Feasibility Study
For
Generation Interconnection Request
GEN-2007-049

SPP Tariff Studies

(#GEN-2007-049)

May, 2008

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 75 MW of wind generation within the control area of Western Farmers Electric Cooperative (WFEC) located in Beckham County, Oklahoma. The proposed interconnection point is at the existing Carter Junction 69 kV substation, owned by WFEC. The proposed in-service date is December 31, 2009.

The WFEC transmission system is being reconfigured starting approximately January 1, 2009. The conversion of the 69kV circuit from Moorewood – Durham – Sweetwater – Erick to 138kV will now call for the removal from service of the existing Erick – Carter Jct. 69kV line. The remaining line at Carter Jct. is rated for 61MVA. Therefore, it is recommended to lower the queue position to 60 MW. Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 75 MW of generation with transmission system reinforcements within the local transmission system. The need for reactive compensation for this interconnection request will be evaluated in the Impact Study based on the wind turbine manufacturer and type requested by the Customer. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the required reactive compensation can be static or a portion must be dynamic (such as a SVC).

The requirement to interconnect the 75 MW of wind generation at the existing Carter Junction (WFEC) 69 kV substation consists of adding a new 69 kV breaker and transmission line terminal. The 69kV line from Elk City – Lake Creek Switch will also need to be rebuilt to accommodate the 75 MW output. Otherwise, the wind farm will be permanently limited to 60 MW. The Customer did not propose a specific route for the 69 kV line extending to serve its 69/34.5 kV collection facilities. It is assumed that obtaining all necessary right-of-way for the new transmission line to serve its facilities will not be a significant expense.

The total minimum cost for building the required facilities for this 75 MW of generation is $10,824,000. These costs are shown in Tables 1 and 2. This cost does not include building the 69 kV line from the Customer 69/34.5 kV collector substation into the point of interconnection. This cost also does not include the Customer's 69/34.5 kV collector substation or possible need for reactive compensation. Network constraints in the American Electric Power West (AEPW), Oklahoma Gas and Electric (OKGE), Southwestern Public Service Company (SPS), and WFEC transmission systems that were identified are shown in Table 3. These Network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. Network Constraints are in the local area of the new generation when this generation is sunk throughout the SPP footprint for the Energy Resource (ER) Interconnection request. With a defined source and sink in a Transmission Service Request, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer for future analyses including the determination of lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. If the loading of a facility is higher, the level of ATC will be lower.

There are several other proposed generation additions in the general area of the Customer's facility. It was assumed in this preliminary analysis that not all of these other projects within the AEPW, OKGE, and WFEC control areas will be in service. Those previously queued projects that have advanced to nearly complete phases were included in this Feasibility Study. In the event that another request for a generation interconnection with a higher priority withdraws, then this request may have to be re-evaluated to determine the local Network Constraints.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through Southwest Power Pool's OASIS.

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Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 75 MW of wind generation within the control area of Western Farmers Electric Cooperative (WFEC) located in Beckham County, Oklahoma. The proposed interconnection point is at the existing Carter Junction 69 kV substation, owned by WFEC. The proposed in-service date is December 31, 2009.

Interconnection Facilities

The primary objective of this study is to identify the system problems associated with connecting the generation to the area transmission system. The Feasibility and other subsequent Interconnection Studies are designed to identify attachment facilities, Network Upgrades and other Direct Assignment Facilities needed to accept power into the grid at the interconnection receipt point.

The WFEC transmission system is being reconfigured starting approximately January 1, 2009. The conversion of the 69kV circuit from Moorewood – Durham – Sweetwater – Erick to 138kV will now call for the removal from service of the existing Erick – Carter Jct. 69kV line. The remaining line at Carter Jct. is rated for 61MVA. Therefore, it is recommended to lower the queue position to 60 MW.

The requirement to interconnect the 75 MW of wind generation at the existing Carter Junction (WFEC) 69 kV substation consists of adding a new 69 kV breaker and line terminal. In addition, the 69kV line from Elk City – Lake Creek will need to be rebuilt to accommodate 75MW operation. Otherwise the, facility will be permanently limited to 60 MW. The Customer did not propose a specific route for the 69 kV line extending to serve its 69/34.5 kV collection facilities. It is assumed that obtaining all necessary right-of-way for the new transmission line to serve its facilities will not be a significant expense.

Other Network Constraints in the American Electric Power West (AEPW), Oklahoma Gas and Electric (OKGE), Southwestern Public Service Company (SPS), and WFEC transmission systems that were identified are shown in Table 3. With a defined source and sink in a Transmission Service Request (TSR), this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements.

A preliminary one-line drawing of the interconnection and direct assigned facilities are shown in Figure 1.

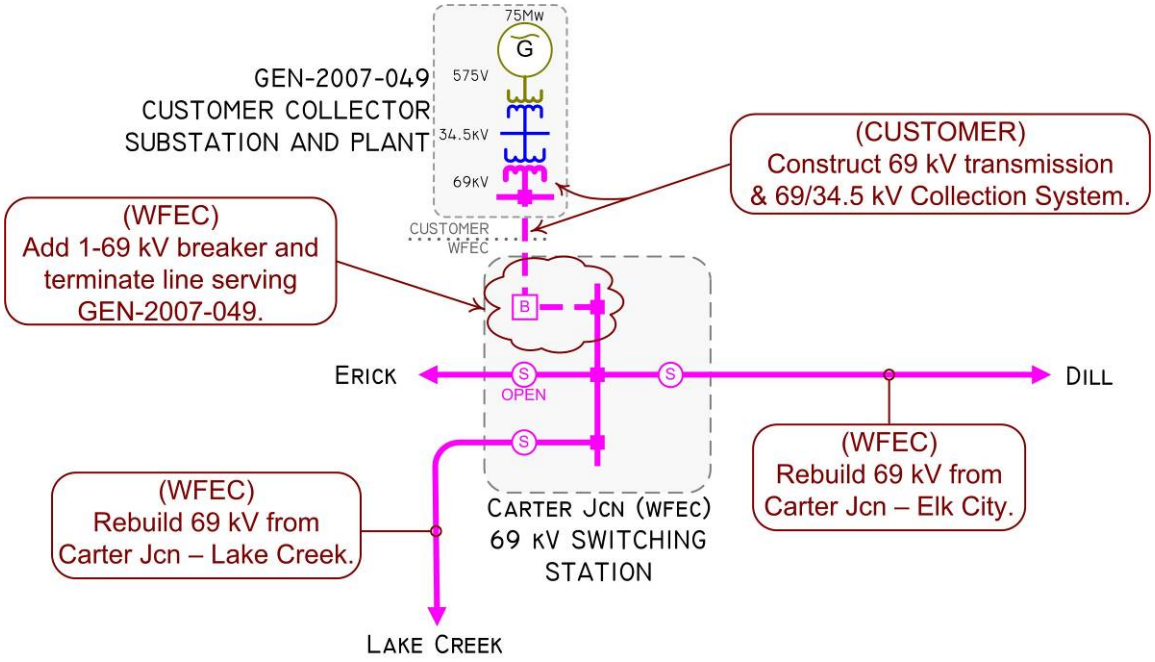

Figure 1: Proposed Method of Interconnection

(Final design to be determined)

Interconnection Estimated Costs

The minimum cost for adding a new 69 kV breaker and terminating the line serving GEN-2007-049 facilities is estimated at $10,824,000. These costs are listed in Tables 1 and 2. These estimates will be refined during the development of the System Impact Study based on the final designs. This cost does not include building the Customer's 69 kV transmission line extending from the point of interconnection to serve its 69/34.5 kV collection facilities. This cost also does not include the Customer's 69/34.5 kV collector substation or the possible need for reactive compensation, all of which should be determined by the Customer. The Customer is responsible for these 69 kV – 34.5 kV facilities up to the point of interconnection.

The costs of interconnecting the facility to the SPS transmission system are listed in Table 1 & 2. **These costs do not include any cost that might be associated with short circuit study results or dynamic stability study results.** These costs will be determined when and if a System Impact Study is conducted.

Table 1: Direct Assignment Facilities

FACILITY	ESTIMATED COST (2008 DOLLARS)
CUSTOMER – 69/34.5 kV collector substation facilities.	*
CUSTOMER – 69 kV line between Customer collector substation and Carter Junction (WFEC) 69 kV substation.	*
WFEC – 1- 69 kV breaker and line terminal at the Carter Junction substation.	$500,000
CUSTOMER – Right-of-Way for all Customer facilities.	*
TOTAL	*****

** Estimates of cost to be determined.*

Table 2: Required Interconnection Network Upgrade Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
WFEC – Rebuild the 69kV line from Elk City to Lake Creek to accommodate 75 MW operation	$10,324,000
TOTAL	**$10,324,000**

** Estimates of cost to be determined.*

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2009 winter peak model, the 2012 summer and winter peak models, and the 2017 summer peak model. The output of the Customer's facility was offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ER) Interconnection request. The proposed in-service date of the generation is December 31, 2009. The available seasonal models used were through the 2017 Summer Peak of which is the end of the current SPP planning horizon.

Following current practice, this analysis was conducted assuming that previous queued requests in the immediate area of this interconnect request were in service. The analysis of the Customer's project indicates that, given the requested generation level of 75 MW and location, additional criteria violations will occur on the existing AEPW, OKGE, SPS, and WFEC transmission systems under steady state and contingency conditions in the peak seasons. Table 3 lists these overloaded facilities.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than one contingency, only the highest loading on the facility for each season is included in the table.

The need for reactive compensation will be determined during the Impact Study. The need for reactive compensation will be based on the Customer's choice of wind turbine make and manufacturer. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the reactive compensation can be static or a portion must be dynamic (such as a SVC or STATCOM). It is possible that an SVC or STATCOM device will be required at the Customer facility because of FERC Order 661A Low Voltage Ride-Through Provisions (LVRT) which went into effect January 1, 2006. FERC Order 661A orders that wind farms stay on-line for 3-phase faults at the point of interconnection even if that requires the installation of a SVC or STATCOM device.

There are several other proposed generation additions in the general area of the Customer's facility. Some of the local projects that were previously queued were assumed to be in service in this Feasibility Study. Not all local projects that were previously queued and have advanced to nearly complete phases were included in this Feasibility Study.

Powerflow Analysis Methodology

The Southwest Power Pool (SPP) criteria states that: “The transmission system of the SPP region shall be planned and constructed so that the contingencies as set forth in the Criteria will meet the applicable NERC Planning Standards for System Adequacy and Security – Transmission System Table l hereafter referred to as NERC Table l) and its applicable standards and measurements”.

Using the created models and the ACCC function of PSS\E, single contingencies in portions or all of the modeled control areas of Sunflower Electric Power Corporation (SUNC), Missouri Public Service (MIPU), Westar Energy (WERE), Kansas City Power & Light (KCPL), West Plains (WEPL), Midwest Energy (MIDW), Oklahoma Gas and Electric (OKGE), American Electric Power West (AEPW), Grand River Dam Authority (GRDA), Southwestern Public Service Company (SPS), Western Farmers Electric Cooperative (WFEC) and other control areas were applied and the resulting scenarios analyzed. This satisfies the ‘more probable’ contingency testing criteria mandated by NERC and the SPP criteria.

Powerflow Results

Table 3: Network Constraints

AREA	OVERLOADED ELEMENT
AEPW	CLINTON CITY - FOSS TAP 69KV CKT 1
AEPW	CLINTON CITY - THOMAS TAP 69KV CKT 1
AEPW	CLINTON JUNCTION - FOSS TAP 69KV CKT 1
AEPW	FLETCHER TAP - LAWTON EASTSIDE 138KV CKT 1
AEPW	HOBART JUNCTION - TAMARAC TAP 138KV CKT 1
AEPW	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1
AEPW	THOMAS TAP - WEATHERFORD 69KV CKT 1
AEPW/SPS	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
AEPW/WFEC	LAKE PAULINE - RUSSELL 138KV CKT 1
AEPW/WFEC	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
OKGE	CIMARRON - HAYMAKER 138KV CKT 1
OKGE	DIVISION AVE - HAYMAKER 138KV CKT 1
OKGE	EL RENO - ROMAN NOSE 138KV CKT 1
WFEC	ANADARKO - CORN TAP 138KV CKT 1
WFEC	ANADARKO - WASHITA 138KV CKT 1
WFEC	CARTER JCT - DILL JCT 69KV CKT 1
WFEC	CARTER JCT - LAKE CREEK 69KV CKT 1
WFEC	DILL JCT - ELK CITY 69KV CKT 1
AEPW	American Electric Power West
OKGE	Oklahoma Gas and Electric
SPS	Southwest Public Service Company
WFEC	Western Farmers Electric Cooperative

Table 4: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
09WP	EL RENO - ROMAN NOSE 138KV CKT 1	153	105	0	2006-02T 230.00 - ELK CITY 230KV 230KV CKT 1
09WP	CARTER JCT - LAKE CREEK 69KV CKT 1	61	118	62	CARTER JCT - DILL JCT 69KV CKT 1
09WP	CARTER JCT - DILL JCT 69KV CKT 1	61	115	64	CARTER JCT - LAKE CREEK 69KV CKT 1
09WP	DILL JCT - ELK CITY 69KV CKT 1	61	110	67	CARTER JCT - LAKE CREEK 69KV CKT 1
12SP	ANADARKO - WASHITA 138KV CKT 1	212	165	0	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
12SP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	260	146	0	ANADARKO - WASHITA 138KV CKT 1
12SP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	196	141	0	BASE CASE
12SP	HOBART JUNCTION - TAMARAC TAP 138KV CKT 1	105	125	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	CLINTON JUNCTION - FOSS TAP 69KV CKT 1	72	118	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12SP	CLINTON CITY - THOMAS TAP 69KV CKT 1	48	118	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12SP	EL RENO - ROMAN NOSE 138KV CKT 1	133	115	0	BASE CASE
12SP	CIMARRON - HAYMAKER 138KV CKT 1	308	113	0	CIMARRON - CZECH HALL 138KV CKT 1
12SP	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	143	112	0	SOUTHWESTERN STATION - VERDEN 138KV CKT 1
12SP	THOMAS TAP - WEATHERFORD 69KV CKT 1	48	111	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12SP	DIVISION AVE - HAYMAKER 138KV CKT 1	308	109	0	CIMARRON - CZECH HALL 138KV CKT 1
12SP	EL RENO - ROMAN NOSE 138KV CKT 1	153	109	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	CLINTON CITY - FOSS TAP 69KV CKT 1	79	107	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12SP	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1	351	107	0	GEN525562 1
12SP	ANADARKO - CORN TAP 138KV CKT 1	118	106	0	BASE CASE
12SP	ANADARKO - CORN TAP 138KV CKT 1	154	104	0	SOUTHWESTERN STATION - VERDEN 138KV CKT 1
12SP	FLETCHER TAP - LAWTON EASTSIDE 138KV CKT 1	143	103	0	ELGIN JUNCTION - SOUTHWESTERN STATION 138KV CKT 1
12SP	CARTER JCT - DILL JCT 69KV CKT 1	61	122	60	CARTER JCT - LAKE CREEK 69KV CKT 1
12SP	CARTER JCT - LAKE CREEK 69KV CKT 1	61	119	62	CARTER JCT - DILL JCT 69KV CKT 1
12SP	DILL JCT - ELK CITY 69KV CKT 1	61	114	64	CARTER JCT - LAKE CREEK 69KV CKT 1
12WP	ANADARKO - WASHITA 138KV CKT 1	212	178	0	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
12WP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	196	164	0	BASE CASE
12WP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	260	161	0	ANADARKO - WASHITA 138KV CKT 1
12WP	EL RENO - ROMAN NOSE 138KV CKT 1	153	117	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
12WP	THOMAS TAP - WEATHERFORD 69KV CKT 1	53	113	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12WP	CLINTON CITY - THOMAS TAP 69KV CKT 1	55	113	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12WP	DIVISION AVE - HAYMAKER 138KV CKT 1	308	111	0	CIMARRON - CZECH HALL 138KV CKT 1
12WP	CLINTON JUNCTION - FOSS TAP 69KV CKT 1	72	110	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
12WP	CARTER JCT - DILL JCT 69KV CKT 1	61	116	64	CARTER JCT - LAKE CREEK 69KV CKT 1
12WP	CARTER JCT - LAKE CREEK 69KV CKT 1	61	115	64	CARTER JCT - DILL JCT 69KV CKT 1
12WP	DILL JCT - ELK CITY 69KV CKT 1	61	111	67	CARTER JCT - LAKE CREEK 69KV CKT 1
12WP	CLINTON CITY - FOSS TAP 69KV CKT 1	79	100	68	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
17SP	ANADARKO - WASHITA 138KV CKT 1	212	165	0	SOUTHWESTERN STATION - WASHITA 138KV CKT 1

TABLE 4: Contingency Analysis (continued)

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
17SP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	260	146	0	ANADARKO - WASHITA 138KV CKT 1
17SP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	196	141	0	BASE CASE
17SP	HOBART JUNCTION - TAMARAC TAP 138KV CKT 1	105	128	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
17SP	CLINTON JUNCTION - FOSS TAP 69KV CKT 1	72	118	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
17SP	CLINTON CITY - THOMAS TAP 69KV CKT 1	48	113	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
17SP	CIMARRON - HAYMAKER 138KV CKT 1	308	112	0	CIMARRON - CZECH HALL 138KV CKT 1
17SP	EL RENO - ROMAN NOSE 138KV CKT 1	133	112	0	BASE CASE
17SP	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1	351	110	0	SPP-SWPS-01
17SP	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	143	110	0	SOUTHWESTERN STATION - VERDEN 138KV CKT 1
17SP	DIVISION AVE - HAYMAKER 138KV CKT 1	308	108	0	CIMARRON - CZECH HALL 138KV CKT 1
17SP	CLINTON CITY - FOSS TAP 69KV CKT 1	79	107	0	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
17SP	EL RENO - ROMAN NOSE 138KV CKT 1	153	106	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
17SP	FLETCHER TAP - LAWTON EASTSIDE 138KV CKT 1	143	103	0	ELGIN JUNCTION - SOUTHWESTERN STATION 138KV CKT 1
17SP	ANADARKO - CORN TAP 138KV CKT 1	118	103	4	BASE CASE
17SP	THOMAS TAP - WEATHERFORD 69KV CKT 1	48	107	9	WEATHERFORD TAP - WEATHERFORD WIND FARM 138KV CKT 1
17SP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	103	37	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
17SP	ANADARKO - CORN TAP 138KV CKT 1	154	101	55	SOUTHWESTERN STATION - VERDEN 138KV CKT 1
17SP	CARTER JCT - DILL JCT 69KV CKT 1	61	121	61	CARTER JCT - LAKE CREEK 69KV CKT 1
17SP	CARTER JCT - LAKE CREEK 69KV CKT 1	61	118	62	CARTER JCT - DILL JCT 69KV CKT 1
17SP	DILL JCT - ELK CITY 69KV CKT 1	61	113	65	CARTER JCT - LAKE CREEK 69KV CKT 1

Note: When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this Table may be greater due to higher priority reservations. If the loading of a facility is higher, the level of ATC will be lower.

Conclusion

The minimum cost of interconnecting the Customer's interconnection request is estimated at $10,824,000 for Direct Assignment Facilities and Network Upgrades. At this time, the cost estimates for other Direct Assignment facilities including those in Tables 1 and 2 have not been defined by the Customer. As stated earlier, some but not all of the local projects that were previously queued are assumed to be in service in this Feasibility Study. These costs exclude upgrades of other transmission facilities that were listed in Table 3 of which are Network Constraints. If the Customer reduced the queue position to 60 MW, the interconnection costs will be $500,000.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than one contingency, only the highest loading on the facility for each season is included in the table.

These interconnection costs do not include any cost that may be associated with short circuit or transient stability analysis. These studies will be performed if the Customer signs a System Impact Study Agreement. At the time of the System Impact Study, a better determination of the interconnection facilities may be available.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through Southwest Power Pool's OASIS.

Appendix A: Point of Interconnection Area Map

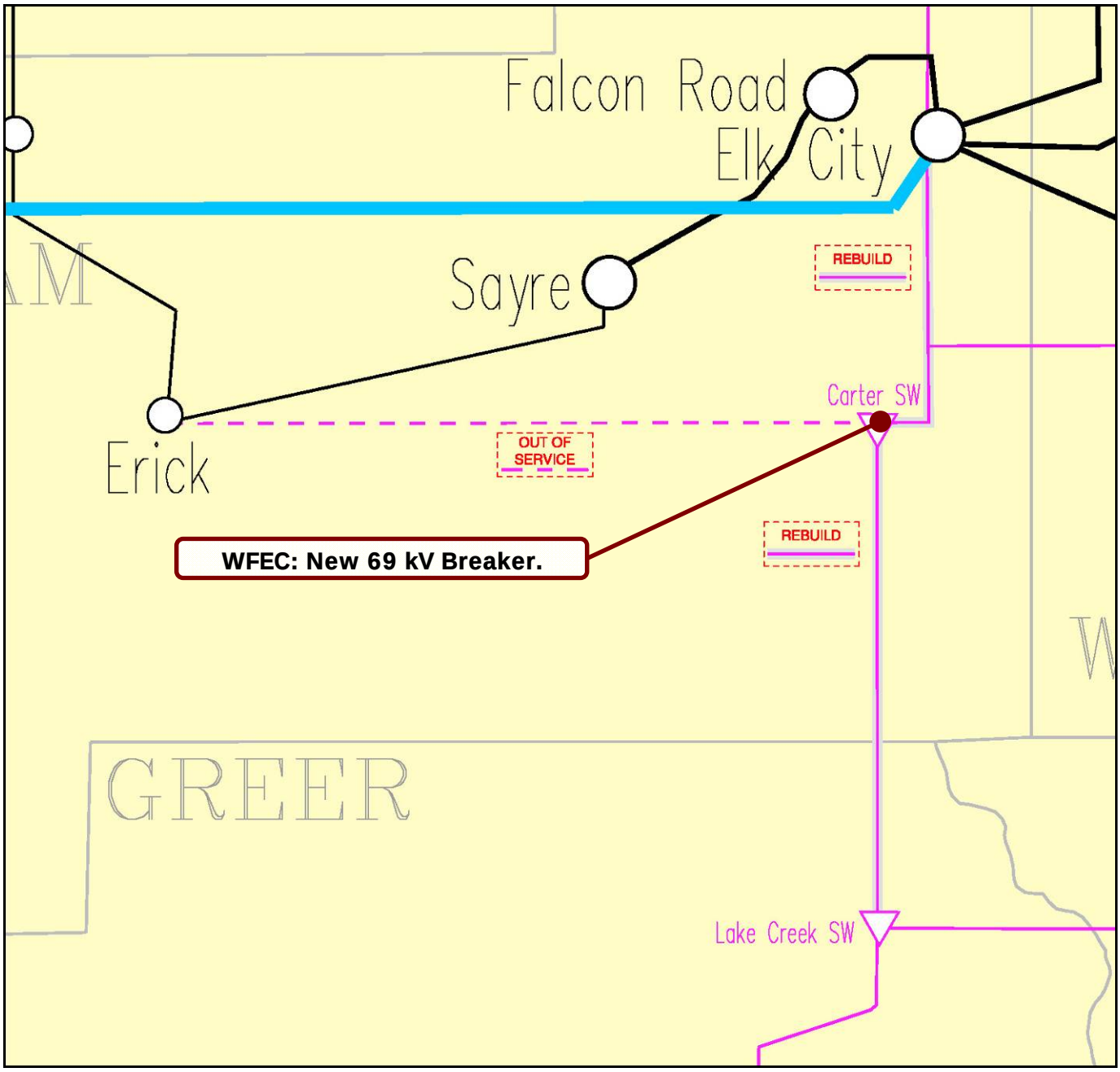

Figure 2: Point of Interconnection Area Map