DRAFT
Interconnection Facility Study Report

For

Request # GI-2003-3

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

January 2005

Xcel Energy Services, Inc.
Transmission Planning – Denver, CO

I. Executive Summary

This Interconnection Facilities Study Report summarizes the analysis performed by Public Service Company of Colorado (PSCo) to specify and estimate the cost of the equipment, engineering, procurement, and construction needed to interconnect 750 MW of new generation at the Comanche Station in Pueblo County, Colorado (Comanche Unit 3 Project). The new coal-fired power plant would be located adjacent to the existing generating facilities at Comanche Station. The expected commercial in-sevice date is October 1, 2009.

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 total estimated cost for the facilities required for interconnection is approximately **$20.2 million**[1] including:

- **$ 956k** for Customer-funded Interconnection facilities (Table 3)
- **$ 19.2 million** for PSCo Network Upgrades for Interconnection (Table 4)

The estimated time required to engineer, permit, and construct the facilities described above is at least **36 months**.

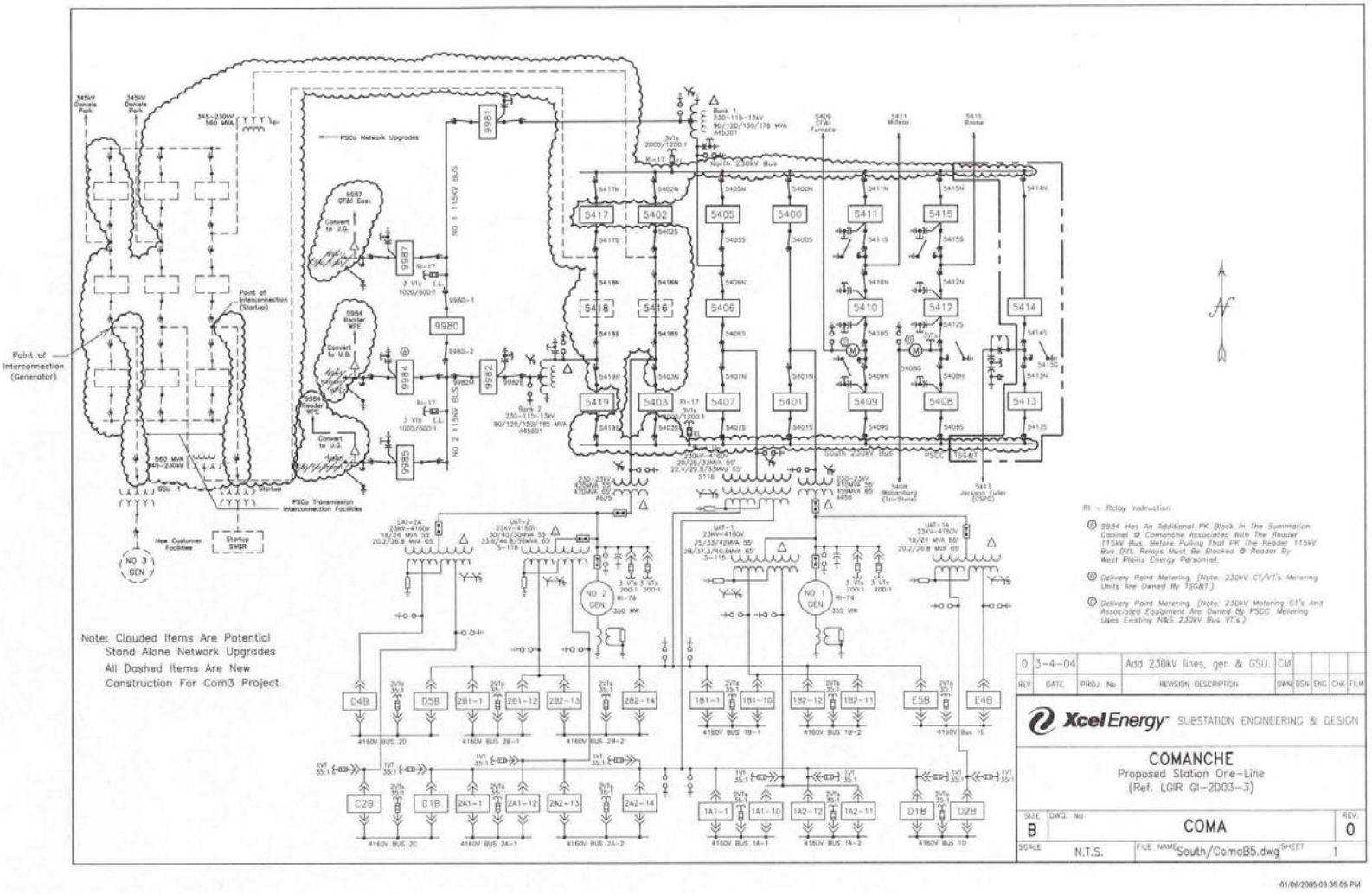
The Network Upgrades recommended for full delivery of the generation consist of building 345kV double-circuit transmission between the Comanche Station and the Daniels Park Substation, south of Denver. The System Impact Study Report estimated the cost of these additional upgrades to be **$130 million**[2] (Table 5). The estimated time required to engineer, permit, and construct the facilities for delivery is a minimum of **54** months.

The total estimated project cost for the PSCo facilities required for interconnection and delivery is approximately **$149.3 million.**

A proposed Station One-Line diagram for the Comanche Switchyard is shown in Figure 1. Figure 2 shows the basic 115kV and 230kV transmission network between Pueblo and Denver as it is expected to exist after 2005. Figure 3 shows the proposed Network Upgrades associated with Delivery for this transmission project.

[1] Appropriation estimate considered to have an accuracy of +/- 20%.
[2] Scoping, or planning level estimate considered to have an accuracy of +/- 30%.

Figure 1 Comanche Switchyard: Proposed Substation One-Line Diagram



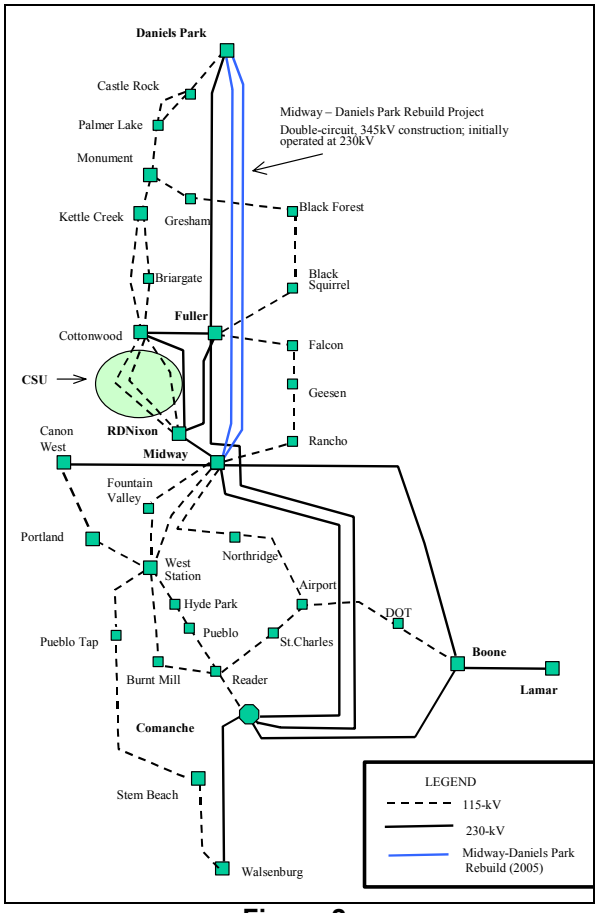


Figure 2
Transmission System, Before GI-2003-3 Network Upgrades for Delivery

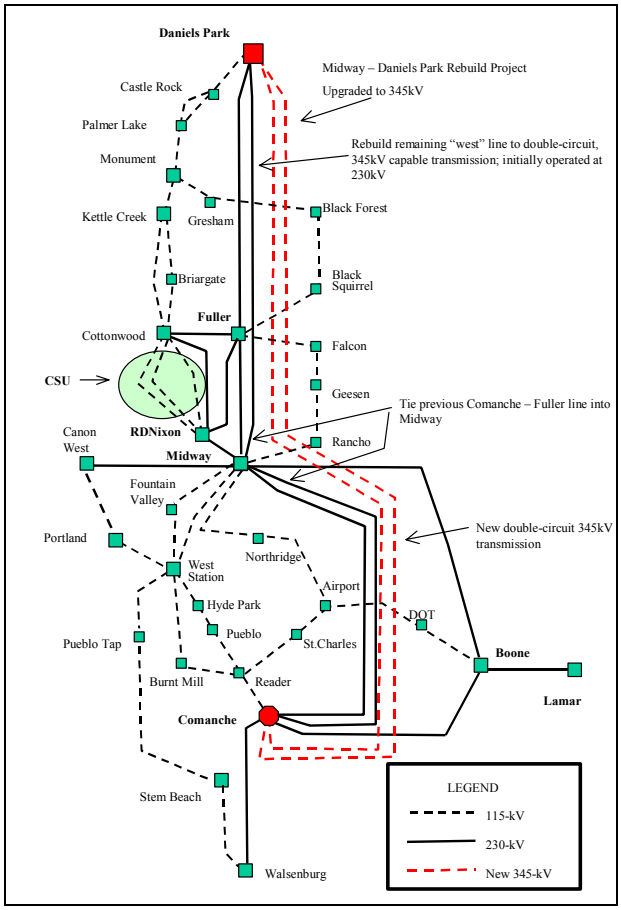


Figure 3
2009 Regional Transmission System with GI-2003-3 Network Upgrades for Delivery

II. Introduction

On July 17, 2003 Xcel Energy Supply (XES) submitted a formal request 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 and posted on the Rocky Mountain Area OASIS (RMAO) web site[3] in September 2003. An Interconnection System Impact Study (SIS) Agreement was executed with the Customer on February 20, 2004, with the SIS Final report posted on RMAO and issued to the Customer on July 1, 2004. An Interconnection Facilities Study Agreement was executed with the Customer on August 24, 2004.

On December 10, 2003, the Customer 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 as #T-2003-5.

III. General Description (Project Design Guide)

The description of the scope of work required, and assumptions used in preparing the estimates for this Study is broken out for each major voltage level at the Comanche switchyard: 345kV, 230kV, and 115kV.

A. General Description of New 345kV Switchyard:

The substation will have two 345-230kV transformers and two 230 kV transmission lines to the existing Comanche 230kV substation. There will be two outgoing 345kV lines, a connection to a single 345kV generator step-up transformer and a 345kV generator start-up (GSU) transformer. See the attached Preliminary Station One-line Drawing (Figure 1), and Preliminary General Arrangement Drawing (Figure 5) for the new 345kV substation.

The design of the 345kV substation allows for an additional breaker-and-half bay with two additional positions in the future within the existing fence. The 345kV substation yard will also have an un-fenced, un-graded portion to the west dedicated to currently unplanned future expansion.

The new 345kV yard is located to the west of the existing 230kV yard. The 345kV transmission lines will exit to the north and the 230kV tie lines to the existing 230kV switchyard will exit to both the north and the south with the south one looping around between the two yards. Both lines will enter the 230kV yard from the north. The Unit 3 GSU and the auxiliary start-up bank will be connected to the south.

[3] www.rmao.com

1. Physical Features:

a) Additional Removals & Installations:

This is a new facility. There are no removals required.

b) Fault Current

After completion of the project in 2009[4] the calculated maximum symmetrical fault current on the Comanche 345kV bus is:

Table 1 Fault Current at 345kV Bus

Model	Comanche 3 Gen OFF or ON	Fault Location	Max Symmetrical fault Current (kA)	
			3-Phase	SLG (3I0)
2009 System with Delivery Upgrades	OFF	Comanche 345kV Bus	9.5	11.4
2009 System with Delivery Upgrades	ON	Comanche 345kV Bus	13.7	15.1

c) Electrical Installations:

The installation will consist of three breaker-and-half bays with a total of nine circuit breakers.

d) AC Systems:

Two new station service transformers will be installed. They will be fed from the tertiary of the 345-230kV autotransformers.

e) Control Building:

A new medium size EEE control building will be installed, complete with battery, charger, AC and DC panels, lighting and HVAC system.

f) Grounding:

All equipment and associated structures will be connected to the ground mat. The 345kV and 230kV substation ground mats will be tied together.

g) Lightning Protection:

The static wires on the transmission lines will be connected to the dead-end structure within the substation to provide overhead direct stroke protection.

[4] without modeling any other projects ahead of this project in the LGIR queue

2. Civil Features

a) Grading & Fencing:

Extensive grading is required. The 345kV substation will be terraced below the grade of the existing 230kV substation. A temporary fence will be erected between the two yards to provide safety during construction. It will be removed once the site is completed. The 345kV substation yard will have a new perimeter fence installed that will tie in to the existing 230kV substation fence. The temporary fence will be removed when construction is completed.

A new substation road entrance will be required. It will come in to the north side of the 345kV substation. The existing west entrance to the 230kV yard will be removed. The south entrance to the 230kV substation will be unchanged.

b) Foundations & Structural

All foundations and structures are new.

c) Removals & Relocations:

None required.

3. Control Features:

a) Electrical Installations:

New relay panels will be installed in the new EEE control building for 345kV line protection. Line protection will consist of a SEL-321 (Pkg-P), SEL-311C (Pkg-S), and SEL-351 (BF and reclosing) using Mirror Bits over the fiber optic ground wire for pilot relay communication. Transducers will also be installed on the new relay panel for SCADA telemetry. A new RTU/LCU will be installed and be utilized for SCADA. The 345kV bus section for both the GSU and the start-up bank will be Basler B-Pro differential relays wrapped around the two 345kV breakers and the transformer high side. Transformer differential and other protection is the responsibility of the Customer. Breaker fail protection will be required for all breakers using a SEL 501 per breaker. New relay panels will be installed for this scheme.

4. Outages:

None required. Sections of the 230kV bus will be de-energized, but it will not require outages to lines or load.

5. Project and Operating Concerns:

Work will be performed adjacent to an energized 230kV substation. Some of the work will require interconnection to the existing 230kV substation control building.

6. Related Substation & Transmission Projects:

The project is related to the Comanche Unit #3 installation and the associated 230kV Substation project.

B. General Description of Modifications to Existing 230kV Switchyard:

The existing 230kV substation must be modified to accommodate the addition of Comanche Unit #3. The substation will have a double circuit 230kV transmission line to the existing Comanche 230kV substation. The transmission line will be constructed for 230kV, 2000A, and terminated in the two west bays in the 230kV yard. Both west bays will be rebuilt at an earlier date to accommodate the line additions. New gas circuit breakers, bus and switches will be upgraded to 3000 amps to accommodate the line additions. In order to meet the 2000A line ratings for the new lines the existing 5417 N and S, 5419 N and S, 5402 N and S, 5403 N and S gang switches will be replaced. New switches will be installed in the 5418 N and S, and 5416 N and S positions. All jumpers between the switches and the equipment or bus will be replaced to ensure they are capable of 3000 amps.

1. Physical Features:

a) Additional Removals & Installations

The north and south strain busses in the existing 230 kV yard will be removed and replaced with 5" tubular bus. All bay connections will be re-terminated on the new bus with the appropriately sized conductors.

b) Fault Current

After completion of the project in 2009 (stand alone, not including any other projects ahead of this project in the LGIR queue), the calculated maximum symmetrical fault current on the Comanche 230kV bus is:

Table 2 Fault Current at 230kV Bus

Model	Comanche 3 Gen OFF or ON	Fault Location	Max Symmetrical fault Current (kA)	
			3-Phase	SLG (3I0)
2009 System with Delivery Upgrades	OFF	Comanche 230kV Bus	16.8	20.6
2009 System with Delivery Upgrades	ON	Comanche 230kV Bus	20.8	24.4

c) AC Systems:

The existing station service transformers are installed and are adequate for this project.

d) DC Systems:

An additional new DC panel may be needed for this installation.

e) Grounding:

All new equipment and associated structures will be connected to the existing ground mat.

f) Lightning Protection:

The static wires on the transmission tie lines will be connected to the dead-end structure within the substation.

2. Civil Features:

a) Grading & Fencing

Existing facilities are adequate.

b) Foundations & Structural:

The existing breaker foundations will be modified to accept the standard gas circuit breaker. In addition a new CCVT foundation and structure will be installed for each of the two new line terminations.
There will be two new dead-end structures installed to accommodate the lines.

c) Removals & Relocations:

The existing two west bay breakers, switches and bus will be removed and upgraded to 3000 amp equipment.

3. Control Features

a) Removals & Relocations:

The existing Bank #2 relaying will be relocated to the new breaker 5418. The south tie line to the 345kV autotransformer will terminate between breakers 5418 and 5417.

The existing generator #2 relaying will be relocated to the new 5416 breaker. The north tie line to the 345kV autotransformer will terminate between breakers 5416 and 5402. Both lines will require new relay panels.

b) Electrical Installations:

Transformer protection would be a SEL387 differential relay wrapped around the two 345kV breakers and the transformer low side with a T-Pro Differential relay wrapped around the two 345kV breakers and the transformer low side. The 230kV side will have a similar package wrapped around the high side of the transformers and the associated 230kV breakers.

Tie line protection would be a SEL311L line differential relay wrapped around the two 230kV breakers and the transformer low side using fiber communication between the two ends. Also, a SEL321 distance relay wrapped around the two 230kV breakers and the transformer low side would be used. Fiber communications between the two ends will be used.

Breaker fail protection will be required for all breakers using a SEL 501 per breaker.
New relay panels will be installed for this scheme.
The existing RTU/LCU will be utilized for SCADA.

4. Outages:

The installation of switch 5416 S and the upgrade of switch 5403 N and the associated bus upgrades will be completed during the Unit 2 outage scheduled for the fall of 2005. An outage on the north and south buses will be required to upgrade the buses. An outage of transformer bank #2 will be required to upgrade the west bay equipment. This will be done during a period of low load so that transformer bank #1 can carry the load.

5. Project and Operating Concerns:

Outages will have to be scheduled and work performed while adjacent portions of the bus remain energized. Great care will be necessary to avoid tripping circuits or endangering personnel.

6. Related Substation & Transmission Projects:

The project is related to the Comanche Unit #3 installation and the associated 345kV Substation project.

C. General Description of 115kV Switchyard Upgrades:

1. **Physical Features:**

   a) Removals & Installations:

   Replace the existing overhead line sections with new underground cables for three existing 115kV overhead lines located inside of the 115kV portion of the Comanche switchyard. This is required to accommodate the construction of the new 345kV switchyard at Comanche.

IV. Costs Estimates and Assumptions:

A. Interconnection

The estimated non-binding good faith total cost for the PSCo Interconnection Facilities and Network Upgrades to provide an Interconnection for the Customer requested generation is:

- **$ 956k for PSCo Transmission Owned Interconnection Facilities (Customer funded).**
- **$ 19.2 million for PSCo Transmission Network Upgrades for Interconnection.**
- **Total Estimated cost of Interconnection = $20.2 million**

The estimated costs shown above are "appropriation estimates" with an accuracy of ± 20%. These estimates do not include any costs for any Customer-owned, supplied, and installed equipment and associated design and engineering for the Customer's facilities. Detailed appropriation level estimates were not performed for estimating the Network Upgrades for Delivery; these upgrades are discussed later, with only scoping level estimates repeated here as performed for the earlier System Impact Study.

B. Stand-Alone

"Stand Alone Network Upgrades" are defined by the FERC LGIP as Network Upgrades that the Interconnection Customer may construct without affecting the day-to-day operations of the Transmission System during their construction. The Transmission Provider and Interconnection Customer must agree as to what constitutes Stand Alone Network Upgrades and identify them in Appendix A to the Standard Large Generator Interconnection Agreement. For this generation interconnection request, it is assumed that the Stand Alone Network Upgrades would include the proposed 345kV Comanche Switchyard. The following are the estimated costs for these Stand Alone Network Upgrades.

- **Stand Alone Network Upgrades = $14.3 million**

Note that these costs are included in the $ 19.2 million total for PSCo Transmission Network Upgrades for Interconnection.

C. Delivery

The additional costs for PSCo Transmission Network Upgrades for Delivery of the full new generation output to PSCo native loads were estimated during the System Impact Study at:

- **$ 130 million[5] for additional PSCo Transmission Network Upgrades for Delivery**

Therefore, the total estimated project cost for the PSCo facilities required for interconnection and delivery is approximately **$149.3 million.**
The Project Design Guide included in Part III of this report describes the assumptions and additional details associated with this project. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines.

D. Interconnection Facilities Component Costs Estimates and Assumptions:

Table 3 describes the improvements assumed necessary to be performed by PSCo Transmission, as dedicated "sole-use" facilities at PSCo Comanche Plant substation for the new Customer interconnection. It does not include all of the costs associated with Network Upgrades, required at or beyond the Point of Interconnection (POI) to the PSCo transmission system, and delivery (NR) of the generation. Those costs are identified in Tables 4 and 5. It is assumed that all of the Customer owned, supplied, and operated equipment, both installed at PSCo Comanche Plant Substation, and equipment installed between and at the Customer Comanche #3 generation site, will be designed, and installed by the Customer, or its contractors (such as the main 345 – 26kV GSU transformer, 345-13.8kV start-up transformer, and other associated Customer–owned substation / plant equipment). The costs of these Customer owned / operated facilities have not been estimated for by PSCo Transmission.

Table 3 PSCo Transmission Interconnection Facilities (Customer funded):

Substation	Description	Cost ($million)
New 345kV Comanche Switchyard	Interconnect Customer's GSU and Start Up transformer to a new 345kV switchyard. The new equipment required includes: • 345kV conductor, insulators and hardware • required steel supporting structures • associated control and protective relaying	$ 0.956
	Total Estimated Cost for PSCo Interconnection Facilities	**$ 0.956**

[5] Scoping, or planning level estimate considered to have an accuracy of +/- 30%.

Table 4 describes the costs associated with providing an interconnection to PSCo Transmission's system. It does not include all of the costs required for full delivery of the generation. Those costs are included in Table 5.

Table 4 PSCo Transmission Network Upgrades Required for Interconnection:

Substation	**Description**	**Cost ($million)**
A. New 345kV Comanche Switchyard	Install a new Breaker-and-Half 345kV switchyard which will interconnect with the existing 230kV switchyard via two 345/230kV autotransformers. The following equipment will be required: • site development • two (2) 345/230kV 560MVA autotransformers • nine (9) 345kV 3000 amp 40kA circuit breakers • eighteen (18) 345kV switches • 230kV overhead transmission line connection to 230kV switchyard • CCVT's • misc. supporting steel • electrical bus work • associated control and relaying	$ 14.274
B. Comanche 230kV Switchyard	Two new 230kV line terminations for new autotransformers from 345kV Swyd. Upgrade equipment in two existing 230kV bays, and upgrade existing north and south busses due to the existing ampacity rating. The following equipment will be required: • six (6) 230kV 3000 amp 50 kA circuit breakers • twelve (12) 230kV switches • misc. supporting steel • electrical bus work • associated control and relaying **1.**	$ 3.079
C. Comanche 115kV Switchyard	Underground existing 115kV transmission lines to allow for new 345kV switchyard development. The following equipment will be required: • concrete duct bank • 115kV UG cable • two (2) UG/OH transition structures • 115kV termination kits • misc. supporting steel • electrical bus work	$ 1.862
	Total Estimated Cost of Network Upgrades for Interconnection	**$19.216**
	Time Frame:	**36 Months**

Assumptions:

1. The estimated costs provided are "Appropriation Estimates" with an accuracy of ± 20%.
2. All applicable overheads are included. AFUDC has been removed.
3. Estimates were escalated at 3% per year through Fall 2007.
4. PSCo Transmission (or its contractor) crews will perform all construction and wiring associated with PSCo Transmission-owned and maintained equipment.
5. A Certificate of Public Convenience and Necessity (CPCN) will be required from Colorado Public Utility Commission (CPUC) for the PSCo Transmission network upgrades for both interconnection and delivery.
6. The estimated time for design, procurement and construction for the PSCo Transmission network upgrades required for the interconnection is at least 36 months after the Interconnection Agreement has been signed.
7. All required transmission outages necessary to support construction will be obtained as needed.
8. Land necessary for the new 345kV switchyard at Comanche will be available.
9. There will be two (2) sets of Current Transformers available on the high voltage bushings of both the Interconnection Customer's generator step-up and the start-up transformers for use in the Transmission Provider's bus differential relaying scheme.
10. The interconnection customer will provide a generator bus reference voltage source to be compared against the 345 kV bus voltage for synchronizing the generator. Closing control for the two (2) breakers in the 345 kV yard will be by the Interconnection customer.
11. The Interconnection Customer will install its own protection scheme for its generator step-up and the start-up transformers, and any other equipment connected to the low voltage side of both transformers.
12. Controls and protection scheme details between the Transmission Provider and Interconnection Customer will be finalized in the Interconnection Agreement.

E. Delivery Component Costs Estimates and Assumptions

Table 5 describes the estimated "scoping level" (+/- 30%) costs of PSCo Network Upgrades for Delivery, those associated with firm delivery of the 750 MW generation to PSCo Transmission native load, without inclusion of network upgrades that may be necessary if other higher queued GI projects are installed. These costs were first determined during the System Impact Study, and have not been significantly refined for this Facilities Study. More detailed, and higher accuracy estimates will need to be performed at later stages in this project, due to the high level of uncertainty regarding specific line routes, permitting, and other details typical for transmission line design and construction of this nature. Many of these details will be determined during the Certificate of Public Convenience and Necessity (CPCN) to be filed with the Colorado PUC for this project.

Table 5 PSCo Transmission Network Upgrades Required for Delivery

Substation	**Description**	**Cost ($million)**
Midway 230kV Substation	Add one (1) new 230kV line termination, and terminate the existing Comanche-Fuller-Daniels Park 230kV transmission line.	$2.315
Daniels Park 345kV Switchyard	Install a new Breaker-and-Half 345kV switchyard which will interconnect with the existing Daniels Park 230kV Switchyard via three (3) 345/230kV 560MVA autotransformers.	$27.516
Transmission		
Comanche 345kV Switchyard to Midway 230kV Substation	New 345kV double circuit transmission line, Illinois structure or double H, constructed to 345kV specifications, 954-bundled conductor, within new ROW (50 miles). New line not interconnected at the Midway Substation.	$38.131
Midway 230kV Substation to Daniels Park 345kV Switchyard via Fuller Sub.	Rebuild existing Comanche-Fuller-Daniels Park single circuit 230kV transmission line to double circuit 230kV line, Illinois structure, constructed to 345kV specifications, within existing ROW, 954-bundled conductor (75 miles). Connect new 345kV double circuit transmission line from Comanche to the previously rebuilt double circuit transmission line from Midway to Daniels Park and energize at 345kV.	$56.584
Siting, Permitting and Acquisition	Siting and Land Rights activities including siting study, public involvement, permitting and land rights acquisition.	$5.497
	Total Estimated Cost for Additional PSCo Network Upgrades for Delivery	**$130.043**
	Time Frame:	**54 months**

The major scope of work associated with the delivery upgrades includes:

1. 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.
2. 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.
3. 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.
4. 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.
5. The tie into Fuller Substation would be maintained using one of the new (rebuilt) 230kV transmission circuits.

6. 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.
7. The existing single-circuit Comanche – Fuller 230kV line would be tied into the Midway Substation from the south.
8. All new 345 transmission and terminations should be built using 954kcmil, two-conductor bundled conductors, capable of at least 1200 MVA (2000 Amps).

Assumptions:

- The estimated costs provided are "Scoping Estimates" with an accuracy of ± 30%. This level of estimate is typical for a project at this budgetary stage in the process.
- All applicable overheads are included. AFUDC has been removed.
- Estimates were escalated at 3% per year and the major construction components were escalated through December 2008.
- PSCo Transmission (or its contractor) crews will perform all construction and wiring associated with PSCo Transmission-owned and maintained equipment.
- A Certificate of Public Convenience and Necessity (CPCN) will be required from Colorado Public Utility Commission (CPUC) for the PSCo Transmission network upgrades fro both interconnection and delivery.
- A siting study and public involvement will be required for the network upgrades required for delivery. Land use permits will be required from multiple local jurisdictions. Permitting is expected to be difficult and potentially controversial.
- The estimated time for siting, permitting, acquisition, design and construction for the PSCo Transmission network upgrades required for delivery is at least 54 months after the Interconnection Agreement has been signed, and based upon other identified assumptions for Siting and Land Rights, Substation Engineering and Transmission Engineering (see below).
- All required transmission outages necessary to support construction will be obtained as needed.
- Where existing transmission line ROW is proposed to be utilized, it will be adequate for the proposed transmission line rebuild.
- If any additional transmission line ROW is required for the proposed transmission line rebuild, it will be minimal and available.
- Additional land will be acquired at Daniels Park Switchyard, but no additional land is needed at Midway.
- It is anticipated that land use permits will be required by six (6) different local jurisdictions, and that all of these permits will be granted in a timely manner to support construction of the project.

V. Engineering, Procurement & Construction Schedule

The following schedule identifies milestones for three separate phases of work needed to complete the interconnection of the proposed 750 MW generator. The following is a brief description of the three phases:

Phase I – underground existing 115kV overhead transmission lines which exit the west side of the existing 115kV switchyard in order to create land area for the proposed 345kV switchyard.

Phase II – Upgrade equipment in the existing 230kV switchyard due to its existing ampacity rating, and add two new line terminations to interconnect the proposed 345kV switchyard via two 345/230kV autotransformers.

Phase III – Construct the new 345kV switchyard.

It is anticipated that the work associated with all three phases can be completed by early 2008 in order to provide electrical back-feed required by the Interconnection Customer to complete its testing and commissioning for the new generator. The Transmission Provider will continue with its testing and commissioning work to support commercial operation of the new generator.

Figure 4: Engineering, Procurement & Construction Schedule

ID	Task Name	Duration
1	**Underground Existing 115kV OH Trans Lines**	**70 days**
2	Install UG duct bank	4 wks
3	Construct UG trans line term. structures at Comanche	4 wks
4	Construct UG trans line term. structure at Reader	2 wks
5	Install UG/OH transition poles	2 wks
6	Install UG 115kV conductor	2 wks
7	Install UG termination kits	2 wks
8	Cut-over trans lines and energize UG lines	2 wks
9	Remove OH lines & structures	5 days
10		
11	**Comanche 230kV Swyd - Gen No. 2 Bay Switch Upgrade**	**45 days**
12	Comanche No. 2 Generator scheduled outage	9 wks
13	Replace 230 switch 5403N and install new switch 5416S	3 wks
14		
15	**Comanche 230kV Swyd Upgrades**	**245 days**
16	Civil work, foundation and conduit/duct bank installation	3 wks
17	Clearance on Gen No. 2 bay between switches 5402N & 5416S	7 wks
18	Install one new 230 brkr, replace one 230 brkr, new DE, switches and bus work	5 wks
19	Install new relay panels, SCADA work & control wiring	2 wks
20	Test, trip check & commission	2 wks
21	Release new 230 brkrs for service and reenergize	1 day
22		
23	Clearance of 230 south bus	5 wks
24	Rebuild and upgrade 230 south bus	2 wks
25	Replace two 230 brkrs and switches	3 wks
26	Test, trip check & commission	2 wks
27	Release new brkrs for service and reenergize 230 south bus	1 day
28		
29	Clearance on Bank No. 2	2.2 wks
30	Install one new 230 switch and replace one 230 switch	2 wks
31	Release switches for service and reenergize Bank 2	1 day
32		
33	Clearance on Bank No. 2 bay	7 wks
34	Install one new 230 brkr, replace one 230 brkr, new DE, switches and bus work	5 wks
35	Install new relay panels, SCADA work & control wiring	2 wks
36	Test, trip check & commission	2 wks
37	Release brkrs for service and reenergize	1 day
38		
39	Clearance of 230 north bus	2 wks
40	Rebuild and upgrade 230 north bus	2 wks
41	Replace two 230 switches	2 wks
42	Release new switches for service and reenergize 230 north bus	1 day
43		
44	**Comanche 345kV Swyd**	**931 days**
45	CPCN Anticipated Completion	1 day
46	Permitting Anticipated Completion	1 day
47	Sub Engineering & Design	7 mons
48	Autotransformer Procurement	12 mons
49	Swyd Material Procurement	6 mons
50	Swyd Construction	7 mons
51	Swyd Testing, Trip Checking & Commissioning	8 wks
52	Electrical Backfeed to Comanche #3	1 day
53	Testing & Comm. support for Commercial Operation	14 mons

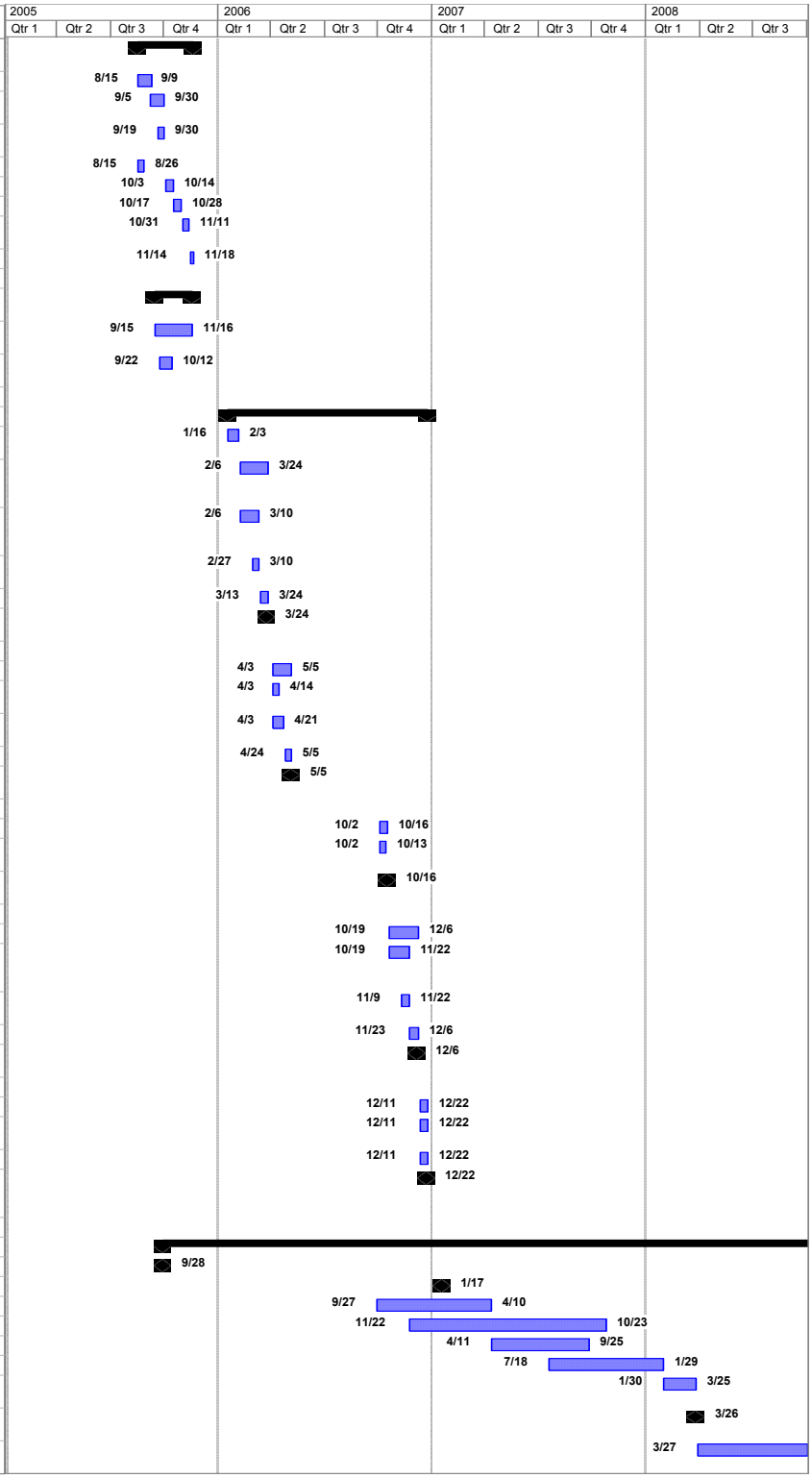


Figure 5: Comanche Switchyard: Proposed General Arrangement Drawing