Feasibility Study
For
Generation Interconnection Request
GEN-2007-025

SPP Tariff Studies
(#GEN-2007-025)

January, 2008

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 300 MW of wind generation within the control area of Westar Energy (WERE) located in Barber County, Kansas. The proposed interconnection point is in the existing Wichita (WERE) – Woodring (OKGE) 345 kV transmission line, owned by WERE. The proposed in-service date is October, 2009.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 300 MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable reactive power compensation, the customer will be required to pay for the installation of a combined total of at least 60 Mvar of 34.5 kV capacitor bank(s) to be installed in the Customer's collector substation. 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 300 MW of wind generation on the existing Wichita (WERE) – Woodring (OKGE) 345 kV transmission line consists of adding a new 345 kV three-breaker ring-bus switching station. The new station will be constructed and maintained by WERE. The Customer did not propose a specific route for the 345 kV line extending to serve its 345/34.5 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 300 MW of generation is $6,036,000. These costs are shown in Tables 1 and 2. This cost does not include building the 345 kV line from the Customer 345/34.5 kV collector substation into the point of interconnection. This cost also does not include the Customer's 345/34.5 kV collector substation or the 34.5 kV, 60 Mvar capacitor bank(s). Network constraints in the American Electric Power West (AEPW), Kansas City Power & Light (KACP), Oklahoma Gas and Electric (OKGE), Southwestern Public Service Company (SPS), West Plains (WEPL) and WERE 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 SPS 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.

Contents

Tables

Figures

Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 300 MW of wind generation within the control area of Westar Energy (WERE) located in Barber County, Kansas. The proposed interconnection point is in the existing Wichita (WERE) – Woodring (OKGE) 345 kV transmission line, owned by WERE. The proposed in-service date is October, 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 requirement to interconnect the 300 MW of wind generation on the existing Wichita (WERE) – Woodring (OKGE) 345 kV transmission line consists of adding a new 345 kV three-breaker ring-bus switching station. The new station will be constructed and maintained by WERE. The Customer did not propose a specific route for the 345 kV line extending to serve its 345/34.5 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), Kansas City Power & Light (KACP), Oklahoma gas and Electric (OKGE), Southwestern Public Service Company (SPS), West Plains (WEPL) and WERE 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.

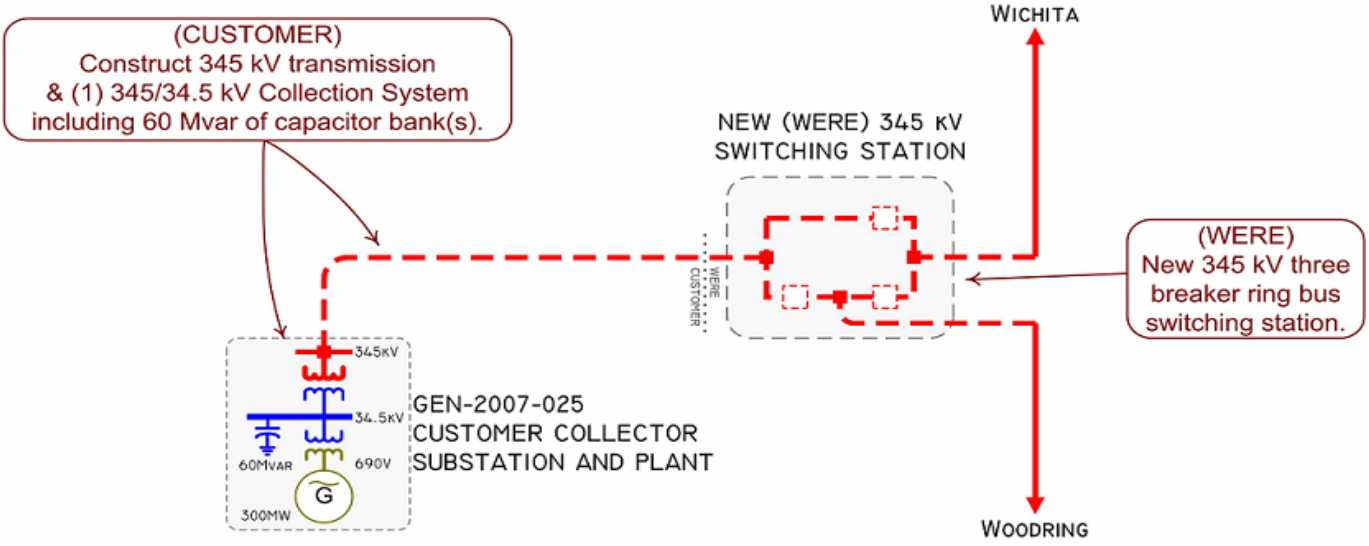

Figure 1: Proposed Method of Interconnection

(Final design to be determined)

Interconnection Estimated Costs

The minimum cost for adding a new 345 kV three-breaker ring-bus switching station serving GEN-2007-025 facilities is estimated at $6,036,000. 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 345 kV transmission line extending from the point of interconnection to serve its 345/34.5 kV collection facilities. This cost also does not include the Customer's 345/34.5 kV collector substation or the 60 Mvar of capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 345 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 (2007 DOLLARS)
CUSTOMER – 345/34.5 kV substation facilities.	*
CUSTOMER – 345 kV line between Customer substation and new WERE 345 kV three-breaker ring-bus switching station.	*
CUSTOMER – 34.5 kV, 60 Mvar capacitor bank(s) to be installed in the Customer 345/34.5 kV collector substation.	*
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)
WERE – 345 kV three-breaker ring-bus switching station to be built for generation request #GEN-2007-025 on the Wichita (WERE) – Woodring (OKGE) 345 kV transmission line. Work to include associated switches, control relaying, high speed communications, metering and related equipment and all related structures.	$6,036,000
TOTAL	**$6,036,000**

* *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, 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 October, 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 300 MW and location, additional criteria violations will occur on the existing WEPL, OKGE, KACP, AEPW, SPS and WERE 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.

In order to maintain a zero reactive power flow exchanged at the point of interconnection, additional reactive compensation is required. The Customer will be required to install a combined total of 60 Mvar of capacitor bank(s) in the Customer's 345/34.5 kV collector substation on the 34.5 kV bus. 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	DIANA - LONE STAR SOUTH 138KV CKT 1
AEPW	LONE STAR SOUTH - WILKES 138KV CKT 1
KACP	STILWELL (STLWL 11) 345/161/13.8KV TRANSFORMER CKT 11
KACP	WEST GARDNER (WGARD 11) 345/161/13.8KV TRANSFORMER CKT 11
OKGE	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1
SPS	DUMAS SUB - EXELL TAP 115KV CKT 1
SPS	ETTER RURAL SUB - MOORE COUNTY INTERCHANGE E. 115KV CKT 1
SPS	EXELL TAP - FAIN SUB 115KV CKT 1
SPS	FAIN SUB - NICHOLS STATION 115KV CKT 1
SPS	HERRING TAP - RITA BLANCA REC-SNEED 115KV CKT 1
SPS	HERRING TAP - RIVERVIEW INTERCHANGE 115KV CKT 1
SPS	MOORE COUNTY INTERCHANGE W. - DUMAS SUB 115KV CKT 1
SPS	MOORE COUNTY INTERCHANGE W. - RITA BLANCA REC-SNEED 115KV CKT 1
SPS	WEST BORGER SUB - HUTCHINSON COUNTY INTERCHANGE N. 115KV CKT 1
WEPL	2006-21T 138.00 - MEDICINE LODGE 138KV CKT 1
WEPL	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
WEPL	MEDICINE LODGE - PRATT 115KV CKT 1
WEPL	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1
WEPL	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
WEPL	PRATT - ST JOHN 115KV CKT 1
WEPL	SEWARD - ST JOHN 115KV CKT 1
WEPL	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
WERE	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1
WERE	EXIDE JUNCTION - NORTH AMERICAN PHILIPS 115KV CKT 1
WERE	EXIDE JUNCTION - SUMMIT 115KV CKT 1
WERE	NORTHVIEW - SUMMIT 115KV CKT 1
AEPW	American Electric Power West
KACP	Kansas City Power and Light
OKGE	Oklahoma Gas and Electric
SPS	Southwestern Public Service Company
WEPL	West Plains
WERE	Westar Energy

Table 4: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
12SP	2006-21T 138.00 - MEDICINE LODGE 138KV CKT 1	72	363	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	EXIDE JUNCTION - NORTH AMERICAN PHILIPS 115KV CKT 1	196	120	0	NORTHVIEW - SUMMIT 115KV CKT 1
12SP	EXIDE JUNCTION - SUMMIT 115KV CKT 1	196	126	0	NORTHVIEW - SUMMIT 115KV CKT 1
12SP	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	178	132	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	MEDICINE LODGE - PRATT 115KV CKT 1	80	207	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1	65	368	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1	178	129	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	NORTHVIEW - SUMMIT 115KV CKT 1	181	137	0	EXIDE JUNCTION - SUMMIT 115KV CKT 1
12SP	PRATT - ST JOHN 115KV CKT 1	80	347	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	SEWARD - ST JOHN 115KV CKT 1	80	171	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1	205	108	0	2006-21T 138.00 - HARPER 138KV CKT 1
12SP	WEST GARDNER (WGARD 11) 345/161/13.8KV TRANSFORMER CKT 11	440	107	0	CRAIG - WEST GARDNER 345KV CKT 1
12SP	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1	360	106	64	CIMARRON - WOODRING 345KV CKT 1
17SP	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1	65	368	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	2006-21T 138.00 - MEDICINE LODGE 138KV CKT 1	72	363	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	PRATT - ST JOHN 115KV CKT 1	80	335	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	MEDICINE LODGE - PRATT 115KV CKT 1	80	197	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	SEWARD - ST JOHN 115KV CKT 1	80	178	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	HERRING TAP - RIVERVIEW INTERCHANGE 115KV CKT 1	164	157	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	HERRING TAP - RITA BLANCA REC-SNEED 115KV CKT 1	164	150	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	FAIN SUB - NICHOLS STATION 115KV CKT 1	146	139	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	MOORE COUNTY INTERCHANGE W. - RITA BLANCA REC-SNEED 115KV CKT 1	164	136	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	EXELL TAP - FAIN SUB 115KV CKT 1	146	135	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	MOORE COUNTY INTERCHANGE W. - DUMAS SUB 115KV CKT 1	90	135	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	178	131	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1	178	126	0	2006-21T 138.00 - HARPER 138KV CKT 1
17SP	ETTER RURAL SUB - MOORE COUNTY INTERCHANGE E. 115KV CKT 1	90	125	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	DUMAS SUB - EXELL TAP 115KV CKT 1	146	120	0	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	LONE STAR SOUTH - WILKES 138KV CKT 1	394	105	0	WELSH REC - WILKES 138KV CKT 1
17SP	STILWELL (STLWL 11) 345/161/13.8KV TRANSFORMER CKT 11	605	103	0	STILWELL (STLWL 22) 345/161/13.8KV TRANSFORMER CKT 22
SEASON	**OVERLOADED ELEMENT**	**RATING**	**LOADING**	**ATC**	**CONTINGENCY**

TABLE 4: Contingency Analysis (continued)

		(MVA)	(%)	(MW)	
17SP	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1	360	107	36	CIMARRON - WOODRING 345KV CKT 1
17SP	WEST BORGER SUB - HUTCHINSON COUNTY INTERCHANGE N. 115KV CKT 1	146	102	221	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1	280	101	272	MOORE COUNTY INTERCHANGE POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	DIANA - LONE STAR SOUTH 138KV CKT 1	287	100	297	LONE STAR SOUTH - WILKES 138KV 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 $6,036,000 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. In addition to the Customer's proposed interconnection facilities, the Customer will be responsible for installing a total of 60 Mvar of capacitor bank(s) in the Customer's substation for reactive support. 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.

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

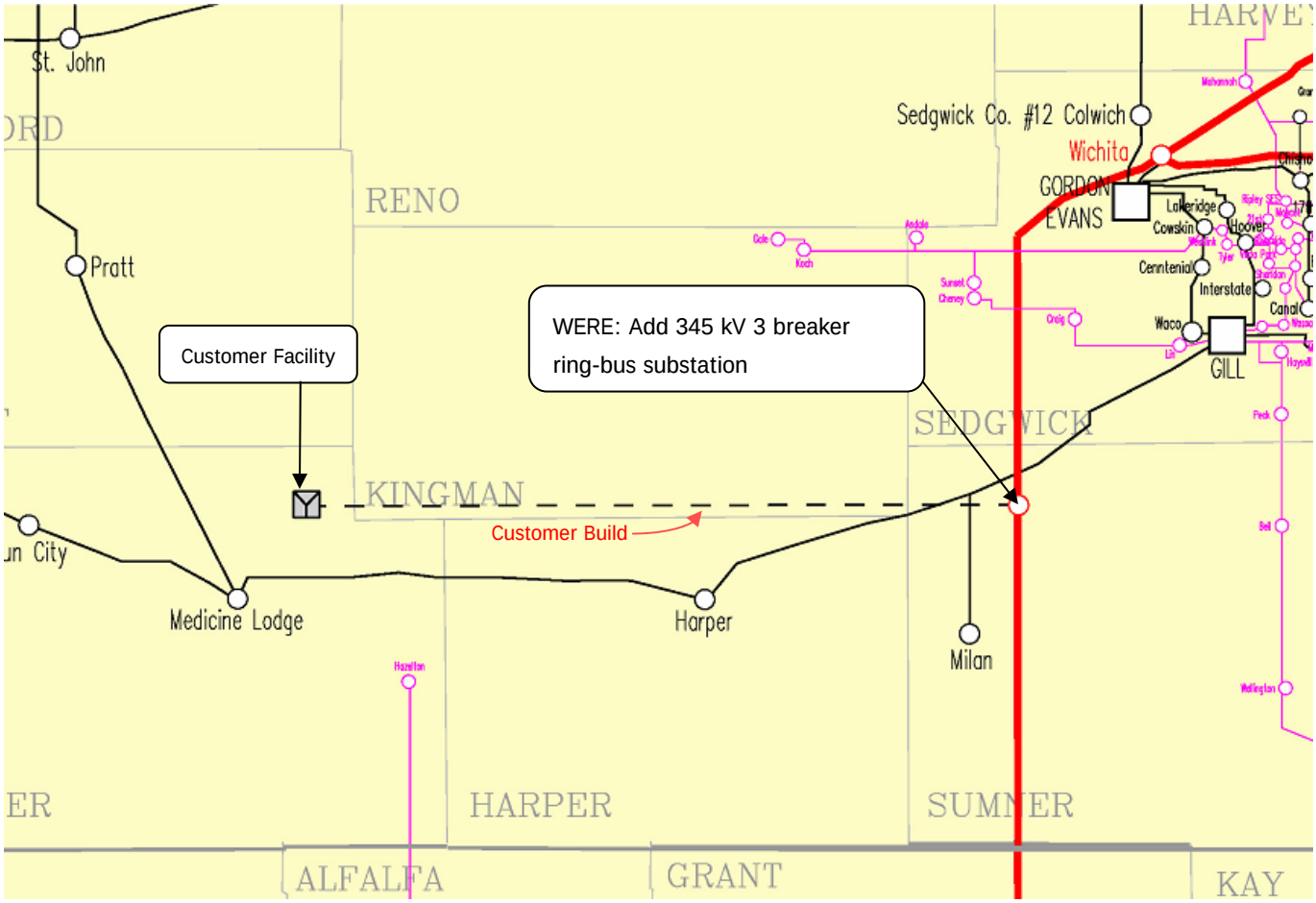

Figure 2: Point of Interconnection Area Map