-364	
	setpgen 60002: pgen+ -1	CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	setpgen 39679: pgen+ 1	CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	setpgen 60001: pgen+ -1	CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				
	setpgen 39678: pgen+ 1	CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
	obranch 60186 60304 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	obranch 60304 60305 1	TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	setpgen 60000: pgen+ -1	CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	setpgen 39680: pgen+ 1	CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
	obranch 60304 39244 1	TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
88	050 4					
	obranch 60315 39706 1	TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	setpgen 60002: pgen+ -1	CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	setpgen 60000: pgen+ -1	CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	obranch 60304 39244 1	TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	setpgen 39678: pgen+ 1	CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
	obranch 60186 60304 1	TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	setpgen 39679: pgen+ 1	CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	obranch 60304 60305 1	TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	setpgen 60001: pgen+ -1	CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				

No.	Contingency	Ckt	Base kV	Area	Zone
	setpgen 39680: pgen+ 1 CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
90	050 5				
	obranch 60304 60305 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	obranch 60186 60304 1 TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	setpgen 39679: pgen+ 1 CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	setpgen 39680: pgen+ 1 CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
	obranch 60315 39706 1 TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	setpgen 39678: pgen+ 1 CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
	setpgen 60002: pgen+ -1 CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
	setpgen 60001: pgen+ -1 CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	setpgen 60000: pgen+ -1 CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
93	050 7				
	setpgen 39679: pgen+ 1 CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	setpgen 60002: pgen+ -1 CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	obranch 60186 60304 1 TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	obranch 60304 60305 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	setpgen 60001: pgen+ -1 CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	setpgen 39680: pgen+ 1 CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
	setpgen 39678: pgen+ 1 CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
	setpgen 60000: pgen+ -1 CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
95	050 6				
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	setpgen 60002: pgen+ -1 CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	setpgen 60001: pgen+ -1 CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				
	setpgen 60000: pgen+ -1 CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	obranch 60315 39706 1 TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	setpgen 39678: pgen+ 1 CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
	setpgen 39679: pgen+ 1 CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	setpgen 39680: pgen+ 1 CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
98	050 8		69/345		
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
100	050 9		115/345		
	obranch 60315 39706 1 TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
103	050 10		345-161	600-364	
	obranch 60304 60305 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	obranch 60186 60304 1 TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
105	050 14				
	obranch 60304 60305 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	obranch 60186 60304 1 TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
108	050 1		69/345		

No.	Contingency	Ckt	Base kV	Area	Zone
	setpgen 60000: pgen+ -1 CHANGE BUS 'SHERC31G24.0' GENERATION BY -133.0 MW				
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
	setpgen 39680: pgen+ 1 CHANGE BUS 'WES G2 13.8' GENERATION BY 133.0 MW				
	setpgen 60002: pgen+ -1 CHANGE BUS 'SHERC33G26.0' GENERATION BY -133.0 MW				
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	setpgen 39679: pgen+ 1 CHANGE BUS 'WES G1 13.8' GENERATION BY 133.0 MW				
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	setpgen 60001: pgen+ -1 CHANGE BUS 'SHERC32G24.0' GENERATION BY -133.0 MW				
	setpgen 39678: pgen+ 1 CHANGE BUS 'WES G3 20.0' GENERATION BY 133.0 MW				
110	050 11				
	obranch 60304 60305 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	obranch 60315 39706 1 TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	obranch 60186 60304 1 TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
113	050 12				
	obranch 60304 60305 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'EAU CLA5 161' CKT	1	345-161	600	604
	obranch 60315 39706 1 TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	obranch 60186 60304 1 TRIP LINE FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345' CKT 1	1	345	600	601-604
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
115	050 13				
	obranch 38333 68821 1 TRIP LINE FROM BUS 'HLT 69 69.0' TO BUS 'MAUSTON 69.0' CKT 1	1	69	364-680	371-680
	obranch 60304 39244 1 TRIP LINE FROM BUS 'EAU CL 3 345' TO BUS 'ARP 345 345' CKT 1	1	345	364-600	371-604
	obranch 60315 39706 1 TRIP LINE FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115' CKT 1	1	115	366-600	366-604
	obranch 39901 38342 1 TRIP LINE FROM BUS 'COC DPC 69.0' TO BUS 'COC 69 69.0' CKT 1	1	69	364	371
118	100		115	626-652	627-655
	obranch 63267 63265 1 TRIP LINE FROM BUS 'DEVIL J7 115' TO BUS 'DEVILSE7 115' CKT 1	1	115	626	627
	obranch 66431 63267 1 TRIP LINE FROM BUS 'DEVILSL7 115' TO BUS 'DEVIL J7 115' CKT 1	1	115	626-652	627-655
	obranch 63265 63266 1 TRIP LINE FROM BUS 'DEVILSE7 115' TO BUS 'RAMSEY 7 115' CKT	1	115	626	627
	obranch 63267 63268 1 TRIP LINE FROM BUS 'DEVIL J7 115' TO BUS 'DEVIL S7 115' CKT 1	1	115	626	627
120	105 1		230	652	655-659
	obranch 66426 66456 1 TRIP LINE FROM BUS 'BISMARK4 230' TO BUS 'WASHBRN4 230' C	1	230	652	655
	obranch 66456 67106 1 TRIP LINE FROM BUS 'WASHBRN4 230' TO BUS 'LELANDO4 230' C	1	230	652	655-659
	obranch 66426 66441 1 TRIP LINE FROM BUS 'BISMARK4 230' TO BUS 'GARRISN4 230' CK	1	230	652	655
123	105 2		230	652	655-659
	obranch 66426 66441 1 TRIP LINE FROM BUS 'BISMARK4 230' TO BUS 'GARRISN4 230' CK	1	230	652	655
	obranch 66441 67106 1 TRIP LINE FROM BUS 'GARRISN4 230' TO BUS 'LELANDO4 230' CK	1	230	652	655-659
125	105 3		230	652	655-659
	obranch 66456 67106 1 TRIP LINE FROM BUS 'WASHBRN4 230' TO BUS 'LELANDO4 230' C	1	230	652	655-659
	obranch 66426 66456 1 TRIP LINE FROM BUS 'BISMARK4 230' TO BUS 'WASHBRN4 230' C	1	230	652	655
128	108 1		230	652-618	
	obranch 66507 66509 1 TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'FTRANDL4 230' CK	1	230	652	654
	obranch 66507 66516 1 TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'LAKPLAT4 230' CK	1	230	652	654
	obranch 63041 63381 1 TRIP LINE FROM BUS 'COAL CR4 230' TO BUS 'UNDERWD4 230' C	1	230	618	618-627
130	108 2		230	652-618	
	obranch 66509 66516 1 TRIP LINE FROM BUS 'FTRANDL4 230' TO BUS 'LAKPLAT4 230' CK	1	230	652	654
	obranch 66507 66509 1 TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'FTRANDL4 230' CK	1	230	652	654
	obranch 63041 63381 1 TRIP LINE FROM BUS 'COAL CR4 230' TO BUS 'UNDERWD4 230' C	1	230	618	618-627
133	110 1		230	652	654
	obranch 66503 66530 1 TRIP LINE FROM BUS 'BLAIR 4 230' TO BUS 'WATERTN4 230' CKT	1	230	652	654
	obranch 66530 66550 1 TRIP LINE FROM BUS 'WATERTN4 230' TO BUS 'GRANITF4 230' CK	1	230	652	654
135	110 2		230	652	654
	obranch 66503 66550 1 TRIP LINE FROM BUS 'BLAIR 4 230' TO BUS 'GRANITF4 230' CKT 1	1	230	652	654

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 66530 66550 1	TRIP LINE FROM BUS 'WATERTN4 230' TO BUS 'GRANITF4 230' CK	1	230	652	654
138	111			345		
	obranch 59393 96039 1	OPEN LINE FROM BUS 'ST JOE 3 345' TO BUS '7FAIRPT 345' CKT	1	345	540-130	540-130
	obranch 64786 96039 1	OPEN LINE FROM BUS 'COOPER 3 345' TO BUS '7FAIRPT 345' CK	1	345	640-130	640-130
140	111			230	652	654
	obranch 66507 66519 1	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'OAHE 4 230' CKT	1	230	652	654
	obranch 66507 66519 2	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'OAHE 4 230' CKT	2	230	652	654
143	11L			115	608	608-620
	obranch 61740 62448 1	TRIP LINE FROM BUS 'GR RPDS7 115' TO BUS 'HILLCTY7 115' CKT	1	115	608	608-620
	obranch 62448 61653 1	TRIP LINE FROM BUS 'HILLCTY7 115' TO BUS 'RIVERTN7 115' CKT	1	115	608	608-620
145	120			115/345	652	654
	obranch 66504 66531 1	TRIP LINE FROM BUS 'BROOKNG7 115' TO BUS 'WATERTN7 115' C	1	115	652	654
	obranch 66529 66537 1	TRIP LINE FROM BUS 'WATERTN3 345' TO BUS 'WHITE 3 345' CKT	1	345	652	654
148	128L			115	608	608
	obranch 61697 61694 1	TRIP LINE FROM BUS 'TAC HBR7 115' TO BUS 'FINLAND7 115' CKT	1	115	608	608
	obranch 62171 61692 1	TRIP LINE FROM BUS 'FINLAND7 115' TO BUS 'SLVRBAY7 115' CKT	1			
	obranch 61694 61692 1	TRIP LINE FROM BUS 'FINLAND7 115' TO BUS 'SLVRBAY7 115' CKT	1	115	608	608
150	130 1			230-115	652	654-659
	obranch 66507 67122 1	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'STORLA 4 230' CK	1	230	652	654-659
	obranch 66507 66523 1	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'SIOUXFL4 230' CK	1	230	652	654
	obranch 66513 67122 1	TRIP LINE FROM BUS 'HANLON 4 230' TO BUS 'STORLA 4 230' CKT	1	230	652	654-659
	obranch 67122 67123 1	TRIP LINE FROM BUS 'STORLA 4 230' TO BUS 'STORLA 7 115' CKT	1	230-115	652	659
	obranch 66507 67122 1	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'STORLA 4 230' CK	1	230	652	654-659
153	130 2			230	652	654
	obranch 66507 66523 1	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'SIOUXFL4 230' CK	1	230	652	654
	obranch 66513 66398 1	TRIP LINE FROM BUS 'HANLON 4 230' TO BUS 'VFODNES4 230' CK	1	230	652	654
155	132L			115	608	608
	obranch 61679 61678 1	TRIP LINE FROM BUS 'GARY 7 115' TO BUS 'NEMADJI7 115' CKT 1	1	115	608	608
	obranch 61678 61683 1	TRIP LINE FROM BUS 'NEMADJI7 115' TO BUS 'STIN-MN7 115' CKT	1	115	608	608
158	138			115-230	640	640
	obranch 64766 65022 1	OPEN LINE FROM BUS 'CANADAY7 115' TO BUS 'CANADY Y 230' C	1	115-230	640	640
	obranch 64765 65022 1	OPEN LINE FROM BUS 'CANADAY4 230' TO BUS 'CANADY Y 230' C	1	230	640	640
	obranch 64759 64765 1	OPEN LINE FROM BUS 'C.CREEK4 230' TO BUS 'CANADAY4 230' C	1	230	640	640
160	139			230-115	640	640
	obranch 64847 65030 1	OPEN LINE FROM BUS 'HASTING4 230' TO BUS 'HASTNG Y 230' CK	1	230	640	640
	obranch 64848 65030 1	OPEN LINE FROM BUS 'HASTING7 115' TO BUS 'HASTNG Y 230' CK	1	115-230	640	640
	obranch 64839 64847 1	OPEN LINE FROM BUS 'GR ISLD4 230' TO BUS 'HASTING4 230' CK	1	230	640	640
163	13L			115	608-618	
	obranch 61654 62638 1	TRIP LINE FROM BUS 'AITKNMN7 115' TO BUS 'AITKIN 7 115' CKT 1	1	115	608	608-620
	obranch 61654 61653 1	TRIP LINE FROM BUS 'AITKNMN7 115' TO BUS 'RIVERTN7 115' CKT	1	115	608	608
	obranch 62637 62636 1	TRIP LINE FROM BUS 'KIMBRLY7 115' TO BUS 'MCGREGR7 115' C	1	115	608	620
	obranch 61655 62636 1	TRIP LINE FROM BUS 'CROMWLL7 115' TO BUS 'MCGREGR7 115'	1	115	608	608-620
	obranch 61673 62445 1	TRIP LINE FROM BUS 'ARROWHD7 115' TO BUS '4CORNRS7 115' C	1	115	608-618	608-619
	obranch 62637 62638 1	TRIP LINE FROM BUS 'KIMBRLY7 115' TO BUS 'AITKIN 7 115' CKT 1	1	115	608	620
165	140				640	640
	obranch 64733 64933 1	OPEN LINE FROM BUS 'AXTELL 3 345' TO BUS 'PAULINE3 345' CKT	1	345	640	640
	obranch 64934 65040 1	OPEN LINE FROM BUS 'PAULINE7 115' TO BUS 'PAULIN Y 345' CKT	1	115-345	640	640
	obranch 64935 65040 1	OPEN LINE FROM BUS 'PAULINE913.8' TO BUS 'PAULIN Y 345' CKT	1	13.8-345	640	640
	obranch 65040 64933 1	OPEN LINE FROM BUS 'PAULIN Y 345' TO BUS 'PAULINE3 345' CKT	1	345	640	640
168	140			230	652	654
	obranch 66507 66514 1	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'HURON 4 230' CK	1	230	652	654
	obranch 66507 66514 2	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'HURON 4 230' CK	2	230	652	654
170	14L			115	608	608

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 61731 61724 1	TRIP LINE FROM BUS '14L TAP7 115' TO BUS 'HIBBING7 115' CKT 1	1	115	608	608
	obranch 61731 61733 1	TRIP LINE FROM BUS '14L TAP7 115' TO BUS 'NATIONL7 115' CKT	1	115	608	608
	obranch 61737 61731 1	TRIP LINE FROM BUS 'NASHWAK7 115' TO BUS '14L TAP7 115' CK	1	115	608	608
173	150			230	652	654
	obranch 66507 66519 3	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'OAHE 4 230' CKT	3	230	652	654
	obranch 66507 66519 4	TRIP LINE FROM BUS 'FTTHOMP4 230' TO BUS 'OAHE 4 230' CKT	4	230	652	654
175	15L			115	608	608
	obranch 61676 61666 1	TRIP LINE FROM BUS 'HIBBARD7 115' TO BUS 'FONDULAC 115' CK	1	115	608	608
	obranch 61665 61666 1	TRIP LINE FROM BUS 'THOMSON7 115' TO BUS 'FONDULAC 115' C	1	115	608	608
178	160 1			230	652	654
	obranch 66509 66526 1	TRIP LINE FROM BUS 'FTRANDL4 230' TO BUS 'UTICAJC4 230' CKT	1	230	652	654
	obranch 66523 66526 1	TRIP LINE FROM BUS 'SIOUXFL4 230' TO BUS 'UTICAJC4 230' CKT	1	230	652	654
	obranch 66526 66536 1	TRIP LINE FROM BUS 'UTICAJC4 230' TO BUS 'RASMUSN4 230' CK	1	230	652	654
	obranch 66509 66565 1	TRIP LINE FROM BUS 'FTRANDL4 230' TO BUS 'SIOUXCY4 230' CK	1	230	652	654
180	160 2			230	652	654
	obranch 66536 66565 1	TRIP LINE FROM BUS 'RASMUSN4 230' TO BUS 'SIOUXCY4 230' CK	1	230	652	654
	obranch 66509 66565 1	TRIP LINE FROM BUS 'FTRANDL4 230' TO BUS 'SIOUXCY4 230' CK	1	230	652	654
183	160 3			230	652	654
	obranch 66526 66536 1	TRIP LINE FROM BUS 'UTICAJC4 230' TO BUS 'RASMUSN4 230' CK	1	230	652	654
	obranch 66523 66526 1	TRIP LINE FROM BUS 'SIOUXFL4 230' TO BUS 'UTICAJC4 230' CKT	1	230	652	654
	obranch 66509 66526 1	TRIP LINE FROM BUS 'FTRANDL4 230' TO BUS 'UTICAJC4 230' CKT	1	230	652	654
185	16L			115	608	608-620
	obranch 61718 61721 1	TRIP LINE FROM BUS '16L TAP7 115' TO BUS 'ETCO 7 115' CKT 1	1	115	608	608
	obranch 61673 62447 1	TRIP LINE FROM BUS 'ARROWHD7 115' TO BUS 'BERGNTP7 115' C	1	115	608	608-620
	obranch 61718 61720 1	TRIP LINE FROM BUS '16L TAP7 115' TO BUS 'COTTNTP7 115' CKT	1	115	608	608
	obranch 61720 62452 1	TRIP LINE FROM BUS 'COTTNTP7 115' TO BUS 'COTTON 7 115' CK	1	115	608	608-620
	obranch 61720 62447 1	TRIP LINE FROM BUS 'COTTNTP7 115' TO BUS 'BERGNTP7 115' CK	1	115	608	608-620
	obranch 61718 62454 1	TRIP LINE FROM BUS '16L TAP7 115' TO BUS 'PEARY 7 115' CKT 1	1	115	608	608-620
	obranch 62454 61708 1	TRIP LINE FROM BUS 'PEARY 7 115' TO BUS 'VIRGNIA7 115' CKT 1	1	115	608	608-620
188	170			230	652	654
	obranch 66514 66530 2	TRIP LINE FROM BUS 'HURON 4 230' TO BUS 'WATERTN4 230' CK	2	230	652	654
	obranch 66514 66530 1	TRIP LINE FROM BUS 'HURON 4 230' TO BUS 'WATERTN4 230' CK	1	230	652	654
190	180 1			230	618	619-618
	obranch 63042 63049 1	TRIP LINE FROM BUS 'COAL TP4 230' TO BUS 'STANTON4 230' CK	1	230	618	619-618
	obranch 63041 63042 1	TRIP LINE FROM BUS 'COAL CR4 230' TO BUS 'COAL TP4 230' CKT	1	230	618	618-619
	obranch 63042 63044 1	TRIP LINE FROM BUS 'COAL TP4 230' TO BUS 'MCHENRY4 230' CK	1	230	618	619
193	180 2			230	618	618-619
	obranch 63041 63042 1	TRIP LINE FROM BUS 'COAL CR4 230' TO BUS 'COAL TP4 230' CKT	1	230	618	618-619
	obranch 63042 63049 1	TRIP LINE FROM BUS 'COAL TP4 230' TO BUS 'STANTON4 230' CK	1	230	618	619-618
	obranch 63041 63049 1	TRIP LINE FROM BUS 'COAL CR4 230' TO BUS 'STANTON4 230' CK	1	230	618	618
	obranch 63042 63044 1	TRIP LINE FROM BUS 'COAL TP4 230' TO BUS 'MCHENRY4 230' CK	1	230	618	619
195	190				626-652	657-655
	obranch 66772 66777 1	TRIP LINE FROM BUS 'CALEDONT 115' TO BUS 'CALEDON913.2' C	1	13.2-115	626	657
	obranch 66430 66443 1	TRIP LINE FROM BUS 'EGF IND7 115' TO BUS 'GRNDFKS7 115' CKT	1	115	652	655
	obranch 66707 66430 1	TRIP LINE FROM BUS 'CALEDON7 115' TO BUS 'EGF IND7 115' CKT	1	115	652-626	655-657
	obranch 66772 66707 1	TRIP LINE FROM BUS 'CALEDONT 115' TO BUS 'CALEDON7 115' C	1	115	626	657
	obranch 66436 66707 1	TRIP LINE FROM BUS 'FARGO 7 115' TO BUS 'CALEDON7 115' CKT	1	115	652-626	655-657
	obranch 66772 67053 1	TRIP LINE FROM BUS 'CALEDONT 115' TO BUS 'CALEDON869.0' C	1	69-115	626	657
198	200				626-652	
	obranch 63188 66923 1	TRIP LINE FROM BUS 'PICKERTY 230' TO BUS 'PICKERT869.0' CKT	1	69-230	626	657-627
	obranch 66437 66759 1	TRIP LINE FROM BUS 'GRNDFKS4 230' TO BUS 'PICKERT4 230' CK	1	230	652-626	655-657
	obranch 63188 63167 1	TRIP LINE FROM BUS 'PICKERTY 230' TO BUS 'PICKERT941.6' CKT	1	41.6-230	626	627
	obranch 66759 63188 1	TRIP LINE FROM BUS 'PICKERT4 230' TO BUS 'PICKERTY 230' CKT	1	230	626	657-627
	obranch 66444 66759 1	TRIP LINE FROM BUS 'JAMESTN4 230' TO BUS 'PICKERT4 230' CK	1	230	652-626	655-657

No.	Contingency		Ckt	Base kV	Area	Zone
200	20L			115	608	608
	obranch 61739 61781 1	TRIP LINE FROM BUS 'BLCKBRY7 115' TO BUS '20L TAP7 115' CKT	1	115	608	608
	obranch 61779 61781 1	TRIP LINE FROM BUS 'BLANDIN7 115' TO BUS '20L TAP7 115' CKT	1	115	608	608
	obranch 61740 61781 1	TRIP LINE FROM BUS 'GR RPDS7 115' TO BUS '20L TAP7 115' CKT	1	115	608	608
203	210			230	652	653-654
	obranch 66488 66519 1	TRIP LINE FROM BUS 'PHILTAP4 230' TO BUS 'OAHE 4 230' CKT 1	1	230	652	653-654
	obranch 66486 66488 1	TRIP LINE FROM BUS 'PHILIP 4 230' TO BUS 'PHILTAP4 230' CKT 1	1	230	652	653
	obranch 66484 66488 1	TRIP LINE FROM BUS 'NUNDRWD4 230' TO BUS 'PHILTAP4 230' CK	1	230	652	653
205	220				626	627-657
	obranch 63190 63360 1	TRIP LINE FROM BUS 'MAPLER2Y 345' TO BUS 'MAPLER2913.8' CK	1	13.8-345	626	627
	obranch 63198 63258 1	TRIP LINE FROM BUS 'BUFFALOY 345' TO BUS 'BUFFALO7 115' CK	1	115-345	626	627
	obranch 63358 63369 1	TRIP LINE FROM BUS 'BUFFALO3 345' TO BUS 'JAMESTN3 345' CK	1	345	626	627
	obranch 63190 66754 1	TRIP LINE FROM BUS 'MAPLER2Y 345' TO BUS 'MAPLE R4 230' CK	1	230-345	626	657-627
	obranch 66792 63190 1	TRIP LINE FROM BUS 'MAPLE R3 345' TO BUS 'MAPLER2Y 345' CK	1	345	626	657-627
	obranch 66792 63189 1	TRIP LINE FROM BUS 'MAPLE R3 345' TO BUS 'MAPLER1Y 345' CK	1	345	626	657-627
	obranch 63189 66754 1	TRIP LINE FROM BUS 'MAPLER1Y 345' TO BUS 'MAPLE R4 230' CK	1	230-345	626	657-627
	obranch 63198 63158 1	TRIP LINE FROM BUS 'BUFFALOY 345' TO BUS 'BUFFALO941.6' CK	1	41.6-345	626	627
	obranch 63358 63198 1	TRIP LINE FROM BUS 'BUFFALO3 345' TO BUS 'BUFFALOY 345' CK	1	345	626	627
	obranch 63189 63359 1	TRIP LINE FROM BUS 'MAPLER1Y 345' TO BUS 'MAPLER1913.8' CK	1	13.8-345	626	627
	obranch 66792 63358 1	TRIP LINE FROM BUS 'MAPLE R3 345' TO BUS 'BUFFALO3 345' CK	1	345	626	627-657
208	230			230-41.6	626-652	627-661
	obranch 63363 63362 1	TRIP LINE FROM BUS 'FORMAN 4 230' TO BUS 'OAKES 4 230' CKT	1	230	626	627
	obranch 63362 63162 1	TRIP LINE FROM BUS 'OAKES 4 230' TO BUS 'OAKES 941.6' CKT 1	1	230-41.6	626	627
	obranch 63363 63193 1	TRIP LINE FROM BUS 'FORMAN 4 230' TO BUS 'FORMAN Y 230' CK	1	230	626	627
	obranch 63363 63327 1	TRIP LINE FROM BUS 'FORMAN 4 230' TO BUS 'HANKSON4 230' CK	1	230	626	627
	obranch 67326 63362 1	TRIP LINE FROM BUS 'ELLENDL4 230' TO BUS 'OAKES 4 230' CKT	1	230	626-652	627-661
210	240			115-41.6	626	627-629
	obranch 63298 63262 1	TRIP LINE FROM BUS 'HOVINGJ7 115' TO BUS 'GWINNER7 115' CK	1	115	626	627-629
	obranch 63260 63261 1	TRIP LINE FROM BUS 'ENDERLN7 115' TO BUS 'LISBON 7 115' CKT	1	115	626	627
	obranch 63262 63263 1	TRIP LINE FROM BUS 'GWINNER7 115' TO BUS 'FORMN 7 115' CK	1	115	626	627
	obranch 63258 63259 1	TRIP LINE FROM BUS 'BUFFALO7 115' TO BUS 'ALICE 7 115' CKT 1	1	115	626	627
	obranch 63298 63299 1	TRIP LINE FROM BUS 'HOVINGJ7 115' TO BUS 'HOVINGJ941.6' CKT	1	115-41.6	626	629
	obranch 63261 63298 1	TRIP LINE FROM BUS 'LISBON 7 115' TO BUS 'HOVINGJ7 115' CKT	1	115	626	627-629
	obranch 63259 63260 1	TRIP LINE FROM BUS 'ALICE 7 115' TO BUS 'ENDERLN7 115' CKT	1			
213	24L			115	608	608-620
	obranch 62895 61642 1	TRIP LINE FROM BUS 'THMSTWN7 115' TO BUS 'VERNDLE7 115' C	1	115	608	608-620
	obranch 61644 61646 1	TRIP LINE FROM BUS 'DOGLAKE7 115' TO BUS 'DOGLKTP7 115' C	1	115	608	608
	obranch 61646 61645 1	TRIP LINE FROM BUS 'DOGLKTP7 115' TO BUS 'BAXTER 7 115' CK	1	115	608	608
	obranch 61646 62895 1	TRIP LINE FROM BUS 'DOGLKTP7 115' TO BUS 'THMSTWN7 115' C	1	115	608	608-620
215	250			230-115	618-626	
	obranch 63056 63047 1	TRIP LINE FROM BUS 'BALTA 4 230' TO BUS 'RAMSEY 4 230' CKT	1	230	618	619
	obranch 63266 63047 1	TRIP LINE FROM BUS 'RAMSEY 7 115' TO BUS 'RAMSEY 4 230' CK	1	115-230	626-618	627-619
	obranch 66755 63047 1	TRIP LINE FROM BUS 'PRAIRIE4 230' TO BUS 'RAMSEY 4 230' CKT	1	230	618-626	619-657
218	25L			115	608	608
	obranch 61707 61708 1	TRIP LINE FROM BUS 'MNTACT27 115' TO BUS 'VIRGNIA7 115' CKT	1	115	608	608
	obranch 61724 61706 1	TRIP LINE FROM BUS 'HIBBING7 115' TO BUS 'KEWTNTP7 115' CK	1	115	608	608
	obranch 61706 61707 1	TRIP LINE FROM BUS 'KEWTNTP7 115' TO BUS 'MNTACT27 115' C	1	115	608	608
220	260			230-115	618	619-602
	obranch 63044 63056 1	TRIP LINE FROM BUS 'MCHENRY4 230' TO BUS 'BALTA 4 230' CKT	1	230	618	619
	obranch 63044 60140 1	TRIP LINE FROM BUS 'MCHENRY4 230' TO BUS 'MCHENRY7 115' C	1	115-230	618	602-619
	obranch 63042 63044 1	TRIP LINE FROM BUS 'COAL TP4 230' TO BUS 'MCHENRY4 230' CK	1	230	618	619
223	26L			115	608	608
	obranch 61664 61656 1	TRIP LINE FROM BUS 'WRENSHL7 115' TO BUS 'MAHTOWA7 115'	1	115	608	608
	obranch 61656 61655 1	TRIP LINE FROM BUS 'MAHTOWA7 115' TO BUS 'CROMWLL7 115'	1	115	608	608

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 61665 61664 1	TRIP LINE FROM BUS 'THOMSON7 115' TO BUS 'WRENSHL7 115' C	1	115	608	608
225	27L			115	608	608
	obranch 61778 61779 1	TRIP LINE FROM BUS 'BLNDTAP7 115' TO BUS 'BLANDIN7 115' CKT	1	115	608	608
	obranch 61748 61778 1	TRIP LINE FROM BUS 'BOSWELL7 115' TO BUS 'BLNDTAP7 115' CK	1	115	608	608
228	28L			115	608	608
	obranch 61791 61780 1	TRIP LINE FROM BUS 'LAKEHD 7 115' TO BUS 'DEER RV7 115' CKT	1	115	608	608
	obranch 61782 61790 1	TRIP LINE FROM BUS '28L TAP7 115' TO BUS 'COHSSTTP 115' CKT	1	115	608	608
	obranch 61748 61782 1	TRIP LINE FROM BUS 'BOSWELL7 115' TO BUS '28L TAP7 115' CKT	1	115	608	608
	obranch 61782 61746 1	TRIP LINE FROM BUS '28L TAP7 115' TO BUS 'GREENWY7 115' CK	1	115	608	608
	obranch 61790 61791 1	TRIP LINE FROM BUS 'COHSSTTP 115' TO BUS 'LAKEHD 7 115' CK	1	115	608	608
230	300				640-652	640-653
	obranch 65002 65045 1	TRIP LINE FROM BUS 'VICTRYH7 115' TO BUS 'VICTHL Y 230' CKT	1	115-230	640	640
	obranch 65001 66573 1	TRIP LINE FROM BUS 'VICTRYH4 230' TO BUS 'STEGALL4 230' CKT	1	230	640-652	640-653
	obranch 65001 65045 1	TRIP LINE FROM BUS 'VICTRYH4 230' TO BUS 'VICTHL Y 230' CKT	1	230	640	640
	obranch 65000 65045 1	TRIP LINE FROM BUS 'VICTR10G13.8' TO BUS 'VICTHL Y 230' CKT	1	13.8-230	640	640
233	310			345	640	640
	obranch 64831 64943 1	TRIP LINE FROM BUS 'GENTLMN3 345' TO BUS 'REDWILO3 345' CK	1	345	640	640
	obranch 64831 64984 2	TRIP LINE FROM BUS 'GENTLMN3 345' TO BUS 'SWEET W3 345' C	2	345	640	640
235	320 1			230	640	640
	obranch 64832 64909 2	TRIP LINE FROM BUS 'GENTLMN4 230' TO BUS 'N.PLATT4 230' CK	2	230	640	640
	obranch 64759 64909 1	TRIP LINE FROM BUS 'C.CREEK4 230' TO BUS 'N.PLATT4 230' CKT	1	230	640	640
	obranch 64832 64909 3	TRIP LINE FROM BUS 'GENTLMN4 230' TO BUS 'N.PLATT4 230' CK	3	230	640	640
238	330			345	640-652	
	obranch 64984 66571 1	TRIP LINE FROM BUS 'SWEET W3 345' TO BUS 'GR ISLD3 345' CKT	1	345	640	640-656
	obranch 66506 66571 1	TRIP LINE FROM BUS 'FTTHOMP3 345' TO BUS 'GR ISLD3 345' CKT	1	345	652-640	654-656
240	340				640	640-641
	obranch 64839 64847 1	TRIP LINE FROM BUS 'GR ISLD4 230' TO BUS 'HASTING4 230' CKT	1	230	640	640
	obranch 64804 64941 1	TRIP LINE FROM BUS 'DONIPHN7 115' TO BUS 'PROSSER7 115' CK	1	115	640	640
	obranch 64804 64805 1	TRIP LINE FROM BUS 'DONIPHN7 115' TO BUS 'DONIPHN934.5' CK	1	34.5-115	640	640
	obranch 65271 64804 1	TRIP LINE FROM BUS 'SUB-D 7 115' TO BUS 'DONIPHN7 115' CKT	1	115	640	640-641
243	34L			115	608	608
	obranch 61708 61705 1	TRIP LINE FROM BUS 'VIRGNIA7 115' TO BUS 'BABBITT7 115' CKT	1	115	608	608
	obranch 61705 61702 1	TRIP LINE FROM BUS 'BABBITT7 115' TO BUS 'LASKIN 7 115' CKT 1	1	115	608	608
245	350			230-115	640	640
	obranch 64839 64847 1	TRIP LINE FROM BUS 'GR ISLD4 230' TO BUS 'HASTING4 230' CKT	1	230	640	640
	obranch 64848 65030 1	TRIP LINE FROM BUS 'HASTING7 115' TO BUS 'HASTNG Y 230' CK	1	115-230	640	640
	obranch 64847 65030 1	TRIP LINE FROM BUS 'HASTING4 230' TO BUS 'HASTNG Y 230' CK	1	230	640	640
248	360			230-115	640	640
	obranch 64765 65022 1	TRIP LINE FROM BUS 'CANADAY4 230' TO BUS 'CANADY Y 230' CK	1	230	640	640
	obranch 64766 65022 1	TRIP LINE FROM BUS 'CANADAY7 115' TO BUS 'CANADY Y 230' CK	1	115-230	640	640
	obranch 64765 64759 1	TRIP LINE FROM BUS 'CANADAY4 230' TO BUS 'C.CREEK4 230' CK	1	230	640	640
250	370				640	640
	obranch 64733 64933 1	TRIP LINE FROM BUS 'AXTELL 3 345' TO BUS 'PAULINE3 345' CKT	1	345	640	640
	obranch 64934 65040 1	TRIP LINE FROM BUS 'PAULINE7 115' TO BUS 'PAULIN Y 345' CKT	1	115-345	640	640
	obranch 64935 65040 1	TRIP LINE FROM BUS 'PAULINE913.8' TO BUS 'PAULIN Y 345' CKT	1	13.8-345	640	640
	obranch 64933 65040 1	TRIP LINE FROM BUS 'PAULINE3 345' TO BUS 'PAULIN Y 345' CKT	1	345	640	640
253	37L			115	608	608-620
	obranch 61735 61708 1	TRIP LINE FROM BUS 'TBIRD S7 115' TO BUS 'VIRGNIA7 115' CKT 1	1	115	608	608
	obranch 61734 62453 1	TRIP LINE FROM BUS 'IRON TP7 115' TO BUS 'IRON 7 115' CKT 1	1	115	608	608-620
	obranch 61722 61734 1	TRIP LINE FROM BUS 'FORBES 7 115' TO BUS 'IRON TP7 115' CKT	1	115	608	608
	obranch 61734 61735 1	TRIP LINE FROM BUS 'IRON TP7 115' TO BUS 'TBIRD S7 115' CKT 1	1	115	608	608
255	380			345		
	obranch 64786 96039 1	TRIP LINE FROM BUS 'COOPER 3 345' TO BUS '7FAIRPT 345' CKT	1	345	640-130	640-130

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 96039 59393 1	TRIP LINE FROM BUS '7FAIRPT 345' TO BUS 'ST JOE 3 345' CKT 1	1	345	540-130	540-130
258	390				640	640
	obranch 64796 64784 1	TRIP LINE FROM BUS 'CRESTON7 115' TO BUS 'COLMBUS7 115' C	1	115	640	640
	obranch 64796 64797 1	TRIP LINE FROM BUS 'CRESTON7 115' TO BUS 'CRESTON934.5' C	1	34.5-115	640	640
	obranch 64889 64890 1	TRIP LINE FROM BUS 'MADISON7 115' TO BUS 'MADISON934.5' CK	1	115-34.5	640	640
	obranch 64920 64889 1	TRIP LINE FROM BUS 'NORFOLK7 115' TO BUS 'MADISON7 115' CK	1	115	640	640
	obranch 64796 64797 2	TRIP LINE FROM BUS 'CRESTON7 115' TO BUS 'CRESTON934.5' C	2	34.5-115	640	640
	obranch 64783 64859 1	TRIP LINE FROM BUS 'COLMBUS4 230' TO BUS 'HOSKINS4 230' CK	1	230	640	640
	obranch 64889 64796 1	TRIP LINE FROM BUS 'MADISON7 115' TO BUS 'CRESTON7 115' CK	1	115	640	640
260	39L			115	608	608-620
	obranch 61736 61708 1	TRIP LINE FROM BUS 'T-BIRD 7 115' TO BUS 'VIRGNIA7 115' CKT 1	1	115	608	608
	obranch 61702 62451 1	TRIP LINE FROM BUS 'LASKIN 7 115' TO BUS 'LAKELND7 115' CKT	1	115	608	608-620
	obranch 62451 61736 1	TRIP LINE FROM BUS 'LAKELND7 115' TO BUS 'T-BIRD 7 115' CKT	1	115	608	608-620
263	400			161	645	645
	obranch 65401 65486 1	TRIP LINE FROM BUS 'S1201 5 161' TO BUS 'S1286 5 161' CKT 1	1	161	645	645
	obranch 65401 65420 1	TRIP LINE FROM BUS 'S1201 5 161' TO BUS 'S1220 5 161' CKT 1	1	161	645	645
265	410		1	161	645	645
	obranch 65450 65409 1	TRIP LINE FROM BUS 'S1250 5 161' TO BUS 'S1209 5 161' CKT 1	1	161	645	645
268	420			161	645	645
	obranch 65450 65411 1	TRIP LINE FROM BUS 'S1250 5 161' TO BUS 'S1211 5 161' CKT 1	1	161	645	645
	obranch 65450 65411 2	TRIP LINE FROM BUS 'S1250 5 161' TO BUS 'S1211 5 161' CKT 2	2	161	645	645
270	42L			115	608	608-620
	obranch 61688 61689 1	TRIP LINE FROM BUS 'COLBYVL7 115' TO BUS 'FRNCHRV7 115' CK	1	115	608	608
	obranch 61689 61690 1	TRIP LINE FROM BUS 'FRNCHRV7 115' TO BUS 'TWO HBR7 115' C	1	115	608	608
	obranch 61691 61692 1	TRIP LINE FROM BUS 'SLVRBYH7 115' TO BUS 'SLVRBAY7 115' CK	1	115	608	608
	obranch 62170 61691 1	TRIP LINE FROM BUS 'WALDO 7 115' TO BUS 'SLVRBYH7 115' CKT	1	115	608	608-620
	obranch 61690 62170 1	TRIP LINE FROM BUS 'TWO HBR7 115' TO BUS 'WALDO 7 115' CK	1	115	608	608-620
273	430			161	645	645
	obranch 65411 65420 1	OPEN BRANCH FROM BUS 'S1211 5 161' TO BUS 'S1220 5 161' CK	1	161	645	645
	obranch 65411 65499 1	OPEN BRANCH FROM BUS 'S1211 5 161' TO BUS 'S1299 5 161' CK	1	161	645	645
275	431			161	645	645
	obranch 65411 65420 1	OPEN BRANCH FROM BUS 'S1211 5 161' TO BUS 'S1220 5 161' CK	1	161	645	645
	obranch 65499 65486 1	OPEN BRANCH FROM BUS 'S1299 5 161' TO BUS 'S1286 5 161' CK	1	161	645	645
278	440			161	645	645
	obranch 65409 65431 2	TRIP LINE FROM BUS 'S1209 5 161' TO BUS 'S1231 5 161' CKT 2	2	161	645	645
	obranch 65409 65431 1	TRIP LINE FROM BUS 'S1209 5 161' TO BUS 'S1231 5 161' CKT 1	1	161	645	645
280	44L			115	608	608
	obranch 61725 61724 1	TRIP LINE FROM BUS '44L TAP7 115' TO BUS 'HIBBING7 115' CKT 1	1	115	608	608
	obranch 61725 61728 1	TRIP LINE FROM BUS '44L TAP7 115' TO BUS 'HIBBTAC7 115' CKT	1	115	608	608
	obranch 61725 61722 1	TRIP LINE FROM BUS '44L TAP7 115' TO BUS 'FORBES 7 115' CKT	1	115	608	608
283	450			161	645	645
	obranch 65435 65434 1	TRIP LINE FROM BUS 'S1235 5 161' TO BUS 'S1234 5 161' CKT 1	1	161	645	645
	obranch 65431 65435 1	TRIP LINE FROM BUS 'S1231 5 161' TO BUS 'S1235 5 161' CKT 1	1	161	645	645
285	451			161	645	645
	obranch 65421 65431 1	OPEN BRANCH FROM BUS 'S1221 5 161' TO BUS 'S1231 5 161' CK	1	161	645	645
	obranch 65421 65455 1	OPEN BRANCH FROM BUS 'S1221 5 161' TO BUS 'S1255 5 161' CK	1	161	645	645
288	452			161	645	645
	obranch 65426 65451 1	OPEN BRANCH FROM BUS 'S1226 5 161' TO BUS 'S1251 5 161' CK	1	161	645	645
	obranch 65426 65498 1	OPEN BRANCH FROM BUS 'S1226 5 161' TO BUS 'S1298 5 161' CK	1	161	645	645
290	453			161	645	645
	obranch 65437 65453 1	OPEN BRANCH FROM BUS 'S1237 5 161' TO BUS 'S1253 5 161' CK	1	161	645	645
	obranch 65437 65453 1	OPEN BRANCH FROM BUS 'S1237 5 161' TO BUS 'S1253 5 161' CK	1	161	645	645
293	460			345	645	645

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 65351 65359 1	TRIP LINE FROM BUS 'S3451 3 345' TO BUS 'S3459 3 345' CKT 1	1	345	645	645
	obranch 65351 65354 1	TRIP LINE FROM BUS 'S3451 3 345' TO BUS 'S3454 3 345' CKT 1	1	345	645	645
295	461			161-69	645	645
	obranch 65410 65417 1	OPEN BRANCH FROM BUS 'S1210 5 161' TO BUS 'S1217 5 161' CK	1	161	645	645
	obranch 65384 65410 1	OPEN BRANCH FROM BUS 'S1210T7T 161' TO BUS 'S1210 5 161' C	1	161	645	645
	obranch 65384 65510 1	OPEN BRANCH FROM BUS 'S1210T7T 161' TO BUS 'S910 869.0' C	1	69-161	645	645
	obranch 65410 65422 1	OPEN BRANCH FROM BUS 'S1210 5 161' TO BUS 'S1222 5 161' CK	1	161	645	645
298	462			161-69	645	645
	obranch 65410 65422 1	OPEN BRANCH FROM BUS 'S1210 5 161' TO BUS 'S1222 5 161' CK	1	161	645	645
	obranch 65410 65417 1	OPEN BRANCH FROM BUS 'S1210 5 161' TO BUS 'S1217 5 161' CK	1	161	645	645
	obranch 65384 65510 1	OPEN BRANCH FROM BUS 'S1210T7T 161' TO BUS 'S910 869.0' C	1	69-161	645	645
	obranch 65384 65410 1	OPEN BRANCH FROM BUS 'S1210T7T 161' TO BUS 'S1210 5 161' C	1	161	645	645
300	463			161-69	645	645
	obranch 65387 65417 1	OPEN BRANCH FROM BUS 'S1217T1T 161' TO BUS 'S1217 5 161' C	1	161	645	645
	obranch 65417 65410 1	OPEN BRANCH FROM BUS 'S1217 5 161' TO BUS 'S1210 5 161' CK	1	161	645	645
	obranch 65387 65517 1	OPEN BRANCH FROM BUS 'S1217T1T 161' TO BUS 'S917 869.0' C	1	69-161	645	645
	obranch 65417 65427 1	OPEN BRANCH FROM BUS 'S1217 5 161' TO BUS 'S1227 5 161' CK	1	161	645	645
303	464			161-69	645	645
	obranch 65417 65427 1	OPEN BRANCH FROM BUS 'S1217 5 161' TO BUS 'S1227 5 161' CK	1	161	645	645
	obranch 65387 65517 1	OPEN BRANCH FROM BUS 'S1217T1T 161' TO BUS 'S917 869.0' C	1	69-161	645	645
	obranch 65387 65417 1	OPEN BRANCH FROM BUS 'S1217T1T 161' TO BUS 'S1217 5 161' C	1	161	645	645
	obranch 65417 65410 1	OPEN BRANCH FROM BUS 'S1217 5 161' TO BUS 'S1210 5 161' CK	1	161	645	645
305	465			161-69	645	645
	obranch 65421 65455 1	OPEN BRANCH FROM BUS 'S1221 5 161' TO BUS 'S1255 5 161' CK	1	161	645	645
	obranch 65388 65521 1	OPEN BRANCH FROM BUS 'S1221T9T 161' TO BUS 'S921 869.0' C	1	69-161	645	645
	obranch 65421 65431 1	OPEN BRANCH FROM BUS 'S1221 5 161' TO BUS 'S1231 5 161' CK	1	161	645	645
	obranch 65388 65421 1	OPEN BRANCH FROM BUS 'S1221T9T 161' TO BUS 'S1221 5 161' C	1	161	645	645
308	466			161-69	645	645
	obranch 65421 65455 1	OPEN BRANCH FROM BUS 'S1221 5 161' TO BUS 'S1255 5 161' CK	1	161	645	645
	obranch 65388 65421 1	OPEN BRANCH FROM BUS 'S1221T9T 161' TO BUS 'S1221 5 161' C	1	161	645	645
	obranch 65388 65521 1	OPEN BRANCH FROM BUS 'S1221T9T 161' TO BUS 'S921 869.0' C	1	69-161	645	645
	obranch 65421 65431 1	OPEN BRANCH FROM BUS 'S1221 5 161' TO BUS 'S1231 5 161' CK	1	161	645	645
310	467			161	645	645
	obranch 65481 65459 1	OPEN BRANCH FROM BUS 'S1281 5 161' TO BUS 'S1259 5 161' CK	1	161	645	645
	obranch 65481 65449 1	OPEN BRANCH FROM BUS 'S1281 5 161' TO BUS 'S1249 5 161' CK	1	161	645	645
313	46L			115	608	608-620
	obranch 62175 61650 1	TRIP LINE FROM BUS 'DEWING 7 115' TO BUS 'LITTLEF7 115' CKT	1	115	608	608-620
	obranch 61651 62175 1	TRIP LINE FROM BUS 'MUDLAKE7 115' TO BUS 'DEWING 7 115' CK	1	115	608	608-620
315	48L		1	115	608	608-620
	obranch 61640 62410 1	TRIP LINE FROM BUS 'BADOURA7 115' TO BUS 'PALMRLK7 115' C	1	115	608	608-620
318	500			69-230	618-652	619-654
	obranch 63050 62427 1	TRIP LINE FROM BUS 'WILLMAR4 230' TO BUS 'WILLMAR869.0' CK	1	69-230	618	619
	obranch 66550 63050 1	TRIP LINE FROM BUS 'GRANITF4 230' TO BUS 'WILLMAR4 230' CK	1	230	618-652	619-654
320	501 1				626	657
	obranch 66763 66787 1	TRIP LINE FROM BUS 'DRAYTO1913.8' TO BUS 'DRAYTO1T 230' CK	1	13.8-230	626	657
	obranch 66705 66787 1	TRIP LINE FROM BUS 'DRAYTON7 115' TO BUS 'DRAYTO1T 230' C	1	115-230	626	657
	obranch 66752 66787 1	TRIP LINE FROM BUS 'DRAYTON4 230' TO BUS 'DRAYTO1T 230' C	1	230	626	657
323	502 2				626	657
	obranch 66752 66788 1	TRIP LINE FROM BUS 'DRAYTON4 230' TO BUS 'DRAYTO2T 230' C	1	230	626	657
	obranch 66705 66788 1	TRIP LINE FROM BUS 'DRAYTON7 115' TO BUS 'DRAYTO2T 230' C	1	115-230	626	657
	obranch 66762 66788 1	TRIP LINE FROM BUS 'DRAYTO2913.8' TO BUS 'DRAYTO2T 230' CK	1	13.8-230	626	657
325	505			115	652	605-654
	obranch 60170 66508 1	TRIP LINE FROM BUS 'MARSHAL7 115' TO BUS 'S3 7 115' CKT 1	1	115	652	605-654

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 66551 66508 1	TRIP LINE FROM BUS 'GRANITF7 115' TO BUS 'S3 7 115' CKT 1	1	115	652	654
	obranch 66552 66508 1	TRIP LINE FROM BUS 'MARS ER7 115' TO BUS 'S3 7 115' CKT 1	1	115	652	654
328	510			230-115	652	655-654
	obranch 66554 66555 1	TRIP LINE FROM BUS 'MORRIS 4 230' TO BUS 'MORRIS 7 115' CKT	1	230-115	652	655
	obranch 66553 66554 1	TRIP LINE FROM BUS 'MOORHED4 230' TO BUS 'MORRIS 4 230' CK	1	230	652	655
	obranch 66550 66554 1	TRIP LINE FROM BUS 'GRANITF4 230' TO BUS 'MORRIS 4 230' CKT	1	230	652	654-655
330	515				626	
	obranch 63236 66717 1	TRIP LINE FROM BUS 'AUDUBON7 115' TO BUS 'ULRICH 7 115' CK	1	115	626	629-657
	obranch 66781 66773 1	TRIP LINE FROM BUS 'ULRICH T 115' TO BUS 'ULRICH 941.6' CKT 1	1	41.6-115	626	657
	obranch 66717 63237 1	TRIP LINE FROM BUS 'ULRICH 7 115' TO BUS 'MAHNOMN7 115' CK	1	115	626	626-657
	obranch 66717 66781 1	TRIP LINE FROM BUS 'ULRICH 7 115' TO BUS 'ULRICH T 115' CKT 1	1	115	626	657
	obranch 66781 67039 1	TRIP LINE FROM BUS 'ULRICH T 115' TO BUS 'ULRICH 869.0' CKT 1	1	69-115	626	657
	obranch 63237 63238 1	TRIP LINE FROM BUS 'MAHNOMN7 115' TO BUS 'WINGER 7 115' C	1	115	626	626
333	51L			115	608	608-620
	obranch 61653 62176 1	TRIP LINE FROM BUS 'RIVERTN7 115' TO BUS 'MERRFLD7 115' CK	1	115	608	608-620
	obranch 62176 61648 1	TRIP LINE FROM BUS 'MERRFLD7 115' TO BUS 'PEQUOT 7 115' CK	1	115	608	608-620
335	520 1				626-608	
	obranch 66710 66716 1	TRIP LINE FROM BUS 'NARY 7 115' TO BUS 'LAPORTE7 115' CKT	1	115	626	657
	obranch 63247 63197 1	TRIP LINE FROM BUS 'CASS LK7 115' TO BUS 'CASS LKY 115' CKT	1	115	626	626
	obranch 63248 63348 1	TRIP LINE FROM BUS 'CASS N 7 115' TO BUS 'NO PIPE94.20' CKT 1	1	115-4.2	626	626
	obranch 66716 61640 1	TRIP LINE FROM BUS 'LAPORTE7 115' TO BUS 'BADOURA7 115' C	1	115	608-626	608-657
	obranch 66710 63247 1	TRIP LINE FROM BUS 'NARY 7 115' TO BUS 'CASS LK7 115' CKT 1	1	115	626	626-657
	obranch 63247 63248 1	TRIP LINE FROM BUS 'CASS LK7 115' TO BUS 'CASS N 7 115' CKT	1	115	626	626
	obranch 63197 63347 1	TRIP LINE FROM BUS 'CASS LKY 115' TO BUS 'CASS LK869.0' CKT	1	69-115	626	626
	obranch 66710 63246 1	TRIP LINE FROM BUS 'NARY 7 115' TO BUS 'BEMIDJI7 115' CKT 1	1	115	626	626-657
	obranch 63247 63349 1	TRIP LINE FROM BUS 'CASS LK7 115' TO BUS 'CASSPIP94.20' CKT	1	115-4.2	626	626
338	520 2			115-4.2	626	626
	obranch 63247 63248 1	TRIP LINE FROM BUS 'CASS LK7 115' TO BUS 'CASS N 7 115' CKT	1	115	626	626
	obranch 63247 63349 1	TRIP LINE FROM BUS 'CASS LK7 115' TO BUS 'CASSPIP94.20' CKT	1	115-4.2	626	626
	obranch 63248 63348 1	TRIP LINE FROM BUS 'CASS N 7 115' TO BUS 'NO PIPE94.20' CKT 1	1	115-4.2	626	626
340	520 3			115-69	626	626
	obranch 63247 63197 1	TRIP LINE FROM BUS 'CASS LK7 115' TO BUS 'CASS LKY 115' CKT	1	115	626	626
	obranch 63197 63347 1	TRIP LINE FROM BUS 'CASS LKY 115' TO BUS 'CASS LK869.0' CKT	1	69-115	626	626
343	525 1			115	600	603
	obranch 60117 60132 1	TRIP LINE FROM BUS 'CHERRYC7 115' TO BUS 'WSX FLS7 115' CK	1	115	600	603
	obranch 60129 60132 1	TRIP LINE FROM BUS 'SPLT RK7 115' TO BUS 'WSX FLS7 115' CKT	1	115	600	603
345	530			69-115	600-652	601-605
	obranch 60119 60853 1	TRIP LINE FROM BUS 'LKYNKTN7 115' TO BUS 'LK YANK869.0' CKT	1	69-115	600	601
	obranch 60148 60171 1	TRIP LINE FROM BUS 'MINVALY7 115' TO BUS 'LYON CO7 115' CKT	1	115	600	601
	obranch 60119 60171 1	TRIP LINE FROM BUS 'LKYNKTN7 115' TO BUS 'LYON CO7 115' CK	1	115	600	601
	obranch 60170 60171 1	TRIP LINE FROM BUS 'MARSHAL7 115' TO BUS 'LYON CO7 115' CK	1	115	652-600	605-601
348	535 1			115	626	602-657
	obranch 60134 60135 1	TRIP LINE FROM BUS 'SHEYNNE7 115' TO BUS 'CASS CO7 115' CK	1	115	626	602
	obranch 66761 60135 1	TRIP LINE FROM BUS 'MODEROW7 115' TO BUS 'CASS CO7 115' C	1	115	626	602-657
	obranch 60135 60137 1	TRIP LINE FROM BUS 'CASS CO7 115' TO BUS 'REDRIVR7 115' CK	1	115	626	602
	obranch 66761 60134 1	TRIP LINE FROM BUS 'MODEROW7 115' TO BUS 'SHEYNNE7 115'	1	115	626	602-657
350	535 2			115	626	602-657
	obranch 60135 66761 1	TRIP LINE FROM BUS 'CASS CO7 115' TO BUS 'MODEROW7 115' C	1	115	626	602-657
	obranch 60135 60137 1	TRIP LINE FROM BUS 'CASS CO7 115' TO BUS 'REDRIVR7 115' CK	1	115	626	602
	obranch 66761 60134 1	TRIP LINE FROM BUS 'MODEROW7 115' TO BUS 'SHEYNNE7 115'	1	115	626	602-657
353	545			230-41.6	626	628-627
	obranch 63314 63325 1	TRIP LINE FROM BUS 'BIGSTON4 230' TO BUS 'BROWNSV4 230' C	1	230	626	628
	obranch 63325 63125 1	TRIP LINE FROM BUS 'BROWNSV4 230' TO BUS 'BROWNSV941.6'	1	230-41.6	626	628
	obranch 63325 63327 1	TRIP LINE FROM BUS 'BROWNSV4 230' TO BUS 'HANKSON4 230' C	1	230	626	628-627

No.	Contingency		Ckt	Base kV	Area	Zone
355	550			115	626-652	
	obranch 63219 63223 1	TRIP LINE FROM BUS 'GRANTCO7 115' TO BUS 'HOOT LK7 115' CK	1	115	626	629-626
	obranch 66555 63219 1	TRIP LINE FROM BUS 'MORRIS 7 115' TO BUS 'GRANTCO7 115' CK	1	115	626-652	629-655
358	550-B			41.6-115	626	665-629
	obranch 63221 67455 1	TRIP LINE FROM BUS 'BRANDN 7 115' TO BUS 'BRANDN 941.6' CK	1	41.6-115	626	665-629
	obranch 63219 63220 1	TRIP LINE FROM BUS 'GRANTCO7 115' TO BUS 'ELBOWLK7 115' C	1	115	626	629
	obranch 63220 63221 1	TRIP LINE FROM BUS 'ELBOWLK7 115' TO BUS 'BRANDN 7 115' CK	1	115	626	629
	obranch 63221 67452 1	TRIP LINE FROM BUS 'BRANDN 7 115' TO BUS 'ALEXSS 115' CKT	1	115	626	629-665
360	551			115	600-626	
	obranch 63222 60144 1	TRIP LINE FROM BUS 'ALEXAND7 115' TO BUS 'DGLASCO7 115' CK	1	115	600-626	601-626
	obranch 67452 63222 1	TRIP LINE FROM BUS 'ALEXSS 115' TO BUS 'ALEXAND7 115' CKT	1	115	626	626-665
363	552			115	626	665
	obranch 67453 67454 1	TRIP LINE FROM BUS 'ALEXSWM 115' TO BUS 'ALEXPLDM 115' CK	1	115	626	665
	obranch 67452 67453 1	TRIP LINE FROM BUS 'ALEXSS 115' TO BUS 'ALEXSWM 115' CKT	1	115	626	665
365	553			115	626	621
	obranch 62527 62531 1	TRIP LINE FROM BUS 'ELMO 7 115' TO BUS 'INMAN 7 115' CKT 1	1	115	626	621
	obranch 62527 62752 1	TRIP LINE FROM BUS 'ELMO 7 115' TO BUS 'MLTN TP7 115' CKT 1	1	115	626	621
368	560 1			115-4.2	626	626-657
	obranch 63243 63281 1	TRIP LINE FROM BUS 'SHEVLIN7 115' TO BUS 'WILT TAP 115' CKT	1	115	626	626
	obranch 66727 63244 1	TRIP LINE FROM BUS 'RICELKT7 115' TO BUS 'ITASCA 7 115' CKT	1	115	626	626-657
	obranch 63240 63340 1	TRIP LINE FROM BUS 'MN PIPE7 115' TO BUS 'MN PIPE94.20' CKT	1	115-4.2	626	626
	obranch 63239 63241 1	TRIP LINE FROM BUS 'BAGLEY 7 115' TO BUS 'CLEARBR7 115' CK	1	115	626	626
	obranch 63244 63344 1	TRIP LINE FROM BUS 'ITASCA 7 115' TO BUS 'ITASCA 94.20' CKT 1	1	115-4.2	626	626
	obranch 63243 66727 1	TRIP LINE FROM BUS 'SHEVLIN7 115' TO BUS 'RICELKT7 115' CKT	1	115	626	626-657
	obranch 66727 66729 1	TRIP LINE FROM BUS 'RICELKT7 115' TO BUS 'RICELAK7 115' CKT	1	115	626	657
	obranch 63239 63243 1	TRIP LINE FROM BUS 'BAGLEY 7 115' TO BUS 'SHEVLIN7 115' CKT	1	115	626	626
	obranch 63241 63242 1	TRIP LINE FROM BUS 'CLEARBR7 115' TO BUS 'CLBKPIP7 115' CKT	1	115	626	626
	obranch 63239 63238 1	TRIP LINE FROM BUS 'BAGLEY 7 115' TO BUS 'WINGER 7 115' CKT	1	115	626	626
	obranch 63241 63240 1	TRIP LINE FROM BUS 'CLEARBR7 115' TO BUS 'MN PIPE7 115' CKT	1	115	626	626
370	560 2			115-4.2	626	626
	obranch 63241 63240 1	TRIP LINE FROM BUS 'CLEARBR7 115' TO BUS 'MN PIPE7 115' CKT	1	115	626	626
	obranch 63240 63340 1	TRIP LINE FROM BUS 'MN PIPE7 115' TO BUS 'MN PIPE94.20' CKT	1	115-4.2	626	626
373	560 3		1	115	626	626
	obranch 63241 63242 1	TRIP LINE FROM BUS 'CLEARBR7 115' TO BUS 'CLBKPIP7 115' CKT	1	115	626	626
375	560 4			115-4.2	626	626-657
	obranch 66727 63244 1	TRIP LINE FROM BUS 'RICELKT7 115' TO BUS 'ITASCA 7 115' CKT	1	115	626	626-657
	obranch 63244 63344 1	TRIP LINE FROM BUS 'ITASCA 7 115' TO BUS 'ITASCA 94.20' CKT 1	1	115-4.2	626	626
378	565				626	626-657
	obranch 63245 66776 1	TRIP LINE FROM BUS 'WILTON 7 115' TO BUS 'WILTON T 115' CKT	1	115	626	626-657
	obranch 66776 63145 1	TRIP LINE FROM BUS 'WILTON T 115' TO BUS 'WILTON 941.6' CKT	1	41.6-115	626	626-657
	obranch 66776 66968 1	TRIP LINE FROM BUS 'WILTON T 115' TO BUS 'WILTON 869.0' CKT	1	69-115	626	657
	obranch 63281 63243 1	TRIP LINE FROM BUS 'WILT TAP 115' TO BUS 'SHEVLIN7 115' CKT	1	115	626	626
	obranch 63246 63245 1	TRIP LINE FROM BUS 'BEMIDJI7 115' TO BUS 'WILTON 7 115' CKT	1	115	626	626
380	570 1				626	626-657
	obranch 63255 63155 2	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'DONALDS941.6' C	2	115-41.6	626	626
	obranch 63255 66714 1	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'WARSAW 7 115' C	1	115	626	626-657
	obranch 63255 66718 1	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'HALMA 7 115' CKT	1	115	626	626-657
	obranch 63256 63356 2	TRIP LINE FROM BUS 'DONDPIP7 115' TO BUS 'DON PIP94.20' CKT	2	115-4.2	626	626
	obranch 63255 63155 1	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'DONALDS941.6' C	1	115-41.6	626	626
	obranch 63256 63356 1	TRIP LINE FROM BUS 'DONDPIP7 115' TO BUS 'DON PIP94.20' CKT	1	115-4.2	626	626
	obranch 63255 63256 1	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'DONDPIP7 115' CK	1	115	626	626
	obranch 66705 63255 1	TRIP LINE FROM BUS 'DRAYTON7 115' TO BUS 'DONALDS7 115' C	1	115	626	626-657
383	570 2			115-41.6	626	626
	obranch 63255 63155 1	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'DONALDS941.6' C	1	115-41.6	626	626

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 63255 63155 2	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'DONALDS941.6' C	2	115-41.6	626	626
385	575				626	657-626
	obranch 66718 66708 1	TRIP LINE FROM BUS 'HALMA 7 115' TO BUS 'KARLSTA7 115' CKT	1	115	626	657
	obranch 66785 63156 1	TRIP LINE FROM BUS 'KARLSTAT 115' TO BUS 'KARLSTD941.6' CK	1	41.6-115	626	626-657
	obranch 66785 66838 1	TRIP LINE FROM BUS 'KARLSTAT 115' TO BUS 'KARLSTA869.0' CK	1	69-115	626	657
	obranch 63254 63354 1	TRIP LINE FROM BUS 'VIKING 7 115' TO BUS 'VIK PIP94.20' CKT 1	1	115-4.2	626	626
	obranch 63255 66718 1	TRIP LINE FROM BUS 'DONALDS7 115' TO BUS 'HALMA 7 115' CKT	1	115	626	626-657
	obranch 66708 66785 1	TRIP LINE FROM BUS 'KARLSTA7 115' TO BUS 'KARLSTAT 115' CK	1	115	626	657
	obranch 66708 63254 1	TRIP LINE FROM BUS 'KARLSTA7 115' TO BUS 'VIKING 7 115' CKT	1	115	626	626-657
388	576			115-4.2	626	626-657
	obranch 63251 63252 1	TRIP LINE FROM BUS 'PLUMTAP7 115' TO BUS 'PLUMMER7 115' C	1	115	626	626
	obranch 66713 63253 1	TRIP LINE FROM BUS 'TRFALLS7 115' TO BUS 'PLUMPIP7 115' CKT	1	115	626	626-657
	obranch 63253 63353 1	TRIP LINE FROM BUS 'PLUMPIP7 115' TO BUS 'PLUMPIP94.20' CKT	1	115-4.2	626	626
	obranch 63253 63353 2	TRIP LINE FROM BUS 'PLUMPIP7 115' TO BUS 'PLUMPIP94.20' CKT	2	115-4.2	626	626
	obranch 63253 63251 1	TRIP LINE FROM BUS 'PLUMPIP7 115' TO BUS 'PLUMTAP7 115' CK	1	115	626	626
	obranch 63251 63238 1	TRIP LINE FROM BUS 'PLUMTAP7 115' TO BUS 'WINGER 7 115' CK	1	115	626	626
390	580 1				626	626-657
	obranch 63284 66724 1	TRIP LINE FROM BUS 'OSLO TN7 115' TO BUS 'ALVARAD7 115' CK	1	115	626	626-657
	obranch 66775 66774 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 913.2' C	1	13.2-115	626	657
	obranch 66775 66714 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 7 115' C	1	115	626	657
	obranch 66722 66714 1	TRIP LINE FROM BUS 'OSLO 7 115' TO BUS 'WARSAW 7 115' CKT	1	115	626	657
	obranch 66775 66834 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 869.0' C	1	69-115	626	657
	obranch 66724 66725 1	TRIP LINE FROM BUS 'ALVARAD7 115' TO BUS 'WARREN 7 115' CK	1	115	626	657
	obranch 66722 63284 1	TRIP LINE FROM BUS 'OSLO 7 115' TO BUS 'OSLO TN7 115' CKT 1	1	115	626	626-657
	obranch 66714 63255 1	TRIP LINE FROM BUS 'WARSAW 7 115' TO BUS 'DONALDS7 115' C	1	115	626	626-657
	obranch 66775 62875 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 869.0' C	1			
	obranch 66706 66722 1	TRIP LINE FROM BUS 'FALCONR7 115' TO BUS 'OSLO 7 115' CKT	1	115	626	657
393	580 2				626	657
	obranch 66775 66774 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 913.2' C	1	13.2-115	626	657
	obranch 66775 66714 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 7 115' C	1	115	626	657
	obranch 66775 66834 1	TRIP LINE FROM BUS 'WARSAW T 115' TO BUS 'WARSAW 869.0' C	1	69-115	626	657
395	580 3		1	115	626	657
	obranch 66723 66713 1	TRIP LINE FROM BUS 'GREENWD7 115' TO BUS 'TRFALLS7 115' C	1	115	626	657
398	585			115	626-652	
	obranch 66706 66722 1	TRIP LINE FROM BUS 'FALCONR7 115' TO BUS 'OSLO 7 115' CKT	1	115	626	657
	obranch 66443 66706 1	TRIP LINE FROM BUS 'GRNDFKS7 115' TO BUS 'FALCONR7 115' C	1	115	652-626	655-657
	obranch 66706 63249 1	TRIP LINE FROM BUS 'FALCONR7 115' TO BUS 'CRKSTON7 115' C	1	115	626	626-657
400	590			115-41.6	626	626-628
	obranch 63213 63212 1	TRIP LINE FROM BUS 'MARIETT7 115' TO BUS 'BURR 7 115' CKT 1	1	115	626	626
	obranch 63212 63210 1	TRIP LINE FROM BUS 'BURR 7 115' TO BUS 'TORONTO7 115' CKT	1	115	626	628-626
	obranch 63213 63113 1	TRIP LINE FROM BUS 'MARIETT7 115' TO BUS 'MARIETT941.6' CKT	1	115-41.6	626	626
	obranch 63212 63211 1	TRIP LINE FROM BUS 'BURR 7 115' TO BUS 'CANBY 7 115' CKT 1	1	115	626	626
	obranch 63214 63213 1	TRIP LINE FROM BUS 'BIGSTON7 115' TO BUS 'MARIETT7 115' CKT	1	115	626	626-628
403	595			115	626	628-626
	obranch 63215 63216 1	TRIP LINE FROM BUS 'HIWY12 7 115' TO BUS 'ORTONVL7 115' CKT	1	115	626	628-626
	obranch 63214 63215 1	TRIP LINE FROM BUS 'BIGSTON7 115' TO BUS 'HIWY12 7 115' CKT	1	115	626	628
405	600			115-41.6	626	626
	obranch 63250 63238 1	TRIP LINE FROM BUS 'FERTILE7 115' TO BUS 'WINGER 7 115' CKT	1	115	626	626
	obranch 63249 63250 1	TRIP LINE FROM BUS 'CRKSTON7 115' TO BUS 'FERTILE7 115' CK	1	115	626	626
	obranch 63250 63150 1	TRIP LINE FROM BUS 'FERTILE7 115' TO BUS 'FERTILE941.6' CKT	1	115-41.6	626	626
408	605			115-41.6	626	
	obranch 63233 63232 1	TRIP LINE FROM BUS 'EDGETAP7 115' TO BUS 'EDGETWN7 115' C	1	115	626	626
	obranch 62529 62530 1	TRIP LINE FROM BUS 'CMRTJCT7 115' TO BUS 'FRAZEE 7 115' CKT	1	115	626	621
	obranch 63236 62529 1	TRIP LINE FROM BUS 'AUDUBON7 115' TO BUS 'CMRTJCT7 115' C	1	115	626	621-629

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 62528 62533 1	TRIP LINE FROM BUS 'TAMARAC7 115' TO BUS 'CORMRNT7 115' C	1	115	626	621
	obranch 63234 62528 1	TRIP LINE FROM BUS 'PEL RPD7 115' TO BUS 'TAMARAC7 115' CK	1	115	626	621-626
	obranch 63223 63233 1	TRIP LINE FROM BUS 'HOOT LK7 115' TO BUS 'EDGETAP7 115' CK	1	115	626	626
	obranch 62528 63310 1	TRIP LINE FROM BUS 'TAMARAC7 115' TO BUS 'TAMARAC941.6' C	1	115-41.6	626	621-629
	obranch 62528 63310 2	TRIP LINE FROM BUS 'TAMARAC7 115' TO BUS 'TAMARAC941.6' C	2	115-41.6	626	621-629
	obranch 63233 63234 1	TRIP LINE FROM BUS 'EDGETAP7 115' TO BUS 'PEL RPD7 115' CK	1	115	626	626
410	610				626	
	obranch 63329 63191 1	TRIP LINE FROM BUS 'WAHPETN4 230' TO BUS 'WAHPET1Y 230' C	1	230	626	627-629
	obranch 63201 63229 1	TRIP LINE FROM BUS 'WAHPET2Y 230' TO BUS 'WAHPETN7 115' C	1	115-230	626	627-629
	obranch 63201 63129 1	TRIP LINE FROM BUS 'WAHPET2Y 230' TO BUS 'WAHPETN941.6' C	1	41.6-230	626	627-629
	obranch 63191 63129 1	TRIP LINE FROM BUS 'WAHPET1Y 230' TO BUS 'WAHPETN941.6' C	1	41.6-230	626	627-629
	obranch 63331 63329 1	TRIP LINE FROM BUS 'FERGSFL4 230' TO BUS 'WAHPETN4 230' C	1	230	626	627-626
	obranch 63329 63201 1	TRIP LINE FROM BUS 'WAHPETN4 230' TO BUS 'WAHPET2Y 230' C	1	230	626	627-629
	obranch 66754 63329 1	TRIP LINE FROM BUS 'MAPLE R4 230' TO BUS 'WAHPETN4 230' CK	1	230	626	627-657
	obranch 63327 63329 1	TRIP LINE FROM BUS 'HANKSON4 230' TO BUS 'WAHPETN4 230' C	1	230	626	627
	obranch 63191 63229 1	TRIP LINE FROM BUS 'WAHPET1Y 230' TO BUS 'WAHPETN7 115' C	1	115-230	626	627-629
413	615				608	608-620
	obranch 61610 61794 1	TRIP LINE FROM BUS 'BADOURA4 230' TO BUS 'BADOUJCT 115' C	1	230-115	608	608
	obranch 61610 63053 1	TRIP LINE FROM BUS 'BADOURA4 230' TO BUS 'HUBBARD4 230' C	1	230	608	608-620
	obranch 61794 61640 1	TRIP LINE FROM BUS 'BADOUJCT 115' TO BUS 'BADOURA7 115' C	1	115	608	608
	obranch 61610 61612 1	TRIP LINE FROM BUS 'BADOURA4 230' TO BUS 'RIVERTN4 230' CK	1	230	608	608
	obranch 61794 61795 1	TRIP LINE FROM BUS 'BADOUJCT 115' TO BUS 'BADOUTR913.8' C	1	115-13.8	608	608
415	616			115	608	608-620
	obranch 61673 62447 1	TRIP LINE FROM BUS 'ARROWHD7 115' TO BUS 'BERGNTP7 115' C	1	115	608	608-620
	obranch 61718 62454 1	TRIP LINE FROM BUS '16L TAP7 115' TO BUS 'PEARY 7 115' CKT 1	1	115	608	608-620
	obranch 61720 61718 1	TRIP LINE FROM BUS 'COTTNTP7 115' TO BUS '16L TAP7 115' CKT	1	115	608	608
	obranch 61720 62452 1	TRIP LINE FROM BUS 'COTTNTP7 115' TO BUS 'COTTON 7 115' CK	1	115	608	608-620
	obranch 61708 62454 1	TRIP LINE FROM BUS 'VIRGNIA7 115' TO BUS 'PEARY 7 115' CKT 1	1	115	608	608-620
	obranch 61718 61721 1	TRIP LINE FROM BUS '16L TAP7 115' TO BUS 'ETCO 7 115' CKT 1	1	115	608	608
	obranch 61720 62447 1	TRIP LINE FROM BUS 'COTTNTP7 115' TO BUS 'BERGNTP7 115' CK	1	115	608	608-620
	obranch 62446 62447 1	TRIP LINE FROM BUS 'BERGNLK7 115' TO BUS 'BERGNTP7 115' C	1	115	608	620
418	617			115	608	608-620
	obranch 62206 61646 1	TRIP LINE FROM BUS 'BAXTER 7 115' TO BUS 'DOGLKTP7 115' CK	1			
	obranch 61645 61646 1	TRIP LINE FROM BUS 'BAXTER 7 115' TO BUS 'DOGLKTP7 115' CK	1	115	608	608
	obranch 61644 61646 1	TRIP LINE FROM BUS 'DOGLAKE7 115' TO BUS 'DOGLKTP7 115' C	1	115	608	608
	obranch 62895 61646 1	TRIP LINE FROM BUS 'THMSTWN7 115' TO BUS 'DOGLKTP7 115' C	1	115	608	608-620
	obranch 61642 62895 1	TRIP LINE FROM BUS 'VERNDLE7 115' TO BUS 'THMSTWN7 115' C	1	115	608	608-620
420	620				608	608
	obranch 61576 61672 1	TRIP LINE FROM BUS 'HILTPJCT 115' TO BUS 'HILLTOP7 115' CKT	1	115	608	608
	obranch 61615 61614 1	TRIP LINE FROM BUS 'ARROWHD4 230' TO BUS '98L TAP4 230' CK	1	230	608	608
	obranch 61625 61614 1	TRIP LINE FROM BUS 'BLCKBRY4 230' TO BUS '98L TAP4 230' CKT	1	230	608	608
	obranch 61616 61576 1	TRIP LINE FROM BUS 'HILLTOP4 230' TO BUS 'HILTPJCT 115' CKT	1	230-115	608	608
	obranch 61616 61614 1	TRIP LINE FROM BUS 'HILLTOP4 230' TO BUS '98L TAP4 230' CKT 1	1	230	608	608
	obranch 61576 61577 1	TRIP LINE FROM BUS 'HILTPJCT 115' TO BUS 'HILTPTR913.8' CKT	1	115-13.8	608	608
423	625				608	608
	obranch 61558 61559 1	TRIP LINE FROM BUS 'MINT1JCT 115' TO BUS 'MINT1TR913.8' CKT	1	115-13.8	608	608
	obranch 61558 61710 1	TRIP LINE FROM BUS 'MINT1JCT 115' TO BUS 'MINNTAC7 115' CKT	1	115	608	608
	obranch 61623 61624 1	TRIP LINE FROM BUS 'MINNTAC4 230' TO BUS 'FORBES 4 230' CKT	1	230	608	608
	obranch 61623 61558 1	TRIP LINE FROM BUS 'MINNTAC4 230' TO BUS 'MINT1JCT 115' CKT	1	230-115	608	608
425	630			115	608	608
	obranch 61656 61664 1	TRIP LINE FROM BUS 'MAHTOWA7 115' TO BUS 'WRENSHL7 115'	1	115	608	608
	obranch 61664 61665 1	TRIP LINE FROM BUS 'WRENSHL7 115' TO BUS 'THOMSON7 115' C	1	115	608	608
	obranch 61655 61656 1	TRIP LINE FROM BUS 'CROMWLL7 115' TO BUS 'MAHTOWA7 115'	1	115	608	608
428	635			115	608	620-608
	obranch 62636 62637 1	TRIP LINE FROM BUS 'MCGREGR7 115' TO BUS 'KIMBRLY7 115' C	1	115	608	620

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 62637 62638 1	TRIP LINE FROM BUS 'KIMBRLY7 115' TO BUS 'AITKIN 7 115' CKT 1	1	115	608	620
	obranch 61654 62638 1	TRIP LINE FROM BUS 'AITKNMN7 115' TO BUS 'AITKIN 7 115' CKT 1	1	115	608	608-620
	obranch 61655 62636 1	TRIP LINE FROM BUS 'CROMWLL7 115' TO BUS 'MCGREGR7 115'	1	115	608	608-620
	obranch 61653 61654 1	TRIP LINE FROM BUS 'RIVERTN7 115' TO BUS 'AITKNMN7 115' CKT	1	115	608	608
430	640					
	obranch 63050 60356 C1	TRIP LINE FROM BUS 'WILLMAR4 230' TO BUS 'PAYNES 4 230' CKT	C1	230	600-618	601-619
	obranch 62425 62005 C1	TRIP LINE FROM BUS 'WILLMAR7 115' TO BUS 'KERKHOT7 115' CK	C1	115	626-618	621-619
	obranch 62425 62427 1	TRIP LINE FROM BUS 'WILLMAR7 115' TO BUS 'WILLMAR869.0' CK	1	69-115	618	619
433	650			115-69	600-618	601-619
	obranch 62090 60205 1	TRIP LINE FROM BUS 'PRKWOOD7 115' TO BUS 'CRKEDLK7 115' C	1	115	600-618	601-619
	obranch 62090 62132 1	TRIP LINE FROM BUS 'PRKWOOD7 115' TO BUS 'PRKWOOD869.0'	1	69-115	618	619
435	655			115-69	600-618	601-619
	obranch 62924 60206 1	TRIP LINE FROM BUS 'MEDINA 7 115' TO BUS 'CROWRVR7 115' CK	1	115	600-618	601-619
	obranch 62924 62951 1	TRIP LINE FROM BUS 'MEDINA 7 115' TO BUS 'MEDINA 869.0' CKT	1	69-115	618	619
438	660			230-69	618	619
	obranch 63043 63046 1	TRIP LINE FROM BUS 'ELK RIV4 230' TO BUS 'BUNKER 4 230' CKT	1	230	618	619
	obranch 63043 62134 2	TRIP LINE FROM BUS 'ELK RIV4 230' TO BUS 'ELKR14S869.0' CKT	2	69-230	618	619
440	665			230-69	600-618	601-619
	obranch 63043 60152 1	TRIP LINE FROM BUS 'ELK RIV4 230' TO BUS 'MNTCELO4 230' CKT	1	230	600-618	601-619
	obranch 63043 62134 1	TRIP LINE FROM BUS 'ELK RIV4 230' TO BUS 'ELKR14S869.0' CKT	1	69-230	618	619
443	670 1				600-618	601-619
	obranch 63031 60160 1	TRIP LINE FROM BUS 'BUNKER 3 345' TO BUS 'SHERCO 3 345' CK	1	345	600-618	601-619
	obranch 60160 60202 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 60160 60202 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 60202 61487 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID2Y 345' CK	1	345	600	601
	obranch 63031 60202 1	TRIP LINE FROM BUS 'BUNKER 3 345' TO BUS 'COON CK3 345' CK	1	345	600-618	601-619
	obranch 63031 60160 1	TRIP LINE FROM BUS 'BUNKER 3 345' TO BUS 'SHERCO 3 345' CK	1	345	600-618	601-619
	obranch 61487 60655 1	TRIP LINE FROM BUS 'CNCMID2Y 345' TO BUS 'CNCTER2934.5' CK	1	345-34.5	600	601
	obranch 63031 60202 1	TRIP LINE FROM BUS 'BUNKER 3 345' TO BUS 'COON CK3 345' CK	1	345	600-618	601-619
	obranch 63046 63031 1	TRIP LINE FROM BUS 'BUNKER 4 230' TO BUS 'BUNKER 3 345' CKT	1	345-230	618	619
	obranch 61487 60203 1	TRIP LINE FROM BUS 'CNCMID2Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
445	670 2			345-230	618-600	619-601
	obranch 63046 63031 1	TRIP LINE FROM BUS 'BUNKER 4 230' TO BUS 'BUNKER 3 345' CKT	1	345-230	618	619
	obranch 63031 60202 1	TRIP LINE FROM BUS 'BUNKER 3 345' TO BUS 'COON CK3 345' CK	1	345	600-618	601-619
	obranch 63031 60160 1	TRIP LINE FROM BUS 'BUNKER 3 345' TO BUS 'SHERCO 3 345' CK	1	345	600-618	601-619
448	670 3				600	601
	obranch 60202 61487 1	TRIP LINE FROM BUS 'COON CK3 345' TO BUS 'CNCMID2Y 345' CK	1	345	600	601
	obranch 61487 60203 1	TRIP LINE FROM BUS 'CNCMID2Y 345' TO BUS 'COON CK7 115' CK	1	345-115	600	601
	obranch 60160 60202 1	TRIP LINE FROM BUS 'SHERCO 3 345' TO BUS 'COON CK3 345' CK	1	345	600	601
	obranch 61487 60655 1	TRIP LINE FROM BUS 'CNCMID2Y 345' TO BUS 'CNCTER2934.5' CK	1	345-34.5	600	601
450	675			345-230	600	601-622
	obranch 60142 60160 1	TRIP LINE FROM BUS 'BENTON 3 345' TO BUS 'SHERCO 3 345' CK	1	345	600	601
	obranch 63045 60142 1	TRIP LINE FROM BUS 'BENTON 4 230' TO BUS 'BENTON 3 345' CKT	1	345-230	600	601-622
	obranch 63045 60142 2	TRIP LINE FROM BUS 'BENTON 4 230' TO BUS 'BENTON 3 345' CKT	2	345-230	600	601-622
453	680				600-618	
	obranch 63045 60143 P2	TRIP LINE FROM BUS 'BENTON 4 230' TO BUS 'BENTON 7 115' CKT	P2	115-230	600	601-622
	obranch 63045 62297 1	TRIP LINE FROM BUS 'BENTON 4 230' TO BUS 'BENTON 869.0' CKT	1	69-230	618-600	619-622
455	685			69-115	618-608	
	obranch 61655 62470 1	TRIP LINE FROM BUS 'CROMWLL7 115' TO BUS 'CROMWLL869.0' C	1	69-115	618-608	619-608
	obranch 61655 62636 1	TRIP LINE FROM BUS 'CROMWLL7 115' TO BUS 'MCGREGR7 115'	1	115	608	608-620
	obranch 61655 61656 1	TRIP LINE FROM BUS 'CROMWLL7 115' TO BUS 'MAHTOWA7 115'	1	115	608	608
458	690			115		
	obranch 62425 62005 C1	TRIP LINE FROM BUS 'WILLMAR7 115' TO BUS 'KERKHOT7 115' CK	C1	115	626-618	621-619
	obranch 62006 62001 1	TRIP LINE FROM BUS 'KERKHO 7 115' TO BUS 'BENSON 7 115' CK	1	115	626	621

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 60357 62005 1	TRIP LINE FROM BUS 'MAYNARD7 115' TO BUS 'KERKHOT7 115' C	1	115	600-626	601-621
	obranch 62005 62006 1	TRIP LINE FROM BUS 'KERKHOT7 115' TO BUS 'KERKHO 7 115' CK	1	115	626	621
460	695			115	600-618	601-619
	obranch 60153 60155 1	TRIP LINE FROM BUS 'MNTCELO7 115' TO BUS 'PULASKI7 115' CK	1	115	600	601
	obranch 62925 62926 1	TRIP LINE FROM BUS 'DICKNSN7 115' TO BUS 'DCKSNSS7 115' CK	1	115	618	619
	obranch 62926 60155 1	TRIP LINE FROM BUS 'DCKSNSS7 115' TO BUS 'PULASKI7 115' CK	1	115	600-618	601-619
463	700 1			345	600	601
	obranch 60217 60236 1	TRIP LINE FROM BUS 'INVRHLS3 345' TO BUS 'REDROCK3 345' CK	1	345	600	601
	obranch 60192 60217 1	TRIP LINE FROM BUS 'BLUE LK3 345' TO BUS 'INVRHLS3 345' CKT	1	345	600	601
	obranch 60105 60192 1	TRIP LINE FROM BUS 'PR ISLD3 345' TO BUS 'BLUE LK3 345' CKT 1	1	345	600	601
465	700 2			345	600	601
	obranch 60192 60217 1	TRIP LINE FROM BUS 'BLUE LK3 345' TO BUS 'INVRHLS3 345' CKT	1	345	600	601
	obranch 60217 60236 1	TRIP LINE FROM BUS 'INVRHLS3 345' TO BUS 'REDROCK3 345' CK	1	345	600	601
468	705 1			345-115	600	601
	obranch 60192 60233 1	TRIP LINE FROM BUS 'BLUE LK3 345' TO BUS 'PARKERS3 345' CKT	1	345	600	601
	obranch 60192 60262 1	TRIP LINE FROM BUS 'BLUE LK3 345' TO BUS 'EDEN PR3 345' CKT	1	345	600	601
	obranch 60262 60263 1	TRIP LINE FROM BUS 'EDEN PR3 345' TO BUS 'EDEN PR7 115' CKT	1	115-345	600	601
470	705 2			115-345	600	601
	obranch 60262 60263 2	TRIP LINE FROM BUS 'EDEN PR3 345' TO BUS 'EDEN PR7 115' CKT	2	115-345	600	601
	obranch 60192 60233 1	TRIP LINE FROM BUS 'BLUE LK3 345' TO BUS 'PARKERS3 345' CKT	1	345	600	601
	obranch 60233 60262 1	TRIP LINE FROM BUS 'PARKERS3 345' TO BUS 'EDEN PR3 345' CK	1	345	600	601
473	705 3			115-345	600	601
	obranch 60262 60263 1	TRIP LINE FROM BUS 'EDEN PR3 345' TO BUS 'EDEN PR7 115' CKT	1	115-345	600	601
	obranch 60192 60262 1	TRIP LINE FROM BUS 'BLUE LK3 345' TO BUS 'EDEN PR3 345' CKT	1	345	600	601
475	705 4			115-345	600	601
	obranch 60262 60263 2	TRIP LINE FROM BUS 'EDEN PR3 345' TO BUS 'EDEN PR7 115' CKT	2	115-345	600	601
	obranch 60233 60262 1	TRIP LINE FROM BUS 'PARKERS3 345' TO BUS 'EDEN PR3 345' CK	1	345	600	601
478	710 1			69-115	600-618	
	obranch 62667 63021 1	TRIP LINE FROM BUS 'ST BONI7 115' TO BUS 'ST BONI869.0' CKT 1	1	69-115	600	622
	obranch 62925 62667 1	TRIP LINE FROM BUS 'DICKNSN7 115' TO BUS 'ST BONI7 115' CKT	1	115	600-618	622-619
	obranch 62667 60277 1	TRIP LINE FROM BUS 'ST BONI7 115' TO BUS 'WWACNIA7 115' CK	1	115	600	601-622
480	710 2			115-69	600-618	
	obranch 62667 60277 1	TRIP LINE FROM BUS 'ST BONI7 115' TO BUS 'WWACNIA7 115' CK	1	115	600	601-622
	obranch 62925 60206 1	TRIP LINE FROM BUS 'DICKNSN7 115' TO BUS 'CROWRVR7 115' C	1	115	600-618	601-619
	obranch 62925 62667 1	TRIP LINE FROM BUS 'DICKNSN7 115' TO BUS 'ST BONI7 115' CKT	1	115	600-618	622-619
	obranch 62667 63021 1	TRIP LINE FROM BUS 'ST BONI7 115' TO BUS 'ST BONI869.0' CKT 1	1	69-115	600	622
483	715 1			115-69	600-618	
	obranch 62975 60244 1	TRIP LINE FROM BUS 62975 TO BUS 60244 CKT 1	1	115	600-618	601-624
	obranch 60242 62668 1	TRIP LINE FROM BUS 60242 TO BUS 62668 CKT 1	1	115	600	601-622
	obranch 62668 62975 1	TRIP LINE FROM BUS 62668 TO BUS 62975 CKT 1	1	115	600-618	622-624
	obranch 62666 62672 2	TRIP LINE FROM BUS 62666 TO BUS 62672 CKT 2	2	69-115	600	622
	obranch 60200 62666 1	TRIP LINE FROM BUS 60200 TO BUS 62666 CKT 1	1	115	600	601-622
	obranch 60190 60242 1	TRIP LINE FROM BUS 60190 TO BUS 60242 CKT 1	1	115	600	601
	obranch 60244 60890 2	TRIP LINE FROM BUS 60244 TO BUS 60890 CKT 2	2	115-69	600	601
485	715 2			115-69	600-618	
	obranch 62975 60244 1	TRIP LINE FROM BUS 62975 TO BUS 60244 CKT 1	1	115	600-618	601-624
	obranch 60244 60890 2	TRIP LINE FROM BUS 60244 TO BUS 60890 CKT 2	2	115-69	600	601
	obranch 60243 60244 1	TRIP LINE FROM BUS 60243 TO BUS 60244 CKT 1	1	115	600	601
	obranch 60194 60931 1	TRIP LINE FROM BUS 60194 TO BUS 60931 CKT 1	1	69-115	600	601
	obranch 60190 60242 1	TRIP LINE FROM BUS 60190 TO BUS 60242 CKT 1	1	115	600	601
	obranch 62666 60243 1	TRIP LINE FROM BUS 62666 TO BUS 60243 CKT 1	1	115	600	601-622
	obranch 62666 62672 1	TRIP LINE FROM BUS 62666 TO BUS 62672 CKT 1	1	69-115	600	622
	obranch 60242 62668 1	TRIP LINE FROM BUS 60242 TO BUS 62668 CKT 1	1	115	600	601-622
	obranch 60243 60194 1	TRIP LINE FROM BUS 60243 TO BUS 60194 CKT 1	1	115	600	601

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 62668 62975 1	TRIP LINE FROM BUS 62668 TO BUS 62975 CKT 1	1	115	600-618	622-624
488	715 3			115-69	600	601-622
	obranch 60200 62666 1	TRIP LINE FROM BUS 60200 TO BUS 62666 CKT 1	1	115	600	601-622
	obranch 62666 62672 2	TRIP LINE FROM BUS 62666 TO BUS 62672 CKT 2	2	69-115	600	622
490	715 4			115-69	600	601-622
	obranch 60243 60194 1	TRIP LINE FROM BUS 60243 TO BUS 60194 CKT 1	1	115	600	601
	obranch 60194 60931 1	TRIP LINE FROM BUS 60194 TO BUS 60931 CKT 1	1	69-115	600	601
	obranch 62666 60243 1	TRIP LINE FROM BUS 62666 TO BUS 60243 CKT 1	1	115	600	601-622
	obranch 62666 62672 1	TRIP LINE FROM BUS 62666 TO BUS 62672 CKT 1	1	69-115	600	622
	obranch 60243 60194 1	TRIP LINE FROM BUS 60243 TO BUS 60194 CKT 1	1	115	600	601
493	715 5			115-69	600-618	
	obranch 60242 62668 1	TRIP LINE FROM BUS 'SAVAGE 7 115' TO BUS 'EGLCKTP7 115' CK	1	115	600	601-622
	obranch 62975 60244 1	TRIP LINE FROM BUS 'SHAKOPE7 115' TO BUS 'SCOTTCO7 115' C	1	115	600-618	601-624
	obranch 62668 62975 1	TRIP LINE FROM BUS 'EGLCKTP7 115' TO BUS 'SHAKOPE7 115' CK	1	115	600-618	622-624
	obranch 60190 60242 1	TRIP LINE FROM BUS 'BLK DOG7 115' TO BUS 'SAVAGE 7 115' CKT	1	115	600	601
	obranch 60244 60890 2	TRIP LINE FROM BUS 'SCOTTCO7 115' TO BUS 'SCOTTCO869.0' C	2	115-69	600	601
495	71L			115	608	608
	obranch 61673 61687 1	TRIP LINE FROM BUS 'ARROWHD7 115' TO BUS 'MIDWAY 7 115' C	1	115	608	608
	obranch 61687 61686 1	TRIP LINE FROM BUS 'MIDWAY 7 115' TO BUS '15TH AV7 115' CKT	1	115	608	608
498	720 1			115	600-618	601-619
	obranch 62924 60211 1	TRIP LINE FROM BUS 'MEDINA 7 115' TO BUS 'GLESNLK7 115' CKT	1	115	600-618	601-619
	obranch 60211 60234 2	TRIP LINE FROM BUS 'GLESNLK7 115' TO BUS 'PARKERS7 115' CK	2	115	600	601
	obranch 60211 60234 1	TRIP LINE FROM BUS 'GLESNLK7 115' TO BUS 'PARKERS7 115' CK	1	115	600	601
500	720 2			115	600-618	601-619
	obranch 62924 60211 1	TRIP LINE FROM BUS 'MEDINA 7 115' TO BUS 'GLESNLK7 115' CKT	1	115	600-618	601-619
	obranch 60211 60234 1	TRIP LINE FROM BUS 'GLESNLK7 115' TO BUS 'PARKERS7 115' CK	1	115	600	601
503	725			230-69	618	619
	obranch 63040 63048 1	TRIP LINE FROM BUS 'BLAINE 4 230' TO BUS 'RUSH CY4 230' CKT	1	230	618	619
	obranch 63040 62128 1	TRIP LINE FROM BUS 'BLAINE 4 230' TO BUS 'BLAINE 869.0' CKT 1	1	69-230	618	619
	obranch 63040 63046 1	TRIP LINE FROM BUS 'BLAINE 4 230' TO BUS 'BUNKER 4 230' CKT	1	230	618	619
505	726L		1	118	608	608
	obranch 61784 61752 1	TRIP LINE FROM BUS 'INTPHAS7 118' TO BUS 'I.FALLS7 118' CKT 1	1	118	608	608
508	735 1			115	600	604-680
	obranch 60303 69120 1	TRIP LINE FROM BUS 'LUGERV 7 115' TO BUS 'CRANDPC 115' CK	1	115	600	604-680
	obranch 60283 60298 1	TRIP LINE FROM BUS 'S109 7 115' TO BUS 'PARKFLS7 115' CKT 1	1	115	600	604
	obranch 69120 60340 1	TRIP LINE FROM BUS 'CRANDPC 115' TO BUS 'PHILIPS7 115' CKT	1	115	600	604-680
	obranch 69108 60301 1	TRIP LINE FROM BUS 'PHILDPC 115' TO BUS 'PRENTCE7 115' CKT	1	115	600	604-680
	obranch 60297 60283 1	TRIP LINE FROM BUS 'OSPREY 7 115' TO BUS 'S109 7 115' CKT 1	1	115	600	604
	obranch 60298 60303 1	TRIP LINE FROM BUS 'PARKFLS7 115' TO BUS 'LUGERV 7 115' CKT	1	115	600	604
	obranch 60340 69108 1	TRIP LINE FROM BUS 'PHILIPS7 115' TO BUS 'PHILDPC 115' CKT 1	1	115	600	604-680
510	735 2			115	600	604
	obranch 60297 60283 1	TRIP LINE FROM BUS 'OSPREY 7 115' TO BUS 'S109 7 115' CKT 1	1	115	600	604
	obranch 60283 60298 1	TRIP LINE FROM BUS 'S109 7 115' TO BUS 'PARKFLS7 115' CKT 1	1	115	600	604
513	735 3			115	600	604-680
	obranch 60298 60303 1	TRIP LINE FROM BUS 'PARKFLS7 115' TO BUS 'LUGERV 7 115' CKT	1	115	600	604
	obranch 69120 60340 1	TRIP LINE FROM BUS 'CRANDPC 115' TO BUS 'PHILIPS7 115' CKT	1	115	600	604-680
	obranch 60303 69120 1	TRIP LINE FROM BUS 'LUGERV 7 115' TO BUS 'CRANDPC 115' CK	1	115	600	604-680
	obranch 69108 60301 1	TRIP LINE FROM BUS 'PHILDPC 115' TO BUS 'PRENTCE7 115' CKT	1	115	600	604-680
	obranch 60340 69108 1	TRIP LINE FROM BUS 'PHILIPS7 115' TO BUS 'PHILDPC 115' CKT 1	1	115	600	604-680
515	740 1			161-115	600	601-622
	obranch 60106 63071 1	TRIP LINE FROM BUS 'PR ISLD5 161' TO BUS 'SPRNGCK5 161' CKT	1	161	600	601-622
	obranch 60103 60104 1	TRIP LINE FROM BUS 'CANNFLS5 161' TO BUS 'CANNFLS7 115' CK	1	115-161	600	601
	obranch 60103 63071 1	TRIP LINE FROM BUS 'CANNFLS5 161' TO BUS 'SPRNGCK5 161' C	1	161	600	601-622

No.	Contingency		Ckt	Base kV	Area	Zone
518	740 2			161-115	600	601-622
	obranch 60103 63071 1	TRIP LINE FROM BUS 'CANNFLS5 161' TO BUS 'SPRNGCK5 161' C	1	161	600	601-622
	obranch 60103 60104 1	TRIP LINE FROM BUS 'CANNFLS5 161' TO BUS 'CANNFLS7 115' CK	1	115-161	600	601
520	745			115-34.5	600	601-622
	obranch 60162 62616 1	TRIP LINE FROM BUS 'WAKEFLD7 115' TO BUS 'BIGSWAN7 115' C	1	115	600	601-622
	obranch 60156 60162 C1	TRIP LINE FROM BUS 'PYNSVIL7 115' TO BUS 'WAKEFLD7 115' CK	C1	115	600	601
	obranch 60162 60706 2	TRIP LINE FROM BUS 'WAKEFLD7 115' TO BUS 'WAKEFLD934.5' C	2	34.5-115	600	601
523	750			69-115	600-608	
	obranch 60144 60749 1	TRIP LINE FROM BUS 'DGLASCO7 115' TO BUS 'DGLAS C869.0' CK	1	69-115	600	601
	obranch 62817 60144 1	TRIP LINE FROM BUS 'LSAUKTP7 115' TO BUS 'DGLASCO7 115' CK	1	115	600	601-622
	obranch 61647 62817 1	TRIP LINE FROM BUS 'LONG PR7 115' TO BUS 'LSAUKTP7 115' CK	1	115	608-600	608-622
525	755			115	600	601-622
	obranch 60166 60153 1	TRIP LINE FROM BUS 'SALIDA 7 115' TO BUS 'MNTCELO7 115' CKT	1	115	600	601
	obranch 60166 60158 1	TRIP LINE FROM BUS 'SALIDA 7 115' TO BUS 'STCLTP 7 115' CKT 1	1	115	600	601
	obranch 60157 60158 1	TRIP LINE FROM BUS 'STCLOUD7 115' TO BUS 'STCLTP 7 115' CKT	1	115	600	601
	obranch 62815 60158 1	TRIP LINE FROM BUS 'I94PARK7 115' TO BUS 'STCLTP 7 115' CKT	1	115	600	601-622
528	756			115	600	601-622
	obranch 60162 60159 1	TRIP LINE FROM BUS 'WAKEFLD7 115' TO BUS 'STCTPW 7 115' CK	1	115	600	601
	obranch 62815 62816 1	TRIP LINE FROM BUS 'I94PARK7 115' TO BUS 'STAUGST7 115' CKT	1	115	600	622
	obranch 62816 60159 1	TRIP LINE FROM BUS 'STAUGST7 115' TO BUS 'STCTPW 7 115' CK	1	115	600	601-622
	obranch 60157 60159 1	TRIP LINE FROM BUS 'STCLOUD7 115' TO BUS 'STCTPW 7 115' CK	1	115	600	601
530	760			345	600	601
	obranch 60105 60236 1	TRIP LINE FROM BUS 'PR ISLD3 345' TO BUS 'REDROCK3 345' CKT	1	345	600	601
	obranch 60105 60236 2	TRIP LINE FROM BUS 'PR ISLD3 345' TO BUS 'REDROCK3 345' CKT	2	345	600	601
533	761L		1	115	608	608
	obranch 61684 61632 1	TRIP LINE FROM BUS 'STIN-WI7 115' TO BUS 'DAHLBRG7 115' CKT	1	115	608	608
535	762L			161	600-608	604-608
	obranch 61631 60290 1	TRIP LINE FROM BUS 'MINONG 5 161' TO BUS 'ST LAKE5 161' CKT	1	161	600-608	604-608
	obranch 61630 61631 1	TRIP LINE FROM BUS 'STINSON5 161' TO BUS 'MINONG 5 161' CKT	1	161	608	608
538	765			230-345	600-618	601-619
	obranch 60361 63048 1	TRIP LINE FROM BUS 'ROCKCR 4 230' TO BUS 'RUSH CY4 230' CK	1	230	600-618	601-619
	obranch 60236 60237 1	TRIP LINE FROM BUS 'REDROCK3 345' TO BUS 'REDROCK4 230' C	1	345-230	600	601
	obranch 63048 60237 1	TRIP LINE FROM BUS 'RUSH CY4 230' TO BUS 'REDROCK4 230' CK	1	230	600-618	601-619
540	770			161-115	600-331	601-393
	obranch 60109 60120 1	TRIP LINE FROM BUS 'WILMART5 161' TO BUS 'BLUEETA5 161' CK	1	161	600	601
	obranch 60120 34009 1	TRIP LINE FROM BUS 'BLUEETA5 161' TO BUS 'WINBAGO5 161' CK	1	161	331-600	393-601
	obranch 60109 60110 1	TRIP LINE FROM BUS 'WILMART5 161' TO BUS 'WILMART7 115' CK	1	115-161	600	601
543	775			115	600-608	
	obranch 60165 60163 1	TRIP LINE FROM BUS 'MEI INT7 115' TO BUS 'WST CLD7 115' CKT	1	115	600	601
	obranch 60165 60164 1	TRIP LINE FROM BUS 'MEI INT7 115' TO BUS 'XRDS 7 115' CKT 1	1	115	600	601
	obranch 62819 60163 1	TRIP LINE FROM BUS 'FSCHRHL7 115' TO BUS 'WST CLD7 115' CK	1	115	600	601-622
	obranch 60154 60163 1	TRIP LINE FROM BUS 'SAUK RV7 115' TO BUS 'WST CLD7 115' CKT	1	115	600	601
	obranch 61650 62819 1	TRIP LINE FROM BUS 'LITTLEF7 115' TO BUS 'FSCHRHL7 115' CKT	1	115	608-600	608-622
	obranch 60154 60157 1	TRIP LINE FROM BUS 'SAUK RV7 115' TO BUS 'STCLOUD7 115' CK	1	115	600	601
	obranch 60146 60164 1	TRIP LINE FROM BUS 'GRANCTY7 115' TO BUS 'XRDS 7 115' CKT	1	115	600	601
545	780			115	600	601
	obranch 60146 60161 1	TRIP LINE FROM BUS 'GRANCTY7 115' TO BUS 'STREGIS7 115' CK	1	115	600	601
	obranch 60143 60348 1	TRIP LINE FROM BUS 'BENTON 7 115' TO BUS 'BENCTP7 115' CKT	1	115	600	601
	obranch 60348 60143 1	TRIP LINE FROM BUS 'BENCTP7 115' TO BUS 'BENTON 7 115' CKT	1	115	600	601
	obranch 60143 60146 1	TRIP LINE FROM BUS 'BENTON 7 115' TO BUS 'GRANCTY7 115' CK	1	115	600	601
548	785				331-600	
	obranch 34003 34004 1	TRIP LINE FROM BUS 'MAGNLIA5 161' TO BUS 'ELK 5 161' CKT 1	1	161	331	393
	obranch 34005 34225 1	TRIP LINE FROM BUS 'HRN LK 5 161' TO BUS 'HERONLK869.0' CKT	1	69-161	331	394-393
	obranch 34004 34005 1	TRIP LINE FROM BUS 'ELK 5 161' TO BUS 'HRN LK 5 161' CKT 1	1	161	331	393

No.	Contingency	Ckt	Base kV	Area	Zone
	obranch 60128 34003 1 TRIP LINE FROM BUS 'SPLT RK5 161' TO BUS 'MAGNLIA5 161' CKT	1	161	331-600	393-603
	obranch 60129 60128 1 TRIP LINE FROM BUS 'SPLT RK7 115' TO BUS 'SPLT RK5 161' CKT	1	115-161	600	603
550	78L		115	608	608
	obranch 61730 61728 1 TRIP LINE FROM BUS '78L TAP7 115' TO BUS 'HIBBTAC7 115' CKT	1	115	608	608
	obranch 61730 61733 1 TRIP LINE FROM BUS '78L TAP7 115' TO BUS 'NATIONL7 115' CKT	1	115	608	608
	obranch 61730 61722 1 TRIP LINE FROM BUS '78L TAP7 115' TO BUS 'FORBES 7 115' CKT	1	115	608	608
553	790		115-230	600-652	601-654
	obranch 60147 60148 1 TRIP LINE FROM BUS 'MINVALY4 230' TO BUS 'MINVALY7 115' CKT	1	115-230	600	601
	obranch 66550 60147 1 TRIP LINE FROM BUS 'GRANITF4 230' TO BUS 'MINVALY4 230' CKT	1	230	600-652	601-654
555	795			600-652	
	obranch 60148 60149 C1 TRIP LINE FROM BUS 'MINVALY7 115' TO BUS 'MINVALT4 230' CKT	C1	115-230	600	601
	obranch 60149 60150 1 TRIP LINE FROM BUS 'MINVALT4 230' TO BUS 'MNVLTAP4 230' CK	1	230	600	601
	obranch 60150 63054 1 TRIP LINE FROM BUS 'MNVLTAP4 230' TO BUS 'PANTHER4 230' CK	1	230	600	601-622
	obranch 66550 60150 1 TRIP LINE FROM BUS 'GRANITF4 230' TO BUS 'MNVLTAP4 230' CK	1	230	600-652	601-654
	obranch 63054 60742 1 TRIP LINE FROM BUS 'PANTHER4 230' TO BUS 'PANTHER869.0' CK	1	69-230	600	601-622
558	800 1			626	626-657
	obranch 63186 63343 1 TRIP LINE FROM BUS 'WILTON Y 230' TO BUS 'WILTON1913.8' CKT	1	13.8-230	626	626
	obranch 63345 63186 1 TRIP LINE FROM BUS 'WILTON 4 230' TO BUS 'WILTON Y 230' CKT	1	230	626	626
	obranch 63186 63245 1 TRIP LINE FROM BUS 'WILTON Y 230' TO BUS 'WILTON 7 115' CKT	1	115-230	626	626
	obranch 66758 63345 1 TRIP LINE FROM BUS 'WINGER 4 230' TO BUS 'WILTON 4 230' CKT	1	230	626	626-657
560	805		115	600	601
	obranch 60224 60176 1 TRIP LINE FROM BUS 'LONG LK7 115' TO BUS 'BAYTOWN7 115' CK	1	115	600	601
	obranch 60222 60224 1 TRIP LINE FROM BUS 'KOLMNLK7 115' TO BUS 'LONG LK7 115' CK	1	115	600	601
	obranch 60187 60176 1 TRIP LINE FROM BUS 'AS KING7 115' TO BUS 'BAYTOWN7 115' CK	1	115	600	601
563	810		230-115	600-618	601-624
	obranch 60189 60190 C1 TRIP LINE FROM BUS 'BLK DOG4 230' TO BUS 'BLK DOG7 115' CKT	C1	230-115	600	601
	obranch 60189 62980 1 TRIP LINE FROM BUS 'BLK DOG4 230' TO BUS 'MCLEOD 4 230' CK	1	230	600-618	601-624
565	811		115	600	601-622
	obranch 60107 62865 1 TRIP LINE FROM BUS 'W FARIB7 115' TO BUS 'AIRTECH7 115' CKT	1	115	600	601-622
	obranch 62865 62234 1 TRIP LINE FROM BUS 'AIRTECH7 115' TO BUS 'LKMARN 7 115' CKT	1	115	600	622
568	815		115	600	601-622
	obranch 62226 60343 1 TRIP LINE FROM BUS 'FISCHER7 115' TO BUS 'WILLPIP7 115' CKT	1	115	600	601-622
	obranch 60343 62228 1 TRIP LINE FROM BUS 'WILLPIP7 115' TO BUS 'APPVLTW7 115' CKT	1	115	600	601-622
	obranch 62225 62226 1 TRIP LINE FROM BUS 'BURNVIL7 115' TO BUS 'FISCHER7 115' CKT	1	115	600	622
	obranch 62228 62227 1 TRIP LINE FROM BUS 'APPVLTW7 115' TO BUS 'JOHNCAK7 115' C	1	115	600	622
570	820		115	600	601
	obranch 60218 60271 1 TRIP LINE FROM BUS 'INVRHLS7 115' TO BUS 'RICHVLY7 115' CKT	1	115	600	601
	obranch 60247 60201 1 TRIP LINE FROM BUS 'LINDETP7 115' TO BUS 'CHEMOLT7 115' CK	1	115	600	601
	obranch 60271 60247 1 TRIP LINE FROM BUS 'RICHVLY7 115' TO BUS 'LINDETP7 115' CKT	1	115	600	601
573	825		345-161	331-600	
	obranch 60102 34018 1 TRIP LINE FROM BUS 'ADAMS 3 345' TO BUS 'HAZLTON3 345' CKT	1	345	331-600	393-601
	obranch 63032 60102 1 TRIP LINE FROM BUS 'PL VLLY3 345' TO BUS 'ADAMS 3 345' CKT 1	1	345	600	601-622
	obranch 60102 34014 1 TRIP LINE FROM BUS 'ADAMS 3 345' TO BUS 'ADAMS 5 161' CKT	1	345-161	600-331	601-393
575	830		115	600	
	obranch 60327 60328 1 TRIP LINE FROM BUS 'T RIVFL7 115' TO BUS 'RIV FLS7 115' CKT 1	1	115	600	604-600
	obranch 60238 68966 1 TRIP LINE FROM BUS 'REDROCK7 115' TO BUS 'GLENMONT 115' C	1	115	600	601-680
	obranch 60327 68966 1 TRIP LINE FROM BUS 'T RIVFL7 115' TO BUS 'GLENMONT 115' CKT	1	115	600	604-680
	obranch 60327 60330 1 TRIP LINE FROM BUS 'T RIVFL7 115' TO BUS 'CRYSTAL7 115' CKT	1	115	600	604
578	835		161	600	604
	obranch 60319 60318 1 TRIP LINE FROM BUS 'WHEATTP5 161' TO BUS 'WHEATON5 161' C	1	161	600	604
	obranch 60282 60319 1 TRIP LINE FROM BUS 'REDCDR 5 161' TO BUS 'WHEATTP5 161' CK	1	161	600	604
	obranch 60319 60320 1 TRIP LINE FROM BUS 'WHEATTP5 161' TO BUS 'HYDROLN5 161' C	1	161	600	604
580	840		161	600	604

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 60319 60318 1	TRIP LINE FROM BUS 'WHEATTP5 161' TO BUS 'WHEATON5 161' C	1	161	600	604
	obranch 60318 60368 1	TRIP LINE FROM BUS 'WHEATON5 161' TO BUS 'JEFRSRD5 161' C	1	161	600	604
583	845			115	600	604-680
	obranch 60306 60322 1	TRIP LINE FROM BUS 'HOLCOMB7 115' TO BUS 'CORNELL7 115' C	1	115	600	604
	obranch 60326 69157 1	TRIP LINE FROM BUS 'JIMFLS 7 115' TO BUS 'ANDERSN7 115' CKT	1	115	600	604-680
	obranch 69157 60322 1	TRIP LINE FROM BUS 'ANDERSN7 115' TO BUS 'CORNELL7 115' C	1	115	600	604-680
585	850				600-680	
	obranch 60312 60314 1	TRIP LINE FROM BUS 'PINE LK5 161' TO BUS 'PINELKT5 161' CKT 1	1	161	600	604
	obranch 60313 60312 1	TRIP LINE FROM BUS 'PINE LK7 115' TO BUS 'PINE LK5 161' CKT 1	1	115-161	600	604
	obranch 60329 60314 1	TRIP LINE FROM BUS 'CRYSTAL5 161' TO BUS 'PINELKT5 161' CKT	1	161	600	604
	obranch 69565 69007 1	TRIP LINE FROM BUS 'APL RVR5 161' TO BUS 'APLRVR 869.0' CKT	1	69-161	680	680-681
	obranch 69565 60314 1	TRIP LINE FROM BUS 'APL RVR5 161' TO BUS 'PINELKT5 161' CKT	1	161	600-680	604-681
588	855			115	626-652	
	obranch 66555 62003 1	TRIP LINE FROM BUS 'MORRIS 7 115' TO BUS 'JOHNJCT7 115' CKT	1	115	626-652	621-655
	obranch 63216 62003 1	TRIP LINE FROM BUS 'ORTONVL7 115' TO BUS 'JOHNJCT7 115' CK	1	115	626	621-626
	obranch 62003 62004 1	TRIP LINE FROM BUS 'JOHNJCT7 115' TO BUS 'GRACEV 7 115' CK	1	115	626	621
590	860			115-41.6	626-652	
	obranch 63218 62002 1	TRIP LINE FROM BUS 'MOROTP 7 115' TO BUS 'WALDEN 7 115' CK	1	115	626	621-626
	obranch 62001 62013 1	TRIP LINE FROM BUS 'BENSON 7 115' TO BUS 'BENSON 941.6' CK	1	41.6-115	626	621
	obranch 66555 63218 1	TRIP LINE FROM BUS 'MORRIS 7 115' TO BUS 'MOROTP 7 115' CKT	1	115	626-652	626-655
	obranch 62002 62001 1	TRIP LINE FROM BUS 'WALDEN 7 115' TO BUS 'BENSON 7 115' CK	1	115	626	621
	obranch 62001 62006 1	TRIP LINE FROM BUS 'BENSON 7 115' TO BUS 'KERKHO 7 115' CK	1	115	626	621
593	865			230-41.6	626	
	obranch 63051 63052 1	TRIP LINE FROM BUS 'HENNING4 230' TO BUS 'INMAN 4 230' CKT	1	230	626	621
	obranch 63331 63051 1	TRIP LINE FROM BUS 'FERGSFL4 230' TO BUS 'HENNING4 230' CK	1	230	626	621-626
	obranch 63051 63309 1	TRIP LINE FROM BUS 'HENNING4 230' TO BUS 'HENNING941.6' CK	1	230-41.6	626	621-629
595	866			230	626-608	621-608
	obranch 63052 63051 1	TRIP LINE FROM BUS 'INMAN 4 230' TO BUS 'HENNING4 230' CKT	1	230	626	621
	obranch 63052 61611 1	TRIP LINE FROM BUS 'INMAN 4 230' TO BUS 'WINGRIV4 230' CKT	1	230	608-626	608-621
598	867L			115	608-600	
	obranch 61647 62817 1	TRIP LINE FROM BUS 'LONG PR7 115' TO BUS 'LSAUKTP7 115' CK	1	115	608-600	608-622
	obranch 60144 62817 1	TRIP LINE FROM BUS 'DGLASCO7 115' TO BUS 'LSAUKTP7 115' CK	1	115	600	601-622
600	875 1			161	600-680	604-681
	obranch 60309 69535 1	TRIP LINE FROM BUS 'MRSHLND5 161' TO BUS 'LAC TAP5 161' CK	1	161	600-680	604-681
	obranch 69523 69535 1	TRIP LINE FROM BUS 'GENOA 5 161' TO BUS 'LAC TAP5 161' CKT	1	161	680	681
	obranch 60308 69535 1	TRIP LINE FROM BUS 'LACROSS5 161' TO BUS 'LAC TAP5 161' CKT	1	161	600-680	604-681
	obranch 60302 60308 1	TRIP LINE FROM BUS 'COULEE 5 161' TO BUS 'LACROSS5 161' CK	1	161	600	604
603	875 2			161	680-600	681-604
	obranch 69523 69535 1	TRIP LINE FROM BUS 'GENOA 5 161' TO BUS 'LAC TAP5 161' CKT	1	161	680	681
	obranch 60308 69535 1	TRIP LINE FROM BUS 'LACROSS5 161' TO BUS 'LAC TAP5 161' CKT	1	161	600-680	604-681
	obranch 60309 69535 1	TRIP LINE FROM BUS 'MRSHLND5 161' TO BUS 'LAC TAP5 161' CK	1	161	600-680	604-681
605	880			161	331-680	393-681
	obranch 69523 34021 1	TRIP LINE FROM BUS 'GENOA 5 161' TO BUS 'LANSINGW 161' CK	1	161	331-680	393-681
	obranch 69523 69527 1	TRIP LINE FROM BUS 'GENOA 5 161' TO BUS 'HARMONY5 161' CK	1	161	680	681
608	885			161	680	681
	obranch 69507 69511 1	TRIP LINE FROM BUS 'SENECA 5 161' TO BUS 'BELLCTR5 161' CKT	1	161	680	681
	obranch 69507 69523 1	TRIP LINE FROM BUS 'SENECA 5 161' TO BUS 'GENOA 5 161' CKT	1	161	680	681
610	8L			46-115	608-618	608-619
	obranch 61803 62404 1	TRIP LINE FROM BUS 'THOM46 946.0' TO BUS 'FOND DU946.0' CKT	1	46	608-618	608-619
	obranch 61665 61803 1	TRIP LINE FROM BUS 'THOMSON7 115' TO BUS 'THOM46 946.0' CK	1	46-115	608	608
613	902			161-345	635-363	638-335
	obranch 64405 64438 1	TRIP LINE FROM BUS 'SUB 91 3 345' TO BUS 'SB 91 5 161' CKT 1	1	161-345	635	638
	obranch 64405 36382 1	TRIP LINE FROM BUS 'SUB 91 3 345' TO BUS 'QUAD ; 345' CKT 1	1	345	363-635	335-638

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 64405 64404 1	TRIP LINE FROM BUS 'SUB 91 3 345' TO BUS 'DAVNPRT3 345' CKT	1	345	635	638
615	904			345-161	635	638-637
	obranch 64403 64680 1	TRIP LINE FROM BUS 'E MOLIN3 345' TO BUS 'SB39MID5 161' CKT	1	345-161	635	638-637
	obranch 64403 64400 1	TRIP LINE FROM BUS 'E MOLIN3 345' TO BUS 'MECCORD3 345' CK	1	345	635	638
	obranch 64403 64402 1	TRIP LINE FROM BUS 'E MOLIN3 345' TO BUS 'LOUISA 3 345' CKT 1	1	345	635	638
618	906			345	356-635	313-638
	obranch 64408 31435 1	TRIP LINE FROM BUS 'SUB T 3 345' TO BUS 'PALM TAP 345' CKT 1	1	345	356-635	313-638
	obranch 64408 64350 1	TRIP LINE FROM BUS 'SUB T 3 345' TO BUS 'HILLS 3 345' CKT 1	1	345	635	638
	obranch 64402 64408 1	TRIP LINE FROM BUS 'LOUISA 3 345' TO BUS 'SUB T 3 345' CKT 1	1	345	635	638
620	908 1			345	356-635	
	obranch 31435 31992 1	TRIP LINE FROM BUS 'PALM TAP 345' TO BUS 'SPENCER 345' CK	1	345	356	313-314
	obranch 64408 31435 1	TRIP LINE FROM BUS 'SUB T 3 345' TO BUS 'PALM TAP 345' CKT 1	1	345	356-635	313-638
	obranch 31992 31230 1	TRIP LINE FROM BUS 'SPENCER 345' TO BUS 'MONTGMRY 345' C	1	345	356	314
623	910			345-161	331-635	391-638
	obranch 64352 34093 1	TRIP LINE FROM BUS 'TIFFIN 3 345' TO BUS 'ARNOLD 3 345' CKT 1	1	345	331-635	391-638
	obranch 64350 64352 1	TRIP LINE FROM BUS 'HILLS 3 345' TO BUS 'TIFFIN 3 345' CKT 1	1	345	635	638
	obranch 64352 64353 1	TRIP LINE FROM BUS 'TIFFIN 3 345' TO BUS 'TIFFIN 5 161' CKT 1	1	161-345	635	638
625	911			161	331-652	391-654
	obranch 66560 34047 1	TRIP LINE FROM BUS 'CRESTON5 161' TO BUS 'ANTA TP5 161' CK	1	161	331-652	391-654
	obranch 66561 34047 1	TRIP LINE FROM BUS 'DENISON5 161' TO BUS 'ANTA TP5 161' CKT	1	161	331-652	391-654
	obranch 34047 34048 1	TRIP LINE FROM BUS 'ANTA TP5 161' TO BUS 'ANITA 5 161' CKT 1	1	161	331	391
628	916			161	331-635	
	obranch 34082 63730 1	TRIP LINE FROM BUS 'EMERYS 5 161' TO BUS 'HAMPTON5 161' CK	1	161	331-635	393-635
	obranch 63730 64239 1	TRIP LINE FROM BUS 'HAMPTON5 161' TO BUS 'FRANKLN5 161' C	1	161	635	635-637
630	917			161	331-680	
	obranch 61930 69531 1	TRIP LINE FROM BUS 'WINDSOR5 161' TO BUS 'POSTVIL5 161' CK	1	161	331-680	615-681
	obranch 34019 61930 1	TRIP LINE FROM BUS 'HAZLTON5 161' TO BUS 'WINDSOR5 161' CK	1	161	331	393-615
633	91L-99L-64L			230-115	608	608-620
	obranch 61610 63053 1	TRIP LINE FROM BUS 'BADOURA4 230' TO BUS 'HUBBARD4 230' C	1	230	608	608-620
	obranch 61610 61794 1	TRIP LINE FROM BUS 'BADOURA4 230' TO BUS 'BADOUJCT 115' C	1	230-115	608	608
	obranch 61612 61610 1	TRIP LINE FROM BUS 'RIVERTN4 230' TO BUS 'BADOURA4 230' CK	1	230	608	608
635	921 1			161	635	638
	obranch 64429 64430 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 76 5 161' CKT 1	1	161	635	638
	obranch 64429 64437 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 90 5 161' CKT 1	1	161	635	638
638	921 2			161	635	638
	obranch 64426 64410 1	TRIP LINE FROM BUS 'SB 58 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64429 64437 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 90 5 161' CKT 1	1	161	635	638
	obranch 64432 64410 1	TRIP LINE FROM BUS 'SB 78 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64429 64410 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
640	921 3			161	635	638
	obranch 64429 64430 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 76 5 161' CKT 1	1	161	635	638
	obranch 64432 64410 1	TRIP LINE FROM BUS 'SB 78 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64429 64410 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64426 64410 1	TRIP LINE FROM BUS 'SB 58 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
643	921 4			161	635	638
	obranch 64429 64410 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64429 64437 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 90 5 161' CKT 1	1	161	635	638
645	921 5			161	635	638
	obranch 64429 64410 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64429 64430 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 76 5 161' CKT 1	1	161	635	638
648	922 1			161	635	638
	obranch 64433 64428 1	TRIP LINE FROM BUS 'SB 79 5 161' TO BUS 'SB 71 5 161' CKT 1	1	161	635	638
	obranch 64438 64433 1	TRIP LINE FROM BUS 'SB 91 5 161' TO BUS 'SB 79 5 161' CKT 1	1	161	635	638

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 64428 64435 1	TRIP LINE FROM BUS 'SB 71 5 161' TO BUS 'SB 88 5 161' CKT 1	1	161	635	638
	obranch 64429 64433 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 79 5 161' CKT 1	1	161	635	638
	obranch 64435 64427 1	TRIP LINE FROM BUS 'SB 88 5 161' TO BUS 'SB 70 5 161' CKT 1	1	161	635	638
650	922 2			161	635	638
	obranch 64438 64433 1	TRIP LINE FROM BUS 'SB 91 5 161' TO BUS 'SB 79 5 161' CKT 1	1	161	635	638
	obranch 64433 64428 1	TRIP LINE FROM BUS 'SB 79 5 161' TO BUS 'SB 71 5 161' CKT 1	1	161	635	638
	obranch 64429 64433 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS 'SB 79 5 161' CKT 1	1	161	635	638
	obranch 64428 64435 1	TRIP LINE FROM BUS 'SB 71 5 161' TO BUS 'SB 88 5 161' CKT 1	1	161	635	638
653	923			161	635	637-636
	obranch 64203 64201 1	TRIP LINE FROM BUS 'NW FTDG5 161' TO BUS 'WEBSTER5 161' C	1	161	635	637
	obranch 64205 64203 1	TRIP LINE FROM BUS 'FT.DODG5 161' TO BUS 'NW FTDG5 161' CK	1	161	635	637
	obranch 64230 64203 1	TRIP LINE FROM BUS 'POMEROY5 161' TO BUS 'NW FTDG5 161' C	1	161	635	637-636
655	924			161	635	637
	obranch 64250 64256 1	TRIP LINE FROM BUS 'BLKHAWK5 161' TO BUS 'UNIONTP5 161' CK	1	161	635	637
	obranch 64256 64285 1	TRIP LINE FROM BUS 'UNIONTP5 161' TO BUS 'BUTLER 5 161' CKT	1	161	635	637
658	926			161	635	637
	obranch 64255 64258 1	TRIP LINE FROM BUS 'MIDPORT5 161' TO BUS 'LUNDQST5 161' CK	1	161	635	637
	obranch 64250 64255 1	TRIP LINE FROM BUS 'BLKHAWK5 161' TO BUS 'MIDPORT5 161' CK	1	161	635	637
660	927			345	635	637
	obranch 64064 64095 1	TRIP LINE FROM BUS 'BONDRNT3 345' TO BUS 'MNTZUMA3 345' C	1	345	635	637
	obranch 64050 64192 1	TRIP LINE FROM BUS 'SE POLK3 345' TO BUS 'GDMEC 345' CKT	1	345	635	637
	obranch 64064 64080 1	TRIP LINE FROM BUS 'BONDRNT3 345' TO BUS 'SYCAMOR3 345' C	1	345	635	637
663	928			345	635	637
	obranch 64050 64056 1	TRIP LINE FROM BUS 'SE POLK3 345' TO BUS 'MADISON3 345' CK	1	345	635	637
	obranch 64056 64060 1	TRIP LINE FROM BUS 'MADISON3 345' TO BUS 'BOONVIL3 345' CK	1	345	635	637
	obranch 63871 64056 1	TRIP LINE FROM BUS 'ADAIR 3 345' TO BUS 'MADISON3 345' CKT	1	345	635	637
665	930 1			345/161	635	637
	obranch 64050 64056 1	TRIP LINE FROM BUS 'SE POLK3 345' TO BUS 'MADISON3 345'	1	345	635	637
	obranch 64051 64066 1	TRIP LINE FROM BUS 'SEPOLK 5 161' TO BUS 'S RIDGE5 161'	1	161	635	637
668	930 2			161/345	331-635	391-637
	obranch 64068 34060 1	TRIP LINE FROM BUS 'GRENFLD5 161' TO BUS 'WNTRST 5 161'	1	161	331-635	391-637
	obranch 64050 64056 1	TRIP LINE FROM BUS 'SE POLK3 345' TO BUS 'MADISON3 345'	1	345	635	637
670	931 1			345/161	635	637
	obranch 64050 64192 1	TRIP LINE FROM BUS 'SE POLK3 345' TO BUS 'GDMEC 345'	1	345	635	637
	obranch 64062 64069 1	TRIP LINE FROM BUS 'DMOINES5 161' TO BUS 'ALTONA 5 161'	1	161	635	637
673	931 2			161/345	635	637
	obranch 64067 64069 1	TRIP LINE FROM BUS 'BONDRNT5 161' TO BUS 'ALTONA 5 161'	1	161	635	637
	obranch 64050 64192 1	TRIP LINE FROM BUS 'SE POLK3 345' TO BUS 'GDMEC 345'	1	345	635	637
675	932 1			345	635	637
	obranch 64202 64080 1	TRIP LINE FROM BUS 'LEHIGH 3 345' TO BUS 'SYCAMOR3 345' CK	1	345	635	637
	obranch 64060 64080 1	TRIP LINE FROM BUS 'BOONVIL3 345' TO BUS 'SYCAMOR3 345' CK	1	345	635	637
678	932 2			115/345	331-635	391-637
	obranch 34073 34059 1	TRIP LINE FROM BUS 'GR JCT 7 115' TO BUS 'BOONE 7 115' CKT 1	1	115	331	391
	obranch 64202 64080 1	TRIP LINE FROM BUS 'LEHIGH 3 345' TO BUS 'SYCAMOR3 345' CK	1	345	635	637
680	932 3			161/345	331-635	391-637
	obranch 34058 34179 1	TRIP LINE FROM BUS 'PERRY 5 161' TO BUS 'JASPER 5 161' CKT	1	161	331	391
	obranch 64202 64080 1	TRIP LINE FROM BUS 'LEHIGH 3 345' TO BUS 'SYCAMOR3 345' CK	1	345	635	637
683	933			345-161	635	637
	obranch 64202 64200 1	TRIP LINE FROM BUS 'LEHIGH 3 345' TO BUS 'WEBSTER3 345' CK	1	345	635	637
	obranch 64200 64645 1	TRIP LINE FROM BUS 'WEBSTER3 345' TO BUS 'WEB MID5 161' CK	1	345-161	635	637
	obranch 64645 64201 1	TRIP LINE FROM BUS 'WEB MID5 161' TO BUS 'WEBSTER5 161' CK	1	161	635	637
685	934			161	331	391
	obranch 34054 34058 1	TRIP LINE FROM BUS 'GR JCT 5 161' TO BUS 'PERRY 5 161' CKT 1	1	161	331	391

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 34058 34179 1	TRIP LINE FROM BUS 'PERRY 5 161' TO BUS 'JASPER 5 161' CKT	1	161	331	391
688	936			115	331	391
	obranch 34052 34076 1	TRIP LINE FROM BUS 'AMES 7 115' TO BUS 'BNE JCT7 115' CKT 1	1	115	331	391
	obranch 34076 34059 1	TRIP LINE FROM BUS 'BNE JCT7 115' TO BUS 'BOONE 7 115' CKT	1	115	331	391
690	937			115-34.5	331	391
	obranch 34075 34158 1	TRIP LINE FROM BUS 'ELDORA 7 115' TO BUS 'ELDORA 934.5' CKT	1	115-34.5	331	391
	obranch 34169 34075 1	TRIP LINE FROM BUS 'WELSBGT7 115' TO BUS 'ELDORA 7 115' CK	1	115	331	391
	obranch 34075 34077 1	TRIP LINE FROM BUS 'ELDORA 7 115' TO BUS 'IA FALS7 115' CKT	1	115	331	391
	obranch 34169 34074 1	TRIP LINE FROM BUS 'WELSBGT7 115' TO BUS 'WELSBRG7 115' C	1	115	331	391
	obranch 34066 34169 1	TRIP LINE FROM BUS 'M-TOWN 7 115' TO BUS 'WELSBGT7 115' CK	1	115	331	391
693	938			115	331	391
	obranch 34066 34085 1	TRIP LINE FROM BUS 'M-TOWN 7 115' TO BUS 'BLRSTWN7 115' CK	1	115	331	391
	obranch 34085 34086 1	TRIP LINE FROM BUS 'BLRSTWN7 115' TO BUS 'WILMSBG7 115' C	1	115	331	391
	obranch 34085 34099 1	TRIP LINE FROM BUS 'BLRSTWN7 115' TO BUS 'PRAR CK7 115' CK	1	115	331	391
695	939			161	331	391
	obranch 34087 34089 1	TRIP LINE FROM BUS 'DYSART 5 161' TO BUS 'VINTON 5 161' CKT	1	161	331	391
	obranch 34089 34091 1	TRIP LINE FROM BUS 'VINTON 5 161' TO BUS 'ARNOLD 5 161' CKT	1	161	331	391
698	941			115-34.5	331	391
	obranch 34120 34121 1	TRIP LINE FROM BUS 'CALAMUS7 115' TO BUS 'E CALMS7 115' CK	1	115	331	391
	obranch 34099 34117 1	TRIP LINE FROM BUS 'PRAR CK7 115' TO BUS 'SUTLIFF7 115' CKT	1	115	331	391
	obranch 34117 34116 1	TRIP LINE FROM BUS 'SUTLIFF7 115' TO BUS 'W.BRCH 7 115' CKT	1	115	331	391
	obranch 34120 34142 1	TRIP LINE FROM BUS 'CALAMUS7 115' TO BUS 'CALAMUS934.5' C	1	115-34.5	331	391
	obranch 34117 34120 1	TRIP LINE FROM BUS 'SUTLIFF7 115' TO BUS 'CALAMUS7 115' CKT	1	115	331	391
700	942			115	331	391
	obranch 34131 34133 1	TRIP LINE FROM BUS 'COGGON 7 115' TO BUS 'DUNDEE 7 115' CK	1	115	331	391
	obranch 34103 34131 1	TRIP LINE FROM BUS 'MARION 7 115' TO BUS 'COGGON 7 115' CK	1	115	331	391
703	943			161	331-635	391-637
	obranch 34190 34174 1	TRIP LINE FROM BUS 'BRDGPRT5 161' TO BUS 'EICTAP 5 161' CKT	1	161	331	391
	obranch 34174 64096 1	TRIP LINE FROM BUS 'EICTAP 5 161' TO BUS 'BEACON 5 161' CKT	1	161	331-635	391-637
	obranch 34189 34190 1	TRIP LINE FROM BUS 'OTTUMWA5 161' TO BUS 'BRDGPRT5 161' C	1	161	331	391
705	946			345-161	635	638-637
	obranch 64404 64405 1	TRIP LINE FROM BUS 'DAVNPRT3 345' TO BUS 'SUB 91 3 345' CKT	1	345	635	638
	obranch 64404 64681 1	TRIP LINE FROM BUS 'DAVNPRT3 345' TO BUS 'SB56MID5 161' CK	1	345-161	635	638-637
	obranch 64404 64409 1	TRIP LINE FROM BUS 'DAVNPRT3 345' TO BUS 'WALCOTT3 345' C	1	345	635	638
708	947			345	635	638
	obranch 64402 64406 1	TRIP LINE FROM BUS 'LOUISA 3 345' TO BUS 'SUB 92 3 345' CKT 1	1	345	635	638
	obranch 64409 64406 1	TRIP LINE FROM BUS 'WALCOTT3 345' TO BUS 'SUB 92 3 345' CKT	1	345	635	638
	obranch 64406 64350 1	TRIP LINE FROM BUS 'SUB 92 3 345' TO BUS 'HILLS 3 345' CKT 1	1	345	635	638
710	948 1				331-635	
	obranch 34038 64422 1	TRIP LINE FROM BUS 'BVR CH 5 161' TO BUS 'SB 49 5 161' CKT 1	1	161	331-635	393-638
	obranch 34043 34046 1	TRIP LINE FROM BUS 'SAVANNA5 161' TO BUS 'YORK 5 161' CKT	1	161	331	393
	obranch 34044 34046 1	TRIP LINE FROM BUS 'ALBANY 5 161' TO BUS 'YORK 5 161' CKT 1	1	161	331	393
	obranch 34044 34045 1	TRIP LINE FROM BUS 'ALBANY 5 161' TO BUS 'ALBANY 6 138' CKT	1	138-161	331	393
	obranch 34038 34044 1	TRIP LINE FROM BUS 'BVR CH 5 161' TO BUS 'ALBANY 5 161' CKT	1	161	331	393
	obranch 34046 34351 1	TRIP LINE FROM BUS 'YORK 5 161' TO BUS 'YORK_8 34.5' CKT 1	1	34.5-161	331	394-393
713	948 2				331	393-394
	obranch 34044 34046 1	TRIP LINE FROM BUS 'ALBANY 5 161' TO BUS 'YORK 5 161' CKT 1	1	161	331	393
	obranch 34043 34046 1	TRIP LINE FROM BUS 'SAVANNA5 161' TO BUS 'YORK 5 161' CKT	1	161	331	393
	obranch 34038 34044 1	TRIP LINE FROM BUS 'BVR CH 5 161' TO BUS 'ALBANY 5 161' CKT	1	161	331	393
	obranch 34046 34351 1	TRIP LINE FROM BUS 'YORK 5 161' TO BUS 'YORK_8 34.5' CKT 1	1	34.5-161	331	394-393
	obranch 34044 34045 1	TRIP LINE FROM BUS 'ALBANY 5 161' TO BUS 'ALBANY 6 138' CKT	1	138-161	331	393
715	950			161	635	638
	obranch 64425 64434 1	TRIP LINE FROM BUS 'DAVNPRT5 161' TO BUS 'SB 85 5 161' CKT 1	1	161	635	638
	obranch 64434 64423 1	TRIP LINE FROM BUS 'SB 85 5 161' TO BUS 'SB 52 5 161' CKT 1	1	161	635	638

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 64415 64434 1	TRIP LINE FROM BUS 'SB 18 5 161' TO BUS 'SB 85 5 161' CKT 1	1	161	635	638
	obranch 64434 64424 1	TRIP LINE FROM BUS 'SB 85 5 161' TO BUS 'SB 53 5 161' CKT 1	1	161	635	638
718	951			161	635	638
	obranch 64426 64410 1	TRIP LINE FROM BUS 'SB 58 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64429 64410 1	TRIP LINE FROM BUS 'SB 74 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
	obranch 64432 64410 1	TRIP LINE FROM BUS 'SB 78 5 161' TO BUS '58TAP 5 161' CKT 1	1	161	635	638
720	952			161	635	638
	obranch 64418 64419 1	TRIP LINE FROM BUS 'E MOLINE 161' TO BUS 'SB 43 5 161' CKT 1	1	161	635	638
	obranch 64419 64415 1	TRIP LINE FROM BUS 'SB 43 5 161' TO BUS 'SB 18 5 161' CKT 1	1	161	635	638
723	953			161	635	638
	obranch 64418 64407 1	TRIP LINE FROM BUS 'E MOLINE 161' TO BUS 'SB 31T 5 161' CKT 1	1	161	635	638
	obranch 64416 64407 1	TRIP LINE FROM BUS 'SB 28 5 161' TO BUS 'SB 31T 5 161' CKT 1	1	161	635	638
	obranch 64407 64417 1	TRIP LINE FROM BUS 'SB 31T 5 161' TO BUS 'SB 31 5 161' CKT 1	1	161	635	638
	obranch 64414 64416 1	TRIP LINE FROM BUS 'SB 17 5 161' TO BUS 'SB 28 5 161' CKT 1	1	161	635	638
725	954			161	635	638
	obranch 64421 64420 1	TRIP LINE FROM BUS 'SB 48 5 161' TO BUS 'SB 47 5 161' CKT 1	1	161	635	638
	obranch 64418 64420 1	TRIP LINE FROM BUS 'E MOLINE 161' TO BUS 'SB 47 5 161' CKT 1	1	161	635	638
728	956			161	635	638
	obranch 64357 64362 1	TRIP LINE FROM BUS 'SB GIC 5 161' TO BUS 'SB YIC 5 161' CKT 1	1	161	635	638
	obranch 64360 64357 1	TRIP LINE FROM BUS 'SB PIC 5 161' TO BUS 'SB GIC 5 161' CKT 1	1	161	635	638
	obranch 64362 64356 1	TRIP LINE FROM BUS 'SB YIC 5 161' TO BUS 'SB EIC 5 161' CKT 1	1	161	635	638
730	957			161	635	638
	obranch 64359 64361 1	TRIP LINE FROM BUS 'SB JIC 5 161' TO BUS 'SB UIC 5 161' CKT 1	1	161	635	638
	obranch 64361 64360 1	TRIP LINE FROM BUS 'SB UIC 5 161' TO BUS 'SB PIC 5 161' CKT 1	1	161	635	638
733	958			161	331	391-393
	obranch 34129 34135 1	TRIP LINE FROM BUS 'LIBERTY5 161' TO BUS 'DUNDEE 5 161' CKT	1	161	331	391
	obranch 34028 34129 1	TRIP LINE FROM BUS 'LORE 5 161' TO BUS 'LIBERTY5 161' CKT 1	1	161	331	393-391
735	960			161	331-680	393-681
	obranch 34028 34033 1	TRIP LINE FROM BUS 'LORE 5 161' TO BUS 'TRK RIV5 161' CKT 1	1	161	331	393
	obranch 34033 69503 1	TRIP LINE FROM BUS 'TRK RIV5 161' TO BUS 'CASVILL5 161' CKT 1	1	161	331-680	393-681
738	961			161	331	393-615
	obranch 34008 61932 1	TRIP LINE FROM BUS 'FOX LK 5 161' TO BUS 'RUTLAND5 161' CKT	1	161	331	393-615
	obranch 61932 34009 1	TRIP LINE FROM BUS 'RUTLAND5 161' TO BUS 'WINBAGO5 161' C	1	161	331	393-615
740	962			161	680-331	
	obranch 69526 69527 1	TRIP LINE FROM BUS 'BVR CRK5 161' TO BUS 'HARMONY5 161' CK	1	161	680	681
	obranch 61980 69526 1	TRIP LINE FROM BUS 'RICE 5 161' TO BUS 'BVR CRK5 161' CKT 1	1	161	331-680	615-681
	obranch 34014 69526 1	TRIP LINE FROM BUS 'ADAMS 5 161' TO BUS 'BVR CRK5 161' CKT	1	161	331-680	393-681
743	97L				608	608
	obranch 61798 61611 1	OPEN LINE FROM BUS 'WINGRJCT 115' TO BUS 'WINGRIV4 230' C	1	230-115	608	608
	obranch 61798 61613 1	OPEN LINE FROM BUS 'WINGRJCT 115' TO BUS 'WINGRIV7 115' C	1	115	608	608
	obranch 61612 61611 1	TRIP LINE FROM BUS 'RIVERTN4 230' TO BUS 'WINGRIV4 230' CKT	1	230	608	608
	obranch 61798 61799 1	OPEN LINE FROM BUS 'WINGRJCT 115' TO BUS 'WINGRTR913.8' C	1	115-13.8	608	608
745	98L			230	608	608
	obranch 61614 61625 1	TRIP LINE FROM BUS '98L TAP4 230' TO BUS 'BLCKBRY4 230' CKT	1	230	608	608
	obranch 61614 61616 1	TRIP LINE FROM BUS '98L TAP4 230' TO BUS 'HILLTOP4 230' CKT 1	1	230	608	608
	obranch 61614 61615 1	TRIP LINE FROM BUS '98L TAP4 230' TO BUS 'ARROWHD4 230' CK	1	230	608	608
748	99			230-115	652	659-661
	obranch 67104 67385 1	TRIP LINE FROM BUS 'TIOGA4 4 230' TO BUS 'TIOGA4 7 115' CKT 1	1	230-115	652	659-661
	obranch 67104 67108 1	TRIP LINE FROM BUS 'TIOGA4 4 230' TO BUS 'LOGAN 4 230' CKT 1	1	230	652	659
750	999			161-138	635-357	638-357
	obranch 32415 64411 1	TRIP BRANCH FROM BUS 'GALESBRG 138' TO BUS 'GALESBR5 16	1	161-138	635-357	638-357
	obranch 32415 64411 2	TRIP BRANCH FROM BUS 'GALESBRG 138' TO BUS 'GALESBR5 16	2	161-138	635-357	638-357
	obranch 64411 64415 1	TRIP BRANCH FROM BUS 'GALESBR5 161' TO BUS 'SB 18 5 161' C	1	161	635	638

No.	Contingency		Ckt	Base kV	Area	Zone
753	9L			115	608	608
	obranch 61671 61670 1	TRIP LINE FROM BUS 'BURNETT7 115' TO BUS 'MDWLNDS7 115' C	1	115	608	608
	obranch 61668 61671 1	TRIP LINE FROM BUS 'CLOQUET7 115' TO BUS 'BURNETT7 115' CK	1	115	608	608
	obranch 61670 61663 1	TRIP LINE FROM BUS 'MDWLNDS7 115' TO BUS 'FLDWDTP7 115' C	1	115	608	608
	obranch 61663 61669 1	TRIP LINE FROM BUS 'FLDWDTP7 115' TO BUS 'FLDWOOD7 115' C	1	115	608	608
	obranch 61663 61739 1	TRIP LINE FROM BUS 'FLDWDTP7 115' TO BUS 'BLCKBRY7 115' CK	1	115	608	608
755	ALT2-01				331	
	obranch 34135 34542 1	TRIP LINE FROM BUS 'DUNDEE 5 161' TO BUS 'DUNDEE1Y 161' CK	1	161	331	391-392
	obranch 34542 34133 1	TRIP LINE FROM BUS 'DUNDEE1Y 161' TO BUS 'DUNDEE 7 115' CK	1	115-161	331	391-392
	obranch 34138 34543 1	TRIP LINE FROM BUS 'DUNDEE 869.0' TO BUS 'DUNDEE2Y 161' CK	1	69-161	331	391-392
	obranch 34135 34020 1	TRIP LINE FROM BUS 'DUNDEE 5 161' TO BUS 'HAZL S 5 161' CKT	1	161	331	393-391
	obranch 34543 34135 1	TRIP LINE FROM BUS 'DUNDEE2Y 161' TO BUS 'DUNDEE 5 161' CK	1	161	331	391-392
	obranch 34135 34129 1	TRIP LINE FROM BUS 'DUNDEE 5 161' TO BUS 'LIBERTY5 161' CKT	1	161	331	391
758	ALTW-02			115-34.5	331	391
	obranch 34133 34119 2	TRIP LINE FROM BUS 'DUNDEE 7 115' TO BUS 'DUNDEE 934.5' CK	2	115-34.5	331	391
	obranch 34133 34131 1	TRIP LINE FROM BUS 'DUNDEE 7 115' TO BUS 'COGGON 7 115' CK	1	115	331	391
	obranch 34133 34119 1	TRIP LINE FROM BUS 'DUNDEE 7 115' TO BUS 'DUNDEE 934.5' CK	1	115-34.5	331	391
760	ALTW-03			161-34.5	331	391-393
	obranch 34126 34140 1	TRIP LINE FROM BUS 'MQOKETA5 161' TO BUS 'MQOKETA934.5' C	1	161-34.5	331	391
	obranch 34126 34127 1	TRIP LINE FROM BUS 'MQOKETA5 161' TO BUS 'WYOMING5 161' C	1	161	331	391
	obranch 34126 34122 1	TRIP LINE FROM BUS 'MQOKETA5 161' TO BUS 'E CALMS5 161' CK	1	161	331	391
	obranch 34126 34030 1	TRIP LINE FROM BUS 'MQOKETA5 161' TO BUS 'SALEM 5 161' CK	1	161	331	393-391
763	ALTW-04			161-34.5	331	391
	obranch 34127 34053 1	TRIP LINE FROM BUS 'WYOMING5 161' TO BUS 'MT VERN5 161' CK	1	161	331	391
	obranch 34127 34141 1	TRIP LINE FROM BUS 'WYOMING5 161' TO BUS 'WYOMING934.5' C	1	161-34.5	331	391
	obranch 34127 34126 1	TRIP LINE FROM BUS 'WYOMING5 161' TO BUS 'MQOKETA5 161' C	1	161	331	391
765	ALTW-05			161	331	391
	obranch 34053 34109 1	TRIP LINE FROM BUS 'MT VERN5 161' TO BUS 'BERTRAM5 161' CK	1	161	331	391
	obranch 34053 34127 1	TRIP LINE FROM BUS 'MT VERN5 161' TO BUS 'WYOMING5 161' CK	1	161	331	391
768	ALTW-06			161-34.5	331	391
	obranch 34050 34167 1	TRIP LINE FROM BUS 'GU CTR 5 161' TO BUS 'GU CTR 934.5' CKT	1	161-34.5	331	391
	obranch 34050 34048 1	TRIP LINE FROM BUS 'GU CTR 5 161' TO BUS 'ANITA 5 161' CKT 1	1	161	331	391
	obranch 34049 34054 1	TRIP LINE FROM BUS 'SCRANTN5 161' TO BUS 'GR JCT 5 161' CKT	1	161	331	391
	obranch 34050 34049 1	TRIP LINE FROM BUS 'GU CTR 5 161' TO BUS 'SCRANTN5 161' CKT	1	161	331	391
770	ALTW-07			161-69	331	392-391
	obranch 34524 34064 1	TRIP LINE FROM BUS 'ANITA Y 161' TO BUS 'ANITA 869.0' CKT 1	1	161-69	331	392-391
	obranch 34048 34050 1	TRIP LINE FROM BUS 'ANITA 5 161' TO BUS 'GU CTR 5 161' CKT 1	1	161	331	391
	obranch 34048 34524 1	TRIP LINE FROM BUS 'ANITA 5 161' TO BUS 'ANITA Y 161' CKT 1	1	161	331	392-391
	obranch 34048 34047 1	TRIP LINE FROM BUS 'ANITA 5 161' TO BUS 'ANTA TP5 161' CKT 1	1	161	331	391
773	ALTW-08 1				331	391-392
	obranch 34124 34143 1	TRIP LINE FROM BUS 'DEWITT 5 161' TO BUS 'DEWITT 934.5' CKT	1	161-34.5	331	391
	obranch 34122 34126 1	TRIP LINE FROM BUS 'E CALMS5 161' TO BUS 'MQOKETA5 161' CK	1	161	331	391
	obranch 34539 34122 1	TRIP LINE FROM BUS 'E CALMSY 161' TO BUS 'E CALMS5 161' CKT	1	161	331	391-392
	obranch 34122 34124 1	TRIP LINE FROM BUS 'E CALMS5 161' TO BUS 'DEWITT 5 161' CKT	1	161	331	391
	obranch 34121 34539 1	TRIP LINE FROM BUS 'E CALMS7 115' TO BUS 'E CALMSY 161' CKT	1	115-161	331	391-392
775	ALTW-08 2			161-34.5	331	391
	obranch 34122 34124 1	TRIP LINE FROM BUS 'E CALMS5 161' TO BUS 'DEWITT 5 161' CKT	1	161	331	391
	obranch 34124 34143 1	TRIP LINE FROM BUS 'DEWITT 5 161' TO BUS 'DEWITT 934.5' CKT	1	161-34.5	331	391
778	ALTW-09			161	331-635	391-638
	obranch 34122 34123 1	TRIP LINE FROM BUS 'E CALMS5 161' TO BUS 'GR MND 5 161' CKT	1	161	331	391
	obranch 34122 64425 1	TRIP LINE FROM BUS 'E CALMS5 161' TO BUS 'DAVNPRT5 161' CK	1	161	331-635	391-638
780	ALTW-11			161	331	391
	obranch 34180 34181 1	TRIP LINE FROM BUS 'DENMARK5 161' TO BUS 'BRLGTN 5 161' CK	1	161	331	391
	obranch 34180 34181 2	TRIP LINE FROM BUS 'DENMARK5 161' TO BUS 'BRLGTN 5 161' CK	2	161	331	391

No.	Contingency		Ckt	Base kV	Area	Zone
783	ALTW-12			161	331	393-391
	obranch 34017 34139 1	TRIP LINE FROM BUS 34017 TO BUS 34139 CKT 1	1	161	331	393-391
	obranch 34082 34017 1	TRIP LINE FROM BUS 34082 TO BUS 34017 CKT 1	1	161	331	393
785	ALTW-13			161	331	393-392
	obranch 34028 34026 1	TRIP LINE FROM BUS 'LORE 5 161' TO BUS 'ASBURY 5 161' CKT 1	1	161	331	393
	obranch 34027 34508 1	TRIP LINE FROM BUS 'CNTRGRV5 161' TO BUS 'JULIAN 5 161' CKT	1	161	331	393-392
	obranch 34508 34030 1	TRIP LINE FROM BUS 'JULIAN 5 161' TO BUS 'SALEM 5 161' CKT 1	1	161	331	393-392
	obranch 34026 34027 1	TRIP LINE FROM BUS 'ASBURY 5 161' TO BUS 'CNTRGRV5 161' CK	1	161	331	393
788	ALTW-14			161	331	393
	obranch 34031 34032 1	TRIP LINE FROM BUS 'SO.GVW.5 161' TO BUS '8TH ST.5 161' CKT	1	161	331	393
	obranch 34030 34031 1	TRIP LINE FROM BUS 'SALEM 5 161' TO BUS 'SO.GVW.5 161' CKT	1	161	331	393
790	ALTW-47			161	331	393-391
	obranch 34017 34139 1	TRIP LINE FROM BUS 34017 TO BUS 34139 CKT 1	1	161	331	393-391
	obranch 34082 34017 1	TRIP LINE FROM BUS 34082 TO BUS 34017 CKT 1	1	161	331	393
793	ALTW-84			161	331	391
	obranch 34180 34181 2	TRIP LINE FROM BUS 'DENMARK5 161' TO BUS 'BRLGTN 5 161' CK	2	161	331	391
	obranch 34180 34181 1	TRIP LINE FROM BUS 'DENMARK5 161' TO BUS 'BRLGTN 5 161' CK	1	161	331	391
795	ALTW-85			161	331	393-392
	obranch 34030 34031 1	TRIP LINE FROM BUS 'SALEM 5 161' TO BUS 'SO.GVW.5 161' CKT	1	161	331	393
	obranch 34030 34508 1	TRIP LINE FROM BUS 'SALEM 5 161' TO BUS 'JULIAN 5 161' CKT 1	1	161	331	393-392
798	ALTW-86			161	331-635	393-638
	obranch 34038 34044 1	TRIP LINE FROM BUS 'BVR CH 5 161' TO BUS 'ALBANY 5 161' CKT	1	161	331	393
	obranch 34038 64422 1	TRIP LINE FROM BUS 'BVR CH 5 161' TO BUS 'SB 49 5 161' CKT 1	1	161	331-635	393-638
800	ARROWHD 6T				608	608
	obranch 61554 61615 1	TRIP LINE FROM BUS 'AWHD1JCT 115' TO BUS 'ARROWHD4 230' C	1	230-115	608	608
	obranch 61554 61673 1	TRIP LINE FROM BUS 'AWHD1JCT 115' TO BUS 'ARROWHD7 115' C	1	115	608	608
	obranch 61554 61555 1	TRIP LINE FROM BUS 'AWHD1JCT 115' TO BUS 'AWHD1TR913.8' C	1	115-13.8	608	608
803	ARROWHD 7T				608	608
	obranch 61556 61673 2	TRIP LINE FROM BUS 'AWHD2JCT 115' TO BUS 'ARROWHD7 115' C	2	115	608	608
	obranch 61556 61615 2	TRIP LINE FROM BUS 'AWHD2JCT 115' TO BUS 'ARROWHD4 230' C	2	230-115	608	608
	obranch 61556 61557 2	TRIP LINE FROM BUS 'AWHD2JCT 115' TO BUS 'AWHD2TR913.8' C	2	115-13.8	608	608
805	BADOURA 1T			230-115	608	608-620
	obranch 61610 61612 1	OPEN LINE FROM BUS 'BADOURA4 230' TO BUS 'RIVERTN4 230' C	1	230	608	608
	obranch 61610 61794 1	OPEN LINE FROM BUS 'BADOURA4 230' TO BUS 'BADOUJCT 115'	1	230-115	608	608
	obranch 61610 63053 1	OPEN LINE FROM BUS 'BADOURA4 230' TO BUS 'HUBBARD4 230'	1	230	608	608-620
808	BLAKBERY 1T				608	608
	obranch 61566 61567 1	TRIP LINE FROM BUS 'BLBY1JCT 115' TO BUS 'BLBY1TR913.8' CKT	1	115-13.8	608	608
	obranch 61566 61625 1	TRIP LINE FROM BUS 'BLBY1JCT 115' TO BUS 'BLCKBRY4 230' CK	1	230-115	608	608
	obranch 61566 61739 1	TRIP LINE FROM BUS 'BLBY1JCT 115' TO BUS 'BLCKBRY7 115' CK	1	115	608	608
810	BLAKBERY 2T				608	608
	obranch 61568 61569 2	TRIP LINE FROM BUS 'BLBY2JCT 115' TO BUS 'BLBY2TR913.8' CKT	2	115-13.8	608	608
	obranch 61568 61625 2	TRIP LINE FROM BUS 'BLBY2JCT 115' TO BUS 'BLCKBRY4 230' CK	2	230-115	608	608
	obranch 61568 61739 2	TRIP LINE FROM BUS 'BLBY2JCT 115' TO BUS 'BLCKBRY7 115' CK	2	115	608	608
813	FORBES 2T				608-600	608-601
	obranch 61550 61551 1	OPEN LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORB1TR934.5' C	1	230-34.5	608	608
	obranch 61564 61722 2	TRIP LINE FROM BUS 'FORB4JCT 115' TO BUS 'FORBES 7 115' CK	2	115	608	608
	obranch 61564 61565 2	TRIP LINE FROM BUS 'FORB4JCT 115' TO BUS 'FORB4TR913.8' CK	2	115-13.8	608	608
	obranch 61550 60101 1	OPEN LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 2 500' CK	1	500-230	600-608	601-608
	obranch 61564 61624 2	TRIP LINE FROM BUS 'FORB4JCT 115' TO BUS 'FORBES 4 230' CK	2	230-115	608	608
	obranch 61550 61624 1	OPEN LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608
815	FORBES 3T				608-600	608-601
	obranch 61564 61565 2	TRIP LINE FROM BUS 'FORB4JCT 115' TO BUS 'FORB4TR913.8' CK	2	115-13.8	608	608
	obranch 61552 60101 1	OPEN LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORBES 2 500' CK	1	500-230	600-608	601-608

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 61564 61722 2	TRIP LINE FROM BUS 'FORB4JCT 115' TO BUS 'FORBES 7 115' CK	2	115	608	608
	obranch 61552 61553 1	OPEN LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORB2TR934.5' C	1	230-34.5	608	608
	obranch 61564 61624 2	TRIP LINE FROM BUS 'FORB4JCT 115' TO BUS 'FORBES 4 230' CK	2	230-115	608	608
	obranch 61552 61624 1	OPEN LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608
818	FORBES 7T-8				608-600	608-601
	obranch 61550 61551 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORB1TR934.5' CK	1	230-34.5	608	608
	obranch 61552 61553 1	TRIP LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORB2TR934.5' CK	1	230-34.5	608	608
	obranch 61550 61624 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608
	obranch 61552 61624 1	TRIP LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608
	obranch 61550 60101 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 2 500' CK	1	500-230	600-608	601-608
	obranch 61552 60101 1	TRIP LINE FROM BUS 'FORB2JCT 230' TO BUS 'FORBES 2 500' CK	1	500-230	600-608	601-608
820	HILLTOP 1T				608	608
	obranch 61576 61616 1	TRIP LINE FROM BUS 'HILTPJCT 115' TO BUS 'HILLTOP4 230' CKT	1	230-115	608	608
	obranch 61576 61672 1	TRIP LINE FROM BUS 'HILTPJCT 115' TO BUS 'HILLTOP7 115' CKT	1	115	608	608
	obranch 61576 61577 1	TRIP LINE FROM BUS 'HILTPJCT 115' TO BUS 'HILTPTR913.8' CKT	1	115-13.8	608	608
	obranch 61614 61625 1	TRIP LINE FROM BUS '98L TAP4 230' TO BUS 'BLCKBRY4 230' CKT	1	230	608	608
	obranch 61616 61614 1	TRIP LINE FROM BUS 'HILLTOP4 230' TO BUS '98L TAP4 230' CKT 1	1	230	608	608
823	LASKIN 1T				608	608
	obranch 61574 61575 1	TRIP LINE FROM BUS 'LASKNJCT 115' TO BUS 'LASKNTR913.8' CK	1	115-13.8	608	608
	obranch 61574 61702 1	TRIP LINE FROM BUS 'LASKNJCT 115' TO BUS 'LASKIN 7 115' CKT	1	115	608	608
	obranch 61574 61701 1	TRIP LINE FROM BUS 'LASKNJCT 115' TO BUS 'LASKIN 6 138' CKT	1	138-115	608	608
825	LIL FORK 1T			118-230	608	
	obranch 66753 61751 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'LITLFRK7 118' CKT	1	118-230	608	608-657
	obranch 66753 60167 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'RUNSWCP4 230' C	1	230	608	601-657
828	MAPP-1		1	161	680	681
	obranch 69523 69507 1	TRIP BRANCH FROM BUS 'GENOA 5 161' TO BUS 'SENECA 5 161'	1	161	680	681
830	MAPP-10		1	345-161	600-331	601-393
	obranch 60102 34014 1	TRIP BRANCH FROM BUS 'ADAMS 3 345' TO BUS 'ADAMS 5 161' C	1	345-161	600-331	601-393
833	MAPP-12		1	345	600	601
	obranch 60186 60199 1	TRIP BRANCH FROM BUS 'AS KING3 345' TO BUS 'CHIS CO3 345' C	1	345	600	601
835	MAPP-13		1	345	600	601
	obranch 60199 60221 1	TRIP BRANCH FROM BUS 'CHIS CO3 345' TO BUS 'KOLMNLK3 345'	1	345	600	601
838	MAPP-14		1	161-345	600	616
	obranch 61950 61948 1	TRIP BRANCH FROM BUS 'BYRON 3 345' TO BUS 'BYRON 5 161' C	1	161-345	600	616
840	MAPP-15A		1	345	600	601
	obranch 60114 60233 1	TRIP BRANCH FROM BUS 'ELM CRK3 345' TO BUS 'PARKERS3 345'	1	345	600	601
843	MAPP-16		1	345	600	601
	obranch 60202 60251 1	TRIP BRANCH FROM BUS 'COON CK3 345' TO BUS 'TERMINL3 345'	1	345	600	601
845	MAPP-17			345	600-618	601-618
	obranch 63030 60270 1	TRIP BRANCH FROM BUS 'DICKNSN3 345' TO BUS 'MPLEGV13 345'	1	345	600-618	601-618
	obranch 60270 60233 1	TRIP BRANCH FROM BUS 'MPLEGV13 345' TO BUS 'PARKERS3 34	1	345	600	601
848	MAPP-181P		1	161	331-680	393-617
	obranch 34014 61984 1	TRIP BRANCH FROM BUS 'ADAMS 5 161' TO BUS 'AUSTIN 5 161' C	1	161	331-680	393-617
850	MAPP-18OP			161/345		
	obranch 34014 61984 1	TRIP BRANCH FROM BUS 'ADAMS 5 161' TO BUS 'AUSTIN 5 161' C	1	161	331-680	393-617
	obranch 60102 34018 1	TRIP BRANCH FROM BUS 'ADAMS 3 345' TO BUS 'HAZLTON3 345'	1	345	331-600	393-601
853	MAPP-19			345		
	obranch 65354 65786 1	OPEN LINE FROM BUS 'S3454 3 345' TO BUS 'WAGENER3 345' CK	1	345	645-650	645-650
	obranch 65351 63875 1	OPEN LINE FROM BUS 'S3451 3 345' TO BUS 'RAUN 3 345' CKT 1	1	345	635-645	636-645
855	MAPP-2		1	345	600	601
	obranch 60105 60236 1	TRIP BRANCH FROM BUS 'PR ISLD3 345' TO BUS 'REDROCK3 345'	1	345	600	601
858	MAPP-20		1	500-230	600-608	601-608

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 60101 61550 1	OPEN LINE FROM BUS 'FORBES 2 500' TO BUS 'FORB1JCT 230' CK	1	500-230	600-608	601-608
860	MAPP-21		1	500	600	601
	obranch 60101 60100 1	OPEN LINE FROM BUS 'FORBES 2 500' TO BUS 'FORBECA2 500' C	1	500	600	601
863	MAPP-24			230-345	640	640
	obranch 65026 64832 1	OPEN LINE FROM BUS 'G.GENT Y 345' TO BUS 'GENTLMN4 230' C	1	230-345	640	640
	obranch 64831 65026 1	OPEN LINE FROM BUS 'GENTLMN3 345' TO BUS 'G.GENT Y 345' C	1	345	640	640
865	MAPP-25		1	345	640	640
	obranch 64831 64878 1	OPEN LINE FROM BUS 'GENTLMN3 345' TO BUS 'KEYSTON3 345' C	1	345	640	640
868	MAPP-26		1	345	640	640
	obranch 64831 64943 1	OPEN LINE FROM BUS 'GENTLMN3 345' TO BUS 'REDWILO3 345' C	1	345	640	640
870	MAPP-27		1	345	640	640
	obranch 64831 64984 1	OPEN LINE FROM BUS 'GENTLMN3 345' TO BUS 'SWEET W3 345'	1	345	640	640
873	MAPP-28		2	345	640	640
	obranch 64831 64984 2	OPEN LINE FROM BUS 'GENTLMN3 345' TO BUS 'SWEET W3 345'	2	345	640	640
875	MAPP-29		1	230	640	640
	obranch 64832 64909 1	OPEN LINE FROM BUS 'GENTLMN4 230' TO BUS 'N.PLATT4 230' CK	1	230	640	640
878	MAPP-3		2	345	600	601
	obranch 60105 60236 2	TRIP BRANCH FROM BUS 'PR ISLD3 345' TO BUS 'REDROCK3 345'	2	345	600	601
880	MAPP-31		1	345	640	640-656
	obranch 66571 64984 1	OPEN LINE FROM BUS 'GR ISLD3 345' TO BUS 'SWEET W3 345' CK	1	345	640	640-656
883	MAPP-32		1	345	652-640	654-656
	obranch 66571 66506 1	OPEN LINE FROM BUS 'GR ISLD3 345' TO BUS 'FTTHOMP3 345' CK	1	345	652-640	654-656
885	MAPP-33		1	345	652	659
	obranch 67101 67105 1	OPEN LINE FROM BUS 'ANTELOP3 345' TO BUS 'LELANDO3 345' C	1	345	652	659
888	MAPP-34		1	230	667	668
	obranch 67503 67566 1	OPEN LINE FROM BUS 'DORSEY 4 230' TO BUS 'DORSEYM4 230' C	1	230	667	668
890	MAPP-35		1	230	652	654
	obranch 66507 66509 1	OPEN LINE FROM BUS 'FTTHOMP4 230' TO BUS 'FTRANDL4 230' C	1	230	652	654
893	MAPP-36		1	230	652	654
	obranch 66507 66514 1	OPEN LINE FROM BUS 'FTTHOMP4 230' TO BUS 'HURON 4 230' C	1	230	652	654
895	MAPP-37		1	230	652	654
	obranch 66507 66519 1	OPEN LINE FROM BUS 'FTTHOMP4 230' TO BUS 'OAHE 4 230' CK	1	230	652	654
898	MAPP-38		1	230	652	654
	obranch 66507 66523 1	OPEN LINE FROM BUS 'FTTHOMP4 230' TO BUS 'SIOUXFL4 230' C	1	230	652	654
900	MAPP-39		1	230	652	654
	obranch 66507 66540 1	OPEN LINE FROM BUS 'FTTHOMP4 230' TO BUS 'BIGBND14 230' C	1	230	652	654
903	MAPP-4		1	345	600	601
	obranch 60105 60192 1	TRIP BRANCH FROM BUS 'PR ISLD3 345' TO BUS 'BLUE LK3 345' C	1	345	600	601
905	MAPP-5		1	345	600	601
	obranch 60192 60108 1	TRIP BRANCH FROM BUS 'BLUE LK3 345' TO BUS 'WILMART3 345'	1	345	600	601
908	MAPP-6		1	345	600	601
	obranch 60192 60217 1	TRIP BRANCH FROM BUS 'BLUE LK3 345' TO BUS 'INVRHLS3 345'	1	345	600	601
910	MAPP-7		1	345	600	601
	obranch 60192 60233 1	TRIP BRANCH FROM BUS 'BLUE LK3 345' TO BUS 'PARKERS3 345'	1	345	600	601
913	MAPP-8		1	345	600	601
	obranch 60192 60262 1	TRIP BRANCH FROM BUS 'BLUE LK3 345' TO BUS 'EDEN PR3 345'	1	345	600	601
915	MAPP-9			345	600	
	obranch 61950 63032 1	TRIP BRANCH FROM BUS 'BYRON 3 345' TO BUS 'PL VLLY3 345' C	1	345	600	616-622
	obranch 63032 60102 1	TRIP BRANCH FROM BUS 'PL VLLY3 345' TO BUS 'ADAMS 3 345' C	1	345	600	601-622
918	MAPP-9GUID			161-345		
	obranch 69547 69549 1	TRIP LINE FROM BUS 'ROCHSTR5 161' TO BUS 'WABACO 5 161' C	1	161	680	681

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 34014 60102 1	TRIP LINE FROM BUS 'ADAMS 5 161' TO BUS 'ADAMS 3 345' CKT	1	345-161	600-331	601-393
920	MINNTAC 1T				608	608
	obranch 61558 61623 1	TRIP LINE FROM BUS 'MINT1JCT 115' TO BUS 'MINNTAC4 230' CKT	1	230-115	608	608
	obranch 61558 61710 1	TRIP LINE FROM BUS 'MINT1JCT 115' TO BUS 'MINNTAC7 115' CKT	1	115	608	608
	obranch 61623 61627 1	TRIP LINE FROM BUS 'MINNTAC4 230' TO BUS 'SHANNON4 230' CK	1	230	608	608
	obranch 61558 61559 1	TRIP LINE FROM BUS 'MINT1JCT 115' TO BUS 'MINT1TR913.8' CKT	1	115-13.8	608	608
923	MINNTAC 2T				608	608
	obranch 61623 61624 1	TRIP LINE FROM BUS 'MINNTAC4 230' TO BUS 'FORBES 4 230' CKT	1	230	608	608
	obranch 61560 61561 2	TRIP LINE FROM BUS 'MINT2JCT 115' TO BUS 'MINT2TR913.8' CKT	2	115-13.8	608	608
	obranch 61560 61623 2	TRIP LINE FROM BUS 'MINT2JCT 115' TO BUS 'MINNTAC4 230' CKT	2	230-115	608	608
	obranch 61560 61710 2	TRIP LINE FROM BUS 'MINT2JCT 115' TO BUS 'MINNTAC7 115' CKT	2	115	608	608
925	MUDLAKE 1T				608	608
	obranch 61578 61651 1	TRIP LINE FROM BUS 'MUDLKJCT 115' TO BUS 'MUDLAKE7 115' C	1	115	608	608
	obranch 61578 61617 1	TRIP LINE FROM BUS 'MUDLKJCT 115' TO BUS 'MUDLAKE4 230' C	1	230-115	608	608
	obranch 61578 61579 1	TRIP LINE FROM BUS 'MUDLKJCT 115' TO BUS 'MUDLKTR913.8' CK	1	115-13.8	608	608
928	RIVERTON 6T				608	608
	obranch 61796 61797 1	TRIP LINE FROM BUS 'RIVERJCT 115' TO BUS 'RIVERTR913.8' CKT	1	115-13.8	608	608
	obranch 61796 61612 1	TRIP LINE FROM BUS 'RIVERJCT 115' TO BUS 'RIVERTN4 230' CKT	1	230-115	608	608
	obranch 61796 61653 1	TRIP LINE FROM BUS 'RIVERJCT 115' TO BUS 'RIVERTN7 115' CKT	1	115	608	608
930	SHANNON 2T				608	608
	obranch 61785 61627 1	TRIP LINE FROM BUS 'SHAN2JCT 115' TO BUS 'SHANNON4 230' C	1	230-115	608	608
	obranch 61785 61750 1	TRIP LINE FROM BUS 'SHAN2JCT 115' TO BUS 'SHAN2TR913.8' CK	1	115-13.8	608	608
	obranch 61785 61749 1	TRIP LINE FROM BUS 'SHAN2JCT 115' TO BUS 'SHANNON7 115' C	1	115	608	608
933	SINGLE-025		1	500	600	601
	obranch 60101 60174 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'ROSEAUS2 500' CK	1	500	600	601
935	SINGLE-028		1	500	600	601
	obranch 60101 60198 1	TRIP LINE FROM BUS 'FORBES 2 500' TO BUS 'CHIS-N 2 500' CKT	1	500	600	601
938	SINGLE-031		1	230	626	657
	obranch 66752 66755 1	TRIP LINE FROM BUS 'DRAYTON4 230' TO BUS 'PRAIRIE4 230' CKT	1	230	626	657
940	SINGLE-034		1	230	626-667	657-668
	obranch 66752 67557 1	TRIP LINE FROM BUS 'DRAYTON4 230' TO BUS 'LETELER4 230' CK	1	230	626-667	657-668
943	SINGLE-040		1	230	608	657
	obranch 66753 66757 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'MORANVI4 230' CK	1	230	608	657
945	SINGLE-042		1	230	608	608-657
	obranch 66753 61627 1	TRIP LINE FROM BUS 'RUNNING4 230' TO BUS 'SHANNON4 230' C	1	230	608	608-657
948	SINGLE-044		1	230	600-667	601-668
	obranch 67576 60175 1	TRIP LINE FROM BUS 'RICHER 4 230' TO BUS 'ROSEAU 4 230' CKT	1	230	600-667	601-668
950	SINGLE-046			345-24	626	661-657
	obranch 67316 67315 1	TRIP LINE FROM BUS 'COYOTE 3 345' TO BUS 'COYOTE1G24.0' CK	1	345-24	626	661
	obranch 66791 67316 1	TRIP LINE FROM BUS 'CENTER 3 345' TO BUS 'COYOTE 3 345' CKT	1	345	626	657-661
953	SJLP-01			161	540	540
	obranch 59394 59392 1	OPEN LINE FROM BUS 'ST JOE 5 161' TO BUS 'MIDWAY 5 161' CKT	1	161	540	540
	obranch 59392 59391 1	OPEN LINE FROM BUS 'MIDWAY 5 161' TO BUS 'MARYVLE5 161' C	1	161	540	540
955	STINSON 1T				608-600	608-604
	obranch 61630 61631 1	TRIP LINE FROM BUS 'STINSON5 161' TO BUS 'MINONG 5 161' CKT	1	161	608	608
	obranch 61631 60290 1	TRIP LINE FROM BUS 'MINONG 5 161' TO BUS 'ST LAKE5 161' CKT	1	161	600-608	604-608
	obranch 61572 61697 1	TRIP LINE FROM BUS 'TACHBJCT 115' TO BUS 'TAC HBR7 115' CK	1	115	608	608
	obranch 61572 61573 1	TRIP LINE FROM BUS 'TACHBJCT 115' TO BUS 'TACHBTR913.8' CK	1	115-13.8	608	608
	obranch 61572 61696 1	TRIP LINE FROM BUS 'TACHBJCT 115' TO BUS 'TAC HBR6 138' CK	1	138-115	608	608
958	TACHRBR 1T				608-600	608-601
	obranch 61550 61551 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORB1TR934.5' CK	1	230-34.5	608	608
	obranch 61550 60101 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 2 500' CK	1	500-230	600-608	601-608
	obranch 61550 61624 1	TRIP LINE FROM BUS 'FORB1JCT 230' TO BUS 'FORBES 4 230' CK	1	230	608	608

No.	Contingency		Ckt	Base kV	Area	Zone
960	WINGRVR 1T			230-115	608-626	608-621
	obranch 61611 61798 1	OPEN LINE FROM BUS 'WINGRIV4 230' TO BUS 'WINGRJCT 115' C	1	230-115	608	608
	obranch 61611 61612 1	OPEN LINE FROM BUS 'WINGRIV4 230' TO BUS 'RIVERTN4 230' CK	1	230	608	608
	obranch 61611 63052 1	OPEN LINE FROM BUS 'WINGRIV4 230' TO BUS 'INMAN 4 230' CKT	1	230	608-626	608-621
963	29		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
965	3720		1	345	635	638
	obranch 64400 64403 1	OPEN BRANCH FROM BUS 'MECCORD3 345' TO BUS 'E MOLIN3 34	1	345	635	638
968	FG100		1	345	365	377-378
	obranch 39547 39918 1	OPEN BRANCH FROM BUS 'MORGAN 345' TO BUS 'PLAINS 345'	1	345	365	377-378
970	FG101		1	345	356-357	321-357
	obranch 30492 32327 1	OPEN BRANCH FROM BUS 'E W FKFT 345' TO BUS 'MT VRNON 34	1	345	356-357	321-357
973	FG1011		1	345	356-635	313-638
	obranch 31435 64408 1	OPEN BRANCH FROM BUS 'PALM TAP 345' TO BUS 'SUB T 3 345'	1	345	356-635	313-638
975	FG102		1	161-138	356	321
	obranch 31026 31023 1	OPEN BRANCH FROM BUS 'MARIONSA 138' TO BUS 'MARION S 16	1	161-138	356	321
978	FG10285		1	345	364-367	371-391
	obranch 39119 39157 1	OPEN BRANCH FROM BUS 'ROE 345 345' TO BUS 'COL 345 345' C	1	345	364-367	371-391
980	FG103		1	345	356-357	321-357
	obranch 32327 30492 1	OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'E W FKFT 34	1	345	356-357	321-357
983	FG104		1	345	359	301
	obranch 33161 33162 1	OPEN BRANCH FROM BUS 'DUCK CRK 345' TO BUS 'TAZEWELL 34	1	345	359	301
985	FG105		1	345-161	356	314
	obranch 31230 31231 1	OPEN BRANCH FROM BUS 'MONTGMRY 345' TO BUS 'MONTGMRY	1	345-161	356	314
988	FG10574		1	345	366	366
	obranch 39785 39676 1	OPEN BRANCH FROM BUS 'ROCKY RN 345' TO BUS 'WESTON 34	1	345	366	366
990	FG106		2	138	356	317
	obranch 30266 31007 2	OPEN BRANCH FROM BUS 'CAMPBELL 138' TO BUS 'MALINE 138'	2	138	356	317
993	FG107		1	138	356	322
	obranch 31180 31558 1	OPEN BRANCH FROM BUS 'MEREDOSA 138' TO BUS 'QUINCY E 13	1	138	356	322
995	FG108		1	138	356	319
	obranch 30500 31698 1	OPEN BRANCH FROM BUS 'E.QUINCY 138' TO BUS 'S.QUINCY 138'	1	138	356	319
998	FG110		1	345	356-357	323-357
	obranch 30395 32280 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'ROXFD IP 345'	1	345	356-357	323-357
1000	FG112		1	138	356	323
	obranch 31297 31739 1	OPEN BRANCH FROM BUS 'MURDOCK 138' TO BUS 'SIDNYCPS 13	1	138	356	323
1003	FG113		1	138-345	357	357
	obranch 32387 32388 1	OPEN BRANCH FROM BUS 'SIDNEY 345' TO BUS 'SIDNEY 138' C	1	138-345	357	357
1005	FG116		1	345	356-357	323-357
	obranch 30395 32280 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'ROXFD IP 345'	1	345	356-357	323-357
1008	FG12003		1	161	331	393
	obranch 34030 34031 1	OPEN BRANCH FROM BUS 'SALEM 5 161' TO BUS 'SO.GVW.5 161'	1	161	331	393
1010	FG12005		1	345	331-600	393-601
	obranch 60102 34018 1	OPEN BRANCH FROM BUS 'ADAMS 3 345' TO BUS 'HAZLTON3 345	1	345	331-600	393-601
1013	FG12006		1	345	331	393-391
	obranch 34093 34018 1	OPEN BRANCH FROM BUS 'ARNOLD 3 345' TO BUS 'HAZLTON3 34	1	345	331	393-391
1015	FG12009		1	345	331	393-391
	obranch 34093 34018 1	OPEN BRANCH FROM BUS 'ARNOLD 3 345' TO BUS 'HAZLTON3 34	1	345	331	393-391
1018	FG12010		1	161	331	393-392
	obranch 34030 34508 1	OPEN BRANCH FROM BUS 'SALEM 5 161' TO BUS 'JULIAN 5 161' C	1	161	331	393-392

No.	Contingency	Ckt	Base kV	Area	Zone
1020	FG12011	1	345	331-600	393-601
	obranch 60102 34018 1 OPEN BRANCH FROM BUS 'ADAMS 3 345' TO BUS 'HAZLTON3 345	1	345	331-600	393-601
1023	FG12012	1	345	331-635	391-638
	obranch 64352 34093 1 OPEN BRANCH FROM BUS 'TIFFIN 3 345' TO BUS 'ARNOLD 3 345'	1	345	331-635	391-638
1025	FG12013	1	345	331	393
	obranch 34036 34029 1 OPEN BRANCH FROM BUS 'ROCK CK3 345' TO BUS 'SALEM 3 345'	1	345	331	393
1028	FG12015	1	345	635	637
	obranch 64202 64200 1 OPEN BRANCH FROM BUS 'LEHIGH 3 345' TO BUS 'WEBSTER3 34	1	345	635	637
1030	FG12016	1	345	331	393-391
	obranch 34018 34093 1 OPEN BRANCH FROM BUS 'HAZLTON3 345' TO BUS 'ARNOLD 3 34	1	345	331	393-391
1033	FG12018	1	345	635	637
	obranch 64064 64095 1 OPEN BRANCH FROM BUS 'BONDRNT3 345' TO BUS 'MNTZUMA3 3	1	345	635	637
1035	FG12019	1	345	331-635	393-636
	obranch 63875 34006 1 OPEN BRANCH FROM BUS 'RAUN 3 345' TO BUS 'LAKEFLD3 345'	1	345	331-635	393-636
1038	FG12023	1	345-161	331	392-391
	obranch 34557 34189 1 OPEN BRANCH FROM BUS 'OTTUMWAY 345' TO BUS 'OTTUMWA5	1	345-161	331	392-391
1040	FG12025	1	345	635	637-638
	obranch 64350 64095 1 OPEN BRANCH FROM BUS 'HILLS 3 345' TO BUS 'MNTZUMA3 345'	1	345	635	637-638
1043	FG121	1	230	356	310
	obranch 31500 31785 1 OPEN BRANCH FROM BUS 'PICKNYVL 230' TO BUS 'STJOHNAM 23	1	230	356	310
1045	FG122	1	230-138	356	321
	obranch 31924 31925 1 OPEN BRANCH FROM BUS 'W.FRKFT 230' TO BUS 'W.FRKFT 138'	1	230-138	356	321
1048	FG123	1	345	356	323
	obranch 31567 31991 1 OPEN BRANCH FROM BUS 'RAMSEY 345' TO BUS 'HOLLAND 345'	1	345	356	323
1050	FG124		345	356-357	323-357
	obranch 31993 31330 1 OPEN BRANCH FROM BUS 'XENIA 345' TO BUS 'NEWTON 345'	1	345	356	323
	obranch 32327 31993 1 OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'XENIA 345'	1	345	356-357	323-357
1053	FG125	1	345	356	323
	obranch 31330 30309 1 OPEN BRANCH FROM BUS 'NEWTON 345' TO BUS 'CASEY 345'	1	345	356	323
1055	FG126	1	345	356	323
	obranch 31330 30309 1 OPEN BRANCH FROM BUS 'NEWTON 345' TO BUS 'CASEY 345'	1	345	356	323
1058	FG127		345	356-357	323-357
	obranch 32327 31993 1 OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'XENIA 345'	1	345	356-357	323-357
	obranch 31993 31330 1 OPEN BRANCH FROM BUS 'XENIA 345' TO BUS 'NEWTON 345'	1	345	356	323
1060	FG128	1	345-138	356	311
	obranch 30648 30650 1 OPEN BRANCH FROM BUS 'GRAYSUM1 345' TO BUS 'GRAY SUM 1	1	345-138	356	311
1063	FG129	1	345	356-130	314-130
	obranch 30154 96041 1 OPEN BRANCH FROM BUS 'BLAND 345' TO BUS '7FRANKS 345'	1	345	356-130	314-130
1065	FG130	1	345	356-540	314-540
	obranch 31408 59201 1 OPEN BRANCH FROM BUS 'OVERTON 345' TO BUS 'SIBLEY 7 345'	1	345	356-540	314-540
1068	FG1307	1	500-138	151	156
	obranch 98107 98108 1 OPEN BRANCH FROM BUS '8RICHARD 500' TO BUS '4RICHARD 13	1	500-138	151	156
1070	FG131	1	345	356	314
	obranch 31230 31992 1 OPEN BRANCH FROM BUS 'MONTGMRY 345' TO BUS 'SPENCER 3	1	345	356	314
1073	FG1319	1	500	524-151	524-159
	obranch 99486 55305 1 OPEN BRANCH FROM BUS '8ANO 50 500' TO BUS 'FTSMITH8 500'	1	500	524-151	524-159
1075	FG132	1	345	356	323
	obranch 31321 31991 1 OPEN BRANCH FROM BUS 'NEOGA 345' TO BUS 'HOLLAND 345'	1	345	356	323
1078	FG133	1	345	356-130	314-130
	obranch 30154 96041 1 OPEN BRANCH FROM BUS 'BLAND 345' TO BUS '7FRANKS 345'	1	345	356-130	314-130
1080	FG134	1	138	356	317-310

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 31877 30266 1	OPEN BRANCH FROM BUS 'VENICE 2 138' TO BUS 'CAMPBELL 138	1	138	356	317-310
1083	FG1709		1	500	145	196
	obranch 14902 14906 1	OPEN BRANCH FROM BUS '8CARSON 500' TO BUS '8CLOVER 50	1	500	145	196
1085	FG22033		1	345	202	202-203
	obranch 21800 22063 1	OPEN BRANCH FROM BUS '02BEAVER 345' TO BUS '02DAV-BE 34	1	345	202	202-203
1088	FG2363		1	500	145-201	196-201
	obranch 14917 20105 1	OPEN BRANCH FROM BUS '8MT STM 500' TO BUS '01DOUBS 500'	1	500	145-201	196-201
1090	FG2861		1	345	202-205	203-251
	obranch 21455 22606 1	OPEN BRANCH FROM BUS '02BAY SH 345' TO BUS '05FOSTOR 34	1	345	202-205	203-251
1093	FG3009		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1095	FG3012		1	345	364	371
	obranch 39058 39119 1	OPEN BRANCH FROM BUS 'PAD 345 345' TO BUS 'ROE 345 345' C	1	345	364	371
1098	FG3013		2	138-345	364	371
	obranch 39119 39120 2	OPEN BRANCH FROM BUS 'ROE 345 345' TO BUS 'ROE 138 138' C	2	138-345	364	371
1100	FG3014		1	345-138	364	371
	obranch 39059 39058 1	OPEN BRANCH FROM BUS 'PAD 138 138' TO BUS 'PAD 345 345' C	1	345-138	364	371
1103	FG3015		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1105	FG3016			345/115		
	obranch 39244 60304 1	OPEN BRANCH FROM BUS 'ARP 345 345' TO BUS 'EAU CL 3 345' C	1	345	364-600	371-604
	obranch 60315 39706 1	OPEN BRANCH FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115'	1	115	366-600	366-604
1108	FG3017		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1110	FG3018			345	600	616-601
	obranch 69999 61950 1	OPEN BRANCH FROM BUS 'RFPBID6 345' TO BUS 'BYRON 3 345'	1	345	600	616-601
	obranch 60105 69999 1	OPEN BRANCH FROM BUS 'PR ISLD3 345' TO BUS 'RFPBID6 345'	1	345	600	601
1113	FG3020		1	345-138	364	371
	obranch 39059 39058 1	OPEN BRANCH FROM BUS 'PAD 138 138' TO BUS 'PAD 345 345' C	1	345-138	364	371
1115	FG3021		1	138	364	371
	obranch 39047 39059 1	OPEN BRANCH FROM BUS 'ROR 138 138' TO BUS 'PAD 138 138' C	1	138	364	371
1118	FG3022		1	345	367	391-367
	obranch 39157 39818 1	OPEN BRANCH FROM BUS 'COL 345 345' TO BUS 'NMA 345 345' C	1	345	367	391-367
1120	FG3024		1	138	364	371
	obranch 39047 39059 1	OPEN BRANCH FROM BUS 'ROR 138 138' TO BUS 'PAD 138 138' C	1	138	364	371
1123	FG3025		1	345	364	371
	obranch 39058 39119 1	OPEN BRANCH FROM BUS 'PAD 345 345' TO BUS 'ROE 345 345' C	1	345	364	371
1125	FG3026		1	138-345	364	371
	obranch 39120 39119 1	OPEN BRANCH FROM BUS 'ROE 138 138' TO BUS 'ROE 345 345' C	1	138-345	364	371
1128	FG3030		1	345	365-366	376-366
	obranch 38894 39785 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'ROCKY RN 345'	1	345	365-366	376-366
1130	FG3031		1	138	364-367	371-367
	obranch 39218 39821 1	OPEN BRANCH FROM BUS 'CHA 138 138' TO BUS 'FCH 138 138' C	1	138	364-367	371-367
1133	FG3118		1	345	205-356	252-323
	obranch 22653 30309 1	OPEN BRANCH FROM BUS '05BREED 345' TO BUS 'CASEY 345'	1	345	205-356	252-323
1135	FG3120		1	345	356	314
	obranch 31230 31992 1	OPEN BRANCH FROM BUS 'MONTGMRY 345' TO BUS 'SPENCER 3	1	345	356	314
1138	FG3122		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1140	FG3123		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335

No.	Contingency		Ckt	Base kV	Area	Zone
1143	FG3124		1	345	147-356	166-316
	obranch 18001 30825 1	OPEN BRANCH FROM BUS '7SHAWNEE 345' TO BUS 'JOPPA TS 34	1	345	147-356	166-316
1145	FG3125		1	138	357	357
	obranch 32388 32405 1	OPEN BRANCH FROM BUS 'SIDNEY 138' TO BUS 'MIRA TAP 138'	1	138	357	357
1148	FG3126		1	345	356	323
	obranch 30395 31445 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'PANA 345'	1	345	356	323
1150	FG3127			345	356-363	323-335
	obranch 30395 31445 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'PANA 345'	1	345	356	323
	obranch 31445 36343 1	OPEN BRANCH FROM BUS 'PANA 345' TO BUS 'KINCA; R 345' C	1	345	356-363	323-335
1153	FG3128		1	138	356	322
	obranch 31558 31559 1	OPEN BRANCH FROM BUS 'QUINCY E 138' TO BUS 'QUINCY S 138'	1	138	356	322
1155	FG3129		1	345-138	356	317
	obranch 31051 31053 1	OPEN BRANCH FROM BUS 'MASON 13 345' TO BUS 'MASON 2 138	1	345-138	356	317
1158	FG3130		1	345	356	316-312
	obranch 30974 31773 1	OPEN BRANCH FROM BUS 'LUTESVIL 345' TO BUS 'ST FRANC 345'	1	345	356	316-312
1160	FG3131		1	345	363	335
	obranch 36342 36348 1	OPEN BRANCH FROM BUS 'KINCA; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
1163	FG3132		1	138-345	357	357
	obranch 32388 32387 1	OPEN BRANCH FROM BUS 'SIDNEY 138' TO BUS 'SIDNEY 345' C	1	138-345	357	357
1165	FG3133		2			
	obranch 30886 31051 2	OPEN BRANCH FROM BUS 'LABADIE 345' TO BUS 'MASON 13 345'	2			
1168	FG3134		1	138	356	310
	obranch 31213 31652 1	OPEN BRANCH FROM BUS 'MISS T 3 138' TO BUS 'ROXFORD 138'	1	138	356	310
1170	FG3135			345	356-357	323-357
	obranch 32327 31993 1	OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'XENIA 345'	1	345	356-357	323-357
	obranch 31993 31330 1	OPEN BRANCH FROM BUS 'XENIA 345' TO BUS 'NEWTON 345'	1	345	356	323
1173	FG3136		1	345	356-363	323-335
	obranch 31445 36343 1	OPEN BRANCH FROM BUS 'PANA 345' TO BUS 'KINCA; R 345' C	1	345	356-363	323-335
1175	FG3137		1	345	356-363	323-335
	obranch 31445 36343 1	OPEN BRANCH FROM BUS 'PANA 345' TO BUS 'KINCA; R 345' C	1	345	356-363	323-335
1178	FG3138		1	345	356	314
	obranch 31088 31230 1	OPEN BRANCH FROM BUS 'MCCREDIE 345' TO BUS 'MONTGMRY	1	345	356	314
1180	FG3139			345	356-363	323-335
	obranch 30395 31445 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'PANA 345'	1	345	356	323
	obranch 31445 36343 1	OPEN BRANCH FROM BUS 'PANA 345' TO BUS 'KINCA; R 345' C	1	345	356-363	323-335
1183	FG3140			345	356-363	323-335
	obranch 30395 31445 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'PANA 345'	1	345	356	323
	obranch 31445 36343 1	OPEN BRANCH FROM BUS 'PANA 345' TO BUS 'KINCA; R 345' C	1	345	356-363	323-335
1185	FG3141		1	138	356	310
	obranch 31212 31652 1	OPEN BRANCH FROM BUS 'MISS T 1 138' TO BUS 'ROXFORD 138'	1	138	356	310
1188	FG3142			345	356-363	323-335
	obranch 30395 31445 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'PANA 345'	1	345	356	323
	obranch 31445 36343 1	OPEN BRANCH FROM BUS 'PANA 345' TO BUS 'KINCA; R 345' C	1	345	356-363	323-335
1190	FG3143		1	345-138	356	310
	obranch 30214 30215 1	OPEN BRANCH FROM BUS 'CAHOKIA 345' TO BUS 'CAHOK 1 138'	1	345-138	356	310
1193	FG3144		1	345	356-130	314-130
	obranch 30154 96041 1	OPEN BRANCH FROM BUS 'BLAND 345' TO BUS '7FRANKS 345'	1	345	356-130	314-130
1195	FG3145		1	345	356	323
	obranch 30395 30386 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'COFFEN N 34	1	345	356	323
1198	FG3146		1	345	359	301
	obranch 33161 33162 1	OPEN BRANCH FROM BUS 'DUCK CRK 345' TO BUS 'TAZEWELL 34	1	345	359	301

No.	Contingency		Ckt	Base kV	Area	Zone
1200	FG3147		1	345	359	301
	obranch 33161 33162 1	OPEN BRANCH FROM BUS 'DUCK CRK 345' TO BUS 'TAZEWELL 34	1	345	359	301
1203	FG3148		1	138	356	310-313
	obranch 31212 31764 1	OPEN BRANCH FROM BUS 'MISS T 1 138' TO BUS 'SIOUX 2 138' C	1	138	356	310-313
1205	FG3150		1	345	356	323
	obranch 30309 31330 1	OPEN BRANCH FROM BUS 'CASEY 345' TO BUS 'NEWTON 345'	1	345	356	323
1208	FG3153		1	345	356-130	314-130
	obranch 30154 96041 1	OPEN BRANCH FROM BUS 'BLAND 345' TO BUS '7FRANKS 345'	1	345	356-130	314-130
1210	FG3157			138/345	356-130	314-130
	obranch 30957 31024 1	OPEN BRANCH FROM BUS 'LKSIDE 1 138' TO BUS 'MARIES 138'	1	138	356	314
	obranch 30154 96041 1	OPEN BRANCH FROM BUS 'BLAND 345' TO BUS '7FRANKS 345'	1	345	356-130	314-130
1213	FG3172		1	138-345	357	357
	obranch 32387 32388 1	OPEN BRANCH FROM BUS 'SIDNEY 345' TO BUS 'SIDNEY 138' C	1	138-345	357	357
1215	FG3220		1	345	363	335
	obranch 36311 36373 1	OPEN BRANCH FROM BUS 'ELECT;4R 345' TO BUS 'PLANO; R 345'	1	345	363	335
1218	FG3221		1	345	363	335
	obranch 36310 36372 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'PLANO; B 345'	1	345	363	335
1220	FG3224		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1223	FG3226		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1225	FG3230		1	345	363	335
	obranch 36335 36355 1	OPEN BRANCH FROM BUS 'GOODI;2R 345' TO BUS 'LOCKP; R 345'	1	345	363	335
1228	FG3236		1	345	363-365	335-376
	obranch 36420 39247 1	OPEN BRANCH FROM BUS 'ZION ; B 345' TO BUS 'ARCADN3 345'	1	345	363-365	335-376
1230	FG3237		1	345	363-365	335-376
	obranch 36421 38849 1	OPEN BRANCH FROM BUS 'ZION ; R 345' TO BUS 'PLS PR2 345' C	1	345	363-365	335-376
1233	FG3238		1	345	363	335
	obranch 36289 36389 1	OPEN BRANCH FROM BUS 'CHERR; R 345' TO BUS 'SILVE; R 345'	1	345	363	335
1235	FG3239			345/115		
	obranch 39244 60304 1	OPEN BRANCH FROM BUS 'ARP 345 345' TO BUS 'EAU CL 3 345' C	1	345	364-600	371-604
	obranch 60315 39706 1	OPEN BRANCH FROM BUS 'T-CRNRS7 115' TO BUS 'WIEN 115'	1	115	366-600	366-604
1238	FG3240		1	345	363-365	335-376
	obranch 36420 39247 1	OPEN BRANCH FROM BUS 'ZION ; B 345' TO BUS 'ARCADN3 345'	1	345	363-365	335-376
1240	FG3241		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1243	FG3242		1	345	363-365	335-376
	obranch 36421 38849 1	OPEN BRANCH FROM BUS 'ZION ; R 345' TO BUS 'PLS PR2 345' C	1	345	363-365	335-376
1245	FG3243		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1248	FG3258		1	345	363-635	335-638
	obranch 36382 64405 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'SUB 91 3 345' C	1	345	363-635	335-638
1250	FG3260		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1253	FG3401		1	138-345	357	357
	obranch 32386 32385 1	OPEN BRANCH FROM BUS 'BUNSONVL 138' TO BUS 'BUNSONVL 3	1	138-345	357	357
1255	FG3402		1	345	356-357	323-357
	obranch 30395 32280 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'ROXFD IP 345'	1	345	356-357	323-357
1258	FG3403		1	138	357	357-391
	obranch 32388 32394 1	OPEN BRANCH FROM BUS 'SIDNEY 138' TO BUS 'WINDSOR 138'	1	138	357	357-391
1260	FG3404		1	345	356-357	323-357

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 30395 32280 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'ROXFD IP 345'	1	345	356-357	323-357
1263	FG3406		1	345	356-357	310-357
	obranch 31651 32278 1	OPEN BRANCH FROM BUS 'ROXFORD 345' TO BUS 'STALLING 34	1	345	356-357	310-357
1265	FG3407		1	345	356-357	310-357
	obranch 31651 32278 1	OPEN BRANCH FROM BUS 'ROXFORD 345' TO BUS 'STALLING 34	1	345	356-357	310-357
1268	FG3408		1	345	363	335
	obranch 36342 36348 1	OPEN BRANCH FROM BUS 'KINCA; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
1270	FG3409		1	345	363	335
	obranch 36344 36348 1	OPEN BRANCH FROM BUS 'PONTI; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
1273	FG3410		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1275	FG3411		1	138	356	323
	obranch 31618 31739 1	OPEN BRANCH FROM BUS 'RNTOUL J 138' TO BUS 'SIDNYCPS 138	1	138	356	323
1278	FG3413			345	356-357	323-357
	obranch 32327 31993 1	OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'XENIA 345'	1	345	356-357	323-357
	obranch 31993 31330 1	OPEN BRANCH FROM BUS 'XENIA 345' TO BUS 'NEWTON 345'	1	345	356	323
1280	FG3414		1	345	356	323
	obranch 30386 30395 1	OPEN BRANCH FROM BUS 'COFFEN N 345' TO BUS 'COFFEEN 34	1	345	356	323
1283	FG3418		1	765	205	250
	obranch 22554 22560 1	OPEN BRANCH FROM BUS '05BROADF 765' TO BUS '05BAKER 76	1	765	205	250
1285	FG3419		1	345	356-357	323-357
	obranch 30395 32280 1	OPEN BRANCH FROM BUS 'COFFEEN 345' TO BUS 'ROXFD IP 345'	1	345	356-357	323-357
1288	FG3420		1	765	205	252
	obranch 22667 22671 1	OPEN BRANCH FROM BUS '05JEFRSO 765' TO BUS '05ROCKPT 76	1	765	205	252
1290	FG3424			345	356-357	323-357
	obranch 32327 31993 1	OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'XENIA 345'	1	345	356-357	323-357
	obranch 31993 31330 1	OPEN BRANCH FROM BUS 'XENIA 345' TO BUS 'NEWTON 345'	1	345	356	323
1293	FG3518		1	345	365	376
	obranch 39253 39329 1	OPEN BRANCH FROM BUS 'ARCADN1 345' TO BUS 'GRANVL1 345	1	345	365	376
1295	FG3519		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1298	FG3520		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1300	FG3522		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1303	FG3523		1	138	365	377
	obranch 38895 39545 1	OPEN BRANCH FROM BUS 'N APP 5 138' TO BUS 'LAWN RD 138'	1	138	365	377
1305	FG3524			345	365-366	
	obranch 38894 39785 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'ROCKY RN 345'	1	345	365-366	376-366
	obranch 39547 39918 1	OPEN BRANCH FROM BUS 'MORGAN 345' TO BUS 'PLAINS 345'	1	345	365	377-378
1308	FG3525		1	345	365	377-378
	obranch 39547 39918 1	OPEN BRANCH FROM BUS 'MORGAN 345' TO BUS 'PLAINS 345'	1	345	365	377-378
1310	FG3527		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1313	FG3533		1	345	367-364	391-371
	obranch 39157 39176 1	OPEN BRANCH FROM BUS 'COL 345 345' TO BUS 'SFL 345 345' C	1	345	367-364	391-371
1315	FG3535		1	138-345	366	366
	obranch 39620 39630 1	OPEN BRANCH FROM BUS 'KEWAUNEE 138' TO BUS 'KEWAUNEE	1	138-345	366	366
1318	FG3613		1	345	365-366	376-366
	obranch 39359 39630 1	OPEN BRANCH FROM BUS 'N APP 1 345' TO BUS 'KEWAUNEE 345	1	345	365-366	376-366
1320	FG3617		1	138	365	377

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 38895 39545 1	OPEN BRANCH FROM BUS 'N APP 5 138' TO BUS 'LAWN RD 138'	1	138	365	377
1323	FG3618		1	138	365-366	377-366
	obranch 39567 39600 1	OPEN BRANCH FROM BUS 'N APP 4 138' TO BUS 'MASON ST 138'	1	138	365-366	377-366
1325	FG3704		1	345	635	637
	obranch 64064 64095 1	OPEN BRANCH FROM BUS 'BONDRNT3 345' TO BUS 'MNTZUMA3 3	1	345	635	637
1328	FG3707		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1330	FG3710		1	345	331-600	393-601
	obranch 60102 34018 1	OPEN BRANCH FROM BUS 'ADAMS 3 345' TO BUS 'HAZLTON3 345	1	345	331-600	393-601
1333	FG3715		1	345	635	638
	obranch 64400 64403 1	OPEN BRANCH FROM BUS 'MECCORD3 345' TO BUS 'E MOLIN3 34	1	345	635	638
1335	FG3716		1	345	363-635	335-638
	obranch 36382 64405 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'SUB 91 3 345' C	1	345	363-635	335-638
1338	FG3718		1	345	635	638
	obranch 64400 64403 1	OPEN BRANCH FROM BUS 'MECCORD3 345' TO BUS 'E MOLIN3 34	1	345	635	638
1340	FG3719		1	345	363-635	335-638
	obranch 36382 64405 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'SUB 91 3 345' C	1	345	363-635	335-638
1343	FG3721		1	345	363-635	335-638
	obranch 36382 64405 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'SUB 91 3 345' C	1	345	363-635	335-638
1345	FG3723		1	345	635	637-638
	obranch 64350 64095 1	OPEN BRANCH FROM BUS 'HILLS 3 345' TO BUS 'MNTZUMA3 345'	1	345	635	637-638
1348	FG3724		1	345	331	393-391
	obranch 34018 34093 1	OPEN BRANCH FROM BUS 'HAZLTON3 345' TO BUS 'ARNOLD 3 34	1	345	331	393-391
1350	FG3725		1	345	331-363	393-335
	obranch 36382 34036 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'ROCK CK3 345'	1	345	331-363	393-335
1353	FG3727		1	345	331-600	393-601
	obranch 34006 60331 1	OPEN BRANCH FROM BUS 'LAKEFLD3 345' TO BUS 'LKFLDXL3 345	1	345	331-600	393-601
1355	FG3728		1	345	331	393-391
	obranch 34018 34093 1	OPEN BRANCH FROM BUS 'HAZLTON3 345' TO BUS 'ARNOLD 3 34	1	345	331	393-391
1358	FG4003		1	345	363	335
	obranch 36310 36362 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'NELSO; B 345'	1	345	363	335
1360	FG4004			345-138	363-357	335-357
	obranch 36348 36342 1	OPEN BRANCH FROM BUS 'LATHA; T 345' TO BUS 'KINCA; B 345' C	1	345	363	335
	obranch 32356 32357 1	OPEN BRANCH FROM BUS 'LATHAM 345' TO BUS 'LATHAM 138'	1	138-345	357	357
	obranch 32357 32362 1	OPEN BRANCH FROM BUS 'LATHAM 138' TO BUS 'N DEC W 138'	1	138	357	357
	obranch 36348 32356 1	OPEN BRANCH FROM BUS 'LATHA; T 345' TO BUS 'LATHAM 345'	1	345	357-363	357-335
	obranch 36348 36344 1	OPEN BRANCH FROM BUS 'LATHA; T 345' TO BUS 'PONTI; B 345' C	1	345	363	335
	obranch 32356 32349 1	OPEN BRANCH FROM BUS 'LATHAM 345' TO BUS 'MAROA W 345	1	345	357	357
	obranch 32357 32359 1	OPEN BRANCH FROM BUS 'LATHAM 138' TO BUS 'LATH STP 138'	1	138	357	357
	obranch 32357 32358 1	OPEN BRANCH FROM BUS 'LATHAM 138' TO BUS 'LATH NTP 138'	1	138	357	357
1363	FG4005		1	765	205	252
	obranch 22667 22671 1	OPEN BRANCH FROM BUS '05JEFRSO 765' TO BUS '05ROCKPT 76	1	765	205	252
1365	FG4006		1	345-138	356	310
	obranch 30214 30215 1	OPEN BRANCH FROM BUS 'CAHOKIA 345' TO BUS 'CAHOK 1 138'	1	345-138	356	310
1368	FG4007			138	356	310-318
	obranch 30216 31525 1	OPEN BRANCH FROM BUS 'CAHOK 3 138' TO BUS 'POPLAR 2 138'	1	138	356	310-318
	obranch 31525 30325 1	OPEN BRANCH FROM BUS 'POPLAR 2 138' TO BUS 'CENTRAL 138	1	138	356	318
1370	FG4008			138	356	318-310
	obranch 30949 31124 1	OPEN BRANCH FROM BUS 'LEMT 2 138' TO BUS 'MER 2&3 138' C	1	138	356	318
	obranch 30216 30949 1	OPEN BRANCH FROM BUS 'CAHOK 3 138' TO BUS 'LEMT 2 138' C	1	138	356	310-318
1373	FG4009			345-138	356-357	312-357

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 31774 31773 2	OPEN BRANCH FROM BUS 'ST FRANC 138' TO BUS 'ST FRANC 345	2	345-138	356	312
	obranch 32274 32278 1	OPEN BRANCH FROM BUS 'BALDWIN 345' TO BUS 'STALLING 345'	1	345	357	357
	obranch 32279 32278 1	OPEN BRANCH FROM BUS 'STALLING 138' TO BUS 'STALLING 345'	1	138-345	357	357
	obranch 31669 31773 1	OPEN BRANCH FROM BUS 'RUSH 345' TO BUS 'ST FRANC 345'	1	345	356	312
1375	FG4011			345-161	356-362	316-362
	obranch 30849 30850 1	OPEN BRANCH FROM BUS 'KELSO 345' TO BUS 'KELSO 161' C	1	345-161	356	316
	obranch 30825 30849 1	OPEN BRANCH FROM BUS 'JOPPA TS 345' TO BUS 'KELSO 345'	1	345	356	316
	obranch 33392 33393 1	OPEN BRANCH FROM BUS 'JOPPA S 161' TO BUS 'JOPPA SR 161'	1	161	362	362
1378	FG4012			345-161	130-356	130-316
	obranch 96038 96075 1	OPEN BRANCH FROM BUS '7ESSEX 345' TO BUS '5ESSEX 161'	1	345-161	130	130
	obranch 30974 96038 1	OPEN BRANCH FROM BUS 'LUTESVIL 345' TO BUS '7ESSEX 345'	1	345	356-130	316-130
1380	FG4013		1	138	356	310-318
	obranch 30216 30949 1	OPEN BRANCH FROM BUS 'CAHOK 3 138' TO BUS 'LEMT 2 138' C	1	138	356	310-318
1383	FG4014			345	356	314
	obranch 31408 31088 1	OPEN BRANCH FROM BUS 'OVERTON 345' TO BUS 'MCCREDIE 34	1	345	356	314
	obranch 31230 31088 1	OPEN BRANCH FROM BUS 'MONTGMRY 345' TO BUS 'MCCREDIE	1	345	356	314
1385	FG4015			138	356	322
	obranch 31180 30369 1	OPEN BRANCH FROM BUS 'MEREDOSA 138' TO BUS 'CLAY JCT 13	1	138	356	322
	obranch 30369 31558 1	OPEN BRANCH FROM BUS 'CLAY JCT 138' TO BUS 'QUINCY E 138'	1	138	356	322
1388	FG4016			138	356	310-313
	obranch 31213 31755 1	OPEN BRANCH FROM BUS 'MISS T 3 138' TO BUS 'SIOUX 1 138' C	1	138	356	310-313
	obranch 31213 31652 1	OPEN BRANCH FROM BUS 'MISS T 3 138' TO BUS 'ROXFORD 138'	1	138	356	310
1390	FG4017			345	356-357	323-357
	obranch 31993 31330 1	OPEN BRANCH FROM BUS 'XENIA 345' TO BUS 'NEWTON 345'	1	345	356	323
	obranch 32327 31993 1	OPEN BRANCH FROM BUS 'MT VRNON 345' TO BUS 'XENIA 345'	1	345	356-357	323-357
1393	FG4018			161-345	515-130	515-130
	obranch 96075 52634 1	OPEN BRANCH FROM BUS '5ESSEX 161' TO BUS 'IDALIA 5 161' C	1	161	515-130	515-130
	obranch 96038 96075 1	OPEN BRANCH FROM BUS '7ESSEX 345' TO BUS '5ESSEX 161'	1	345-161	130	130
1395	FG4019			345-161	130-356	130-316
	obranch 96038 96075 1	OPEN BRANCH FROM BUS '7ESSEX 345' TO BUS '5ESSEX 161'	1	345-161	130	130
	obranch 30974 96038 1	OPEN BRANCH FROM BUS 'LUTESVIL 345' TO BUS '7ESSEX 345'	1	345	356-130	316-130
1398	FG4020		1	345	130	130
	obranch 96049 96044 1	OPEN BRANCH FROM BUS '7THOMHL 345' TO BUS '7MCCRED 34	1	345	130	130
1400	FG4022			345-138	356	316-312
	obranch 30974 31773 1	OPEN BRANCH FROM BUS 'LUTESVIL 345' TO BUS 'ST FRANC 345'	1	345	356	316-312
	obranch 31773 31774 1	OPEN BRANCH FROM BUS 'ST FRANC 345' TO BUS 'ST FRANC 138	1	345-138	356	312
1403	FG4023			345	363	335
	obranch 36342 36348 1	OPEN BRANCH FROM BUS 'KINCA; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
	obranch 36344 36348 1	OPEN BRANCH FROM BUS 'PONTI; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
1405	FG4024			345	363	335
	obranch 36344 36348 1	OPEN BRANCH FROM BUS 'PONTI; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
	obranch 36342 36348 1	OPEN BRANCH FROM BUS 'KINCA; B 345' TO BUS 'LATHA; T 345' C	1	345	363	335
1408	FG4027			345-138	356-357	310-357
	obranch 30214 32274 1	OPEN BRANCH FROM BUS 'CAHOKIA 345' TO BUS 'BALDWIN 345'	1	345	356-357	310-357
	obranch 30214 30216 1	OPEN BRANCH FROM BUS 'CAHOKIA 345' TO BUS 'CAHOK 3 138'	1	345-138	356	310
1410	FG45009		1	500	201	201
	obranch 20103 20101 1	OPEN BRANCH FROM BUS '01BLACKO 500' TO BUS '01BEDNGT 50	1	500	201	201
1413	FG45019		1	500	201	201
	obranch 20101 20105 1	OPEN BRANCH FROM BUS '01BEDNGT 500' TO BUS '01DOUBS 50	1	500	201	201
1415	FG5002		1	345	520-524	520-524
	obranch 53794 54908 1	OPEN BRANCH FROM BUS 'R.S.S.-7 345' TO BUS 'ARCADIA7 345' C	1	345	520-524	520-524
1418	FG5005		1	138-161	520-523	520-523

No.	Contingency		Ckt	Base kV	Area	Zone
	obranch 53802 54438 1	OPEN BRANCH FROM BUS 'CATOOSA4 138' TO BUS 'CATSAGR5 1	1	138-161	520-523	520-523
1420	FG5007		1	138	520-525	520-525
	obranch 54140 55814 1	OPEN BRANCH FROM BUS 'S.W.S.-4 138' TO BUS 'ANADARK4 138'	1	138	520-525	520-525
1423	FG5008		1	345	520	520
	obranch 53277 54037 1	OPEN BRANCH FROM BUS 'LYDIA 7 345' TO BUS 'VALIANT7 345' C	1	345	520	520
1425	FG5010		2	138-345	520	520
	obranch 53527 53528 2	OPEN BRANCH FROM BUS 'DIANA 4 138' TO BUS 'DIANA 7 345' C	2	138-345	520	520
1428	FG5014		1	345	526-520	526-520
	obranch 51534 54119 1	OPEN BRANCH FROM BUS 'TUCO7 345' TO BUS 'O.K.U.-7 345' CK	1	345	526-520	526-520
1430	FG5017		1	345-500	524	524
	obranch 55302 55305 1	OPEN BRANCH FROM BUS 'FTSMITH7 345' TO BUS 'FTSMITH8 500'	1	345-500	524	524
1433	FG5022		1	345	536	537
	obranch 56769 56796 1	OPEN BRANCH FROM BUS 'LANG 7 345' TO BUS 'WICHITA7 345'	1	345	536	537
1435	FG5023		1	345	541	541
	obranch 57965 57981 1	OPEN BRANCH FROM BUS 'W.GRDNR7 345' TO BUS 'LACYGNE7 3	1	345	541	541
1438	FG5029		1	345	502-520	502-520
	obranch 50045 53454 1	OPEN BRANCH FROM BUS 'DOLHILL7 345' TO BUS 'SW SHV 7 345'	1	345	502-520	502-520
1440	FG5037		1	345	520-524	520-524
	obranch 53794 55224 1	OPEN BRANCH FROM BUS 'R.S.S.-7 345' TO BUS 'MUSKOGE7 345'	1	345	520-524	520-524
1443	FG5042		1	345	520	520
	obranch 53277 54037 1	OPEN BRANCH FROM BUS 'LYDIA 7 345' TO BUS 'VALIANT7 345' C	1	345	520	520
1445	FG5046		1	138	520	520
	obranch 53770 53827 1	OPEN BRANCH FROM BUS 'PRATTV-4 138' TO BUS 'S.S.---4 138' C	1	138	520	520
1448	FG5047		1	138	520	520
	obranch 53771 53795 1	OPEN BRANCH FROM BUS 'JENKS--4 138' TO BUS 'R.S.S.-4 138' C	1	138	520	520
1450	FG5049		2			
	obranch 57968 57969 2	OPEN BRANCH FROM BUS 'STILWEL7 345' TO BUS 'STILWEL5 161'	2			
1453	FG5054		1	138	520	520
	obranch 54117 54140 1	OPEN BRANCH FROM BUS 'FTCOBNG4 138' TO BUS 'S.W.S.-4 138'	1	138	520	520
1455	FG5058		1	230	502	502
	obranch 50023 50126 1	OPEN BRANCH FROM BUS 'CARROLL6 230' TO BUS 'MESSICK6 23	1	230	502	502
1458	FG5063		1	345	520	520
	obranch 53866 53955 1	OPEN BRANCH FROM BUS 'T.NO.--7 345' TO BUS 'N.E.S.-7 345' CK	1	345	520	520
1460	FG5068		1	345	520-524	520-524
	obranch 54033 55224 1	OPEN BRANCH FROM BUS 'PITTSB-7 345' TO BUS 'MUSKOGE7 34	1	345	520-524	520-524
1463	FG5069		1	345	520-524	520-524
	obranch 54033 55224 1	OPEN BRANCH FROM BUS 'PITTSB-7 345' TO BUS 'MUSKOGE7 34	1	345	520-524	520-524
1465	FG5073		1	345	520	520
	obranch 53929 53955 1	OPEN BRANCH FROM BUS 'DELWARE7 345' TO BUS 'N.E.S.-7 345'	1	345	520	520
1468	FG5074		1	161	520	520
	obranch 53139 53187 1	OPEN BRANCH FROM BUS 'FLINTCR5 161' TO BUS 'GENTRYR5 16	1	161	520	520
1470	FG5078		1	345	520-536	520-537
	obranch 53929 56793 1	OPEN BRANCH FROM BUS 'DELWARE7 345' TO BUS 'NEOSHO 7 3	1	345	520-536	520-537
1473	FG5083		2	230	526	526
	obranch 50907 50915 2	OPEN BRANCH FROM BUS 'HARRNG6 230' TO BUS 'NICHOL6 230'	2	230	526	526
1475	FG60014		1	345	365	376
	obranch 39253 39329 1	OPEN BRANCH FROM BUS 'ARCADN1 345' TO BUS 'GRANVL1 345	1	345	365	376
1478	FG6029			345	600	616-601
	obranch 69999 61950 1	OPEN BRANCH FROM BUS 'RFPBID6 345' TO BUS 'BYRON 3 345'	1	345	600	616-601
	obranch 60105 69999 1	OPEN BRANCH FROM BUS 'PR ISLD3 345' TO BUS 'RFPBID6 345'	1	345	600	601

No.	Contingency		Ckt	Base kV	Area	Zone
1480	FG6062		1	345	600	601-604
	obranch 60186 60304 1	OPEN BRANCH FROM BUS 'AS KING3 345' TO BUS 'EAU CL 3 345'	1	345	600	601-604
1483	FG63002		1	345	363	335
	obranch 36336 36354 1	OPEN BRANCH FROM BUS 'GOODI;4B 345' TO BUS 'LOCKP; B 345'	1	345	363	335
1485	FG63007		1	765	363	335
	obranch 36255 36258 1	OPEN BRANCH FROM BUS 'COLLI; 765' TO BUS 'PLANO; 765' CK	1	765	363	335
1488	FG63008		1	345	363	335
	obranch 36335 36355 1	OPEN BRANCH FROM BUS 'GOODI;2R 345' TO BUS 'LOCKP; R 345'	1	345	363	335
1490	FG63009		1	345	363	335
	obranch 36315 36337 1	OPEN BRANCH FROM BUS 'ELWOO; R 345' TO BUS 'GOODI;1R 345	1	345	363	335
1493	FG63011		1	345	363	335-341
	obranch 36309 37649 1	OPEN BRANCH FROM BUS 'E FRA; R 345' TO BUS 'UPNOR;RP 345'	1	345	363	335-341
1495	FG63013		1	345	363	335
	obranch 36378 36336 1	OPEN BRANCH FROM BUS 'POWER; B 345' TO BUS 'GOODI;4B 345	1	345	363	335
1498	FG63014		1	345	363	335
	obranch 36379 36335 1	OPEN BRANCH FROM BUS 'POWER; R 345' TO BUS 'GOODI;2R 345	1	345	363	335
1500	FG63019		1	345	363	335
	obranch 36310 36362 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'NELSO; B 345'	1	345	363	335
1503	FG63023		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1505	FG63026		1	345	363	335
	obranch 36301 36357 1	OPEN BRANCH FROM BUS 'DP 46; R 345' TO BUS 'LOMBA; R 345'	1	345	363	335
1508	FG63028		1	345	331-363	393-335
	obranch 36382 34036 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'ROCK CK3 345'	1	345	331-363	393-335
1510	FG63032		1	345	363-365	335-376
	obranch 36420 39247 1	OPEN BRANCH FROM BUS 'ZION ; B 345' TO BUS 'ARCADN3 345'	1	345	363-365	335-376
1513	FG63038		1			
	obranch 36291 36355 1	OPEN BRANCH FROM BUS 'COLLI; R 345' TO BUS 'LOCKP; R 345'	1			
1515	FG63039		1	345	363	335
	obranch 36340 36354 1	OPEN BRANCH FROM BUS 'JO 29; B 345' TO BUS 'LOCKP; B 345' C	1	345	363	335
1518	FG63040		1	345	363	335
	obranch 36300 36356 1	OPEN BRANCH FROM BUS 'DP 46; B 345' TO BUS 'LOMBA; B 345' C	1	345	363	335
1520	FG63041		1	345	363	335
	obranch 36336 36354 1	OPEN BRANCH FROM BUS 'GOODI;4B 345' TO BUS 'LOCKP; B 345'	1	345	363	335
1523	FG63050		1	345	363	335-341
	obranch 37616 36284 1	OPEN BRANCH FROM BUS 'CORDO; 345' TO BUS 'CORDO; B 345'	1	345	363	335-341
1525	FG63051		1	345	363	350-335
	obranch 36382 36368 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'H471 ; 345' CK	1	345	363	350-335
1528	FG63052		1	345	363	335
	obranch 36301 36357 1	OPEN BRANCH FROM BUS 'DP 46; R 345' TO BUS 'LOMBA; R 345'	1	345	363	335
1530	FG63056		1	345	363	335
	obranch 36310 36372 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'PLANO; B 345'	1	345	363	335
1533	FG63058		1	138	357	357-391
	obranch 32348 32378 1	OPEN BRANCH FROM BUS 'BROKAW 138' TO BUS 'NORMAL E 13	1	138	357	357-391
1535	FG63061		1	345	359-363	301-335
	obranch 36379 33162 1	OPEN BRANCH FROM BUS 'POWER; R 345' TO BUS 'TAZEWELL 34	1	345	359-363	301-335
1538	FG63064		1	345	363	335
	obranch 36310 36372 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'PLANO; B 345'	1	345	363	335
1540	FG63065		1	345	363	335
	obranch 36310 36362 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'NELSO; B 345'	1	345	363	335

No.	Contingency		Ckt	Base kV	Area	Zone
1543	FG63066		1	138	363	333
	obranch 37038 36688 1	OPEN BRANCH FROM BUS 'NELSO; B 138' TO BUS 'DIXON; B 138'	1	138	363	333
1545	FG63068		1	138-345	357	357
	obranch 32354 32352 1	OPEN BRANCH FROM BUS 'OREANA W 345' TO BUS 'OREANA 13	1	138-345	357	357
1548	FG63072		1	138	363	333
	obranch 37038 36688 1	OPEN BRANCH FROM BUS 'NELSO; B 138' TO BUS 'DIXON; B 138'	1	138	363	333
1550	FG63074		1	345	363	335
	obranch 36310 36372 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'PLANO; B 345'	1	345	363	335
1553	FG63077		1	345	363	335
	obranch 36310 36372 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'PLANO; B 345'	1	345	363	335
1555	FG63087		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1558	FG63088		1	345	363	335-341
	obranch 37616 36284 1	OPEN BRANCH FROM BUS 'CORDO; 345' TO BUS 'CORDO; B 345'	1	345	363	335-341
1560	FG63089		1	345	363	350-335
	obranch 36382 36368 1	OPEN BRANCH FROM BUS 'QUAD ; 345' TO BUS 'H471 ; 345' CK	1	345	363	350-335
1563	FG63090		1	345	363	335
	obranch 36301 36357 1	OPEN BRANCH FROM BUS 'DP 46; R 345' TO BUS 'LOMBA; R 345'	1	345	363	335
1565	FG63100		1	345	363	335
	obranch 36303 36315 1	OPEN BRANCH FROM BUS 'DRESD; R 345' TO BUS 'ELWOO; R 345	1	345	363	335
1568	FG63101		1	345	363	335-341
	obranch 36311 37637 1	OPEN BRANCH FROM BUS 'ELECT;4R 345' TO BUS 'AUROR;RP 34	1	345	363	335-341
1570	FG65000		1	345	365	377-378
	obranch 39547 39918 1	OPEN BRANCH FROM BUS 'MORGAN 345' TO BUS 'PLAINS 345'	1	345	365	377-378
1573	FG65001		1	138	365	378
	obranch 39524 39543 1	OPEN BRANCH FROM BUS 'AMBERG 138' TO BUS 'NOW T 138'	1	138	365	378
1575	FG65004		1	345	364	371
	obranch 39058 39119 1	OPEN BRANCH FROM BUS 'PAD 345 345' TO BUS 'ROE 345 345' C	1	345	364	371
1578	FG65006		1	138	365-368	379-368
	obranch 38919 39885 1	OPEN BRANCH FROM BUS 'TILDEN4 138' TO BUS 'CEDARU 138'	1	138	365-368	379-368
1580	FG65009		1	345	367	391-367
	obranch 39157 39818 1	OPEN BRANCH FROM BUS 'COL 345 345' TO BUS 'NMA 345 345' C	1	345	367	391-367
1583	FG65010		2	138	364	371
	obranch 39145 39167 2	OPEN BRANCH FROM BUS 'POR 138 138' TO BUS 'COL 138 138' C	2	138	364	371
1585	FG65011		1	138	364	371
	obranch 39145 39167 1	OPEN BRANCH FROM BUS 'POR 138 138' TO BUS 'COL 138 138' C	1	138	364	371
1588	FG65012		1	345	364	371
	obranch 39176 39214 1	OPEN BRANCH FROM BUS 'SFL 345 345' TO BUS 'EDG 345 345' C	1	345	364	371
1590	FG65014		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1593	FG65016		1	345	365	376
	obranch 38894 38901 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'PT BCH5 345' C	1	345	365	376
1595	FG65018		1	345	365	376
	obranch 38894 38901 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'PT BCH5 345' C	1	345	365	376
1598	FG65020		1	138-345	365	377-376
	obranch 38895 38893 1	OPEN BRANCH FROM BUS 'N APP 5 138' TO BUS 'N APP 2 345' C	1	138-345	365	377-376
1600	FG65021		1	138-345	365	377-376
	obranch 39567 39359 1	OPEN BRANCH FROM BUS 'N APP 4 138' TO BUS 'N APP 1 345' C	1	138-345	365	377-376
1603	FG65022		1	345	365	377-376
	obranch 39568 38894 1	OPEN BRANCH FROM BUS 'NAP3 NEU 345' TO BUS 'N APP 3 345'	1	345	365	377-376

No.	Contingency		Ckt	Base kV	Area	Zone
1605	FG65023		1	138-345	365	377-376
	obranch 38895 38893 1	OPEN BRANCH FROM BUS 'N APP 5 138' TO BUS 'N APP 2 345' C	1	138-345	365	377-376
1608	FG65024		1	138	366	366
	obranch 39619 39620 1	OPEN BRANCH FROM BUS 'EAST KRK 138' TO BUS 'KEWAUNEE 1	1	138	366	366
1610	FG65026		1	138	365-366	377-366
	obranch 39567 39600 1	OPEN BRANCH FROM BUS 'N APP 4 138' TO BUS 'MASON ST 138'	1	138	365-366	377-366
1613	FG65027			138	365-366	377-366
	obranch 38897 39589 2	OPEN BRANCH FROM BUS 'STILES5 138' TO BUS 'PULLIAM 138'	2	138	365-366	377-366
	obranch 39575 39589 1	OPEN BRANCH FROM BUS 'STILES4 138' TO BUS 'PULLIAM 138'	1	138	365-366	377-366
1615	FG65029		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371
1618	FG65030		1	138	364	371
	obranch 39059 38057 1	OPEN BRANCH FROM BUS 'PAD 138 138' TO BUS 'NWT 138 138'	1	138	364	371
1620	FG65031		1	345	365	377-378
	obranch 39547 39918 1	OPEN BRANCH FROM BUS 'MORGAN 345' TO BUS 'PLAINS 345'	1	345	365	377-378
1623	FG65032		1	138	365	378
	obranch 39524 39543 1	OPEN BRANCH FROM BUS 'AMBERG 138' TO BUS 'NOW T 138'	1	138	365	378
1625	FG65034		1	345	365	376
	obranch 38894 38901 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'PT BCH5 345' C	1	345	365	376
1628	FG65035		1	345	367-364	391-371
	obranch 39157 39176 1	OPEN BRANCH FROM BUS 'COL 345 345' TO BUS 'SFL 345 345' C	1	345	367-364	391-371
1630	FG65040		1	345	365-366	376-366
	obranch 38894 39785 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'ROCKY RN 345'	1	345	365-366	376-366
1633	FG65041		3	115-345	366	366
	obranch 39785 39786 3	OPEN BRANCH FROM BUS 'ROCKY RN 345' TO BUS 'ROCKY RN 11	3	115-345	366	366
1635	FG65043		1	345	363	335
	obranch 36289 36389 1	OPEN BRANCH FROM BUS 'CHERR; R 345' TO BUS 'SILVE; R 345'	1	345	363	335
1638	FG65045		1	138	365	376
	obranch 38879 39512 1	OPEN BRANCH FROM BUS 'SGR CK4 138' TO BUS 'UNIVRSTY 138'	1	138	365	376
1640	FG65046		1	345	365-366	376-366
	obranch 38894 39785 1	OPEN BRANCH FROM BUS 'N APP 3 345' TO BUS 'ROCKY RN 345'	1	345	365-366	376-366
1643	FG65067		1	345	365	376
	obranch 38850 39471 1	OPEN BRANCH FROM BUS 'PLS PR3 345' TO BUS 'RACINE1 345'	1	345	365	376
1645	FG65068		1	345	363-365	335-376
	obranch 36420 39247 1	OPEN BRANCH FROM BUS 'ZION ; B 345' TO BUS 'ARCADN3 345'	1	345	363-365	335-376
1648	FG94		1	345	356	323
	obranch 31330 30309 1	OPEN BRANCH FROM BUS 'NEWTON 345' TO BUS 'CASEY 345'	1	345	356	323
1650	FG95		1	345	363	335
	obranch 36310 36362 1	OPEN BRANCH FROM BUS 'ELECT; B 345' TO BUS 'NELSO; B 345'	1	345	363	335
1653	FG98		1	345-161	356-362	316-362
	obranch 30825 33394 1	OPEN BRANCH FROM BUS 'JOPPA TS 345' TO BUS 'JOPPA TS 161'	1	345-161	356-362	316-362
1655	FG99		1	765	205-363	252-335
	obranch 22660 36260 1	OPEN BRANCH FROM BUS '05DUMONT 765' TO BUS 'WILTO; 765'	1	765	205-363	252-335
1658	FG9905		1	345	363-364	335-371
	obranch 36406 39058 1	OPEN BRANCH FROM BUS 'WEMPL; B 345' TO BUS 'PAD 345 345'	1	345	363-364	335-371

APPENDIX C

NORMAL SYSTEM OVERLOADS

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Base Case

7/23/2002

Overloaded Facility										Normal System Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings			Norm	Emer
								Norm	Emer	MVA	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	115	161	161
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	116	116
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 1

7/23/2002

Overloaded Facility										Normal System Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings			Norm	Emer
								Norm	Emer	MVA	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114	161	161
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	116	116
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 2

7/23/2002

Overloaded Facility										**Normal System Overloads**		
From	**Name**	**To**	**Name**	**Circuit**	**Base kV**	**Area**	**Zone**	**Ratings**			**Norm**	**Emer**
								Norm	**Emer**	**MVA**	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114	161	161
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	116	116
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 3

7/22/2002

Overloaded Facility										Normal System Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings			Norm	Emer
								Norm	Emer	MVA	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	115	161	161
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	116	116
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	91	108	108
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	145	102	102
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	145	101	101
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	97	100	100

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 4 and 5

7/22/2002

Overloaded Facility										Normal System Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings			Norm	Emer
								Norm	Emer	MVA	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	110	154	154
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	115	115
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	88	104	104
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100
59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	237	106	97

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 4 and 6

7/22/2002

Overloaded Facility										**Normal System Overloads**		
From	**Name**	**To**	**Name**	**Circuit**	**Base kV**	**Area**	**Zone**	**Ratings**			**Norm**	**Emer**
								Norm	**Emer**	**MVA**	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114	160	160
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	116	116
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100
59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	237	106	97

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 5 and 6

7/22/2002

Overloaded Facility										**Normal System Overloads**		
From	**Name**	**To**	**Name**	**Circuit**	**Base kV**	**Area**	**Zone**	**Ratings**			**Norm**	**Emer**
								Norm	**Emer**	**MVA**	(%)	(%)
34127	WYOMING5	34141	WYOMING9	1	161-34.5	331	391	18	18	33	185	185
67455	BRANDN 9	63221	BRANDN 7	1	41.6-115	626	665-629	12	12	20	170	170
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	110	155	155
34124	DEWITT 5	34143	DEWITT 9	1	161-34.5	331	391	24	24	31	130	130
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30	116	116
21420	02BRKSID	21822	02BRGR E	1	138	202	202	98	103	105	107	102
34530	WELSBRGY	34074	WELSBRG7	1	115	331	392-391	50	50	50	100	100

Notes:

1. Overloads are based on 100% of Rating 1
2. Normal System Conditions - No Outages
3. Minimum Reporting Level is 100%

APPENDIX D

POWER FLOW REPORTS COMPARISONS AND DETAILED

Table 1. Impacts

1	2	3	4 and 5	4 and 6	5 and 6	From Bus		To Bus		Circuit	Base kV	Area	Zone	Rating1	Rating2	Length (mi)
		x				36362	NELSO; B	37632	LEECO;BP	1	345	363	335	1000.00	1000.00	12.2*
		x				36953	MAREN;RT	37119	P VAL; R	1	138	363	345	210.00	260.00	12.6*
		x				36457	ALPIN;RT	36599	CHERR; R	1	138	363	345-333	351.00	445.00	5.2*
		x				36532	BELVI; B	36606	B465 ;BT	1	138	363	345-333	290.00	330.00	0.2*
		x				38342	COC 69	39239	COC 138	1	138-69	364	371	33.00	33.00	tx
			x	x		59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223.00	245.00	3.21
		x				57968	STILWEL7	57981	LACYGNE7	1	345	541	541	1099.00	1202.00	30.8
			x	x		58036	OLATHEE5	58046	OXFORD 5	1	161	541	541	224.00	224.00	4.4
x						60217	INVRHLS3	60218	INVRHLS7	1	345-115	600	601	550.00	550.00	tx
x						60200	BLK DG27	60258	WILSON 7	2	115	600	601	167.00	167.00	4.5
x						60201	CHEMOLT7	60204	COTTAGE7	1	115	600	601	191.00	191.00	5.2
x						60201	CHEMOLT7	60247	LINDETP7	1	115	600	601	167.00	167.00	7.8
x						60204	COTTAGE7	60238	REDROCK7	1	115	600	601	191.00	191.00	7.6
x						60218	INVRHLS7	60220	INVRGRV7	1	115	600	601	371.00	371.00	1.9*
x						60218	INVRHLS7	60223	KOCHREF7	1	115	600	601	371.00	371.00	1.8
x						60223	KOCHREF7	60341	ROSEMON7	1	115	600	601	191.00	191.00	1.7
x						62227	JOHNCAK7	62228	APPVLTW7	1	115	600	622	224.00	224.00	0.2
x						62227	JOHNCAK7	62229	APPVLTE7	1	115	600	622	224.00	224.00	1.1
x						60103	CANNFLS5	63071	SPRNGCK5	1	161	600	601-622	90.00	90.00	21.8
x						60104	CANNFLS7	62235	EMPIRE 7	1	115	600	601-622	140.00	140.00	14.6
x						60200	BLK DG27	62230	PILOTKB7	1	115	600	601-622	194.00	194.00	4.6
x						60220	INVRGRV7	62230	PILOTKB7	1	115	600	601-622	239.00	239.00	5.7
x						60341	ROSEMON7	62235	EMPIRE 7	1	115	600	601-622	140.00	140.00	8.5
x						60343	WILLPIP7	62226	FISCHER7	1	115	600	601-622	224.00	224.00	0.6
x						60343	WILLPIP7	62228	APPVLTW7	1	115	600	601-622	224.00	224.00	0.38
		x	x	x		63051	HENNING4	63052	INMAN 4	1	230	626	621	143.00	143.00	3.8
		x				64403	E MOLIN3	64680	SB39MID5	1	345-161	635	638-637	500.00	500.00	tx
		x	x			34087	DYSART 5	64269	WASHBRN5	1	161	331-635	391-637	260.00	260.00	20.3

*Line lengths followed by an asterisk indicate that the length was estimated using a unit impedance of 0.7 ohm/mile.

Table 2. Existing Overloads Increased by Transfers

1	2	3	4 and 5	4 and 6	5 and 6	From Bus		To Bus		Circuit	Base kV	Area	Zone	Rating1	Rating2	Length (mi)
		x				99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148.00	148.00	11.3*
			x	x		34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97.00	97.00	27
	x		x	x	x	34028	LORE 5	34032	8TH ST.5	1	161	331	393	84.00	84.00	12.8
	x	x	x	x		34043	SAVANNA5	34046	YORK 5	1	161	331	393	84.00	84.00	8.2
		x				39122	KEG 138	39218	CHA 138	1	138	364	371	240.00	240.00	9.75
		x		x		39145	POR 138	39167	COL 138	1	138	364	371	286.00	286.00	5.66
		x		x		39145	POR 138	39167	COL 138	2	138	364	371	286.00	286.00	5.66
			x			60203	COON CK7	60253	TWIN LK7	1	115	600	601	371.00	371.00	9
		x	x	x		63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96.00	96.00	3.6

*Line lengths followed by an asterisk indicate that the length was estimated using a unit impedance of 0.7 ohm/mile.

Table 3. Existing Overloads Decreased by Transfers

1	2	3	4 and 5	4 and 6	5 and 6	From Bus		To Bus		Circuit	Base kV	Area	Zone	Rating1	Rating2	Length (mi)
			x			27106	11KNOB C	27135	11POND C	1	138	211	211	143.00	143.00	2.4*
			x			27135	11POND C	27144	11TIPTOP	1	138	211	211	143.00	143.00	10.3*
		x				31221	MOBERLY	31409	OVERTON	1	161	356	314	142.00	142.00	20.7*
		x	x	x	x	60244	SCOTTCO7	60890	SCOTTCO8	1	115	600	601	70.00	70.00	tx
		x		x		61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144.00	144.00	3.7*
			x		x	63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448.00	448.00	tx

*Line lengths followed by an asterisk indicate that the length was estimated using a unit impedance of 0.7 ohm/mile.

Table 4. Benefits

1	2	3	4 and 5	4 and 6	5 and 6	From Bus		To Bus		Circuit	Base kV	Area	Zone	Rating1	Rating2	Length (mi)
		x	x	x		34015	LIME CK5	34016	EMERYN	1	161	331	393	167.00	167.00	17.2*
		x	x	x		60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272.00	272.00	4.3
			x			39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96.00	96.00	5.3*

*Line lengths followed by an asterisk indicate that the length was estimated using a unit impedance of 0.7 ohm/mile.

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI — Base Case — 7/23/2002

F204SUPK.SAV /SUMMER PEAK / SI — Bid 1 — 7/23/2002

Branches Exceeding 100% of Emergency Rating										Cont	pi_rfp				pi_rfp_bid1			
								Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
											Normal	First Contingency			Normal	First Contingency		
	From Bus	To Bus		Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 1 New Overloads											**Not Overloaded**				**Overloaded**			
	60201 CHEMOLT7	60204	COTTAGE7	1	115	600	601	191	191	463	52.8	---	---	0 / 0	59.4	216.3	216.3	2 / 0
	60217 INVRHLS3	60218	INVRHLS7	1	345-115	600	601	550	550	463	21.4	---	---	0 / 0	33	201.3	201.3	2 / 0
	60220 INVRGRV7	62230	PILOTKB7	1	115	600	601-622	239	239	465	62.6	---	---	0 / 0	70.2	200.2	200.2	2 / 0
	60204 COTTAGE7	60238	REDROCK7	1	115	600	601	191	191	463	27.2	---	---	0 / 0	33.3	192.2	192.2	2 / 0
	60218 INVRHLS7	60223	KOCHREF7	1	115	600	601	371	371	463	66	---	---	0 / 0	76.4	184.0	184.0	2 / 0
	60200 BLK DG27	60258	WILSON 7	2	115	600	601	167	167	465	33.4	---	---	0 / 0	37.9	181.6	181.6	2 / 0
	60200 BLK DG27	62230	PILOTKB7	1	115	600	601-622	194	194	465	14.9	---	---	0 / 0	23.3	176.5	176.5	2 / 0
	62227 JOHNCAK7	62229	APPVLTE7	1	115	600	622	224	224	465	57	---	---	0 / 0	62.1	146.8	146.8	2 / 0
	60201 CHEMOLT7	60247	LINDETP7	1	115	600	601	167	167	463	28.7	---	---	0 / 0	22.6	137.0	137.0	2 / 0
	60218 INVRHLS7	60220	INVRGRV7	1	115	600	601	371	371	465	47.8	---	---	0 / 0	52.6	136.8	136.8	2 / 0
	60223 KOCHREF7	60341	ROSEMON7	1	115	600	601	191	191	463	11.1	---	---	0 / 0	17.7	121.1	121.1	2 / 0
	60103 CANNFLS5	63071	SPRNGCK5	1	161	600	601-622	90	90	463	63.8	---	---	0 / 0	47.1	105.0	105.0	1 / 1
	60104 CANNFLS7	62235	EMPIRE 7	1	115	600	601-622	140	140	463	14.6	---	---	0 / 0	29	104.4	104.4	0 / 2
	60343 WILLPIP7	62228	APPVLTW7	1	115	600	601-622	224	224	465	37	---	---	0 / 0	39.7	103.3	103.3	0 / 2
	62227 JOHNCAK7	62228	APPVLTW7	1	115	600	622	224	224	465	37	---	---	0 / 0	39.7	103.3	103.3	0 / 2
	60341 ROSEMON7	62235	EMPIRE 7	1	115	600	601-622	140	140	463	14.8	---	---	0 / 0	29.1	103.2	103.2	0 / 2
	60343 WILLPIP7	62226	FISCHER7	1	115	600	601-622	224	224	465	35.4	---	---	0 / 0	38.1	101.8	101.8	0 / 2
Group 2 Pre-existingOverload in Case1 with Increased Overloading in Case2											**Overload 1**			**<less than<**	**Overload 2**			
E	34028 LORE 5	34032	8TH ST.5	1	161	331	393	84	84	1018	58	124.6	124.6	1 / 1	59.1	126.3	126.3	1 / 1
E	62672 GLNDALE8	62666	GLNDALE7	2	115	600	622	47	47	485	63.1	112.1	112.1	2 / 0	63.7	113.6	113.6	2 / 0
E	60244 SCOTTCO7	60890	SCOTTCO8	1	115	600	601	70	70	485	63	116.1	116.1	1 / 1	63.9	117.5	117.5	1 / 1
E	61676 HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	155	84	119.0	119.0	6 / 0	84.8	120.2	120.2	6 / 0
E	34043 SAVANNA5	34046	YORK 5	1	161	331	393	84	84	795	70.1	137.9	137.9	2 / 0	70.7	138.9	138.9	2 / 0
E	60153 MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	545	75.3	157.0	157.0	2 / 0	75.8	157.8	157.8	2 / 0
E	60158 STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	545	72.3	149.9	149.9	2 / 0	72.8	150.7	150.7	2 / 0
E	60152 MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	450	72.1	125.1	125.1	1 / 1	72.5	125.8	125.8	1 / 1
E	34066 M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	683	90	117.5	117.5	2 / 0	90.4	118.1	118.1	2 / 0
E	60305 EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	1480	81.8	110.3	110.3	1 / 0	80.5	110.6	110.6	1 / 0
E	60749 DGLAS C8	60144	DGLASCO7	1	115	600	601	47	47	545	88.4	108.7	108.7	2 / 8	88.6	108.9	108.9	2 / 8
E	60203 COON CK7	60253	TWIN LK7	1	115	600	601	371	371	48	57.3	103.9	103.9	0 / 1	57.2	104.0	104.0	0 / 1
E	62132 PRKWOOD8	62090	PRKWOOD7	2	115	618	619	112	112	433	82.1	123.3	123.3	1 / 0	82.2	123.4	123.4	1 / 0
E	64909 N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	233	70.5	100.1	100.1	0 / 1	70.5	100.2	100.2	0 / 1
E	67541 STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	15	116	119.6	119.6	***	116.1	119.7	119.7	***

Ex A2_MISO Xcel RFP Initial Screening Review

C:\T2000\Work\miso\pi_rfp.cft : C:\T2000\Work\miso\pi_rfp_bid1.cft

Branches Exceeding 100% of Emergency Rating										Cont	pi_rfp				pi_rfp_bid1			
								Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus		To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal	First Contingency			Normal	First Contingency		
											System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 3 Pre-existing Overload in Case1 with Decreased Overloading in Case2											Overload 1	>=greater than or equal to>=			Overload 2			
E	27106 11KNOB C	27135	11POND C	1	138	211	211	143	143	1283	99.1	121.0	121.0	1 / 19	99	121.0	121.0	1 / 18
E	27135 11POND C	27144	11TIPTOP	1	138	211	211	143	143	1283	98.7	120.5	120.5	1 / 12	98.7	120.5	120.5	1 / 12
E	30422 CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	1060	71.6	101.9	101.9	0 / 1	71.6	101.9	101.9	0 / 1
E	31051 MASON 13	31053	MASON 2	2	345-138	356	317	560	560	1155	72.6	106.3	106.3	1 / 0	72.6	106.3	106.3	1 / 0
E	31221 MOBERLY	31409	OVERTON	1	161	356	314	142	142	1398	53.4	104.9	104.9	0 / 1	53.4	104.9	104.9	0 / 1
E	31340 NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	780	40.1	108.5	108.5	2 / 0	40	108.5	108.5	2 / 0
E	32277 TURKY HL	32307	E BELLVL	1	138	357	357	287	287	1373	71.1	100.4	100.4	0 / 1	71.1	100.4	100.4	0 / 1
E	34059 BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	688	57.3	148.9	148.9	1 / 0	57.9	148.9	148.9	1 / 0
E	34059 BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	678	89.4	121.7	121.7	1 / 2	89	121.7	121.7	1 / 2
E	34073 GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	688	57.3	149.1	149.1	1 / 0	57.9	149.1	149.1	1 / 0
E	34529 GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	688	57.2	152.5	152.5	1 / 0	57.8	152.5	152.5	1 / 0
E	39122 KEG 138	39218	CHA 138	1	138	364	371	240	240	1130	93.3	126.6	126.6	3 / 0	93.3	126.6	126.6	3 / 0
E	39145 POR 138	39167	COL 138	1	138	364	371	286	286	1583	56.3	100.5	100.5	0 / 1	56.3	100.5	100.5	0 / 1
E	39145 POR 138	39167	COL 138	2	138	364	371	286	286	1585	56.3	100.5	100.5	0 / 1	56.3	100.5	100.5	0 / 1
E	39686 WESTONWP	39676	WESTON	1	115-345	366	366	200	220	83	20.1	110.8	100.7	0 / 4	19.8	110.8	100.7	0 / 4
E	39885 CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	1578	79.7	137.0	137.0	1 / 0	79.7	137.0	137.0	1 / 0
E	50024 CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	1438	52.4	100.9	100.9	0 / 1	52.4	100.9	100.9	0 / 1
E	53139 FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	1468	83.9	119.6	108.9	1 / 0	83.9	119.6	108.9	1 / 0
E	60153 MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	23	60.9	103.1	103.1	0 / 1	61.1	103.1	103.1	0 / 1
E	60177 CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	38	67.5	147.2	147.2	5 / 1	67.9	147.2	147.2	5 / 1
E	61612 RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	40 - 935	59.3	107.2	107.2	5 / 0	59.5	107.2	107.2	5 / 0
E	61984 AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	915	38.1	100.6	100.6	0 / 1	36.4	100.6	100.6	0 / 1
E	62132 PRKWOOD8	62090	PRKWOOD7	1	115	618	619	84	84	503	97.2	116.9	116.9	5 / 8	97.2	116.9	116.9	5 / 9
E	64909 N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	233	71.2	101.1	101.1	0 / 1	71.1	101.1	101.1	0 / 1
E	96049 7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	1398	44.2	102.9	102.9	0 / 1	44.2	102.9	102.9	0 / 1
E	96120 5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	1398	69	105.5	105.5	1 / 0	69	105.5	105.5	1 / 0
E	61721 ETCO 7	61722	FORBES 7	1	115	608	608	98	98	63 - 50	74.7	101.4	101.4	0 / 5	74.8	101.3	101.3	0 / 5
E	65355 S3455 3	65337	S3455T1T	1	345	645	645	560	560	278	84.8	100.9	100.9	0 / 1	84.7	100.8	100.8	0 / 1
E	65409 S1209 5	65383	S1209T1T	1	161	645	645	124	124	285	74.1	105.3	105.3	1 / 0	74.1	105.2	105.2	1 / 0
E	63030 DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	30	73.9	108.7	108.7	1 / 0	73.9	108.4	108.4	1 / 0
E	63219 GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	595	79.2	100.5	100.5	0 / 1	78.9	100.1	100.1	0 / 1
E	63214 BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	69.3	102.6	102.6	0 / 1
E	63314 BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	69.3	102.6	102.6	0 / 1
E	60194 CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	30	76.9	121.9	121.9	1 / 0	76.5	121.1	121.1	1 / 0
E	60277 WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	30	97.5	149.2	149.2	12 / 6	97.3	148.4	148.4	11 / 7
E	62003 JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	135	64.3	105.2	105.2	1 / 0	63.9	104.3	104.3	0 / 1
E	62667 ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	30	161.3	240.3	240.3	***	160.9	239.0	239.0	***
E	60853 LK YANK8	60119	LKYNKTN7	2	115	600	601	15	15	345	44.4	132.6	132.6	1 / 0	44.3	131.1	131.1	1 / 0
E	34015 LIME CK5	34016	EMERYN	1	161	331	393	167	167	683	73.4	102.6	102.6	0 / 2	70.7	100.5	100.5	0 / 2

Branches Exceeding 100% of Emergency Rating								pi_rfp				pi_rfp_bid1			
						Ratings		:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	Cont ID	Normal System%	First Contingency Norm%	First Contingency Emer%	First Contingency A/B	Normal System%	First Contingency Norm%	First Contingency Emer%	First Contingency A/B

Notes:

1. '---' = Less than the Minimum Reporting Level of 100%
2. '***' = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. E = Pre-existing overload that was changed by less than 3% in the new case
4. Overloads are based on 100% of Rating 2
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI — Base Case — 7/23/2002

F204SUPK.SAV /SUMMER PEAK / SI — Bid 2 — 7/23/2002

	Branches Exceeding 100% of Emergency Rating						Ratings		Cont	pi_rfp				pi_rfp_bid2			
										:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
										Normal	First Contingency			Normal	First Contingency		
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 1	**New Overloads**									**Not Overloaded**						**Overloaded**	
	99817 5ISES 1	99826 5MORFLD	1				223	223	1073	92.6	---	---	0 / 0	93.5	100.6	100.6	0 / 1
Group 2	**Pre-existing Overload in Case1 with Increased Overloading in Case2**									**Overload 1**			**<less than<**			**Overload 2**	
	34028 LORE 5	34032 8TH ST.5	1	161	331	393	84	84	1018	58	124.6	124.6	1 / 1	61.4	130.0	130.0	2 / 0
	34043 SAVANNA5	34046 YORK 5	1	161	331	393	84	84	795	70.1	137.9	137.9	2 / 0	71.9	141.1	141.1	2 / 0
E	60853 LK YANK8	60119 LKYNKTN7	2	115	600	601	15	15	345	44.4	132.6	132.6	1 / 0	44.6	135.1	135.1	1 / 0
E	99798 5BATEVL	99808 5CUSHMN	1				148	148	1073	95.2	105.7	105.7	1 / 8	96.4	107.1	107.1	1 / 9
E	62003 JOHNJCT7	63216 ORTONVL7	1	115	626	621-626	97	97	135	64.3	105.2	105.2	1 / 0	64.8	106.5	106.5	1 / 0
E	34066 M-TOWN 7	34169 WELSBGT7	1	115	331	391	97	97	683	90	117.5	117.5	2 / 0	91	118.7	118.7	2 / 0
E	63214 BIGSTON7	63195 BIGSTONY	1	115-230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	69.9	104.2	104.2	0 / 1
E	63314 BIGSTON4	63195 BIGSTONY	1	230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	69.9	104.2	104.2	0 / 1
E	63219 GRANTCO7	63220 ELBOWLK7	1	115	626	629	96	96	595	79.2	100.5	100.5	0 / 1	79.7	101.3	101.3	0 / 1
E	39145 POR 138	39167 COL 138	1	138	364	371	286	286	1583	56.3	100.5	100.5	0 / 1	56.7	101.2	101.2	0 / 1
E	39145 POR 138	39167 COL 138	2	138	364	371	286	286	1585	56.3	100.5	100.5	0 / 1	56.7	101.2	101.2	0 / 1
E	62667 ST BONI7	62925 DICKNSN7	1	115	600-618	622-619	71	71	30	161.3	240.3	240.3	***	161.2	240.9	240.9	***
E	39122 KEG 138	39218 CHA 138	1	138	364	371	240	240	1130	93.3	126.6	126.6	3 / 0	93.7	127.1	127.1	3 / 0
E	60177 CHAMPLN7	60178 CHAMP T7	1	115	600	605-601	140	140	38	67.5	147.2	147.2	5 / 1	67	147.5	147.5	5 / 1
E	60277 WWACNIA7	62667 ST BONI7	1	115	600	601-622	71	71	30	97.5	149.2	149.2	12 / 6	97.5	149.5	149.5	12 / 6
E	60749 DGLAS C8	60144 DGLASCO7	1	115	600	601	47	47	545	88.4	108.7	108.7	2 / 8	88.8	109.0	109.0	2 / 8
E	32277 TURKY HL	32307 E BELLVL	1	138	357	357	287	287	1373	71.1	100.4	100.4	0 / 1	71.3	100.7	100.7	0 / 1
E	60194 CARVRCO7	60277 WWACNIA7	1	115	600	601	71	71	30	76.9	121.9	121.9	1 / 0	76.6	122.2	122.2	1 / 0
E	30422 CONWAY 3	31391 ORGD 1	1	138	356	318	205	205	1060	71.6	101.9	101.9	0 / 1	71.9	102.1	102.1	0 / 1
E	50024 CARROLL4	50023 CARROLL6	1	138-230	502	502	336	336	1438	52.4	100.9	100.9	0 / 1	52.4	101.1	101.1	0 / 1
E	61612 RIVERTN4	61625 BLCKBRY4	1	230	608	608	327	327	40	59.3	107.2	107.2	5 / 0	58.9	107.3	107.3	5 / 0
E	61721 ETCO 7	61722 FORBES 7	1	115	608	608	98	98	63 - 50	74.7	101.4	101.4	0 / 5	74.7	101.5	101.5	0 / 5
E	65355 S3455 3	65337 S3455T1T	1	345	645	645	560	560	278	84.8	100.9	100.9	0 / 1	84.9	101.0	101.0	0 / 1
Group 3	**Pre-existing Overload in Case1 with Decreased Overloading in Case2**									**Overload 1**			**>=greater than or equal to>=**			**Overload 2**	
E	34059 BOONE 7	34073 GR JCT 7	1	115	331	391	50	50	688	57.3	148.9	148.9	1 / 0	57.4	148.9	148.9	1 / 0
E	34059 BOONE 7	34076 BNE JCT7	1	115	331	391	60	60	678	89.4	121.7	121.7	1 / 2	89.3	121.7	121.7	1 / 2
E	34073 GR JCT 7	34529 GRJCT5Y	1	115-161	331	391-392	50	50	688	57.3	149.1	149.1	1 / 0	57.4	149.1	149.1	1 / 0
E	34529 GRJCT5Y	34054 GR JCT 5	1	161	331	392-391	50	50	688	57.2	152.5	152.5	1 / 0	57.3	152.5	152.5	1 / 0
E	39686 WESTONWP	39676 WESTON	1	115-345	366	366	200	220	83	20.1	110.8	100.7	0 / 4	20.5	110.8	100.7	0 / 4
E	60153 MNTCELO7	60151 MNTCELO3	1	115-345	600	601	336	336	23	60.9	103.1	103.1	0 / 1	60.8	103.1	103.1	0 / 1

Branches Exceeding 100% of Emergency Rating										Cont	pi_rfp				pi_rfp_bid2			
								Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal	First Contingency			Normal	First Contingency		
										System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 3 Pre-existing Overload in Case1 with Decreased Overloading in Case2										**Overload 1**		**>=greater than or equal to>=**			**Overload 2**		
E	60203 COON CK7	60253	TWIN LK7	1	115	600	601	371	371	48	57.3	103.9	103.9	0 / 1	57.4	103.9	103.9	0 / 1
E	61984 AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	915	38.1	100.6	100.6	0 / 1	37.5	100.6	100.6	0 / 1
E	62672 GLNDALE8	62666	GLNDALE7	2	115	600	622	47	47	485	63.1	112.1	112.1	2 / 0	63.1	112.1	112.1	2 / 0
E	67541 STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	15	116	119.6	119.6	***	116	119.6	119.6	***
E	96049 7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	1398	44.2	102.9	102.9	0 / 1	44.8	102.9	102.9	0 / 1
E	53139 FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	1468	83.9	119.6	108.9	1 / 0	83.8	119.5	108.8	1 / 0
E	62132 PRKWOOD8	62090	PRKWOOD7	1	115	618	619	84	84	503	97.2	116.9	116.9	5 / 8	97	116.8	116.8	5 / 7
E	63030 DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	30	73.9	108.7	108.7	1 / 0	73.5	108.6	108.6	1 / 0
E	31051 MASON 13	31053	MASON 2	2	345-138	356	317	560	560	1155	72.6	106.3	106.3	1 / 0	72.5	106.2	106.2	1 / 0
E	39885 CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	1578	79.7	137.0	137.0	1 / 0	79.6	136.9	136.9	1 / 0
E	62132 PRKWOOD8	62090	PRKWOOD7	2	115	618	619	112	112	433	82.1	123.3	123.3	1 / 0	82	123.2	123.2	1 / 0
E	65409 S1209 5	65383	S1209T1T	1	161	645	645	124	124	285	74.1	105.3	105.3	1 / 0	74.1	105.2	105.2	1 / 0
E	64909 N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	233	71.2	101.1	101.1	0 / 1	71.2	100.8	100.8	0 / 1
E	31340 NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	780	40.1	108.5	108.5	2 / 0	39.4	108.2	108.2	2 / 0
E	61676 HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	155	84	119.0	119.0	6 / 0	83.6	118.5	118.5	6 / 0
E	96120 5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	1398	69	105.5	105.5	1 / 0	68.8	105.0	105.0	1 / 0
E	60152 MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	450	72.1	125.1	125.1	1 / 1	71.8	124.5	124.5	1 / 1
E	60244 SCOTTCO7	60890	SCOTTCO8	1	115	600	601	70	70	485	63	116.1	116.1	1 / 1	62.8	115.5	115.5	1 / 1
E	31221 MOBERLY	31409	OVERTON	1	161	356	314	142	142	1398	53.4	104.9	104.9	0 / 1	53	104.0	104.0	0 / 1
E	60158 STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	545	72.3	149.9	149.9	2 / 0	71.5	148.9	148.9	2 / 0
E	60153 MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	545	75.3	157.0	157.0	2 / 0	74.5	155.9	155.9	2 / 0
E	27106 11KNOB C	27135	11POND C	1	138	211	211	143	143	1283	99.1	121.0	121.0	1 / 19	97.9	119.7	119.7	1 / 11
E	27135 11POND C	27144	11TIPTOP	1	138	211	211	143	143	1283	98.7	120.5	120.5	1 / 12	97.5	119.2	119.2	1 / 11
E	34015 LIME CK5	34016	EMERYN	1	161	331	393	167	167	683	73.4	102.6	102.6	0 / 2	70.6	100.5	100.5	0 / 2
E	60305 EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	1480	81.8	110.3	110.3	1 / 0	81.1	108.0	108.0	1 / 0
Group 4 Pre-existing Overload in Case1 with Overloading Eliminated in Case2										**Overloaded**					**Not Overloaded**			
	64909 N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	233	70.5	100.1	100.1	0 / 1	70.5	---	---	0 / 0

Notes:

1. '---' = Less than the Minimum Reporting Level of 100%
2. '***' = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. E = Pre-existing overload that was changed by less than 3% in the new case
4. Overloads are based on 100% of Rating 2
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI — Base Case — 7/23/2002

F204SUPK.SAV /SUMMER PEAK / SI — Bid 3 — 7/22/2002

Branches Exceeding 100% of Emergency Rating										pi_rfp				pi_rfp_bid3			
							Ratings		Cont	:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
										Normal	First Contingency			Normal	First Contingency		
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 1 New Overloads										**Not Overloaded**					**Overloaded**		
	36362 NELSO; B	37632 LEECO;BP	1	345	363	335	1000	1000	1233	22.2	---	---	0 / 0	94	132.5	132.5	16 / 10
	34185 POWESHK5	34191 REASNOR5	1	161	331	391	167	167	660	47.6	---	---	0 / 0	63.2	117.4	117.4	1 / 0
	34087 DYSART 5	64269 WASHBRN5	1	161	331-635	391-637	260	260	1013	58.2	---	---	0 / 0	70.1	114.9	114.9	5 / 0
	34030 SALEM 5	34508 JULIAN 5	1	161	331	393-392	202	202	1008	43.5	---	---	0 / 0	62.8	112.1	112.1	2 / 0
	34009 WINBAGO5	61932 RUTLAND5	1	161	331	393-615	84	84	1013	78.1	---	---	0 / 0	92.3	110.7	110.7	9 / 9
	34027 CNTRGRV5	34508 JULIAN 5	1	161	331	393-392	202	202	1008	41.1	---	---	0 / 0	60.3	108.2	108.2	2 / 0
	36532 BELVI; B	36606 B465 ;BT	1	138	363	345-333	290	330	1233	80.3	---	---	0 / 0	86.5	123.0	108.1	2 / 0
	60302 COULEE 5	69523 GENOA 5	1	161	600-680	604-681	240	240	603	62.4	---	---	0 / 0	71.8	106.4	106.4	1 / 0
	38342 COC 69	39239 COC 138	1	138	364	371	33	33	88	46.7	---	---	0 / 0	50.3	106.3	106.3	2 / 0
	36457 ALPIN;RT	36599 CHERR; R	1	138	363	345-333	351	445	1233	94.5	---	---	0 / 0	99.7	132.4	104.4	0 / 2
	63213 MARIETT7	63214 BIGSTON7	1	115	626	626-628	96	96	135	54.5	---	---	0 / 0	56.9	104.4	104.4	0 / 1
	64403 E MOLIN3	64680 SB39MID5	1	345-161	635	638-637	500	500	613	65.9	---	---	0 / 0	70.2	103.6	103.6	0 / 5
	63051 HENNING4	63052 INMAN 4	1	230	626	621	143	143	355	65.7	---	---	0 / 0	80.2	103.2	103.2	0 / 1
	36953 MAREN;RT	37119 P VAL; R	1	138	363	345	210	260	1233	58.2	---	---	0 / 0	68.3	126.5	102.2	0 / 2
	34043 SAVANNA5	69505 GALENA 5	1	161	331-680	393-681	126	126	795	25.1	---	---	0 / 0	43	101.9	101.9	0 / 1
	99817 5ISES 1	99826 5MORFLD	1				223	223	1073	92.6	---	---	0 / 0	94.5	101.9	101.9	0 / 1
	64418 E MOLINE	64680 SB39MID5	1	161	635	638-637	500	500	613	65	---	---	0 / 0	69.2	101.8	101.8	0 / 1
	57968 STILWEL7	57981 LACYGNE7	1	345	541	541	1099	1202	1435	71.1	---	---	0 / 0	72.4	110.4	100.9	0 / 1
Group 2 Pre-existing Overload in Case1 with Increased Overloading in Case2										**Overload 1**			**<less than<**		**Overload 2**		
	34043 SAVANNA5	34046 YORK 5	1	161	331	393	84	84	795	70.1	137.9	137.9	2 / 0	96.6	184.1	184.1	26 / 28
	60853 LK YANK8	60119 LKYNKTN7	2	115	600	601	15	15	345	44.4	132.6	132.6	1 / 0	46.5	154.0	154.0	1 / 0
	62003 JOHNJCT7	63216 ORTONVL7	1	115	626	621-626	97	97	135	64.3	105.2	105.2	1 / 0	70	117.9	117.9	2 / 0
	39145 POR 138	39167 COL 138	1	138	364	371	286	286	1583	56.3	100.5	100.5	0 / 1	62.6	111.7	111.7	1 / 0
	39145 POR 138	39167 COL 138	2	138	364	371	286	286	1585	56.3	100.5	100.5	0 / 1	62.6	111.7	111.7	1 / 0
	63214 BIGSTON7	63195 BIGSTONY	1	115-230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	72.9	112.3	112.3	1 / 0
	63314 BIGSTON4	63195 BIGSTONY	1	230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	72.9	112.3	112.3	1 / 0
	39122 KEG 138	39218 CHA 138	1	138	364	371	240	240	1130	93.3	126.6	126.6	3 / 0	98.5	133.8	133.8	3 / 13
	62667 ST BONI7	62925 DICKNSN7	1	115	600-618	622-619	71	71	30	161.3	240.3	240.3	***	161.4	247.3	247.3	***
	63219 GRANTCO7	63220 ELBOWLK7	1	115	626	629	96	96	595	79.2	100.5	100.5	0 / 1	84	107.3	107.3	1 / 2
	60277 WWACNIA7	62667 ST BONI7	1	115	600	601-622	71	71	30	97.5	149.2	149.2	12 / 6	97	153.0	153.0	11 / 7
	60194 CARVRCO7	60277 WWACNIA7	1	115	600	601	71	71	30	76.9	121.9	121.9	1 / 0	76.3	125.4	125.4	1 / 0
	99798 5BATEVL	99808 5CUSHMN	1				148	148	1073	95.2	105.7	105.7	1 / 8	97.9	109.1	109.1	1 / 16

	Branches Exceeding 100% of Emergency Rating							Ratings		Cont	pi_rfp				pi_rfp_bid3			
											:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus		To Bus		Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal System%	First Contingency Norm%	Emer%	A/B	Normal System%	First Contingency Norm%	Emer%	A/B
E	60177 CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	38	67.5	147.2	147.2	5 / 1	64	149.8	149.8	5 / 0
E	31340 NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	780	40.1	108.5	108.5	2 / 0	37.8	111.1	111.1	2 / 0
E	61721 ETCO 7	61722	FORBES 7	1	115	608	608	98	98	63 - 50	74.7	101.4	101.4	0 / 5	74.1	102.7	102.7	0 / 5
E	65355 S3455 3	65337	S3455T1T	1	345	645	645	560	560	278	84.8	100.9	100.9	0 / 1	86.1	101.9	101.9	0 / 1
E	60749 DGLAS C8	60144	DGLASCO7	1	115	600	601	47	47	545	88.4	108.7	108.7	2 / 8	89.9	109.4	109.4	5 / 5
E	32277 TURKY HL	32307	E BELLVL	1	138	357	357	287	287	1373	71.1	100.4	100.4	0 / 1	71.6	101.1	101.1	0 / 1
E	60203 COON CK7	60253	TWIN LK7	1	115	600	601	371	371	48	57.3	103.9	103.9	0 / 1	57.9	104.5	104.5	0 / 1
E	50024 CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	1438	52.4	100.9	100.9	0 / 1	52.5	101.3	101.3	0 / 1
E	61612 RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	40	59.3	107.2	107.2	5 / 0	55.8	107.4	107.4	5 / 0
E	34059 BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	678	89.4	121.7	121.7	1 / 2	89.7	121.8	121.8	1 / 2
E	34529 GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	688	57.2	152.5	152.5	1 / 0	55.7	152.6	152.6	1 / 0
E	30422 CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	1060	71.6	101.9	101.9	0 / 1	71.7	102.0	102.0	0 / 1
E	61984 AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	915	38.1	100.6	100.6	0 / 1	30.7	100.7	100.7	0 / 1
E	34073 GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	688	57.3	149.1	149.1	1 / 0	55.8	149.2	149.2	1 / 0
Group 3	**Pre-existing Overload in Case1 with Decreased Overloading in Case2**										**Overload 1**		**>=greater than or equal to>=**		**Overload 2**			
E	34059 BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	688	57.3	148.9	148.9	1 / 0	55.8	148.9	148.9	1 / 0
E	63030 DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	30	73.9	108.7	108.7	1 / 0	71.4	108.7	108.7	1 / 0
E	65409 S1209 5	65383	S1209T1T	1	161	645	645	124	124	285	74.1	105.3	105.3	1 / 0	74.2	105.3	105.3	1 / 0
E	96049 7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	1398	44.2	102.9	102.9	0 / 1	47.3	102.9	102.9	0 / 1
E	60153 MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	23	60.9	103.1	103.1	0 / 1	59.6	103.0	103.0	0 / 1
E	39686 WESTONWP	39676	WESTON	1	115-345	366	366	200	220	83 - 90	20.1	110.8	100.7	0 / 4	24.9	110.5	100.5	0 / 4
E	62672 GLNDALE8	62666	GLNDALE7	2	115	600	622	47	47	485	63.1	112.1	112.1	2 / 0	63.1	111.8	111.8	2 / 0
E	67541 STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	15	116	119.6	119.6	***	115.6	119.3	119.3	***
E	53139 FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	1468	83.9	119.6	108.9	1 / 0	83.7	119.2	108.6	1 / 0
E	39885 CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	1578	79.7	137.0	137.0	1 / 0	79.3	136.5	136.5	1 / 0
E	31051 MASON 13	31053	MASON 2	2	345-138	356	317	560	560	1155	72.6	106.3	106.3	1 / 0	72.1	105.6	105.6	1 / 0
E	62132 PRKWOOD8	62090	PRKWOOD7	1	115	618	619	84	84	503	97.2	116.9	116.9	5 / 8	96.4	116.2	116.2	5 / 6
E	62132 PRKWOOD8	62090	PRKWOOD7	2	115	618	619	112	112	433	82.1	123.3	123.3	1 / 0	81.4	122.6	122.6	1 / 0
E	96120 5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	1398	69	105.5	105.5	1 / 0	68.9	103.6	103.6	0 / 1
	31221 MOBERLY	31409	OVERTON	1	161	356	314	142	142	1398	53.4	104.9	104.9	0 / 1	52.5	101.4	101.4	0 / 1
	60152 MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	450	72.1	125.1	125.1	1 / 1	69.2	119.2	119.2	1 / 1
	60244 SCOTTCO7	60890	SCOTTCO8	1	115	600	601	70	70	485	63	116.1	116.1	1 / 1	60.4	110.0	110.0	1 / 0
	61676 HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	155 - 63	84	119.0	119.0	6 / 0	78.5	112.0	112.0	6 / 0
	60158 STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	545	72.3	149.9	149.9	2 / 0	65.5	140.5	140.5	1 / 1
	60153 MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	545	75.3	157.0	157.0	2 / 0	68.5	147.1	147.1	1 / 1
Group 4	**Pre-existing Overload in Case1 with Overloading Eliminated in Case2**										**Overloaded**					**Not Overloaded**		
	64909 N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	233	70.5	100.1	100.1	0 / 1	71	---	---	0 / 0
	64909 N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	233	71.2	101.1	101.1	0 / 1	71.7	---	---	0 / 0

Branches Exceeding 100% of Emergency Rating									Cont	pi_rfp				pi_rfp_bid3			
							Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal	First Contingency			Normal	First Contingency		
										System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 4 Pre-existing Overload in Case1 with Overloading Eliminated in Case2										**Overloaded**					**Not Overloaded**		
	34015 LIME CK5	34016 EMERYN	1	161	331	393	167	167	683	73.4	102.6	102.6	0 / 2	49.8	---	---	0 / 0
	60305 EAU CLA5	60317 WHEATON5	1	161	600	604	272	272	1480	81.8	110.3	110.3	1 / 0	73.9	---	---	0 / 0

Notes:

1. '---' = Less than the Minimum Reporting Level of 100%
2. '***' = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. E = Pre-existing overload that was changed by less than 3% in the new case
4. Overloads are based on 100% of Rating 2
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI — Base Case — 7/23/2002

F204SUPK.SAV /SUMMER PEAK / SI — Bids 4 and 5 — 7/22/2002

	Branches Exceeding 100% of Emergency Rating							Ratings		Cont	pi_rfp				pi_rfp_bid4and5			
											:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
											Normal	First Contingency			Normal	First Contingency		
	From Bus	To Bus		Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 1 New Overloads											**Not Overloaded**					**Overloaded**		
	34009 WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	905	78.1	---	---	0 / 0	104.2	124.4	124.4	***
	58036 OLATHEE5	58046	OXFORD 5	1	161	541	541	224	224	1435	45.6	---	---	0 / 0	56.7	104.4	104.4	0 / 1
	63051 HENNING4	63052	INMAN 4	1	230	626	621	143	143	355	65.7	---	---	0 / 0	80.7	103.6	103.6	0 / 1
	63213 MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	135	54.5	---	---	0 / 0	56	102.4	102.4	0 / 1
	59206 PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	1435	61.9	---	---	0 / 0	106.1	111.1	101.1	***
	34087 DYSART 5	64269	WASHBRN5	1	161	331-635	391-637	260	260	1013	58.2	---	---	0 / 0	66	100.5	100.5	0 / 5
	60302 COULEE 5	69523	GENOA 5	1	161	600-680	604-681	240	240	603	62.4	---	---	0 / 0	67.3	100.3	100.3	0 / 1
	60153 MNTCELO7	60269	HASSAN 7	1	115	600	601	140	140	23	34.9	---	---	0 / 0	36	100.1	100.1	0 / 1
Group 2 Pre-existing Overload in Case1 with Increased Overloading in Case2											**Overload 1**			**<less than<**		**Overload 2**		
	34028 LORE 5	34032	8TH ST.5	1	161	331	393	84	84	1018	58	124.6	124.6	1 / 1	76.3	154.1	154.1	7 / 0
	60853 LK YANK8	60119	LKYNKTN7	2	115	600	601	15	15	345	44.4	132.6	132.6	1 / 0	46.1	151.1	151.1	1 / 0
	34043 SAVANNA5	34046	YORK 5	1	161	331	393	84	84	795	70.1	137.9	137.9	2 / 0	79.1	155.0	155.0	2 / 1
	62003 JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	135	64.3	105.2	105.2	1 / 0	70	116.6	116.6	2 / 0
	63214 BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	72.5	110.9	110.9	1 / 0
	63314 BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	72.5	110.9	110.9	1 / 0
	63219 GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	595	79.2	100.5	100.5	0 / 1	84.3	107.6	107.6	2 / 1
	34066 M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	683	90	117.5	117.5	2 / 0	95	124.3	124.3	7 / 0
	60203 COON CK7	60253	TWIN LK7	1	115	600	601	371	371	48	57.3	103.9	103.9	0 / 1	58.6	106.9	106.9	1 / 0
E	39122 KEG 138	39218	CHA 138	1	138	364	371	240	240	1130	93.3	126.6	126.6	3 / 0	94.9	128.8	128.8	2 / 0
E	61721 ETCO 7	61722	FORBES 7	1	115	608	608	98	98	63	74.7	101.4	101.4	0 / 5	74.4	103.2	103.2	0 / 5
E	60177 CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	38	67.5	147.2	147.2	5 / 1	69.9	148.7	148.7	6 / 0
E	65355 S3455 3	65337	S3455T1T	1	345	645	645	560	560	278	84.8	100.9	100.9	0 / 1	85.9	101.7	101.7	0 / 1
E	31051 MASON 13	31053	MASON 2	2	345-138	356	317	560	560	1155	72.6	106.3	106.3	1 / 0	73	106.9	106.9	1 / 0
E	31340 NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	780	40.1	108.5	108.5	2 / 0	39.6	109.0	109.0	2 / 0
E	53139 FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	1468	83.9	119.6	108.9	1 / 0	84.2	120.0	109.3	1 / 0
E	34059 BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	678	89.4	121.7	121.7	1 / 2	87.2	121.8	121.8	1 / 2
E	34529 GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	688	57.2	152.5	152.5	1 / 0	61.4	152.6	152.6	1 / 0
E	34073 GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	688	57.3	149.1	149.1	1 / 0	61.5	149.2	149.2	1 / 0
Group 3 Pre-existing Overload in Case1 with Decreased Overloading in Case2											**Overload 1**		**>=greater than or equal to>=**			**Overload 2**		
E	30422 CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	1060	71.6	101.9	101.9	0 / 1	71.7	101.9	101.9	0 / 1
E	34059 BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	688	57.3	148.9	148.9	1 / 0	61.5	148.9	148.9	1 / 0
E	39686 WESTONWP	39676	WESTON	1	115-345	366	366	200	220	83	20.1	110.8	100.7	0 / 4	22.6	110.7	100.7	0 / 4

Ex A2_MISO Xcel RFP Initial Screening Review

Branches Exceeding 100% of Emergency Rating										Cont	pi_rfp				pi_rfp_bid4and5			
								Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus		To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal	First Contingency			Normal	First Contingency		
											System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 3 Pre-existing Overload in Case1 with Decreased Overloading in Case2											Overload 1	>=greater than or equal to>=			Overload 2			
E	61984 AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	915	38.1	100.6	100.6	0 / 1	30.7	100.6	100.6	0 / 1
E	96049 7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	1398	44.2	102.9	102.9	0 / 1	42.7	102.9	102.9	0 / 1
E	60749 DGLAS C8	60144	DGLASCO7	1	115	600	601	47	47	545	88.4	108.7	108.7	2 / 8	89.2	108.5	108.5	4 / 6
E	65409 S1209 5	65383	S1209T1T	1	161	645	645	124	124	285	74.1	105.3	105.3	1 / 0	74.1	105.1	105.1	1 / 0
E	50024 CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	1438	52.4	100.9	100.9	0 / 1	52.4	100.5	100.5	0 / 1
E	62132 PRKWOOD8	62090	PRKWOOD7	1	115	618	619	84	84	503	97.2	116.9	116.9	5 / 8	96.6	116.3	116.3	5 / 4
E	67541 STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	15	116	119.6	119.6	***	115.3	119.0	119.0	***
E	61612 RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	40	59.3	107.2	107.2	5 / 0	54.7	106.5	106.5	5 / 0
E	62132 PRKWOOD8	62090	PRKWOOD7	2	115	618	619	112	112	433	82.1	123.3	123.3	1 / 0	81.6	122.4	122.4	1 / 0
E	64909 N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	233	71.2	101.1	101.1	0 / 1	71.7	100.1	100.1	0 / 1
E	62672 GLNDALE8	62666	GLNDALE7	2	115	600	622	47	47	485	63.1	112.1	112.1	2 / 0	63	110.8	110.8	2 / 0
E	96120 5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	1398	69	105.5	105.5	1 / 0	66.3	103.8	103.8	0 / 1
E	31221 MOBERLY	31409	OVERTON	1	161	356	314	142	142	1398	53.4	104.9	104.9	0 / 1	50.1	103.0	103.0	0 / 1
E	61676 HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	155	84	119.0	119.0	6 / 0	82.3	116.3	116.3	6 / 0
E	60153 MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	23	60.9	103.1	103.1	0 / 1	58.4	100.3	100.3	0 / 1
	27106 11KNOB C	27135	11POND C	1	138	211	211	143	143	1283	99.1	121.0	121.0	1 / 19	96.4	118.0	118.0	1 / 0
	27135 11POND C	27144	11TIPTOP	1	138	211	211	143	143	1283	98.7	120.5	120.5	1 / 12	96.1	117.5	117.5	1 / 0
	63030 DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	30	73.9	108.7	108.7	1 / 0	70.6	104.6	104.6	0 / 1
	60152 MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	450	72.1	125.1	125.1	1 / 1	69.9	119.8	119.8	1 / 1
	60194 CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	30	76.9	121.9	121.9	1 / 0	71.9	115.3	115.3	1 / 0
	60277 WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	30	97.5	149.2	149.2	12 / 6	91.6	142.2	142.2	5 / 4
	62667 ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	30	161.3	240.3	240.3	***	154.4	231.6	231.6	***
	60244 SCOTTCO7	60890	SCOTTCO8	1	115	600	601	70	70	485	63	116.1	116.1	1 / 1	58.1	107.0	107.0	1 / 0
	60158 STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	545	72.3	149.9	149.9	2 / 0	66.1	140.4	140.4	1 / 1
	60153 MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	545	75.3	157.0	157.0	2 / 0	69.1	147.0	147.0	2 / 0
Group 4 Pre-existing Overload in Case1 with Overloading Eliminated in Case2											Overloaded				Not Overloaded			
	64909 N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	233	70.5	100.1	100.1	0 / 1	71	---	---	0 / 0
	32277 TURKY HL	32307	E BELLVL	1	138	357	357	287	287	1373	71.1	100.4	100.4	0 / 1	70.8	---	---	0 / 0
	39145 POR 138	39167	COL 138	1	138	364	371	286	286	1583	56.3	100.5	100.5	0 / 1	58.4	---	---	0 / 0
	39145 POR 138	39167	COL 138	2	138	364	371	286	286	1585	56.3	100.5	100.5	0 / 1	58.4	---	---	0 / 0
	34015 LIME CK5	34016	EMERYN	1	161	331	393	167	167	683	73.4	102.6	102.6	0 / 2	55.8	---	---	0 / 0
	60305 EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	1480	81.8	110.3	110.3	1 / 0	78.9	---	---	0 / 0
	39885 CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	1578	79.7	137.0	137.0	1 / 0	79.4	---	---	0 / 0

Branches Exceeding 100% of Emergency Rating								Cont	pi_rfp				pi_rfp_bid4and5			
						Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
									Normal	First Contingency			Normal	First Contingency		
From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B

Notes:

1. '---' = Less than the Minimum Reporting Level of 100%
2. '***' = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. E = Pre-existing overload that was changed by less than 3% in the new case
4. Overloads are based on 100% of Rating 2
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI — Base Case — 7/23/2002

F204SUPK.SAV /SUMMER PEAK / SI — Bids 4 and 6 — 7/22/2002

Branches Exceeding 100% of Emergency Rating									Cont	pi_rfp				pi_rfp_bid4and6			
							Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal System%	First Contingency Norm%	Emer%	A/B	Normal System%	First Contingency Norm%	Emer%	A/B
Group 1 New Overloads										**Not Overloaded**					**Overloaded**		
	58036 OLATHEE5	58046 OXFORD 5	1	161	541	541	224	224	1435	45.6	---	---	0 / 0	57	104.9	104.9	0 / 1
	34009 WINBAGO5	61932 RUTLAND5	1	161	331	393-615	84	84	1013	78.1	---	---	0 / 0	91.3	104.1	104.1	0 / 11
	63213 MARIETT7	63214 BIGSTON7	1	115	626	626-628	96	96	135	54.5	---	---	0 / 0	56.3	102.2	102.2	0 / 1
	59206 PRALEE 5	59211 BLSPS 5	1	161	540	540	223	245	1435	61.9	---	---	0 / 0	106.1	111.1	101.1	***
	63051 HENNING4	63052 INMAN 4	1	230	626	621	143	143	355	65.7	---	---	0 / 0	77.3	100.1	100.1	0 / 1
Group 2 Pre-existing Overload in Case1 with Increased Overloading in Case2										**Overload 1**			**<less than<**		**Overload 2**		
	34028 LORE 5	34032 8TH ST.5	1	161	331	393	84	84	1018	58	124.6	124.6	1 / 1	73.6	149.7	149.7	7 / 0
	60853 LK YANK8	60119 LKYNKTN7	2	115	600	601	15	15	345	44.4	132.6	132.6	1 / 0	46	148.8	148.8	1 / 0
	34043 SAVANNA5	34046 YORK 5	1	161	331	393	84	84	795	70.1	137.9	137.9	2 / 0	77.8	152.5	152.5	2 / 1
	62003 JOHNJCT7	63216 ORTONVL7	1	115	626	621-626	97	97	135	64.3	105.2	105.2	1 / 0	68.8	115.0	115.0	2 / 0
	63214 BIGSTON7	63195 BIGSTONY	1	115-230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	72.1	110.1	110.1	1 / 0
	63314 BIGSTON4	63195 BIGSTONY	1	230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	72.1	110.1	110.1	1 / 0
	34066 M-TOWN 7	34169 WELSBGT7	1	115	331	391	97	97	683	90	117.5	117.5	2 / 0	94.9	124.0	124.0	7 / 1
	63219 GRANTCO7	63220 ELBOWLK7	1	115	626	629	96	96	595	79.2	100.5	100.5	0 / 1	83	105.9	105.9	1 / 2
	39145 POR 138	39167 COL 138	1	138	364	371	286	286	1583	56.3	100.5	100.5	0 / 1	58.2	103.8	103.8	0 / 1
	39145 POR 138	39167 COL 138	2	138	364	371	286	286	1585	56.3	100.5	100.5	0 / 1	58.2	103.8	103.8	0 / 1
Group 3 Pre-existing Overload in Case1 with Same or Decreased Overloading in Case2										**Overload 1**			**>=greater than or equal to>=**		**Overload 2**		
	61676 HIBBARD7	61680 WNTR ST7	1	115	608	608	144	144	155	84	119.0	119.0	6 / 0	81.9	115.9	115.9	6 / 0
	60244 SCOTTCO7	60890 SCOTTCO8	1	115	600	601	70	70	485	63	116.1	116.1	1 / 1	61.3	112.1	112.1	1 / 0
	60152 MNTCELO4	60151 MNTCELO3	1	230-345	600	601	336	336	450	72.1	125.1	125.1	1 / 1	69.7	120.3	120.3	1 / 1
	60158 STCLTP 7	60166 SALIDA 7	1	115	600	601	139	139	545	72.3	149.9	149.9	2 / 0	67.1	142.5	142.5	1 / 1
	60153 MNTCELO7	60166 SALIDA 7	1	115	600	601	140	140	545	75.3	157.0	157.0	2 / 0	70.1	149.2	149.2	2 / 0
Group 4 Pre-existing Overload in Case1 with Overloading Eliminated in Case2										**Overloaded**					**Not Overloaded**		
	64909 N.PLATT4	65038 N.PLT9 Y	1	230	640	640	187	187	233	70.5	100.1	100.1	0 / 1	71.1	---	---	0 / 0
	32277 TURKY HL	32307 E BELLVL	1	138	357	357	287	287	1373	71.1	100.4	100.4	0 / 1	70.9	100.0	100.0	0 / 0
	64909 N.PLATT4	65037 N.PLT8 Y	1	230	640	640	187	187	233	71.2	101.1	101.1	0 / 1	71.8	100.0	100.0	0 / 0
	34015 LIME CK5	34016 EMERYN	1	161	331	393	167	167	683	73.4	102.6	102.6	0 / 2	59.6	---	---	0 / 0
	60305 EAU CLA5	60317 WHEATON5	1	161	600	604	272	272	1480	81.8	110.3	110.3	1 / 0	79.6	---	---	0 / 0

Branches Exceeding 100% of Emergency Rating								Cont	pi_rfp				pi_rfp_bid4and6			
						Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
									Normal	First Contingency			Normal	First Contingency		
From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B

Notes:

1. '---' = Less than the Minimum Reporting Level of 100%
2. '***' = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria

4. Overloads are based on 100% of Rating 2
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI — Base Case — 7/23/2002

F204SUPK.SAV /SUMMER PEAK / SI — Bids 5 and 6 — 7/22/2002

	Branches Exceeding 100% of Emergency Rating							Ratings		Cont	pi_rfp				pi_rfp_bid5and6			
											:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
											Normal	First Contingency			Normal	First Contingency		
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm%	Emer%	A/B	System%	Norm%	Emer%	A/B
Group 1	**New Overloads**									**Not Overloaded**				**Overloaded**			
	34009 WINBAGO5	61932 RUTLAND5	1	161	331	393-615	84	84	540	78.1	---	---	0 / 0	87.2	107.3	107.3	1 / 1
Group 2	**Pre-existing Overload in Case1 with Increased Overloading in Case2**									**Overload 1**			**<less than<**	**Overload 2**			
	60853 LK YANK8	60119 LKYNKTN7	2	115	600	601	15	15	345	44.4	132.6	132.6	1 / 0	44.6	136.4	136.4	1 / 0
	34028 LORE 5	34032 8TH ST.5	1	161	331	393	84	84	1018	58	124.6	124.6	1 / 1	60	127.9	127.9	1 / 1
E	60203 COON CK7	60253 TWIN LK7	1	115	600	601	371	371	48	57.3	103.9	103.9	0 / 1	58.3	106.7	106.7	1 / 0
E	62003 JOHNJCT7	63216 ORTONVL7	1	115	626	621-626	97	97	135	64.3	105.2	105.2	1 / 0	65.8	107.6	107.6	1 / 1
E	63219 GRANTCO7	63220 ELBOWLK7	1	115	626	629	96	96	595	79.2	100.5	100.5	0 / 1	80.8	102.6	102.6	0 / 1
E	34043 SAVANNA5	34046 YORK 5	1	161	331	393	84	84	795	70.1	137.9	137.9	2 / 0	71.1	139.8	139.8	2 / 0
E	63214 BIGSTON7	63195 BIGSTONY	1	115-230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	70.1	104.5	104.5	0 / 1
E	63314 BIGSTON4	63195 BIGSTONY	1	230	626	628	233	233	135	69.5	103.2	103.2	0 / 1	70.1	104.5	104.5	0 / 1
E	60177 CHAMPLN7	60178 CHAMP T7	1	115	600	605-601	140	140	38	67.5	147.2	147.2	5 / 1	70.9	148.3	148.3	6 / 0
E	61721 ETCO 7	61722 FORBES 7	1	115	608	608	98	98	63 - 50	74.7	101.4	101.4	0 / 5	74.7	102.0	102.0	0 / 5
E	31340 NIOTA	34181 BRLGTN 5	1	161	356-331	322-391	224	224	780	40.1	108.5	108.5	2 / 0	40.4	108.9	108.9	2 / 0
E	39145 POR 138	39167 COL 138	1	138	364	371	286	286	1583	56.3	100.5	100.5	0 / 1	56.5	100.9	100.9	0 / 1
E	39145 POR 138	39167 COL 138	2	138	364	371	286	286	1585	56.3	100.5	100.5	0 / 1	56.5	100.9	100.9	0 / 1
E	39122 KEG 138	39218 CHA 138	1	138	364	371	240	240	1130	93.3	126.6	126.6	3 / 0	93.5	126.9	126.9	3 / 0
E	31221 MOBERLY	31409 OVERTON	1	161	356	314	142	142	1398	53.4	104.9	104.9	0 / 1	53.5	105.2	105.2	1 / 0
E	96120 5THMHIL	96126 5MOBTAP	1	161	130	130-133	372	372	1398	69	105.5	105.5	1 / 0	69	105.7	105.7	1 / 0
E	31051 MASON 13	31053 MASON 2	2	345-138	356	317	560	560	1155	72.6	106.3	106.3	1 / 0	72.6	106.4	106.4	1 / 0
Group 3	**Pre-existing Overload in Case1 with Decreased Overloading in Case2**									**Overload 1**			**>=greater than or equal to>=**	**Overload 2**			
E	32277 TURKY HL	32307 E BELLVL	1	138	357	357	287	287	1373	71.1	100.4	100.4	0 / 1	71.1	100.4	100.4	0 / 1
E	34059 BOONE 7	34073 GR JCT 7	1	115	331	391	50	50	688	57.3	148.9	148.9	1 / 0	58.2	148.9	148.9	1 / 0
E	34059 BOONE 7	34076 BNE JCT7	1	115	331	391	60	60	678	89.4	121.7	121.7	1 / 2	88.9	121.7	121.7	1 / 2
E	34066 M-TOWN 7	34169 WELSBGT7	1	115	331	391	97	97	683	90	117.5	117.5	2 / 0	90	117.5	117.5	2 / 0
E	34073 GR JCT 7	34529 GRJCT5Y	1	115-161	331	391-392	50	50	688	57.3	149.1	149.1	1 / 0	58.2	149.1	149.1	1 / 0
E	34529 GRJCT5Y	34054 GR JCT 5	1	161	331	392-391	50	50	688	57.2	152.5	152.5	1 / 0	58.1	152.5	152.5	1 / 0
E	39686 WESTONWP	39676 WESTON	1	115-345	366	366	200	220	83	20.1	110.8	100.7	0 / 4	20.4	110.8	100.7	0 / 4
E	50024 CARROLL4	50023 CARROLL6	1	138-230	502	502	336	336	1438	52.4	100.9	100.9	0 / 1	52.4	100.9	100.9	0 / 1
E	53139 FLINTCR5	53194 ELMSPRR5	1	161	520	520	305	335	1468	83.9	119.6	108.9	1 / 0	83.9	119.6	108.9	1 / 0
E	61676 HIBBARD7	61680 WNTR ST7	1	115	608	608	144	144	155	84	119.0	119.0	6 / 0	84	119.0	119.0	6 / 0
E	61984 AUSTIN 5	63070 PL VLLY5	1	161	680-618	617-618	445	445	915	38.1	100.6	100.6	0 / 1	35.5	100.6	100.6	0 / 1
E	64909 N.PLATT4	65037 N.PLT8 Y	1	230	640	640	187	187	233	71.2	101.1	101.1	0 / 1	71.1	101.1	101.1	0 / 1

	Branches Exceeding 100% of Emergency Rating								Cont	pi_rfp				pi_rfp_bid5and6			
							Ratings			:204SUPK.SAV /SUMMER PEAK / S				204SUPK.SAV /SUMMER PEAK / S			
	From Bus	To Bus	Ckt	Base kV	Area	Zone	Norm	Emer	ID	Normal System%	First Contingency Norm%	Emer%	A/B	Normal System%	First Contingency Norm%	Emer%	A/B
Group 3 Pre-existing Overload in Case1 with Decreased Overloading in Case2										**Overload 1**	**>=greater than or equal to>=**			**Overload 2**			
E	64909 N.PLATT4	65038 N.PLT9 Y	1	230	640	640	187	187	233	70.5	100.1	100.1	0 / 1	70.4	100.1	100.1	0 / 1
E	65409 S1209 5	65383 S1209T1T	1	161	645	645	124	124	285	74.1	105.3	105.3	1 / 0	74.2	105.3	105.3	1 / 0
E	96049 7THOMHL	96120 5THMHIL	1	345-161	130	130	625	625	1398	44.2	102.9	102.9	0 / 1	44	102.9	102.9	0 / 1
E	30422 CONWAY 3	31391 ORGD 1	1	138	356	318	205	205	1060	71.6	101.9	101.9	0 / 1	71.6	101.8	101.8	0 / 1
E	39885 CEDARU	39892 NATIONAL	1	138	368-365	368-379	96	96	1578	79.7	137.0	137.0	1 / 0	79.7	136.9	136.9	1 / 0
E	27106 11KNOB C	27135 11POND C	1	138	211	211	143	143	1283	99.1	121.0	121.0	1 / 19	98.8	120.8	120.8	1 / 13
E	27135 11POND C	27144 11TIPTOP	1	138	211	211	143	143	1283	98.7	120.5	120.5	1 / 12	98.5	120.3	120.3	1 / 12
E	60749 DGLAS C8	60144 DGLASCO7	1	115	600	601	47	47	545	88.4	108.7	108.7	2 / 8	88.4	108.5	108.5	2 / 8
E	67541 STVITAL7	67726 DAKOTB17	1	110	667	668-667	26	26	15	116	119.6	119.6	***	115.8	119.4	119.4	***
E	62132 PRKWOOD8	62090 PRKWOOD7	1	115	618	619	84	84	503	97.2	116.9	116.9	5 / 8	97.1	116.7	116.7	5 / 8
E	65355 S3455 3	65337 S3455T1T	1	345	645	645	560	560	278	84.8	100.9	100.9	0 / 1	84.5	100.7	100.7	0 / 1
E	99798 5BATEVL	99808 5CUSHMN	1				148	148	1073	95.2	105.7	105.7	1 / 8	94.9	105.4	105.4	1 / 10
E	62132 PRKWOOD8	62090 PRKWOOD7	2	115	618	619	112	112	433	82.1	123.3	123.3	1 / 0	82	122.9	122.9	1 / 0
E	61612 RIVERTN4	61625 BLCKBRY4	1	230	608	608	327	327	40	59.3	107.2	107.2	5 / 0	57.5	106.7	106.7	5 / 0
E	60152 MNTCELO4	60151 MNTCELO3	1	230-345	600	601	336	336	450	72.1	125.1	125.1	1 / 1	72.1	124.3	124.3	1 / 1
E	62672 GLNDALE8	62666 GLNDALE7	2	115	600	622	47	47	485	63.1	112.1	112.1	2 / 0	62.9	110.9	110.9	2 / 0
E	60153 MNTCELO7	60151 MNTCELO3	1	115-345	600	601	336	336	23	60.9	103.1	103.1	0 / 1	59.8	101.6	101.6	0 / 1
E	60305 EAU CLA5	60317 WHEATON5	1	161	600	604	272	272	1480	81.8	110.3	110.3	1 / 0	81.9	108.7	108.7	1 / 0
E	60158 STCLTP 7	60166 SALIDA 7	1	115	600	601	139	139	545	72.3	149.9	149.9	2 / 0	70.7	147.1	147.1	2 / 0
	60153 MNTCELO7	60166 SALIDA 7	1	115	600	601	140	140	545	75.3	157.0	157.0	2 / 0	73.7	154.0	154.0	2 / 0
	63030 DICKNSN3	62925 DICKNSN7	1	345-115	618	618-619	448	448	30	73.9	108.7	108.7	1 / 0	72.3	105.5	105.5	1 / 0
	60244 SCOTTCO7	60890 SCOTTCO8	1	115	600	601	70	70	485	63	116.1	116.1	1 / 1	59.4	110.0	110.0	1 / 0
	60194 CARVRCO7	60277 WWACNIA7	1	115	600	601	71	71	30	76.9	121.9	121.9	1 / 0	72.5	114.9	114.9	1 / 0
	60277 WWACNIA7	62667 ST BONI7	1	115	600	601-622	71	71	30	97.5	149.2	149.2	12 / 6	92.6	141.9	141.9	7 / 3
	62667 ST BONI7	62925 DICKNSN7	1	115	600-618	622-619	71	71	30	161.3	240.3	240.3	***	155.1	230.2	230.2	***
Group 4 Pre-existing Overload in Case1 with Overloading Eliminated in Case2										**Overloaded**				**Not Overloaded**			
	34015 LIME CK5	34016 EMERYN	1	161	331	393	167	167	683	73.4	102.6	102.6	0 / 2	70.1	100.0	100.0	0 / 0

Notes:

1. '---' = Less than the Minimum Reporting Level of 100%
2. '***' = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. E = Pre-existing overload that was changed by less than 3% in the new case
4. Overloads are based on 100% of Rating 2
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Base Case
Case Date	7/23/2002

Power Flow File C:\T2000\Work\miso\pi_rfp.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Base Case

7/23/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114.5	161	60 / 0	240
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	105.4	75	2 / 0	157
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	28.6	57	1 / 0	153
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	100.4	72	2 / 0	150
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	69.2	98	12 / 6	149
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	28.6	57	1 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	28.6	57	1 / 0	149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	94.6	68	5 / 1	147
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	58.9	70	2 / 0	138
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	76.5	80	1 / 0	137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	6.7	44	1 / 0	133
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	224.0	93	3 / 0	127
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	242.1	72	1 / 1	125
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	48.7	58	1 / 1	125
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	92.0	82	1 / 0	123
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	54.6	77	1 / 0	122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	53.6	89	1 / 2	122
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	141.7	99	1 / 19	121
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	141.1	99	1 / 12	121
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.2	116	18 / 0	120
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	121.0	84	6 / 0	119
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	87.3	90	2 / 0	118
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.6	97	5 / 8	117
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	44.1	63	1 / 1	116
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.6	63	2 / 0	112
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	222.6	82	1 / 0	110
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	255.9	84	1 / 0	109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	41.5	88	2 / 8	109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	331.1	74	1 / 0	109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	89.8	40	2 / 0	109
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	193.9	59	5 / 0	107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	406.5	73	1 / 0	106
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	140.8	95	1 / 8	106
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	256.7	69	1 / 0	106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	91.9	74	1 / 0	105
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	62.3	64	1 / 0	105
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	75.9	53	0 / 1	105
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	212.7	57	0 / 1	104
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	162.0	70	0 / 1	103
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	162.0	70	0 / 1	103
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	204.6	61	0 / 1	103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	276.4	44	0 / 1	103
34015	LIME CK5	34016	EMERYN	1	161	331	393	167	167	122.5	73	0 / 2	103
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	146.8	72	0 / 1	102
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	73.2	75	0 / 5	101
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	133.1	71	0 / 1	101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.2	52	0 / 1	101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	474.6	85	0 / 1	101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	40.3	20	0 / 4	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	169.7	38	0 / 1	101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	161.0	56	0 / 1	101

Overloaded Facility										Normal System		Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
39145	POR 138	39167	COL 138	2	138	364	371	286	286	161.0	56	0 / 1	101
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	76.0	79	0 / 1	101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	204.1	71	0 / 1	100
64909	N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	131.8	70	0 / 1	100
												149 / 94	240

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Base Case

7/23/2002

Overloaded Facility			Contingency							Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	115	161	161
	30 '009 5'				345	600-618	601-618				171	240	240
	845 MAPP-17				345	600-618	601-618				141	198	198
	470 '705 2'				345-115	600	601				128	180	180
	53 '022 3'					600	601				127	179	179
	48 '022 1'					600	601				126	177	177
	38 '009 8'					600-618	601-618				126	177	177
	498 '720 1'				115	600-618	601-619				124	175	175
	483 '715 1'				115-69	600-618					124	175	175
	28 '009 4'					600-618	601-618				124	174	174
	23 '009 2'					600	601				124	174	174
	35 '009 7'					600	601				123	174	174
	840 MAPP-15A			1	345	600	601				122	172	172
	475 '705 4'				345-115	600	601				121	171	171
	485 '715 2'				115-69	600-618					121	170	170
	488 '715 3'				69-115	600	622-601				120	169	169
	58 '022 5'					600	601				120	169	169
	473 '705 3'				115-345	600	601				119	168	168
	70 '022 10'					600	601				118	166	166
	843 MAPP-16			1	345	600	601				118	166	166
	55 '022 4'					600	601				117	165	165
	463 '700 1'				345	600	601				117	164	165
	493 '715 5'				115-69	600-618					117	164	164
	113 '050 12'										117	164	164
	110 '050 11'										116	164	164
	468 '705 1'				345-115	600	601				116	164	164
	525 '755 '				115	600	601-622				116	164	164
	103 '050 10'				345-161	364-600					116	164	164
	105 '050 14'										116	164	164
	460 '695 '				115	618-600	619-601				116	164	164
	68 '022 9'				345-115	600	601				116	164	164
	115 '050 13'										116	164	164
	543 '775 '				115	600-608					116	164	164
	490 '715 4'				115-69	600	601-622				116	163	163
	1235 FG3239				345/115						116	163	163
	1105 FG3016				345/115						116	163	163
	100 '050 9'				115/345						116	163	163
	1480 FG6062			1	345	600	601-604				116	163	163
	555 '795 '					600-652					116	163	163
	838 MAPP-14			1	161-345	600	616				116	163	163

Overloaded Facility		Contingency							Ratings		Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		Norm MVA	Norm (%)	Emer (%)
	98	'050 8'			345/69							116	163	163
	560	'805 '			115	600	601					116	163	163
	523	'750 '			115-69	608-600						113	160	160
	1353	FG3727		1	345	331-600	393-601					113	160	160
	450	'675 '			345-230	600	601-622					113	159	159
	40	'015 2'			500	600	601					113	159	159
	45	'020 '			500-115	600	601					113	159	159
	430	640 '										113	159	159
	935	'SINGLE-028'		1	500	600	601					113	159	159
	50	'022 2'				600	601					113	159	159
	318	'500'			69-230	618-652	619-654					113	159	159
	530	'760 '			345	600	601					112	158	158
	545	'780 '			115	600	601					112	157	157
	65	'022 8'			345-115	600	601					112	157	157
	93	'050 7'										112	157	157
	85	'050 3'			345-161	364-600						112	157	157
	90	'050 5'										111	157	157
	88	'050 4'										111	157	157
	108	'050 1'			69/345							111	157	157
	95	'050 6'										111	156	157
	83	'050 2'			345/115							111	156	156
												60 / 0		240
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601		140	140	NS	105	75	75
	545	'780 '			115	600	601					220	157	157
	450	'675 '			345-230	600	601-622					159	113	113
												2 / 0		157
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391		50	50	NS	29	57	57
	688	'936 '			115	331	391					76	153	153
												1 / 0		153
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601		139	139	NS	100	72	72
	545	'780 '			115	600	601					208	150	150
	450	'675 '			345-230	600	601-622					152	109	109
												2 / 0		150

Overloaded Facility		Contingency									Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	NS	69	98	98
	30 '009 5'				345	600-618	601-618				106	149	149
	845 MAPP-17				345	600-618	601-618				87	123	123
	470 '705 2'				345-115	600	601				82	115	115
	53 '022 3'					600	601				80	112	112
	48 '022 1'					600	601				79	111	111
	483 '715 1'				115-69	600-618					78	110	110
	38 '009 8'					600-618	601-618				78	110	110
	28 '009 4'					600-618	601-618				77	109	109
	23 '009 2'					600	601				76	106	107
	35 '009 7'					600	601				75	106	106
	488 '715 3'				69-115	600	622-601				75	105	105
	475 '705 4'				345-115	600	601				75	105	105
	58 '022 5'					600	601				74	104	104
	840 MAPP-15A			1	345	600	601				74	104	104
	70 '022 10'					600	601				72	102	102
	473 '705 3'				115-345	600	601				72	102	102
	843 MAPP-16			1	345	600	601				72	101	101
	55 '022 4'					600	601				72	101	101
											12 / 6		149
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	NS	29	57	57
	688 '936 '				115	331	391				75	149	149
											1 / 0		149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	NS	29	57	57
	688 '936 '				115	331	391				74	149	149
											1 / 0		149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	NS	95	68	68
	38 '009 8'					600-618	601-618				206	147	147
	35 '009 7'					600	601				205	147	147
	30 '009 5'				345	600-618	601-618				161	115	115
	840 MAPP-15A			1	345	600	601				156	111	111
	443 '670 1'					600-618	601-619				155	111	111
	28 '009 4'					600-618	601-618				146	104	104
											5 / 1		147
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	NS	59	70	70
	795 ALTW-85				161	331	393-392				116	138	138
	1025 FG12013			1	345	331	393				89	106	106
											2 / 0		138
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	NS	77	80	80
	1578 FG65006			1	138	365-368	379-368				132	137	137
											1 / 0		137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	NS	7	44	44
	345 '530 '				69-115	600-652	601-605				20	133	133
											1 / 0		133

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	NS	224	93	93
	1130 FG3031			1	138	364-367	371-367				304	127	127
	1118 FG3022			1	345	367	391-367				287	119	120
	1580 FG65009			1	345	367	391-367				287	119	120
											3 / 0		127
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	242	72	72
	450 '675 '				345-230	600	601-622				420	125	125
	23 '009 2'					600	601				351	105	105
											1 / 1		125
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	NS	49	58	58
	1018 FG12010			1	161	331	393-392				105	125	125
	785 'ALTW-13 '				161	331	393-392				85	101	101
											1 / 1		125
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	92	82	82
	433 '650 '				115-69	600-618	601-619				138	123	123
											1 / 0		123
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	NS	55	77	77
	30 '009 5'				345	600-618	601-618				87	122	122
											1 / 0		122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	54	89	89
	678 '932 2'				115/345	331-635	391-637				73	122	122
	770 'ALTW-07 '				161-69	331	391-392				62	104	104
	625 '911 '				161	331-652	391-654				61	102	102
											1 / 2		122

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	142	99	99
	1283	FG3418		1	765	205	250				173	121	121
	1260	FG3404		1	345	356-357	323-357				146	102	102
	1285	FG3419		1	345	356-357	323-357				146	102	102
	1255	FG3402		1	345	356-357	323-357				146	102	102
	998	FG110		1	345	356-357	323-357				146	102	102
	1005	FG116		1	345	356-357	323-357				146	102	102
	1290	FG3424			345	356-357	323-357				146	102	102
	1050	FG124			345	356-357	323-357				146	102	102
	1170	FG3135			345	356-357	323-357				146	102	102
	1390	FG4017			345	356-357	323-357				146	102	102
	1058	FG127			345	356-357	323-357				146	102	102
	1278	FG3413			345	356-357	323-357				146	102	102
	1133	FG3118		1	345	205-356	252-323				144	101	101
	1410	FG45009		1	500	201	201				144	100	100
	1210	FG3157			345/138	356-130	314-130				143	100	100
	1078	FG133		1	345	356-130	314-130				143	100	100
	1208	FG3153		1	345	356-130	314-130				143	100	100
	1193	FG3144		1	345	356-130	314-130				143	100	100
	1063	FG129		1	345	356-130	314-130				143	100	100
	640	'921 3'			161	635	638				143	100	100
											1 / 19		121
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	NS	141	99	99
	1283	FG3418		1	765	205	250				172	121	121
	998	FG110		1	345	356-357	323-357				145	102	102
	1260	FG3404		1	345	356-357	323-357				145	102	102
	1255	FG3402		1	345	356-357	323-357				145	102	102
	1005	FG116		1	345	356-357	323-357				145	102	102
	1285	FG3419		1	345	356-357	323-357				145	102	102
	1290	FG3424			345	356-357	323-357				145	102	102
	1058	FG127			345	356-357	323-357				145	102	102
	1390	FG4017			345	356-357	323-357				145	102	102
	1050	FG124			345	356-357	323-357				145	102	102
	1170	FG3135			345	356-357	323-357				145	102	102
	1278	FG3413			345	356-357	323-357				145	102	102
	1133	FG3118		1	345	205-356	252-323				144	101	101
											1 / 12		121

Overloaded Facility		Contingency							Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	NS	30	116	116
	15	'003 '									31	120	120
	948	'SINGLE-044'		1	230	600-667	601-668				31	119	119
	13	'001 '			230						31	119	119
	18	'007 '				608	657-608				31	119	119
	943	'SINGLE-040'		1	230	608	657				31	119	119
	945	'SINGLE-042'		1	230	608	608-657				31	118	118
	950	'SINGLE-046'			345-24	626	657-661				31	118	118
	40	'015 2'			500	600	601				31	117	117
	45	'020 '			500-115	600	601				31	117	117
	935	'SINGLE-028'		1	500	600	601				31	117	117
	63	'022 7'				600	601				31	117	117
	205	'220 '				626	627-657				30	117	117
	50	'022 2'				600	601				31	117	117
	215	'250 '			115-230	626-618					30	117	117
	380	'570 1'				626	626-657				30	115	115
	818	'FORBES 7T-8'				600-608	601-608				30	114	114
	938	'SINGLE-031'		1	230	626	657				29	113	113
	940	'SINGLE-034'		1	230	626-667	657-668				28	109	109
											18 / 0		120
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	121	84	84
	155	132L			115	608	608				171	119	119
	63	'022 7'				600	601				166	116	116
	50	'022 2'				600	601				166	115	115
	40	'015 2'			500	600	601				162	113	113
	935	'SINGLE-028'		1	500	600	601				162	113	113
	45	'020 '			500-115	600	601				162	113	113
											6 / 0		119
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	NS	87	90	90
	1028	FG12015		1	345	635	637				114	117	118
	683	'933 '			345-161	635	637				114	117	118
											2 / 0		118

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	82	97	97
	503 '725 '				69-230	618	619				98	117	117
	440 '665 '				230-69	600-618	601-619				95	113	113
	445 '670 2'				345-230	600-618	601-619				95	113	113
	450 '675 '				345-230	600	601-622				91	108	108
	538 '765 '				345-230	600-618	601-619				89	106	106
	30 '009 5'				345	600-618	601-618				85	102	102
	463 '700 1'				345	600	601				85	101	102
	435 '655 '				115-69	600-618	601-619				85	101	102
	818 'FORBES 7T-8'					600-608	601-608				85	101	101
	840 MAPP-15A			1	345	600	601				85	101	101
	453 '680 '					618-600					84	101	101
	438 '660 '				230-69	618	619				84	100	100
	443 '670 1'					600-618	601-619				84	100	100
											5 / 8		117
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	44	63	63
	485 '715 2'				115-69	600-618					81	116	116
	493 '715 5'				115-69	600-618					71	102	102
											1 / 1		116
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	63	63
	485 '715 2'				115-69	600-618					53	112	112
	490 '715 4'				115-69	600	601-622				52	111	111
											2 / 0		112
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	NS	223	82	82
	1480 FG6062			1	345	600	601-604				300	110	110
											1 / 0		110
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	256	84	76
	1468 FG5074			1	161	520	520				365	120	109
											1 / 0		109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	88	88
	545 '780 '				115	600	601				51	109	109
	543 '775 '				115	600-608					50	107	107
	135 '110 2'				230	652	654				48	103	103
	430 640 '										48	103	103
	318 '500'				69-230	618-652	619-654				48	101	101
	935 'SINGLE-028'			1	500	600	601				47	100	101
	45 '020 '				500-115	600	601				47	100	100
	40 '015 2'				500	600	601				47	100	100
	50 '022 2'					600	601				47	100	100
	63 '022 7'					600	601				47	100	100
											2 / 8		109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	331	74	74
	30 '009 5'				345	600-618	601-618				487	109	109
											1 / 0		109

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	90	40	40
	793 ALTW-84				161	331	391				243	109	109
	780 'ALTW-11 '				161	331	391				243	109	109
											2 / 0		109
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	194	59	59
	45 '020 '				500-115	600	601				351	107	107
	935 'SINGLE-028'			1	500	600	601				351	107	107
	40 '015 2'				500	600	601				351	107	107
	50 '022 2'					600	601				349	107	107
	63 '022 7'					600	601				349	107	107
											5 / 0		107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	406	73	73
	1155 FG3129			1	345-138	356	317				595	106	106
											1 / 0		106
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	141	95	95
	1073 FG1319			1	500	524-151	524-159				156	106	106
	1210 FG3157				345/138	356-130	314-130				150	101	101
	1078 FG133			1	345	356-130	314-130				150	101	101
	1208 FG3153			1	345	356-130	314-130				150	101	101
	1063 FG129			1	345	356-130	314-130				150	101	101
	1193 FG3144			1	345	356-130	314-130				150	101	101
	1423 FG5008			1	345	520	520				149	101	101
	1443 FG5042			1	345	520	520				149	101	101
	660 '927 '				345	635	637				149	101	101
											1 / 8		106
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	257	69	69
	1398 FG4020			1	345	130	130				393	106	106
											1 / 0		106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
	285 '451 '				161	645	645				131	105	105
											1 / 0		105
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	62	64	64
	135 '110 2'				230	652	654				102	105	105
											1 / 0		105
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	76	53	53
	1398 FG4020			1	345	130	130				149	105	105
											0 / 1		105
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	213	57	57
	48 '022 1'					600	601				385	104	104
											0 / 1		104
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	162	70	70
	135 '110 2'				230	652	654				240	103	103
											0 / 1		103

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	162	70	70
	135 '110 2'				230	652	654				240	103	103
											0 / 1		103
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	205	61	61
	23 '009 2'					600	601				346	103	103
											0 / 1		103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	276	44	44
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
34015	LIME CK5	34016	EMERYN	1	161	331	393	167	167	NS	123	73	73
	1028 FG12015			1	345	635	637				171	103	103
	683 '933 '				345-161	635	637				171	103	103
											0 / 2		103
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	75	75
	63 '022 7'					600	601				99	101	101
	50 '022 2'					600	601				99	101	101
	935 'SINGLE-028'			1	500	600	601				99	101	101
	45 '020 '				500-115	600	601				99	101	101
	40 '015 2'				500	600	601				99	101	101
											0 / 5		101
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	NS	133	71	71
	233 '310 '				345	640	640				189	101	101
											0 / 1		101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				339	101	101
											0 / 1		101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	475	85	85
	278 '440 '				161	645	645				565	101	101
											0 / 1		101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	40	20	18
	88 '050 4'										222	111	101
	83 '050 2'				345/115						222	111	101
	90 '050 5'										221	111	101
	95 '050 6'										221	111	101
											0 / 4		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	170	38	38
	915 MAPP-9				345	600					448	101	101
											0 / 1		101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	NS	161	56	56
	1583 FG65010			2	138	364	371				287	100	101
											0 / 1		101

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
39145	POR 138	39167	COL 138	2	138	364	371	286	286	NS	161	56	56
	1585 FG65011			1	138	364	371				287	100	101
											0 / 1		101
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	76	79	79
	595 '866 '				230	608-626	608-621				96	101	101
											0 / 1		101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	NS	204	71	71
	1373 FG4009				138-345	357-356	357-312				288	100	100
											0 / 1		100
64909	N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	NS	132	70	70
	233 '310 '				345	640	640				187	100	100
											0 / 1		100
											149 / 94		240.3

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp_bid1

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Bid 1
Case Date	7/23/2002

Power Flow File C:\T2000\Work\miso\pi_rfp_bid1.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 1

7/23/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114.3	161	60 / 0	239
60201	CHEMOLT7	60204	COTTAGE7	1	115	600	601	191	191	113.4	59	2 / 0	216
60217	INVRHLS3	60218	INVRHLS7	1	345-115	600	601	550	550	181.6	33	2 / 0	201
60220	INVRGRV7	62230	PILOTKB7	1	115	600	601-622	239	239	167.7	70	2 / 0	200
60204	COTTAGE7	60238	REDROCK7	1	115	600	601	191	191	63.7	33	2 / 0	192
60218	INVRHLS7	60223	KOCHREF7	1	115	600	601	371	371	283.3	76	2 / 0	184
60200	BLK DG27	60258	WILSON 7	2	115	600	601	167	167	63.3	38	2 / 0	182
60200	BLK DG27	62230	PILOTKB7	1	115	600	601-622	194	194	45.1	23	2 / 0	177
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	106.2	76	2 / 0	158
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	28.9	58	1 / 0	153
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	101.2	73	2 / 0	151
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	29.0	58	1 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	29.0	58	1 / 0	149
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	69.1	97	11 / 7	148
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	95.1	68	5 / 1	147
62227	JOHNCAK7	62229	APPVLTE7	1	115	600	622	224	224	139.0	62	2 / 0	147
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	59.4	71	2 / 0	139
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	76.5	80	1 / 0	137
60201	CHEMOLT7	60247	LINDETP7	1	115	600	601	167	167	37.7	23	2 / 0	137
60218	INVRHLS7	60220	INVRGRV7	1	115	600	601	371	371	195.2	53	2 / 0	137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	6.6	44	1 / 0	131
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	224.0	93	3 / 0	127
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	49.7	59	1 / 1	126
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	243.6	72	1 / 1	126
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	92.1	82	1 / 0	123
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	53.4	89	1 / 2	122
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	54.3	76	1 / 0	121
60223	KOCHREF7	60341	ROSEMON7	1	115	600	601	191	191	33.9	18	2 / 0	121
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	141.6	99	1 / 18	121
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	141.1	99	1 / 12	121
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	122.1	85	6 / 0	120
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.2	116	17 / 0	120
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	87.7	90	2 / 0	118
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	44.7	64	1 / 1	118
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.7	97	5 / 9	117
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.9	64	2 / 0	114
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	218.8	80	1 / 0	111
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	255.9	84	1 / 0	109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	41.6	89	2 / 8	109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	89.6	40	2 / 0	109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	331.2	74	1 / 0	108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	194.5	59	5 / 0	107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	406.5	73	1 / 0	106
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	140.8	95	1 / 8	106
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	256.6	69	1 / 0	106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	91.9	74	1 / 0	105
60103	CANNFLS5	63071	SPRNGCK5	1	161	600	601-622	90	90	42.4	47	1 / 1	105
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	75.8	53	0 / 1	105
60104	CANNFLS7	62235	EMPIRE 7	1	115	600	601-622	140	140	40.6	29	0 / 2	104
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	62.0	64	0 / 1	104
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	212.3	57	0 / 1	104

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
60343	WILLPIP7	62228	APPVLTW7	1	115	600	601-622	224	224	88.9	40	0 / 2	103
62227	JOHNCAK7	62228	APPVLTW7	1	115	600	622	224	224	88.9	40	0 / 2	103
60341	ROSEMON7	62235	EMPIRE 7	1	115	600	601-622	140	140	40.7	29	0 / 2	103
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	205.2	61	0 / 1	103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	276.2	44	0 / 1	103
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	161.5	69	0 / 1	103
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	161.5	69	0 / 1	103
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	146.8	72	0 / 1	102
60343	WILLPIP7	62226	FISCHER7	1	115	600	601-622	224	224	85.3	38	0 / 2	102
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	73.3	75	0 / 5	101
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	133.0	71	0 / 1	101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.2	52	0 / 1	101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	474.3	85	0 / 1	101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	39.7	20	0 / 4	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	162.0	36	0 / 1	101
34015	LIME CK5	34016	EMERYN	1	161	331	393	167	167	118.0	71	0 / 2	101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	161.1	56	0 / 1	101
39145	POR 138	39167	COL 138	2	138	364	371	286	286	161.1	56	0 / 1	101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	204.1	71	0 / 1	100
64909	N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	131.7	70	0 / 1	100
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	75.7	79	0 / 1	100
												169 / 107	239

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 1

7/23/2002

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	114	161	161
	30 '009 5'				345	600-618	601-618				170	239	239
	845 MAPP-17				345	600-618	601-618				140	197	197
	470 '705 2'				345-115	600	601				127	179	179
	53 '022 3'					600	601				127	179	179
	48 '022 1'					600	601				126	177	177
	38 '009 8'					600-618	601-618				126	177	177
	483 '715 1'				115-69	600-618					124	175	175
	498 '720 1'				115	600-618	601-619				124	175	175
	28 '009 4'					600-618	601-618				124	174	174
	23 '009 2'					600	601				123	174	174
	35 '009 7'					600	601				123	173	173
	840 MAPP-15A			1	345	600	601				122	171	171
	485 '715 2'				115-69	600-618					121	170	171
	475 '705 4'				345-115	600	601				121	170	170
	488 '715 3'				69-115	600	622-601				120	169	169
	58 '022 5'					600	601				120	168	168
	473 '705 3'				115-345	600	601				119	167	167
	70 '022 10'					600	601				118	166	166
	843 MAPP-16			1	345	600	601				118	166	166
	55 '022 4'					600	601				117	165	165
	493 '715 5'				115-69	600-618					116	164	164
	113 '050 12'										116	164	164
	110 '050 11'										116	164	164
	490 '715 4'				115-69	600	601-622				116	164	164
	103 '050 10'				345-161	364-600					116	164	164
	525 '755 '				115	600	601-622				116	164	164
	105 '050 14'										116	164	164
	460 '695 '				115	618-600	619-601				116	163	164
	68 '022 9'				345-115	600	601				116	163	163
	468 '705 1'				345-115	600	601				116	163	163
	115 '050 13'										116	163	163
	1235 FG3239				345/115						116	163	163
	1480 FG6062			1	345	600	601-604				116	163	163
	1105 FG3016				345/115						116	163	163
	543 '775 '				115	600-608					116	163	163
	100 '050 9'				115/345						116	163	163
	555 '795 '					600-652					116	163	163
	98 '050 8'				345/69						116	163	163
	560 '805 '				115	600	601				115	163	163

Overloaded Facility		Contingency							Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		Norm MVA	Norm (%)	Emer (%)
	838	MAPP-14		1	161-345	600	616				115	163	163
	523	'750 '			115-69	608-600					113	159	159
	1353	FG3727		1	345	331-600	393-601				113	159	159
	45	'020 '			500-115	600	601				113	159	159
	450	'675 '			345-230	600	601-622				113	159	159
	40	'015 2'			500	600	601				113	159	159
	50	'022 2'				600	601				113	159	159
	935	'SINGLE-028'		1	500	600	601				113	159	159
	430	640 '									113	158	159
	318	'500'			69-230	618-652	619-654				112	158	158
	65	'022 8'			345-115	600	601				112	157	157
	545	'780 '			115	600	601				111	157	157
	85	'050 3'			345-161	364-600					111	157	157
	93	'050 7'									111	157	157
	90	'050 5'									111	157	157
	88	'050 4'									111	157	157
	108	'050 1'			69/345						111	156	157
	95	'050 6'									111	156	156
	83	'050 2'			345/115						111	156	156
	463	'700 1'			345	600	601				106	149	149
	465	'700 2'			345	600	601				103	145	145
											60 / 0		239
60201	CHEMOLT7	60204	COTTAGE7	1	115	600	601	191	191	NS	113	59	59
	463	'700 1'			345	600	601				413	216	216
	465	'700 2'			345	600	601				411	215	215
											2 / 0		216
60217	INVRHLS3	60218	INVRHLS7	1	345-115	600	601	550	550	NS	182	33	33
	465	'700 2'			345	600	601				1107	201	201
	463	'700 1'			345	600	601				1107	201	201
											2 / 0		201
60220	INVRGRV7	62230	PILOTKB7	1	115	600	601-622	239	239	NS	168	70	70
	465	'700 2'			345	600	601				478	200	200
	463	'700 1'			345	600	601				476	199	199
											2 / 0		200
60204	COTTAGE7	60238	REDROCK7	1	115	600	601	191	191	NS	64	33	33
	463	'700 1'			345	600	601				367	192	192
	465	'700 2'			345	600	601				365	191	191
											2 / 0		192
60218	INVRHLS7	60223	KOCHREF7	1	115	600	601	371	371	NS	283	76	76
	463	'700 1'			345	600	601				683	184	184
	465	'700 2'			345	600	601				682	184	184
											2 / 0		184

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		MVA	Norm (%)	Emer (%)
60200	BLK DG27	60258	WILSON 7	2	115	600	601		167	167	NS	63	38	38
	465 '700 2'				345	600	601					303	182	182
	463 '700 1'				345	600	601					298	179	179
												2 / 0		182
60200	BLK DG27	62230	PILOTKB7	1	115	600	601-622		194	194	NS	45	23	23
	465 '700 2'				345	600	601					342	176	177
	463 '700 1'				345	600	601					339	175	175
												2 / 0		177
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601		140	140	NS	106	76	76
	545 '780 '				115	600	601					221	158	158
	450 '675 '				345-230	600	601-622					160	114	114
												2 / 0		158
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391		50	50	NS	29	58	58
	688 '936 '				115	331	391					76	153	153
												1 / 0		153
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601		139	139	NS	101	73	73
	545 '780 '				115	600	601					209	151	151
	450 '675 '				345-230	600	601-622					153	110	110
												2 / 0		151
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392		50	50	NS	29	58	58
	688 '936 '				115	331	391					75	149	149
												1 / 0		149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391		50	50	NS	29	58	58
	688 '936 '				115	331	391					74	149	149
												1 / 0		149

Overloaded Facility	Contingency							Ratings		Overloads			
From Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60277 WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	NS	69	97	97
30 '009 5'				345	600-618	601-618				105	148	148
845 MAPP-17				345	600-618	601-618				87	122	122
470 '705 2'				345-115	600	601				81	114	114
53 '022 3'					600	601				80	112	112
48 '022 1'					600	601				79	111	111
483 '715 1'				115-69	600-618					78	110	110
38 '009 8'					600-618	601-618				78	110	110
28 '009 4'					600-618	601-618				77	109	109
23 '009 2'					600	601				75	106	106
488 '715 3'				69-115	600	622-601				75	105	105
35 '009 7'					600	601				75	105	105
475 '705 4'				345-115	600	601				74	105	105
58 '022 5'					600	601				74	104	104
840 MAPP-15A			1	345	600	601				73	103	104
70 '022 10'					600	601				72	102	102
473 '705 3'				115-345	600	601				72	102	102
843 MAPP-16			1	345	600	601				72	101	101
55 '022 4'					600	601				72	101	101
										11 / 7		148
60177 CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	NS	95	68	68
38 '009 8'					600-618	601-618				206	147	147
35 '009 7'					600	601				205	147	147
30 '009 5'				345	600-618	601-618				161	115	115
443 '670 1'					600-618	601-619				156	112	112
840 MAPP-15A			1	345	600	601				156	112	112
28 '009 4'					600-618	601-618				147	105	105
										5 / 1		147
62227 JOHNCAK7	62229	APPVLTE7	1	115	600	622	224	224	NS	139	62	62
465 '700 2'				345	600	601				329	147	147
463 '700 1'				345	600	601				327	146	146
										2 / 0		147
34043 SAVANNA5	34046	YORK 5	1	161	331	393	84	84	NS	59	71	71
795 ALTW-85				161	331	393-392				117	139	139
1025 FG12013			1	345	331	393				90	107	107
										2 / 0		139
39885 CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	NS	77	80	80
1578 FG65006			1	138	365-368	379-368				132	137	137
										1 / 0		137
60201 CHEMOLT7	60247	LINDETP7	1	115	600	601	167	167	NS	38	23	23
463 '700 1'				345	600	601				229	137	137
465 '700 2'				345	600	601				227	136	136
										2 / 0		137

Overloaded Facility	Contingency							Ratings		Overloads			
From Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60218 INVRHLS7	60220	INVRGRV7	1	115	600	601	371	371	NS	195	53	53
465 '700 2'				345	600	601				508	137	137
463 '700 1'				345	600	601				505	136	136
										2 / 0		137
60853 LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	NS	7	44	44
345 '530 '				69-115	600-652	601-605				20	131	131
										1 / 0		131
39122 KEG 138	39218	CHA 138	1	138	364	371	240	240	NS	224	93	93
1130 FG3031			1	138	364-367	371-367				304	127	127
1580 FG65009			1	345	367	391-367				287	119	120
1118 FG3022			1	345	367	391-367				287	119	120
										3 / 0		127
34028 LORE 5	34032	8TH ST.5	1	161	331	393	84	84	NS	50	59	59
1018 FG12010			1	161	331	393-392				106	126	126
785 'ALTW-13 '				161	331	393-392				87	103	103
										1 / 1		126
60152 MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	244	72	72
450 '675 '				345-230	600	601-622				423	126	126
23 '009 2'					600	601				352	105	105
										1 / 1		126
62132 PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	92	82	82
433 '650 '				115-69	600-618	601-619				138	123	123
										1 / 0		123
34059 BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	53	89	89
678 '932 2'				115/345	331-635	391-637				73	122	122
770 'ALTW-07 '				161-69	331	391-392				62	104	104
625 '911 '				161	331-652	391-654				61	102	102
										1 / 2		122
60194 CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	NS	54	76	76
30 '009 5'				345	600-618	601-618				86	121	121
										1 / 0		121
60223 KOCHREF7	60341	ROSEMON7	1	115	600	601	191	191	NS	34	18	18
463 '700 1'				345	600	601				231	121	121
465 '700 2'				345	600	601				229	120	120
										2 / 0		121

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	142	99	99
	1283 FG3418			1	765	205	250				173	121	121
	1005 FG116			1	345	356-357	323-357				146	102	102
	1260 FG3404			1	345	356-357	323-357				146	102	102
	998 FG110			1	345	356-357	323-357				146	102	102
	1285 FG3419			1	345	356-357	323-357				146	102	102
	1255 FG3402			1	345	356-357	323-357				146	102	102
	1290 FG3424				345	356-357	323-357				146	102	102
	1390 FG4017				345	356-357	323-357				146	102	102
	1278 FG3413				345	356-357	323-357				146	102	102
	1050 FG124				345	356-357	323-357				146	102	102
	1058 FG127				345	356-357	323-357				146	102	102
	1170 FG3135				345	356-357	323-357				146	102	102
	1133 FG3118			1	345	205-356	252-323				144	101	101
	1410 FG45009			1	500	201	201				144	100	100
	1063 FG129			1	345	356-130	314-130				143	100	100
	1078 FG133			1	345	356-130	314-130				143	100	100
	1208 FG3153			1	345	356-130	314-130				143	100	100
	1210 FG3157				345/138	356-130	314-130				143	100	100
	1193 FG3144			1	345	356-130	314-130				143	100	100
											1 / 18		121
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	NS	141	99	99
	1283 FG3418			1	765	205	250				172	120	121
	1005 FG116			1	345	356-357	323-357				145	102	102
	1260 FG3404			1	345	356-357	323-357				145	102	102
	1255 FG3402			1	345	356-357	323-357				145	102	102
	998 FG110			1	345	356-357	323-357				145	102	102
	1285 FG3419			1	345	356-357	323-357				145	102	102
	1390 FG4017				345	356-357	323-357				145	101	102
	1170 FG3135				345	356-357	323-357				145	101	102
	1058 FG127				345	356-357	323-357				145	101	102
	1050 FG124				345	356-357	323-357				145	101	102
	1278 FG3413				345	356-357	323-357				145	101	102
	1290 FG3424				345	356-357	323-357				145	101	102
	1133 FG3118			1	345	205-356	252-323				144	101	101
											1 / 12		121
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	122	85	85
	155 132L				115	608	608				173	120	120
	63 '022 7'					600	601				167	116	116
	50 '022 2'					600	601				167	116	116
	935 'SINGLE-028'			1	500	600	601				163	113	113
	40 '015 2'				500	600	601				163	113	113
	45 '020 '				500-115	600	601				163	113	113
											6 / 0		120

Overloaded Facility	Contingency								Ratings		Overloads			
From Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
67541 STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	NS	30	116	116
	15	'003 '								31	120	120
	13	'001 '		230						31	119	119
	948	'SINGLE-044'	1	230	600-667	601-668				31	119	119
	18	'007 '			608	657-608				31	119	119
	943	'SINGLE-040'	1	230	608	657				31	119	119
	945	'SINGLE-042'	1	230	608	608-657				31	118	119
	950	'SINGLE-046'		345-24	626	657-661				31	118	118
	40	'015 2'		500	600	601				31	117	117
	45	'020 '		500-115	600	601				31	117	117
	50	'022 2'			600	601				31	117	117
	935	'SINGLE-028'	1	500	600	601				31	117	117
	63	'022 7'			600	601				31	117	117
	205	'220 '			626	627-657				30	117	117
	380	'570 1'			626	626-657				30	115	115
	818	'FORBES 7T-8'			600-608	601-608				30	114	114
	938	'SINGLE-031'	1	230	626	657				29	113	113
	940	'SINGLE-034'	1	230	626-667	657-668				28	109	109
										17 / 0		120
34066 M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	NS	88	90	90
	683	'933 '		345-161	635	637				115	118	118
	1028	FG12015	1	345	635	637				115	118	118
										2 / 0		118
60244 SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	45	64	64
	485	'715 2'		115-69	600-618					82	117	118
	493	'715 5'		115-69	600-618					72	103	103
										1 / 1		118
62132 PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	82	97	97
	503	'725 '		69-230	618	619				98	117	117
	440	'665 '		230-69	600-618	601-619				95	113	113
	445	'670 2'		345-230	600-618	601-619				95	113	113
	450	'675 '		345-230	600	601-622				91	108	108
	538	'765 '		345-230	600-618	601-619				89	106	106
	30	'009 5'		345	600-618	601-618				85	102	102
	435	'655 '		115-69	600-618	601-619				85	102	102
	818	'FORBES 7T-8'			600-608	601-608				85	101	101
	840	MAPP-15A	1	345	600	601				85	101	101
	453	'680 '			618-600					84	101	101
	438	'660 '		230-69	618	619				84	100	100
	443	'670 1'			600-618	601-619				84	100	100
	465	'700 2'		345	600	601				84	100	100
	463	'700 1'		345	600	601				84	100	100
										5 / 9		117

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	64	64
	485 '715 2'				115-69	600-618					53	114	114
	490 '715 4'				115-69	600	601-622				53	113	113
											2 / 0		114
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	NS	219	80	80
	1480 FG6062			1	345	600	601-604				301	111	111
											1 / 0		111
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	256	84	76
	1468 FG5074			1	161	520	520				365	120	109
											1 / 0		109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	89	89
	545 '780 '				115	600	601				51	109	109
	543 '775 '				115	600-608					50	107	107
	135 '110 2'				230	652	654				48	103	103
	430 640 '										48	103	103
	318 '500'				69-230	618-652	619-654				48	101	101
	935 'SINGLE-028'			1	500	600	601				47	100	100
	45 '020 '				500-115	600	601				47	100	100
	40 '015 2'				500	600	601				47	100	100
	63 '022 7'					600	601				47	100	100
	50 '022 2'					600	601				47	100	100
											2 / 8		109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	90	40	40
	793 ALTW-84				161	331	391				243	108	109
	780 'ALTW-11 '				161	331	391				243	108	109
											2 / 0		109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	331	74	74
	30 '009 5'				345	600-618	601-618				486	108	108
											1 / 0		108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	194	59	59
	935 'SINGLE-028'			1	500	600	601				350	107	107
	40 '015 2'				500	600	601				350	107	107
	45 '020 '				500-115	600	601				350	107	107
	50 '022 2'					600	601				349	107	107
	63 '022 7'					600	601				348	107	107
											5 / 0		107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	406	73	73
	1155 FG3129			1	345-138	356	317				595	106	106
											1 / 0		106

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	141	95	95
	1073 FG1319			1	500	524-151	524-159				156	106	106
	1210 FG3157				345/138	356-130	314-130				150	101	101
	1193 FG3144			1	345	356-130	314-130				150	101	101
	1208 FG3153			1	345	356-130	314-130				150	101	101
	1078 FG133			1	345	356-130	314-130				150	101	101
	1063 FG129			1	345	356-130	314-130				150	101	101
	1443 FG5042			1	345	520	520				149	101	101
	1423 FG5008			1	345	520	520				149	101	101
	660 '927 '				345	635	637				149	101	101
											1 / 8		106
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	257	69	69
	1398 FG4020			1	345	130	130				393	106	106
											1 / 0		106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
	285 '451 '				161	645	645				131	105	105
											1 / 0		105
60103	CANNFLS5	63071	SPRNGCK5	1	161	600	601-622	90	90	NS	42	47	47
	463 '700 1'				345	600	601				94	105	105
	465 '700 2'				345	600	601				93	103	103
											1 / 1		105
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	76	53	53
	1398 FG4020			1	345	130	130				149	105	105
											0 / 1		105
60104	CANNFLS7	62235	EMPIRE 7	1	115	600	601-622	140	140	NS	41	29	29
	463 '700 1'				345	600	601				146	104	104
	465 '700 2'				345	600	601				145	103	103
											0 / 2		104
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	62	64	64
	135 '110 2'				230	652	654				101	104	104
											0 / 1		104
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	212	57	57
	48 '022 1'					600	601				386	104	104
											0 / 1		104
60343	WILLPIP7	62228	APPVLTW7	1	115	600	601-622	224	224	NS	89	40	40
	465 '700 2'				345	600	601				231	103	103
	463 '700 1'				345	600	601				230	103	103
											0 / 2		103
62227	JOHNCAK7	62228	APPVLTW7	1	115	600	622	224	224	NS	89	40	40
	465 '700 2'				345	600	601				231	103	103
	463 '700 1'				345	600	601				230	103	103
											0 / 2		103

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60341	ROSEMON7	62235	EMPIRE 7	1	115	600	601-622	140	140	NS	41	29	29
	463 '700 1'				345	600	601				145	103	103
	465 '700 2'				345	600	601				143	102	102
											0 / 2		103
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	205	61	61
	23 '009 2'					600	601				346	103	103
											0 / 1		103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	276	44	44
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	161	69	69
	135 '110 2'				230	652	654				239	103	103
											0 / 1		103
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	161	69	69
	135 '110 2'				230	652	654				239	103	103
											0 / 1		103
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
60343	WILLPIP7	62226	FISCHER7	1	115	600	601-622	224	224	NS	85	38	38
	465 '700 2'				345	600	601				228	102	102
	463 '700 1'				345	600	601				226	101	101
											0 / 2		102
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	75	75
	50 '022 2'					600	601				99	101	101
	63 '022 7'					600	601				99	101	101
	935 'SINGLE-028'			1	500	600	601				99	101	101
	45 '020 '				500-115	600	601				99	101	101
	40 '015 2'				500	600	601				99	101	101
											0 / 5		101
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	NS	133	71	71
	233 '310 '				345	640	640				189	101	101
											0 / 1		101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				339	101	101
											0 / 1		101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	474	85	85
	278 '440 '				161	645	645				565	101	101
											0 / 1		101

Overloaded Facility			Contingency							Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	40	20	18
	83 '050 2'				345/115						222	111	101
	88 '050 4'										222	111	101
	95 '050 6'										221	111	101
	90 '050 5'										221	111	101
											0 / 4		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	162	36	36
	915 MAPP-9				345	600					448	101	101
											0 / 1		101
34015	LIME CK5	34016	EMERYN	1	161	331	393	167	167	NS	118	71	71
	683 '933 '				345-161	635	637				168	100	101
	1028 FG12015			1	345	635	637				168	100	101
											0 / 2		101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	NS	161	56	56
	1583 FG65010			2	138	364	371				288	101	101
											0 / 1		101
39145	POR 138	39167	COL 138	2	138	364	371	286	286	NS	161	56	56
	1585 FG65011			1	138	364	371				288	101	101
											0 / 1		101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	NS	204	71	71
	1373 FG4009				138-345	357-356	357-312				288	100	100
											0 / 1		100
64909	N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	NS	132	70	70
	233 '310 '				345	640	640				187	100	100
											0 / 1		100
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	76	79	79
	595 '866 '				230	608-626	608-621				96	100	100
											0 / 1		100
											169 / 107		239.0

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp_bid2

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Bid 2
Case Date	7/23/2002

Power Flow File M:\PROJ\MISO\286001\PFLOW\ConvertedCases\pi_rfp_bid2.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 2

7/23/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114.5	161	58 / 0	241
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	104.3	74	2 / 0	156
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	28.7	57	1 / 0	153
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	69.2	97	12 / 6	150
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	28.7	57	1 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	28.7	57	1 / 0	149
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	99.3	71	2 / 0	149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	93.8	67	5 / 1	148
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	60.4	72	2 / 0	141
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	76.4	80	1 / 0	137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	6.7	45	1 / 0	135
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	51.6	61	2 / 0	130
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	224.8	94	3 / 0	127
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	241.2	72	1 / 1	125
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	91.8	82	1 / 0	123
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	54.4	77	1 / 0	122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	53.6	89	1 / 2	122
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	140.0	98	1 / 11	120
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.2	116	18 / 0	120
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	139.5	98	1 / 11	119
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	88.3	91	2 / 0	119
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	120.4	84	6 / 0	119
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.5	97	5 / 7	117
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	44.0	63	1 / 1	116
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.7	63	2 / 0	112
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	41.7	89	2 / 8	109
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	255.6	84	1 / 0	109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	329.4	74	1 / 0	109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	88.3	39	2 / 0	108
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	220.5	81	1 / 0	108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	192.8	59	5 / 0	107
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	142.7	96	1 / 9	107
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	62.9	65	1 / 0	107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	405.9	72	1 / 0	106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	91.9	74	1 / 0	105
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	255.9	69	1 / 0	105
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	162.8	70	0 / 1	104
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	162.8	70	0 / 1	104
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	75.2	53	0 / 1	104
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	212.8	57	0 / 1	104
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	204.3	61	0 / 1	103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	280.1	45	0 / 1	103
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	147.4	72	0 / 1	102
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	73.2	75	0 / 5	102
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	76.5	80	0 / 1	101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	162.2	57	0 / 1	101
39145	POR 138	39167	COL 138	2	138	364	371	286	286	162.2	57	0 / 1	101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.2	52	0 / 1	101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	475.6	85	0 / 1	101
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	133.2	71	0 / 1	101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	204.7	71	0 / 1	101

Overloaded Facility										Normal System		Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	41.0	21	0 / 4	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	166.7	37	0 / 1	101
99817	5ISES 1	99826	5MORFLD	1	161	151	159	223	223	208.4	93	0 / 1	101
34015	LIME CK5	34016	EMERYN	1	161	331	393	167	167	117.8	71	0 / 2	101
												148 / 84	241

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 2

7/23/2002

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	114	161	161
	30 '009 5'				345	600-618	601-618				171	241	241
	845 MAPP-17				345	600-618	601-618				141	198	198
	470 '705 2'				115-345	600	601				128	180	180
	53 '022 3'					600	601				127	178	179
	48 '022 1'					600	601				126	177	177
	38 '009 8'					600-618	601-618				126	177	177
	498 '720 1'				115	600-618	601-619				124	175	175
	483 '715 1'				115-69	600-618					124	175	175
	23 '009 2'					600	601				124	174	174
	28 '009 4'					600-618	601-618				124	174	174
	35 '009 7'					600	601				123	174	174
	840 MAPP-15A			1	345	600	601				122	172	172
	475 '705 4'				345-115	600	601				121	171	171
	485 '715 2'				69-115	600-618					120	170	170
	488 '715 3'				69-115	600	622-601				120	169	169
	58 '022 5'					600	601				120	169	169
	473 '705 3'				115-345	600	601				119	168	168
	70 '022 10'					600	601				118	166	166
	843 MAPP-16			1	345	600	601				118	166	166
	55 '022 4'					600	601				117	165	165
	493 '715 5'				115-69	600-618					117	164	164
	468 '705 1'				345-115	600	601				117	164	164
	113 '050 12'										116	164	164
	525 '755 '				115	600	601-622				116	164	164
	110 '050 11'										116	164	164
	463 '700 1'				345	600	601				116	164	164
	105 '050 14'										116	164	164
	460 '695 '				115	600-618	601-619				116	164	164
	103 '050 10'				345-161	364-600					116	164	164
	68 '022 9'				345-115	600	601				116	164	164
	543 '775 '				115	600-608					116	164	164
	115 '050 13'										116	163	163
	1480 FG6062			1	345	600	601-604				116	163	163
	1235 FG3239				115/345						116	163	163
	1105 FG3016				345/115						116	163	163
	555 '795 '					600-652					116	163	163
	100 '050 9'				345/115						116	163	163
	490 '715 4'				115-69	600	601-622				116	163	163
	838 MAPP-14			1	161-345	600	616				116	163	163

Overloaded Facility		Contingency							Ratings		Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		Norm MVA	Norm (%)	Emer (%)
	560	'805 '			115	600	601					116	163	163
	523	'750 '			115-69	608-600						113	159	159
	450	'675 '			345-230	600	601-622					113	159	159
	40	'015 2'			500	600	601					113	159	159
	45	'020 '			500-115	600	601					113	159	159
	935	'SINGLE-028'		1	500	600	601					113	159	159
	430	640 '										113	159	159
	50	'022 2'				600	601					113	159	159
	318	'500'			69-230	618-652	619-654					113	159	159
	530	'760 '			345	600	601					112	158	158
	545	'780 '			115	600	601					112	157	157
	65	'022 8'			345-115	600	601					112	157	157
	93	'050 7'										111	157	157
	85	'050 3'			345-161	364-600						111	157	157
	88	'050 4'										111	157	157
	90	'050 5'										111	157	157
	108	'050 1'			345/69							111	157	157
	95	'050 6'										111	156	156
	83	'050 2'			115/345							111	156	156
												58 / 0		241
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601		140	140	NS	104	74	74
	545	'780 '			115	600	601					218	156	156
	450	'675 '			345-230	600	601-622					157	112	112
												2 / 0		156
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391		50	50	NS	29	57	57
	688	'936 '			115	331	391					76	153	153
												1 / 0		153

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	NS	69	97	97
	30 '009 5'				345	600-618	601-618				106	150	150
	845 MAPP-17				345	600-618	601-618				87	123	123
	470 '705 2'				115-345	600	601				82	115	115
	53 '022 3'					600	601				79	112	112
	48 '022 1'					600	601				79	111	111
	483 '715 1'				115-69	600-618					78	110	110
	38 '009 8'					600-618	601-618				78	110	110
	28 '009 4'					600-618	601-618				77	109	109
	23 '009 2'					600	601				76	106	107
	35 '009 7'					600	601				75	106	106
	475 '705 4'				345-115	600	601				75	105	105
	488 '715 3'				69-115	600	622-601				75	105	105
	58 '022 5'					600	601				74	104	104
	840 MAPP-15A			1	345	600	601				74	104	104
	473 '705 3'				115-345	600	601				72	102	102
	70 '022 10'					600	601				72	102	102
	843 MAPP-16			1	345	600	601				72	101	101
	55 '022 4'					600	601				72	101	101
											12 / 6		150
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	NS	29	57	57
	688 '936 '				115	331	391				75	149	149
											1 / 0		149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	NS	29	57	57
	688 '936 '				115	331	391				74	149	149
											1 / 0		149
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	NS	99	71	71
	545 '780 '				115	600	601				207	149	149
	450 '675 '				345-230	600	601-622				151	108	108
											2 / 0		149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	NS	94	67	67
	38 '009 8'					600-618	601-618				207	148	148
	35 '009 7'					600	601				206	147	147
	30 '009 5'				345	600-618	601-618				161	115	115
	840 MAPP-15A			1	345	600	601				156	112	112
	443 '670 1'					600-618	601-619				155	110	111
	28 '009 4'					600-618	601-618				145	104	104
											5 / 1		148
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	NS	60	72	72
	795 ALTW-85				161	331	393-392				119	141	141
	1025 FG12013			1	345	331	393				91	108	108
											2 / 0		141

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	NS	76	80	80
	1578 FG65006			1	138	365-368	379-368				131	137	137
											1 / 0		137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	NS	7	45	45
	345 '530 '				69-115	600-652	601-605				20	135	135
											1 / 0		135
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	NS	52	61	61
	1018 FG12010			1	161	331	393-392				109	130	130
	785 'ALTW-13 '				161	331	393-392				90	107	107
											2 / 0		130
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	NS	225	94	94
	1130 FG3031			1	138	364-367	371-367				305	127	127
	1118 FG3022			1	345	367	391-367				287	120	120
	1580 FG65009			1	345	367	391-367				287	120	120
											3 / 0		127
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	241	72	72
	450 '675 '				345-230	600	601-622				418	125	125
	23 '009 2'					600	601				351	104	104
											1 / 1		125
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	92	82	82
	433 '650 '				115-69	600-618	601-619				138	123	123
											1 / 0		123
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	NS	54	77	77
	30 '009 5'				345	600-618	601-618				87	122	122
											1 / 0		122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	54	89	89
	678 '932 2'				345/115	635-331	637-391				73	122	122
	770 'ALTW-07 '				161-69	331	391-392				62	104	104
	625 '911 '				161	331-652	391-654				61	102	102
											1 / 2		122
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	140	98	98
	1283 FG3418			1	765	205	250				171	120	120
	1260 FG3404			1	345	356-357	323-357				144	101	101
	998 FG110			1	345	356-357	323-357				144	101	101
	1255 FG3402			1	345	356-357	323-357				144	101	101
	1285 FG3419			1	345	356-357	323-357				144	101	101
	1005 FG116			1	345	356-357	323-357				144	101	101
	1050 FG124				345	356-357	323-357				144	101	101
	1390 FG4017				345	356-357	323-357				144	101	101
	1290 FG3424				345	356-357	323-357				144	101	101
	1170 FG3135				345	356-357	323-357				144	101	101
	1058 FG127				345	356-357	323-357				144	101	101
	1278 FG3413				345	356-357	323-357				144	101	101
											1 / 11		120

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		MVA	Norm (%)	Emer (%)
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667		26	26	NS	30	116	116
	15 '003 '											31	120	120
	13 '001 '				230							31	119	119
	948 'SINGLE-044'			1	230	600-667	601-668					31	119	119
	18 '007 '					608	657-608					31	119	119
	943 'SINGLE-040'			1	230	608	657					31	119	119
	945 'SINGLE-042'			1	230	608	608-657					31	118	118
	950 'SINGLE-046'				345-24	626	657-661					31	118	118
	935 'SINGLE-028'			1	500	600	601					30	117	117
	63 '022 7'					600	601					30	117	117
	45 '020 '				500-115	600	601					30	117	117
	50 '022 2'					600	601					30	117	117
	40 '015 2'				500	600	601					30	117	117
	205 '220 '					626	627-657					30	117	117
	215 '250 '				230-115	618-626						30	117	117
	380 '570 1'					626	626-657					30	115	115
	818 'FORBES 7T-8'					600-608	601-608					30	114	114
	938 'SINGLE-031'			1	230	626	657					29	113	113
	940 'SINGLE-034'			1	230	626-667	657-668					28	109	109
												18 / 0		120
27135	11POND C	27144	11TIPTOP	1	138	211	211		143	143	NS	139	98	98
	1283 FG3418			1	765	205	250					170	119	119
	998 FG110			1	345	356-357	323-357					144	100	101
	1005 FG116			1	345	356-357	323-357					144	100	101
	1285 FG3419			1	345	356-357	323-357					144	100	101
	1260 FG3404			1	345	356-357	323-357					144	100	101
	1255 FG3402			1	345	356-357	323-357					144	100	101
	1390 FG4017				345	356-357	323-357					143	100	100
	1170 FG3135				345	356-357	323-357					143	100	100
	1050 FG124				345	356-357	323-357					143	100	100
	1278 FG3413				345	356-357	323-357					143	100	100
	1058 FG127				345	356-357	323-357					143	100	100
	1290 FG3424				345	356-357	323-357					143	100	100
												1 / 11		119
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391		97	97	NS	88	91	91
	1028 FG12015			1	345	635	637					115	119	119
	683 '933 '				345-161	635	637					115	119	119
												2 / 0		119

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	120	84	84
	155 132L				115	608	608				171	118	119
	63 '022 7'					600	601				166	115	115
	50 '022 2'					600	601				166	115	115
	40 '015 2'				500	600	601				162	112	112
	935 'SINGLE-028'			1	500	600	601				162	112	112
	45 '020 '				500-115	600	601				162	112	112
											6 / 0		119
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	81	97	97
	503 '725 '				69-230	618	619				98	117	117
	440 '665 '				230-69	600-618	601-619				95	113	113
	445 '670 2'				345-230	600-618	601-619				94	112	112
	450 '675 '				345-230	600	601-622				90	108	108
	538 '765 '				230-345	600-618	601-619				89	106	106
	30 '009 5'				345	600-618	601-618				85	102	102
	435 '655 '				115-69	600-618	601-619				85	101	101
	818 'FORBES 7T-8'					600-608	601-608				85	101	101
	840 MAPP-15A			1	345	600	601				85	101	101
	453 '680 '					618-600					84	100	100
	438 '660 '				230-69	618	619				84	100	100
	443 '670 1'					600-618	601-619				84	100	100
											5 / 7		117
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	44	63	63
	485 '715 2'				69-115	600-618					81	115	116
	493 '715 5'				115-69	600-618					71	101	102
											1 / 1		116
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	63	63
	485 '715 2'				69-115	600-618					53	112	112
	490 '715 4'				115-69	600	601-622				52	111	111
											2 / 0		112
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	89	89
	545 '780 '				115	600	601				51	109	109
	543 '775 '				115	600-608					50	107	107
	430 640 '										49	104	104
	135 '110 2'				230	652	654				49	103	103
	318 '500'				69-230	618-652	619-654				48	102	102
	935 'SINGLE-028'			1	500	600	601				47	101	101
	45 '020 '				500-115	600	601				47	101	101
	40 '015 2'				500	600	601				47	101	101
	63 '022 7'					600	601				47	101	101
	50 '022 2'					600	601				47	101	101
											2 / 8		109

Overloaded Facility		Contingency									Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	256	84	76
	1468 FG5074			1	161	520	520				364	119	109
											1 / 0		109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	329	74	74
	30 '009 5'				345	600-618	601-618				487	109	109
											1 / 0		109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	88	39	39
	793 ALTW-84				161	331	391				242	108	108
	780 'ALTW-11 '				161	331	391				242	108	108
											2 / 0		108
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	NS	221	81	81
	1480 FG6062			1	345	600	601-604				294	108	108
											1 / 0		108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	193	59	59
	45 '020 '				500-115	600	601				351	107	107
	935 'SINGLE-028'			1	500	600	601				351	107	107
	40 '015 2'				500	600	601				351	107	107
	50 '022 2'					600	601				349	107	107
	63 '022 7'					600	601				349	107	107
											5 / 0		107
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	143	96	96
	1073 FG1319			1	500	524-151	524-159				159	107	107
	1423 FG5008			1	345	520	520				151	102	102
	1210 FG3157				345/138	356-130	314-130				151	102	102
	1443 FG5042			1	345	520	520				151	102	102
	660 '927 '				345	635	637				151	102	102
	1208 FG3153			1	345	356-130	314-130				151	102	102
	1193 FG3144			1	345	356-130	314-130				151	102	102
	1078 FG133			1	345	356-130	314-130				151	102	102
	1063 FG129			1	345	356-130	314-130				151	102	102
	950 'SINGLE-046'				345-24	626	657-661				149	101	101
											1 / 9		107
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	63	65	65
	135 '110 2'				230	652	654				103	107	107
											1 / 0		107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	406	72	72
	1155 FG3129			1	345-138	356	317				595	106	106
											1 / 0		106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
	285 '451 '				161	645	645				130	105	105
											1 / 0		105
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	256	69	69
	1398 FG4020			1	345	130	130				391	105	105
											1 / 0		105

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	163	70	70
	135 '110 2'				230	652	654				243	104	104
											0 / 1		104
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	163	70	70
	135 '110 2'				230	652	654				243	104	104
											0 / 1		104
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	75	53	53
	1398 FG4020			1	345	130	130				148	104	104
											0 / 1		104
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	213	57	57
	48 '022 1'					600	601				386	104	104
											0 / 1		104
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	204	61	61
	23 '009 2'					600	601				346	103	103
											0 / 1		103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	280	45	45
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	75	75
	50 '022 2'					600	601				99	102	102
	63 '022 7'					600	601				100	102	102
	40 '015 2'				500	600	601				99	101	101
	45 '020 '				500-115	600	601				99	101	101
	935 'SINGLE-028'			1	500	600	601				99	101	101
											0 / 5		102
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	77	80	80
	595 '866 '				230	626-608	621-608				97	101	101
											0 / 1		101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	NS	162	57	57
	1583 FG65010			2	138	364	371				290	101	101
											0 / 1		101
39145	POR 138	39167	COL 138	2	138	364	371	286	286	NS	162	57	57
	1585 FG65011			1	138	364	371				290	101	101
											0 / 1		101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				340	101	101
											0 / 1		101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	476	85	85
	278 '440 '				161	645	645				566	101	101
											0 / 1		101

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	NS	133	71	71
	233 '310 '				345	640	640				189	101	101
											0 / 1		101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	NS	205	71	71
	1373 FG4009				138-345	357-356	357-312				289	101	101
											0 / 1		101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	41	21	19
	88 '050 4'										222	111	101
	83 '050 2'				115/345						222	111	101
	95 '050 6'										221	111	101
	90 '050 5'										221	111	101
											0 / 4		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	167	37	37
	915 MAPP-9				345	600					448	101	101
											0 / 1		101
99817	5ISES 1	99826	5MORFLD	1	161	151	159	223	223	NS	208	93	93
	1073 FG1319			1	500	524-151	524-159				224	101	101
											0 / 1		101
34015	LIME CK5	34016	EMERYN	1	161	331	393	167	167	NS	118	71	71
	1028 FG12015			1	345	635	637				168	100	101
	683 '933 '				345-161	635	637				168	100	101
											0 / 2		101
											148 / 84		240.9

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp_bid3

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Bid 3
Case Date	7/22/2002

Power Flow File M:\PROJ\MISO\286001\PFLOW\ConvertedCases\pi_rfp_bid3.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 3

7/22/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	114.6	161	52 / 0	247
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	90.5	108	131 / 4	204
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	81.2	97	26 / 28	184
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	7.0	46	1 / 0	154
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	68.9	97	11 / 7	153
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	27.9	56	1 / 0	153
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	89.6	64	5 / 0	150
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	27.9	56	1 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	27.9	56	1 / 0	149
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	95.8	68	1 / 1	147
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	91.0	65	1 / 1	141
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	76.2	79	1 / 0	137
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	236.3	98	3 / 13	134
36362	NELSO; B	37632	LEECO;BP	1	345	363	335	1000	1000	939.7	94	16 / 10	133
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	97.2	100	19 / 36	129
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	54.2	76	1 / 0	125
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	145.4	102	6 / 39	124
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	144.9	101	1 / 35	124
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	91.2	81	1 / 0	123
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	53.8	90	1 / 2	122
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.1	116	17 / 0	119
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	232.4	69	1 / 1	119
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	67.9	70	2 / 0	118
34185	POWESHK5	34191	REASNOR5	1	161	331	391	167	167	105.6	63	1 / 0	117
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.0	96	5 / 6	116
34087	DYSART 5	64269	WASHBRN5	1	161	331-635	391-637	260	260	182.3	70	5 / 0	115
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	169.8	73	1 / 0	112
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	169.8	73	1 / 0	112
34030	SALEM 5	34508	JULIAN 5	1	161	331	393-392	202	202	126.8	63	2 / 0	112
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	113.1	79	6 / 0	112
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.7	63	2 / 0	112
39145	POR 138	39167	COL 138	1	138	364	371	286	286	179.1	63	1 / 0	112
39145	POR 138	39167	COL 138	2	138	364	371	286	286	179.1	63	1 / 0	112
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	84.7	38	2 / 0	111
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	77.5	92	9 / 9	111
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	42.3	60	1 / 0	110
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	42.3	90	5 / 5	109
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	144.9	98	1 / 16	109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	319.8	71	1 / 0	109
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	255.2	84	1 / 0	109
34027	CNTRGRV5	34508	JULIAN 5	1	161	331	393-392	202	202	121.9	60	2 / 0	108
36532	BELVI; B	36606	B465 ;BT	1	138	363	345-333	290	330	250.8	86	2 / 0	108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	182.4	56	5 / 0	107
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	80.6	84	1 / 2	107
60302	COULEE 5	69523	GENOA 5	1	161	600-680	604-681	240	240	172.4	72	1 / 0	106
38342	COC 69	39239	COC 138	1	69-138	364	371	33	33	16.6	50	2 / 0	106
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	403.9	72	1 / 0	106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	92.0	74	1 / 0	105
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	214.9	58	0 / 1	105
36457	ALPIN;RT	36599	CHERR; R	1	138	363	345-333	351	445	349.9	100	0 / 2	104
63213	MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	54.6	57	0 / 1	104

Overloaded Facility										Normal System		Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
64403	E MOLIN3	64680	SB39MID5	1	345-161	635	638-637	500	500	350.8	70	0 / 5	104
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	256.2	69	0 / 1	104
63051	HENNING4	63052	INMAN 4	1	230	626	621	143	143	114.7	80	0 / 1	103
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	200.2	60	0 / 1	103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	295.4	47	0 / 1	103
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	72.6	74	0 / 5	103
36953	MAREN;RT	37119	P VAL; R	1	138	363	345	210	260	143.5	68	0 / 2	102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	147.0	72	0 / 1	102
34043	SAVANNA5	69505	GALENA 5	1	161	331-680	393-681	126	126	54.2	43	0 / 1	102
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	482.3	86	0 / 1	102
99817	5ISES 1	99826	5MORFLD	1	161	151	159	223	223	210.7	94	0 / 1	102
64418	E MOLINE	64680	SB39MID5	1	161	635	638-637	500	500	346.0	69	0 / 1	102
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	74.5	52	0 / 1	101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.3	52	0 / 1	101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	205.4	72	0 / 1	101
57968	STILWEL7	57981	LACYGNE7	1	345	541	541	1099	1202	795.5	72	0 / 1	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	136.4	31	0 / 1	101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	49.8	25	0 / 4	101
												360 / 249	247

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bid 3

7/22/2002

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	115	161	161
	30 '009 5'				345	600-618	601-618				176	247	247
	845 MAPP-17				345	600-618	601-618				143	201	201
	470 '705 2'				115-345	600	601				131	184	184
	53 '022 3'					600	601				126	178	178
	38 '009 8'					600-618	601-618				125	177	177
	48 '022 1'					600	601				125	177	177
	498 '720 1'				115	600-618	601-619				125	176	176
	23 '009 2'					600	601				125	175	176
	35 '009 7'					600	601				124	175	175
	483 '715 1'				115-69	600-618					124	175	175
	28 '009 4'					600-618	601-618				123	173	173
	840 MAPP-15A			1	345	600	601				123	173	173
	475 '705 4'				345-115	600	601				121	171	171
	488 '715 3'				115-69	600	601-622				120	169	169
	58 '022 5'					600	601				120	169	169
	473 '705 3'				115-345	600	601				119	168	168
	485 '715 2'				115-69	600-618					119	167	167
	468 '705 1'				345-115	600	601				118	167	167
	70 '022 10'					600	601				118	166	167
	843 MAPP-16			1	345	600	601				118	166	166
	493 '715 5'				115-69	600-618					117	165	165
	55 '022 4'					600	601				117	165	165
	525 '755 '				115	600	601-622				116	164	164
	1035 FG12019			1	345	331-635	393-636				116	164	164
	500 '720 2'				115	600-618	601-619				116	164	164
	68 '022 9'				345-115	600	601				116	164	164
	543 '775 '				115	600-608					116	164	164
	460 '695 '				115	618-600	619-601				116	164	164
	435 '655 '				115-69	600-618	601-619				116	164	164
	555 '795 '					600-652					116	164	164
	560 '805 '				115	600	601				116	163	163
	563 '810 '				230-115	600-618	601-624				116	163	163
	63 '022 7'					600	601				113	160	160
	523 '750 '				115-69	608-600					113	160	160
	205 '220 '					626	627-657				113	160	160
	450 '675 '				345-230	600	601-622				113	159	159
	40 '015 2'				500	600	601				113	159	159
	45 '020 '				500-115	600	601				113	159	159
	935 'SINGLE-028'			1	500	600	601				113	159	159

Overloaded Facility	Contingency								Overloads		
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Emer (%)
	430 640 '								112	158	158
	318 '500'			69-230	618-652	619-654			112	158	158
	50 '022 2'				600	601			112	158	158
	545 '780 '			115	600	601			112	158	158
	905 MAPP-5		1	345	600	601			111	157	157
	65 '022 8'			345-115	600	601			111	156	156
	108 '050 1'			69/345					110	155	155
	85 '050 3'			345-161	364-600				110	155	155
	93 '050 7'								110	155	155
	90 '050 5'								110	154	154
	88 '050 4'								110	154	154
	83 '050 2'			345/115					110	154	154
	95 '050 6'								109	154	154
									52 / 0		247

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	NS	91	108	108
	1018	FG12010		1	161	331	393-392				171	204	204
	785	'ALTW-13 '			161	331	393-392				152	181	181
	1013	FG12006		1	345	331	393-391				127	151	151
	1030	FG12016		1	345	331	393-391				127	151	151
	1015	FG12009		1	345	331	393-391				127	151	151
	1355	FG3728		1	345	331	393-391				127	151	151
	1348	FG3724		1	345	331	393-391				127	151	151
	1093	FG3009		1	345	363-364	335-371				116	138	138
	1108	FG3017		1	345	363-364	335-371				116	138	138
	1328	FG3707		1	345	363-364	335-371				116	138	138
	1250	FG3260		1	345	363-364	335-371				116	138	138
	1295	FG3519		1	345	363-364	335-371				116	138	138
	1240	FG3241		1	345	363-364	335-371				116	138	138
	1310	FG3527		1	345	363-364	335-371				116	138	138
	1245	FG3243		1	345	363-364	335-371				116	138	138
	1615	FG65029		1	345	363-364	335-371				116	138	138
	1103	FG3015		1	345	363-364	335-371				116	138	138
	1298	FG3520		1	345	363-364	335-371				116	138	138
	1590	FG65014		1	345	363-364	335-371				116	138	138
	1300	FG3522		1	345	363-364	335-371				116	138	138
	1658	FG9905		1	345	363-364	335-371				116	138	138
	623	'910 '			345-161	635-331	638-391				114	136	136
	1023	FG12012		1	345	331-635	391-638				114	136	136
	90	'050 5'									103	122	122
	95	'050 6'									102	122	122
	88	'050 4'									102	121	121
	660	'927 '			345	635	637				101	120	120
	83	'050 2'			345/115						101	120	120
	1358	FG4003		1	345	363	335				100	119	119
	1540	FG63065		1	345	363	335				100	119	119
	1650	FG95		1	345	363	335				100	119	119
	1500	FG63019		1	345	363	335				100	119	119
	1335	FG3716		1	345	363-635	335-638				98	117	117
	1343	FG3721		1	345	363-635	335-638				98	117	117
	1248	FG3258		1	345	363-635	335-638				98	117	117
	1340	FG3719		1	345	363-635	335-638				98	117	117
	1123	FG3025		1	345	364	371				98	116	116
	1575	FG65004		1	345	364	371				98	116	116
	1095	FG3012		1	345	364	371				98	116	116
	613	'902 '			161-345	635-363	638-335				97	116	116
	950	'SINGLE-046'			345-24	626	657-661				97	116	116
	708	'947 '			345	635	638				97	115	115
	63	'022 7'				600	601				97	115	115

Overloaded Facility	Contingency							Overloads		
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm Emer	MVA	Norm (%)	Emer (%)
50 '022 2'					600	601		97	115	115
45 '020 '				500-115	600	601		97	115	115
85 '050 3'				345-161	364-600			97	115	115
40 '015 2'				500	600	601		97	115	115
935 'SINGLE-028'			1	500	600	601		97	115	115
93 '050 7'								97	115	115
108 '050 1'				69/345				96	115	115
683 '933 '				345-161	635	637		96	115	115
1028 FG12015			1	345	635	637		96	115	115
1033 FG12018			1	345	635	637		96	114	114
1325 FG3704			1	345	635	637		96	114	114
1100 FG3014			1	345-138	364	371		96	114	114
1113 FG3020			1	345-138	364	371		96	114	114
828 MAPP-1			1	161	680	681		95	113	113
1635 FG65043			1	345	363	335		95	113	113
1233 FG3238			1	345	363	335		95	113	113
695 '939 '				161	331	391		94	112	112
1035 FG12019			1	345	331-635	393-636		94	112	112
763 'ALTW-04 '				161-34.5	331	391		94	112	112
580 '840 '				161	600	604		94	112	112
1333 FG3715			1	345	635	638		94	112	112
135 '110 2'				230	652	654		94	112	112
965 3720			1	345	635	638		94	112	112
1338 FG3718			1	345	635	638		94	112	112
900 MAPP-39			1	230	652	654		94	112	112
618 '906 '				345	356-635	313-638		94	112	112
1643 FG65067			1	345	365	376		93	111	111
1128 FG3030			1	345	365-366	376-366		93	111	111
1305 FG3524				345	365-366			93	111	111
1630 FG65040			1	345	365-366	376-366		93	111	111
700 '942 '				115	331	391		93	111	111
1640 FG65046			1	345	365-366	376-366		93	111	111
133 '110 1'				230	652	654		93	111	111
205 '220 '					626	627-657		93	110	110
110 '050 11'								92	110	110
680 '932 3'				161/345	331-635	391-637		92	110	110
678 '932 2'				115/345	331-635	391-637		92	110	110
1118 FG3022			1	345	367	391-367		92	110	110
1580 FG65009			1	345	367	391-367		92	110	110
1040 FG12025			1	345	635	637-638		92	110	110
1345 FG3723			1	345	635	637-638		92	110	110
640 '921 3'				161	635	638		92	110	110
675 '932 1'				345	635	637		92	110	110
605 '880 '				161	680-331	681-393		92	110	110

Overloaded Facility	Contingency							Overloads		
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm Emer	MVA	Norm (%)	Emer (%)
30 '009 5'				345	600-618	601-618		92	110	110
775 'ALTW-08 2'				161-34.5	331	391		92	109	110
905 MAPP-5			1	345	600	601		92	109	109
23 '009 2'					600	601		92	109	109
705 '946 '				345-161	635	638-637		92	109	109
715 '950 '				161	635	638		92	109	109
1130 FG3031			1	138	364-367	371-367		92	109	109
703 '943 '				161	331-635	391-637		92	109	109
188 '170 '				230	652	654		92	109	109
978 FG10285			1	345	364-367	371-391		92	109	109
1383 FG4014				345	356	314		92	109	109
100 '050 9'				345/115				91	109	109
1105 FG3016				115/345				91	109	109
1235 FG3239				115/345				91	109	109
758 'ALTW-02 '				115-34.5	331	391		91	109	109
570 '820 '				115	600	601		90	107	107
380 '570 1'					626	626-657		89	107	107
615 '904 '				345-161	635	638-637		89	106	106
1070 FG131			1	345	356	314		89	106	106
1135 FG3120			1	345	356	314		89	106	106
620 '908 1'				345	356-635			89	106	106
608 '885 '				161	680	681		89	106	106
740 '962 '				161	331-680			89	106	106
1538 FG63064			1	345	363	335		89	106	106
1530 FG63056			1	345	363	335		89	106	106
545 '780 '				115	600	601		89	106	106
1553 FG63077			1	345	363	335		89	106	106
1550 FG63074			1	345	363	335		89	106	106
1218 FG3221			1	345	363	335		89	106	106
485 '715 2'				115-69	600-618			89	106	106
483 '715 1'				115-69	600-618			89	106	106
460 '695 '				115	618-600	619-601		89	106	106
493 '715 5'				115-69	600-618			89	106	106
568 '815 '				115	600	601-622		89	106	106
105 '050 14'								89	106	106
760 'ALTW-03 '				161-34.5	331	391-393		89	106	106
348 '535 1'				115	626	602-657		89	105	106
603 '875 2'				161	600-680	604-681		89	105	106
1628 FG65035			1	345	367-364	391-371		88	105	105
1313 FG3533			1	345	367-364	391-371		88	105	105
915 MAPP-9				345	600			88	105	105
543 '775 '				115	600-608			88	105	105
1478 FG6029				345	600	616-601		88	105	105
1110 FG3018				345	600	601-616		88	105	105

Overloaded Facility			Contingency							Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Emer (%)
	98	'050 8'			69/345					88	105	105
	1230	FG3237		1	345	363-365	335-376			87	103	103
	1243	FG3242		1	345	363-365	335-376			87	103	103
	600	'875 1'			161	600-680	604-681			86	102	102
										131 / 4		204

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	NS	81	97	97
	795	ALTW-85			161	331	393-392				155	184	184
	1025	FG12013		1	345	331	393				122	146	146
	1008	FG12003		1	161	331	393				105	125	125
	788	'ALTW-14 '			161	331	393				101	120	120
	1300	FG3522		1	345	363-364	335-371				96	114	114
	1298	FG3520		1	345	363-364	335-371				96	114	114
	1093	FG3009		1	345	363-364	335-371				96	114	114
	1240	FG3241		1	345	363-364	335-371				96	114	114
	1245	FG3243		1	345	363-364	335-371				96	114	114
	1328	FG3707		1	345	363-364	335-371				96	114	114
	1615	FG65029		1	345	363-364	335-371				96	114	114
	1590	FG65014		1	345	363-364	335-371				96	114	114
	1658	FG9905		1	345	363-364	335-371				96	114	114
	1310	FG3527		1	345	363-364	335-371				96	114	114
	1295	FG3519		1	345	363-364	335-371				96	114	114
	1250	FG3260		1	345	363-364	335-371				96	114	114
	1103	FG3015		1	345	363-364	335-371				96	114	114
	1108	FG3017		1	345	363-364	335-371				96	114	114
	1355	FG3728		1	345	331	393-391				95	114	114
	1015	FG12009		1	345	331	393-391				95	114	114
	1030	FG12016		1	345	331	393-391				95	114	114
	1348	FG3724		1	345	331	393-391				95	114	114
	1013	FG12006		1	345	331	393-391				95	114	114
	1023	FG12012		1	345	331-635	391-638				94	111	112
	623	'910 '			345-161	635-331	638-391				94	111	112
	773	'ALTW-08 1'				331	391-392				91	109	109
	90	'050 5'									88	104	104
	775	'ALTW-08 2'			161-34.5	331	391				87	104	104
	95	'050 6'									87	104	104
	88	'050 4'									87	104	104
	83	'050 2'			345/115						87	103	103
	660	'927 '			345	635	637				87	103	103
	760	'ALTW-03 '			161-34.5	331	391-393				87	103	103
	1500	FG63019		1	345	363	335				86	103	103
	1650	FG95		1	345	363	335				86	103	103
	1358	FG4003		1	345	363	335				86	103	103
	1540	FG63065		1	345	363	335				86	103	103
	1123	FG3025		1	345	364	371				85	101	102
	1575	FG65004		1	345	364	371				85	101	102
	1095	FG3012		1	345	364	371				85	101	102
	708	'947 '			345	635	638				85	101	101
	950	'SINGLE-046'			345-24	626	657-661				85	101	101
	85	'050 3'			345-161	364-600					84	101	101

Overloaded Facility		Contingency							Ratings		Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		Norm	Emer
											MVA	(%)	(%)
	93	'050 7'									84	101	101
	108	'050 1'			69/345						84	100	101
	63	'022 7'				600	601				84	100	100
	1113	FG3020		1	345-138	364	371				84	100	100
	45	'020 '			500-115	600	601				84	100	100
	935	'SINGLE-028'		1	500	600	601				84	100	100
	50	'022 2'				600	601				84	100	100
	1100	FG3014		1	345-138	364	371				84	100	100
	40	'015 2'			500	600	601				84	100	100
	683	'933 '			345-161	635	637				84	100	100
	1028	FG12015		1	345	635	637				84	100	100
											26 / 28		184
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	NS	7	46	46
	345	'530 '			69-115	600-652	601-605				23	154	154
											1 / 0		154
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	NS	69	97	97
	30	'009 5'			345	600-618	601-618				109	153	153
	845	MAPP-17			345	600-618	601-618				88	124	124
	470	'705 2'			115-345	600	601				84	118	118
	53	'022 3'				600	601				79	111	111
	48	'022 1'				600	601				78	110	110
	483	'715 1'			115-69	600-618					78	109	109
	38	'009 8'				600-618	601-618				77	109	109
	28	'009 4'				600-618	601-618				77	108	108
	23	'009 2'				600	601				76	107	107
	35	'009 7'				600	601				75	106	106
	475	'705 4'			345-115	600	601				75	105	105
	488	'715 3'			115-69	600	601-622				74	104	104
	840	MAPP-15A		1	345	600	601				74	104	104
	58	'022 5'				600	601				74	104	104
	468	'705 1'			345-115	600	601				72	102	102
	70	'022 10'				600	601				72	101	102
	473	'705 3'			115-345	600	601				72	101	102
	843	MAPP-16		1	345	600	601				72	101	101
											11 / 7		153
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	NS	28	56	56
	688	'936 '			115	331	391				76	153	153
											1 / 0		153

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		MVA	Norm (%)	Emer (%)
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601		140	140	NS	90	64	64
	38 '009 8'					600-618	601-618					210	150	150
	35 '009 7'					600	601					209	149	150
	30 '009 5'				345	600-618	601-618					164	117	117
	840 MAPP-15A			1	345	600	601					159	114	114
	443 '670 1'					600-618	601-619					150	107	107
												5 / 0		150
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392		50	50	NS	28	56	56
	688 '936 '				115	331	391					75	149	149
												1 / 0		149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391		50	50	NS	28	56	56
	688 '936 '				115	331	391					74	149	149
												1 / 0		149
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601		140	140	NS	96	68	68
	545 '780 '				115	600	601					206	147	147
	450 '675 '				345-230	600	601-622					146	105	105
												1 / 1		147
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601		139	139	NS	91	65	65
	545 '780 '				115	600	601					195	141	141
	450 '675 '				345-230	600	601-622					140	101	101
												1 / 1		141
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379		96	96	NS	76	79	79
	1578 FG65006			1	138	365-368	379-368					131	137	137
												1 / 0		137
39122	KEG 138	39218	CHA 138	1	138	364	371		240	240	NS	236	98	98
	1130 FG3031			1	138	364-367	371-367					321	134	134
	1580 FG65009			1	345	367	391-367					298	124	124
	1118 FG3022			1	345	367	391-367					298	124	124
	978 FG10285			1	345	364-367	371-391					248	103	103
	1635 FG65043			1	345	363	335					244	102	102
	1233 FG3238			1	345	363	335					244	102	102
	1113 FG3020			1	345-138	364	371					243	101	101
	1100 FG3014			1	345-138	364	371					243	101	101
	795 ALTW-85				161	331	393-392					242	101	101
	1350 FG3725			1	345	331-363	393-335					241	100	100
	1013 FG12006			1	345	331	393-391					240	100	100
	1348 FG3724			1	345	331	393-391					240	100	100
	1508 FG63028			1	345	331-363	393-335					241	100	100
	1015 FG12009			1	345	331	393-391					240	100	100
	1355 FG3728			1	345	331	393-391					240	100	100
	1030 FG12016			1	345	331	393-391					240	100	100
												3 / 13		134

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
36362	NELSO; B	37632	LEECO;BP	1	345	363	335	1000	1000	NS	940	94	94
	1635	FG65043		1	345	363	335				1325	132	133
	1233	FG3238		1	345	363	335				1325	132	133
	1295	FG3519		1	345	363-364	335-371				1197	120	120
	1298	FG3520		1	345	363-364	335-371				1197	120	120
	1245	FG3243		1	345	363-364	335-371				1197	120	120
	1590	FG65014		1	345	363-364	335-371				1197	120	120
	1615	FG65029		1	345	363-364	335-371				1197	120	120
	1658	FG9905		1	345	363-364	335-371				1197	120	120
	1240	FG3241		1	345	363-364	335-371				1197	120	120
	1328	FG3707		1	345	363-364	335-371				1197	120	120
	1093	FG3009		1	345	363-364	335-371				1197	120	120
	1310	FG3527		1	345	363-364	335-371				1197	120	120
	1103	FG3015		1	345	363-364	335-371				1197	120	120
	1108	FG3017		1	345	363-364	335-371				1197	120	120
	1250	FG3260		1	345	363-364	335-371				1197	120	120
	1300	FG3522		1	345	363-364	335-371				1197	120	120
	95	'050	6'								1040	104	104
	90	'050	5'								1040	104	104
	83	'050	2'		345/115						1036	104	104
	88	'050	4'								1035	104	104
	1575	FG65004		1	345	364	371				1014	101	101
	1123	FG3025		1	345	364	371				1014	101	101
	1095	FG3012		1	345	364	371				1014	101	101
	93	'050	7'								1005	100	101
	85	'050	3'		345-161	364-600					1005	100	101
	108	'050	1'		69/345						1005	100	101
											16 / 10		133

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	NS	97	100	100
	1028	FG12015		1	345	635	637				125	129	129
	683	'933 '			345-161	635	637				125	129	129
	1355	FG3728		1	345	331	393-391				112	116	116
	1013	FG12006		1	345	331	393-391				112	116	116
	1348	FG3724		1	345	331	393-391				112	116	116
	1015	FG12009		1	345	331	393-391				112	116	116
	1030	FG12016		1	345	331	393-391				112	116	116
	680	'932 3'			161/345	331-635	391-637				104	107	107
	678	'932 2'			115/345	331-635	391-637				103	106	106
	573	'825 '			345-161	331-600					103	106	106
	675	'932 1'			345	635	637				103	106	106
	95	'050 6'									102	106	106
	90	'050 5'									103	106	106
	88	'050 4'									102	106	106
	83	'050 2'			345/115						102	105	106
	1010	FG12005		1	345	331-600	393-601				102	105	105
	1020	FG12011		1	345	331-600	393-601				102	105	105
	850	MAPP-18OP			161/345						102	105	105
	1330	FG3710		1	345	331-600	393-601				102	105	105
	93	'050 7'									101	104	104
	85	'050 3'			345-161	364-600					101	104	104
	108	'050 1'			69/345						101	104	104
	950	'SINGLE-046'			345-24	626	657-661				100	103	103
	655	'924 '			161	635	637				99	103	103
	795	ALTW-85			161	331	393-392				99	102	102
	935	'SINGLE-028'		1	500	600	601				99	102	102
	50	'022 2'				600	601				99	102	102
	63	'022 7'				600	601				99	102	102
	45	'020 '			500-115	600	601				99	102	102
	40	'015 2'			500	600	601				99	102	102
	1310	FG3527		1	345	363-364	335-371				99	102	102
	1295	FG3519		1	345	363-364	335-371				99	102	102
	1245	FG3243		1	345	363-364	335-371				99	102	102
	1590	FG65014		1	345	363-364	335-371				99	102	102
	1328	FG3707		1	345	363-364	335-371				99	102	102
	1300	FG3522		1	345	363-364	335-371				99	102	102
	1615	FG65029		1	345	363-364	335-371				99	102	102
	1658	FG9905		1	345	363-364	335-371				99	102	102
	1250	FG3260		1	345	363-364	335-371				99	102	102
	1298	FG3520		1	345	363-364	335-371				99	102	102
	1240	FG3241		1	345	363-364	335-371				99	102	102
	1103	FG3015		1	345	363-364	335-371				99	102	102
	1035	FG12019		1	345	331-635	393-636				99	102	102

Overloaded Facility		Contingency							Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm Emer		Norm	Emer
									MVA	(%)	(%)
	1093	FG3009		1	345	363-364	335-371		99	102	102
	1108	FG3017		1	345	363-364	335-371		99	102	102
	660	'927 '			345	635	637		99	102	102
	1325	FG3704		1	345	635	637		98	101	102
	1033	FG12018		1	345	635	637		98	101	102
	135	'110 2'			230	652	654		98	101	101
	1038	FG12023		1	345-161	331	392-391		98	101	101
	900	MAPP-39		1	230	652	654		98	101	101
	30	'009 5'			345	600-618	601-618		98	101	101
	623	'910 '			345-161	635-331	638-391		98	101	101
	1023	FG12012		1	345	331-635	391-638		98	101	101
	580	'840 '			161	600	604		98	101	101
									19 / 36		129
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71 71	NS	54	76	76
	30	'009 5'			345	600-618	601-618		89	125	125
									1 / 0		125

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	145	102	102
	1283	FG3418		1	765	205	250				177	124	124
	1260	FG3404		1	345	356-357	323-357				150	105	105
	998	FG110		1	345	356-357	323-357				150	105	105
	1255	FG3402		1	345	356-357	323-357				150	105	105
	1005	FG116		1	345	356-357	323-357				150	105	105
	1285	FG3419		1	345	356-357	323-357				150	105	105
	1050	FG124			345	356-357	323-357				150	105	105
	1278	FG3413			345	356-357	323-357				150	105	105
	1058	FG127			345	356-357	323-357				150	105	105
	1390	FG4017			345	356-357	323-357				150	105	105
	1290	FG3424			345	356-357	323-357				150	105	105
	1170	FG3135			345	356-357	323-357				150	105	105
	1133	FG3118		1	345	205-356	252-323				148	104	104
	95	'050 6'									147	103	103
	1410	FG45009		1	500	201	201				147	103	103
	90	'050 5'									147	103	103
	83	'050 2'			345/115						147	103	103
	88	'050 4'									147	103	103
	1063	FG129		1	345	356-130	314-130				147	103	103
	1078	FG133		1	345	356-130	314-130				147	103	103
	1193	FG3144		1	345	356-130	314-130				147	103	103
	1208	FG3153		1	345	356-130	314-130				147	103	103
	1210	FG3157			138/345	356-130	314-130				147	103	103
	85	'050 3'			345-161	364-600					147	103	103
	93	'050 7'									147	103	103
	108	'050 1'			69/345						147	103	103
	543	'775 '			115	600-608					147	103	103
	348	'535 1'			115	626	602-657				147	103	103
	1423	FG5008		1	345	520	520				144	101	101
	1443	FG5042		1	345	520	520				144	101	101
	1160	FG3131		1	345	363	335				144	101	101
	1268	FG3408		1	345	363	335				144	101	101
	1135	FG3120		1	345	356	314				144	101	101
	1360	FG4004			345-138	363-357	335-357				144	100	101
	1070	FG131		1	345	356	314				144	101	101
	620	'908 1'			345	356-635					144	101	101
	1403	FG4023			345	363	335				144	100	100
	1405	FG4024			345	363	335				144	100	100
	63	'022 7'				600	601				143	100	100
	50	'022 2'				600	601				143	100	100
	580	'840 '			161	600	604				143	100	100
	1073	FG1319		1	500	524-151	524-159				143	100	100
	45	'020 '			500-115	600	601				143	100	100

Overloaded Facility From	Contingency Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	Overloads	MVA	Norm (%)	Emer (%)
	40	'015 2'			500	600	601				143	100	100
	935	'SINGLE-028'		1	500	600	601				143	100	100
	1653	FG98		1	345-161	356-362	316-362				143	100	100
											6 / 39		124
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	NS	145	101	101
	1283	FG3418		1	765	205	250				177	123	124
	1255	FG3402		1	345	356-357	323-357				150	105	105
	998	FG110		1	345	356-357	323-357				150	105	105
	1005	FG116		1	345	356-357	323-357				150	105	105
	1260	FG3404		1	345	356-357	323-357				150	105	105
	1285	FG3419		1	345	356-357	323-357				150	105	105
	1278	FG3413			345	356-357	323-357				149	104	104
	1170	FG3135			345	356-357	323-357				149	104	104
	1390	FG4017			345	356-357	323-357				149	104	104
	1290	FG3424			345	356-357	323-357				149	104	104
	1058	FG127			345	356-357	323-357				149	104	104
	1050	FG124			345	356-357	323-357				149	104	104
	1133	FG3118		1	345	205-356	252-323				148	103	103
	90	'050 5'									147	103	103
	95	'050 6'									147	103	103
	88	'050 4'									147	103	103
	1410	FG45009		1	500	201	201				147	103	103
	83	'050 2'			345/115						147	103	103
	1078	FG133		1	345	356-130	314-130				147	103	103
	1208	FG3153		1	345	356-130	314-130				147	103	103
	1210	FG3157			138/345	356-130	314-130				147	103	103
	1193	FG3144		1	345	356-130	314-130				147	103	103
	1063	FG129		1	345	356-130	314-130				147	103	103
	543	'775 '			115	600-608					146	102	102
	85	'050 3'			345-161	364-600					146	102	102
	108	'050 1'			69/345						146	102	102
	1423	FG5008		1	345	520	520				143	100	100
	1443	FG5042		1	345	520	520				143	100	100
	1070	FG131		1	345	356	314				143	100	100
	1135	FG3120		1	345	356	314				143	100	100
	1268	FG3408		1	345	363	335				143	100	100
	620	'908 1'			345	356-635					143	100	100
	1160	FG3131		1	345	363	335				143	100	100
	1403	FG4023			345	363	335				143	100	100
	1405	FG4024			345	363	335				143	100	100
	1360	FG4004			345-138	363-357	335-357				143	100	100
											1 / 35		124

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	91	81	81
	433 '650 '				115-69	600-618	601-619				137	123	123
											1 / 0		123
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	54	90	90
	678 '932 2'				115/345	331-635	391-637				73	122	122
	770 'ALTW-07 '				161-69	331	392-391				62	104	104
	625 '911 '				161	331-652	391-654				61	102	102
											1 / 2		122
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	NS	30	116	116
	15 '003 '										31	119	119
	13 '001 '				230						31	119	119
	948 'SINGLE-044'			1	230	600-667	601-668				31	119	119
	18 '007 '					608	657-608				31	119	119
	943 'SINGLE-040'			1	230	608	657				31	118	118
	945 'SINGLE-042'			1	230	608	608-657				31	118	118
	950 'SINGLE-046'				345-24	626	657-661				31	118	118
	205 '220 '					626	627-657				30	117	117
	40 '015 2'				500	600	601				30	117	117
	935 'SINGLE-028'			1	500	600	601				30	117	117
	45 '020 '				500-115	600	601				30	117	117
	215 '250 '				230-115	618-626					30	117	117
	50 '022 2'					600	601				30	117	117
	380 '570 1'					626	626-657				30	114	114
	818 'FORBES 7T-8'					608-600	608-601				30	114	114
	938 'SINGLE-031'			1	230	626	657				29	113	113
	940 'SINGLE-034'			1	230	626-667	657-668				28	109	109
											17 / 0		119
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	232	69	69
	450 '675 '				345-230	600	601-622				400	119	119
	23 '009 2'					600	601				346	103	103
											1 / 1		119
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	68	70	70
	135 '110 2'				230	652	654				114	118	118
	410 '610 '					626					104	107	107
											2 / 0		118
34185	POWESHK5	34191	REASNOR5	1	161	331	391	167	167	NS	106	63	63
	660 '927 '				345	635	637				196	117	117
											1 / 0		117

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	81	96	96
	503 '725 '				69-230	618	619				98	116	116
	440 '665 '				230-69	600-618	601-619				95	113	113
	445 '670 2'				345-230	600-618	601-619				94	112	112
	450 '675 '				345-230	600	601-622				89	106	107
	538 '765 '				345-230	600-618	601-619				88	105	105
	465 '700 2'				345	600	601				86	102	102
	30 '009 5'				345	600-618	601-618				85	102	102
	463 '700 1'				345	600	601				85	101	101
	435 '655 '				115-69	600-618	601-619				85	101	101
	840 MAPP-15A			1	345	600	601				84	100	101
	818 'FORBES 7T-8'					608-600	608-601				84	100	100
											5 / 6		116
34087	DYSART 5	64269	WASHBRN5	1	161	331-635	391-637	260	260	NS	182	70	70
	1348 FG3724			1	345	331	393-391				299	115	115
	1355 FG3728			1	345	331	393-391				299	115	115
	1030 FG12016			1	345	331	393-391				299	115	115
	1015 FG12009			1	345	331	393-391				299	115	115
	1013 FG12006			1	345	331	393-391				299	115	115
											5 / 0		115
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	170	73	73
	135 '110 2'				230	652	654				262	112	112
											1 / 0		112
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	170	73	73
	135 '110 2'				230	652	654				262	112	112
											1 / 0		112
34030	SALEM 5	34508	JULIAN 5	1	161	331	393-392	202	202	NS	127	63	63
	1008 FG12003			1	161	331	393				227	112	112
	788 'ALTW-14 '				161	331	393				220	109	109
											2 / 0		112
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	113	79	79
	63 '022 7'					600	601				161	112	112
	50 '022 2'					600	601				161	112	112
	155 132L				115	608	608				159	111	111
	935 'SINGLE-028'			1	500	600	601				158	109	110
	40 '015 2'				500	600	601				158	109	109
	45 '020 '				500-115	600	601				158	109	109
											6 / 0		112
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	63	63
	485 '715 2'				115-69	600-618					53	112	112
	490 '715 4'				69-115	600	622-601				52	111	111
											2 / 0		112

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
39145	POR 138	39167	COL 138	1	138	364	371	286	286	NS	179	63	63
	1583 FG65010			2	138	364	371				320	112	112
											1 / 0		112
39145	POR 138	39167	COL 138	2	138	364	371	286	286	NS	179	63	63
	1585 FG65011			1	138	364	371				320	112	112
											1 / 0		112
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	85	38	38
	780 'ALTW-11 '				161	331	391				249	111	111
	793 ALTW-84				161	331	391				249	111	111
											2 / 0		111
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	NS	78	92	92
	1355 FG3728			1	345	331	393-391				93	111	111
	1348 FG3724			1	345	331	393-391				93	111	111
	1013 FG12006			1	345	331	393-391				93	111	111
	1030 FG12016			1	345	331	393-391				93	111	111
	1015 FG12009			1	345	331	393-391				93	111	111
	573 '825 '				345-161	331-600					90	107	107
	1020 FG12011			1	345	331-600	393-601				88	105	105
	1010 FG12005			1	345	331-600	393-601				88	105	105
	1330 FG3710			1	345	331-600	393-601				88	105	105
	850 MAPP-18OP				161/345						88	105	105
	1023 FG12012			1	345	331-635	391-638				87	103	103
	623 '910 '				345-161	635-331	638-391				87	103	103
	63 '022 7'					600	601				85	101	102
	45 '020 '				500-115	600	601				85	101	101
	40 '015 2'				500	600	601				85	101	101
	935 'SINGLE-028'			1	500	600	601				85	101	101
	50 '022 2'					600	601				85	101	101
	135 '110 2'				230	652	654				84	100	101
											9 / 9		111
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	42	60	60
	485 '715 2'				115-69	600-618					77	110	110
											1 / 0		110

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	90	90
	545 '780 '				115	600	601				51	109	109
	430 640 '										51	109	109
	543 '775 '				115	600-608					51	108	108
	318 '500'				69-230	618-652	619-654				51	108	108
	135 '110 2'				230	652	654				50	106	106
	935 'SINGLE-028'			1	500	600	601				49	104	104
	50 '022 2'					600	601				49	104	104
	40 '015 2'				500	600	601				49	104	104
	45 '020 '				500-115	600	601				49	104	104
	63 '022 7'					600	601				49	104	104
											5 / 5		109
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	145	98	98
	1073 FG1319			1	500	524-151	524-159				161	109	109
	660 '927 '				345	635	637				155	104	104
	1423 FG5008			1	345	520	520				154	104	104
	1210 FG3157				138/345	356-130	314-130				154	104	104
	1443 FG5042			1	345	520	520				154	104	104
	1193 FG3144			1	345	356-130	314-130				154	104	104
	1063 FG129			1	345	356-130	314-130				154	104	104
	1078 FG133			1	345	356-130	314-130				154	104	104
	1208 FG3153			1	345	356-130	314-130				154	104	104
	950 'SINGLE-046'				345-24	626	657-661				152	102	102
	900 MAPP-39			1	230	652	654				149	101	101
	1468 FG5074			1	161	520	520				149	101	101
	1375 FG4011				161-345	362-356	362-316				149	101	101
	95 '050 6'										149	100	100
	90 '050 5'										149	100	100
	88 '050 4'										148	100	100
	83 '050 2'				345/115						148	100	100
											1 / 16		109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	320	71	71
	30 '009 5'				345	600-618	601-618				487	109	109
											1 / 0		109
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	255	84	76
	1468 FG5074			1	161	520	520				364	119	109
											1 / 0		109
34027	CNTRGRV5	34508	JULIAN 5	1	161	331	393-392	202	202	NS	122	60	60
	1008 FG12003			1	161	331	393				219	108	108
	788 'ALTW-14 '				161	331	393				212	105	105
											2 / 0		108

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
36532	BELVI; B	36606	B465 ;BT	1	138	363	345-333	290	330	NS	251	86	76
	1233	FG3238		1	345	363	335				357	123	108
	1635	FG65043		1	345	363	335				357	123	108
											2 / 0		108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	182	56	56
	40	'015 2'			500	600	601				351	107	107
	935	'SINGLE-028'		1	500	600	601				351	107	107
	45	'020 '			500-115	600	601				351	107	107
	50	'022 2'				600	601				350	107	107
	63	'022 7'				600	601				349	107	107
											5 / 0		107
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	81	84	84
	595	'866 '			230	626-608	621-608				103	107	107
	593	'865 '			230-41.6	626					101	105	105
	365	'553 '			115	626	621				99	103	103
											1 / 2		107
60302	COULEE 5	69523	GENOA 5	1	161	600-680	604-681	240	240	NS	172	72	72
	603	'875 2'			161	600-680	604-681				255	106	106
											1 / 0		106
38342	COC 69	39239	COC 138	1	69-138	364	371	33	33	NS	17	50	50
	88	'050 4'									35	106	106
	83	'050 2'			345/115						35	105	105
											2 / 0		106
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	404	72	72
	1155	FG3129		1	345-138	356	317				592	106	106
											1 / 0		106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
	285	'451 '			161	645	645				131	105	105
											1 / 0		105
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	215	58	58
	48	'022 1'				600	601				388	104	105
											0 / 1		105
36457	ALPIN;RT	36599	CHERR; R	1	138	363	345-333	351	445	NS	350	100	79
	1233	FG3238		1	345	363	335				465	132	104
	1635	FG65043		1	345	363	335				465	132	104
											0 / 2		104
63213	MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	NS	55	57	57
	135	'110 2'			230	652	654				100	104	104
											0 / 1		104

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
64403	E MOLIN3	64680	SB39MID5	1	345-161	635	638-637	500	500	NS	351	70	70
	613 '902 '				161-345	635-363	638-335				518	104	104
	1248 FG3258			1	345	363-635	335-638				500	100	100
	1343 FG3721			1	345	363-635	335-638				500	100	100
	1340 FG3719			1	345	363-635	335-638				500	100	100
	1335 FG3716			1	345	363-635	335-638				500	100	100
											0 / 5		104
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	256	69	69
	1398 FG4020			1	345	130	130				385	104	104
											0 / 1		104
63051	HENNING4	63052	INMAN 4	1	230	626	621	143	143	NS	115	80	80
	355 '550 '				115	626-652					148	103	103
											0 / 1		103
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	200	60	60
	23 '009 2'					600	601				346	103	103
											0 / 1		103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	295	47	47
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	74	74
	63 '022 7'					600	601				101	103	103
	50 '022 2'					600	601				101	103	103
	45 '020 '				500-115	600	601				100	102	103
	935 'SINGLE-028'			1	500	600	601				100	102	103
	40 '015 2'				500	600	601				100	102	103
											0 / 5		103
36953	MAREN;RT	37119	P VAL; R	1	138	363	345	210	260	NS	143	68	55
	1635 FG65043			1	345	363	335				266	127	102
	1233 FG3238			1	345	363	335				266	127	102
											0 / 2		102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
34043	SAVANNA5	69505	GALENA 5	1	161	331-680	393-681	126	126	NS	54	43	43
	795 ALTW-85				161	331	393-392				128	102	102
											0 / 1		102
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	482	86	86
	278 '440 '				161	645	645				571	102	102
											0 / 1		102
99817	5ISES 1	99826	5MORFLD	1	161	151	159	223	223	NS	211	94	94
	1073 FG1319			1	500	524-151	524-159				227	102	102
											0 / 1		102

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
64418	E MOLINE	64680	SB39MID5	1	161	635	638-637	500	500	NS	346	69	69
	613 '902 '				161-345	635-363	638-335				509	102	102
											0 / 1		102
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	75	52	52
	1398 FG4020			1	345	130	130				144	101	101
											0 / 1		101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				340	101	101
											0 / 1		101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	NS	205	72	72
	1373 FG4009				345-138	356-357	312-357				290	101	101
											0 / 1		101
57968	STILWEL7	57981	LACYGNE7	1	345	541	541	1099	1202	NS	796	72	66
	1435 FG5023			1	345	541	541				1213	110	101
											0 / 1		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	136	31	31
	915 MAPP-9				345	600					448	101	101
											0 / 1		101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	50	25	23
	95 '050 6'										221	111	101
	90 '050 5'										221	111	101
	83 '050 2'				345/115						221	110	100
	88 '050 4'										221	110	100
											0 / 4		101
											360 / 249		247.3

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp_bid4and5

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Bids 4 and 5
Case Date	7/22/2002

Power Flow File M:\PROJ\MISO\286001\PFLOW\ConvertedCases\pi_rfp_bid4and5.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 4 and 5

7/22/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	109.7	154	56 / 0	232
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	66.4	79	2 / 1	155
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	64.1	76	7 / 0	154
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	30.7	61	1 / 0	153
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	6.9	46	1 / 0	151
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	30.8	62	1 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	30.8	62	1 / 0	149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	97.9	70	6 / 0	149
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	96.7	69	2 / 0	147
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	65.1	92	5 / 4	142
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	91.9	66	1 / 1	140
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	227.8	95	2 / 0	129
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	87.6	104	76 / 41	124
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	92.2	95	7 / 0	124
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	91.4	82	1 / 0	122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	52.3	87	1 / 2	122
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	234.8	70	1 / 1	120
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.0	115	18 / 0	119
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	137.9	96	1 / 0	118
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	137.4	96	1 / 0	118
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	67.9	70	2 / 0	117
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	118.5	82	6 / 0	116
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.2	97	5 / 4	116
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	51.0	72	1 / 0	115
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	168.9	72	1 / 0	111
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	168.9	72	1 / 0	111
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.6	63	2 / 0	111
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	256.9	84	1 / 0	109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	88.6	40	2 / 0	109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	41.9	89	4 / 6	109
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	80.9	84	2 / 1	108
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	40.7	58	1 / 0	107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	408.7	73	1 / 0	107
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	217.3	59	1 / 0	107
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	178.9	55	5 / 0	107
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	91.8	74	1 / 0	105
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	316.2	71	0 / 1	105
58036	OLATHEE5	58046	OXFORD 5	1	161	541	541	224	224	127.0	57	0 / 1	104
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	246.5	66	0 / 1	104
63051	HENNING4	63052	INMAN 4	1	230	626	621	143	143	115.4	81	0 / 1	104
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	73.0	74	0 / 5	103
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	71.1	50	0 / 1	103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	266.9	43	0 / 1	103
63213	MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	53.7	56	0 / 1	102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	147.0	72	0 / 1	102
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	480.9	86	0 / 1	102
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	135.5	92	0 / 1	101
59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	236.7	106	0 / 1	101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	45.1	23	0 / 4	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	136.4	31	0 / 1	101
34087	DYSART 5	64269	WASHBRN5	1	161	331-635	391-637	260	260	171.5	66	0 / 5	101

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.0	52	0 / 1	101
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	196.1	58	0 / 1	100
60302	COULEE 5	69523	GENOA 5	1	161	600-680	604-681	240	240	161.5	67	0 / 1	100
60153	MNTCELO7	60269	HASSAN 7	1	115	600	601	140	140	50.4	36	0 / 1	100
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	134.0	72	0 / 1	100
												227 / 92	232

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 4 and 5

7/22/2002

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	110	154	154
	30 '009 5'				345	600-618	601-618				164	232	232
	845 MAPP-17				345	600-618	601-618				135	191	191
	53 '022 3'					600	601				123	173	173
	470 '705 2'				115-345	600	601				122	172	172
	48 '022 1'					600	601				122	171	171
	38 '009 8'					600-618	601-618				122	171	171
	28 '009 4'					600-618	601-618				120	168	168
	498 '720 1'				115	600-618	601-619				120	168	168
	23 '009 2'					600	601				118	167	167
	483 '715 1'				115-69	600-618					118	167	167
	35 '009 7'					600	601				118	166	167
	840 MAPP-15A			1	345	600	601				117	164	164
	475 '705 4'				345-115	600	601				116	164	164
	58 '022 5'					600	601				115	162	162
	488 '715 3'				115-69	600	601-622				115	161	161
	473 '705 3'				115-345	600	601				114	161	161
	70 '022 10'					600	601				113	160	160
	485 '715 2'				115-69	600-618					113	159	159
	843 MAPP-16			1	345	600	601				113	159	159
	55 '022 4'					600	601				113	159	159
	493 '715 5'				115-69	600-618					112	157	157
	460 '695 '				115	618-600	619-601				112	157	157
	68 '022 9'				345-115	600	601				111	157	157
	525 '755 '				115	600	601-622				111	157	157
	468 '705 1'				345-115	600	601				111	157	157
	543 '775 '				115	600-608					111	157	157
	60 '022 6'				345	600	601				111	157	157
	555 '795 '					600-652					111	156	156
	563 '810 '				230-115	600-618	601-624				111	156	156
	560 '805 '				115	600	601				111	156	156
	113 '050 12'										111	156	156
	500 '720 2'				115	600-618	601-619				111	156	156
	103 '050 10'				345-161	364-600					111	156	156
	110 '050 11'										111	156	156
	105 '050 14'										111	156	156
	435 '655 '				115-69	600-618	601-619				111	156	156
	205 '220 '					626	627-657				108	153	153
	523 '750 '				115-69	608-600					108	153	153
	63 '022 7'					600	601				108	153	153

Overloaded Facility		Contingency							Overloads		
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Emer		Norm MVA	Emer (%)
	450 '675 '			345-230	600	601-622				108	152	152
	50 '022 2'				600	601				108	152	152
	45 '020 '			500-115	600	601				108	152	152
	40 '015 2'			500	600	601				108	152	152
	935 'SINGLE-028'		1	500	600	601				108	152	152
	430 640 '									107	151	151
	318 '500'			69-230	618-652	619-654				107	151	151
	65 '022 8'			345-115	600	601				107	151	151
	545 '780 '			115	600	601				107	151	151
	85 '050 3'			345-161	364-600					106	149	149
	93 '050 7'									106	149	149
	108 '050 1'			69/345						106	149	149
	90 '050 5'									106	149	149
	88 '050 4'									106	149	149
	95 '050 6'									105	149	149
	83 '050 2'			345/115						105	149	149
	905 MAPP-5		1	345	600	601				101	142	142
										56 / 0		232
34043 SAVANNA5	34046 YORK 5		1	161	331	393	84	84	NS	66	79	79
	795 ALTW-85			161	331	393-392				130	155	155
	1025 FG12013		1	345	331	393				100	119	119
	1008 FG12003		1	161	331	393				88	105	105
										2 / 1		155
34028 LORE 5	34032 8TH ST.5		1	161	331	393	84	84	NS	64	76	76
	1018 FG12010		1	161	331	393-392				129	154	154
	785 'ALTW-13 '			161	331	393-392				110	131	131
	1015 FG12009		1	345	331	393-391				93	111	111
	1013 FG12006		1	345	331	393-391				93	111	111
	1348 FG3724		1	345	331	393-391				93	111	111
	1030 FG12016		1	345	331	393-391				93	111	111
	1355 FG3728		1	345	331	393-391				93	111	111
										7 / 0		154
34529 GRJCT5Y	34054 GR JCT 5		1	161	331	392-391	50	50	NS	31	61	61
	688 '936 '			115	331	391				76	153	153
										1 / 0		153
60853 LK YANK8	60119 LKYNKTN7		2	69-115	600	601	15	15	NS	7	46	46
	345 '530 '			69-115	600-652	601-605				23	151	151
										1 / 0		151
34073 GR JCT 7	34529 GRJCT5Y		1	115-161	331	391-392	50	50	NS	31	62	62
	688 '936 '			115	331	391				75	149	149
										1 / 0		149
34059 BOONE 7	34073 GR JCT 7		1	115	331	391	50	50	NS	31	62	62
	688 '936 '			115	331	391				74	149	149
										1 / 0		149

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		MVA	Norm (%)	Emer (%)
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601		140	140	NS	98	70	70
	38 '009 8'					600-618	601-618					208	149	149
	35 '009 7'					600	601					207	148	148
	30 '009 5'				345	600-618	601-618					162	116	116
	443 '670 1'					600-618	601-619					160	114	114
	840 MAPP-15A			1	345	600	601					158	113	113
	28 '009 4'					600-618	601-618					151	108	108
												6 / 0		149
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601		140	140	NS	97	69	69
	545 '780 '				115	600	601					206	147	147
	450 '675 '				345-230	600	601-622					147	105	105
												2 / 0		147
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622		71	71	NS	65	92	92
	30 '009 5'				345	600-618	601-618					101	142	142
	845 MAPP-17				345	600-618	601-618					83	116	116
	470 '705 2'				115-345	600	601					77	108	108
	53 '022 3'					600	601					76	107	107
	48 '022 1'					600	601					75	106	106
	38 '009 8'					600-618	601-618					74	105	105
	28 '009 4'					600-618	601-618					74	104	104
	483 '715 1'				115-69	600-618						73	103	103
	23 '009 2'					600	601					71	100	100
												5 / 4		142
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601		139	139	NS	92	66	66
	545 '780 '				115	600	601					195	140	140
	450 '675 '				345-230	600	601-622					141	101	101
												1 / 1		140
39122	KEG 138	39218	CHA 138	1	138	364	371		240	240	NS	228	95	95
	1130 FG3031			1	138	364-367	371-367					309	129	129
	1118 FG3022			1	345	367	391-367					290	121	121
												2 / 0		129

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	NS	88	104	104
	905	MAPP-5		1	345	600	601				104	124	124
	540	'770 '			161-115	331-600	393-601				99	118	118
	1015	FG12009		1	345	331	393-391				99	118	118
	1013	FG12006		1	345	331	393-391				99	118	118
	1355	FG3728		1	345	331	393-391				99	118	118
	1030	FG12016		1	345	331	393-391				99	118	118
	1348	FG3724		1	345	331	393-391				99	118	118
	573	'825 '			345-161	331-600					96	114	114
	63	'022 7'				600	601				96	114	114
	50	'022 2'				600	601				96	114	114
	45	'020 '			500-115	600	601				95	114	114
	40	'015 2'			500	600	601				95	114	114
	935	'SINGLE-028'		1	500	600	601				95	114	114
	135	'110 2'			230	652	654				94	112	112
	623	'910 '			345-161	635-331	638-391				94	112	112
	1023	FG12012		1	345	331-635	391-638				94	112	112
	133	'110 1'			230	652	654				94	112	112
	1028	FG12015		1	345	635	637				93	111	111
	683	'933 '			345-161	635	637				93	111	111
	1330	FG3710		1	345	331-600	393-601				93	111	111
	1010	FG12005		1	345	331-600	393-601				93	111	111
	1020	FG12011		1	345	331-600	393-601				93	111	111
	850	MAPP-18OP			161/345						92	109	109
	918	MAPP-9GUID			345-161						90	108	108
	463	'700 1'			345	600	601				90	107	107
	795	ALTW-85			161	331	393-392				90	107	107
	555	'795 '				600-652					89	106	107
	410	'610 '				626					89	107	107
	205	'220 '				626	627-657				89	106	107
	548	'785 '				331-600					89	106	106
	620	'908 1'			345	356-635					89	106	106
	88	'050 4'									89	106	106
	1103	FG3015		1	345	363-364	335-371				89	106	106
	1300	FG3522		1	345	363-364	335-371				89	106	106
	1070	FG131		1	345	356	314				89	106	106
	1310	FG3527		1	345	363-364	335-371				89	106	106
	1298	FG3520		1	345	363-364	335-371				89	106	106
	1135	FG3120		1	345	356	314				89	106	106
	1240	FG3241		1	345	363-364	335-371				89	106	106
	1093	FG3009		1	345	363-364	335-371				89	106	106
	1250	FG3260		1	345	363-364	335-371				89	106	106
	1245	FG3243		1	345	363-364	335-371				89	106	106
	1295	FG3519		1	345	363-364	335-371				89	106	106

Overloaded Facility		Contingency							Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm Emer	MVA	Norm (%)	Emer (%)
	1108	FG3017		1	345	363-364	335-371		89	106	106
	1328	FG3707		1	345	363-364	335-371		89	106	106
	1350	FG3725		1	345	331-363	393-335		89	106	106
	90	'050 5'							89	106	106
	580	'840 '			161	600	604		89	106	106
	53	'022 3'				600	601		89	106	106
	618	'906 '			345	356-635	313-638		89	106	106
	1508	FG63028		1	345	331-363	393-335		89	106	106
	973	FG1011		1	345	356-635	313-638		89	106	106
	48	'022 1'				600	601		89	106	106
	318	'500'			69-230	618-652	619-654		89	106	106
	830	MAPP-10		1	345-161	600-331	601-393		89	106	106
	430	640 '							89	106	106
	1363	FG4005		1	765	205	252		89	106	106
	1288	FG3420		1	765	205	252		89	106	106
	1025	FG12013		1	345	331	393		89	106	106
	303	'464 '			161-69	645	645		89	106	106
	83	'050 2'			345/115				89	106	106
	300	'463 '			69-161	645	645		89	106	106
	308	'466 '			161-69	645	645		89	106	106
	193	'180 2'			230	618	619-618		89	106	106
	1040	FG12025		1	345	635	637-638		89	106	106
	295	'461 '			161-69	645	645		89	106	106
	593	'865 '			230-41.6	626			89	106	106
	1345	FG3723		1	345	635	637-638		89	106	106
	305	'465 '			161-69	645	645		89	106	106
	298	'462 '			161-69	645	645		89	106	106
	868	MAPP-26		1	345	640	640		89	105	106
	95	'050 6'							89	105	105
	168	'140 '			230	652	654		89	105	105
	23	'009 2'				600	601		89	105	105
	595	'866 '			230	626-608	621-608		88	105	105
	663	'928 '			345	635	637		88	105	105
	998	FG110		1	345	356-357	323-357		87	103	103
	1255	FG3402		1	345	356-357	323-357		87	103	103
	880	MAPP-31		1	345	640	640-656		87	103	103
	1285	FG3419		1	345	356-357	323-357		87	103	103
	1260	FG3404		1	345	356-357	323-357		87	103	103
	1005	FG116		1	345	356-357	323-357		87	103	103
	543	'775 '			115	600-608			87	103	103
	1423	FG5008		1	345	520	520		87	103	103
	848	MAPP-181P		1	161	331-680	393-617		87	103	103
	1443	FG5042		1	345	520	520		87	103	103
	608	'885 '			161	680	681		87	103	103

Overloaded Facility		Contingency							Overloads		
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Emer		Norm	Emer
									MVA	(%)	(%)
	1435	FG5023	1	345	541	541			87	103	103
	450	'675 '		345-230	600	601-622			87	103	103
	678	'932 2'		115/345	331-635	391-637			87	103	103
	183	'160 3'		230	652	654			86	103	103
	238	'330 '		345	640-652				86	103	103
	105	'050 14'							86	103	103
	1073	FG1319	1	500	524-151	524-159			86	103	103
	1235	FG3239		115/345					86	103	103
	100	'050 9'		345/115					86	103	103
	853	MAPP-19		345					86	103	103
	180	'160 2'		230	652	654			86	103	103
	1105	FG3016		115/345					86	103	103
	828	MAPP-1	1	161	680	681			86	103	103
	545	'780 '		115	600	601			86	103	103
	680	'932 3'		161/345	331-635	391-637			86	103	103
	1283	FG3418	1	765	205	250			86	103	103
	113	'050 12'							86	103	103
	130	'108 2'		230	652-618				86	103	103
	605	'880 '		161	680-331	681-393			86	103	103
	128	'108 1'		230	652-618				86	102	102
	898	MAPP-38	1	230	652	654			86	102	102
	98	'050 8'		69/345					86	102	102
	940	'SINGLE-034'	1	230	626-667	657-668			85	102	102
	115	'050 13'							85	102	102
	950	'SINGLE-046'		345-24	626	657-661			85	101	101
	145	'120 '		115/345	652	654			85	101	101
	178	'160 1'		230	652	654			85	101	101
	153	'130 2'		230	652	654			84	100	101
	1325	FG3704	1	345	635	637			84	100	100
	1033	FG12018	1	345	635	637			84	100	100
									76 / 41		124
34066 M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	NS	92	95	95
	1028	FG12015	1	345	635	637			121	124	124
	683	'933 '		345-161	635	637			121	124	124
	1015	FG12009	1	345	331	393-391			104	107	107
	1013	FG12006	1	345	331	393-391			104	107	107
	1030	FG12016	1	345	331	393-391			104	107	107
	1355	FG3728	1	345	331	393-391			104	107	107
	1348	FG3724	1	345	331	393-391			104	107	107
									7 / 0		124
62132 PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	91	82	82
	433	'650 '		115-69	600-618	601-619				137	122	122
									1 / 0			122

Overloaded Facility		Contingency						Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	52	87	87
	678 '932 2'				115/345	331-635	391-637				73	122	122
	770 'ALTW-07 '				161-69	331	392-391				62	103	103
	625 '911 '				161	331-652	391-654				60	100	100
											1 / 2		122
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	235	70	70
	450 '675 '				345-230	600	601-622				402	120	120
	23 '009 2'					600	601				343	102	102
											1 / 1		120
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	NS	30	115	115
	15 '003 '										31	119	119
	13 '001 '				230						31	119	119
	948 'SINGLE-044'			1	230	600-667	601-668				31	119	119
	18 '007 '					608	657-608				31	119	119
	943 'SINGLE-040'			1	230	608	657				31	118	118
	945 'SINGLE-042'			1	230	608	608-657				31	118	118
	950 'SINGLE-046'				345-24	626	657-661				31	118	118
	205 '220 '					626	627-657				30	117	117
	935 'SINGLE-028'			1	500	600	601				30	117	117
	40 '015 2'				500	600	601				30	117	117
	45 '020 '				500-115	600	601				30	117	117
	63 '022 7'					600	601				30	117	117
	50 '022 2'					600	601				30	117	117
	215 '250 '				230-115	618-626					30	117	117
	380 '570 1'					626	626-657				30	114	114
	818 'FORBES 7T-8'					608-600	608-601				30	114	114
	938 'SINGLE-031'			1	230	626	657				29	113	113
	940 'SINGLE-034'			1	230	626-667	657-668				28	109	109
											18 / 0		119
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	138	96	96
	1283 FG3418			1	765	205	250				169	118	118
											1 / 0		118
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	NS	137	96	96
	1283 FG3418			1	765	205	250				168	118	118
											1 / 0		118
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	68	70	70
	135 '110 2'				230	652	654				113	117	117
	410 '610 '					626					104	107	107
											2 / 0		117

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	118	82	82
	155 132L				115	608	608				168	116	116
	63 '022 7'					600	601				167	116	116
	50 '022 2'					600	601				167	116	116
	935 'SINGLE-028'			1	500	600	601				163	113	113
	45 '020 '				500-115	600	601				163	113	113
	40 '015 2'				500	600	601				163	113	113
											6 / 0		116
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	81	97	97
	503 '725 '				69-230	618	619				98	116	116
	440 '665 '				230-69	600-618	601-619				95	113	113
	445 '670 2'				345-230	600-618	601-619				94	112	112
	450 '675 '				345-230	600	601-622				90	107	107
	538 '765 '				345-230	600-618	601-619				88	105	105
	463 '700 1'				345	600	601				85	102	102
	435 '655 '				115-69	600-618	601-619				85	101	101
	30 '009 5'				345	600-618	601-618				85	101	101
	818 'FORBES 7T-8'					608-600	608-601				84	101	101
											5 / 4		116
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	NS	51	72	72
	30 '009 5'				345	600-618	601-618				82	115	115
											1 / 0		115
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	169	72	72
	135 '110 2'				230	652	654				258	111	111
											1 / 0		111
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	169	72	72
	135 '110 2'				230	652	654				258	111	111
											1 / 0		111
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	63	63
	485 '715 2'				115-69	600-618					52	111	111
	490 '715 4'				69-115	600	622-601				52	110	110
											2 / 0		111
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	257	84	77
	1468 FG5074			1	161	520	520				366	120	109
											1 / 0		109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	89	40	40
	793 ALTW-84				161	331	391				244	109	109
	780 'ALTW-11 '				161	331	391				244	109	109
											2 / 0		109

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	89	89
	545 '780 '				115	600	601				51	109	109
	430 640 '										51	108	108
	543 '775 '				115	600-608					50	107	107
	318 '500'				69-230	618-652	619-654				50	107	107
	135 '110 2'				230	652	654				49	105	105
	935 'SINGLE-028'			1	500	600	601				48	103	103
	50 '022 2'					600	601				48	103	103
	45 '020 '				500-115	600	601				48	103	103
	63 '022 7'					600	601				48	103	103
	40 '015 2'				500	600	601				48	103	103
											4 / 6		109
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	81	84	84
	595 '866 '				230	626-608	621-608				103	108	108
	593 '865 '				230-41.6	626					101	105	105
	365 '553 '				115	626	621				99	104	104
											2 / 1		108
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	41	58	58
	485 '715 2'				115-69	600-618					75	107	107
											1 / 0		107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	409	73	73
	1155 FG3129			1	345-138	356	317				599	107	107
											1 / 0		107
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	217	59	59
	48 '022 1'					600	601				397	107	107
											1 / 0		107
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	179	55	55
	40 '015 2'				500	600	601				348	106	107
	45 '020 '				500-115	600	601				348	106	107
	935 'SINGLE-028'			1	500	600	601				348	106	107
	50 '022 2'					600	601				346	106	106
	63 '022 7'					600	601				346	106	106
											5 / 0		107
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
	285 '451 '				161	645	645				130	105	105
											1 / 0		105
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	316	71	71
	30 '009 5'				345	600-618	601-618				469	105	105
											0 / 1		105
58036	OLATHEE5	58046	OXFORD 5	1	161	541	541	224	224	NS	127	57	57
	1435 FG5023			1	345	541	541				234	104	104
											0 / 1		104

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	246	66	66
	1398 FG4020			1	345	130	130				386	104	104
											0 / 1		104
63051	HENNING4	63052	INMAN 4	1	230	626	621	143	143	NS	115	81	81
	355 '550 '				115	626-652					148	104	104
											0 / 1		104
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	74	74
	63 '022 7'					600	601				101	103	103
	50 '022 2'					600	601				101	103	103
	45 '020 '				500-115	600	601				101	103	103
	40 '015 2'				500	600	601				101	103	103
	935 'SINGLE-028'			1	500	600	601				101	103	103
											0 / 5		103
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	71	50	50
	1398 FG4020			1	345	130	130				146	103	103
											0 / 1		103
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	267	43	43
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
63213	MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	NS	54	56	56
	135 '110 2'				230	652	654				98	102	102
											0 / 1		102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	481	86	86
	278 '440 '				161	645	645				569	102	102
											0 / 1		102
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	136	92	92
	1073 FG1319			1	500	524-151	524-159				150	101	101
											0 / 1		101
59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	NS	237	106	97
	1435 FG5023			1	345	541	541				248	111	101
											0 / 1		101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	45	23	21
	83 '050 2'				345/115						221	111	101
	88 '050 4'										221	111	101
	95 '050 6'										221	111	101
	90 '050 5'										221	111	101
											0 / 4		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	136	31	31
	915 MAPP-9				345	600					448	101	101
											0 / 1		101

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
34087	DYSART 5	64269	WASHBRN5	1	161	331-635	391-637	260	260	NS	172	66	66
	1355 FG3728			1	345	331	393-391				261	100	101
	1348 FG3724			1	345	331	393-391				261	100	101
	1013 FG12006			1	345	331	393-391				261	100	101
	1030 FG12016			1	345	331	393-391				261	100	101
	1015 FG12009			1	345	331	393-391				261	100	101
											0 / 5		101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				338	101	101
											0 / 1		101
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	196	58	58
	23 '009 2'					600	601				337	100	100
											0 / 1		100
60302	COULEE 5	69523	GENOA 5	1	161	600-680	604-681	240	240	NS	161	67	67
	603 '875 2'				161	600-680	604-681				241	100	100
											0 / 1		100
60153	MNTCELO7	60269	HASSAN 7	1	115	600	601	140	140	NS	50	36	36
	23 '009 2'					600	601				140	100	100
											0 / 1		100
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	NS	134	72	72
	233 '310 '				345	640	640				187	100	100
											0 / 1		100
											227 / 92		231.6

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp_bid4and6

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Bids 4 and 6
Case Date	7/22/2002

Power Flow File M:\PROJ\MISO\286001\PFLOW\ConvertedCases\pi_rfp_bid4and6.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 4 and 6

7/22/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	113.7	160	58 / 0	242
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	30.0	60	1 / 0	153
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	65.3	78	2 / 1	153
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	61.8	74	7 / 0	150
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	68.3	96	9 / 7	149
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	30.1	60	1 / 0	149
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	98.2	70	2 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	30.1	60	1 / 0	149
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	6.9	46	1 / 0	149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	92.6	66	5 / 1	148
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	93.3	67	1 / 1	143
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	76.2	79	1 / 0	137
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	227.3	95	3 / 0	129
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	92.1	95	7 / 1	124
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	91.4	82	1 / 0	123
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	53.7	76	1 / 0	122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	52.7	88	1 / 2	122
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	234.4	70	1 / 1	120
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.0	116	18 / 0	119
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	138.2	97	1 / 0	118
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	137.7	96	1 / 0	118
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.2	97	5 / 5	116
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	118.0	82	6 / 0	116
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	66.7	69	2 / 0	115
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	42.9	61	1 / 0	112
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.6	63	2 / 0	112
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	168.0	72	1 / 0	110
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	168.0	72	1 / 0	110
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	256.9	84	1 / 0	109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	42.1	90	4 / 6	109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	87.9	39	2 / 0	109
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	322.0	72	1 / 0	108
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	184.1	56	5 / 0	107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	408.6	73	1 / 0	107
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	79.7	83	1 / 2	106
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	91.8	74	1 / 0	105
58036	OLATHEE5	58046	OXFORD 5	1	161	541	541	224	224	127.7	57	0 / 1	105
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	76.7	91	0 / 11	104
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	213.6	58	0 / 1	104
39145	POR 138	39167	COL 138	1	138	364	371	286	286	166.3	58	0 / 1	104
39145	POR 138	39167	COL 138	2	138	364	371	286	286	166.3	58	0 / 1	104
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	246.5	66	0 / 1	104
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	268.7	43	0 / 1	103
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	71.0	50	0 / 1	103
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	73.0	74	0 / 5	103
63213	MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	54.1	56	0 / 1	102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	147.0	72	0 / 1	102
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	199.4	59	0 / 1	102
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	482.4	86	0 / 1	102
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	135.9	92	0 / 1	102
59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	236.7	106	0 / 1	101

Overloaded Facility										Normal System		Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	44.6	22	0 / 4	101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.0	52	0 / 1	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	154.2	35	0 / 1	101
63051	HENNING4	63052	INMAN 4	1	230	626	621	143	143	110.5	77	0 / 1	100
												157 / 63	242

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 4 and 6

7/22/2002

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	114	160	160
	30 '009 5'				345	600-618	601-618				172	242	242
	845 MAPP-17				345	600-618	601-618				141	198	198
	470 '705 2'				115-345	600	601				128	180	180
	53 '022 3'					600	601				126	177	177
	38 '009 8'					600-618	601-618				125	176	176
	48 '022 1'					600	601				125	176	176
	498 '720 1'				115	600-618	601-619				124	174	174
	483 '715 1'				115-69	600-618					123	174	174
	23 '009 2'					600	601				123	173	173
	35 '009 7'					600	601				123	173	173
	28 '009 4'					600-618	601-618				123	173	173
	840 MAPP-15A			1	345	600	601				121	171	171
	475 '705 4'				345-115	600	601				120	170	170
	488 '715 3'				115-69	600	601-622				119	168	168
	58 '022 5'					600	601				119	167	168
	485 '715 2'				115-69	600-618					119	167	167
	473 '705 3'				115-345	600	601				118	166	166
	70 '022 10'					600	601				117	165	165
	843 MAPP-16			1	345	600	601				117	165	165
	468 '705 1'				345-115	600	601				116	164	164
	55 '022 4'					600	601				116	164	164
	493 '715 5'				115-69	600-618					116	163	163
	525 '755 '				115	600	601-622				115	163	163
	460 '695 '				115	618-600	619-601				115	163	163
	68 '022 9'				345-115	600	601				115	162	162
	543 '775 '				115	600-608					115	162	162
	1035 FG12019			1	345	331-635	393-636				115	162	162
	555 '795 '					600-652					115	162	162
	463 '700 1'				345	600	601				115	162	162
	500 '720 2'				115	600-618	601-619				115	162	162
	435 '655 '				115-69	600-618	601-619				115	162	162
	113 '050 12'										115	162	162
	560 '805 '				115	600	601				115	162	162
	110 '050 11'										115	162	162
	838 MAPP-14			1	161-345	600	616				115	162	162
	103 '050 10'				345-161	364-600					115	162	162
	105 '050 14'										115	162	162
	63 '022 7'					600	601				113	158	159
	205 '220 '					626	627-657				112	158	158

Overloaded Facility		Contingency							Overloads		
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Emer		Norm MVA	Emer (%)
	530 '760 '			345	600	601				112	158	158
	523 '750 '			115-69	608-600					112	158	158
	450 '675 '			345-230	600	601-622				112	158	158
	45 '020 '			500-115	600	601				112	158	158
	40 '015 2'			500	600	601				112	158	158
	935 'SINGLE-028'		1	500	600	601				112	158	158
	50 '022 2'				600	601				112	157	157
	430 640 '									112	157	157
	905 MAPP-5		1	345	600	601				111	157	157
	318 '500'			69-230	618-652	619-654				111	157	157
	545 '780 '			115	600	601				111	156	156
	65 '022 8'			345-115	600	601				110	156	156
	85 '050 3'			345-161	364-600					110	155	155
	93 '050 7'									110	155	155
	108 '050 1'			69/345						110	155	155
	88 '050 4'									110	155	155
	90 '050 5'									110	155	155
	83 '050 2'			345/115						110	154	154
	95 '050 6'									110	154	154
										58 / 0		242
34529 GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	NS	30	60	60
	688 '936 '			115	331	391				76	153	153
										1 / 0		153
34043 SAVANNA5	34046	YORK 5	1	161	331	393	84	84	NS	65	78	78
	795 ALTW-85			161	331	393-392				128	153	153
	1025 FG12013		1	345	331	393				98	117	117
	1008 FG12003		1	161	331	393				87	103	103
										2 / 1		153
34028 LORE 5	34032	8TH ST.5	1	161	331	393	84	84	NS	62	74	74
	1018 FG12010		1	161	331	393-392				126	150	150
	785 'ALTW-13 '			161	331	393-392				106	127	127
	1013 FG12006		1	345	331	393-391				88	105	105
	1348 FG3724		1	345	331	393-391				88	105	105
	1030 FG12016		1	345	331	393-391				88	105	105
	1015 FG12009		1	345	331	393-391				88	105	105
	1355 FG3728		1	345	331	393-391				88	105	105
										7 / 0		150

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	NS	68	96	96
	30 '009 5'				345	600-618	601-618				106	149	149
	845 MAPP-17				345	600-618	601-618				87	122	122
	470 '705 2'				115-345	600	601				82	115	115
	53 '022 3'					600	601				78	110	111
	48 '022 1'					600	601				78	110	110
	483 '715 1'				115-69	600-618					77	109	109
	38 '009 8'					600-618	601-618				77	108	108
	28 '009 4'					600-618	601-618				76	108	108
	23 '009 2'					600	601				75	105	105
	35 '009 7'					600	601				74	104	105
	475 '705 4'				345-115	600	601				74	104	104
	488 '715 3'				115-69	600	601-622				74	104	104
	840 MAPP-15A			1	345	600	601				73	103	103
	58 '022 5'					600	601				73	103	103
	70 '022 10'					600	601				71	101	101
	473 '705 3'				115-345	600	601				71	101	101
											9 / 7		149
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	NS	30	60	60
	688 '936 '				115	331	391				75	149	149
											1 / 0		149
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	NS	98	70	70
	545 '780 '				115	600	601				209	149	149
	450 '675 '				345-230	600	601-622				149	107	107
											2 / 0		149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	NS	30	60	60
	688 '936 '				115	331	391				74	149	149
											1 / 0		149
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	NS	7	46	46
	345 '530 '				69-115	600-652	601-605				22	149	149
											1 / 0		149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	NS	93	66	66
	38 '009 8'					600-618	601-618				207	148	148
	35 '009 7'					600	601				206	147	147
	30 '009 5'				345	600-618	601-618				162	116	116
	840 MAPP-15A			1	345	600	601				157	112	112
	443 '670 1'					600-618	601-619				153	109	109
	28 '009 4'					600-618	601-618				144	103	103
											5 / 1		148
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	NS	93	67	67
	545 '780 '				115	600	601				198	142	143
	450 '675 '				345-230	600	601-622				143	103	103
											1 / 1		143

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	NS	76	79	79
	1578 FG65006			1	138	365-368	379-368				131	137	137
											1 / 0		137
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	NS	227	95	95
	1130 FG3031			1	138	364-367	371-367				309	129	129
	1580 FG65009			1	345	367	391-367				290	121	121
	1118 FG3022			1	345	367	391-367				290	121	121
											3 / 0		129
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	NS	92	95	95
	683 '933 '				345-161	635	637				120	124	124
	1028 FG12015			1	345	635	637				120	124	124
	1355 FG3728			1	345	331	393-391				102	106	106
	1030 FG12016			1	345	331	393-391				102	106	106
	1015 FG12009			1	345	331	393-391				102	106	106
	1348 FG3724			1	345	331	393-391				102	106	106
	1013 FG12006			1	345	331	393-391				102	106	106
	680 '932 3'				161/345	331-635	391-637				97	100	100
											7 / 1		124
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	91	82	82
	433 '650 '				115-69	600-618	601-619				137	123	123
											1 / 0		123
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	NS	54	76	76
	30 '009 5'				345	600-618	601-618				87	122	122
											1 / 0		122
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	53	88	88
	678 '932 2'				115/345	331-635	391-637				73	122	122
	770 'ALTW-07 '				161-69	331	392-391				62	103	103
	625 '911 '				161	331-652	391-654				60	101	101
											1 / 2		122
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	234	70	70
	450 '675 '				345-230	600	601-622				404	120	120
	23 '009 2'					600	601				345	103	103
											1 / 1		120

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	NS	30	116	116
	15 '003 '										31	119	119
	13 '001 '				230						31	119	119
	948 'SINGLE-044'			1	230	600-667	601-668				31	119	119
	18 '007 '					608	657-608				31	119	119
	943 'SINGLE-040'			1	230	608	657				31	118	118
	945 'SINGLE-042'			1	230	608	608-657				31	118	118
	950 'SINGLE-046'				345-24	626	657-661				31	118	118
	205 '220 '					626	627-657				30	117	117
	45 '020 '				500-115	600	601				30	117	117
	63 '022 7'					600	601				30	117	117
	935 'SINGLE-028'			1	500	600	601				30	117	117
	40 '015 2'				500	600	601				30	117	117
	50 '022 2'					600	601				30	117	117
	215 '250 '				230-115	618-626					30	117	117
	380 '570 1'					626	626-657				30	114	114
	818 'FORBES 7T-8'					608-600	608-601				30	114	114
	938 'SINGLE-031'			1	230	626	657				29	113	113
	940 'SINGLE-034'			1	230	626-667	657-668				28	109	109
											18 / 0		119
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	138	97	97
	1283 FG3418			1	765	205	250				169	118	118
											1 / 0		118
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	NS	138	96	96
	1283 FG3418			1	765	205	250				168	118	118
											1 / 0		118
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	81	97	97
	503 '725 '				69-230	618	619				98	116	116
	440 '665 '				230-69	600-618	601-619				95	113	113
	445 '670 2'				345-230	600-618	601-619				94	112	112
	450 '675 '				345-230	600	601-622				90	107	107
	538 '765 '				345-230	600-618	601-619				89	106	106
	465 '700 2'				345	600	601				86	102	102
	30 '009 5'				345	600-618	601-618				85	101	101
	435 '655 '				115-69	600-618	601-619				85	101	101
	818 'FORBES 7T-8'					608-600	608-601				84	101	101
	840 MAPP-15A			1	345	600	601				84	100	100
											5 / 5		116

Overloaded Facility		Contingency									Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	118	82	82
	155 132L				115	608	608				167	116	116
	63 '022 7'					600	601				166	115	115
	50 '022 2'					600	601				165	115	115
	45 '020 '				500-115	600	601				162	112	112
	40 '015 2'				500	600	601				162	112	112
	935 'SINGLE-028'			1	500	600	601				162	112	112
											6 / 0		116
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	67	69	69
	135 '110 2'				230	652	654				112	115	115
	410 '610 '					626					102	105	105
											2 / 0		115
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	43	61	61
	485 '715 2'				115-69	600-618					78	112	112
											1 / 0		112
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	63	63
	485 '715 2'				115-69	600-618					52	112	112
	490 '715 4'				69-115	600	622-601				52	111	111
											2 / 0		112
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	168	72	72
	135 '110 2'				230	652	654				257	110	110
											1 / 0		110
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	168	72	72
	135 '110 2'				230	652	654				257	110	110
											1 / 0		110
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	257	84	77
	1468 FG5074			1	161	520	520				366	120	109
											1 / 0		109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	90	90
	545 '780 '				115	600	601				51	109	109
	543 '775 '				115	600-608					51	108	108
	430 640 '										50	107	107
	318 '500'				69-230	618-652	619-654				50	106	106
	135 '110 2'				230	652	654				49	105	105
	935 'SINGLE-028'			1	500	600	601				48	103	103
	40 '015 2'				500	600	601				48	103	103
	45 '020 '				500-115	600	601				48	103	103
	50 '022 2'					600	601				48	103	103
	63 '022 7'					600	601				48	103	103
											4 / 6		109
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	88	39	39
	780 'ALTW-11 '				161	331	391				243	109	109
	793 ALTW-84				161	331	391				243	109	109
											2 / 0		109

Overloaded Facility	Contingency								Overloads			
From Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
63030 DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	322	72	72
30 '009 5'				345	600-618	601-618				482	108	108
										1 / 0		108
61612 RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	184	56	56
45 '020 '				500-115	600	601				350	107	107
935 'SINGLE-028'			1	500	600	601				350	107	107
40 '015 2'				500	600	601				350	107	107
50 '022 2'					600	601				349	107	107
63 '022 7'					600	601				348	106	107
										5 / 0		107
31051 MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	409	73	73
1155 FG3129			1	345-138	356	317				598	107	107
										1 / 0		107
63219 GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	80	83	83
595 '866 '				230	626-608	621-608				102	106	106
593 '865 '				230-41.6	626					99	103	103
365 '553 '				115	626	621				98	102	102
										1 / 2		106
65409 S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
285 '451 '				161	645	645				130	105	105
										1 / 0		105
58036 OLATHEE5	58046	OXFORD 5	1	161	541	541	224	224	NS	128	57	57
1435 FG5023			1	345	541	541				235	105	105
										0 / 1		105
34009 WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	NS	77	91	91
1355 FG3728			1	345	331	393-391				87	104	104
1348 FG3724			1	345	331	393-391				87	104	104
1013 FG12006			1	345	331	393-391				87	104	104
1015 FG12009			1	345	331	393-391				87	104	104
1030 FG12016			1	345	331	393-391				87	104	104
573 '825 '				345-161	331-600					85	101	101
63 '022 7'					600	601				84	100	100
935 'SINGLE-028'			1	500	600	601				84	100	100
40 '015 2'				500	600	601				84	100	100
50 '022 2'					600	601				84	100	100
45 '020 '				500-115	600	601				84	100	100
										0 / 11		104
60203 COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	214	58	58
48 '022 1'					600	601				386	104	104
										0 / 1		104
39145 POR 138	39167	COL 138	1	138	364	371	286	286	NS	166	58	58
1583 FG65010			2	138	364	371				297	104	104
										0 / 1		104

Overloaded Facility				Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
39145	POR 138	39167	COL 138	2	138	364	371	286	286	NS	166	58	58
	1585 FG65011			1	138	364	371				297	104	104
											0 / 1		104
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	247	66	66
	1398 FG4020			1	345	130	130				385	104	104
											0 / 1		104
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	269	43	43
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	71	50	50
	1398 FG4020			1	345	130	130				146	103	103
											0 / 1		103
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	74	74
	63 '022 7'					600	601				101	103	103
	50 '022 2'					600	601				101	103	103
	45 '020 '				500-115	600	601				100	102	102
	935 'SINGLE-028'			1	500	600	601				100	102	102
	40 '015 2'				500	600	601				100	102	102
											0 / 5		103
63213	MARIETT7	63214	BIGSTON7	1	115	626	626-628	96	96	NS	54	56	56
	135 '110 2'				230	652	654				98	102	102
											0 / 1		102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	199	59	59
	23 '009 2'					600	601				342	102	102
											0 / 1		102
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	482	86	86
	278 '440 '				161	645	645				570	102	102
											0 / 1		102
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	136	92	92
	1073 FG1319			1	500	524-151	524-159				150	102	102
											0 / 1		102
59206	PRALEE 5	59211	BLSPS 5	1	161	540	540	223	245	NS	237	106	97
	1435 FG5023			1	345	541	541				248	111	101
											0 / 1		101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	45	22	20
	83 '050 2'				345/115						221	111	101
	88 '050 4'										221	111	101
	95 '050 6'										221	111	101
	90 '050 5'										221	111	101
											0 / 4		101

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				338	101	101
											0 / 1		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	154	35	35
	915 MAPP-9				345	600					448	101	101
											0 / 1		101
63051	HENNING4	63052	INMAN 4	1	230	626	621	143	143	NS	111	77	77
	355 '550 '				115	626-652					143	100	100
											0 / 1		100
											157 / 63		241.6

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

Case Summary pi_rfp_bid5and6

Project Name	2002 SERIES -- FIANL (F1)2004 SUMMER PEAK M
Title1	F204SUPK.SAV /SUMMER PEAK / SI
Title2	Bids 5 and 6
Case Date	7/22/2002

Power Flow File M:\PROJ\MISO\286001\PFLOW\ConvertedCases\pi_rfp_bid5and6.cft

Power Flow Controls

Area Control	☐	***SmoothStep***	☑
Remote Control	☑	***XfrmVcon***	☐
GenVar Control	☑	***XfrmFcon***	☐
Solve Method	DSOLVE		

Case Settings

Overload	☑	***VlimMin***	0.9	***RateFactor***	1
VLimit	☑	***VlimMax***	1.05	***AmpFactor***	1
VChange	☑	***VlimChange***	0.05	***RatingNumber***	2
Monitored Set	monitored	10835 Buses			

Contingency

Contingencies loaded from file M:\PROJ\MISO\286001\PFLOW\Con_MonFiles\PI_RFP.con 1

660 contingencies

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 5 and 6

7/22/2002

Overloaded Facility								Normal System				Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	110.1	155	62 / 0	230
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	103.2	74	2 / 0	154
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	29.1	58	1 / 0	153
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	29.1	58	1 / 0	149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	29.1	58	1 / 0	149
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601	140	140	99.2	71	6 / 0	148
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601	139	139	98.3	71	2 / 0	147
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622	71	71	65.7	93	7 / 3	142
34043	SAVANNA5	34046	YORK 5	1	161	331	393	84	84	59.7	71	2 / 0	140
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379	96	96	76.5	80	1 / 0	137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601	15	15	6.7	45	1 / 0	136
34028	LORE 5	34032	8TH ST.5	1	161	331	393	84	84	50.4	60	1 / 1	128
39122	KEG 138	39218	CHA 138	1	138	364	371	240	240	224.5	94	3 / 0	127
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	242.1	72	1 / 1	124
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	91.9	82	1 / 0	123
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	53.4	89	1 / 2	122
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	141.4	99	1 / 13	121
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	140.8	98	1 / 12	120
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	30.1	116	18 / 0	119
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	120.9	84	6 / 0	119
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	87.3	90	2 / 0	118
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	81.5	97	5 / 8	117
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	51.5	72	1 / 0	115
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	29.6	63	2 / 0	111
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	41.6	59	1 / 0	110
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	90.5	40	2 / 0	109
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	255.9	84	1 / 0	109
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	222.7	82	1 / 0	109
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	41.6	88	2 / 8	109
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	63.8	66	1 / 1	108
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	73.3	87	1 / 1	107
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	216.2	58	1 / 0	107
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	188.2	58	5 / 0	107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	406.7	73	1 / 0	106
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	256.6	69	1 / 0	106
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	323.8	72	1 / 0	106
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	140.5	95	1 / 10	105
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	92.0	74	1 / 0	105
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	76.0	53	1 / 0	105
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	163.3	70	0 / 1	105
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	163.3	70	0 / 1	105
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	274.8	44	0 / 1	103
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	77.5	81	0 / 1	103
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	73.2	75	0 / 5	102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	146.8	72	0 / 1	102
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	201.1	60	0 / 1	102
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	132.9	71	0 / 1	101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	161.7	57	0 / 1	101
39145	POR 138	39167	COL 138	2	138	364	371	286	286	161.7	57	0 / 1	101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	176.1	52	0 / 1	101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	40.8	20	0 / 4	101

Overloaded Facility										Normal System		Overloads	
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer	MVA	Norm (%)	Count A / B	Max (%)
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	473.4	85	0 / 1	101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	158.0	35	0 / 1	101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	204.0	71	0 / 1	100
64909	N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	131.6	70	0 / 1	100
												150 / 83	230

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

2002 SERIES -- FIANL (F1)2004 SUMMER PEAK MODEL

F204SUPK.SAV /SUMMER PEAK / SI

Bids 5 and 6

7/22/2002

Overloaded Facility			Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62667	ST BONI7	62925	DICKNSN7	1	115	600-618	622-619	71	71	NS	110	155	155
	30 '009 5'				345	600-618	601-618				163	230	230
	845 MAPP-17				345	600-618	601-618				135	191	191
	53 '022 3'					600	601				123	174	174
	48 '022 1'					600	601				122	172	173
	38 '009 8'					600-618	601-618				122	172	172
	470 '705 2'				115-345	600	601				122	172	172
	28 '009 4'					600-618	601-618				120	169	169
	498 '720 1'				115	600-618	601-619				120	169	169
	483 '715 1'				115-69	600-618					119	167	167
	23 '009 2'					600	601				119	167	167
	35 '009 7'					600	601				118	167	167
	840 MAPP-15A			1	345	600	601				117	165	165
	475 '705 4'				345-115	600	601				117	164	164
	58 '022 5'					600	601				116	163	163
	488 '715 3'				115-69	600	601-622				115	162	162
	473 '705 3'				115-345	600	601				115	162	162
	485 '715 2'				115-69	600-618					115	161	161
	70 '022 10'					600	601				114	161	161
	55 '022 4'					600	601				114	160	160
	843 MAPP-16			1	345	600	601				114	160	160
	68 '022 9'				345-115	600	601				112	158	158
	525 '755 '				115	600	601-622				112	158	158
	113 '050 12'										112	158	158
	493 '715 5'				115-69	600-618					112	158	158
	460 '695 '				115	618-600	619-601				112	158	158
	110 '050 11'										112	158	158
	105 '050 14'										112	158	158
	103 '050 10'				345-161	364-600					112	158	158
	543 '775 '				115	600-608					112	157	157
	115 '050 13'										112	157	157
	1235 FG3239				115/345						112	157	157
	1105 FG3016				115/345						112	157	157
	100 '050 9'				345/115						112	157	157
	60 '022 6'				345	600	601				112	157	157
	1480 FG6062			1	345	600	601-604				112	157	157
	560 '805 '				115	600	601				111	157	157
	555 '795 '					600-652					111	157	157
	838 MAPP-14			1	161-345	600	616				111	157	157
	98 '050 8'				69/345						111	157	157

Overloaded Facility				Contingency								Overloads		
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer			MVA	Norm (%)	Emer (%)
		468	'705 1'		345-115	600	601					111	157	157
		530	'760 '		345	600	601					109	154	154
		63	'022 7'			600	601					109	154	154
		205	'220 '			626	627-657					109	154	154
		50	'022 2'			600	601					109	153	153
		523	'750 '		115-69	608-600						109	153	153
		450	'675 '		345-230	600	601-622					109	153	153
		45	'020 '		500-115	600	601					108	153	153
		40	'015 2'		500	600	601					108	153	153
		935	'SINGLE-028'	1	500	600	601					108	153	153
		1353	FG3727	1	345	331-600	393-601					108	152	153
		430	640 '									108	152	152
		318	'500'		69-230	618-652	619-654					108	152	152
		65	'022 8'		345-115	600	601					108	152	152
		545	'780 '		115	600	601					107	151	151
		93	'050 7'									107	151	151
		85	'050 3'		345-161	364-600						107	151	151
		90	'050 5'									107	151	151
		88	'050 4'									107	151	151
		108	'050 1'		69/345							107	151	151
		95	'050 6'									107	150	150
		83	'050 2'		345/115							107	150	150
		905	MAPP-5	1	345	600	601					103	146	146
												62 / 0		230
60153	MNTCELO7	60166	SALIDA 7	1	115	600	601	140	140	NS		103	74	74
		545	'780 '		115	600	601					216	154	154
		450	'675 '		345-230	600	601-622					156	111	111
												2 / 0		154
34529	GRJCT5Y	34054	GR JCT 5	1	161	331	392-391	50	50	NS		29	58	58
		688	'936 '		115	331	391					76	153	153
												1 / 0		153
34073	GR JCT 7	34529	GRJCT5Y	1	115-161	331	391-392	50	50	NS		29	58	58
		688	'936 '		115	331	391					75	149	149
												1 / 0		149
34059	BOONE 7	34073	GR JCT 7	1	115	331	391	50	50	NS		29	58	58
		688	'936 '		115	331	391					74	149	149
												1 / 0		149

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone		Norm	Emer		MVA	Norm (%)	Emer (%)
60177	CHAMPLN7	60178	CHAMP T7	1	115	600	605-601		140	140	NS	99	71	71
	38 '009 8'					600-618	601-618					208	148	148
	35 '009 7'					600	601					207	148	148
	30 '009 5'				345	600-618	601-618					162	116	116
	443 '670 1'					600-618	601-619					161	115	115
	840 MAPP-15A			1	345	600	601					157	112	112
	28 '009 4'					600-618	601-618					153	109	109
												6 / 0		148
60158	STCLTP 7	60166	SALIDA 7	1	115	600	601		139	139	NS	98	71	71
	545 '780 '				115	600	601					204	147	147
	450 '675 '				345-230	600	601-622					149	107	107
												2 / 0		147
60277	WWACNIA7	62667	ST BONI7	1	115	600	601-622		71	71	NS	66	93	93
	30 '009 5'				345	600-618	601-618					101	142	142
	845 MAPP-17				345	600-618	601-618					83	117	117
	53 '022 3'					600	601					77	108	108
	470 '705 2'				115-345	600	601					76	108	108
	48 '022 1'					600	601					76	107	107
	38 '009 8'					600-618	601-618					75	106	106
	28 '009 4'					600-618	601-618					75	105	105
	483 '715 1'				115-69	600-618						74	104	104
	23 '009 2'					600	601					72	101	101
	35 '009 7'					600	601					71	100	100
												7 / 3		142
34043	SAVANNA5	34046	YORK 5	1	161	331	393		84	84	NS	60	71	71
	795 ALTW-85				161	331	393-392					117	140	140
	1025 FG12013			1	345	331	393					90	107	107
												2 / 0		140
39885	CEDARU	39892	NATIONAL	1	138	368-365	368-379		96	96	NS	76	80	80
	1578 FG65006			1	138	365-368	379-368					131	137	137
												1 / 0		137
60853	LK YANK8	60119	LKYNKTN7	2	69-115	600	601		15	15	NS	7	45	45
	345 '530 '				69-115	600-652	601-605					20	136	136
												1 / 0		136
34028	LORE 5	34032	8TH ST.5	1	161	331	393		84	84	NS	50	60	60
	1018 FG12010			1	161	331	393-392					107	128	128
	785 'ALTW-13 '				161	331	393-392					88	105	105
												1 / 1		128
39122	KEG 138	39218	CHA 138	1	138	364	371		240	240	NS	224	94	94
	1130 FG3031			1	138	364-367	371-367					305	127	127
	1580 FG65009			1	345	367	391-367					287	120	120
	1118 FG3022			1	345	367	391-367					287	120	120
												3 / 0		127

Overloaded Facility		Contingency								Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
60152	MNTCELO4	60151	MNTCELO3	1	230-345	600	601	336	336	NS	242	72	72
	450 '675 '				345-230	600	601-622				418	124	124
	23 '009 2'					600	601				349	104	104
											1 / 1		124
62132	PRKWOOD8	62090	PRKWOOD7	2	69-115	618	619	112	112	NS	92	82	82
	433 '650 '				115-69	600-618	601-619				138	123	123
											1 / 0		123
34059	BOONE 7	34076	BNE JCT7	1	115	331	391	60	60	NS	53	89	89
	678 '932 2'				115/345	331-635	391-637				73	122	122
	770 'ALTW-07 '				161-69	331	392-391				62	104	104
	625 '911 '				161	331-652	391-654				61	102	102
											1 / 2		122
27106	11KNOB C	27135	11POND C	1	138	211	211	143	143	NS	141	99	99
	1283 FG3418			1	765	205	250				173	121	121
	1260 FG3404			1	345	356-357	323-357				146	102	102
	1255 FG3402			1	345	356-357	323-357				146	102	102
	998 FG110			1	345	356-357	323-357				146	102	102
	1005 FG116			1	345	356-357	323-357				146	102	102
	1285 FG3419			1	345	356-357	323-357				146	102	102
	1290 FG3424				345	356-357	323-357				145	102	102
	1390 FG4017				345	356-357	323-357				145	102	102
	1050 FG124				345	356-357	323-357				145	102	102
	1058 FG127				345	356-357	323-357				145	102	102
	1170 FG3135				345	356-357	323-357				145	102	102
	1278 FG3413				345	356-357	323-357				145	102	102
	1133 FG3118			1	345	205-356	252-323				144	101	101
	1410 FG45009			1	500	201	201				143	100	100
											1 / 13		121
27135	11POND C	27144	11TIPTOP	1	138	211	211	143	143	NS	141	98	98
	1283 FG3418			1	765	205	250				172	120	120
	1255 FG3402			1	345	356-357	323-357				145	101	101
	998 FG110			1	345	356-357	323-357				145	101	101
	1005 FG116			1	345	356-357	323-357				145	101	101
	1260 FG3404			1	345	356-357	323-357				145	101	101
	1285 FG3419			1	345	356-357	323-357				145	101	101
	1290 FG3424				345	356-357	323-357				145	101	101
	1058 FG127				345	356-357	323-357				145	101	101
	1278 FG3413				345	356-357	323-357				145	101	101
	1050 FG124				345	356-357	323-357				145	101	101
	1170 FG3135				345	356-357	323-357				145	101	101
	1390 FG4017				345	356-357	323-357				145	101	101
	1133 FG3118			1	345	205-356	252-323				144	100	100
											1 / 12		120

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
67541	STVITAL7	67726	DAKOTB17	1	110	667	668-667	26	26	NS	30	116	116
	15 '003 '										31	119	119
	948 'SINGLE-044'			1	230	600-667	601-668				31	119	119
	13 '001 '				230						31	119	119
	18 '007 '					608	657-608				31	119	119
	943 'SINGLE-040'			1	230	608	657				31	118	119
	945 'SINGLE-042'			1	230	608	608-657				31	118	118
	950 'SINGLE-046'				345-24	626	657-661				31	118	118
	935 'SINGLE-028'			1	500	600	601				30	117	117
	40 '015 2'				500	600	601				30	117	117
	205 '220 '					626	627-657				30	117	117
	50 '022 2'					600	601				30	117	117
	63 '022 7'					600	601				30	117	117
	45 '020 '				500-115	600	601				30	117	117
	215 '250 '				230-115	618-626					30	117	117
	380 '570 1'					626	626-657				30	115	115
	818 'FORBES 7T-8'					608-600	608-601				30	114	114
	938 'SINGLE-031'			1	230	626	657				29	113	113
	940 'SINGLE-034'			1	230	626-667	657-668				28	109	109
											18 / 0		119
61676	HIBBARD7	61680	WNTR ST7	1	115	608	608	144	144	NS	121	84	84
	155 132L				115	608	608				171	119	119
	63 '022 7'					600	601				167	116	116
	50 '022 2'					600	601				167	116	116
	45 '020 '				500-115	600	601				163	113	113
	40 '015 2'				500	600	601				163	113	113
	935 'SINGLE-028'			1	500	600	601				163	113	113
											6 / 0		119
34066	M-TOWN 7	34169	WELSBGT7	1	115	331	391	97	97	NS	87	90	90
	1028 FG12015			1	345	635	637				114	118	118
	683 '933 '				345-161	635	637				114	118	118
											2 / 0		118

Overloaded Facility		Contingency									Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
62132	PRKWOOD8	62090	PRKWOOD7	1	69-115	618	619	84	84	NS	82	97	97
	503 '725 '				69-230	618	619				98	117	117
	440 '665 '				230-69	600-618	601-619				95	113	113
	445 '670 2'				345-230	600-618	601-619				94	112	112
	450 '675 '				345-230	600	601-622				90	108	108
	538 '765 '				345-230	600-618	601-619				89	106	106
	435 '655 '				115-69	600-618	601-619				85	101	101
	465 '700 2'				345	600	601				85	101	101
	30 '009 5'				345	600-618	601-618				85	101	101
	818 'FORBES 7T-8'					608-600	608-601				85	101	101
	463 '700 1'				345	600	601				84	101	101
	840 MAPP-15A			1	345	600	601				84	100	100
	453 '680 '					600-618					84	100	100
	438 '660 '				230-69	618	619				84	100	100
											5 / 8		117
60194	CARVRCO7	60277	WWACNIA7	1	115	600	601	71	71	NS	51	72	72
	30 '009 5'				345	600-618	601-618				82	115	115
											1 / 0		115
62672	GLNDALE8	62666	GLNDALE7	2	69-115	600	622	47	47	NS	30	63	63
	485 '715 2'				115-69	600-618					52	111	111
	490 '715 4'				69-115	600	622-601				52	110	110
											2 / 0		111
60244	SCOTTCO7	60890	SCOTTCO8	1	115-69	600	601	70	70	NS	42	59	59
	485 '715 2'				115-69	600-618					77	110	110
											1 / 0		110
31340	NIOTA	34181	BRLGTN 5	1	161	356-331	322-391	224	224	NS	91	40	40
	793 ALTW-84				161	331	391				244	109	109
	780 'ALTW-11 '				161	331	391				244	109	109
											2 / 0		109
53139	FLINTCR5	53194	ELMSPRR5	1	161	520	520	305	335	NS	256	84	76
	1468 FG5074			1	161	520	520				365	120	109
											1 / 0		109
60305	EAU CLA5	60317	WHEATON5	1	161	600	604	272	272	NS	223	82	82
	1480 FG6062			1	345	600	601-604				296	109	109
											1 / 0		109

Overloaded Facility		Contingency							Ratings		Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Norm	Emer		MVA	Norm (%)	Emer (%)
60749	DGLAS C8	60144	DGLASCO7	1	69-115	600	601	47	47	NS	42	88	88
	545 '780 '				115	600	601				51	108	109
	543 '775 '				115	600-608					50	107	107
	430 640 '										49	104	104
	318 '500'				69-230	618-652	619-654				48	103	103
	135 '110 2'				230	652	654				48	103	103
	935 'SINGLE-028'			1	500	600	601				47	101	101
	40 '015 2'				500	600	601				47	101	101
	45 '020 '				500-115	600	601				47	101	101
	50 '022 2'					600	601				47	101	101
	63 '022 7'					600	601				47	101	101
											2 / 8		109
62003	JOHNJCT7	63216	ORTONVL7	1	115	626	621-626	97	97	NS	64	66	66
	135 '110 2'				230	652	654				104	108	108
	410 '610 '					626					98	101	101
											1 / 1		108
34009	WINBAGO5	61932	RUTLAND5	1	161	331	393-615	84	84	NS	73	87	87
	540 '770 '				161-115	331-600	393-601				90	107	107
	905 MAPP-5			1	345	600	601				86	102	102
											1 / 1		107
60203	COON CK7	60253	TWIN LK7	1	115	600	601	371	371	NS	216	58	58
	48 '022 1'					600	601				396	107	107
											1 / 0		107
61612	RIVERTN4	61625	BLCKBRY4	1	230	608	608	327	327	NS	188	58	58
	40 '015 2'				500	600	601				349	107	107
	935 'SINGLE-028'			1	500	600	601				349	107	107
	45 '020 '				500-115	600	601				349	107	107
	50 '022 2'					600	601				347	106	106
	63 '022 7'					600	601				347	106	106
											5 / 0		107
31051	MASON 13	31053	MASON 2	2	345-138	356	317	560	560	NS	407	73	73
	1155 FG3129			1	345-138	356	317				596	106	106
											1 / 0		106
96120	5THMHIL	96126	5MOBTAP	1	161	130	130-133	372	372	NS	257	69	69
	1398 FG4020			1	345	130	130				393	106	106
											1 / 0		106
63030	DICKNSN3	62925	DICKNSN7	1	345-115	618	618-619	448	448	NS	324	72	72
	30 '009 5'				345	600-618	601-618				473	106	106
											1 / 0		106

Overloaded Facility		Contingency									Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	NS	141	95	95
	1073 FG1319			1	500	524-151	524-159				156	105	105
	1110 FG3018				345	600	601-616				150	101	101
	1478 FG6029				345	600	616-601				150	101	101
	1210 FG3157				138/345	356-130	314-130				149	101	101
	1208 FG3153			1	345	356-130	314-130				149	101	101
	1078 FG133			1	345	356-130	314-130				149	101	101
	1063 FG129			1	345	356-130	314-130				149	101	101
	1193 FG3144			1	345	356-130	314-130				149	101	101
	1423 FG5008			1	345	520	520				149	101	101
	1443 FG5042			1	345	520	520				149	101	101
	660 '927 '				345	635	637				149	101	101
											1 / 10		105
65409	S1209 5	65383	S1209T1T	1	161	645	645	124	124	NS	92	74	74
	285 '451 '				161	645	645				131	105	105
											1 / 0		105
31221	MOBERLY	31409	OVERTON	1	161	356	314	142	142	NS	76	53	53
	1398 FG4020			1	345	130	130				149	105	105
											1 / 0		105
63214	BIGSTON7	63195	BIGSTONY	1	115-230	626	628	233	233	NS	163	70	70
	135 '110 2'				230	652	654				243	104	105
											0 / 1		105
63314	BIGSTON4	63195	BIGSTONY	1	230	626	628	233	233	NS	163	70	70
	135 '110 2'				230	652	654				243	104	105
											0 / 1		105
96049	7THOMHL	96120	5THMHIL	1	345-161	130	130	625	625	NS	275	44	44
	1398 FG4020			1	345	130	130				643	103	103
											0 / 1		103
63219	GRANTCO7	63220	ELBOWLK7	1	115	626	629	96	96	NS	78	81	81
	595 '866 '				230	626-608	621-608				99	103	103
											0 / 1		103
61721	ETCO 7	61722	FORBES 7	1	115	608	608	98	98	NS	73	75	75
	50 '022 2'					600	601				100	102	102
	63 '022 7'					600	601				100	102	102
	40 '015 2'				500	600	601				100	102	102
	935 'SINGLE-028'			1	500	600	601				100	102	102
	45 '020 '				500-115	600	601				100	102	102
											0 / 5		102
30422	CONWAY 3	31391	ORGD 1	1	138	356	318	205	205	NS	147	72	72
	1060 FG128			1	345-138	356	311				209	102	102
											0 / 1		102
60153	MNTCELO7	60151	MNTCELO3	1	115-345	600	601	336	336	NS	201	60	60
	23 '009 2'					600	601				341	102	102
											0 / 1		102

Overloaded Facility		Contingency							Overloads			
From	Name	To	Name	Circuit	Base kV	Area	Zone	Ratings Norm	Ratings Emer		MVA	Norm (%)	Emer (%)
64909	N.PLATT4	65037	N.PLT8 Y	1	230	640	640	187	187	NS	133	71	71
	233 '310 '				345	640	640				189	101	101
											0 / 1		101
39145	POR 138	39167	COL 138	1	138	364	371	286	286	NS	162	57	57
	1583 FG65010			2	138	364	371				289	101	101
											0 / 1		101
39145	POR 138	39167	COL 138	2	138	364	371	286	286	NS	162	57	57
	1585 FG65011			1	138	364	371				289	101	101
											0 / 1		101
50024	CARROLL4	50023	CARROLL6	1	138-230	502	502	336	336	NS	176	52	52
	1438 FG5029			1	345	502-520	502-520				339	101	101
											0 / 1		101
39686	WESTONWP	39676	WESTON	1	115-345	366	366	200	220	NS	41	20	19
	83 '050 2'				345/115						222	111	101
	88 '050 4'										222	111	101
	95 '050 6'										221	111	101
	90 '050 5'										221	111	101
											0 / 4		101
65355	S3455 3	65337	S3455T1T	1	345	645	645	560	560	NS	473	85	85
	278 '440 '				161	645	645				564	101	101
											0 / 1		101
61984	AUSTIN 5	63070	PL VLLY5	1	161	680-618	617-618	445	445	NS	158	35	35
	915 MAPP-9				345	600					448	101	101
											0 / 1		101
32277	TURKY HL	32307	E BELLVL	1	138	357	357	287	287	NS	204	71	71
	1373 FG4009				345-138	356-357	312-357				288	100	100
											0 / 1		100
64909	N.PLATT4	65038	N.PLT9 Y	1	230	640	640	187	187	NS	132	70	70
	233 '310 '				345	640	640				187	100	100
											0 / 1		100
											150 / 83		230.2

Notes:

1. Overloads are based on 100% of Rating 2
2. NS = Normal System Conditions (No Outages)
3. Minimum Reporting Level is 100%
4. Statistical Information (A/B Stats and Maximum Overload)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

APPENDIX E

COST ESTIMATES WITH UNIT COSTS

BID 1 COST ESTIMATE

Impacts

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Cost ($ x 1000) Total
60103	CANNFLS5	63071	SPRNGCK5	1	161	Line	21.8	miles	161R1c954	285	6,213
60104	CANNFLS7	62235	EMPIRE 7	1	115	Line	14.6	miles	138R1c795	225	3,285
60200	BLK DG27	60258	WILSON 7	2	115	Line	4.5	miles	138R1c795	225	1,013
60200	BLK DG27	62230	PILOTKB7	1	115	Line	4.6	miles	138R1c795	225	1,035
60201	CHEMOLT7	60204	COTTAGE7	1	115	Line	5.2	miles	138R1c795	225	1,170
60201	CHEMOLT7	60247	LINDETP7	1	115	Line	7.8	miles	138R1c795	225	1,755
60204	COTTAGE7	60238	REDROCK7	1	115	Line	7.6	miles	138R1c795	225	1,710
60217	INVRHLS3	60218	INVRHLS7	1	345-115	tx	1	ea	MS345/138	5700	5,700
60218	INVRHLS7	60220	INVRGRV7	1	115	Line	1.9	miles	138R1c795	225	428
60218	INVRHLS7	60223	KOCHREF7	1	115	Line	1.8	miles	138R1c795	225	405
60220	INVRGRV7	62230	PILOTKB7	1	115	Line	5.7	miles	138R1c795	225	1,283
60223	KOCHREF7	60341	ROSEMON7	1	115	Line	1.7	miles	138R1c795	225	383
60341	ROSEMON7	62235	EMPIRE 7	1	115	Line	8.5	miles	138R1c795	225	1,913
60343	WILLPIP7	62226	FISCHER7	1	115	Line	0.6	miles	138R1c795	225	135
60343	WILLPIP7	62228	APPVLTW7	1	115	Line	0.38	miles	138R1c795	225	86
62227	JOHNCAK7	62228	APPVLTW7	1	115	Line	0.2	miles	138R1c795	225	45
62227	JOHNCAK7	62229	APPVLTE7	1	115	Line	1.1	miles	138R1c795	225	248
									Estimated Cost to Upgrade		**26,804**

Benefits

None

BID 2 COST ESTIMATE

Impacts

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
No upgrades necessary											
									Estimated Cost to Upgrade		**0**

Benefits

None

BID 3 COST ESTIMATE

Impacts

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
64403	E MOLIN3	64680	SB39MID5	1	345-161	tx	1	ea	MS345/161	6200	6,200
57968	STILWEL7	57981	LACYGNE7	1	345	Line	30.8	miles	345N1c954	600	18,480
36362	NELSO; B	37632	LEECO;BP	1	345	Line	12.2	miles	345N1c954	600	7,320
63051	HENNING4	63052	INMAN 4	1	230	Line	3.8	miles	138R1c795	225	855
34087	DYSART 5	64269	WASHBRN5	1	161	Line	20.3	miles	161R1c954	285	5,786
36457	ALPIN;RT	36599	CHERR; R	1	138	Line	5.2	miles	138R1c795	225	1,170
36532	BELVI; B	36606	B465 ;BT	1	138	Line	0.2	miles	138R1c795	5700	1,140
36953	MAREN;RT	37119	P VAL; R	1	138	Line	12.6	miles	138R1c795	225	2,835
38342	COC 69	39239	COC 138	1	138-69	tx	1	ea	MS138/69	3900	3,900
									Estimated Cost to Upgrade		**47,686**

Benefits

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
34015	LIME CK5	34016	EMERYN	1	161	Line	17.2	miles	161R1c954	285	4,902
60305	EAU CLA5	60317	WHEATON5	1	161	Line	4.3	miles	161R1c954	285	1,226
									Estimated Avoided Costs		**6,128**

Total Transmission Impact (Upgrade-Avoided) **41,558**

BIDS 4 AND 5 COST ESTIMATE

Impacts

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
63051	HENNING4	63052	INMAN 4	1	230	Line	3.8	miles	230R1c954	300	1,140
34087	DYSART 5	64269	WASHBRN5	1	161	Line	20.3	miles	161R1c954	285	5,786
58036	OLATHEE5	58046	OXFORD 5	1	161	Line	4.4	miles	161R1c954	285	1,254
59206	PRALEE 5	59211	BLSPS 5	1	161	Line	3.21	miles	161R1c954	285	915
									Estimated Cost to Upgrade		**9,094**

Benefits

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
34015	LIME CK5	34016	EMERYN	1	161	Line	17.2	miles	161R1c954	285	4,902
60305	EAU CLA5	60317	WHEATON5	1	161	Line	4.3	miles	161R1c954	285	1,226
39885	CEDARU	39892	NATIONAL	1	138	Line	5.3	miles	138R1c795	225	1,193
									Estimated Avoided Costs		**7,320**
									Total Transmission Impact (Upgrade-Avoided)		**1,774**

BIDS 4 AND 6 COST ESTIMATE

Impacts

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
63051	HENNING4	63052	INMAN 4	1	230	Line	3.8	miles	230R1c954	300	1,140
58036	OLATHEE5	58046	OXFORD 5	1	161	Line	4.4	miles	161R1c954	285	1,254
59206	PRALEE 5	59211	BLSPS 5	1	161	Line	3.21	miles	161R1c954	285	915
									Estimated Cost to Upgrade		**3,309**

Benefits

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Total
34015	LIME CK5	34016	EMERYN	1	161	Line	17.2	miles	161R1c954	285	4,902
60305	EAU CLA5	60317	WHEATON5	1	161	Line	4.3	miles	161R1c954	285	1,226
									Estimated Avoided Costs		**6,128**

Total Transmission Impact (Upgrade-Avoided) **(2,819)**

BIDS 5 AND 6 COST ESTIMATE

Impacts

From #	From Name	To #	To Name	Circuit	Base kV	Type	Quantity	Units	Code	Cost ($ x 1000) Unit	Cost ($ x 1000) Total
No upgrades necessary											
									Estimated Cost to Upgrade		**0**

Benefits

None

Table F-5
Unit Cost Estimate Table

Code	Description	Unit Cost $x1000 Cost	Units
Transmission Line Unit Costs		Unit Cost Estimate	
138N1c795	138 kV New Line, S/C no underbuild, 795 ACSR	300	$/mi
138N1c954	138 kV New Line, S/C no underbuild, 954 ACSR	315	$/mi
138N1Uc954	138 kV New Line with distr. Underbuild, 954 ACSR	413	$/mi
138N2c795	138 kV New Line, D/C no underbuild, 795 ACSR	450	$/mi
138N2c954	138 kV New Line, D/C no underbuild, 954 ACSR	480	$/mi
138NRC1c795	138 kV New River Crossing, 795 ACSR	1650	ea
138R1c795	138 kV Reconductor S/C line with 795 ACSR	225	$/mi
138R1cb477	138 kV Reconductor S/C line with bundled 477 ACSR	285	$/mi
138UV1c477	Existing 69 kV to 138 kV Upgrade S/C line with existing 477 ACSR	188	$/mi
161N2c954	161 kV New Line, D/C no underbuild, 954 ACSR	495	$/mi
161R1c954	161 kV Reconductor S/C line with 954 ACSR	285	$/mi
230R1c954	161 kV Reconductor S/C line with 954 ACSR	300	$/mi
345N1c954	345 kV New Line no underbuild, 2-954 ACSR	600	$/mi
345NRC2c954	345 kV New River Crossing, 2-954 ACSR	2250	ea
69LS1200	69 kV Upgrade Line Switch to 1200A	7.5	ea
69N1c477	69 kV New Line with no underbuild, 477 ACSR	225	$/mi
69N1Uc477	69 kV New Line with distr. underbuild, 477 ACSR	300	$/mi
69N1Uc795	69 kV New Line with distr. underbuild, 795 ACSR	323	$/mi
69N2c477	69 kV New Line, D/C with no underbuild, 477 ACSR	345	$/mi
69R1c336	69 kV Reconductor S/C line with 336 ACSR	135	$/mi
69R1c477	69 kV Reconductor S/C line with 477 ACSR	150	$/mi
69R1c795	69 kV Reconductor S/C line with 795 ACSR	195	$/mi
69U1c336	69 kV Upgrade Line for 95^{o}C/100^{o}C Cond. Temp	45	$/mi
69U1c477	69 kV Upgrade Line for 95^{o}C/100^{o}C Cond. Temp	45	$/mi
MS138/69	Modify Subst: Add 138/69 kV Transfmr	3900	ea
MS161/138	Modify Subst: Add 138/161 kV Transfmr	4800	ea
MS345/138	Modify Subst: Add 345/138 kV Transfmr	5700	ea
MS345/161	Modify Subst: Add 345/161 kV Transfmr	6200	ea

Ex. B - Radiobological shot noise

SCIENTIFIC REPORTS
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Radiobiological shot noise explains Three Mile Island biodosimetry indicating nearly 1,000 mSv exposures

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The 1979 accident at the Three Mile Island nuclear power station in Pennsylvania released about 22 million Curies of xenon-133 into the environment. Because physical dosimetry indicated exposures to the nearby population of less than about 2 mSv, discernible impacts to the health of the exposed population are not generally believed to have resulted. However, there is contrary evidence, including especially the results of biodosimetry via cytogenetic analysis using the FISH method. This report examines the discrepancy between the results of physical dosimetry and biodosimetry, which among the small number of persons examined indicated exposures between 600 and 900 mSv. The paradox reveals a fundamental error in the health physics body of knowledge: the definition of the energy imparted to tissue, ε, fails to properly account for the temporal distribution of ionization products resulting from dilute contamination with an internally incorporated beta-emitting radionuclide. Application of a century-old result describing "shot noise" in an electronic system repairs the deficiency. The Xe-133 concentration in the tissue of those individuals exposed to the most intense portion of the radioactive plume released from the TMI facility is shown to have been on the order of 0.1 μCi/l, persisting for multiple hours. Shot noise reference doses in the range from 820 to 1,700 mSv follow, a result which is consistent with biodosimetric analysis. The finding should motivate a comprehensive re-evaluation of the conventional understanding of the 1979 accident at the Three Mile Island nuclear power station, especially regarding its impact upon the population of the surrounding area.

The 1979 accident at the Three Mile Island (TMI) nuclear power station in Pennsylvania released a large quantity of the radioactive noble gas xenon-133 into the surrounding environment. Although it is well-established that gamma ray exposures to the affected population were comparable to or smaller than the annual dose due to background radiation (around 1 mSv), the topic of health effects relating to the accident has always been controversial. The Report of the President's Commission on the Accident at Three Mile Island (known as the Kemeny Commission Report, after its chairman) asserted that any health or medical impacts affecting the population living within twenty miles of the accident site were due to mental distress[1]. On the basis of what is known about the accident and the nature of the exposure suffered by those nearby, it is therefore not conventionally believed that any discernible impact to human health caused by exposure to ionizing radiation has been observed[2–4].

However, contrary evidence does exist, and ought not to be summarily dismissed. For instance, contemporaneous accounts from hundreds of local residents describe symptoms consistent with significant exposure to ionizing radiation, including erythema, hair loss, nausea, and vomiting[5]. Researchers later correlated more than a dozen verified reports of medical impacts to simultaneous meteorological conditions at the TMI facility[6], at least suggesting the presence of the radioactive plume at the location of the individuals making the reports. Because the persons affected in some cases were not aware that a radiological release from the TMI facility had occurred following an accident, and in most or all cases may not have been knowledgeable regarding the medical impacts of radiation poisoning, a diagnosis of mental distress as an explanation for the acute effects observed is difficult to accept.

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Furthermore, large-scale epidemiological investigations have uncovered health decrements including breast and lung cancer, heart disease, and early mortality among the exposed population within ten miles[7] and five miles[8–10] of the TMI facility. Because the doses suffered by the exposed population were small and because the discernible health impacts were not those expected for the nature of the exposure, among other reasons, most investigators have been unwilling to interpret these epidemiological results as convincing evidence relating the observed health impacts to exposure to ionizing radiation. Due in part to their results showing a clear dose response for lung cancer, however, a group of researchers from the University of North Carolina at Chapel Hill contended that the emissions from the accident should be considered causative for the observed excess incidence of cancer in the surrounding ten-mile area[11]. In order to justify their conclusion, the UNC researchers hypothesized that the doses to the affected population may have been much higher than generally accepted. There is little corroborating evidence for the claim. The Kemeny Commission, for instance, concluded that the greatest exposure to any individual due to the accident was only about 0.7 mSv.

The present article engages specifically with one piece of evidence cited by the UNC team supporting their view: the results of the cytogenetic analysis of 29 individuals, living near TMI at the time of the accident, who reported symptoms consistent with radiation poisoning contemporaneous with the accident[12]. The analysis produced dose estimates in the range of 600–900 mSv, orders of magnitude larger than the gamma ray doses estimated by the Kemeny Commission, the Nuclear Regulatory Commission[13,14], experienced nuclear industry consultants[15,16], or the Three Mile Island Public Health Fund[17]. While the results of the cytogenetic analysis have been published in the open scientific literature and are freely available, the existence of this information does not appear to be widely known.

While the dose estimate based upon cytogenetic analysis is sufficient to explain contemporaneous reports of acute effects, then, it contradicts firmly established estimates of the gamma dose to affected individuals. Because those gamma ray dose estimates are anchored to actual, physical measurements taken by dosimeter at the time of the accident, the cytogenetic results are difficult to explain. Although the conflict seems irreconcilable, in fact its existence illuminates a fundamental oversight in the health physics body of knowledge[18]. While the phenomenon of shot noise[19] deriving from the discrete nature of electrical charge has long been known to apply to biological systems at least in the context of nerve-muscle junctions[20] and membrane conduction[21], its application to radiobiology has up until the present time been neglected.

It will be shown (contrary to the assertions of authorities) that the gamma ray doses suffered by those in the path of the Xe-133 plume were far from the most significant exposures that occurred. The results of cytogenetic analysis are instead consistent with the effects of internal exposure to beta radiation. Correcting a fundamental oversight in the health physics body of knowledge—relating to shot noise in the context of radiobiology—resolves the apparent paradox. The finding should motivate a comprehensive re-evaluation of the conventional understanding of the 1979 accident at the Three Mile Island nuclear power station, especially regarding its impact upon the population of the surrounding area.

Materials and methods

Results of cytogenetic analysis. The microscopic study of chromosomes (termed cytogenetics) began in the 1930s and has been well-established for many decades. The field evolved jointly (frequently collaboratively) with the study of x-ray mutagenesis. Important early workers in these two fields included the American Nobel prizewinners Barbara McClintock[22] and H.J. Muller[23]. Due to their discoveries, along with the efforts of countless others, it has long been established that a) mutations due to ionizing radiation can be stably inherited across multiple generations, and b) the mutation rate increases linearly with dose[24]. The scientific heritage embodied by these findings was the genesis of the idea, first suggested in the early 1960's, that chromosomal aberrations might serve as a kind of retrospective biological dosimeter[25]. Practical cytogenetic dosimetry in humans was well-established by the late 1960s[26]. The International Atomic Energy Agency (IAEA) has maintained a program in biodosimetry for several decades and recommends that knowledge in this area should be employed to guide response in case of a radiation emergency[27].

Because in fact not all chromosomal anomalies are stably inherited across cellular generations, the general picture is more complex if dosimetry is contemplated many years or decades after exposure. In fact, the dicentric aberrations from peripheral blood lymphocytes typically employed for biodosimetry via "conventional" cytogenetic analysis are cleared from the body on an uncertain time scale of about three years or more[28]. Chromosomal aberrations of this kind are termed “unstable.” Since the mid-1990s, however, it has been possible instead to analyze for stable chromosome aberrations using the FISH (Fluorescent In-Situ Hybridization) method[29]. Biodosimetry using the FISH method is today well-established and has been employed to examine exposed populations including the survivors of the atomic bombings at Hiroshima and Nagasaki[30,31], radiation workers at Sellafield[32], atomic test veterans[33], and even astronauts on the International Space Station[34]. It is conventionally believed that population doses not lower than 100 mSv may be determined retrospectively using conventional cytogenetic methods[35], while the threshold for the minimum detectable dose using the FISH method is 200–300 mSv[36–40].

Since the sensitivity threshold for cytogenetic analysis of 100 mSv far exceeds the exposures understood to have occurred in the area surrounding the Three Mile Island nuclear power station in March–April 1979 (not greater than 2 mSv), state and national authorities of the United States appear not to have performed cytogenetic testing of any affected persons in an attempt to quantify the exposures due to the accident. Nevertheless, in the course of litigation such testing was performed on a relatively small number of persons, aged 16 to about 60 years[12], in 1994–1995 (fifteen years after the accident). The cytogenetic analysis was performed by experienced researchers from the Russian Academy of Sciences, who had previously applied these same methods to examine populations exposed by the Chernobyl accident[41,42], as well as releases from the Mayak plutonium production facility and fallout due to Soviet nuclear testing[43]. The results relevant to the Three Mile Island accident, published

		Conventional			FISH			
		#	Cells	C_{dr} (/1,000)	#	Cells	F_p (/100)	F_g (/100)
Altai-LL (alive 1949)	Exposed	84	22,195	1.9 ± 0.3	14	7,026	0.41 ± 0.08	1.29 ± 0.11
	Exposed				8	4,271	0.58 ± 0.12	1.82 ± 0.17
	Control	30	7,831	0.3 ± 0.2	12	13,586	0.10 ± 0.03	0.32 ± 0.05
TMI	Exposed	29	14,854	2.0 ± 0.4				
	Exposed	6	3,024	4.6 ± 1.2	6	3,468	0.49 ± 0.12	1.55 ± 0.21
	Control	82	26,849	0.2 ± 0.1				

Table 1. Summary of the results of cytogenetic testing, from[43]. The table describes the number of persons examined, the number of cells scored, and the rate of unstable dicentric and ring chromosomal aberrations, as well as the frequency of stable translocations and the genomic translocation frequency as determined by the method of Fluorescence In-Situ Hybridization (FISH). FISH analysis of the population of Laptev Log in the Altai Mountains (Altai-LL) revealed that the principal exposure occurred in 1949, subsequent to the Soviet Union's first nuclear test. The rate of stable translocations found among six persons living near Three Mile Island at the time of the 1979 accident indicates exposure nearly as great as that found among villagers exposed to bomb fallout in the Soviet Union.

in an academic format in a conference proceedings in English, as well as in a Russian-language journal[44], are given in Table 1.

Table 1 summarizes the results of both conventional cytogenetic analysis (examining both dicentric and centric ring chromosomal aberrations) and FISH analysis (examining symmetrical translocations) for the examined populations in two locations: residents of the village of Laptev Log in the Altai Mountains ("Altai-LL"), as well as residents of Pennsylvania living near Three Mile Island at the time of the 1979 accident ("TMI"). The Laptev Log exposures occurred subsequent to the Soviet Union's first test of an atomic weapon in 1949, which irradiated a large inhabited area in southern Siberia northeast of the test site in Kazakhstan. Experimental measurements and mathematical simulation revealed that the residents of Laptev Log received exposures of about 970 mSv as a result of the 1949 nuclear test.

The data labeled "Conventional" in Table 1 clearly indicate greatly elevated rates (by a factor of six to ten or more) of unstable chromosomal aberrations in the exposed populations compared to reference levels. The measured rates of chromosomal aberrations in the control populations were similar in both locations. The conventional cytogenetic results are strong evidence that significant exposures occurred among the population affected by the accident at Three Mile Island. However, because the types of chromosomal aberrations described are unstable with elapsed time, no retrospective dosimetric evaluation for either population can be supported on the basis of the cytogenetic testing results. For this reason, six persons from among the twenty-nine individuals from Pennsylvania for whom conventional cytogenetic testing was performed were selected for further evaluation using the FISH method.

The following expression relates the frequency of stable translocations f_{trans} to the absorbed dose D, measured in Grays[36,45]:

$$f_{trans} = 10^{-3}\{0.96 + 9.5D + 14.5D^2\}. \quad (1)$$

Applying Eq. (1), which assumes the dose to be prompt/acute in character, the measured frequency of stable translocations among the residents of Laptev Log who were alive in 1949 indicates an exposure of approximately 370 mGy. (Residents of Laptev Log born after 1949, who were not exposed to fallout from the Soviet Union's first nuclear test, showed a rate of stable translocations not significantly different from the control.) The dosimetry is complex, however, since the exposure was due to environmental contamination, difficult to characterize, and chronic or prolonged in character. Because acute doses are more efficient at producing chromosomal damage[46], an upward adjustment by a factor of two to three is justified[44]. In this manner one arrives at an exposure among the population of Laptev Log of approximately 1,000 mSv, which agrees with the result obtained from physical dosimetry and mathematical modeling.

A rate of stable translocations found among the TMI population similar to that found for the residents of Laptev Log (0.49 versus 0.58 translocations per 100 cells) implies a biodosimetric result of a similar magnitude. Equation (1) yields a value for $D = 300$ mGy, which if one applies the adjustment for non-acute exposures produces a dose estimate for those affected in the range of 600–900 mSv. While the result possesses a solid foundation and is consequently well-justified, it is important to acknowledge several significant caveats. First, there is no documentary evidence that the results were adjusted for age, which would be a requirement in the present day[47]. Second, there was no distinct control group for TMI FISH analysis. The researchers used the population from Laptev Log for this purpose. Third, since the duration of the TMI exposures is not really clear, it is uncertain that the additional factor of 2–3 × for protracted exposures is justified. Fourth, and finally, it is proper to ask whether testimony submitted in the course of a legal dispute is acceptable as a foundation for a scientific investigation.

The concern about age adjustment is entirely valid and would be a valuable area for follow-up expert review. Regarding the second concern, the finding from conventional cytogenetic testing that the rates of dicentric and ring chromosomal aberrations were similar between the control groups at both locations (each consisting of more than eighty persons) is reassuring. As to the third point, it will be shown that the duration of the TMI exposures exceeded twenty-four hours. The exposure therefore certainly cannot be described as acute in character. Finally,

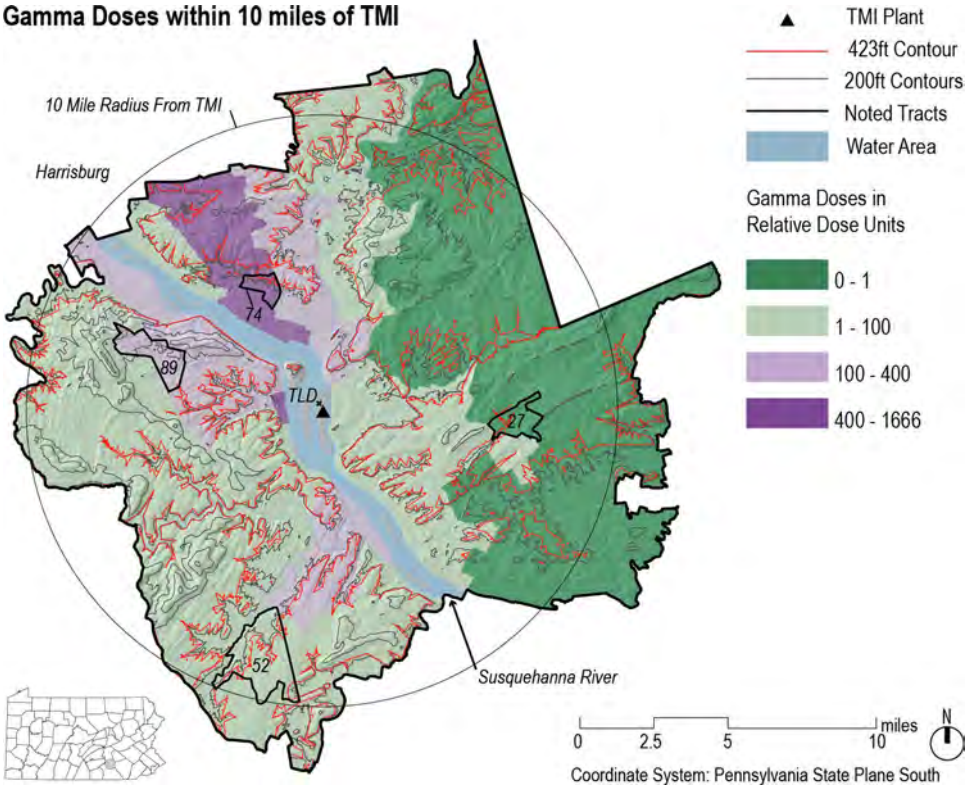

Figure 1. Gamma dose estimates by BDC for the region within ten miles of Three Mile Island, reduced to four categories of exposure for ease of visualization. The northwesterly path of the most intense releases is clear. In the base case scenario, the peak value of 1666 relative dose units corresponds to a gamma dose estimate of 1.1 mSv. The 423-foot contour corresponds to the elevation of the release point. The TLD at the indicated location recorded a gamma dose of 10.26 mSv. The map was created using the QGIS 2.14 software package (https://qgis.org).

the researchers who performed the work were well-credentialed in the Soviet Union and possessed decades of relevant experience. While it is naturally vital to maintain a healthy level of skepticism on any controversial topic, there is no justification for failing to at least consider the results of cytogenetic testing in this situation.

Nature and magnitude of the Xe-133 exposure. Estimates of the release rates provided by the Nuclear Regulatory Commission correspond to an overall source term due to the TMI accident of about 7 million Curies (MCi) Xe-133[48]. According to the report of the Kemeny Commission, noble gas emissions due to the accident were 13 MCi or less, with whole-body gamma doses to the local population not greater than 0.7 mSv. Researchers working for the Three Mile Island Public Health Fund several years later (henceforth referred to by their initials, BDC) concluded that the likeliest value of the source term was 22 MCi, with doses to individuals from the Xe-133 release as large as about 2 mSv[17].

BDC based their analysis upon meteorological data, available in 15-min increments, along with the readings of twenty thermoluminescent dosimeters (TLDs) surrounding the TMI facility. Only four of the dosimeters registered exposures greater than 1 mSv. The wind direction was measured with an accuracy of five degrees. As shown in Fig. 1, BDC determined that the most significant exposures occurred northwest of the reactor, coinciding with the wind direction during the hours of peak Xe-133 emission. Therefore the seven tracts northwest of TMI with doses between 400 and 1,600 relative dose units are referred to as "downwind".

Because information about the effluent temperature was not captured during the accident at TMI-2, the base case scenario cannot be regarded as definitive. Since a plume with greater rise must contain more activity in order to generate the ground level doses measured by TLD, there is very significant uncertainty related to plume rise. BDC dealt with this uncertainty in two ways. Firstly, the authors considered a range of values for the plume rise, between zero and high thermal buoyancy. For temperature differences of 0, 10, and 100 °C degrees, BDC found maximum gamma doses at any receptor equal to 1.0, 2.1, and 3.8 mSv, respectively, with total releases of 8.6, 22.1, and 45.4 MCi. The base case (most likely) scenario was judged to be the modest temperature difference of 10 °C. Secondly, BDC defined their results using a relative scale, measuring the gamma dose between zero and 1666 relative dose units. Using a relative scale to measure exposure preserved the ability to compare outcomes between tracts (supporting epidemiological investigation) without specifying the maximum dose in physical units.

Consideration of the thermal rise uncertainty emphasizes the nature of the BDC analysis, which is the outcome of a model anchored to measurements. The dose estimates across more than sixty tracts illustrated in Fig. 1 do not themselves directly represent measurements of gamma dose. If the chosen model assumptions were not

well-justified or did not reflect the actual meteorological conditions existing near TMI at that time, then the results of the BDC model might not be strictly correct. The concern is legitimate because direct measurements of the Xe-133 plume made by helicopter at the time of the accident (although hours after the period of greatest release) revealed it not to conform to a classical Gaussian plume shape, even exhibiting a tendency to "puddle" under conditions of light wind[49]. Nevertheless, for purposes of discussion and clarity this report assumes the BDC base case analysis to be correct.

The analysis performed by BDC divided the hours following the accident into seven distinct time segments, covering 38 h in total. The release rate within each segment was assumed to be constant. BDC utilized the available meteorological data with a variable-trajectory puff model to calculate the gamma dose to each receptor via a point-kernel method of integration over the extent of each puff at a given time. The spatial extent of each puff was characterized using the Pasquill–Gifford dispersion coefficients, consistent with experimental results for dispersion of a continuous-release plume[50]. The results are summarized in Table 2. BDC concluded that most of the Xe-133 release occurred during two distinct intervals (Interval 3 and Interval 4) beginning at 14:00 h on 28 March 1979. 80% of the total emissions were released during Interval 3 and Interval 4.

Published data indicate that the wind measured at TMI blew steadily to the northwest, with class E stability conditions, beginning at 17:00 h March 28, partway through Interval 3. The shift in wind direction motivates the division of Interval 3 into two segments, Interval 3a and Interval 3b. Because the wind direction was consistent to the northwest during all of Interval 3b and Interval 4, the exposures received in downwind tracts accrued almost solely during these hours, when the recorded wind speed lay between 3.2 and 4.5 m/s. The average wind speed was u = 3.9 m/s[51]. The data describing wind speed and direction utilized in this report are resolved to one hour and 22.5 degrees, respectively, which is inferior to the meteorological data employed by BDC.

For the base case scenario with a 10 C° temperature difference, BDC found the greatest dose encountered in any study tract to occur in Tract 74, an area located approximately 7.37 km northwest of the TMI-2 vent stack. The tract is labeled in Fig. 1. The Tract 74 gamma dose of 1.1 mSv was averaged spatially over not fewer than ten receptors, with the greatest dose calculated at a single receptor of D_γ = 2.1 mSv. The difference between the maximum and average doses implies a narrow plume and very steady wind conditions (that is, constant puff trajectories). Using the standard expression for a Gaussian plume, along with the PG dispersion parameters, the Xe-133 release rates calculated by BDC, and an assumed 50 m plume rise, a point-kernel calculation gives a ground-level gamma dose of 0.90 mSv during Interval 3b, followed by an additional 1.20 mSv during Interval 4. The combined gamma dose of 2.1 mSv corresponds precisely to the BDC result. The calculated Xe-133 concentration at the receptor is $\chi = 0.55$ μCi/l during Interval 3b, increasing to 3.5 μCi/l during Interval 4. For reference, the limit set by the Nuclear Regulatory Commission for occupational exposures to airborne Xe-133 is 0.1 μCi/l [52].

The kinetics of inhaled xenon gas in the human body. The half-life of Xenon-133 is 5.25 days. The radioisotope decays with a total energy of 427.4 kilo-electron Volts (keV). In its principal decay path, this energy is divided between an 81 keV gamma ray and the kinetic energy of a beta particle, up to a maximum of $Q = 346.4$ keV. The average beta particle kinetic energy $E_{av} = 100.5$ keV[53]. Because the mean free path of a 100 keV beta particle in air (0.13 m)[54] is far less than the mean free path of an 81 keV gamma ray (50 m)[55], the external gamma ray dose dominates other contributions to the total dose received due to immersion within a dilute cloud of Xe-133. According to the conventional understanding, it follows that the beta dose may for the most part be neglected. Anticipating the shot noise result of the next section, however, it is worthwhile to examine the situation more deeply.

A person immersed in a cloud of Xe-133 will suffer internal exposure via the inhalation pathway in addition to external gamma-ray and beta-ray exposures. For example, the concentration of Xe-133 in the lungs will be equal to the ambient concentration in air. The internal beta-ray exposure is not confined to tissue in the lung and respiratory pathway, however. Based upon fundamental considerations, one expects that gaseous xenon will be absorbed into the blood from the lungs[56,57]. Furthermore, because the hemoglobin molecule possesses a significant affinity for xenon[58], circulating blood carries dissolved Xe-133 throughout the entire volume of the body, which observation explains the utility of gaseous xenon as an anesthetic agent[59,60]. The uniform distribution of Xe-133 via the circulatory system creates a uniform whole-body beta dose to tissue due to internal incorporation of the radionuclide. Because of shot noise, the biological effect of this exposure can be very great.

Investigations examining the uptake of Xe-133 in human subjects were performed by researchers in the Soviet Union using a hermetic exposure chamber[61]. The researchers observed that the biological half-life of Xe-133 in lungs and blood is only 30 s, indicating free exchange between the lungs and the circulatory system. The distribution factor in human blood (alternatively known both as the blood-gas partition coefficient, and as the Ostwald coefficient, λ) was measured to be $\lambda = 0.17$ ml/g (averaged among four test subjects) after nine hours of exposure. The value is somewhat higher than the value of $\lambda = 0.14$ ml/g generally accepted in the anesthesiology community. There is additional evidence, including recent experimental results, that the value might be as low as $\lambda = 0.115$ ml/g[62–64].

While the blood-gas exchange describes how Xe-133 enters the human body, the residence time and distribution of the radionuclide in tissue are more complex. The noble gas is soluble in tissue—in fat especially—and is observed to both accumulate and dissipate following exponential curves with time constants as large as several hours. Full saturation is observed only after an exposure duration exceeding about twenty hours. The results published by Turkin and Moskalev, presented in Table 3, summarize the relevant findings[61]. It is notable that the distribution factor in fat tissue is nearly ten times larger than the blood-gas partition coefficient.

Using the constant values of the ambient Xe-133 concentration during Interval 3b and Interval 4 from Table 2 and the half-lives of Xe-133 dissolved in tissue from Table 3, it is possible to create a time profile of the

Interval	Times of day (28–29 March)	Duration (h)	Release Rate (MCi/hr)	Activity (MCi)	Wind direction	D_γ(mSv)	[Xe-133] (μCi/l)
1	04:00–11:45	7.75	0.067	0.52	Shifting		
2	11:45–14:00	2.25	0.287	0.65	S		
3			1.040	9.36			
3a	14:00–17:00	3.00			SSW		
3b	17:00–23:00	6.00			SSE	0.9	0.55
4	23:00–00:15	1.25	6.600	8.25	SSE	1.2	3.5
5	00:15–01:30	1.25	0.038	0.048	S		
6	01:30–07:30	6.00	0.398	2.39	Shifting		
7	07:30–17:15	9.75	0.106	1.03	Shifting		
			TOTAL	22.3		2.1	

Table 2. Time intervals and base case release rates as determined by BDC[17]. The wind blew steadily to the northwest with Class E stability conditions beginning at 17:00 h on 28 March 1979, throughout all of Interval 3b and Interval 4. The gamma dose and ground-level Xe-133 concentration are calculated using the point-kernel method, assuming a plume rise of 50 m in accordance with the base case scenario.

	λ (ml/g)	τ_{abs}	τ_{rel}
Fat tissue	1.4	5 h	6.3 h
Muscle and other tissue	0.13	0.4 h	0.7 h
Blood	0.17	30 s	30 s
Lungs	2	30 s	30 s

Table 3. Parameters describing the kinetics of Xe-133 in the human body, as determined by researchers in the Soviet Union[61]. τ_{abs} and τ_{rel} represent the half-lives for absorption by and release of Xe-133 from tissue, respectively.

concentration of this noble gas in human tissue due to inhalation following release from the TMI facility. For example, for absorption toward saturation the concentration in tissue is given by the expression.

$$c(t) = c_o + (\lambda\rho\chi - c_o)\left[1 - exp(-t \cdot ln2/\tau_{abs})\right]. \quad (2)$$

For the release from tissue after dissipation of the external plume, the concentration in tissue instead has the form.

$$c(t) = c_o exp(-t \cdot ln2/\tau_{rel}). \quad (3)$$

In Eqs. (2) and (3), c represents the concentration of Xe-133 in tissue (in units of μCi/l), c_o is the concentration c at time $t = 0$, ρ is the density of water, and the term *ln(2)* arises because the time constants are defined as half-lives. The expressions of Eqs. (2) and (3) describe responses to stepwise changes in the ambient concentration either upward, from an initial concentration c_o possibly different from zero, or downward, to zero concentration.

The time profile of the Xe-133 concentration in tissue is shown in Fig. 2. The figure demonstrates that the tissue of persons in Tract 74 during the evening hours of 28 March 1979 was contaminated with concentrations of Xe-133 on the order of 0.1 μCi/l. The result was a uniform internal exposure to tissue due to energetic beta particles, with a range in tissue of about 1 millimeter[54,65]. The exposure persisted for more than forty hours.

Realistically, because the intervals of greatest release included evening and late evening hours when most persons affected were indoors, and because overnight temperatures were cold (between 30 and 40 degrees Fahrenheit) in Middletown, PA, on 28 March 1979, shielding may have had some impact and should be considered. Under cold weather conditions in residential buildings of that era in Pennsylvania, it is reasonable to assume neutral pressurization resulting in infiltration at a rate of one air change per hour (1 ACH)[66]. A simple description of air exchange using a single time constant to characterize both infiltration and exfiltration yields a peak indoor concentration of around 2.5 μCi/l, about 30% lower than the ambient value outside. However, because infiltrated air does not dissipate immediately when the external plume is removed, an increased duration of exposure is found to compensate for the lower indoor peak concentration. Because the net result is found to be little different from the case with no shielding, only the case of exposure to the outdoor ambient concentration is considered further.

The next section describes the shot noise result for the time-averaged power dissipated in tissue due to radioactive decay. Due to shot noise, it is dramatically incorrect to neglect the effect of the internal exposure to Xe-133 just derived.

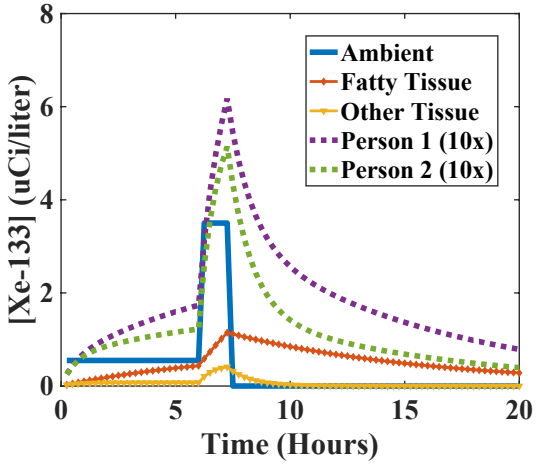

Figure 2. Concentrations of xenon-133 in the atmosphere (solid line), in fatty and other tissue (marked lines), and averaged according to Eq. (10) for Person 1 and Person 2 (dashed lines, magnified by 10 × for clarity).

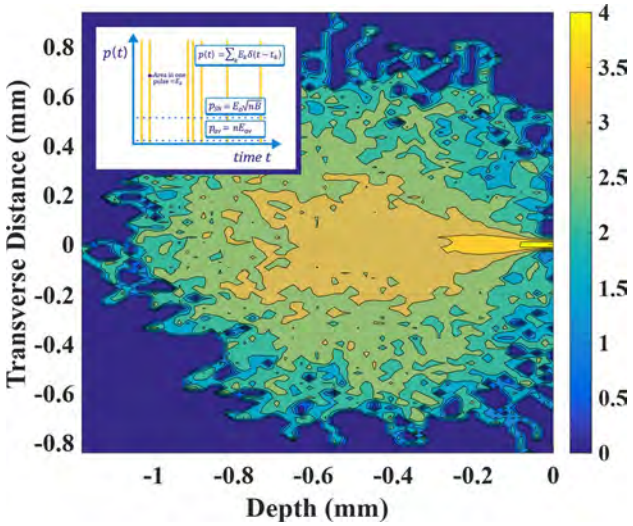

Figure 3. Illustration of the beta particle interaction volume in cross-section for $Q = 364.4$ keV, obtained by Monte Carlo modeling with two million individual interactions. The volume is determined by rotation of a two-dimensional slice in the transverse direction around the central axis. The image was created using the 2016 version of MATLAB (www.matlab.com). The color scheme is logarithmic. (inset) Schematic describing the pulse train $p(t)$ of Eq. (4), illustrating the difference between the instantaneous power, the average power, and the shot noise power.

The biological effect of an internally incorporated beta-emitting radionuclide. As a model of living tissue, consider a quantity of water (denoted sample A) in which Xe-133 is dilutely incorporated. The chemically reactive free radicals generated in sample A by radiolysis following beta particle emission possess a short lifetime on the order of 1 ns[67–69] and are confined within a small interaction volume V delimited by the beta particle range. The results of Monte Carlo modeling[70,71] for electrons with the maximum kinetic energy $Q = 364.4$ keV, illustrated in Fig. 3, indicate that the interaction volume possesses the shape of a teardrop[72], with a volume of about $V = 1.6$ mm^3.

As an example, assume the Xe-133 concentration in sample A to be equal to the ambient atmospheric concentration during Interval 4, $c = 3.5$ μCi/l. In this case, on average one instance of beta decay occurs in a given interaction volume only every 4.8 s. Compared to the time scale set by the rate of the chemical reaction, decays are very infrequent, and a state of chemical equilibrium exists at most instants of time. However, when a decay does occur, the instantaneous power dissipation and the degree of chemical disequilibrium are very large relative to their average values. The instantaneous power dissipation $p(t)$ in the volume V is accurately described using a pulse train:

$$p(t) = \sum_k E_k \delta(t - t_k). \tag{4}$$

In Eq. (4), δ represents the Dirac delta function, with infinitesimal width and unit area, while E_k represents the kinetic energy of the kth beta particle emitted at random time t_k. The time-averaged power dissipation $\bar{p}$ is given by the equation[18,19].

$$\bar{p}^2 = E_o^2 nB + E_{av}^2 n^2. \tag{5}$$

In Eq. (5), E_o and E_{av} represent the expected value and the average value of the beta particle kinetic energy spectrum, respectively, the pulse emission rate $n = cV$, and B represents the bandwidth expressing a limit to the speed of the chemical reaction that dissipates power in solution and is responsible for biological injury. The value of $B = 1.59 \times 10^8\ s^{-1}$ corresponds to the hydroxyl radical lifetime of 1 ns.

Recognizing that the average power is given by the expression $p_{av} = \int_0^T p(t)dt/T$, it follows that the second term on the right-hand side of Eq. (5) represents the average dissipated power: $p_{av} = nE_{av}$. The first term, on the other hand, exists to account for the high level of instantaneous dissipated power associated with a single, individual pulse, or "shot". The excess contribution due to this term is denoted the shot noise dissipated power,

$$p_{SN} = E_o \sqrt{nB}. \tag{6}$$

Equation (5) for the time-averaged dissipated power may therefore be easily understood as the sum in quadrature of two independent contributions: $\bar{p}^2 = p_{SN}^2 + p_{av}^2$. In most practical circumstances $n << B$, so that the shot noise dissipated power dominates the average power by orders of magnitude. In short, the shot noise contribution to the time-averaged dissipated power may not be neglected and ought not to be overlooked.

The formalism of microdosimetry offers a convenient means by which to determine the reference dose to the model tissue of sample A. According to this framework, the energy ε imparted to a volume of interest is defined as the sum[73].

$$\varepsilon = \sum_i^N \varepsilon_i. \tag{7}$$

In Eq. (7), ε_i is a stochastic quantity representing the energy deposited by a single ionization event or interaction. The random character of the energy deposits arises because the approach focuses on small interaction volumes (about one micron or less in size) corresponding to the size of biological targets of interest. The fluctuations considered are spatial in nature since ionization events occur in certain discrete locations—and are even clustered together in some instances—but are absent in others. The reference or equivalent dose is defined as the ratio of the mean energy $d\bar{\varepsilon}$ imparted to the volume of interest to the mass of that volume, dm.

Considering that the pulse train expression of Eq. (3) describes fluctuations of a temporal, rather than spatial, character, it is obvious that Eq. (7) is not perfectly general: the expression in no way accounts for the temporal distribution of ionization events. The approach is not suitable to describe chemical effects arising from the instantaneous concentration of free radicals, the class of so-called "indirect effects". A more general expression accounting for the temporal distribution of ionization events within the well-defined interaction volume V is.

$$\varepsilon = \int_0^T p(t)dt. \tag{8}$$

In Eq. (8), $p(t)$ refers to the pulse train expression of Eq. (4), while T represents the duration of exposure. The expression is merely a clear statement of the basic relationship between energy and instantaneous dissipated power.

It follows from Eq. (8) that the mean energy imparted to the interaction volume is $d\bar{\varepsilon} = T\bar{p}$, with $\bar{p}$ given by the expression for the time-averaged dissipated power, Eq. (5). In order to contextualize the foregoing, now consider a second small volume of water, sample B, irradiated with x-rays in order to replicate the power dissipation within and the chemical state of sample A. The x-ray dose to sample B is simply the reference dose to sample A, $D_{ref} = d\bar{\varepsilon}/dm$. The result is.

$$D_{ref} = \frac{E_o T}{\rho V} \sqrt{cVB}. \tag{9}$$

Because $n << B$ in virtually any imaginable practical situation, one expects the reference dose to sample B to be orders of magnitude larger than the beta dose to sample A responsible for the chemical effect.

Since the reference dose represents a notional exposure to x-rays, Eq. (9) is compatible with the Linear No Threshold (LNT) framework describing x-ray carcinogenesis[74]. The reference doses D_{ref} in successive time short time intervals dt with constant concentrations $c(t)$ may therefore be straightforwardly summed. It follows that it is a simple matter of integration to determine the reference dose when the concentration c is changing in time, as illustrated for instance in Fig. 2.

Results

Fundamentally, this report addresses a single question, motivated by the nature and magnitude of the exposures believed to have occurred immediately following the accident at Three Mile Island. What is the single best value expressing the magnitude of an x-ray reference dose generating a degree of chemical disequilibrium equivalent to

Person	% Body fat	Reference dose D_{ref} (mSv)	
		Weighted by concentration	Weighted by dose (whole body)
1	28	1,700	1,200
2	14	1,300	820

Table 4. Whole body reference doses using different weightings for fatty and non-fatty tissue, for two persons with different percentages of body fat. The beta doses to Person 1 and Person 2 are 9 μGy and 6 μGy, respectively, three orders of magnitude less than the gamma ray dose and nearly six orders of magnitude less than the reference dose representing the true biological impact.

that resulting from the non-uniform internal incorporation of radioxenon at concentrations of about 0.1 μCi/l? Because the human body is structurally complex across many scales of length and because xenon dissolves preferentially in fatty tissue, it is not immediately obvious how properly to apply the result of Eq. (9) to address the question. Nevertheless, insight can be obtained from the examination of simple models. For instance, since every human body consists of some combination of fatty and non-fatty tissues, consideration of each sort of tissue on its own describes two limiting cases. Applying Eq. (9) to the time series concentrations illustrated in Fig. 2 and integrating numerically, the reference doses to fatty and non-fatty ("other") tissues are found to be $D_{fat} = 2{,}900$ mSv and $D_{other} = 470$ mSv, respectively. The limiting values for non-fatty and fatty tissues accord with the results of cytogenetic analysis in the range of 600–900 mGy.

Two simple models may additionally be suggested. If fatty and non-fatty tissues are intermingled on length scales of less than about one millimeter (the beta particle range), for instance, then one might consider modeling the inhomogeneous distribution of Xe-133 throughout the human body with an average concentration weighted by the percentage of body fat,

$$c_{avg} = f c_{fat} + (1 - f) c_{other}. \tag{10}$$

In Eq. (10), f represents the percentage of body fat, c_{fat} the concentration of Xe-133 in fatty tissue, and c_{other} the concentration of Xe-133 in muscle and other tissue. The average Xe-133 concentration c_{avg} is then utilized in Eq. (9) to calculate the reference dose.

On the other hand, if fatty and non-fatty tissues are distinct on length scales of one millimeter and greater—so that the concentration of Xe-133 can be sensibly defined as spatially inhomogeneous—it is nevertheless true that the reference dose of x-rays refers to a spatially homogeneous whole-body exposure. In this case, one might consider instead weighting by the reference doses to each kind of tissue:

$$D_{ref} = f D_{fat} + (1 - f) D_{other}. \tag{11}$$

In Eq. (11), D_{fat} and D_{other} each refer to the reference dose result of Eq. (9) using the individual Xe-133 concentrations in fatty and non-fatty tissue, respectively. The results of calculations for two archetypical persons, using both approaches, are given in Table 4. The results lie between 820 and 1,700 mSv, which corresponds reasonably well (perhaps higher by a factor of less than two) to the results of cytogenetic testing. A comprehensive attempt at error analysis is not justified because, among other factors, the author is not aware whether any of the individuals who underwent cytogenetic testing were in fact in or near Tract 74 at the time of the accident. Nevertheless, the demonstrated agreement is sufficient to justify further careful investigation.

Discussion

The work described in this report about the 1979 incident at the Three Mile Island nuclear power plant in Pennsylvania is motivated by a paradox: the published results of biodosimetry and of physical dosimetry (coupled with the modeling of atmospheric dispersion) relating to the accident disagree by a factor of around 1,000. It has been shown that the paradox is neatly resolved if one separates the causes of the biological and physical dosimetric results while simultaneously addressing a serious oversight in the field of microdosimetry. Regarding the first point, while the physical dosimetry supports assessment of the degree of external exposure to gamma rays (around 2 mSv), this report has argued that the biodosimetric result arises from internal exposure to the beta-emitting radionuclide Xe-133. Regarding the second point, the conventional expression for the energy imparted to tissue, ε, does not consider the temporal character of energy deposition and therefore cannot account properly for the nature of the chemical insult to tissue resulting from exposure to an internally incorporated beta-emitting radionuclide. The general expression of Eq. (8)—which reduces to the conventional expression of Eq. (7) for $n >> B$—must be utilized instead. The surprising numerical results presented therefore essentially derive straightforwardly from a basic application of the calculus, which should not be in the least controversial.

Since it is widely and commonly believed that no one was harmed by the Three Mile Island accident, certainly it will be found controversial to assert that exposures equivalent to nearly 1,000 mSv did occur and have been legitimately verified in the population living near the TMI facility at the time of the accident using biodosimetry. The assertion is provocative and seems, superficially at least, to be highly unconventional. For this reason, it is valuable to examine the claims that have been presented for their concordance with existing and established scientific knowledge. What controversial assertions have been made?

The four components of the argument presented include the cytogenetic analysis along with the three complementary pieces of information required to derive a comparison to the results of that analysis: calculation of the ambient concentration of Xe-133, χ, further calculation of the concentration of xenon in the tissue of a

human being, c, and finally the application of shot noise statistics to determine the power dissipated in tissue due to radioactive decay (p_{SN}) and the reference dose D_{ref}. Regarding the concentrations of xenon-133 in the atmosphere and in human tissue, although the values utilized in this report are not accurately known with high confidence, the claims are entirely conventional. While the BDC results for the source term and greatest exposure are a few times higher than the conventional belief as expressed by the Kemeny Commission report (22 MCi vs. 2.4–11 MCi and 2.1 mSv vs. 0.7 mSv), the atmospheric modeling was performed carefully following established methods[75], and there seems to be no basis upon which to question atmospheric concentrations of xenon-133 on the order of 1 μCi/l persisting for multiple hours. Furthermore, the basic claims that the gas passes easily from the atmosphere into the bloodstream and accumulates preferentially in fatty tissue, from which it is slowly released on a time scale of hours, are firmly established experimentally.

Regarding the shot noise dissipated power and the reference dose, on the other hand, certainly a claim has been made contrary in at least some respects to established belief in the field of health physics. If Eq. (9) is correct, for instance, then it follows that no radiation weighting factor w_R can be defined for exposure to an internally incorporated beta-emitting radionuclide[76]. The statement certainly contradicts the conventional belief that $w_R = 1$ for exposure to beta radiation[77]. Nevertheless, the expression of Eq. (6) for the shot noise dissipated power is precisely analogous to the Schottky result for the shot noise current in an electrical circuit, a century-old finding well-known within the electrical engineering and applied mathematics communities[78]. While undoubtedly new information to workers in health physics and radiobiology, the expression for the shot noise dissipated power therefore possesses a solid foundation and must be considered firmly established. Derivation of the reference dose expression of Eq. (9) additionally requires only the redefinition of the energy imparted to tissue to properly account for the temporal character of energy deposition. The adjustment is fully justified simply by the elementary statement that energy is the time integral of dissipated power.

For this reason, while the results of the reference dose calculations given in Table 4 may rightly be considered surprising, the theoretical foundation supporting the calculations must be considered sound and well-established. Beyond the theory, however, the expression of Eq. (9) for the shot noise reference dose has in fact been verified experimentally in a relevant model system[76,79]. Future investigation is urgently needed and may offer additional support. Since both isotopes are beta-emitters, for instance, existing work examining tritium[80,81] or the medical administration of I-131[82–84] may additionally validate the presence of shot noise in a radiobiological system in vivo.

It remains to consider the cytogenetic analysis, which was performed by qualified experts, employed the accepted FISH method examining stable chromosome aberrations, and followed applicable IAEA guidelines[85]. While the results of cytogenetic analysis of a small number of persons should not be fully embraced without appropriate skepticism, it would at a minimum be possible for outside experts to review the authors' conclusions on the basis of their published observations. A more vigorous approach, however, would be to undertake a rigorous, transparent, and comprehensive program of cytogenetic testing in the present day. It is only forty years since the 1979 accident at Three Mile Island. The Russian experience with the Altai population—where the time lag between exposure and cytogenetic testing was forty-three years—confirms the feasibility of the proposal. Many of the individuals affected by the meltdown at Three Mile Island in Pennsylvania may still be alive, could be identified, and might be willing to cooperate with investigation, including cytogenetic testing and verification of their location on 28–29 March 1979. Persons who did not exhibit obvious signs of radiation sickness at the time of the accident could easily still have received reference doses exceeding the detection threshold.

A short statement about error analysis is also appropriate. The reasonable numerical agreement between the results of cytogenetic testing (600–900 mSv) and theory (820–1,700 mSv) is a statement of best knowledge, but it is perhaps better understood as the result of a model rather than a statement of fact. In the model, the BDC results for Xe-133 emission rates and atmospheric dispersion are assumed to be strictly correct, and the affected individuals are assumed to have been in place, out of doors, at the single location identified by BDC as suffering the greatest gamma exposure (Tract 74) at the time of the accident. Whether these two assumptions are correct dominates all other contributions to the overall uncertainty, including for instance uncertainties involving the free radical lifetime (which could be either more or less than 1 ns), the interaction volume (which might be judged larger if the number of electron tracks simulated were increased), the parameters describing the biokinetics of inhaled xenon, the effect of shielding (if any), and even the dose rate factor of 2–3 × applied to the results of cytogenetic analysis. A strict quantitative judgment is therefore not really supportable. Instead, a justifiable conclusion is that a discrepancy of three orders of magnitude (that is, the 2.1 mSv gamma exposure, based upon physical dosimetry, versus 600—900 mSv by biodosimetry) has been reduced to zero orders of magnitude (a factor of less than two). Although it remains to investigate many specific details, shot noise resolves what otherwise appears to be an insurmountable paradox.

In closing, there is actually one location where the ambient concentration of Xe-133 due to the most intense release was directly measured. Scientists working for the New York State Department of Health in Albany reported these results in *Science* magazine[48]. Using cryogenic separation and beta spectroscopy, the researchers measured Xe-133 concentrations of 3.1–3.9 pCi/l in air samples taken between 15:00 h on 30 March and 01:45 h 31 March 1979. They also deployed a semiconductor detector to observe the 81 keV Xe-133 gamma ray line in ambient air in the laboratory, from which results of 1.4 and 1.1 pCi/l over sampling periods from 12:30 29 March to 15:00 30 March and 15:30 30 March to 08:30 2 April were obtained. Using the ambient activity values, Wahlen and colleagues calculated whole-body doses to individuals in the Albany area of 40 nSv due to the passing cloud of Xe-133.

The data do not provide a precise means to determine the onset of exposure in Albany in 1979, but by way of a reasonable comparison one might consider exposure to a dilute cloud of Xe-133 at a concentration of 1 pCi/l persisting for 24 h. Following the calculational framework presented in this report the shot noise reference dose

in this case comes to around 2–3 mSv, which is about the same as the BDC result for the greatest gamma ray dose encountered in the vicinity of the Three Mile Island facility at the time of the accident. The discrepancy between the calculated whole-body gamma ray dose and the shot noise reference dose representing the true biological impact to those persons living in Albany, NY, in 1979 is of the order of fifty thousand times.

Conclusion

While the conventional belief is that no one was harmed by exposure to ionizing radiation due to the 1979 accident at the Three Mile Island nuclear power plant, actually the most comprehensive epidemiological evidence addressing the question is equivocal. Researchers have found that the population near the facility does appear, by comparison to control (unexposed) populations, to have suffered health decrements including cancer, cardiac disease, and early mortality. Because the whole-body gamma ray doses are deemed too small to have been causative of the observed medical impacts, however, researchers concluded that exposure to ionizing radiation cannot have been responsible for the health impacts observed.

The fundamental contribution made by this report is the presentation of evidence pointing out a serious logical flaw in the exclusionary reasoning employed: it relies upon the health physics body of knowledge, which is incomplete in an important and fundamental respect. While dose measures solely the energy dissipated in tissue, without regard for its temporal distribution, the chemical impact of dilute contamination with the beta-emitting noble gas Xe-133 results precisely from the instantaneous temporal distribution of ionization events (and not at all from the dose, which is indeed negligible). The definition of the energy imparted to tissue, ε, must be expanded to properly represent the very large departures from chemical equilibrium caused by beta emission due to an internally-incorporated radionuclide. With this single, simple, and well-justified modification to the definition of a single microdosimetric parameter, reference doses to the most-exposed population near Three Mile Island in the range from 820 to 1,700 mSv are obtained. The results are of similar magnitude (larger by less than a factor of two) to the results of cytogenetic analysis showing exposures in the range of 600–900 mSv.

The information presented therefore represents a paradigm shift[86] in the field of health physics. If a gamma ray dose not greater than 2 mSv were indeed the greatest exposure suffered by any individual near Three Mile Island at the time of the accident, then it would in fact be impossible to engage usefully with the results of cytogenetic analysis indicating exposures of nearly 1,000 mSv. It is not possible, in the real world, to chase down every lead, to engage with every experimental finding, or to reconcile every assertion. With the result of Eq. (9) for the shot noise reference dose, however, the results of cytogenetic analysis—possibly as well as the epidemiological findings—are suddenly easily explainable. It is merely a matter of detail to resolve a discrepancy of about a factor of two. It follows that the true history of the Three Mile Island accident and its impacts upon the health of the surrounding population may remain to be written.

The work has significant implications at many levels and deserves widespread attention, not limited to re-evaluation of existing knowledge or past epidemiological investigations. It does appear that a substantial revision to the body of knowledge in the field of health physics is required to bring it into concordance with a well-established scientific result, published a century ago, deriving from the discrete nature of the electron. Because the health physics body of knowledge is incomplete as regards the biological action of dilute concentrations of internally-incorporated beta-emitting radionuclides, existing work in the area of reactor accident consequence analysis[87] is not constructed upon a firm scientific foundation, and regulations governing batch releases from operating nuclear reactors[88] are not protective to the public as intended. Moreover, if the conventional understanding that no one was harmed by the Three Mile Island accident is incorrect—as it happens, due to the failure to apply elementary calculus—then society-wide arguments about the safety, utility, desirability, and necessity of nuclear power have been badly misinformed for more than a generation. Further investigation is urgently needed, including hopefully the institution of a comprehensive program of cytogenetic testing focused upon those persons still alive who suffered exposure to the plume of Xe-133 released during the accident at Three Mile Island forty years ago. The subject population would be restricted to willing participants who can be positively identified and whose locations on 28–29 March 1979 are known with certainty.

Statement on use of experimental animals or human subjects. The author declares that he has performed no experimental work involving animal subjects or human participants in the course of his research.

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Competing interests

The author declares no competing interests.

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