EL PASO ELECTRIC COMPANY (EPE)

GENERATOR INTERCONNECTION FEASIBILITY STUDY

FOR PROPOSED XXXXXXXX GENERATION ON THE

SIERRA BLANCA-FARMER 69 KV LINE

El Paso Electric Company
System Planning Department

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APPENDICIES

1.0 EXECUTIVE SUMMARY

On January 19, 2007, XXXXXX XXX, LLC (XXXXXX) and El Paso Electric Company (EPE) signed a study scope agreement (Appendix 1) for EPE to conduct a *Generation Interconnection Feasibility Study (GIFS)* to interconnect XXXXXX wind generation into the EPE system. The purpose of this GIFS was to determine the thermal, voltage and short circuit impacts to the EPE system due to the interconnection of a new wind generation resource proposed for May 2008. A good faith recommendation for facilities needed for the primary interconnection scenario, as well as two alternative scenarios is identified in this report along with a good faith cost estimate. Please note that this study did not analyze the impact of a non-dispatching generator on the EPE control area. That generation analysis will be part of a future System Impact Study (SIS).

As requested by XXXXXX, the proposed generation was modeled as a 29.4 MW (fourteen 2.1 MW wind turbines) wind generation site interconnected at a new substation named Airtap (primary interconnection scenario) located approximately 11 miles west of Van Horn (Farmer Substation) on the Sierra Blanca-Farmer 69 kV line. The wind turbine farm would be located approximately 15 miles north of the proposed Allamore, Texas Airtap Substation. Two alternate interconnection powerflow studies were also conducted where XXXXXX wind generation would instead interconnect at EPE's Sierra Blanca Substation or EPE's Farmer Substation. Also, a sensitivity study was included to investigate whether the Arroyo Phase Shifting Transformer (PST) would be capable of regulating the contractual south to north flow of 201 MW on the West Mesa-Arroyo 345 kV line when the Afton generator was "off". All study cases were analyzed using the criteria and methodologies described in subsequent sections of this report.

The study periods analyzed for powerflows in this study were the 2008 peak summer load and light winter load seasons as well as the 2010 peak summer load season. Please note that this study did not analyze or assume the availability of any transmission service required for the delivery of the proposed XXXXXX generation.

This Study analyzed power flows (transmission elements loading and bus voltage profiles) under all-lines-in-service and contingency conditions, Q-V reactive margin, and fault currents. The reliability criteria standards used by EPE in performing this Study are readily acceptable standards and are listed in Section 4 of EPE's FERC Form 715 (Appendix 2).

Powerflow results showed that transmission element overloading problems existed that were attributable to the two interconnection study projects ahead of the XXXXXX Interconnection in EPE's Interconnection Queue but not due to the XXXXXX Interconnection. However, what was attributable to the XXXXXX Interconnection was the lowering of the voltage profiles in the area of the interconnection. Remedies to this were the making use of existing available substation VAR resources and the addition of more VAR support at the Sierra Blanca 24.9 kV bus and the accelerating of the 2014 planned VAR support project at Felipe 69 kV Substation to the year 2008. Also, due to the XXXXXX Interconnection, the Felipe and Sierra Blanca capacitor banks required the need for local voltage controlled switching.

At the time this study was being conducted, there were two other interconnection projects ahead in this study in EPE's Interconnection Queue that were being simultaneously studied. When enough information was developed as to what system improvements these first two projects would likely be responsible for, the information was then used to identify what EPE system improvements would be needed as a result of the system impact attributable to XXXXXX. *If any of these two projects were to not go forward, a re-study of the XXXXXX Interconnection would be required at additional cost to XXXXXX.*

Three preliminary cost estimates were developed for the XXXXXX Interconnection. Costs estimates were provided by EPE and Burns & McDonnell Engineering (Appendix 3). These costs did not include costs at the wind generation site end (XXXXXX would be responsible for that cost estimate). If in the future a System Impact Study (SIS) is conducted, it will more clearly define final cost estimates.

A. The primary scenario interconnection cost estimate is $15,071,170 and includes new Airtap Substation, 15 miles of 556 ACSR transmission line, adding two 1.2 MVAR, 24.9 kV capacitor banks at Sierra Blanca Substation (with local voltage switching control), and the accelerating of the 2014 planned Felipe 69 kV Substation 7.5 MVAR capacitor bank to the year 2008 (also with local voltage switching control).
B. The Alternative #1 scenario interconnection cost estimate is $29,214,170 and includes interconnection facilities costs at Sierra Blanca Substation , 38 miles of 556 ACSR transmission line, adding two 1.2 MVAR, 24.9 kV capacitor banks at Sierra Blanca Substation (with local voltage switching control), and the accelerating of the 2014 planned Felipe 69 kV Substation 7.5 MVAR capacitor bank to the year 2008 (also with local voltage switching control).
C. The Alternative #2 scenario interconnection cost estimate is $20,154,170 and includes interconnection facilities costs at Farmer Substation , 26 miles of 556 ACSR transmission line, adding two 1.2 MVAR, 24.9 kV capacitor banks at Sierra Blanca Substation (with local voltage switching control), and the accelerating of the 2014 planned Felipe 69 kV Substation 7.5 MVAR capacitor bank to the year 2008 (also with local voltage switching control).

In recent years, equipment and material costs have fluctuated on a monthly basis. As a result, the costs given in this report are good faith cost estimates applicable only at the date of the report. These costs may change in the future depending on market forces.

2.0 INTRODUCTION

XXXXXX Energy, LLC is interested in building a 29.4 MW wind turbine farm approximately 15 miles north of Allamore, Texas by May 2008. The proposed primary interconnection into EPE's system would be at Allamore, Texas at a new substation referred to in this study as Airtap 69 kV Substation. Airtap would be located approximately 11 miles west of Van Horn (Farmer Substation) on the Sierra Blanca-Farmer 69 kV line. Two other possible interconnection points from the wind farm generation site were also evaluated. One is Sierra Blanca Substation that would be approximately up to 38 line miles from the wind generation site. The other would possibly be Farmer Substation of approximately up to 26 line miles from the wind generation site.

This feasibility study was primarily focused on 2008 and 2010 heavy summer load and 2008 light winter load powerflow base and contingency cases (transmission element loading and voltage profiles), 2008 and 2010 Q-V margin and 2008 fault analysis. Powerflow scenarios were analyzed in this study with the main emphasis on the interconnection at Airtap Substation (due to budget and time constraints). Powerflow maps can be found in Appendix 4 and Q-V plots in Appendix 5. Fault analysis was limited to the primary Airtap Substation scenario and output can be found in Appendix 6.

3.0 MODELING AND METHODOLOGY

The primary study scenario was the interconnection at Airtap Substation. Powerflow modeling consisted of tapping into the Sierra Blanca-Farmer 69 kV line with a new substation called Airtap located about 11 miles from Farmer Substation. The existing transmission line size in that area is 4/0 ACSR and a 15 mile, 4/0 ACSR transmission line was modeled from the wind farm generation site, referred to as Airstrm, to the new substation Airtap. However, in an effort to reduce losses, it is recommended that a better choice would be 556 ACSR. At Airstrm, a 29.4 MW generator was modeled at 34.5 kV whose output would feed a 10% impedance, 34.5/69 kV, 35 MVA step-up transformer.

In alternative scenario #1, Airtap Substation would not exist and the Airstrm generation output was instead routed to Sierra Blanca 69 kV Substation through a 38 mile long 4/0 ACSR transmission line. Also, at Airstrm, a 29.4 MW generator was modeled at 34.5 kV whose output would feed a 10% impedance, 34.5/69 kV, 35 MVA step-up transformer.

In alternative scenario #2, Airtap Substation would not exist and the Airstrm generation output was instead routed to Farmer 69 kV Substation through a 26 mile long 4/0 ACSR transmission line. Also, at Airstrm, a 29.4 MW generator was modeled at 34.5 kV whose output would feed a 10% impedance, 34.5/69 kV, 35 MVA step-up transformer.

At the time this study was being conducted, there were two other interconnection projects in the EPE Interconnection Queue ahead of the XXXXXX project that were also being simultaneously studied. When enough information was developed as to what system improvements these first two projects would likely be responsible for, the information was then used to identify what EPE system improvements would be needed as a result of the system impact attributable to XXXXXX. As previously mentioned, if any of these two projects were to not go forward, a re-study of the XXXXXX Interconnection would be required.

The powerflow methodology used for analysis of all scenarios included identifying transmission element overloading for all lines in service and contingency conditions as well as voltage violations as per standard reliability criteria. The Western Electric Coordinating Council (WECC) General Electric Powerflow (PSLF) Program was used for this purpose. Powerflow criteria violations were remedied by adding the necessary system improvements as shown in the results summary. For Q-V analysis, the availability of VAR support under specific contingency conditions was identified at pertinent transmission system buses as shown in the results table.

Fault analysis was conducted for the Airtap scenario in 2008 using the EPE data base and Aspen Fault program. Fault results are shown in the results summary table and in Appendix 6.

As previously mentioned, the reliability criteria standards used by EPE in performing this Study are readily acceptable standards and are listed in Section 4 of EPE's FERC Form 715 (Appendix 2). Poweflow analysis was performed using the GE PSLF program. For pre-contingency solutions, transformer tap, phase-shifting transformer angle movement and static VAR device switching was allowed. For each contingency studied, all regulating equipment (transformer controls and switched shunts) was fixed at pre-contingency positions. All buses, lines, and transformers in the El Paso control area with base voltages of 69 kV and above were monitored.

Pre-contingency flows on lines and transformers must remain at or below the normal rating of the element, and post-contingency flows on network elements must remain at or below the emergency rating. Flows above 100% of an element's rating are considered violations.

The minimum and maximum voltages are specified in FERC Form 715. Any voltage that does not meet criteria in the benchmark cases (without the proposed XXXXXX generating plant) were considered an exception to the criteria for that specific bus and did not have a penalizing effect when evaluating the XXXXXX interconnection.

3.1 Benchmark Case (no XXXXXX Interconnection)

The benchmark case included the following existing and proposed third party generation ahead of the XXXXXX Generation Interconnection in the study queue.

1. 570 MW of existing generation (Luna Energy Facility) interconnected at Luna 345 kV Substation and scheduled to WECC.
2. 141 MW of existing generation (Afton) interconnected at Afton 345 kV Substation and scheduled through EPE's Arroyo PST.
3. 160 MW of existing generation interconnected at Tri-State Generation and Transmission Association, Inc.'s (Tri-State) Hidalgo 115 kV Substation and scheduled to WECC.
4. 80 MW of existing generation interconnected at Texas-New Mexico Power Company's (TNMP) Lordsburg 115 kV Substation and scheduled to WECC.
5. 94 MW of generation (presently being constructed) interconnected at Afton 345 kV Substation and scheduled to WECC.
6. In 2008, one proposed wind generation at 200 MW (interconnected to the Amrad-Artesia 345 kV line) and another proposed wind generation at 100 MW (interconnected at the Coyote 115 kV Substation). Both studies are in EPE's Interconnection Queue ahead of the XXXXXX Study.
7. In 2010, the amount of wind generation as described in item #6 above was increased with one proposed wind generation at 350 MW (interconnected on the Amrad-Artesia 345 kV line) and another proposed wind generation at 150 MW (interconnected at the Coyote 115 kV Substation). Both studies are in EPE's Interconnection Queue ahead of the XXXXXX Study.

3.2 Generation Interconnection Scenarios

The primary generation interconnection scenario case modeled the Benchmark Case with the XXXXXX generation interconnected into the EPE system at Allamore, Texas at a new substation called Airtap located about 11 miles west of Farmer Substation (Van Horn, Texas) on the Sierra Blanca-Farmer 69 kV line. The XXXXXX (Airstrm) 29.4 MW wind generation farm is located about 15 miles north of Airtap Substation.

In alternative scenario #1, the Benchmark Case is modified to show that the Airstrm generation output is connected to Sierra Blanca 69 kV Substation (instead of Airtap Substation) through a 38 mile long, 4/0 ACSR transmission line. Also, at Airstrm, a 29.4 MW generator was modeled at 34.5 kV whose output would feed a 10% impedance, 34.5/69 kV, 35 MVA step-up transformer.

In alternative scenario #2, the Benchmark Case is modified to show that the Airstrm generation output is connected to Farmer 69 kV Substation (instead of Airtap Substation) through a 26 mile long, 4/0 ACSR transmission line. Also, at Airstrm, a 29.4 MW generator was modeled at 34.5 kV whose output would feed a 10% impedance, 34.5/69 kV, 35 MVA step-up transformer.

4.0 RESULTS

Results of the analyses in the Benchmark Case (no XXXXXX Generation Interconnection) show that some criteria violations occur. Power flow analyses revealed thermal overload violations of certain autotransformers and transmission lines. Also, in the Arroyo PST sensitivity studies the scheduled 201 MW flow of the Arroyo PST, when Afton generation is off, could not be met due to insufficient phase angle range. At the time this study was conducted, two other interconnection projects ahead of the XXXXXX Interconnection were also being studied. It was assumed in this study that the interconnection projects ahead of the XXXXXX Interconnection would be required to provide the necessary system improvements to eliminate the overloading violations and insufficient Arroyo PST phase angle range. (Powerflow maps with system improvements and with and without the XXXXXX Interconnection are shown in Appendix 4). However, with the introduction of the XXXXXX Interconnection, it was revealed that area bus voltage profiles were impacted by being lowered and corrective measures in terms of additional capacitor banks with voltage control switching were added. However, future more detailed studies may require the need of a dynamic VAR source such as a Static VAR Generator instead of switched capacitor banks to minimize switching voltage spikes.

It must be emphasized that according to EPE's Open Access Transmission Tariff document, Section 6.4 states "*If Re-Study of the Interconnection Feasibility Study is required due to a higher queued project dropping out of the queue, or a modification of a higher queued project subject to Section 4.4, or re-designation of the Point of Interconnection pursuant to Section 6.1, Transmission Provider shall notify Interconnection Customer in writing. Such Re-Study shall take not longer than forty-five (45) Calendar Days from the date of notice. Any cost of Re-Study shall be borne by the Interconnection Customer being re-studied*".

4.1 THERMAL RESULTS

XXXXXX Generation Interconnection results of thermal overloads are shown in 4.1A below. As can be seen, the XXXXXX Project in some cases contributed slightly to already overloaded elements and consequently the project itself was not charged with the system improvements necessary to correct the overloads.

4.1A Overloads Summary (Interconnection at Airtap Substation)

Year 2008 Heavy Summer Load Case - Contingency Results

Case	Overloaded Element	% of Emergency Rating	Contingency	XXXXXX Project
08plan_11g	None			No
08plan_11haa	None			Yes

Year 2008 Light Winter Load Case - Contingency Results

Case	Overloaded Element	% of Emergency Rating	Contingency	XXXXXX Project
08plan_11lwidt	None			No
08plan_11lwi3a	None			Yes

Year 2010 Heavy Summer Load Case - Contingency Results

Case	Overloaded Element *	% of Emergency Rating	Contingency	XXXXXX Project
10plan_11da	Arroyo autotransformer	101.5	Other Arroyo auto	No
10plan_11da	Lane autotransformer	100.9	Scotsdale-Vista 115 kV	No
10plan_11da	Lane autotransformer	100.9	Scotsdale auto	No
10plan_11da	Leo-Milagro 69 kV	100.7	Milagro-Newman 115 kV	No
10plan_11eaaa	Arroyo autotransformer	101.9	Other Arroyo auto	Yes
10plan_11eaaa	Leo-Milagro 69 kV	101.2	Milagro-Newman 115 kV	Yes

* None of these overloads are due to the XXXXXX Interconnection.

Cases without the XXXXXX Interconnection include 08plan_11g, 08plan_11lwidt, and 10plan_11da. Cases with the XXXXXX Interconnection include 08plan_11haa, 08plan_11lwi3a and 10plan_11eaaa.

In the alternatives studies with the XXXXXX Interconnection at Sierra Blanca Substation or Farmer Substation instead of Airtap Substation no overloaded elements were attributable to the XXXXXX Interconnection as shown below in 4.1B and 4.1C.

4.1B Overloads Summary (Alternative Scenario #1 - Interconnection at Sierra Blanca Substation)

Year 2008 Heavy Summer Load Case - Contingency Results				
Case	Overloaded Element	% of Emergency Rating	Contingency	XXXXXX Project
08plan_11g	None			No
08plan_11hopt1	None			Yes

Year 2008 Light Winter Load Case - Contingency Results				
Case	Overloaded Element	% of Emergency Rating	Contingency	XXXXXX Project
08plan_11lwidt	None			No
08plan_11lwi3aopt1	None			Yes

Cases without the XXXXXX Interconnection include 08plan_11g and 08plan_11lwidt. Cases with the XXXXXX Interconnection include 08plan_11hopt1 and 08plan_11lwi3aopt1.

4.1C Overloads Summary (Alternative Scenario #2 - Interconnection at Farmer Substation)

Year 2008 Heavy Summer Load Case - Contingency Results				
Case	Overloaded Element	% of Emergency Rating	Contingency	XXXXXX Project
08plan_11g	None			No
08plan_11hopt2	None			Yes

Year 2008 Light Winter Load Case - Contingency Results				
Case	Overloaded Element	% of Emergency Rating	Contingency	XXXXXX Project
08plan_11lwidt	None			No
08plan_11lwi3aopt2	None			Yes

Cases without the XXXXXX Interconnection include 08plan_11g and 08plan_11lwidt. Cases with the XXXXXX Interconnection include 08plan_11hopt2 and 08plan_11lwi3aopt2.

4.2 VOLTAGE RESULTS

Because of the electrical proximity of Alternative Scenario #1 (interconnection at Sierra Blanca) and Alternative Scenario #2 (interconnection at Farmer Substation) to the primary interconnection scenario at Airtap Substation, results were very similar. In the interest of speeding up the study results, Alternate Scenario Studies were not conducted for the year 2010. That is, in 2010, due to 2008 study results and using engineering judgment, no overloading of system elements attributable to the XXXXXX Interconnection were expected.

From a bus voltage perspective, however, the impact of adding the XXXXXX Interconnection to the EPE system is to lower voltage profiles in the area. Corrective action taken was to switch "on" the planned 2008 Rio Bosque 69 kV, 30 MVAR capacitor bank, add a 7.2 MVAR capacitor bank at Felipe 69 kV Substation (originally planned for 2014) and increase the Sierra Blanca single 24.9 kV, 1.2 MVAR capacitor bank to three such banks to help maintain better area voltage profiles. In instances where XXXXXX generation is interrupted, voltages will rise to unacceptable levels and voltage controlled switching off at Felipe and Sierra Blanca substations of capacitor banks as shown below in 4.2A and 4.2B will be needed. Under system disturbance conditions, EPE criteria limits bus voltage change to 7% or less and bus voltage magnitude to not less than 0.925 or more than 1.05 per unit voltage. As can be seen in the tables below, the loss of XXXXXX generation requires instantaneous switching off of the Sierra Blanca capacitor banks or both the Felipe and Sierra Blanca capacitor banks. Under light winter load conditions, the corrective action requires instantaneous switching out of the Felipe and Sierra Blanca capacitor banks to meet criteria. Whereas, under heavy summer load conditions, the corrective action requires instantaneous switching out of the Sierra Blanca capacitor banks. By doing so, bus voltage changes are minimized and bus voltages are kept within criteria. Nevertheless, additional detailed future studies may indicate a need for a dynamic VAR source such as a Static VAR Generator instead of switched capacitor banks to minimize voltage spikes. Also, the XXXXXX Interconnection area is served through EPE's Alamo 69 kV voltage regulator. This study looked briefly at the impact on this voltage regulator and resultant flows due to the XXXXXX interconnection. This interaction will need to be studied in more detail under the Interconnection System Impact Study.

4.2A

2008 Light Winter Case (lwi3a)
Interconnection at Airtap Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with SB & Felipe caps switched out *	% Voltage Change
XXXXXX 69KV	1.0338	1.1066	7.28%	1.0343	0.05%
ALAMO 69KV	1.0336	1.0803	4.67%	1.05	1.64%
FARMER 69KV	1.0175	1.1036	8.61%	1.0305	1.30%
FELIPE 69KV	1.0274	1.0531	2.57%	1.0327	0.53%
SIERRA BLANCA 69KV	1.0209	1.1076	8.67%	1.0374	1.65%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		OFF	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Felipe and Sierra Blanca.

2008 Heavy Summer Case (11haa)
Interconnection at Airtap Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with Sierra Blanca caps switched out *	% Voltage Change
XXXXXX 69KV	1.0341	1.0645	3.0%	1.0065	-2.76%
ALAMO 69KV	1.0189	1.0481	2.9%	1.032	1.31%
FARMER 69KV	1.0193	1.0626	4.3%	1.0036	-1.57%
FELIPE 69KV	1.009	1.0265	1.8%	1.0196	1.06%
SIERRA BLANCA 69KV	1.0179	1.0641	4.6%	1.0088	-0.91%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		ON	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Sierra Blanca.

2010 Heavy Summer Case (11eaaa)
Interconnection at Airtap Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with Sierra Blanca caps switched out *	% Voltage Change
XXXXXX 69KV	1.0337	1.0618	2.8%	1.0028	-3.09%
ALAMO 69KV	1.0248	1.0535	2.9%	1.0372	1.24%
FARMER 69KV	1.0172	1.0587	4.1%	0.9985	-1.87%
FELIPE 69KV	1.0161	1.0333	1.7%	1.0262	1.01%
SIERRA BLANCA 69KV	1.019	1.0639	4.5%	1.0077	-1.13%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		ON	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Sierra Blanca.

The alternative interconnection scenario studies (either Sierra Blanca or Farmer) also gave similar results to the primary interconnection at Airtap Substation. Again, from a bus voltage perspective, the impact of adding the XXXXXX Interconnection to the EPE system is to lower voltage profiles in the area. Switching “on” of existing area capacitor banks and the addition of new capacitor banks at Sierra Blanca and Felipe Substations will help maintain better voltage profiles. In instances where XXXXXX generation is interrupted, voltages will rise to unacceptable levels and voltage controlled switching off at Felipe and Sierra Blanca substations of capacitor banks as shown below in Section 4.5 will be needed.

4.2B

2008 Light Winter Case (lwi3aopt1)

Interconnection at Sierra Blanca Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with SB & Felipe caps switched out *	% Voltage Change
XXXXXX 69KV	1.0327	1.1211	8.84%	1.0498	1.71%
ALAMO 69KV	1.032	1.0831	5.11%	1.0526	2.06%
FARMER 69KV	1.0039	1.1118	10.79%	1.038	3.41%
FELIPE 69KV	1.0268	1.0544	2.76%	1.0338	0.70%
SIERRA BLANCA 69KV	1.0134	1.1173	10.39%	1.0462	3.28%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		OFF	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Felipe and Sierra Blanca.

2008 Light Winter Case (lwi3aopt2)

Interconnection at Farmer Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with SB & Felipe caps switched out *	% Voltage Change
XXXXXX 69KV	1.0278	1.1129	8.51%	1.0391	1.13%
ALAMO 69KV	1.0307	1.0817	5.10%	1.0513	2.06%
FARMER 69KV	0.9999	1.1112	11.13%	1.0375	3.76%
FELIPE 69KV	1.0265	1.0538	2.73%	1.0333	0.68%
SIERRA BLANCA 69KV	1.0055	1.1122	10.67%	1.0415	3.60%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		OFF	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Felipe and Sierra Blanca.

4.2B - Continued

2008 Heavy Summer Case (11hopt1)
Interconnection at Sierra Blanca Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with Sierra Blanca caps switched out *	% Voltage Change
XXXXXX 69KV	1.0311	1.0777	4.7%	1.0216	-0.95%
ALAMO 69KV	1.0168	1.0511	3.4%	1.0349	1.81%
FARMER 69KV	1.0003	1.0713	7.1%	1.0118	1.15%
FELIPE 69KV	1.0085	1.028	2.0%	1.0209	1.24%
SIERRA BLANCA 69KV	1.0074	1.074	6.7%	1.0181	1.07%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		ON	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Sierra Blanca.

2008 Heavy Summer Case (11hopt2)
Interconnection at Farmer Substation - Loss of XXXXXX Generation Voltage Change

	With XXXXXX Generation	Loss of XXXXXX Generation	% Voltage Change	Loss of XXXXXX Generation with Sierra Blanca caps switched out *	% Voltage Change
XXXXXX 69KV	1.0286	1.0719	4.3%	1.0124	-1.62%
ALAMO 69KV	1.0158	1.0495	3.4%	1.0334	1.76%
FARMER 69KV	1.0023	1.0702	6.8%	1.0108	0.85%
FELIPE 69KV	1.0081	1.0273	1.9%	1.0203	1.22%
SIERRA BLANCA 69KV	1.0028	1.0687	6.6%	1.0131	1.03%
FELIPE 69KV, 7.5 MVAR CAP	ON	ON		ON	
RIO BOSQUE 69KV, 30 MVAR CAP	ON	ON		ON	
SIERRA BLANCA 24.9KV, 3.6 MVAR CAP	ON	ON		OFF	

* Voltage controlled switching at Sierra Blanca.

4.3 Q-V RESULTS

The addition of the XXXXXX Interconnection required the optimizing use of existing EPE capacitor banks and the addition of new ones as previously discussed. Analyses of the 2008 and 2010 Q-V margin without and with XXXXXX generation are shown in the tables below. In general, the XXXXXX Interconnection did not adversely impact the existing EPE system Q-V margin (see Appendix 5 for Q-V plots). The negative sign means favorable Q-V margin.

4.3A- 2008 Heavy Summer Load Case Q-V Margin (MVAR)

Fabens-Felipe 69 kV Contingency		
	Without XXXXXX	With XXXXXX
Lane 115 KV	-565.6	-588.4
Vista 115 KV	-587.3	-598.1
Horizon 115 KV	-359.2	-366.9
Sparks 115 KV	-384.6	-430.4
Montwood 115 KV	-492.2	-498.6
Springerville-Luna 345 kV Contingency		
	Without XXXXXX	With XXXXXX
Hidalgo 345 KV	-1017.2	-1009.9
Luna 345 KV	-1218.6	-1217.1
Caliente 345 KV	-822.9	-831.1
Newman 345 KV	-949.0	-957.4
Arroyo 345 KV	-836.7	-841.6
Diablo 345 KV	-747.6	-754.6

4.3B- 2010 Heavy Summer Load Case Q-V Margin (MVAR)

Fabens-Felipe 69 kV Contingency		
	Without XXXXXX	With XXXXXX
Lane 115 KV	-576.8	-611.5
Vista 115 KV	-662.4	-632.8
Horizon 115 KV	-350.3	-336.5
Sparks 115 KV	-363.6	-398.3
Montwood 115 KV	-497.3	-469.2
Springerville-Luna 345 kV Contingency		
	Without XXXXXX	With XXXXXX
Hidalgo 345 KV	-926.0	-909.7
Luna 345 KV	-1216.8	-1198.0
Caliente 345 KV	-823.0	-808.1
Newman 345 KV	-1004.4	-983.1
Arroyo 345 KV	-872.5	-856.8
Diablo 345 KV	-816.6	-806.5

4.4 SHORT CIRCUIT RESULTS

Short-circuit (fault) analyses were performed with and without the XXXXXX generation interconnected into the EPE system. These consisted of substation three phase and single phase-to-ground bus fault simulations at Airtap and adjacent buses of the XXXXXX interconnection. The objective of this analysis is to determine the incremental fault current contribution from the XXXXXX interconnection and determine if the existing substation circuit breakers can safely accommodate this additional fault current without exceeding their interruption ratings. Study results showed that none of EPE's circuit breakers exceeded their fault interrupting capability in the primary XXXXXX interconnection scenario. Short circuit results are shown in Appendix 6 and are summarized below. As previously mentioned, two generation interconnectors were scheduled ahead of Airtream in the EPE Interconnection Queue and as such their short circuit representations were modeled in the study case along with the XXXXXX representation. One of the generation interconnectors did not have a detailed short circuit representation for their system in the feasibility study phase and consequently certain short circuit parameters were estimated by EPE as best as possible. If in the future this particular generation interconnector should decide to continue with the System Impact Study phase, a more accurate short circuit representation will be included and study results for the XXXXXX short circuit study may change.

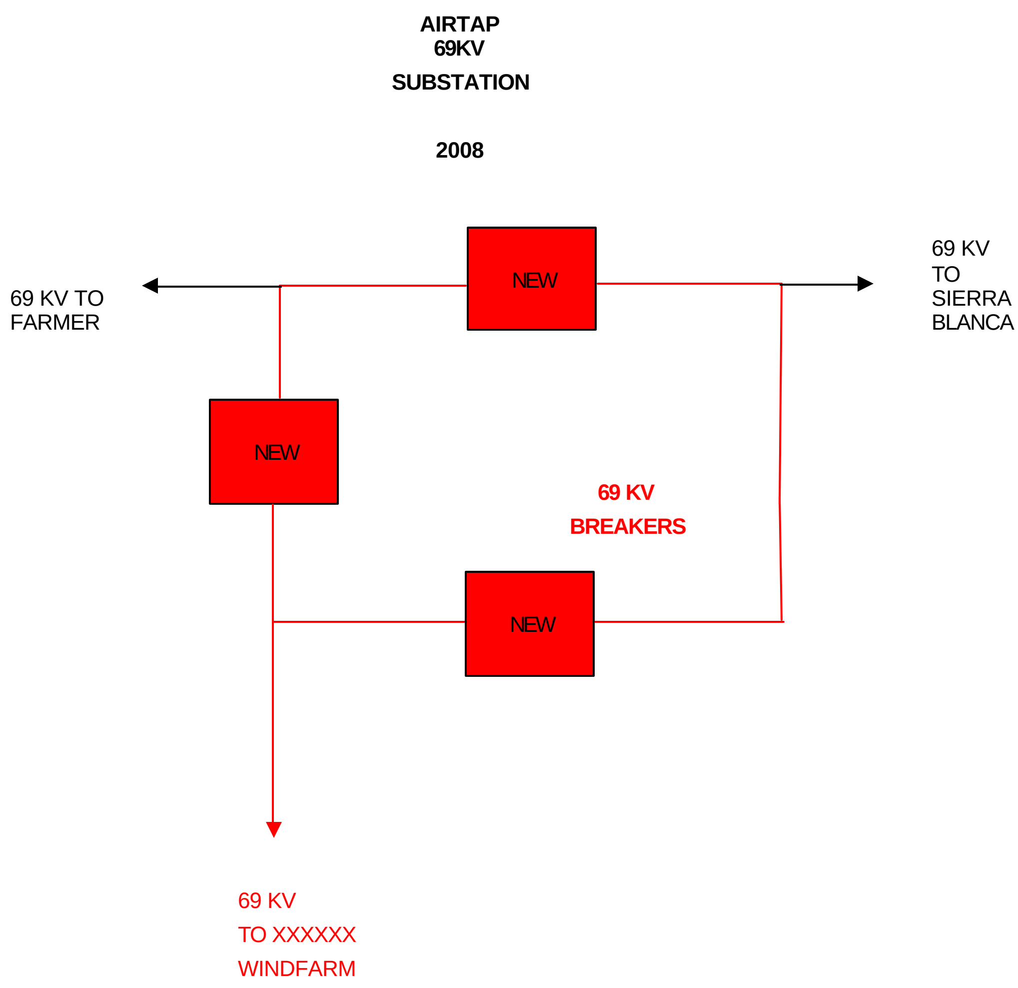
4.4A 2008 Short Circuit Currents Summary

Short Circuit Current (in Amperes) Without XXXXXX Generation			
Substation	3Ø-g	1Ø-g	Existing Breaker & Rating
Airtap 69 kV	438	283	N/A
Alamo 69 kV	1973	1322	2135B & 7301 both 40,000
Farmer 69 kV	392	254	2215B-19,000 / 2085B-31,000
Felipe 69 kV	4924	3182	0085B-31,000 / 0075B, 0095B & 9945B all 40,000
Neely 69 kV	576	374	9935B-31,000
Sierra Blanca 69 kV	581	377	N/A

Short Circuit Current (in Amperes) With XXXXXX Generation			
Substation	3Ø-g	1Ø-g	Existing Breaker & Rating
Airtap 69 kV	1192	1053	N/A
Alamo 69 kV	2327	1582	2135B & 7301 both 40,000
Farmer 69 kV	918	740	2215B-19,000 / 2085B-31,000
Felipe 69 kV	5246	3417	0085B-31,000 / 0075B, 0095B & 9945B all 40,000
Neely 69 kV	1141	856	9935B-31,000
Sierra Blanca 69 kV	1135	847	N/A

5.0 COST ESTIMATES

A one-line diagram showing the proposed configuration of the primary interconnection scenario is shown below. The other two possible interconnection scenarios include constructing a transmission line between the XXXXXX generation site and Sierra Blanca 69 kV Substation or Farmer 69 kV Substation. Also shown below is a summary of the XXXXXX Generation Interconnection Costs. Some cost estimates for the primary Airtap Substation interconnection scenario were provided by the consulting firm Burns & McDonnell (see Appendix 3). To minimize study costs to XXXXXX, some cost estimates were developed by EPE and should be regarded as rough preliminary costs estimates that are subject to change when and if this study is expanded to the System Impact Study phase where the design characteristics are better defined. Note that all possible cost estimates may not have been accounted for such as additional equipment that may show up in the design phase, access roads, sales tax, bond costs, etc.



Airtap 69 kV Substation	$3,700,000
Wind Farm to Airtap 69 kV Transmission Line (15 miles)	$11,025,000
Felipe 7.2 MVAR Capacitor Bank plus voltage controller	$176,170
Sierra Blanca Capacitors (two 24.9 kV,1200 kVAR banks plus three voltage switching controllers)	$170,000
Total	$15,071,170

Interconnection at Sierra Blanca 69 kV Substation

Sierra Blanca 69 kV Substation	$938,000
Wind Farm to Airtap 69 kV Transmission Line (38 miles)	$27,930,000
Felipe 7.2 MVAR Capacitor Bank plus voltage controller	$176,170
Sierra Blanca Capacitors (two 24.9 kV,1200 kVAR banks plus three voltage switching controllers)	$170,000
Total	$29,214,170

Interconnection at Farmer 69 kV Substation

Farmer 69 kV Substation	$698,000
Wind Farm to Airtap 69 kV Transmission Line (26 miles)	$19,110,000
Felipe 7.2 MVAR Capacitor Bank plus voltage controller	$176,170
Sierra Blanca Capacitors (two 24.9 kV,1200 kVAR banks plus three voltage switching controllers)	$170,000
Total	$20,154,170

In recent years, equipment and material costs have fluctuated on a monthly basis. As a result, the costs given in this report are good faith cost estimates applicable only at the date of the report. These costs may change in the future depending on market forces.

A more detailed breakdown of the estimated costs is given below.

Airtap Substation Cost Estimate

Engineering	$330,000
Procurement	$1,030,000
Construction Management (BMcD)	$180,000
Construction	$1,300,000
Contingency (30%)	$852,000
Total	$3,692,000

Procurement	Unit Cost	Quantity	Total
2000A 40kA 69kV CB	$50,000	3	$150,000
2000A 61kA 69kV Manual DSW	$7,500	9	$67,500
69kV Revenue Metering Unit	$10,000	9	$90,000

69kV PT	$4,000	11	$44,000
69kV Surge Arrester	$1,000	6	$6,000
Substation Bus and Fittings	$50,000	1	$50,000
Prefab Control House	$400,000	1	$400,000
Substation Structures			
Dead End Structure	$25,000	3	$75,000
Switch Structure	$2,500	9	$22,500
Bus Support Structure (3 Phase)	$2,000	20	$40,000
Revenue Metering Support (3 phase)	$2,000	9	$18,000
PT Support (3 phase)	$2,000	5	$10,000
80 ft. lightning mast	$12,000	1	$12,000
Land Acquisition	$15,000	3	$45,000
Total Procurement			$1,030,000

Construction	Unit Cost	Quantity	Total
Site Preparation	$250,000	1	$250,000
Grounding system with material	$150,000	1	$150,000
Conduit system with materials	$100,000	1	$100,000
Distribution conduit system	$500,000	0	
Foundations	$300,000	1	$300,000
Steel Erection	$150,000	1	$150,000
Equipment Installation	$200,000	1	$200,000
Testing and Commission	$150,000	1	$150,000
Total Construction			$1,300,000

Airtap Transmission Single Circuit 69kV Line Estimate

	Common Values for all routes	Route 1 Option A Delta
Line Length (ft)		79200
Line Length (miles)		15.00
Total # of Structures		226
# of Structures/mile		15.09
Average Span (ft)		350
# of Deadend Structures		10
# of Tangent Structures		216
Cost of Tangent Installed		$22,000
Cost of Deadend Installed		$70,000
Tangent Structure Cost		$4,759,000
Deadend Structure Cost		$700,000
Total Structure Cost		$5,459,000

Removal Costs

Conductor - Single 556 "Dove" ACSR		
Cost per foot installed of conductor	$5.25	
Static Wire - 3/8" EHS Static		
Cost per foot installed of static	$3.25	
Conductor Costs		$1,310,000
Static Wire Costs		$271,000
Total Wire Costs		$1,581,000
Total Labor and Material (rounded)		$7,040,000
Engineering Costs**	10%	$704,000
** to include geotech and survey		
ROW COSTS		
Cost Per Acre	$15,000	
Acreage Required (based on 40' ROW)		72.73
ROW Acquisition		$1,091,000
ROW Restoration, erosion, etc.		$300,000
ROW Costs (rounded)		$1,391,000
Mobilization and misc costs		$50,000
Subtotal		$9,185,000
Contingency Costs	20%	$1,837,000
Total Cost (**rounded**)		$11,030,000
Per Mile Cost		$735,333

6.0 DISCLAIMER

This study assumes that transmission service has not been obtained by XXXXXX to deliver its generation output. Therefore, this Study modeled the XXXXXX power output as being distributed evenly across the entire WECC electrical grid. Whenever XXXXXX determines where it will deliver its generation output to, XXXXXX will have to purchase the required transmission service from the appropriate entity and a Transmission Service Study performed. This study makes no warranties as to the existence or availability of any transmission service XXXXXX will need in order to deliver its generation output. Also, the transfer capacities of certain transmission lines and paths within the southern New Mexico transmission system are limited by contracts between the New Mexico transmission owners and any use of the transfer capacities above the contractual limits will require approval by the contractual parties and renegotiation of the applicable contract(s).

If any of the project data used in this study and provided by XXXXXX varies significantly from the actual data once the XXXXXX equipment is installed, the results from this study will need to be verified with the actual data at the Project developer's expense.

This study assumes certain generators exist in the EPE Interconnection Queue under specific system configurations. Should any of these generators make a change to their project (output level of proposed units or project not materializing) before the proposed project is interconnected, the results of this Study will have to be re-evaluated. Likewise, any major change in the EPE or southern New Mexico systems will also require a re-evaluation of this Study.

7.0 CERTIFICATION

El Paso Electric Company (EPE) has performed this Generation Interconnection Feasibility Study for XXXXXX XXXXXX, LLC (XXXXXX) pursuant to XXXXXX's letter requesting to interconnect its XXXXXX Wind Project to EPE's control area, dated January 2, 2007. The Study determined the impacts to the EPE system due to the interconnection of the XXXXXX generation in the 2008 and 2010 time period. The study recommends system upgrades required to correct impacts due to the addition of the proposed XXXXXX generation and estimated costs for installing those required system upgrades. The powerflow data used to model the XXXXXX generation was supplied by XXXXXX. EPE performed power flow, Q-V reactive margin, and Short-Circuit analyses in this study.

Name: Dennis Malone

Title: Manager, System Planning

Signature: ____________________________

Date: ____________________________

Investigating Engineer: Joaquin Aguilar