

October 13, 2019

Mayor and City Council

Part I: Overview of Financial Consequences

Prior majority voter approved planning for the Mill Creek Electrical Substation and connecting transmission line to Perche Creek Electrical Substation, positioned the city to meet needed redundancy conditions, load growth in the southwest and transmission authority responsibilities throughout the city to name just a few benefits. This last electrical transmission leg was well engineered to develop a full loop when the Grindstone Electrical Substation was completed. The planning started upon the completion of the Grindstone ESS which created the connecting 161 Kv transmission line from the north and east into the Grindstone ESS.

The prior completed electrical infrastructure (161 Kv/ 69Kv TL, Grindstone ESS) is being underutilized since it was put in place to continue west on Grindstone to the growing southwest Columbia and the Perche Creek ESS. By not being fully utilized, the ratepayers money is being wasted (\$ millions?).

The city's electrical ratepayers have been paying increased electrical rates since June, 2015 (over 4 years) with the expectation that they would be afforded the improvement they voted for (68% approval). The completion of the resulting project would position the city to be ahead of the game for many years into the future. The city has struggled to keep pace with needed infrastructure city wide (new/replacement) (water (water treatment plant derated from 32 MGD to 24 MGD), sewer, transit, solid waste, etc.).

I have gone back and checked the financial projections made in the spring/summer of 2015. From information provided by the city to me, the increased electric revenue needed was approximately \pm \$2,650,000 per year (refer to the bond repayment schedule) to pay the principal and interest annually on the 2015 bonds issued. The electric revenue projections from the city memo dated June 4, 2015 for a 3% electric rate increase for bond payments only would equate to approximately \pm \$3,750,000 per year. By not going back to the financial projections when the project was put on hold, it is very clear that the city has been overcharging at least approximately \pm \$1,000,000 per year since 2015. Please refer to the attached spreadsheet showing the approximate accumulated overcharge that has been accruing to approximately \pm \$4,600,000 and continues to accrue every month. Additionally, the overcharge has been compounded for each time the city has increased electric rates since 2015. When computing the actual electrical revenue needed, the electric rates should have been increased only 2% but who knew that the project would be put on hold. The oversight must be corrected immediately with no clear path forward for a project. This overcharge is one reason that the unrestricted cash reserves have increased during this time period in the W&L Department (Electrical) and is being questioned by the Mayor and others. See attached unaudited Balance Sheet for the Electrical Department for Assets - Current Assets -

"Cash and Cash Equivalents for the period ending August 31, 2019 with a balance of \$36,954,621" that demonstrates that the city has unrestricted ^{CASH} reserve funds to repay the overcharge. Two actions need to happen immediately to rectify the situation. First, refund/credit the \pm \$4,600,000 overcharge and decrease the electrical rates by 1%. If the Phase 2 bonds are ever issued, recalculate the percent of new revenue required for these bonds and change the electrical rates corresponding.

The city keeps spending hundreds of thousands of dollars for additional reports that do not bring any new useful information to support any king of reasonable alternative for a long term answer for the city (Ameren Report, BM Report, Quanta Report, etc.). The irony of the situation lies with the W&L Department staff. They have worked there for years, know the system, have the data, have the model but unwilling to express their professional opinion to know what is best for their ratepayers and electrical system they operate 24/7. They always push it off to another consultant. Mr. Karl Skala said it the best in January of 2016, "There is no compelling reason to decide any differently than what we have approved". Please refer to the WLAB unanimous decision conveyed in the letter dated September 18, 2016 with multiple supporting documentation. This letter has gone unanswered by the Mayor and Council.

With a substantial portion of the southwest electric service area on a radial feed, we need to be mindful of those ratepayers that have severe health conditions that rely on 100% electricity availability to survive daily or rely on an elevator. I am glad that I do not have those responsibilities to carry this electric burden daily until such time that something is put in place to protect the public's safety and welfare. Murphy's Law has more variables than can be accounted for and will raise its ugly head in due time to cause suffering.

Part II: Capacity of Perche Creek Substation

Who authored this report and was it supervised by one of the W&L Department's licensed Missouri Professional Engineers? If there are follow up questions we will need to know who to contact.

A simple reading of the report titled "Capacity of Perche Creek Substation" would give the impression that "existing substation capacity should be adequate for up to 10 years."

This is accomplished by redirecting the discussion to the "system" rather than focusing on Perche Creek Substation. It is generally known that customer growth rate and load forecasts have never been tracked at the substation level and is a totally different issue. The report can be casuistical because recent years were compared to the last system peak year when the difference in temperature isn't mentioned (105 degrees for historic peak was mentioned but the comparative temperature of 97 degrees for Quanta Report (Executive Summary attached) was not).

The original issue is that Perche Creek Substation is **connected by only one transmission path**, and during recent years when temperatures reached 97 degrees, both transformers were loaded at 80% of their capacity. Loads cannot be switched to the other transformers if a failure occurs.

Currently, Westbury Village is under construction and all the load will be added to Perche Creek Substation. In addition, it should not be assumed that summer temperatures will remain at or below 97 degrees.

Historic Columbia temperature records - 94 days of 100 degrees or higher; 45 days of 105 degrees or higher; 14 days of 110 degrees or higher. Looking forward, the Climate Adaptation Plan projects higher temperatures and the "electrification" of current use of natural gas and motor fuels.

The following suggested improvements to expand the report should be considered:

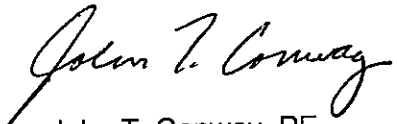
Look at Perche Creek Substation only:

1. Collect annual customer growth information for each substation transformer at Perche Creek back to the last system peak (2011). This should be possible because the information is computerized - service installation date; distribution transformer and circuit information.
2. Based on Westbury Village full development plans, estimate customer and load information.
3. Using substation level load and customer data, forecast substation transformer loading under record temperature scenarios.

Other missing information that Council should expect in the report that isn't included:

1. Age of transformers at Perche Creek Substations.
2. Last time that a substation transformer failed...date and under what level of load.
3. What level of loading is present in the "adjacent" substations that are mentioned as possible if a Perche Creek transformer fails? This should be at the circuit level to determine if transfer is actually possible or if a new "express" feeder would have to be installed to complete the transfer.
4. Estimate how long black-outs (report uses "load shedding" terminology) would be necessary to replace a substation transformer or install an express feeder, if there was a failure at Perche Creek. How long would it take to replace the Transformer(s)?

Ratepayers, particularly those along Scott Blvd, need the expanded information to assess their vulnerability than what is in the report sent to Council. More data transparency is needed on this critical issue.



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Attachments

1. Quanta Report - Executive Summary
2. Spreadsheet for Electric Overcharge
3. Electrical Department Balance Sheet for the period ending August 31, 2019



EXECUTIVE SUMMARY

The results of the substation capacity adequacy assessment indicate that the existing substation capacity should be adequate for approximately five years. This assessment is based on the assumptions that all of the substations would experience up to 5% annual compound non-coincident load growth and that feeder to feeder load transfers could be performed in a timely manner to avoid N-1 transformer loading above nameplate ratings.

Substation transformer capacity adequacy was evaluated based on present and forecast substation load, substation N-1 transformer capacity, and feeder to feeder load transfers. Load transfers to adjacent substations were limited by feeder thermal ratings using existing CWLD circuit capacity standards, voltage limits, and transformer nameplate capacity. Normally open bus tie breakers were not closed to increase the transformer load carrying capability in adjacent substations. Compound annual substation load growth of 2-5% over five and ten years was considered to evaluate future substation transformer capacity adequacy.

A sustained non-coincident compound load growth at these substations has been used as a planning tool to identify substations which may have future capacity adequacy issues. Using a 3% annual load growth assumption, the ten year out results indicate that the Perche Creek, Harmony Branch, and Hinkson Creek substations are the most likely candidates to require some form of transformer capacity additions to provide loading relief. These three stations would need to utilize a loss of life rating above nameplate to avoid curtailing loads for a transformer outage to address the forecast load growth.

Both the five year and ten year assessments should be refined at such time as improved substation load forecasts are available. In addition, the planned feeder improvements associated with Harmony T3 should be included in future evaluations.

The primary risk in assessing the substation capacity adequacy is associated with the ability to transfer loads between adjacent substations in a timely manner. This risk is mitigated by the likelihood of a transformer failure occurring at or near peak conditions and the thermal time constant of the affected transformers. Loads below peak values and the time delay before the affected transformers reach their maximum allowed top oil temperature will provide a buffer to allow for the implementation of pre-defined feeder to feeder switching solutions.

The primary use of a substation capacity adequacy assessment which utilizes feeder to feeder transfers and loss of life ratings (as acceptable) is to provide a means of identifying the need for substation capacity additions and provide a mechanism to defer these capacity additions subject to risk tolerance. The results of this analysis indicate that, based on actual load forecasts, additional substation capacity should be included in future plans to relieve Perche Creek, Harmony Branch, and Hinkson Creek Substations. The timing and method for providing this additional substation capacity will be dependent on local development, actual load growth, and the City's risk tolerance to rely on feeder to feeder load transfers and the possible exposure to some transformer loss of life. The details of such a capacity addition plan will develop in conjunction with a detailed substation/feeder load forecast



The distribution system study started by creating power flow models of all distribution circuits based on provided GIS graphical and equipment data. Once circuits were modeled load allocations were performed considering provided non-coincidental circuit peak demand. Feeder egress thermal loading was determined based on CWLD underground system construction standards, ambient temperature, cable's type and cross-section. The study also assessed the distribution circuits' voltage and thermal loading performance for current system conditions. Furthermore load growth was estimated based on provided system load forecast data. The growth rate was applied to the circuit power flow model to re-assesses voltage and thermal loading performance. The steady state studies were performed using CymeDist tool.

The ampacity study results, which calculate the feeder egress capacity, indicate that the circuit's capacity can be increased in about 1 MVA from currently assumed values. The study also calculates emergency capacity values which add another 1 MVA capacity that could be taken into account during emergency conditions.

The distribution system study results show the distribution circuits are suitable to handle the load even if the load growth reaches 5.62% of the current peak demand values. No ANSI standard violations or thermal loading issues were recorded with the exception of Circuit PC 221 that requires the installation of voltage regulation device in a short term to correct low voltage risk. The implementation of voltage regulation mitigation will allow the PC 221 circuit to service the load even with the forecasted 5.62% load growth.

The city's distribution planning criteria considers the use of fewer cables and conductor types (fewer number of cross-sections) to enhance load transfer capability via distribution feeders, while maintaining voltage profile within ANSI standards.

Potential Projects to Increase Reliability

- Monitor transformer capacity adequacy at the Perche Creek, Harmony Branch and Hinkson Creek Substations based on individual substation load growth
- Include a Bus Tie for the Harmony Branch 3 Transformer and Switchgear
- Add Voltage regulation to the PC 221 feeder.

Additional Recommended Actions to gather more information

- Perform a spatial load forecast study at substation level that attempts to identify areas of the city where load growth is likely to occur
- Perform a loss of life study on the substation transformers in order to better understand acceptable overload conditions

WATER AND ELECTRIC UTILITY FUND
BALANCE SHEET
ESTIMATED PRELIMINARY DRAFT
CREATED FOR INTERNAL MANAGEMENT USE ONLY
AUGUST 31ST, 2019

ASSETS	WATER	ELECTRIC	TOTAL
CURRENT ASSETS:			
Cash and Cash Equivalents	\$ 8,025,837	\$ 36,954,621	\$ 44,980,458
Inventory	\$ 1,190,981	\$ 5,302,311	\$ 6,493,292
GASB 31 Cash Adjustment Balance	(1,833,843)	(877,011)	(2,710,854)
Accounts Receivable	3,334,984	18,846,179	22,181,163
Grants Receivable	-	-	-
Accrued Interest	67,142	121,727	188,869
Due from Other Funds	-	-	-
Advances to other Funds	-	-	-
Loans Receivable from Other Funds	-	82,087	82,087
Prepaid Expenses	-	6,340	6,340
Total Current Assets	<u>10,785,101</u>	<u>60,436,254</u>	<u>71,221,355</u>
RESTRICTED ASSETS:			
Cash for Bond Debt Service and Interest and Cash with Fiscal Agents	4,313,350	8,768,205	13,081,555
Bond Cash for Capital Projects Account	16,889,125	14,929,511	31,818,636
Enterprise Cash Restricted for Capital Projects	9,073,801	11,252,090	20,325,891
Replacement and Renewal Account	450,000	1,050,000	1,500,000
Debt Service Reserve Account	6,092,637	8,569,582	14,662,219
Customer Security and Escrow Deposits	1,272,024	3,958,469	5,230,493
Total Restricted Assets	<u>38,090,937</u>	<u>48,527,857</u>	<u>86,618,794</u>
OTHER ASSETS:			
Net Pension Asset	-	-	-
Net OPEB Asset	129,321	240,167	369,488
Unamortized Costs	-	-	-
Investments	-	-	-
Loans Receivable from Other Funds - Noncurrent	-	196,096	196,096
Total Other Assets	<u>129,321</u>	<u>436,263</u>	<u>565,584</u>
FIXED ASSETS:			
Property, Plant, and Equipment	185,171,222	347,494,000	532,665,222
Accumulated Depreciation	(59,659,162)	(212,822,214)	(272,481,376)
Net Plant in Service	<u>125,512,060</u>	<u>134,671,786</u>	<u>260,183,846</u>
Construction in Progress	1,961,234	22,621,946	24,583,180
Net Fixed Assets	<u>127,473,294</u>	<u>157,293,732</u>	<u>284,767,026</u>
DEFERRED OUTFLOWS OF RESOURCES:			
Deferred Charge on Pension	656,637	1,304,983	1,961,620
Deferred Charge on OPEB	2,242	4,162	6,404
Deferred Charge on Refunding	267,350	7,434,777	7,702,127
Total Deferred Outflows of Resources	<u>926,229</u>	<u>8,743,922</u>	<u>9,670,151</u>
TOTAL ASSETS	<u>\$ 177,404,882</u>	<u>\$ 275,438,028</u>	<u>\$ 452,842,910</u>

Giving Back to the Community											
	Past					Future					
	FY15(Partial FY)	FY16	FY17	FY18	FY19(Est.)	FY20(Est.)	FY21(Est.)	FY22(Est.)			
Principal and Interest Payment *	\$866,375	\$2,705,148	\$2,709,425	\$2,708,838	\$2,708,838	\$2,708,838	\$2,708,838	\$2,708,838	\$2,708,838	\$2,708,838	\$2,708,838
Approximate Electric Revenue Base for Electric Rate Increase**	\$1,344,000	\$3,750,000	\$125,000,000	\$125,000,000	\$125,000,000	\$125,000,000	\$125,000,000	\$125,000,000	\$125,000,000	\$125,000,000	\$125,000,000
3% of prior FY Electric Revenue***	\$477,625	\$1,044,852	\$1,040,575	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162
Difference between A and B	\$477,625	\$1,044,852	\$1,040,575	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162
Electric Revenue collected over Scheduled P+I Payment	\$477,625	\$1,044,852	\$1,040,575	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162	\$1,041,162
Cumulative Overcharge of Electric Revenue	\$477,625	\$1,522,477	\$2,563,052	\$3,604,214	\$4,645,376	\$5,686,538	\$6,727,700	\$7,768,862			

Electric Rates increased 3% in June, 2015 for Electric Bond Issue
Please refer to the Balance Sheet dated March, 2019 for balance of Cash and Cash Equivalents for Electric Department
Under "Assets" - "Current Assets" - Cash and Cash Equivalents available" in the approximate amount of ~~\$35,000~~ ^{\$36,954,621} to repay the overcharge

*See Attached Bond Repayment Schedule

**See Attached City Budget Document

***See Attached City Budget Document raising Electric Rates 3% in June, 2015