



SPP

*Southwest
Power Pool*

***Impact Study
Addendum
For
Generation Interconnection
Request
GEN-2005-013***

SPP Tariff Studies

(#GEN-2005-013)

May 2010

Executive Summary

<OMITTED TEXT> (Customer) has requested an Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of approximately 199.80 MW of wind generation within the control area of Westar Energy in Latham County, Kansas. The facility studied with Vestes V-90 1.8MW wind generators. The interconnection request was previously studied with GE wind generators.

The initial study was conducted by Excel Engineering. The stability study shows that the change in wind turbine technology creates a need for increased reactive power capability requirement for the generation facility. The impact study has identified the need for the wind farm to be able to provide 95% lagging power factor (supplying vars) at the point of interconnection. For the Vestes wind turbines, this will require the addition of multiple banks of capacitors. It is estimated that 110 Mvar of capacitors will be needed on the 34.5kv buses of the wind farm to meet the power factor requirement. The interconnection customer shall size the capacitors in multiple banks to avoid voltage variations on the 345kV bus. With the addition of the capacitors, the transmission system was found to be stable.

The Customer then requested a separate power factor analysis to be performed with the assumption that GEN-2004-010 and GEN-2005-016 do not come out of suspension and are withdrawn from the interconnection queue. In addition, SPP consulted with Westar concerning the capacitor banks and LTC transformers in the Rose Hill and Benton substations. The decision was made to perform the new power factor study with the taps locked on the autotransformers and that the capacitors do not switch on at these substations. The new power factor results show that the wind farm is required to provide 98% lagging (supplying) power factor at the point of interconnection and 96% leading (absorbing) power factor at the point of interconnection.

The interconnection agreement for this facility will need to be amended to reflect this change in technology.

Nothing in this study should be construed as a guarantee of transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service shall be requested on Southwest Power Pool's OASIS by the Customer.

GEN-2005-013 Power Factor Analysis without GEN-2004-010 and GEN-2005-016

SEASON	POI	Mvars at POI	Power Factor	CONTINGENCY
14SP	198.5	-53.51	96.39	leading (absorbing) 'G05-13T 345.00 - LATHAMS7 345.00 345KV CKT 1'
14WP	198.5	-46.28	97.29	leading (absorbing) 'G05-13T 345.00 - LATHAMS7 345.00 345KV CKT 1'
14SP	198.5	36.80	98.29	lag (supplying) 'G05-13T 345.00 - NEOSHO 345KV CKT 1'
14SP	198.5	-33.92	98.54	leading (absorbing) 'ROSE HILL - WOLF CREEK 345KV CKT 1'
14WP	198.5	-31.28	98.76	leading (absorbing) 'G05-13T 345.00 - NEOSHO 345KV CKT 1'
14SP	198.5	-29.37	98.91	leading (absorbing) 'BENTON - WOLF CREEK 345KV CKT 1'
14WP	198.5	-29.08	98.93	leading (absorbing) 'ROSE HILL - WOLF CREEK 345KV CKT 1'
14WP	198.5	-27.49	99.04	leading (absorbing) 'BENTON - WOLF CREEK 345KV CKT 1'
14SP	198.5	26.89	99.08	lag (supplying) 'LATHAMS7 345.00 - ROSE HILL 345KV CKT 1'
14SP	198.5	-24.65	99.23	leading (absorbing) 'GEN547502 1-ELK RIVER WIND PROJECT - MAIN BUS #1'
14SP	198.5	-24.65	99.23	leading (absorbing) 'GEN547503 1-ELK RIVER WIND PROJECT - MAIN BUS #2'
14WP	198.5	23.23	99.32	lag (supplying) 'GEN547502 1-ELK RIVER WIND PROJECT - MAIN BUS #1'
14WP	198.5	23.23	99.32	lag (supplying) 'GEN547503 1-ELK RIVER WIND PROJECT - MAIN BUS #2'
14SP	198.5	20.18	99.48	lag (supplying) 'BEECH - BEECH TAP 138KV CKT 1'
14WP	198.5	19.78	99.50	lag (supplying) 'LATHAMS7 345.00 - ROSE HILL 345KV CKT 1'
14WP	198.5	19.70	99.51	lag (supplying) 'GEN542956 2-LACYGNE UNIT #2'
14WP	198.5	-19.15	99.54	leading (absorbing) 'BENTON - WICHITA 345KV CKT 1'
14WP	198.5	-17.51	99.61	leading (absorbing) 'BEECH - BEECH TAP 138KV CKT 1'
14WP	198.5	-17.46	99.61	leading (absorbing) 'BENTON - ROSE HILL 345KV CKT 1'
14SP	198.5	-16.80	99.64	leading (absorbing) 'BENTON - ROSE HILL 345KV CKT 1'
14WP	198.5	-16.68	99.65	leading (absorbing) 'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
14WP	198.5	-16.61	99.65	leading (absorbing) 'NEOSHO 1 13KV SWITCHED SHUNT'
14SP	198.5	16.38	99.66	lag (supplying) 'GEN514806 1-SOONER UNIT 2'
14SP	198.5	-16.37	99.66	leading (absorbing) 'BAKER - LITCHFIELD 161KV CKT 1'
14WP	198.5	-16.25	99.67	leading (absorbing) 'GEN542955 1-LACYGNE UNIT #1'
14WP	198.5	-16.13	99.67	leading (absorbing) 'GEN560203 1-G08-127 0.6900'
14SP	198.5	15.63	99.69	lag (supplying) 'GILL ENERGY CENTER WEST - WACO 138KV CKT 1'
14WP	198.5	-14.78	99.72	leading (absorbing) 'ALTOONA - TIOGA 138KV CKT 1'
14WP	198.5	-14.46	99.73	leading (absorbing) 'BENTON 1 13KV SWITCHED SHUNT'
14WP	198.5	14.26	99.74	lag (supplying) 'GEN542962 2-IATAN UNIT #2'
14WP	198.5	-14.08	99.75	leading (absorbing) 'NEOSHO 1 13KV SWITCHED SHUNT'
14WP	198.5	-14.06	99.75	leading (absorbing) 'ROSE HILL - STEARMAN 138KV CKT 1'
14SP	198.5	-12.69	99.80	leading (absorbing) 'BASE CASE'
14WP	198.5	-11.12	99.84	leading (absorbing) 'BASE CASE'
14SP	198.5	-9.74	99.88	leading (absorbing) 'COFFEYVILLE SUB - DEARING 69KV CKT 1'
14SP	198.5	9.72	99.88	lag (supplying) 'EL PASO - SIXTY-FOURTH (64TH) 138KV CKT 1'
14SP	198.5	9.61	99.88	lag (supplying) '29TH 4 138.00 - NORTHEAST 138KV CKT 1'
14SP	198.5	-9.60	99.88	leading (absorbing) 'GILL ENERGY CENTER WEST - HAYSVILLE JUNCTION 69KV CKT 1'
14SP	198.5	-9.41	99.89	leading (absorbing) 'GEN549890 1-SOUTHWEST 1'
14SP	198.5	-9.25	99.89	leading (absorbing) 'EAST MANHATTAN - JEFFREY ENERGY CENTER 230KV CKT 1'
14SP	198.5	-9.20	99.89	leading (absorbing) 'GEN533561 1-CITY OF WINFIELD'
14SP	198.5	-9.17	99.89	leading (absorbing) 'ATHENS SWITCHING STATION - COFFEY COUNTY NO. 4 VERNON 69KV CKT 1'
14SP	198.5	9.15	99.89	lag (supplying) 'GEN547649 1-ASBURY UNIT #1'
14SP	198.5	9.13	99.89	lag (supplying) 'GEN532725 1-EVANS ENERGY CENTER GAS TURBINE 3'
14SP	198.5	9.12	99.89	lag (supplying) 'GEN532721 1-EVANS ENERGY CENTER UNIT 1'
14SP	198.5	9.08	99.90	lag (supplying) 'BELAIRE4 138.00 - COMOTARA 138KV CKT 1'
14SP	198.5	-9.08	99.90	leading (absorbing) '29TH 4 138.00 - BENTON 138KV CKT 1'
14SP	198.5	-9.08	99.90	leading (absorbing) 'COFFEY COUNTY NO. 4 VERNON - GREEN 69KV CKT 1'
14SP	198.5	9.01	99.90	lag (supplying) 'BELAIRE4 138.00 - BENTON 138KV CKT 1'
14SP	198.5	8.96	99.90	lag (supplying) 'BOEING - CANAL 138KV CKT 1'
14SP	198.5	8.94	99.90	lag (supplying) 'CANAL - FOWLER 138KV CKT 1'
14SP	198.5	8.88	99.90	lag (supplying) 'GEN549893 2-SOUTHWEST 2'
14SP	198.5	8.88	99.90	lag (supplying) 'CIRCLE - HUTCHINSON ENERGY CENTER UNIT 4 115KV CKT 1'
14SP	198.5	-8.77	99.90	leading (absorbing) 'CENTENNIAL - WACO 138KV CKT 1'
14SP	198.5	8.77	99.90	lag (supplying) 'GEN532732 1-GILL ENERGY CENTER UNIT 2'
14SP	198.5	-8.73	99.90	leading (absorbing) 'COFFEY COUNTY NO. 3 WESTPHALIA - GREEN 69KV CKT 1'
14SP	198.5	-8.65	99.91	leading (absorbing) 'BURLINGTON JUNCTION - COFFEY COUNTY NO. 3 WESTPHALIA 69KV CKT 1'
14SP	198.5	8.62	99.91	lag (supplying) 'G07-25 345.00 - G07-25T 345.00 345KV CKT 1'
14SP	198.5	8.48	99.91	lag (supplying) 'BURLINGTON JUNCTION - WOLF CREEK 69KV CKT 1'
14SP	198.5	-8.34	99.91	leading (absorbing) 'EVANS ENERGY CENTER NORTH - MAIZE 4 138.00 138KV CKT 1'
14SP	198.5	8.31	99.91	lag (supplying) 'CRESWELL 138KV SWITCHED SHUNT'
14WP	198.5	-8.17	99.92	leading (absorbing) 'FOWLER - SEVENTEENTH 138KV CKT 1'
14WP	198.5	-8.16	99.92	leading (absorbing) 'CENTENNIAL - WACO 138KV CKT 1'
14WP	198.5	-8.14	99.92	leading (absorbing) 'COFFEYVILLE SUB - CRA 69KV CKT 1'
14WP	198.5	-8.06	99.92	leading (absorbing) 'COFFEYVILLE SUB - DEARING 69KV CKT 1'
14WP	198.5	8.00	99.92	lag (supplying) 'GEN549893 2-SOUTHWEST 2'
14WP	198.5	-7.93	99.92	leading (absorbing) 'GEN509394 1-FLINT CREEK'
14WP	198.5	-7.69	99.92	leading (absorbing) 'RENO COUNTY - WICHITA 345KV CKT 1'
14WP	198.5	7.64	99.93	lag (supplying) 'GEN547649 1-ASBURY UNIT #1'
14SP	198.5	-7.48	99.93	leading (absorbing) 'FOWLER - SEVENTEENTH 138KV CKT 1'
14WP	198.5	-7.34	99.93	leading (absorbing) 'BOEING - CANAL 138KV CKT 1'
14SP	198.5	-7.34	99.93	leading (absorbing) 'GILL ENERGY CENTER SOUTH - GILL ENERGY CENTER WEST 138KV CKT 1'
14SP	198.5	-7.34	99.93	leading (absorbing) 'COFFEYVILLE FARMLAND 138KV SWITCHED SHUNT'
14WP	198.5	-7.24	99.93	leading (absorbing) 'EAST MANHATTAN - JEFFREY ENERGY CENTER 230KV CKT 1'
14WP	198.5	-7.08	99.94	leading (absorbing) 'CENTENNIAL - COWSKIN 138KV CKT 1'
14SP	198.5	-7.06	99.94	leading (absorbing) 'RENO COUNTY - SUMMIT 345KV CKT 1'

14SP	198.5	-6.97	99.94	leading (absorbing) 'CHISHOLM - MAIZE 4 138.00 138KV CKT 1'
14SP	198.5	-6.94	99.94	leading (absorbing) 'NEOSHO - NORTHEAST PARSONS 138KV CKT 1'
14SP	198.5	-6.93	99.94	leading (absorbing) 'NORTHEAST 69KV SWITCHED SHUNT'
14WP	198.5	-6.92	99.94	leading (absorbing) 'JEFFERY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1'
14SP	198.5	-6.88	99.94	leading (absorbing) 'CENTENNIAL - COWSKIN 138KV CKT 1'
14WP	198.5	6.82	99.94	lag (supplying) 'G07-25 345.00 - G07-25T 345.00 345KV CKT 1'
14SP	198.5	-6.79	99.94	leading (absorbing) 'MIDIAN 69KV SWITCHED SHUNT'
14SP	198.5	-6.54	99.95	leading (absorbing) 'RENO COUNTY - WICHITA 345KV CKT 1'
14WP	198.5	-6.26	99.95	leading (absorbing) 'ATHENS SWITCHING STATION - COFFEY COUNTY NO. 4 VERNON 69KV CKT 1'
14SP	198.5	-6.24	99.95	leading (absorbing) 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
14WP	198.5	-6.12	99.95	leading (absorbing) 'CHISHOLM - SEVENTEENTH 138KV CKT 1'
14SP	198.5	-6.11	99.95	leading (absorbing) 'BENTON - MIDIAN 138KV CKT 1'
14WP	198.5	-6.10	99.95	leading (absorbing) 'COFFEY COUNTY NO. 4 VERNON - GREEN 69KV CKT 1'
14WP	198.5	-5.92	99.96	leading (absorbing) 'RENO COUNTY - SUMMIT 345KV CKT 1'
14WP	198.5	-5.84	99.96	leading (absorbing) 'COFFEY COUNTY NO. 3 WESTPHALIA - GREEN 69KV CKT 1'
14WP	198.5	-5.78	99.96	leading (absorbing) 'NORTHEAST PARSONS 138KV SWITCHED SHUNT'
14WP	198.5	-5.77	99.96	leading (absorbing) 'BURLINGTON JUNCTION - COFFEY COUNTY NO. 3 WESTPHALIA 69KV CKT 1'
14SP	198.5	-5.77	99.96	leading (absorbing) 'GEN532734 1-GILL ENERGY CENTER UNIT 4'
14WP	198.5	-5.75	99.96	leading (absorbing) 'BURLINGTON JUNCTION - WOLF CREEK 69KV CKT 1'
14SP	198.5	-5.57	99.96	leading (absorbing) 'NORTHEAST PARSONS 138KV SWITCHED SHUNT'
14WP	198.5	-5.56	99.96	leading (absorbing) 'COFFEYVILLE FARMLAND 138KV SWITCHED SHUNT'
14WP	198.5	-5.54	99.96	leading (absorbing) 'NEOSHO - NORTHEAST PARSONS 138KV CKT 1'
14SP	198.5	-5.52	99.96	leading (absorbing) '59TH ST - EL PASO 138KV CKT 1'
14SP	198.5	-5.46	99.96	leading (absorbing) 'CHISHOLM - SEVENTEENTH 138KV CKT 1'
14SP	198.5	5.39	99.96	lag (supplying) 'GEN532733 1-GILL ENERGY CENTER UNIT 3'
14WP	198.5	-5.32	99.96	leading (absorbing) 'G08-127 345.00 - ROSE HILL 345KV CKT 1'
14SP	198.5	-4.79	99.97	leading (absorbing) 'JEFFERY ENERGY CENTER - SUMMIT 345KV CKT 1'
14SP	198.5	-4.54	99.97	leading (absorbing) 'G07-25T 345.00 - WICHITA 345KV CKT 1'
14WP	198.5	-4.51	99.97	leading (absorbing) 'G07-25T 345.00 - WICHITA 345KV CKT 1'
14SP	198.5	-4.25	99.98	leading (absorbing) '59TH ST - GILL ENERGY CENTER SOUTH 138KV CKT 1'
14WP	198.5	-3.99	99.98	leading (absorbing) 'EMPORIA ENERGY CENTER - WICHITA 345KV CKT 1'
14SP	198.5	-3.46	99.98	leading (absorbing) 'EMPORIA ENERGY CENTER - WICHITA 345KV CKT 1'
14WP	198.5	-3.12	99.99	leading (absorbing) 'COWSKIN - EVANS ENERGY CENTER SOUTH 138KV CKT 1'
14WP	198.5	-3.11	99.99	leading (absorbing) 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
14WP	198.5	-2.98	99.99	leading (absorbing) 'JEFFERY ENERGY CENTER - SUMMIT 345KV CKT 1'
14SP	198.5	-2.57	99.99	leading (absorbing) 'G08-127 345.00 - ROSE HILL 345KV CKT 1'
14SP	198.5	2.24	99.99	lag (supplying) 'GEN532722 1-EVANS ENERGY CENTER UNIT 2'
14SP	198.5	2.23	99.99	lag (supplying) 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
14SP	198.5	-1.82	100.00	leading (absorbing) 'GEN560120 1-G05-13T 345.00'
14WP	198.5	-1.24	100.00	leading (absorbing) 'CHISHOLM - MAIZE 4 138.00 138KV CKT 1'
14WP	198.5	-1.06	100.00	leading (absorbing) 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'