Generation Interconnection Expedited System Impact Study

For

>Customer<

SPP-GEN-2002-026

5 September 2003

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Executive Summary

<Customer>, requested an Expedited System Impact Study under the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) to determine the impact of developing a 121 MW wind generating plant in Morris County, Kansas. The proposed >Omitted Text< plant request includes a 115 kV interconnection to the Westar Energy, Inc. (WR) McDowell Creek – Morris County 115 kV transmission line. Figure 1 shows the area transmission facilities. Figure 2 shows the site of the proposed project. The proposed project is planned to be in commercial operation by December 2003. Based upon the lead-time for engineering, procurement, and construction, it is likely that commercial operation by December 2003 is not possible.

The principal objectives of this study are:

- Determine feasible interconnection options.
- Evaluate the potential modifications required to effect the interconnection.
- Evaluate the potential for system problems resulting from the interconnection with the delivery of the full output of the proposed plant into the WR control area.

Several feasible options exist to interconnect the proposed plant to the WR electric transmission. In the application, >Omitted Text< requested to interconnect to the McDowell Creek – Morris County 115 kV transmission line. Current plans are for that line to be converted to its 230 kV design voltage in the near future. This conversion requires a broader view of feasibility.

Feasible options studied are:

Option 1 – Tap the existing McDowell Creek – Morris County 115 kV line.

Option 2 – Construct a 12.5 – mile radial 115 kV line from >Omitted Text< to Morris County.

Option 3 - Tap the McDowell Creek – Morris County line at 230 kV and accelerate conversion of the line to 230 kV.

Option 4 – Construct a 12.5 – mile radial 230 kV line from >Omitted Text< to Morris County.

Option 5 – Tap the McDowell Creek – Morris County 115 kV line, but construct a 230 kV class substation that can be expanded into a ring bus when conversion occurs.

Certain facilities are required to connect the proposed >Omitted Text< plant to the existing WR transmission system. The estimated costs to effect the interconnection based on the options identified are shown in Table 1 below. The details of the various options are shown in Appendix 1. The precise allocation of these costs between direct assigned cost and costs for credit under a transmission service request are not yet determined.

Table 1 - Interconnection Cost Summary

Interconnection Option	Estimated Costs (2003 Dollars)
Option 1	$ 1,750,000
Option 2	$ 4,593,000
Option 3	$ 8,335,000
Option 4	$ 4,789,000
Option 5	$ 3,113,000

Estimated costs include land for transmission line right-of-way.

Power flow studies evaluate possible transmission impacts associated with scheduling power out of the proposed >Omitted Text< plant. Power flow studies used are: 2003 winter peak; 2004 spring, summer, summer-shoulder, fall and winter peak; and 2009 summer, summer-shoulder and winter peak models. Changes are incorporated to evaluate the proposed >Omitted Text< plant under various appropriate options. Results of power flow studies through 2009/10 winter peak conditions are that the addition of the proposed >Omitted Text< plant requires transmission facility upgrades to effect a transfer of the full output of the proposed >Omitted Text< plant under all conditions regardless of the interconnection voltage. Short circuit and transient stability studies are conducted to evaluate interconnection impacts of the proposed >Omitted Text< plant. Short circuit studies used a 2002 summer peak models with all generation on line. Results of short circuit studies are that the addition of the proposed >Omitted Text< plant does not require equipment upgrades based on fault current considerations regardless of the interconnection voltage. Transient stability studies use a summer peak model. Results of transient stability studies are that the addition of the proposed >Omitted Text< plant does not require additional equipment or equipment upgrades based on transient stability considerations regardless of the interconnection voltage.

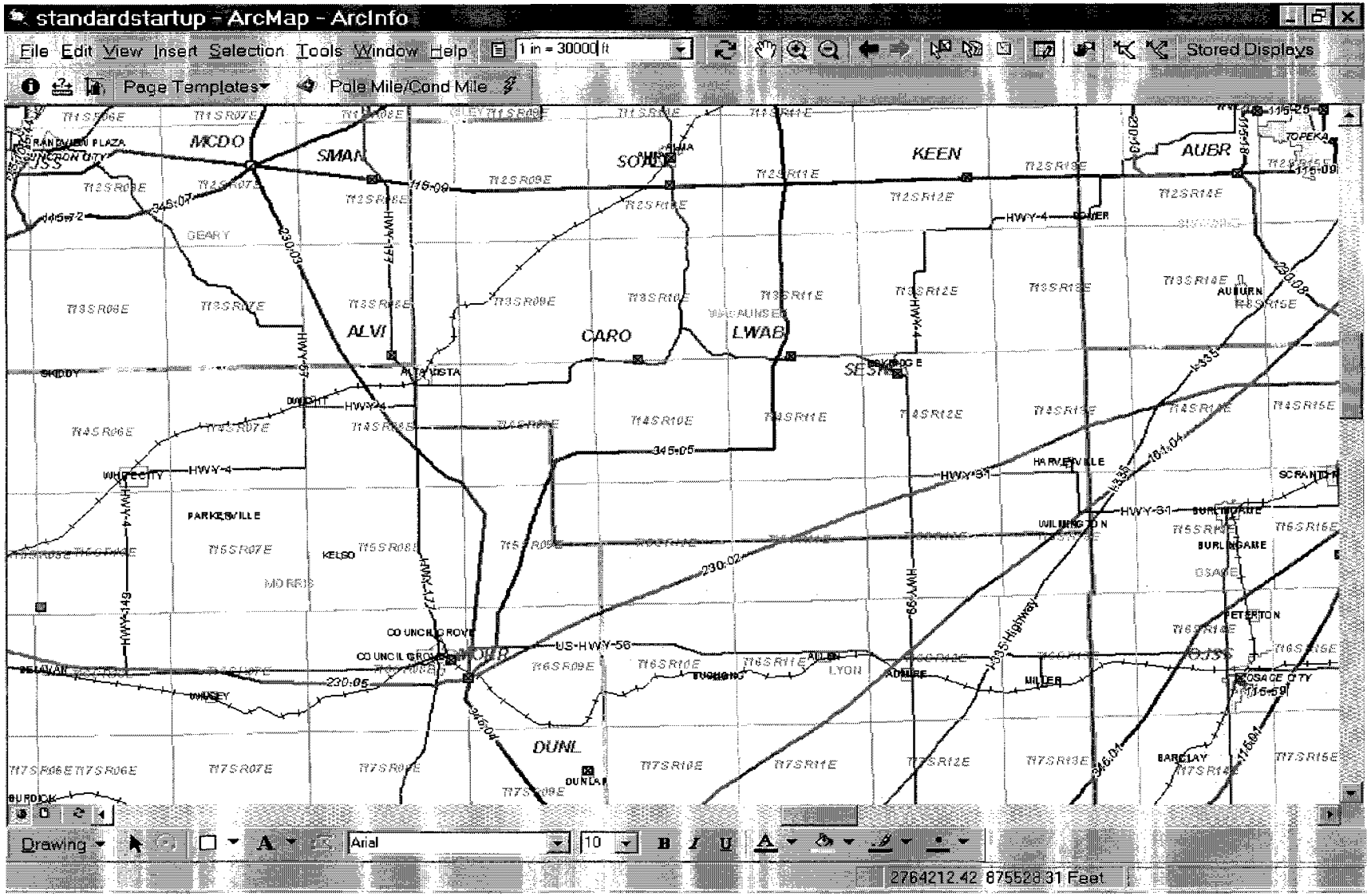


Figure 1 – Area Transmission Facilities

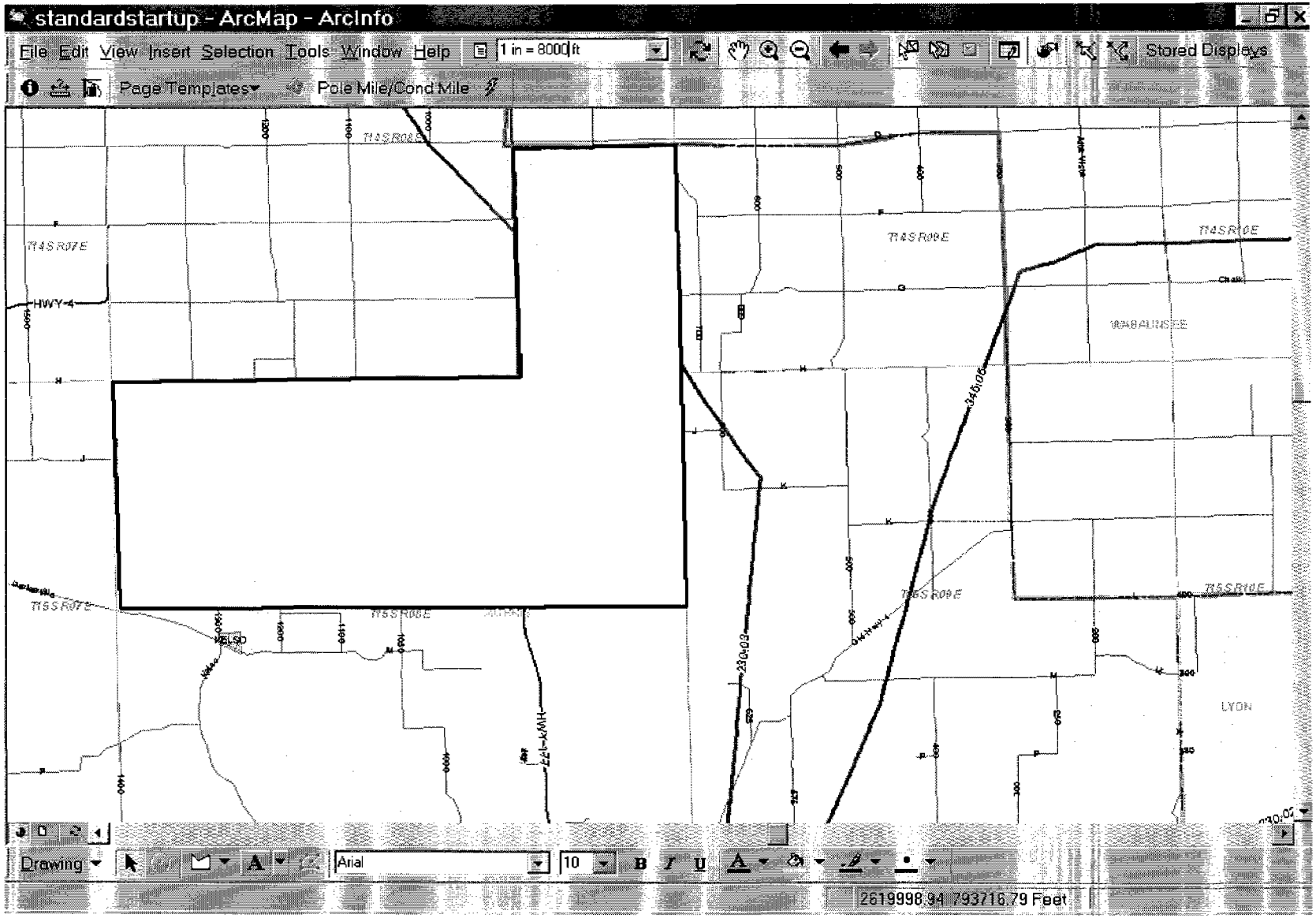


Figure 2 – Proposed Project Site

Feasibility Study

Introduction

<Customer>, requested an Expedited System Impact Study under the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) to determine the impact of developing a 121 MW wind generating plant in Morris County, Kansas. This portion of the report summarizes the results of the feasibility portion of that study. The request by >Omitted Text< is for 121 MW of wind-powered generation on the Westar Energy (WR) transmission system near >Omitted Text<. The projected in-service date of the proposed >Omitted Text< plant is December 2003.

Project Location and Existing Facilities

The project is located >Omitted Text<. Two Westar Energy transmission lines are near the project site: the McDowell Creek – Morris County 115 kV transmission line, which runs through the proposed >Omitted Text< plant site, and the Jeffrey Energy Center – Morris County 345 kV transmission line, which runs 1.5 miles east of the proposed >Omitted Text< plant site. Figure 1 shows the area transmission facilities. Figure 2 shows the proposed site of the project.

The 28.50-mile McDowell Creek – Morris County 115 kV line is a 1965 vintage line built using wood H-frame construction. The conductor is 927.2 kcmil AAAC and is sag limited to 181 MVA. The line is constructed for 230 kV, but is operated at 115 kV. The proposed plant is approximately 12 miles from the Morris County substation.

Connection Options

For evaluating interconnections, line mileage is calculated from a point approximately 12 miles north of Council Grove, Kansas. Connection options considered to integrate the proposed project into the area transmission system are:

Option 1 - Tap the McDowell Creek – Morris County 115 kV line.

Option 2 – Construct a 12.5-mile radial 115 kV line from >Omitted Text< to Morris County.

Option 3 - Tap the McDowell Creek – Morris County line at 230 kV and accelerate conversion to 230 kV.

Option 4 – Construct a 12.5-mile radial 230 kV line from >Omitted Text< to Morris County.

Option 5 – Tap the McDowell Creek – Morris County 115 kV line, but construct a 230 kV class substation that can be expanded into a ring bus when conversion occurs.

Feasible options that were considered but were not evaluated or studied were a 17-mile radial 115 kV transmission line to the McDowell Creek Substation and an interconnection to the Jeffrey Energy Center – Morris 345 kV transmission line.

Westar Energy also maintains its own Facility Connection Standards, which may be found on the WR web-site (www.wr.com). Estimated costs include both potential transformers and current

transformers for interconnection metering located at the interconnection substation. **Estimated costs include land for transmission line right-of-way.**

Option 1 - Tap the Existing McDowell Creek – Morris County 115 kV Line
The McDowell Creek – Morris County line is a 1965 vintage designed for 230 kV and operated at 115 kV. The conductor is 927.2 kcmil AAAC and is sag limited to 181 MVA. The minimum work to tap the 115 kV transmission line requires a new 115 kV line tap and circuit breaker; however additional work is required at both the McDowell Creek and Morris County 115 kV substations. The time required for this option is 14 months. **This option is feasible only so long as the McDowell Creek – Morris County 115 kV transmission line is not uprated to 230 kV operation.**

115 kV interconnection substation – $1,650,000
Required equipment upgrades at McDowell Creek – $50,000
Required equipment upgrades at Morris County – $50,000
Total for Option 1 – $1,750,000

Option 2 – Construct a 12.5-mile radial 115 kV line to the Morris County Substation
Construct a new 115 kV transmission line approximately 12.5 miles to the Morris County substation. This option requires additional equipment at the Morris County substation to construct a new 115 kV line terminal. The time required for this option is 10 months. Metering for the interconnection will be at the Morris County substation. **The project owner will own the transmission line to the project substation.** This option is feasible regardless of whether or not the McDowell Creek – Morris County 115 kV transmission line is uprated to 230 kV operation.

Morris County substation work – $850,000
12.5-mile 115 kV transmission line to project substation – $3,743,000
Total for Option 2 – $4,593,000

Option 3 – Tap the Existing McDowell Creek – Morris County Line at 230 kV and Accelerate Conversion of the Line to 230 kV
Existing plans are to convert the McDowell Creek – Morris County transmission line to 230 kV operation in the future. Under this option, the proposed project is constructed for operation at 230 kV and the conversion of the line to 230 kV is accelerated. Under the WR Facility Connection Standards, interconnection at 230 kV or higher voltage requires a minimum of a ring-bus configuration. The time required for this option is 18 months.

230 kV interconnection substation – $4,030,000
McDowell Creek substation work for conversion to 230 kV – $3,263,000
Morris County substation work for conversion to 230 kV – $1,042,000
Total for Option 3 – $8,335,000

Option 4 – Construct a 12.5-mile radial 230 kV line to the Morris County Substation
Construct a new 230 kV transmission line approximately 12.5 miles to the Morris County substation. This option requires additional equipment at the Morris County substation to expand the existing 230 kV ring bus substation in order to provide a 230 kV terminal. The time required for this option is 10 months. Metering for the interconnection will be at the Morris County substation. **The project owner will own the transmission line to the project substation.** This option is feasible regardless of whether or not the McDowell Creek – Morris County 115 kV transmission line is uprated to 230 kV operation.

Morris County Substation work – $1,025,000
12.5-mile 230 kV transmission line to project substation – $3,764,000
Total for Option 4 – $4,789,000

Option 5 - Tap the Existing McDowell Creek – Morris County 115 kV Line With a 230 kV Substation
This option is substantially the same as Option 1 except that the substation is constructed with 230 kV equipment such that it can be converted to a ring bus configuration when the line is converted to 230 kV operation. The option requires the installation of a dual winding transformer by >Omitted Text< that can operate at either 230 kV or 115 kV. The time required for this option is 13 months. This option is feasible through all operating voltages of the McDowell Creek – Morris County line.

115 kV interconnection substation constructed at 230 kV – $3,013,000
Required equipment upgrades at McDowell Creek – $50,000
Required equipment upgrades at Morris County – $50,000
Total for Option 5, Phase 1 – $3,113,000

Conclusion

The entire output of the proposed project can be delivered into the Westar Energy system with suitable system facilities. In order to interconnect with the McDowell Creek – Morris County 115 kV line system equipment must be improved. At some point in the future, the McDowell Creek – Morris County transmission line must be converted to 230 kV operation. **The estimated time to complete any option does not include time to acquire land for transmission line right-of-way.**

Total for Option 1 – $ 1,750,000 – 14 months
Total for Option 2 – $ 4,593,000 – 10 months
Total for Option 3 – $ 8,335,000 – 18 months
Total for Option 4 – $ 4,789,000 – 10 months
Total for Option 5 – $ 3,515,000 – 13 months

System Impact Study

Introduction

<Customer>, requested an Expedited System Impact Study under the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) to determine the impact of developing a 121 MW wind generating plant in >Omitted Text<. The proposed >Omitted Text< plant includes a request for a 115 kV interconnection to the Westar Energy, Inc. (WR) McDowell Creek – Morris County 115 kV transmission line. The proposed >Omitted Text< plant is planned to be in commercial operation by December 2003.

System conditions are studied using power flow for both normal (no lines out) and single-contingency outage conditions to evaluate possible transmission limitations. The power flow studies are performed for all identified interconnection options. (Option 5 is not evaluated because electrically it is indistinguishable from Option 1 and Option 3.) The seasons evaluated are: 2003 winter peak; 2004 spring, summer, summer-shoulder, fall and winter peak; and 2009 summer, summer-shoulder, and winter peak. Power flow analyses are evaluated using SPP Criteria. Specifically, facility loading greater than 100 percent of normal rating during base case conditions or facility loading greater than 100 percent of emergency rating during single-contingency outage conditions require mitigation. Transmission facilities subject to monitoring for adverse impact are those operated at 69 kV or greater in the WR control area. Because no request for transmission service has been made, the power flow studies assume that the full output of the proposed >Omitted Text< plant is delivered into the WR control area and not transmitted out of the control area.

For purposes of evaluating the interconnection of the proposed >Omitted Text< plant, short circuit and transient stability studies are performed. These studies identify any equipment that may require upgrades due solely to the generation interconnection. The short circuit and transient stability studies are performed for all options. (Option 5 is not evaluated because electrically it is indistinguishable from Option 1 and Option 3.)

Power Flow Studies

SPP-developed base cases for the seasons studied are used. Data representing the proposed >Omitted Text< plant is added to each base case. The full output of the proposed >Omitted Text< plant is assumed to be delivered into the WR control area. Automatic single-contingency analysis of the base case and of the case with the proposed plant added is performed for each season to determine if facility overloads were created due to the addition of the proposed >Omitted Text< plant. Incremental improvements are made to mitigate any overloads. In this way, the minimum improvements necessary are determined. The results of the power flow contingency studies are summarized in Appendix 2.

Short Circuit Studies

An SPP-developed base case for the 2002 summer peak season is used. Data representing the proposed >Omitted Text< plant is added to the base case to evaluate each interconnection option. Automatic short circuit calculations are performed and the results analyzed to determine if equipment is overdutied due to the addition of the proposed >Omitted Text< plant. System improvements determined by the power flow studies are then added to the appropriate short circuit models and the fault calculations repeated. The fault calculations are repeated for all proposed >Omitted Text< plant connection options. Three-phase and single-phase-to-ground faults are applied at buses in the vicinity of the proposed plant to evaluate the impact on equipment. All generation within the WR system is assumed to be on line. Overdutied equipment is reported. Estimated overdutied equipment replacement costs are identified.

Transient Stability Studies

An SPP developed base case for a summer peak season was used. Data representing the proposed >Omitted Text< plant is added to the base case, fault conditions are applied, and the transient performance of the area is monitored to evaluate each interconnection option. The studies are repeated without and with the proposed >Omitted Text< plant in service.

Discussion of Results – Power Flow Studies

2003/04 Winter Peak

Option 1

During 2003/04 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2003/04 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 2

During 2003/04 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2003/04 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3

This option is not evaluated for this season. It is not feasible to implement in the time available.

Option 4

During 2003/04 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2003/04 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2004 Spring Peak

Option 1

During 2004 spring peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 spring peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 2
During 2004 spring peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 spring peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3
This option is not evaluated for this season. It is not feasible to implement in the time available.

Option 4
During 2004 spring peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 spring peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2004 Summer Peak

Option 1
During 2004 summer peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 2
During 2004 summer peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3
This option is not evaluated for this season. It is not feasible to implement in the time available.

Option 4
During 2004 summer peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2004 Summer-Shoulder Peak

Option 1

During 2004 summer-shoulder peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer-shoulder peak conditions, the full output of the proposed >Omitted Text< plant causes new overloads during single-contingency outage conditions. Facilities that exceed emergency rating during a single-contingency outage and the emergency rating are:

11.00-mile Ft. Junction – McDowell Creek 115 kV line, circuit 1, 68 MVA

Option 2

During 2004 summer-shoulder peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer-shoulder peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3

This option is not evaluated for this season. It is not feasible to implement in the time available.

Option 4

During 2004 summer-shoulder peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer-shoulder peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2004 Fall Peak

Option 1

During 2004 fall peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 fall peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 2

During 2004 fall peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 fall peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3

During 2004 fall peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 fall peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 4

During 2004 fall peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 fall peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2004/05 Winter Peak

Option 1
During 2004/05 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004/05 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 2
During 2004/05 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004/05 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3
During 2004/05 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004/05 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 4
During 2004/05 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004/05 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2009 Summer Peak

Option 1
This option is not evaluated for this season. The McDowell Creek – Morris County line is converted to 230 kV operation.

Option 2
During 2009 summer peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009 summer peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3

During 2009 summer peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009 summer peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 4
During 2009 summer peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2004 summer peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2009 Summer Shoulder Peak

Option 1
This option is not evaluated for this season. The McDowell Creek – Morris County line is converted to 230 kV operation.

Option 2
During 2009 summer-shoulder peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009 summer-shoulder peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3
During 2009 summer-shoulder peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009 summer-shoulder peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 4
During 2009 summer-shoulder peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009 summer-shoulder peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

2009/10 Winter Peak

Option 1
This option is not evaluated for this season. The McDowell Creek – Morris County line is converted to 230 kV operation.

Option 2
During 2009/10 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009/10

winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 3
During 2009/10 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009/10 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Option 4
During 2009/10 winter peak conditions with no lines out of service, the full output of the proposed >Omitted Text< plant does not cause overloads or low voltages. During 2009/10 winter peak conditions, the full output of the proposed >Omitted Text< plant does not cause new overloads during single-contingency outage conditions.

Discussion of Results – Short Circuit Studies

2002 Summer Peak
During 2002 summer peak conditions, the addition of the proposed >Omitted Text< plant does not cause existing equipment to exceed their interrupting duties.

Discussion of Results – Transient Stability Studies

2005 Summer Peak
During 2005 summer peak conditions, the addition of the proposed >Omitted Text< plant does not cause stability problems in the area.

Transmission Service Mitigation

No request for transmission service has been made concurrent with this request for generation interconnection. Absent such a request, it is assumed that the full output of the proposed >Omitted Text< plant is delivered into WR control area. Available gas-fired generation is displaced in order to absorb the full output of the proposed plant. Existing Transmission Operating Directives which may alter the existing transmission configuration or generation dispatch in lieu of construction are implemented for certain specific contingencies. These Directives are used until short-term emergency ratings are exceeded. Based on the results of power flow studies transmission system improvements are required to transmit the full out put of the proposed plant into the WR control area under all conditions regardless of the interconnection voltage. Facilities which require mitigation are:

11.00-mile Ft. Junction – McDowell Creek 115 kV line, circuit 1.

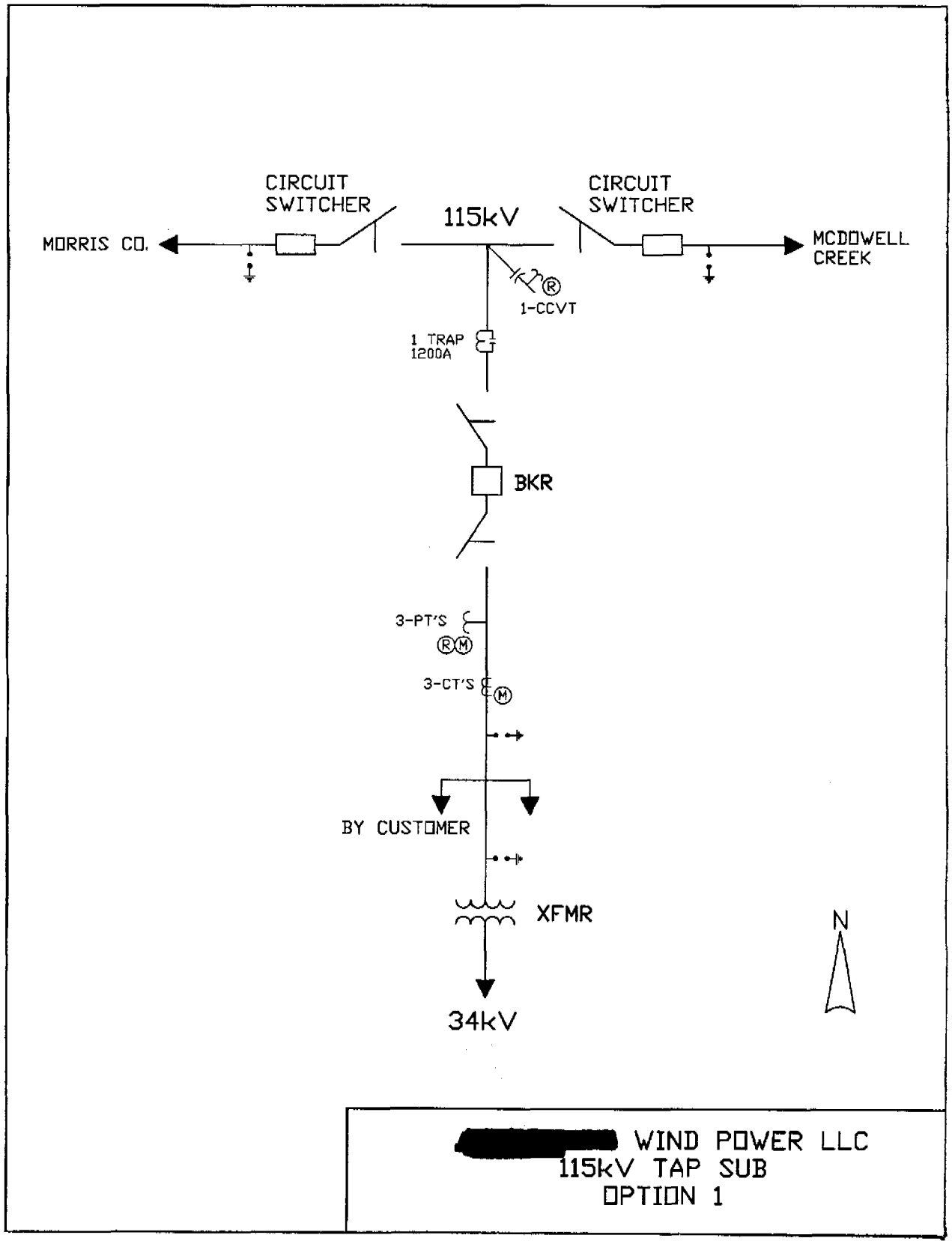
The entity acquiring the output of the proposed >Omitted Text< plant will be responsible for arranging appropriate transmission service through the SPP under the terms of the Regional OATT.

Appendix 1 – Details of Interconnection Options

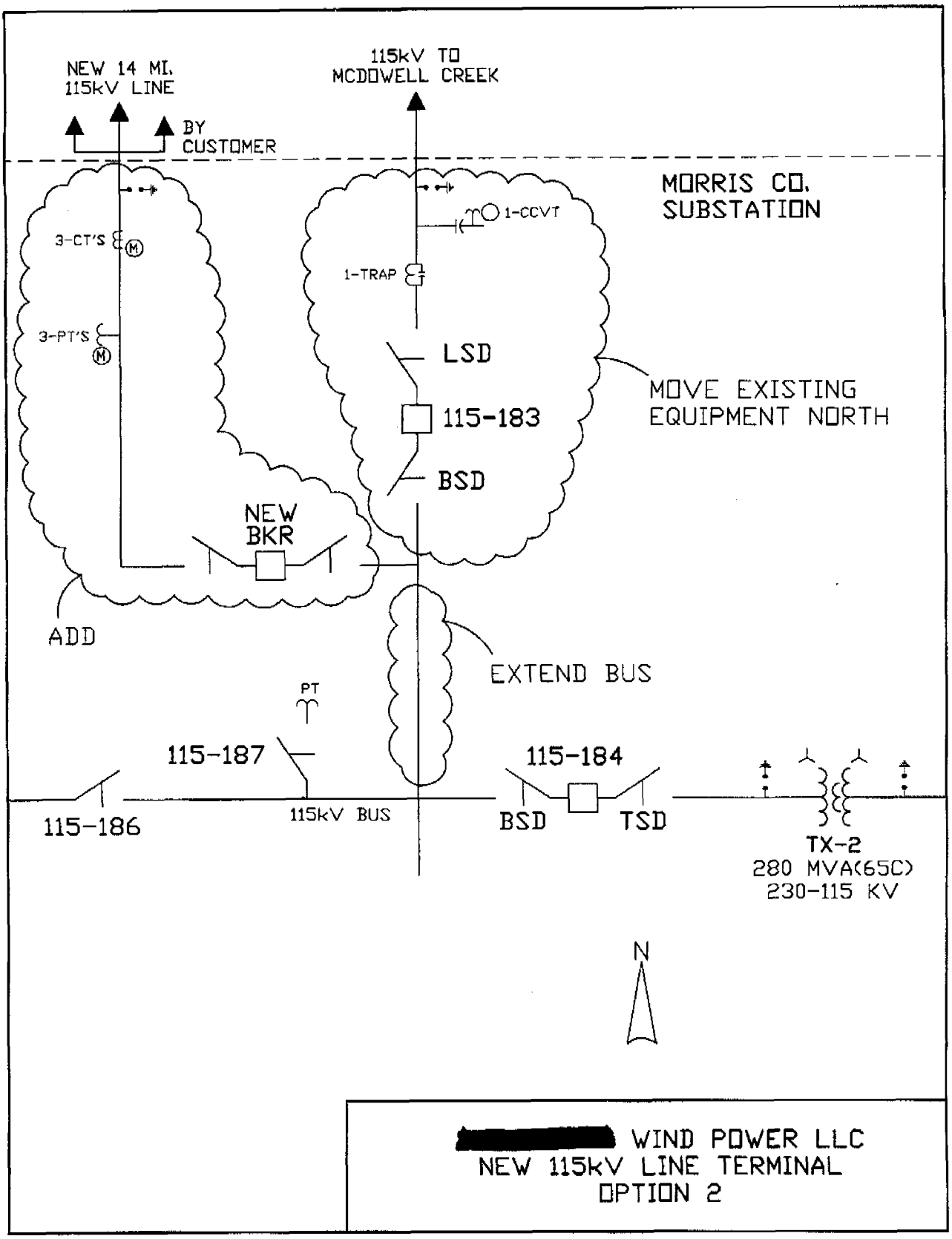
This appendix presents information about the configuration of each identified interconnection option.

Option 1 - Tap the Existing McDowell Creek – Morris County 115 kV Line
The minimum work to tap the 115 kV transmission line requires a new 115 kV line tap substation and circuit breaker. However additional relay work is required at both the McDowell Creek and Morris County 115 kV substations on the corresponding line terminals to the proposed >Omitted Text< plant.

Installation of the 115 kV interconnection substation includes: 3 current transformers; 3 potential transformers; 1 115 kV circuit breaker; 4 115 kV switches; 1 115 kV 1200A wave trap and line trap unit; 1 115 kV CCVT; 2 100 kVA station power transformers; 2 115 kV circuit switchers; 9 115 kV lightning arresters; and associated steel structures, conductors, and other substation equipment such as, but not limited to, site preparation, control building, battery and charger, SCADA system, RTU, and relay panels.


CIRCUIT SWITCHER
115kV
CIRCUIT SWITCHER
MORRIS CO.
MCDOWELL CREEK
1-CCVT
1 TRAP 1200A
BKR
3-PT'S
3-CT'S
BY CUSTOMER
XFMR
34kV
N
[redacted] WIND POWER LLC
115kV TAP SUB
OPTION 1

Option 2 – Construct a 12.5-mile radial 115 kV line to the Morris County Substation
Construct a new 115 kV transmission line approximately 12.5 miles from the proposed >Omitted Text< plant to the Morris County substation. This option requires additional equipment at the Morris County substation to construct a new 115 kV line terminal: 1 115 kV circuit breaker; 3 new current transformers; 3 new potential transformers; 3 new 115 kV lightning arresters; associated steel structures; conductors, and other substation equipment; plus it requires moving an existing circuit breaker, wave trap, CCVT, and associated equipment within the Morris County substation to make room for the new transmission line connection (grading, rock and fence extension), and extend the 115 kV bus within the Morris County substation to accommodate new and moved equipment


NEW 14 MI.
115kV LINE
BY
CUSTOMER
115kV TO
MCDOWELL CREEK
MORRIS CO.
SUBSTATION
3-CT'S
3-PT'S
1-CCVT
1-TRAP
LSD
115-183
BSD
MOVE EXISTING
EQUIPMENT NORTH
NEW
BKR
ADD
EXTEND BUS
PT
115-187
115-184
115-186
115kV BUS
BSD
TSD
TX-2
280 MVA(65C)
230-115 KV
N
WIND POWER LLC
NEW 115kV LINE TERMINAL
OPTION 2

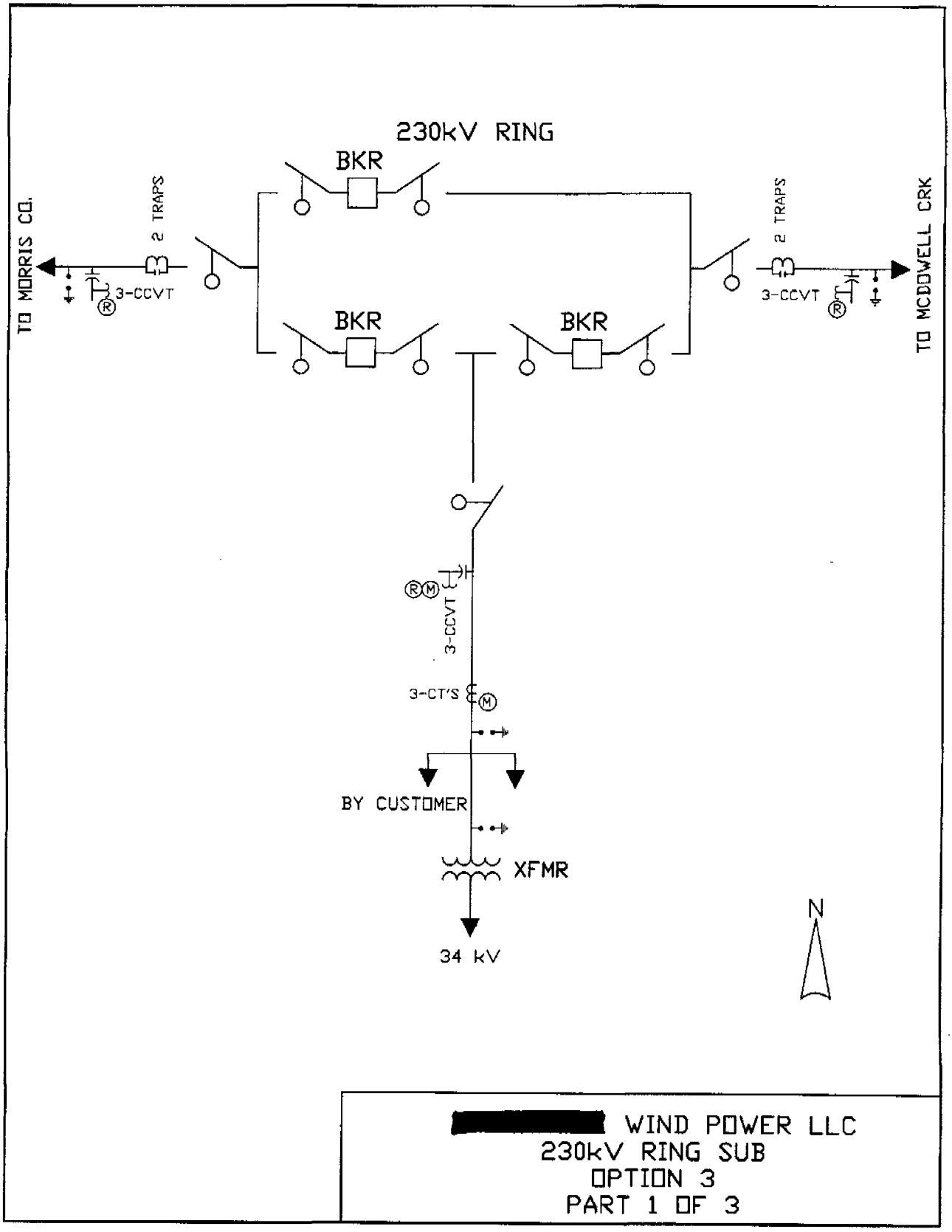
Option 3 – Tap the Existing McDowell Creek – Morris County Line at 230 kV and Accelerate Conversion of the Line to 230 kV

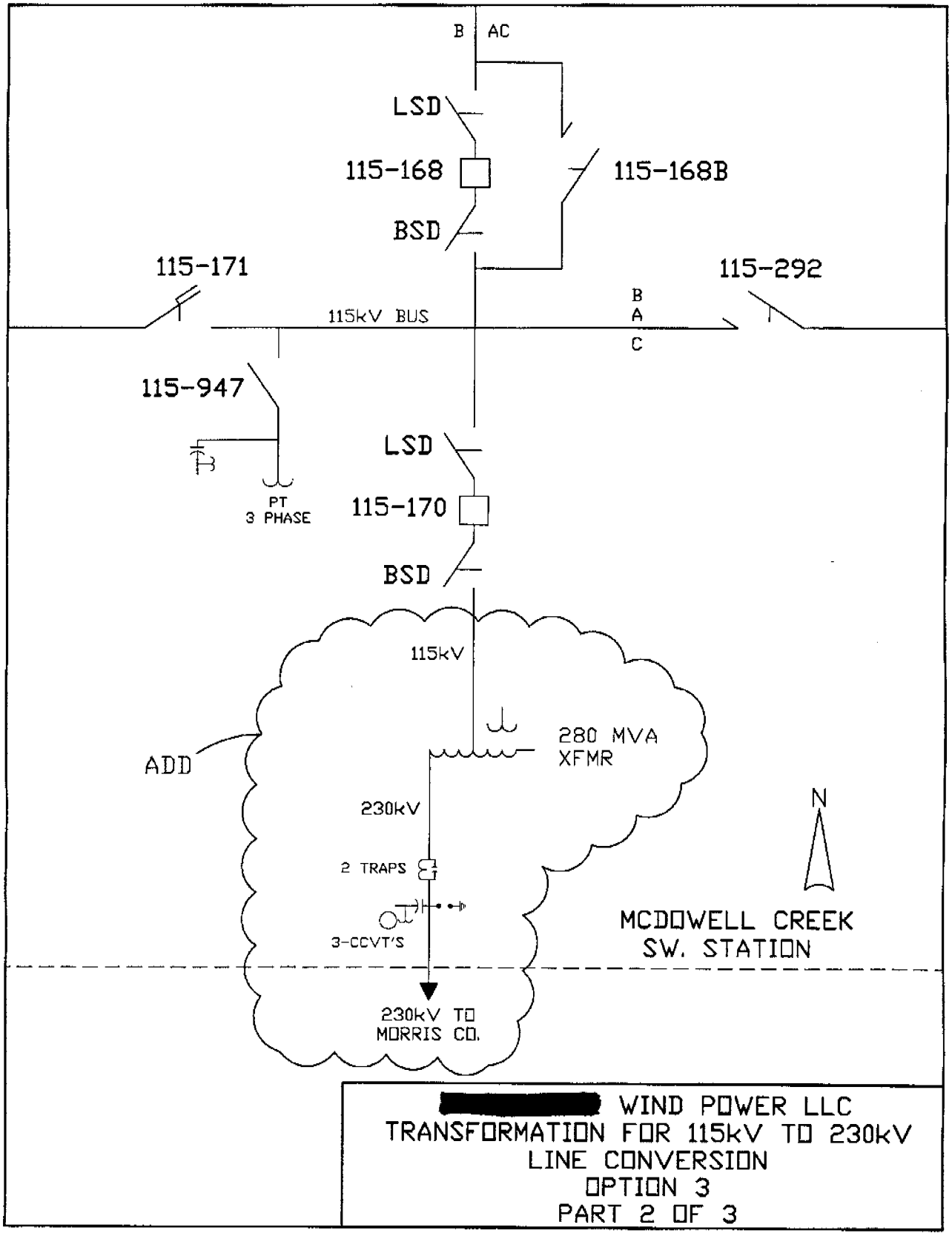
Existing plans are to convert the McDowell Creek – Morris County transmission line to 230 kV operation in the future. Under this option, the proposed >Omitted Text< project is constructed for operation at 230 kV and the conversion of the line to 230 kV is accelerated. Under the WR Facility Connection Standard, interconnection at 230 kV or higher voltage requires a minimum of a ring-bus configuration.

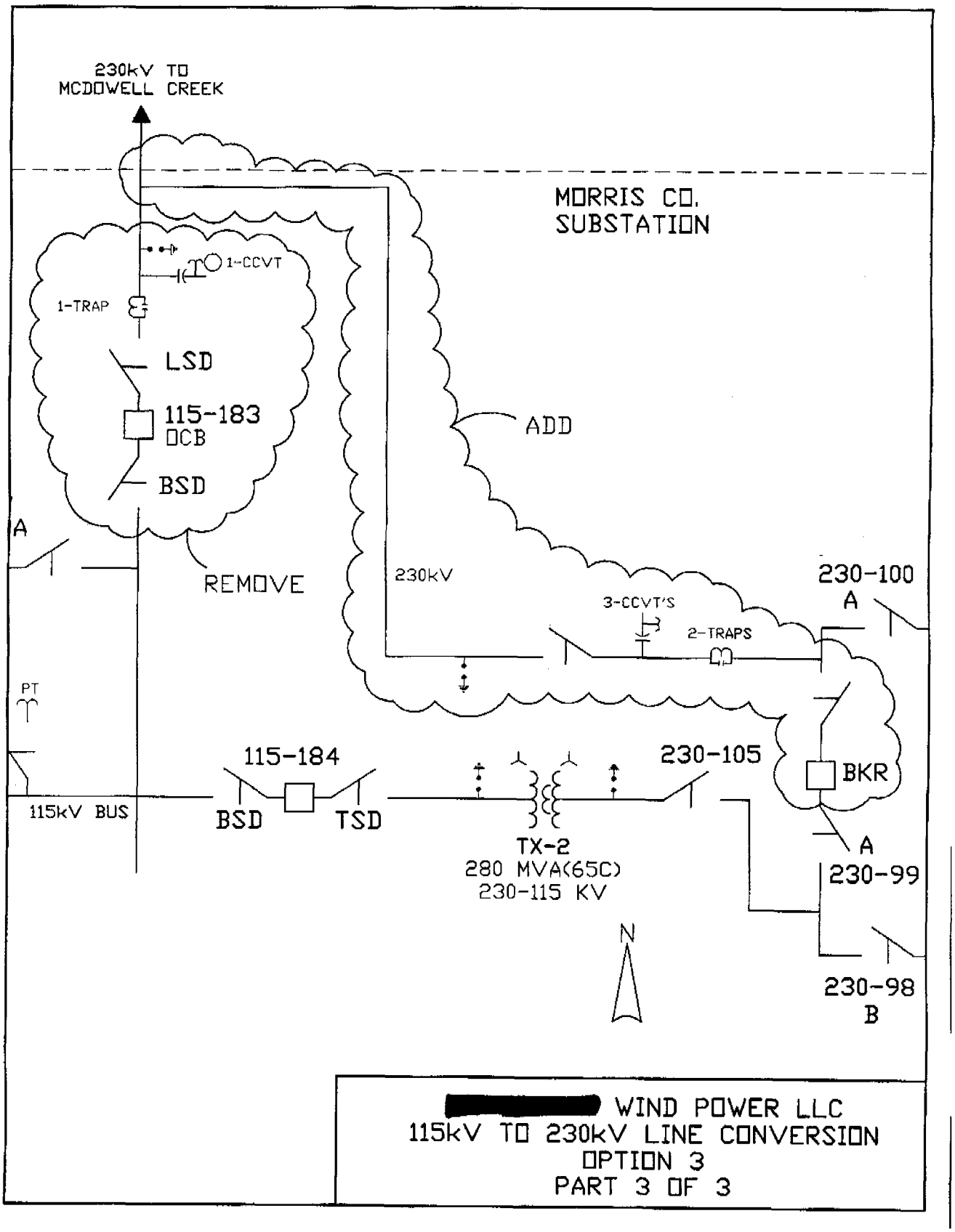
Installation of a new 230 kV substation requires: 3 current transformers; 3 230 kV breakers in a ring bus configuration; 9 230 kV switches with motor operators; 4 230 kV wave traps and 4 line terminal units; 9 230 kV CCVTs; 9 230 kV lightning arresters; associated steel structures, conductors, and other substation equipment such as, but not limited to, site preparation, 1-12 kV distribution source (1.5miles), 1 station power back-up generator and ATO, control building, 2 battery sets and 2 chargers, SCADA, RTU, and relay panels .

McDowell Creek substation work for conversion to 230 kV requires: expanding the substation and adding 1 230-115 kV 280 MVA transformer; 2 230 kV wave traps and 2 line terminal units; 3 230 kV CCVTs; 3 230 kV lightning arresters; removing 1 115 kV wave trap and line terminal unit, 1 115 kV CCVT, and 3 115 kV lightning arresters; associated steel structures, conductors, and other substation equipment such as, but not limited to, site preparation, control building, battery and charger, SCADA, RTU, and relay panels.

Morris County substation work for conversion to 230 kV requires: removing 1 115 kV circuit breaker, 2 115 kV switches, 1 115 kV wave trap and line terminal unit, 1 115 kV CCVT, and 3 115 kV lightning arresters; adding 1 230 kV circuit breaker, 2 230 kV switches with motor operators, 2 230 kV wave traps and line terminal units, 3 230 kV CCVTs, 3 230 kV lightning arresters; associated steel structures, conductors, and other substation equipment such as, but not limited to, site preparation, control building, battery and charger, SCADA, RTU, and relay panels.

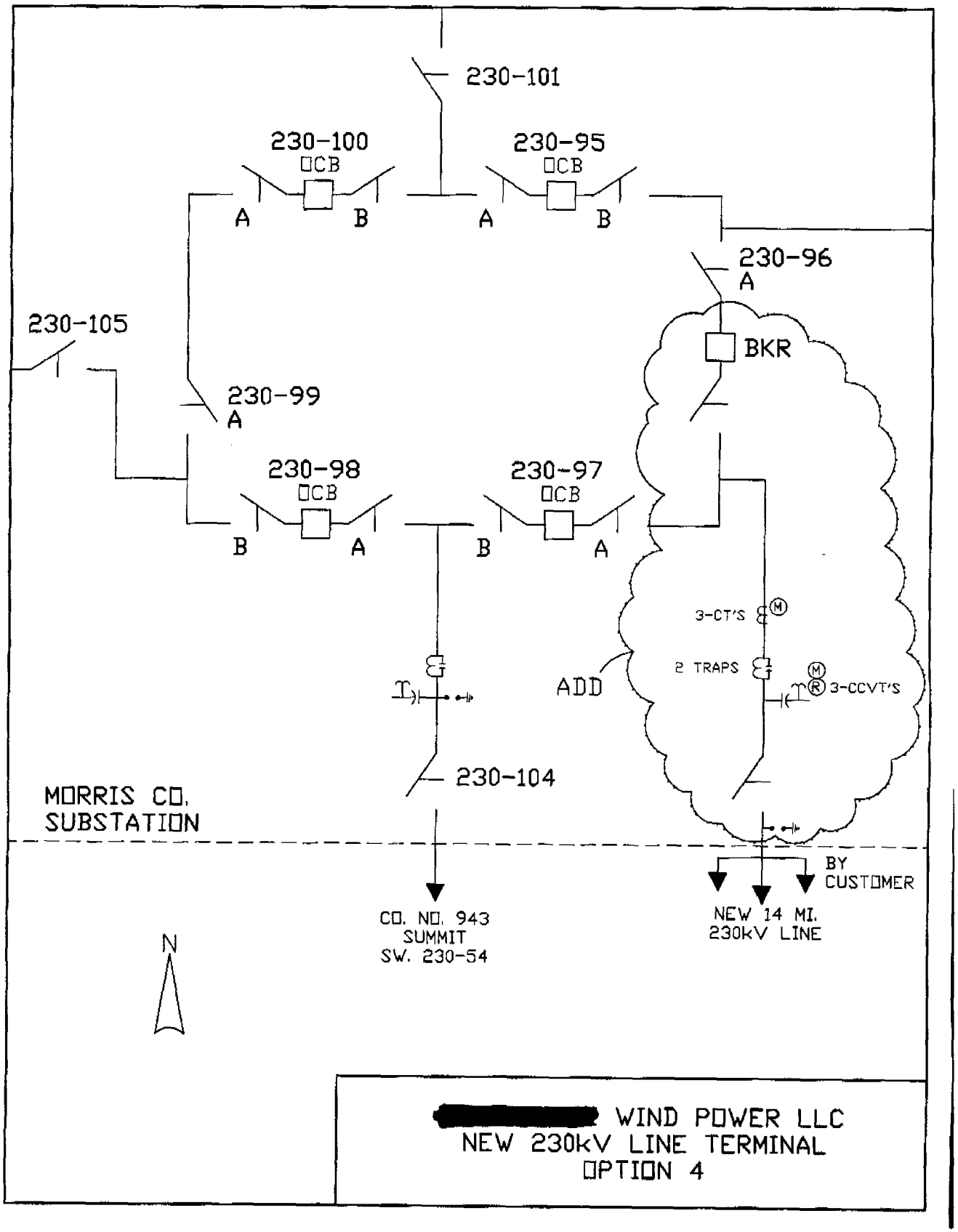

230kV RING
BKR
BKR
BKR
TO MORRIS CO.
2 TRAPS
3-CCVT
2 TRAPS
3-CCVT
TO MCDOWELL CRK
3-CCVT
3-CT'S
BY CUSTOMER
XFMR
34 kV
N
[redacted] WIND POWER LLC
230kV RING SUB
OPTION 3
PART 1 OF 3


B
AC
LSD
115-168
115-168B
BSD
115-171
115-292
115kV BUS
B
A
C
115-947
LSD
PT
3 PHASE
115-170
BSD
115kV
280 MVA
XFMR
ADD
230kV
2 TRAPS
3-CCVT'S
N
MCDOWELL CREEK
SW. STATION
230kV TO
MORRIS CO.
[redacted] WIND POWER LLC
TRANSFORMATION FOR 115kV TO 230kV
LINE CONVERSION
OPTION 3
PART 2 OF 3


230kV TO
MCDOWELL CREEK
MORRIS CO.
SUBSTATION
1-CCVT
1-TRAP
LSD
115-183
OCB
BSD
ADD
A
REMOVE
230kV
3-CCVT'S
2-TRAPS
230-100
A
PT
115-184
230-105
BKR
115kV BUS
BSD
TSD
TX-2
280 MVA(65C)
230-115 KV
A
230-99
N
230-98
B
WIND POWER LLC
115kV TO 230kV LINE CONVERSION
OPTION 3
PART 3 OF 3

Option 4 – Construct a 12.5-mile radial 230 kV line to the Morris County Substation
Construct a new 230 kV transmission line approximately 12.5 miles to the Morris County substation. This option requires additional equipment at the Morris County substation to expand the existing 230 kV ring bus substation in order to provide a 230 kV terminal: adding 1 230 kV circuit breaker, 2 230 kV switches with motor operators, 3 current transformers, 2 230 kV wave traps and line terminal units, 3 230 kV CCVTs, 3 230 kV lightning arresters; associated steel structures, conductors, and other substation equipment such as, but not limited to, site preparation, control building, battery and charger, SCADA, RTU, and relay panels.

The 230 kV facility substation would be constructed and owned by >Omitted Text< and may include: 1 230 kV circuit breaker; 2 230 kV switches; 3 current transformers; 2 230 kV wave traps and line terminal units;
3 230 kV lightning arresters; 3 potential transformers or CCVTs; associated steel structures, conductors, and other substation equipment such as, but not limited to, site preparation, 1 12 kV distribution source (1.5miles), 1 station power back-up generator and ATO, control building, 2 battery sets and 2 chargers, SCADA, RTU, and relay panels .


230-101
230-100
□CB
230-95
□CB
A
B
A
B
230-96
A
230-105
BKR
230-99
A
230-98
□CB
230-97
□CB
B
A
B
A
3-CT'S
2 TRAPS
3-CCVT'S
ADD
230-104
MORRIS CO.
SUBSTATION
BY
CUSTOMER
CO. NO. 943
SUMMIT
SW. 230-54
NEW 14 MI.
230kV LINE
N
[redacted] WIND POWER LLC
NEW 230kV LINE TERMINAL
□PTION 4

Option 5 - Tap the Existing McDowell Creek – Morris County 115 kV Line With a 230 kV Substation

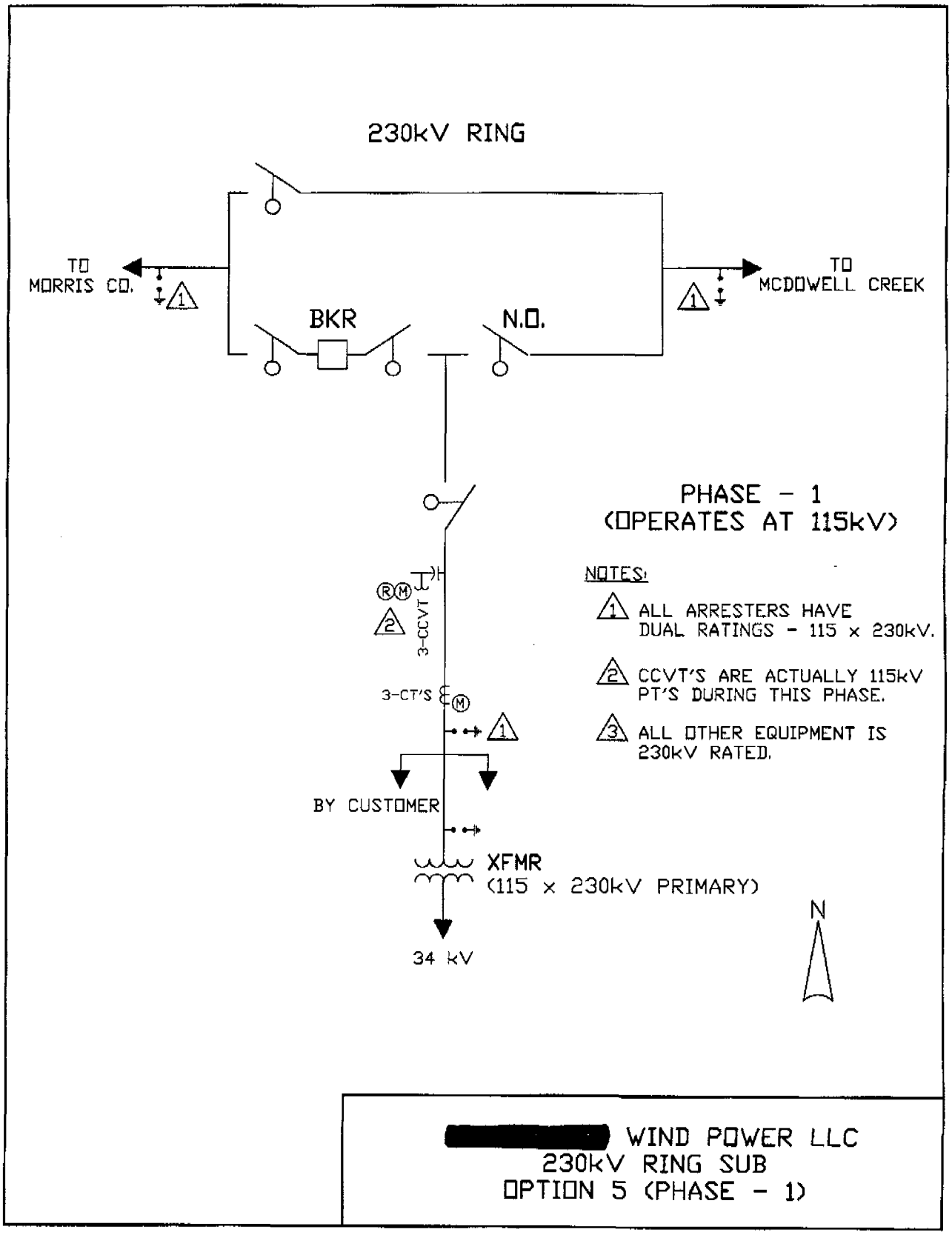
This option is substantially the same as Option 1 except that the substation is constructed with 230 kV equipment (like Option 3) such that it can be converted to a ring bus configuration when the line is converted to 230 kV operation. The option requires the installation of a dual winding 230/115-34.5 kV transformer by >Omitted Text<.

Installation of the 115kV interconnection substation, upgrade ready to 230kV includes: 1 230 kV circuit breaker; 5 230 kV switches with motor operators; 3 current transformers rated to 230 kV; 3 115 kV CCVTs (to be replaced at line conversion with 230 kV CCVT's); 9 lightning arresters with dual 115/230 kV ratings; associated steel structures, conductors, and other substation equipment, configured for ring bus (similar to option 3).

Note for Option 5: When line is upgraded to 230 kV, the project will not be required to participate in the costs of upgrading the McDowell Creek Substation, the Morris County Substation, or the McDowell-Morris Creek Transmission Line. At the time of line upgrade, the project will be required to make whatever upgrades to the project substation ($1,017,000) are necessary for its connection to the 230 kV line, and those costs are not included above.

Note: Customer's Facility Substation (230-34 kV) needs the following options included in the design:

1) Dual Winding 230/115 kV primary to 34 kV secondary substation transformer
2) 115 kV CCVT's will be replaced with 230 kV CCVT's.
3) Other equipment or options able to make transition from 115 kV to 230 kV.


230kV RING
TO
MORRIS CO.
TO
MCDOWELL CREEK
BKR
N.O.
3-CCVT
3-CT'S
BY CUSTOMER
XFMR
(115 x 230kV PRIMARY)
34 kV
PHASE - 1
(OPERATES AT 115kV)
NOTES:
1 ALL ARRESTERS HAVE DUAL RATINGS - 115 x 230kV.
2 CCVT'S ARE ACTUALLY 115kV PT'S DURING THIS PHASE.
3 ALL OTHER EQUIPMENT IS 230kV RATED.
N
[redacted] WIND POWER LLC
230kV RING SUB
OPTION 5 (PHASE - 1)

Shown in the following tables are the costs of the various options. These costs are those cost shown in the Feasibility Study. In these tables, the potential impacts of taxes are added to the cost estimates for informational purposes only. In all estimates, the inclusion of transmission line costs for radial transmission lines are shown for informational purposes only. **The project owner will own radial transmission lines to the project substation.**

Table 2 - Estimated Interconnection Facility Costs – Option 1 (Required for Interconnection)

Item	Cost ($)
Install 115 kV interconnection substation	1,650,000
Upgrade McDowell Creek 115 kV line terminal	50,000
Upgrade Morris County 115 kV line terminal	50,000
Subtotal	1,750,000
Allowance for Tax Consequences	858,000
Estimated Interconnection Facility Costs	2,608,000

Table 3 - Estimated Interconnection Facility Costs – Option 2 (Required for Interconnection)

Item	Cost ($)
Add Morris County substation 115 kV line terminal	850,000
12.5-mile 115 kV line (provided by customer)	3,743,000
Subtotal	4,593,000
Allowance for Tax Consequences	2,251,000
Estimated Interconnection Facility Costs	6,844,000

Table 4 - Estimated Interconnection Facility Costs – Option 3 (Required for Interconnection)

Item	Cost ($)
Install 230 kV interconnection substation	4,030,000
McDowell Creek substation work for conversion to 230 kV	3,263,000
Morris County substation work for conversion to 230 kV	1,042,000
Subtotal	8,335,000
Allowance for Tax Consequences	4,085,000
Estimated Interconnection Facility Costs	12,420,000

Table 5 - Estimated Interconnection Facility Costs – Option 4 (Required for Interconnection)

Item	Cost ($)
Morris County substation 230 kV work	1,025,000
12.5-mile 230 kV line (provided by customer)	3,764,000
Subtotal	4,789,000
Allowance for Tax Consequences	2,347,000
Estimated Interconnection Facility Costs	7,136,000

Table 6 - Estimated Interconnection Facility Costs – Option 5 (Required for Interconnection)

Item	Cost ($)
Install 115 kV interconnection substation constructed at 230 kV	3,013,000
Upgrade McDowell Creek 115 kV line terminal	50,000
Upgrade Morris County 115 kV line terminal	50,000
Subtotal	3,113,000
Allowance for Tax Consequences	1,525,000
Estimated Interconnection Facility Costs	6,638,000

Appendix 2 – AC Contingency Results Summary

The results of AC contingency studies on both the base case power flow and power flow with the proposed >Omitted Text< project are compared. Overloads which appear with the proposed project in service that did not occur in the base case are reported below by season. The base case includes previously queued generation operating at full output.

THE OVERLOADS LISTED IN THIS FILE ARE ELEMENTS NOT ORIGINALLY LISTED IN THE INITIAL REPORT
BUT ARE INTRODUCED IN THE TEST REPORT. --- ALL CONTINGENCIES ARE ASSUMED TO BE OPEN LINES

2003/04 WINTER PEAK - OPTION 1
NO NEW OVERLOADS

2003/04 WINTER PEAK - OPTION 2
NO NEW OVERLOADS

2003/04 WINTER PEAK - OPTION 4
NO NEW OVERLOADS

2004 SPRING PEAK - OPTION 1
NO NEW OVERLOADS

2004 SPRING PEAK - OPTION 2
NO NEW OVERLOADS

2004 SPRING PEAK - OPTION 4
NO NEW OVERLOADS

2004 SUMMER PEAK - OPTION 1
NO NEW OVERLOADS

2004 SUMMER PEAK - OPTION 2
NO NEW OVERLOADS

2004 SUMMER PEAK - OPTION 4
NO NEW OVERLOADS

2004 SUMMER-SHOULDER PEAK - OPTION 1

1 X-------- C O N T I N G E N C Y E V E N T S --------X X-- O V E R L O A D E D L I N E S --X X--MVA(MW)FLOW--X

	X---- MULTI-SECTION LINE GROUPINGS ----X	FROM NAME	TO NAME	CKT	PRE-CNT	POST-CNT	RATING	PERCENT
WERE-WERE	OPEN LINE FROM BUS 57328 [FT JCT 3115.00] TO BUS 57335 [MCDOWEL3115.00] CKT 3							CONTINGENCY
WERE-WERE		57238 FT JCT 3 115	57335 MCDOWEL3 115	1	49.2	67.7	68.0	101.0

2004 SUMMER-SHOULDER PEAK - OPTION 2
NO NEW OVERLOADS

2004 SUMMER-SHOULDER PEAK - OPTION 4
NO NEW OVERLOADS

2004 FALL PEAK - OPTION 1
NO NEW OVERLOADS

2004 FALL PEAK - OPTION 2
NO NEW OVERLOADS

2004 FALL PEAK - OPTION 3
NO NEW OVERLOADS

2004 FALL PEAK - OPTION 4
NO NEW OVERLOADS

2004/05 WINTER PEAK - OPTION 1
NO NEW OVERLOADS

2004/05 WINTER PEAK - OPTION 2
NO NEW OVERLOADS

2004/05 WINTER PEAK - OPTION 3
NO NEW OVERLOADS

2004/05 WINTER PEAK - OPTION 4
NO NEW OVERLOADS

2009 SUMMER PEAK - OPTION 2
NO NEW OVERLOADS

2009 SUMMER PEAK - OPTION 3
NO NEW OVERLOADS

2009 SUMMER PEAK - OPTION 4
NO NEW OVERLOADS

2004 SUMMER-SHOULDER PEAK - OPTION 2
NO NEW OVERLOADS

2009 SUMMER-SHOULDER PEAK - OPTION 3
NO NEW OVERLOADS

2009 SUMMER-SHOULDER PEAK - OPTION 4
NO NEW OVERLOADS

2009/10 WINTER PEAK - OPTION 2
NO NEW OVERLOADS

2009/10 SUMMER PEAK - OPTION 3
NO NEW OVERLOADS

2009/10 WINTER PEAK - OPTION 4
NO NEW OVERLOADS

Appendix 3 – Evaluation of Modified Project Output

It is possible that with a modified plant output, the transmission mitigation issues can be eliminated. Power flow studies of the season(s) in which overloads are identified are used to evaluate changes in the proposed >Omitted Text< plant output. The seasonal cases with overloads were reevaluated by reducing the proposed plant output until the overload is eliminated. The results of the studies are that if the proposed >Omitted Text< plant is limited to 100 MW, then the overloads identified in the study and reported in Appendix 2 above are eliminated.