The Operating Support you need...
When you need it.

November 9, 2020

Maurice Cordell

City of St Marys, KS

Dear Maurice

Thank you for the opportunity for Utility HelpNet, Inc. to provide engineering services for your community.

We have completed our 2020 analysis of the City of St Marys electrical Distribution system. We have attached the analysis along with an spreadsheet of a 5 year projected cost analysis if this path was selected. We realize that budget and resources will dictate the exact time frame and as such may impact the final cost. All of these costs were based on historical averages for similar contractor built projects. There are many factors that affect the actual project costs and these should not be considered final cost estimates.

Please feel free to call me at **(316) 946-1144** if you would like additional information. We look forward to hearing from you.

Sincerely,

Cris Naegele

Cris Naegele P.E. (KS,TX,OK,NE,MO,MN,WI, IN, IL, CO)

Cc: Don Colson

PO Box 9286, Wichita, KS, 67277
(316) 946-1144
www.utilityhelpnet.com

City of St. Marys Ks
Electrical System Assessment 2020

Executive Summary:

The City of St Marys has been making major improvements on their electrical distribution system for many years. This Study identifies the next phase of improvements to that system.

There are four areas to be included in this study. Improvements to the City owned substation. Improvements to the industrial park area. Improvements in the central core area, and improvements to the north side area.

Definitions:

Fault Indicators: Fault indicators are used to identify if measured current has exceed the programmed threshold. A visual flag is set that is easily seen from a distance. By going to these locations before attempting to restore power, a troubleshooter is more likely to identify roughly where a fault has occurred. This allows a known faulted section to be isolated before an attempt to retore power and will allow a majority of customer to receive power while identifying the exact cause of the fault.

Sectionalizers: These devices work by always monitoring current flow. If any of the three phases detect a high current flow followed by a loss in voltage it will signal all three phases in that group to open up while the power is off. When the substation tries a reclose cycle, the balance of the circuit will be restored. The advantage of these devices is relatively low cost and will prevent a customer from single phasing and potential causing damage to their equipment if a single fuse blows. These devices can be installed without an outage to the customer using approved hot work methods by replacing the existing fuses with a sectionalizing device. The negative side of the sectionalizing option is the substation circuit must operate and kill power for long enough for the sectionalizer to operate before restoring power. That does cause all customers on the circuit to see a brief operation. For installations on underground section they are a good alternative since fault on the underground are rare.

Reclosers: Reclosers operate similar to the breakers at the substation. When they sense a current that exceeds their preset value they open all three phases. They are more expensive than sectionalizers and require all devices in a string to be coordinated with each other. This can be difficult if there are too many in series with each other.

Opinion of Probable Cost by year						
	Project Year					
Project Point	1	2	3	4	5	Total
1	175,000					
10	1,500					
13	1,500					
15	0					
20	10,000					
21			2,250			
23		1,500				
24				1,500		
25	0					
26		35,000	35,000			
27				1,500		
28			2,250			
29	0					
30					1,500	
31					1,500	
40				4,000		
41				40,000		
42		15,000				
43		5,000				
44	1,500					
50	27,500					
51	75,000					
52			90,000			
53		15,000				
54			90,000			
55			130,000			
56					55,000	
57					75,000	
58					40,000	
Total	292,000	71,500	349,500	47,000	173,000	$ 933,000

Substation Improvements:

Point 1: Project Year 1 $ 175,000

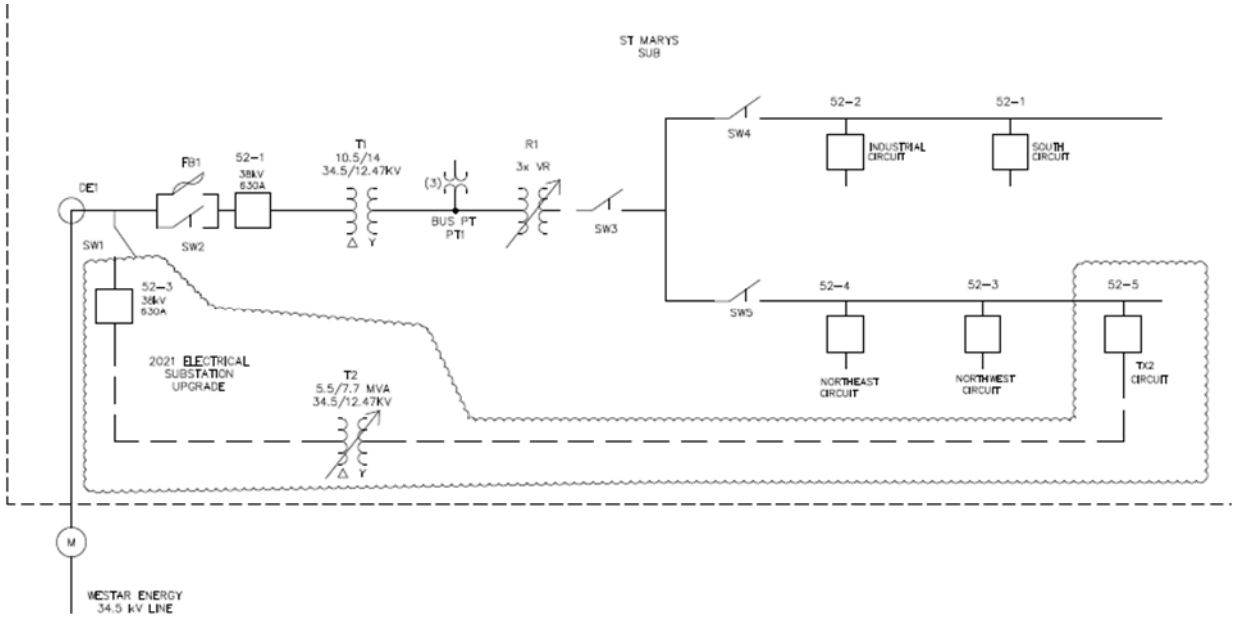
The City purchased a transformer from Evergy in 2016 for a nominal cost as a backup for the substation. During the last major substation expansion, there were provisions made for a portable transformer to be installed without the need for an outage on the 34.5kV system. This provision could be utilized for a feed to second transformer.

This transformer would remain de-energized most of the time and would only be used for emergency or maintenance activities. This would greatly decrease the amount of time the City would be down in the event of a major failure in the transformer or voltage regulators.

By tying in the 2nd transformer into the north bus section the two substation sections can be isolated. Combining this construction with the recommend feeder circuit improvements in the sections of this study will substantially improve reliability and maintenance activity options.

Major items required for substation modifications

1. Install new foundation and oil containment for TX2 north of TX1.
2. Install new 35kv recloser on existing deadend structure
3. Install new underground 35kv cable to TX2
4. Install new 12kv Breaker in substation on north side bay 3.
5. Install new underground 12kv cable from transformer TX2 to new 52-5 breaker.



Industrial Circuit Improvements:

The Industrial circuit is arguably the most important circuit on the St Marys distribution system. It is operated primarily as an express feeder from the substation to the industrial park on the south east part of the City. There is also a portion of this circuit that feeds customers west along Hwy 24. This circuit is overhead from the substation to Grand avenue where it transitions to underground. There are a number of loops and alternative feeds in this area but troubleshooting on the existing system is difficult and time consuming.

We are proposing a number of additional protective and monitoring devices on this circuit in the industrial park area. They are divided into multiple projects and priorities. This will allow implementation to proceed as budgets allow while maximizing results. The included map identifies key points on the Industrial circuit. The scope of work to be performed at each location is detailed below.

There are some locations where cables will remain energized but will not be carrying any load. It is very important to continue to keep these cables energized. If they are not, their ability to be utilized if necessary, would be unknown and may cause additional delay and confusion while troubleshooting.

No solution will eliminate outages or voltage disturbances. These proposals will minimize the number of customers disrupted due to a fault and minimize potential damage due to single phasing of loads. It will also reduce the amount of outage time to the majority of customers while isolating a faulty component.

Point 10: Project Year 1 $ 1,500

Install fault indicators on the overhead power lines both north and south of tap.

This should become the second location to check in the event of a lockout of this circuit. Point 44 should be the first. No fault indication here will mean the fault is back towards the substation.

Point 13: Project Year 1 $ 1,500

Energize the cable feeding north to point 15. There will be no load on this cable. Install fault indicators on cables feeding north and east. The power source for point 13 will be from the west.

Point 15: Project Year 1 $ 0

Make point 15 a normally open point feeding south. The south cable should remain energized from point 13 but will not carry any load. The source for point 15 will be from the west there will be load feeding east.

Point 20: Project Year 1 $ 10,000

This applies to both underground risers.

Replace fuses with Sectionalizers. There are several options for 3 phase sectionalizers that will replace the existing fuse tubes. There would be some Engineering cost to verify coordination with the substation relays and customer loads.

Point 21: Project Year 3 $ 2,250

Install fault indicators on all outgoing feeders. Normal power source is from the west.

Point 23: Project Year 2 $ 1,500

Install fault indicators on outgoing feeder cables north and east of this pedestal. Normal power source is from the west.

Point 24: Project Year 4 $ 1,500

Install fault indicators on outgoing feeder cables north and east of this pedestal. Normal power source is from the south.

Point 25: Project Year 1 $ 0

Make this point a normally open point feeding east. This would isolate the Short Stop from faults down stream while allowing for manual restoration from an alternative source. Normal power source is from the west. Cable feeding east is open but energized from east source.

Point 26: Project Year 2-3 $ 35,000

Install a padmount reclosure for loads east of this point. Along with recommendation at point 25 this will effectively cut in half the underground cable path in the industrial park. This will isolate customers upstream to remain in service after the fault is isolated. Customers upstream may see a voltage disturbance during a fault but will remain with power.

Point 27: Project Year 4 $ 1,500

Install fault indicators on outgoing feeder cables north and east and west of this pedestal. Normal power source is from the south.

Point 28: Project Year 3 $ 2,250

Install fault indicators on outgoing feeder cables north, east, and south of this pedestal. Normal Power source is from the west.

Point 29: Project Year 1 $ 0

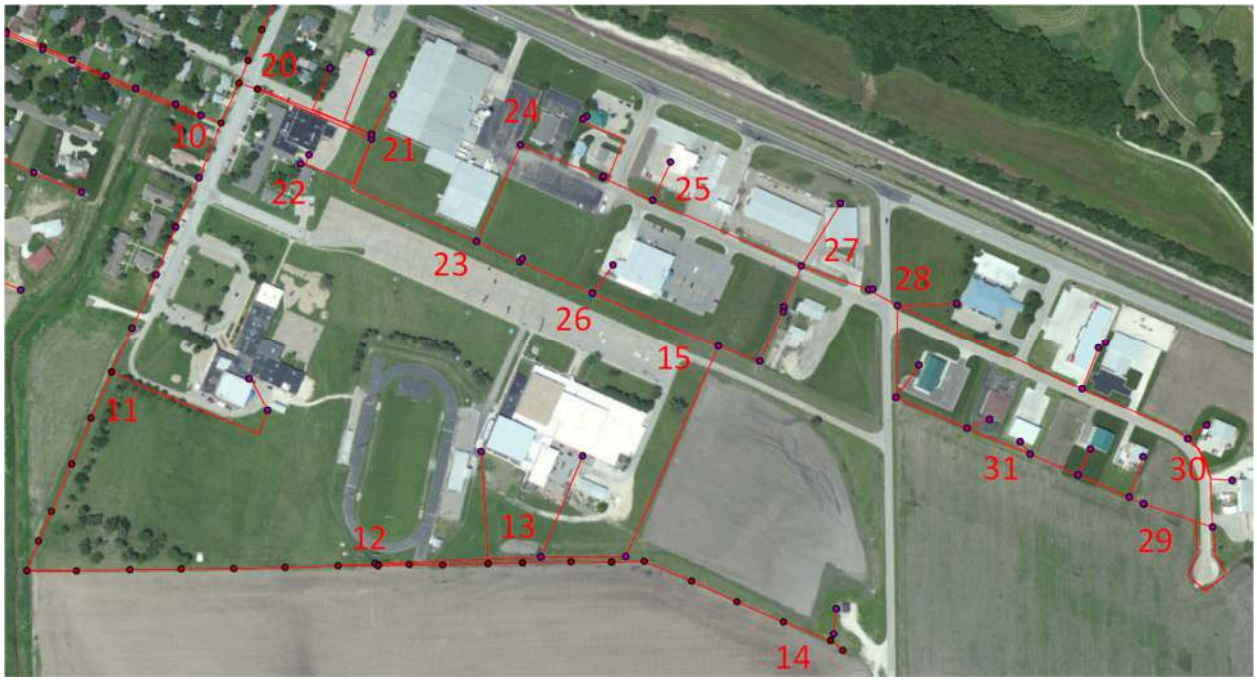
Make normally open point. Cables are energized from two different sources, 30 and 31.

Point 30: Project Year 5 $ 1,500

Install fault indicators on cables east, and south of this pedestal. Normal Power source is from the west.

Point 31: Project Year 5 $ 1,500

Install fault indicators on cables north and east of this pedestal. Normal Power source is from the west.



Central Town improvements

These projects create tie points between the NE circuit, South Circuit and the Industrial Circuit. It will replace 1200' of conductor that is in poor condition and has limited ampacity. This coupled with the substation project will allow either the entire north or south bus in the substation to be taken out of service for maintenance without an outage. In the event of major damage to either bus the City load can be carried by the other bus until repairs are made. Then the system can be put back to normal conditions without a customer outage.

Point 40: Project Year 4 $ 4,000

Reconductor 1 span, 75', to 4/0 ACSR. By reconductoring this will allow full capacity throughout the year.

Point 41: Project Year 4 $ 40,000

Reconductor 11 spans, 975', to 4/0 ACSR. By reconductoring this will allow full capacity throughout the year.

Point 42: Project Year 2 $ 15,000

Install new double deadend pole and goab switch. Install jumpers on pole NE corner of 7th and mission. This will Create a tie point between NE and South circuits.

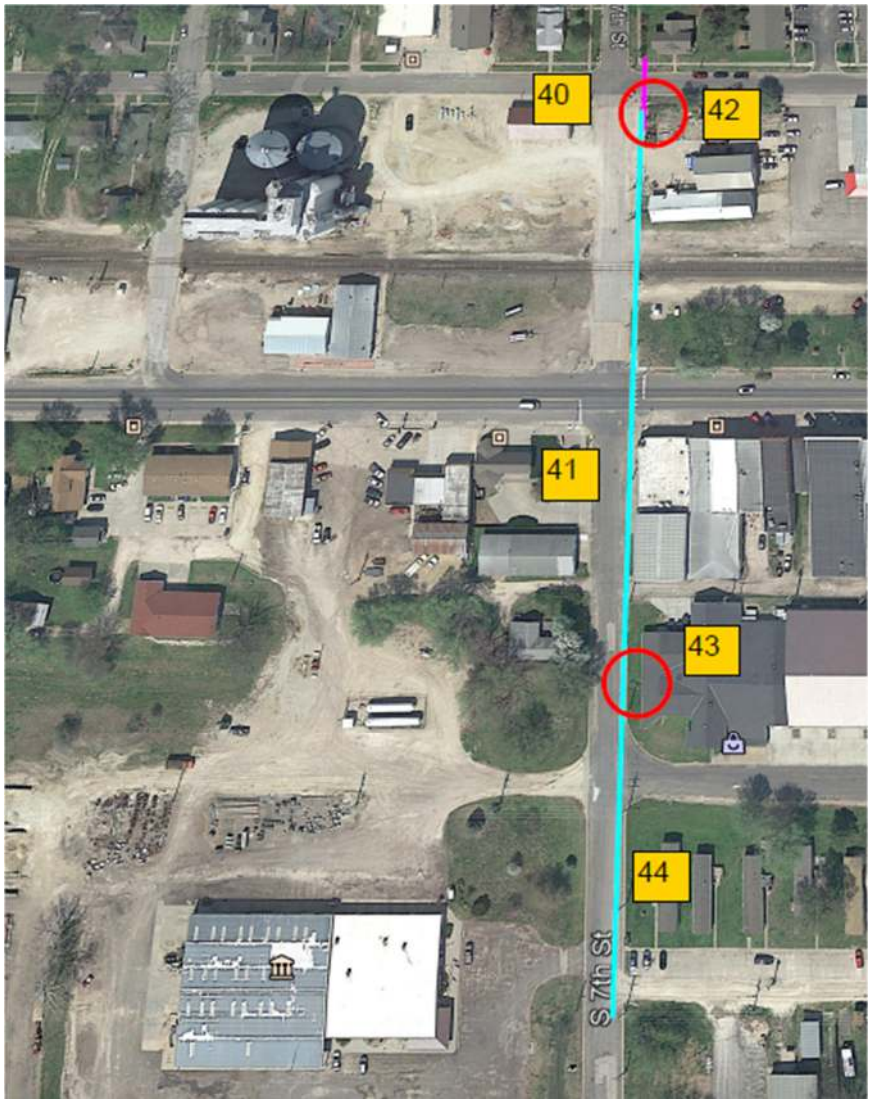
Point 43: Project Year 2 $ 5,000

Install jumpers on pole to complete tie between South and Industrial circuits.

Point 44: Project Year 1 $ 1,500

Install OH fault indicators on both South and Industrial circuits just north of the alley across the street from City Hall.

This will become the first location to check in the event of a lockout of the Industrial or South circuit. circuits. No fault indication here will mean the fault is back towards the substation. If a fault is indicated the appropriate GOAB(s) north of City Hall can be opened to isolate the faulted section of line. Then the circuit breaker can be closed in the substation restoring power to part of the circuit while troubleshooting and repairs continue.


40
42
41
43
44
S 7th St

Northside Town improvements

These projects provid a number of important improvements to the north side of the City. This creates two tie points between the NE and NW circuits. It replaces around 3200' of conductor that is in poor condition and is difficult to repair in poor weather conditions. It allows for two feeds to the new church on 2nd street and the water tower.

Point 50: Project Year 1 $ 27,500

Install 2 poles and 200' 1/0 overhead primary. Install underground riser with 3 phase sectionalizers and feed east across N 2nd street to new duct bank. An alternate to this point would be to install a riser pole inline along Mt Calvary road and put the whole new circuit underground.

Point 51: Project Year 1 $ 75,000

Install 850' 1/0 URD cable in duct. Install 4 sectionalizing cabinets. The duct bank can run under or adjacent to walking path. Fault indicators should be installed at least the halfway point on this underground section. Points 50 and 51 can be timed to support the new service to the church. This cost does not include any costs for a transformer or power cables to feed the church.

Point 52: Project Year 3 $ 90,000

Reconductor 920' 3 phase overhead 2/0 ACSR. Several poles will need to be replaced. This is on the NW circuit.

Point 53: Project Year 2 $ 15,000

Install new double deadend pole and goab switch. This will Create a tie point between NE and NW circuits.

Point 54: Project Year 3 $ 90,000

Reconductor 940' 3 phase overhead 2/0 ACSR. Several poles will need to be replaced. This is on the NE circuit.

Point 55: Project Year 3 $ 130,000

reconductor 1200' 3 phase overhead 2/0 ACSR. Several poles will need to be replaced. This is on the NE circuit.

Point 56: Project Year 5 $ 55,000

Reconductor 940’ 3 phase overhead 2/0 ACSR Several poles will need to be replaced. This is on the NE circuit. Install underground riser with 3 phase sectionalizers and feed east across N 2nd street to new duct bank.

Point 57: Project Year 5 $ 75,000

Install 850’ 1/0 URD cable in duct. Install 4 sectionalizing cabinets. The duct bank can run under or adjacent to walking path. Fault indicators should be installed at least the halfway point on this underground section. This project is to complete the loop around the north end of the City.

Point 58: Project Year 5 $ 40,000

At the service point to the new church install 3 way padmount cabinet to tie circuits together and feed church loads. This project is to complete the loop around the north end of the City.


50
Mt Calvary Rd
51
58
63
Walnut St
57
Maple St
52
53
54
N 6th St
Durink St
N 5th St
56
N 7th St
Alma St
55
N 2nd St
N 3rd St