Interconnection System Impact Study Report
Generation Interconnection Request # GI-2003-3
Transmission Service Request # T-2003-5 (OASIS 81954)

750 MW Coal Fired Generation in Pueblo, Colorado
(Comanche Unit 3 Project)

Xcel Energy Transmission Planning
June 2004

Executive Summary

This System Impact Study Report summarizes the analysis performed by the Transmission Planning group of Public Service Company of Colorado (PSCo) to interconnect 750 MW of new generation at the Comanche Station in Pueblo County, Colorado (Comanche Unit 3 Project). The report is intended to meet requirements for both the PSCo Generation Interconnection Request # GI-2003-3 and the PSCo Network Transmission Service Request # T-2003-5. The new coal-fired power plant would be located adjacent to the existing generating facilities at Comanche Station. The Customer proposed in-service date for commercial operation of the proposed facility is October 1, 2009, with a back-feed date of approximately April 1, 2009. This project was evaluated as a Network Resource (NR) with the power going to PSCo customers.

As an NR request, PSCo evaluated the transmission network and determined the upgrades required to deliver the full 750 MW of generation to PSCo native load customers. Studies show that the 750 MW injection into the PSCo system in 2009 will require transmission additions in order to prevent unacceptable conditions on neighboring transmission systems. The recommended Network Upgrades for interconnection include a new 345kV switching station that would connect to the existing Comanche 230kV substation with two 345/230kV autotransformers. The Network Upgrades recommended for full delivery of the generation to native loads consists of building 345kV double-circuit transmission transmission between the Comanche power station south of Pueblo and the Daniels Park Substation, south of Denver.

The total estimated cost for Network Upgrades is approximately $152 million including:

- $0.1 million for Customer Interconnection facilities;
- $18.6 million for PSCo Network Upgrades for interconnection;
- $133.3 million for PSCo Network Upgrades to deliver generation to native load.

The time required to engineer, permit, and construct all the required PSCo facilities is at least 54 months from the time an Interconnection Agreement (IA) is signed.

If projects with a higher queue position in the PSCo Interconnection Queue (www.rmao.com) are considered, additional Network Upgrades will be required which are estimated to cost $26.0 million. The additional upgrades can be accomplished within the 54 months listed above.

Figure 1 shows the basic 115kV and 230kV transmission network between Pueblo and Denver as it is expected to exist after 2005. Figure 2 shows the proposed transmission project. Figure 3 shows the additional Network Upgrades that would be required if projects with a higher queue position in the PSCo Interconnection Queue are considered.

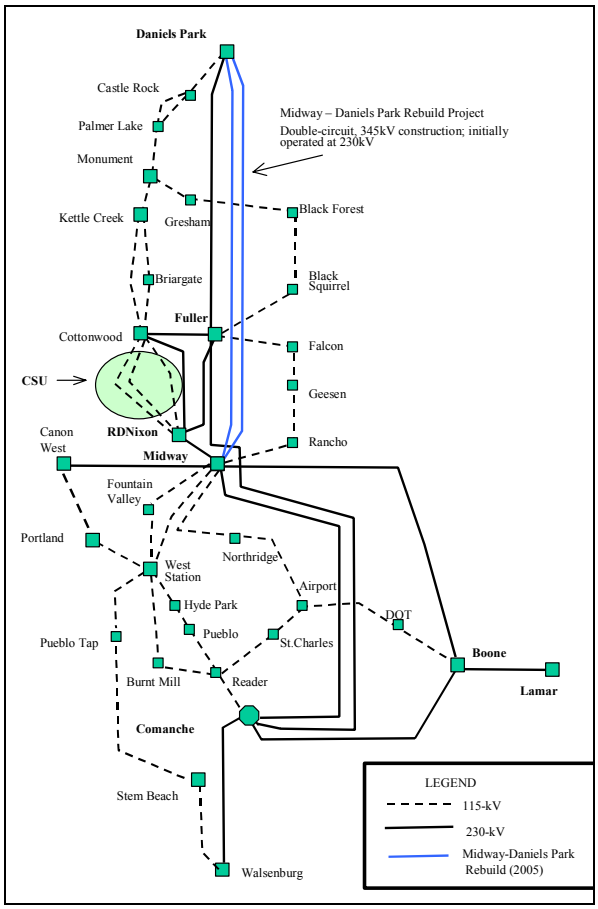

Figure 1

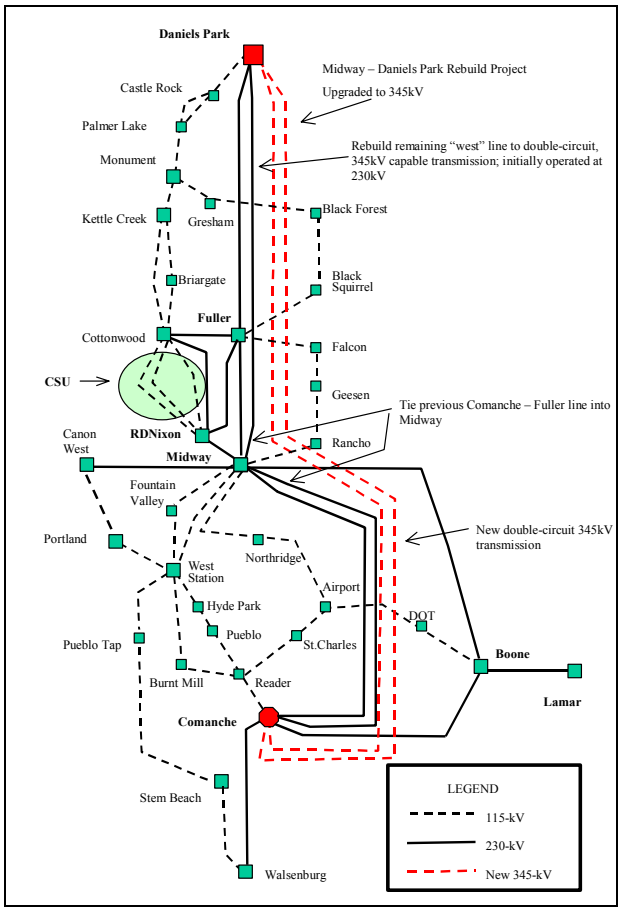

Figure 2

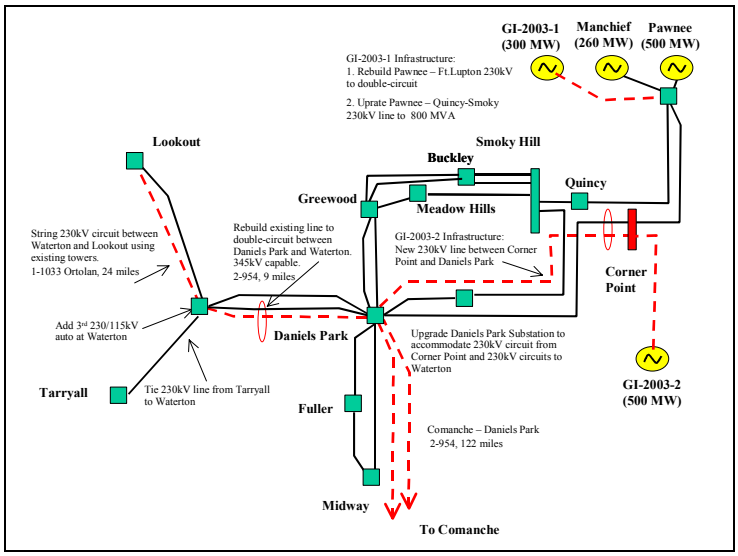

Figure 3

Introduction

On July 17, 2003 Xcel Energy Supply (XES) submitted a formal request to the Xcel Energy Transmission group to evaluate the integration of a 750 MW coal fired generating unit at the Comanche Station near Pueblo, Colorado. The Feasibility Study report was issued in September 2003, and was titled Pueblo County 750 MW Generation Addition Transmission Impact Study Report. The study has been posted on the Rocky Mountain Area OASIS (RMAO) web site (www.rmao.com) as PSCo Request #GI-2003-3. On February 20, 2004 a System Impact Study (SIS) Agreement was signed.

On December 10, 2003, PSCo Energy Markets (XEM) requested that PSCo Transmission designate the Comanche Unit 3 generation as a new Network Resource under the Company's Network Service arrangements. That request has been posted on the RMAO as #T-2003-5.

This System Impact Study Report provides more detailed analysis from the original Feasibility Study and the recommendations supercede those made in that study. This Report also meets the requirements for both the Generation Interconnection Request # GI-2003-3 and the Transmission Request # T-2003-5. Both requests can be viewed at www.rmao.com.

Due to the nature of this project, Planning has prepared another study report that will be filed with the Public Utilities Commission of Colorado (PUC) as an exhibit to the application for a Certificate of Public Convenience and Necessity (CPCN) for the transmission associated with the Comanche Unit 3[1].

[1] The **Comanche Unit 3 750 MW Generator Addition Transmission Study Report** has been prepared as an exhibit to the CPCN application for the Comanche – Daniels Park 345kV Transmission Project. The application is scheduled be filed with the PUC on or around July 12, 2004.

Study Scope and Analysis

The Interconnection System Impact Study evaluated the transmission requirements associated with the proposed interconnection to the PSCo transmission system. As per section 7.3 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, short circuit, and stability analyses. The power flow analysis identified thermal or voltage limit violations resulting for the interconnection. For the Generator Interconnection Network Resource Request (#GI-2003-3) and for the Transmission Request (#T-2003-5), the power flow analysis also identified Network Upgrades required to deliver the proposed generation to PSCo native loads. The short circuit analysis identified circuit breakers at risk of having their short circuit capability exceeded. The dynamic stability analysis verified that there were no limitations due to angular instability of the system for regional disturbances.

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.

Any new major generation or transmission additions have the potential to impact other regional entities. The following systems of regional entities were monitored for impacts:

- Aquila Networks (Aquila)
- Colorado Springs Utilities (CSU)
- Intermountain Rural Electric Association (IREA), served by PSCo
- Mountain View Electric Association (MVEA), a member of Tri-State
- Tri-State Generation & Transmission (Tri-State)
- Western Area Power Administration (WAPA)

Aquila and CSU are considered Affected Systems and cooperated with PSCo in the development of these studies.

Power Flow Study Models

Studies were initiated with a powerflow model that represented 2010 summer peak loading conditions in the region of study. The model was developed from Western Electricity Coordinating Council (WECC) case 2008HS2SA, a 2004 Study Program[2] case that modeled 2008 summer loading conditions. Loads were adjusted throughout Colorado to 2010 levels based on PSCo[3], CSU, and Aquila forecasts. WAPA and Tri-State loads were also increased to an appropriate level. Additional detailed system representation data was included in some areas and a benchmark model was developed that did not include the Comanche Unit 3. In 2010, additional generation resources in Colorado will be required due to the forecasted level of electrical loads for that year. To create a benchmark model for which resources could match the expected load, generation in the PSCo area was maximized to the highest extent possible, especially in the southern Colorado system. In addition, generation was increased in other areas outside of Colorado and imported from those areas into the Colorado system. This method of balancing loads and resources was used to create a more neutral impact to the Colorado electrical system as compared to the simulation of uncertain or fictitious in-state generation sites.

From the benchmark model, other cases were developed to include the Comanche Unit 3, with and without transmission infrastructure alternatives.

According to the LGIP, interconnection studies must consider other requests that have higher queue positions in the PSCo Interconnection Queue when performing system analyses. For this study, the projects with higher queue positions include:

1. **GI-2003-1**: 300 MW wind generation 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 637 MVA to 800 MVA.
   b. Rebuild 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 generation connecting to the Pawnee - 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, capable of 800 MVA at 230kV.

The two projects are listed on the Rocky Mountain Area Oasis web site (www.rmao.com), and the most recent queue list is shown in Appendix A. System power flow models were created with and without the two projects.

[2] The WECC Annual Study Program is the means for compilation of powerflow and stability study data and models.
[3] PSCo forecast dated February 27, 2004

Study Results:

Prior to modeling the Comanche Unit 3 Project, benchmark studies of the 2010 studies showed some contingency loading issues on the CSU system. Implementation of the 750 MW generation addition resulted in element overloads for both contingency and system intact conditions on the Aquila and CSU systems. Therefore, it was apparent that the new generation would require additional Network Upgrades. Four transmission upgrades were considered to provide both an interconnection and the capability to deliver the generation to native loads. Studies attempted to identify alternatives that would provide the same level of performance or better than the benchmark without the Comanche Unit 3 Project. The alternatives studied were:

1. Comanche – Daniels Park 345kV transmission (proposed alternative)
2. Comanche – Daniels Park 230kV transmission
3. Comanche – West Station – Waterton 230kV transmission
4. Comanche – Corner Point – Denver 345/230kV transmission

The alternative that exhibited the best performance was the Comanche – Daniels Park 345kV transmission alternative. This alternative was the only one that fully accommodated the Comanche Unit 3 generation without requiring upgrades to the regional CSU or Aquila systems. It exhibited higher path flows and lower losses than the other alternatives, implements higher-voltage transmission, and makes practical use of existing transmission facilities and corridors. Since the other projects required upgrades to neighboring systems, the proposed project is ultimately the least cost alternative.

Table 1 summarizes some of the contingency results and compares the performance of the proposed Comanche – Daniels Park 345kV Transmission Project with the benchmark analysis.

Case 10bas-3g is the benchmark 2010 powerflow model without the Comanche Unit 3 generation. The table shows that there would be overloads on the CSU system as high as 127%.

Case 10bas7-3g adds the Comanche Unit 3 with an output of 750 MW. The contingency overloads increase to almost 170% for some outages.

Case 10w-a6-2g2 models the proposed Network Upgrades. The system performs as well or better than the benchmark case 10bas-3g[4]. In order to alleviate Monument – Palmer 115kV loading, PSCo and CSU have agreed to investigate operating procedures that would trip or open that line during overload conditions.

Results of the power flow studies indicate that the proposed Network Upgrades will accommodate the 750 MW of Comanche Unit 3 generation.

[4] Two contingencies show a 1% increase in contingency loading. Common transmission planning practices generally consider changes less than 5% to be negligible.

Table 1

Contingency Results				Contingency / Loaded Element	Pueblo - Reader 115 'Reader - Burntmil 115	Boone - MidwayPS 230 Apt Park - Apt Mem 115	Briargate - Cotwd S 115 Ctwd N - KettleCk	Kelker E - Templeton 115 KelkerW - Rock Isld 115	RD Nixon - KelkerE 230 RD Nixon - Kelker 230	DanielsPk - Fuller 230 Mon - Palmer 115
				Rating→	100	103	133	133	319	135
Case:	**Description**	**Flow (MW)**	**Loss (MW)**							
10bas-3g	Benchmark without Unit 3	695	508	86%	71%	127%	119%	104%	111%
10bas7-3g	Benchmark with 750 MW Unit 3 No new transmission	1029	499	162%	116%	168%	130%	111%	168%
10w-a6-2g2	**Alternative 1 PROPOSED Comanche-Daniels 345X2 345/230 autos @ Coman(2), Midway(0),Daniels(3)**	**1270**	**431**	**89%**	**<90%**	**128%**	**118%**	**105%**	**<90%**

When including generation and associated infrastructure for requests GI-2003-1 and GI-2003-2 into the studies there were some contingency overloads on the 230kV lines north of Daniels Park. The results are shown in Table 2. To alleviate the overloads, additional 230kV transmission was modeled between Daniels Park, Waterton, and Lookout substations. A third 230/115kV autotransformer also had to be added at Waterton substation.

It should be noted that if the requests GI-2003-1 and GI-2003-2 were to drop out of the Interconnection Queue and not be implemented, the proposed 345kV Network Upgrades between Comanche and Daniels Park would not be affected.

Table 2

Contingency Results		Contingency/ Loaded Element/ (MVA Rating)	
Case:	**Description**	'Daniels Park - Greenwood 230 Daniels Park - Prairie 230 (635 MVA)[5]	Smoky - Buckley2 230 Monaco - Greenwood 230 (439 MVA)
10bas-3g	Benchmark without Unit 3	72%	72%
10w-a6-2g2	**GI-2003-3 with proposed transmission: Comanche-Daniels 345X2 345/230 autos @ Coman(2) & Daniels(3)**	**102%**	**<90%**
bw-a6-2r1	**Add GI-2003-1 and GI-2003-2 and Transmission**	**117%**	**119%**
bw-a6-2r2	**Add Daniels-Waterton 230X2 Add 2nd Waterton-Lookout 230 Add 3rd Waterton 230/115**	**101%**	**98%**

[5] PSCo Engineering has determined that the Daniels Park – Prairie 230kV line can be rated at 665 MVA.

Detailed Network Upgrades

The recommended Network Upgrades consist of the following:

Interconnection Facilities:

1. Construct a new 345kV switchyard with breaker-and-a-half configuration near the plant. The switchyard connects to the existing 230kV Comanche Substation using two 560 MVA 345/230kV autotransformers.

(Interconnection Costs = $18.7 million, Time to construct = 24 months)

Delivery Facilities:

2. From Comanche to just outside the Midway Substation, build new double-circuit 345kV transmission, adjacent to the existing Comanche – Midway and Comanche – Fuller 230kV transmission lines.
3. The new double-circuit 345kV line would connect to the double-circuit transmission being built between Midway and Daniels Park substations (Midway – Daniels Park Rebuild Project), which would then be operated at 345kV. There would be no 345kV tie to the Midway Substation.
4. At Daniels Park, construct a new 345kV switchyard, and connect the double-circuit 345kV transmission to the 230kV system with three 560 MVA 345/230kV autotransformers.
5. Between the Midway and Daniels Park substations, rebuild the existing single-circuit 230kV section of transmission that originates at Comanche, taps the Fuller Substation and terminates at Daniels Park. That 230kV line section should be rebuilt to double-circuit transmission, capable of 345kV, but initially operated at 230kV.
6. The tie into Fuller Substation would be maintained using one of the new (rebuilt) 230kV transmission circuits.
7. The Midway – Fuller – Daniels Park 230kV double-circuit rebuild would tie into the Midway Substation from the north in place of the 230kV Midway – Daniels Park lines rebuilt prior to this project.
8. The existing single-circuit Comanche – Fuller 230kV line would be tied into the Midway Substation from the south.
9. All new 345 transmission and terminations should be built using 954kcmil, two-conductor bundled conductors, capable of at least 1200 MVA (2000 Amps).

(Network Upgrades for delivery = $133.3 million, Time to Construct = 54 months)

Additional Upgrades to account for PSCo Interconnection Higher Queued Projects:

If projects GI-2003-1 and GI-2003-2 are considered to be in-service prior to the Comanche Unit 3, more transmission will be required besides what was listed above. The additional transmission includes:

10. Tie the Tarryall – Daniels Park 230kV line into the Waterton Substation.
11. Rebuild the resulting Waterton – Daniels Park 230kV line to double-circuit 345kV capable, 230kV operated transmission.
12. Add a third 100 MVA 230/115kV transformer at the Waterton substation.
13. Add a second 230kV circuit between the Waterton and Lookout substations.

(Additional Cost for Network Upgrades = $26 million, Time to Construct = 54 months)

Short Circuit Analysis

The short circuit analysis consisted of faulting 230kV buses in the region of study. Three-phase and single-line to ground faults were evaluated and the three-phase faults were found to be more severe. The results are shown in Table 3.

Table 3 Short Circuit Study Results

Configuration	Fault Current (Amps)			
	Comanche	Daniels Park	Midway	Smoky Hill
Benchmark Existing 2008 system	12215	26004	16795	28987
(GI-2003-3) Add proposed generation and Comanche – Daniels Park 345kV Transmission Project	20724	30639	20079	32948
GI-2003-3 combined with GI-2003-2 and GI-2003-1 (Generation and all associated transmission)	20983	35405	20306	35553

Results indicated that the largest increase in fault currents would be at the Daniels Park substation, which showed an increase of approximately 4600 Amps. There are some breakers at Daniels Park that have a 31.5 kA rating, but they will not be at risk for the fault levels studied.

If interconnection requests GI-2003-1 and GI-2003-2 are placed in service prior to this project, the the Comanche Unit 3 Project will result in additional power injections into the Daniels Park substation in 2009. Short circuit studies showed fault currents at Daniels Park increased to over 35,000 Amps and will result in the requirement to upgrade two breakers.

Stability Study Results

Transient stability analysis was performed by modeling three-phase faults and single contingencies in the region of study. Faults were cleared and elements removed from service after six cycles. Dynamic models for the proposed project were prepared using Customer supplied data. The analysis indicated that the project would not adversely affect the transient stability performance of the system. The stability performance met WECC/NERC Reliability Criteria. The disturbances modeled are shown in Table 4 below. Stability plots are available upon request.

Table 4 Stability Runs

Run Name / Powerflow	Faulted Bus	Element(s) Removed	Results
w-a6-2-s1 10w-a6-2g2	Daniels Park 345	Comanche – Daniels Park 345 Comanche 750 MW unit	Stable / Damped
w-a6-2-s2 10w-a6-2g2	Daniels Park 345	Comanche – Daniels Park 345	Stable / Damped
w-a6-2-s3 10w-a6-2g2	Comanche 345	Comanche –Daniels Park 345	Stable / Damped
w-a6-2-s4 10w-a6-2g2	Daniels Park 345	Comanche – Daniels Park 345#1 Comanche – Daniels Park 345#2	Stable / Damped
w-a6-2-s6 10w-a6-2g2	Daniels Park 345	Comanche – Daniels Park 345#1 Comanche – Daniels Park 345#2 Comanche 750 MW unit	Stable / Damped

Costs Estimates and Assumptions:

The estimated indicative total costs for the PSCo transmission Network Upgrades without considering requests GI-2003-1 and GI-2003-2 is $**152 million**

The estimated total costs for the PSCo Network Upgrades with requests GI-2003-1 and GI-2003-2 considered is **$178 million.**

The estimated costs shown are scoping level estimates and the level of accuracy is considered to be +/-30%. This level of estimate is typical for a project at this budgetary stage in the process. The estimates were escalated to reflect the approximate dollar values for the appropriate year of construction. In this case, the costs for major construction components were escalated through December 2008. 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.

The following lists the improvements required to accommodate the interconnection and the delivery of the proposed 750 MW facility.

Customer Interconnection Facilities:

Table 5 Customer Interconnection Facilities

Element	Description	Cost
Comanche Substation	Construct a 345kV overhead transmission line to connect the Customer's GSU to the new switchyard dead-end structure. The equipment required includes: • Approximately 325' of 345kV transmission line, bundled 954 conductor • One 345kV transmission structure	$100,000
TOTAL	**Total Cost**	**$100,000**

PSCo Network Interconnection Facilities

Table 6 describes the costs associated with providing an interconnection to PSCo's system. It does not include all of the costs required for full delivery of the generation. Those costs are included in Table 7.

Table 6 Network Upgrades Required for Interconnection

Element	Description	Cost
Comanche Substation	Construct the network interconnection portion of a new 345kV switchyard configured as a breaker and a half arrangement at Comanche. This new switchyard would interconnect with the existing 230kV switchyard with two 560 MVA autotransformers. The equipment required includes: • Site development • Control building • Six 345kV circuit breakers • Two 345/230kV 560 MVA autotransformers • Six new 230kV circuit breakers • Associated 345kV and 230kV switches, bus work, connectors, steel structures, etc. • Relaying and communication equipment	$18.6
TOTAL	**Total Cost**	**$18.6 million**
Time Frame		**24 months**

PSCo Network Delivery Facilities

The following table describes the costs associated with the facilities required to deliver the proposed 750 MW as an NR Request. The cost of the Network Delivery facilities is the additional change in cost between Interconnection and Delivery. It does not take into account higher queued projects in the PSCo Interconnection Queue.

Table 7 Network Upgrades Without Other Interconnection Requests

Element	Description	Cost ($million)
Comanche Substation	Construct the network delivery portion of a new 345kV switchyard configured as a breaker and a half arrangement at Comanche. This portion of the new switchyard would connect to two new 345kV transmission lines. The equipment required includes: • Site development • Control building • Two 345kV circuit breakers, associated 345kV switches, bus work, connectors, steel structures, etc. • Relaying and communication equipment	$3.3
Daniels Park Substation	Construct a new 345kV switchyard configured as a breaker and a half arrangement at Daniels Park. This new switchyard would interconnect with the existing 230kV switchyard with three 560 MVA autotransformers. The equipment required includes: • Site development • Control building • Eight 345kV circuit breakers • Three 345/230kV 560 MVA autotransformers • Six new 230kV circuit breakers • Associated 345kV and 230kV switches, bus work, connectors, steel structures, etc. • Relaying and communication equipment	$27.5
Midway Substation	The existing 230kV switchyard must be modified to add a new 230kV bay to accommodate a new 230kV transmission line termination from Comanche. Modifications include: • Three new 230kV circuit breakers • Associated 230kV switches, bus work, connectors, steel structures, etc. • Relaying and communication equipment	$2.3
Transmission	• Comanche to Near Midway - One new 345kV double circuit transmission line, Illinois structure or double H, 954-bundled conductor, within new ROW (50 miles). • Near Midway to DP via Fuller - Rebuild existing single circuit 230kV transmission line to double circuit 230kV line, Illinois structure, constructed to 345kV specifications, within existing ROW, 954-bundled conductor (75 miles).	$94.7
Siting & Land Rights	Siting and Land Rights activities, permitting and acquisition	**$5.5**
TOTAL		**$133.3**
Time Frame		**54 Months**

PSCo Additional Network Upgrades for Delivery If Higher Queued Requests Included

The following table describes the additional facilities and costs required to deliver the proposed 750 MW as an NR Request, taking into account higher position requests (GI-2003-1 and GI-2003-2) projects in the Rocky Mountain OASIS Request Queue.

Table 8 Additional Network Upgrades If GI-2003-1 and GI-2003-2 are Included

Element	Description	Cost ($million)
Daniels Park Substation	Modify the Daniels Park substation to accommodate a new 230kV line to Waterton substation. The equipment required includes: • Site Development • Two 230kV circuit breakers • Associated switches, bus work, connectors, structures, etc. • Relaying and communication equipment	$1.15
Waterton Substation	Modify the Waterton substation to accommodate new 230kV transmission from Daniels Park and Lookout, as well as a third 100 MVA 230/115kV autotransformer. Waterton must also be modified to terminate the existing - Tarryall to Daniels Park 230kV line into Waterton Sub, creating a Waterton – Daniels Park 230kV line and a Waterton – Tarryall 230kV line. The equipment required includes: • Site Development • Nine 230kV circuit breakers • One 230/115kV 100 MVA autotransformer • One 115kV circuit breaker • Associated 230kV and 115kV switches, bus work, connectors, structures, etc. • Relaying and communication equipment	$10.36
Lookout Substation	The existing 230kV switchyard must be modified to terminate a new 230kV line to Waterton substation. Modifications include: • Two 230kV circuit breakers • Associated 230kV switches, bus work, connectors, steel structures, etc. • Relaying and communication equipment	$.75
Transmission	• Rebuild existing single circuit 230kV transmission line from Waterton to Daniels Park to double circuit 230kV line built to 345kV specifications, within existing ROW with both lines terminating at Waterton. Illinois structure or double H, 954-bundled conductor, within new ROW (9 miles). • String 3rd circuit between Waterton and Lookout, single 1033.5 Ortolan conductor (24.1 miles) • Relocate 2.13 miles of the Soda Lakes - Conifer 115kV line. New ROW may be needed, but has not been estimated	$11.73
Siting & Land Rights	Siting and Land Rights activities, permitting and acquisition	**$1.72**
TOTAL		**$25.71**
Time Frame		**54 Months**

Assumptions:

- Normal substation and transmission line construction is utilized, and no unusual conditions are present.
- The Comanche-Fuller-Daniels Park 230kV transmission line being rebuilt from Midway to Daniels Park will utilize normal construction techniques.
- All required trans line outages needed to support construction can be obtained.
- No significant grading is required at any substation sites.
- PUC appeals are possible.
- Where existing ROW is being utilized, it has been assumed that this ROW will be adequate for any proposed transmission line rebuild.
- Permitting to take at least 16 months.
- Minimal additional ROW required and available to rebuild.
- No land requirements for substations
- Land use permitting required for 6 local jurisdictions

APPENDIX A
PSCo Generation Interconnection Request Queue

GENERATION INTERCONNECTION REQUESTS
June 18, 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 complete
GI-2004-2	2/9/2004	Wind	Network +Energy Resource	Baca Co., CO	Lamar Substation	238	238	9/31/2005	Feasibility Study complete