Interconnection Facilities Study
For
Southwestern Public Service/Xcel Energy
Shared Network Upgrade(s)
Transmission Facilities

SPP Generator
Interconnection Studies

(#IFS-2014-002)

September 2015

Revision History

Date	Author	Change Description
9/18/2015	SPP	Shared Network Upgrade(s) Facilities Study Report Revision 0 Issued

Summary

Southwestern Public Service/Xcel Energy (SPS) a performed a detailed Interconnection Facility Study at the request of Southwest Power Pool (SPP) for Shared Network Upgrade(s) assigned in SPP Generator Interconnection (GI) impact study DISIS-2014-002 and impact restudies DISIS-2014-002-1 and DISIS-2014-002-2. Interconnection Request(s) that have cost allocation responsibilities for assigned network upgrades will require the assigned network upgrades to be in-service for full Interconnection Service. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generator interconnections on SPP's transmission system. The SPP Shared Network Upgrade(s) Facilities Study request consist the following Shared Network Upgrades:

- Plant X – Tolk 230kV rebuild circuit #1 and #2
  - Cost Estimate: $9,921,693
- TUCO 2 (Crawfish Draw) 345/230kV substation and transformer
  - Cost Estimate: $24,764,205
- Pleasant Hill – Norton 230/115kV transmission circuit and transformer
  - Cost Estimate: $49,592,501
- Norton 115kV Reactive Power Support
  - Cost Estimate: $1,200,000
- Carlisle 230/115/13kV transformer circuit #1
  - Cost Estimate: $4,192,913

Generator Interconnection Request(s)

The Interconnection Request(s) assigned the Shared Network Upgrade(s) are listed in the corresponding **Tables 1 – 5**.

Table 1: Generator Interconnection Requests for Plant X – Tolk 230kV rebuild circuit #1 and #2

GI Request Number	Point of Interconnection (POI)	Capacity (MW)
ASGI-2014-002	Tucumcari 115kV	49.6
ASGI-2014-005	Strata 69kV	10
ASGI-2014-008	South Loving 69kV	10
ASGI-2014-009	Wood Draw 115kV	10
ASGI-2014-010	Ochoa 115kV	10
ASGI-2014-012	Cooper Ranch 115kV	10
GEN-2013-027/IFS-2014-002-02	Tap Tolk - Yoakum 230kV	150
GEN-2014-033/IFS-2014-002-10	Chaves 115kV	70
GEN-2014-034/IFS-2014-002-11	Chaves 115kV	70
GEN-2014-035/IFS-2014-002-12	Chaves 115kV	30
GEN-2014-047/IFS-2014-002-16	Crossroads 345kV	40
GEN-2014-066/IFS-2014-002-25	Norton 115kV	30

Table 2: Generator Interconnection Requests for TUCO 2 (Crawfish Draw) 345/230kV substation and transformer

GI Request Number	Point of Interconnection (POI)	Capacity (MW)
ASGI-2014-002	Tucumcari 115kV	49.6
ASGI-2014-005	Strata 69kV	10
ASGI-2014-008	South Loving 69kV	10
ASGI-2014-009	Wood Draw 115kV	10
ASGI-2014-010	Ochoa 115kV	10
ASGI-2014-012	Cooper Ranch 115kV	10
GEN-2013-027/IFS-2014-002-02	Tap Tolk - Yoakum 230kV	150
GEN-2014-033/IFS-2014-002-10	Chaves 115kV	70
GEN-2014-034/IFS-2014-002-11	Chaves 115kV	70
GEN-2014-035/IFS-2014-002-12	Chaves 115kV	30
GEN-2014-047/IFS-2014-002-16	Crossroads 345kV	40
GEN-2014-053/IFS-2014-002-19	Carlisle 230kV	80
GEN-2014-054/IFS-2014-002-20	Carlisle 230kV	120
GEN-2014-066/IFS-2014-002-25	Norton 115kV	30

Table 3: Generator Interconnection Requests for Pleasant Hill – Norton 230/115kV transmission circuit and transformer

GI Request Number	Point of Interconnection (POI)	Capacity (MW)
ASGI-2014-002	Tucumcari 115kV	49.6
GEN-2014-066/IFS-2014-002-25	Norton 115kV	30

Table 4: Generator Interconnection Requests for Norton 115kV Reactive Power Support

GI Request Number	Point of Interconnection (POI)	Capacity (MW)
ASGI-2014-002	Tucumcari 115kV	49.6
GEN-2014-066/IFS-2014-002-25	Norton 115kV	30

Table 5: Generator Interconnection Requests for Carlisle 230kV transformer

GI Request Number	Point of Interconnection (POI)	Capacity (MW)
GEN-2014-053/IFS-2014-002-19	Carlisle 230kV	80
GEN-2014-054/IFS-2014-002-20	Carlisle 230kV	120

The Interconnection Request(s) mentioned above were included in the DISIS-2014-002 Impact Study. DISIS-2014-002-1 Impact Restudy, and DISIS-2014-002-2 Impact Restudy in which the studies identified the required Shared Network Upgrade(s) for each Interconnection Request in order to interconnect to the SPP transmission system. Updated cost allocations were included in the DISIS-2014-002-3 Impact Restudy.

Shared Network Upgrade(s) Facilities Descriptions and Costs
Shared Network Upgrade(s) description and total costs are shown in Table 5. The Network Upgrades are described below.

- Plant X – Tolk 230kV rebuild circuit #1 and #2
    - Rebuild both Plant X – Tolk 230kV transmission circuits. Circuit #1 and Circuit #2 are each approximately 10 miles in length. The existing 795 MCM ACSR conductor for both circuits will be replaced with 995 MCM ACCS conductor along with upgrading associated disconnect switches, structural steel, foundations, relay, protective, and metering equipment, and all associated and miscellaneous materials.

    - Current estimated Engineering and Construction (E&C) lead time is approximately eighteen (18) months after fully executed Generator Interconnection Agreements (GIAs).

- TUCO 2 (Crawfish Draw) 345/230kV substation and transformer
    - Construct a new 345/230kV substation near the location where TUCO Interchange - Border 345kV transmission line intersects the TUCO Interchange - Swisher 230kV transmission line. This approximate location is estimated at being four (4) miles from TUCO Interchange. The new substation, TUCO 2 (Crawfish Draw), will include a 345kV breaker-and-a-half bus configuration with 345kV line terminals to TUCO Interchange 345kV, Border 345kV, and to the new 345/230kV 560MVA autotransformer. The 230kV substation to include a 230kV breaker-and-a-half configuration with 230kV line terminals to Swisher 230kV, TUCO Interchange 230kV, and to the new 345/230/13kV 560MVA autotransformer. TUCO 2 (Crawfish Draw) Substation include three (3) 3000 continuous amp 345kV circuit breakers, three (3) 3000 continuous amp 230kV circuit breakers, associated disconnect switches, structural steel, foundations, relay, protective, and metering equipment, and all associated and miscellaneous materials.
    - Relocate the existing TUCO Interchange in-line reactors totaling to 100Mvars and associated terminal equipment for the TUCO Interchange – Border 345kV transmission circuit to TUCO 2 (Crawfish Draw) towards Border 345kV.
    - Current estimated Engineering and Construction (E&C) lead time is approximately thirty - six (36) months after fully executed Generator Interconnection Agreements (GIAs).

- Pleasant Hill – Norton 230/115kV transmission circuit and transformer
  - New Transmission Line: Construct approximately sixty (60) miles of 230kV transmission circuit with 795 MCM ACSR single conductor per phase from Norton – Pleasant Hill and install corresponding structures and associated miscellaneous structure materials.
  - Pleasant Hill Substation: The work includes the addition of a 230kV transmission line terminal at Pleasant Hill. The Pleasant Hill Substation work will include the addition of one (1) 3000 continuous ampacity 230kV circuit breaker, associated disconnect switches, structural steel, foundations, relay, protective, and metering equipment and all associated and miscellaneous materials.
  - Norton Substation – The work includes the addition of a 230kV substation switchyard 115kV switchyard expansion, one (1) 230/115/13kV 250 MVA autotransformer, and the addition of the 115kV terminal to connect the autotransformer. The Norton Substation work will include the addition of one (1) 3000 continuous ampacity 230kV circuit breaker, four (4) 3000 continuous ampacity 115kV circuit breakers, associated disconnect switches, structural steel, foundations, relay, protective, and metering equipment and all associated and miscellaneous materials.
  - Current estimated Engineering and Construction (E&C) lead time is approximately thirty (30) months after fully executed Generator Interconnection Agreements (GIAs).

- Norton 115kV Reactive Power Support
  - The work includes the addition of one (1) 115kV terminal, one (1) 115kV breaker, 24Mvars of switchable capacitor bank(s), associated disconnect switches, structural steel, foundations, relay, protective, and metering equipment and all associated and miscellaneous materials.
  - Current estimated Engineering and Construction (E&C) lead time is approximately thirty (30) months after fully executed Generator Interconnection Agreements (GIAs).

- Carlisle 230/115/13kV transformer circuit #1
  - Replace the existing Carlisle 230/115/13kV 150 MVA autotransformer with a 230/115/13kV 250 MVA autotransformer. This work will include the addition of the autotransformer, associated circuit breakers, disconnect switches, structural steel foundations, protective relay and metering equipment and all associated and miscellaneous materials.
  - Current estimated Engineering and Construction (E&C) lead time is approximately twenty - four (24) months after fully executed Generator Interconnection Agreements (GIAs).

Table 6: Shared Network Upgrade(s) Facilities Costs

Network Upgrade(s)	Total Cost
Plant X – Tolk 230kV rebuild circuit #1 and #2	$9,921,693
TUCO 2 (Crawfish Draw) 345/230kV substation and transformer	$24,764,205
Pleasant Hill – Norton 230/115kV transmission circuit and transformer	$49,592,501
Norton 115kV Reactive Power Support	$1,200,000
Carlisle 230/115/13kV transformer circuit #1	$4,192,913
Total	**$89,671,312**

If higher or equally queued Interconnection Requests(s) withdraw from the SPP GI Queue, suspend or terminate their Generator Interconnection Agreement (GIA), restudies will have to be conducted to determine the need for Network Upgrades and if applicable the Interconnection Requests' allocation of Shared Network Upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests and upgrades being placed in service.

Shared Network Upgrade(s) Cost Allocation by Request(s)

Shared Network Upgrade(s) Cost Allocation by each Interconnection Request(s) responsibility is shown in the **Appendix A**.

If higher or equally queued Interconnection Requests(s) withdraw from the SPP Generator Interconnection Queue, suspend or terminate their Generator Interconnection Agreement (GIA), restudies will have to be conducted to determine the need for Network Upgrades and if applicable the Interconnection Requests' allocation of Shared Network Upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests and upgrades being placed in service.

Conclusion

The Network Upgrades listed in this Shared Interconnection Facilities Study are required for Interconnection Service for the Interconnection Request(s) listed in **Tables 1 - 5**. Interconnection Service will be delayed until the Shared Network Upgrades listed in Table 6 are constructed. Currently, The Interconnection Customer(s) are responsible for $89,671,312 of Shared Network Upgrades.

Appendix A

Appendix A. Cost Allocation by Upgrade

(Does Not Include Interconnection Costs or Previously Allocated Network Upgrades)

Carlisle 230/115/13kV Transformer CKT 1			**$4,192,913**
Replace existing Carlisle 230/115/13kV Transformer circuit #1 with 250 MVA.		**Allocated Cost**	**Allocated %**
	GEN-2014-053	$1,677,165	40.00%
	GEN-2014-054	$2,515,748	60.00%
	Total Allocated Costs	**$4,192,913**	

Norton 115kV Reactive Power Support			**$1,200,000**
Install approximately 24Mvars of switchable shunt capacitor bank(s)		**Allocated Cost**	**Allocated %**
	ASGI-2014-002	$747,739	62.31%
	GEN-2014-066	$452,261	37.69%
	Total Allocated Costs	**$1,200,000**	

Norton - Pleasant Hill 230kV CKT 1			**$49,592,501**
Build approximately 60 miles of new 230kV line. Modify Norton substation to add 230kV bus and autotr		**Allocated Cost**	**Allocated %**
	ASGI-2014-002	$30,901,860	62.31%
	GEN-2014-066	$18,690,641	37.69%
	Total Allocated Costs	**$49,592,501**	

Tolk - Plant X 230kV CKT 1 & 2			**$9,921,693**
Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.		**Allocated Cost**	**Allocated %**
	ASGI-2014-002	$1,084,922	10.93%
	ASGI-2014-005	$151,224	1.52%
	ASGI-2014-008	$158,605	1.60%
	ASGI-2014-009	$143,625	1.45%
	ASGI-2014-010	$140,564	1.42%
	ASGI-2014-012	$133,635	1.35%
	GEN-2013-027	$3,379,101	34.06%
	GEN-2014-033	$1,311,591	13.22%
	GEN-2014-034	$1,311,591	13.22%
	GEN-2014-035	$562,110	5.67%
	GEN-2014-047	$888,523	8.96%
	GEN-2014-066	$656,203	6.61%
	Total Allocated Costs	**$9,921,693**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

TUCO 2 (Crawfish Draw) Substation Upgrade 345/230kV **$24,764,205**

Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 (Crawfish Draw) 345kV substa

	Allocated Cost	Allocated %
ASGI-2014-002	$1,738,147	7.02%
ASGI-2014-005	$356,374	1.44%
ASGI-2014-008	$356,062	1.44%
ASGI-2014-009	$356,661	1.44%
ASGI-2014-010	$356,791	1.44%
ASGI-2014-012	$357,078	1.44%
GEN-2013-027	$5,322,161	21.49%
GEN-2014-033	$2,479,297	10.01%
GEN-2014-034	$2,479,297	10.01%
GEN-2014-035	$1,062,556	4.29%
GEN-2014-047	$1,418,200	5.73%
GEN-2014-053	$2,972,113	12.00%
GEN-2014-054	$4,458,169	18.00%
GEN-2014-066	$1,051,299	4.25%
Total Allocated Costs	**$24,764,205**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs