Feasibility Study Report for PSCo OASIS Request # GI-2004-1

Generation Interconnection Request for a 150 MW Wind Generation Facility Near Ft. Morgan, Colorado

Xcel Energy Transmission Planning
June 18, 2004

Executive Summary

PSCo Transmission received a generation request to determine the feasibility of interconnecting 150 MW of new Customer wind turbine generation into the PSCo transmission system at the Pawnee Station 230 kV bus. The Customer proposed commercial operation date is December 31, 2005 with a back feed date of June 1, 2005.

This study shows that after execution of an Interconnection Agreement (IA), the Customer can interconnect within 9 months and deliver the full 150 MW in 24 months.

The Customer requested both an ER (Energy Resource) and an NR (Network Resource) Interconnection Service into the Pawnee Station 230 kV bus via the Customer's 18-20 mile line. The ER portion of this study determined that the transmission system could accept approximately 62 MW of the proposed Customer generation before additional transmission infrastructure would be required. This determination is dependent upon the loading of the TOT 3 import path as well as assumed infrastructure additions required to accommodate the delivery of proposed generation from pending higher queued interconnection requests. In this case TOT 3 was loaded to a high level of 1470 MW and the TOT 3 limit was 1543 MW based on operating studies for Summer 2004. If the flows are lower on the TOT 3 path, the existing transmission system could accept higher levels of generation from the proposed wind farm. If the assumed infrastructure additions as part of higher queued interconnection requests are not constructed, the amount of delivery for the ER request would be zero (0). The current PSCo generation interconnection queue can be found in Appendix E.

The estimated cost of designing and constructing the new PSCo interconnection facilities required to interconnect the new Customer wind turbine generation into the Pawnee Station 230 kV bus is $625,000. The estimated time required to engineer, permit, and construct the network upgrades associated with interconnection is at least 9 months from the time an (IA) is signed. As per the Customer's request, this study assumed that the Customer would engineer, permit, construct, pay, and fund their 230 kV transmission line that will interconnect at the Pawnee Station 230 kV bus.

As a NR request, PSCo evaluated the network to determine the upgrades required to deliver the full 150 MW of the wind facility to PSCo native load Customers. Powerflow studies show that the 150 MW injection into the PSCo system in 2006 will create overloads on the PSCo system and increase overloads on nearby neighboring systems, thus network upgrades are required to relieve these problems. The initial upgrades will consist of an uprate of the PSCo Ft. Lupton Station-Henry Lake Substation –Riverdale Substation-Cherokee Station 230kV transmission line from its current rating of 435 MVA to at least 460 MVA. Preliminary engineering has determined that this will require changing jumpers on termination equipment at Riverdale Substation and Cherokee Station at an estimated cost of $153,000. Due to the position of this request in the PSCo generation interconnection queue, other upgrades will be required in 2008 as a result of this project's influence on request GI-2003-2 in 2008. This will require upgrading PSCo's 115 kV line from Ft. Lupton Station to Cherokee Station to 230 kV operation with an 800 MVA rating. The estimated cost for this upgrade is $23,595,000.

In summary, total requirements for a NR interconnection request includes:

- $625,000 for Pawnee Station interconnection facilities required in 2006.
- $153,000 for the Ft.Lupton Station –Henry Lake Substation-Riverdale Substation to Cherokee Station 230kV line uprate required in 2006.
- $23,595,000 to upgrade the Ft. Lupton Station – Cherokee Station 115kV line to 230kV required in 2008.

Total NR cost is estimated at $24,373,000. The time required to engineer, permit, and construct all the required PSCo facilities, including the 115 kV to 230 kV conversion, is at least 24 months from the time an Interconnection Agreement (IA) is signed. The cost responsibilities associated with these PSCo facilities, if constructed, would be handled as per applicable FERC policies.

Other impacts on TOT 3 and the neighboring utilities were monitored, but not addressed in the scope of this study. Should the Customer continue this request

and move on to the System Impact Study, all impacts on the PSCo and neighboring utilities will be identified and these studies would include participation from those Affected Systems Operators/Planners.

It should be noted that if infrastructure associated GI-2003-1 is not constructed, then additional facilities and time will be required to support both an ER and NR request. Specifically, those facilities estimated in GI-2003-1 Feasibility Study associated with an NR request consist of the following:

1) Uprate the PSCo 230 KV line from Pawnee Station to Quincy Substation and on to Smoky Hill Substation.
2) Upgrade the PSCo 230 kV line from Pawnee Station to Ft. Lupton Station to a 230 kV double circuit, 800 MVA per circuit rated transmission line.

PSCo estimated that it would take at least 27 months to construct the above facilities from the execution of an IA. The completed GI-2003-1 Feasibility study report is available via the Rocky Mountain Area Oasis (www.rmao.com).

Introduction

PSCo Transmission received this large generator interconnection request (GI-2004-1) to interconnect one hundred (100) 1.5 MW, GE doubly fed induction generator (DFIG) wind turbines, for a total of 150 MW generation, with a commercial operation date of December 31, 2005 and a back feed date of June 1, 2005. The proposed wind farm would be located near Ft. Morgan, Colorado and would interconnect into the PSCo transmission system via an 18-20 mile radial 230 kV line terminating at the PSCo Pawnee Station. The Customer has requested that this Project be evaluated as a Network Resource (NR) and an Energy Resource (ER) with the energy going to PSCo Customers.

Study Scope and Analysis

The Interconnection Feasibility Study preliminarily evaluated the transmission requirements associated with the proposed interconnection to the PSCo Transmission System. As per section 6.2 of the FERC LGIP, the Study considered the Base Case as well as all Generating Facilities (and with respect to (iii), any identified Network Upgrades) that, on the date the Interconnection Feasibility Study is commenced:

(i) are directly interconnected to the Transmission System;

(ii) are interconnected to Affected Systems and may have an impact on the Interconnection Request;
(iii) that have a pending higher queued Interconnection Request to interconnect to the Transmission System; and
(iv) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

The Study consisted of power flow and short circuit analyses. The power flow analysis provided a preliminary identification of any thermal or voltage limit violations resulting for the interconnection; and for a NR request, a preliminary identification of network upgrades required to deliver the proposed generation to PSCo loads. The short circuit analysis provided a preliminary identification of any circuit breaker short circuit capability limits exceeded as a result of the Interconnection and for a NR request, the delivery of the proposed generation to PSCo loads.

PSCo adheres to NERC / WECC Reliability Criteria, as well as internal Company criteria for planning studies. During system intact conditions, criteria are to maintain transmission system bus voltages between 0.95 and 1.05 per-unit of system nominal / normal conditions, and steady state power flows within 1.0 per-unit of all elements thermal (continuous current or MVA) ratings. Operationally, PSCo tries to maintain a transmission system voltage profile ranging from 1.02 per-unit or higher at generation buses, to 1.0 per-unit or higher at transmission load buses. Following a single contingency element outage, transmission system steady state bus voltages must remain within 0.90 per-unit to 1.10 per-unit, and power flows within 1.0 per-unit of the elements continuous thermal ratings.

Power Flow Study Models:

The power flow study used a 2006 heavy summer power flow model with high TOT 3 load flow that was created from the Western Electricity Coordinating Council (WECC) 2004 Heavy Summer Case Operating case. The Tot 3 limit was assumed to be 1543 MW, based on 2004 summer studies. This study did not include a comprehensive analysis of how the TOT3 limit might be affected by this project. A full TOT 3 analysis would be part of a later Interconnection System Impact Study during which the Affected System Operators would need to take part in the system analysis. Appendix A details the transmission lines that comprise the TOT 3 interface.

To evaluate the impact of this request on those ahead in the PSCo Interconnection Queue (See Appendix E), another set of load flow cases with heavy summer 2010 loads and resources were used that were based on the

WECC 2008 Heavy Summer case. The generators in the interconnection queue that affect this request are as follows:

1. GI-2003-1: 300 MW Wind Farm connected to Pawnee Station and its associated infrastructure with a proposed ISD of 12/05. The infrastructure identified in GI-2003-1 consists of the following:
   a. Uprate the 94 mile PSCo 230 KV line from Pawnee Station to Quincy and Smoky Hill Substations from 500 MVA to 800 MVA.
   b. Upgrade the PSCo 64 mile 230 kV line from Pawnee Station to Ft. Lupton Station to a 230 kV double circuit, 800 MVA per circuit rated transmission line.
2. GI-2003-2: 500 MW Coal fired generator connecting to the Pawnee to Daniels Park 230 kV line near Deer Trail, Colorado and its associated infrastructure with a proposed ISD of 10/08. The infrastructure identified in GI-2003-2 consists of the following:
   a. Construct a new Corner Point Substation 40 miles east of Smoky Hill connecting to the PSCo Pawnee to Daniels Park 230 kV transmission line.
   b. Construct a new 63 mile 230 kV line with 345 kV specifications from Corner Point to Daniels Park.
3. GI-2003-3: 750 MW Coal fired generator connected at Comanche Station and it's associated infrastructure with a proposed ISD of 10/09. The infrastructure identified in GI-2003-3 consists of the following:
   a. 345 kV yards at Comanche Station and Daniels Park Substation
   b. Two new 122 mile 345 kV lines from Comanche Station to Daniels Park Substation.

As an NR request, the proposed generation was scheduled to the Denver Metro Area and Southeast Colorado peaking units.

At this Feasibility Study stage, the 150 MW wind farm was modeled as two (2) 75 MW conventional generators with a 0.9 pu lag power factor and a 0.95 pu lead power factor capability (+25/-36.5 MVAR) to simulate the VAR requirements of the generators. This is on the assumption that Customer will be using the GE 1.5 MW DFIG turbines that will have power factor and voltage control capability, as proposed and stated in their request.

As previously stated, the Customer to PSCo point of interconnection (POI) will be located at PSCo's Pawnee Station 230 kV switch yard, terminating the Customer's radial 18 to 20 mile 230 kV line constructed from the Customer's

wind turbine generation facility collector site to the PSCo Pawnee Station. Customer provided all the impedance data for their interconnecting radial 230 kV transmission line and their 230/34.5 kV step-up transformer.

Power Flow Study Results and Conclusions

Energy Resource (ER) Study Results:

The ER results were determined by using PTI's MUST program for performing power transfer limit analysis, and utilizing a PSS/E powerflow model.. The case included GI-2003-1, a 300 MW Wind Farm connecting at Pawnee Station along with it's associated infrastructure, with TOT 3 at 1470 MW, and showed that this wind project could inject 62 MW of power into the PSCo transmission system before network upgrades are constructed. The amount that the wind project can inject into the PSCo is directly related to the loading of the TOT 3 interface as well as other current generation currently dispatched at Pawnee Station and at nearby IPP's. For higher levels of TOT 3 there will be less injection capability is and similarly for lower levels of TOT 3 more injection capacity will be available. Also it should be noted that if any Pawnee area generation is off–line or reduced, more injection capability would be available. Appendix B shows the MUST transfer level results determining the 62 MW limit at 1470 MW TOT 3 loading. This level was also confirmed using a PSS/E saved case. The cost of the interconnecting facilities at Pawnee Station is $625,000 and will take at least 9 months from the signing of an Interconnection agreement (IA) to complete construction.

Network Resource (NR) Study Results:

The NR study determined the network upgrades that will be required to accept the full 150 MW from the proposed wind farm for the conditions studied,. As stated earlier, the amount that can be injected into the PSCo transmission system is dependent upon the loading of the TOT 3 interface study examined 150 MW injections with TOT 3 at the 1470 MW level. Appendix C at the end of this document will show the MUST single contingency analysis study results that determine the need for infrastructure along with a contingency comparison table for the requests ahead of this one in the queue.

To determine the network upgrades the 2006 case from the ER evaluation was used and the proposed Ft. Morgan 150 MW Wind Farm was set at full 150 MW output along with the generation in the Pawnee area modeled at full output. Laramie River Station in Southern Wyoming was also dispatched so

that it was at its full capacity. With the wind generation dispatched to replace Cherokee Station generation, heavy loading occurs on the PSCo 230 kV system south of Ft. Lupton Station. For the loss of the Ft. Lupton Station to JL Green 230 kV line, the Ft. Lupton Station to Henry Lake line overloads 105% of its 435 MVA rating. Also the 230 kV line section from Henry Lake Substation to Riverdale Substation is at 100% of its rating

When including those requests higher in the Interconnection queue, the 2010 case showed that a Ft. Lupton Station to Henry Lake contingency will produce overloads as high as 112% for the Ft. Lupton Station to JL Green section and 110% for the JL Green to Washington line section. Other less severe overloads also occur for the loss of one of the three PSCo 230 kV lines exiting from Ft. Lupton Station south to Cherokee Station. To relieve the overloading conditions, network upgrades are required.

Coincident with the December 2006 interconnection, an uprate of the 230 kV line from Ft. Lupton Station-Henry Lake Substation-Riverdale Substation-Cherokee Station from 435 MVA to at least 460 MVA will be required. The estimated cost for this would be approximately $153,000 and consists of installing double 1272 kCMIL ACSR jumpers on the equipment at Cherokee Station and Riverdale Substation.

By October 2008, the required network upgrades include converting the existing PSCo 28 mile Ft. Lupton Station to Platte Valley to Cherokee Station 115 kV line to 230 kV operation with an 800 MVA capacity. A system one-line diagram showing this entire infrastructure can be found below in Figure 1. Appendix D shows the one-line diagrams of the substations and their required changes.

The 115 kV to 230 kV conversion will be required before GI-2003-2 goes in service with a proposed ISD of 10/08. As mentioned earlier there are three 230 kV lines leaving Ft. Lupton Station and terminating at Cherokee Station and they are:

- Ft. Lupton Station – JL Green – Washington - Glenn – Cherokee Station
- Ft. Lupton Station – Henry Lake Substation– Riverdale Substation- Cherokee Station
- Ft. Lupton Station – Green Valley Station – Barr Lake Station – Reunion Substation– Cherokee Station

Powerflow studies that have generators GI-2003-1 (Brush 300 MW Wind Farm) and GI-2003-2 (Buick 500 MW Coal) and their associated infrastructure

show that for contingency of the line section from Ft. Lupton Station to JL Green overloads occur on the Ft. Lupton Station – Henry Lake Substation– Riverdale Substation- Cherokee Station line as much as 105% of the 435 MVA rating. Likewise for a contingency of the Ft. Lupton Station to Henry Lake Substation line, the Ft. Lupton Station – JL Green Substation – Washington Substation- Glenn Substation – Cherokee Station line overloads as much as 112% in addition to the Ft. Lupton Station 230/115 kV 280 MVA rated autotransformer overloading 108%. This results in the need to convert the 115 kV line from Ft. Lupton Station to Cherokee Station to 230 kV and convert the tapped Platte Valley Substation to 230 kV operation. With this upgrade in the powerflow studies, the above contingency overloads are alleviated.

Short Circuit Study Results

The short circuit analysis at Pawnee Station consisted of faulting the 230kV bus at Pawnee Station with three-phase and phase to ground faults. Previous studies show that the type of wind turbines specified by the Customer, provide little to no fault current. To exaggerate the fault current, the wind turbines were modeled as conventional generators using impedances supplied from the power flow studies. More detailed short circuit models, and associated possible Customer generation fault contribution (or lack thereof) will need to be addressed in later studies, such as the Interconnection System Impact Study (SIS), and the following Interconnection Facilities Study (IFS).

The fault currents are listed below.

Before the addition of the proposed Ft. Morgan 150MW Wind Farm (GI-2004-1) Wind Farm:

Location	3 Phase	Single Phase
Pawnee	23,625A	26,079A
Ft. Lupton	30,544A	26,033A
Smoky Hill	20,317A	21,134A

Before the addition of the proposed Ft. Morgan 150MW Wind Farm (GI-2004-1) Wind Farm:

Location	3 Phase	Single Phase
Pawnee	23,668A	26,114A
Ft. Lupton	30,552A	26,037A
Smoky Hill	27,103A	24,031A
Ft. Morgan Wind Farm	699A	32A

The fault current at these substations is within the 40kA rating of the breakers; therefore, the 150 MW Ft. Morgan Wind Farm and associated infrastructure will not cause fault current to exceed the circuit breaker ratings.

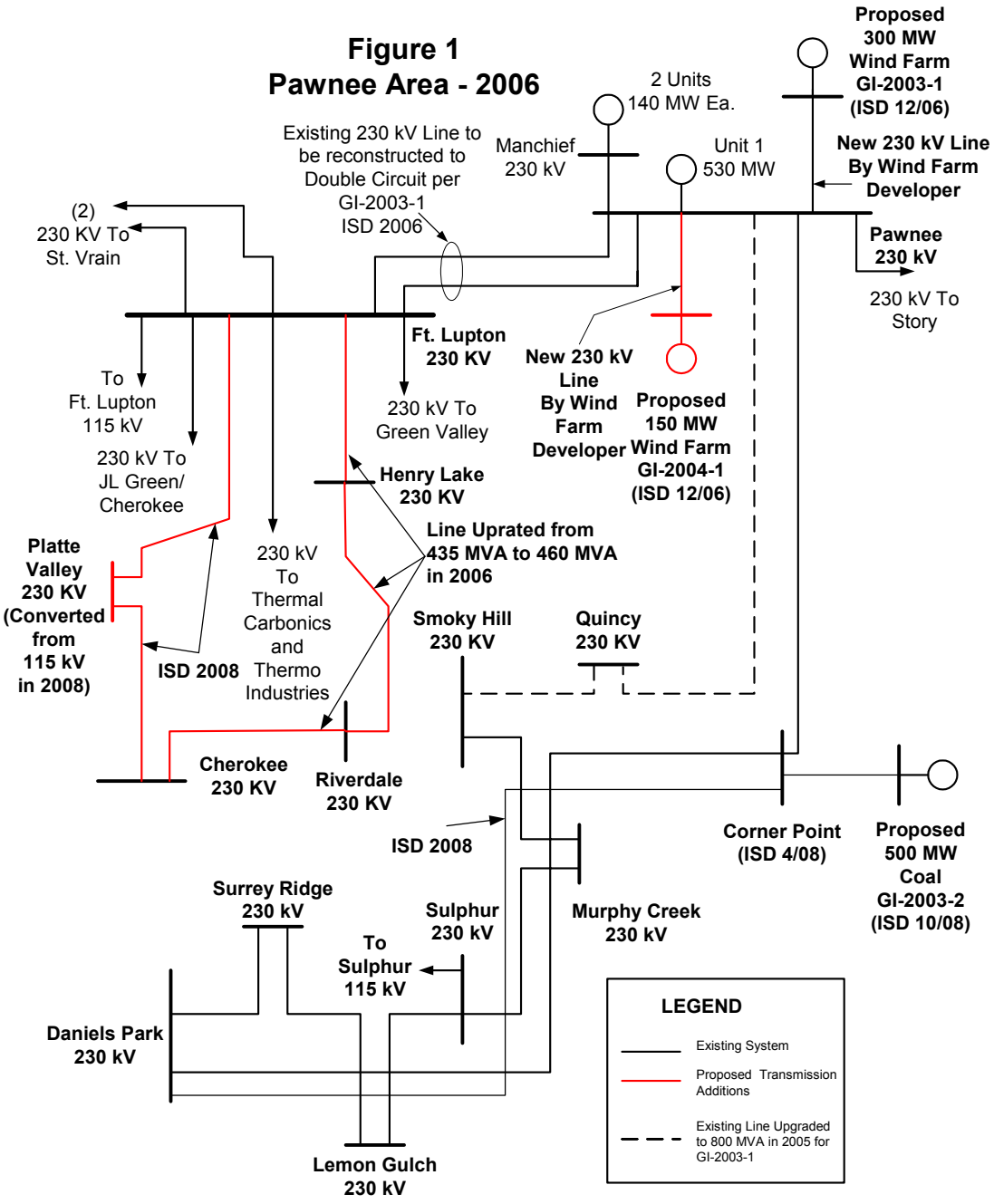


Figure 1
Pawnee Area - 2006
Proposed 300 MW Wind Farm GI-2003-1 (ISD 12/06)
2 Units 140 MW Ea.
Existing 230 kV Line to be reconstructed to Double Circuit per GI-2003-1 ISD 2006
Manchief 230 kV
Unit 1 530 MW
New 230 kV Line By Wind Farm Developer
(2) 230 KV To St. Vrain
Pawnee 230 kV
230 kV To Story
Ft. Lupton 230 KV
To Ft. Lupton 115 kV
230 kV To Green Valley
New 230 kV Line By Wind Farm Developer
Proposed 150 MW Wind Farm GI-2004-1 (ISD 12/06)
230 kV To JL Green/ Cherokee
Henry Lake 230 KV
Line Uprated from 435 MVA to 460 MVA in 2006
Platte Valley 230 KV (Converted from 115 kV in 2008)
ISD 2008
230 kV To Thermal Carbonics and Thermo Industries
Smoky Hill 230 KV
Quincy 230 KV
Cherokee 230 KV
Riverdale 230 KV
ISD 2008
Corner Point (ISD 4/08)
Proposed 500 MW Coal GI-2003-2 (ISD 10/08)
Surrey Ridge 230 kV
Sulphur 230 kV
Murphy Creek 230 kV
To Sulphur 115 kV
Daniels Park 230 kV
Lemon Gulch 230 kV
LEGEND
Existing System
Proposed Transmission Additions
Existing Line Upgraded to 800 MVA in 2005 for GI-2003-1

Costs Estimates and Assumptions:

To provide an interconnection and delivery for the Customer requested generation at the PSCo Pawnee Station; network upgrades must be made on the PSCo transmission system.

The estimated indicative total cost for the PSCo network upgrades is:

$24,373,000

The estimated cost shown is an "indicative" (+/-30%) preliminary budgetary cost in 2006 dollars and is based upon typical construction costs for previously performed similar construction. These estimated costs include all applicable labor and overheads associated with the engineering, design, and construction of these new PSCo facilities. This estimate does not include any costs for any Customer-owned, supplied, and installed equipment and associated design and engineering. This estimate also does not include any costs that may be required for other entities' systems.

The following lists the improvements required to accommodate the interconnection and the delivery of the proposed 150 MW facility. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines.

System Improvements (subject to change upon more detailed analysis):

PSCo Interconnection Facilities

Substation	Description	Cost
Pawnee Station	Interconnect Customer's 230 kV line, which will connect to the far west bay of the 230 kV switchyard. The new equipment required includes: • a new 230 kV 3000 A, 50 kA circuit breaker • 230 kV bi-directional revenue metering • two 230 kV switches • required steel supporting structures • associated control and relaying changes and additions. (See one-line in Appendix D)	$550k

	Transmission line relocation	$55k
	Siting and Land Rights for misc. permits	$20k
	Total Cost	**$625k**

PSCo Network Upgrades required to deliver the proposed 150 MW as an NR Request

2006 Additions

Substation	**Description**	**Cost**
Cherokee Station and Riverdale Substation	• Install two (2) 1272 kCMIL ACSR jumpers from the incoming/outgoing transmission lines to the substation bus work, in addition to associated control and relaying changes and additions. (See one-lines in Appendix D)	$83k
	Transmission Line Survey	$50k
	Siting and Land Rights for misc. permits	$20k
	Total Cost	**$155k**

2008 Additions

	Description	**Cost**
Ft. Lupton Station	New 230 kV 2000 Amp Line Terminal to Cherokee Station via Platte Valley Substation which will be located on the far west bay o f the 230 kV switchyard sharing the middle circuit breaker with one of the Ft. St. Vrain lines. The following equipment will be required: • one (1) 230 kV 3000 amp 50 kA circuit breaker • two (2) 230 kV switches • misc. supporting steel • electrical bus work • associated metering control and relaying (See One-line in Appendix D)	$665k
Platte Valley Substation	Convert this Tri-State/Untied Power 115 kV delivery point to 230 kV operation. The	$2,961k

	Description	Cost
	following equipment will be required: • two (2) 230 kV 2000 amp circuit breakers • two (2) 230 kV 1200 amp circuit switchers • two 230/13 kV, 25 MVA transformers • misc. supporting steel • electrical bus work • associated metering, control and relaying (See One-line in Appendix D)	
Cherokee Station	New 230 kV 2000 Amp Line Terminal to Ft. Lupton via Platte Valley Substation which will be located on the far west bay o f the 230 kV switchyard sharing the middle circuit breaker with one of the Ft. St. Vrain lines. The following equipment will be required: • one (1) 230 kV 3000 amp 50 kA circuit breaker • two (2) 230 kV switches • misc. supporting steel • electrical bus work • associated metering control and relaying (See One-line in Appendix D)	$669k
Transmission	Convert the existing 115 kV line from Ft. Lupton Station to Cherokee Station via Platte Valley to 230 kV operation.	$18,600k
Siting and Permitting	Obtain necessary siting, permits, and ROW as required	$700k
	TOTAL COST	**$23,595k**
	TOTAL COST ALL PROJECTS	**$24,373k**

Assumptions:

- Infrastructure associated with Interconnection Request GI-2003-1 is assumed to be constructed (See previous description) and it was determined that these network upgrades required a minimum of 27 months to complete following the execution of and IA. The feasibility study report for GI-2003-1 is available via RMAO.com.

- PSCo (or its contractor) crews will perform all construction and wiring associated with PSCo-owned and maintained equipment.

- The estimated time for design and construction of PSCo interconnection facilities at Pawnee Station is at least 9 months and is completely independent of GI-2003-1.

- The estimated time for design and construction for the PSCo network upgrades is at least 24 months after authorization to proceed has been received, and based upon other identified assumptions for Siting and Land Rights, and Transmission (see below).

- The last span into Pawnee Station from the Customer owned 230 kV line will be a slack span between the PSCo substation dead-end and the Customer's last structure, which is assumed to be a dead-end tangent structure.

- New Ft. Lupton Station-Platte Valley-Cherokee Station 230 kV line has a two conductor bundled 954 ACSR conductors per phase. Rebuild is constructed within existing ROW with daily outages and rebuilt one section at a time.

- A siting study will not be required if constructed in existing ROW

- Permitting to take at least 16 months and will be difficult in obtaining permits through six (6) local jurisdictions. It is also anticipated that a Certificate of Public Convenience and Necessity (CPCN) will be required from Colorado Public Utility Commission (CPUC).

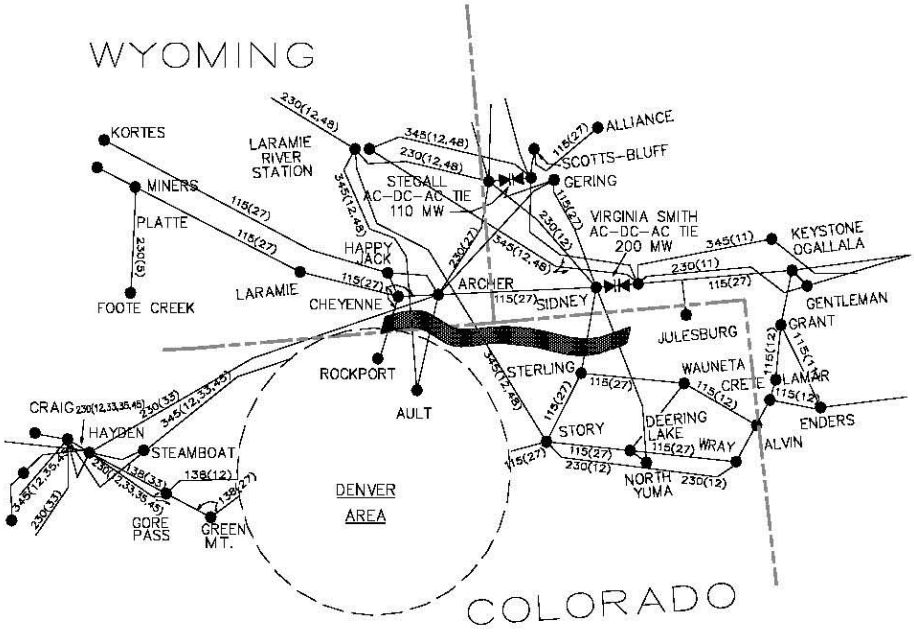
- Minimal additional ROW required and available to rebuild.

- No land requirements for substations

APPENDIX A
TOT 3 DETAILS

Revised February 2003

36. TOT 3



Revised February 2003

36. TOT 3

Accepted Rating ☒
Existing Rating ☐
Other ☐

Location:	Border between Northeast Colorado and Southeast Wyoming
Definition:	Sum of the flows on the following transmission lines: Line — Metered End Archer-Ault 230 kV — Archer Laramie River-Ault 345 kV — Laramie River Laramie River-Story 345 kV — Laramie River Cheyenne-Rockport 115 kV — Cheyenne Sidney-Sterling 115 kV — Sidney Sidney-N. Yuma 230 kV — Sidney
Transfer Limit:	North to South: 1605 MW (Maximum) South to North: Not defined Depending on local generation levels, DC tie levels and direction, the real-time rating can range between a maximum of 1605 W and a minimum of 843 MW. Typically, the real-time rating is calculated dynamically and updated every minute based on Table 1B.
Critical Disturbance that limits the transfer capability:	The critical disturbances and limiting elements vary with the various scenarios. Reference Table 1B for further information.
When:	Rating was first established in 1981. The current rating was established in July 1999 with publication of the "Comprehensive Progress Report for the Revised Rating of the TOT 3 Transfer Path." The study was conducted by Western and the revised rating was jointly proposed by: Western Area Power Administration (WAPA) - Loveland Tri-State Generation & Transmission Association, Inc. (TSGT) Public Service Company of Colorado (PSC) Basin Electric Power Cooperative (BEPC)
System Conditions:	This rating is independent of transfer levels between major areas of WECC. The transfer limit is impacted by local area generation and the direction and magnitude of DC tie flows. Historically, the flows have all been north to south across the path. Under certain operating conditions when TOT 3 is loaded to its limit, the TOT 5 capability cannot be used since additional schedule on TOT 5 will overload TOT 3.

Revised February 2000

Study Criteria:	(Summary) System intact: • Per unit voltages between 0.95 p.u. and 1.05 p.u. • All lines and transformers loaded to less than continuous rating. Single contingency outage conditions: • Per unit voltages between 0.90 p.u. and 1.10 p.u. • All lines loaded to less than 15-minute emergency ratings. • All transformers loaded to less than 30-minute emergency ratings. • Transient voltage swings down to 0.7 p.u. permitted.
Remedial Actions Required:	Remedial actions are required to achieve the rated transfer capability. Following an outage, all overloaded lines and transformers must have their loadings reduced to continuous ratings within 15 minutes. This is accomplished by reducing schedules and adjusting generation.
Formal Operating Procedure:	There is a formal operating procedure dated November 1999. WAPA-Loveland is the operating agent and uses real-time flows to monitor the path.
Allocation:	The transfer capability of the path is divided between WAPA, Missouri Basin Power Project (MBPP), Public Service Company of Colorado (PSC), and Tri-State Generation & Transmission (TSGT). TSGT and BEPC are members of MBPP.
Interaction w/Other Transfer Paths:	None
Contact Person:	Thu-Hong Tran Western Area Power Administration Rocky Mountain Region P. O. Box 3700 Loveland, CO 80539-3003 (970) 461-7404 (970) 461-7213 - fax trant@wapa.gov

APPENDIX B
MUST TRANSFER REPORT

AC FCITC Single Study – TOT 3 at 1470 MW

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  *** MUST 6.01  ***  TUE, JUN 08 2004   9:54 ***
      06HS- GI-2003-1 IN SERVICE; FROM 06 BASE...06 BUDGET REV 11

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Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\Pacific Power Marketing\Cases\PSSE\MUST FILES\NECO.CON

Exclud.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\Pacific Power Marketing\Cases\PSSE\MUST FILES\GI-2003-1A.exc

 Study transfer level -      200.0 MW. Total violations: 1711

 First violation      -        6.0 MW.

Study transfer. From PAWNEE         To DENVER        . Transfer level -    200.0 MW


      AC       DC   Delta L: Limiting constraint                          PreShft PostShf           AC_TDF   DC_TDF
   FCITC    FCITC    FCITC C: Contingency description                  Ncon MVA/MW  MVA/MW  Rating  Average
    62.4      6.0     56.4 L:70192 FTLUPTON 230 70605 HENRYLAK 230 1          430.6   435.2   435.0  0.07447  0.07049
                           C:70192 FTLUPTON 230 70529 JLGREEN  230 1     192
                             Open 70192 FTLUPTON 230 70529 JLGREEN  230 1

    85.7     44.0     41.7 L:70192 FTLUPTON 230 70605 HENRYLAK 230 1          429.0   435.3   435.0  0.07444  0.07049
                           C:70461 WASHINGT 230 70529 JLGREEN  230 1     320
                             Open 70461 WASHINGT 230 70529 JLGREEN  230 1

   165.5    134.5     31.0 L:70311 PAWNEE   230 73192 STORY    230 1          606.1   575.6   576.0 -0.18426  0.18203
 Removed                   C:73012 AULT     345 73108 LAR.RIVR 345 1     394
                             Open 73012 AULT     345 73108 LAR.RIVR 345 1

   122.6    138.4    -15.8 L:70006 BRSHWIND 230 70007 BRSHWND134.5 1         151.9   167.1   167.0  0.12357 -0.12282
                           C:73034 BURL PSC 115 73209 WANIBETP 115 1     428
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                        Open 73034 BURL PSC 115 73209 WANIBETP 115 1

 122.6   138.4   -15.8 L:70006 BRSHWIND 230 70007 BRSHWND134.5 1         151.9   167.1   167.0  0.12357 -0.12282
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                        Open 73034 BURL PSC 115 73485 BURL KC  115 1
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APPENDIX C
MUST CONTINGENCY REPORTS

Branch Violations - 2006 Cases

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Subsys.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\Pacific Power Marketing\Cases\PSSE\MUST FILES\NECO.SUB
Monit.File  S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\Pacific Power Marketing\Cases\PSSE\MUST FILES\NECO.MON
Contin.File S:\LDC-LI\Tra\2Jim\TRANSMISSION REQUESTS\Pacific Power Marketing\Cases\PSSE\MUST FILES\NECO.CON
Exclud.File None

************** Report on violations ********************
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Branches with MVA flow more than 100.0 % of nominal rating

From bus	**	**	To bus	**	CKt	Tp	Rating	LOAD FLOW CASES: Base Case TOT 3 at 1476 MW Loading%	Base CASE W/ Brush 300 MW Wind and Upgrades (GI-2003-1) TOT 3 at 1484 MW Loading%	Base CASE W/ GI-2003-1 & Ft. Morgan 150 MW (GI-2004-1) TOT 3 @ 1480 MW Loading%	Ft. Morgan 150 MW Wind W/Network Delivery Upgrades TOT 3 @ 1482 MW Loading%	Contingency
70469 WELD	46.0	70470	WELD PS	115	T2	TR	46.7	111.3	111.3	111.3	111.3	** Base Case **
70149 DENVTM	230	70177	ELATI3	230	1	LN	300.0	*<100%*	*<100%*	107.7	120.8	70018 SODALAKE 230 70266 LOOKOUT 230 1
70264 LITTLET2	115	70483	MARTN1TP	115	1	LN	135.0	122.0	124.0	125.0	122.6	70037 ARAPAHOB 115 70165 ENGLE3TP 115 1
70463 WATERTON	115	70483	MARTN1TP	115	1	LN	135.0	136.9	139.1	140.3	137.6	70037 ARAPAHOB 115 70165 ENGLE3TP 115 1
70149 DENVTM	230	70177	ELATI3	230	1	LN	300.0	*<100%*	*<100%*	100.1	115.8	70038 ARAPAHOE 230 70137 DAKOTA 230 1
70087 CAPHILL1	115	70300	NORTH547	115	1	LN	130.0	117.9	110.0	112.3	106.3	70039 ARGO 115 70108 CHEROKEE 115 1
70087 CAPHILL1	115	70300	NORTH547	115	1	LN	130.0	109.3	101.8	103.8	*<100%*	70039 ARGO 115 70323 PLATTEPS 115 1
70087 CAPHILL1	115	70300	NORTH547	115	1	LN	130.0	102.7	<100	*<100%*	*<100%*	70041 ARVADA 115 70108 CHEROKEE 115 1
70149 DENVTM	230	70177	ELATI3	230	1	LN	300.0	*<100%*	107.8	115.9	128.4	70046 BUCKLEY2 230 70396 SMOKYHIL 230 1
70149 DENVTM	230	70177	ELATI3	230	1	LN	300.0	*<100%*	104.2	112.2	124.8	70046 BUCKLEY2 230 70491 TOLGATE 230 1
70149 DENVTM	230	70177	ELATI3	230	1	LN	300.0	*<100%*	*<100%*	101.7	112.5	70048 GREENVAL 230 70393 SKYRANCT 230 1
70087 CAPHILL1	115	70300	NORTH547	115	1	LN	130.0	111.4	104.5	106.7	100.9	70073 CALIFOR1 115 70075 CALIFOR3 115 1

70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	122.0	114.8	117.4	101.1	70073 CALIFOR1 115 70299 NORTH542 115 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	103.0	<100%	<100%	<100%	70074 CALIFOR2 115 70075 CALIFOR3 115 1
70073 CALIFOR1 115 70299 NORTH542 115 1	LN	137.0	113.3	110.1	112.8	108.6	70087 CAPHILL1 115 70215 HARRISPS 115 1
70073 CALIFOR1 115 70299 NORTH542 115 1	LN	137.0	107.0	101.8	104.2	<100%	70087 CAPHILL1 115 70300 NORTH547 115 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	105.2	102.0	104.4	100.4	70088 CAPHILL2 115 70148 DENVTM 115 1
70035 ARAP4 13.8 70037 ARAPAHOB 115 U4	TR	120.0	<100%	<100%	100.2	<100%	70106 CHEROK4 22.0 70108 CHEROKEE 115 U4
70073 CALIFOR1 115 70299 NORTH542 115 1	LN	137.0	102.6	101.1	104.5	105.8	70107 CHEROKEE 230 70324 LACOMBE 230 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	117.0	114.4	118.8	121.1	70107 CHEROKEE 230 70324 LACOMBE 230 1
70065 BROMFLD1 115 70382 SEMPER 115 1	LN	134.8	122.8	124.9	125.8	122.9	70108 CHEROKEE 115 70174 FEDERHT1 115 1
70073 CALIFOR1 115 70299 NORTH542 115 1	LN	137.0	111.5	106.4	108.7	104.2	70108 CHEROKEE 115 70276 MAPLETO1 115 1
70088 CAPHILL2 115 70148 DENVTM 115 1	LN	131.0	<100%	<100%	101.7	<100%	70108 CHEROKEE 115 70276 MAPLETO1 115 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	122.0	115.0	117.5	111.6	70108 CHEROKEE 115 70299 NORTH542 115 2
70121 COMANCHE 115 70122 COMANCHE 230 A1	TR	176.0	101.9	107.1	105.5	<100%	70121 COMANCHE 115 70122 COMANCHE 230 A2
70121 COMANCHE 115 70122 COMANCHE 230 A2	TR	185.0	<100%	102.1	100.6	<100%	70121 COMANCHE 115 70122 COMANCHE 230 A2
70149 DENVTM 230 70177 ELATI3 230 1	LN	300.0	<100%	<100%	107.3	122.8	70137 DAKOTA 230 70149 DENVTM 230 1
70149 DENVTM 230 70177 ELATI3 230 1	LN	300.0	<100%	<100%	102.0	117.0	70139 DANIELPK 230 70311 PAWNEE 230 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	<100%	100.1	<100%	70139 DANIELPK 230 70311 PAWNEE 230 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	109.3	101.8	103.8	<100%	70148 DENVTM 115 70323 PLATTEPS 115 1
70073 CALIFOR1 115 70299 NORTH542 115 1	LN	137.0	<100%	<100%	101.8	103.1	70149 DENVTM 230 70324 LACOMBE 230 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	113.0	110.6	114.9	117.3	70149 DENVTM 230 70324 LACOMBE 230 1
70463 WATERTON 115 70483 MARTN1TP 115 1	LN	135.0	100.7	102.2	103.0	100.3	70165 ENGLE3TP 115 70263 LITTLET1 115 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	<100%	100.6	100.6	70192 FTLUPTON 230 70311 PAWNEE 230 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	<100%	100.6	100.6	70192 FTLUPTON 230 70311 PAWNEE 230 2
70192 FTLUPTON 230 70605 HENRYLAK 230 1	LN	435.0	<100%	<100%	105.4	<100%	70192 FTLUPTON 230 70529 JLGREEN 230 1
70362 RIVERDAL 230 70605 HENRYLAK 230 1	LN	435.0	<100%	<100%	100.3	<100%	70192 FTLUPTON 230 70529 JLGREEN 230 1
70087 CAPHILL1 115 70300 NORTH547 115 1	LN	130.0	106.3	101.9	103.1	<100%	70259 LEETSDAL 115 70260 LEETSDAL 230 T4
70444 VALMONT 115 70447 VALMONT 230 T7	TR	280.0	<100%	101.3	101.8	<100%	70266 LOOKOUT 230 70570 PLNENDSS 230 1
70073 CALIFOR1 115 70299 NORTH542 115 1	LN	137.0	107.0	101.9	104.1	<100%	70276 MAPLETO1 115 70300 NORTH547 115 1
70310 PAWNEE 22.0 70311 PAWNEE 230 1B	TR	364.0	137.9	140.0	142.8	139.9	70310 PAWNEE 22.0 70311 PAWNEE 230 1A
70310 PAWNEE 22.0 70311 PAWNEE 230 1A	TR	364.0	137.9	140.0	142.8	139.9	70310 PAWNEE 22.0 70311 PAWNEE 230 1B
70149 DENVTM 230 70177 ELATI3 230 1	LN	300.0	<100%	<100%	113.7	128.2	70311 PAWNEE 230 70343 QUINCY 230 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	<100%	101.5	<100%	70311 PAWNEE 230 70343 QUINCY 230 1

73023 BIJOUTAP 115 73379 FMWEST 115 1	LN	80.0	<100%	101.9	101.0	101.1	70311 PAWNEE 230 73192 STORY 230 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	119.3	119.9	119.6	70311 PAWNEE 230 73192 STORY 230 1
70149 DENVTM 230 70177 ELATI3 230 1	LN	300.0	<100%	<100%	<100%	100.9	70311 PAWNEE 230 73192 STORY 230 1
70149 DENVTM 230 70177 ELATI3 230 1	LN	300.0	<100%	<100%	113.1	127.7	70343 QUINCY 230 70396 SMOKYHIL 230 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	<100%	101.2	<100%	70343 QUINCY 230 70396 SMOKYHIL 230 1
70149 DENVTM 230 70177 ELATI3 230 1	LN	300.0	<100%	<100%	101.7	112.5	70393 SKYRANCT 230 70528 SPRUCE 230 1
70523 SULPHUR 115 70524 SULPHUR 230 T1	TR	168.0	105.1	108.5	106.4	108.9	70395 SMOKYHIL 115 70521 PEAKVIEW 115 1
70192 FTLUPTON 230 70605 HENRYLAK 230 1	LN	435.0	<100%	<100%	104.9	<100%	70461 WASHINGT 230 70529 JLGREEN 230 1
70165 ENGLE3TP 115 70263 LITTLET1 115 1	LN	134.8	105.6	106.9	108.0	105.6	70463 WATERTON 115 70483 MARTN1TP 115 1
73211 WELD LM 115 73212 WELD LM 230 1	TR	150.0	142.2	134.5	134.4	135.0	70471 WELD PS 230 73212 WELD LM 230 1
70570 PLNENDSS 230 70580 PLNENDNG13.8 U2	TR	100.0	119.9	121.7	121.7	121.7	70570 PLNENDSS 230 70580 PLNENDNG13.8 U1
70570 PLNENDSS 230 70580 PLNENDNG13.8 U1	TR	100.0	119.9	121.7	121.7	121.7	70570 PLNENDSS 230 70580 PLNENDNG13.8 U2
73043 CHEYENNE 115 73480 CROWCRK 115 1	LN	80.0	112.2	113.8	114.2	114.3	73008 ARCHER 115 73043 CHEYENNE 115 1
73008 ARCHER 115 73043 CHEYENNE 115 1	LN	80.0	108.6	109.7	110.0	110.1	73008 ARCHER 115 73183 SKYLINE 115 1
73008 ARCHER 115 73043 CHEYENNE 115 1	LN	80.0	142.7	144.4	144.8	114.3	73008 ARCHER 115 73480 CROWCRK 115 1
70311 PAWNEE 230 73192 STORY 230 1	LN	576.0	<100%	105.5	100.6	101.2	73012 AULT 345 73108 LAR.RIVR 345 1
73009 ARCHER 230 73190 STEGALL 230 1	LN	400.0	112.1	110.2	112.2	111.6	73012 AULT 345 73108 LAR.RIVR 345 1
73023 BIJOUTAP 115 73379 FMWEST 115 1	LN	80.0	105.9	100.1	104.2	103.8	73012 AULT 345 73108 LAR.RIVR 345 1
73024 BLKHLWTP 115 73552 AULT 115 1	LN	85.1	101.8	101.2	102.6	102.6	73012 AULT 345 73108 LAR.RIVR 345 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	103.6	107.7	112.6	111.8	73012 AULT 345 73108 LAR.RIVR 345 1
73145 NUNN 115 73552 AULT 115 1	LN	85.1	102.1	101.5	102.9	102.9	73012 AULT 345 73108 LAR.RIVR 345 1
73179 SIDNEY 115 73180 SIDNEY 230 1	TR	167.0	100.2	<100%	<100%	<100%	73012 AULT 345 73108 LAR.RIVR 345 1
73013 B.CK PS 115 73014 B.CK PS 230 T1	TR	224.0	<100%	110.1	110.1	110.1	73013 B.CK PS 115 73020 BEAVERCK 115 1
73015 B.CK TRI 115 73020 BEAVERCK 115 1	LN	200.0	<100%	<100%	103.2	102.7	73013 B.CK PS 115 73020 BEAVERCK 115 1
73023 BIJOUTAP 115 73379 FMWEST 115 1	LN	80.0	101.6	103.0	107.7	107.7	73020 BEAVERCK 115 73464 ADENA 115 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	121.7	<100%	107.0	112.7	112.3	73020 BEAVERCK 115 73464 ADENA 115 1
73098 KODAK 115 73211 WELD LM 115 1	LN	120.0	110.9	113.7	114.3	113.9	73026 BOYD 115 73027 BOYD 230 1
73120 LOVE W 115 73124 LOVEWTAP 115 1	LN	110.0	107.3	107.3	107.5	107.3	73026 BOYD 115 73118 LOVE E 115 1
73008 ARCHER 115 73043 CHEYENNE 115 1	LN	80.0	119.8	121.4	121.8	121.9	73043 CHEYENNE 115 73480 CROWCRK 115 1
73052 DRAKE RD 115 73198 TIMBERLN 115 1	LN	105.2	101.4	<100%	<100%	<100%	73051 DIXON CK 115 73149 OVERLAND 115 1
73051 DIXON CK 115 73149 OVERLAND 115 1	LN	96.0	108.7	102.9	103.1	102.9	73052 DRAKE RD 115 73198 TIMBERLN 115 1
73149 OVERLAND 115 73506 LAPORTAP 115 1	LN	96.0	108.7	102.8	103.1	102.9	73052 DRAKE RD 115 73198 TIMBERLN 115 1

73098 KODAK 115 73211 WELD LM 115 1	LN	**120.0**	108.8	106.8	108.2	107.7	73078 HARMONY 230 73199 TIMBERLN 230 1
73023 BIJOUTAP 115 73379 FMWEST 115 1	LN	80.0	100.3	101.7	106.4	106.4	73088 HOYT 115 73464 ADENA 115 1
73031 BRUSHTAP 115 73305 EFMORGTP 115 1	LN	**121.7**	*<100%*	107.0	111.9	111.6	73088 HOYT 115 73464 ADENA 115 1
73115 LONGPEAK 115 73116 LONGPEAK 230 2	TR	**168.0**	117.7	119.0	118.1	118.0	73115 LONGPEAK 115 73116 LONGPEAK 230 1
73115 LONGPEAK 115 73116 LONGPEAK 230 1	TR	**168.0**	117.4	118.7	117.8	117.7	73115 LONGPEAK 115 73116 LONGPEAK 230 2
73048 DEL CTAP 115 73133 MEADOW 115 1	LN	**154.0**	109.9	111.0	111.0	110.7	73115 LONGPEAK 115 73196 TERRY 115 1
73113 LNGMNTNW 115 73133 MEADOW 115 1	LN	**110.2**	104.1	105.6	105.4	105.1	73115 LONGPEAK 115 73196 TERRY 115 1
73179 SIDNEY 115 73180 SIDNEY 230 1	TR	**167.0**	116.5	115.6	115.1	114.9	73143 N.YUMA 230 73180 SIDNEY 230 1
73166 REDWILLW 115 73208 WAGES 115 1	LN	55.0	106.9	105.2	105.5	105.5	73175 SANDHILL 115 73223 WRAY 115 1
73105 LAPORTE 115 73106 LAPORTE 230 1	TR	**168.0**	103.1	*<100%*	*<100%*	*<100%*	73198 TIMBERLN 115 73199 TIMBERLN 230 1
73384 BIRDSALE 115 73386 BIRDSALS34.5 1	TR	27.0	101.3	105.2	101.5	101.4	73382 BIRDSAL213.8 73386 BIRDSALS34.5 1
73384 BIRDSALE 115 73386 BIRDSALS34.5 1	TR	27.0	124.5	124.7	124.8	124.7	73383 BIRDSAL313.8 73386 BIRDSALS34.5 1
73396 DRAKE E 34.5 73398 DRAKE S 115 1	TR	67.0	118.6	118.8	118.8	118.8	73396 DRAKE E 34.5 73427 DRAKE 5 13.8 1
73409 KELKER W 115 73420 ROCKISLD 115 1	LN	**132.9**	100.2	*<100%*	*<100%*	*<100%*	73408 KELKER E 115 73409 KELKER W 115 1
73412 MIDWAYBR 115 73413 MIDWAYBR 230 A2	TR	100.0	103.7	110.2	111.4	108.7	73413 MIDWAYBR 230 73419 RD_NIXON 230 1
73110 LIBERTY 115 73309 BARLOW 115 1	LN	60.0	100.1	*<100%*	*<100%*	*<100%*	73413 MIDWAYBR 230 73531 LINCOLNT 230 1
73023 BIJOUTAP 115 73379 FMWEST 115 1	LN	80.0	*<100%*	*<100%*	104.2	104.0	73413 MIDWAYBR 230 73531 LINCOLNT 230 1
79051 FLAGST&A 345 79024 FLAGSTAF 345 2	LN	**747.0**	118.7	118.6	118.5	118.5	79024 FLAGSTAF 345 79032 GLENCANY 345 &1
73384 BIRDSALE 115 73386 BIRDSALS34.5 1	TR	27.0	115.3	115.3	115.3	115.3	GEN.Outage:73383 BIRDSAL313.8
73396 DRAKE E 34.5 73398 DRAKE S 115 1	TR	67.0	109.2	109.0	109.0	108.8	GEN.Outage:73427 DRAKE 5 13.8

COLOR CODES
WESTERN FACILITIES
TRI-STATE FACILITIES
PSCO FACILITIES
PRPA FACILITIES
CSU FACILITIES
IREA FACILITES

2010 Case Contingency Comparison

Element Loading									Case	2010 Comanche Base As per SIS Study (10w-a6-2g2)	2010 All Gen in queue w/o Ft. Morgan (10wallgen5a)	2010 All Gen in queue with Ft. Morgan (10wallgen5)	2010 with Buick and Pawnee Wind (10w-buick-b)	2010 with Buick, Pawnee Wind, and Ft. Morgan Wind (10w-buick-e)	Contingency					
From Bus				To Bus			CKT	rating	cont	cont	cont	cont	cont	From Bus			To Bus		
#	--name--	-kv-	zon	#	--name--	-kv-	ID	[MVA]	load	load	load	load	load	#	--name--	-kv-	#	--name--	-kv-
70353	READER	69	712	70352	READER	115	1	47	151%	153%	153%	151%	152%	70353	READER	69	70352	READER	115
70353	READER	69	712	70352	READER	115	2	47	151%	153%	153%	151%	152%	70353	READER	69	70352	READER	115
70005	BRUSHCPP	115	706	73013	B.CK PS	115	1	162	136%	113%	113%	134%	134%	70005	BRUSHCPP	115	73013	B.CK PS	115
73391	CTTNWD N	115	757	73410	KETTLECK	115	1	133	129%	128%	129%	117%	117%	73389	BRIARGAT	115	73393	CTTNWD S	115
70470	WELD PS	115	706	70471	WELD PS	230	2	150	127%	112%	112%	115%	115%	70439	UNC	115	70502	QF UNC	14
70132	CTY LAJ	69	712	70248	LAJUNTAT	69	1	39	124%	124%	124%	125%	125%	70247	LAJUNTAT	115	70248	LAJUNTAT	69
79029	FLAMGORG	69	790	79026	FLAMGORG	138	1	19	123%	123%	123%	123%	123%	70005	BRUSHCPP	115	73013	B.CK PS	115
70275	MANZANOL	69	712	70419	MANZANOL	115	1	25	122%	118%	118%	118%	120%	70060	BOONE	115	70419	MANZANOL	115
73211	WELD LM	115	754	73212	WELD LM	230	1	150	122%	130%	130%	126%	125%	70470	WELD PS	115	70471	WELD PS	230
70005	BRUSHCPP	115	706	73013	B.CK PS	115	2	187	118%	98%	98%	133%	133%	70005	BRUSHCPP	115	73013	B.CK PS	115
70054	BMONT TP	69	712	70455	W.STATON	69	1	47.8	117%	118%	118%	119%	119%	70042	ASPEN TP	69	70051	BLENDE	69
70308	PALMER	115	704	73414	MONUMENT	115	1	133	117%	112%	113%	99%	99%	73477	FULLER	230	70139	DANIELPK	230
73409	KELKER W	115	757	73420	ROCKISLD	115	1	120	115%	115%	115%	114%	115%	73408	KELKER E	115	73422	TEMPLTON	115
70242	KENDRICK	115	700	70045	BANCROFT	115	1	192	113%	113%	113%	113%	114%	70400	SODALAKE	115	70023	ALLISON	115
70042	ASPEN TP	69	712	70051	BLENDE	69	1	47.8	112%	112%	112%	113%	112%	70054	BMONT TP	69	70305	OVERTON	69
70400	SODALAKE	115	700	70023	ALLISON	115	1	189	111%	112%	112%	113%	113%	70242	KENDRICK	115	70045	BANCROFT	115
70354	RIDGE	115	700	70355	RIDGE	230	2	100	110%	109%	109%	109%	109%	70354	RIDGE	115	70355	RIDGE	230
70524	SULPHUR	230	700	70523	SULPHUR	115	1	168	109%	105%	105%	112%	113%	70395	SMOKYHIL	115	70521	PEAKVIEW	115

73407	KELKER	230	757	73409	KELKER W	115	1	280	109%	109%	109%	109%	109%	73446	KELKER S	230	73408	KELKER E	115
73446	KELKER S	230	757	73408	KELKER E	115	1	280	109%	109%	109%	109%	109%	73407	KELKER	230	73409	KELKER W	115
73023	BIJOUTAP	115	752	73379	FMWEST	115	1	80	104%	104%	104%	104%	103%	73192	STORY	230	70311	PAWNEE	230
70329	PORTLAND	69	712	70330	PORTLAND	115	2	25	103%	103%	103%	103%	103%	70329	PORTLAND	69	70330	PORTLAND	115
70139	DANIELPK	230	700	70331	PRAIRIE	230	1	635	102%	103%	104%	<90%	<90%	70139	DANIELPK	230	70212	GREENWD	230
73410	KETTLECK	115	757	73414	MONUMENT	115	1	133	102%	103%	103%	<90%	<90%	73481	FULLER	115	73460	BLK SQMV	115
70523	SULPHUR	115	700	70517	PARKERPS	115	1	180	102%	98%	98%	106%	105%	70395	SMOKYHIL	115	70521	PEAKVIEW	115
73419	RD_NIXON	230	757	73446	KELKER S	230	1	319	102%	102%	102%	102%	102%	73407	KELKER	230	73419	RD_NIXON	230
73407	KELKER	230	757	73419	RD_NIXON	230	1	319	102%	102%	102%	102%	102%	73419	RD_NIXON	230	73446	KELKER S	230
70088	CAPHILL2	115	700	70148	DENVTM	115	1	150	102%	107%	107%	102%	101%	70259	LEETSDAL	115	70260	LEETSDAL	230
70265	LOOKOUT	115	700	70266	LOOKOUT	230	1	150	101%	97%	98%	98%	98%	70265	LOOKOUT	115	70266	LOOKOUT	230
73008	ARCHER	115	753	73043	CHEYENNE	115	1	80	101%	107%	107%	100%	100%	73165	RAWHIDE	230	70350	RAWHIDE	24
70139	DANIELPK	230	700	70278	MARCY	230	1	434.6	100%	<90%	<90%	96%	98%	70266	LOOKOUT	230	70018	SODALAKE	230
70265	LOOKOUT	115	700	70266	LOOKOUT	230	2	150	100%	96%	96%	97%	97%	70265	LOOKOUT	115	70266	LOOKOUT	230
70456	W.STATON	115	712	70455	W.STATON	69	1	42	98%	98%	98%	98%	98%	70042	ASPEN TP	69	70051	BLENDE	69
70139	DANIELPK	230	700	70212	GREENWD	230	1	635	98%	98%	99%	<90%	<90%	70139	DANIELPK	230	70331	PRAIRIE	230
73420	ROCKISLD	115	757	73422	TEMPLTON	115	1	120	98%	101%	101%	102%	102%	73409	KELKER W	115	73420	ROCKISLD	115
70539	CHAM48TH	230	700	70538	CHAM48TH	115	1	280	98%	<90%	<90%	<90%	<90%	70610	REUNION	230	70047	BARRLAKE	230
70354	RIDGE	115	700	70355	RIDGE	230	1	112	97%	97%	98%	93%	93%	70354	RIDGE	115	70355	RIDGE	230
70192	FTLUPTON	230	706	70311	PAWNEE	230	1	413.5	97%	<90%	<90%	<90%	<90%	70311	PAWNEE	230	70623	CORNER1	230
73389	BRIARGAT	115	757	73393	CTTNWD S	115	1	159	97%	96%	97%	<90%	<90%	73391	CTTNWD N	115	73410	KETTLECK	115
70395	SMOKYHIL	115	700	70521	PEAKVIEW	115	1	186.6	96%	93%	93%	102%	101%	70523	SULPHUR	115	70517	PARKERPS	115
70456	W.STATON	115	712	70455	W.STATON	69	2	42	96%	96%	96%	96%	96%	70042	ASPEN TP	69	70051	BLENDE	69
73408	KELKER E	115	757	73422	TEMPLTON	115	1	117	96%	95%	96%	95%	95%	73409	KELKER W	115	73420	ROCKISLD	115
70208	GRAY ST	115	700	70045	BANCROFT	115	1	192	95%	91%	91%	98%	97%	70400	SODALAKE	115	70023	ALLISON	115
70136	CTY LAM	69	712	70473	WILOW CK	69	1	19	95%	<90%	<90%	91%	94%	70254	LAMAR CO	230	70253	LAMAR CO	115
73098	KODAK	115	754	73211	WELD LM	115	1	120	95%	<90%	<90%	97%	97%	70471	WELD PS	230	70410	ST.VRAIN	230
70463	WATERTON	115	700	70464	WATERTON	230	2	100	95%	100%	101%	<90%	<90%	70463	WATERTON	115	70464	WATERTON	230
70247	LAJUNTAT	115	712	70248	LAJUNTAT	69	1	25	95%	95%	95%	<90%	<90%	70060	BOONE	115	70061	BOONE	230
70049	BELMONT	69	712	70305	OVERTON	69	1	47.8	95%	96%	96%	96%	96%	70042	ASPEN TP	69	70051	BLENDE	69
70073	CALIFOR1	115	700	70299	NORTH542	115	1	150	95%	<90%	<90%	<90%	<90%	70108	CHEROKEE	115	70276	MAPLETO1	115

70463	WATERTON	115	700	70464	WATERTON	230	1	100	94%	99%	99%	<90%	91%	70463	WATERTON	115	70464	WATERTON	230
73078	HARMONY	230	754	73199	TIMBERLN	230	1	472.1	94%	<90%	<90%	91%	92%	73011	AULT	230	70474	WINDSOR	230
73404	FOUNTAIN	115	757	73417	RD_NIXON	115	1	159	94%	94%	94%	94%	94%	73407	KELKER	230	73409	KELKER W	115
70087	CAPHILL1	115	700	70300	NORTH547	115	1	150	94%	<90%	<90%	<90%	93%	70108	CHEROKEE	115	70299	NORTH542	115
70250	LAJUNTAW	69	712	70249	LAJUNTAW	115	1	25	93%	<90%	<90%	<90%	93%	70275	MANZANOL	69	70419	MANZANOL	115
70108	CHEROKEE	115	700	70298	NORTH PS	115	1	170.9	93%	92%	92%	93%	93%	70108	CHEROKEE	115	70277	MAPLETO2	115
73305	EFMORGTP	115	752	73379	FMWEST	115	1	121	93%	92%	93%	93%	93%	73192	STORY	230	70311	PAWNEE	230
70395	SMOKYHIL	115	700	70396	SMOKYHIL	230	1	150	93%	94%	94%	93%	<90%	70395	SMOKYHIL	115	70396	SMOKYHIL	230
73013	B.CK PS	115	706	73020	BEAVERCK	115	1	319	93%	<90%	<90%	100%	100%	73192	STORY	230	70311	PAWNEE	230
70231	HOPKINS	115	708	79003	BASALT	115	1	66.9	92%	90%	91%	NA	NA	70654	COMANCHE	345	70777	COMAN 3	24
70108	CHEROKEE	115	700	70174	FEDERHT1	115	1	186	91%	90%	94%	90%	<90%	70108	CHEROKEE	115	70175	FEDERHT2	115
70108	CHEROKEE	115	700	70175	FEDERHT2	115	2	186	91%	90%	93%	90%	<90%	70108	CHEROKEE	115	70174	FEDERHT1	115
70444	VALMONT	115	703	70447	VALMONT	230	1	280	91%	<90%	<90%	<90%	<90%	70266	LOOKOUT	230	70570	PLNENDSS	230
70139	DANIELPK	230	700	70601	DANIELPK	345	2	560	<90%	95%	96%	NA	NA	70139	DANIELPK	230	70601	DANIELPK	345
70139	DANIELPK	230	700	70601	DANIELPK	345	3	560	<90%	95%	96%	NA	NA	70139	DANIELPK	230	70601	DANIELPK	345
70139	DANIELPK	230	700	70601	DANIELPK	345	1	560	<90%	95%	96%	NA	NA	70139	DANIELPK	230	70601	DANIELPK	345
70442	UNIVERS2	115	700	70036	ARAPAHOA	115	1	150	<90%	92%	92%	<90%	<90%	70259	LEETSDAL	115	70260	LEETSDAL	230
70352	READER	115	712	70483	BURNTMIL	115	1	99.6	<90%	91%	91%	<90%	<90%	70339	PUEBLO	115	70352	READER	115
70539	CHAM48TH	230	700	70538	CHAM48TH	115	1	280	<90%	103%	102%	<90%	<90%	70048	GREENVAL	230	70047	BARRLAKE	230
70463	WATERTON	115	700	70464	WATERTON	230	3	100	NA	100%	101%	NA	NA	70463	WATERTON	115	70464	WATERTON	230
70192	FTLUPTON	230	706	70529	JLGREEN	230	1	435	<90%	93%	94%	108%	112%	70192	FTLUPTON	230	70605	HENRYLAK	230
70529	JLGREEN	230	706	70461	WASHINGT	230	1	495	<90%	<90%	93%	106%	110%	70192	FTLUPTON	230	70605	HENRYLAK	230
70191	FTLUPTON	115	706	70192	FTLUPTON	230	1	280	<90%	96%	98%	105%	108%	70192	FTLUPTON	230	70529	JLGREEN	230
73073	GRANBYPP	69	755	73132	MCKENZIE	69	1	36	<90%	99%	98%	NA	NA	70654	COMANCHE	345	70777	COMAN 3	24
73132	MCKENZIE	69	755	73436	MARYLKSB	69	1	33	<90%	96%	96%	NA	NA	70654	COMANCHE	345	70777	COMAN 3	24
70073	CALIFOR1	115	700	70299	NORTH542	115	1	150	<90%	<90%	<90%	104%	97%	70087	CAPHILL1	115	70215	HARRISPS	115
70087	CAPHILL1	115	700	70300	NORTH547	115	1	150	<90%	<90%	<90%	102%	<90%	70073	CALIFOR1	115	70299	NORTH542	115
70192	FTLUPTON	230	706	70605	HENRYLAK	230	1	435	<90%	<90%	<90%	101%	105%	70192	FTLUPTON	230	70529	JLGREEN	230
70605	HENRYLAK	230	706	70362	RIVERDAL	230	1	435	<90%	<90%	<90%	98%	102%	70192	FTLUPTON	230	70529	JLGREEN	230
70108	CHEROKEE	115	700	70299	NORTH542	115	2	170.9	<90%	<90%	<90%	91%	<90%	70087	CAPHILL1	115	70215	HARRISPS	115
70481	MONACO12	230	700	70212	GREENWD	230	1	439	<90%	<90%	<90%	90%	<90%	70396	SMOKYHIL	230	70046	BUCKLEY2	230

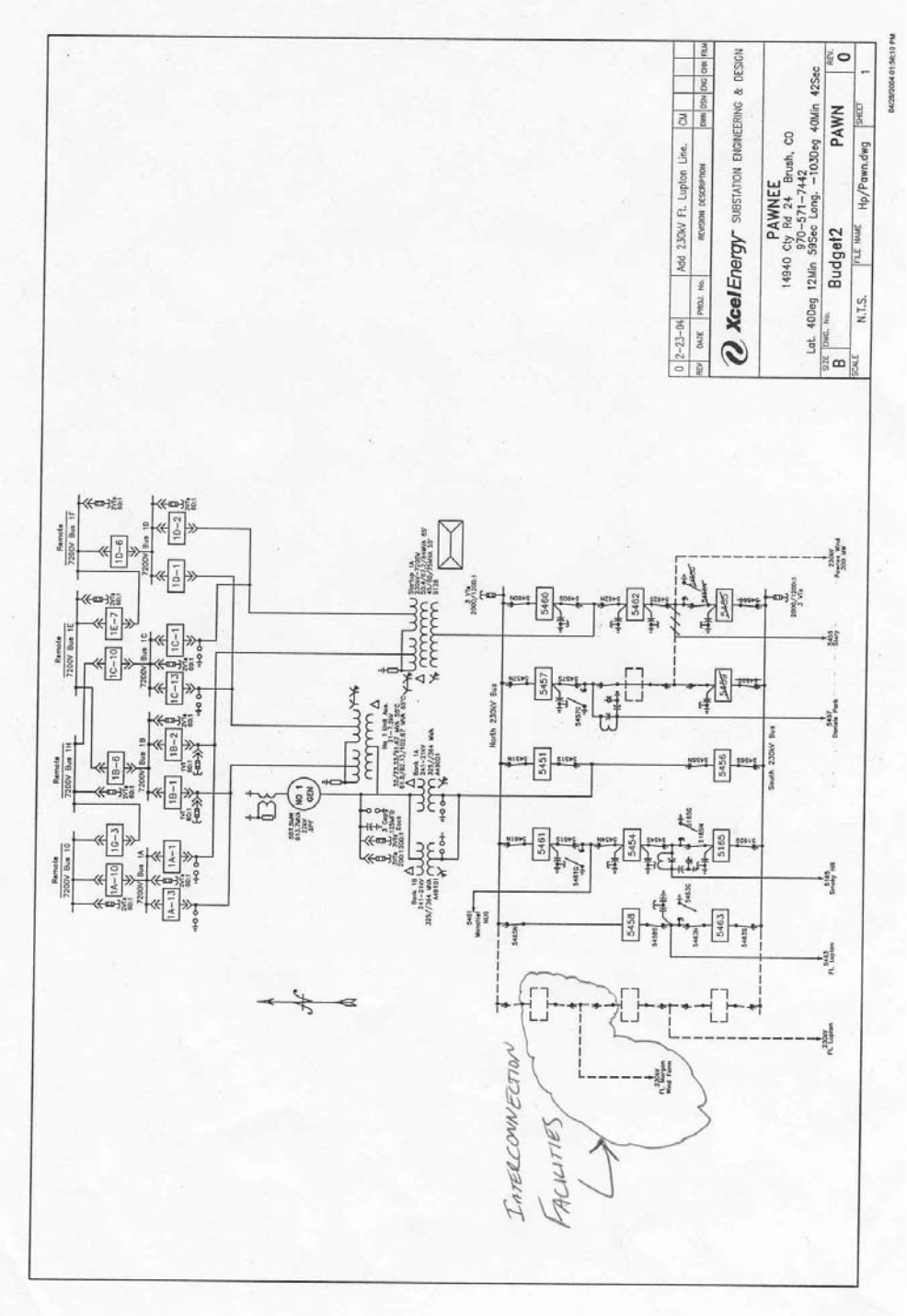
70539	CHAM48TH	230	700	70538	CHAM48TH	115	1	280	<90%	<90%	<90%	102%	107%	70528	SPRUCE	230	70396	SMOKYHIL	230
70250	LAJUNTAW	69	712	70249	LAJUNTAW	115	1	25	<90%	<90%	<90%	95%	95%	70254	LAMAR CO	230	70253	LAMAR CO	115
70395	SMOKYHIL	115	700	70396	SMOKYHIL	230	1	150	<90%	<90%	<90%	<90%	95%	70539	CHAM48TH	230	70538	CHAM48TH	115
70396	SMOKYHIL	230	700	70046	BUCKLEY2	230	1	435	<90%	<90%	<90%	<90%	94%	70481	MONACO12	230	70212	GREENWD	230

Color Code
Noticeable Load Increase
Aquila Equipment
CSU Equipment
TSGT Equipment
PSCO Equipment
IREA Equipment
WAPA or Other Equipment

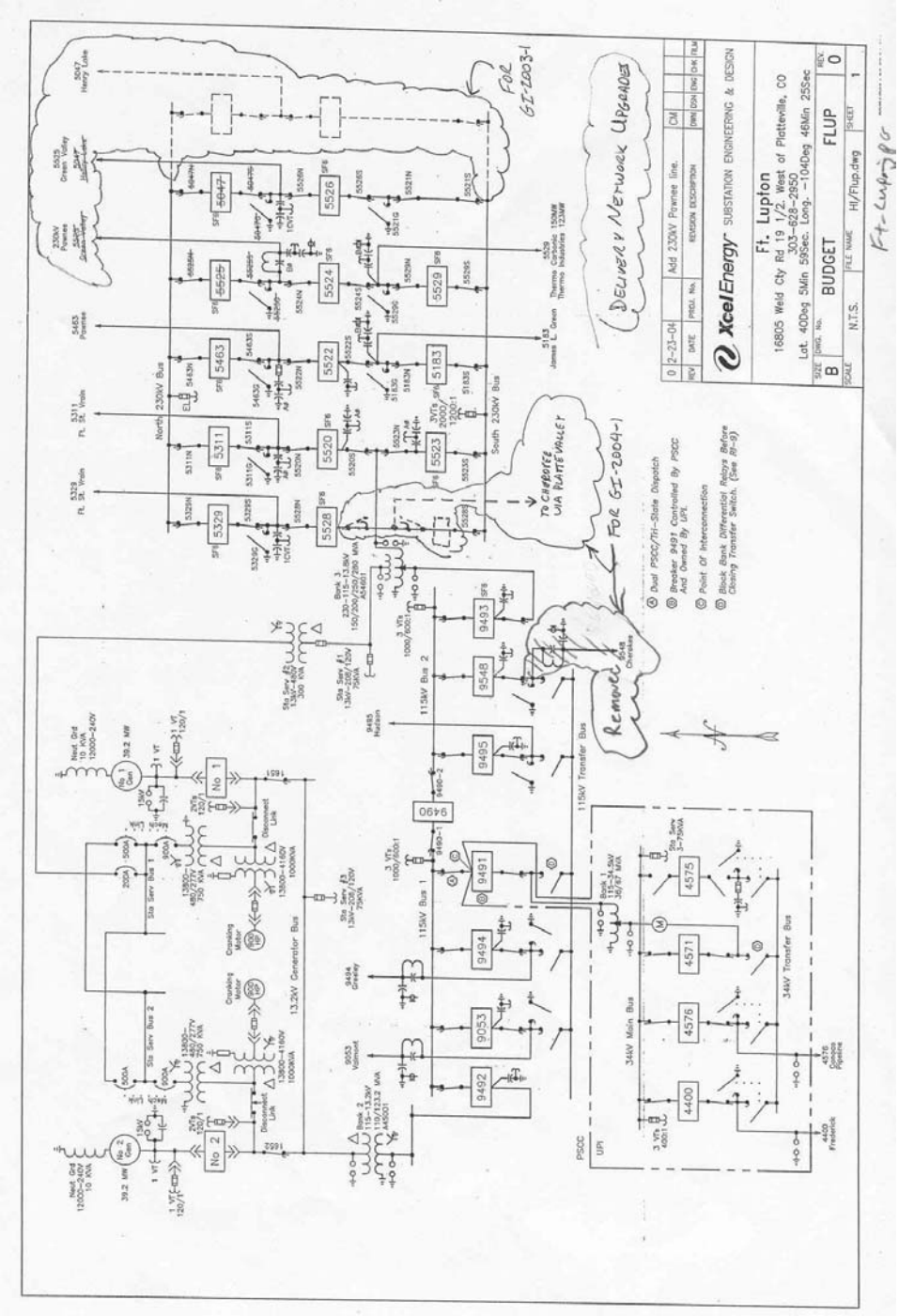
APPENDIX D

ONE-LINES

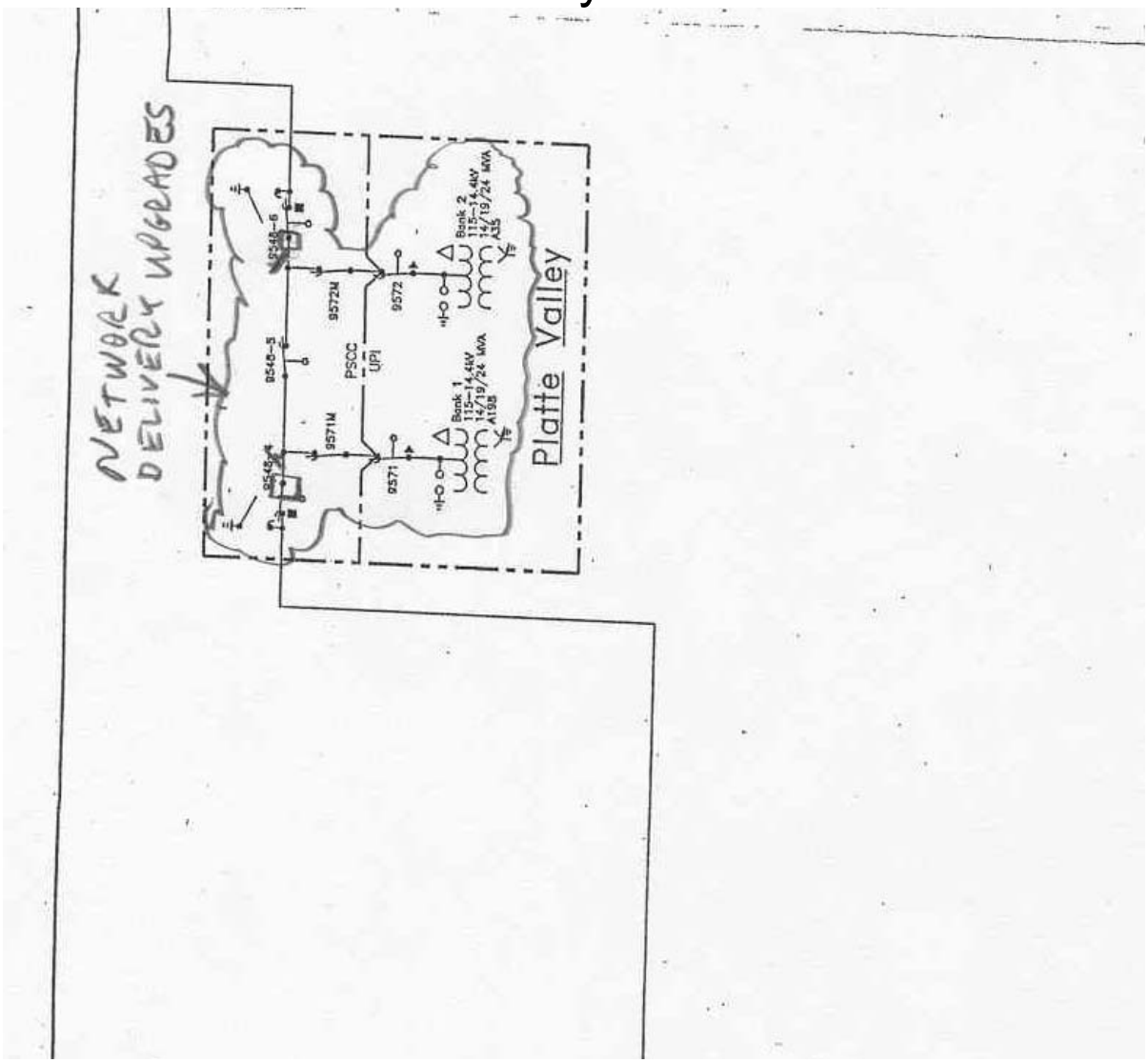
Appendix D-1
Pawnee Station One-line



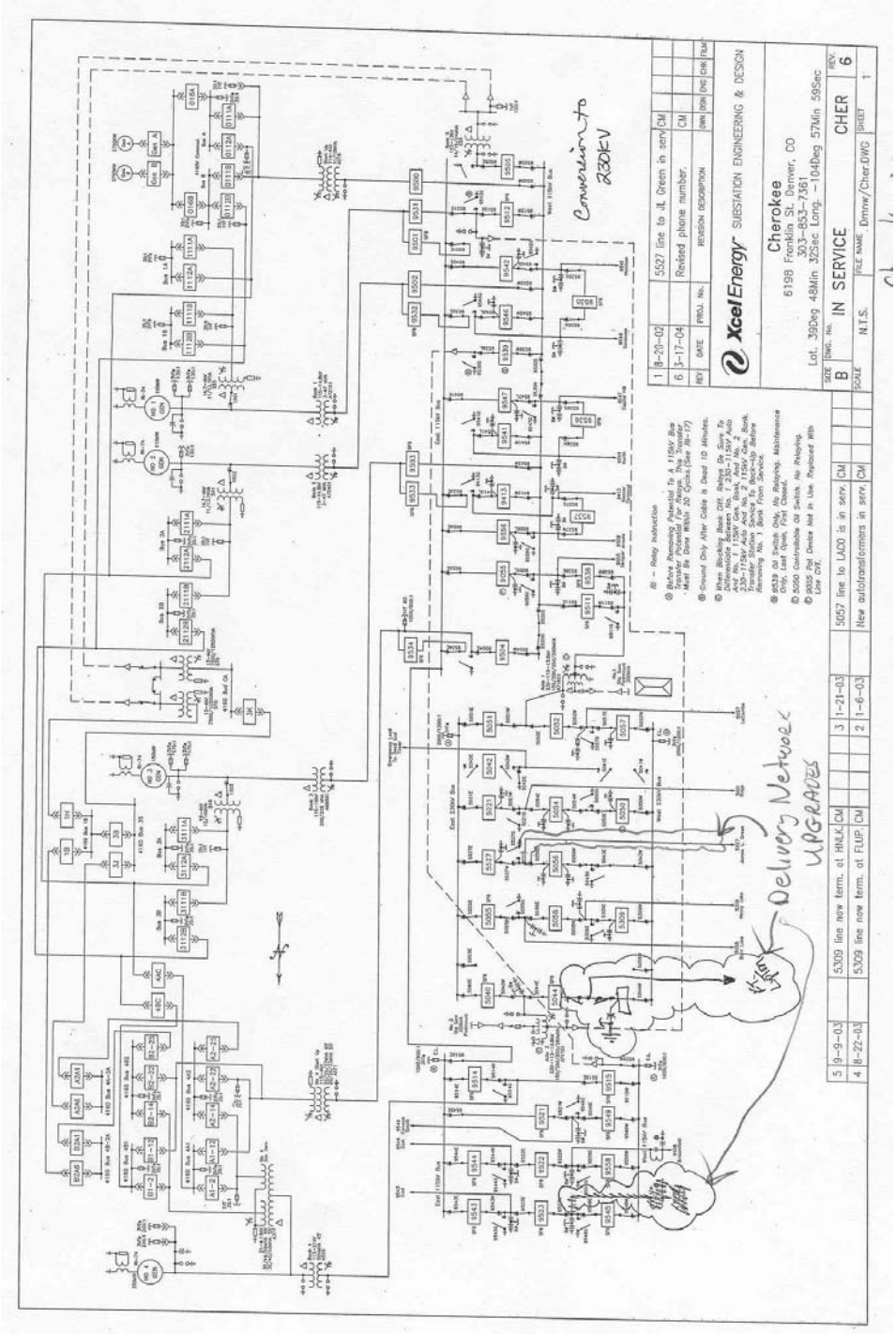
Appendix D-2
Ft. Lupton Station One-line



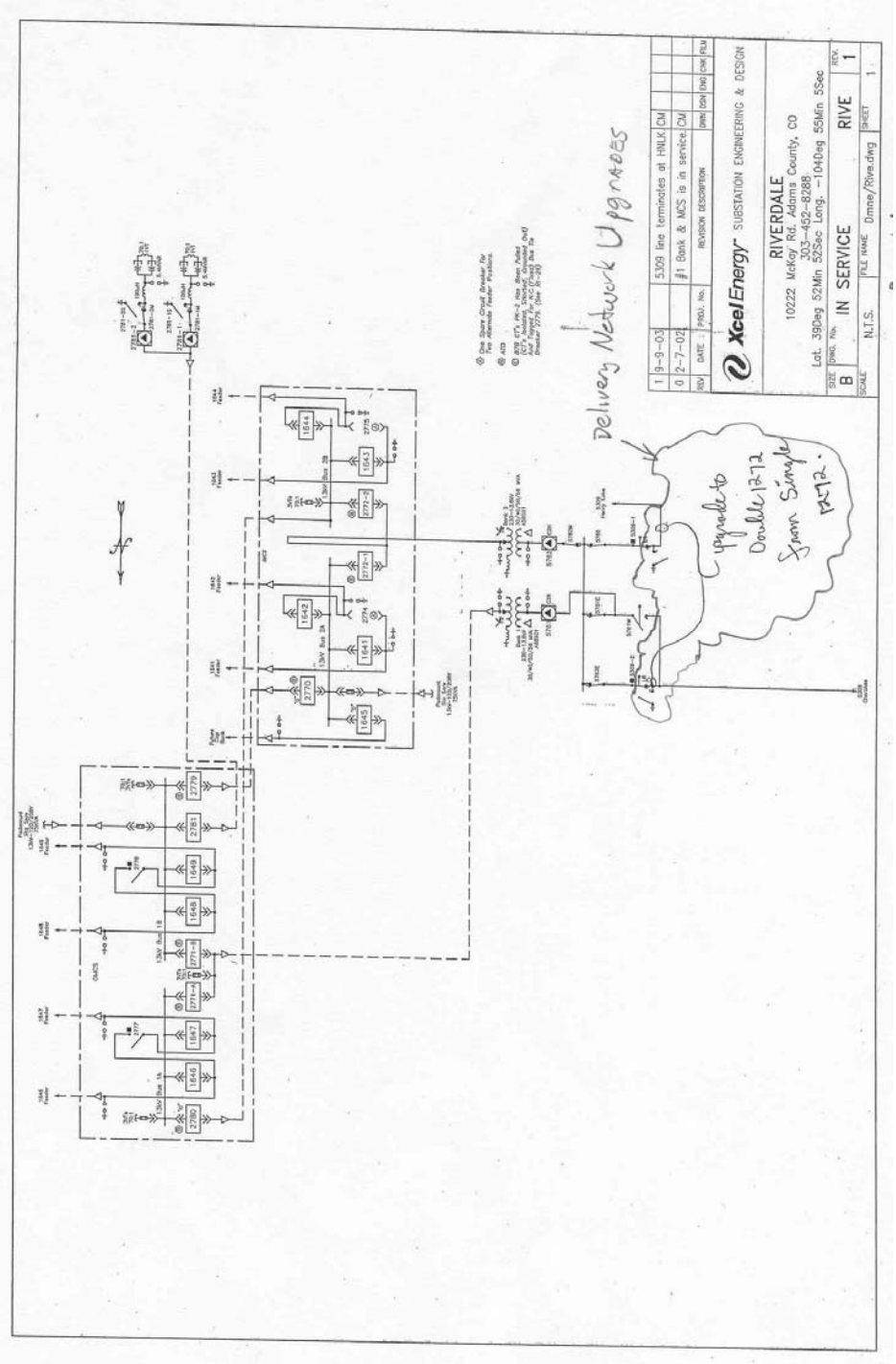
Appendix D-3
Platte Valley One-Line



Appendix D-4
Cherokee Station One-Line



Appendix D-5
Riverdale Substation One-Line



APPENDIX E
PSCo Generation Interconnection Request Queue

GENERATION INTERCONNECTION REQUESTS
May 28, 2004

Queue Number	Date Received	Generation Type	Service Type	Location County/State	Interconnection Point Station or Line	Net Plant Max MW Sum	Win	In-Service Date	Comments/Status/Reason not Completed
GI-2003-1	10/21/2003	Wind	Network Resource	Morgan Co., CO	Pawnee Substation	300	300	12/1/2006	Feasibility Study complete System Impact Study underway
GI-2003-2	11/3/2003	Coal	Network +Energy Resource	Elbert Co., CO	Smokey Hill-Pawnee 230kV line	500	500	6/1/2008	Feasibility Study complete System Impact Study underway
GI-2003-3	11/7/2003	Coal	Network Resource	Pueblo Co., CO	Comanche Substation	750	750	10/1/2009	Feasibility Study complete System Impact Study underway
GI-2003-4	11/11/2003	Wind	Network +Energy Resource	Laramie Co., WY	Ponnequin Substation	30	30	Q2:2004	Feasibility Study complete System Impact Study underway
GI-2003-5	12/29/2003	Coal	Network Resource	Morgan Co., CO	Pawnee Substation	750	750	10/1/2009	Request withdrawn 2/20/04
GI-2004-1	1/19/2004	Wind	Network +Energy Resource	Morgan Co., CO	Story Substation	150	150	12/31/2005	Feasibility Study underway
GI-2004-2	2/9/2004	Wind	Network +Energy Resource	Baca Co., CO	Lamar Substation	238	238	9/31/2005	Feasibility Study complete