Interconnection System Impact Study Report
Request # GI-2007-10

201 MW Wind Farm, Near Simla, Colorado

Public Service Company of Colorado
Transmission Planning
November 2008

Executive Summary

Public Service Company of Colorado received an interconnection request to install a 201 MW wind turbine generator facility near Simla, Colorado. The original request envisioned connecting to the PSCo system at the Jackson Fuller Substation. However, for the System Impact Study, the proposed interconnection point was moved 5 miles south to connect to the Jackson Fuller-Midway 230 kV line (see Figures 1 & 2 below). The wind generating facilities are located 35 miles east of the interconnection point and would be connected via a developer owned radial 230 kV line. The requested in service date is December 1, 2010 with a projected backfeed date of June 1, 2010.

This request was studied as a Network Resource[1] at the full 201 MW rated output. The project's Energy Resource[2] status was also considered. These investigations included steady-state power flow, transient stability, and short circuit analyses. The request was studied as a stand-alone project only, with no evaluations made of other potential new generation requests that may exist in the Large Generator Interconnection Request (LGIR) queue, other than the generation projects that are already approved and planned to be in service by the summer of 2010. The main purpose of this System Impact Study was to evaluate the potential impact on the PSCo transmission infrastructure as well as that of neighboring utilities when injecting the proposed 201 MW of generation at the interconnection point south of the Jackson Fuller Substation, and delivering the additional generation to native PSCo loads. The costs to

[1] **Network Resource Interconnection Service** shall mean an Interconnection Service that allows the Interconnection Customer to integrate its Large Generating Facility with the Transmission Provider's Transmission System (1) in a manner comparable to that in which the Transmission Provider integrates its generating facilities to serve native load customers; or (2) in an RTO or ISO with market based congestion management, in the same manner as all other Network Resources. Network Resource Interconnection Service in and of itself does not convey transmission service.

[2] **Energy Resource Interconnection Service** shall mean an Interconnection Service that allows the Interconnection Customer to connect its Generating Facility to the Transmission Provider's Transmission System to be eligible to deliver the Generating Facility's electric output using the existing non-firm capacity of the Transmission Provider's Transmission System on an as available basis. Energy Resource Interconnection Service in and of itself does not convey transmission service

interconnect the project with the transmission system have been evaluated by PSCo Engineering.

Network Resource

The results of the Network Resource analysis indicate that the developer could provide 201 MW if the following is completed:

- Upgrade the Cottonwood-Kettle Creek 115 kV line and the Fuller 230/115 kV transformer to address contingency overload concerns. These facilities are owned by Colorado Springs Utilities and Tri-State Generation & Transmission. The developer should contact these utilities directly to develop plans to mitigate the reported overloads. Our results will be communicated to CSU and TSG&T.

Energy Resource

Non-firm transmission capability may be available depending upon demand levels, generation levels, dispatch patterns, marketing activities and the status of transmission facilities.

The cost for the transmission interconnection (in 2008 dollars):

Transmission Proposal
The total estimated cost of the recommended system improvements to interconnect the project is approximately **$3,946,000** and includes:

- $ 0.751 million for PSCo-Owned, Developer-Funded Attachment Facilities
- $ 3.195 million for PSCo-Owned, PSCo-Funded Attachment Facilities
- $ 0.000 million[2] for PSCo Network Upgrades for Delivery to PSCo Loads

This work can be completed in 18 months following receipt of authorization to proceed. The proposed project schedule and station one-line are in Sections D and E, respectively, of the Appendix.

The Interconnection Agreement (IA) requires that certain conditions be met, as follows:

1 The conditions of the Large Generator Interconnection Guidelines (LGIG) are met.

[2]Does not include potential costs to address CSU and TSG&T overload concerns.

2 PSCO will require testing of the full range of 0 MW to 201 MW operational capability of the facility. These tests will include, but not be limited to, power factor control at the POI for various generation output levels (0 to 201 MW) of the Customer's wind generation facility. Wind turbine generators are required to maintain the power factor at the POI within the range of 0.95 leading to 0.95 lagging.

3 A single point of contact needs to be provided to PSCo Operations to facilitate reliable management of the transmission system.

Figure 1 Network Diagram with Proposed POI and Planned Comanche Project (2010)

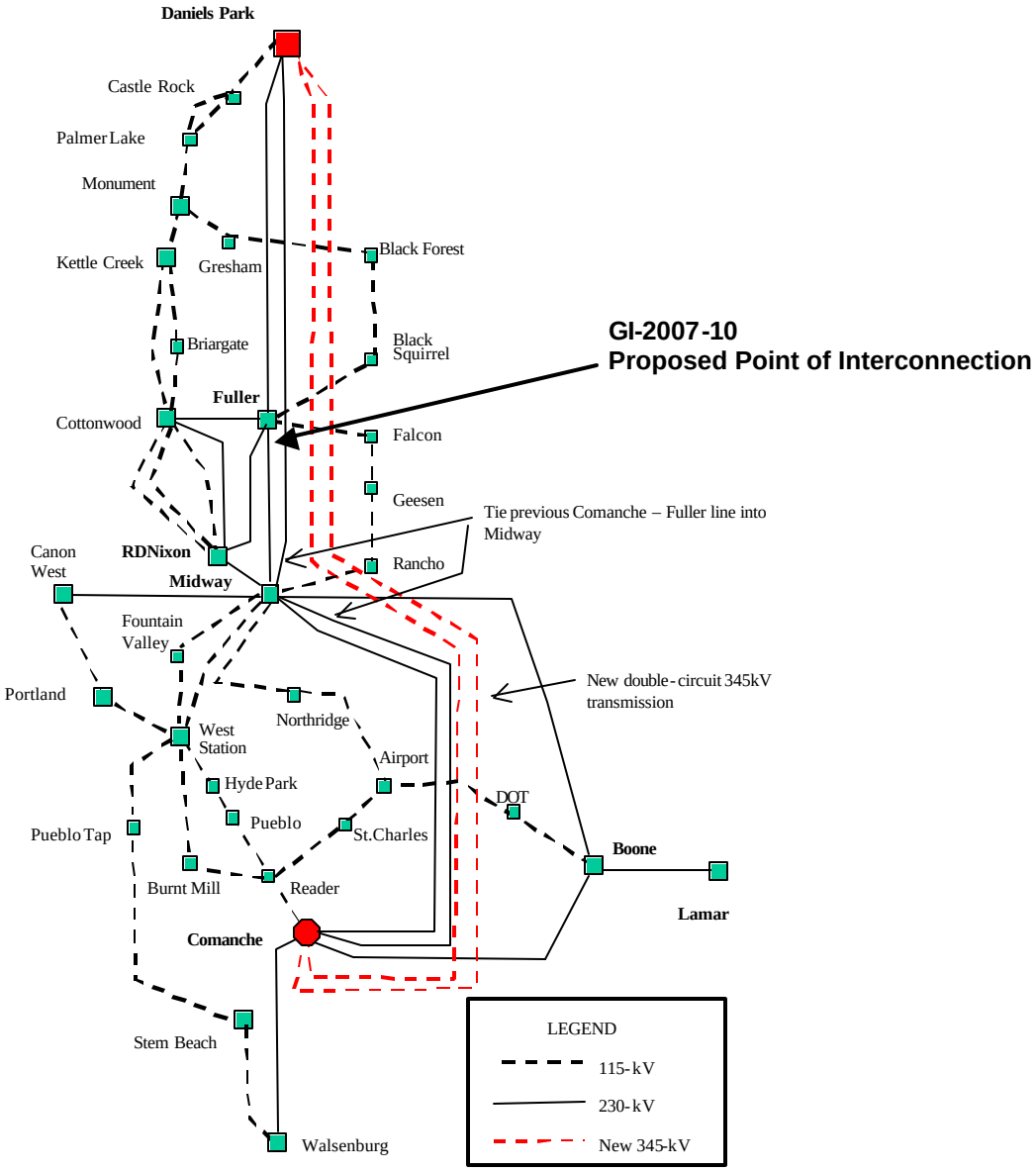
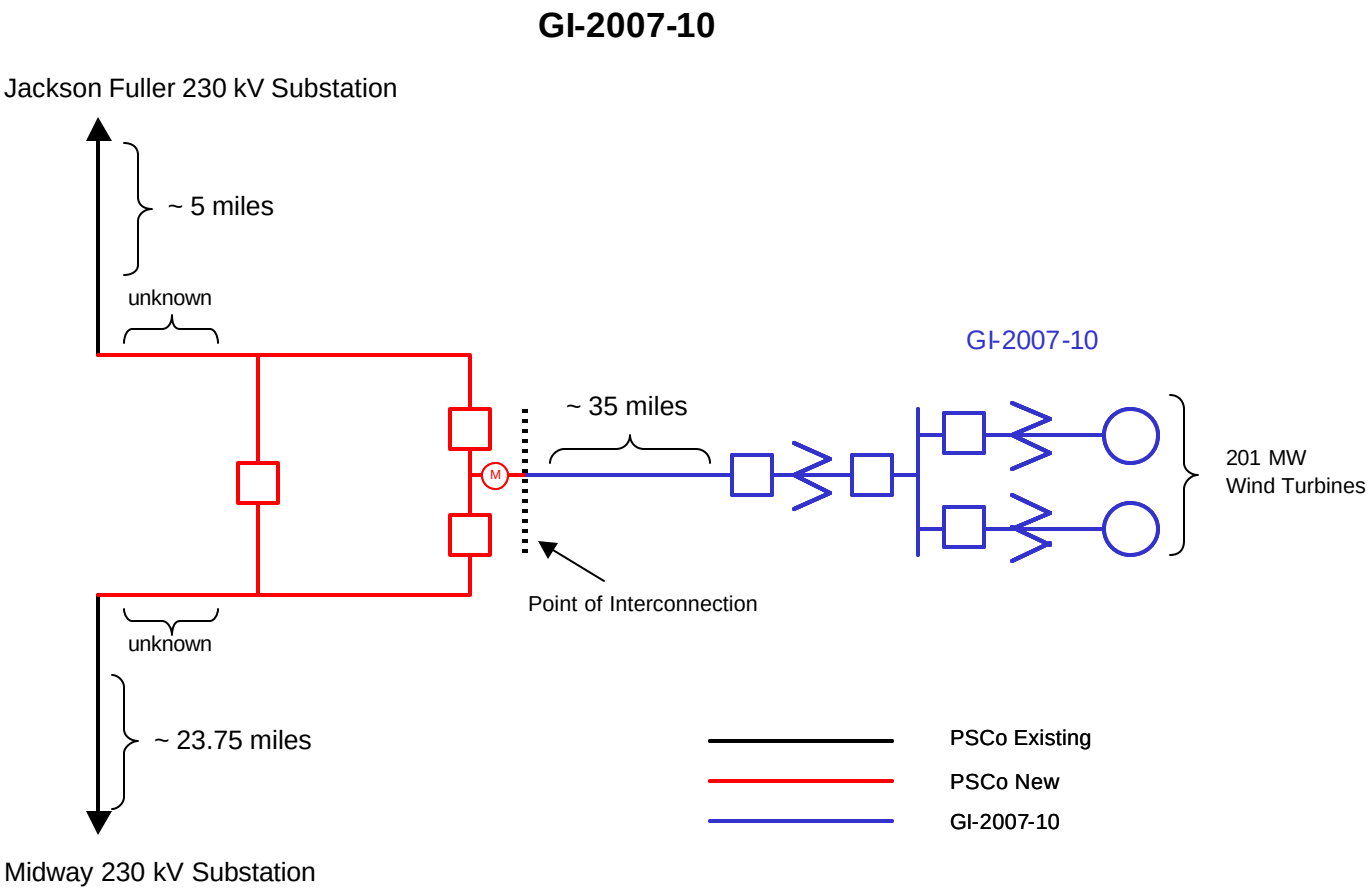


Figure 2 Proposed Interconnection Station One-Line Diagram (PSCo upgrades Marked in Red)



Introduction

Public Service Company of Colorado received a large generator interconnection request to install a 201 MW wind turbine generator facility near Simla, Colorado. The project includes 134 GE 1.5 MW wind turbine generators. The original request envisioned connecting to the PSCo system at the Jackson Fuller Substation. However, for the System Impact Study, the proposed interconnection point was moved 5 miles south to connect to the Jackson Fuller-Midway 230 kV line. The wind generating facilities are located 35 miles east of the interconnection point and would be connected via a developer owned radial 230 kV line. The requested in service date is December 1, 2010 with a projected backfeed date of June 1, 2010.

This study determined the system reinforcements and associated costs required to facilitate the addition of the new generating plant to the transmission system as a Network Resource. The reinforcements include the direct connection of the generator to the system and any network upgrades necessary to maintain the reliability of the transmission system.

Study Scope and Analysis

The System Impact Study evaluated the transmission impacts associated with the proposed generating station. It consisted of power flow, transient stability, and short circuit analyses. The power flow analysis identified any thermal or voltage limit violations resulting from the interconnection and a preliminary identification of network upgrades required to deliver the proposed generation to PSCo loads. The stability analysis identified any dynamic stability problems associated with the new generation. The short circuit analysis identified any circuit breakers that might exceed their fault interruption capability due to addition of the new generation.

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 nominal, and steady-state power flows below the thermal ratings of all facilities. 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, transmission system steady state bus voltages must remain within 0.90 per unit to 1.10 per unit, and power flows within 100% of the facilities' continuous thermal ratings. Also, the units should remain transiently stable with no undamped oscillations. Wind plants are required to remain in service during a three-phase or single line to ground fault lasting up to 9 cycles.

For this project, potential affected parties include the Intermountain Rural Electric Association (IREA) transmission system in the regions south of the Denver area, Tri-State Generation & Transmission (TSG&T), and Colorado Springs Utilities (CSU).

Power Flow Study Models

The power flow studies were based on a PSCo-developed 2010 heavy summer base case that originated from the study model developed in early 2008 as part of PSCo's normal annual Five Year Transmission Capital Budget project identification process. These budget case models are developed from Western Electricity Coordinating Council (WECC) approved models, modified as appropriate for PSCo planned and approved projects and associated topology. Load levels reflect 2010 heavy summer peak system conditions. The case reflects the addition of the Comanche Project through 2010. This includes the addition of the 750 MW Comanche #3 unit and two Comanche-Daniels Park 345 kV lines. The case also includes the replacement of the Daniels Park and two Waterton 230/115 kV transformers with 280 MVA units.

The Project's wind turbine generators were modeled as a conventional 201 MW machine connected to a 0.575 kV bus. The wind plant model includes an equivalent 34.5/0.575 kV generator step-up transformer and equivalent collector system impedance. It also includes the main 230/34.5 kV 240 MVA transformer. This model is connected to the interconnection station through a 35-mile 230 kV overhead transmission line. The reactive capability of the equivalent generator was based on values provided by the project developer and generator scheduled voltage was set so that the injected power at the POI is near unity power factor.

PSCo control area (Area 70) wind generation facilities, other than GI-2007-10, were dispatched to approximately 12% of facility ratings, consistent with other similar planning study models.

To evaluate the capabilities of the existing transmission system and the potential reinforcements that would be required, the power flow model was modified to simulate high flows from southeastern Colorado to the north. Specifically, generation from the Comanche units was near maximum capability and the generation at Fountain Valley was placed online at full capability, displacing generation at Fort St. Vrain. Also, the Lamar DC Tie was modeled as a 200 MW injection source into the PSCo system, with corresponding adjustments made to generation in northern Colorado. The Colorado Green and Twin Buttes wind farms were each modeled at 12.5 % of their output rating.

Two main power flow case model generation dispatch scenarios were evaluated: a reference model without the proposed wind farm, and a model with the new 201 MW injected at the interconnection point. Wind farm generation in the GI-2007-10 case was offset with generation in the northern part of the PSCo system in order to maintain the south-to-north system load flow case stress. Specifically, this was accomplished by decreasing the generation by 201 MW, split equally between the Fort St. Vrain and Manchief power plants.

Power Flow Study Process

Automated contingency power flow studies were completed on the reference model and the model with the proposed generation using PTI's PSS™MUST program, switching out single branches one at a time for all of the transmission facilities (lines and transformers) in control areas 70 (PSCo) and 73 (WAPA RM). Results from the two cases were compared and new overloads or overloads that increased by greater than 5% in the new generator case were noted.

Power Flow Results

A list of the transmission facilities that experienced new or significantly increased overloads in the case with the new generation as compared to the reference case can be found in Table 7 in the Appendix. One of the two facilities is the Cottonwood-Kettle Creek 115 kV line. This is a Colorado Springs Utilities (CSU) facility. The other is the Jackson Fuller 230/115 kV transformer, which is owned by Tri-State Generation & Transmission (TSG&T). Both of the overloads can be relieved through operation of the Monument-Palmer Lake 115 kV normally open. This occurred for several months through the end of September 2008. However, this circuit is now normally closed and operation in a normally open state is not considered a long-term fix due to single contingency concerns that arise with this configuration. The project developer will need to work with CSU and TSG&T to determine appropriate plans to address these overloads.

Contingency overloads were not observed on PSCo's system due to the proposed generation. In the Feasibility Study, the 100 MVA Waterton transformers and 150 MVA Daniels Park transformer experienced contingency overloads. However, replacement of these transformers has been approved in the current Capital Budget Process, with new 280 MVA units expected to be in service in 2010.

In the Feasibility Study, some IREA facilities were listed as contingency overload problems. However, the System Impact studies show that operation of the Monument-Palmer Lake 115 kV line normally closed relieves the overloads. Therefore, they are not listed in this study.

Transient Stability Models

The transient stability studies were based on the WECC approved 10HS2SA1P base case. Load levels reflect 2010 heavy summer peak system conditions. The case was modified to reflect the addition of the Comanche Project. This includes the addition of the 750 MW Comanche #3 unit and two Comanche-Daniels Park 345 kV lines. The case was also modified to include the replacement of the Daniels Park and two Waterton 230/115 kV transformers with 280 MVA units. The new generation was offset by turning off the Squirrel Creek units since construction of these generators has been cancelled, and by adjusting other units at Arapahoe and Cabin Creek. The Fountain

Valley units at Midway were also turned on, with offsetting adjustments made to the Fort St. Vrain units.

The Project's wind turbine generators were modeled as a conventional 201 MW machine connected to a 0.575 kV bus. The wind plant model includes an equivalent 34.5/0.575 kV generator step-up transformer and equivalent collector system impedance. It also includes the main 230/34.5 kV 240 MVA transformer. This model is connected to the interconnection station through a 35-mile 230 kV overhead transmission line. The reactive capability of the equivalent generator was based on values provided by the project developer and generator scheduled voltage was set so that the injected power at the POI is near unity power factor.

PSCo control area (Area 70) wind generation facilities, other than GI-2007-10, were dispatched to approximately 12% of facility ratings, consistent with other similar planning study models.

Transient Stability Study Process

The transient stability studies were conducted using PTI's PSS/E Version 30.3.2 software. NERC Category B & C contingencies were considered as part of the analysis. The simulations considered three-phase faults with normal clearing and single line to ground faults with breaker failure and clearing by backup breakers. The analyses using three-phase faults assumed 5 cycle normal clearing time. The single line to ground breaker failure analyses used a backup clearing time of 17 cycles. The results were assessed for transient stability performance, including wind turbine generator low voltage ride through.

Transient Stability Study Results

The list of contingencies that were evaluated and the associated results can be found in Table 8 in the Appendix. The range of contingencies evaluated was limited to that necessary to adequately assess the transient stability performance of the proposed wind turbine generator project. Plots of machine speed, power, and voltage for each contingency were produced to perform the assessment. The study shows that with the turbines specified, GE 1.5 MW (134 turbines), and operating in power factor control mode, the proposed generating plant will be transiently stable and meet the low voltage ride through requirement when the controlled power factor at the 34.5 kV collector bus is 0.99 lagging (turbines supplying VARs) and with the following manufacturer recommended voltage trip levels and times:

Voltage at the terminal of the generator:
- 0.75 pu or lower for 1.9 seconds
- 0.50 pu or lower for 1.2 seconds
- 0.30 pu or lower for 0.70 second
- 0.15 pu or lower for 0.20 second

1.15 pu or higher for 0.10 second
1.30 pu or higher for 0.02 second

Network Resource (NR)

This Study has determined that the requested generation increase injected at the interconnection point 5 miles south of the Jackson Fuller 230 kV substation causes overloads on the CSU and TSG&T systems. Therefore, the 201 MW Network Resource value requested will require Transmission Network Upgrades.

NR = 201 MW (with required Network Upgrades)

Power Factor Design Criteria at the Point of Interconnection

Pursuant to FERC Order 661-A and Xcel Energy Interconnection Guidelines, the wind farm needs to maintain approximate power factor neutrality at the POI. Specifically:

- The project developer needs to demonstrate that the proposed facility is capable of maintaining the power factor at the POI within the range of 0.95 leading to 0.95 lagging for the full MW operating range of the facility.

- It is the responsibility of the project developer to determine what type of equipment (DVAR, added switched capacitors, SVC, reactors, etc.), the ratings (MVAR, voltage--34.5 kV or 230 kV), and the locations of those facilities to meet these power factor control standards.

Short Circuit Study Results

Based on a review of the short circuit results in the Feasibility Study, it was determined that updated studies addressing the change in point of interconnection were not required. Therefore, the previous results are still applicable and no new circuit breakers are expected to exceed their fault interruption capabilities following installation of the new generation. However, revised short circuit parameters were calculated for the new interconnection point. Table 1 contains the results of those calculations.

Table 1 Short Circuit Parameters at the Point of Interconnection

System Condition	Three-Phase Fault Level (Amps)	Single-Line-to-Ground Fault Level (Amps)	Thevenin System Equivalent Impedance (R +j X) (ohms)
All Facilities in Service	I_1= 14,643.3 $I_2=I_0$= 0 $I_A=I_B=I_C$= 14,643.3	$I_1=I_2$= 3,611.54 $3I_0$= 10,834.6 I_A= 10,834.6 $I_B=I_C$= 0	Z1(pos)= 0.73661 +j 9.03838 Z2(neg)= 0.73937 +j 9.03981 Z0(zero)= -0.7143 +j 18.6824
Jackson Fuller Line Out	I_1= 7,114.82 $I_2=I_0$=0 $I_A=I_B=I_C$= 7,114.82	$I_1=I_2$= 1,974.31 $3I_0$= 5,922.93 I_A= 5,922.93 $I_B=I_C$=0	Z1(pos)= 1.52765 +j 18.6013 Z2(neg)= 1.52881 +j 18.6046 Z0(zero)= -14.680 +j 29.0414
Midway Line Out	I_1= 9,825.12 $I_2=I_0$=0 $I_A=I_B=I_C$= 9,825.12	$I_1=I_2$= 2,402.63 $3I_0$= 7,207.88 I_A= 7,207.88 $I_B=I_C$=0	Z1(pos)= 1.23304 +j 13.4590 Z2(neg)= 1.23717 +j 13.4591 Z0(zero)= 4.94632 +j 27.8509

Costs Estimates and Assumptions

The Developer has requested a 201 MW Wind Generation Project interconnecting on the bus at a new 230kV substation tapping the Jackson Fuller-Midway transmission line. The new substation will be located approximately 5 miles south of Jackson Fuller Substation. A 35-mile, 230kV radial transmission line (funded and constructed by the Developer) will connect the Developer's collector site with the PSCo transmission system at the Point of Interconnection. The estimated total cost for the required upgrades for is **$3,946,000.**

The estimated costs shown are (+/-30%) estimates in 2008 dollars and are based upon typical construction costs for previously performed similar construction. These estimated costs include all applicable labor and overheads associated with the engineering, design, procurement and construction of these new PSCo facilities. This estimate did not include the cost for any other Developer owned equipment and associated design and engineering.

The following tables list the improvements required to accommodate the interconnection and the delivery of the Project. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines. System improvements are subject to change upon more detailed analysis.

Table 2 – PSCo Owned; Developer Funded Interconnection Facilities

Element	Description	Cost Est. Millions
New 230kV Substation	Interconnect Developer to tap the bus at the New 230kV substation. The new equipment includes: • 230kV bidirectional metering • Three 230kV combination CT/PT instrument transformers • One 230kV, 2000 amp gang switch • Associated foundations and structures • Associated transmission line communications, relaying and testing	**$0.261**
	Transmission Line Tap – install slack span into the New 230kV Substation (one span, tap structure, OPGW splicing). Engineered, procured and constructed by Xcel Energy.	**$0.460**
	Developer Generator Communication to Lookout	**$0.010**
	Developer LF/AGC and Generator Witness Testing	**$0.010**
	Siting and Land Rights for required easements, reports, permits and licenses	**$0.010**
	Total Cost Estimate for Developer Interconnection Facilities	**$0.751**

Table 2: PSCo Owned; PSCo Funded Interconnection Facilities

Element	Description	Cost
New 230kV Substation	Interconnect Developer to tap the bus at the New 230kV substation. The new equipment includes: • Three (3) 230kV, 2000 amp, gas circuit breakers • Six (6) 230kV, 2000 amp gang switches • Two (2) transformers, CCVT, 230kV, 2000 amp • One (1) electric equipment enclosure (EEE) • Associated communications and SCADA equipment • Line relaying and testing • Electrical bus work • Associated foundations and structures • Associated yard surfacing, landscaping, fencing and grounding	**$2.895**
New 230kV Substation	Siting and Land Rights for required 5-acre parcel acquisition, siting studies, reports, permits and licenses	**$0.300**
	Total Estimated Cost for PSCo Interconnection Facilities	**$3.195**
Time Frame	**To site, engineer, procure and construct all interconnection facilities**	**18 Months**

Table 3 – PSCo Network Upgrades for Delivery Not Applicable

Element	Description	Cost Est. Millions

Assumptions

- The cost estimates provided are “scoping estimates” with an accuracy of +/- 30%.
- Estimates are based on 2008 dollars.
- There is no contingency added to the estimates. AFUDC is not included.
- Labor is estimated for straight time only – no overtime included.
- Lead times for materials were included as a consideration
- The Generator is not in PSCo’s retail service territory. Therefore no costs for retail load metering are included in these estimates.
- Substation site is located on the west side of the Jackson Fuller-Midway 230kV transmission line.
- PSCo (or it’s Contractor) crews will perform all construction and wiring associated with PSCo owned and maintained facilities.
- The estimated time to site, design, procure and construct the interconnection facilities is at least 18 months, and is completely independent of other queued projects and their respective ISD’s. This does not include any time for preparation and receipt of a CPCN, which would add an additional 10 to 12 months to this schedule.
- A CPCN may be required for interconnection facility construction.
- Developer will string OPGW fiber into substation as part of the transmission line construction scope.
- PSCo crews to perform checkout, relay panel construction and final commissioning.

Appendix

A. Generation Dispatch

Table 5 – Generation Dispatch Assumed in the Study Benchmark Case

GI-2007-10 System Impact Study				
Generation in Benchmark Case				
Bus	Name	ID	Status	Pgen
70119	COMAN 1 24.000	G1	1	305.4
70120	COMAN 2 24.000	G2	1	320.0
70777	COMAN 3 24.000	1	1	750.0
70577	FTNVL1-2 13.800	G1	1	38.0
70577	FTNVL1-2 13.800	G2	1	38.0
70578	FTNVL3-4 13.800	G3	1	38.0
70578	FTNVL3-4 13.800	G4	1	38.0
70579	FTNVL5-6 13.800	G5	1	38.0
70579	FTNVL5-6 13.800	G6	1	38.0
70560	LAMAR DC 230.00	1	1	200.0
70701	CO GRN E 34.500	1	1	10.0
70702	CO GRN W 34.500	1	1	10.0
70703	TWNBUTTE 34.500	1	1	9.4
73507	FTRNG1CC 18.000	1	1	150.0
73508	FTRNG2CC 18.000	1	1	150.0
73509	FTRNG3CC 18.000	1	1	180.0
73418	RD_NIXON 20.000	1	1	200.0
73435	NIXONCT1 12.500	1	1	30.0
73434	NIXONCT2 12.500	1	1	30.0
			(1=on)	

Table 6 – Generation Dispatch Assumed in the Study Transient Stability Case

GI-2007-10 System Impact Study				
Generation in Transient Stability Case				
Bus	Name	ID	Status	Pgen
70119	COMAN 1 24.000	G1	1	320.0
70120	COMAN 2 24.000	G2	1	320.0
70777	COMAN 3 24.000	1	1	750.0
70577	FTNVL1-2 13.800	G1	1	40.0
70577	FTNVL1-2 13.800	G2	1	40.0
70578	FTNVL3-4 13.800	G3	1	40.0
70578	FTNVL3-4 13.800	G4	1	40.0
70579	FTNVL5-6 13.800	G5	1	40.0
70579	FTNVL5-6 13.800	G6	1	40.0
70560	LAMAR DC 230.00	1	1	-110.0
70701	CO GRN E 34.500	1	1	8.0
70702	CO GRN W 34.500	1	1	8.0
70703	TWNBUTTE 34.500	1	1	7.5
73507	FTRNG1CC 18.000	1	1	150.0
73508	FTRNG2CC 18.000	1	1	150.0
73509	FTRNG3CC 18.000	1	1	180.0
73418	RD_NIXON 20.000	1	1	200.0
73435	NIXONCT1 12.500	1	1	30.0
73434	NIXONCT2 12.500	1	1	30.0
			(1=on)	

Appendix

B. Power Flow Contingency Results

The results of the power flow studies are summarized in Table 7 below. The facilities identified in this study report as overloaded in the contingency analysis are limited to new or significantly increased overloads and do not address all of the facilities that may have been flagged as overloaded in the contingency runs. The other facilities that may be overloaded, independent of the new 201 MW generation injection south of the Jackson Fuller substation, will be addressed through other separate Transmission Planning project proposals or by other affected utilities.

Table 7 – Summary Listing of Differentially Overloaded Facilities[3]

				Branch N-1 Loading Without GI-2007-10			Branch N-1 Loading With GI-2007-10, 201 MW			
Monitored Facility (Line or Transformer) From Bus To Bus	**Type**	**Line Owner**	**Branch Rating MVA**	**N-1 Flow in MVA**	**N-1 Flow in % of Rating**	**Total # of Violations**	**N-1 Flow in MVA**	**N-1 Flow in % of Rating**	**Total # of Violations**	**N-1 Contingency Outage From Bus To Bus**
73391 CTTNWD N 115 73410 KETTLECK 115 1	LN	CSU	125.0	140.6	112.5	1	152.7	122.1	1	73389 BRIARGT 115 73393 CTTNWD S 115 1
73477 FULLER 230 73481 FULLER 115 1	TR	CSU	100.0	92.5	92.5	0	109.5	109.5	8	73410 KETTLECK 115 73576 FLYHORSE 115 1

[3] **Newly overloaded elements, or delta overloads > 5% of rating, due to proposed 201 MW generation injection at POI.**

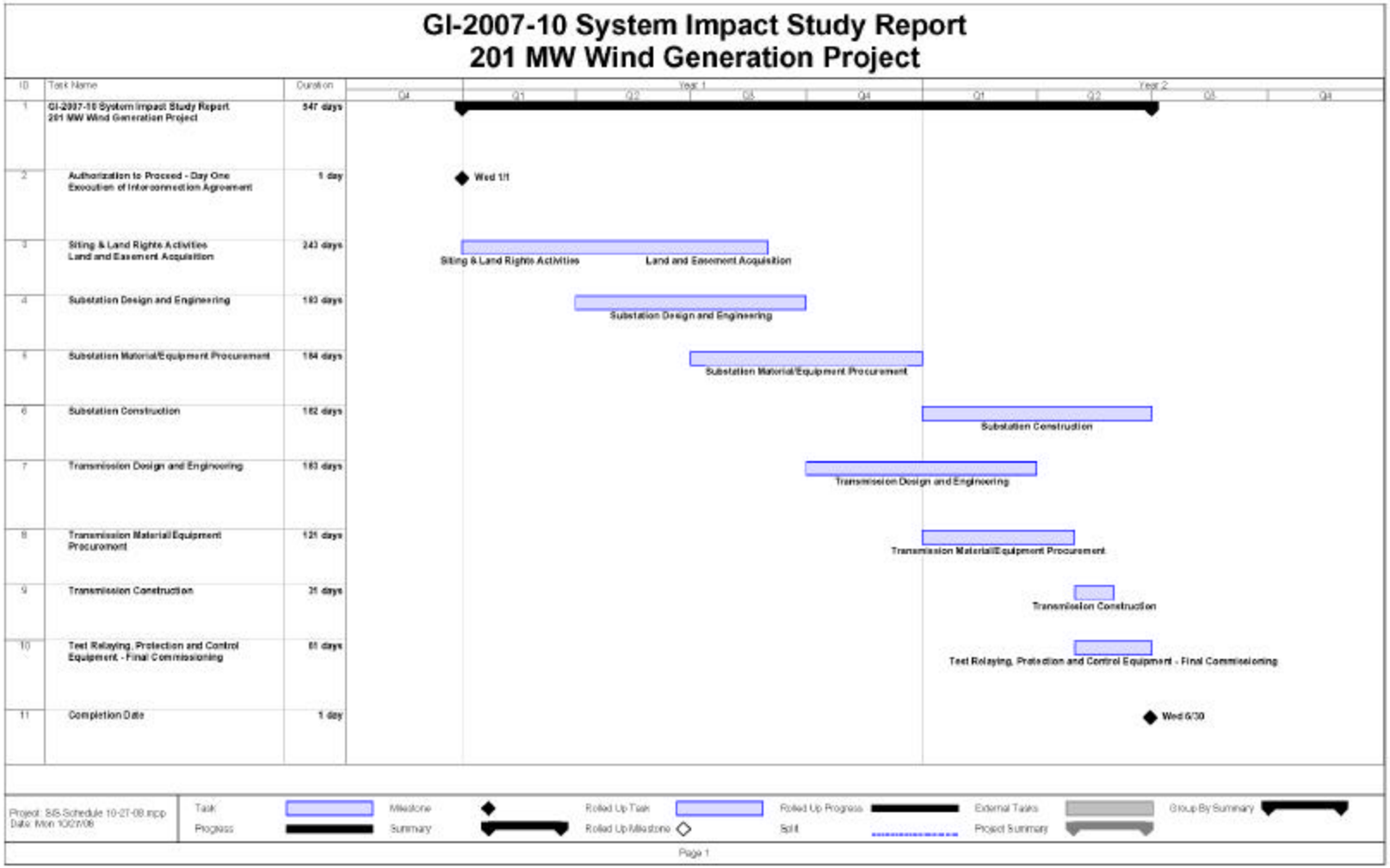
C. Transient Stability Study Faults and Results

Table 8 – Summary Listing of Transient Stability Study Contingencies and Results

Case #	Fault Type	Fault Location	Affected Facility	Additional Affected Facility	Results
100	3ph	GI-2007-10 230 kV	GI-2007-10 – Jackson Fuller 230 kV	N/A	Stable
101	3ph	GI-2007-10 230 kV	GI-2007-10 – Midway 230 kV	N/A	Stable
110	3ph	Jackson Fuller 230 kV	Jackson Fuller – GI-2007-10 230 kV	N/A	Stable
111	3ph	Jackson Fuller 230 kV	Jackson Fuller – Daniels Park 230 kV	N/A	Stable
112	3ph	Jackson Fuller 230 kV	Jackson Fuller – Cottonwood 230 kV	N/A	Stable
113	3ph	Jackson Fuller 230 kV	Jackson Fuller – RD Nixon 230 kV	N/A	Stable
114	3ph	Jackson Fuller 230 kV	Jackson Fuller 230/115 kV	N/A	Stable
120	3ph	Midway 230 kV	Midway – GI-2007-10 230 kV	N/A	Stable
121	3ph	Midway 230 kV	Midway – Boone 230 kV	N/A	Stable
122	3ph	Midway 230 kV	Midway – Comanche 230 kV #1	N/A	Stable
123	3ph	Midway 230 kV	Midway – Comanche 230 kV #2	N/A	Stable
124	3ph	Midway 230 kV	Midway – Daniels Park 230 kV	N/A	Stable
125	3ph	Midway 230 kV	Midway – Lincoln 230 kV	N/A	Stable
126	3ph	Midway 230 kV	Midway – RD Nixon 230 kV	N/A	Stable
127	3ph	Midway 230 kV	Midway – Canon West 230 kV	N/A	Stable
128	3ph	Midway 230 kV	Midway 230/115 kV #1	N/A	Stable
129	3ph	Midway 230 kV	Midway 230/115 kV #2	N/A	Stable
130	3ph	Cottonwood 230 kV	Cottonwood – Jackson Fuller 230 kV	N/A	Stable
131	3ph	Cottonwood 230 kV	Cottonwood – RD Nixon 230 kV	N/A	Stable
132	3ph	Cottonwood 230 kV	Cottonwood North 230/115 kV	N/A	Stable
133	3ph	Cottonwood 230 kV	Cottonwood South 230/115 kV	N/A	Stable
140	3ph	RD Nixon 230 kV	RD Nixon – Kelker South 230 kV	N/A	Stable
141	3ph	RD Nixon 230 kV	RD Nixon – Kelker North 230 kV	N/A	Stable
142	3ph	RD Nixon 230 kV	RD Nixon 230/115 kV	N/A	Stable
143	3ph	RD Nixon 230 kV	RD Nixon – Fuller 230 kV	N/A	Stable
144	3ph	RD Nixon 230 kV	RD Nixon – Midway 230 kV	N/A	Stable
145	3ph	RD Nixon 230 kV	RD Nixon – Cottonwood 230 kV	N/A	Stable

210	slg	Jackson Fuller 230 kV	Jackson Fuller – Cottonwood 230 kV	Jackson Fuller – RD Nixon 230 kV	Stable
211	slg	Jackson Fuller 230 kV	Jackson Fuller – Daniels Park 230 kV	Jackson Fuller – GI-2007-10 230 kV	Stable
220	slg	Midway 230 kV	Midway – Comanche 230 kV	Fountain Valley NUG	Stable
221	slg	Midway 230 kV	Midway – Daniels Park 230 kV	Midway – Comanche 230 kV	Stable
222	slg	Midway 230 kV	Midway – GI-2007-10 230 kV	MidwayPS – MidwayWAPA 230 kV	Stable
223	slg	Midway 230 kV	Midway – RD Nixon 230 kV	MidwayPS – MidwayWAPA 230 kV Midway – Lincoln 230 kV Midway – Canon West 230 kV Midway 230/115 kV #2	Stable
230	slg	Cottonwood 230 kV	Cottonwood North 230/115 kV	Cottonwood – Jackson Fuller 230 kV	Stable
231	slg	Cottonwood 230 kV	Cottonwood South 230/115 kV	Cottonwood – RD Nixon 230 kV	Stable
240	slg	RD Nixon 230 kV	RD Nixon – Kelker N 230 kV	RD Nixon Unit 1	Stable
241	slg	RD Nixon 230 kV	RD Nixon – Cottonwood 230 kV	RD Nixon 230/115 kV #1	Stable
242	slg	RD Nixon 230 kV	RD Nixon – Jackson Fuller 230 kV	RD Nixon Units 2 & 3	Stable
243	slg	RD Nixon 230 kV	RD Nixon – Midway 230 kV	Front Range Units 1-3	Stable

D. Project Schedule



E. Proposed Interconnection Station One-line