

CapX 2020 Technical Update: Identifying Minnesota's Electric Transmission Infrastructure Needs

May 2005

EXECUTIVE SUMMARY

Background

Minnesota's electric transmission infrastructure, a network of transmission lines of 230 kilovolts and higher, primarily was designed and built during the 1960s and 1970s. As explained in CapX 2020's December 2004 interim report, the system is adequate to meet today's needs. But to support customers' growing demand for electricity, this high-voltage transmission system in Minnesota and neighboring states requires major upgrades and expansion during the next 15 years.

To ensure that this backbone transmission system is developed and available to serve growing demand for electricity and to plan for major capital expenditures, Minnesota's largest transmission-owning utilities—Great River Energy, Minnesota Power, Missouri River Energy Services, Otter Tail Power Company, Southern Minnesota Municipal Power Agency, and Xcel Energy—initiated the CapX 2020 project.

CapX 2020's mission is to:

- Create a joint vision of required transmission infrastructure investments needed to meet growing demand for electricity in Minnesota and the region.
- Work to create an environment that allows these projects to be developed in a timely, efficient manner, consistent with the public interest.

The utilities have completed a draft study that defines a vision for transmission infrastructure investments needed in Minnesota through 2020. That technical study, which meets the first part of CapX 2020's mission, is described in this report. Studies will continue to determine which facilities will need to be built first. As other regional transmission studies are completed, they will be integrated into the CapX 2020 study. A report that describes progress on the second part of CapX 2020's mission, including pending legislation, is planned for this summer.

Study overview

In developing this long-range plan for major new construction, the CapX 2020 technical team considered two potential scenarios for growth in electricity demand:

1. Anticipated load growth of 2.49 percent annually from 2009 through 2020, for an increase of 6,300 megawatts. This is based on load projections for utilities with customers in Minnesota, published by the Mid-Continent Area Power Pool (MAPP) in the *2004 MAPP Load and Capability Report* and in recent utility resource plan filings. Load growth of 6,300 MW would require over 8000 MW of new generation, given losses that occur when transmitting electricity, electric service to generation stations, and planning reserve margins of 15 percent to ensure reliability.

2. Slower load growth—about two-thirds of the published load projections—of 4,500 MW.

Based on information from independent power producers, wind developers, utility resource planning staff, and the Midwest Independent Transmission System Operator’s generation interconnection queue, the team also worked out three generation scenarios, each including 2,400 MW of renewable energy, to illustrate potential locations of new electric generating plants or wind farms.

The goals were to identify new transmission *independent* of where plants are located *and* to identify new transmission *specific* to particular electric generation scenarios. The team considered planning requirements for meeting the Minnesota Renewable Energy Objective, addressed issues related to relieving transmission congestion, and focused on high-voltage solutions that best addressed the three different generation scenarios.

Results: The CapX 2020 Vision Plan

Facilities common to two of the three generation scenarios were identified as the cornerstone of the CapX 2020 Vision Plan—1,620 miles of 345 kV transmission lines that total \$1.215 billion, about 80 percent of the cost of each scenario individually. The following table identifies these facilities. Any long-range vision plan also will have to include additional unique facilities for each scenario.

Facility Name				
From	To	Volt (kV)	Miles	Cost (\$M)
Alexandria, MN	Benton County (St. Cloud, MN)	345	80	60
Alexandria, MN	Maple River (Fargo, ND)	345	126	94.5
Antelope Valley (Beulah, ND)	Jamestown, ND	345	185	138.75
Arrowhead (Duluth, MN)	Chisago County (Chisago City, MN)	345	120	90
Arrowhead (Duluth, MN)	Forbes (northwest Duluth, MN)	345	60	45
Benton County (St. Cloud, MN)	Chisago County (Chisago City, MN)	345	59	44.25
Benton County (St. Cloud, MN)	Granite Falls, MN	345	110	82.5
Benton County (St. Cloud, MN)	St. Bonifacius, MN	345	62	46.5
Blue Lake (southwest Twin Cities, MN)	Ellendale, MN	345	200	150
Chisago County (Chisago City, MN)	Prairie Island (Red Wing, MN)	345	82	61.5

Columbia	North LaCrosse	345	80	60
Ellendale, ND	Hettinger, ND	345	231	173.25
Rochester, MN	North LaCrosse	345	60	45
Jamestown, ND	Maple River (Fargo, ND)	345	107	80.25
Prairie Island (Red Wing, MN)	Rochester, MN	345	58	43.5
Total miles 1620		Total cost \$1,215 (\$M)		

Conclusion

The CapX 2020 technical team believes the results documented here to be the basis for additional studies to better identify the transmission needs of the study region. The following report details the technical study behind this update. Section headings are:

- Base model assumptions
(about loads and generation and how scenarios were determined, biases).
- Analysis
(of study assumptions such as system conditions, contingencies, Big Stone II, and other sensitivities).
- Scenario analysis
(of existing system performance, transmission alternatives, and line flows on interface and tie lines).
- Slow growth analysis.
- Common facilities.
- Conclusion and next steps.
- CapX 2020 Technical Team members.
- Appendices.

Although the existing transmission system is adequate to meet the reliability needs of customers today, the CapX 2020 study shows that the study region will experience specific and numerous transmission overloads, outages, and voltage problems if we make no transmission additions between now and 2020. Collaborative efforts and plans, such as those identified in this report, are necessary to reduce the risk of investing in new transmission infrastructure and to preserve electric reliability for customers.

2. Base Model Assumptions

The CapX study region encompasses the service territories of electric utilities that have load-serving responsibilities for Minnesota consumers. This region is represented in Diagram 1 below.

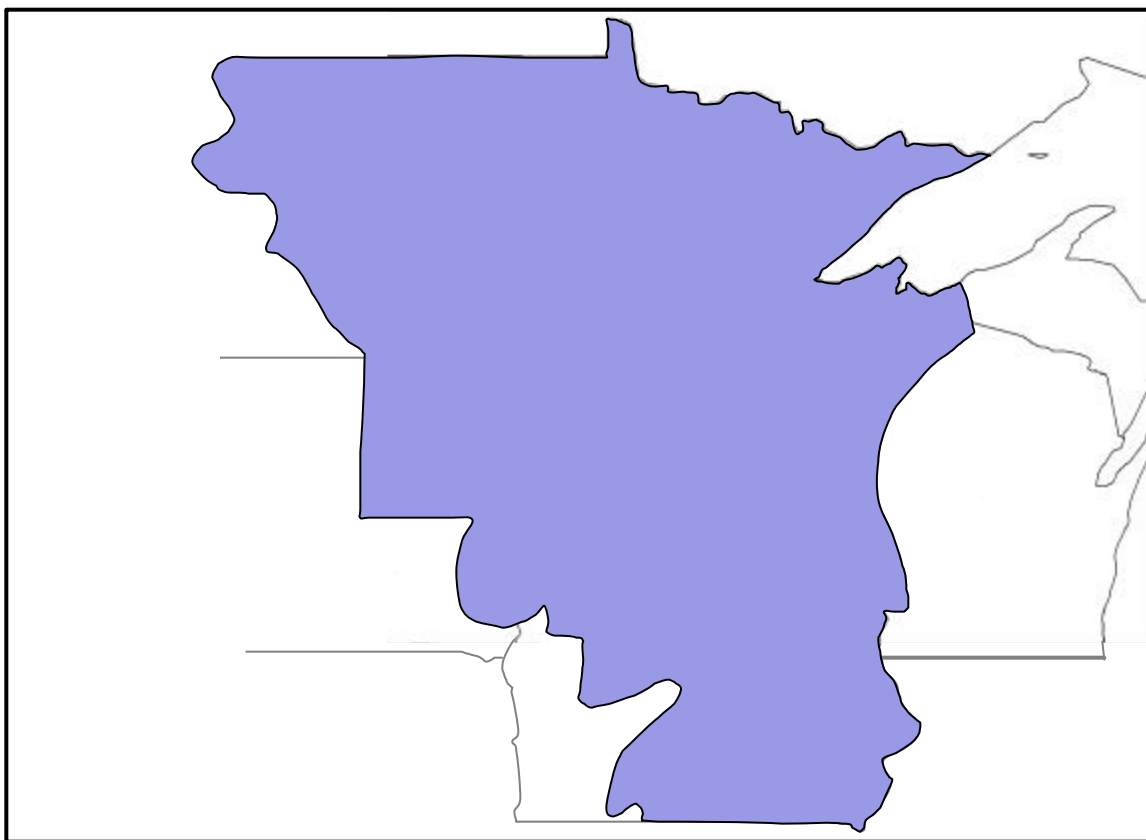


Diagram 1 – CapX 2020 Region

2.1 Loads

The CapX 2020 technical team chose the MAPP 2004 Series, 2009 summer peak model, as the base model to begin scaling loads to the anticipated 2020 load level. To accurately model 2020 loads, the technical team used individual company load growth from the *2004 MAPP Load and Capability Report* for the following control areas: Alliant Energy (west), Xcel Energy (north), Southern Minnesota Municipal Power Agency, Otter Tail Power Company, and Dairyland Power Cooperative.

Note that each control area contains not only load belonging to the control area operator, but also that of other companies. For example, Missouri River Energy Services has load in the Alliant Energy (west), Minnesota Power, Otter Tail Power Company, Western Area Power Administration, and Xcel Energy (north) control areas).

Minnesota Power and Great River Energy's loads were scaled based on their most recent resource plan filings. The growth results are in Table 1

Control area	2009 load level (2004 MAPP Series) (MW)	Yearly growth rate (%)	Calculated 2020 load level (MW)
ALT (West)	3265.3	1.60	3888.2
Xcel Energy (North)	9632.6	2.68	12885.1
MP	1507.3	1.70	1814.4
SMPA/RPU	330.0	2.70	442.4
GRE	2833.5	3.27	3943.2
OTP/MPC	1677.2	2.70	2248.3
DPC	954.7	2.60	1266.2
Total	20200.6	Ave. = 2.49%	26487.8

Table 1 – CapX 2020 Anticipated Area Growth

Table 1 shows an anticipated load growth of approximately 6300 megawatts (MW) in the CapX 2020 region for the period from 2009 to 2020. The technical team also studied historical loads for Great River Energy, Minnesota Power, Missouri River Energy Services, Otter Tail Power Company, and Xcel Energy to determine whether anticipated load growth was consistent with historical load growth in the region. Load growth for these companies averaged 2.64 percent during the period 1980 to 2004. Diagram 2 shows the variability of load growth as well as the continuing upward growth in load for the region. The technical team's forecast from 2009 through 2020 is a slower growth curve than the actual growth in the early 2000's (2.49 percent vs. 2.64 percent).

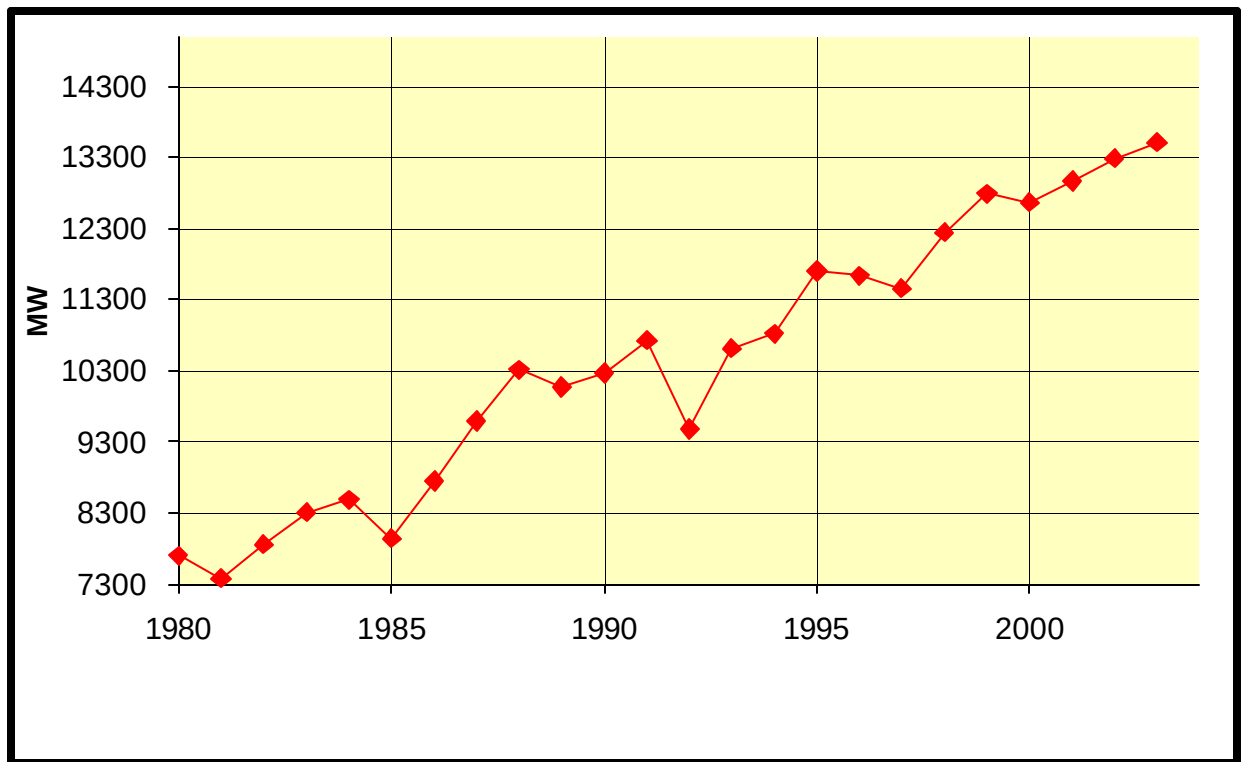


Diagram 2 – Historical Growth

2.2 Generation

The CapX 2020 technical team assumed that the generation modeled in the 2009 summer model would still exist in 2020 and would continue to serve the load modeled in 2009. To address anticipated load growth of 6,300 MW, the technical team solicited information from independent power producers (including wind developers), resource planning entities within various organizations, and the Midwest Independent System Operator's (MISO) generation interconnection queue.

Diagrams 3 and 4 are maps of potential generation addition locations that have been identified either from the MISO queue (Diagram 3) or from Wind on the Wires (which is a wind advocate organization) potential wind sites (Diagram 4).

The technical team combined this information to form potential generation development nodes, independent of fuel type, which they used in the modeling process to supply load increases.

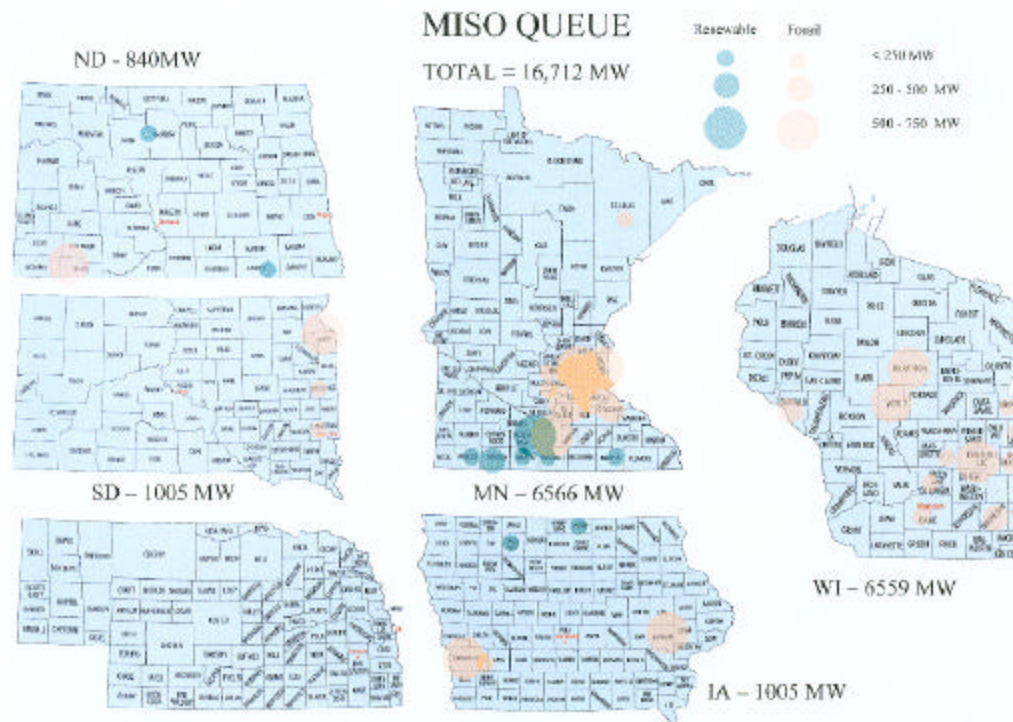


Diagram 3 – Potential Generation Areas

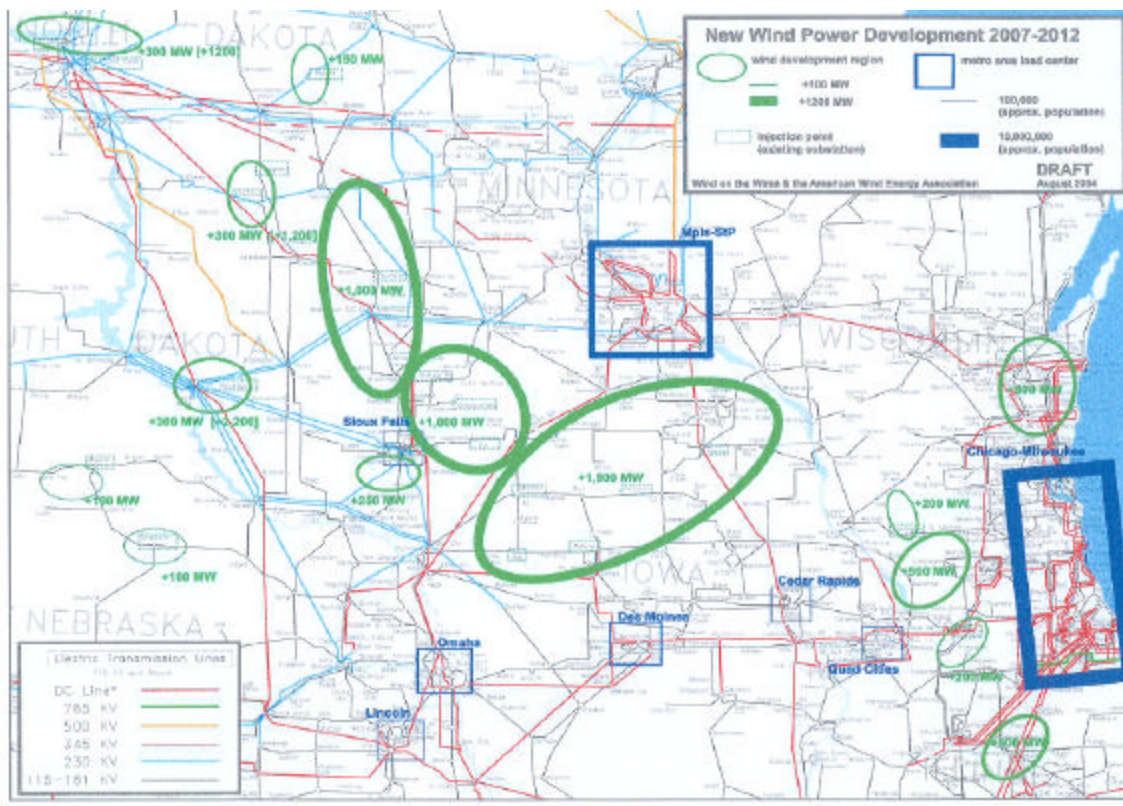


Diagram 4 – Potential Wind Generation Areas

The CapX 2020 technical team mapped the locations of these resources and identified five generation regions: Northern Minnesota, Dakotas (North Dakota and South Dakota), Southern Minnesota/Northern Iowa, Wisconsin and the Metro (Twin Cities Metropolitan) area. These regions are shown in Diagram 5.

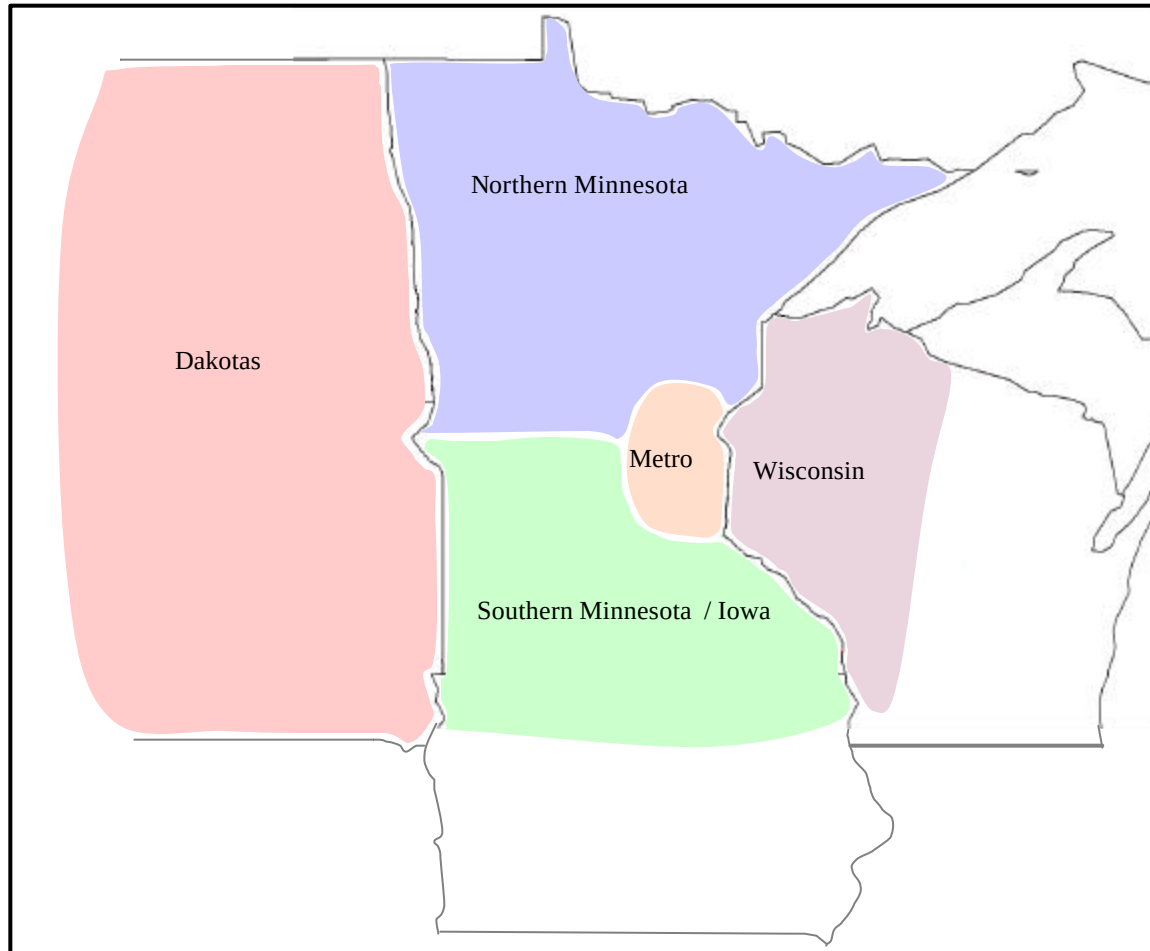


Diagram 5 – CapX 2020 Generation Regions

2.3 Scenario determination

The team modeled three generation scenarios to address the anticipated load growth of 6,300 MW from 2009 to 2020. Each of the scenarios includes sufficient renewable resources to address the Minnesota Renewable Energy Objective of the CapX 2020 participants.

The three generation scenarios consist of a North/West bias, a Minnesota bias, and an Eastern bias. These three generation biases reflect potential generation development that might influence electric power flows on the regional grid and thus indicate the size and location of new transmission infrastructure needed to deliver the generation to customers.

Each of the scenarios includes generation resources from several of the regions. See Table 2.

Generation areas	Scenario		
	North /West Bias	Minnesota Bias	Eastern Bias
Northern MN	1700 ¹	1250	550
Dakotas	2100	1000	1600
Southern MN/ Iowa	1875	1875	2175
Metro	650	2200	1000
Wisconsin	0	0	1000
Total	6325	6325	6325

Table 2 – Generation Scenarios

Diagrams 6, 7, and 8 provide geographical representation of the regions for which generation will be modeled in each scenario.

2.3.1 North/West Bias Generation

In the north/west bias generation case the new generation modeled is more heavily based on importing generation into Minnesota from Manitoba, North Dakota, South Dakota, and Iowa.

The generation mix includes 2275 MW to meet Minnesota’s Renewable Energy Objective: 975 MW from Minnesota and 1300 MW from outside of Minnesota. It also includes 1950 MW of other Minnesota generation and 2100 MW of other generation from outside of Minnesota.

Chart 1 below illustrates the north/west generation mix.

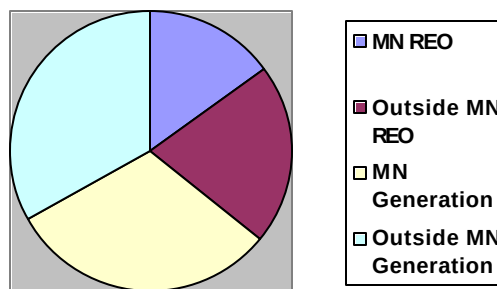


Chart 1 - North/West Bias Generation Mix

¹ This 1700-MW total includes a 1000-MW import from Manitoba.

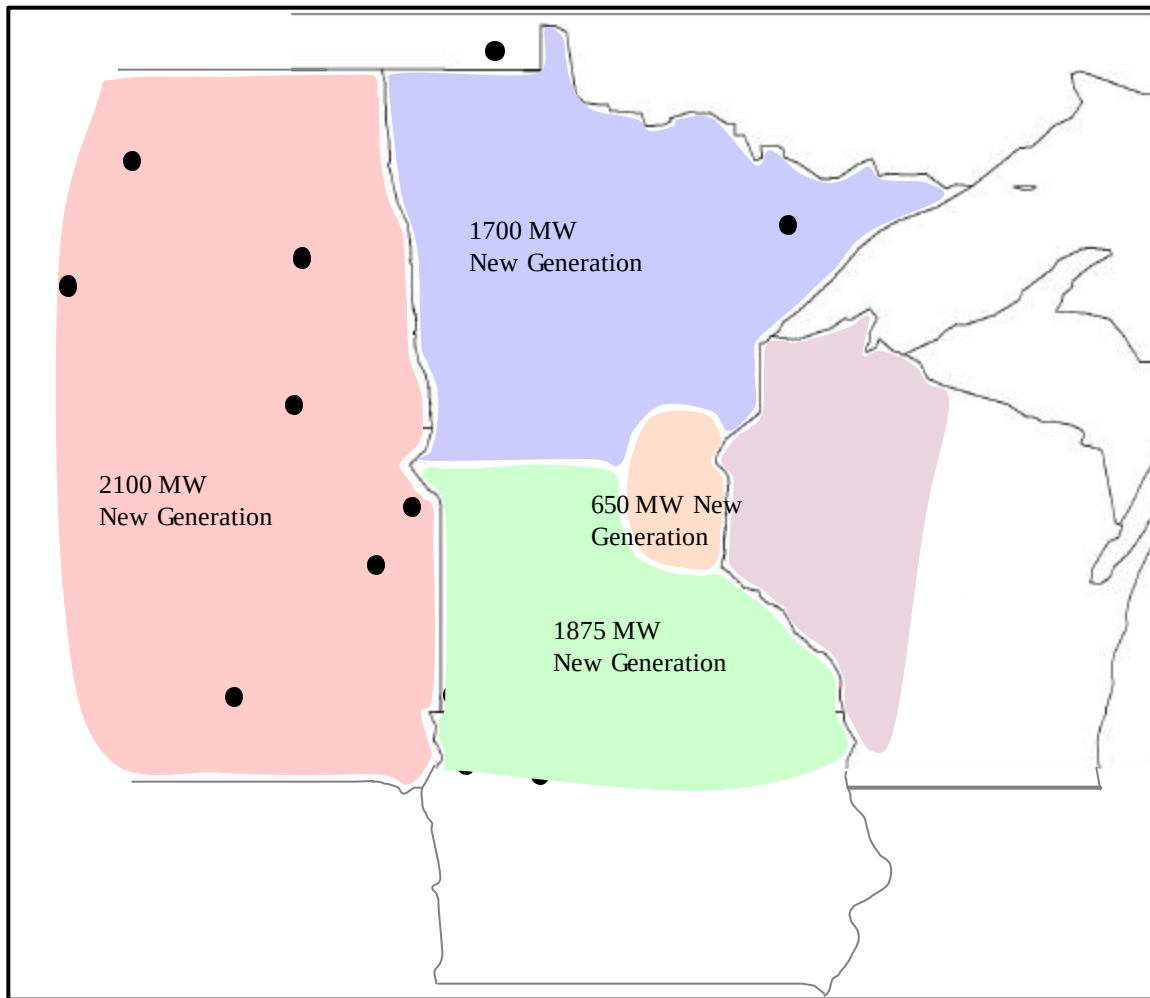


Diagram 6 - North/West Bias Generation Locations

2.3.2 Minnesota Bias Generation

In the Minnesota Bias Generation case all new generation outside of Minnesota (North Dakota, South Dakota, and Iowa) is modeled as 1300 MW of wind generation (REO). The generation modeled inside of Minnesota is a mixture of REO, peaking, and base load generation.

The generation mix includes 2275 MW of Renewable Energy Objective and 4050 MW of Minnesota generation.

Chart 2 below illustrates the Minnesota bias generation mix.

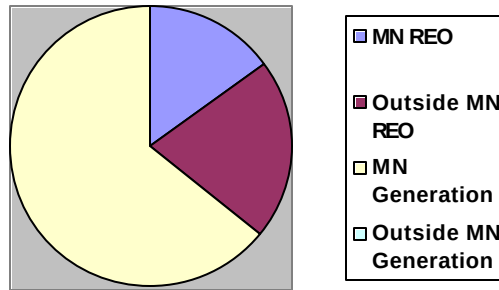


Chart 2 - Minnesota Bias Generation Mix Chart

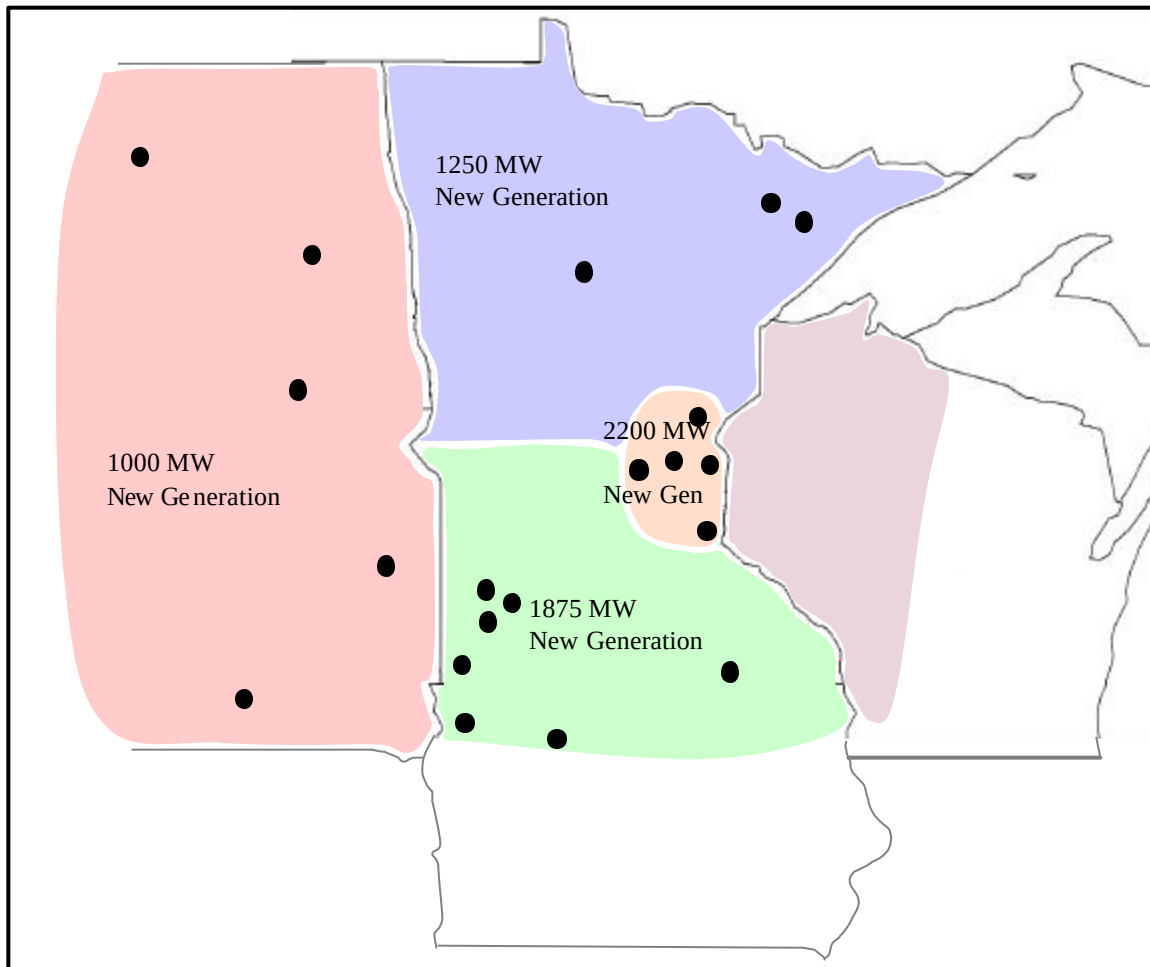


Diagram 7 - Minnesota Bias Generation Locations

2.3.3 Eastern Bias Generation

In the Eastern Bias generation case the new generation modeled is more heavily based on importing generation into Minnesota from Wisconsin and Iowa with 1000 MW new generation modeled in Wisconsin and 1050 MW of new generation modeled in Iowa.

The generation mix includes 2275 MW of Renewable Energy Objective (975 MW of Minnesota REO and 1300 MW from outside of Minnesota REO), 1700 MW of generation from inside of Minnesota, and 2350 MW of generation from outside of Minnesota.

Chart 3 below illustrates the Eastern bias generation mix.

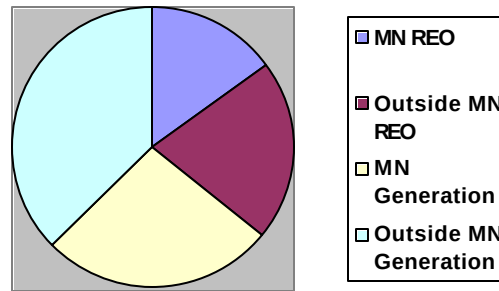


Chart 3 - Eastern Bias Generation Mix

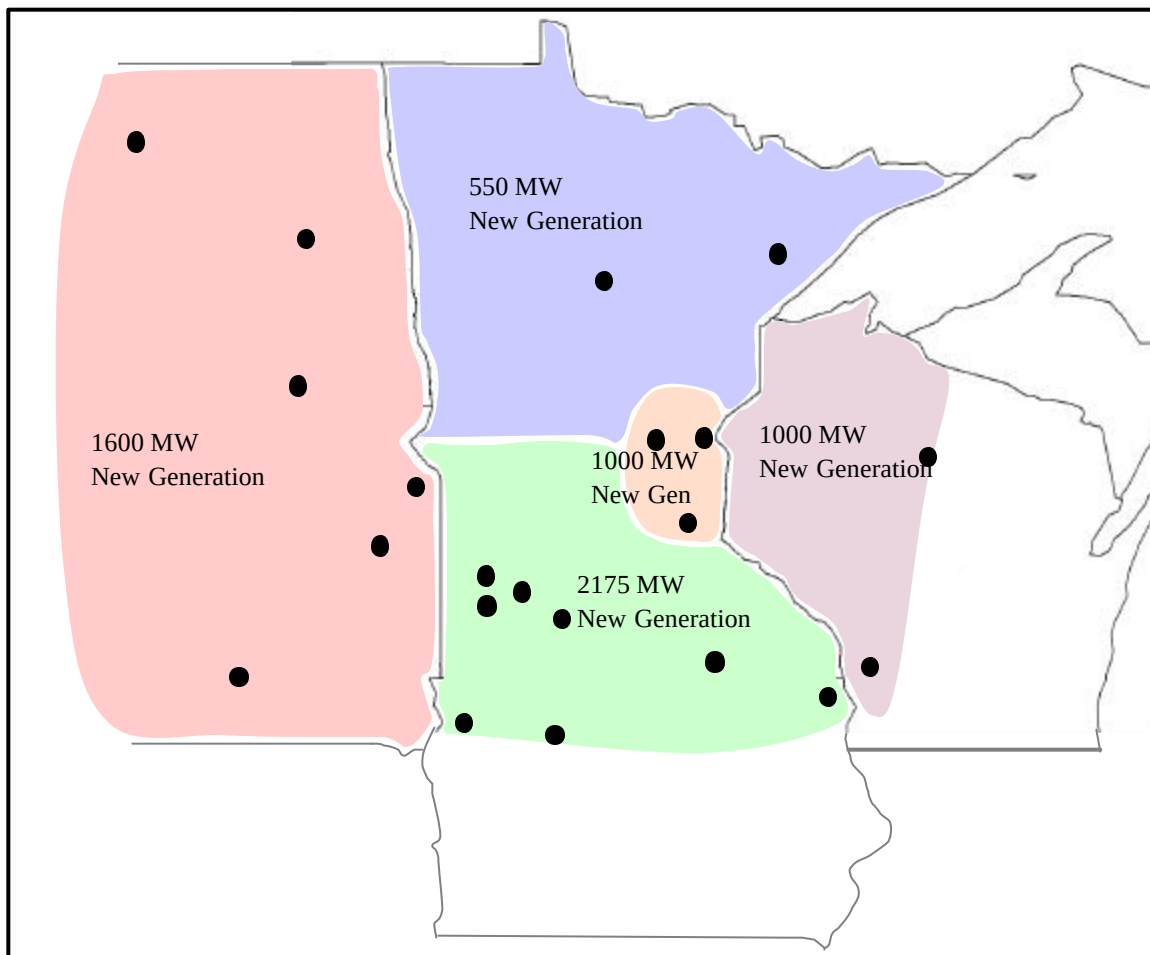


Diagram 8 - Eastern Bias Generation Locations

3 Analysis

The CapX 2020 technical team's primary goal was to create a common transmission backbone that could sustain system growth based on the three generation scenarios. In the future as specific generation is built, other transmission facilities will be required to tie the generation to the transmission backbone system and tie the load-serving centers to the local-serving distribution substations.

With this goal in mind, the team developed an initial list of possible transmission facilities. These facilities are shown in Diagram 9. Diagram 9 was created using inputs from various regional Midwest Independent System Operator (MISO) exploratory studies, the 2004 MISO Transmission Expansion Plan (MTEP '04), as well as input from utility transmission planners in the study area. The team purposely kept lines vague, leaving the routes and endpoints to be determined as study work progressed. Transmission alternatives were limited to facilities 345 kilovolts and larger for the purpose of this vision study of the high voltage bulk transmission study.

The technical team incorporated transmission alternatives identified in on-going studies in conjunction with transmission plans identified by various transmission stakeholders. The goals were to identify transmission improvements that connect remote generation to the load-serving centers in the region and to develop a transmission backbone that supports continued load growth in the various load centers. The transmission improvements focused on high voltage solutions (345 kV lines and 500 kV lines) that best addressed the load areas and the various generation scenarios.

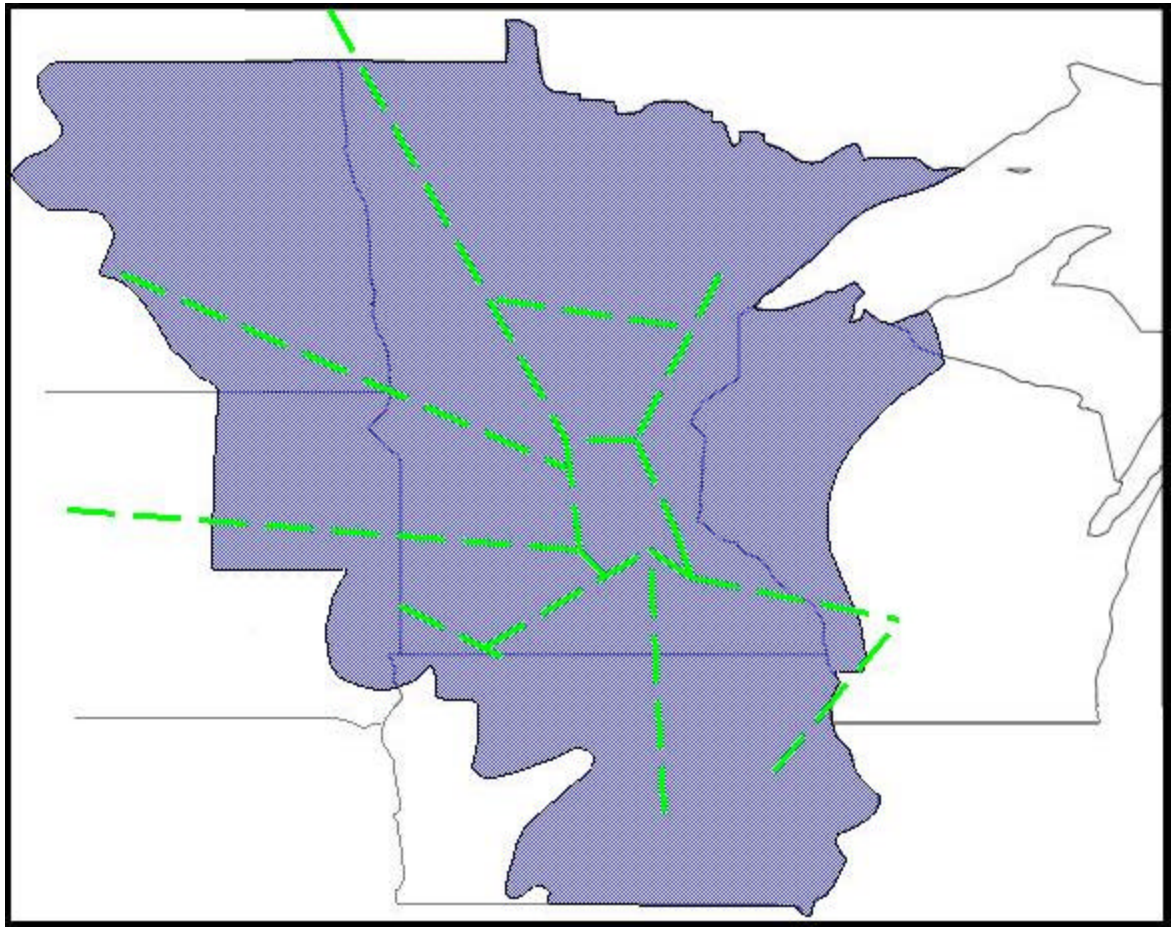


Diagram 9 – Possible Transmission Facilities

As a starting point, the technical team utilized the most probable transmission options from the exploratory studies already underway in the MISO/MAPP footprint, most notably the Southwest Minnesota/ Northern Iowa study and the Northwest Exploratory study. These transmission options are shown below:

- A 345 kV line from the North Dakota coal fields to Fargo and continuing to near St. Cloud, Minnesota
- A 345 kV line from Prairie Island, near Red Wing, Minnesota, to Rochester, Minnesota, and continuing to southwest Wisconsin
- Two 345 kV lines into central Iowa
- A 345 kV or 500 kV line from Manitoba into near St. Cloud, Minnesota.
- Generation outlet transmission facilities presently under study through MISO.

Once these lines were placed on the map, the technical team analyzed the system for the best regional method to tie all these study results together, while maximizing load-serving potential for the entire region well into the future. The team also created a second 345 kV transmission ring around the wider Twin Cities metro area, with “spokes” leading out to the smaller load and/or generation pockets in the region.

A complete list of the potential transmission facilities is included in Appendix A.

3.1 Study Assumptions

3.1.1 System Condition Assumptions

The CapX 2020 study was based on a system snapshot with the best-known 2020 state of the transmission system as of August 2004 for the MAPP region. Since August 2004, very few changes have been made to the base case model. In the last ten months, load, generation and transmission modeling may have been modified in other studies, which the CapX 2020 study does not reflect.

3.1.2 Contingency Analysis Assumptions

The technical team tested several transmission solutions for each generation scenario and performed steady-state powerflow analysis (first contingency simulations) to determine which transmission solution eliminates thermal overloads on transmission lines 161 kV and higher in the region. Because the intent of this study was bulk level load serving, the technical team decided to model all generation on the highest voltage bus available local to the generation, and to run the contingency simulations on a limited list of facilities, namely 161 kV and above.

When reviewing the results of this study, note that only the bulk system overloads and solution are represented. None of the associated substation, generation interconnection facilities, or underlying lower-voltage (below 161 kV) transmission system infrastructure was studied.

3.1.3 Big Stone II Inclusion in the CapX 2020 Vision Study

Interconnection steady-state results from the Big Stone II generation study were completed in the late fall 2004 and, therefore, were included in the CapX 2020 Vision Study. Big Stone II was modeled in the north/west and eastern biases. In the north/west bias, the generator was modeled along with the outlet options that included:

- Big Stone – Canby new 230 kV line
- Canby – Granite Falls 115 kV line converted to 230 kV
- Big Stone – Willmar new 230 kV line

The eastern bias included the generator along with outlet options that included:

- Big Stone – Canby, Minnesota, new 230 kV line
- Canby – Granite Falls, Minnesota, 115 kV line converted to 230 kV
- Big Stone – Ortonville, Minnesota, new 230 kV-line
- Ortonville – Johnson Jct. - Morris, Minnesota, 115 kV line converted to 230 kV

Because the Minnesota bias focused on generation located within state boundaries with the exception of wind resources, Big Stone II, which is a potential coal-fired plant in South Dakota, was not included in this generation bias.

Based on the results from this vision study, the Minnesota and north/west generation biases include a new 345 kV line from Granite Falls, Minnesota, to Benton County (St. Cloud), Minnesota, and all three generation scenarios include a new 345 kV line from Ellendale, North Dakota, to Blue Lake (Mpls/St. Paul), Minnesota, regardless of whether Big Stone II was included. These lines could be instrumental to wind outlet in the North Dakota and South Dakota.

3.1.4 Sensitivities to Current Area Study Work

- Big Stone II was partially included in this vision study as described in section 3.1.3 above. Because the Big Stone II interconnection study was completed during the CapX 2020 technical study timeframe, variations of the interconnection study results were included in the CapX 2020 study. When a certificate of need (CON) is filed for Big Stone II, a vision study sensitivity will be completed to determine how the Big Stone II project proposed facilities fit into the timeline for the CapX 2020 vision study facility additions.
- Buffalo Ridge Incremental Study conducted by Xcel Energy in the winter of 2004 through spring 2005 had no public results available to include during the CapX 2020 case development time. In addition, the Buffalo Ridge study is a lower voltage study than the CapX 2020 focus.

4 Scenario Analysis

The preliminary base case model for the year 2020 includes the 6300 MW of anticipated load growth and the new generation to meet and serve the growth, however the base case doesn't contain any new necessary transmission facilities.² The CapX 2020 technical team's preliminary base case analysis of the three generation scenarios identified a significant number of transmission overloads that could occur if no additional transmission is built to serve the projected load growth and the new generation needed by 2020 to meet this growth. The team simulated the loss (outage) of single transmission elements (n-1 analysis) to help determine transmission alternatives to address potential violations of North American Electric Reliability Council criteria, such as low voltages and thermally overloaded facilities.

Power Technology's PSS/E program, Version 29, was used to perform this analysis. Within PSS/E, the activity called ACCC, or AC Contingency Checking, was used as a first check of the entire study area to find problems. ACCC sequentially examines all relevant single contingencies in the region of interest for a given load and transfer base case. Facilities identified in the ACCC outputs were considered limiters if they had line outage distribution factors of 2 percent or greater. Bus voltages lower than 0.9 per unit were also flagged.

For the more detailed analysis of each scenario, the team used a contingency program developed by Great River Energy. The contingency program uses the IPLAN programming language within PSS/E. It performs many functions on the user-defined model, including developing user-defined contingencies with appropriate line-switching procedures, monitoring files for bus voltage and line loading violations, and the output files are then easily imported into Microsoft Excel. Transmission facilities identified in the Excel outputs were considered limiters if they had power transfer distribution factors and/or line outage

² Exception: The north/west bias base 2020 case includes a 345 kV facility from Manitoba to near St Cloud, MN

distribution factors of 2 percent or greater. Bus voltages lower than 0.9 per unit were also flagged

For the n-1 analysis, the team ran transmission contingencies and monitored the transmission system in the following control areas:

Control area	PSS/E area #
Alliant Energy West	331
Xcel Energy	600
Minnesota Power	608
Southern Minnesota Municipal Power Agency	613
Great River Energy	618
Otter Tail Power Company	626
Dairyland Power Company	680

4.1 Existing System Performance / Base Case Analysis

The ACCC activity performs all contingencies in the area and, therefore, provides an excellent screening tool for determining as to when and where violations of the planning criteria occur.

Initially, the team ran ACCC on the existing system for the three generation scenario bias cases: Peak load with all the Minnesota bias generation on-line at the 2020 load levels, peak load with all the north/west bias generation on-line at the with 2020 load levels, and peak load with all the eastern bias generation on-line at the 2020 load levels. The team temporarily put aside base case results but eventually will compare them with the post-new facility results for each bias to find the most effective set of 345 kV and higher transmission infrastructure additions to meet the 6,300 MW of new load. The base case system n-1 results are included in Appendix B of this report for each bias case.

Table 3 shows the number of overloaded transmission facilities and voltage violations in the base case 2020 models. Sections 4.2 through 4.5 of this report will discuss the results for each scenario in further detail. Again, n-1 contingency output results are tabulated in Appendix B.

Scenario	System Intact Overloads	n-1 Overload Violations ³	Voltage Violations
North/West Bias ⁴	42	142	45
Minnesota Bias	42	187	14
Eastern Bias	42	197	33

Table 3 – Base Case 2020 Transmission System Violations

³ Outages of individual facilities 161 kV and higher were simulated.

⁴ Includes the addition of a 345 kV facility from Manitoba to near St. Cloud, Minnesota

4.2 Transmission Alternatives

As mentioned previously in this report, Appendix A of this report includes a complete list of all transmission facilities 345 kV and higher that the CapX 2020 technical team considered. The team analyzed each generation scenario separately to determine which of these facilities would most effectively solve thermal and voltage violations on the bulk (161 kV and higher) transmission system in the study area. To do this, the team inserted specific facilities or facility groups from Appendix A one at a time into the model to assess each facility's benefits.

The team selected facilities to insert into the model by determining the location of the need for system improvement. The team recommended as facility additions those facilities that had the greatest benefit to the system by reducing the thermal overload and/or solving voltage violations during n-1 contingency.

The results of the facility addition benefits are shown in Appendix B in the n-1 contingency output result tables for each generation scenario.

4.3 Minnesota Bias Scenario Results

4.3.1 Recommended Transmission Vision Facilities

Diagram 10 shows the final compilation of recommended transmission facilities for the Minnesota bias based on the n-1 contingency analysis completed using the facilities in Appendix A and Table 4. All contingency analysis results and PSS/E automaps are included in Appendix B-1.

Ref. Ref.#	Data Source	Facility name				
		From	To	Volt (kV)	Miles	Cost (\$M)
F-02	TIPS	Alexandria	Benton County	345	80	60
F-03	TIPS	Alexandria	Maple River	345	126	94.5
F-06	NW	Antelope Valley	Maple River	345	292	219
F-07	CAPX	Arrowhead	Chisago	345	120	90
F-08	CAPX	Arrowhead	Forbes	345	60	45
F-09	CAPX	Benton County	Chisago County	345	59	44.25
F-10	CAPX	Benton County	Granite Falls	345	110	82.5
F-11	MH	Benton County	Riverton	345	78	58.5
F-12	CAPX	Benton County	St. Boni	345	62	46.5
F-13	CAPX	Blue Lake	Ellendale	345	200	150
F-17	CAPX	Boswell	Forbes	345	64	48

F-26	CAPX	Chisago County	Prairie Island	345	82	61.5
F-28	CAPX	Columbia	North LaCrosse	345	80	60
F-30	NW	Ellendale	Hettinger	345	231	173.25
F-32	CAPX	Forbes	Riverton	345	114	85.5
F-36	SMNI	Rochester	North LaCrosse	345	60	45
F-56	SMNI	Prairie Island	Rochester	345	58	43.5
F-63	CAPX	Lakefield Jct	Adams	345	92	69
				Total	1968	1,476

CAPX – CapX Technical Team

NW – MISO Northwest Exploratory Study

SMNI – MISO Southern Minnesota/Northern Iowa Exploratory Study

TIPS – Transmission Improvement Plans Study

MH – Manitoba Hydro Studies

Table 4 – Minnesota Bias Recommended Facilities

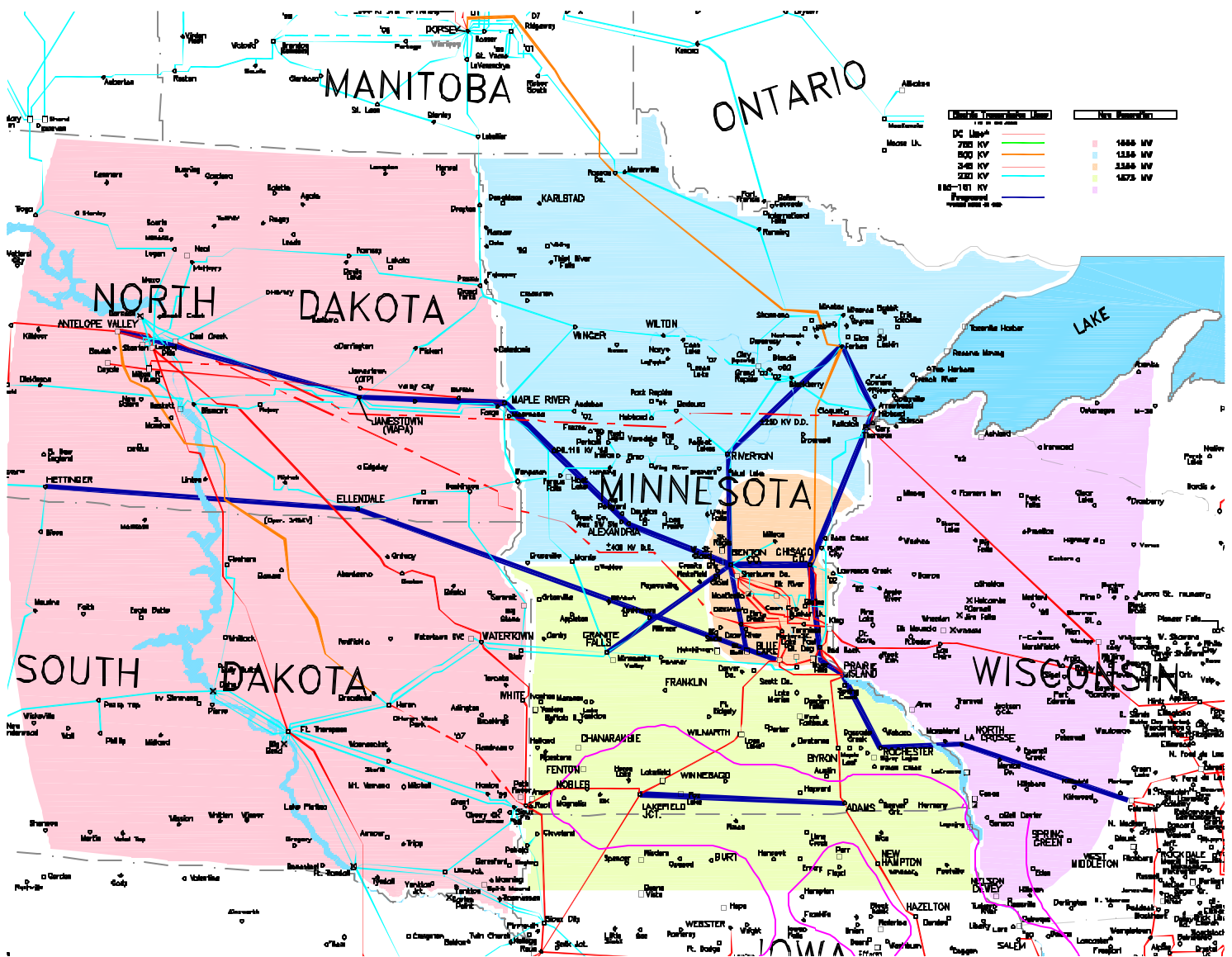


Diagram 10 – Minnesota Bias Recommended Facilities

4.3.2 Line Flows on Interface and Tie Lines

The CapX 2020 technical team collected system intact line flows on a select set of tie lines and interfaces in and around the Minnesota system. Table 5 predominantly focuses on lines coming into and going out of Minnesota, including some lines internal to Minnesota connecting pockets of transmission. Table 5 shows that adding the facilities recommended for the Minnesota bias scenario mostly causes reductions in MW flow over these 230 kV and higher interfaces.

LINE	kV Voltage Level	Base 6300 MW flow (MW)	6300 mw UPGRADE scenario (MW)	Description
Forbes – Chisago	500 kV	870	687	Northern Minnesota to Twin Cities loop
Riel – Roseau	500 kV	1418	1308	Manitoba Hydro to northern Minnesota
Richer – Roseau	230 kV	170	183	Manitoba Hydro to northern Minnesota
Letellier – Drayton	230 kV	325	300	Manitoba Hydro to MN-ND border
Glenboro – Rugby	230 kV	18	2	Manitoba Hydro – North Dakota (this and the 3 lines above are all that ties Manitoba and U.S. as planned of 2009)
Arrowhead – Stone Lake	345 kV	116	97	Duluth area to northwestern Wisconsin (then to Weston)
Eau Claire – Arpin	345 kV	111	87	West to central Wisconsin
Prairie Island – Byron	345 kV	116	320	South of Twin Cities metro to west of Rochester
Adams – Hazelton	345 kV	127	50	Southeastern Minnesota – eastern Iowa
Lakefield Jct. – Wilmarth	345 kV	768	594	Southwestern Minnesota to Mankato area
Split Rock – Nobles County	345 kV	175	159	North of Sioux Falls, SD, to northwest of Worthington, MN
Nobles County – Lakefield Jct.	345 kV	300	285	Northwest of Worthington to Lakefield Jct. sub. (Minnesota)
Watertown – Granite Falls	230 kV	315	292	Eastern South Dakota to western Minnesota
Blair – Granite Falls	230 kV	329	317	Runs parallel with Watertown – Granite Falls
Granite Falls – Minnesota Valley	230 kV	263	220	Western Minnesota
Fargo – Moorhead	230 kV	53	62	Fargo, North Dakota, to Moorhead, Minnesota
Fargo – Sheyenne	230 kV	260	162	North Dakota, Minnesota border
Maple River – Winger	230 kV	76	69	Fargo area to northwestern Minnesota
Prairie – Winger	230 kV	138	84	Grand Forks area to Winger
Wahpeton – Fergus Falls	230 kV	234	153	ND-MN border east to Fergus Falls
Bear Creek – Rock Creek	230 kV	53	51	South of Duluth toward the Twin Cities loop
Blackberry – Riverton	230 kV	220	114	Northern Minnesota towards south
Mud Lake – Benton County	230 kV	10	26	Coming from the north into St. Cloud
Sheyenne – Audubon	230 kV	214	178	Fargo area west into Minnesota
Genoa – Coulee	161 kV	263	204	Western Wisconsin
Boswell – Blackberry Ckt 1	230 kV	291	192	Northern Minnesota
Boswell – Blackberry Ckt 2	230 kV	283	187	Northern Minnesota

Table 5 – Minnesota Bias Tie Line / Interface Flows

4.4 North / West Scenario Results

4.4.1 Recommended Transmission Vision Facilities

Diagram 11 shows the final compilation of recommended facilities for the North/West Bias based on the n-1 contingency analysis using the facilities in Appendix A and Table 6. All contingency analysis results and PSS/E automaps are included in Appendix B-2.

Ref. Ref.#	Data Source	Facility Name				
		From	To	Volt (kV)	Miles	Cost (\$M)
F-02	TIPS	Alexandria	Benton County	345	80	60
F-03	TIPS	Alexandria	Maple River	345	126	94.5
F-06	NW	Antelope Valley	Maple River	345	292	219
F-07	CAPX	Arrowhead	Chisago	345	120	90
F-08	CAPX	Arrowhead	Forbes	345	60	45
F-09	CAPX	Benton County	Chisago County	345	59	44.25
F-10	CAPX	Benton County	Granite Falls	345	110	82.5
F-12	CAPX	Benton County	St. Boni	345	62	46.5
F-13	CAPX	Blue Lake	Ellendale	345	200	150
F-26	CAPX	Chisago County	Prairie Island	345	82	61.5
F-28	CAPX	Columbia	North LaCrosse	345	80	60
F-29	MH	Dorsey	Karlstad	345	134	100.5
F-30	NW	Ellendale	Hettinger	345	231	173.25
F-36	SMNI	Rochester	North LaCrosse	345	60	45
F-45	MH	Karlstad	Winger	345	91	68
F-40	MH	Winger	Benton Co.	345	162	121.5
F-56	SMNI	Prairie Island	Rochester	345	58	43.5
	Total				2007	1,505

Table 6 – North/West Bias Recommended Facilities

Key for Table 6:

CAPX – CapX Technical Team

NW – MISO Northwest Exploratory Study

SMNI – MISO Southern Minnesota/Northern Iowa Exploratory Study

TIPS – Transmission Improvement Plans Study

MH – Manitoba Hydro Studies

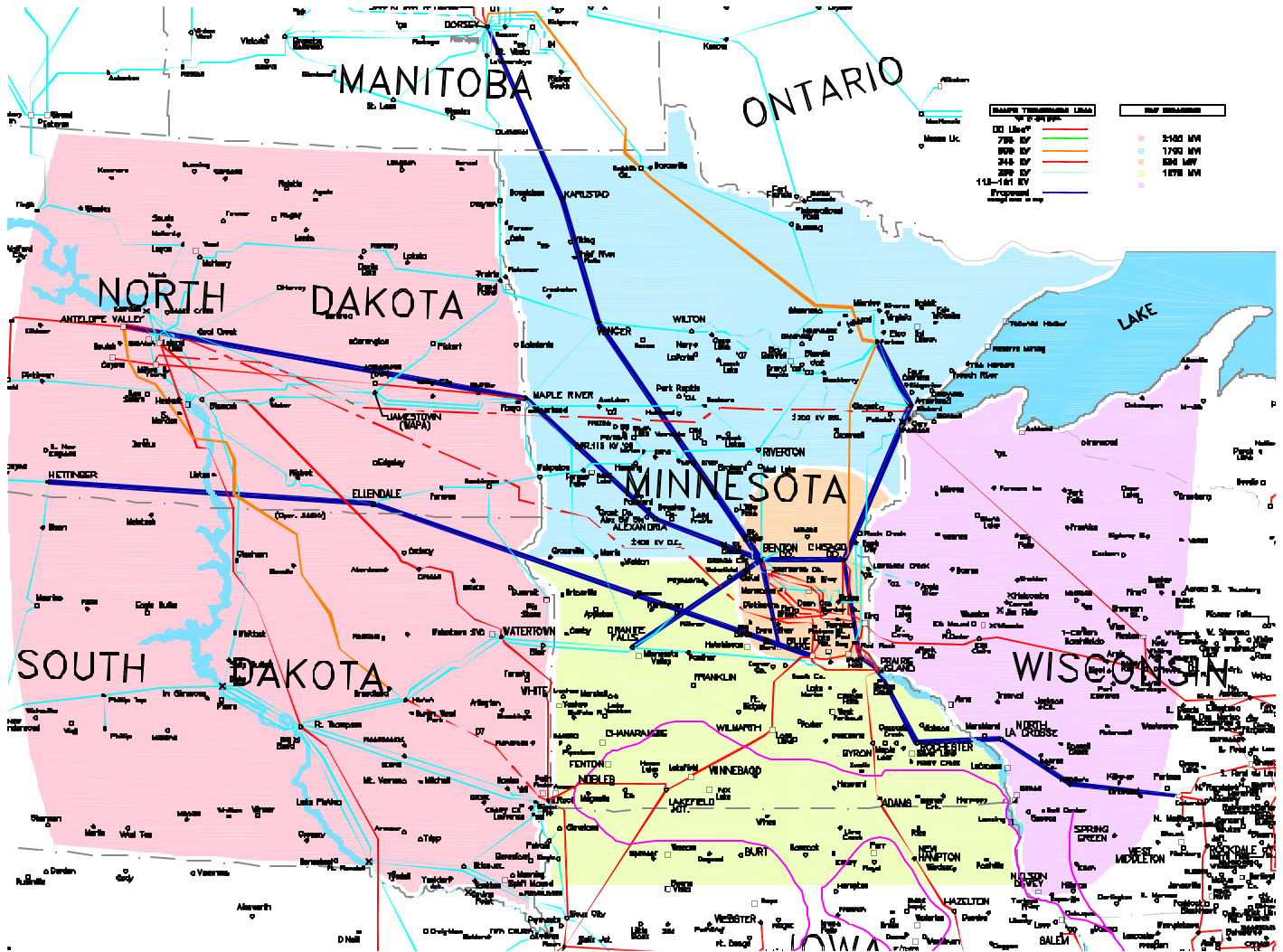


Diagram 11 – North/West Bias Recommended Facilities

4.4.2 Line Flows on Interface and Tie Lines

The Technical Team collected system intact line flows on a select set of tie lines and interfaces in and around the Minnesota system. Table 7 predominantly focuses on lines coming into and going out of Minnesota, including some lines internal to Minnesota connecting pockets of transmission.

The table shows that adding the facilities recommended for the north /west bias scenario causes about equal amounts of reductions and additions in MW flow

over these 230 kV-and-higher interfaces. Note that in this north/west scenario the Manitoba Hydro flows are lower than in the slow growth scenario Manitoba Hydro export. The reason for this difference is that the CapX technical team has added the 345 kV line in the 6,300 MW load base case, which has 816 megavolt amperes flowing on it.

LINE	kV Voltage Level	Base 6300 MW flow (MW)	6300 MW UPGRADE scenario (MW)	Description
Forbes – Chisago	500 kV	1507.7	1343.3	Northern Minnesota to Twin Cities loop
Riel – Roseau	500 kV	1591.8	1507.5	Manitoba Hydro to northern Minnesota
Richer – Roseau	230 kV	219.2	212.8	Manitoba Hydro to northern Minnesota
Letellier – Drayton	230 kV	286.5	303.7	Manitoba Hydro to MN-ND border
Glenboro – Rugby	230 kV	64.4	10.6	Manitoba Hydro – North Dakota (This and the 3 lines above are all that ties Manitoba and U.S. as planned through 2009.)
Arrowhead – Stone Lake	345 kV	271.0	295.4	Duluth area to northwestern Wisconsin (then to Weston)
Eau Claire – Arpin	345 kV	148.4	71.0	West to central Wisconsin
Prairie Island – Byron	345 kV	284.4	277.3	South of Twin Cities metro to west of Rochester
Adams – Hazelton	345 kV	274.1	156.6	Southeastern Minnesota – eastern Iowa
Lakefield Jct. – Wilmarth	345 kV	978.5	819.3	Southwestern Minnesota to Mankato area
Split Rock – Nobles County	345 kV	350.7	261.6	North of Sioux Falls, SD, to northwest of Worthington, MN
Nobles County – Lakefield Jct.	345 kV	500.7	409.9	Northwest of Worthington to Lakefield Jct. sub. (Minnesota)
Watertown – Granite Falls	230 kV	293.0	245.0	Eastern South Dakota to western Minnesota
Blair – Granite Falls	230 kV	334.5	292.4	Runs parallel with Watertown – Granite Falls
Granite Falls – Minnesota Valley	230 kV	455.5	404.4	Western Minnesota
Fargo – Moorhead	230 kV	50.8	39.1	Fargo, North Dakota to Moorhead, Minnesota
Fargo – Sheyenne	230 kV	286.6	230.0	North Dakota, Minnesota border
Maple River – Winger	230 kV	64.3	20.9	Fargo area to northwestern Minnesota
Prairie – Winger	230 kV	110.0	70.8	Grand Forks area to Winger
Wahpeton – Fergus Falls	230 kV	277.8	213.4	ND-MN border east to Fergus Falls
Bear Creek – Rock Creek	230 kV	89.6	90.0	South of Duluth toward the Twin Cities loop
Blackberry – Riverton	230 kV	203.5	175.0	Northern Minnesota towards south
Mud Lake – Benton County	230 kV	47.6	36.6	Coming from the north into St.Cloud area
Sheyenne – Audubon	230 kV	265.4	233.0	Fargo area west into Minnesota
Genoa – Coulee	161 kV	278.0	212.0	Western Wisconsin

Boswell – Blackberry Ckt 1	230 kV	284.4	276.2	Northern Minnesota
Boswell – Blackberry Ckt 2	230 kV	277.6	269.7	Northern Minnesota

Table 7 – North/West Bias Tie Line/Interface Flows

4.5 Eastern Bias

In the eastern bias scenario, the CapX 2020 technical team added part of the additional generation to the east of Minnesota (part on the border of northeastern Iowa and southwestern Wisconsin, part central Wisconsin), in addition to having generation throughout Minnesota, northern Iowa, North Dakota, and South Dakota as in the other two scenarios.

The identification of transmission solutions to address thermal and voltage violations for the eastern bias case proved difficult. It appears that the legacy of having a minimal level of inter-regional transmission planning, that is, between MAPP and MAIN (Mid-American Interconnected Network), has resulted in a limited number of facilities to accommodate the expansion of the transmission network between the regions. The natural barriers of the St. Croix and Mississippi Rivers and the lack of voltage sources in this border region made it very difficult to identify constructible transmission solutions to move generation from Wisconsin into the load centers in Minnesota.

The major issue found with the east bias case is the limited capability of the 161 kV transmission network in the northern Iowa, western Wisconsin, and partly southeastern Minnesota region. On a transmission map this area is roughly defined by the Prairie Island-to-Byron-to-Adams-to-Hazelton 345 kV line to the west, Wempleton-to-Paddock-to-Rockdale-to-Columbia 345 kV line to the east, Hazelton-to-Salem-to-Quad Cities to the south, and the northern portion of Wisconsin.

*The east bias scenario shows that even with some of the new generation to the east, major new transmission is still required. **The transmission solution presented does not solve all of the transmission issues in the eastern bias case.** Among the issues remaining are some overloads on the 230 kV transmission system in Northern Minnesota and North Dakota. These overloads were addressed in the other two generation scenarios, and further vision study analysis is needed to determine a common set of criteria for when a facility is added to the vision plan.*

The CapX 2020 technical team will also consider a continuing vision level study to discuss the issue that the transmission facilities in Appendix A did not fit for the eastern bias case, and to create a new “laundry list” of facilities to test.

The following section 4.5.1 is a discussion of some of the alternatives tested, and how they performed in the eastern bias case.

4.5.1 Transmission Alternatives Considered

From the transmission facility concepts presented in Diagram 9, various combinations were tested, except for adding the new transmission line between Manitoba, Canada, and Minnesota. Because no new generation was introduced in

Canada in this scenario, such a transmission concept was not needed.

Many of the transmission concepts did not effectively correct some of the transmission issues seen in this scenario, and therefore those concepts were not included in the final set of facilities. One of the is in determining how to electrically connect or route transmission lines from the east and south east into Minnesota and determining where such lines should terminate. Following is a general discussion of which combinations were tested.

4.5.1.1 Transmission lines from the west towards Minnesota

The team noted that transmission relief was particularly needed on the 230 kV system from South Dakota to Granite Falls to the Twin Cities area. It was deemed that a high voltage facility coming from the Dakota's, and going into the Twin Cities loop would be beneficial. In the above development, a 345 kV line from Ellendale – Big Stone – Blue Lake was modeled. Also tested were the lines Antelope Valley – Fargo – Alexandria – Saint Cloud, Hettinger – Ellendale – Blue Lake, and Watertown – White – Franklin – Blue Lake. As various generation and transmission projects develop further, various combinations or segments of such lines could be considered. It would be of future interest to pursue further study work on a new line connecting the eastern part of the Dakota's to the Twin Cities metro transmission loop area.

4.5.1.2 Transmission lines from northern Minnesota towards the Twin Cities

Transmission lines from the northern part of the state were studied, such as Arrowhead – Chisago, or Grand Rapids (Boswell) – Riverton – near Saint Cloud, and connecting to the Twin Cities metro loop. In conjunction with one of the above lines, a sensitivity was also examined to see if operating the phase shifting (and therefore MW flow controlling) transformer at Arrowhead could correct regional system violations. While such lines and operating procedures could have merit, none were retained as a recommendation for this scenario.

4.5.1.3 Transmission lines from the east and southeast of Minnesota

Many different options were considered for connecting northeastern Iowa, and southwestern Wisconsin to the existing high voltage system (345 kV). One of the main purposes of such lines in the east bias scenario was to provide for bulk facilities to allow for the power flow from, or through the area, and to unload the stressed 161 kV system. One of the challenges that was studied in a few sensitivity runs was to determine where to tap such high voltage facilities along the route. Tapping the 345 kV line at an improper point, such as connecting the higher voltage (345 kV) to the lower voltage (161 kV) can cause additional overloads, as well as mitigate other overloads. The final list of recommended transmission facilities in this

region, as presented in section 4.4.2, provides for some redundancy of bulk transmission facilities. Past study work, and operational history has indicated that adding transmission in this area can also improve the locational marginal pricing (LMP) market, and relieve flows that have been constraining power transfers.

4.5.2 Preliminary List of Recommended Transmission Vision Facilities

Ref. #	Data Source	Facility Name				
		From	To	Volt (kV)	Miles	Cost (\$M)
F-56	SMNI	Prairie Island	Rochester	345	58	43.7
F-64	CAPX	Eau Claire	King	345	84	63.1
F-65	CAPX	N. LaCrosse	Eau Claire	345	73	55.1
F-66	CAPX	Genoa	N LaCrosse	345	42	31.7
F-67	CAPX	Genoa	Columbia	345	113	84.8
F-68	CAPX	Genoa	Nelson Dewey	345	70	52.4
F-69	SMNI	Nelson Dewey	Salem	345	34	25.6
F-70	CAPX	Genoa	Lansing	345	21	15.8
F-71	CAPX	Lansing	Rochester	345	89	66.8
F-72	CAPX	Ellendale	Big Stone	345	194	145.8
F-73	CAPX	Big Stone	Blue Lake	345	71	53.4
Total					849	638

Table 8 – Eastern Bias Preliminary Recommended Facilities

Key for Table 8:

CAPX – CapX Technical Team

NW – MISO Northwest Exploratory Study

SMNI – MISO Southern Minnesota/Northern Iowa Exploratory Study

TIPS – Transmission Improvement Plans Study

MH – Manitoba Hydro Studies

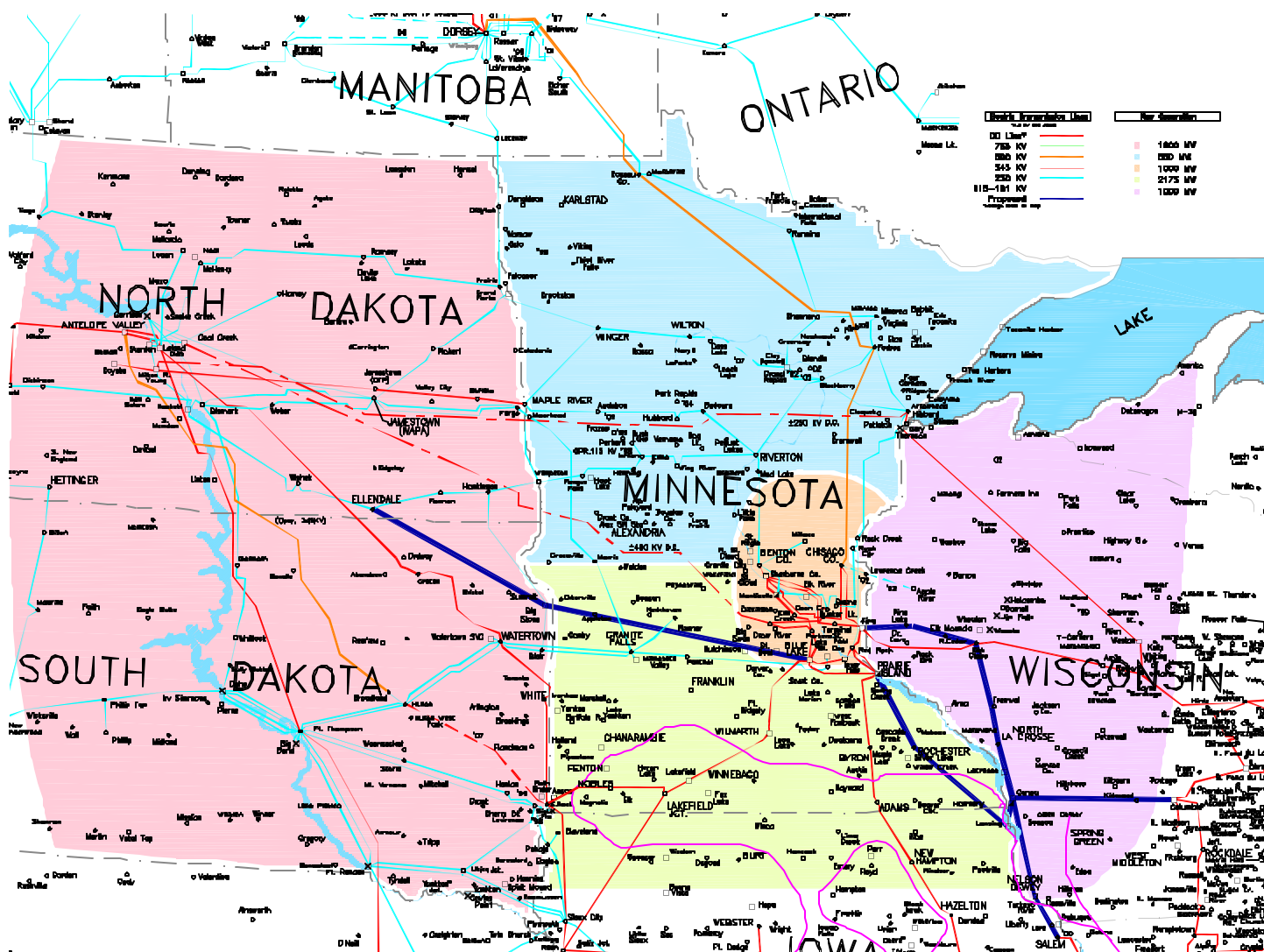


Diagram 12 – Eastern Bias Preliminary Recommended Facilities

4.5.3 Line Flows on Interface and Tie Lines

The CapX 2020 technical team collected system intact line flows on a select set of tie lines and interfaces in and around the Minnesota system. Table 9 predominantly focuses on lines coming into and going out of Minnesota, including some lines inside Minnesota connecting pockets of transmission.

LINE	kV Voltage Level	Base 6300 MW flow (MW)	6300 MW UPGRADE scenario (MW)	Description
Forbes – Chisago	500 kV	1209.6	1191.7	Northern Minnesota to Twin Cities loop
Riel – Roseau	500 kV	1344.9	1329.6	Manitoba Hydro to northern Minnesota
Richer – Roseau	230 kV	178.8	177.7	Manitoba Hydro to northern Minnesota
Letellier – Drayton	230 kV	306.5	314.1	Manitoba Hydro to MN-ND border

Glenboro – Rugby	230 kV	-26.9	-18.6	Manitoba Hydro – North Dakota (This and the three lines above are all that ties Manitoba and U.S. as planned through 2009.)
Arrowhead – Stone Lake	345 kV	177.1	174.5	Duluth area to northwestern Wisconsin (then to Weston)
Eau Claire – Arpin	345 kV	-174.1	-41.8	West to central Wisconsin
Prairie Island – Byron	345 kV	-380.5	-263.7	South of Twin Cities metro to west of Rochester
Adams – Hazelton	345 kV	-138.5	-12.5	Southeastern Minnesota – eastern Iowa
Lakefield Jct. – Wilmarth	345 kV	724.4	660.1	Southwestern Minnesota to Mankato area
Split Rock – Nobles County	345 kV	97.9	81.1	North of Sioux Falls, SD, to northwest of Worthington, MN
Nobles County – Lakefield Jct.	345 kV	279.4	265.4	Northwest of Worthington to Lakefield Jct. sub. (Minnesota)
Watertown – Granite Falls	230 kV	234.2	224.2	Eastern South Dakota to western Minnesota
Blair – Granite Falls	230 kV	276.8	269.9	Runs parallel with Watertown – Granite Falls
Granite Falls – Minnesota Valley	230 kV	373.6	362.8	Western Minnesota
Fargo – Moorhead	230 kV	-23.1	-21.4	Fargo, North Dakota, to Moorhead, Minnesota
Fargo – Sheyenne	230 kV	305.9	297.2	North Dakota, Minnesota border
Maple River – Winger	230 kV	91.5	88.5	Fargo area to northwestern Minnesota
Prairie – Winger	230 kV	129.2	129.3	Grand Forks area to Winger
Wahpeton – Fergus Falls	230 kV	242.6	234.9	ND-MN border east to Fergus Falls
Bear Creek – Rock Creek	230 kV	93.1	92.5	South of Duluth toward the Twin Cities loop
Blackberry – Riverton	230 kV	227.0	233.4	Northern Minnesota towards south
Mud Lake – Benton County	230 kV	38.3	31.5	Coming from the north into St. Cloud area
Sheyenne – Audubon	230 kV	230.6	222.3	Fargo area west into Minnesota
Genoa – Coulee	161 kV	391.9	210.8	Western Wisconsin
Boswell – Blackberry Ckt 1	230 kV	279.9	280.3	Northern Minnesota
Boswell – Blackberry Ckt 2	230 kV	273.2	273.5	Northern Minnesota

Table 9 – Eastern Bias Tie Line/Interface Flows

5 Slow Growth Analysis

The CapX 2020 technical team performed a sensitivity analysis for a reduced load level of 4,500 MW to determine which facility additions are necessary at this slower growth load level. Assuming the 6,300 MW increased load level is reached in 2020 and using a linear load growth rate, the team determined that the 4,500 MW increased load level would be reached in the year 2016.

To model the 4,500 MW load level, the 6,300 MW load model was scaled down in each control area uniformly by scaling the load growth down by a factor of 2/3 (4500/6300). The scaled down load totals for each control area are shown in Table 10.

Control area	Calculated 2020 load level (6300 MW)	Scaled load level (4500 MW)
Alliant Energy (West) (331)	3888.2	3711.1
Xcel Energy (North) (600)	12885.1	11960.5
Minnesota Power Co. (608)	1814.4	1727.1
Southern MN Municipal Power Agency (613)	442.4	410.4
Great River Energy (618)	3943.2	3627.8
Otter Tail Power (626)	2248.3	2085.9
Dairyland Power Co. (680)	1266.2	1177.6
Total	26487.8	24700.6

Table 10 – CapX 2020 Slow Area Growth

The generation total also was reduced by scaling each generator down by a factor of 2/3 (4500/6300). Table 11 shows the reduced generation totals for each generation bias scenario.

Slow Growth Analysis						
	North/West		Minnesota		Eastern	
	6300 MW	4500 MW	6300 MW	4500 MW	6300 MW	4500 MW
Northern Minnesota	1700	1214	1250	893	550	393
Dakotas	2100	1500	1000	714	1600	1143
Southern MN/ Northern Iowa	1875	1340	1875	1340	2125	1554
Metro	650	464	2200	1571	1000	714
Wisconsin	0	0	0	0	1000	714
Total	6325	4518	6325	4518	6325	4518

Table 11 – Slow Growth Generation Scenario

The results for each generation scenario at the slow growth load level will be discussed in detail in sections 5.1 – 5.3 of this report. The n-1 contingency output results tabulated in Appendices B-1 through B-3. For the slow growth n-1 analysis, the same contingencies from the anticipated growth study were run again and the transmission system was monitored in the following control areas:

Control Area	PSS/E Area #
Alliant Energy West	331
Xcel Energy	600
Minnesota Power Co.	608
Southern Minnesota Municipal Power Agency	613
Great River Energy	618
Otter Tail Power Company	626
Dairyland Power Company	680

5.1 Transmission Alternatives Considered for Slow Growth

For the slow growth sensitivity the CapX 2020 technical team began the analysis of each generation scenario with the facilities recommended for the 6300-MW vision study. The recommended facilities were individually removed to determine which of the facilities were also necessary at the 4,500 MW load/generation level.

For the Minnesota and North/West biases, the team determined that the majority of the facilities still were necessary even with the load reduced by 33 percent. For the eastern bias case at the slow growth level, there was less justification for some of the various recommended transmission lines. Although, higher voltage lines from the Wisconsin – Iowa border area towards the Twin Cities were still appropriate. It was also still clear that relief of existing facilities is needed on the system between the Dakotas and Minnesota. As explained in section 4.5, additional sensitivity work is still pending for the eastern bias case, both at the 6300 MW level and the slow growth scenario.

5.2 Minnesota Bias Scenario Slow Growth Results

5.2.1 Recommended Facilities

Ref. #	Data Source	Facility Name				
		From	To	Volt (kV)	Miles	Cost (\$M)
F-02	TIPS	Alexandria	Benton County	345	80	60
F-03	TIPS	Alexandria	Maple River	345	126	94.5
F-06	NW	Antelope Valley	Maple River	345	292	219
F-07	CAPX	Arrowhead	Chisago	345	120	90
F-08	CAPX	Arrowhead	Forbes	345	60	45
F-09	CAPX	Benton County	Chisago County	345	59	44.25
F-10	CAPX	Benton County	Granite Falls	345	110	82.5
F-11	MH	Benton County	Riverton	345	78	58.5
F-12	CAPX	Benton County	St. Boni	345	62	46.5
F-13	CAPX	Blue Lake	Ellendale	345	200	150

F-17	CAPX	Boswell	Forbes	345	64	48
F-26	CAPX	Chisago County	Prairie Island	345	82	61.5
F-28	CAPX	Columbia	North LaCrosse	345	80	60
F-30	NW	Ellendale	Hettinger	345	231	173.25
F-32	CAPX	Forbes	Riverton	345	114	85.5
F-36	SMNI	Rochester	North LaCrosse	345	60	45
F-56	SMNI	Prairie Island	Rochester	345	58	43.5
				Total	1876	1407

Table 12 – Slow Growth Load Level Minnesota Bias Recommended Facilities

Table 12 key:

CAPX – CapX Technical Team

NW – MISO Northwest Exploratory Study

SMNI – MISO Southern Minnesota/Northern Iowa Exploratory Study

TIPS – Transmission Improvement Plans Study

MH – Manitoba Hydro Studies

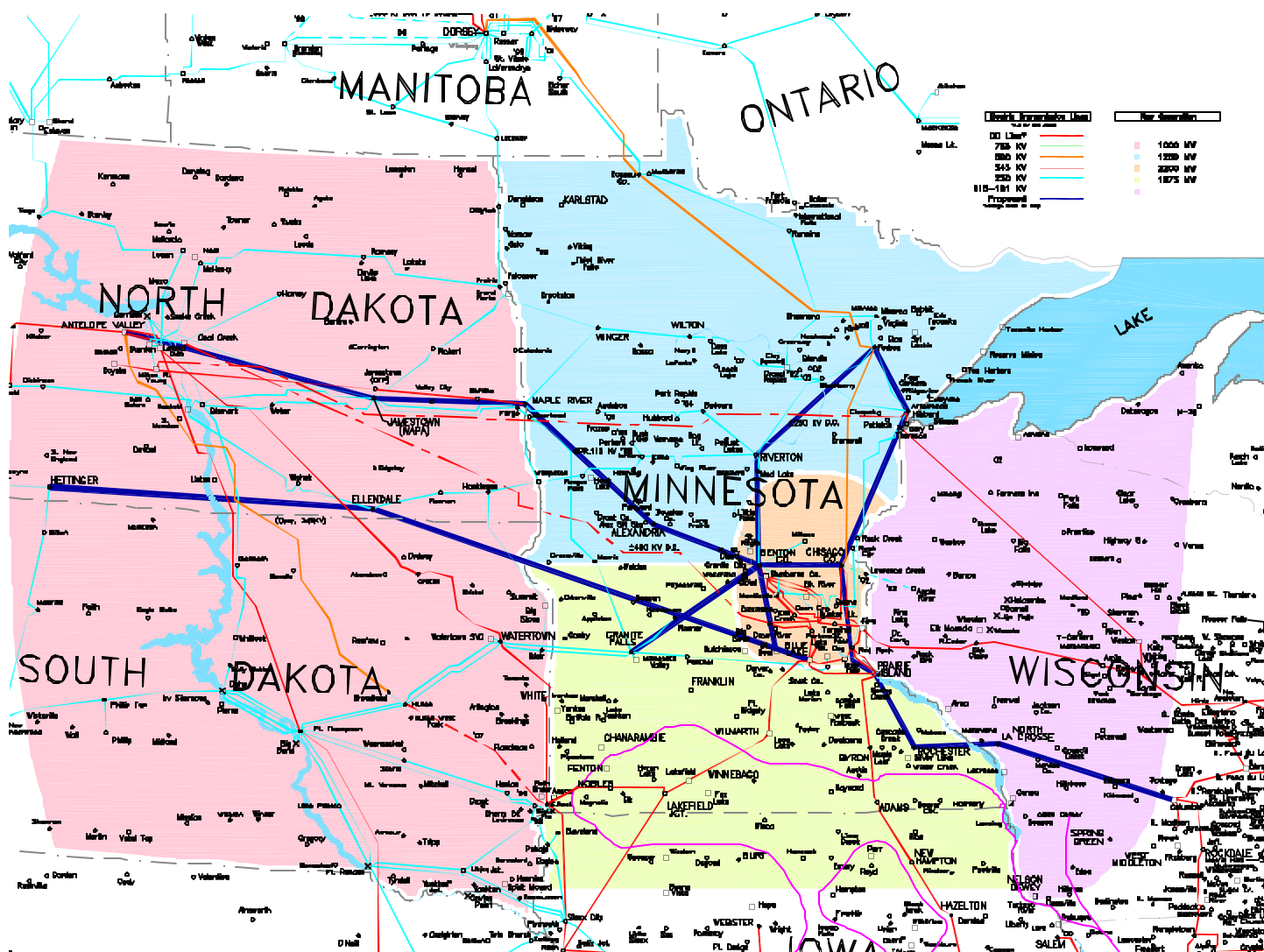


Diagram 13 – Slow Growth Load Level Minnesota Bias Recommended Facilities

5.2.2 Line Flows on Interface and Tie Lines

LINE	kV Voltage Level	Base 4500 MW FLOW (MW)	4500 MW UPGRADE scenario (MW)	Description
Forbes – Chisago	500 kV	1351	1187	Northern Minnesota to Twin Cities loop
Riel – Roseau	500 kV	1228	1224	Manitoba Hydro to northern Minnesota
Richer – Roseau	230 kV	180	184	Manitoba Hydro to northern Minnesota
Letellier – Drayton	230 kV	363	340	Manitoba Hydro to MN-ND border
Glenboro – Rugby	230 kV	17	38	Manitoba Hydro – North Dakota (This and the three lines above are all that ties Manitoba and U.S. as planned through 2009.)
Arrowhead – Stone Lake	345 kV	88	98	Duluth area to northwestern Wisconsin (then to Weston)

Eau Claire – Arpin	345 kV	206	146	West to central Wisconsin
Prairie Island – Byron	345 kV	169	227	South of Twin Cities metro to west of Rochester
Adams – Hazelton	345 kV	260	197	Southeastern Minnesota – Eastern Iowa
Lakefield Jct. – Wilmarth	345 kV	719	622	Southwestern Minnesota to Mankato area
Split Rock – Nobles County	345 kV	175	129	North of Sioux Falls, SD to northwest of Worthington, MN
Nobles County – Lakefield Jct.	345 kV	220	128	Northwest of Worthington to Lakefield Jct. sub. (Minnesota)
Watertown – Granite Falls	230 kV	302	272	Eastern South Dakota to western Minnesota
Blair – Granite Falls	230 kV	317	297	Runs parallel with Watertown – Granite Falls
Granite Falls – Minnesota Valley	230 kV	250	220	Western Minnesota
Fargo – Moorhead	230 kV	54	64	Fargo, North Dakota to Moorhead, Minnesota
Fargo – Sheyenne	230 kV	245	144	North Dakota, Minnesota border
Maple River – Winger	230 kV	75	55	Fargo area to northwestern Minnesota
Prairie – Winger	230 kV	137	78	Grand Forks area to Winger
Wahpeton – Fergus Falls	230 kV	209	136	ND-MN border east to Fergus Falls
Bear Creek – Rock Creek	230 kV	91	80	South of Duluth toward the Twin Cities loop
Blackberry – Riverton	230 kV	227	156	Northern Minnesota towards south
Mud Lake – Benton County	230 kV	1.2	34	Coming from the north into St.Cloud area
Sheyenne – Audubon	230 kV	194	165	Fargo area west into Minnesota
Genoa – Coulee	161 kV	268	206	Western Wisconsin
Boswell – Blackberry Ckt 1	230 kV	288	188	Northern Minnesota
Boswell – Blackberry Ckt 2	230 kV	281	183	Northern Minnesota

Table 13 – Slow Growth Minnesota Bias Tie Line/Interface Flows

5.3 North / West Scenario Slow Growth Results

5.3.1 Recommended Facilities

Ref. #	Data Source	Facility Name				
		From	To	Volt (kV)	Miles	Cost (\$M)
F-02	TIPS	Alexandria	Benton County	345	80	60
F-03	TIPS	Alexandria	Maple River	345	126	94.5
F-06	NW	Antelope Valley	Maple River	345	292	219
F-07	CAPX	Arrowhead	Chisago	345	120	90
F-08	CAPX	Arrowhead	Forbes	345	60	45
F-09	CAPX	Benton County	Chisago County	345	59	44.25
F-10	CAPX	Benton	Granite Falls	345	110	82.5

		County				
F-12	CAPX	Benton County	St. Boni	345	62	46.5
F-13	CAPX	Blue Lake	Ellendale	345	200	150
F-26	CAPX	Chisago County	Prairie Island	345	82	61.5
F-28	CAPX	Columbia	North LaCrosse	345	80	60
F-30	NW	Ellendale	Hettinger	345	231	173.25
F-36	SMNI	Rochester	North LaCrosse	345	60	45
F-56	SMNI	Prairie Island	Rochester	345	58	43.5
Total				1620	1215	

Table 14 – Slow Growth Load Level North/West Bias Recommended Facilities

Table 14 key:

CAPX – CapX Technical Team

NW – MISO Northwest Exploratory Study

SMNI – MISO Southern Minnesota/Northern Iowa Exploratory Study

TIPS – Transmission Improvement Plans Study

MH – Manitoba Hydro Studies

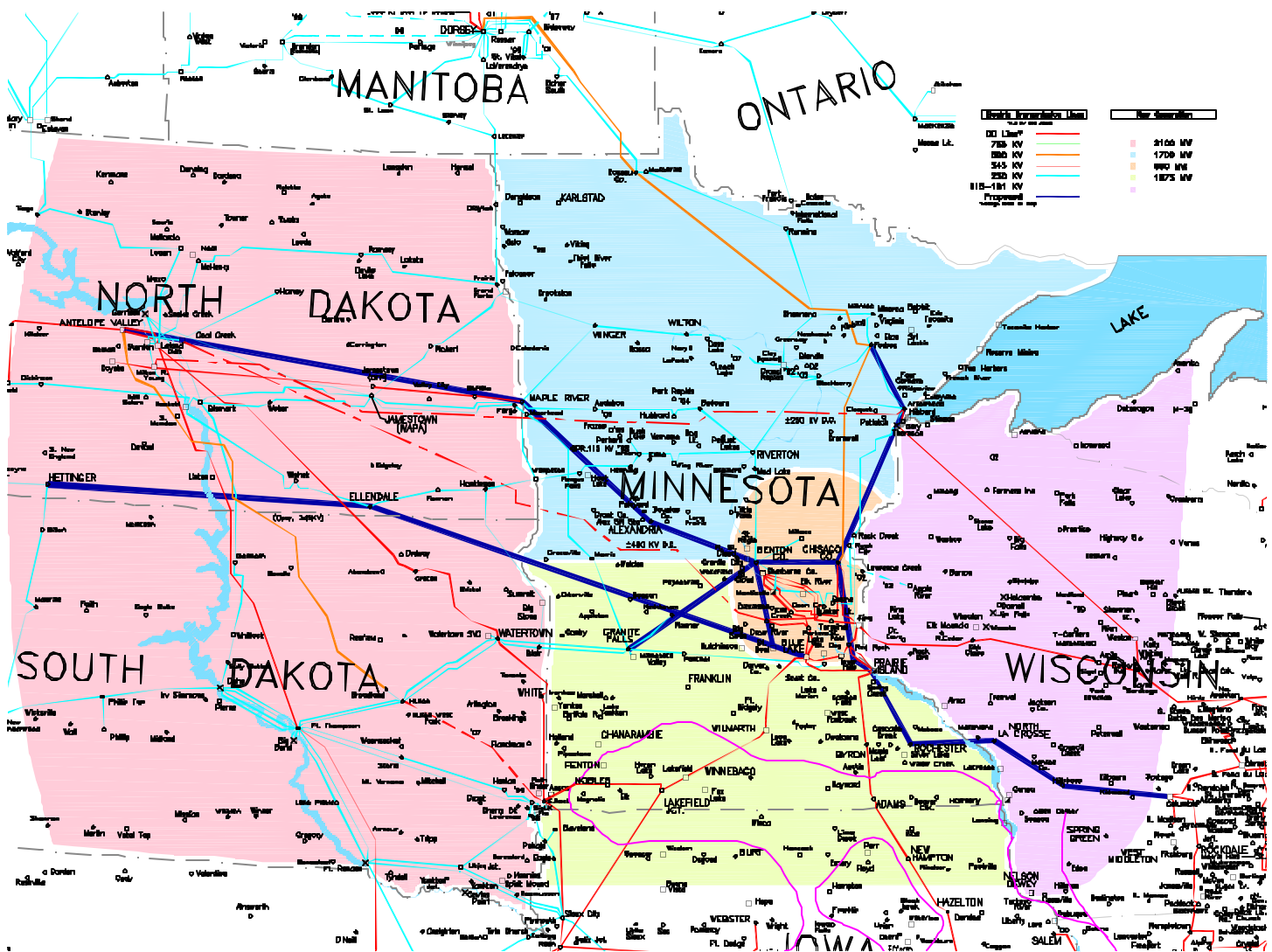


Diagram 14 – Slow Growth Load Level North/West Bias Recommended Facilities

5.3.2 Line Flows on Interface and Tie Lines

LINE	kV Voltage Level	Base 4500 MW FLOW	4500 MW UPGRADE scenario	Description
Forbes – Chisago	500 kV	1540.3	1398.6	Northern Minnesota to Twin Cities loop
Riel – Roseau	500 kV	1842.1	1782.9	Manitoba Hydro to Northern Minnesota
Richer – Roseau	230 kV	228.5	223.5	Manitoba Hydro to Northern Minnesota
Letellier – Drayton	230 kV	392.3	405.6	Manitoba Hydro to MN-ND border
Glenboro – Rugby	230 kV	34.1	81.1	Manitoba Hydro – North Dakota (This and the three lines above are all that ties Manitoba and U.S. as planned through 2009.)

Arrowhead – Stone Lake	345 kV	298.3	310.9	Duluth area to northwestern Wisconsin (then to Weston)
Eau Claire – Arpin	345 kV	72.3	57.8	West to central Wisconsin
Prairie Island – Byron	345 kV	165.4	185.3	South of Twin Cities metro to west of Rochester
Adams – Hazelton	345 kV	173.9	92.9	Southeastern Minnesota – eastern Iowa
Lakefield Jct. – Wilmarth	345 kV	746.1	602.3	Southwestern Minnesota to Mankato area
Split Rock – Nobles County	345 kV	263.9	184.4	North of Sioux Falls, SD, to northwest of Worthington, MN
Nobles County – Lakefield Jct.	345 kV	336.4	252.5	Northwest of Worthington to Lakefield Jct. sub. (Minnesota)
Watertown – Granite Falls	230 kV	248.5	232.0	Eastern South Dakota to western Minnesota
Blair – Granite Falls	230 kV	279.8	270.1	Runs parallel with Watertown – Granite Falls
Granite Falls – Minnesota Valley tap	230 kV	375.4	288.3	Western Minnesota
Fargo – Moorhead	230 kV	54.5	55.4	Fargo, North Dakota, to Moorhead, Minnesota
Fargo – Sheyenne	230 kV	271	200.7	North Dakota, Minnesota border
Maple River – Winger	230 kV	75.1	82.9	Fargo area to northwestern Minnesota
Prairie – Winger	230 kV	168.3	139.6	Grand Forks area to Winger
Wahpeton – Fergus Falls	230 kV	241.8	164.3	ND-MN border east to Fergus Falls
Bear Creek – Rock Creek	230 kV	96.1	95.5	South of Duluth toward the Twin Cities loop
Blackberry – Riverton	230 kV	232.8	216.5	Northern Minnesota towards south
Mud Lake – Benton County	230 kV	63.6	23.9	Coming from the north into St.Cloud area
Sheyenne – Audubon	230 kV	233.9	197.2	Fargo area west into Minnesota
Genoa – Coulee	161 kV	249.8	189.1	Western Wisconsin
Boswell – Blackberry Ckt 1	230 kV	293.9	287.2	Northern Minnesota
Boswell – Blackberry Ckt 2	230 kV	286.9	280.4	Northern Minnesota

Table 15 – Slow Growth North/West Bias Tie Line/Interface Flows

5.4 Eastern Scenario Slow Growth Results

5.4.1 Recommended Facilities

The transmission list shown in Table 16 is a somewhat shorter list than shown in the 6,300-MW scenario in section 4.4.2. This does not fix all overloads; but the level of overload is less and, from the point of this discrete scenario, other more optimal fixes may exist. Nevertheless, knowing what lies ahead in the long run, fixing issues related to this slower growth scenario would perhaps not be a long term effective plan. The east bias slow growth scenario compared with the faster pace growth suggests that new higher voltage facilities from the east towards Minnesota would be more critical than a line from the Dakotas into Minnesota.

Again, as stated in section 4.4, identifying transmission solutions to address thermal and voltage violations for the eastern bias was difficult. The legacy of

having a minimal level of inter-regional transmission planning (between MAPP and MAIN) has resulted in limited number of facilities to expand the transmission network between the regions. The natural barrier of the St. Croix and Mississippi Rivers and the lack of voltage sources in this region made it difficult to identify transmission solutions to move generation from Wisconsin into the load centers in Minnesota. After studying various alternatives to address base system conditions, the CapX 2020 technical team thought that amount of transmission needed would become significant and costly and, therefore, did not pursue looking further at transmission alternatives for the 6,300- and 4,500-MW load levels.

Ref. #	Data Source	Facility Name				
		From	To	Volt (kV)	Miles	Cost (\$M)
F-56	SMNI	Prairie Island	Rochester	345	58	43.7
F-64	CAPX	Eau Claire	King	345	84	63.1
F-65	CAPX	N. LaCrosse	Eau Claire	345	73	55.1
F-66	CAPX	Genoa	N LaCrosse	345	42	31.7
F-67	CAPX	Genoa	Columbia	345	113	84.8
F-70	CAPX	Genoa	Lansing	345	21	15.8
F-71	CAPX	Lansing	Rochester	345	89	66.8
			Total		480	305.9

Table 16 – Slow Growth Load Level Eastern Bias Recommended Facilities

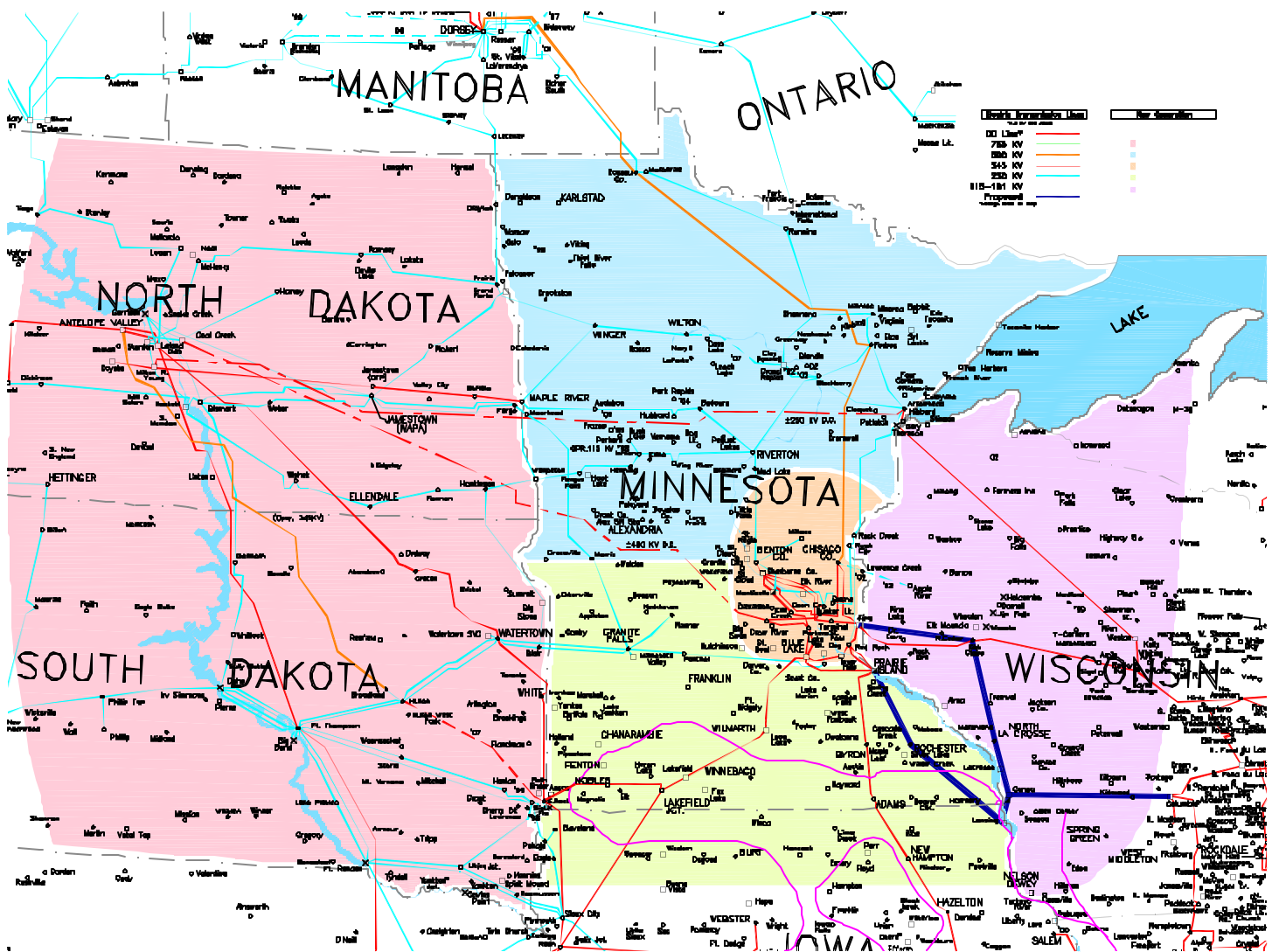


Diagram 15 – Slow Growth Load Level Preliminary Eastern Bias Recommended Facilities

5.4.2 Line Flows on Interface and Tie Lines

LINE	kV Voltage Level	Base 4500 MW FLOW (MW)	4500 MW UPGRADE scenario (MW)	Description
Forbes – Chisago	500 kV	1110.5	1109.7	Northern Minnesota to Twin Cities loop
Riel – Roseau	500 kV	1319.1	1311.0	Manitoba Hydro to northern Minnesota
Richer – Roseau	230 kV	171.5	170.6	Manitoba Hydro to northern Minnesota
Letellier – Drayton	230 kV	314.0	318.1	Manitoba Hydro to MN-ND border
Glenboro – Rugby	230 kV	-2.2	2.4	Manitoba Hydro – North Dakota (This and the three lines above are all that ties Manitoba and U.S. as planned through 2009.)
Arrowhead – Stone Lake	345 kV	217.6	204.7	Duluth area to northwestern Wisconsin (then to Weston)
Eau Claire – Arpin	345 kV	-59.2	44.8	West to central Wisconsin

Prairie Island – Byron	345 kV	-216.0	-165.2	South of Twin Cities metro to west of Rochester
Adams – Hazelton	345 kV	-69.7	7.9	Southeastern Minnesota – Eastern Iowa
Lakefield Jct. – Wilmarth	345 kV	546.8	512.8	Southwestern Minnesota to Mankato area
Split Rock – Nobles County	345 kV	76.2	68.2	North of Sioux Falls, SD, to northwest of Worthington, MN
Nobles County – Lakefield Jct.	345 kV	171.3	165.1	Northwest of Worthington to Lakefield Jct. sub. (Minnesota)
Watertown – Granite Falls	230 kV	202.6	196.1	Eastern South Dakota to western Minnesota
Blair – Granite Falls	230 kV	229.2	224.4	Runs parallel with Watertown – Granite Falls
Granite Falls – Minnesota Valley	230 kV	305.4	299.0	Western Minnesota
Fargo – Moorhead	230 kV	1.1	1.9	Fargo, North Dakota, to Moorhead, Minnesota
Fargo – Sheyenne	230 kV	256.6	253.2	North Dakota, Minnesota border
Maple River – Winger	230 kV	78.0	76.5	Fargo area to northwestern Minnesota
Prairie – Winger	230 kV	121.3	121.4	Grand Forks area to Winger
Wahpeton – Fergus Falls	230 kV	200.5	196.6	ND-MN border east to Fergus Falls
Bear Creek – Rock Creek	230 kV	80.1	83.2	South of Duluth toward the Twin Cities loop
Blackberry – Riverton	230 kV	223.9	228.9	Northern Minnesota towards south
Mud Lake – Benton County	230 kV	16.3	14.4	Coming from the north into St. Cloud area
Sheyenne – Audubon	230 kV	199.3	195.7	Fargo area west into Minnesota
Genoa – Coulee	161 kV	336.1	188.3	Western Wisconsin
Boswell – Blackberry Ckt 1	230 kV	282.1	282.1	Northern Minnesota
Boswell – Blackberry Ckt 2	230 kV	275.1	275.1	Northern Minnesota

Table 17 – Slow Growth Eastern Bias Tie Line/Interface Flows

6 Common Facilities

The CapX 2020 technical team’s primary goal for this initial vision study was to identify a long-range transmission plan that would benefit Minnesota’s electric reliability as load continues to grow over the next 15 years and beyond.

6.1 Common transmission alternatives between Minnesota and North/West Biases

The team found that the Minnesota and North/West biases had 1620 miles of 345 kV transmission lines in common, for a total of \$1.215 billion.⁵ For comparison, that is a little more than 80 percent of the cost of each scenario individually. The common facilities are shown in Table 18.

⁵ When reviewing the results of this study, note that only the cost of transmission line per mile is represented. None of the associated substation, generation interconnection facilities, or underlying lower-voltage (below 161 kV) transmission system infrastructure costs are determined or included in this vision study.

Facility Name				
From	To	Volt (kV)	Miles	Cost (\$M)
Alexandria	Benton County	345	80	60
Alexandria	Maple River	345	126	94.5
Antelope Valley	Jamestown	345	185	138.75
Arrowhead	Chisago	345	120	90
Arrowhead	Forbes	345	60	45
Benton County	Chisago County	345	59	44.25
Benton County	Granite Falls	345	110	82.5
Benton County	St. Boni	345	62	46.5
Blue Lake	Ellendale	345	200	150
Chisago County	Prairie Island	345	82	61.5
Columbia	North LaCrosse	345	80	60
Ellendale	Hettinger	345	231	173.25
Rochester	North LaCrosse	345	60	45
Jamestown	Maple River	345	107	80.25
Prairie Island	Rochester	345	58	43.5
Total miles 1620		Total cost \$1,215 (\$M)		

Table 18 – Common Minnesota and North/West Bias Recommended Facilities

6.2 Additional transmission facilities for each scenario

In addition to the common facilities in the above table, the Minnesota bias had three additional unique facilities for a total of 256 miles and \$192 million. These facilities are a result of the high concentration of generation in the St Paul/Minneapolis metro area.

The north/west bias also had three unique facilities for a total of 387 miles and \$290 million. These facilities are a direct result of the 1000-MW import from Manitoba Hydro, which is included in the north/west generation bias.

6.3 Eastern Bias

As mentioned in section 4.5 of this report, the eastern bias had vastly different preliminary results than the Minnesota and north/west biases, and has additional study work to be performed. When all three generation biases are considered together, they

have only two common facilities at this point in the study work: Blue Lake to Ellendale 345 kV and Prairie Island to Rochester 345 kV. The eastern bias also includes a 345 kV line from Rochester to Columbia as in the other scenarios but interconnects it to two 345 kV stations, Lansing and Genoa.

7 Conclusion and Next Steps

The CapX 2020 technical team believes these results to be the cornerstone of future studies to better identify the transmission needs of the study region. These results need to be integrated into the MISO Transmission Expansion Plan and ongoing utility load-serving studies.

The CapX 2020 technical team will continue its work with the following sensitivity study:

- The previously mentioned study work to complete the eastern bias case. Sensitivities will be done to determine if more of the facilities recommended for the Minnesota and north/west bias cases solve some of the remaining overloads in the eastern bias. The CapX 2020 technical team will also create a new list similar to Appendix A of this report for possible transmission facilities for the eastern bias case.

The team also envisions future study efforts to incorporate the results of adjoining regional study efforts, investigate how the bulk transmission solutions can support the load-serving transmission, and investigate how the impacts of new load forecasts and generation interconnections impact the transmission vision. Additional studies to consider include:

- Scaling the 2009 model's load to a point where transmission violations begin to occur and determining which transmission alternative best solves the problem. The study should continue this effort to determine sequence and/or combinations of transmission additions.
- Analyzing the lower voltage system (below 161 kV) for voltage violations and thermal overloads during n-1 contingency analysis.
- Conducting detail studies (including stability analysis) to support a certificate of need for facilities identified as being critical to meet the needs of the transmission customer.
- Identifying bulk substation locations that address overloads on the load-serving transmission system and preparing least-cost planning alternatives that meet the anticipated load growth in the area. Studies would involve detailed load scaling efforts to better model local load growth. The team would review short-term alternatives to address immediate concerns such as switched capacitors, reconductoring, and voltage upgrades on existing corridors.
- Investigating impacts of alternative transmission technology (DC, FACTS, phase shifting transformers, etc.)
- Reconsidering alternative generation locations in each of the biases to determine the sensitivity of generation location on the transmission vision.
- Updating study results based on new generation interconnect/delivery study results.

- Integrating results of adjoining regional and MISO study efforts to determine impacts on transmission vision.

CapX 2020 Technical Team members:

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Appendices

- A. Composite List of Transmission Data
- B. Tabulated Contingency Results, Load Flow Data and Automaps
 - B-1. MN Bias
 - N-1 Output 6300 MW
 - Automaps for 6300 MW Case
 - N-1 Output 4500 MW
 - Automaps for 4500 MW case
 - B-2. NW Bias
 - N-1 Output 6300 MW
 - Automaps for 6300 MW Case
 - N-1 Output 4500 MW
 - Automaps for 4500 MW case
 - B-3. Eastern Bias
 - N-1 Output 6300 MW
 - Automaps for 6300 MW Case
 - N-1 Output 4500 MW
 - Automaps for 4500 MW case
- C. Transmission Characteristics and Cost Estimate Data

Appendix A
Composite List of Transmission Data – Recommended Facilities Include Facility Characteristics

Ref. #	Data Source	Facility Name					Facility Characteristics						
		From Name	To Name	Volt (kV)	Miles	Cost (\$M)	From Bus #	To Bus #	R	X	Bch	Rating (MVA)	
												Summer	
F-01	SMNI	Adams	Hayward	345	34	25.3							
F-02	TIPS	Alexandria	Benton County	345	80	59.9	67010	60142	.00299	.03276	.559	1165	
F-03	TIPS	Alexandria	Maple River	345	126	94.2	67010	66792	.00506	.05544	.946	1165	
F-04	CAPX	Alma	Rock Elm	345	60	45							
F-05	CAPX	Alma	Tremval	345	40	30							
F-06	NW	Antelope Valley	Maple River	345	292	219	67101	66792	.01058	.11592	1.978	1165	
F-07	CAPX	Arrowhead	Chisago	345	120	90	61608	60199	.00438	.04718	.80974	1303	
F-08	CAPX	Arrowhead	Forbes	345	60	45	61608	61622	.00191	.02060	.35357	1303	
F-09	CAPX	Benton County	Chisago County	345	59	43.9	60142	60199	.00269	.02890	.49602	1303	
F-10	CAPX	Benton County	Granite Falls	345	110	82.7	60142	66797	.00506	.05449	.93523	1303	
F-11	MH	Benton County	Riverton	500	78	58.5	61620	60142	.00361	.000494	.665	1303	
F-12	CAPX	Benton County	St. Boni	345	62	46.6	60142	62655	.00285	.03068	.52655	1303	
F-13	CAPX	Blue Lake	Ellendale	345	200	150	60192	99990	.014398	.157752	2.6918	1166	
F-14	NW	Blue Lake	Franklin	345	87	65.0							
F-15	NW	Blue Lake	Granite Falls	345	127	95.4							
F-16	CAPX	Blue Lake	West Faribault	345	50	37.5							
F-17	CAPX	Boswell	Forbes	345	64	47.7	61628	61622	.00292	.03142	.53926	1303	
F-18	TIPS	Boswell	Wilton County	230	72	54.3							
F-19	SMNI	Burt	Webster	345	50	37.3							
F-20	SMNI	Burt	Winnebago	345	56	41.9							
F-21	SMNI	Byron	Rochester	345	31	23.6							
F-22	SMNI	Byron	Wilmarth	345	72	54.2							
F-23	SMNI	White	Franklin	345	76	57.2							
F-24	SMNI	Chanarambie	White	345	53	39.8							
F-25	CAPX	Chisago County	King	345	52	39							
F-26	CAPX	Chisago County	Prairie Island	345	82	61.2	60199	60105	.00375	.04031	.69189	1303	
F-27	CAPX	Columbia	Genoa	345	110	83							
F-28	CAPX	Columbia	North LaCrosse	345	80	60	39157	92605	.00316	.04954	.5371	1328	
F-29	MH	Dorsey	Karlstad	345	134	100.5	67625	66750	.00383	.05688	.89380	1295	
F-30	NW	Ellendale	Hettinger	345	231	173.3	99990	67175	.0092	.1008	1.72	1165	
F-31	NW	Ellendale	Watertown	345	131	98.2							

F-32	CAPX	Forbes	Riverton	345	114	85.4	61622	61620	.00522	.05622	.96491	1303	
F-33	CAPX	Franklin	Granite Falls	345	48	36							
F-34	CAPX	Franklin	Lyon County	345	70	52.5							
F-35	CAPX	Franklin	Wilmarth	345	60	45							
F-36	SMNI	Rochester	North LaCrosse	345	60	44.9	69999	92603	.00253	.02717	.46635	2110	
F-37	SMNI	Freemont	Rochester	345	0	0							
F-38	NW	Granite Falls	Watertown	345	93	69.9							
F-39	CAPX	Genoa	Lansing	345	0	0							
F-40	MH	Winger	Benton Co	345	162	121.5	66760	60142	.00735	.10920	1.7157	1295	
F-42	SMNI	Hayward	Winnebago	345	56	41.9							
F-43	SMNI	Hazelton	Salem	345	78	58.1							
F-44	NW	Jamestown	Maple River	345	107	80.4							
F-45	MH	Karlstad	Winger	345	91	114	66750	66803	.00311	.04623	.72631	1295	
F-46	CAPX	King	Rock Elm	345	50	37.5							
F-47	SMNI	Lakefield Junction	Winnebago	345	64	47.9							
F-48	CAPX	Lansing	Rochester	345	100	75							
F-49	CAPX	Lyon County	White	345	50	37.5							
F-50	SMNI	Nelson Dewey	Salem	345	35	25.9							
F-51	SMNI	Nelson Dewey	Spring Green	345	67	50.2							
F-52	SMNI	Nobles	Wilmarth	345	120	89.7							
F-54	SMNI	North LaCrosse	Spring Green	345	105	78.8							
F-55	CAPX	North Lacrosse	Tremval	345	55	41.3							
F-56	SMNI	Prairie Island	Rochester	345	58	43.7	60105	6999	.0046	.0494	.8479	2110	
F-57	MH	Riverton	Wilton County	500	96	72							
F-58	SMNI	Rockdale	West Middleton	345	36	26.7							
F-59	SMNI	Spring Green	West Middleton	345	31	23.2							
F-60	CAPX	West Faribault	Wilmarth	345	45	33.75							
F-61	MH	Wilton County	Winger	345	66	49.5							
F-62	CAPX	Wilmarth	Rochester	345	75	56.25							
F-63	CAPX	Lakefield Jct.	Adams	345	92	69	60331	60102	.00644	.06916	1.187	1303	
F-64	CAPX	Eau Claire	King	345	84	63.1							
F-65	CAPX	North LaCrosse	Eau Claire	345	73	55.1							
F-66	CAPX	Genoa	North LaCrosse	345	42	31.7							
F-67	CAPX	Genoa	Columbia	345	113	84.8							
F-68	CAPX	Genoa	Nelson Dewey	345	70	52.4							
F-69	SMNI	Nelson Dewey	Salem	345	34	25.6							

F-70	CAPX	Genoa	Lansing	345	21	15.8							
F-71	CAPX	Lansing	Rochester	345	89	66.8							
F-72	CAPX	Ellendale	Big Stone	345	194	145.8							
F-73	CAPX	Big Stone	Blue Lake	345	71	53.4							
				Total	0	0							

CAPX – CapX Technical Team

NW – MISO Northwest Exploratory Study

TIPS – Transmission Improvement Plans Study

MH – Manitoba Hydro Studies

SMNI – MISO Southern Minnesota/Northern Iowa Exploratory Study

Appendix B

Tabulated Contingency Results, Load Flow Data, and Automaps

B-1. MN Bias

B-2. NW Bias

B-3. Eastern Bias

Appendix B-1

MN Bias

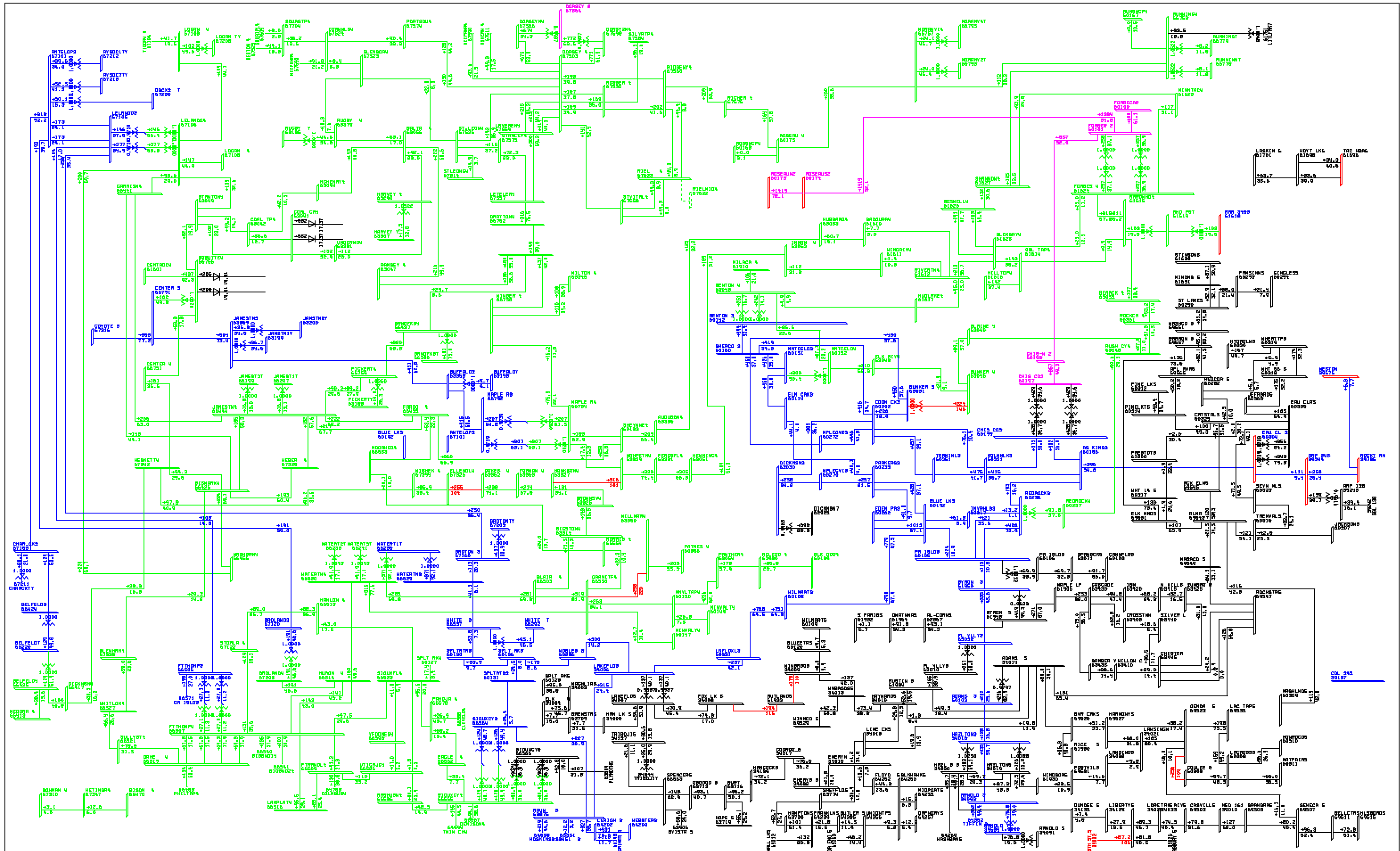
N-1 Contingency Results

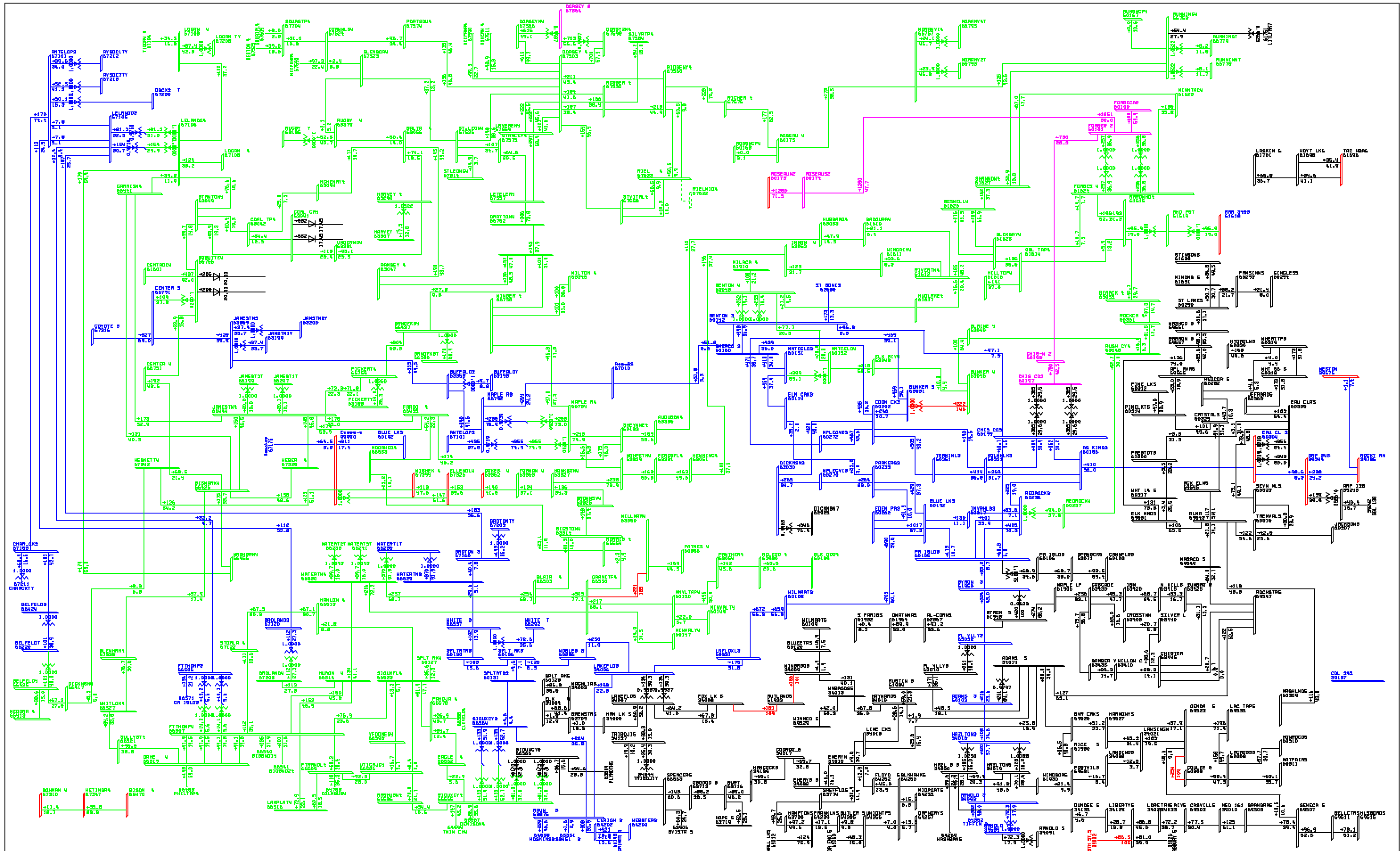
Tabulated Base Case Results

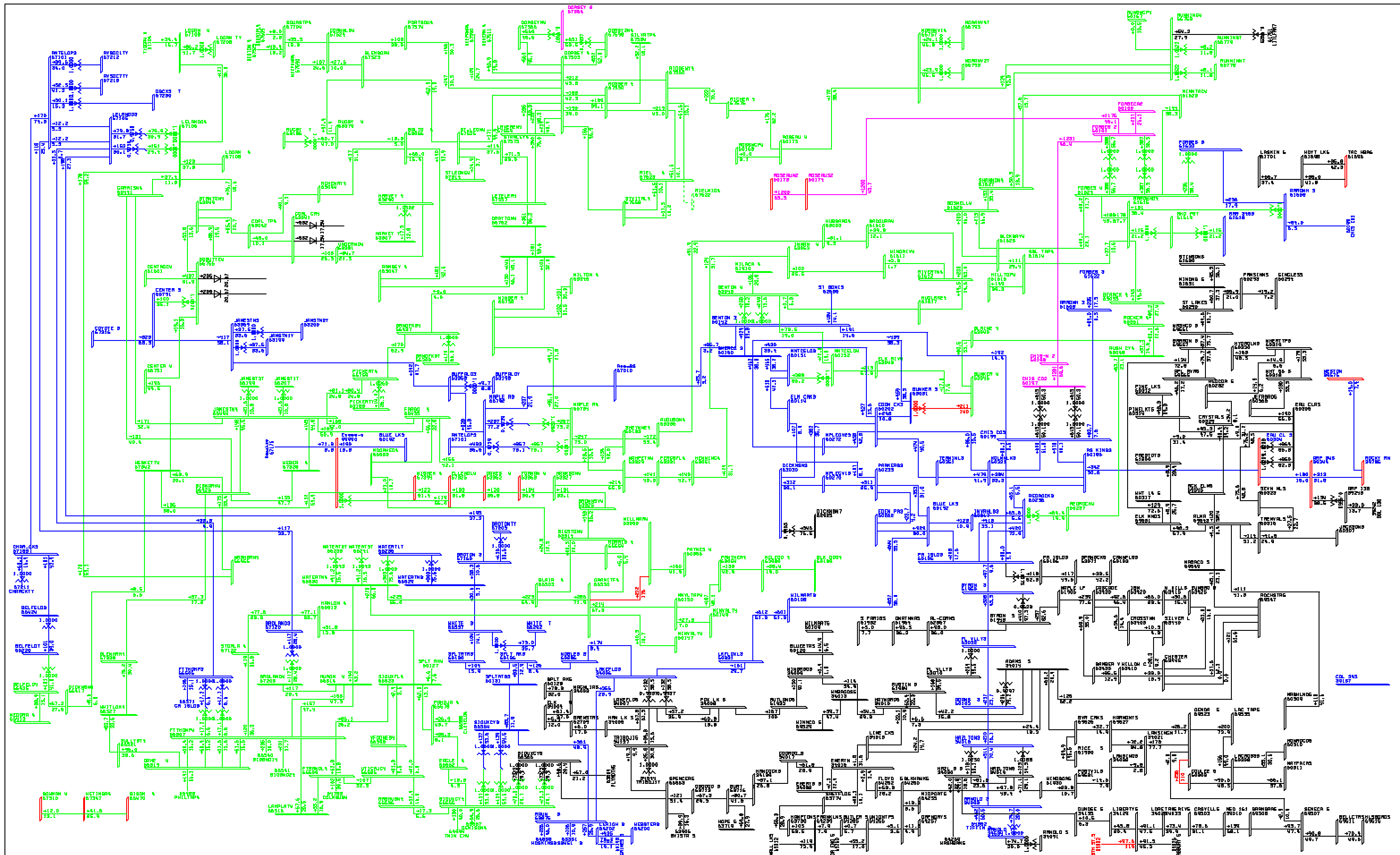
Tabulated Results of Analysis

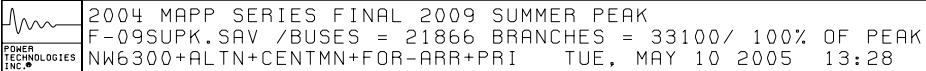
Black Column:	MN Bias with 2020 loads and generation, no facility additions
Red Column:	Black plus addition of the NW Exploratory Study Option N iddev
Green Column:	Red plus addition of the Central MN and Forbes idves
Gray Column:	Green plus addition of Riverton – Benton 345kV line iddev
Blue Column:	Gray plus addition of Prairie Island – Rochester – Columbia 345kV line iddev
Orange Column:	Blue plus addition of Lakefield Jct – Adams 345kV line iddev

Line Overload: System Intact		95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%					
Contingency		95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%					
Transformer Overload: System Intact		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%					
Contingency		115.0%	115.0%	115.0%	115.0%	115.0%	115.0%	115.0%					
Number of Violations Monitored:		10	10	10	10	10	10	10					
Output File:		mrbias.sav	nwexpN-cent.sav	nwexpN-cent-forbes	nwexpN-cent-forbes-ribben	nwexpN-cent-forbes-ribben-col	nwexpN-cent-forbes-ribben-col-ada						
CIRCUIT FROM: # NAME	CIRCUIT TO: # NAME	CTK	RATE MVA	OVRLD CURRENT %	OVRLD CURRENT MVA	OVRLD CURRENT %	OVRLD CURRENT MVA	OVRLD CURRENT %	OVRLD CURRENT MVA	CONTINGENCY FROM TO	CTK	SWITCH	
34014 ADAMS	5 161 69547 ROCHSTR5 161 1	201	65.4 131.47 140.7 282.72 136.7 272.71 158.2 318 155.7 312.98	63.1 126.92 137.9 277.12 132.8 266.97 153.7 308.91 137.4 276.2	62.9 126.36 137.4 276.23 132.4 266.09 153.4 308.24 137.5 276.3	63 126.59 137.6 276.63 132.6 266.49 153.4 308.4 137.6 276.55	49.6 99.7	64.2 109.03	49.6 99.7	61906 MAPLE LF 161 61948 BYRON 5 161 1 61906 MAPLE LF 161 63430 CASCADE 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 61950 BYRON 3 345 63032 PL VLLY3 345 1			
34018 HAZLTN3 345 34093 ARNOLD 3 345 1		720	59.7 430.04 102.3 736.56							SYSTEM INTACT			
34026 ASBURY 5 161 34027 CNTRGRV5 161 1		202	54 109.12 112.1 226.36 104.1 210.25	53.3 107.76 107.6 217.34	53.1 107.31 107.5 217.15	53.1 107.21 107.4 217.03	46.3 93.44 96.8 195.63			SYSTEM INTACT			
34027 CNTRGRV5 161 34508 JULIAN 5 161 1		202	64.2 129.61 122.3 247.06 114.3 230.92	63.5 128.28 117.8 238.03 109.9 221.9	63.3 127.82 117.7 237.84 109.8 221.71	63.2 127.73 117.7 237.72 109.7 221.59	56.4 113.98 107.1 216.29 99.2 200.34			SYSTEM INTACT			
34030 SALEM 5 161 34126 MOOKETA5 161 1		168	48.4 81.24 103.4 173.73 103.5 173.94							SYSTEM INTACT			
34030 SALEM 5 161 34508 JULIAN 5 161 1		202	66.5 134.41 124.7 251.83 116.7 235.69	65.9 133.06 120.2 242.82 112.2 226.67	65.6 132.6 120.1 242.62 112.1 226.48	65.6 132.51 120.1 242.5 112.1 226.36	58.8 118.74 109.4 221.08 101.5 205.12			SYSTEM INTACT			
34087 DYSART 5 161 64269 WASHBRN5 161 1		260	73.3 190.64 120 311.97	72.2 187.64 111.9 290.95	72 187.28 111.9 291.03	72 187.27 120 311.97	69.5 180.73 106 275.69			SYSTEM INTACT			
60133 SHEYNNIE4 230 60134 SHEYNNIE7 115 5		187	76.4 142.95 125.9 235.39							SYSTEM INTACT			
60133 SHEYNNIE4 230 60134 SHEYNNIE7 115 6		187	76.4 142.95 125.9 235.39							SYSTEM INTACT			
60142 BENTON 3 345 63045 BENTON 4 230 1		336	76.7 257.69 121.4 407.79	79.1 265.88 120 403.17	78.8 264.6 119.4 401.27					SYSTEM INTACT			
60142 BENTON 3 345 63045 BENTON 4 230 2		336	74.1 248.94 109.4 401.97	76.4 256.94 118.1 396.66	76.1 255.61 117.5 394.77					SYSTEM INTACT			
60150 MNVLTPA4 230 66550 GRANITF4 230 1		318	84.1 267.39 107.2 340.83 104.7 333.02 104.8 333.21 112.1 366.38							SYSTEM INTACT			
60151 MNTCELO3 345 60152 MNTCELO4 230 6		336	90.4 303.81 157.1 527.98							SYSTEM INTACT			
60152 MNTCELO4 230 63045 BENTON 4 230 1		383.2	23.6 90.38 103.5 366.76							SYSTEM INTACT			
60192 BLUE LK3 345 60233 PARKERS3 345 1		1165	37.1 432 102 1188.26							SYSTEM INTACT			
60192 BLUE LK3 345 60262 EDEN PR3 345 1		1165	87.2 1015.87 118.1 1376.28	87.3 1017.43 115.7 1348.47	87.3 1016.77 115.8 1348.87	87.3 1016.66 115.7 1348.25	85.9 1001.31 113.6 1323.08	85.5 995.75 112.7 1315.44		SYSTEM INTACT			
60302 COULEE 5 161 60308 LACROSS5 161 1		195	48.4 94.4 108.9 212.36	47.3 92.32 104.1 202.95	47.1 91.77 103.8 202.49	47.1 91.84 103.9 202.55				SYSTEM INTACT			
60302 COULEE 5 161 69523 GENOA 5 161 1		240	108.1 251.84 116 278.3	108.6 260.76	108.4 260.11	108.4 260.2	82.3 197.42	83.5 200.35		SYSTEM INTACT			
			117.3 281.55 116.1 278.65 125.9 302.16 154.8 371.43 118.8 285.1 117.7 282.39 113.4 272.11 123.8 297.18 110.5 333.67 116.7 280.01	113 271.22 116.6 279.82 115.5 277.32 113.4 272.11 119.3 286.34 113.4 272.19 114.2 274.19 113.4 272.05 180.8 385.85	120.8 289.81 152.3 365.64 116.6 279.78 115.4 276.92 113.2 271.74 119.2 286.08 113.3 271.9 114.1 273.8 113.2 271.66 160.5 385.3	120.6 289.44 152.4 365.76 116.6 279.82 115.4 277.01 113.3 271.81 119.2 286.17 113.3 271.9 114.1 273.9 113.2 271.75 160.6 385.36	96.2 230.8 99.7 239.28	98.4 236.24		SYSTEM INTACT			
60304 EAU CL 3 345 60305 EAU CLA5 161 10		300	79.8 239.55 137 410.98	80 240.12 137.3 411.81	79.9 239.6 137 410.93	79.8 239.3 136.9 410.44				SYSTEM INTACT			
60304 EAU CL 3 345 60305 EAU CLA5 161 9		300	84.2 252.56 139.3 417.76	84.4 253.16 139.6 418.72	84.2 252.61 139.3 417.84	84.1 252.29 139.1 417.34				SYSTEM INTACT			
60308 LACROSS5 161 69535 LAC TAP5 161 1		335	49.2 164.79 106.1 355.43	49.7 166.38 105 351.87	49.6 166.14 104.9 351.4	49.6 166.21 104.9 351.49				SYSTEM INTACT			
61625 BLCKBRY4 230 61626 BOSWELL4 230 2		399	69.4 277.03 121.2 443.66	65.9 263.05 120.3 479.98	65.1 259.78 118.5 472.98	65.1 259.78 118.5 472.98				SYSTEM INTACT			
61906 MAPLE LF 161 61948 BYRON 5 161 1		302	87 262.86 104.7 316.1 116 350.29	88.2 266.36 107.1 323.54 116.2 350.79	87.9 265.49 106.7 322.24 115.7 349.49	88 265.85 106.8 322.53 115.9 349.98				SYSTEM INTACT			
61906 MAPLE LF 161 63430 CASCADE 161 1		302	82 247.53 110.5 333.67	83.1 250.92 110.7 334.34	82.8 250.07 101.3 306.06 110.3 333.05	82.9 250.43 101.4 306.35 110.4 333.54				SYSTEM INTACT			
61948 BYRON 5 161 61950 BYRON 3 345 1		448	99.3 444.82 117.3 525.35	99.5 445.83 116.4 521.52	99.3 444.99 116.2 520.45	99.3 444.94 116.2 520.5				SYSTEM INTACT			
63187 WINGER Y 230 66758 WINGER 4 230 1		140	71.7 100.38 112.8 157.91 112.8 157.91 112.9 157.99	69.9 97.88 105.9 148.24 105.9 148.24 105.6 147.79	69.9 97.82 105.8 148.06 105.8 148.06 105.4 147.6		72.1 100.87 105.5 147.64 105.5 147.64			SYSTEM INTACT			
63195 BIGSTONY 230 63214 BIGSTON7 115 1		233	93.2 217.24 117.3 273.2 120.5 280.88							SYSTEM INTACT			
63195 BIGSTONY 230 63314 BIGSTON4 230 1		233	93.2 217.23 110.1 256.63 106.3 247.59 109 253.88 117.2 273.19 104.1 242.58 120.5 280.87	86.1 200.62 110.7 334.34 108.7 253.38	86.1 200.54 110.3 333.05 108.7 253.39	86.2 200.91 110.4 333.54 109.1 254.19	86.4 201.31			SYSTEM INTACT			
63327 HANKSON4 230 63329 WAHPETN4 230 1		320	101.7 325.51 116.6 373.08 116.1 371.53 118.1 377.76 120.2 384.62 109.8 351.27 121.1 387.52 121.1 387.51 111.7 357.48 117.5 375.96 112 358.46								SYSTEM INTACT		
63362 OAKES 4 230 67326 ELLENDL4 230 1		240	104.2 250.16 109 261.51 109.7 263.32 109.2 262.16 111.6 267.89 107.1 257.07 108.4 260.27 108.4 260.24 117.8 282.81 116.9 280.5 109 261.53								SYSTEM INTACT		
63445 CHESTER 161 69547 ROCHSTR5 161 15		302	7.9 23.93 119.7 361.48	6.7 20.38 117.6 355.07	7 21.23 117.7 355.47	6.9 20.87 117.6 355.05	40 120.87 130.5 394.09	36.5 110.36 132 398.73		SYSTEM INTACT			
66756 SQBUTTE4 230 66791 CENTER 3 345 1		336	49.8 167.32 130.3 437.79							SYSTEM INTACT			
69523 GENOA 5 161 69535 LAC TAP5 161 1		279	72.2 201.35 134.5 375.23	71.4 199.12 130.7 364.63	71.1 198.42 130.5 364.08	71.1 198.49 130.5 364.12				SYSTEM INTACT			
69557 BARRON 5 161 69561 WASHCO 5 161 1		120	83.9 100.7 108.5 130.25 109 130.79 124.3 149.16 123.9 148.72	86.1 103.34 108.8 130.54 124.1 148.94 123.8 148.52	82.4 98.9 101.4 121.65 107.4 128.87 122.8 147.34 122.4 146.92	83 99.04 101.7 122.05 110.2 132.23 125.6 150.67 125.3 150.41	88.2 105.84 101.7 122.05 110.2 132.23 125.6 150.67 125.3 150.41	88.7 106.42 110.4 132.51 125.8 150.94 125.6 150.68		SYSTEM INTACT			
			80290 ST LAKES 161 61631 MINONG 5 161 1 61670 STINSOCT 115 61630 STINSO 5 161 1 61630 STINSO 5 161 61631 MINONG 5 161 1							SYSTEM INTACT			









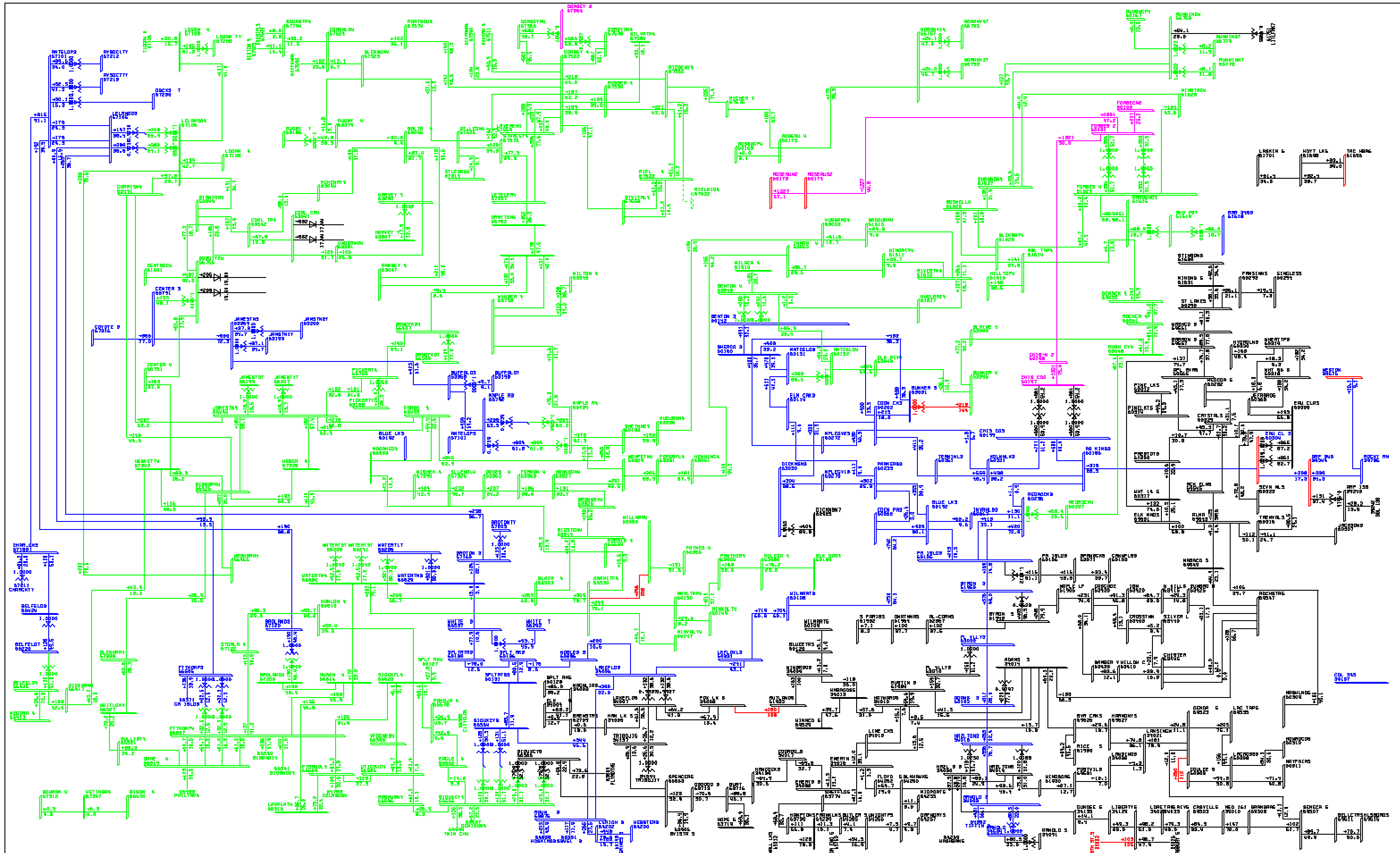
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BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR

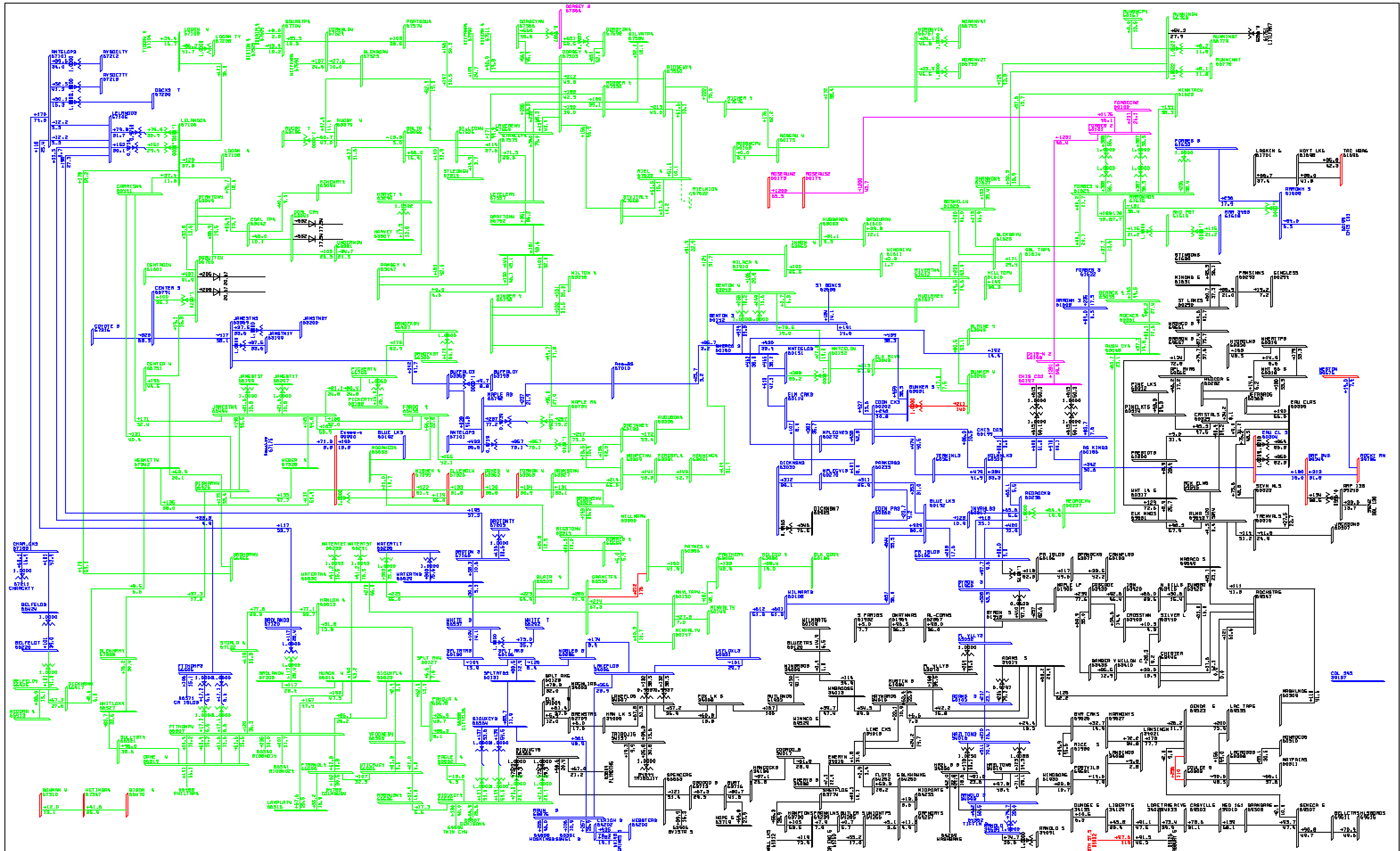
MN Bias
4500 MW Scenario

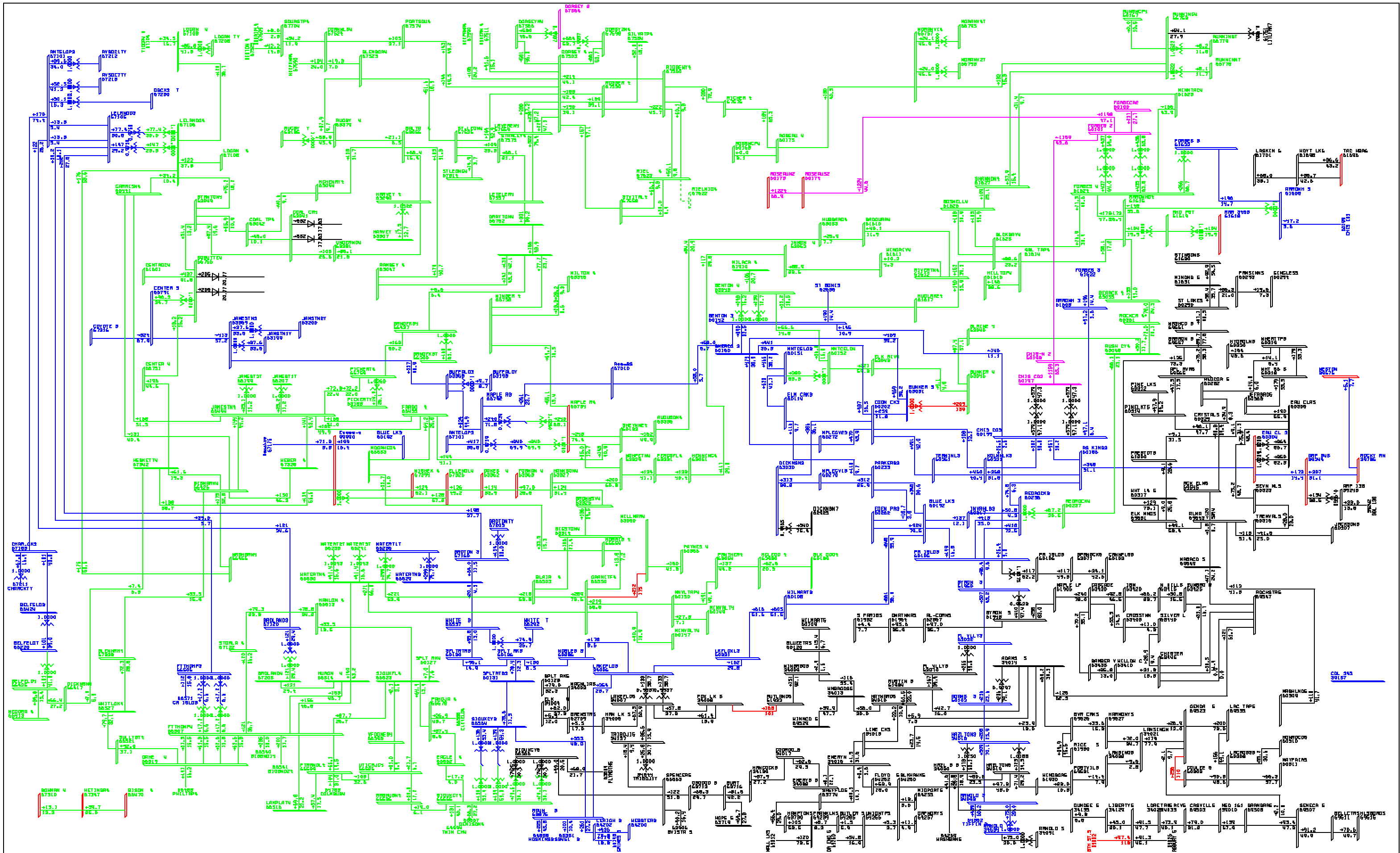
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Contingency 100.0% 100.0% 100.0% 100.0% 100.0%
Transformer Overload: System Intact 100.0% 100.0% 100.0% 100.0% 100.0%
Contingency 115.0% 115.0% 115.0% 115.0% 115.0%
Number of Violations Monitored: 10 10 10 10 10
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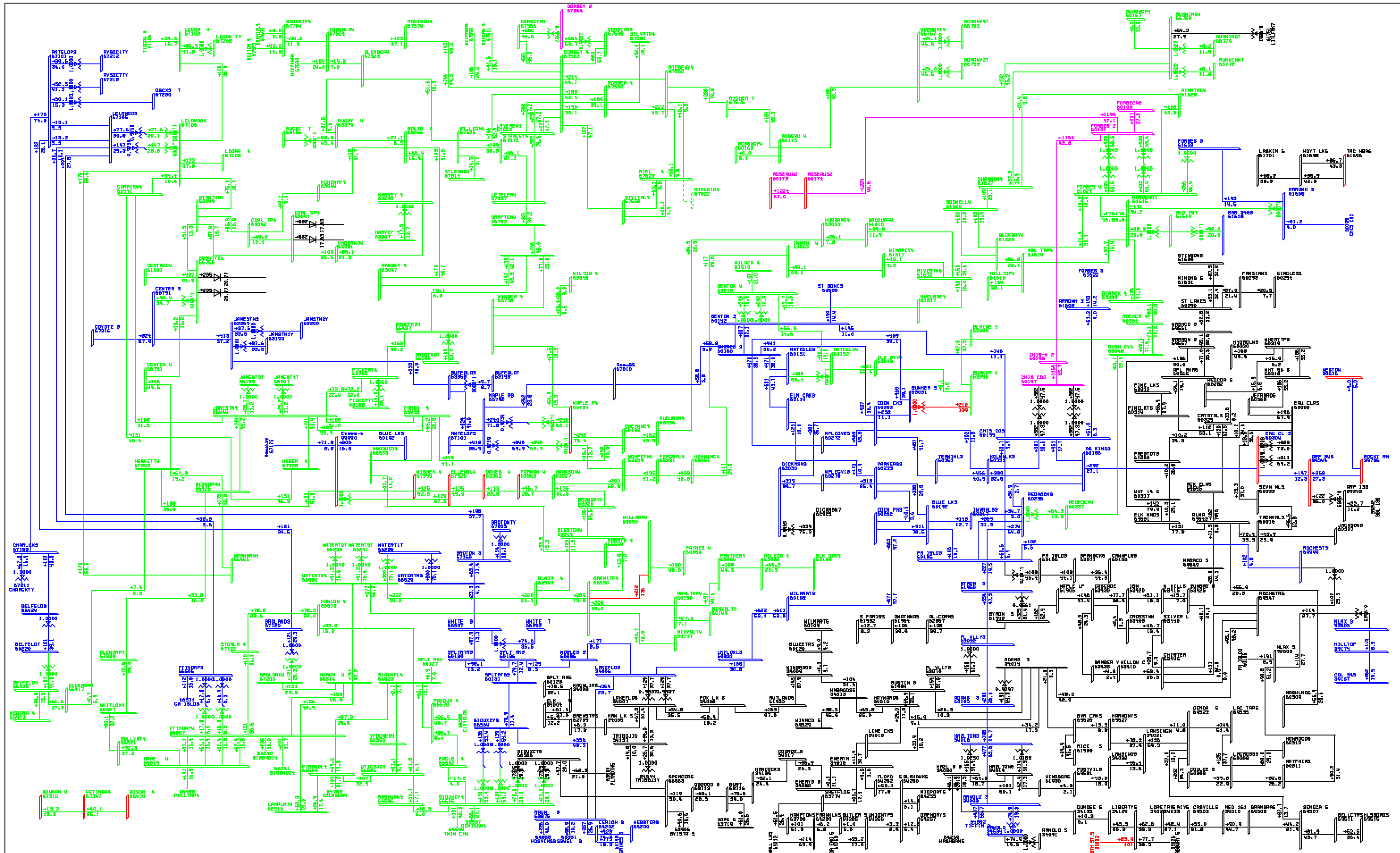
CIRCUIT FROM: CIRCUIT TO: CKT		RATEA	OVRDLD CURRENT		OVRDLD CURRENT		OVRDLD CURRENT		OVRDLD CURRENT		OVRDLD CURRENT		CONTINGENCY		SWITCH				
# NAME	# NAME	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	FROM	TO					
34008 FOX LK 5 161 61932 RUTLAND5 161 1		167	108	180.4	100.7	168.23	99.9	166.9	100.1	167.19	97.1	162.22	SYSTEM INTACT						
			129.1	215.65	114.3	190.83	113.4	189.4	113.7	189.86									
			114.2	190.76															
			119.9	200.2	110.6	184.65													
			115.8	193.38															
			115.2	192.34															
			113	188.7															
			118.5	197.83	105.6	176.38													
			189.2	316	162.8	271.81	161.8	270.15	162.2	270.8	159.1	265.74							
					110.2	183.98													
			114	190.45															
			112.6	188.01															
34009 WINBAGO5 161 61932 RUTLAND5 161 1		167	99.9	166.89	92.2	154.05	91.3	152.49	91.5	152.81	88.1	147.07	SYSTEM INTACT						
			119.6	199.73	104.8														
			113	188.64															
			113.3	189.23															
			185.2	309.23	157.3	262.64	156.1	260.62	156.5	261.31	153	255.59							
34014 ADAMS 5 161 69547 ROCHSTR5 161 1		201	66.3	133.25	62.3	125.32	62.2	124.99	62.4	125.36	48.9	98.24	SYSTEM INTACT						
			134.4	270.14	132.9	267.19	132.5	266.37	132.9	267.06									
			129.4	260.12	127.9	257.17	127.5	256.27	127.9	257.02									
			154.3	310.19	151.1	303.61	150.9	303.24	151.2	303.89									
			155.6	312.77	138.1	277.53	138	277.45	138.4	278.26	128.4	258.1							
34021 LANSINGW 161 69523 GENOA 5 161 1		223	78.9	175.89									SYSTEM INTACT						
			101.1	225.46									34021 LANSINGW 161 69527 HARMONY5 161 1						
34026 ASBURY 5 161 34027 CNTRGRV5 161 1		202	61.4	124.08	58.6	118.43	58.7	118.66	58.9	118.91									
			119.8	241.91	115.5	233.3	115.6	233.59	115.8	234									
			111.8	225.75															
34026 ASBURY 5 161 34028 LORE 5 161 1		202	47.9	96.81	45.1	91.19	45.3	91.41	45.4	91.66									
			106.2	214.43	101.9	205.86	102.1	206.15	102.3	206.55									
34027 CNTRGRV5 161 34508 JULIAN 5 161 1		202	71.6	144.59	68.8	138.94	68.9	139.16	69	139.41									
			101.1	204.18															
			130	262.61	125.7	254	125.9	254.29	126.1	254.69									
			122	246.42	117.7	237.84	117.9	238.13	118.1	238.53									
34087 DYSART 5 161 34089 VINTON 5 161 1		276	56.1	154.71															
			101.2	279.37															
34087 DYSART 5 161 64269 WASHBRN5 161 1		260	79.5	206.8	76.7	199.31	76.7	199.47	76.8	199.68	73.8	191.76	SYSTEM INTACT						
			133.8	347.95	125.5	326.33	125.8	326.99	126	327.52	118.1	307.18	34018 HAZLTON3 345 34093 ARNOLD 3 345 1						
60105 PR ISLD3 345 60236 REDROCK3 345 2		568	73.4	416.83	73.1	414.99	73.4	416.93	73.6	418.04									
			117.7	668.45	112.1	636.73	112.6	639.85	113	641.6									
60133 SHEYNN4 230 60134 SHEYNN7 115 5		187	76.5	143.08															
			124	231.84															
60133 SHEYNN4 230 60134 SHEYNN7 115 6		187	76.5	143.08															
			124	231.84															
60133 SHEYNN4 230 66754 MAPLE R4 230 1		318	61.3	194.82	74.4	236.61	75	238.48	74.8	238.01									
			114	362.63			110	349.88											
					112.3	356.97	112.5	357.87	112.4	357.32									
60136 MAPLE R7 115 66754 MAPLE R4 230 5		187	72.3	135.21	76.1	142.25	77.1	144.1	77	144.04	76.1	142.25	SYSTEM INTACT						
			115.3	215.66	123.9	231.66	124.9	233.59	124.8	233.34	123.9	231.64	60133 SHEYNN4 230 66754 MAPLE R4 230 1						
60142 BENTON 3 345 63045 BENTON 4 230 1		336	76.2	256.06			78.2	262.86	78.1	262.51									
			119.5	401.68			118.7	398.93	118.6	398.6									
60142 BENTON 3 345 63045 BENTON 4 230 2		336	73.6	247.36			75.6	253.93	75.5	253.59									
			117.9	396.23			116.8	392.48	116.7	392.16									
60150 MNVLTPA4 230 66550 GRANITF4 230 1		318	79.1	251.51															
			100.1	318.18															
			104.7	333.06															
60151 MNTCELO3 345 60152 MNTCELO4 230 6		336	88.4	296.9															
			153.7	516.5															
60152 MNTCELO4 230 63045 BENTON 4 230 1		383.2	23.4	89.59															
			101.9	390.41															
60262 EDEN PR3 345 60263 EDEN PR7 115 10		448	97.5	436.61	97.2	435.6	97.3	435.72	97.3	435.8	96.8	433.59	SYSTEM INTACT						
			155.1	694.99	154.8	693.32	154.8	693.53	154.8	693.66	154.1	690.17	60262 EDEN PR3 345 60263 EDEN PR7 115 9						
60262 EDEN PR3 345 60263 EDEN PR7 115 9		448	104.8	469.62	104.6	468.53	104.6	468.65	104.6	468.74	104.1	466.37	SYSTEM INTACT						
			160.2	717.64	159.8	715.97	159.9	716.2	159.9	716.32	159.1	712.71	60262 EDEN PR3 345 60263 EDEN PR7 115 10						
60302 COULEE 5 161 60308 LACROSS5 161 1		195	50.9	99.23	48.7	94.94	48.6	94.79	48.8	95.13									
			110.8	216.15	106.9	208.44	106.8	208.28	107.1	208.8									
60302 COULEE 5 161 69523 GENOA 5 161 1		240	111.8	268.25	109.8	263.53	109.7	263.34	109.9	263.74	84.3	202.25	SYSTEM INTACT						
			116.8	280.39															
			117.9	282.97															
			116.7	280.1															
					121.1	290.72	120.8	289.82											
			154.7	371.28	153	367.26	152.9	366.96	153.1	367.44									
			119.2	286.18	117.5	281.99	117.4	281.79	117.6	282.19									
			118.2	283.72	116.4	279.47	116.3	279.23	116.6	279.75									
					114.6	274.96	114.5	274.86	114.7	275.21									
			124.8	299.56	120.9	290.16	120.8	290	121	290.46									
					114.4	274.51	114.3	274.29	114.5	274.8									
			117.1	280.93	115.2	276.5	115.1	276.24	115.3	276.67									
			116.5	279.64	114.5	274.73	114.4	274.51	114.6	274.94									
			166.6	399.84	163.1	391.54	163.1	391.4	163.3	391.95	116.4	279.32							
			60304 EAU CL 3 345 60305 EAU CLA5 161 10		300	82.7	248.03	82.3	246.76	82.3	247.05	82.4	247.28						
						141.9	425.62	141.1	423.34	141.3	423.84	141.4	424.27						
			60304 EAU CL 3 345 60305 EAU CLA5 161 9		300	87.2	261.49	86.7	260.16	86.8	260.46	86.9	260.7			SYSTEM INTACT			

			144.3	432.75	143.5	430.42	143.6	430.93	143.8	431.38		60304 EAU CL 3 345 60305 EAU CLA5 161 10	
60308 LACROSS5 161 69535 LAC TAP5 161 1	335		49.1	164.61	49.1	164.51	49	164.31	49.1	164.48		SYSTEM INTACT	
			105.6	353.78	104.7	350.88	104.6	350.57	104.8	351		60302 COULEE 5 161 69523 GENOA 5 161 1	
61552 FORB2JCT 230 61624 FORBES 4 230 1	672				64	430.19						SYSTEM INTACT	
					108.7	730.39						61550 FORBJCT 230 61624 FORBES 4 230 1	
61625 BLCKBRY4 230 61626 BOSWELL4 230 2	399		68.8	274.5			66.9	267	68	271.33		SYSTEM INTACT	
			125.7	501.49			122.1	487.34	124.2	495.48		61625 BLCKBRY4 230 61626 BOSWELL4 230 1	
61906 MAPLE LF 161 63430 CASCADE 161 1	302		74.9	226.14	78	235.43	77.6	234.34	77.8	234.94		SYSTEM INTACT	
			103.8	313.54	105.2	317.76	104.8	316.49	105.1	317.34		34014 ADAMS 5 161 69547 ROCHSTR5 161 1	
63187 WINGER Y 230 66758 WINGER 4 230 1	140		70.9	99.26	73.4	102.76	69.7	97.61	69.7	97.52		SYSTEM INTACT	
			111.5	156.1	110.6	154.81	106.3	148.82	106.3	148.88		63186 WILTON Y 230 63245 WILTON 7 115 1	
			111.5	156.1	110.6	154.81	106.3	148.82	106.3	148.88		63186 WILTON Y 230 63345 WILTON 4 230 1	
			111.6	156.25			106.1	148.6	106.2	148.63		63345 WILTON 4 230 66758 WINGER 4 230 1	
63195 BIGSTONY 230 63214 BIGSTON7 115 1	233		91.3	212.75								SYSTEM INTACT	
			116.9	272.42								66503 BLAIR 4 230 66550 GRANITF4 230 1	
63195 BIGSTONY 230 63314 BIGSTON4 230 1	233		91.3	212.73								SYSTEM INTACT	
			112.6	262.29								63327 HANKSON4 230 63329 WAHPETN4 230 1	
			116.9	272.41								66503 BLAIR 4 230 66550 GRANITF4 230 1	
63362 OAKES 4 230 67326 ELLENDL4 230 1	240		90.7	217.68								SYSTEM INTACT	
			102.8	246.76								63314 BIGSTON4 230 63325 BROWNSV4 230 1	
			101.9	244.52								63325 BROWNSV4 230 63327 HANKSON4 230 1	
63445 CHESTER 161 69547 ROCHSTR5 161 15	302		15.2	45.78	11.9	36.02	12.3	37.11	12.1	36.51	42.8	129.24	SYSTEM INTACT
			122.6	370.16	120.3	363.33	120.6	364.26	120.6	364.11	132.5	400.15	61948 BYRON 5 161 61950 BYRON 3 345 1
66503 BLAIR 4 230 66550 GRANITF4 230 1	398		78.8	313.57								SYSTEM INTACT	
			100.1	398.25								63195 BIGSTONY 230 63214 BIGSTON7 115 1	
			100.1	398.25								63195 BIGSTONY 230 63314 BIGSTON4 230 1	
66752 DRAYTON4 230 66787 DRAYTO1T 230 1	140		54.5	76.24	50.8	71.07	53.1	74.31	53.4	74.74		SYSTEM INTACT	
			112.8	157.9			109.9	153.9	110.6	154.78		66705 DRAYTON7 115 66788 DRAYTO2T 230 1	
			112.8	157.9			109.9	153.9	110.6	154.78		66752 DRAYTON4 230 66788 DRAYTO2T 230 1	
66752 DRAYTON4 230 67557 LETELER4 230 1	419.5		86.6	363.43								SYSTEM INTACT	
			100.5	421.51								63047 RAMSEY 4 230 66755 PRAIRIE4 230 1	
66756 SQBUTTE4 230 66791 CENTER 3 345 1	336		48.1	161.76								SYSTEM INTACT	
			127.3	427.85								66791 CENTER 3 345 67316 COYOTE 3 345 1	
67316 COYOTE 3 345 67318 COYOTE 7 115 1	168		4.8	8.1	23.5	39.46	22.8	38.28	22.8	38.35	23.5	39.41	SYSTEM INTACT
			216.9	364.4	216.7	364.13	216.8	364.14	216.8	364.15	216.7	364.13	66791 CENTER 3 345 67316 COYOTE 3 345 1
69523 GENOA 5 161 69535 LAC TAP5 161 1	279		75.1	209.56	73	203.55	72.9	203.41	73.1	203.84		SYSTEM INTACT	
			136.1	379.67	132.8	370.61	132.7	370.37	133	371.05		60302 COULEE 5 161 69523 GENOA 5 161 1	
69557 BARRON 5 161 69561 WASHCO 5 161 1	120		78.4	94.06	78.3	93.99	76.2	91.42	78.6	94.27	83.1	99.78	SYSTEM INTACT
			120.3	144.35	120.7	144.9	119.9	143.88	120.6	144.73	123.1	147.78	61570 STINSJCT 115 61630 STINSON5 161 1
			120.2	144.19	120.5	144.62	119.6	143.55	120.4	144.48	122.8	147.3	61630 STINSON5 161 61631 MINONG 5 161 1









2004 MAPP SERIES FINAL 2009 SUMMER PEAK F-09SUPK.SAV /BUSES = 21866 BRANCHES = 33100/ 100% OF PEAK NW4500+ALTN+CENTMN+FOR-ARR+PRI TUE. MAY 10 2005 13:45	100% RATE 0.920UV 1.050UV KV=161.4230.4345	BUS - NONE BRANCH - NW/% OF RATE A EQUIPMENT - MW/MVAR
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Appendix B-2

North/West Bias

N-1 Contingency Results

Tabulated Base Case Results

Tabulated Results of Analysis

Black Column:	North/West Bias with 2020 loads and generation, addition of MH Dorsey – Winger – Benton Co. 345 kV line idev
Red Column:	Black plus addition of the NW Exploratory Study Option N 345 kV lines idev
Pink Column:	Red plus addition of the Central MN 345 kV lines idev
Blue Column:	Pink plus addition of Forbes – Arrowhead – Chisago 345 kV line idev
Orange Column:	Blue plus addition of Prairie Island – Rochester – Columbia 345kV line idev

Date: 5/11/2005 10:08
 Date of Run: APR 26 2005
 Line Overload: System Intact 95.0%
 Contingency 95.0%
 Transformer Overload: System Intact 100.0%
 Contingency 100.0%
 Number of Violations Monitored: 10
 Output File: IWbias_base.sav-line.

CIRCUIT FROM: CIRCUIT TO: CKT		RATEA	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	ALL CONTINGENCY
#	NAME	#	NAME	MVA	%	MVA	%	MVA	%	MVA	%	MVA	FROM TO CKT
34005	HRN LK 5 161	34007	LAKEFLD5 161	112	50.1	56.13	54.3	60.82	55.6	62.26	55.6	62.24	SYSTEM INTACT
					125.7	140.8	123.9	138.76	123.3	138.11	123.3	138.12	34003 MAGNLIA5 161 34004 ELK 5 161 1
					131	146.7	129.5	145.04	129	144.46	129	144.46	34003 MAGNLIA5 161 60128 SPLT RK5 161 1
					129.6	145.13	128.1	143.51	127.5	142.8	127.5	142.81	60128 SPLT RK5 161 60129 SPLT RK7 115 6
34006	LAKEFLD3 345	60331	LKFLDXL3 345	568	87.5	496.96	64.4	365.92	59.3	336.81			SYSTEM INTACT
					104.2	591.93							34008 FOX LK 5 161 61932 RUTLAND5 161 1
					104.3	592.43							34009 WINBAGO5 161 61932 RUTLAND5 161 1
					97.1	551.62							34018 HAZLTON3 345 34093 ARNOLD 3 345 1
					95.6	543.07							34018 HAZLTON3 345 60102 ADAMS 3 345 1
					96.8	549.88							60102 ADAMS 3 345 63032 PL VLLY3 345 1
					96.5	548.03							60105 PR ISLD3 345 61950 BYRON 3 345 1
					106.8	606.65							60108 WILMART3 345 60908 WLM STM4 115 3
					96.8	549.83							60142 BENTON 3 345 66802 WINGERS3 345 1
					95.5	542.46							60186 AS KING3 345 60199 CHIS CO3 345 1
					96.7	549.38							66760 WINGER 3 345 66802 WINGERS3 345 1
							103.3	586.84	95.4	541.99			60101 FORBES 2 500 60198 CHIS-N 2 500 1
							103.3	586.84	95.4	541.99			60197 CHIS CO2 500 60198 CHIS-N 2 500 1
34007	LAKEFLD5 161	34008	FOX LK 5 161	160	60	95.99	52.5	83.94					SYSTEM INTACT
					102.2	163.54	101.5	162.36					60108 WILMART3 345 60331 LKFLDXL3 345 1
											49.9	79.76	34007 LAKEFLD5 161 34008 FOX LK 5 161 P2
											97.2	155.54	
34008	FOX LK 5 161	61932	RUTLAND5 161	167	143.1	239.02	129.7	216.68	125.4	209.5	125.5	209.54	SYSTEM INTACT
					191.4	319.71	163.3	272.75	155.6	259.85	155.7	260.01	34006 LAKEFLD3 345 60331 LKFLDXL3 345 1
					149.6	249.82	136.6	228.11	132.5	221.34	132.6	221.37	34014 ADAMS 5 161 60102 ADAMS 3 345 9
					156	260.59	139.7	233.36	134.7	224.94	134.7	225	34018 HAZLTON3 345 34093 ARNOLD 3 345 1
					151.5	252.93	136	227.05	131.2	219.19	131.3	219.24	34093 ARNOLD 3 345 64352 TIFFIN 3 345 1
					150.3	250.95	135.7	226.57	131.2	219.03	131.2	219.07	34139 HANCOCK5 161 63716 BURT 5 161 1
							143.4	239.5	136.4	227.84	135.6	226.4	60108 WILMART3 345 60192 BLUE LK3 345 1
							140.4	234.46	133.5	222.95	133.5	222.96	60108 WILMART3 345 60331 LKFLDXL3 345 1
							221.9	370.62	209.5	349.92	209.6	350.04	60108 WILMART3 345 60331 LKFLDXL3 345 1
							143.4	239.5	136.4	227.84	135.6	226.4	60197 CHIS CO2 500 60198 CHIS-N 2 500 1
							135.7	226.66	131.7	219.92	131.7	219.95	61984 AUSTIN 5 161 63070 PL VLLY5 161 1
					148.5	247.91							34017 CGORDO_5 161 34082 EMERY5 5 161 1
					149.2	249.12							34017 CGORDO_5 161 34139 HANCOCK5 161 1
					148.9	248.61							34018 HAZLTON3 345 60102 ADAMS 3 345 1
					152	253.81							60142 BENTON 3 345 66802 WINGERS3 345 1
					148.4	247.84							60192 BLUE LK3 345 99990 Ellendal 345 1
											107.4	216.85	
34009	WINBAGO5 161	61932	RUTLAND5 16	167	136	227.12	122.1	203.89	117.5	196.15	117.5	196.19	SYSTEM INTACT
					179.9	300.36	152.6	254.76	144.8	241.84	144.9	241.98	34006 LAKEFLD3 345 60331 LKFLDXL3 345 1
					143.2	239.18	129.6	216.46	125.3	209.2	125.3	209.21	34014 ADAMS 5 161 60102 ADAMS 3 345 9
					150.1	250.63	133	222.16	127.6	213.08	127.6	213.14	34018 HAZLTON3 345 34093 ARNOLD 3 345 1
					145.1	242.34	128.9	215.32	123.9	206.85	123.9	206.89	34093 ARNOLD 3 345 64352 TIFFIN 3 345 1
					143.8	240.21	128.6	214.74	123.7	206.61	123.7	206.65	34139 HANCOCK5 161 63716 BURT 5 161 1
							135.1	225.67	127.8	213.36	126.8	211.82	60101 FORBES 2 500 60198 CHIS-N 2 500 1
							136.3	227.68	128.5	214.53	128.5	214.55	60108 WILMART3 345 60192 BLUE LK3 345 1
							219.5	366.51	206.2	344.38	206.3	344.5	60108 WILMART3 345 60331 LKFLDXL3 345 1
							135.1	225.67	127.8	213.36	126.8	211.82	60197 CHIS CO2 500 60198 CHIS-N 2 500 1
							128.9	215.27	124.6	208.04	124.6	208.07	61984 AUSTIN 5 161 63070 PL VLLY5 161 1
					142.1	237.28							34017 CGORDO_5 161 34082 EMERY5 5 161 1
					142.7	238.26							34017 CGORDO_5 161 34139 HANCOCK5 161 1
					142.3	237.71							34018 HAZLTON3 345 60102 ADAMS 3 345 1
					145.5	242.99							64350 HILLS 3 345 64352 TIFFIN 3 345 1
					141.7	236.67							

34014 ADAMS 5 161 60102 ADAMS 3 345 9	300	88.9	266.6	91.2	273.68	92.9	278.72	92.8	278.28	77.6	232.88	SYSTEM INTACT	
				102.1	306.3	103.6	310.93	103.5	310.46			34009 WINBAGO5 161 34013 WNBAGOS5 161 1	
		170.6	511.76	151.8	455.46	146.8	440.39	146.8	440.5	140.4	421.31	60102 ADAMS 3 345 63032 PL VLLY3 345 1	
		127.9	383.6	129.2	387.53	129.8	389.43	129.5	388.49			61906 MAPLE LF 161 61948 BYRON 5 161 1	
		126.2	378.46	127.4	382.23	129.8	389.35	129.5	388.47			61906 MAPLE LF 161 63430 CASCADE 161 1	
		140.6	421.84	139.9	419.64	139.7	419.07	139.4	418.3			61948 BYRON 5 161 61950 BYRON 3 345 1	
				169.2	507.49	163.3	489.99	163.3	489.96	154.2	462.59	61950 BYRON 3 345 63032 PL VLLY3 345 1	
		113.3	339.95	117.8	353.4	120.4	361.26	120.2	360.68	101.3	303.93	61984 AUSTIN 5 161 63070 PL VLLY5 161 1	
		104.2	312.7			100.5	301.4	100.3	300.96			60105 PR ISLD3 345 61950 BYRON 3 345 1	
												34009 WINBAGO5 161 61932 RUTLAND5 161 1	
34014 ADAMS 5 161 69547 ROCHSTR5 161	201	77.1	154.93	69.8	140.33	68	136.6	67.9	136.49	55.8	112.17	SYSTEM INTACT	
		119.4	239.95	100.7	202.43	95.3	191.49	95.3	191.57			60102 ADAMS 3 345 63032 PL VLLY3 345 1	
		145.9	293.25	142	285.37	142.1	285.66	141.8	285.01			61906 MAPLE LF 161 61948 BYRON 5 161 1	
		141	283.35	137.1	275.47	137.2	275.76	136.8	275.06			61906 MAPLE LF 161 63430 CASCADE 161 1	
		169.2	340.06	160.8	323.14	161.8	325.25	161.6	324.8	99.1	199.24	61948 BYRON 5 161 61950 BYRON 3 345 1	
		95.6	192.25									63032 PL VLLY3 345 63070 PL VLLY5 161 1	
				160.9	323.4	151.1	303.79	151.2	303.86	146.7	294.94	61950 BYRON 3 345 63032 PL VLLY3 345 1	
34018 HAZLTON3 345 34019 HAZLTON5 16	224	55.5	124.22	57.9	129.77	58.9	131.94	58.8	131.82	54.2	121.48	SYSTEM INTACT	
		112	250.97	113.4	254.11	115.1	257.8	115	257.57	105.7	236.75	34018 HAZLTON3 345 34020 HAZL S 5 161 2	
34018 HAZLTON3 345 34093 ARNOLD 3 345	720			67.1	483.22	63.9	460.23	64	460.57			SYSTEM INTACT	
				108.3	779.6	102.8	739.84	101.3	729.33			60101 FORBES 2 500 60198 CHIS-N 2 500 1	
				108.3	779.6	102.8	739.84	101.3	729.33			60197 CHIS CO2 500 60198 CHIS-N 2 500 1	
34021 LANSINGW 161 69523 GENOA 5 161	223	82.6	184.19	80	178.46	79.8	177.93	79.7	177.8			SYSTEM INTACT	
		104.2	232.28	100.1	223.25	99.4	221.74	99.4	221.62			34021 LANSINGW 161 69527 HARMONY5 161 1	
34026 ASBURY 5 161 34027 CNTRGRV5 161	202	62.5	126.34	57.7	116.52	56.5	114.17	56.5	114.11	50.4	101.76	SYSTEM INTACT	
		124.2	250.94	116.8	235.99	115.1	232.42	115	232.32	105.2	212.57	34030 SALEM 5 161 34031 SO.GVW.5 161 1	
		115.6	233.61	108.2	218.65	106.5	215.09	106.4	214.99	96.8	195.44	34031 SO.GVW.5 161 34032 8TH ST.5 161 1	
34026 ASBURY 5 161 34028 LORE 5 161 1	202	48.2	97.33	43.4	87.58	42.2	85.25	42.2	85.19			SYSTEM INTACT	
		109.7	221.68	102.4	206.86	100.7	203.32	100.6	203.22			34030 SALEM 5 161 34031 SO.GVW.5 161 1	
		101.2	204.43									34031 SO.GVW.5 161 34032 8TH ST.5 161 1	
34027 CNTRGRV5 161 34508 JULIAN 5 161	202	73.4	148.21	68.5	138.39	67.3	136.04	67.3	135.98	61.2	123.61	SYSTEM INTACT	
		103.4	208.77	95.6	193.08							34028 LORE 5 161 34032 8TH ST.5 161 1	
		135.2	273.1	127.8	258.1	126	254.52	125.9	254.42	116.1	234.62	34030 SALEM 5 161 34031 SO.GVW.5 161 1	
		126.6	255.72	119.2	240.7	117.4	237.13	117.3	237.03	107.6	217.45	34031 SO.GVW.5 161 34032 8TH ST.5 161 1	
		95.8	193.55									34018 HAZLTON3 345 34093 ARNOLD 3 345 1	
34028 LORE 5 161 34032 8TH ST.5 161 1	84	126.1	105.88	114.1	95.81	111.2	93.4	111.1	93.34	96.4	81	SYSTEM INTACT	
		179.6	150.9	159.1	133.62	153.6	129.03	153.6	129	134.6	113.08	34018 HAZLTON3 345 34093 ARNOLD 3 345 1	
		223.5	187.73	203.9	171.25	199.1	167.27	199	167.18	174.3	146.41	34026 ASBURY 5 161 34027 CNTRGRV5 161 1	
		201	168.87	181.4	152.41	176.7	148.43	176.6	148.34	152.1	127.74	34026 ASBURY 5 161 34028 LORE 5 161 1	
		240.4	201.92	220.7	185.4	216	181.43	215.9	181.33	191.1	160.49	34027 CNTRGRV5 161 34508 JULIAN 5 161 1	
		244.3	205.2	224.6	188.68	219.9	184.7	219.8	184.61	194.9	163.76	34030 SALEM 5 161 34508 JULIAN 5 161 1	
		153	128.53	140.4	117.93	137.4	115.38	137.3	115.34	121.7	102.22	34032 8TH ST.5 161 34473 DBQ 8TH869.0 1	
		162.6	136.61	144.2	121.1	139.7	117.33	139.6	117.29	121.7	102.25	34093 ARNOLD 3 345 64352 TIFFIN 3 345 1	
				162.6	136.62	156.9	131.79	155.7	130.78	140.2	117.79	60101 FORBES 2 500 60198 CHIS-N 2 500 1	
				162.6	136.62	156.9	131.79	155.7	130.78	140.2	117.79	60197 CHIS CO2 500 60198 CHIS-N 2 500 1	
				136.2	114.44	133.2	111.87	133.1	111.8	117.2	98.45	69165 GALENA8 69.0 69505 GALENA 5 161 1	
		149	125.18									60108 WILMART3 345 60908 WLM STM4 115 3	
		136.7	114.8									64350 HILLS 3 345 64352 TIFFIN 3 345 1	
		149.2	125.36										
		34029 SALEM 3 345 34030 SALEM 5 161 1	336	93	312.61	88.9	298.86	87.9	295.5	87.9	295.45		
107.8	362.19			100.8	338.61							34018 HAZLTON3 345 34093 ARNOLD 3 345 1	
103.6	348.11											34030 SALEM 5 161 34126 MQOKETA5 161 1	
105.4	353.99			101	339.38							34036 ROCK CK3 345 34037 ROCK CK5 161 1	
102.3	343.9											34043 SAVANNA5 161 34046 YORK 5 161 1	
103.8	348.74											34044 ALBANY 5 161 34046 YORK 5 161 1	
108.6	364.73			101.5	341.05							34093 ARNOLD 3 345 64352 TIFFIN 3 345 1	
102.9	345.65											64350 HILLS 3 345 64352 TIFFIN 3 345 1	
		107.8	362.29	105.5	354.57	105	352.82				60101 FORBES 2 500 60198 CHIS-N 2 500 1		
		107.8	362.29	105.5	354.57	105	352.82				60197 CHIS CO2 500 60198 CHIS-N 2 500 1		
34030 SALEM 5 161 34031 SO.GVW.5 161 1	305	65.5	199.64	62.8	191.61	62.2	189.72	62.2	189.65			SYSTEM INTACT	
		95.4	291.01									34026 ASBURY 5 161 34027 CNTRGRV5 161 1	
		100.7	307.13	95.7	291.85							34027 CNTRGRV5 161 34508 JULIAN 5 161 1	

		101.9	310.85	96.9	295.55	95.7	291.94	95.7	291.83			34030 SALEM 5 161 34508 JULIAN 5 161 1	
34030 SALEM 5 161 34126 MQOKETA5 161	168	57.5	96.63	55.1	92.57	54.6	91.71	54.5	91.63	50	83.95	SYSTEM INTACT	
		114.2	191.86	108.2	181.84	106.9	179.53	106.8	179.43	98.4	165.3	34029 SALEM 3 345 34030 SALEM 5 161 1	
		114.4	192.15	108.4	182.03	107	179.73	106.9	179.64	98.5	165.55	34029 SALEM 3 345 34036 ROCK CK3 345 1	
				95.3	160.15							34036 ROCK CK3 345 36382 QUAD ; 345 1	
34030 SALEM 5 161 34508 JULIAN 5 161 1	202	75.9	153.27	71	143.45	69.9	141.1	69.8	141.04	63.7	128.68	SYSTEM INTACT	
		98.4	198.69									34018 HAZLTON3 345 34093 ARNOLD 3 345 1	
		105.9	213.82	98.1	198.13	96.2	194.39	96.2	194.29			34028 LORE 5 161 34032 8TH ST.5 161 1	
		137.7	278.24	130.3	263.24	128.5	259.66	128.5	259.55	118.7	239.75	34030 SALEM 5 161 34031 SO.GVVW.5 161 1	
		129.1	260.84	121.7	245.82	119.9	242.26	119.9	242.16	110.2	222.57	34031 SO.GVVW.5 161 34032 8TH ST.5 161 1	
34043 SAVANNA5 161 34046 YORK 5 161 1	84	110.5	92.81	104.6	87.82	103.1	86.59	103.1	86.57	95	79.83	SYSTEM INTACT	
		131.4	110.41	122.1	102.53	119.6	100.45	119.6	100.44	110.6	92.88	34018 HAZLTON3 345 34093 ARNOLD 3 345 1	
		166.7	140.05	157.6	132.37	155.4	130.52	155.3	130.48	143.6	120.62	34029 SALEM 3 345 34030 SALEM 5 161 1	
		166.7	140.07	157.6	132.37	155.3	130.48	155.3	130.45	143.6	120.63	34029 SALEM 3 345 34036 ROCK CK3 345 1	
		147.4	123.84	139.8	117.42	138	115.88	137.9	115.84	127.8	107.37	34030 SALEM 5 161 34031 SO.GVVW.5 161 1	
		125.2	105.13	118.3	99.38	116.7	98.01	116.6	97.98	107.2	90.05	34030 SALEM 5 161 34126 MQOKETA5 161 1	
		142.2	119.41	134.3	112.85	132.5	111.33	132.5	111.29	122.6	103.02	34031 SO.GVVW.5 161 34032 8TH ST.5 161 1	
		129.7	108.94	120.4	101.1	118.1	99.18	118.1	99.17	109.2	91.72	34093 ARNOLD 3 345 64352 TIFFIN 3 345 1	
				130	109.21	127	106.72	126.4	106.19	118.8	99.8	60101 FORBES 2 500 60198 CHIS-N 2 500 1	
				130	109.21	127	106.72	126.4	106.19	118.8	99.8	60197 CHIS CO2 500 60198 CHIS-N 2 500 1	
		122.6	102.98	114.8	96.47							64350 HILLS 3 345 64352 TIFFIN 3 345 1	
		121	101.67			113.3	95.19	113.3	95.17	105.4	88.56	34035 ROCKCKW5 161 34037 ROCK CK5 161 1	
		116.3	97.66									34035 ROCKCKW5 161 34124 DEWITT 5 161 1	
		34087 DYSART 5 161 64269 WASHBRN5 16	260	81.1	210.88	76	197.7	74.7	194.21	74.7	194.22	72.5	188.51
		137.8	358.29	123.4	320.95	119.5	310.73	119.6	310.84	114.2	296.93	34018 HAZLTON3 345 34093 ARNOLD 3 345 1	
34093 ARNOLD 3 345 64352 TIFFIN 3 345 1	720			59.3	426.73							SYSTEM INTACT	
				97.6	702.63							60101 FORBES 2 500 60198 CHIS-N 2 500 1	
				97.6	702.63							60197 CHIS CO2 500 60198 CHIS-N 2 500 1	
34122 E CALMS5 161 64425 DAVNPRT5 161	200			31.4	62.75	30.7	61.45	30.7	61.42			SYSTEM INTACT	
				99.9	199.87	98.7	197.46	98.7	197.43			34036 ROCK CK3 345 36382 QUAD ; 345 1	
39450 ST LAKE 345 60290 ST LAKE5 161 1	300											SYSTEM INTACT	
												60101 FORBES 2 500 60198 CHIS-N 2 500 1	
												60197 CHIS CO2 500 60198 CHIS-N 2 500 1	
60100 FORBECA2 500 60101 FORBES 2 500	1000	100.9	1008.88	93.6	935.76	91.9	919.5	92.1	921.09	92.5	924.66	SYSTEM INTACT	
				97.5	975.4					95.1	951.03	60108 WILMART3 345 60192 BLUE LK3 345 1	
				97	970.22								60108 WILMART3 345 60331 LKFLDXL3 345 1
				96.9	968.86								60142 BENTON 3 345 60160 SHERCO 3 345 1
		119.5	1194.72	106.3	1063.19	105.6	1056.25	105.3	1053.16	105.6	1055.84	60142 BENTON 3 345 66802 WINGERS3 345 1	
				97.4	974.21					95.4	953.69	60192 BLUE LK3 345 99990 Ellendal 345 1	
				118.4	1184.33	117.1	1170.52	117	1170.39	117.6	1176.11	66750 KARLSTD3 345 66803 WINGERN3 345 1	
				124	1240.18	124.3	1242.61	123.5	1235.4	124.5	1245.3	66750 KARLSTD3 345 67625 DORSEY 3 345 1	
		119.1	1190.74	105.7	1056.76	105.3	1053.18	105.2	1051.93	105.4	1053.72	66760 WINGER 3 345 66802 WINGERS3 345 1	
				116.4	1163.97	115.6	1156.02	115.6	1156.38	116	1160.16	66760 WINGER 3 345 66803 WINGERN3 345 1	
				96.8	967.99	95	950.16	95.2	952.33	96.2	962.15	66792 MAPLE R3 345 67010 AlexSS 345 1	
		103.9	1039.1									60114 ELM CRK3 345 60151 MNTCELO3 345 1	
		102.6	1026.19									60189 BLK DOG4 230 60190 BLK DOG7 115 5	
		104.8	1048.44									60196 CHISAGO7 115 60199 CHIS CO3 345 6	
		102.4	1023.53									60197 CHIS CO2 500 61493 CHIS D1Y 110 10	
		102.4	1023.53									60197 CHIS CO2 500 61494 CHIS D2Y 110 9	
		102.3	1023.5									61611 WINGRIV4 230 63052 INMAN 4 230 1	
		102.6	1025.54									61614 98L TAP4 230 61625 BLCKBRY4 230 1	
		102.3	1023.41									63053 HUBBARD4 230 63336 AUDUBON4 230 1	
		60103 CANNFLS5 161 63071 SPRNGCK5 16	112	102.6	114.92	99.8	111.8	100.8	112.88	100.8	112.88		
112.2	125.71			108.3	121.25	108.9	121.99	108.9	121.99			60105 PR ISLD3 345 60236 REDROCK3 345 1	
112.5	126.04			108.5	121.54	109.2	122.26	109.2	122.25			60105 PR ISLD3 345 60236 REDROCK3 345 2	
149.4	167.34			144.7	162.01	144.6	161.99	144.6	161.98			60217 INVRHLS3 345 60218 INVRHLS7 115 9	
114.8	128.56			107	119.8	107.4	120.31	107.4	120.32			60217 INVRHLS3 345 60236 REDROCK3 345 1	
110.2	123.48			106.5	119.26	107.3	120.13	107.3	120.14			61161 WBYRON 869.0 61948 BYRON 5 161 1	
109.9	123.12			107.2	120.09	107.8	120.76	107.8	120.74			61948 BYRON 5 161 61950 BYRON 3 345 1	
111.7	125.15			106.6	119.35	107.5	120.41	107.5	120.43			61948 BYRON 5 161 62867 AL-CORN5 161 1	
111.9	125.34			106.7	119.47	107.6	120.5	107.6	120.52			61964 OWATNNA5 161 62867 AL-CORN5 161 1	

		112.7 126.2 111.3 124.64	110.1 123.35 108.7 121.75	111.4 124.72 109.9 123.09	111.3 124.7 109.9 123.07		62387 SPRNGCK869.0 63071 SPRNGCK5 161 1 62387 SPRNGCK869.0 63071 SPRNGCK5 161 2
60105 PR ISLD3 345 60106 PR ISLD5 161 10	224	111.6 249.93 120.1 268.98 120.3 269.57 144.2 322.98 120 268.79 115.4 258.57 123.9 277.55 122 273.18 118.6 265.68 118.7 265.94 116.5 260.9	111.5 249.68 119.1 266.7 119.3 267.23 141.9 317.9 116.1 260.07 115.1 257.85 122.4 274.23 115.2 257.95 122.1 273.49 116.3 260.47 116.4 260.64	113.4 254.11 120.6 270.17 120.8 270.65 143.1 320.63 117.7 263.73 116.9 261.79 124.2 278.19 117 262.07 123.7 277.06 118.2 264.81 118.3 264.93	113.4 253.94 120.5 269.99 120.7 270.46 143.1 320.45 117.7 263.57 116.8 261.62 124.1 278.01 116.9 261.84 123.6 276.8 118.1 264.65 118.2 264.78	106.3 238.11 112.2 251.34 112.4 251.72 135.4 303.33 110.2 246.82 117.4 263.03 110 246.32 112 250.81 112 250.95 110 246.39 110.6 247.68	SYSTEM INTACT 60105 PR ISLD3 345 60236 REDROCK3 345 1 60105 PR ISLD3 345 60236 REDROCK3 345 2 60217 INVRHLS3 345 60218 INVRHLS7 115 9 60217 INVRHLS3 345 60236 REDROCK3 345 1 60236 REDROCK3 345 60238 REDROCK7 115 9 61161 WBYRON 869.0 61948 BYRON 5 161 1 61906 MAPLE LF 161 61948 BYRON 5 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 61948 BYRON 5 161 62867 AL-CORN5 161 1 61964 OWATNNA5 161 62867 AL-CORN5 161 1 60105 PR ISLD3 345 60192 BLUE LK3 345 1 60105 PR ISLD3 345 92603 NLAX 5 161 P1 68884 RCK ELM869.0 69545 RCK ELM5 161 1
60105 PR ISLD3 345 60236 REDROCK3 345	568	78 443.08 125.4 712.1	72.1 409.42 115.5 656.02 98.4 558.75 98.4 558.75	80.2 455.55 123.5 701.24	80.1 455.21 123.4 700.69	72.3 410.89 110.2 625.79	SYSTEM INTACT 60105 PR ISLD3 345 60236 REDROCK3 345 1 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1
60106 PR ISLD5 161 63071 SPRNGCK5 161	236.5	100.7 238.18 108.4 256.32 108.6 256.88 128.6 304.15 107.7 254.66 104.2 246.41 110.5 261.44 110.1 260.32 106.4 251.72 106.5 251.96 105.1 248.63	100.6 237.93 107.5 254.14 107.7 254.64 127.3 301.11 104.8 247.84 103.9 245.71 109.9 259.82 103.9 245.81 110.2 260.6 105 248.22 105 248.38	102.4 242.14 108.9 257.43 109 257.88 128.4 303.69 106.3 251.31 105.5 249.45 111.4 263.55 105.6 249.72 111.6 263.99 106.7 252.35 106.8 252.47	102.3 241.98 108.8 257.26 109 257.71 128.3 303.52 106.2 251.15 105.4 249.29 111.4 263.38 105.5 249.5 111.5 263.74 106.6 252.2 106.7 252.32	95.9 226.92 101.3 239.51 101.4 239.87 121.5 287.32 99.5 235.22 105.4 249.21 99.3 234.74 101.1 239.03 101.1 239.17 99.3 234.8 99.8 236.04	SYSTEM INTACT 60105 PR ISLD3 345 60236 REDROCK3 345 1 60105 PR ISLD3 345 60236 REDROCK3 345 2 60217 INVRHLS3 345 60218 INVRHLS7 115 9 60217 INVRHLS3 345 60236 REDROCK3 345 1 60236 REDROCK3 345 60238 REDROCK7 115 9 61161 WBYRON 869.0 61948 BYRON 5 161 1 61906 MAPLE LF 161 61948 BYRON 5 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 61948 BYRON 5 161 62867 AL-CORN5 161 1 61964 OWATNNA5 161 62867 AL-CORN5 161 1 60105 PR ISLD3 345 60192 BLUE LK3 345 1 60105 PR ISLD3 345 92603 NLAX 5 161 P1 68884 RCK ELM869.0 69545 RCK ELM5 161 1
60108 WILMART3 345 60192 BLUE LK3 345	1165	87.5 1019.46 95.3 1110.22				SYSTEM INTACT 60105 PR ISLD3 345 61950 BYRON 3 345 1	
60133 SHEYNNE4 230 63336 AUDUBON4 23	318	88.4 280.98 99.1 315.07 96 305.34 102.2 325.09 95.2 302.62 95.2 302.62 98.9 314.64				SYSTEM INTACT 60142 BENTON 3 345 66802 WINGERS3 345 1 61611 WINGRIV4 230 63052 INMAN 4 230 1 63051 HENNING4 230 63052 INMAN 4 230 1 63187 WINGER Y 230 63238 WINGER 7 115 1 63187 WINGER Y 230 66758 WINGER 4 230 1 66760 WINGER 3 345 66802 WINGERS3 345 1	
60133 SHEYNNE4 230 66435 FARGO 4 230	391	76.9 300.5 105.1 410.8				SYSTEM INTACT 60133 SHEYNNE4 230 66754 MAPLE R4 230 1	
60133 SHEYNNE4 230 66754 MAPLE R4 230	318	77.2 245.56 140.4 446.53 116.3 369.98	81.1 257.93 131.6 418.53 118.7 377.53 95.2 302.8 119.8 380.81	82.2 261.42 129.7 412.31 120.5 383.28 96.3 306.37 121.5 386.43	82.2 261.3 129.5 411.88 120.6 383.37 96.3 306.2 121.7 386.88	77.3 245.93 130.4 414.71 115.3 366.79 119.3 379.36	SYSTEM INTACT 60133 SHEYNNE4 230 66435 FARGO 4 230 1 60136 MAPLE R7 115 66754 MAPLE R4 230 5 63329 WAHPETN4 230 63331 FERGSFL4 230 1 66792 MAPLE R3 345 67010 AlexSS 345 1
60142 BENTON 3 345 63045 BENTON 4 230	336	85.5 287.37 134.2 451.05 102.1 342.96 109 366.36	86.8 291.49 132.6 445.41 100.5 337.71 108.5 364.68	85.2 286.16 128.7 432.46 102.2 343.37	85 285.67 128.4 431.5 102 342.59	79.6 267.62 120.9 406.25	SYSTEM INTACT 60142 BENTON 3 345 63045 BENTON 4 230 2 60151 MNTCELO3 345 60152 MNTCELO4 230 6 60151 MNTCELO3 345 60160 SHERCO 3 345 1
60142 BENTON 3 345 63045 BENTON 4 230	336	82.6 277.6 132.4 444.95 105.3 353.91	83.8 281.59 130.5 438.59 104.8 352.28	82.3 276.44 126.7 425.77	82.1 275.96 126.3 424.45	76.9 258.52 119 399.9	SYSTEM INTACT 60142 BENTON 3 345 63045 BENTON 4 230 1 60151 MNTCELO3 345 60160 SHERCO 3 345 1
60147 MINVALY4 230 66550 GRANITF4 230	239	41.5 99.09 104.1 248.87				SYSTEM INTACT 60150 MNVLTAP4 230 66550 GRANITF4 230 1	
60150 MNVLTAP4 230 63054 PANTHER4 23	388	110.3 427.9				96.2 373.06 108.2 419.74	93.7 363.48 99.8 387.16

					109.4 424.53 113.8 441.45 115.4 447.8 104.1 403.98 108.2 419.74 115.4 447.73 102.8 398.91 102.3 396.79 102 395.6				105.4 408.96 109.8 426.18 112 434.65 100.9 391.42 99.8 387.16 112 434.55 100.1 388.26 100.1 388.3 99.8 387.11	60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60156 PYNSVIL7 115 60356 PAYNES 4 230 1 60192 BLUE LK3 345 99990 Ellendal 345 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 60356 PAYNES 4 230 63050 WILLMAR4 230 1 63050 WILLMAR4 230 66550 GRANITF4 230 1 63314 BIGSTON4 230 63325 BROWNSV4 230 1 63325 BROWNSV4 230 63327 HANKSON4 230 1 34006 LAKEFLD3 345 60286 NOBLES 3 345 P1 34006 LAKEFLD3 345 60331 LKFLDXL3 345 1 34018 HAZLTON3 345 34093 ARNOLD 3 345 1 60102 ADAMS 3 345 63032 PL VLLY3 345 1 60105 PR ISLD3 345 61950 BYRON 3 345 1 60142 BENTON 3 345 66802 WINGERS3 345 1 61611 WINGRIV4 230 63052 INMAN 4 230 1 63051 HENNING4 230 63052 INMAN 4 230 1 66760 WINGER 3 345 66802 WINGERS3 345 1
60150 MNVLTAP4 230 66550 GRANITF4 230	318	150.2 477.72		131.9 419.59 144.5 459.59 141 448.44 151.7 482.33 143.1 455.05 143.1 455.09 155.9 495.67 142 451.71 144.5 459.59 155.9 495.79 143.2 455.33	111.2 353.59	111.3 353.98	128.5 408.63	SYSTEM INTACT 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60147 MINVALY4 230 60148 MINVALY7 115 P5 60147 MINVALY4 230 66550 GRANITF4 230 1 60156 PYNSVIL7 115 60356 PAYNES 4 230 1 60192 BLUE LK3 345 99990 Ellendal 345 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 60356 PAYNES 4 230 63050 WILLMAR4 230 1 63050 WILLMAR4 230 66550 GRANITF4 230 1 34006 LAKEFLD3 345 60286 NOBLES 3 345 P1 34006 LAKEFLD3 345 60331 LKFLDXL3 345 1 60126 SPLT RK3 345 60286 NOBLES 3 345 P1 60142 BENTON 3 345 66802 WINGERS3 345 1 62427 WILLMAR869.0 63050 WILLMAR4 230 1 63051 HENNING4 230 63052 INMAN 4 230 1 66760 WINGER 3 345 66802 WINGERS3 345 1 63314 BIGSTON4 230 63325 BROWNSV4 230 1 61743 GRANITF3 345 66550 GRANITF4 230 1 60142 BENTON 3 345 61743 GRANITF3 345 P1 63325 BROWNSV4 230 63327 HANKSON4 230 1		
60173 ROSEAUN2 500 60174 ROSEAUS2 50	1732	88 1524.12 104.1 1803.25 104.1 1802.96		82.8 1434.91 104.6 1811.57 109.8 1901.5 103.8 1798.09	81.8 1416.81	81.8 1417.46	83.1 1438.43 95.5 1654.25 105.5 1826.76 110.9 1920.85 95.4 1652.94 104.8 1816	SYSTEM INTACT 60142 BENTON 3 345 66802 WINGERS3 345 1 66750 KARLSTD3 345 66803 WINGERN3 345 1 66750 KARLSTD3 345 67625 DORSEY 3 345 1 66760 WINGER 3 345 66802 WINGERS3 345 1 66760 WINGER 3 345 66803 WINGERN3 345 1		
60173 ROSEAUN2 500 67621 RIEL 2 500 1	1732.1	90.2 1562.82 106.8 1849.39 106.8 1849.09		84.9 1471.23 96.8 1677.49 107.3 1857.93 112.6 1950.27 96.6 1673.63 106.5 1844.14	83.9 1452.67 96.3 1668.61 106.9 1852.42 112.7 1952.17 96.2 1666.94 106.4 1842.92	83.9 1453.33 96.2 1665.66 106.9 1852.31 112.8 1952.95 96.1 1665.3 106.4 1842.62	85.1 1474.86 97.9 1696.45 108.2 1873.52 113.7 1970.12 97.9 1695.1 107.5 1862.52	SYSTEM INTACT 60142 BENTON 3 345 66802 WINGERS3 345 1 66750 KARLSTD3 345 66803 WINGERN3 345 1 66750 KARLSTD3 345 67625 DORSEY 3 345 1 66760 WINGER 3 345 66802 WINGERS3 345 1 66760 WINGER 3 345 66803 WINGERN3 345 1		
60186 AS KING3 345 60199 CHIS CO3 345 1	1165			60.8 707.75 106.7 1243.08				SYSTEM INTACT 60199 CHIS CO3 345 60221 KOLMNLK3 345 1		
60197 CHIS CO2 500 60198 CHIS-N 2 500 1	1732	83.7 1450.27 95.9 1660.47 95.8 1659.95		79.5 1377.43 95.6 1656.5	79.1 1369.41 97.4 1686.19	80.2 1388.93 97.8 1693.07		SYSTEM INTACT 66750 KARLSTD3 345 67625 DORSEY 3 345 1 60142 BENTON 3 345 66802 WINGERS3 345 1 66760 WINGER 3 345 66802 WINGERS3 345 1		
60199 CHIS CO3 345 60221 KOLMNLK3 345	1165	71.2 829.87 109.2 1272.02				SYSTEM INTACT 60186 AS KING3 345 60199 CHIS CO3 345 1				
60199 CHIS CO3 345 61493 CHIS D1Y 110 1	1203	59.9 720.14				SYSTEM INTACT				

		117.2 116.9	1409.9 1406.25									60197 CHIS CO2 500 61494 CHIS D2Y 110 9 60199 CHIS CO3 345 61494 CHIS D2Y 110 9		
60290 ST LAKE5 161 69561 WASHCO 5 161	120	84.7	101.6	81.9 128.2	98.28 153.8	79.9 121.3	95.82 145.55	81.5 103.7	97.81 124.41	77.9 96.8	93.51 116.14	SYSTEM INTACT 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60196 CHISAGO7 115 60199 CHIS CO3 345 6 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 61051 STCRX 5G 161 61131 LAW CRK5 161 P1 61051 STCRX 5G 161 69565 APL RVR5 161 P1 61128 LAW CRK7 115 61131 LAW CRK5 161 P1 69551 ELK MND5 161 69557 BARRON 5 161 1 39244 ARP 345 345 60304 EAU CL 3 345 1		
		110	131.97	105.1 128.2	126.15 153.8	101.7 121.3	122.09 145.55	107.4 103.7	128.83 124.41	99.6 96.8	119.53 116.14			
		112.4	134.83	110.2 132.29	132.53	107.5 107.7	128.94 129.3	110.4 110.9	132.52 133.02	102.8 103.2	123.37 123.87			
		112.7	135.27	110.4 132.53	132.04	107.7 107.3	129.3 128.72	110.9 109.6	133.02 131.55	103.2 102.6	123.87 123.12			
		112.1	134.55	110 132.04	132.75	107.3 102	128.72 122.45	109.6 103.8	131.55 124.53	102.6 103.6	123.12 124.32			
		107.6	129.13	104 124.75	124.75	102	122.45	103.8	124.53	103.6	124.32			
		99.4	119.24											
60302 COULEE 5 161 60308 LACROSS5 161	195	51.3 99.4 113.3	100.1 193.84 220.99	46.9 95.2 105.3	91.44 185.66 205.34	46.2 90.11 103.9	90.11 202.7 202.7	47.5 96 105.1	92.57 187.16 204.99	SYSTEM INTACT 60308 LACROSS5 161 69535 LAC TAP5 161 1 69523 GENOA 5 161 69535 LAC TAP5 161 1				
60302 COULEE 5 161 69523 GENOA 5 161	240	117.4	281.74	113.4 127.6 119.9 118.6 127.6 160.4 125.6 121.1 126.5 119 166.9	272.18 306.31 287.76 284.61 306.31 384.91 301.46 290.52 303.56 285.56 400.63	112.8 124.4 118.3 124.4 160.1 124.8 120.4 124.7 118.4 165.7	270.69 298.61 283.81 298.61 384.2 299.58 289.05 299.33 284.12 397.67	90.1 99.3 99.3 99.6 131.5	273.75 302.02 302.02 302.02 385.83 301.91 291.97 302.72 399.76	SYSTEM INTACT 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 60308 LACROSS5 161 69535 LAC TAP5 161 1 60309 MRSHLND5 161 69543 ALMA 5 161 1 60316 TREMVAL5 161 69543 ALMA 5 161 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 69507 SENECA 5 161 69511 BELLCTR5 161 1 69523 GENOA 5 161 69535 LAC TAP5 161 1 60102 ADAMS 3 345 63032 PL VLLY3 345 1 60105 PR ISLD3 345 61950 BYRON 3 345 1 60308 LACROSS5 161 69535 LAC TAP5 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 68795 HILLSBOR69.0 69515 HLSBORO5 161 1 69511 BELLCTR5 161 69515 HLSBORO5 161 1				
		130.6	313.34	125.6 121.1 126.5	301.46 290.52 303.56	124.8 120.4 124.7	299.58 289.05 299.33	99.3 96 99.6	301.91 291.97 302.72					
		124.8	299.43	121.1 126.5 119 166.9	290.52 303.56 285.56 400.63	120.4 124.7 118.4 165.7	289.05 299.33 284.12 397.67	96 99.6 131.5	291.97 302.72 399.76					
		122.8	294.75	119 166.9	285.56 400.63	118.4 165.7	284.12 397.67	131.5	399.76					
		174.2	418.08											
		124.4	298.52											
		122.2	293.37											
		164.5	394.69											
		122.3	293.63			117.8	282.73							
		122	292.73											
		122	292.89											
		60304 EAU CL 3 345 60305 EAU CLA5 161 1	300	77.7 132.5	233.06 397.59	77.7 132.5	233.09 397.59	77.1 131.6	231.34 394.78	76.9 131.2	230.77 393.68	63.3 106.9	189.98 320.73	SYSTEM INTACT 60304 EAU CL 3 345 60305 EAU CLA5 161 9
		60304 EAU CL 3 345 60305 EAU CLA5 161 9	300	81.9 134.8	245.71 404.44	81.9 134.8	245.74 404.48	81.3 133.9	243.89 401.59	81.1 133.5	243.29 400.48	66.8 108.9	200.33 326.6	SYSTEM INTACT 60304 EAU CL 3 345 60305 EAU CLA5 161 10
		60311 MAYFAIR5 161 92603 NLAX 5 161 1	197										59 100.8 99.2	116.17 198.51 195.43
61550 FORB1JCT 230 61624 FORBES 4 230	672										57.4 100 100	385.54 672.28 672.28	SYSTEM INTACT 60101 FORBES 2 500 61552 FORB2JCT 230 1 61552 FORB2JCT 230 61624 FORBES 4 230 1	
61552 FORB2JCT 230 61624 FORBES 4 230	672										57.6 100.1 100.1	386.82 672.86 672.86	SYSTEM INTACT 60101 FORBES 2 500 61550 FORB1JCT 230 1 61550 FORB1JCT 230 61624 FORBES 4 230 1	
61622 FORBES 3 345 61624 FORBES 4 230	400										64.6 104.9 104.9	258.53 419.57 419.57	SYSTEM INTACT 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1	
60308 LACROSS5 161 69535 LAC TAP5 161	335	53.4 113.8	178.84 381.28	53.1 111.8	177.99 374.69	53.2 111.4	178.28 373.22	52.1 111.4	174.43 373.04	SYSTEM INTACT 60302 COULEE 5 161 69523 GENOA 5 161 1				
60309 MRSHLND5 161 69535 LAC TAP5 161	162	43.7 101.4	70.81 164.25	36.7 97.8	59.45 158.45	35.4 97.2	57.3 157.41	35 96.6	56.64 156.57	SYSTEM INTACT 60309 MRSHLND5 161 69543 ALMA 5 161 1				
60356 PAYNES 4 230 63050 WILLMAR4 230	387	95.6 99.3 103.7 103.6 99.2 100.7 101 99.3 100.8 101.7	370.1 384.14 401.35 401.11 384 389.73 390.77 384.26 389.91 393.52	79.6 308.02	SYSTEM INTACT 34006 LAKEFLD3 345 60286 NOBLES 3 345 P1 60142 BENTON 3 345 66802 WINGERS3 345 1 60150 MNVLTAP4 230 66550 GRANITF4 230 1 60151 MNTCELO3 345 60153 MNTCELO7 115 10 60189 BLK DOG4 230 60190 BLK DOG7 115 5 60189 BLK DOG4 230 62980 MCLEOD 4 230 1 62427 WILLMAR869.0 63050 WILLMAR4 230 1 62980 MCLEOD 4 230 62981 MCLEOD 7 115 1 63051 HENNING4 230 63052 INMAN 4 230 1									

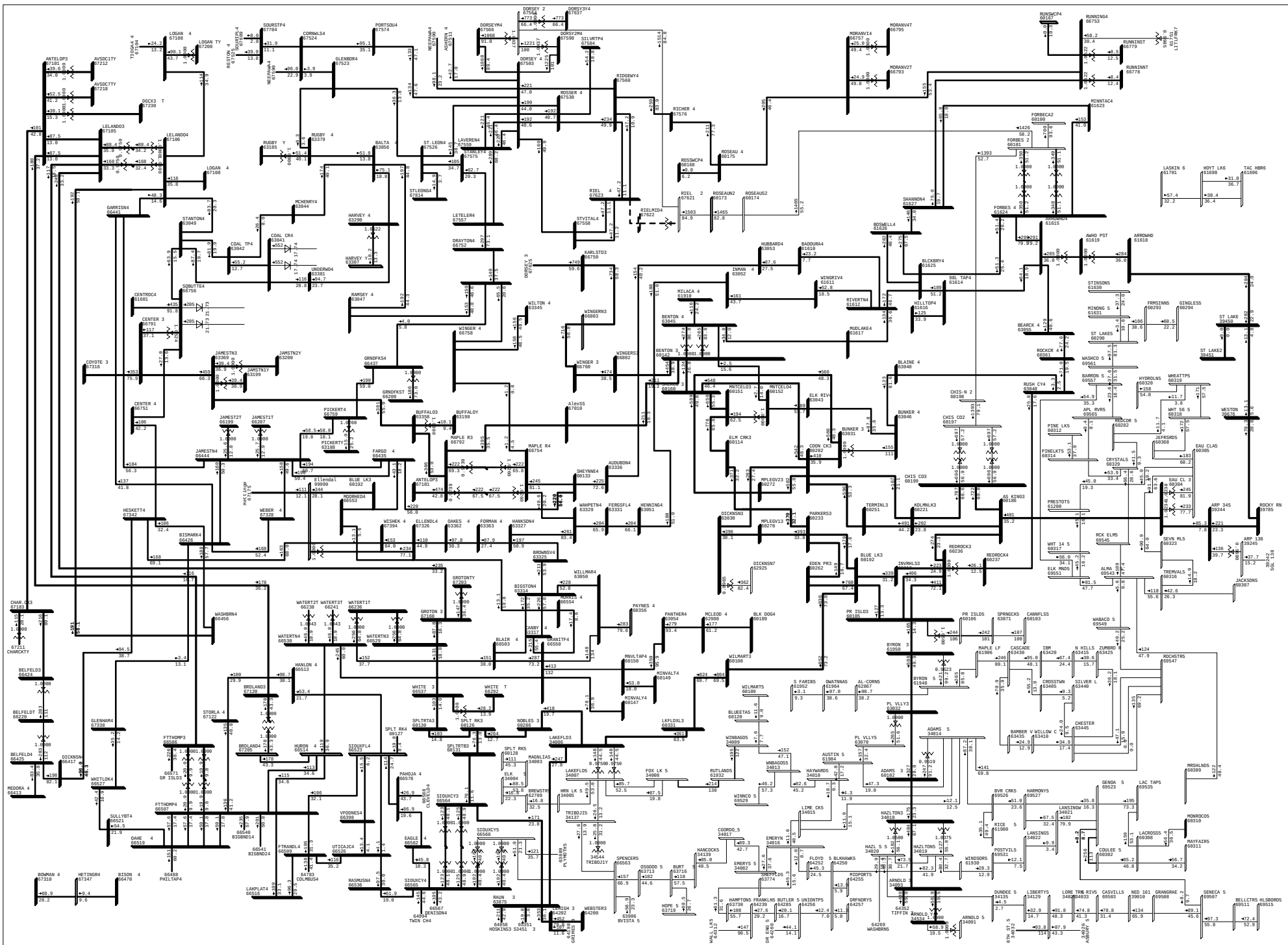
		103.2	399.46										66760 WINGER 3 345 66802 WINGERS3 345 1 60150 MNVLTAP4 230 63054 PANTHER4 230 1
61601 CENTRDC4 230 66748 CENTER2G20	465	99.4	462.17	95.7	370.27								SYSTEM INTACT
		100.8	468.72										66791 CENTER 3 345 67316 COYOTE 3 345 1
61615 ARROWHD4 230 61624 FORBES 4 23	370	79	292.48	79.5	294.1	78	288.78	74.8	276.65				SYSTEM INTACT
				108	399.77	105.8	391.49	117	432.99				60101 FORBES 2 500 60198 CHIS-N 2 500 1
				108	399.77	105.8	391.49	117	432.99				60197 CHIS CO2 500 60198 CHIS-N 2 500 1
		100.5	371.94	101.2	374.56	99.3	367.45						61614 98L TAP4 230 61625 BLCKBRY4 230 1
61625 BLCKBRY4 230 61626 BOSWELL4 23	399	68.5	273.39	67.5	269.36	67.4	268.93	67.3	268.44	66.1	263.61		SYSTEM INTACT
		124.6	497.14	123.3	491.92	123.1	491.1	122.8	490.15	120.7	481.74		61625 BLCKBRY4 230 61626 BOSWELL4 230 1
61906 MAPLE LF 161 61948 BYRON 5 161 1	302	82.1	247.91	85.8	259.12	88.2	266.25	87.9	265.4				SYSTEM INTACT
		100.6	303.96	105	317.2	107.8	325.55	107.5	324.59				34014 ADAMS 5 161 60102 ADAMS 3 345 9
		116.4	351.38	117	353.31	118.5	358	118.2	357.06				34014 ADAMS 5 161 69547 ROCHSTR5 161 1
		102.8	310.52	97.4	294.1	96.4	291.06	96.2	290.66				60105 PR ISLD3 345 61950 BYRON 3 345 1
						95.8	289.41	95.6	288.61				61948 BYRON 5 161 62867 AL-CORN5 161 1
						95.8	289.36	95.6	288.57				61964 OWATNNA5 161 62867 AL-CORN5 161 1
						95.5	288.54	95.2	287.65				61984 AUSTIN 5 161 63070 PL VLLY5 161 1
61906 MAPLE LF 161 63430 CASCADE 161	302	76.4	230.64	80.1	242.05	82.6	249.34	82.3	248.51				SYSTEM INTACT
		95	286.95	99.4	300.08	102.1	308.45	101.8	307.49				34014 ADAMS 5 161 60102 ADAMS 3 345 9
		110.4	333.27	111.1	335.44	112.7	340.29	112.4	339.35				34014 ADAMS 5 161 69547 ROCHSTR5 161 1
		97	292.85										60105 PR ISLD3 345 61950 BYRON 3 345 1
61948 BYRON 5 161 61950 BYRON 3 345 1	448	98.2	439.86	99.2	444.45	100.8	451.39	100.6	450.7	82.6	369.87		SYSTEM INTACT
		109.7	491.28	111.4	498.94	113.3	507.42	113.1	506.62				34014 ADAMS 5 161 60102 ADAMS 3 345 9
		119.1	533.67	118.2	529.7	119.3	534.38	119.1	533.6				34014 ADAMS 5 161 69547 ROCHSTR5 161 1
		102.2	457.79	103.5	463.72	104.9	470.12	104.8	469.39				60105 PR ISLD3 345 60106 PR ISLD5 161 10
		101.2	453.26	102	456.88	103.3	462.72	103.1	462				60105 PR ISLD3 345 60236 REDROCK3 345 1
		101.3	453.68	102.1	457.26	103.4	463.06	103.2	462.33				60105 PR ISLD3 345 60236 REDROCK3 345 2
		120.1	538.03	111.4	498.98	109.3	489.64	109.3	489.62	107.3	480.77		60105 PR ISLD3 345 61950 BYRON 3 345 1
		102.2	457.78	103.5	463.72	104.9	470.12	104.8	469.38				60106 PR ISLD5 161 63071 SPRNGCK5 161 1
		101.2	453.17	102.7	460.08	103.9	465.52	103.8	464.82				60217 INVRHLS3 345 60218 INVRHLS7 115 9
		102.9	460.79	104.3	467.17	106	474.73	105.8	474				61984 AUSTIN 5 161 63070 PL VLLY5 161 1
		100.3	449.56	101.5	454.91								69523 GENOA 5 161 69535 LAC TAP5 161 1
						103.1	462.04						61051 STCRX 5G 161 69565 APL RVR5 161 P1
								102.9	460.96				61128 LAW CRK7 115 61131 LAW CRK5 161 P1
62980 MCLEOD 4 230 63054 PANTHER4 23	319	108.6	346.46	93.4	297.94					91.1	290.55		SYSTEM INTACT
		114.6	365.6	107.7	343.56					98.8	315.31		34006 LAKEFLD3 345 60286 NOBLES 3 345 P1
		114.4	365.05	116.2	370.67					111.8	356.77		34006 LAKEFLD3 345 60331 LKFLDXL3 345 1
		112.7	359.66	108.8	347.22					105.1	335.42		34018 HAZLTON3 345 34093 ARNOLD 3 345 1
		112.8	359.83	114.3	364.46					111	354.01		60102 ADAMS 3 345 63032 PL VLLY3 345 1
		113.1	360.66	102.1	325.6					99	315.95		60105 PR ISLD3 345 61950 BYRON 3 345 1
		118.6	378.22	107.7	343.56					98.8	315.31		60142 BENTON 3 345 66802 WINGERS3 345 1
		118.3	377.28	114.2	364.39					111	354		60742 PANTHER869.0 63054 PANTHER4 230 1
		117.9	376.11	101.9	325.14					99.4	316.94		63050 WILLMAR4 230 66550 GRANITF4 230 1
		113.8	362.99	100.1	319.45					98	312.59		63051 HENNING4 230 63052 INMAN 4 230 1
		117.9	375.99	100	318.89					97.7	311.53		66760 WINGER 3 345 66802 WINGERS3 345 1
63031 BUNKER 3 345 63046 BUNKER 4 230	159.3	115.2	183.57	110.9	176.73	108.7	173.22	108.3	172.46	75.5	120.27		SYSTEM INTACT
		155.1	247.14	144.5	230.19	143	227.87	142.1	226.31	95.6	152.31		60151 MNTCELO3 345 60152 MNTCELO4 230 6
		152.2	242.45	145.9	232.48	141.7	225.8	140.8	224.37	98.2	156.42		60151 MNTCELO3 345 60160 SHERCO 3 345 1
		174.9	278.62	174.7	278.32	172.4	274.65	171.1	272.62	99.9	159.13		60152 MNTCELO4 230 63043 ELK RIV4 230 1
		167.6	267.06	123.6	196.89	121.4	193.41	120.7	192.27	114.3	182.09		60202 COON CK3 345 63031 BUNKER 3 345 1
		129.4	206.17	123.8	197.17	121.6	193.7	120.9	192.56	96.7	154.09		60361 ROCKCR 4 230 63048 RUSH CY4 230 1
		130.5	207.94	167.9	267.41	165.1	262.95	164.5	262.05				60361 ROCKCR 4 230 63055 BEARCK 4 230 1
		141.8	225.92	124.2	197.92	130.4	207.71	119.7	190.72				61615 ARROWHD4 230 63055 BEARCK 4 230 1
		129.9	206.99	134.4	214.03	120.5	191.98	120.7	192.3				61910 MILACA 4 230 62301 MILACA 869.0 1
		130.3	207.65	123.3	196.4	120.8	192.43	130.4	207.71				61910 MILACA 4 230 63045 BENTON 4 230 1
		141.4	225.2	142.8	227.52	141.8	225.83	140.6	223.99				63043 ELK RIV4 230 63046 BUNKER 4 230 1
63040 BLAINE 4 230 63046 BUNKER 4 230 1	159.3	75.9	120.92	81.6	130.01	81.7	130.1	80.1	127.62				SYSTEM INTACT
		97.3	155.06	96.5	153.69	102.6	163.51	101.1	161.1				60202 COON CK3 345 63031 BUNKER 3 345 1
		99.2	157.96	104.6	166.65	96	152.97	99.2	157.96				60361 ROCKCR 4 230 63048 RUSH CY4 230 1
		100.9	160.74	101.3	161.36	99.3	158.18	100.9	160.68				60361 ROCKCR 4 230 63055 BEARCK 4 230 1
		114.6	182.6	103	164.13	101	160.89	114.3	182.01				61615 ARROWHD4 230 63055 BEARCK 4 230 1

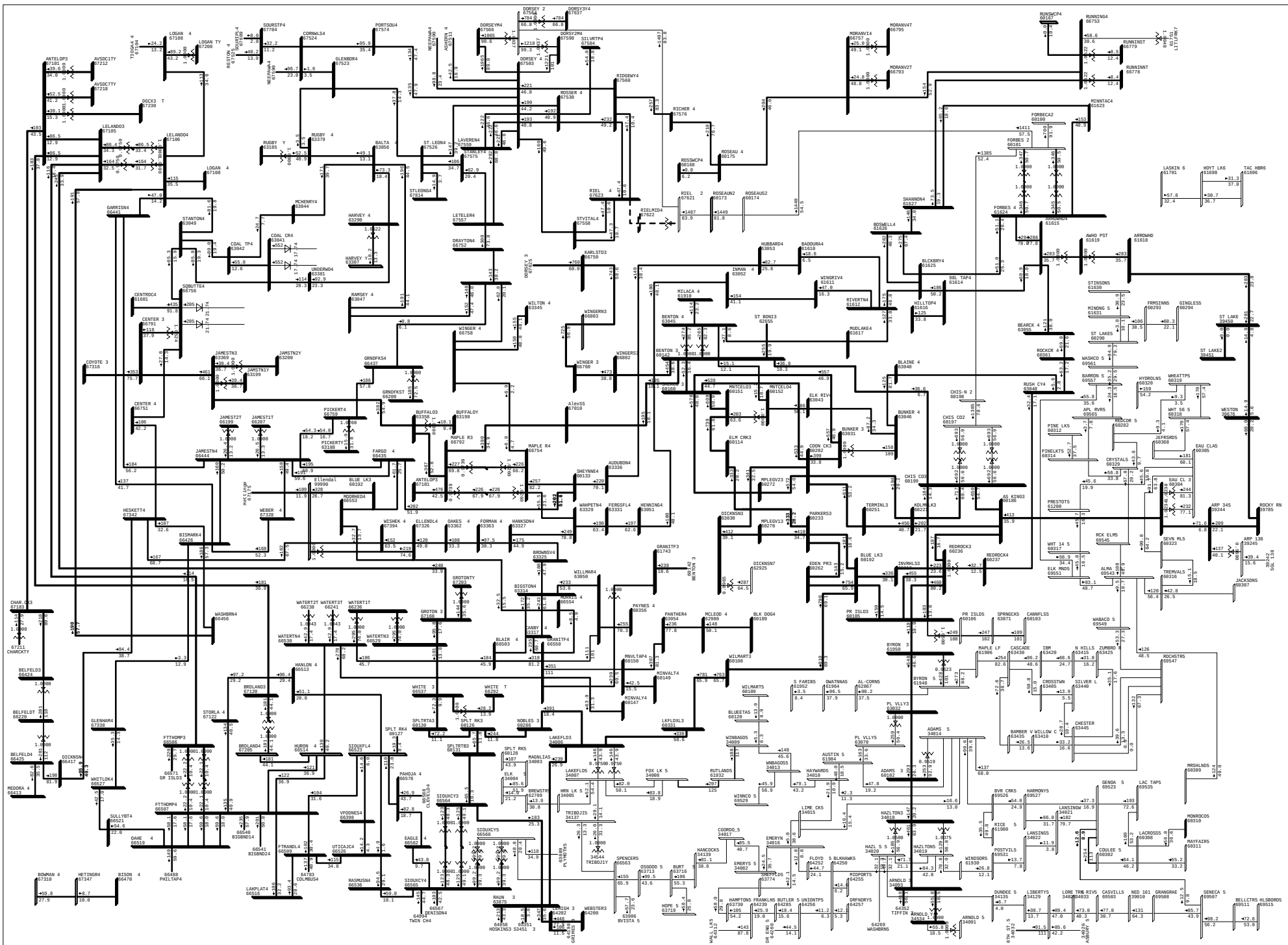
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					116.7	185.9	114.6	182.64				61615 ARROWHD4 230 63055 BEARCK 4 230 1
					102.6	163.47	102.8	163.79				62147 BNKRLLK 869.0 63046 BUNKER 4 230 1
63050 WILLMAR4 230 66550 GRANITF4 230	119.5	168.1	200.86	136.6	163.18	103.9	124.12	103.7	123.91	50.4	160.92	SYSTEM INTACT
		177.8	212.53	157.5	188.23	119.3	142.55	119	142.26	98.7	314.75	60133 SHEYNNNE4 230 66435 FARGO 4 230 1
		183.3	219.03	169.7	202.83	114.2	136.42	113.9	136.12			60142 BENTON 3 345 66802 WINGERS3 345 1
		209.9	250.79	159.6	190.7	135.1	161.44	135.1	161.39			60150 MNVLTP4 230 66550 GRANITF4 230 1
		177.9	212.54	201.4	240.63	142.4	170.15	142.4	170.22			60151 MNTCELO3 345 60153 MNTCELO7 115 10
		187.4	223.92	173	206.76	127.1	151.83	127	151.74			60189 BLK DOG4 230 60190 BLK DOG7 115 5
		187.7	224.34	151.3	180.78	134.4	160.57	134.3	160.54			60189 BLK DOG4 230 62980 MCLEOD 4 230 1
		186.9	223.33	157.5	188.23	115.6	138.1	115.7	138.29			62980 MCLEOD 4 230 62981 MCLEOD 7 115 1
		311.1	371.77	151.6	181.14	133.3	159.26	133.1	159.1			63050 WILLMAR4 230 63314 BIGSTON4 230 1
		179.3	214.25	186.3	222.69	233.2	278.68	233.5	279.03			63051 HENNING4 230 63052 INMAN 4 230 1
182	217.5	264.7	316.29	113.9	136.07	113.7	135.91			66760 WINGER 3 345 66802 WINGERS3 345 1		
63051 HENNING4 230 63331 FERGSFL4 230	320	90.7	290.13									SYSTEM INTACT
		101.8	325.86									60142 BENTON 3 345 66802 WINGERS3 345 1
		105.6	338.05									63053 HUBBARD4 230 63336 AUDUBON4 230 1
		101.6	325.21									66760 WINGER 3 345 66802 WINGERS3 345 1
63186 WILTON Y 230 63345 WILTON 4 230	140	123.7	173.12	113.7	159.19	112.7	157.8	112.3	157.17	112	156.86	SYSTEM INTACT
				129.8	181.66	128.1	179.29	127.9	179.08	128.1	179.37	60133 SHEYNNNE4 230 63336 AUDUBON4 230 1
		148.6	208	134	187.6	132.9	186.01	132	184.82	132.5	185.56	60142 BENTON 3 345 66802 WINGERS3 345 1
		129	180.58	118.8	166.36	117.6	164.61	117	163.84	117.1	163.98	61611 WINGRIV4 230 63052 INMAN 4 230 1
				120.3	168.45	119.2	166.89	118.8	166.36	118.3	165.55	61612 RIVERTN4 230 61625 BLCKBRY4 230 1
		131.6	184.17	118.7	166.19					117	163.76	63051 HENNING4 230 63052 INMAN 4 230 1
				119.3	167.08	117.9	165.08	117.4	164.31	117.5	164.56	63051 HENNING4 230 63331 FERGSFL4 230 1
		140.4	196.5	126.5	177.17	125	174.96	124.4	174.2	124.7	174.6	63053 HUBBARD4 230 63336 AUDUBON4 230 1
		149.7	209.63	139.8	195.69	138.3	193.55	138.2	193.45			63187 WINGER Y 230 63238 WINGER 7 115 1
		149.7	209.63	139.8	195.7	138.5	193.92	138.5	193.84			63187 WINGER Y 230 66758 WINGER 4 230 1
		148	207.22	133.6	187.09	132.7	185.77	132.1	184.88	132.3	185.24	66760 WINGER 3 345 66802 WINGERS3 345 1
		127.2	178.05									60133 SHEYNNNE4 230 66754 MAPLE R4 230 1
		129.2	180.89			117.6	164.6	117.1	164.01	117	163.76	61610 BADOURA4 230 61794 BADOUJCT 115 1
127.6	178.59							116.9	163.65	61641 HUBBARD7 115 63053 HUBBARD4 230 1		
63187 WINGER Y 230 66758 WINGER 4 230	140	108.1	151.31	106.7	149.38	106.2	148.75	106.8	149.56	105.3	147.46	SYSTEM INTACT
				131.5	184.04	129.7	181.56	129.7	181.53	128.9	180.49	60133 SHEYNNNE4 230 63336 AUDUBON4 230 1
		115	161	113.8	159.34	113.5	158.91	114.1	159.72	112.1	156.94	60133 SHEYNNNE4 230 66754 MAPLE R4 230 1
		138.1	193.38	132.8	185.87	131.4	183.97	131.9	184.71	131.1	183.61	60142 BENTON 3 345 66802 WINGERS3 345 1
				160.2	224.24	159.1	222.68	158.5	221.93	156.6	219.18	63186 WILTON Y 230 63245 WILTON 7 115 1
				160.2	224.24	159.1	222.68	158.5	221.93	156.6	219.18	63186 WILTON Y 230 63345 WILTON 4 230 1
		119.4	167.2	113.9	159.5	113.9	159.4	114.6	160.49	113.4	158.73	63202 AUDUBONY 230 63236 AUDUBON7 115 1
		117.9	165.07	113.8	159.28	113.5	158.89	114.2	159.9	112.9	158.02	63202 AUDUBONY 230 63336 AUDUBON4 230 1
				160.3	224.41	159.1	222.72	158.3	221.59	156.6	219.2	63345 WILTON 4 230 66758 WINGER 4 230 1
		115.7	161.99	115	161	114.5	160.33	115.1	161.09	113.5	158.87	66752 DRAYTON4 230 67557 LETELERA 230 1
		138.2	193.46	132.4	185.37	131.2	183.72	132	184.83	131	183.43	66760 WINGER 3 345 66802 WINGERS3 345 1
		111	155.35									60142 BENTON 3 345 63045 BENTON 4 230 1
		110.8	155.07									60142 BENTON 3 345 63045 BENTON 4 230 2
111.1	155.57									63047 RAMSEY 4 230 63056 BALTA 4 230 1		
112.6	157.6									63136 AUDUBON941.6 63336 AUDUBON4 230 1		
63189 MAPLER1Y 345 66754 MAPLE R4 230	336	69.8	234.43	67.5	226.75	67.9	228.2	67.9	228.02	66.2	222.3	SYSTEM INTACT
		134.1	450.48	122	409.87	122.7	412.33	122.6	412	119.5	401.62	63190 MAPLER2Y 345 66754 MAPLE R4 230 1
		134.1	450.55	122	409.91	122.7	412.37	122.6	412.04	119.5	401.66	63190 MAPLER2Y 345 66792 MAPLE R3 345 1
				112.7	378.6	112.3	377.37	112.3	377.49	113.5	381.49	66792 MAPLE R3 345 67010 AlexSS 345 1
63189 MAPLER1Y 345 66792 MAPLE R3 345	336	71.7	240.8	69.3	232.92	69.8	234.42	69.7	234.23	68	228.35	SYSTEM INTACT
		137.7	462.64	125.3	420.95	126	423.47	125.9	423.14	122.8	412.48	63190 MAPLER2Y 345 66754 MAPLE R4 230 1
		137.7	462.71	125.3	420.99	126	423.52	125.9	423.18	122.8	412.52	63190 MAPLER2Y 345 66792 MAPLE R3 345 1
				115.7	388.84	115.4	387.58	115.4	387.7	116.6	391.81	66792 MAPLE R3 345 67010 AlexSS 345 1
63190 MAPLER2Y 345 66754 MAPLE R4 230	336	69.8	234.43	67.5	226.75	67.9	228.2	67.9	228.02	66.2	222.3	SYSTEM INTACT
		134.1	450.48	122	409.87	122.7	412.33	122.6	412	119.5	401.62	63189 MAPLER1Y 345 66754 MAPLE R4 230 1
		134.1	450.55	122	409.91	122.7	412.37	122.6	412.04	119.5	401.66	63189 MAPLER1Y 345 66792 MAPLE R3 345 1
				112.7	378.6	112.3	377.37	112.3	377.49	113.5	381.49	66792 MAPLE R3 345 67010 AlexSS 345 1
63190 MAPLER2Y 345 66792 MAPLE R3 345	336	71.7	240.8	69.3	232.92	69.8	234.42	69.7	234.23	68	228.35	SYSTEM INTACT

		137.7	462.64	125.3	420.95	126	423.47	125.9	423.14	122.8	412.48	63189 MAPLER1Y 345 66754 MAPLE R4 230 1
		137.7	462.71	125.3	420.99	126	423.52	125.9	423.18	122.8	412.52	63189 MAPLER1Y 345 66792 MAPLE R3 345 1
				115.7	388.84	115.4	387.58	115.4	387.7	116.6	391.81	66792 MAPLE R3 345 67010 AlexSS 345 1
63195 BIGSTONY 230 63314 BIGSTON4 230	233	92.5	215.43	84.3	196.4	85.5	199.11	85.5	199.14	84.5	196.88	SYSTEM INTACT
		107.9	251.48	98.3	228.99	99.6	232.17	99.7	232.26	98.4	229.36	63050 WILLMAR4 230 63314 BIGSTON4 230 1
		127.8	297.78	116.1	270.46	119.1	277.42	119.1	277.52	115.9	270.11	63314 BIGSTON4 230 63317 CANBY 4 230 1
				98.4	229.19	97.8	227.98	97.8	227.97	99	230.78	63314 BIGSTON4 230 63325 BROWNSV4 230 1
		104.8	244.12	97.3	226.78	98.5	229.39	98.5	229.46	97.3	226.62	63314 BIGSTON4 230 66503 BLAIR 4 230 1
				97.6	227.46	97.1	226.28	97.1	226.28	98.3	229.06	63325 BROWNSV4 230 63327 HANKSON4 230 1
				95.2	221.78	95.8	223.18	95.7	223.03	95.7	222.97	63327 HANKSON4 230 63329 WAHPETN4 230 1
		107.2	249.78	96.5	224.89	98.5	229.57	98.6	229.65	96.6	224.99	66503 BLAIR 4 230 66550 GRANITF4 230 1
63317 CANBY 4 230 63318 CANBY Y4 230 1	125	4.2	5.22	5.9	7.36	4.7	5.86	4.7	5.81	6.5	8.11	SYSTEM INTACT
		112.5	140.6	100.5	125.65	97.7	122.1	97.7	122.15	101.6	127.06	63195 BIGSTONY 230 63214 BIGSTON7 115 1
		112.5	140.58	100.5	125.64	97.7	122.08	97.7	122.13	101.6	127.04	63195 BIGSTONY 230 63314 BIGSTON4 230 1
63327 HANKSON4 230 63329 WAHPETN4 2	320	121	387.17	83.6	267.38	79.1	253	78.9	252.63	86.5	276.84	SYSTEM INTACT
				95.9	306.75					97.9	313.33	60108 WILMART3 345 60192 BLUE LK3 345 1
				105	335.89	98.1	313.92	98.1	313.79	107.5	343.96	60192 BLUE LK3 345 99990 Ellendal 345 1
				97.3	311.39					100.1	320.41	63358 BUFFALO3 345 63369 JAMESTN3 345 1
				97.1	310.8					99.9	319.65	63358 BUFFALO3 345 66792 MAPLE R3 345 1
				99.3	317.71					102.1	326.82	63369 JAMESTN3 345 66791 CENTER 3 345 1
				101.4	324.6	95.9	307.01	95.8	306.43	104.3	333.77	66792 MAPLE R3 345 67101 ANTELOP3 345 1
				100.4	321.29					103.4	330.76	67326 ELLENDL4 230 99990 Ellendal 345 1
										97.8	313.12	60101 FORBES 2 500 60198 CHIS-N 2 500 1
										97.3	311.34	60156 PYNSVIL7 115 60356 PAYNES 4 230 1
										97.8	313.12	60197 CHIS CO2 500 60198 CHIS-N 2 500 1
		136.9	438.24									60133 SHEYNNE4 230 66435 FARGO 4 230 1
		125.8	402.53									60189 BLK DOG4 230 62980 MCLEOD 4 230 1
		130.4	417.36									63050 WILLMAR4 230 63314 BIGSTON4 230 1
		128.6	411.62									63195 BIGSTONY 230 63214 BIGSTON7 115 1
		128.6	411.65									63195 BIGSTONY 230 63314 BIGSTON4 230 1
		128.6	411.36									63314 BIGSTON4 230 63317 CANBY 4 230 1
		128.9	412.55									63314 BIGSTON4 230 66503 BLAIR 4 230 1
		130.3	416.84									63317 CANBY 4 230 66550 GRANITF4 230 1
		128.2	410.23									63329 WAHPETN4 230 66754 MAPLE R4 230 1
		127.7	408.73									66503 BLAIR 4 230 66550 GRANITF4 230 1
63329 WAHPETN4 230 63331 FERGSFL4 23	320	96.3	308.15									SYSTEM INTACT
		102.9	329.19									60133 SHEYNNE4 230 66754 MAPLE R4 230 1
		105.5	337.66									60142 BENTON 3 345 66802 WINGERS3 345 1
		100.9	322.77									63050 WILLMAR4 230 63314 BIGSTON4 230 1
		105.4	337.19									63053 HUBBARD4 230 63336 AUDUBON4 230 1
		100.5	321.68									63195 BIGSTONY 230 63214 BIGSTON7 115 1
		100.5	321.7									63195 BIGSTONY 230 63314 BIGSTON4 230 1
		99.6	318.85									63314 BIGSTON4 230 63317 CANBY 4 230 1
		100.2	320.79									63317 CANBY 4 230 66550 GRANITF4 230 1
		99.7	318.97									66503 BLAIR 4 230 66550 GRANITF4 230 1
		105.5	337.52									66760 WINGER 3 345 66802 WINGERS3 345 1
63362 OAKES 4 230 67326 ELLENDL4 230	240	112.3	269.45	45.1	108.12	49.1	117.76	49	117.7	46.3	111.05	SYSTEM INTACT
				101.4	243.29	102.6	246.18	102.6	246.35	101.4	243.31	60192 BLUE LK3 345 99990 Ellendal 345 1
		115	275.9									34006 LAKEFLD3 345 60331 LKFLDXL3 345 1
		117.7	282.5									60133 SHEYNNE4 230 66435 FARGO 4 230 1
		114	273.51									63041 COAL CR4 230 63381 UNDERWD4 230 1
		114.5	274.75									63044 MCHENRY4 230 63056 BALTA 4 230 1
		116	278.5									63047 RAMSEY 4 230 63056 BALTA 4 230 1
		116	278.5									63047 RAMSEY 4 230 66755 PRAIRIE4 230 1
		114.2	274.2									63329 WAHPETN4 230 66754 MAPLE R4 230 1
		113.8	273.21									63379 RUGBY 4 230 67523 GLENBOR4 230 1
		114.2	274.16									66751 CENTER 4 230 66756 SQBUTTE4 230 1
		115.8	277.91									66756 SQBUTTE4 230 66791 CENTER 3 345 1
63445 CHESTER 161 69547 ROCHSTR5 16	302	20.2	60.91	15.9	47.89	13.3	40.05	13.5	40.91	44.5	134.31	SYSTEM INTACT
		107	323.18	106.7	322.08	106.8	322.46	106.7	322.32	101.3	305.99	61906 MAPLE LF 161 61948 BYRON 5 161 1
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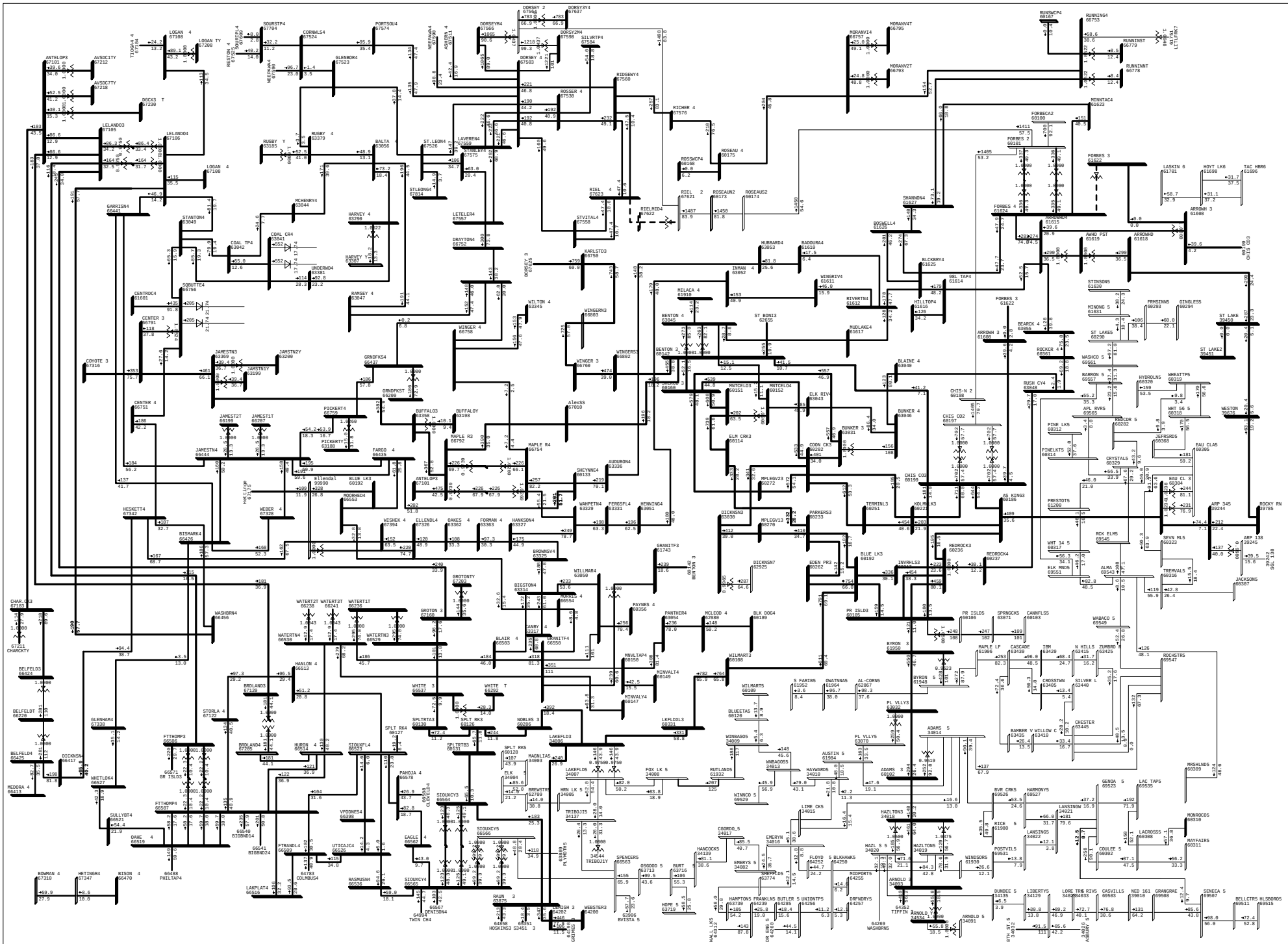
		132.3	399.46	126.6	382.37	127.9	386.19	128	386.58	138.6	418.47	61948 BYRON 5 161 61950 BYRON 3 345 1
										100.1	302.37	61950 BYRON 3 345 63032 PL VLLY3 345 1
66503 BLAIR 4 230 66550 GRANITF4 230 1	398	84.4	335.79									SYSTEM INTACT
		100.7	400.85									63050 WILLMAR4 230 63314 BIGSTON4 230 1
		100.1	398.45									63314 BIGSTON4 230 63317 CANBY 4 230 1
		104.8	416.97									63317 CANBY 4 230 66550 GRANITF4 230 1
66703 KARLSTY3 345 66750 KARLSTD3 345	112			14.9	16.63	15.2	17.05	15.3	17.1	13.4	14.96	SYSTEM INTACT
				186.7	209.09	186.1	208.44	186.2	208.54	182.6	204.55	66750 KARLSTD3 345 66803 WINGERN3 345 1
				189.4	212.14	188.5	211.08	188.5	211.09	184.9	207.07	66760 WINGER 3 345 66803 WINGERN3 345 1
66752 DRAYTON4 230 66787 DRAYTO1T 23	140	51	71.46	49.3	68.98	49.2	68.95	49.3	69.01	49.3	68.99	SYSTEM INTACT
		103.2	144.53	99.5	139.37	99.5	139.26	99.6	139.4	99.6	139.4	66705 DRAYTON7 115 66788 DRAYTO2T 230 1
		103.2	144.53	99.5	139.37	99.5	139.26	99.6	139.4	99.6	139.4	66752 DRAYTON4 230 66788 DRAYTO2T 230 1
66752 DRAYTON4 230 67557 LETELER4 23	419.5			73.6	308.57	74.3	311.49	74.3	311.68	72.8	305.29	SYSTEM INTACT
				118.4	496.57	117.1	491.36	117.1	491.17	115.2	483.41	66750 KARLSTD3 345 67625 DORSEY 3 345 1
66756 SQBUTTE4 230 66791 CENTER 3 345	336	47.8	160.7	37.1	124.71	37.9	127.27	37.8	126.92	38	127.85	SYSTEM INTACT
		138.7	465.87	110.5	371.19	110.6	371.75	110.6	371.6	111.6	374.96	66791 CENTER 3 345 67316 COYOTE 3 345 1
66757 MORANVI4 230 66793 MORANV2T 23	50	49.6	24.79	49	24.51	48.8	24.4	48.8	24.38	48.8	24.39	SYSTEM INTACT
		100.9	50.44	99.6	49.78	98.9	49.44	98.8	49.38	98.8	49.41	66719 MORANVI7 115 66795 MORANV4T 230 1
		100.9	50.44	99.6	49.78	98.9	49.44	98.8	49.38	98.8	49.41	66757 MORANVI4 230 66795 MORANV4T 230 1
66757 MORANVI4 230 66795 MORANV4T 23	50	49.9	24.96	49.4	24.68	49.1	24.57	49.1	24.54	49.1	24.55	SYSTEM INTACT
		100.8	50.42	99.5	49.77	98.9	49.43	98.7	49.37	98.8	49.4	66719 MORANVI7 115 66793 MORANV2T 230 1
		100.8	50.42	99.5	49.77	98.9	49.43	98.7	49.37	98.8	49.4	66757 MORANVI4 230 66793 MORANV2T 230 1
66758 WINGER 4 230 66797 WINGERY3 345	336	53.6	180.18	73	245.18	75.7	254.23	75.6	254.16	69.2	232.49	SYSTEM INTACT
		132.3	444.39	148.7	499.47	149.9	503.62	149.9	503.59	145.1	487.54	60142 BENTON 3 345 66802 WINGERS3 345 1
		132.3	444.67	148.9	500.15	150	503.93	150.1	504.21	145.2	487.79	66760 WINGER 3 345 66802 WINGERS3 345 1
66760 WINGER 3 345 66797 WINGERY3 345	336	55.1	185.01	74.9	251.75	77.7	261.04	77.7	260.97	71	238.72	SYSTEM INTACT
		135.8	456.29	152.6	512.85	153.9	517.11	153.9	517.09	149	500.6	60142 BENTON 3 345 66802 WINGERS3 345 1
						95.7	321.47	95.7	321.41			66752 DRAYTON4 230 67557 LETELER4 230 1
		135.9	456.59	152.8	513.55	154	517.43	154.1	517.72	149.1	500.87	66760 WINGER 3 345 66802 WINGERS3 345 1
66791 CENTER 3 345 67316 COYOTE 3 345	478	85.8	410.36									SYSTEM INTACT
		100.1	478.3									66756 SQBUTTE4 230 66791 CENTER 3 345 1
67326 ELLENDL4 230 99990 Ellendal 345 1	336			77.1	259.16	74.6	250.79	74.7	251.13	76.8	258.14	SYSTEM INTACT
				109.2	367.08	106.4	357.58	106.5	357.86	108.7	365.31	67175 Hettinge 345 67347 HETINGR4 230 1
69523 GENOA 5 161 69535 LAC TAP5 161 1	279	77.6	216.54	73.3	204.59	72.6	202.56	71.9	200.58			SYSTEM INTACT
		142.6	397.96	136.2	380.01	134.9	376.39	134.9	376.29			60302 COULEE 5 161 69523 GENOA 5 161 1
		99.2	276.75	95.1	265.35							60309 MRSHLND5 161 69543 ALMA 5 161 1

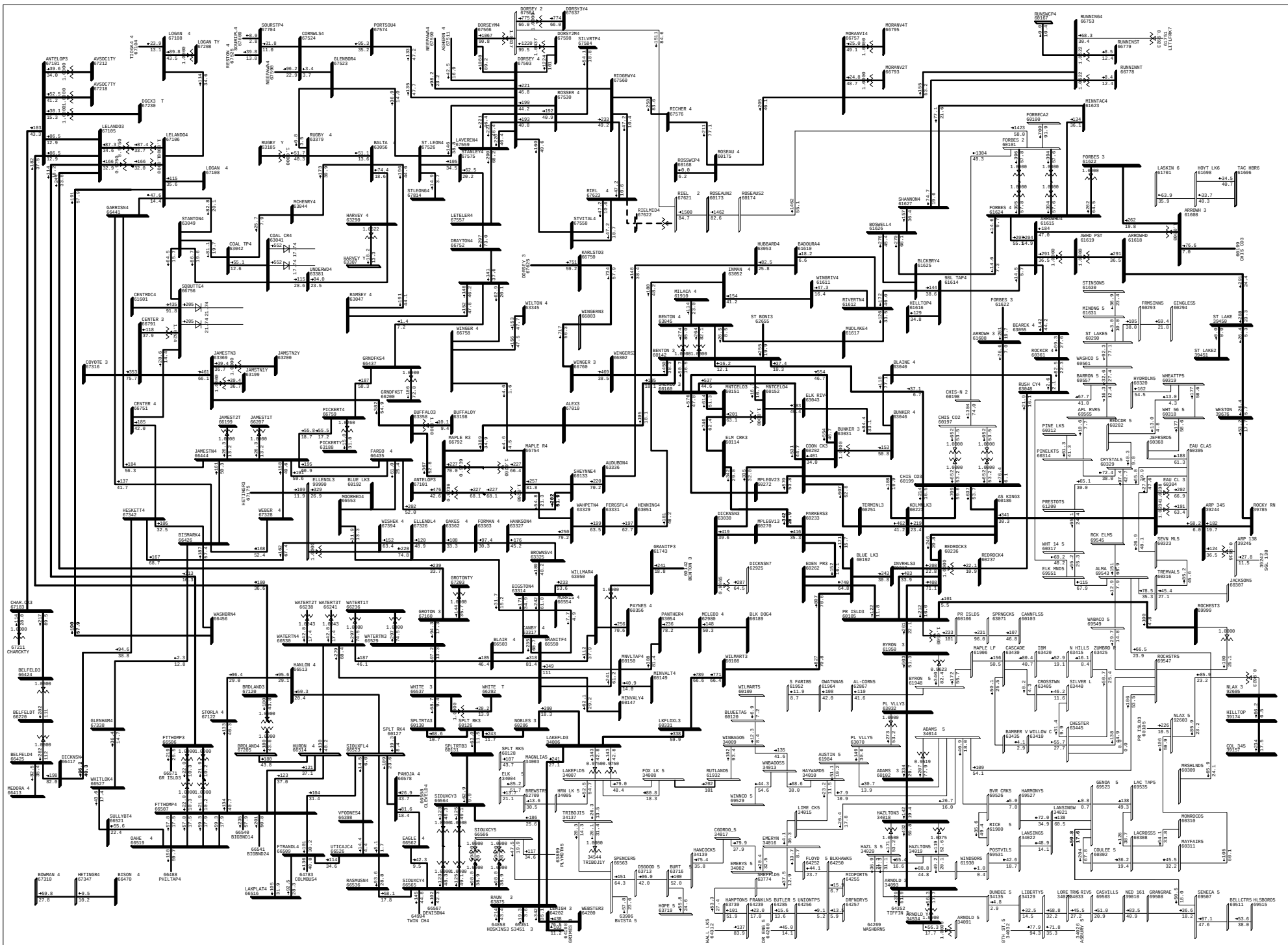






2004 MAPP SERIES FINAL 2009 SUMMER PEAK F-09SUPK.SAV /BUSES = 21866 BRANCHES = 33100/ 100% OF PEAK NW6300+ALTN+CENTMN (MH345+BG-W TUE, MAY 10 2005 13:12	100% RATEA 0.920 UV 1.050 OV KV: ±161, ±230, ±345	BUS - NONE BRANCH - MW/% OF RATEA EQUIPMENT - MW/MVAR
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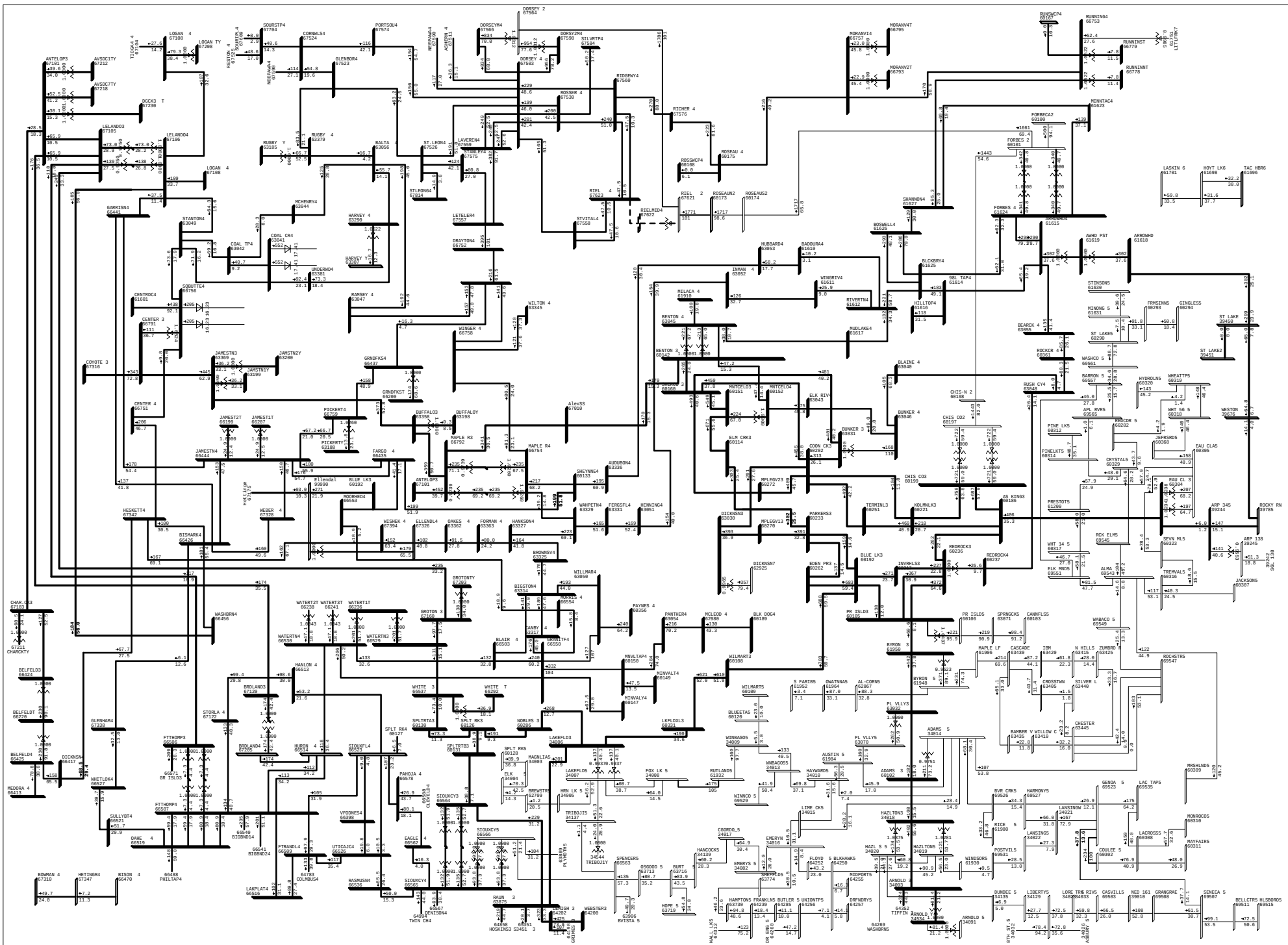


**North/West Bias
4500 MW Scenario**

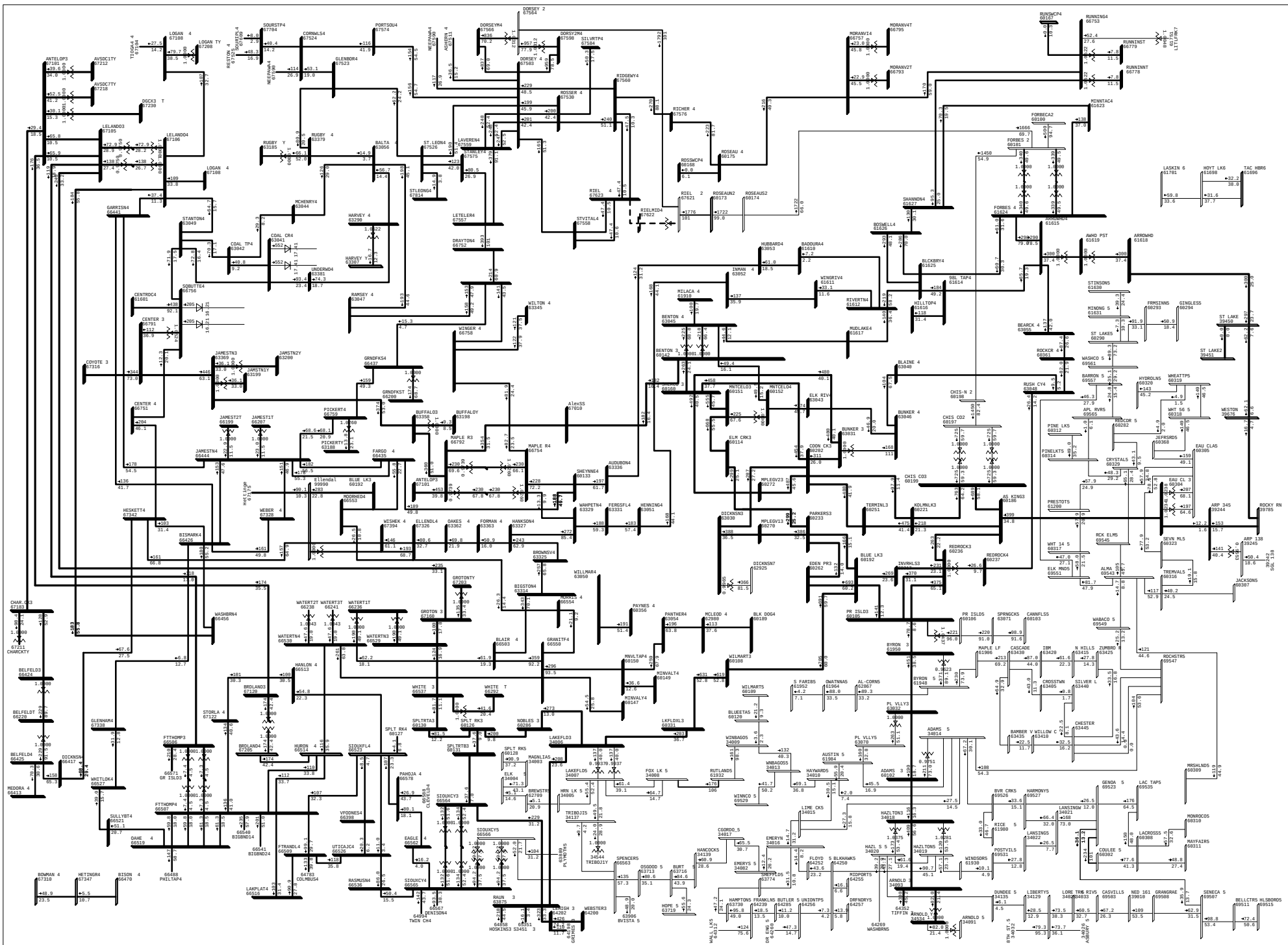
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Date of Run:		MAR 11 2005	
Line Overload: System Intact		95.0%	
Contingency		95.0%	
Transformer Overload: System Intact		100.0%	
Contingency		100.0%	
Number of Violations Monitored:		10	
Output File:		bias4500.sav-line.out	
CIRCUIT FROM: CIRCUIT TO: CKT		RATEA CURRENT	
# NAME		# NAME	
34005 HRN LK 5 161 34007 LAKEFLDS 161 1		112	
		47.6 53.27	
		114.6 128.32	
		119.9 134.29	
		119 133.24	
34008 FOX LK 5 161 61932 RUTLANDS 161 1		167	
		116.5 194.62	
		148.1 247.26	
		121.9 203.58	
		126.5 211.34	
		129.2 215.85	
		206.8 345.35	
		122 203.74	
		122 203.82	
		122.2 204.14	
		121.9 203.52	
		121.7 203.16	
34009 WINBAGO5 161 61932 RUTLANDS 161 1		167	
		109.9 183.51	
		138.6 231.54	
		116.1 193.85	
		120.9 201.93	
		126.6 211.43	
		205.6 343.32	
		116.2 194.05	
		115.9 193.55	
		116.2 194.06	
		115.8 193.37	
		115.4 192.72	
34014 ADAMS 5 161 60102 ADAMS 3 345 9		300	
		70.4 211.27	
		120.7 362.22	
		100.3 300.96	
		109.4 328.21	
		142.2 426.63	
34014 ADAMS 5 161 69547 ROCHSTRS 161 1		201	
		59.9 120.37	
		119.3 239.69	
		114.6 230.29	
		138.8 279.08	
		143.5 288.41	
34018 HAZLTON3 345 34019 HAZLTON5 161 1		224	
		53 118.8	
		108.2 242.48	
34018 HAZLTON3 345 34093 ARNOLD 3 345 1			
		56.6 407.22	
		98.8 711.52	
		98.8 711.52	
34026 ASBURY 5 161 34027 CNTRGRV5 161 1		202	
		52.7 106.53	
		106.7 215.52	
		98.8 199.58	
34027 CNTRGRV5 161 34508 JULIAN 5 161 1		202	
		62.7 126.72	
		116.8 235.92	
		108.9 219.94	
34028 LORE 5 161 34032 8TH ST.5 161 1		84	
		104.1 87.48	
		146.6 123.12	
		186.2 156.42	
		165.5 139.01	
		201.7 169.45	
		205.2 172.35	
		127.6 107.18	
		130.4 109.5	
		147.3 123.74	
		147.3 123.74	
		115.8 97.26	
		124.7 104.77	
		118.7 99.74	
		122.1 102.56	
34030 SALEM 5 161 34508 JULIAN 5 161 1		202	
		65 131.39	
		119.1 240.66	
		111.2 224.66	
34043 SAVANNAS 161 34046 YORK 5 161 1		84	
		94.2 79.12	
		112.4 94.39	
		143.4 120.42	
		143.5 120.51	
		127.2 106.88	
		106.7 89.62	
		122.2 102.66	
		103.7 87.08	
		108.7 91.33	
		118.8 99.79	
		118.8 99.79	
		102 85.67	
		103.4 86.88	
34087 DYSART 5 161 64269 WASHBRNS 161 1		260	
		75.3 195.67	
		120.8 314.11	
60100 FORBECA2 500 60101 FORBES 2 500 1		1000	
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		108.2 1081.94	
		107.5 1074.86	
		97.3 973.01	
		96.9 969.24	
		97.8 977.54	
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		94.7 946.69	

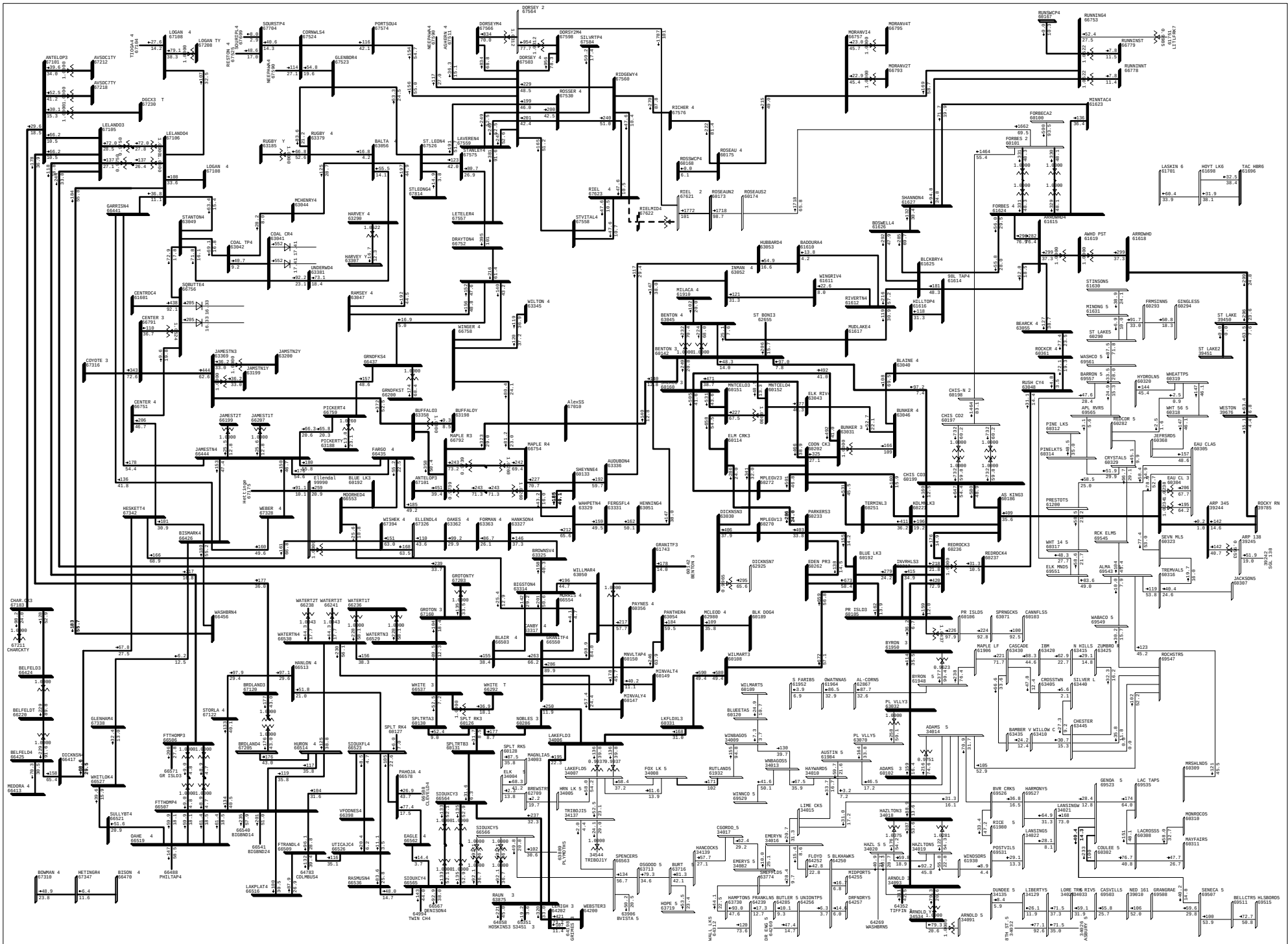
		98.8	414.36	105.5	442.5	106.2	445.57	105.5	442.48	104	436.07	103.9	435.71	61612 RIVERTN4 230 61625 BLCKBRY4 230 1
		96	402.86	103.2	432.88	103.9	435.86	103.5	434.04					61615 ARROWHD4 230 61624 FORBES 4 230 1
		106.5	446.79	111.5	467.65	112.2	470.48	112	469.68	110.7	464.55	110.7	464.19	63047 RAMSEY 4 230 63056 BALTA 4 230 1
		108.5	455.17	112.4	471.71	113.1	474.43	112.9	473.57	111.5	467.8	111.4	467.49	63047 RAMSEY 4 230 66755 PRAIRIE4 230 1
				103.1	432.49			103.5	434.33	102.3	429.25	102.2	428.89	63358 BUFFALO3 345 63369 JAMESTN3 345 1
				103.5	434.28	104.4	437.79	103.9	436.05	102.7	430.9	102.6	430.57	63369 JAMESTN3 345 66791 CENTER 3 345 1
		97.3	408.33	105.1	440.74	105.7	443.37	105.7	443.24	104.5	438.4	104.4	437.97	66754 MAPLE R4 230 66758 WINGER 4 230 1
				104.1	436.5	104.9	440.02	104.5	438.44	103.3	433.33	103.2	433.07	66792 MAPLE R3 345 67101 ANTELOP3 345 1
		96.3	403.83											66791 CENTER 3 345 67316 COYOTE 3 345 1
		95.5	400.45											39450 ST LAKE 345 61618 ARROWHD 345 1
		97	406.79											63314 BIGSTON4 230 63325 BROWNSV4 230 1
		96.8	406.18											63325 BROWNSV4 230 63327 HAWKSON4 230 1
		96.8	406.01											63379 RUGBY 4 230 67523 GLENBOR4 230 1
						103.8	435.48							60142 BENTON 3 345 60160 SHERCO 3 345 1
66756 SQBUTTE4 230 66791 CENTER 3 345 1	336	46.2	155.11	36.9	123.98	36.7	123.44	36.7	123.17	36.5	122.8	36.7	123.21	63358 BUFFALO3 345 66792 MAPLE R3 345 1
		131.3	441.27	106.4	357.57	106.1	356.48	105.7	355.09	105.5	354.64	105.8	355.35	SYSTEM INTACT
69523 GENOA 5 161 69535 LAC TAP5 161 1	279	67.6	188.59	64.5	180.05	64.2	179.11	64	178.56	63.8	177.93			66791 CENTER 3 345 67316 COYOTE 3 345 1
		124.2	346.62	119.8	334.27	119.3	332.96	119.1	332.16	118.7	331.15			SYSTEM INTACT
69543 ALMA 5 161 69551 ELK MND5 161 1	173											66.7	115.47	60302 COULEE 5 161 69523 GENOA 5 161 1
												113.4	196.13	SYSTEM INTACT
														60186 AS KING3 345 60304 EAU CL 3 345 1

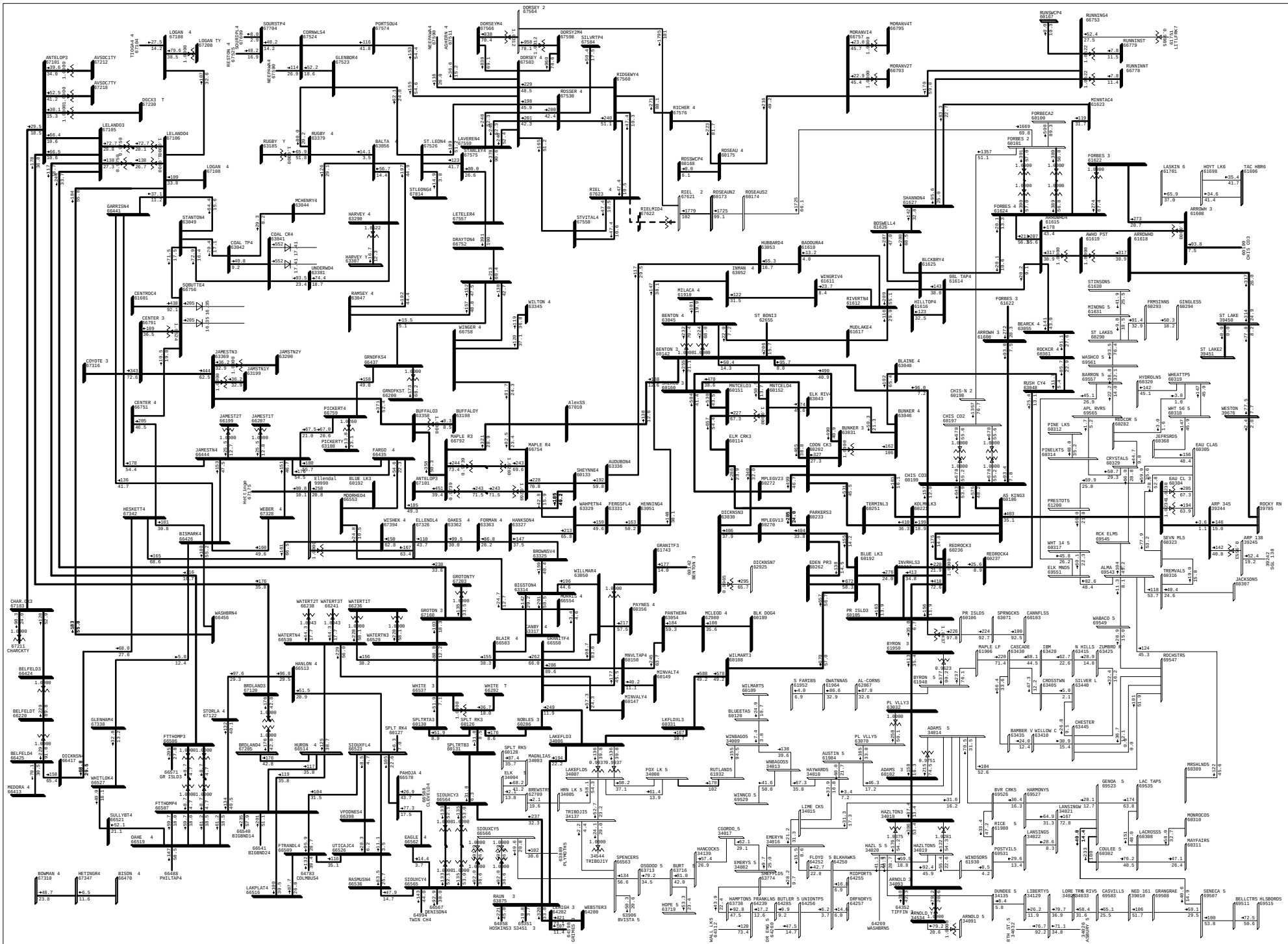


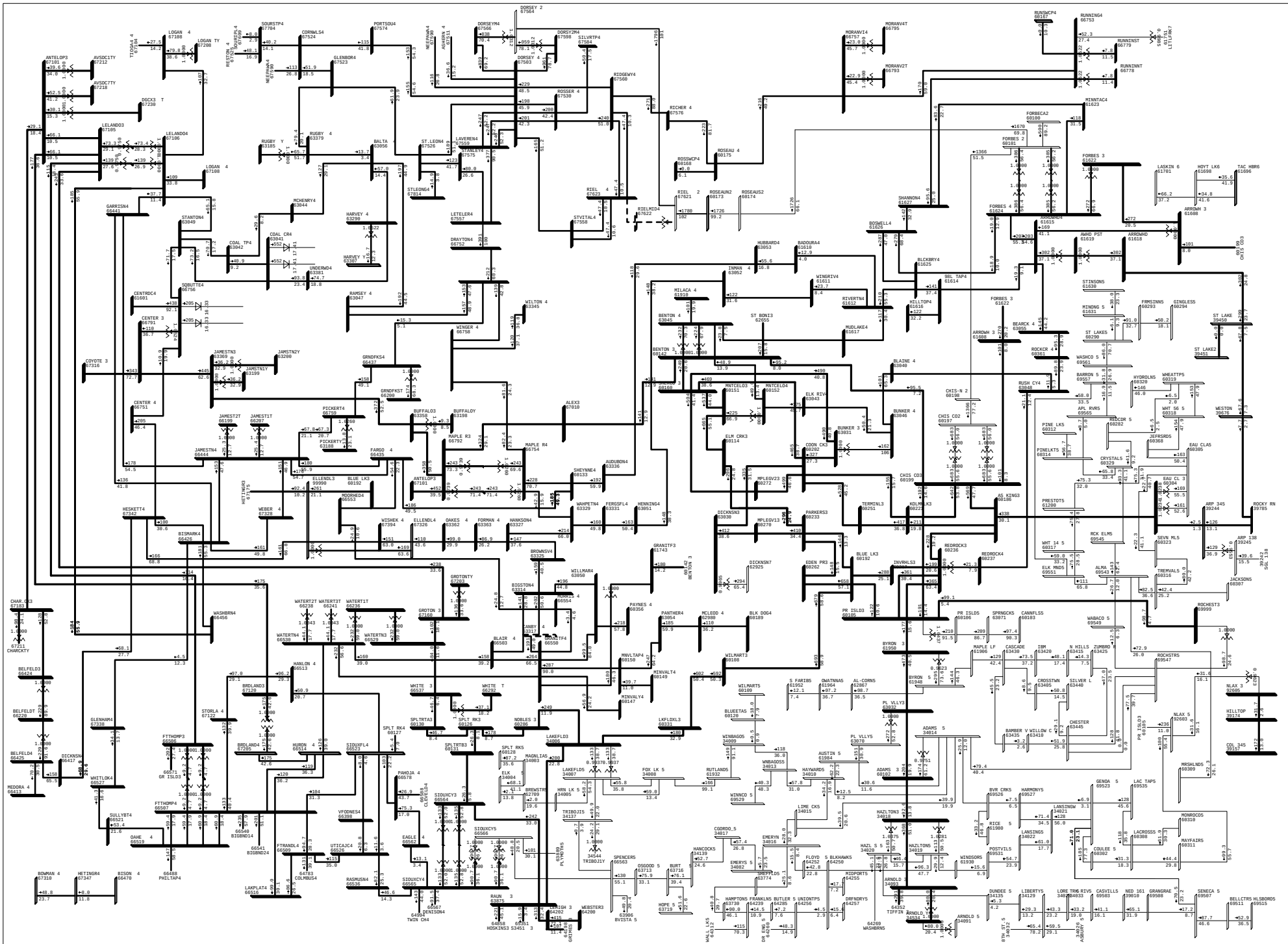


2004 MAPP SERIES FINAL 2009 SUMMER PEAK F-09SUPK.SAV /BUSES = 21866 BRANCHES = 33100/ 100% OF PEAK NW4500+ALTN(BG-WLMR230) TUE, MAY 10 2005 14:02	100% RATEA 0.920 UV 1.050 OV KV: ±161, ±230, ±345	BUS - NONE BRANCH - MW/% OF RATEA EQUIPMENT - MW/MVAR
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Appendix B-3

Eastern Bias

To	From	Facility #
King	Eau Claire North	1
Eau Claire North	LaCrosse	2
LaCrosse	Genoa	3
Genoa	Columbia	4
Genoa	Nelson Dewey	5
Nelson Dewey	Salem	6
Lansing	Genoa	7
Lansing	Rochester	8
Rochester	Prairie Island	9
Ellendale	Big Stone	10
Big Stone	Blue Lake	11
AVS	Maple River	12
Maple River	Alex - Benton	13

Table B-3 – 1: Facilities and assigned facility number

Table B-3 - 1 above assigns a number to each facility (in no particular order). Table B-3 – 2 on the following page describes what facilities are included in each scenario.

Scenario Name	Facilities (by number)
Scenario 1a	All
Scenario 1b	Scenario 1a less 13
Scenario 1c	Scenario 1 a less 12
Scenario 2	Scenario 1 less 10 and 11
Scenario 3	Scenario 2 less 5 and 6
Scenario 4	Scenario 3 less 8 and 9
Scenario 5	Scenario 4 less 4
Scenario 6	Scenario 5 less 1,2,3, and 7 - base:::
Scenario 7	Only 10 and 11
Scenario 8	Only 1,2,3,7
Scenario 9	Only 1,2,3,7,4
Scenario 10	Only 7,8,9
Scenario 11	Only 13
Scenario 12	Only 13 and 14

Table B-3 – 2: Description of scenarios

							95.4	191.74	141.1	283.62	139.9	281.12			97.2	195.34			95.3	191.59			61950 BYRON 3 345 63032 PL VLLY3 345 1 63032 PL VLLY3 345 63070 PL VLLY5 161 1	
34018 HAZLTON3 345 34019 HAZLTON5 161 1	224	53.3	119.37	53	118.67	52.9	118.44	52.1	116.71	53.1	118.89												SYSTEM INTACT	
		98.7	221.15	98.2	219.86	98	219.43	96.5	216.25	98.4	220.42												34018 HAZLTON3 345 34020 HAZL S 5 161 2	
34021 LANSINGW 161 34022 LANSING5 161 1	336																						SYSTEM INTACT	
																							34014 ADAMS 5 161 60102 ADAMS 3 345 9 34018 HAZLTON3 345 34093 ARNOLD 3 345 1 34371 RICE 869.0 61980 RICE 5 161 1 60105 PR ISLD3 345 61950 BYRON 3 345 1 60302 COULEE 5 161 60308 LACROSS5 161 1 60302 COULEE 5 161 60967 COULEE 869.0 2 60305 EAU CLA5 161 60323 SEVN ML5 161 1 60309 MRSHLND5 161 69502 N LACRS5 161 1 60316 TREMVALS 161 60323 SEVN ML5 161 1 60316 TREMVALS 161 69502 N LACRS5 161 1 60316 TREMVALS 161 69543 ALMA 5 161 1 61980 RICE 5 161 69526 BVR CRK5 161 1 68795 HILLSBORO69.0 69515 HLSBORO5 161 1 69502 N LACRS5 161 69535 LAC TAP5 161 1 69507 SENECA 5 161 69511 BELLCSTR5 161 1 69511 BELLCSTR5 161 69515 HLSBORO5 161 1 69523 GENOA 5 161 69527 HARMONY5 161 1	
																							34000 LANS3 345 63446 ROCHSTR3 345 X1 34000 LANS3 345 69600 GENOA 3 345 X1 34006 LAKEFLD3 345 60331 LKFLDXL3 345 1 34014 ADAMS 5 161 60102 ADAMS 3 345 9 34014 ADAMS 5 161 69526 BVR CRK5 161 1 34014 ADAMS 5 161 69547 ROCHSTR5 161 1 34018 HAZLTON3 345 64316 NHAMPTN3 345 1 34019 HAZLTON5 161 61930 WINDSOR5 161 1 34021 LANSINGW 161 34022 LANSING5 161 1 34021 LANSINGW 161 69527 HARMONY5 161 1 34033 TRK RIV5 161 34465 TURK RV869.0 1 60102 ADAMS 3 345 63032 PL VLLY3 345 1 60102 ADAMS 3 345 64316 NHAMPTN3 345 1 60105 PR ISLD3 345 61950 BYRON 3 345 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60186 AS KING3 345 60304 EAU CL 3 345 1 61906 MAPLE LF 161 61948 BYRON 5 161 1 61906 MAPLE LF 161 63430 CASCADE 161 1 61930 WINDSOR5 161 69531 POSTVIL5 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 68726 HARMNY 69.0 69527 HARMONY5 161 1 68726 HARMNY 69.0 69527 HARMONY5 161 2 68748 POST 69.0 69531 POSTVIL5 161 1 69501 N LACRS3 345 69600 GENOA 3 345 X1 69523 GENOA 5 161 69600 GENOA 3 345 X1	
34021 LANSINGW 161 69523 GENOA 5 161 1	223																						SYSTEM INTACT	
																							34000 LANS3 345 63446 ROCHSTR3 345 X1 34000 LANS3 345 69600 GENOA 3 345 X1 34006 LAKEFLD3 345 60331 LKFLDXL3 345 1 34014 ADAMS 5 161 60102 ADAMS 3 345 9 34014 ADAMS 5 161 69526 BVR CRK5 161 1 34014 ADAMS 5 161 69547 ROCHSTR5 161 1 34018 HAZLTON3 345 64316 NHAMPTN3 345 1 34019 HAZLTON5 161 61930 WINDSOR5 161 1 34021 LANSINGW 161 34022 LANSING5 161 1 34021 LANSINGW 161 69527 HARMONY5 161 1 34033 TRK RIV5 161 34465 TURK RV869.0 1 60102 ADAMS 3 345 63032 PL VLLY3 345 1 60102 ADAMS 3 345 64316 NHAMPTN3 345 1 60105 PR ISLD3 345 61950 BYRON 3 345 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60186 AS KING3 345 60304 EAU CL 3 345 1 61906 MAPLE LF 161 61948 BYRON 5 161 1 61906 MAPLE LF 161 63430 CASCADE 161 1 61930 WINDSOR5 161 69531 POSTVIL5 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 68726 HARMNY 69.0 69527 HARMONY5 161 1 68726 HARMNY 69.0 69527 HARMONY5 161 2 68748 POST 69.0 69531 POSTVIL5 161 1 69501 N LACRS3 345 69600 GENOA 3 345 X1 69523 GENOA 5 161 69600 GENOA 3 345 X1	
																							34000 LANS3 345 63446 ROCHSTR3 345 X1 34000 LANS3 345 69600 GENOA 3 345 X1 34014 ADAMS 5 161 60102 ADAMS 3 345 9 34018 HAZLTON3 345 64316 NHAMPTN3 345 1 60102 ADAMS 3 345 63032 PL VLLY3 345 1 60102 ADAMS 3 345 64316 NHAMPTN3 345 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60108 WILMART3 345 60908 WLM STM4 115 3 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 60302 COULEE 5 161 60308 LACROSS5 161 1 60305 EAU CLA5 161 60323 SEVN ML5 161 1 60309 MRSHLND5 161 69502 N LACRS5 161 1 60316 TREMVALS 161 60323 SEVN ML5 161 1 60316 TREMVALS 161 69502 N LACRS5 161 1 60316 TREMVALS 161 69543 ALMA 5 161 1 68795 HILLSBORO69.0 69515 HLSBORO5 161 1 69501 N LACRS3 345 69600 GENOA 3 345 X1 69502 N LACRS5 161 69535 LAC TAP5 161 1 69507 SENECA 5 161 69511 BELLCSTR5 161 1 69511 BELLCSTR5 161 69515 HLSBORO5 161 1 69523 GENOA 5 161 69527 HARMONY5 161 1	
34021 LANSINGW 161 69527 HARMONY5 161 1	202																						SYSTEM INTACT	
																							34000 LANS3 345 63446 ROCHSTR3 345 X1 34000 LANS3 345 69600 GENOA 3 345 X1 34014 ADAMS 5 161 60102 ADAMS 3 345 9 34018 HAZLTON3 345 64316 NHAMPTN3 345 1 60102 ADAMS 3 345 63032 PL VLLY3 345 1 60102 ADAMS 3 345 64316 NHAMPTN3 345 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60108 WILMART3 345 60908 WLM STM4 115 3 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 60302 COULEE 5 161 60308 LACROSS5 161 1 60305 EAU CLA5 161 60323 SEVN ML5 161 1 60309 MRSHLND5 161 69502 N LACRS5 161 1 60316 TREMVALS 161 60323 SEVN ML5 161 1 60316 TREMVALS 161 69502 N LACRS5 161 1 60316 TREMVALS 161 69543 ALMA 5 161 1 68795 HILLSBORO69.0 69515 HLSBORO5 161 1 69501 N LACRS3 345 69600 GENOA 3 345 X1 69502 N LACRS5 161 69535 LAC TAP5 161 1 69507 SENECA 5 161 69511 BELLCSTR5 161 1 69511 BELLCSTR5 161 69515 HLSBORO5 161 1 69523 GENOA 5 161 69527 HARMONY5 161 1	
																							34000 LANS3 345 63446 ROCHSTR3 345 X1 34014 ADAMS 5 161 60102 ADAMS 3 345 9 34014 ADAMS 5 161 69526 BVR CRK5 161 1	
34022 LANSING5 161 69531 POSTVIL5 161 1	223																						SYSTEM INTACT	
																							34000 LANS3 345 63446 ROCHSTR3 345 X1 34014 ADAMS 5 161 60102 ADAMS 3 345 9 34014 ADAMS 5 161 69526 BVR CRK5 161 1	

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				165.6 309.6	165.9 310.21	166.1 310.63	166 310.33	165.9 310.28	164.2 307.04	164.3 307.22	165.2 308.86	165.4 309.39	167.7 313.59	164.9 308.41	164.6 307.78	60197 CHIS CO2 500 60198 CHIS-N 2 500 1	SW500
				147.1 275.11	147.5 275.76	147.7 276.22	149.3 279.21	149.3 279.14	147.5 275.74	147.6 276.06	148.1 276.92	146.6 274.16	150.9 282.26	147.8 276.33	147.4 275.69	60217 INVRHLS3 345 60218 INVRHLS7 115 9	
				142.9 267.31	143.2 267.87	143.4 268.22	143.7 268.68	143.7 268.64	142 265.51	142.1 265.69	142.9 267.27	142.8 267.02	145.3 271.72	142.7 266.85	142.4 266.28	60217 INVRHLS3 345 60236 REDROCK3 345 1	
				143.4 268.15	143.7 268.72	143.9 269.07	144.1 269.53	144.1 269.49	142.4 266.35	142.5 266.53	143.4 268.15	143.3 267.9	145.8 272.6	143.2 267.72	142.9 267.14	60236 REDROCK3 345 60238 REDROCK7 115 9	
				142.9 267.21	143.2 267.76	143.4 268.08	143.6 268.55	143.6 268.51	144.2 269.58	144.2 269.64		144.9 271	148.9 278.38	145.8 272.72	144.5 270.27	60262 EDEN PR3 345 60263 EDEN PR7 115 9	
				146.2 273.42	146.5 274.01	146.7 274.37	147 274.95	147 274.91	144.9 270.88	145 271.11	146.1 273.19	145.8 272.74	148.9 278.38	145.8 272.72	145.5 272.07	61948 BYRON 5 161 61950 BYRON 3 345 1	
				146.2 273.48	146.6 274.08	146.8 274.43	147.1 275.02	147 274.97	144.9 270.94	145 271.17	146.1 273.27	145.9 272.8	148.9 278.44	145.9 272.78	145.5 272.14	61964 OWATNNA5 161 62867 AL-CORN5 161 1	
				148.2 277.14	148.5 277.68	148.7 278	148.9 278.36	148.8 278.33	147 274.86	147 274.96	148.1 276.91	148 276.81	150.8 281.95	147.9 276.54	147.6 276.02	62387 SPRNGCK869.0 63071 SPRNGCK5 161 1	
				147.3 275.38	147.6 275.92	147.7 276.24	147.9 276.62	147.9 276.58	146.1 273.16	146.1 273.27	147.1 275.15	147.1 275.03	149.8 280.11	146.9 274.78	146.7 274.25	62387 SPRNGCK869.0 63071 SPRNGCK5 161 2	
60103 CANNFLS5 161 63071 SPRNGCK5 161 1	112			82.1 91.98	81.7 91.47	81.4 91.19	81.1 90.82	81.1 90.86	83.9 93.91	83.7 93.73	82.2 92.03	82.4 92.26	78.4 87.85	82.5 92.41	83 92.95	SYSTEM INTACT	
				310 347.16	310 347.15	309.9 347.14	309.9 347.12	309.9 347.12	310 347.17	310 347.17	309.8 346.97	309.9 347.03	309.8 346.99	309.8 347.01	309.9 347.06	60103 CANNFLS5 161 60104 CANNFLS7 115 5	
				100.8 112.91	100.6 112.64	100.4 112.48	99.6 111.58	99.7 111.66	98.9 110.74	98.3 110.12	100.1 112.08	101.2 113.34	102.2 114.5	100.4 112.45	100.8 112.9	60105 PR ISLD3 345 60106 PR ISLD5 161 10	
				100.8 112.85	100.5 112.57	100.4 112.42	99.6 111.52	99.6 111.59	98.8 110.68	98.3 110.06	100 112.03	101.2 113.29	102.2 114.44	100.4 112.4	100.8 112.84	60106 PR ISLD5 161 63071 SPRNGCK5 161 1	
60114 ELM CRK3 345 60115 ELMCRK 7 115 9	448			86.2 386.26	86.4 387.03	86.6 388.13	84.4 378.28	84.5 378.38	83.7 375.15	83.7 374.82	84.9 380.24	87.1 390.28	85.3 382.31	84.7 379.42	84.5 378.35	SYSTEM INTACT	
				102.5 459.25	100.7 451.04	100.1 448.31	102.2 458.01	102.2 458.01	102.8 460.41	102.7 460.25	102.3 458.26	100 448.17	101.7 455.67	104 465.76	105.9 474.4	60114 ELM CRK3 345 60233 PARKERS3 345 1	
				95.5 428.05	95.7 428.55	96.1 430.4						96.5 432.44				60151 MNTCELO3 345 60153 MNTCELO7 115 10	
				96.6 432.82	96.7 433.31	97 434.41					95.3 426.95	97.4 436.41	95.7 428.8	95.2 426.3		60202 COON CK3 345 61487 CNCMIDY2 110 10	
				96.8 433.49	96.9 433.98	97.1 435.08	95 425.81	95.1 425.9			95.5 427.63	97.6 437.08	95.9 429.47	95.3 426.99	95.1 426.21	60202 COON CK3 345 61488 CNCMIDY1 110 9	
				95.3 426.93	95.5 427.83	95.8 429.18						96.3 431.58				60233 PARKERS3 345 61489 PKLMIDY2 110 10	
				95.2 426.42	95.4 427.32	95.7 428.67						96.2 431.07				60233 PARKERS3 345 61490 PKLMIDY1 110 9	
60133 SHEYNN4 230 60134 SHEYNN7 115 5	187			66.4 124.2	75 140.22	76.8 143.54	76.7 143.42	76.7 143.43	78 145.81	76.7 143.42	78 145.78	76.7 143.52	78 145.82	75.8 141.7	73.6 137.58	SYSTEM INTACT	
				109.7 205.1	121.4 227.05	123.6 231.15	127.5 238.48	127.5 238.47	125.5 234.7	127.5 238.47	126.5 236.55	124.6 233.01	125.5 234.71	125.8 235.17	118 220.62	60133 SHEYNN4 230 60134 SHEYNN7 115 6	
					96.7 180.91	97.6 182.6	98.2 183.55	98.2 183.57	98.2 183.64	98.2 183.56	98.4 184	97.8 182.8	98.2 183.6	97.2 181.84	97.2 181.76	60136 MAPLE R7 115 66754 MAPLE R4 230 5	
60133 SHEYNN4 230 60134 SHEYNN7 115 6	187			66.4 124.2	75 140.22	76.8 143.54	76.7 143.42	76.7 143.43	78 145.81	76.7 143.42	78 145.78	76.7 143.52	78 145.82	75.8 141.7	73.6 137.58	SYSTEM INTACT	
				109.7 205.1	121.4 227.05	123.6 231.15	127.5 238.48	127.5 238.47	125.5 234.7	127.5 238.47	126.5 236.55	124.6 233.01	125.5 234.71	125.8 235.17	118 220.62	60133 SHEYNN4 230 60134 SHEYNN7 115 5	
					96.7 180.91	97.6 182.6	98.2 183.55	98.2 183.57	98.2 183.64	98.2 183.56	98.4 184	97.8 182.8	98.2 183.6	97.2 181.84	97.2 181.76	60136 MAPLE R7 115 66754 MAPLE R4 230 5	
60133 SHEYNN4 230 66435 FARGO 4 230 1	391				84.6 330.65	71.2 278.39	75.7 295.99	75.8 296.26	76.3 298.35	75.8 296.3	77.7 303.84	72.4 283.1	76.5 298.94	94.1 367.91	64.1 250.54	SYSTEM INTACT	
														106.4 416.12		60108 WILMART3 345 60192 BLUE LK3 345 1	
							96.4 376.92	96.5 377.2	97.3 380.62	96.5 377.38	98.6 385.42		97.5 381.19	104.1 406.85		60108 WILMART3 345 60331 LKFLDXL3 345 1	
														102 398.75		60133 SHEYNN4 230 66754 MAPLE R4 230 1	
														101.3 395.97		60156 PYNSVIL7 115 60356 PAYNES 4 230 1	
														103.1 396.11		60356 PAYNES 4 230 63050 WILLMAR4 230 1	
														104 406.83		63314 BIGSTON4 230 63325 BROWNSV4 230 1	
														103.5 404.64		63325 BROWNSV4 230 63327 HANKSON4 230 1	
														122.9 480.48		63327 HANKSON4 230 63329 WAHPETN4 230 1	
														103.3 403.99		63327 HANKSON4 230 63363 FORMAN 4 230 1	
														139.2 544.09		63358 BUFFALO3 345 63369 JAMESTN3 345 1	
														137.8 538.76		63358 BUFFALO3 345 66792 MAPLE R3 345 1	
														146.4 572.24	95.6 373.83	63369 JAMESTN3 345 66791 CENTER 3 345 1	
														104.8 409.73		66755 PRAIRIE4 230 66758 WINGER 4 230 1	
														103.6 405.09		66756 SQUETTE4 230 66791 CENTER 3 345 1	
														103.3 403.89		66791 CENTER 3 345 67316 COYOTE 3 345 1	
60133 SHEYNN4 230 66754 MAPLE R4 230 1	318			64.7 205.64	25 79.49	54.7 174.02	56.3 179.03	56.3 179.05	56.4 179.31	56.4 179.29	56.5 179.69	54.9 174.73	56.3 179.1	21.8 69.29	60.6 192.67	SYSTEM INTACT	
				113 359.46	98.8 314.21	113.9 362.06	120.3 382.53	120.4 382.77	121.1 385.01	120.5 383.09	123.2 391.68	115.1 365.88	120.8 384.05	105.2 334.67	119.2 379.18	60133 SHEYNN4 230 66435 FARGO 4 230 1	
				101.3 322.12											96.3 306.22	60136 MAPLE R7 115 66754 MAPLE R4 230 5	
				96.7 307.54											99.4 316.15	66792 MAPLE R3 345 67010 AlexSS 345 1	
60136 MAPLE R7 115 66754 MAPLE R4 230 5	187			73.9 138.26		73.7 137.77	74.6 139.56	74.6 139.59	73.8 138.01	74.7 139.6	74.1 138.56	73.9 138.13	73.8 137.94		71.6 133.89	SYSTEM INTACT	
				114.7 214.47		106.4 198.98	108.6 203.16	108.7 203.21	109.1 203.98	108.7 203.3	109.4 204.63	106.7 199.5	109 203.8		110 205.73	60133 SHEYNN4 230 66754 MAPLE R4 230 1	
60140 MCHENRY7 115 63044 MCHENRY4 230 1	84			65.2 54.73	56.1 47.13	56.6 47.53	55.8 46.9	55.8 46.86	55.6 46.7	55.8 46.87	54.8 46	55.7 46.77	55.5 46.64	55.3 46.43	63.4 53.24	SYSTEM INTACT	
				123.7 103.9	121.7 102.22	123.1 103.39	125.4 105.36	125.4 105.38	125.4 105.3	125.4 105.36	125.9 105.74	123.5 103.7	125.4 105.37	123.9 104.04	125.5 105.41	63044 MCHENRY4 230 63056 BALTA 4 230 1	
60142 BENTON 3 345 63045 BENTON 4 230 1	336			72.7 244.19	71.4 239.87	73.5 246.9	69.3 232.81	69.3 232.72	68.7 230.71	69.1 232.19	68.3 229.51	72.8 244.54	69.3 232.77	70.3 236.09	71.4 240.04	SYSTEM INTACT	
				111.8 375.78	109.9 369.2	115.1 386.63	108.8 365.57	108.9 365.8	107.8 362.27	108.5 364.59	107.4 360.84	114 383.02	108.8 365.44	108.2 363.65	110 369.58	60142 BENTON 3 345 63045 BENTON 4 230 2	
60142 BENTON 3 345 63045 BENTON 4 230 2	336			70.2 235.89	69 231.72	71 238.51	66.9 224.89	66.9 224.81	66.3 222.87	66.8 224.3	66 221.71	70.3 236.23	66.9 224.86	67.9 228.07	69 231.88	SYSTEM INTACT	
				110.1 370.04	108.2 363.57	113.4 381.1	107.4 360.74	107.3 360.6	106.3 357.12	107.1 359.78	105.8 355.58	112.4 377.54	107.2 360.25	106.6 358.12	108.3 363.95	60142 BENTON 3 345 63045 BENTON 4 230 1	
60143 BENTON 7 115 63045 BENTON 4 230 P5	336			60.4 202.94	59.9 201.35	62.5 210.02	60.8 204.22	60.8 204.18	60.6 203.59	60.8 204.21	60.3 202.75	62 208.33	60.5 203.45	58.8 197.41	59 198.4	SYSTEM INTACT	
				108.9 365.83	108.1 363.14	113 379.73	110.6 371.56	110.6 371.5	110.2 370.41	110.6 371.54	109.8 368.96	112.5 378.01	110.2 370.33	106.3 357.17	106.8 358.72	60143 BENTON 7 115 63045 BENTON 4 230 P6	
60143 BENTON 7 115 63045 BENTON 4 230 P6	336			60.4 202.94	59.9 201.35	62.5 210.02	60.8 204.22	60.8 204.18	60.6 203.59	60.8 204.21	60.3 202.75	62 208.33	60.5 203.45	58.8 197.41	59 198.4	SYSTEM INTACT	
				108.9 365.83	108.1 363.14	113 379.73	110.6 371.56	110.6 371.54	110.2 370.41	110.6 371.54	109.8 368.96	112.5 378.01	110.2 370.33	106.3 357.17	106.8 358.72	60143 BENTON 7 115 63045 BENTON 4 230 P5	
60147 MINVALY4 230 60148 MINVALY7 115 P5	187						43.1 80.59	43.1 80.59	43.2 80.72	43.2 80.78	43 80.36		42.9 80.17	39.1 73.07	39.4 73.59	SYSTEM INTACT	
							10										

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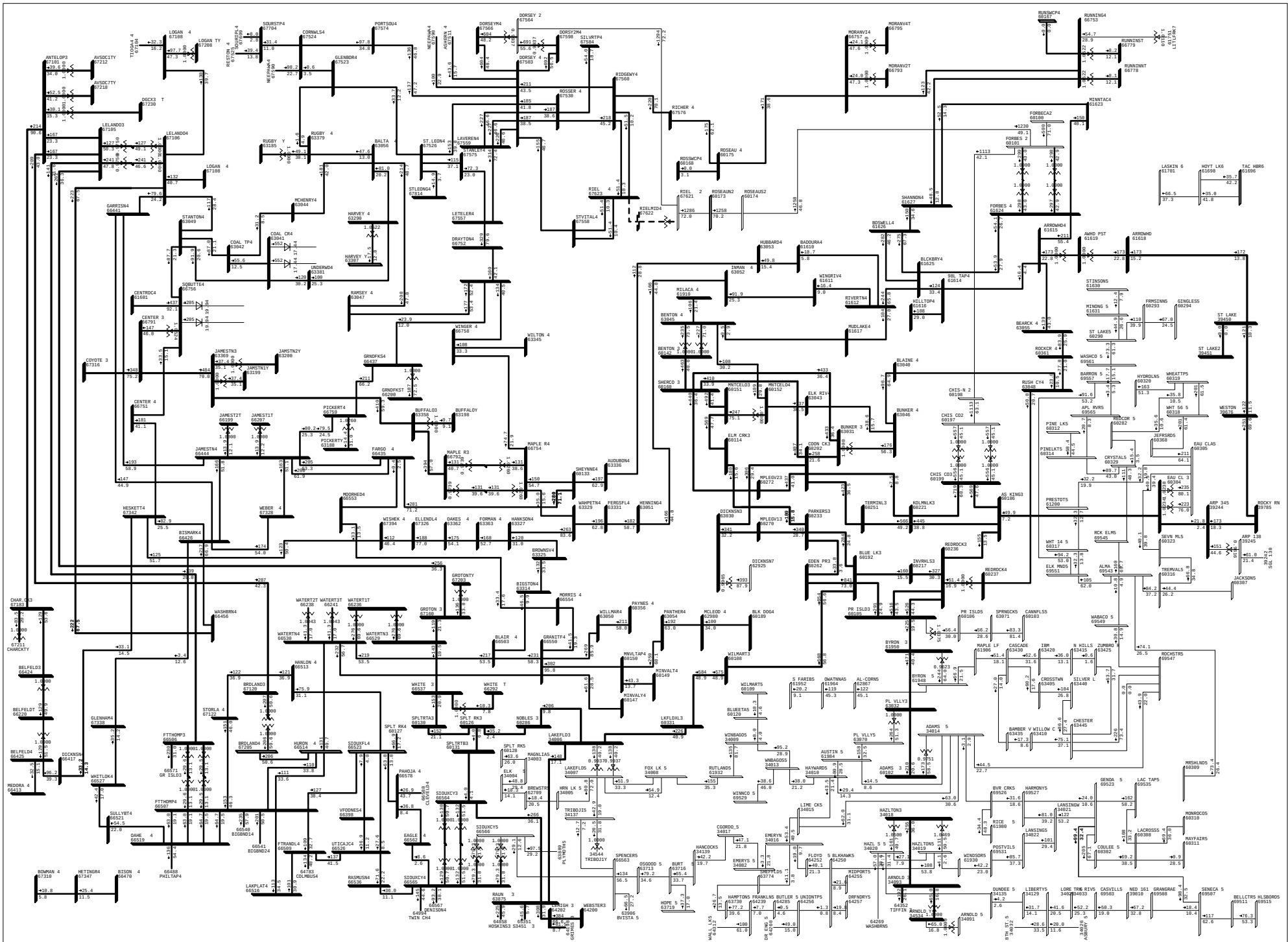
										103.6 232.09	104.3 233.72		103.8 232.41	104 232.92	69507 SENECA 5 161 69511 BELLCSTR5 161 1	
										99.6 223.07	100.2 224.37		100 224.04	100 224.01	69511 BELLCSTR5 161 69515 HLSBOROS 161 1	
61948 BYRON 5 161 61950 BYRON 3 345 1	448							80.6 361.08	79.4 355.91	82.1 367.77	82.9 371.38		82.2 368.31	82.3 368.68	SYSTEM INTACT	
								95.8 429.19		102.8 460.6	102.8 460.37		102.6 459.54	102.1 457.58	34014 ADAMS 5 161 69547 ROCHSTR5 161 1	
								98.2 439.79	96.7 433.3		106.5 477.02		108.7 486.88	106.7 477.97	60105 PR ISLD03 345 61950 BYRON 3 345 1	
62925 DICKNSN7 115 63030 DICKNSN3 345 1	448	87.1 390.43	87.3 391.14	88.2 395.23	85.3 382.22	85.3 382.08	85.2 381.7	85.4 382.58	84.5 378.51	87.6 392.28	85.1 381.16	84 376.37	98.8 447.13	99.7 446.57	SYSTEM INTACT	
		103.2 462.33	103.2 462.53	104.4 467.51	101.4 454.17	101.3 454.02	101.3 453.65	101.5 454.68	100.5 450.04	103.7 464.49	101.1 452.8	100.6 450.83	99.9 447.67	60151 MNTCELO3 345 60153 MNTCELO7 115 10		
		104.1 466.45	104.7 469.08	105.8 473.89	101.7 455.68	101.7 455.64	101.4 452.54	101.3 452.97	101.4 454.35	105.6 473.2	102.3 458.34	100.6 450.83	99.9 447.67	60202 COON CK3 345 63030 DICKNSN3 345 1	SW402	
		106.1 475.11	105.7 473.57	106.5 477.05	105.6 473.25	105.6 473.07	106.1 475.52	106.4 476.64	104.6 468.65	105.6 473.27	104.7 468.98	104.4 467.79	104.7 468.97	60233 PARKERS3 345 60270 MPLEGV13 345 1	SW402	
		106.2 475.61	105.8 474.01	106.6 477.61	105.8 473.79	105.7 473.61	106.3 476.06	106.5 477.18	104.7 469.18	105.8 473.82	104.8 469.52	104.5 468.31	104.8 469.5	60270 MPLEGV13 345 63030 DICKNSN3 345 1	SW402	
62980 MCLEOD 4 230 62981 MCLEOD 7 115 1	159.3							66.7 106.19	66.7 106.28	68.5 109.05		66.9 106.54	65.4 104.21	63.8 101.57	SYSTEM INTACT	
								98.4 156.81	98.6 157.1	99.6 158.64	99 157.7	98.7 157.3	97.8 155.72	95.3 151.84	60189 BLK DOGA 230 60190 BLK DOG67 115 5	
								98.6 157.04	98.8 157.34	99.7 158.88	99.1 157.94	98.9 157.53	97.9 155.96	95.4 152	60189 BLK DOGA 230 62980 MCLEOD 4 230 1	
62980 MCLEOD 4 230 63054 PANTHER4 230 1	319							79.4 253.22	79.5 253.74	80.7 257.47	80 255.34	79.5 253.68	80 255.28	78.2 249.4	SYSTEM INTACT	
								100.2 319.71	100.9 321.76	103.3 329.67	102.6 327.26	102 325.42	102.1 325.82	99.1 316.04	60108 WILMART3 345 60192 BLUE LK3 345 1	
										95.9 305.93	95.2 303.55	100.4 320.2			60108 WILMART3 345 60331 LKFLDXL3 345 1	
								99.1 316	99.3 316.85	100.8 321.55	100 319.11	104.4 333.05		99.9 305.94	60156 PYNSVL7 115 60356 PAYNES 4 230 1	
								99.1 316.03	99.3 316.87	100.8 321.49	100 318.91	104.4 333.01		95.9 305.85	60356 PAYNES 4 230 63050 WILLMAR4 230 1	
								97.4 310.62	97.6 311.2	99.1 316.08	98.2 313.3	102.6 327.26	97.9 312.33	97 309.43	63050 WILLMAR4 230 66550 GRANITF4 230 1	
63040 BLAINE 4 230 63046 BUNKER 4 230 1	159.3	67.3 107.22	65.9 105.04	64.9 103.42	63.6 101.31	63.6 101.34	63.5 101.2	64 101.92	64 101.93	65.7 104.61	64.7 103.04	66.3 105.55	67.9 108.09	SYSTEM INTACT		
		102.9 163.86	101.5 161.7	101 160.94	101.5 161.76	101.6 161.78	102.8 163.76	102.8 163.77	102.1 162.61	101.5 161.73	101 160.86	103.6 165.02	105 167.21	61615 ARROWHD4 230 63055 BEARCK 4 230 1		
63047 RAMSEY 4 230 63266 RAMSEY 7 115 1	84		53.9 45.28	51.8 43.52	52.3 43.92	52.3 43.91	52.3 43.92	52.3 43.91	52 43.68	52.9 44.43	52.3 43.9	50.8 42.66		SYSTEM INTACT		
			95.6 80.32	95.4 80.1	99 83.14	99 83.2	99.3 83.41	99.1 83.21	100.6 84.51	98.1 82.42	99.4 83.49	97.5 81.87		63047 RAMSEY 4 230 63056 BALTA 4 230 1		
										95.2 80.01		95.4 80.13		63047 RAMSEY 4 230 66755 PRAIRIE4 230 1		
63050 WILLMAR4 230 66550 GRANITF4 230 1	319		81.5 259.94	86.2 275.04	97.4 310.71	97.5 311.07	98 312.61	97.6 311.5	100.2 319.68	88.1 281.08	97.6 311.44	94.1 300.03	91.3 291.13	SYSTEM INTACT		
									102.6 327.39	102.2 326.02	100.6 338.01	102 325.46	98.7 314.74	95.2 303.53	34006 LAKEFLD3 345 60331 LKFLDXL3 345 1	
												108.2 345.18	104.5 333.46	60108 WILMART3 345 60192 BLUE LK3 345 1		
											98 312.55	104.5 333.25	101.1 322.45	60108 WILMART3 345 60331 LKFLDXL3 345 1		
											95.7 305.29	101.9 325.13		60133 SHEYNNE4 230 63336 AUDUBON4 230 1		
												98.1 312.89		60133 SHEYNNE4 230 66435 FARGO 4 230 1		
												97.6 311.3		60142 BENTON 3 345 60160 SHERCO 3 345 1		
												114.5 365.35	111.2 354.81	60150 MNVLTPA4 230 63054 PANTHER4 230 1		
												106.6 340.05	103.5 330.29	60150 MNVLTPA4 230 66550 GRANITF4 230 1		
												97.6 311.38		60189 BLK DOGA 230 62980 MCLEOD 4 230 1		
														60192 BLUE LK3 345 99991 BIGSTONE 345 1		
											100.9 321.95	103.7 330.72	99.8 318.27	96.8 308.86	62980 MCLEOD 4 230 62981 MCLEOD 7 115 1	
												113.6 362.39	109.4 349.04	106.1 338.59	62980 MCLEOD 4 230 63054 PANTHER4 230 1	
												102.8 328.02		63051 HENNING4 230 63052 INMAN 4 230 1		
												103.4 329.94		63051 HENNING4 230 63331 FERGSFL4 230 1		
												102.1 325.74	99.2 316.46	95.7 305.32	63314 BIGSTON4 230 63325 BROWNSV4 230 1	
												98.9 315.62	95.5 304.52	63325 BROWNSV4 230 63327 HANKSON4 230 1		
												102.3 326.36	97.8 311.91	63327 HANKSON4 230 63329 WAHPETM4 230 1		
												103.4 329.92		63329 WAHPETM4 230 63331 FERGSFL4 230 1		
												104.9 334.7	99.4 317.12	96.3 307.2	66554 MORRIS 4 230 66555 MORRIS 7 115 1	
												99.1 316.15	98.2 313.16	66792 MAPLE R3 345 67010 AlexSS 345 1		
63186 WILTON Y 230 63245 WILTON 7 115 1	140			77.3 108.17	81.7 114.36	81.7 114.45	81.6 114.26	81.8 114.49	82.8 115.98	78.3 109.62	81.6 114.21			76 106.4	SYSTEM INTACT	
					100.1 140.08	100.2 140.21	100.5 140.74	100.3 140.36	102.2 143.08	95.2 133.23	100.5 140.74				60133 SHEYNNE4 230 63336 AUDUBON4 230 1	
					95.5 133.7	95.6 133.84	96.2 134.63	95.7 133.93	97.9 137.05		96.2 134.65				63053 HUBBARD4 230 63336 AUDUBON4 230 1	
					97.9 137.11	103.1 144.31	103.2 144.41	103.1 144.38	103.2 144.45	104.6 146.44	99.2 138.82	103.1 144.33		96.7 135.32	63187 WINGER Y 230 63238 WINGER 7 115 1	
					97.9 137.11	103.1 144.31	103.2 144.41	103.1 144.38	103.2 144.45	104.6 146.44	99.2 138.82	103.1 144.33		96.7 135.32	63187 WINGER Y 230 66758 WINGER 4 230 1	
63186 WILTON Y 230 63345 WILTON 4 230 1	140			77.3 108.17	81.7 114.36	81.7 114.45	81.6 114.26	81.8 114.49	82.8 115.98	78.3 109.62	81.6 114.21			76 106.4	SYSTEM INTACT	
					100.1 140.08	100.2 140.21	100.5 140.74	100.3 140.36	102.2 143.08		100.5 140.74				60133 SHEYNNE4 230 63336 AUDUBON4 230 1	
					95.5 133.7	95.6 133.84	96.2 134.63	95.7 133.93	97.9 137.05		96.2 134.65				63053 HUBBARD4 230 63336 AUDUBON4 230 1	
					97.9 137.11	103.1 144.31	103.2 144.41	103.1 144.38	103.2 144.45	104.6 146.44	99.2 138.82	103.1 144.33		96.7 135.32	63187 WINGER Y 230 63238 WINGER 7 115 1	
					97.9 137.11	103.1 144.31	103.2 144.41	103.1 144.38	103.2 144.45	104.6 146.44	99.2 138.82	103.1 144.33		96.7 135.32	63187 WINGER Y 230 66758 WINGER 4 230 1	
63187 WINGER Y 230 63238 WINGER 7 115 1	140	69.7 97.51		70.1 98.17	72.7 101.75	72.7 101.79	72.7 101.79	72.7 101.78	73.4 102.75	70.7 98.92	72.7 101.81	66.8 93.46	71.3 99.75	SYSTEM INTACT		
					99.9 139.83	100 139.96	100.3 140.44	100.1 140.07	101.9 142.66	95.4 133.55	100.3 140.47			60133 SHEYNNE4 230 63336 AUDUBON4 230 1		
		106.2 148.73		110.2 154.27	115.2 161.28	115.3 161.39	115.4 161.5	115.3 161.39	116.5 163.17	111.1 155.54	115.4 161.56	104.5 146.34	109.6 153.49	63186 WILTON Y 230 63245 WILTON 7 115 1		
		106.2 148.73		110.2 154.27	115.1 161.18	115.3 161.4	115.4 161.5	115.3 161.39	116.6 163.17	111.1 155.54	115.4 161.56	104.5 146.34	109.6 153.49	63186 WILTON Y 230 63345 WILTON 4 230 1		
		105.9 148.31		109.8 153.69	114.9 160.9	115 161.01	115 160.95	115.1 161.12	116.3 162.89	110.9 155.24	115.2 161.22	104.4 146.22	109.3 153.06	63345 WILTON 4 230 66758 WINGER 4 230 1		
63187 WINGER Y 230 66758 WINGER 4 230 1	140	69.7 97.51		70.1 98.17	72.7 101.75	72.7 101.79	72.7 101.79	72.7 101.78	73.4 102.75	70.7 98.92	72.7 101.81	66.8 93.46	71.3 99.75	SYSTEM INTACT		
					99.9 139.83	100 139.96	100.1 140.44	100.1 140.07	101.9 142.66	95.4 133.55	100.3 140.47			60133 SHEYNNE4 230 63336 AUDUBON4 230 1		
		106.2 148.73		110.2 154.27	115.2 161.28	115.3 161.39	115.4 161.5	115.3 161.39	116.5 163.17	111.1 155.54	115.4 161.56	104.5 146.34	109.6 153.49	63186 WILTON Y 230 63245 WILTON 7 115 1		
		106.2 148.73		110.2 154.27	115.1 161.18	115.3 161.4	115.4 161.5	115.3 161.39	116.6 163.17	111.1 155.54	115.4 161.56	104.5 146.34	109.6 153.49	63186 WILTON Y 230 63345 WILTON 4 230 1		
		105.9 148.31		109.8 153.69	114.9 160.9	115 161.01	115 160.95	115.1 161.12	116.3 162.89	110.9 155.24	115.2 161.22	104.4 146.22	109.3 153.06	63345 WILTON 4 230 66758 WINGER 4 230 1		
63195 BIGSTONY 230 63214 BIGSTON7 115 1	233	48.7 113.43	49 114.2	49.3 114.97	56 130.48	56 130.51	56.1 130.64	56 130.58	56.2 131.02	49.3 114.83	56 130.45	55.7 129.75	55.4 129.01	SYSTEM INTACT		
					98.3 229.06	98.3 229.07	98.4 229.21	98.4 229.17	98.4 229.37		98.2 228.91	97.5 227.1	98 228.4	63216 ORTONVL7 115 63321 ORTNVLEY 230 1		

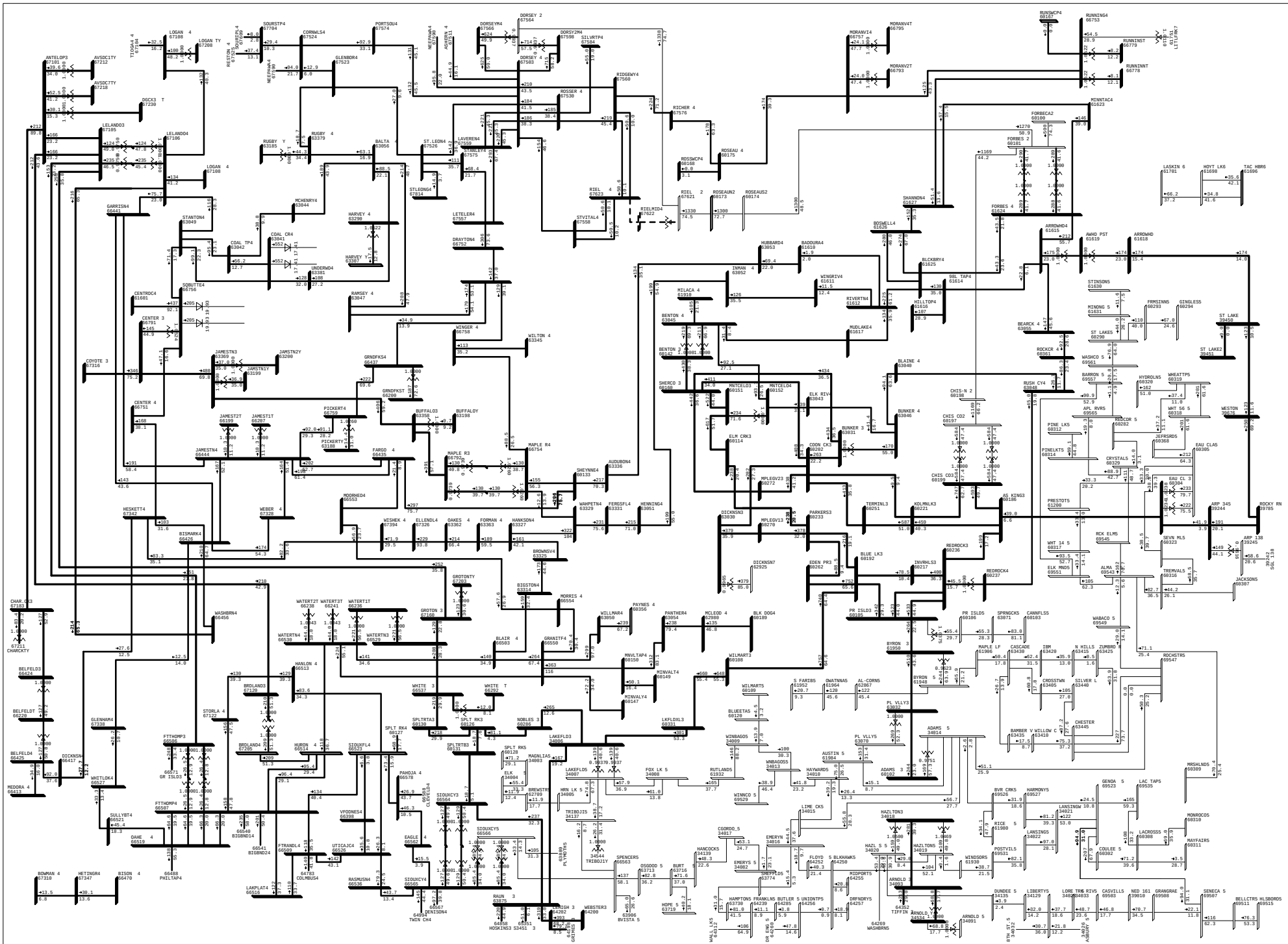
			114.1 142.67 98.6 123.31 100.1 125.13 99.7 124.64 97.4 121.73	114 142.54 97 121.21 98 122.5	114.5 143.08 97.2 121.46 97.5 121.87 99.1 123.93	124.2 155.21 98.1 122.59 100.3 125.33 100.5 125.59	124.2 155.22 98.1 122.58 100.3 125.32 100.5 125.58	124.3 155.32 98.1 122.63 100.3 125.34 100.5 125.59	124.2 155.27 98.1 122.63 100.3 125.4 100.5 125.62	124.3 155.44 97.9 122.41 100 125 100.3 125.41	114.3 142.81 97 121.28 97.2 121.46 99 123.75	124.2 155.19 98 122.46 100.1 125.08 100.4 125.47	123.6 154.52 96.8 120.99 98 122.52 98.6 123.24 95.3 119.12	123.6 154.53 98.6 123.3 101.3 126.58 100.3 125.43 97.4 121.74	63337 JHNSNJT4 230 66554 MORRIS 4 230 1 66503 BLAIR 4 230 66550 GRANITF4 230 1 66550 GRANITF4 230 66554 MORRIS 4 230 1 66554 MORRIS 4 230 66555 MORRIS 7 115 1 66792 MAPLE R3 345 67010 AlexSS 345 1			
63320 ORTNVLE4 230 63337 JHNSNJT4 230 1	390.4					73.6 287.35 97.5 380.45 95.5 372.82	73.6 287.51 97.5 380.65 95.6 373.15	73.7 287.89 97.7 381.23 95.9 374.41	73.7 287.61 97.6 380.92 95.6 373.36	74.6 291.12 98.6 384.87 97.4 380.21		73.7 287.81 97.5 380.71 95.9 374.54	73.7 287.81 97.9 382.39 96.8 378.04			SYSTEM INTACT 63311 CANBY 4 230 66550 GRANITF4 230 1 63327 HANKSON4 230 63329 WAHPETN4 230 1		
63327 HANKSON4 230 63329 WAHPETN4 230 1	320		84.5 270.36 99.9 319.54 105.4 337.3 95.4 305.27 104.7 335.09 104.3 333.67 107.1 342.71	83.8 268.07 100 320.09 103.2 330.1 95.6 305.87 107.8 344.9 107.4 343.53 111 355.1	104.4 334.05 114.2 365.57 112.5 359.88 122.1 390.56 111.7 357.31 112.5 360.05 112.3 359.47 111.7 357.32 113.7 363.82 115.8 370.55 123.1 393.97 121.9 390.21 128.3 410.57 127.8 408.97 131.5 420.74 112.7 360.56	104.5 334.38 114.6 366.65 112.8 361.09 122.2 390.98 111.8 357.82 112.7 360.57 112.5 359.98 111.8 357.89 113.8 364.17 115.9 370.9 123.2 394.38 122.1 390.62 128.5 411.07 127.9 409.43 131.6 421.28 112.8 360.92	104.6 334.76 115.6 369.83 113.6 363.66 122.6 392.35 112 358.53 112.9 361.16 112.9 361.41 112.3 359.22 113.9 364.63 116.1 371.38 123.7 395.68 122.5 391.91 129.5 414.53 129.2 413.5 132.2 422.95 112.9 361.23	104.5 334.28 115.2 368.49 113.2 362.34 122.2 390.94 111.9 358.03 112.7 360.72 112.5 360.1 111.9 358.02 113.8 364.16 115.9 370.85 123.2 394.39 122.1 390.62 128.5 411.06 128 409.6 131.7 421.43 112.8 360.88	106.8 341.62 85 271.98 101.6 325.06 105.7 338.32 97 310.5 96 307.35 109.5 350.56 129.6 349.47 112.7 360.53	104.9 335.66 115.8 370.56 113.7 363.98 122.9 393.36 112.3 359.23 113.4 362.87 113.2 362.26 112.5 360.13 114.2 365.4 116.3 372.26 123.9 396.57 122.8 392.8 129.8 415.46 129.6 414.68 132.6 424.3 113.2 362.15	110 351.99 123.8 396.26 121 387.28 128.6 411.43 118.6 379.53 118.2 378.27 118.3 378.49 116.7 373.53 117.8 376.85 119.5 382.35 121.3 388.1 128.6 411.67 127.5 408.03 132.1 422.78 131.6 421.18 134.3 429.63	93.9 300.61 105.9 338.77 103.4 330.86 104.6 334.86 102 326.48 101.6 325.07 101.6 325.26 103.6 331.59 104.5 334.52 101.7 325.59 110.9 354.78 109.8 351.27 107.3 343.46 107.1 342.58 108.9 348.55 110 351.99	60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60133 SHEYNEE4 230 66435 FARGO 4 230 1 60150 MNVLTPA4 230 63054 PANTHER4 230 1 60156 PYNSVL7 115 60356 PAYNES 4 230 1 60192 BLUE LK3 345 99991 BIGSTONE 345 1 60356 PAYNES 4 230 63050 WILLMAR4 230 1 61612 RIVERTN4 230 61625 BLCKBRY4 230 1 62980 MCLEOD 4 230 63054 PANTHER4 230 1 63050 WILLMAR4 230 66550 GRANITF4 230 1 63311 CANBY 4 230 66550 GRANITF4 230 1 63314 BIGSTON4 230 63320 ORTNVLE4 230 1 63314 BIGSTON4 230 66503 BLAIR 4 230 1 63320 ORTNVLE4 230 63337 JHNSNJT4 230 1 63337 JHNSNJT4 230 66554 MORRIS 4 230 1 63358 BUFFALO3 345 63369 JAMESTN3 345 1 63358 BUFFALO3 345 66792 MAPLE R3 345 1 63369 JAMESTN3 345 66791 CENTER 3 345 1 66554 MORRIS 4 230 66555 MORRIS 7 115 1 66792 MAPLE R3 345 67101 ANTELOP3 345 1					
63329 WAHPETN4 230 63331 FERGSFL4 230 1	320					75.8 242.57 95.3 305.08	75.9 242.9 95.5 305.58	76.3 244.04 96.1 307.4	76 243.09 95.6 305.91	78.3 250.59 98.8 316.04		76.3 244.3 96.2 307.75				SYSTEM INTACT 60133 SHEYNEE4 230 63336 AUDUBON4 230 1		
63362 OAKES 4 230 67326 ELLENDL4 230 1	240		77.7 186.39 97.6 234.23 95.9 230.05 98.5 236.44 98.5 236.46	77 184.77 97 232.69 95.2 228.57 99.7 239.35 99.7 239.37	93.9 225.37 95.5 229.15 97.2 233.35 97.7 234.39 98.4 236.2 96.2 230.87 95.7 229.69 97.1 232.93 97.2 233.39 108.9 261.29 107.9 259.07 111.2 266.99 110.9 266.09 116.8 280.29 95.6 229.39 97.6 234.2	94 225.5 94.1 225.92 95.9 230.18 97.3 233.53 98.3 236.02 98.8 237.21 96.6 231.92 95.9 230.25 97.4 233.86 97.6 234.35 109 261.65 108.1 259.41 108.2 261.29 111.8 268.31 117.3 281.57 95.6 229.53 97.6 234.44	94.1 225.92 95.9 230.18 97.9 234.9 98.1 235.46 98.6 236.62 96.4 231.3 95.8 229.92 95.9 230.06 97.2 233.31 97.4 233.77 109 261.63 108.1 259.41 111.5 267.49 112.7 270.43 117 280.87 96.2 230.77 98 235.12	94 225.71 95.1 228.31 97.3 233.57 100.1 240.31 100 240.04 97.5 233.97 97 232.74 98.5 236.4 98.7 236.9 110.4 264.99 109.5 262.76 113.5 272.28 112.7 270.43 118.7 284.82 97.1 233.09 99 237.61 96.7 232.1	77.6 186.3 95.9 230.08 97.7 234.53 95.9 230.08 95.9 230.13 101.2 242.81 101.2 242.83	94 225.54 95.7 229.58 97.7 234.55 98.1 235.47 98.7 236.85 96.4 231.35 95.8 229.94 97.3 233.48 97.5 233.96 109 261.54 108 259.3 111.9 268.61 111.7 268.01 117.2 281.34 96 230.35 97.8 234.73	94.7 227.22 96.8 232.4 96.3 231.17 99.4 238.68 99.6 238.96 99.6 238.98 96.3 231.19 97.8 234.67 98 235.17 110.2 264.57 109.3 262.32 112.7 270.38 112.3 269.49 117.9 282.91 96.6 231.77 99.1 237.91	84.1 201.9 97.7 234.42 96.7 232.11 95.5 229.12 95.2 228.49 99.6 238.93 97.7 234.42 96.7 232.11 95.5 229.12 95.2 228.49 99.6 238.93	63406 LAKEFLD3 345 60331 LKFLDXL3 345 1 60105 PR ISLD3 345 61950 BYRON 3 345 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60133 SHEYNEE4 230 66435 FARGO 4 230 1 61612 RIVERTN4 230 61625 BLCKBRY4 230 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 63044 MCHENRY4 230 63056 BALTA 4 230 1 63047 RAMSEY 4 230 63056 BALTA 4 230 1 63047 RAMSEY 4 230 66755 PRAIRIE4 230 1 63314 BIGSTON4 230 63325 BROWNSV4 230 1 63325 BROWNSV4 230 63327 HANKSON4 230 1 63358 BUFFALO3 345 63369 JAMESTN3 345 1 63358 BUFFALO3 345 66792 MAPLE R3 345 1 63369 JAMESTN3 345 66791 CENTER 3 345 1 66751 CENTER 4 230 66756 SQBUTTE4 230 1 66755 PRAIRIE4 230 66758 WINGER 4 230 1 66756 SQBUTTE4 230 66791 CENTER 3 345 1 66791 CENTER 3 345 67316 COYOTE 3 345 1 67326 ELLENDL4 230 99990 ElIendal 345 1 99990 ElIendal 345 99991 BIGSTONE 345 1					
63445 CHESTER 161 69547 ROCHSTR5 161 15	302	73.4 221.62 95 286.96 139.6 421.61 114.9 347.01	73.3 221.44 95 287.05 139.8 422.13 116.7 352.51	73.4 221.53 95.1 287.08 139.9 422.47 117.5 354.77	73.7 222.57 95.1 287.32 140.2 423.39 121.9 368.28	73.4 221.65 95.1 287.31 140.1 423.06 121.6 367.28	42.6 128.54 99.2 299.56 130.6 394.55 106.8 322.46	44.7 134.99 99.2 299.59 131.3 396.49 108 326.04	45.4 137.18 101.8 307.39 95.8 289.34	42.8 129.2 101.5 306.63 95.6 288.66 133.7 403.65	82.1 247.97 98.3 296.73 122.2 369.16	82.1 247.97 98.3 296.73 122.2 369.16	44.7 134.97 101.7 307.02 95.6 288.84	43.7 132.03 101.4 306.17 95.4 288.18 133.8 404.18	60102 ADAMS 3 345 63032 PL VLLY3 345 1 60105 PR ISLD3 345 63446 ROCHSTR3 345 X1 61906 MAPLE LF 161 61948 BYRON 5 161 1 61906 MAPLE LF 161 63430 CASCADE 161 1 61948 BYRON 5 161 61950 BYRON 3 345 1 61950 BYRON 3 345 63032 PL VLLY3 345 1			
66437 GRNDFKS4 230 66759 PICKERT4 230 1	319					70.6 225.28 95.1 303.51	70.7 225.45 95.2 303.61	70.8 225.91 95.1 303.42	70.6 225.32 95.8 305.48	72 229.62 95.8 305.48		71 226.42 95.1 303.38				SYSTEM INTACT 66752 DRAYTON4 230 67557 LETELER4 230 1		SW502
66554 MORRIS 4 230 66555 MORRIS 7 115 1	100	90.1 90.06 98.7 98.7 102.4 102.35 99 99.03 97.7 97.69 98.4 98.36 112.5 112.54 95.7 95.75	95.2 95.17 102.5 102.51 116.3 116.34 106 106.03 102.6 102.62 103.5 103.52 117.8 117.82 128.9 128.87 132.8 132.82	122.5 122.49 136.4 136.43 139.7 139.67 129.9 129.88 130 129.98 143 142.95 128.9 128.87 130.8 130.76 128.8 128.83 132.8 132.82		140.9 140.88 151.7 151.74 150.6 150.63 157.3 157.32 160.2 160.2 152.5 152.48 152.8 152.84 150.4 150.37	141 141.03 153.1 153.05 151.7 151.7 157.9 157.93 160.8 160.78 153.1 153.14 150.6 150.59 151.5 151.46	140.9 140.91 153.2 152.56 151.2 151.2 160.9 160.86 163.6 163.58 152.6 152.65 153 152.97 150.5 150.47	143.3 143.32 154.6 154.57 160.9 160.86 163.6 163.58 155.5 155.55 155.8 155.75 153.1 153.12 153.3 153.31 153.8 130.75 131.9 131.87	123.7 123.68 138.4 138.36 141.2 141.15 131 131 131.8 131.81 130.6 130.62 145.9 145.86 130.8 130.75 131.9 131.87	141 141.05 153 152.98 151.5 151.47 157.9 157.95 160.8 160.83 152.7 152.71 153 153 150.9 150.94	119.6 119.58 133.8 133.83 131.3 131.26 145.2 145.24 133.1 133.14 132.3 132.33 129.2 129.2	114.1 114.09 127.5 127.47 125.2 125.22 129.9 129.89 127.1 127.07 126.5 126.49	60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60133 SHEYNEE4 230 63336 AUDUBON4 230 1 60133 SHEYNEE4 230 66435 FARGO 4 230 1 60142 BENTON 3 345 60160 SHERCO 3 345 1 60150 MNVLTPA4 230 63054 PANTHER4 230 1 60150 MNVLTPA4 230 66550 GRANITF4 230 1 60156 PYNSVL7 115 60356 PAYNES 4 230 1 60192 BLUE LK3 345 99991 BIGSTONE 345 1 60356 PAYNES 4 230 63050 WILLMAR4 230 1 61612 RIVERTN4 230 61625 BLCKBRY4 230 1 62427 WILLMAR869 0 63050 WILLMAR4 230 1 62531 INMAN 7 115 63052 INMAN 4 230 1 62980 MCLEOD 4 230 63054 PANTHER4 230 1				

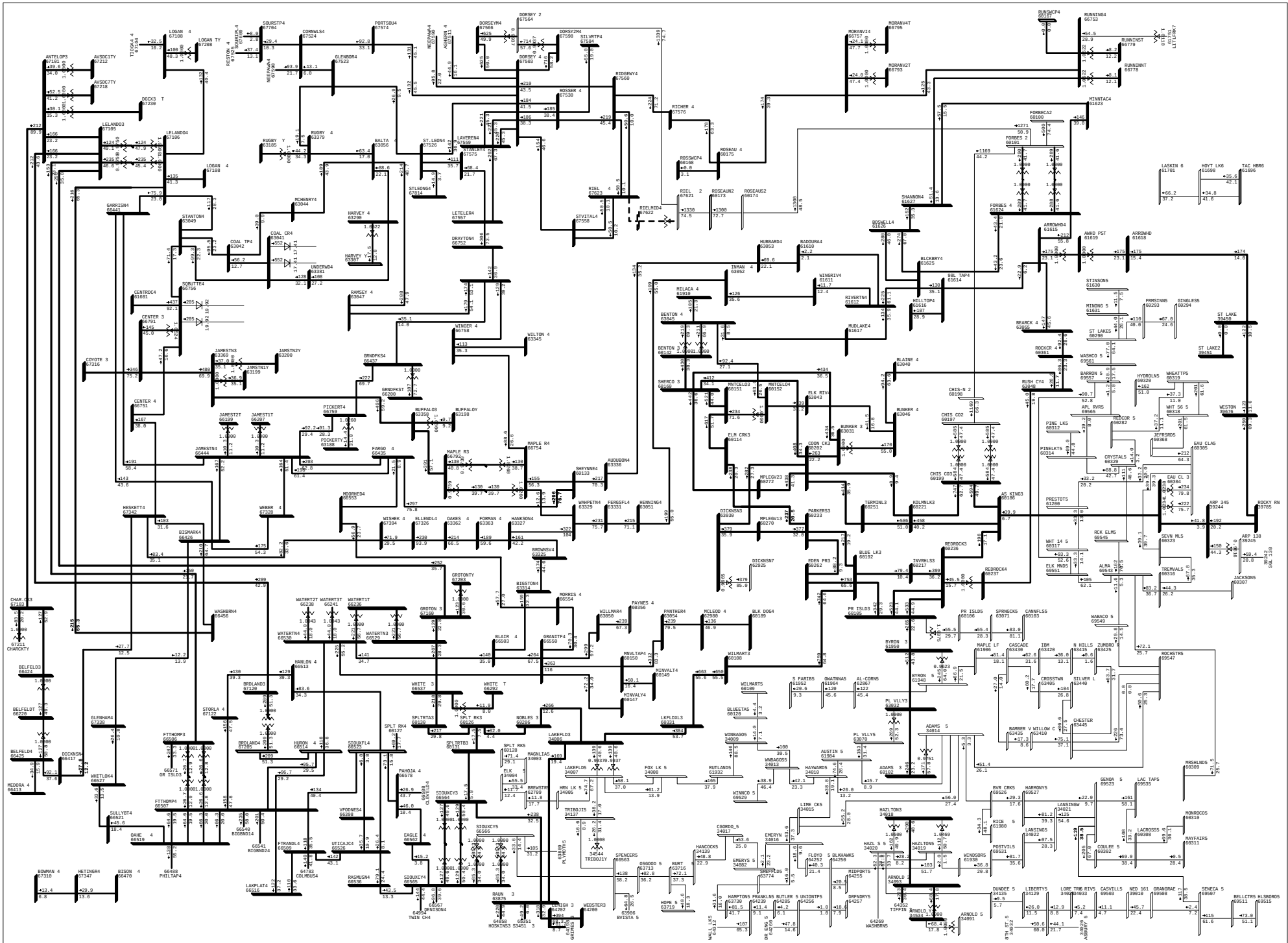
			109.1	109.05	114.2	114.22	146	145.97			169	169.01	170.1	170.13	169.2	169.24	173.1	173.14	148.3	148.31	170.1	170.07	144.5	144.46	137.9	137.93	63050 WILLMAR2 230 66550 GRANITF4 230 1			
			97.2	97.22	103.6	103.63	131.4	131.4			152.3	152.32	152.5	152.5	152.4	152.39	154.9	154.88			152.5	152.45	131.4	131.42	126	125.96	63311 CANBY 4 230 66550 GRANITF4 230 1			
											159.6	159.64	159.8	159.77	159.7	159.65	162.4	162.39	132.6	132.63	159.9	159.93	140.7	140.68	132.8	132.82	63314 BIGSTON4 230 63325 BROWNSV4 230 1			
			96.6	96.61	103	103.01	130.8	130.81			158.6	158.57	158.7	158.7	158.6	158.59	161.3	161.32	131.9	131.92	158.9	158.86	139.5	139.51	131.7	131.68	63325 BROWNSV4 230 63327 HANKSON4 230 1			
			109	108.96	118.5	118.54	148.8	148.84			176.4	176.44	177.2	177.18	176.6	176.55	180.7	180.65	151	151.03	177.3	177.3	154.5	154.48	143	143.01	63327 HANKSON4 230 63329 WAHPETN4 230 1			
			108.8	108.8	113.1	113.15	156.4	156.45			183.6	183.56	184	184	183.7	183.69	187.5	187.47	159	159.04	184.1	184.08	144.5	144.55	139.6	139.55	63329 WAHPETN4 230 63331 FERGSFL4 230 1			
					101.7	101.73																						63358 BUFFALO3 345 63369 JAMESTN3 345 1		
					101.7	101.74																						63358 BUFFALO3 345 66792 MAPLE R3 345 1		
					102.6	102.63																						63362 OAKES 4 230 67326 ELLENDL4 230 1		
					102.4	102.44	129.8	129.82			154.6	154.56	154.9	154.89	154.7	154.7	157	157.02	131.2	131.15	154.6	154.6	131.5	131.48	129.6	129.57	63369 JAMESTN3 345 66791 CENTER 3 345 1			
			100.8	100.82																			135.6	135.61	135.8	135.79	66550 GRANITF4 230 66554 MORRIS 4 230 1			
			105.9	105.87																			141	140.96	137.4	137.43	66792 MAPLE R3 345 67010 AlexSS 345 1			
			118.3	118.33																								67010 AlexSS 345 67452 ALEXSS 115 1		
66705 DRAYTON7 115 66787 DRAYTO1T 230 1	140		51.8	72.55	52.8	73.89	52.1	73	50.6	70.88	50.6	70.86	50.5	70.72	50.7	70.91	50.1	70.19	51.8	72.55	50.4	70.56	51.9	72.69	50.3	70.45	SYSTEM INTACT			
			107.3	150.26	108.9	152.48	108	151.27	104.9	146.9	104.9	146.85	104.3	146.09	105	146.97	103.9	145.47	107.4	150.35	104.1	145.74	107.6	150.61	104.2	145.94	66705 DRAYTON7 115 66788 DRAYTO2T 230 1			
			107.3	150.26	108.9	152.48	108	151.27	104.9	146.9	104.9	146.85	104.3	146.09	105	146.97	103.9	145.47	107.4	150.35	104.1	145.74	107.6	150.61	104.2	145.94	66752 DRAYTON4 230 66788 DRAYTO2T 230 1			
66719 MORANVI7 115 66793 MORANV2T 230 1	50		47.2	23.59	47.2	23.6	47.3	23.64	47.4	23.7	47.4	23.7	47.4	23.69	47.4	23.7	47.4	23.72	47.3	23.66	47.4	23.71	47.3	23.66	47.3	23.64	SYSTEM INTACT			
			95.6	47.81	95.7	47.83	95.8	47.91	96.1	48.03	96.1	48.03	96	48.02	96.1	48.03	96.1	48.07	95.9	47.95	96.1	48.05	95.9	47.96	95.8	47.91	66719 MORANVI7 115 66795 MORANV4T 230 1			
			95.6	47.81	95.7	47.83	95.8	47.91	96.1	48.03	96.1	48.03	96	48.02	96.1	48.03	96.1	48.07	95.9	47.95	96.1	48.05	95.9	47.96	95.8	47.91	66757 MORANV4 230 66795 MORANV4T 230 1			
66719 MORANVI7 115 66795 MORANV4T 230 1	50		47.5	23.75	47.5	23.76	47.6	23.8	47.7	23.86	47.7	23.86	47.7	23.86	47.7	23.86	47.8	23.88	47.6	23.82	47.7	23.87	47.7	23.83	47.6	23.8	SYSTEM INTACT			
			95.6	47.79	95.6	47.81	95.8	47.9	96	48.01	96	48.01	96	48.01	96	48.01	96.1	48.06	95.9	47.94	96.1	48.03	95.9	47.95	95.8	47.89	66719 MORANVI7 115 66793 MORANV2T 230 1			
			95.6	47.79	95.6	47.81	95.8	47.9	96	48.01	96	48.01	96	48.01	96	48.01	96.1	48.06	95.9	47.94	96.1	48.03	95.9	47.95	95.8	47.89	66757 MORANV4 230 66793 MORANV2T 230 1			
66752 DRAYTON4 230 66787 DRAYTO1T 230 1	140		51.8	72.55	52.8	73.89	52.1	73	50.6	70.88	50.6	70.86	50.5	70.72	50.7	70.91	50.1	70.19	51.8	72.55	50.4	70.56	51.9	72.69	50.3	70.45	SYSTEM INTACT			
			107.3	150.26	108.9	152.48	108	151.27	104.9	146.9	104.9	146.85	104.3	146.09	105	146.97	103.9	145.47	107.4	150.35	104.1	145.74	107.6	150.61	104.2	145.94	66705 DRAYTON7 115 66788 DRAYTO2T 230 1			
			107.3	150.26	108.9	152.48	108	151.27	104.9	146.9	104.9	146.85	104.3	146.09	105	146.97	103.9	145.47	107.4	150.35	104.1	145.74	107.6	150.61	104.2	145.94	66752 DRAYTON4 230 66788 DRAYTO2T 230 1			
66752 DRAYTON4 230 67557 LETELER4 230 1	419.5		79.7	334.41	82.8	347.3	80	335.62																			SYSTEM INTACT			
			121.2	508.38	124.2	521.19	120.3	504.48																				60101 FORBES 2 500 60198 CHIS-N 2 500 1	SW500	
			121.2	508.38	124.2	521.16																						60197 CHIS CO2 500 60198 CHIS-N 2 500 1	SW500	
					95.3	399.82																						63047 RAMSEY 4 230 66755 PRAIRIE4 230 1		
66756 SQBUTTE4 230 66791 CENTER 3 345 1	336		36.8	123.8	53.1	178.43	46	154.41	44.9	151	45	151.06	45.7	153.68	45	151.25	46	154.62	46.5	156.09	45.7	153.52	55	184.93	38.5	129.52	SYSTEM INTACT			
			100.9	338.89	129.5	435.2	122.4	411.18	121.5	408.39	121.6	408.6	122.2	410.74	121.7	408.92	123.3	414.19	123.7	415.58	122.1	410.42	133.6	448.83	103.8	348.92	66791 CENTER 3 345 67316 COYOTE 3 345 1			
66757 MORANVIA 230 66793 MORANV2T 230 1	50		47.2	23.59	47.2	23.6	47.3	23.64	47.4	23.7	47.4	23.7	47.4	23.69	47.4	23.7	47.4	23.72	47.3	23.66	47.4	23.71	47.3	23.66	47.3	23.64	SYSTEM INTACT			
			95.6	47.81	95.7	47.83	95.8	47.91	96.1	48.03	96.1	48.03	96	48.02	96.1	48.03	96.1	48.07	95.9	47.95	96.1	48.05	95.9	47.96	95.8	47.91	66719 MORANVI7 115 66795 MORANV4T 230 1			
			95.6	47.81	95.7	47.83	95.8	47.91	96.1	48.03	96.1	48.03	96	48.02	96.1	48.03	96.1	48.07	95.9	47.95	96.1	48.05	95.9	47.96	95.8	47.91	66757 MORANV4 230 66795 MORANV4T 230 1			
66757 MORANVIA 230 66795 MORANV4T 230 1	50		47.5	23.75	47.5	23.76	47.6	23.8	47.7	23.86	47.7	23.86	47.7	23.86	47.7	23.86	47.8	23.88	47.6	23.82	47.7	23.87	47.7	23.83	47.6	23.8	SYSTEM INTACT			
			95.6	47.79	95.6	47.81	95.8	47.9	96	48.01	96	48.01	96	48.01	96	48.01	96.1	48.06	95.9	47.94	96.1	48.03	95.9	47.95	95.8	47.89	66719 MORANVI7 115 66793 MORANV2T 230 1			
			95.6	47.79	95.6	47.81	95.8	47.9	96	48.01	96	48.01	96	48.01	96	48.01	96.1	48.06	95.9	47.94	96.1	48.03	95.9	47.95	95.8	47.89	66757 MORANV4 230 66793 MORANV2T 230 1			
67316 COYOTE 3 345 67318 COYOTE 7 115 1	168		23.1	38.73	5.2	8.71	9.3	15.56	10.4	17.39	10.3	17.32	9.8	16.46	10.3	17.23	8.9	14.96	8.1	13.69	9.8	16.54	3.5	5.85	21.5	36.08	SYSTEM INTACT			
			216.8	364.23	216.8	364.23	216.8	364.22	216.8	364.19	216.8	364.19	216.8	364.18	216.8	364.19	216.8	364.18	216.9	364.42	216.8	364.18	216.9	364.4	216.8	364.19	66791 CENTER 3 345 67316 COYOTE 3 345 1			
69501 N LACRS3 345 69502 N LACRS5 161 X2	448												77.5	347.2	83.2	372.73											SYSTEM INTACT			
													118.2	529.4	100.3	449.55												60302 COULEE 5 161 69523 GENOA 5 161 1		
															143.8	644.3												60304 EAU CL 3 345 69501 N LACRS3 345 1		
															97.8	438.2												69523 GENOA 5 161 69535 LAC TAPS 161 1		
															101.7	455.58												69523 GENOA 5 161 69600 GENOA 3 345 X1		
69502 N LACRS5 161 69535 LAC TAPS 161 1	162		51.6	83.61	54	87.46	54.4	88.09	55.8	90.36	54.1	87.59	65.5	106.09	67.4	109.19	178.1	288.51	174.6	282.8	114.2	185	176.6	286.1	174.2	282.22	SYSTEM INTACT			
																												34000 LANS3 345 63446 ROCHSTR3 345 X1		
																												34014 ADAMS 5 161 60102 ADAMS 3 345 9		
																												34014 ADAMS 5 161 69547 ROCHSTR5 161 1		
																												34021 LANSINGW 161 34022 LANSING5 161 1		
																												39244 ARP 345 345 60304 EAU CL 3 345 1		
																												60102 ADAMS 3 345 63032 PL VLLY3 345 1		

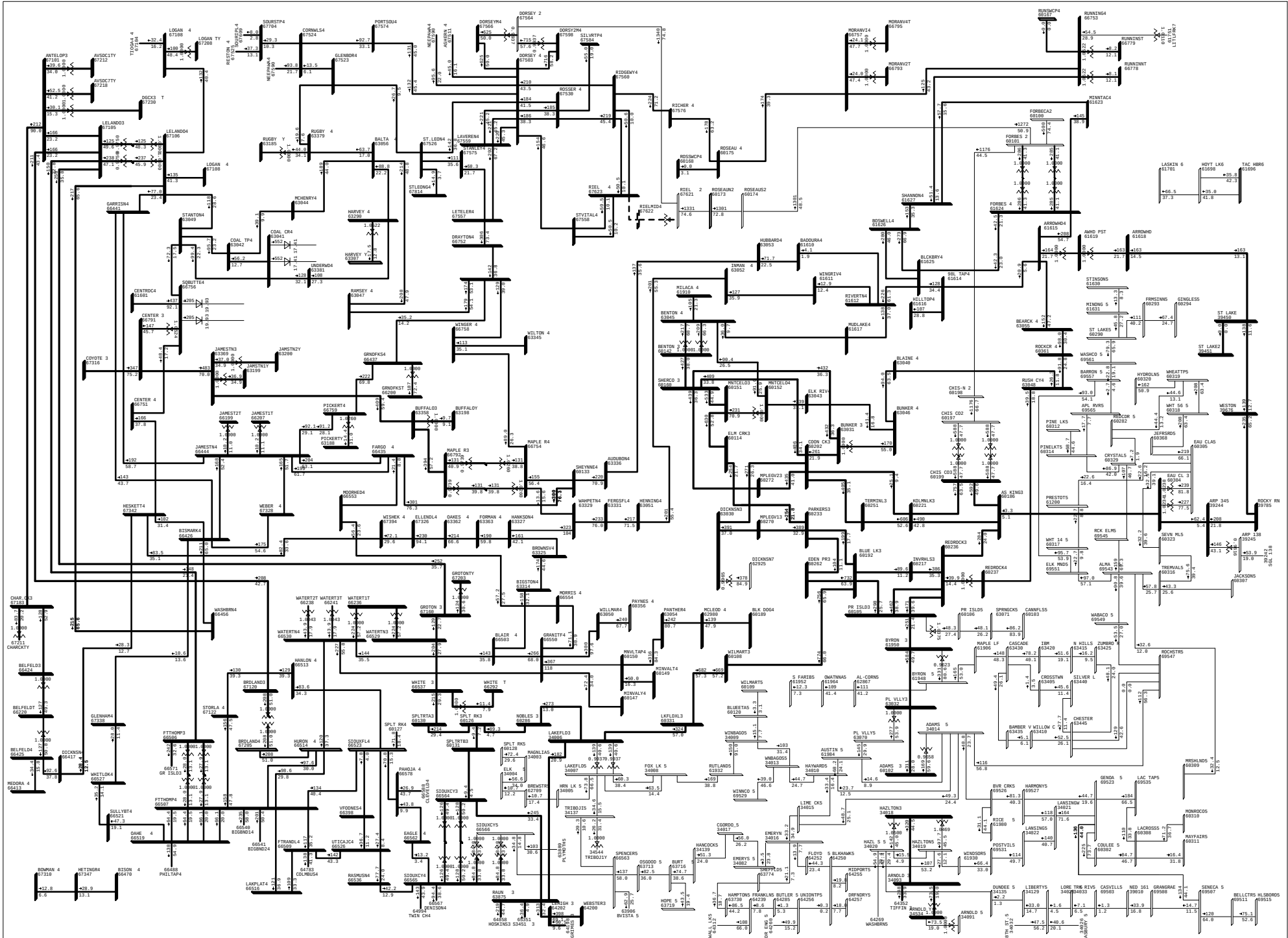
69507 SENECA 5 161 69511 BELLCTR5 161 1	189									88.5 167.24	96.1 193.16			95.7 192.34	69507 SENECA 5 161 69511 BELLCTR5 161 1	
										101 190.83	101.2 191.33			101.1 191.05	SYSTEM INTACT	
69507 SENECA 5 161 69523 GENOA 5 161 1	304									84 255.29	85.9 261.22			85.9 261.2	39959 GRANGRAE69.0 69508 GRANGRAE 161 1	
										96.8 294.27	98.5 299.59			98.3 298.96	60309 MRSHLND5 161 69502 N LACRS5 161 1	
										96.4 292.96	97.7 297.1			97.6 296.59	60316 TREMVALS 161 69502 N LACRS5 161 1	
											95.2 289.33				69502 N LACRS5 161 69535 LAC TAP5 161 1	
69523 GENOA 5 161 69535 LAC TAP5 161 1	279		58.2 162.25	58.5 163.09	59.5 166.01	58.3 162.62	66.7 186.17	68.8 191.9	145.1 404.73	142.9 398.69	105 292.83	144.1 402.15	142.7 398	SYSTEM INTACT		
									150.5 419.77	147.1 410.42	151.8 423.58	148.9 415.35		34000 LANS3 345 63446 ROCHSTR3 345 X1		
									149.7 417.77	147.5 411.47		148.7 414.95	147.2 410.6	34014 ADAMS 5 161 60102 ADAMS 3 345 9		
									149.6 417.34		109.1 304.34			34014 ADAMS 5 161 69547 ROCHSTR5 161 1		
									156.4 436.49	151.9 423.87				34021 LANSINGW 161 34022 LANSING5 161 1		
										151 421.38		154.3 430.5	151.7 423.36	39244 ARP 345 345 60304 EAU CL 3 345 1		
											110.8 309.24	154.5 431.17	151 421.25	60102 ADAMS 3 345 63032 PL VLLY3 345 1		
									153.7 428.83	151.1 421.45	108.9 303.74	154.9 432.23	151.8 423.52	60105 PR ISLD3 345 61950 BYRON 3 345 1		
										149.2 416.35		151.6 422.96	149.3 416.66	60105 PR ISLD3 345 63446 ROCHSTR3 345 X1		
									183.6 512.14	180.4 503.37	109.5 305.55	154.9 432.23	151.8 423.52	60108 WILMART3 345 60192 BLUE LK3 345 1		
							101.5 283.11	104.4 291.17	149.7 417.66	147.2 410.65	127.9 356.95	148.2 415.35	180.3 503.08	60108 WILMART3 345 60331 LKFLDXL3 345 1		
											173.7 484.69	148.4 414.15	146.8 409.57	60186 AS KING3 345 60304 EAU CL 3 345 1		
									149.6 417.48			148.5 414.39	146.8 409.7	60302 COULEE 5 161 60967 COULEE 869.0 2		
									149.3 416.43		113.8 317.5	148.2 413.6		60302 COULEE 5 161 69523 GENOA 5 161 1		
									149.4 416.86	147.5 411.55		148.5 414.45	147.1 410.5	60305 EAU CLA5 161 60323 SEVN ML5 161 1		
									149.2 416.15	147.1 410.53		148.2 413.6	146.7 409.38	60308 LACROSS5 161 60311 MAYFAIR5 161 1		
										148.2 413.6		148.5 414.45	147.1 410.5	60309 MRSHLND5 161 69543 ALMA 5 161 1		
											111.1 309.83		146.7 409.38	60316 TREMVALS 161 69543 ALMA 5 161 1		
											111.7 311.74		147.9 412.6	61906 MAPLE LF 161 61948 BYRON 5 161 1		
												150.8 420.76	149 415.82	61948 BYRON 5 161 61950 BYRON 3 345 1		
									151.6 423.03	149.3 416.41	108.7 303.15	150.8 420.76	149 415.82	61950 BYRON 3 345 63032 PL VLLY3 345 1		
														63446 ROCHSTR3 345 69547 ROCHSTR5 161 X1		
														68795 HILLSBORO69.0 69515 HLSBORO5 161 1		
														69501 N LACRS3 345 69502 N LACRS5 161 X2		
														69501 N LACRS3 345 69600 GENOA 3 345 X1		
									156.6 436.89	154.6 431.23	110.1 307.31	155.7 434.31	153.9 429.4	69507 SENECA 5 161 69511 BELLCTR5 161 1		
											115.5 322.16			69507 SENECA 5 161 69523 GENOA 5 161 1		
									151.9 423.74	149.7 417.68	108.7 303.16	151.1 421.67	149.3 416.48	69511 BELLCTR5 161 69515 HLSBORO5 161 1		
									151.5 422.81	148.8 415.05		150.3 419.32	148.5 414.35	69523 GENOA 5 161 69527 HARMONY5 161 1		
											109.9 306.74			69547 ROCHSTR5 161 69549 WABACO 5 161 1		
69523 GENOA 5 161 69600 GENOA 3 345 X1	300	47.8 143.34	48 143.98	48.1 144.38	48.6 145.8	51.8 155.45	67.5 202.51	84.2 252.57	188 563.89	187.1 561.36	151.1 453.2	187.6 562.72	187 561.01	SYSTEM INTACT		
								118 353.95			177.7 533.13			34000 LANS3 345 34021 LANSINGW 161 X1		
											273.7 820.98			34000 LANS3 345 63446 ROCHSTR3 345 X1		
											168.8 506.26			34000 LANS3 345 69600 GENOA 3 345 X1		
									197.8 593.52	195.2 585.48	153.5 460.37	196.4 589.24	194.2 582.64	34014 ADAMS 5 161 60102 ADAMS 3 345 9		
											174.9 524.74			34021 LANSINGW 161 34022 LANSING5 161 1		
											157.6 472.74			34021 LANSINGW 161 69523 GENOA 5 161 1		
														34021 LANSINGW 161 69527 HARMONY5 161 1		
									195.9 587.71	192.7 578	153.7 460.97	194.1 582.22	192.5 577.5	60102 ADAMS 3 345 63032 PL VLLY3 345 1		
											153.7 461.22			60105 PR ISLD3 345 60236 REDROCK3 345 1		
														60105 PR ISLD3 345 60236 REDROCK3 345 2		
											193.8 581.39	196.8 590.54	193.8 581.29	60105 PR ISLD3 345 61950 BYRON 3 345 1		
											168 504.08			60105 PR ISLD3 345 63446 ROCHSTR3 345 X1		
									193.6 580.69	192.1 576.22		195.1 585.24	192.6 577.88	60108 WILMART3 345 60192 BLUE LK3 345 1		
										190.7 572.13	156.1 468.24	192.1 576.22	190.7 571.97	60108 WILMART3 345 60331 LKFLDXL3 345 1		
														60186 AS KING3 345 60304 EAU CL 3 345 1		
									193.7 581.11	192.2 576.58		193.5 580.52	192.3 576.98	60302 COULEE 5 161 60308 LACROSS5 161 1		
									191.8 575.51					60302 COULEE 5 161 60967 COULEE 869.0 2		
														60304 EAU CL 3 345 69501 N LACRS3 345 1		
									197.4 592.3	195.6 586.7		196.7 590.12	195.7 587.15	60305 EAU CLA5 161 60323 SEVN ML5 161 1		
									198.1 594.19	197.1 591.28	156.3 468.76	198 593.98	196.7 590.24	60309 MRSHLND5 161 69502 N LACRS5 161 1		
														60309 MRSHLND5 161 69543 ALMA 5 161 1		
									191.7 575.2	190.7 572.24		191.4 574.24	190.5 571.61	60316 TREMVALS 161 60323 SEVN ML5 161 1		
									196.6 589.93	195.2 585.51		196.1 588.35	194.9 584.58	60316 TREMVALS 161 69502 N LACRS5 161 1		
									193.5 580.57	192.9 578.77	153.5 460.35	193.2 579.5	192.7 578.07	60316 TREMVALS 161 69543 ALMA 5 161 1		
											166.8 500.5			63446 ROCHSTR3 345 69547 ROCHSTR5 161 X1		
									191.8 575.25	190.5 571.55		191.5 574.36	190.5 571.46	68795 HILLSBORO69.0 69515 HLSBORO5 161 1		
									191.6 574.83					69124 NRTHLAX869.0 69502 N LACRS5 161 1		
														69501 N LACRS3 345 69502 N LACRS5 161 X2		
														69501 N LACRS3 345 69600 GENOA 3 345 X1		
									195.6 586.94	193.6 580.9		194.7 584.22	193.2 579.55	69502 N LACRS5 161 69535 LAC TAP5 161 1		
									195 584.99	194.2 582.56		194.5 583.58	193.5 580.45	69507 SENECA 5 161 69511 BELLCTR5 161 1		
									192.1 576.45	191.2 573.56		192 575.97	190.9 572.56	69511 BELLCTR5 161 69515 HLSBORO5 161 1		
											153.4 460.13			69543 ALMA 5 161 69549 WABACO 5 161 1		
											155.7 467.14			69547 ROCHSTR5 161 69549 WABACO 5 161 1		
69526 BVR CRK5 161 69527 HARMONY5 161 1	223								112.4 250.61	110.4 246.26	34 75.76	111.7 249.01	110.7 246.97	SYSTEM INTACT		
											108.9 242.75			34000 LANS3 345 63446 ROCHSTR3 345 X1		
									120.4 268.59	117.7 262.58		119.3 266.03	117.3 261.57	34014 ADAMS 5 161 60102 ADAMS 3 345 9		
									121.7 271.49	116.5 259.81		119.6 266.81	116.9 260.78	34018 HAZLTON3 345 64316 NHAMPTN3 345 1		

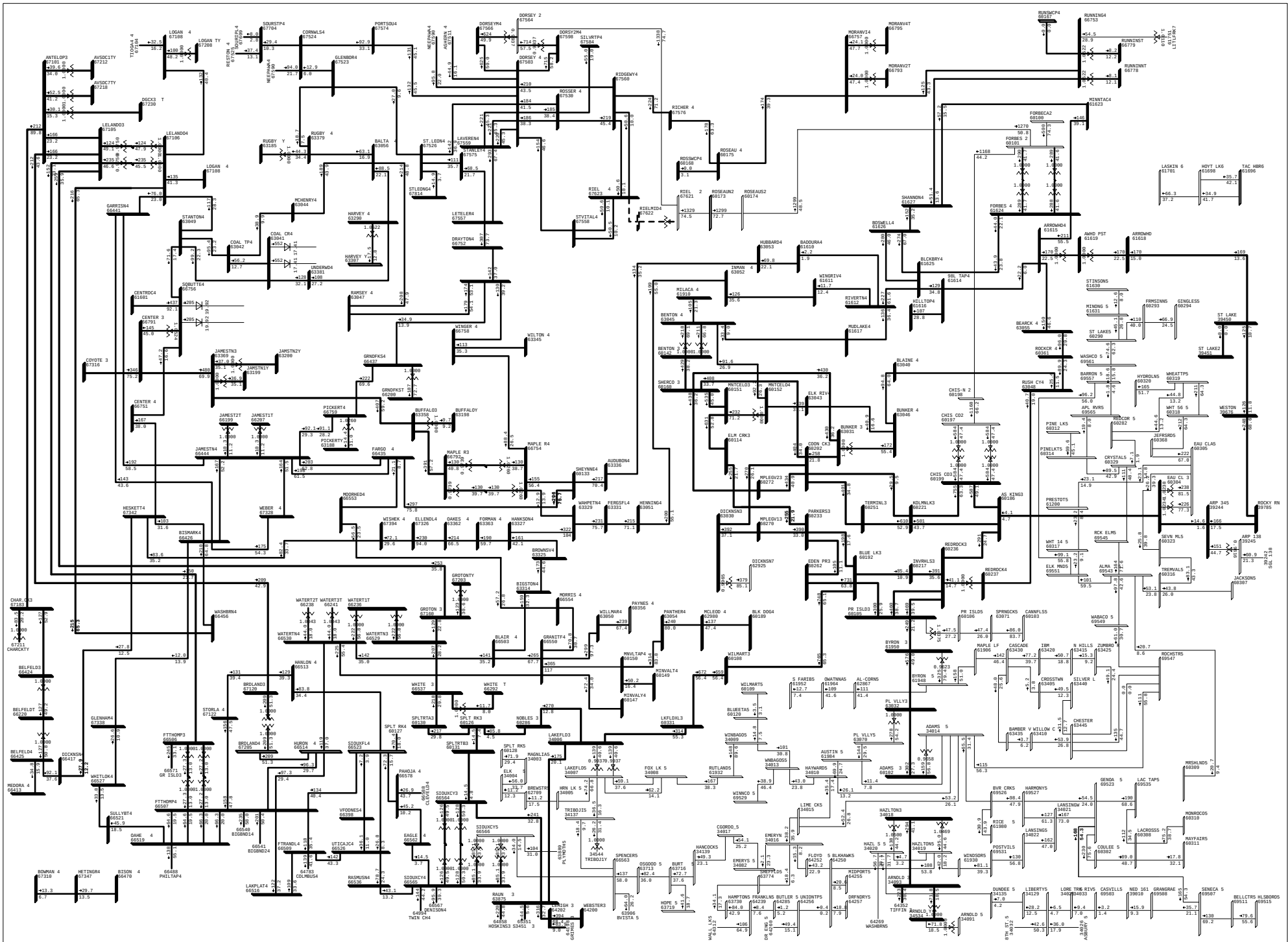
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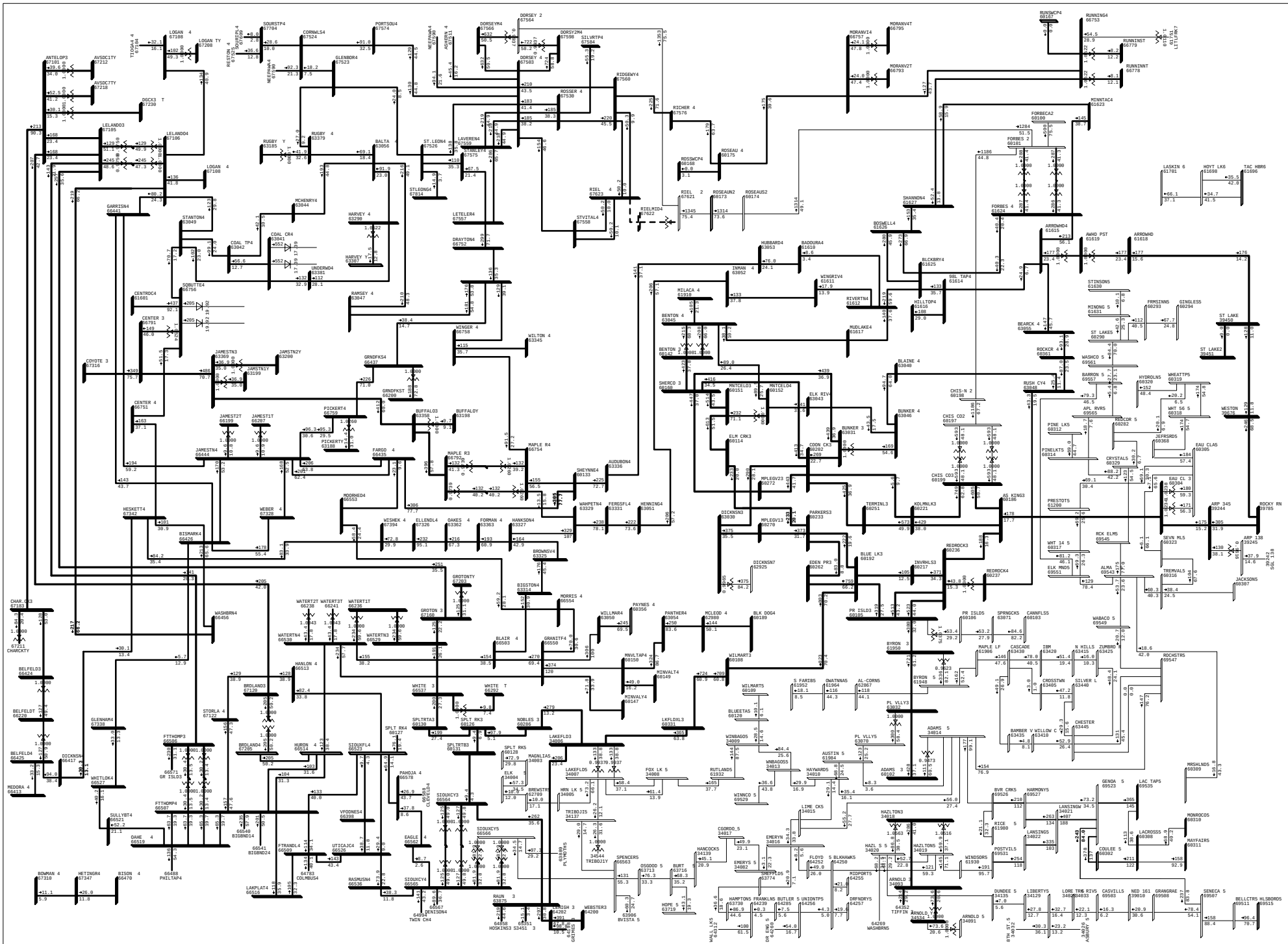


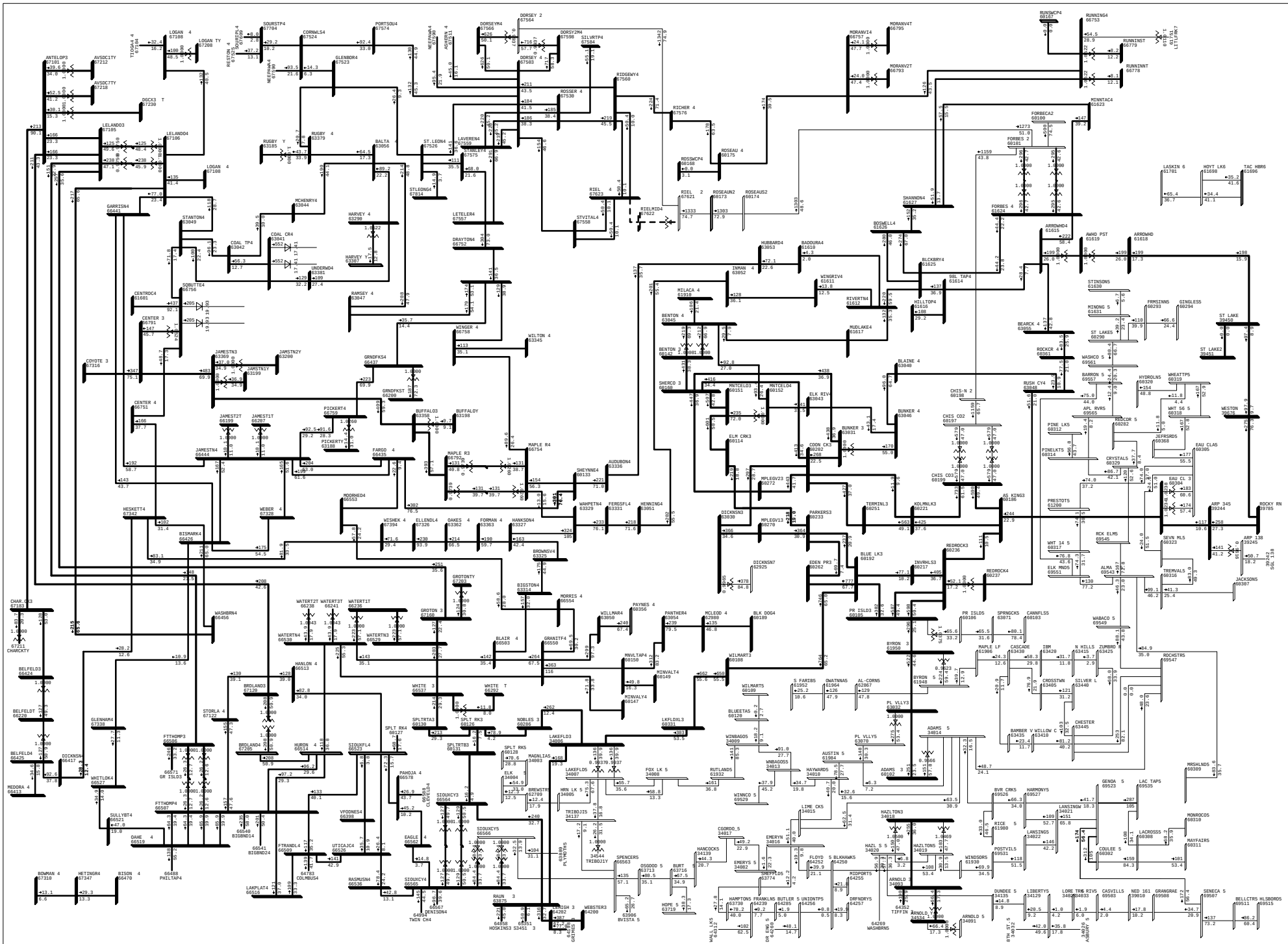










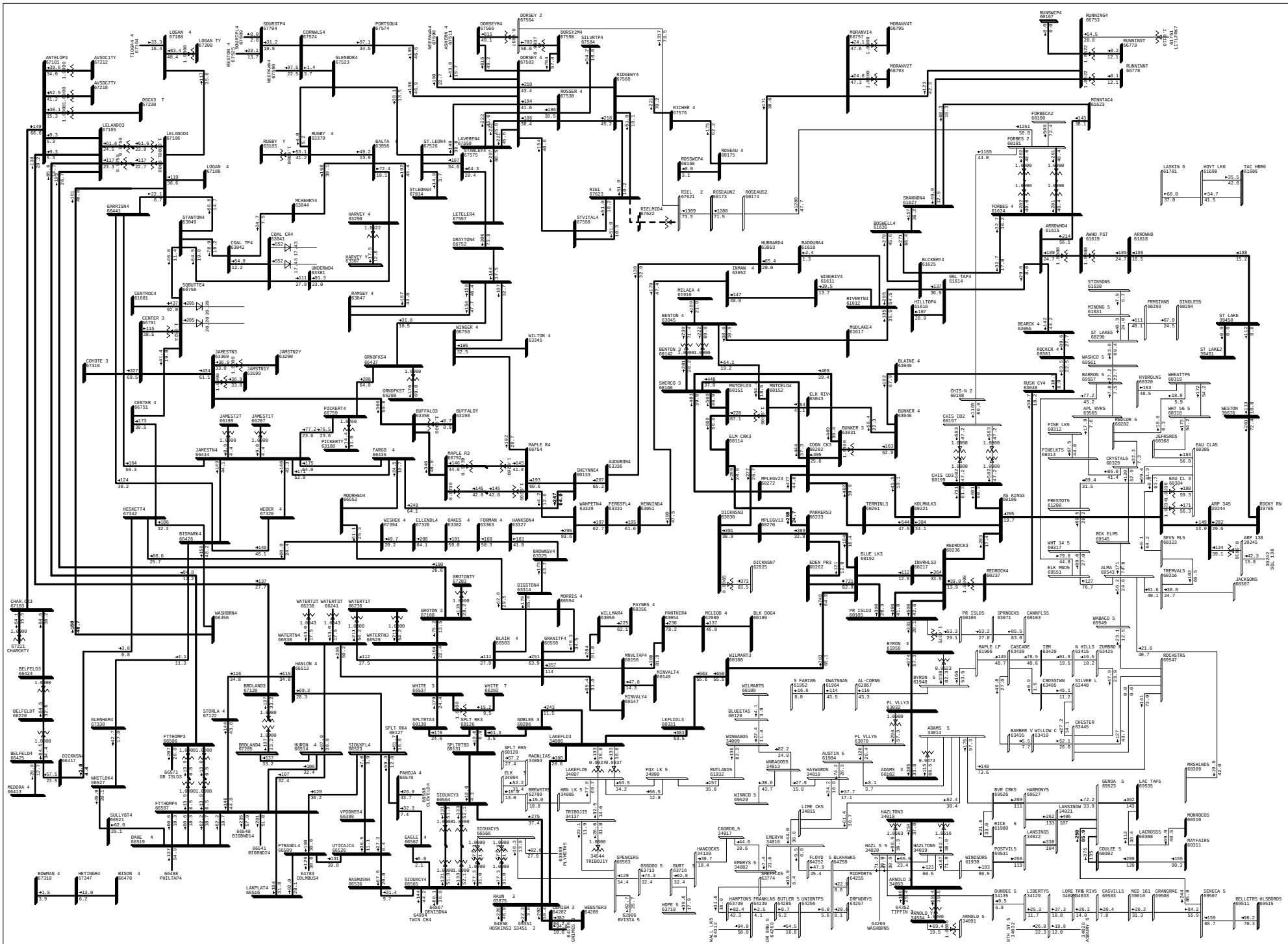


2004 MAPP SERIES FINAL 2009 SUMMER PEAK : CAPX 6300 SCEN 10
 F-09SUPK.SAV /BUSES = 21866 BRANCHES = 33100/ 100% OF PEAK
 CAPX 2009 TUE, MAY 10 2005 11:28

100% RATEA
 0.920 UV 1.050 OV
 KV: ±161, ±230, ±345

BUS - NONE
 BRANCH - MW/% OF RATEA
 EQUIPMENT - MW/MVAR





**Eastern Bias
4500 MW Scenario**

scenario1a_4500.sa scenario1b_4500.sa scenario1c_4500.sa scenario2_4500.sav- scenario3_4500.sav- scenario4_4500.sav- scenario5_4500.sav- scenario6_4500.sav- scenario7_4500.sav- scenario10_4500.sa scenario11_4500.sa scenario12_4500

CIRCUIT FROM: CIRCUIT TO: CKT		RATEA	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	OVRLD	CURRENT	CONTINGENCY	SWITCH		
#	NAME	#	NAME	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	MVA	%	FROM	TO	CKT		
34000	LANS3 345 34021 LANSINGW 161 X1	300													28.1	84.32	37.1	111.2	176.1	528.37	176.1	528.35	28.2	84.7	176.1	528.36	176.1	528.35	SYSTEM INTACT			
															176	528.01	176	528.01					104.6	313.72								
															176.8	530.27	176.7	530.22					176.7	530.25	176.7	530.22			34000 LANS3 345 63446 ROCHSTR3 345 X1			
															176.6	529.67	176.5	529.64					176.6	529.66	176.5	529.64			34000 LANS3 345 69600 GENOA 3 345 X1			
															179.4	538.26	179.4	538.19					179.4	538.19	179.3	537.94			34014 ADAMS 5 161 69526 BVR CRK5 161 1			
															186.2	558.7	186.2	558.45					186.2	558.53	186.2	558.45			34019 HAZLTON5 161 61930 WINDSOR5 161 1			
															178.1	534.21	178.1	534.17					178.1	534.19	178	534.12			34021 LANSINGW 161 34022 LANSINGS 161 1			
															176.6	529.87	176.6	529.85					176.6	529.86	176.6	529.81			34021 LANSINGW 161 69523 GENOA 5 161 1			
															177.3	532.03	177.4	532.05					177.4	532.06	177.3	532.02			34022 LANSINGS 161 34023 LANSINGB69.0 1			
															176.9	530.58	176.8	530.53					176.9	530.56	176.8	530.55			60302 COULEE 5 161 69523 GENOA 5 161 1			
															176.4	529.29	176.4	529.23					176.4	529.27	176.4	529.22			60309 MRSHLND5 161 69502 N LACRS5 161 1			
															176.7	529.99	176.6	529.9					176.7	529.97	176.6	529.89			60309 MRSHLND5 161 69543 ALMA 5 161 1			
															177.2	531.7	177.2	531.67					177.2	531.69	177.2	531.66			61930 WINDSOR5 161 69531 POSTVIL5 161 1			
															176.8	530.52	176.9	530.66					176.9	530.64	176.9	530.68			69501 N LACRS3 345 69600 GENOA 3 345 X1			
															176.9	530.57	176.8	530.54					176.9	530.57	176.8	530.52			69507 SENECA 5 161 69523 GENOA 5 161 1			
															176.7	530.21	176.7	530.08					176.7	530.17	176.7	530.03			69523 GENOA 5 161 69600 GENOA 3 345 X1			
															177.3	531.85	177.3	531.79					177.3	531.83	177.3	531.8			69526 BVR CRK5 161 69527 HARMONY5 161 1			
34005	HRN LK 5 161 34007 LAKEFLD5 161 1	112	72.3	80.94	70.3	78.77	70	78.41	66.3	74.3	66.2	74.19	65.7	73.64	66.1	73.99	65.8	73.68	69.6	77.94	66.7	74.68	66.7	74.71	68.7	76.99	SYSTEM INTACT					
			108.8	121.89	109	122.06	109	122.09	109.3	122.4	109.3	122.42	109.4	122.52	109.3	122.46	109.4	122.56	109.2	122.27	109.3	122.37	109.3	122.46	109.2	122.31	34003 MAGNLIAS 161 34004 ELK 5 161 1					
			115.2	129	115.2	129.04	115.2	129.04	115.4	129.21	115.4	129.2	115.4	129.21	115.4	129.22	115.4	129.25	115.3	129.17	115.3	129.18	115.4	129.17	115.2	129.05	34003 MAGNLIAS 161 60128 SPLT RK5 161 1					
			114.1	127.82	114.2	127.87	114.2	127.87	114.3	128.03	114.3	128.03	114.3	128.04	114.3	128.05	114.3	128.06	114.1	127.79	114.3	128	114.2	127.92	114.2	127.87	60128 SPLT RK5 161 60129 SPLT RK7 115 6					
34009	WINBAGOS 161 61932 RUTLANDS 161 1	167	68.4	114.26	71	118.63	71.5	119.36	76.3	127.38	76.6	127.99	78.8	131.56	77.6	129.52	75.3	125.72	70.4	117.49	74.1	123.73	74	123.73	113.1	119	SYSTEM INTACT					
			116.1	193.8	122.3	204.24	124.2	207.38	138.1	230.56	139.5	232.98	143.3	239.35	141.4	236.16	143.4	239.47	127.5	213	137	228.86	138.2	230.85	130.9	218.68	60108 WILMART3 345 60331 LKFLD3 345 1					
34014	ADAMS 5 161 60102 ADAMS 3 345 9	300			54.3	162.92	54.2	162.75	53.3	159.98	53.9	161.76	54.8	164.51	52.5	157.43	43.7	131.11	44.8	134.48			43.9	131.83	44.5	133.36	SYSTEM INTACT					
					95.8	287.27	96.3	288.82	98.8	296.27	101	302.97	108.1	324.29	105	314.86	107.6	322.87	102.8	308.55			106.2	318.57	102.5	307.61	61950 BYRON 3 345 63032 PL VLLY3 345 1					
34014	ADAMS 5 161 69547 ROCHSTR5 161 1	201											44.2	88.89	43.8	87.94	58.7	118.05	56.6	113.79			58	116.58	56.4	113.27	SYSTEM INTACT					
													101.6	204.25	100.8	202.6	101.6	204.26	100.8	202.6			101.2	203.36	100.1	201.13	61906 MAPLE LF 161 61948 BYRON 5 161 1					
													96.9	193.98	96.2	193.3	96.9	193.98	96.4	191.83			96.5	193.98	95.4	191.83	61906 MAPLE LF 161 63430 CASCADE 161 1					
													108.7	218.43	107.4	215.87	125.4	252	123.9	249.11			124.7	250.71	123.2	247.71	61948 BYRON 5 161 61950 BYRON 3 345 1					
													106.3	213.6	105	210.99	139.5	280.49	130.7	262.79			136.3	273.98	130.8	262.81	61950 BYRON 3 345 63032 PL VLLY3 345 1					
34018	HAZLTON3 345 34019 HAZLTON5 161 1	224	51.5	115.41	51.2	114.74	51.2	114.61			51.5	115.27															SYSTEM INTACT					
			96.2	215.4	95.6	214.17	95.5	213.93			96.1	215.25															34018 HAZLTON3 345 34020 HAZL 5 5 161 2					
34021	LANSINGW 161 34022 LANSINGS 161 1	336																	73.7	247.7			74	248.66	74.7	250.88	SYSTEM INTACT					
																											34014 ADAMS 5 161 60102 ADAMS 3 345 9					
																			127.1	426.9	127.6	428.61			127.2	427.47	34018 HAZLTON3 345 34093 ARNOLD 3 345 1					
																											34021 LANSINGW 161 69523 GENOA 5 161 1					
																											34021 LANSINGW 161 69527 HARMONY5 161 1					
34021	LANSINGW 161 69523 GENOA 5 161 1	223											59.7	133.11	60.8	135.48	145.8	325.21	145.3	323.91			58	129.26	145.6	324.66	145	323.3	SYSTEM INTACT			
													170.6	380.47	168	374.66											34000 LANS3 345 69600 GENOA 3 345 X1					
													152	338.93					151.3	337.45			151.7	338.32	151.1	336.89	34014 ADAMS 5 161 69526 BVR CRK5 161 1					
													166.4	371.02					166.1	370.51			166	370.11	166	370.11	34019 HAZLTON5 161 61930 WINDSOR5 161 1					
													222.5	496.19					222.4	496.37			222.4	496.04	222.4	496.04	34021 LANSINGW 161 34022 LANSINGS 161 1					
													210.8	470.1					209.9	467.99			210.4	469.27	209.5	467.28	34021 LANSINGW 161 69527 HARMONY5 161 1					
													158.3	353.03					157.8	351.9			158.1	352.54	157.5	351.3	34022 LANSINGS 161 34023 LANSINGB69.0 1					
													188.8	420.92					188.6	420.68			188.7	420.85	188.5	420.32	34022 LANSINGS 161 69531 POSTVIL5 161 1					
													150	334.48					148.8	331.84			149.5	333.46	148.5	331.23	60102 ADAMS 3 345 63032 PL VLLY3 345 1					
													149.3	332.88					148	329.96			148.8	331.78	147.7	329.47	60105 PR ISLD3 345 61950 BYRON 3 345 1					
													149.9	334.2					148.4	331.01			149.3	332.88	148.4	330.93	60108 WILMART3 345 60192 BLUE LK3 345 1					
													149.3	332.88					148.9	332.12			149.1	332.53	148.7	331.61	60186 AS KING3 345 60304 EAU CL 3 345 1					
													174.6	389.38					174.4	388.87			174.5	389.13	174.2	388.47	61930 WINDSOR5 161 69531 POSTVIL5 161 1					
													149.3	332.89					148.7	331.65			149	332.34	148.4	330.94	61948 BYRON 5 161 61950 BYRON 3 345 1					
													158.2	352.86					156.6	349.21			157.6	351.35	156.4	348.67	61950 BYRON 3 345 63032 PL VLLY3 345 1					
													174.6	389.26					173.9	387.77			174.3	388.62	173.6	387.1	69523 GENOA 5 161 69600 GENOA 3 345 X1					

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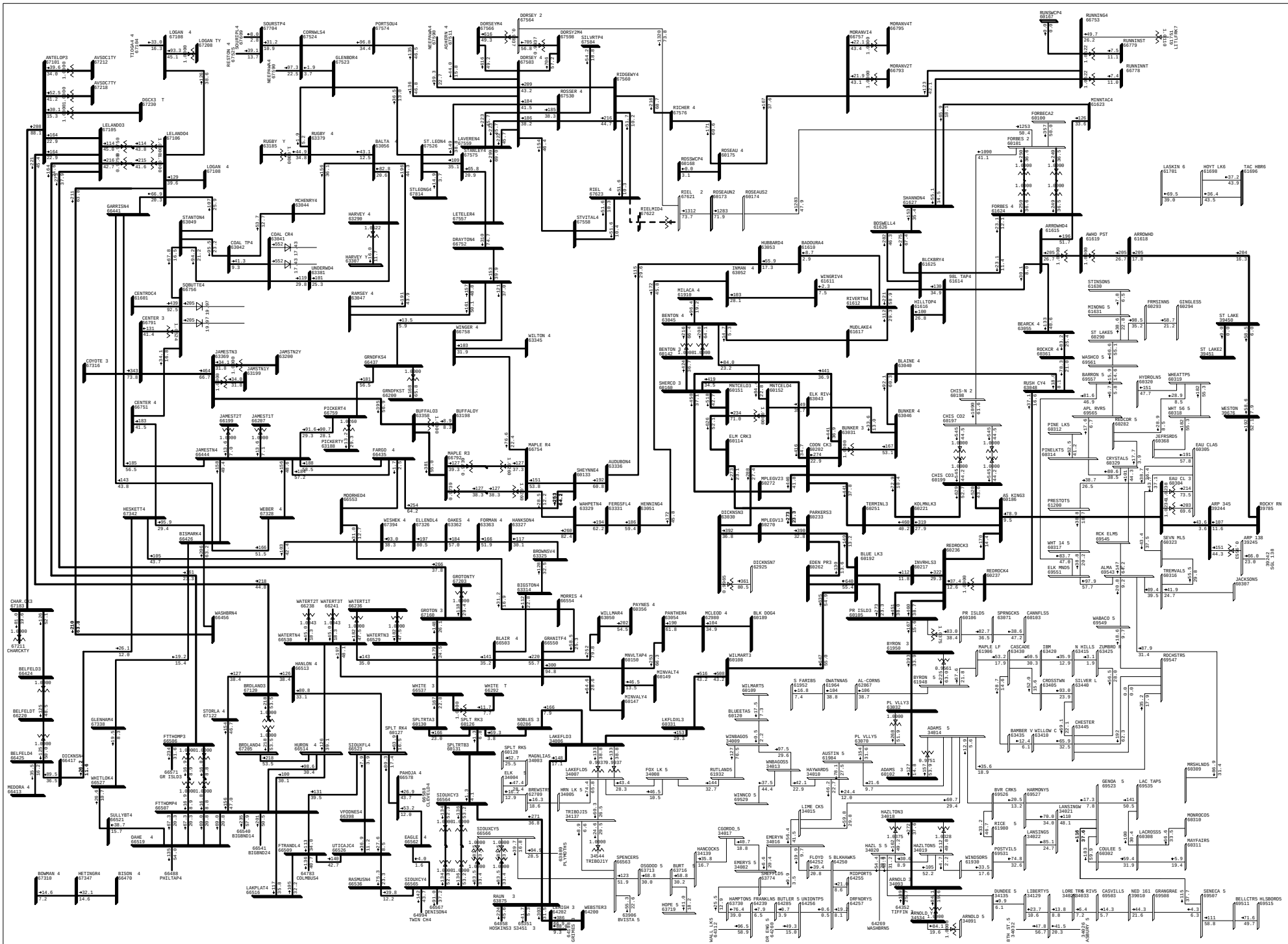
60136 MAPLE R7 115 66754 MAPLE R4 230 5	187	68.2 127.58 109.3 204.48		66 123.44 98.7 184.57	71.2 133.13 102.3 191.35	71.2 133.15 102.3 191.39	71.2 133.21 102.4 191.48	71.2 133.15 102.4 191.4	72.4 135.41 102.9 192.49	70.8 132.31 100.7 188.34	72.3 135.28 102.8 192.17	70 130.84 101.33 SHEYNEE4 230 66754 MAPLE R4 230 1			
60140 MCHENRY7 115 63044 MCHENRY4 230 1	84	54.4 45.68 102.2 85.86	46.5 39.03 100.3 84.29	46.9 39.35 101.4 85.15	46.3 38.9 103.2 86.66	46.3 38.85 103.2 86.69	46.2 38.78 103.2 86.68	46.3 38.91 102.2 86.65	45.7 38.4 103.4 86.84	46.3 38.91 101.6 85.35	46.1 38.75 103.3 86.75	45.2 37.99 101.8 85.51	53.2 44.65 103.5 86.97	SYSTEM INTACT 63004 MCHENRY4 230 63056 BALTA 4 230 1	
60142 BENTON 3 345 63045 BENTON 4 230 1	336	68.7 230.68 105.5 354.5	67.4 226.31 103.4 347.5	70 235.3 109.4 367.65	66.4 223.21 103.8 348.67	66.4 223.04 103.7 348.41	66.2 222.32 103.4 347.31	66.4 223.09 103.7 348.49	66 221.78 103.3 346.96	69.9 234.82 109.2 366.79	66.8 224.54 104.4 350.75	66.4 223.06 102.1 342.97	67.7 227.4 104 349.59	SYSTEM INTACT 60142 BENTON 3 345 63045 BENTON 4 230 1	
60142 BENTON 3 345 63045 BENTON 4 230 2	336	66.3 222.84 103.9 349.07	65.1 218.62 101.8 342.17	67.7 227.3 107.8 362.33	64.2 215.63 102.3 343.66	64.1 215.46 102.2 343.41	63.9 214.77 101.9 342.32	64.1 215.51 102.2 343.48	63.8 214.25 101.8 341.97	67.5 226.84 107.6 361.49	64.6 216.91 102.9 345.71	64.1 215.48 100.5 337.73	65.4 219.67 102.5 344.24	SYSTEM INTACT 60142 BENTON 3 345 63045 BENTON 4 230 1	
60143 BENTON 7 115 63045 BENTON 4 230 P5	336	56.3 189.25 101.1 339.85	55.8 187.65 100.1 336.42	58 194.98 104 351.41	56.4 189.54 101.6 341.24	56.4 189.44 101.6 341.27	56.4 189.34 101.5 341.11	56.4 189.52 101.7 341.68	56 188.13 101.2 339.94	57.8 194.29 104.2 350.26	56.4 189.47 101.6 341.32	54.6 183.35 98.2 329.85	55 184.31 98.9 332.33	SYSTEM INTACT 60143 BENTON 7 115 63045 BENTON 4 230 P6	
60143 BENTON 7 115 63045 BENTON 4 230 P6	336	56.3 189.25 101.1 339.85	55.8 187.65 100.1 336.42	58 194.98 104 351.41	56.4 189.54 101.6 341.24	56.4 189.44 101.6 341.27	56.4 189.34 101.5 341.11	56.4 189.52 101.7 341.68	56 188.13 101.2 339.94	57.8 194.29 104.2 350.26	56.4 189.47 101.6 341.32	54.6 183.35 98.2 329.85	55 184.31 98.9 332.33	SYSTEM INTACT 60143 BENTON 7 115 63045 BENTON 4 230 P5	
60150 MNVLTAP4 230 66550 GRANITF4 230 1	318	78.4 249.27	79.4 252.56	79.5 252.83	94.6 300.97 112.9 358.91 102.6 326.22 107.5 341.74 99.4 316.15 99.4 316.15 103.8 329.96 103.8 329.99 113.1 359.63	94.8 301.61 113.3 360.35 103.1 327.91 108 343.54 99.6 316.67 99.6 316.67 104 330.6 104.7 330.06 113.4 360.56	95.6 303.96 114.3 363.51 104.4 331.86 109.4 347.81 100.3 318.88 100.3 318.88 104.1 331.08 104.1 331.12 113.6 361.12	95 302.02 113.9 362.21 103.8 309.09 108.7 355.12 111.6 359.08 99.7 317.13 101.1 321.46 101.1 321.46 105.8 336.29 105.8 336.33 115.7 368.02	96.3 306.1 116.8 371.57 106.7 339.12 111.6 359.08 101.1 321.46 101.1 321.46 105.8 336.29 105.8 336.33 115.7 368.02	80.8 256.81 94.4 300.04 113.7 361.43 108.4 344.62 103.1 327.93 107.2 342.85 99 314.91 99 314.92 103.4 328.91 103.4 328.95 113 359.24	94.4 300.04 108.4 344.62 103.1 327.93 106.6 339.12 99 314.91 99 314.92 102.9 327.38 103 327.4 111.5 354.48	92.9 295.39 107.3 341.26 99.6 316.8 104.5 332.33 96.8 307.85	60101 FORBES 2 500 60198 CHIS-N 2 500 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60108 WILMART3 345 60331 LKFLDXL3 345 1 60126 SPLT RK3 345 60130 SPLTRTA3 345 1 60130 SPLTRTA3 345 66537 WHITE 3 345 1 60147 MINVAL Y4 230 60148 MINVALY7 115 P5 60147 MINVAL Y4 230 66550 GRANITF4 230 1 60156 PYNSVL7 115 60356 PAYNES 4 230 1 60192 BLUE LK3 345 99991 BIGSTONE 345 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 60356 PAYNES 4 230 63050 WILLMAR4 230 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 63050 WILLMAR4 230 66550 GRANITF4 230 1 63051 HENNING4 230 63052 INMAN 4 230 1 63051 HENNING4 230 63331 FERGSFL4 230 1 63314 BIGSTON4 230 63325 BROWNSV4 230 1 63325 BROWNSV4 230 63327 HANKSON4 230 1 63327 HANKSON4 230 63329 WAHPETN4 230 1 66554 MORRIS 4 230 66555 MORRIS 7 115 1 66792 MAPLE R3 345 67010 AlexSS 345 1	SW500	
				95.8 304.57	112.8 358.84 113.1 359.68	113.3 360.29 113.4 360.62	114.3 363.44 114.2 363.31	113.9 362.16 113.6 361.18	116.9 371.77 115.8 368.13 102.3 325.44	95.5 303.8 95.4 309.66 101.8 323.6	113.6 361.36 113 359.33	108.3 344.41 111.5 354.49 98.7 313.97	107.3 341.2 99.7 348.73 97.6 310.35	60197 CHIS CO2 500 60198 CHIS-N 2 500 1 63056 PAYNES 4 230 63050 WILLMAR4 230 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 63050 WILLMAR4 230 66550 GRANITF4 230 1 63051 HENNING4 230 63052 INMAN 4 230 1 63051 HENNING4 230 63331 FERGSFL4 230 1 63314 BIGSTON4 230 63325 BROWNSV4 230 1 63325 BROWNSV4 230 63327 HANKSON4 230 1 63327 HANKSON4 230 63329 WAHPETN4 230 1 66554 MORRIS 4 230 66555 MORRIS 7 115 1 66792 MAPLE R3 345 67010 AlexSS 345 1	SW500
	97.1 308.78	98.8 314.04	100.1 318.27	119.3 379.36	98.9 314.35 98.8 314.14	99.1 315.12 99 314.82	99.9 317.6 99.7 317.19	99.2 315.61 99.1 315.21	101.1 321.61	101.8 323.6	119.2 378.92 98.2 312.42	102.9 327.38 103 327.4 111.5 354.48	101.8 323.84 101.8 323.86 97.6 310.35	60147 MINVAL Y4 230 60148 MINVALY7 115 P5 60147 MINVAL Y4 230 66550 GRANITF4 230 1 60156 PYNSVL7 115 60356 PAYNES 4 230 1 60192 BLUE LK3 345 99991 BIGSTONE 345 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1 63056 PAYNES 4 230 63050 WILLMAR4 230 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 63050 WILLMAR4 230 66550 GRANITF4 230 1 63051 HENNING4 230 63052 INMAN 4 230 1 63051 HENNING4 230 63331 FERGSFL4 230 1 63314 BIGSTON4 230 63325 BROWNSV4 230 1 63325 BROWNSV4 230 63327 HANKSON4 230 1 63327 HANKSON4 230 63329 WAHPETN4 230 1 66554 MORRIS 4 230 66555 MORRIS 7 115 1 66792 MAPLE R3 345 67010 AlexSS 345 1	
60151 MNTCELO3 345 60152 MNTCELO4 230 6	336	70.6 237.19 110.5 371.38	72.3 243.02 113.3 400.81	73.9 248.45 132.1 443.96	71 238.62 126.7 425.62	71 238.55 126.6 425.42	70.7 237.55 126.1 423.83	70.8 238.04 126.5 424.96	70.9 238.2 126.3 424.46	74 248.66 132 243.49	71.6 240.54 127.6 428.58	69.2 232.52 110.6 371.5	72.5 226.65 101.6 341.28	SYSTEM INTACT 60142 BENTON 3 345 60160 SHERCO 3 345 1	
60151 MNTCELO3 345 60153 MNTCELO7 115 10	336	74.8 251.18 95.2 319.95 99.9 335.79	73.3 249.79 95.6 321.12 99.6 334.52	75.5 253.68 96.6 321.12 101.9 342.26	74.3 249.75 95.6 321.12 100 335.87	74.3 249.66 95.6 321.12 99.9 335.73	74.4 249.82 95.9 322.35 100 335.91	74.4 250.13 96.1 322.74 100.1 336.36	74 248.58 95.2 320 99.6 334.73	73.3 253.01 95.3 319.54 101.6 341.31	74.3 249.49 95.2 319.94 99.9 335.58	73.4 248.78 95.2 319.94 98.8 332.13	73.9 248.19 96 322.61 99.2 332.61	SYSTEM INTACT 60114 ELM CRK3 345 60151 MNTCELO3 345 1 62925 DICKNSN7 115 63030 DICKNSN3 345 1	
60152 MNTCELO4 230 63045 BENTON 4 230 1	383.2			26.2 100.31 96.4 369.58						26 99.74 96 368.03				SYSTEM INTACT 60142 BENTON 3 345 60160 SHERCO 3 345 1	
60202 COON CK3 345 61487 CNCMDI2Y 110 10	672	67.5 453.27 102.7 690.23	67.1 450.6 102.1 696.17	67.1 450.68 102.1 696.38	67.7 455.24 103.2 693.36	67.7 455.15 103.2 693.22	68 457.13 103.6 696.17	68.1 457.46 103.7 696.75	67.7 454.83 103.1 692.78	67 450.28 102.8 690.59	67.5 453.39 103.4 690.61	67.9 456.07 103.4 690.43	68.3 458.89 104 690.89	SYSTEM INTACT 60202 COON CK3 345 61488 CNCMDIY 110 9	
60202 COON CK3 345 61488 CNCMDIY 110 9	672	68.1 457.6 103.2 693.4	67.7 454.9 102.6 689.31	67.7 454.98 102.6 689.53	68.4 459.5 103.7 696.53	68.4 459.5 103.6 696.4	68.7 461.15 104.1 699.36	68.7 461.82 104.2 699.94	68.3 459.17 103.6 695.92	67.6 454.58 102.5 688.98	68.1 457.72 103.2 693.75	68.5 460.43 103.8 697.79	69 462.87 104.5 702.09	SYSTEM INTACT 60202 COON CK3 345 61487 CNCMDI2Y 110 10	
60233 PARKERS3 345 61489 PKLMDI2Y 110 10	450	78.9 356.04 115.7 520.76	79.2 356.32 116.1 522.47	79.3 356.96 116.3 523.57	77.1 347.07 113.1 509.09	77.1 347.07 113.2 509.22	76.7 345.3 112.6 506.21	76.7 345.3 112.6 506.21	77.3 349.47 113.4 510.26	76.8 356.06 116.7 522.22	77.7 349.49 114 512.79	77.1 347.07 113.2 509.25	76.8 356.06 112.7 507.3	60233 PARKERS3 345 61489 PKLMDIY 110 9	
60233 PARKERS3 345 61490 PKLMDIY 110 9	450	78.2 352.03 115.2 518.41	78.5 353.3 115.6 520.11	78.7 353.93 115.8 521.2	76.5 344.04 112.6 506.79	76.5 344.13 112.7 506.93	76.1 342.97 112.5 504.19	76 342.07 112 503.93	76.6 349 112.9 509.96	76.8 356.02 116.2 522.85	77 346.53 113.4 510.48	76.5 344.12 112.7 506.96	76.2 347.02 112.2 505.01	60233 PARKERS3 345 61490 PKLMDIY 110 9	
60236 REDROCK3 345 60238 REDROCK7 115 10	448	74.5 333.69 116.3 520.94	74.9 335.48 116.9 523.75	75 335.93 117.1 524.47	74.3 332.94 116 519.79	74.3 332.94 116 519.89	73.2 328.21 114.4 512.68	73.2 327.76 114.3 512.07	74.8 334.93 116.8 523.4	75.6 339.73 118.2 529.35	76.6 343.78 119.6 535.82	74.6 334.74 116.6 522.31	74.2 332.74 116.1 519.96	SYSTEM INTACT 60236 REDROCK3 345 60238 REDROCK7 115 9	
60236 REDROCK3 345 60238 REDROCK7 115 9	448	86.2 385.99 96.1 430.75 102.6 459.75	86.6 388.07 96.6 432.63 103.1 461.83	86.7 388.93 96.7 433.19 103.2 462.49	86 395.13 96 429.97	86 395.13 96 430.03	84.7 379.85 101 452.48	84.6 379.13 100.9 451.96	86.5 379.83 102.8 460.65	91.5 391.82 104.1 466.35	88.6 396.85 105 402.79 97.6 437.3	86.3 396.63 102.6 459.85 97.6 437.3	85.9 384.9 96.2 430.94 102.3 458.11	60196 AS KING3 345 60187 AS KING7 115 1 60217 INVRHL3 345 60218 INVRHL3 115 9 60217 INVRHL3 345 60236 REDROCK3 345 1 60236 REDROCK3 345 60238 REDROCK7 115 10	
		125 559.87	125.6 562.89	125.8 563.66	124.7 558.63	124.7 558.73	123 550.92	122.8 550.26	125.5 562.42	127 568.81	128.5 575.82	125.3 561.26	124.7 558.73		
60251 TERMINL3 345 61491 TERMDI2Y 110 9	672	66.8 448.62 98.5 661.7	66.4 446.19 97.7 658.13	66.4 446.03 97.9 657.93	67 450.48 98.9 664.54	67 450.36 98.9 664.35	67.5 453.72 99.6 652.92	67.6 454.17 99.7 670.04	67 450.36 98.9 664.51	66.4 446.03 97.9 658.1	66.7 447.92 98.3 660.89	67.2 451.5 99.1 666.16	67.6 454.18 99.7 666.16	SYSTEM INTACT 60251 TERMINL3 345 61492 TERMDIY 110 10	
60251 TERMINL3 345 61492 TERMDIY 110 10	672	66.1 444.38 98 658.43	65.8 441.97 97.6 654.88	65.7 441.81 97.4 654.68	66.4 446.22 98.4 661.26	66.4 446.1 98.1 665.97	66.9 449.42 99.1 665.97	66.9 449.88 99.2 666.73	66.4 446.1 98.4 661.21	65.7 441.82 97.4 654.85	66 443.68 97.9 657.63	66.6 447.23 98.6 662.87	66.9 449.86 99.2 666.77	SYSTEM INTACT 60251 TERMINL3 345 61491 TERMDIY 110 9	
60262 EDEN PR3 345 60263 EDEN PR7 115 10	448	85.9 384.87 136.6 612.02	86 385.46 136.9 613.43	86.1 385.77 136.9 613.43	83.5 373.88 132.8 594.81	83.5 373.94 132.8 594.73	83.2 372.88 132.4 593.09	83.2 372.66 132.3 592.75	83.6 374.56 133 595.93	86.4 386.89 137.3 615.23	83.9 375.85 133.5 595.95	83.6 374.58 133 595.96	83.5 374 132.8 595.03	SYSTEM INTACT 60262 EDEN PR3 345 60263 EDEN PR7 115 9	
60262 EDEN PR3 345 60263 EDEN PR7 115 9	448	92.4 413.97	92.5 414.6	92.6 414.94	89.8 402.15	89.8 402.21	89.5 401.06	89.5 400.83	89.9 402.87	92.9 416.14 95 425.62	90.2 404.27	89.9 402.9	89.8 402.27	SYSTEM INTACT 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60114 ELM CRK3 345 60115 ELMCRK 7 115 9 60150 MNVLTAP4 230 63054 PANTHERA 230 1 60189 BLK DOG4 230 60190 BLK DOG7 115 5 60189 BLK DOG4 230 62980 MCLEOD 4 230 1 60192 BLUE LK3 345 60217 INVRHL3 345 1 60202 COON CK3 345 60300 DICKNSN3 345 1 60233 PARKERS3 345 61489 PKLMDI2Y 110 10 60233 PARKERS3 345 61490 PKLMDIY 110 9 60236 REDROCK3 345 60238 REDROCK7 115 9 60262 EDEN PR3 345 60263 EDEN PR7 115 10 62925 DICKNSN7 115 63030 DICKNSN3 345 1 62980 MCLEOD 4 230 63054 PANTHERA 230 1	SW500
		95.3 426.95 95.6 428.51	95.4 427.48 95.8 429.25	95.5 427.97 95.9 429.84						95.8 429.26 96.3 431.39 95.3 427.07 95.3 427.05 95.6 428.47 95.1 426.08	98.1 439.4	97.8 437.96	97.6 437.33		
		100.3 449.19 97.1 434.82 97 4													

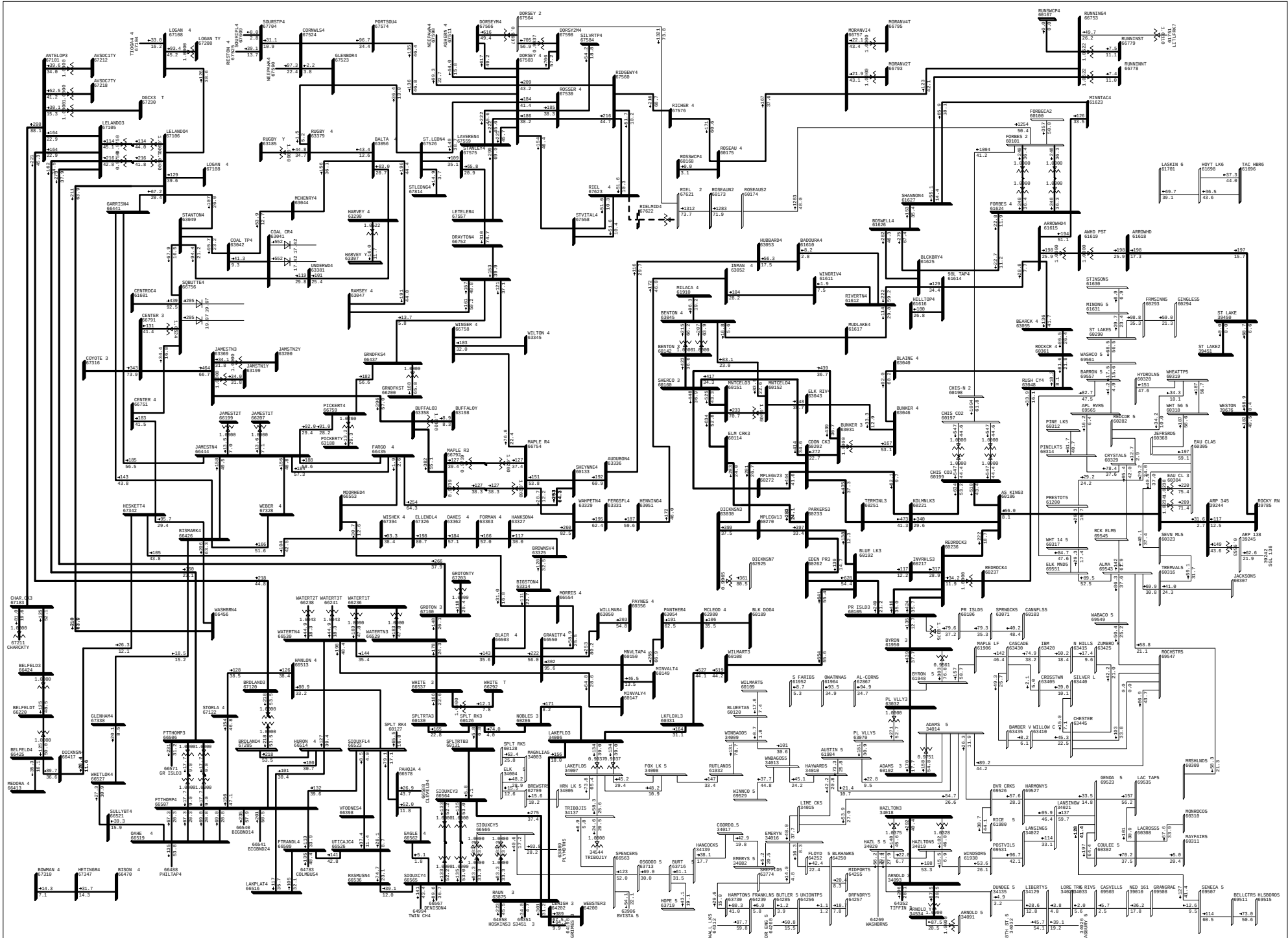
				122.9	147.45	122.7	147.23	124.6	149.5	131.3	157.56	132	158.37	134.3	161.13	132	158.41	137.4	164.93	129.8	155.71	134.1	160.9	132.5	159.04	132.6	159.08	60101 FORBES 2 500 60198 CHIS-N 2 500 1	SW500		
				122.8	147.37	122.8	147.33	124.6	149.55	131.2	157.46		131.9	158.31	134.2	161.04	131.9	158.31	137.5	165.05	129.6	155.58	133.9	160.73	132.3	158.74	132.5	159.02	60197 CHIS CO2 500 60198 CHIS-N 2 500 1	SW500	
60302 COULEE 5 161 60308 LACROSS5 161 1	195																39.3	76.63	94.6	184.51	93.6	182.48	69.9	136.31	94.2	183.67	93.2	181.74	SYSTEM INTACT 34000 LANSS3 345 63446 ROCHSTR3 345 X1 34014 ADAMS 5 161 69526 BVR CRKS 5 161 1 34019 HAZLTONS 161 61930 WINDSORS 161 1 34021 LANSINGW 161 34022 LANSINGS 5 161 1 34022 LANSINGS 161 69531 POSTVL5 161 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60302 COULEE 5 161 60967 COULEE 869 0 1 60302 COULEE 5 161 60967 COULEE 869 0 2 60308 LACROSS5 161 69535 LAC TAP5 161 1 60309 MRSHLND5 161 69543 ALMA 5 161 1 61930 WINDSORS 161 69531 POSTVL5 161 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 69501 N LACRS3 345 69600 GENOA 3 345 X1 69507 SENECA 5 161 69511 BELLCTRS 161 1 69507 SENECA 5 161 69523 GENOA 5 161 1 69511 BELLCTRS 161 69515 HLSBOROS 161 1 69523 GENOA 5 161 69535 LAC TAP5 161 1 69526 BVR CRKS 161 69527 HARMONY5 161 1		
60302 COULEE 5 161 69523 GENOA 5 161 1	304													64.5	195.08	66	200.59	110.1	334.75	109.3	324.13	90.1	274.03	108.9	331.31	109	331.31	SYSTEM INTACT 34000 LANSS3 345 63446 ROCHSTR3 345 X1 34014 ADAMS 5 161 69526 BVR CRKS 161 1 34019 HAZLTONS 161 61930 WINDSORS 161 1 34021 LANSINGW 161 34022 LANSINGS 5 161 1 34022 LANSINGS 161 69531 POSTVL5 161 1 60108 WILMART3 345 60192 BLUE LK3 345 1 60308 LACROSS5 161 69535 LAC TAP5 161 1 60309 MRSHLND5 161 69543 ALMA 5 161 1 61930 WINDSORS 161 69531 POSTVL5 161 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 68795 HILLSBORO6 0 69515 HLSBOROS 161 1 69501 N LACRS3 345 69600 GENOA 3 345 X1 69502 N LACRS5 161 69535 LAC TAP5 161 1 69507 SENECA 5 161 69511 BELLCTRS 161 1 69507 SENECA 5 161 69523 GENOA 5 161 1 69511 BELLCTRS 161 69515 HLSBOROS 161 1 69523 GENOA 5 161 69535 LAC TAP5 161 1 69526 BVR CRKS 161 69527 HARMONY5 161 1			
60304 EAU CL 3 345 60305 EAU CLA5 161 10	300	70.2	210.46	69.9	209.64	69.9	209.55	69.5	208.55	69.6	208.88	71.4	214.33	71.3	213.86														SYSTEM INTACT 60304 EAU CL 3 345 60305 EAU CLA5 161 9		
60304 EAU CL 3 345 60305 EAU CLA5 161 9	300	74	222.03	73.7	221.16	73.7	221.06	73.3	220	73.5	220.36	75.4	228.09	75.2	225.6														SYSTEM INTACT 60304 EAU CL 3 345 60305 EAU CLA5 161 10		
60308 LACROSS5 161 60311 MAYFAIRS 161 1	197																												SYSTEM INTACT 69502 N LACRS5 161 69535 LAC TAP5 161 1		
60309 MRSHLND5 161 69502 N LACRS5 161 1	162											60	97.18																SYSTEM INTACT 34021 LANSINGW 161 34022 LANSINGS 161 1 60304 EAU CL 3 345 69501 N LACRS3 345 1 60316 TREMVALS 161 69502 N LACRS5 161 1 61950 BYRON 3 345 63032 PL VLLY3 345 1 69507 SENECA 5 161 69523 GENOA 5 161 1 69526 BVR CRKS 161 69527 HARMONY5 161 1		
60311 MAYFAIRS 161 69502 N LACRS5 161 1	197																												SYSTEM INTACT 69502 N LACRS5 161 69535 LAC TAP5 161 1		
60316 TREMVALS 161 69502 N LACRS5 161 1	197											49.3	97.14																SYSTEM INTACT 60304 EAU CL 3 345 69501 N LACRS3 345 1 60309 MRSHLND5 161 69502 N LACRS5 161 1		
61550 FORB1JCT 230 61624 FORBES 4 230 1	672	36.2	243.28	37	248.33	37.6	252.57	36.5	245.55	36.5	245.44	36.3	243.8	36.6	246.22	37	248.67	38.2	256.89	37.8	253.89	36.7	246.45	36	241.64					SW500	
		95.7	643.23	96.1	645.79	97.4	654.46	99.3	667.61	99.4	668.1	99.4	667.9	99.5	668.41	99.9	671.51	98	658.89	99.7	670.25	97.7	656.48	97.2	653.47					SW500	
		95.7	643.12	96.1	645.84	97.4	654.32	99.3	667.46	99.4	667.95	99.4	667.75	99.4	668.26	99.9	671.17	98	658.76	99.7	670.1	97.7	656.35	97.2	653.3						
61552 FORB2JCT 230 61624 FORBES 4 230 1	672	36.3	244.09	37.1	249.16	37.7	253.41	36.7	246.37	36.6	246.26	36.4	244.62	36.8	247.04	37.1	249.5	38.4	257.74	37.9	254.74	36.8	247.27	36.1	242.45					SW500	
		96	645.38	96.4	647.95	97.7	656.64	99.7	669.83	99.8	670.33	99.7	670.13	99.8	670.64	100.3	673.75	98.4	661.09	98	658.67	98	658.67	97.6	655.65					SW500	
		96	645.26	96.4	647.99	97.7	656.5	99.7	669.68	99.7	670.18	99.7	669.98	99.8	670.49	100.2	673.41	98.4	660.96	100	672.33	98	658.53	97.5	655.48					SW500	
61612 RIVERTN4 230 61625 BLCKBRY4 230 1	378	57	217.19	60.9	230.28	63.2	238.82	59.2	223.6	59.1	223.27	59.4	224.35	59.4	224.53	57.9	218.78	62	234.45	57.9	218.89	56.6	214.01	53	200.17					SW500	
		118.6	448.26	121.6	459.8	123	465.13	121.6	459.72	121.6	459.62	121.8	460.56	121.8	460.51	121.9	460.88	122.7	463.66	120.5	455.54	120.5	455.6	117.2	442.88					SW500	
		118.6	448.3	121.8	460.39	123	465.1	121.6	459.67	121.6	459.58	121.8	460.51	121.8	460.47	121.8	460.88	122.6	463.61	120.5	455.48	120.4	455.15	117.2	442.97					SW500	
61615 ARROWHD4 230 61624 FORBES 4 230 1	370	51.3	189.69	51.1	189.06	51.4	190.23	51.7	191.26	51.7	191.33	51.1	189.06	51.8	191.54	53.3	197.25	53.3	191.56	54.8	202.67	53	195.94	53.3	197.14					SW500	
		134.3	267.28	136.6	271.92	138.8	276.22	140.3	279.2	140.4	279.48	140.5	279.55	140.5	279.55	145.8	539.73	140.4	519.51	145.9	539.73	140.9	521.32	141.5	523.68					SW500	
		134.3	267.32	136.8	272.21	138.8	276.15	140.3	279.14	140.4	279.38	140.4	279.49	140.4	279.49	141.1	280.85	139.4	277.46	140.2	279.07	138	274.65	135.5	269.6					SW500	
61625 BLCKBRY4 230 61626 BOSWELL4 230 2	399	67.1	267.57	67.4	268.87	67.6	269.86	67.4	268.8	67.4	268.78	67.4	268.74	67.4	268.9	67.4	268.82	67.7	269.97	67.4	269.12	67.2	268.09	66.8	266.72					SW500	
																													SYSTEM INTACT 60101 FORBES 2 500 60198 CHIS-N 2 500 1 60197 CHIS CO2 500 60198 CHIS-N 2 500 1		
61624 FORBES 4 230 61625 BLCKBRY4 230 1	199	11.5	22.98	14.6	28.98	16.4	32.56	12.2	24.31	12.1	24.15	11.9	23.78	12.5	24.87	12.1	24.01	16.5	32.92	13.2	26.26	11.6	23.04	8.7	17.31					SW500	
		134.3	267.28	136.6	271.92	138.8	276.22	140.3	279.2	140.4	279.48	140.5	279.55	140.5	279.55	141.2	281.04	139.5	277.53	140.3	279.07	138.1	274.81	135.5	269.65					SW500	
		134.3	267.32	136.8	272.21	138.8	276.15	140.3	279.14	140.4	279.38	140.4	279.49	140.4	279.49	141.1	280.85	139.4	277.46	140.2	279.07	138	274.65	135.5	269.6					SW500	
61625 BLCKBRY4 230 61626 BOSWELL4 230 2	399	67.1	267.57	67.4	268.87	67.6	269.86	67.4	268.8	67.4	268.78	67.4	268.74	67.4	268.9	67.4	268.82	67.7	269.97	67.4	269.12	67.2	268.09	66.8	266.72					SW500	

			122.5	488.71	123.1	491.09	123.6	492.99	123	490.59	122.9	490.56	123	490.96	123	490.77	123	490.63	123.6	493.21	123.2	491.66	122.7	489.68	122.1	487.16	61625	BLCKBRY4	230	61626	BOSWELL4	230	1								
61930	WINDSOR5	161	69531	POSTVIL5	161	1	224										67.8	151.86	68.7	153.85		68.1	152.61	68.9	154.34																
																	118.6	265.56	119.2	266.95		118.8	266.02	119.3	267.24																
62925	DICKNSN7	115	63030	DICKNSN3	345	1	448	82.5	369.55	82.6	370.21	83.2	372.84	80.8	361.9	80.7	361.69	80.7	361.71	80.9	362.39	80.3	359.74	82.9	371.54	80.8	361.8														
								97.6	437.46	97.6	437.32	98.6	441.66	95.9	429.54	95.8	429.31	95.8	429.39	96	430.16	95.4	427.45	98.3	440.17	95.8	429.36														
								99.3	444.67	99.8	447.11	100.4	449.7	97.2	435.32	96.7	433.83	96.8	433.83	97	434.34	100.4	449.58	97.6	437.44	96.4	432.07	95.9	429.64								SW402				
								102.3	458.31	102	457.07	102.5	459.27	101.6	455.12	101.5	454.84	101.9	456.61	102.1	457.51	101	452.55	102.1	457.35	101.1	453.05	100.9	451.97	101.2	453.4						SW402				
								102.4	458.82	102.1	457.58	102.6	459.77	101.7	455.6	101.6	455.32	102	457.09	102.2	457.99	101.1	453.03	102.2	457.86	101.2	453.54	101	452.46	101.3	453.89						SW402				
63040	BLAINE	4	230	63046	BUNKER	4	230	1	159.3	62.8	100.02						60.2	95.9	60.6	96.57					62.8	100.02	64.3	102.47													
										95.5	152.12						95.2	151.69	95.2	151.7					95.7	152.5	97.1	154.61													
63050	WILLMAR4	230	66550	GRANITF4	230	1	319						79.8	254.66	80	255.12	80.3	256.11	79.9	254.8	81.1	258.82			79.9	254.93															
													96.4	307.52	96.6	308.26	97.1	309.85	96.6	308.19					96.6	308															
63187	WINGER	Y	230	63238	WINGER	7	115	1	140	64.1	89.67		64.1	89.67	65.8	92.16	65.9	92.22	65.9	92.31	65.8	92.16	66.2	92.68	64.3	90.08	65.9	92.29													
								98	137.19				99.9	139.88	103.4	144.81	103.4	144.77	103.5	144.96	103.3	144.68	104.2	145.88	100.5	140.77	103.6	145.08													
								98	137.19				99.9	139.88	103.4	144.81	103.4	144.77	103.5	144.96	103.3	144.68	104.2	145.88	100.5	140.77	103.6	145.08													
								97.8	136.93				99.8	139.78	103.3	144.61	103.4	144.73	103.5	144.94	103.3	144.64	104.2	145.87	100.5	140.7	103.5	144.89													
63187	WINGER	Y	230	66758	WINGER	4	230	1	140	64.1	89.67		64.1	89.67	65.8	92.16	65.9	92.22	65.9	92.31	65.8	92.16	66.2	92.68	64.3	90.08	65.9	92.29													
								98	137.19				99.9	139.88	103.4	144.81	103.4	144.77	103.5	144.96	103.3	144.68	104.2	145.88	100.5	140.77	103.6	145.08													
								98	137.19				99.9	139.88	103.4	144.81	103.4	144.77	103.5	144.96	103.3	144.68	104.2	145.88	100.5	140.77	103.6	145.08													
								97.8	136.93				99.8	139.78	103.3	144.61	103.4	144.73	103.5	144.94	103.3	144.64	104.2	145.87	100.5	140.7	103.5	144.89													
63195	BIGSTONY	230	63214	BIGSTON7	115	1	233	44.2	103.06	44.5	103.77	44.9	104.56	49.7	115.7	49.7	115.73	49.7	115.83	49.7	115.74	49.8	116.01	44.8	104.46	49.6	115.67	49.4	115.1	49.2	114.53										
								104.6	243.65	108.1	251.95	109.7	255.6	129.8	302.51	129.9	302.63	130	302.91	129.9	302.57	130.4	303.81	109.7	255.55	129.9	302.64	129.5	301.79	125.9	293.34										
63195	BIGSTONY	230	63314	BIGSTON4	230	1	233	44.2	103.05	44.5	103.76	44.9	104.55	49.7	115.69	49.7	115.72	49.7	115.82	49.7	115.73	49.8	116	44.8	104.45	49.6	115.66	49.4	115.09	49.2	114.52										
								104.6	243.64	108.1	251.95	109.7	255.59	129.8	302.5	129.9	302.62	130	302.9	129.9	302.56	130.4	303.81	109.7	255.54	129.9	302.63	129.5	301.78	125.9	293.33										
63216	ORTONVL7	115	63321	ORTNVLEY	230	1	125	94.7	118.32	92.9	116.12	92.9	116.11	93.5	116.87	93.5	116.86	93.5	116.88	93.5	116.9	93.6	116.94	92.8	115.96	93.4	116.78	93	116.31	94.9	118.57										
								96.5	120.57			95.5	119.36	96.6	120.78	96.6	120.79	96.6	120.79	96.6	120.79	96.5	120.69	95.5	119.43	96.5	120.67										SW500				
								96.1	120.16	95.5	119.36			95.7	119.61	95.7	119.6	95.7	119.63	95.7	119.64	95.6	119.5			95.6	119.53	95.7	119.62	95.6	120.69										
								96.5	120.57			95.5	119.36	96.6	120.78	96.6	120.77	96.6	120.79	96.6	120.78	96.5	120.68	95.5	119.43	96.5	120.67										SW500				
								95.4	119.28					96.6	120.78	96.6	120.77	96.6	120.79	96.6	120.78	96.5	120.68	95.5	119.43	96.5	120.67	165.1	206.37	165.6	208.2										
								159	198.8	157.7	197.15	158.2	197.72	165.9	207.36	165.9	207.37	166	207.46	165.9	207.42	166.1	207.67	158	197.48	165.8	207.24	165.6	208.18	63195	BIGSTONY	230	63214	BIGSTON7	115	1					
								159	198.78	157.7	197.15	158.2	197.7	165.9	207.34	165.9	207.35	166	207.44	165.9	207.42	166.1	207.65	158	197.46	165.8	207.22	165.1	206.35	166.5	208.18	63195	BIGSTONY	230	63314	BIGSTON4	230	1			
								102	124.35	98	122.51	97.8	122.21	97.5	121.84	97.5	121.83	97.7	122.1	97.5	121.86	97.5	121.94	97.7	122.07	97.4	121.76	97.1	121.41	98.8	123.56	63211	CANBY	7	115	63312	CANBY	Y4	230	1	
								102	127.47	99.9	124.85	99.9	124.82	104.7	130.93	104.7	130.93	104.8	130.99	104.8	130.99	104.7	130.85	99.7	124.58	104.6	130.79	103.9	129.94	106.2	132.72	63311	CANBY	4	230	63314	BIGSTON4	230	1		
								109.8	137.28	109.9	137.39	110.2	137.71	117.7	147.06	117.7	147.08	117.7	147.13	117.7	147.09	117.7	147.17	110.1	137.58	117.6	147.02	117.4	146.7	96.1	120.17	63314	BIGSTON4	230	66503	BLAIR	4	230	1		
								95.4	119.28					108.1	135.19	108.2	135.3	108.5	135.62	115.9	144.86	115.9	144.87	108.4	135.49	115.9	144.82	115.6	144.49	115.5	144.35	63320	ORTNVLE4	230	63337	JHNSNJ74	230	1			
								96.8	120.96	95.1	118.89	95.2	118.99	96	120.04	96	120.03	96.1	120.06	96.1	120.07	96	119.94	95.1	118.88	96	119.94	95.5	119.4	97.2	121.54	63337	JHNSNJ74	230	66554	MORRIS	4	230	1		
								98.4	123.03	95.5	119.4	95.4	119.19	97.8	122.25	97.8	122.24	97.8	122.29	97.8	122.31	96.7	122.06	95.2	118.94	97.7	122.08	96.9	121.07	99.9	124.85	66503	BLAIR	4	230	66550	GRANITF4	230	1		
								97.3	121.65	95.7	119.68	96.7	120.87	98	122.46	98	122.46	98	122.49	98	122.49	97.9	122.39	96.6	120.76	97.9	122.39	96.5	120.66	98.2	122.7	66550	GRANITF4	230	66554	MORRIS	4	230	1		
								97.7	121.65																			96	119.95	96	119.95	66792	MAPLE	R3	345	67010	AlexSS	345	1		
63311	CANBY	4	230	63312	CANBY	Y4	230	1	125	96.6	120.7	95.2	119.05	96	119.99	104.3	130.38	104.3	130.38	104.4	130.44	104.3	130.43	104.9	131.11	95.7	119.64	104.2	130.26	103.7	129.63	105.2	131.51								
								98.2	122.75	96.9	121.08	97.6	121.95	108.8	136.02	108.8	136.02	108.9	136.1	108.9	136.07	108.9	136.11	97.8	122.25	108.8	135.94	106.9	133.6	108.4	135.5	60101	FORBES	2	500	60198	CHIS-N	2	500	1	
								106.2	132.74	104.9	131.17	105.6	131.98	108.8	136.03	108.8	136.04	108.9	136.1	108.8	136.06	108.8	136.06	97.8	122.25	108.8	135.94	106.9	133.6	108.4	135.51	60192	BLUE	LK3	345	99991	BIG				

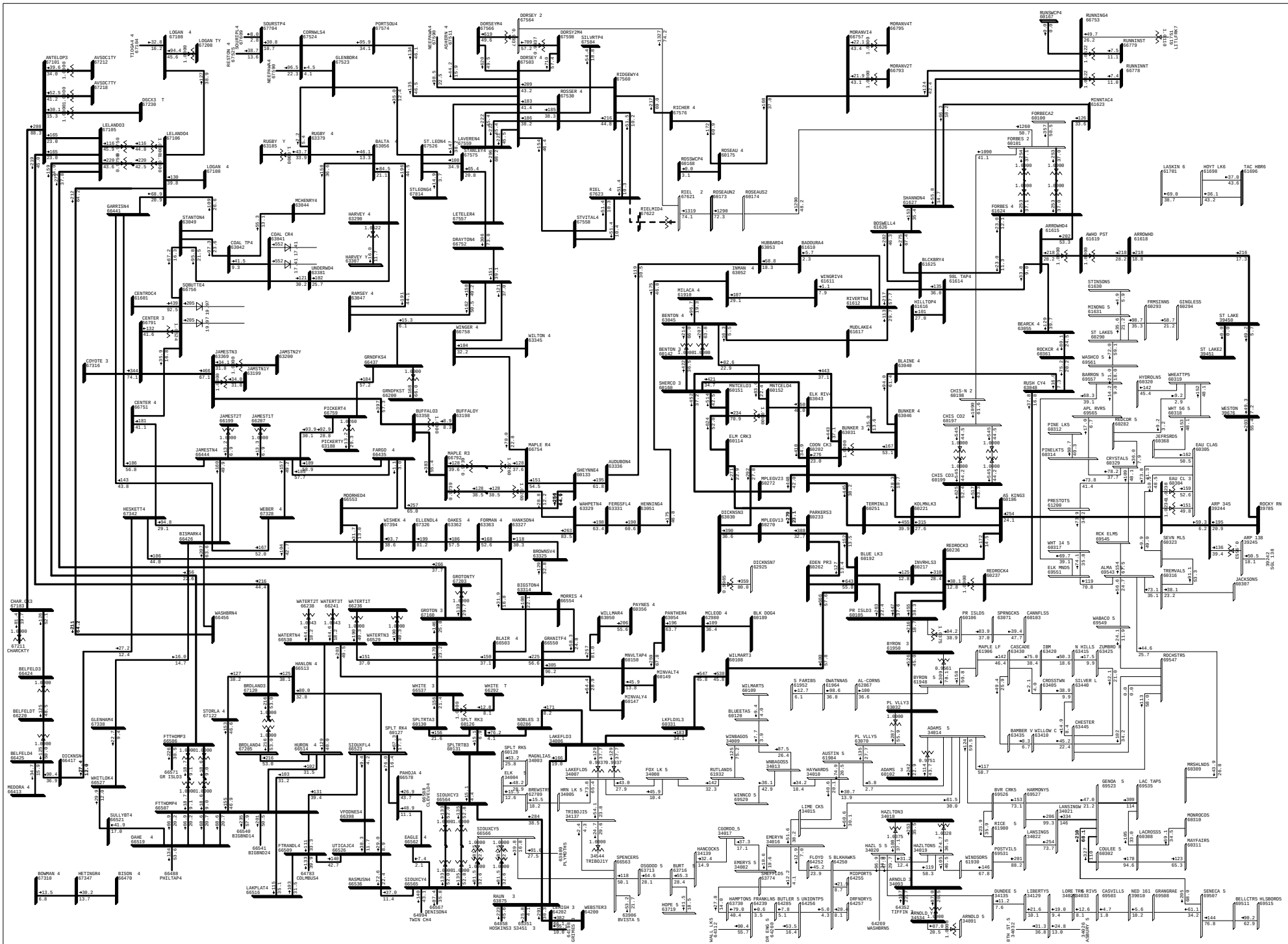
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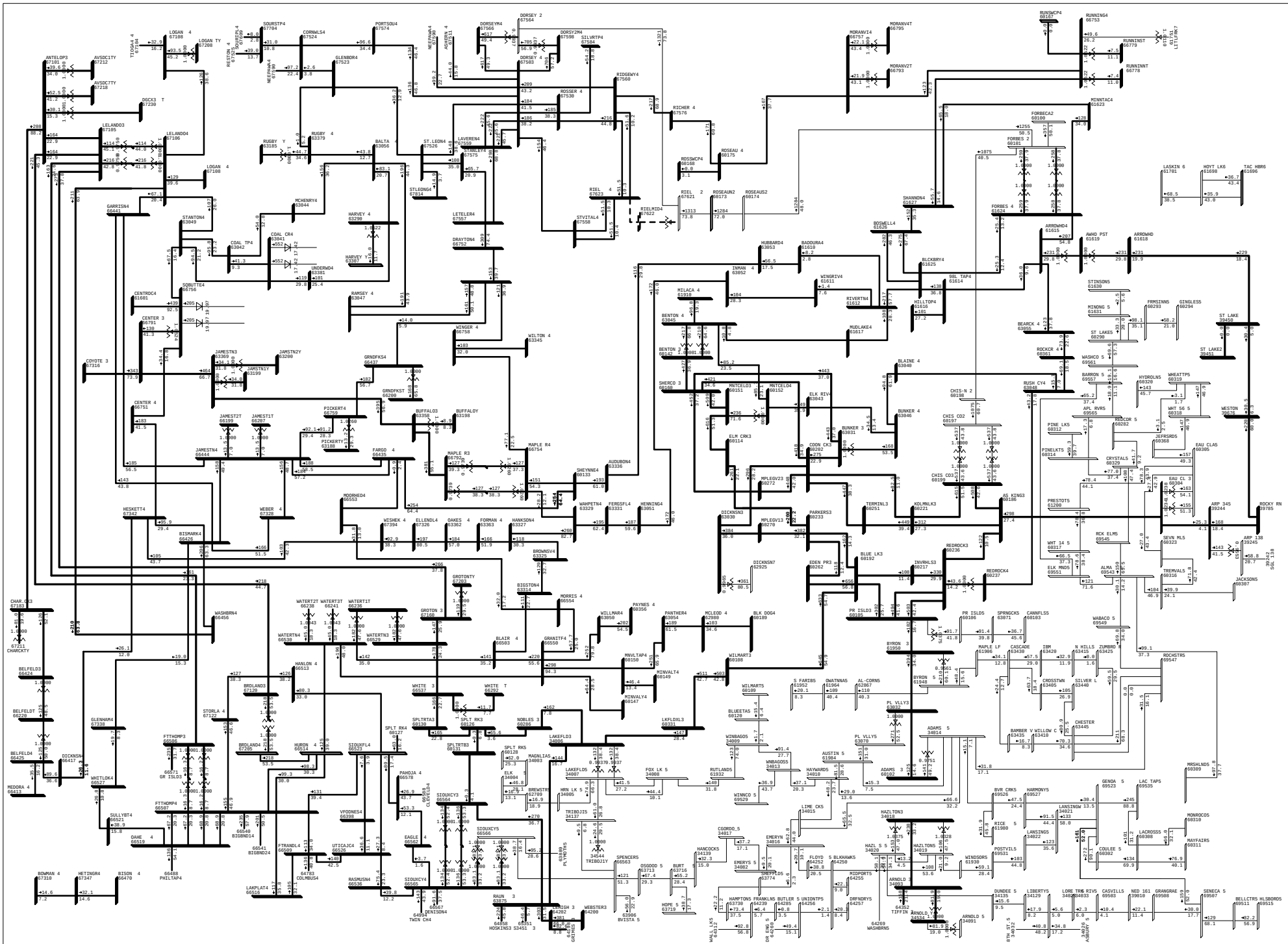
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2004 MAPP SERIES FINAL 2009 SUMMER PEAK : CAPX 4500 SCEN 10
 F-09SUPK.SAV /BUSES = 21866 BRANCHES = 33100/ 100% OF PEAK
 CAPX 2009 TUE, MAY 10 2005 11:56

100% RATEA
 0.920 UV 1.059 OV
 KV: §161 , §230 , §345

BUS - NONE
 BRANCH - MW/% OF RATEA
 EQUIPMENT - MW/MVAR

Appendix C Transmission Characteristics and Cost Estimate Data

Transmission Characteristics

Constr kV	Oper kV	Conductor			Branch Characteristics (per mile) Per Unit in 100 MVA base at 50° C			Summer MVA at 40° C	Winter MVA at 0° C	X/R
		Size (kcm)	Type	Strands	R	X	Bch			
345	345	2-1192	ACSR	45/7	0.000037	0.000495	0.008475	1482	1936	13.24
345	345	2-954	ACSR	54/7	0.000046	0.000494	0.008479	1303	1697	10.76
345	345	2-795	ACSR		0.000048	0.000504	0.008540	1158	1510	10.50
345	345	2-795	ACSR	26/7	0.000056	0.000502	0.008352	1165	1518	8.96
500	500	3-1272	ACSR	54/7	0.000011	0.000216	0.019250	3222	4209	18.95
500	500		ACSR	45/7	0.000012	0.000216	0.019250	3222	4209	17.70
500	500		ACSR		0.000013	0.000223	0.018697	3222	4209	17.70

Cost Estimate

Voltage	Cost (\$/mile)
345	750,000
500	1,250,000