



SPP *Southwest Power Pool*

***System Impact Study SPP-2002-169
For Transmission Service
Requested By
Power Resource Group, Inc***

***From AEPW To Entergy for 620 MW
From 6/1/03 To 6/1/13
With Redirect of ERCOTE to EES Confirmed Service***

SPP Transmission Planning

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1. Introduction

Power Resource Group, Inc. has requested an impact study for transmission service from AEPW to EES. The transfer is for the amount of 620 MW from 6/1/2003 to 6/1/2013. The previously confirmed service from ERCOTE to EES results in a decrease in ATC on some facilities identified for the AEPW to EES transfer. Redirecting this service may provide for additional ATC on these assigned facilities. The redirect of this previously confirmed service is evaluated to determine the change in response factors on the assigned facilities between the ERCOTE to EES transfer and the AEPW to EES transfer.

System Impact Study SPP-2000-108 was performed to identify any facility limitations for the 620 MW from 6/1/2003 to 6/1/2006. System Impact Study SPP-2002-046 supplemented the original study to evaluate extending the service to a period of 6/1/2003 to 6/1/2013.

The previously completed studies identify several facility limitations which must be upgraded in order to accommodate the 620 MW of service from AEPW to EES. Many options have been evaluated in an attempt to provide this service at the lowest cost available to the customer.

The objective of this study is to evaluate the impact of redirecting the previously confirmed service from ERCOTE to EES to provide for additional ATC on those facilities which have been identified as limitations for the 620 MW AEPW to EES request.

The ERCOTE to EES transfer has been previously confirmed for a period of 1/1/2001 to 1/1/2006. This study determines any potential cost savings provided for redirecting the ERCOTE to EES transfer from 6/1/2003 to 1/1/2006. In the event the ERCOTE to EES service is renewed beyond the current end date of 1/1/2006, this study also determines any potential cost savings provided for redirecting the ERCOTE to EES transfer from 6/1/2003 to 6/1/2013.

2. Results

Tables 1, 2 and 3 contain the ATC results and facility upgrades required for granting a service period equal to the period of the redirect, 6/1/2003 to 1/1/2006. Table 1 gives the ATC and cost analysis determined for a redirect of 150 MW from ERCOTE to EES. Table 2 gives the ATC and cost analysis determined for a redirect of 300 MW from ERCOTE to EES. Table 3 gives a summary of the total cost of facility upgrades required at 150 MW and 300 MW of redirect for incremental levels of ATC.

Tables 4, 5 and 6 contain the ATC results and facility upgrades required for granting a service period equal to the requested extended period of 6/1/2003 to 6/1/2013. Table 4 gives the ATC and cost analysis determined for a redirect of 150 MW from ERCOTE to EES. Table 5 gives the ATC and cost analysis determined for a redirect of 300 MW from ERCOTE to EES. Table 6 gives a summary of the total cost of facility upgrades required at 150 MW and 300 MW of redirect for incremental levels of ATC.

Table 7 documents the potential cost savings that may be created by canceling any upgrades that were previously assigned to the ERCOTE to EES request.

A description of the tables documenting the results is given below.

Study Year – The seasonal case in which the worst instance of this overload was recorded.

ATC (MW) With Linn County Addition – The ATC is provided for each facility in the seasonal case identified as determined with the addition of the Linn County transformer. The initial ATC is given with the addition of the Linn County transformer due to the need to relieve the La Cygne to Stilwell limitation to achieve the desired levels of ATC.

SPP Transmission Solution – The solution given is for each facility identified as a limitation for the 620 MW transfer as given in the facility study.

Cost Without Uplifts – The cost is the estimated cost given from the transmission owner for the upgrade identified.

ERCOTE to EES Response – The response of the ERCOTE to EES transfer on those facilities identified for the 620 MW AEPW to EES study. The response given was determined using primarily a DC analysis of the system.

Kiowa to EES Response – The response of the Kiowa to EES transfer on those facilities identified for the 620 MW AEPW to EES study. The response given was determined using primarily a DC analysis of the system.

Kiowa to EES ATC Available for Redirect of ERCOTE to EES Transfer – The ATC listed is the amount of “credit” given on that facility if the specified amount of ERCOTE to EES service is redirected.

Total ATC – The ATC listed is the total amount of ATC that can be given on that facility including the “credit” received for the ERCOTE to EES redirect and the ATC previously granted to the 620 MW transfer.

Cost of Upgrades at 620 MW of ATC – The total cost of upgrades required to grant 620MW of service at the specified level of ERCOTE to EES redirect.

Table 1 - Upgrades Required for 620 MW ATC With 150 MW ERCOTE to EES Redirect from 6/1/2003 to 1/1/2006

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 620MW of ATC	Cost of Upgrades at 620MW ATC
03FA	543	Atlas-Carthage 69 kV rebuild of 8 miles - Due to Linn County	\$ 5,200,000	0.01503	0.01239	182	725	No	\$ -
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	65	65	Yes	\$ 6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	65	685	Yes	\$ 6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-44	0	Yes	\$ 450,000
04SP	670	Hoyt HTI Switching JCT To Circleville 115KV: Replace 82 structures to increase line rating to 100 degree C conductor rating of 97 MVA by WR.	\$ 742,000	0.00173	0.00399	65	735	No	\$ -
06SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kv 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	51	51	Yes	\$ 3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	Yes	\$ 2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 32 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	62	267	Yes	\$ 1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	67	395	Yes	\$ 20,000
04SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-504	0	Yes	\$ 1,565,000
04SP	0	Gill Energy Center East To Macarthur 69KV: Replace sub bus and jumpers at MacArthur	\$ 22,000	0.00017	0.00041	62	62	Yes	\$ 22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR EDE.	\$ 1,230,000	0.00114	0.002155	79	360	Yes	\$ 1,230,000
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	111	589	Yes	\$ 60,000
04SP	670	TATUM TO ROCKHILL. 138KV: Reset CTs @ Rock Hill by CSWS.	\$ 2,000	0.04269	0.01965	326	996	No	\$ -
06SP	0	Cherokee REC - Knox Lee 138kv: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	326	326	Yes	\$ 981,000
06SP	10	Replace jumpers @ Greenland 69 kv bus	\$ 20,000	0.00181	0.00511	53	63	Yes	\$ 20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	70	151	Yes	\$ 150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	60	196	Yes	\$ 60,000
06SP	215	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-23	192	Yes	\$ 75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	70	256	Yes	\$ 250,000
06SP	226	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	312	538	Yes	\$ 60,000
06SP	226	Lieberman - IPC Jefferson 138kv: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	312	538	Yes	\$ 7,172,000
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	44	274	Yes	\$ 4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	45	317	Yes	\$ 2,000
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	63	351	Yes	\$ 500,000
06SP	398	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	44	442	Yes	\$ 2,100,000
06SP	404	Cherokee REC - Tatum 138kv: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	326	730	No	\$ -
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kv (use 800 A.), Replace line switch at Oatville 69 kv (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	63	269	Yes	\$ 45,000
06SP	543	Winnsboro To Scrogns 69KV: Replace switches, 350 CU jumpers, & reset relays @ Winnsboro by CSWS.	\$ 80,000	0.00092	0.00054	256	799	No	\$ -
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	2	559	Yes	\$ 55,000
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-51	508	Yes	\$ 100,000
06SP	571	Rock Hill - Tatum 138kv: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	326	897	No	\$ -
06SP	574	Tahlequah To Highway 59 161KV: Remove switches #130 and #132 to increase rating from 600A to conductor limit of 662 Amps for Rate B and replace structures by OKGE.	\$ 30,000	0.01813	0.04716	58	632	No	\$ -
04SP	391	*Norfolk 161/69KV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	75	466	Yes	\$ 1,000,000
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	60	60	Yes	\$ 1,600,000
06SP	155	*Larussel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	65	220	Yes	\$ 60,000

Total Cost of Facility Upgrades Required

\$ 36,072,500

*Cost for Accelerated In-Service Date

¹ AC Response Value Used

Table 2 - Upgrades Required for 620 MW ATC With 300 MW ERCOTE to EES Redirect from 6/1/2003 to 1/1/2006

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 620MW of ATC	Cost of Upgrades at 620MW ATC
03FA	543	Atlas-Carthage 69 kV rebuild of 8 miles - Due to Linn County	\$ 5,200,000	0.01503	0.01239	364	907	No	\$ -
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	130	130	Yes	\$ 6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	130	750	Yes	\$ 6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-89	0	Yes	\$ 450,000
04SP	670	Hoyt HTI Switching JCT To Circleville 115KV: Replace 82 structures to increase line rating to 100 degree C conductor rating of 97 MVA by WR.	\$ 742,000	0.00173	0.00399	130	800	No	\$ -
06SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	103	103	Yes	\$ 3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	Yes	\$ 2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 32 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	124	329	Yes	\$ 1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	134	462	Yes	\$ 20,000
04SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-1007	0	Yes	\$ 1,565,000
04SP	0	Gill Energy Center East To MacArthur 69KV: Replace sub bus and jumpers at MacArthur	\$ 22,000	0.00017	0.00041	124	124	Yes	\$ 22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR EDE.	\$ 1,230,000	0.00114	0.002155	159	440	Yes	\$ 1,230,000
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	222	700	No	\$ -
04SP	670	TATUM TO ROCKHILL. 138KV: Reset CTs @ Rock Hill by CSWS.	\$ 2,000	0.04269	0.01965	652	1322	No	\$ -
06SP	0	Cherokee REC - Knox Lee 138kV: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	652	652	No	\$ -
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	106	116	Yes	\$ 20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	140	221	Yes	\$ 150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	121	257	Yes	\$ 60,000
06SP	215	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-45	170	Yes	\$ 75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	140	326	Yes	\$ 250,000
06SP	226	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	624	850	No	\$ -
06SP	226	Lieberman - IPC Jefferson 138kV: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	624	850	No	\$ -
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	89	319	Yes	\$ 4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	89	361	Yes	\$ 2,000
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	127	415	Yes	\$ 500,000
06SP	398	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	88	486	Yes	\$ 2,100,000
06SP	404	Cherokee REC - Tatum 138kV: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	652	1056	No	\$ -
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	127	333	Yes	\$ 45,000
06SP	543	Winnsboro To Scrogns 69KV: Replace switches, 350 CU jumpers, & reset relays @ Winnsboro by CSWS.	\$ 80,000	0.00092	0.00054	511	1054	No	\$ -
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	3	560	Yes	\$ 55,000
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-103	456	Yes	\$ 100,000
06SP	571	Rock Hill - Tatum 138kV: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	652	1223	No	\$ -
06SP	574	Tahlequah To Highway 59 161KV: Remove switches #130 and #132 to increase rating from 600A to conductor limit of 662 Amps for Rate B and replace structures by OKGE.	\$ 30,000	0.01813	0.04716	115	689	No	\$ -
04SP	391	*Norfolk 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	150	541	Yes	\$ 1,000,000
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	120	120	Yes	\$ 1,600,000
06SP	155	*Larussel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	129	284	Yes	\$ 60,000
Total Cost of Facility Upgrades Required									\$ 25,139,500

*Cost for Accelerated In-Service Date

¹ AC Response Value Used

Table 3 - Cost of Facility Upgrades Required for Various ATC Amounts with 150 MW and 300 MW of Redirect from 6/1/2003 to 1/1/2006

Amount of ATC Provided	*Cost of Facility Upgrades Required for 150MW Redirect	Minimum Base Rate Required for Redirect/ATC Provided ¹	Amount of ATC Provided	*Cost of Facility Upgrades Required for 300MW Redirect	Minimum Base Rate Required for Redirect/ATC Provided ¹
200	\$ 13,895,000	\$ 4,140,000	200	\$ 13,685,000	\$ 6,210,000
300	\$ 20,132,500	\$ 6,210,000	300	\$ 13,955,000	\$ 6,210,000
400	\$ 22,865,500	\$ 8,280,000	400	\$ 20,134,500	\$ 8,280,000
500	\$ 25,965,500	\$ 10,350,000	500	\$ 24,084,500	\$ 10,350,000
620	\$ 33,412,500	\$ 12,834,000	620	\$ 25,139,500	\$ 12,834,000

*The estimated cost excludes consideration of any facilities assigned to the ERCOTE to EES transfer, as well as any cost that may be assigned for the redispatch of Wolf Creek for the construction of the Linn County substation

¹ The customer is responsible for paying the higher of the cost of facility upgrades or the base rate of transmission service provided. If the amount of service redirected is greater than the amount of service provided, the customer is responsible for paying the higher of the cost of facility upgrades or the base rate of transmission service redirected.

Table 4 – Upgrades Required for 620 MW ATC With 150 MW ERCOTE to EES Redirect from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost Without Uplifts	ERCOTE TO EES Response	KIOWA TO EES Response	Kiowa to Entergy ATC Available for Redirect of ERCOTE to EES Transfer	Total ATC with Linn County Substation	Cost of Upgrades at 620MW ATC
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	65	65	\$ 6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	65	685	\$ 6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-44	0	\$ 450,000
08SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	51	51	\$ 3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	\$ 2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 32 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	62	267	\$ 1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	67	395	\$ 20,000
08SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-504	0	\$ 1,565,000
08SP	0	Gill Energy Center East To Macarthur 69KV: Replace sub bus and jumpers at MacArthur 69 kV by WR.	\$ 22,000	0.00017	0.00041	62	62	\$ 22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR by EDE.	\$ 1,230,000	0.00114	0.002155	79	360	\$ 1,230,000
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	111	589	\$ 60,000
06SP	0	Cherokee REC - Knox Lee 138kV: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	326	326	\$ 981,000
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	53	63	\$ 20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	70	151	\$ 150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	60	196	\$ 60,000
08SP	0	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-23	0	\$ 75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	70	256	\$ 250,000
08SP	0	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	312	312	\$ 60,000
08SP	0	Lieberman - IPC Jefferson 138kV: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	312	312	\$ 7,172,000
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	44	274	\$ 4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	45	317	\$ 2,000
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	63	351	\$ 500,000
08SP	0	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	44	44	\$ 2,100,000
08SP	0	Cherokee REC - Tatum 138kV: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	326	326	\$ 1,641,000
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	63	269	\$ 45,000

Table 4 – Continued – Upgrades Required for 620 MW ATC With 150 MW ERCOTE to EES Redirect from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost Without Uplifts	ERCOTE TO EES Response	KIOWA TO EES Response	Kiowa to Entergy ATC Available for Redirect of ERCOTE to EES Transfer	Total ATC with Linn County Substation	Cost of Upgrades at 620MW ATC
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	2	559	\$ 55,000
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-51	508	\$ 100,000
08SP	103	Rock Hill - Tatum 138kV: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	326	429	\$ 342,970
08SP	0	Pecan Creek to Muskogee 345 - Pecan Creek CT's	\$ 2,500	0.02246	0.06605	51	51	\$ 2,500
08SP	0	Reset Relays at Jacksonville & Overton	\$ 15,000	0.03779	0.02181	260	260	\$ 15,000
08SP	0	412Sub- Kansas Tp	\$ 1,488,000	0.00766	0.01681	68	68	\$ 1,488,000
08SP	0	Kerr- 412sub 161	\$ 1,918,000	0.00766	0.01681	68	68	\$ 1,918,000
08SP	9	Replace Springfield 161/69 kV auto	\$ 1,300,000	0.00035	0.00077	68	77	\$ 1,300,000
08SP	136	Marshall to North Marshall - Replace bus & jumpers at N. Marshall	\$ 23,356	0.00499	0.00158	474	610	\$ 23,356
08SP	248	Rebuild 4.3 miles of Broken Arrow N - Oneta 138 kV line	\$ 2,370,500	0.00883	0.02295	58	306	\$ 2,370,500
08SP	265	Rebuild 5.3 miles of Raines - Arsenal Hill 138 kV line	\$ 3,731,000	0.0267	0.01541	260	525	\$ 3,731,000
08SP	279	Replace Clay to Logan 161 kV structures	\$ 250,000	0.02132	0.04885	65	344	\$ 250,000
08SP	283	Reconstruct part of Orango Jct-Joplin-Oakland North 161 kV line	\$ 800,000	0.00438	0.01037	63	346	\$ 800,000
08SP	320	Oak Pan - Harr Rec to Longwood 161	\$ 750,000	0.0354	0.02051	259	579	\$ 750,000
08SP	367	Ferndale Lake Tap to Pittsburg - Reset Pittsburg 69 kV CT's	\$ 10,000	0.00018	0.00035	77	444	\$ 10,000
08SP	372	Chamber Springs 345/161 auto #2	\$ 4,000,000	0.02215	0.05416	61	433	\$ 4,000,000
08SP	380	Lake Elmdale - Chamber Springs Rd. 161 kV: Rebuild 15 miles with 1590 ACSR by AEP	\$ 6,000,000	0.00532	0.01319	61	441	\$ 6,000,000
08SP	445	Reconductor 9.4 miles of TitanTP - Tahlequah 161 kV line	\$ 1,551,000	0.00046	0.00154	45	490	\$ 1,551,000
08SP	448	Clay to Springfield - Replace disconnect switches @ Springfield	\$ 200,000	0.00799	0.01828	66	514	\$ 200,000
08SP	503	Reinmilller 161/69 kV auto replacement	\$ 1,730,000	0.00012	0.002903	6	509	\$ 1,730,000
08SP	503	VBI to Van Buren Switches, relaying, etc	\$ 2,100,000	0.02461	0.05776	64	567	\$ 2,100,000
08SP	537	Rebuild 0.6 miles of Bonanza Tp - Bonanza 161 kV line	\$ 50,000	0.00035	0.00317	17	554	\$ 50,000
08WP	360	Hugo Tap to Valiant - Replace wavetrap @ Valliant	\$ 30,000	0.00014	0.03099	1	361	\$ 30,000
04SP	391	*Norfolk 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	75	466	\$ 1,000,000
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	60	60	\$ 1,600,000
06SP	155	*Larusel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	65	220	\$ 60,000
08SP	0	*Payne Switch Station - Expedite construction of new facility with 70MVA auto (replaces upgrade needed for cyril to anadarko)	\$ 1,800,000	-0.00061 ¹	0.000196 ¹	-467	0	\$ 1,800,000
08SP	0	*Lindsay to Lindsay SW - Expedite replacing conductor in 8.0 miles from 1/0 to 556 ACSR, TS-1 to TH-10 - ²	\$ 1,648,000	-0.00104	-0.00029	N/A	0	\$ 1,648,000
08SP	474	Hallsview-Longview Hgts rebuild 7.1 miles ²	\$ 3,000,000	-0.00374	-0.00143	N/A	474	\$ 3,000,000
Total Cost of Facility Upgrades Required			80,338,826					70,163,826

* Cost for Accelerated In-Service Date

¹ AC Response Value Used

² Required due to upgrades included in models assigned to SPP-2002-046 Impact Study

Table 5 – Upgrades Required for 620 MW ATC With 300 MW ERCOTE to EES Redirect from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost Without Uplifts	ERCOTE TO EES Response	KIOWA TO EES Response	Kiowa to Entergy ATC Available for Redirect of ERCOTE to EES Transfer	Total ATC with Linn County Substation	Cost of Upgrades at 620MW ATC
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	130	130	\$ 6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	130	750	\$ 6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-89	0	\$ 450,000
08SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	103	103	\$ 3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	\$ 2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 32 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	124	329	\$ 1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	134	462	\$ 20,000
08SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-1007	0	\$ 1,565,000
08SP	0	Gill Energy Center East To Macarthur 69KV: Replace sub bus and jumpers at MacArthur 69 kV by WR.	\$ 22,000	0.00017	0.00041	124	124	\$ 22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR by EDE.	\$ 1,230,000	0.00114	0.002155	159	440	\$ 1,230,000
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	106	116	\$ 20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	140	221	\$ 150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	121	257	\$ 60,000
08SP	0	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-45	0	\$ 75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	140	326	\$ 250,000
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	89	319	\$ 4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	89	361	\$ 2,000
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	127	415	\$ 500,000
08SP	0	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	88	88	\$ 2,100,000
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	127	333	\$ 45,000
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	3	560	\$ 55,000
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-103	456	\$ 100,000
08SP	0	Pecan Creek to Muskogee 345 - Pecan Creek CT's	\$ 2,500	0.02246	0.06605	102	102	\$ 2,500

Table 5 – Continued – Upgrades Required for 620 MW ATC With 300 MW ERCOTE to EES Redirect from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost Without Uplifts	ERCOTE TO EES Response	KIOWA TO EES Response	Kiowa to Entergy ATC Available for Redirect of ERCOTE to EES Transfer	Total ATC with Linn County Substation	Cost of Upgrades at 620MW ATC
08SP	0	Reset Relays at Jacksonville & Overton	\$ 15,000	0.03779	0.02181	520	520	\$ 15,000
08SP	0	412Sub- Kansas Tp	\$ 1,488,000	0.00766	0.01681	137	137	\$ 1,488,000
08SP	0	Kerr- 412sub 161	\$ 1,918,000	0.00766	0.01681	137	137	\$ 1,918,000
08SP	9	Replace Springfield 161/69 kV auto	\$ 1,300,000	0.00035	0.00077	136	145	\$ 1,300,000
08SP	248	Rebuild 4.3 miles of Broken Arrow N - Oneta 138 kV line	\$ 2,370,500	0.00883	0.02295	115	363	\$ 2,370,500
08SP	279	Replace Clay to Logan 161 kV structures	\$ 250,000	0.02132	0.04885	131	410	\$ 250,000
08SP	283	Reconstruct part of Orango Jct-Joplin-Oakland North 161 kV line	\$ 800,000	0.00438	0.01037	127	410	\$ 800,000
08SP	367	Ferndale Lake Tap to Pittsburg - Reset Pittsburg 69 kV CT's	\$ 10,000	0.00018	0.00035	154	521	\$ 10,000
08SP	372	Chamber Springs 345/161 auto #2	\$ 4,000,000	0.02215	0.05416	123	495	\$ 4,000,000
08SP	380	Lake Elmdale - Chamber Springs Rd. 161 kV: Rebuild 15 miles with 1590 ACSR by AEP	\$ 6,000,000	0.00532	0.01319	121	501	\$ 6,000,000
08SP	445	Reconductor 9.4 miles of TitanTP - Tahlequah 161 kV line	\$ 1,551,000	0.00046	0.00154	90	535	\$ 1,551,000
08SP	448	Clay to Springfield - Replace disconnect switches @ Springfield	\$ 200,000	0.00799	0.01828	131	579	\$ 200,000
08SP	503	Reinmiller 161/69 kV auto replacement	\$ 1,730,000	0.00012	0.002903	12	515	\$ 1,730,000
08SP	537	Rebuild 0.6 miles of Bonanza Tp - Bonanza 161 kV line	\$ 50,000	0.00035	0.00317	33	570	\$ 50,000
08WP	360	Hugo Tap to Valiant - Replace wavetrap @ Valliant	\$ 30,000	0.00014	0.03099	1	361	\$ 30,000
04SP	391	*Norfolk 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	150	541	\$ 1,000,000
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	120	120	\$ 1,600,000
06SP	155	*Larussel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	129	284	\$ 60,000
08SP	0	*Payne Switch Station - Expedite construction of new facility with 70MVA auto (replaces upgrade needed for cyril to anadarko)	\$ 1,800,000	-0.00061 ¹	0.000196 ¹	-934	0	\$ 1,800,000
08SP	0	*Lindsay to Lindsay SW - Expedite replacing conductor in 8.0 miles from 1/0 to 556 ACSR, TS-1 to TH-10 - ²	\$ 1,648,000	-0.00104	-0.00029	N/A	0	\$ 1,648,000
08SP	474	Hallsview-Longview Hgts rebuild 7.1 miles ²	\$ 3,000,000	-0.00374	-0.00143	N/A	474	\$ 3,000,000
Total Cost of Facility Upgrades Required			80,338,826					53,302,500

* Cost for Accelerated In-Service Date

¹ AC Response Value Used

² Required due to upgrades included in models assigned to SPP-2002-046 Impact Study

Table 6 - Cost of Facility Upgrades Required for Various ATC Amounts with 150 MW and 300 MW of Redirect from 6/1/2003 to 6/1/2013

Amount of ATC Provided	*Cost of Facility Upgrades Required for 150MW Redirect	Minimum Base Rate Required for Redirect/ATC Provided ¹
200	\$ 24,151,500	\$ 16,560,000
300	\$ 30,404,000	\$ 24,840,000
400	\$ 45,460,500	\$ 33,120,000
500	\$ 61,364,470	\$ 41,400,000
620	\$ 70,163,826	\$ 51,336,000

Amount of ATC Provided	*Cost of Facility Upgrades Required for 300MW Redirect	Minimum Base Rate Required for Redirect/ATC Provided ¹
200	\$ 23,941,500	\$ 24,840,000
300	\$ 24,211,500	\$ 24,840,000
400	\$ 32,791,500	\$ 33,120,000
500	\$ 42,691,500	\$ 41,400,000
620	\$ 53,302,500	\$ 51,336,000

*The estimated cost excludes consideration of any facilities assigned to the ERCOTE to EES transfer, as well as any cost that may be assigned for the redispatch of Wolf Creek for the construction of the Linn County substation

¹ The customer is responsible for paying the higher of the cost of facility upgrades or the base rate of transmission service provided. If the amount of service redirected is greater than the amount of service provided, the customer is responsible for paying the higher of the cost of facility upgrades or the base rate of transmission service redirected.

Table 7 – Potential Cost Savings Created by Canceling Upgrades Previously Required for the ERCOTE to EES Transfer

Season Identified	ERCOTE to EES ATC	SPP Transmission Solution	2005 SP		2008 SP		Comments	KIOWA to EES ATC Provided With 150 MW Redirect	KIOWA to EES ATC Provided With 300 MW Redirect
			ERCOTE to EES Response	KIOWA TO EES Response	ERCOTE to EES Response	KIOWA TO EES Response			
01AP	418	Jacksonville to Pine Grove 138KV - Reset 300/5 CTs at Jacksonville to 400/5	0.0300	0.0516	0.0495	0.0288	Upgrade Already Completed No Potential Cost Saving	N/A	N/A
01SR	594	Patterson to Ashdown REC 115kV - Patterson Switch Replacement, 600A To 1200A	0.0178	0.0328	-0.0030	0.0021	Upgrade Already Completed No Potential Cost Saving	N/A	N/A
01SP	315	Arsenal Hill to Waterworks 69KV - Replace Three sets of Switches	0.0003	0.0002	0.0002	0.0003	Upgrade Already Completed No Potential Cost Saving	N/A	N/A
01SP	248	Gentry REC to East Centerton 161 KV - E.Centerton 161kV Breaker & Switch Replacements & Gentry Tap 161kV Line Switch Replacement	0.0108	0.0048	0.0021	0.0049	Upgrade Already Completed No Potential Cost Saving	N/A	N/A
04SP	530	Longwood to Oak Pan-Harr REC, 138KV - Replace 500 CU jumpers @ Longwood	0.0213	0.0369	0.0354	0.0205	Upgrade Already Completed No Potential Cost Saving	N/A	N/A
04WP	340	NW Texarkana to Alumax Tap 138KV - Replace Switches Alumax Tap	0.0229	0.0238	0.0144	0.0188	Potential Cost Saving \$30,000	374	488
01SP	558	Tipton Ford to Monett 161KV - Reconductor 30 miles of 336 ACSR with 795 ACSR	0.0134	0.0058	0.0055	0.0131	Upgrade In Progress To Be Completed Before 6/1/2003 No Potential Cost Saving	N/A	N/A

3. Conclusion

This study was performed in order to give an initial overview of any substantial benefit that may be provided through redirecting the previously confirmed ERCOTE to EES transfer. The results document the response factors of both the ERCOTE to EES and AEPW to EES transfers on each of the facilities assigned to the 620 MW transfer. The difference in response factors is used to determine if any additional ATC is provided through redirecting the previously confirmed service.

In order to provide more thorough and accurate results, a comprehensive system impact study and facility study must be completed. To determine the final results, the redirect must be requested on OASIS and the queue position should be established. The system impact study will then be performed to identify any new facility upgrades that may be required due to the new position in the queue. The impact study will also determine if redirecting the ERCOTE to EES transfer reduces the ATC on additional facilities that were not previously identified due to the decrease in loading on that facility caused by the ERCOTE to EES transfer. The final costs associated with the redirect of the ERCOTE to EES service and the resulting facility upgrades required will be determined through the completion of a facility study.

Appendix A

Table 8 – Detailed List of Upgrades Required With 150 MW Redirect for 200 MW and 300 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 200MW of ATC	Cost of Upgrades at 200MW ATC	Upgrades Needed for 300MW of ATC	Cost of Upgrades at 300MW ATC
03FA	543	Atlas-Carthage 69 kV rebuild of 8 miles - Due to Linn County	\$ 5,200,000	0.01503	0.01239	182	725	No	0	No	0
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	65	65	Yes	6,000	Yes	6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	65	685	Yes	6,945,000	Yes	6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-44	0	Yes	450,000	Yes	450,000
04SP	670	Hoyt HTI Switching JCT To Circleville 115KV: Replace 82 structures to increase line rating to 100 degree C conductor rating of 97 MVA by WR.	\$ 742,000	0.00173	0.00399	65	735	No	0	No	0
08SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	51	51	Yes	3,000,000	Yes	3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	Yes	2,000	Yes	2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 3/2 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	62	267	No	0	Yes	1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	67	395	No	0	No	0
08SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-504	0	Yes	1,565,000	Yes	1,565,000
08SP	0	Gill Energy Center East To Macarthur 69KV: Replace sub bus and jumpers at MacArthur 69 kV by WR.	\$ 22,000	0.00017	0.00041	62	62	Yes	22,000	Yes	22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR by EDE.	\$ 1,230,000	0.00114	0.002155	79	360	No	0	No	0
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	111	589	No	0	No	0
04SP	670	TATUM TO ROCKHILL, 138KV: Reset CTs @ Rock Hill by CSWS.	\$ 2,000	0.04269	0.01965	326	996	No	0	No	0
06SP	0	Cherokee REC - Knox Lee 138KV: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	326	326	No	0	No	0
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	53	63	Yes	20,000	Yes	20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	70	151	Yes	150,000	Yes	150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	60	196	Yes	60,000	Yes	60,000
08SP	0	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-23	0	Yes	75,000	Yes	75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	70	256	No	0	Yes	250,000
08SP	0	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	312	312	No	0	No	0
08SP	0	Lieberman - IPC Jefferson 138kv: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	312	312	No	0	No	0
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	44	274	No	0	Yes	4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	45	317	No	0	No	0
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	63	351	No	0	No	0
08SP	0	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	44	44	Yes	2,100,000	Yes	2,100,000
08SP	0	Cherokee REC - Tatum 138KV: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	326	326	No	0	No	0
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	63	269	No	0	Yes	45,000
06SP	543	Winnsboro To Scrogns 69KV: Replace switches, 350 CU jumpers, & reset relays @ Winnsboro by CSWS.	\$ 80,000	0.00092	0.00054	256	799	No	0	No	0
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	2	559	No	0	No	0
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-51	508	No	0	No	0
08SP	103	Rock Hill - Tatum 138kv: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	326	429	No	0	No	0

Table 8 – Continued – Detailed List of Upgrades Required With 150 MW Redirect for 200 MW and 300 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 200MW of ATC	Cost of Upgrades at 200MW ATC	Upgrades Needed for 300MW of ATC	Cost of Upgrades at 300MW ATC
06SP	574	Tahlequah To Highway 59 161KV: Remove switches #130 and #132 to increase rating from 600A to conductor limit of 662 Amps for Rate B and replace structures by OKGE.	\$ 30,000	0.01813	0.04716	58	632	No	0	No	0
08SP	0	Pecan Creek to Muskogee 345 - Pecan Creek CT's	\$ 2,500	0.02246	0.06605	51	51	Yes	2,500	Yes	2,500
08SP	0	Reset Relays at Jacksonville & Overton	\$ 15,000	0.03779	0.02181	260	260	No	0	Yes	15,000
08SP	0	412Sub- Kansas Tp	\$ 1,488,000	0.00766	0.01681	68	68	Yes	1,488,000	Yes	1,488,000
08SP	0	Kerr- 412sub 161	\$ 1,918,000	0.00766	0.01681	68	68	Yes	1,918,000	Yes	1,918,000
08SP	9	Replace Springfield 161/69 kV auto	\$ 1,300,000	0.00035	0.00077	68	77	Yes	1,300,000	Yes	1,300,000
08SP	136	Marshall to North Marshall - Replace bus & jumpers at N. Marshall	\$ 23,356	0.00499	0.00158	474	610	No	0	No	0
08SP	137	Pittsburg to Lone Star South - Reset CT @ Pittsburg 138 kV	\$ 10,000	0.00274	0.00053	775	912	No	0	No	0
08SP	248	Rebuild 4.3 miles of Broken Arrow N - Oneta 138 kV line	\$ 2,370,500	0.00883	0.02295	58	306	No	0	No	0
08SP	265	Rebuild 5.3 miles of Raines - Arsenal Hill 138 kV line	\$ 3,731,000	0.0267	0.01541	260	525	No	0	No	0
08SP	279	Replace Clay to Logan 161 kV structures	\$ 250,000	0.02132	0.04885	65	344	No	0	No	0
08SP	283	Reconstruct part of Orango Jct-Joplin-Oakland North 161 kV line	\$ 800,000	0.00438	0.01037	63	346	No	0	No	0
08SP	320	Oak Pan - Harr Rec to Longwood 161	\$ 750,000	0.0354	0.02051	259	579	No	0	No	0
08SP	367	Ferndale Lake Tap to Pittsburg - Reset Pittsburg 69 kV CT's	\$ 10,000	0.00018	0.00035	77	444	No	0	No	0
08SP	372	Chamber Springs 345/161 auto #2	\$ 4,000,000	0.02215	0.05416	61	433	No	0	No	0
08SP	380	Lake Elmdale - Chamber Springs Rd. 161 kV: Rebuild 15 miles with 1590 ACSB by AEP	\$ 6,000,000	0.00532	0.01319	61	441	No	0	No	0
08SP	384	Oak Hill to Knox Lee 138kV - Wavetrap @ Knoxlee	\$ 20,000	0.00692	0.00382	272	656	No	0	No	0
08SP	423	Longwood-Noram 138 reconductor	\$ 1,577,000	0.0267	0.01541	260	683	No	0	No	0
08SP	445	Reconductor 9.4 miles of TitanTP - Tahlequah 161 kV line	\$ 1,551,000	0.00046	0.00154	45	490	No	0	No	0
08SP	447	Reset relays @ IPC Jefferson 138	\$ 5,000	0.04641	0.02232	312	759	No	0	No	0
08SP	447	Reconductor 0.7 miles of Jeff-Lieb 138 kV line	\$ 174,000	0.04641	0.02232	312	759	No	0	No	0
08SP	448	Clay to Springfield - Replace disconnect switches @ Springfield	\$ 200,000	0.00799	0.01828	66	514	No	0	No	0
08SP	503	Reinmiller 161/69 kV auto replacement	\$ 1,730,000	0.00012	0.002903	6	509	No	0	No	0
08SP	503	VBI to Van Buren Switches, relaying, etc	\$ 2,100,000	0.02461	0.05776	64	567	No	0	No	0
08SP	537	Rebuild 0.6 miles of Bonanza Tp - Bonanza 161 kV line	\$ 50,000	0.00035	0.00317	17	554	No	0	No	0
08SP	570	Osage-Cont. Blocks 69 kV, rebuild 0.6 miles	\$ 255,000	0.0034	0.0081	63	633	No	0	No	0
08SP	577	Rebuild 5.6 miles of Noram-Raines 138 kV line	\$ 2,000,000	0.0267	0.01541	260	837	No	0	No	0
08SP	608	Muskogee to Gore - Replace Wavetrap & CT ratio at Gore 161 kV	\$ 30,000	0.01158	0.03969	44	652	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	372	655	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	372	655	No	0	No	0
08WP	360	Hugo Tap to Valiant - Replace wavetrap @ Valliant	\$ 30,000	0.00014	0.03099	1	361	No	0	No	0
04SP	391	*Norfork 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	75	466	No	0	No	0
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSB	\$ 1,600,000	0.00331	0.0083	60	60	Yes	1,600,000	Yes	1,600,000
06SP	155	*Larusel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	65	220	No	0	Yes	60,000
08SP	0	*Payne Switch Station - Expedite construction of new facility with 70MVA auto (replaces upgrade needed for Cyril to Anadarko)	\$ 1,800,000	-0.00061 ¹	0.000196 ¹	-467	0	Yes	1,800,000	Yes	1,800,000
08SP	0	*Lindsay to Lindsay SW - Expedite replacing conductor in 8.0 miles from 1/0 to 556 ACSB, TS-1 to TH-10 ⁻²	\$ 1,648,000	-0.00104	-0.00029	N/A	0	Yes	1,648,000	Yes	1,648,000
08SP	474	Hallsview-Longview Hgts rebuild 7.1 miles ²	\$ 3,000,000	-0.00374	-0.00143	N/A	474	No	0	No	0
Total Cost of Facility Upgrades Required			\$80,338,826						\$24,151,500		\$30,404,000

* Cost for Accelerated In-Service Date

¹ AC Response Value Used

² Required due to upgrades included in models assigned to SPP-2002-046 Impact Study

Table 9 – Detailed List of Upgrades Required With 150 MW Redirect for 400 MW and 620 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 400MW of ATC	Cost of Upgrades at 400MW ATC	Upgrades Needed for 620MW of ATC	Cost of Upgrades at 620MW ATC
03FA	543	Atlas-Carthage 69 kV rebuild of 8 miles - Due to Linn County	\$ 5,200,000	0.01503	0.01239	182	725	No	0	No	0
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	65	65	Yes	6,000	Yes	6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	65	685	Yes	6,945,000	Yes	6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-44	0	Yes	450,000	Yes	450,000
04SP	670	Hoyt HTI Switching JCT To Circleville 115KV: Replace 82 structures to increase line rating to 100 degree C conductor rating of 97 MVA by WR.	\$ 742,000	0.00173	0.00399	65	735	No	0	No	0
08SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	51	51	Yes	3,000,000	Yes	3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	Yes	2,000	Yes	2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 3/2 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	62	267	Yes	1,882,500	Yes	1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	67	395	Yes	20,000	Yes	20,000
08SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-504	0	Yes	1,565,000	Yes	1,565,000
08SP	0	Gill Energy Center East To Macarthur 69KV: Replace sub bus and jumpers at MacArthur 69 kV by WR.	\$ 22,000	0.00017	0.00041	62	62	Yes	22,000	Yes	22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR by EDE.	\$ 1,230,000	0.00114	0.002155	79	360	Yes	1,230,000	Yes	1,230,000
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	111	589	No	0	Yes	60,000
04SP	670	TATUM TO ROCKHILL, 138KV: Reset CTs @ Rock Hill by CSWS.	\$ 2,000	0.04269	0.01965	326	996	No	0	No	0
06SP	0	Cherokee REC - Knox Lee 138KV: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	326	326	Yes	981,000	Yes	981,000
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	53	63	Yes	20,000	Yes	20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	70	151	Yes	150,000	Yes	150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	60	196	Yes	60,000	Yes	60,000
08SP	0	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-23	0	Yes	75,000	Yes	75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	70	256	Yes	250,000	Yes	250,000
08SP	0	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	312	312	Yes	60,000	Yes	60,000
08SP	0	Lieberman - IPC Jefferson 138kv: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	312	312	Yes	7,172,000	Yes	7,172,000
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	44	274	Yes	4,000,000	Yes	4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	45	317	Yes	2,000	Yes	2,000
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	63	351	Yes	500,000	Yes	500,000
08SP	0	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	44	44	Yes	2,100,000	Yes	2,100,000
08SP	0	Cherokee REC - Tatum 138KV: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	326	326	Yes	1,641,000	Yes	1,641,000
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	63	269	Yes	45,000	Yes	45,000
06SP	543	Winnsboro To Scrogns 69KV: Replace switches, 350 CU jumpers, & reset relays @ Winnsboro by CSWS.	\$ 80,000	0.00092	0.00054	256	799	No	0	No	0
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	2	559	No	0	Yes	55,000
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-51	508	No	0	Yes	100,000
08SP	103	Rock Hill - Tatum 138KV: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	326	429	No	0	Yes	342,970

Table 9 - Continued – Detailed List of Upgrades Required With 150 MW Redirect for 400 MW and 620 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 400MW of ATC	Cost of Upgrades at 400MW ATC	Upgrades Needed for 620MW of ATC	Cost of Upgrades at 620MW ATC
06SP	574	Tahlequah To Highway 59 161KV: Remove switches #130 and #132 to increase rating from 600A to conductor limit of 662 Amps for Rate B and replace structures by OKGE.	\$ 30,000	0.01813	0.04716	58	632	No	0	No	0
08SP	0	Pecan Creek to Muskogee 345 - Pecan Creek CT's	\$ 2,500	0.02246	0.06605	51	51	Yes	2,500	Yes	2,500
08SP	0	Reset Relays at Jacksonville & Overton	\$ 15,000	0.03779	0.02181	260	260	Yes	15,000	Yes	15,000
08SP	0	412Sub- Kansas Tp	\$ 1,488,000	0.00766	0.01681	68	68	Yes	1,488,000	Yes	1,488,000
08SP	0	Kerr- 412sub 161	\$ 1,918,000	0.00766	0.01681	68	68	Yes	1,918,000	Yes	1,918,000
08SP	9	Replace Springfield 161/69 kV auto	\$ 1,300,000	0.00035	0.00077	68	77	Yes	1,300,000	Yes	1,300,000
08SP	136	Marshall to North Marshall - Replace bus & jumpers at N. Marshall	\$ 23,356	0.00499	0.00158	474	610	No	0	Yes	23,356
08SP	137	Pittsburg to Lone Star South - Reset CT @ Pittsburg 138 kV	\$ 10,000	0.00274	0.00053	775	912	No	0	No	0
08SP	248	Rebuild 4.3 miles of Broken Arrow N - Oneta 138 kV line	\$ 2,370,500	0.00883	0.02295	58	306	Yes	2,370,500	Yes	2,370,500
08SP	265	Rebuild 5.3 miles of Raines - Arsenal Hill 138 kV line	\$ 3,731,000	0.0267	0.01541	260	525	No	0	Yes	3,731,000
08SP	279	Replace Clay to Logan 161 kV structures	\$ 250,000	0.02132	0.04885	65	344	Yes	250,000	Yes	250,000
08SP	283	Reconstruct part of Orango Jct-Joplin-Oakland North 161 kV line	\$ 800,000	0.00438	0.01037	63	346	Yes	800,000	Yes	800,000
08SP	320	Oak Pan - Harr Rec to Longwood 161	\$ 750,000	0.0354	0.02051	259	579	No	0	Yes	750,000
08SP	367	Ferndale Lake Tap to Pittsburg - Reset Pittsburg 69 kV CT's	\$ 10,000	0.00018	0.00035	77	444	No	0	Yes	10,000
08SP	372	Chamber Springs 345/161 auto #2	\$ 4,000,000	0.02215	0.05416	61	433	No	0	Yes	4,000,000
08SP	380	Lake Elmdale - Chamber Springs Rd. 161 kV: Rebuild 15 miles with 1590 ACSR by AEP	\$ 6,000,000	0.00532	0.01319	61	441	No	0	Yes	6,000,000
08SP	384	Oak Hill to Knox Lee 138kV - Wavetrap @ Knoxlee	\$ 20,000	0.00692	0.00382	272	656	No	0	No	0
08SP	423	Longwood-Noram 138 reconductor	\$ 1,577,000	0.0267	0.01541	260	683	No	0	No	0
08SP	445	Reconductor 9.4 miles of TitanTP - Tahlequah 161 kV line	\$ 1,551,000	0.00046	0.00154	45	490	No	0	Yes	1,551,000
08SP	447	Reset relays @ IPC Jefferson 138	\$ 5,000	0.04641	0.02232	312	759	No	0	No	0
08SP	447	Reconductor 0.7 miles of Jeff-Lieb 138 kV line	\$ 174,000	0.04641	0.02232	312	759	No	0	No	0
08SP	448	Clay to Springfield - Replace disconnect switches @ Springfield	\$ 200,000	0.00799	0.01828	66	514	No	0	Yes	200,000
08SP	503	Reinmiller 161/69 kV auto replacement	\$ 1,730,000	0.00012	0.002903	6	509	No	0	Yes	1,730,000
08SP	503	VBI to Van Buren Switches, relaying, etc	\$ 2,100,000	0.02461	0.05776	64	567	No	0	Yes	2,100,000
08SP	537	Rebuild 0.6 miles of Bonanza Tp - Bonanza 161 kV line	\$ 50,000	0.00035	0.00317	17	554	No	0	Yes	50,000
08SP	570	Osage-Cont. Blocks 69 kV, rebuild 0.6 miles	\$ 255,000	0.0034	0.0081	63	633	No	0	No	0
08SP	577	Rebuild 5.6 miles of Noram-Raines 138 kV line	\$ 2,000,000	0.0267	0.01541	260	837	No	0	No	0
08SP	608	Muskogee to Gore - Replace Wavetrap & CT ratio at Gore 161 kV	\$ 30,000	0.01158	0.03969	44	652	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	372	655	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	372	655	No	0	No	0
08WP	360	Hugo Tap to Valiant - Replace wavetrap @ Valliant	\$ 30,000	0.00014	0.03099	1	361	Yes	30,000	Yes	30,000
04SP	391	*Norfork 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	75	466	No	0	Yes	1,000,000
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	60	60	Yes	1,600,000	Yes	1,600,000
06SP	155	*Larusel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	65	220	Yes	60,000	Yes	60,000
08SP	0	*Payne Switch Station - Expedite construction of new facility with 70MVA auto (replaces upgrade needed for Cyril to Anadarko)	\$ 1,800,000	-0.00061 ¹	0.000196 ¹	-467	0	Yes	1,800,000	Yes	1,800,000
08SP	0	*Lindsay to Lindsay SW - Expedite replacing conductor in 8.0 miles from 1/0 to 556 ACSR, TS-1 to TH-10 ⁻²	\$ 1,648,000	-0.00104	-0.00029	N/A	0	Yes	1,648,000	Yes	1,648,000
08SP	474	Hallsview-Longview Hgts rebuild 7.1 miles ²	\$ 3,000,000	-0.00374	-0.00143	N/A	474	No	0	Yes	3,000,000
Total Cost of Facility Upgrades Required			\$80,338,826						\$45,460,500		\$70,163,826

* Cost for Accelerated In-Service Date

¹ AC Response Value Used

² Required due to upgrades included in models assigned to SPP-2002-046 Impact Study

Table 10 – Detailed List of Upgrades Required With 300 MW Redirect for 200 MW and 300 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 200MW of ATC	Cost of Upgrades at 200MW ATC	Upgrades Needed for 300MW of ATC	Cost of Upgrades at 300MW ATC
03FA	543	Atlas-Carthage 69 kV rebuild of 8 miles - Due to Linn County	\$ 5,200,000	0.01503	0.01239	364	907	No	0	No	0
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	130	130	Yes	6,000	Yes	6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	130	750	Yes	6,945,000	Yes	6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-89	0	Yes	450,000	Yes	450,000
04SP	670	Hoyt HTI Switching JCT To Circleville 115KV: Replace 82 structures to increase line rating to 100 degree C conductor rating of 97 MVA by WR.	\$ 742,000	0.00173	0.00399	130	800	No	0	No	0
08SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	103	103	Yes	3,000,000	Yes	3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	Yes	2,000	Yes	2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 32 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	124	329	No	0	No	0
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	134	462	No	0	No	0
08SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-1007	0	Yes	1,565,000	Yes	1,565,000
08SP	0	Gill Energy Center East To Macarthur 69KV: Replace sub bus and jumpers at MacArthur 69 kV by WR.	\$ 22,000	0.00017	0.00041	124	124	Yes	22,000	Yes	22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR by EDE.	\$ 1,230,000	0.00114	0.002155	159	440	No	0	No	0
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	222	700	No	0	No	0
04SP	670	TATUM TO ROCKHILL, 138KV: Reset CTs @ Rock Hill by CSWS.	\$ 2,000	0.04269	0.01965	652	1322	No	0	No	0
06SP	0	Cherokee REC - Knox Lee 138KV: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	652	652	No	0	No	0
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	106	116	Yes	20,000	Yes	20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	140	221	No	0	Yes	150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	121	257	No	0	Yes	60,000
08SP	0	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-45	0	Yes	75,000	Yes	75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	140	326	No	0	No	0
08SP	0	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	624	624	No	0	No	0
08SP	0	Lieberman - IPC Jefferson 138KV: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	624	624	No	0	No	0
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	89	319	No	0	No	0
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	89	361	No	0	No	0
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	127	415	No	0	No	0
08SP	0	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	88	88	Yes	2,100,000	Yes	2,100,000
08SP	0	Cherokee REC - Tatum 138KV: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	652	652	No	0	No	0
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	127	333	No	0	No	0
06SP	543	Winnsboro To Scrogns 69KV: Replace switches, 350 CU jumpers, & reset relays @ Winnsboro by CSWS.	\$ 80,000	0.00092	0.00054	511	1054	No	0	No	0
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	3	560	No	0	No	0
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-103	456	No	0	No	0
08SP	103	Rock Hill - Tatum 138KV: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	652	755	No	0	No	0
06SP	574	Tahlequah To Highway 59 161KV: Remove switches #130 and #132 to increase rating from 600A to conductor limit of 662 Amps for Rate B and replace structures by OKGE.	\$ 30,000	0.01813	0.04716	115	689	No	0	No	0
08SP	0	Pecan Creek to Muskogee 345 - Pecan Creek CT's	\$ 2,500	0.02246	0.06605	102	102	Yes	2,500	Yes	2,500

Table 10 - Continued – Detailed List of Upgrades Required With 300 MW Redirect for 200 MW and 300 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 200MW of ATC	Cost of Upgrades at 200MW ATC	Upgrades Needed for 300MW of ATC	Cost of Upgrades at 300MW ATC
08SP	0	Reset Relays at Jacksonville & Overton	\$ 15,000	0.03779	0.02181	520	520	No	0	No	0
08SP	0	412Sub- Kansas Tp	\$ 1,488,000	0.00766	0.01681	137	137	Yes	1,488,000	Yes	1,488,000
08SP	0	Kerr- 412sub 161	\$ 1,918,000	0.00766	0.01681	137	137	Yes	1,918,000	Yes	1,918,000
08SP	9	Replace Springfield 161/69 kV auto	\$ 1,300,000	0.00035	0.00077	136	145	Yes	1,300,000	Yes	1,300,000
08SP	136	Marshall to North Marshall - Replace bus & jumpers at N. Marshall	\$ 23,356	0.00499	0.00158	947	1083	No	0	No	0
08SP	137	Pittsburg to Lone Star South - Reset CT @ Pittsburg 138 kV	\$ 10,000	0.00274	0.00053	1551	1688	No	0	No	0
08SP	248	Rebuild 4.3 miles of Broken Arrow N - Oneta 138 kV line	\$ 2,370,500	0.00883	0.02295	115	363	No	0	No	0
08SP	265	Rebuild 5.3 miles of Raines - Arsenal Hill 138 kV line	\$ 3,731,000	0.0267	0.01541	520	785	No	0	No	0
08SP	279	Replace Clay to Logan 161 kV structures	\$ 250,000	0.02132	0.04885	131	410	No	0	No	0
08SP	283	Reconstruct part of Orango Jct-Joplin-Oakland North 161 kV line	\$ 800,000	0.00438	0.01037	127	410	No	0	No	0
08SP	320	Oak Pan - Harr Rec to Longwood 161	\$ 750,000	0.0354	0.02051	518	838	No	0	No	0
08SP	367	Ferndale Lake Tap to Pittsburg - Reset Pittsburg 69 kV CT's	\$ 10,000	0.00018	0.00035	154	521	No	0	No	0
08SP	372	Chamber Springs 345/161 auto #2	\$ 4,000,000	0.02215	0.05416	123	495	No	0	No	0
08SP	380	Lake Elmdale - Chamber Springs Rd. 161 kV: Rebuild 15 miles with 1590 ACSR by AEP	\$ 6,000,000	0.00532	0.01319	121	501	No	0	No	0
08SP	384	Oak Hill to Knox Lee 138kV - Wavetrap @ Knoxlee	\$ 20,000	0.00692	0.00382	543	927	No	0	No	0
08SP	423	Longwood-Noram 138 reconductor	\$ 1,577,000	0.0267	0.01541	520	943	No	0	No	0
08SP	445	Reconductor 9.4 miles of TitanTP - Tahlequah 161 kV line	\$ 1,551,000	0.00046	0.00154	90	535	No	0	No	0
08SP	447	Reset relays @ IPC Jefferson 138	\$ 5,000	0.04641	0.02232	624	1071	No	0	No	0
08SP	447	Reconductor 0.7 miles of Jeff-Lieb 138 kV line	\$ 174,000	0.04641	0.02232	624	1071	No	0	No	0
08SP	448	Clay to Springfield - Replace disconnect switches @ Springfield	\$ 200,000	0.00799	0.01828	131	579	No	0	No	0
08SP	503	Reinmiller 161/69 kV auto replacement	\$ 1,730,000	0.00012	0.002903	12	515	No	0	No	0
08SP	503	VBI to Van Buren Switches, relaying, etc	\$ 2,100,000	0.02461	0.05776	128	631	No	0	No	0
08SP	537	Rebuild 0.6 miles of Bonanza Tp - Bonanza 161 kV line	\$ 50,000	0.00035	0.00317	33	570	No	0	No	0
08SP	570	Osage-Cont. Blocks 69 kV, rebuild 0.6 miles	\$ 255,000	0.0034	0.0081	126	696	No	0	No	0
08SP	577	Rebuild 5.6 miles of Noram-Raines 138 kV line	\$ 2,000,000	0.0267	0.01541	520	1097	No	0	No	0
08SP	608	Muskogee to Gore - Replace Wavetrap & CT ratio at Gore 161 kV	\$ 30,000	0.01158	0.03969	88	696	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	743	1026	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	743	1026	No	0	No	0
08WP	360	Hugo Tap to Valiant - Replace wavetrap @ Valliant	\$ 30,000	0.00014	0.03099	1	361	No	0	No	0
04SP	391	*Norfolk 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	150	541	No	0	No	0
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	120	120	Yes	1,600,000	Yes	1,600,000
06SP	155	*Larussel to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	129	284	No	0	Yes	60,000
08SP	0	*Payne Switch Station - Expedite construction of new facility with 70MVA auto (replaces upgrade needed for Cyril to Anadarko)	\$ 1,800,000	-0.00061 ¹	0.000196 ¹	-934	0	Yes	1,800,000	Yes	1,800,000
08SP	0	*Lindsay to Lindsay SW - Expedite replacing conductor in 8.0 miles from 1/0 to 556 ACSR, TS-1 to TH-10- ²	\$ 1,648,000	-0.00104	-0.00029	N/A	0	Yes	1,648,000	Yes	1,648,000
08SP	474	Hallsview-Longview Hgts rebuild 7.1 miles ²	\$ 3,000,000	-0.00374	-0.00143	N/A	474	No	0	No	0
Total Cost of Facility Upgrades Required			\$80,338,826						\$23,941,500		\$24,211,500

* Cost for Accelerated In-Service Date

¹ AC Response Value Used

² Required due to upgrades included in models assigned to SPP-2002-046 Impact Study

Table 11 – Detailed List of Upgrades Required With 300 MW Redirect for 400 MW and 620 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 400MW of ATC	Cost of Upgrades at 400MW ATC	Upgrades Needed for 620MW of ATC	Cost of Upgrades at 620MW ATC
03FA	543	Atlas-Carthage 69 kV rebuild of 8 miles - Due to Linn County	\$ 5,200,000	0.01503	0.01239	364	907	No	0	No	0
03SP	0	Bucyrus-Stillwell	\$ 6,000	0.00672	0.01554	130	130	Yes	6,000	Yes	6,000
04SP	620	La Cygne to Stilwell 345kV - Linn County Substation	\$ 6,945,000	0.027	0.06212	130	750	Yes	6,945,000	Yes	6,945,000
04SP	39	Southwest Station To Anadarko 138KV: Replace bus, jumpers, switches, supports and foundations at Anadarko Switch Station by WFEC.	\$ 450,000	-0.0017	0.00575	-89	0	Yes	450,000	Yes	450,000
04SP	670	Hoyt HTI Switching JCT To Circleville 115KV: Replace 82 structures to increase line rating to 100 degree C conductor rating of 97 MVA by WR.	\$ 742,000	0.00173	0.00399	130	800	No	0	No	0
08SP	0	Pecan Creek 345/161KV Transformer: Add 2nd 345/161 kV 369MVA unit by OKGE.	\$ 3,000,000	0.02227	0.06511	103	103	Yes	3,000,000	Yes	3,000,000
04SP	195	Lone Star South To Wilkes 138KV: Reset CTs by CSWS.	\$ 2,000	0 ¹	0.00663 ¹	0	195	Yes	2,000	Yes	2,000
04SP	205	Eureka Springs To Beaver Dam 161KV: Reconductor 6 miles of 795 ACSR with 1590 ACSR. Reconnect CT's to 1000:5 Tap on Bkrs 42 32 & half or 22. Replace metering & reset relays for Line 2 & Line 3 by SPA.	\$ 1,882,500	0.01861	0.04516	124	329	Yes	1,882,500	Yes	1,882,500
04SP	328	South Coffeyville To Dearing 138 KV: Replace wave trap to increase rating to conductor rating (2000 A) by WR.	\$ 20,000	0.01001	0.02236	134	462	No	0	Yes	20,000
08SP	0	Joplin Southwest 161/69KV Transformer: Replace with 150MVA unit by EDE.	\$ 1,565,000	-0.00225	0.00067	-1007	0	Yes	1,565,000	Yes	1,565,000
08SP	0	Gill Energy Center East To MacArthur 69KV: Replace sub bus and jumpers at MacArthur 69 kV by WR.	\$ 22,000	0.00017	0.00041	124	124	Yes	22,000	Yes	22,000
04SP	281	Diamond JCT. To Sarcoxie Southwest Tap 69KV: Recond. 1/0 CU with 336 ACSR by EDE.	\$ 1,230,000	0.00114	0.002155	159	440	No	0	Yes	1,230,000
04SP	478	Wilburton To Lone Oak 69KV: Replace 400A line switch # 4839 by CSWS.	\$ 60,000	0.00553	0.00747	222	700	No	0	No	0
04SP	670	TATUM TO ROCKHILL, 138KV: Reset CTs @ Rock Hill by CSWS.	\$ 2,000	0.04269	0.01965	652	1322	No	0	No	0
06SP	0	Cherokee REC - Knox Lee 138KV: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 981,000	0.04269	0.01965	652	652	No	0	No	0
06SP	10	Replace jumpers @ Greenland 69 kV bus	\$ 20,000	0.00181	0.00511	106	116	Yes	20,000	Yes	20,000
06SP	81	Midway To Bull Shoals 161KV: Replace disconnect switches, metering CTs and wave trap at Bull Shoals by SPA.	\$ 150,000	0.00935	0.02008	140	221	Yes	150,000	Yes	150,000
06SP	136	Farmington AECC To Chamber Springs Rd 161KV: Replace Farmington Switch by CSWS.	\$ 60,000	0.00417	0.01037	121	257	Yes	60,000	Yes	60,000
08SP	0	Pharoah To Weleetka 138KV: Replace wavetrap at Weleetka and replace jumpers by WFEC.	\$ 75,000	-0.00089	0.00588	-45	0	Yes	75,000	Yes	75,000
06SP	186	NORFORK TO BUFORD TAP 161KV: Resag conductor and replace structures as necessary by SPA.	\$ 250,000	0.01481	0.03179	140	326	Yes	250,000	Yes	250,000
08SP	0	IPC JEFFERSON TO LIEBERMAN 138KV: Replace switches @ Lieberman by CSWS.	\$ 60,000	0.04815	0.02316	624	624	No	0	No	0
08SP	0	Lieberman - IPC Jefferson 138KV: Reconductor 26.35 miles of 336 ACSR with 795 ACSR by CSWS.	\$ 7,172,000	0.04815	0.02316	624	624	No	0	No	0
06SP	230	Muskogee Tap To Gore 161KV: Recond. 16 miles with 795 ACSR by SPA.	\$ 4,000,000	0.01171	0.03958	89	319	Yes	4,000,000	Yes	4,000,000
06SP	272	Snyder To Frederick JCT 69KV: Reset Frederick Jct. CTs by CSWS.	\$ 2,000	0.00014	0.00047	89	361	Yes	2,000	Yes	2,000
06SP	288	Gore To Sallisaw 161KV: Increase clearances of approximately ten spans by SPA.	\$ 500,000	0.01911	0.04518	127	415	No	0	Yes	500,000
08SP	0	Fulton To Patmos 115KV: Recond. 7.1 miles with 1272 ACSR by CSWS.	\$ 2,100,000	0.00012	0.00041	88	88	Yes	2,100,000	Yes	2,100,000
08SP	0	Cherokee REC - Tatum 138KV: Reconductor 6.25 miles of 666 ACSR with 1272 ACSR by CSWS.	\$ 1,641,000	0.04358	0.02006	652	652	No	0	No	0
06SP	206	Gill Energy Center East To Oatville 69KV: Replace disconnect switches at Gill 69 kV (use 800 A.), Replace line switch at Oatville 69 kV (use 800 A.) by WR.	\$ 45,000	0.00027	0.00064	127	333	Yes	45,000	Yes	45,000
06SP	543	Winnsboro To Scrogns 69KV: Replace switches, 350 CU jumpers, & reset relays @ Winnsboro by CSWS.	\$ 80,000	0.00092	0.00054	511	1054	No	0	No	0
06SP	557	Franklin Switch To Midwest Tap 138KV: Replace 600A metering CTs with 1200A by WFEC.	\$ 55,000	0.00014	0.01334	3	560	No	0	Yes	55,000
06SP	559	Park Lane To Seminole 138KV: Replace 1200Ct and 1600 Amp switch with 2000Amp equipment by OKGE.	\$ 100,000	-0.00446	0.01303	-103	456	No	0	Yes	100,000
08SP	103	Rock Hill - Tatum 138KV: Reconductor 0.81 miles 666MCM to 1272 ACSR by CSWS.	\$ 342,970	0.04358	0.02006	652	755	No	0	No	0
06SP	574	Tahlequah To Highway 59 161KV: Remove switches #130 and #132 to increase rating from 600A to conductor limit of 662 Amps for Rate B and replace structures by OKGE.	\$ 30,000	0.01813	0.04716	115	689	No	0	No	0
08SP	0	Pecan Creek to Muskogee 345 - Pecan Creek CT's	\$ 2,500	0.02246	0.06605	102	102	Yes	2,500	Yes	2,500

Table 11 - Continued – Detailed List of Upgrades Required With 300 MW Redirect for 400 MW and 620 MW of ATC from 6/1/2003 to 6/1/2013

Study Year	ATC (MW) With Linn County Addition	SPP Transmission Solution	Cost without uplifts	ERCOTE TO EES RESPONSE	KIOWA TO EES RESPONSE	Kiowa to Entergy Available for Redirect of ERCOTE to Entergy Transfer	Total ATC with Linn County Substation	Upgrades Needed for 200MW of ATC	Cost of Upgrades at 200MW ATC	Upgrades Needed for 300MW of ATC	Cost of Upgrades at 300MW ATC
08SP	0	Reset Relays at Jacksonville & Overton	\$ 15,000	0.03779	0.02181	520	520	No	0	Yes	15,000
08SP	0	412Sub- Kansas Tp	\$ 1,488,000	0.00766	0.01681	137	137	Yes	1,488,000	Yes	1,488,000
08SP	0	Kerr- 412sub 161	\$ 1,918,000	0.00766	0.01681	137	137	Yes	1,918,000	Yes	1,918,000
08SP	9	Replace Springfield 161/69 kV auto	\$ 1,300,000	0.00035	0.00077	136	145	Yes	1,300,000	Yes	1,300,000
08SP	136	Marshall to North Marshall - Replace bus & jumpers at N. Marshall	\$ 23,356	0.00499	0.00158	947	1083	No	0	No	0
08SP	137	Pittsburg to Lone Star South - Reset CT @ Pittsburg 138 kV	\$ 10,000	0.00274	0.00053	1551	1688	No	0	No	0
08SP	248	Rebuild 4.3 miles of Broken Arrow N - Oneta 138 kV line	\$ 2,370,500	0.00883	0.02295	115	363	Yes	2,370,500	Yes	2,370,500
08SP	265	Rebuild 5.3 miles of Raines - Arsenal Hill 138 kV line	\$ 3,731,000	0.0267	0.01541	520	785	No	0	No	0
08SP	279	Replace Clay to Logan 161 kV structures	\$ 250,000	0.02132	0.04885	131	410	No	0	Yes	250,000
08SP	283	Reconstruct part of Orango Jct-Joplin-Oakland North 161 kV line	\$ 800,000	0.00438	0.01037	127	410	No	0	Yes	800,000
08SP	320	Oak Pan - Harr Rec to Longwood 161	\$ 750,000	0.0354	0.02051	518	838	No	0	No	0
08SP	367	Ferndale Lake Tap to Pittsburg - Reset Pittsburg 69 kV CT's	\$ 10,000	0.00018	0.00035	154	521	No	0	Yes	10,000
08SP	372	Chamber Springs 345/161 auto #2	\$ 4,000,000	0.02215	0.05416	123	495	No	0	Yes	4,000,000
08SP	380	Lake Elmdale - Chamber Springs Rd. 161 kV: Rebuild 15 miles with 1590 ACSR by AEP	\$ 6,000,000	0.00532	0.01319	121	501	No	0	Yes	6,000,000
08SP	384	Oak Hill to Knox Lee 138kV - Wavetrap @ Knoxlee	\$ 20,000	0.00692	0.00382	543	927	No	0	No	0
08SP	423	Longwood-Noram 138 reconductor	\$ 1,577,000	0.0267	0.01541	520	943	No	0	No	0
08SP	445	Reconductor 9.4 miles of TitanTP - Tahlequah 161 kV line	\$ 1,551,000	0.00046	0.00154	90	535	No	0	Yes	1,551,000
08SP	447	Reset relays @ IPC Jefferson 138	\$ 5,000	0.04641	0.02232	624	1071	No	0	No	0
08SP	447	Reconductor 0.7 miles of Jeff-Lieb 138 kV line	\$ 174,000	0.04641	0.02232	624	1071	No	0	No	0
08SP	448	Clay to Springfield - Replace disconnect switches @ Springfield	\$ 200,000	0.00799	0.01828	131	579	No	0	Yes	200,000
08SP	503	Reinmiller 161/69 kV auto replacement	\$ 1,730,000	0.00012	0.002903	12	515	No	0	Yes	1,730,000
08SP	503	VBI to Van Buren Switches, relaying, etc	\$ 2,100,000	0.02461	0.05776	128	631	No	0	No	0
08SP	537	Rebuild 0.6 miles of Bonanza Tp - Bonanza 161 kV line	\$ 50,000	0.00035	0.00317	33	570	No	0	Yes	50,000
08SP	570	Osage-Cont. Blocks 69 kV, rebuild 0.6 miles	\$ 255,000	0.0034	0.0081	126	696	No	0	No	0
08SP	577	Rebuild 5.6 miles of Noram-Raines 138 kV line	\$ 2,000,000	0.0267	0.01541	520	1097	No	0	No	0
08SP	608	Muskogee to Gore - Replace Wavetrap & CT ratio at Gore 161 kV	\$ 30,000	0.01158	0.03969	88	696	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	743	1026	No	0	No	0
08WP	283	Marshall 138/69kV TR - Replace Strain Buswork at Marshall	\$ 25,000	0.00503	0.00203	743	1026	No	0	No	0
08WP	360	Hugo Tap to Valiant - Replace wavetrap @ Valliant	\$ 30,000	0.00014	0.03099	1	361	Yes	30,000	Yes	30,000
04SP	391	*Norfolk 161/69kV Transformer - Replace Unit by SPA	\$ 1,000,000	0.00018	0.00036	150	541	No	0	Yes	1,000,000
06SP	0	*Lake Elmdale to Dyess 161kV - Rebuild 4 miles of 2-397 with 2156 ACSR	\$ 1,600,000	0.00331	0.0083	120	120	Yes	1,600,000	Yes	1,600,000
06SP	155	*Larusell to Springfield 161kV - Replace 3 600A disconnect switches with 1200A at Springfield	\$ 60,000	0.00466	0.01083	129	284	Yes	60,000	Yes	60,000
08SP	0	*Payne Switch Station - Expedite construction of new facility with 70MVA auto (replaces upgrade needed for Cyril to Anadarko)	\$ 1,800,000	-0.00061 ¹	0.000196 ¹	-934	0	Yes	1,800,000	Yes	1,800,000
08SP	0	*Lindsay to Lindsay SW - Expedite replacing conductor in 8.0 miles from 1/0 to 556 ACSR, TS-1 to TH-10 ⁻²	\$ 1,648,000	-0.00104	-0.00029	N/A	0	Yes	1,648,000	Yes	1,648,000
08SP	474	Hallsview-Longview Hgts rebuild 7.1 miles ²	\$ 3,000,000	-0.00374	-0.00143	N/A	474	No	0	Yes	3,000,000
Total Cost of Facility Upgrades Required			\$80,338,826						\$32,791,500		\$53,302,500

* Cost for Accelerated In-Service Date

¹ AC Response Value Used

² Required due to upgrades included in models assigned to SPP-2002-046 Impact Study