



Operations Monitoring Report

Third Quarter FY23

Prepared by:

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April 28, 2023

I. Executive Summary

A review of the fiscal year 2023 (FY23) Third Quarter performance and contract obligations between Constellation Energy Solutions, LLC. (CES) and the Metropolitan Government of Nashville and Davidson County (Metro) is presented in this report by Thermal Engineering Group, Inc. (TEG). The status of the available funds for all active capital construction and repair and improvement projects is also presented.

During the Third Quarter FY23, CES improved the performance of the EGF resulting in consistently meeting all of the chilled water guarantees and the steam-electric guarantee for the quarter. CES also met the steam-fuel guarantee for two months of the quarter. CES is required to meet this performance criteria each month in accordance with Paragraph 8.d of Amendment 2 of the Amended and Restated DES Management Agreement (ARMA) between Metro and CES and Section 18 of the ARMA. TEG continues to monitor CES's operations.

Metro asked CES during the First Quarter FY22 for a plan to bring the operation of the EGF (Energy Generating Facility) into compliance with the new performance guarantees. CES began implementing some of the recommendations presented in the report from their engineer during the Second and Third Quarters FY23. The operational changes made by CES have resulted in additional energy savings and improved performance.

For the Third Quarter FY23, the chilled water sales increased 14.1% over the previous Third Quarter (FY22). The chilled water sendout also increased 16.4% over the previous Third Quarter. However, the system losses also increased. The number of cooling degree days decreased 26.9%. The peak chilled water demand for the current quarter was 12,066 tons, which is 23.1% higher than the previous Third Quarter and due to unseasonably warm days.

Steam sendout for the current quarter decreased by 13.0% over the previous Third Quarter with steam sales decreasing 13.5%. This decrease came with a 26.0% decrease in heating degree days. Total steam system losses decreased 7.1% from the previous Third Quarter. The peak steam demand for the current quarter is 135,150 pounds per hour, which represents a decrease in the Third Quarter demand of approximately 9.8%. The unseasonably warmer weather has resulted in an overall decrease in steam usage for the quarter.

Work continued with the DES Capital and Repair & Improvement Projects during the Third Quarter. Repair and Improvements to the EDS continue as scheduled. Of these ongoing projects, CES has an active role in six with three nearing completion. As noted in prior quarterly monitoring reports, the postponement or deferral of these items will result in an increase in maintenance costs to the DES and could impact the delivery of steam and chilled water. Projects DES206 and DES207 have been added. Projects DES139, DES143, DES177, DES188, DES197, DES199 and DES204 were closed during the quarter.

The current fiscal year system operating costs to date are \$15,206,849. This value represents approximately 74.0% of the total budgeted operating cost for FY23. The customer revenues from the sales of steam and chilled water for FY23 are \$15,306,849 (75.9% of budgeted amount) which



includes the annual true-up amount for FY22. The Metro funding amount transferred to date for FY23 is \$280,725 (75.0% of budget). The actual MFA can only be estimated due to outstanding invoices as of the date of this report and an audit of the customer revenues has not been performed which will be included in the FY23 True-up analysis.

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II. Energy Distribution Sales and Performance

A. Chilled Water

This section of the report discusses and presents performance information regarding the operation of the EGF for the periods described. Charts and tabular data are also presented to provide a more detailed description of the actual EGF performance.

1. Sales and Sendout

A comparison for the Third Quarter chilled water sales is shown in Figure 1. This data reflects a 14.1% increase in sales for the current quarter over the same quarter of the previous fiscal year.

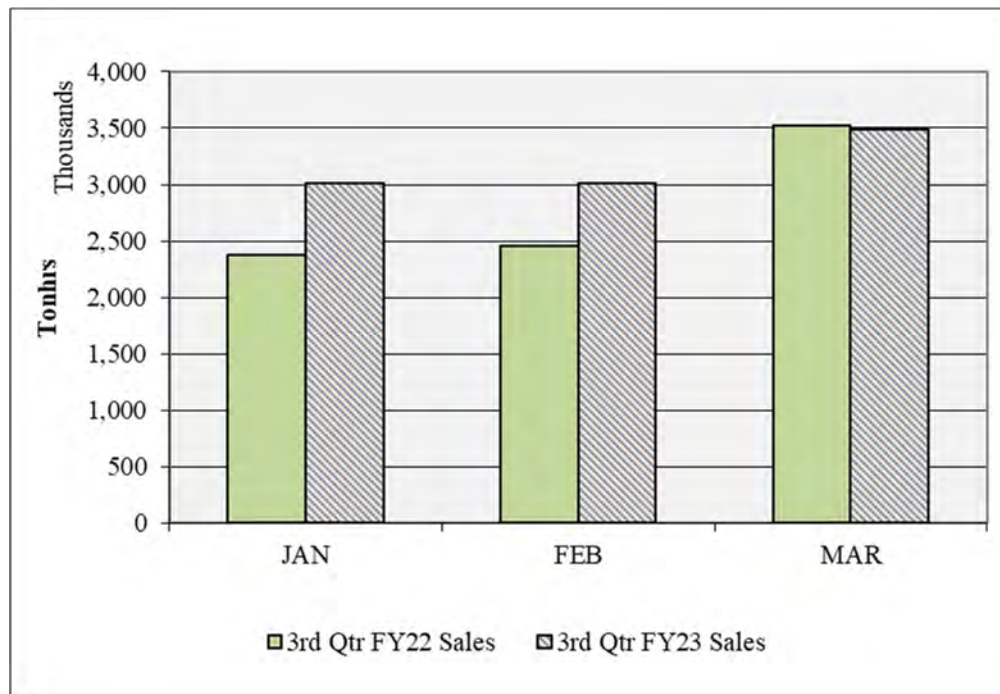


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 12,066 tons, which represents a 23.1% increase over the previous Third Quarter. The number of cooling degree days were 26.9% lower in FY23 than in FY22 due to warmer weather than normal in January and February.

Figure 2 shows the chilled water sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in tonhrs per month between the recorded sendout and sales values and represent the total energy loss for chilled water in the EDS. The number of cooling degree days per month are also tracked for comparison.

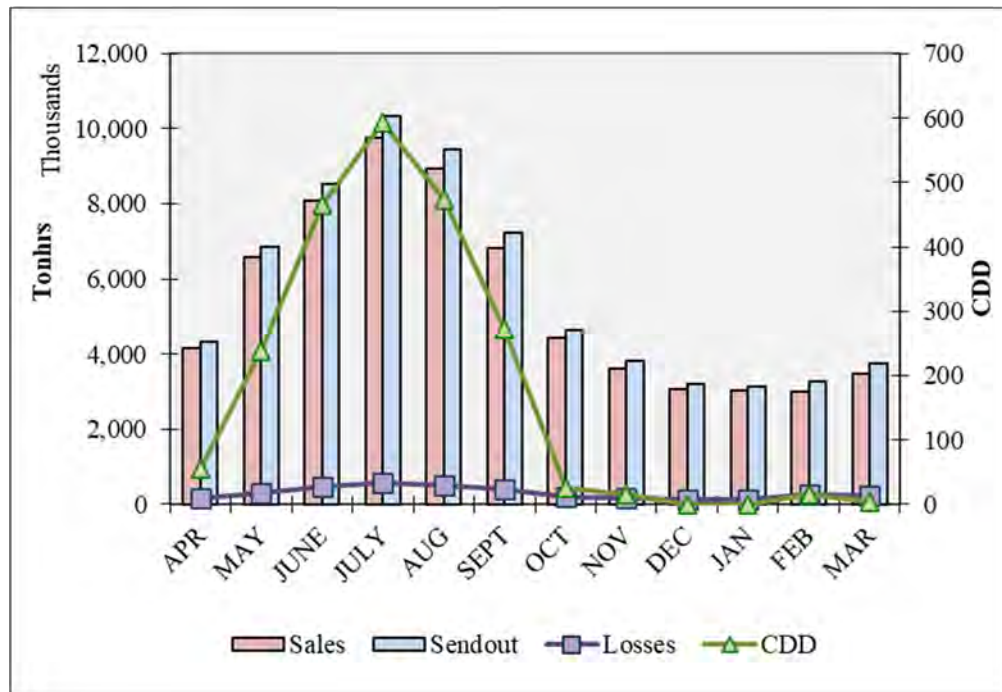


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

A comparison of the total chilled water energy losses in the EDS for the Third Quarter is shown in Figure 3. These losses are the difference in chilled water sendout and sales.

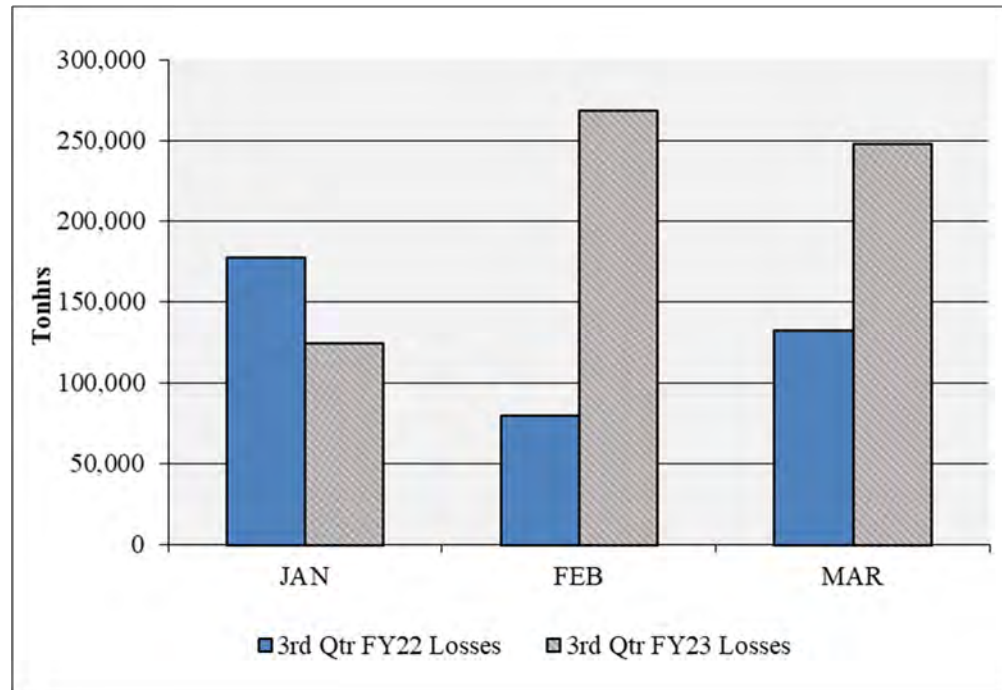


Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by 4.0% over the previous Third Quarter, but the average daily make-up amounts have slowly been increasing over the past year. TEG and CES suspect another leak in 5th Ave N, but previous efforts to locate the actual source of the leak have been unsuccessful. TEG and CES are continuing to monitor the EDS make-up and investigate any potential leaks. If the location of an additional leak is discovered, DES will address the issue promptly.

The make-up to the cooling towers increased 20.4% over the previous Third Quarter. The water usage in the cooling towers is typically proportional to the production of chilled water and should vary with chilled water sales, thus the increase in cooling tower make-up would be expected with the increase in sales over the previous Third Quarter. The total chiller plant water use increased 17.6% over the Third Quarter FY22. The overall city water make-up comparison for the chilled water system Third Quarter is shown in Figure 4.

The number of cycles of concentration in the condensing water circuit increased 40.0%. CES began reporting a new metric associated with the cooling tower blowdown in March. This metric may assist them in determining if operational

changes to the condensing water system have resulted in an overall reduction in chiller plant water usage. In future reports, the metric will be presented in Table 1 and discussed in detail.

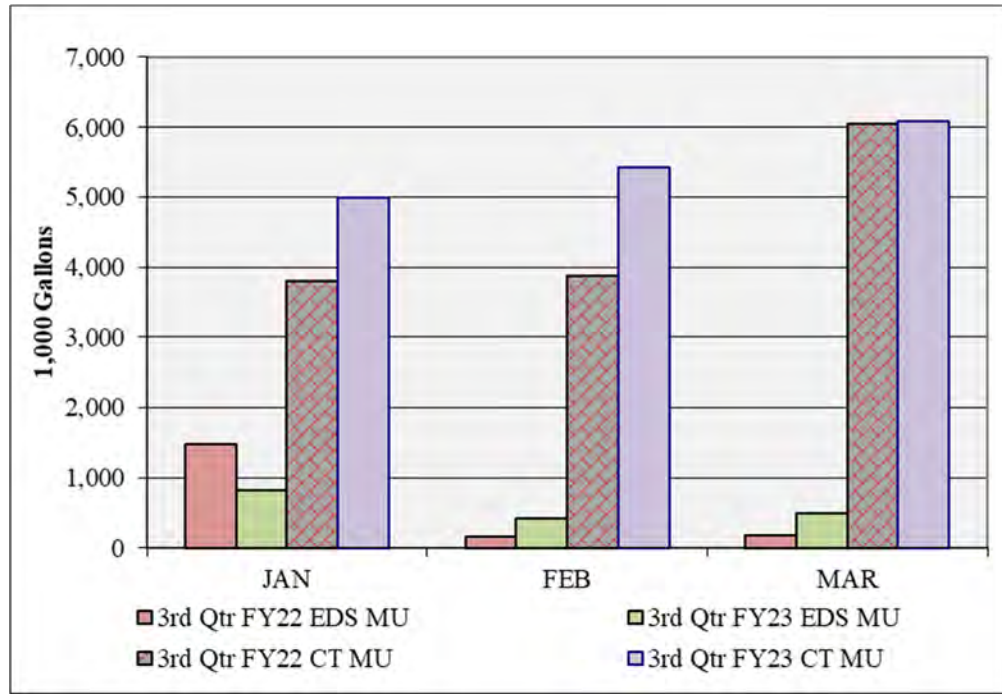


Figure 4. Chilled Water System City Water Usage Comparison

3. Performance

The performance of the chilled water portion of the EGF is presented in the following two charts, Figures 5 and 6, for the previous twelve months. The System Performance Guarantee levels as described in Amendment 2 of the ARMA were consistently achieved for the chilled water system for each month of the Third Quarter. The chilled water electric metric has also been met for the previous twelve months. The efforts made by CES, and the repair of the chilled water leaks have resulted in an improvement of these metrics.

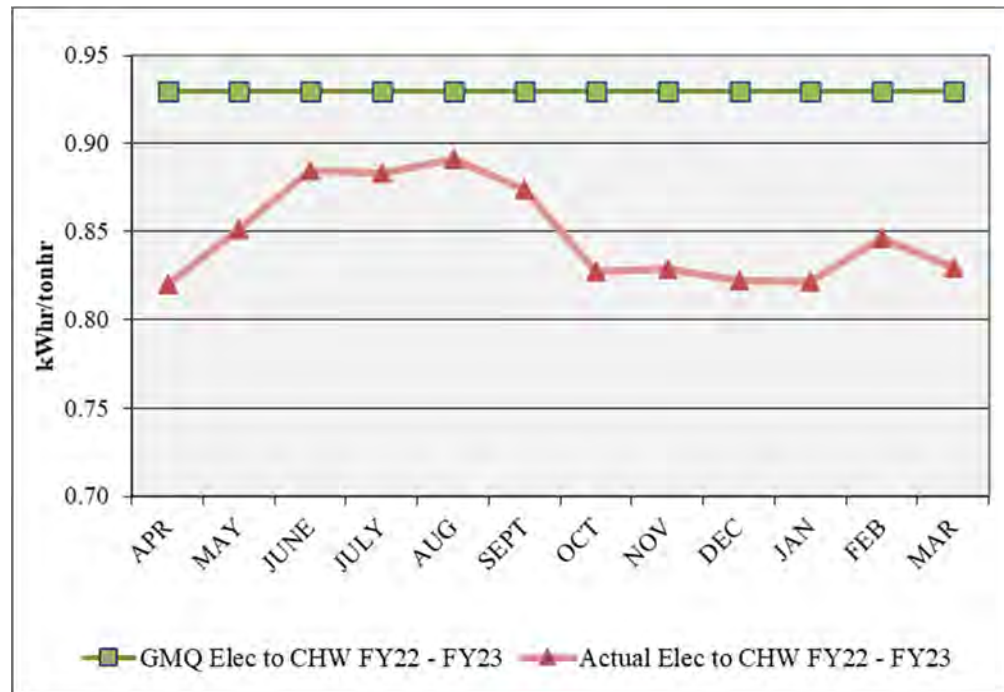


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

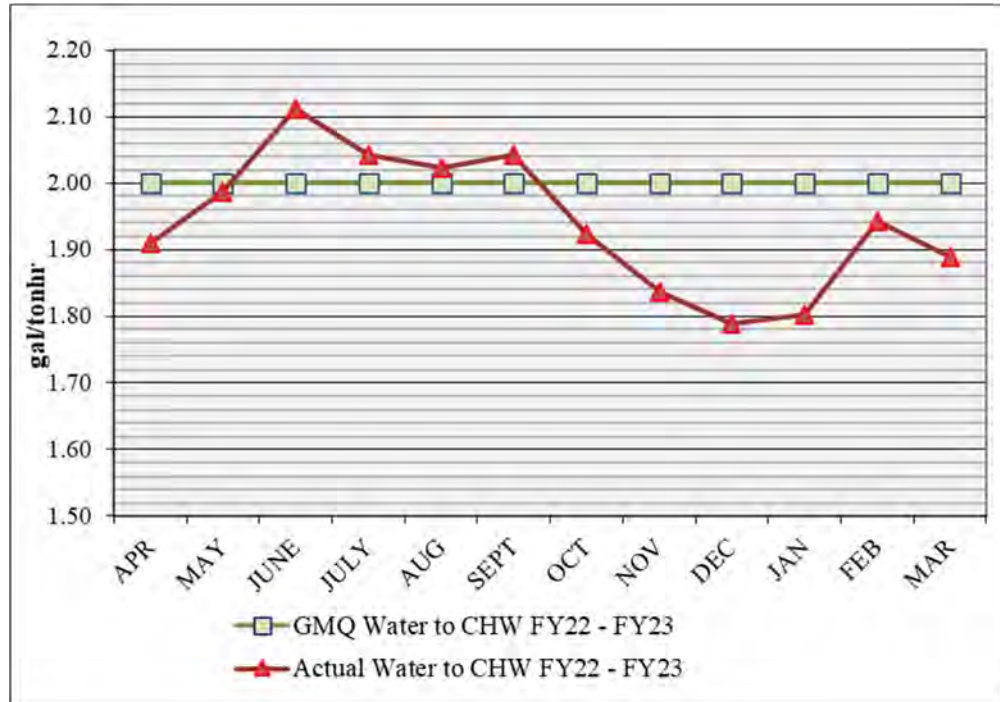


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 0.93 kWhr per tonhr for the current quarter on average with no excursions reported for the current fiscal year. The electric usage per unit of sales increased 2.4% over the previous Third Quarter. CES and TEG continue to monitor the improvements created by CES’s operational changes.

The total consumption of city water for the chiller plant for the current quarter has increased over the previous Third Quarter due largely to an increase in chilled water sales. The water conversion factor for the chiller plant decreased by approximately 7.6% (on average) over the Third Quarter FY23.

B. Steam

1. Sales and Sendout

The steam sendout decreased by approximately 13.0% over the previous Third Quarter (FY22), and the sales increased by approximately 13.5%. The Quarter experienced a 26.1% decrease in the number of heating degree days. The steam system losses decreased 7.1%, and the relative amount of condensate return decreased 3.4% during the quarter due to the dumping of a portion of the condensate return from some customer buildings due to hardness and iron. A comparison for the Third Quarter steam sales is shown in Figure 7.

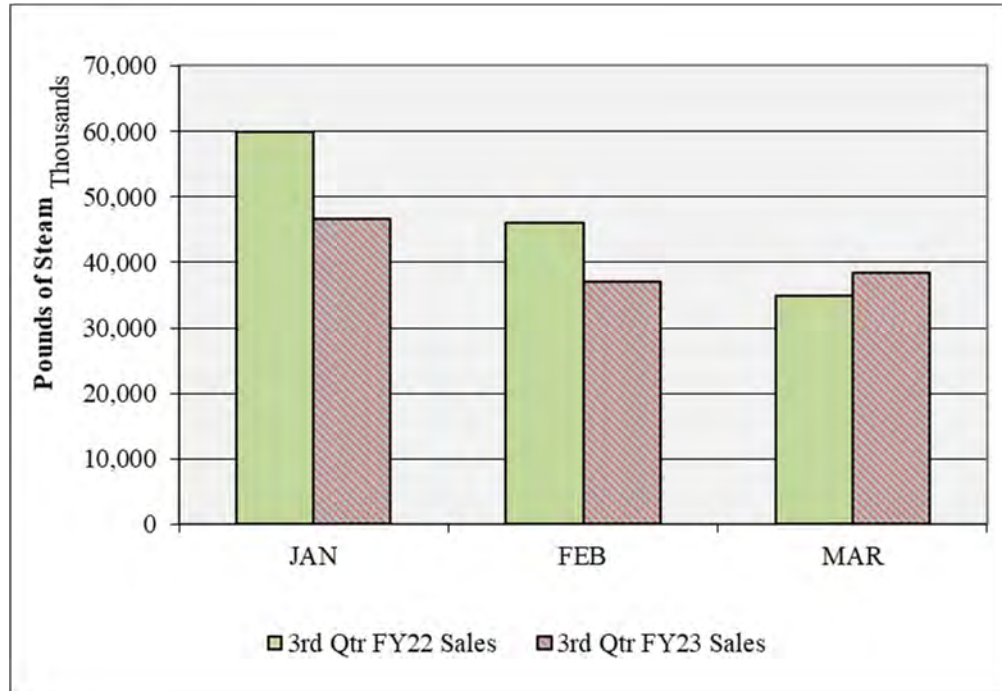


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 135,150 pph, which reflects a 9.8% decrease in the peak steam production over the previous Third Quarter. Figure 8 shows the steam sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in pounds per month between the recorded sendout and sales values and represent the total mass loss in the EDS between the EGF and the customer meters.

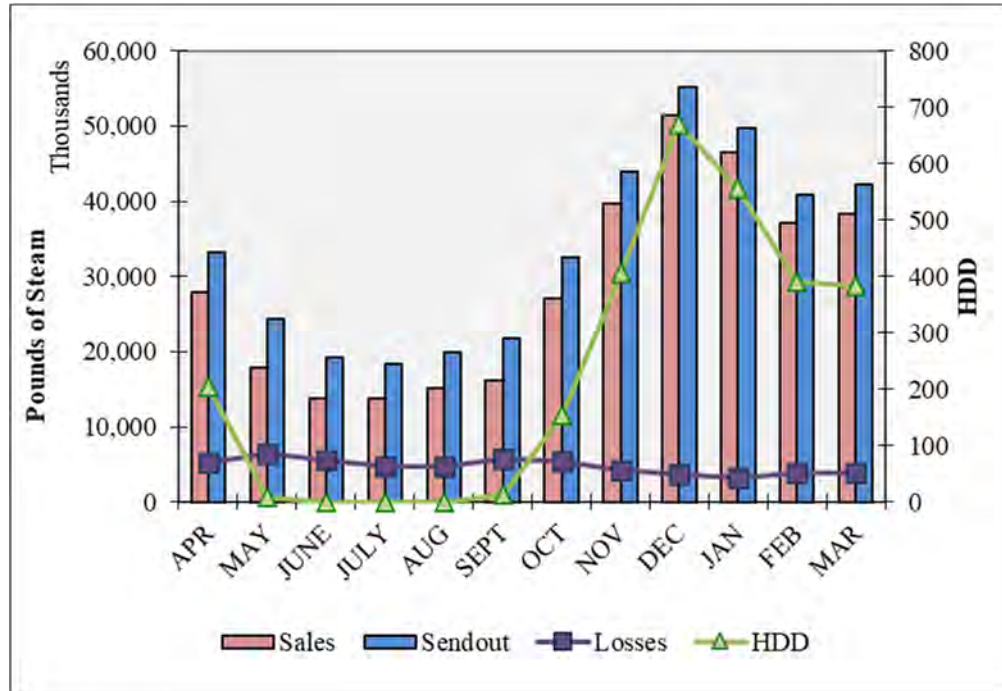


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

A comparison of the total steam mass losses in the EDS for the Third Quarter is shown in Figure 9. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty traps, steam leaks or meter error could also be a contributing cause of these losses. Whenever steam sales decrease from the previous quarter, the percentage of system losses can be expected to increase since most of these losses are based on a near constant heat loss of the system.

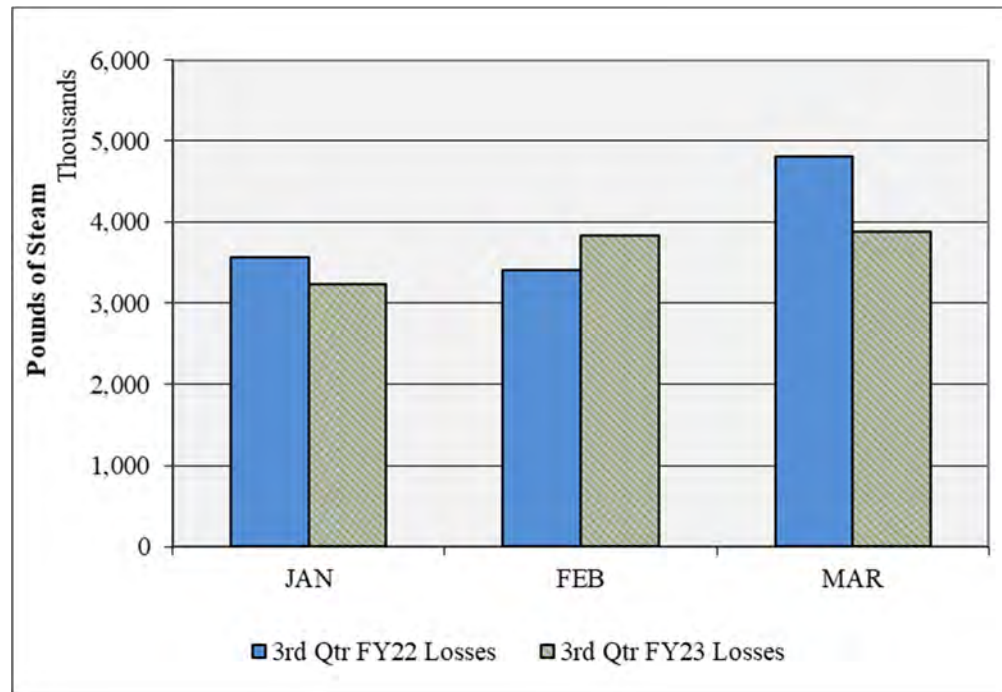


Figure 9. Steam System Losses

The amount of city water make-up (MU) to the steam system consists of the loss in mass between the EGF and the customers, in the condensate return from the customers to the EGF and losses at the EGF. The corresponding data for steam system make-up is shown in the comparison of Third Quarter data in Figure 10.

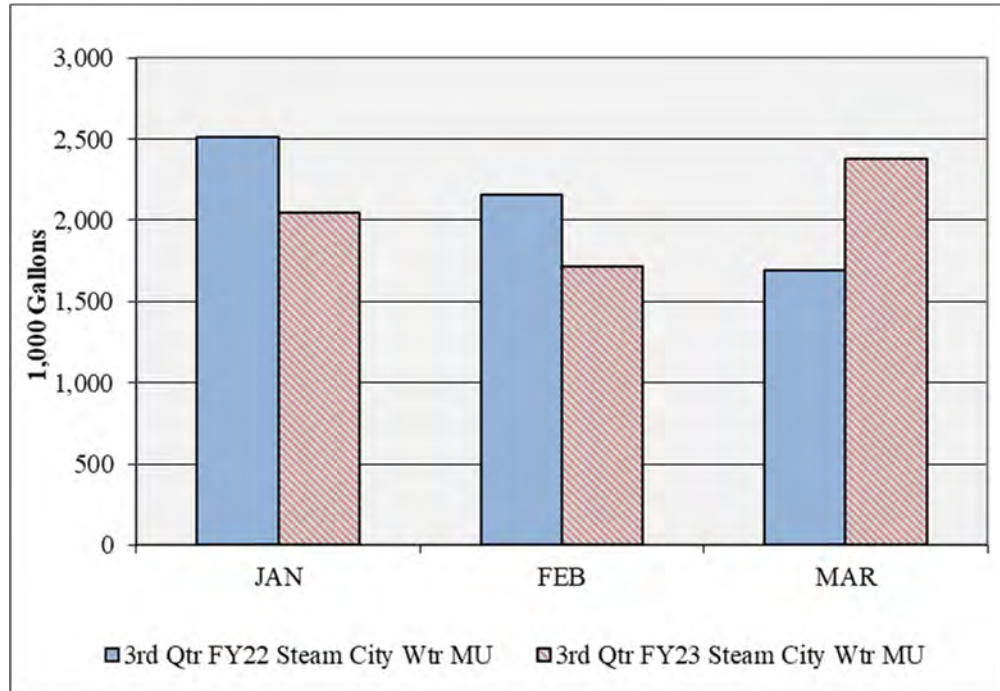


Figure 10. Steam System City Water Make-up Comparison

3. Performance

The performance of the steam system of the EGF is presented in the following three charts, Figures 11, 12 and 13. The steam fuel conversion factor exceeded the guaranteed values in January 2023; however, the differences between the actual and guaranteed values were relatively small. The steam electric conversion factor was met each month of the quarter and for the previous twelve months. The steam water conversion factor exceeded the guaranteed values for each month in the quarter. TEG monitors CES’s performance regularly and will continue to report any non-compliance in the EGF’s operation.

The steam plant electric consumption for the current quarter was 13.6% lower in FY23 than in FY22. The steam-electric metric decreased marginally over the same period due in part to the increased amount of sales and sendout. The monthly steam-to-electric conversion factors, along with the guaranteed values, are shown in Figure 11.

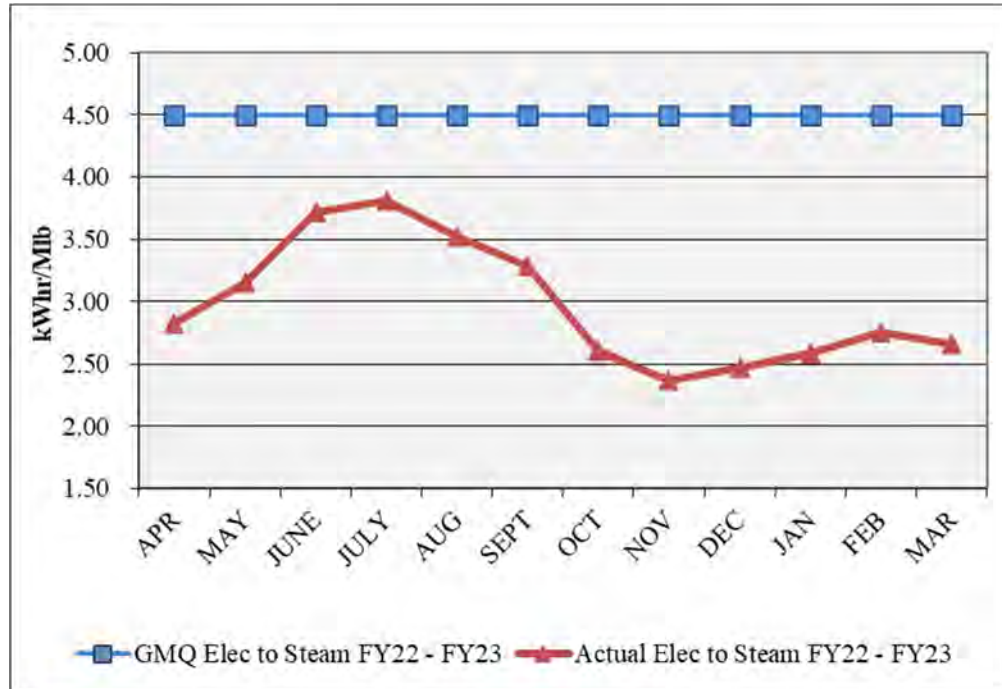


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

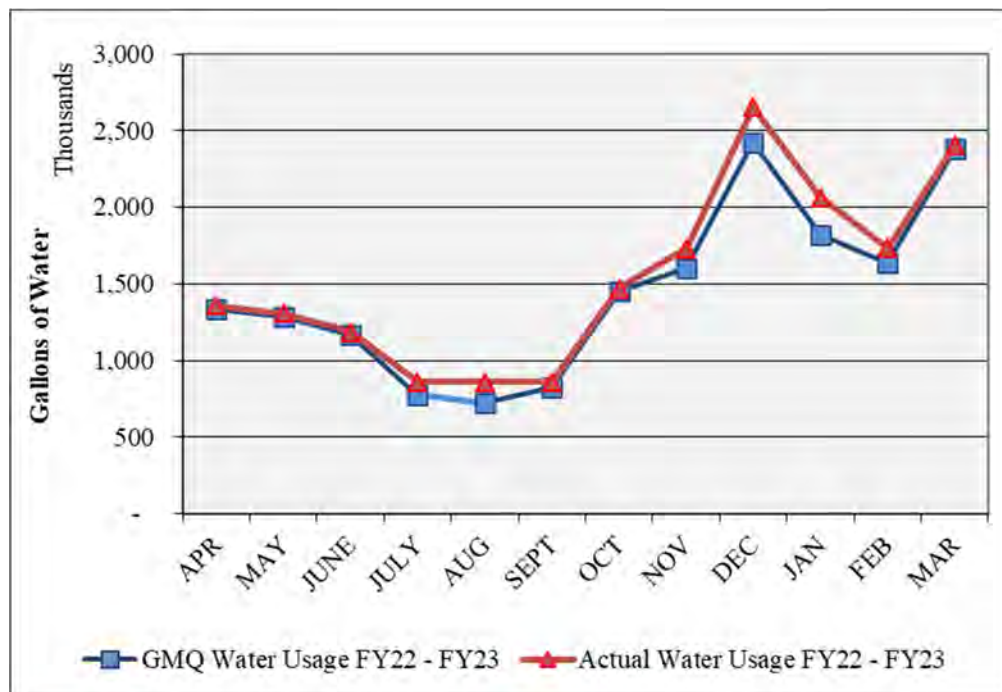


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

The water consumption for the steam plant decreased 3.5% this quarter as compared to the previous Third Quarter. Figure 12 shows the comparison between the actual and guaranteed steam-to-water usages for each month.

CES and TEG continue to monitor the performance of the EGF as CES makes efforts to improve the DES performance. However, the steam-water metric is consistently close to the guaranteed value, varying less than 7% (on average) from guarantee on average for the quarter. The guaranteed steam-water performance value is based on an equation which incorporates the amount of steam sendout and condensate return and did not change with the adoption of the new performance values in Amendment 2. CES has verified the accuracy of the meter readings and continues to review the operation.

The fuel consumption per unit of steam sendout decreased 1.8% over the previous Third Quarter. As shown in Figure 13, the performance guarantee was met in February and March. The relative amount of condensate return is shown on this graph to reflect the influence that the condensate return has on the plant efficiency. Although the performance level for this metric changed with the adoption of Amendment 2, the equation used to calculate the value relies heavily on readings from the condensate return and steam sendout meters.

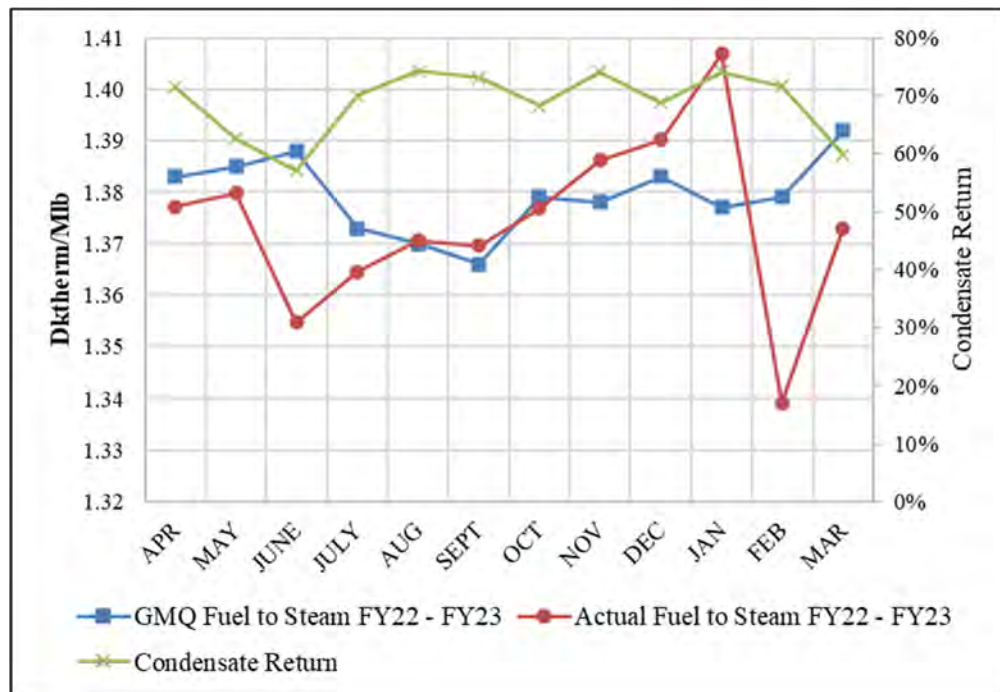


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

C. Contract Guarantee Performance

The production and sales performance for the EGF and EDS are summarized in Table 1 for the current quarter. Additional parameters, such as cooling tower blow-down and peak demands are listed in this table, as well. Table 2 presents the Third Quarter comparisons of the Guaranteed Maximum Quantities (GMQ) or System Performance Guarantees of the criteria commodities (fuel, water, and electricity).

Table 1. Third Quarter FY23 Production, Sales, and Consumption Summary

Item	Unit	Third Quarter FY23	Third Quarter FY22	*Percent Difference
	days	90	90	0.00%
Total Electric Use	kWhrs	8,246,525	7,154,909	15.26%
Chilled Water	kWhrs	7,922,749	6,780,189	16.85%
Steam	kWhrs	323,776	374,720	-13.60%
Total Water Use	kgal	24,395	21,890	11.44%
Total Chilled Water	kgal	18,253	15,525	17.57%
EDS Make-up	kgal	1,744	1,816	-3.96%
Cooling Towers	kgal	16,509	13,709	20.42%
Calc CT Evaporation	kgal	14,164	11,129	27.27%
CT Blowdown	kgal	2,345	2,580	-9.11%
Calc # Cycles		6.04	4.31	40.03%
Steam	kgal	6,142	6,365	-3.50%
Total Fuel Use	mmBTU	182,724	213,557	-14.44%
Natural Gas	mmBTU	182,692	213,548	-14.45%
Propane	mmBTU	33	8	302.44%
Condensate Return	kgal	11,215	13,348	-15.98%
	lbs	91,470,248	108,864,123	-15.98%
Avg Temp	°F	173.0	167.7	3.18%
Sendout				
Chilled Water	tonhrs	10,159,500	8,732,200	16.35%
Steam	lbs	132,864,000	152,736,000	-13.01%
Peak CHW Demand	tons	12,066	9,802	23.10%
Peak Steam Demand	lb/hr	135,150	149,750	-9.75%
CHW LF		38.98%	41.24%	-5.49%
Steam LF		45.51%	47.22%	-3.61%
Sales				
Chilled Water	tonhrs	9,519,430	8,342,705	14.10%
Steam	lbs	121,922,304	140,961,767	-13.51%
Losses				
Chilled Water	tonhrs	640,070	389,495	64.33%
Steam	lbs	10,941,696	11,774,233	-7.07%
		8.24%	7.71%	6.83%
Degree Days				
CDD		19	26	-26.92%
HDD		1,331	1,799	-26.01%

*positive percent difference values imply an increase from FY22 to FY23

Table 2. Third Quarter Performance Guarantee Comparison for Steam and Chilled Water

GMQ Calculations	Unit	Third Quarter FY23	Third Quarter FY22	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	4.50	4.50	
Electric Conversion	kWhr/Mlb	2.66	2.67	-0.22%
GMQ Plant Efficiency	Dth/Mlb	1.383	1.384	
Plant Efficiency	Dth/Mlb	1.373	1.398	-1.80%
Actual %CR		68.85%	71.28%	-3.41%
Avg CR Temp	°F	173	168	3.18%
GMQ Water Conversion	gal	5,836,647	6,186,070	
Water Conversion	gal	6,203,420	6,428,650	-3.50%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	0.930	0.930	
Electric Conversion	kWhr/tonhr	0.832	0.813	2.42%
GMQ Water Conversion	gal/tonhr	2.00	2.00	
Water Conversion	gal/tonhr	1.88	1.74	7.64%

*positive percent difference values imply an increase from FY22 to FY23

D. Operating Costs

The fixed operating costs for the DES include the management fee to CES, debt service payments on the bonds and engineering and administration costs and are charged to the Initial System Customers (ISCs) relative to their contract demand. For all non-ISCs, their fixed costs are principally based on a value established by their contracts and are not tied directly to the actual costs of the debt service or CES's management fee.

The variable costs are dependent on the amounts of steam and chilled water produced and sold to the customers. These latter costs include the utility and chemical treatment costs and are passed onto the customers directly without mark-up. A summary of the total operating costs for the fiscal year-to-date are shown in Table 3.

The revenues shown in Tables 3 and 4 reflect the charges to the customers for their respective steam and chilled water service. The difference between the total costs and revenues from the customers is the shortfall that must be covered by Metro. The shortfall exists due to the remaining unsold capacity at the EGF and the debt service for bonds to which the customers do not directly contribute.

The current fiscal year system operating costs to date are \$15,206,849. This value represents approximately 74.0% of the total budgeted operating cost for FY23. The customer revenues from the sales of steam and chilled water for FY23 are \$15,306,849 (75.9% of budgeted amount) which includes the annual true-up amount for FY22. The Metro funding amount transferred to date for FY23 is \$280,725 (75.0% of budget). The actual MFA can only be estimated due to outstanding invoices as of the date of this report and an audit of the customer revenues has not been performed which will be included in the FY23 True-up analysis.

Table 3. DES Expenses and Revenues to Date

Item	FY23 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget	
Operating Management Fee								
FOC: Basic	\$ 4,006,800	\$ 1,001,705	\$ 1,001,705	\$ 1,001,705	\$ -	\$ 3,005,114	75.00%	
9th Chiller	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
C/O 6A	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
C/O 6B	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
C/O 7	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
C/O 8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
Pass-thru Charges: Chemical Treatment	\$ 255,700	\$ 57,601	\$ 51,607	\$ 48,331	\$ -	\$ 157,539	61.61%	
Insurance	\$ 22,900	\$ -	\$ 29,475	\$ -	\$ -	\$ 29,475	128.71%	
Marketing: CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
FEA: Steam	\$ 84,700	\$ (441)	\$ 1,528	\$ (1,128)	\$ -	\$ (41)	-0.05%	
Chilled Water	\$ 126,200	\$ 25,885	\$ 39,621	\$ 25,835	\$ -	\$ 91,342	72.38%	
Misc: Metro Credit	\$ -	\$ (415,775)	\$ (223,940)	\$ (181,022)	\$ -	\$ (820,737)	n.a.	
ARFA	\$ 63,000	\$ 15,754	\$ 15,754	\$ 15,754	\$ -	\$ 47,263	75.02%	
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
Subtotal - Man Fee =	\$ 4,559,300	\$ 1,100,504	\$ 1,139,691	\$ 1,090,498	\$ -	\$ 3,330,692	73.05%	
Reimbursed Management Fee + Chem Treatment		\$ 1,100,504	\$ 1,139,691	\$ 356,921	\$ -	\$ 2,597,115	0.00%	
Metro Costs								
Pass-thru Charges:								
Engineering	\$ 129,500	\$ 6,332	\$ 6,723	\$ 11,188	\$ -	\$ 24,242	18.72%	
EDS R&I Transfers	\$ 303,700	\$ 75,925	\$ 75,925	\$ 75,925	\$ 25,308	\$ 253,083	83.33%	
Metro Marketing	\$ 60,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%	
Project Administration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
Metro Incremental Cost	\$ 718,800	\$ 118,250	\$ 133,184	\$ 119,080	\$ 5,842	\$ 376,356	52.36%	
Utility Costs:								
Water/Sewer	\$ 759,700	\$ 394,055	\$ 207,226	\$ 170,056	\$ -	\$ 771,337	101.53%	
EDS Water/Sewer	\$ -	\$ 47	\$ 535	\$ 445	\$ -	\$ 1,026	n.a.	
EDS Electricity	\$ 71,700	\$ 21,920	\$ 16,416	\$ 11,173	\$ -	\$ 49,510	69.05%	
Electricity	\$ 6,181,900	\$ 2,286,229	\$ 994,219	\$ 904,133	\$ -	\$ 4,184,580	67.69%	
Natural Gas Consultant	\$ 12,400	\$ -	\$ 9,080	\$ 3,960	\$ -	\$ 13,040	105.16%	
Natural Gas Transport	\$ -	\$ 56,143	\$ 99,216	\$ 96,291	\$ -	\$ 251,650	n.a.	
Natural Gas Fuel	\$ 3,203,850	\$ 495,442	\$ 1,001,717	\$ 976,425	\$ -	\$ 2,473,584	77.21%	
Propane	\$ 139,050	\$ -	\$ 119,216	\$ (72,000)	\$ -	\$ 47,216	33.96%	
Subtotal - Metro Costs =	\$ 11,581,500	\$ 3,454,343	\$ 2,663,456	\$ 2,296,676	\$ 31,150	\$ 8,445,626	72.92%	
Subtotal - Operations =		\$ 16,140,800	\$ 4,554,847	\$ 3,803,147	\$ 3,387,173	\$ 31,150	\$ 11,776,318	72.96%
Debt Service								
2012A Bonds	\$ 3,178,500	\$ 869,138	\$ 769,787	\$ 769,787	\$ -	\$ 2,408,712	75.78%	
2005B Bonds	\$ 281,100	\$ 261,398	\$ -	\$ 19,677	\$ -	\$ 281,076	99.99%	
Series 2018	\$ 117,200	\$ 29,300	\$ 29,300	\$ 29,300	\$ -	\$ 87,900	75.00%	
Series 2015C	\$ 64,700	\$ 16,175	\$ 16,175	\$ 16,175	\$ -	\$ 48,525	75.00%	
Series 2017	\$ 41,800	\$ 10,450	\$ 10,450	\$ 10,450	\$ -	\$ 31,350	75.00%	
Series 2013A	\$ 506,000	\$ 126,500	\$ 126,500	\$ 126,500	\$ -	\$ 379,500	75.00%	
Series 2021C	\$ 122,000	\$ 29,822	\$ -	\$ 92,147	\$ -	\$ 121,968	99.97%	
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.	
Oper. Reserve Fund	\$ 85,800	\$ 21,450	\$ 21,450	\$ 21,450	\$ 7,150	\$ 71,500	83.33%	
Subtotal - Capital =	\$ 4,397,100	\$ 1,364,232	\$ 973,662	\$ 1,085,486	\$ 7,150	\$ 3,430,531	78.02%	
Total =		\$ 20,537,900	\$ 5,919,080	\$ 4,776,809	\$ 4,472,660	\$ 38,300	\$ 15,206,849	74.04%
Customer Revenues								
Taxes Collected		\$ 133,033	\$ 105,053	\$ 99,399	\$ -	\$ 337,486	n.a.	
Taxes Paid		\$ 133,033	\$ 105,052	\$ 35,767	\$ -	\$ 273,852	n.a.	
Interest & Misc Revenue	\$ 50,600	\$ 35,408	\$ 79,142	\$ 103,505	\$ -	\$ 218,055	430.94%	
Penalty Revenues/Credits		\$ 21,733	\$ 75,571	\$ 6,376	\$ -	\$ 103,680	n.a.	
Energy Revenues Collected	\$ 20,113,000	\$ 5,639,947	\$ 4,721,500	\$ 4,560,033	\$ -	\$ 14,921,480	74.19%	
Revenues =	\$ 20,163,600	\$ 5,697,088	\$ 4,876,214	\$ 4,733,546	\$ -	\$ 15,306,849	75.91%	
Metro Funding Amount =		\$ 374,300	\$ 221,991	\$ (99,405)	\$ (260,886)	\$ 38,300	\$ (100,000)	-26.72%

The DES serves 21 customers and 42 buildings in downtown Nashville. These customers are divided into three categories: 1) Privately-owned buildings, 2) State of TN-owned buildings and 3) Metro-owned buildings. The New Customers listed in Table 4 are non-Initial System private customers. A summary of the annual costs for each of these three categories is presented in Table 4. These values include late fees and penalties and any unpaid balances.

Table 4. Customer Revenue Summary to Date

Building	Chilled Water			Steam		
	Total Cost	Consumption (tonhrs/yr)	Unit Cost (\$/tonhr)	Total Cost	Consumption (Mlb/yr)	Unit Cost (\$/Mlb)
Private Customers	\$ 3,436,837	16,520,118	\$ 0.2080	\$ 1,395,547	77,172	\$ 18.0836
State Government	\$ 2,654,892	10,433,953	\$ 0.2544	\$ 1,809,892	95,605	\$ 18.9310
Metro Government	\$ 3,829,075	19,212,995	\$ 0.1993	\$ 1,795,237	112,262	\$ 15.9915
New Customers	\$ 2,531,909	11,999,333	\$ 0.2110	\$ 1,269,452	84,333	\$ 15.0528
Total	\$ 9,920,804	46,167,066	\$ 0.2149	\$ 5,000,676	285,038	\$ 17.5439

Total Revenue \$ 14,921,480
 True-up and Adjustments (Net) \$ 385,369
 Net Revenue \$ 15,306,849

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CES for FY23. TEG and CES continue to meet monthly and regularly communicate about important issues and on-going projects. CES has reported and managed EGF operations satisfactorily which is reflected in the reduction in the items noted in the EGF Walkthrough reports and in the improvement in meeting the performance guarantees in Amendment 2 of the ARMA.

A. Reliability

The principal issues surrounding the reliable operation of the EGF relates to the ability to operate without significant interruption, exclusive of planned outages, and disruption of service to the customers. The following disruptions in service occurred during the quarter.

-) A sudden swing in steam demand on January 1st caused the steam sendout pressure to drop to a low of 108 psig. CES immediately started another boiler, but the sendout pressure was below 150 psig for approximately seventy-five minutes.
-) During the chilled water outage on January 4, the chilled water temperature was above 43.3°F for approximately 1,464 minutes. This planned outage was necessary to make several repairs in the EDS and the EGF.
-) Boiler 2 tripped on January 5 and was immediately restarted. CES did not report on the cause of the trip. The steam sendout pressure was below 150 psig for approximately forty-five minutes with a low pressure of 95.7 psig.
-) While performing tune-ups on boilers 2 and 4 on January 9, the steam sendout pressure was below 105 psig for approximately 150 minutes reaching a low pressure of 54.6 psig.

-
-) Boiler 2 tripped again on January 26 resulting in the steam sendout pressure being below 150 psig for approximately forty-five minutes. The lowest pressure reported was 134.7 psig. The cause of the trip was not reported by CES, but they are investigating the cause of the nuisance trips.
 -) Boiler 3 tripped on January 31 for an unreported cause. The steam sendout pressure was below 150 psig for approximately forty-five minutes. The lowest pressure reported was 137.9 psig.
 -) In February, CES and Trane (their chiller maintenance contractor) performed annual preventative maintenance and tube cleaning on the chillers. The condensing water tubes were cleaned on all nine chillers and on three of the evaporators. Eddy current testing was also performed on chillers 2, 3, and 9. During this testing and maintenance, the chilled water sendout temperature exceeded 43.3°F for 118 minutes on February 6 and twice for thirty-six minutes on February 7. The highest reported sendout temperature was 47.2°F.
 -) Due to anticipating the isolation of the Music City Center so they could perform internal maintenance on February 21, CES lowered the steam pressure. During this time, the steam sendout pressure dropped below 150 psig for approximately thirty minutes reaching a low pressure of 145.4 psig. On February 22, steam service was restored to the Music City Center resulting in the steam sendout pressure being below 150 psig for approximately thirty minutes. The lowest steam pressure reported was 13.25 psig.
 -) Chiller 6 tripped on March 3rd due to low differential oil pressure. The sendout temperature exceeded 43.3°F for approximately forty-two minutes reaching a high temperature of 45.0°F.
 -) Boiler 2 tripped on March 11 during the annual boiler run inspection and was immediately restarted. The steam sendout pressure was below 150 psig for approximately forty-five minutes reaching a low pressure of 143 psig.
 -) Boiler 2 tripped again due to an issue with the flame scanner on March 18. Another boiler was started in its place. The steam sendout pressure was below 150 psig for approximately 135 minutes reaching a low pressure of 76 psig.
 -) There were no other reported issues during the quarter.

B. Efficiency

The operation of the EGF did not satisfy the steam-water guaranteed levels for each month during the quarter, and the steam-fuel metric was not met in January. All other performance guarantees were met. A more detailed discussion of the contract guarantee performance was presented previously in this report.

C. Environment, Health, and Safety

No environmental violations were reported during the quarter.

CES has implemented and requires regular attendance of online safety courses for their employees.

D. Personnel

As of the end of the quarter, CES has reported they are currently staffed with nineteen full time employees, one remote part-time employee and two shared employees. Of the current number of employees, thirteen were previously employed by Nashville Thermal Transfer Corporation.

E. Training

Staff training for this quarter consisted of the Health and Safety training discussed previously.

F. Water Treatment

The water treatment program consists of regular testing and monitoring of the water chemistry in the steam, chilled water, and condensing water systems. Chemicals are added to control the water hardness, chlorine levels and biologicals and to aid in the prevention of corrosion. Remote testing of the condensate at the AA Birch, Tennessee Tower and the Andrew Jackson buildings also occurs regularly to monitor the concentration and distribution of the steam system chemicals.

) Steam System

- The condensate return averaged approximately 68.9% of the steam sendout during the quarter, which represents a 3.4% decrease over the previous Third Quarter. A portion of the condensate continues to be dumped due to hardness or iron from a few customer buildings. The Legislative Plaza and War Memorial buildings are dumping their condensate due to iron levels and do not plan on making repairs until building renovations begin.
- Feedwater iron, pH, and hardness (for the portion of the condensate returned) remained within their acceptable ranges during the quarter.

) Condensing Water System

- The conductivity of the condensing water continues to be normal with only a few excursions.
- The cooling tower blowdown decreased 9.1% over the previous Third Quarter. This decrease resulted in an average increase in the cycles of concentration in the cooling towers by 40.0%. CES began monitoring a new metric associated with the cooling tower blowdown in March. This value will begin to appear in Table 1 of this report as more data is collected.

) Chilled Water System

- CES continues to monitor and test for the presence of bacteria in the system. The biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent. Chem-Aqua's proprietary biological treatment system continues to function properly.

- The installation of the side stream filter at the EGF continued during the quarter with an anticipated completion date in May. The filter is being installed under project number DES200.

G. Maintenance and EGF Repairs

CES continues to report on the routine and preventative maintenance activities performed on the EGF primary and ancillary equipment. The principal items are discussed herein as they relate to the repair, maintenance or replacement of equipment or devices at the facility and are not considered extraordinary. The cost for these items is included as part of the FOCs.

Repairs and As Needed Maintenance

-) Office Janitorial Services, equipment room cleanup and pest control;
-) Checked, updated, and backed up plant computers and servers;
-) Checked and adjusted packing on all pumps;
-) Assisted with data acquisition for Plant Efficiency (Skyspark);
-) EGF steam trap survey performed;
-) Coated cooling tower risers;

Repairs or Replacement

-) Repaired plant lighting and electrical;
-) Installed electrical conduit and wiring for Skyspark water meter monitoring;
-) Water softener UPS and brine draw piping replacement;
-) Repaired cooling tower air regulators;
-) Repaired cooling tower level indicator piping;
-) Cleaned drains on boiler and chiller level;
-) Replaced deaerator 2 pressure transmitter;
-) Chilled water outage repairs;
-) Installed new boiler conductivity controller on boiler 2;
-) Tuned boilers 2 and 4;
-) Painted offices, hallways, restrooms, stairwell, etc.;
-) Replaced belts on cooling towers 2, 3 and 17;
-) Moved Refrigerant back into chiller 6A;
-) Annual chiller tube cleaning;
-) Tested vaporizer;
-) Troubleshoot low water cut-out 2;
-) Repaired leak on boiler 1 economizer tube;
-) Rebuilt boiler 3 blowdown valve;
-) Tested and reset boiler 2 high steam pressure alarm switch;

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-) Repaired boiler feedwater pumps 3 and 5 (thrust bearings and oil seals on outboard ends);
 -) Replaced coupling on condensate pump 2;
 -) Repaired shop air compressor;
 -) Eddy current testing on chillers 2, 3, and 9;
 -) Completed tube condenser tube cleaning on all chillers and the evaporators;
 -) Repaired vacuum breaker on water line at chiller level;
 -) Repaired cooling tower 5 fill;
 -) Changed cooling tower drive belts and adjusted motor on tower 14;
 -) Removed refrigerant from chiller 6B;
 -) Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CES.

H. EGF Walkthrough

The EGF Walkthrough was conducted on March 28, 2023, by Kevin L. Jacobs, P.E., and Adrienne Fancher with Metro Water Services. Based on the review of the EGF, the following comments and observations are presented. CES continues to make efforts to address many of the issues contained in the previous Walkthrough reports resulting in the elimination of many of the older items. CES appeared to be in the process of cleaning the cooling towers during the Walkthrough. In addition, a contractor was working on the installation of the new side stream filter (Project DES200).

-) CES has reported in the previous quarters that the riser tubes in all of the cooling towers had been painted and that the cooling tower fill had all been replaced. Rust spots on the riser tubes remained present in the Fourth Quarter FY19 Walkthrough and continued to worsen. CES applied a new coating on the riser tubes to most of the cooling towers. **Subsequent to the Walkthrough, CES completed the coating of the riser tubes. This item will be removed from future reports unless the issue returns.**
-) The louvers and portions of the fill at cooling towers 1, 6 and 15 appear to have been damaged. As noted in the First Quarter FY22 Walkthrough, no additional work appears to have been completed since this item was noted in the Third Quarter FY20 Walkthrough. The damaged portions need to be repaired or replaced. In addition, the sections of the louvers on towers 5 and 6 appear to have separated in several places. **Subsequent to the Walkthrough, CES repaired the louvers on tower 5 and have stated they are seeking pricing on the remaining fill and louver replacements.**
-) The west side of cooling tower 18 and the east side of towers 7, 8, and 17 all had some black colored debris or mastic-type substance splattered against the exterior of the basins. **CES appears to have cleaned these areas, but some of the mastic-type substance remains at tower 7.**
-) The air curtain heaters were venting steam and dripping condensate. Water had accumulated on the floor in the area. **CES reported they were working on this**

issue and had replacement parts on order. The curtain heaters were not leaking during the Walkthrough and appeared to be isolated.

- J A section of the steam insulation has been damaged or was removed on the east side of the de-aerator in the basement. **CES has repaired the damaged insulation. This item will be removed from future reports.**
- J The pressure gauge on the steam bypass line located at the expansion tank level no longer operates. **CES should replace this gauge.**
- J The main steam valve for boilers 1 and 4 were venting steam during the Walkthrough. In addition, an unused pressure tap on the top of boiler 1 was venting steam. **Subsequent to the Walkthrough, TEG and CES discussed the need to replace these valves during the next steam outage which may occur in the First Quarter FY24.**
- J The pressure gauge at the expansion tank indicated a pressure of approximately 100 psig. However, the chilled water return pressure was reported to be approximately 130 psig, as indicated on the control room screen. The difference between these two instruments should be approximately equal to their elevation difference. **CES should verify if the pressure gauge at the expansion tank level is reading properly.**
- J A small portion of algae has returned to the cooling tower deck on the east side of the EGF. **This issue has been addressed and will be removed from future reports.**
- J Three of the lamps above the catwalk near the expansion tank were dimmer than the others in the plant. The lamp at the south end of the mezzanine level was flickering. **CES should repair these lamps.**
- J The “90 Peabody St” sign at the southwest corner of the building remains discolored. **CES should remove this sign or have it repaired or replaced.**
- J The computer in the Metro office was frozen and required two re-boots in order for it to be operational. During a site visit earlier in March, the computer had a similar issue. When the computer is frozen, the Carbonite software cannot perform back-ups. When the computer finally booted, its operation was slow requiring a restart of the Carbonite software and a later return to the office to verify the program was running. In addition, “num lock” is not automatically engaged with a reboot of the computer. **Subsequent to the Walkthrough, CES replaced this computer, and Carbonite has been restored. This item will be removed from future reports unless the issue returns.**
- J Other action items previously noted to be addressed by CES have been completed. (See also the “Quarterly EGF Walkthrough Report,” dated April 25, 2023, by TEG for additional information.)

IV. Capital Projects

The Capital Projects discussed in this section are those projects funded through the issuance of bonds by Metro. Costs for these projects will be paid from funds already appropriated. The status of the projects is discussed, and the project cost-to-date and bond balances are also presented.

A. Third Quarter FY23 Open Projects

The following projects remained open at the end of the Third Quarter FY23.

1. DES139 – DES Options Review

TEG, the Metro Liaison, and Metro Water Services (MWS) discussed the Business and Marketing Plans proposed by TEG in FY21. The draft of these documents has been under review by MWS, and TEG has been working under this project number to address the questions and comments raised by MWS. No additional work has been requested by Metro; therefore, this project is now closed.

2. DES143 – MH-N1 and N2 Insulation

This project addresses the installation of insulation in two (2) manholes: MH-N1 and MH-N2. These manholes house chilled water piping which is partially uninsulated. MH-N1 was to be included in CES's Amendment 2 obligations, but the needed insulation would exceed CES's Amendment 2 obligation beyond their contract expiration. Therefore, MH-N1's insulation has been moved to a new project – see DES207.

MH-N2's insulation will be addressed by CES under its Amendment 2 obligations. This project is now closed.

3. DES163 – New Service to MDHA Parcel K (Peabody Union)

The Peabody Union development includes the construction of Guthrie St that will require the modification to the east retaining wall along the EGF property. The installation of this new road may affect the entrance and exit to the EGF site and result in the loss of DES property. Unfortunately, they have elected to not be a DES customer. This project number is used to track costs and activities associated with the new road, the on-site construction activities, and their impact on DES.

Blasting at the Peabody Union site ended during the quarter. Design Blasting and Vibratex removed their seismographs during the quarter.

Conversations continued between all parties related to the aesthetic of the proposed DES wall and the sizes and nature of the proposed aprons and gates. All parties are working together to accommodate the necessary modifications to the DES property with respect to Guthrie St.

4. DES177 – MH-B1 Ladder and Platform

The proposal from CES has been declined and the project has been closed.

5. DES178 – MH-5 Repairs

MH-5 has several structural steel piping supports which are corroded and need to be cleaned and coated. This project addresses the cleaning and coating of these components and the replacement of damaged and missing piping insulation.

The cleaning and coating of the structural steel has been completed and reviewed by TEG. The insulation has been awarded and the installation contractor has ordered the new insulation blankets. Once the blankets arrive (expected in early May), the installing contractor shall complete the insulation portion of this project.

6. DES180 – State Tunnel Pipe Support Repairs

The State Tunnel has several steel piping supports which are corroded and need to be cleaned and coated. This project addresses the cleaning and coating of these components. The primary cause of this corrosion is water infiltration into the tunnel, and it would be prudent for the State to make repairs to the tunnel structure to address the water infiltration before the steel piping supports are cleaned and coated. TEG has spoken with the State and transmitted photos outlining the existing conditions and damage. TEG and CES met with the State and their structural engineer and conducted a walk-through of the tunnel on March 3, 2022. Based on a conference call with the State, they are approaching the needed repairs in two phases: Short-Term Repairs and Long-Term Repairs. Their engineer recently revisited the tunnel system to better define the entire scope of repairs and TEG was told that a report with their recommendations and an estimated budget was scheduled to be presented to the State in November 2022. The State has indicated that the interior waterproofing of the tunnel will be addressed in the short-term.

TEG has compiled a scope outline of the most severely corroded supports to be cleaned and coated and CES has obtained pricing and presented a proposal to TEG for this scope. The intent is to have these supports addressed prior to the State initiating the interior waterproofing of the tunnel. The project was delayed and will begin next quarter.

7. DES191 – MH-20 Repairs

MH-20 houses steam, condensate return and chilled water service piping for Hume Fogg High School, and it sits on top of a vertical shaft that connects to the 7th Ave Tunnel. The pipe supports within the manhole are badly corroded, the existing entry ladder consists of individual embedded rungs which are prone to failure with little warning, a caisson that prevents groundwater from flowing down the vertical shaft is badly corroded, and the condensate return piping is leaking. This project addresses these issues.

This project was bid during the Third Quarter FY22. The project was awarded during the Fourth Quarter FY22. The excavation portion of this project was completed during the First Quarter FY23. Some of the work within the manhole was completed during the Second Quarter FY23, however due to a delivery delay for a high temperature hose, the project was put on hold. The hose was received in January and the installing contractor is lining up a mechanical subcontractor to complete the piping work. It is expected that the project will be completed during the Fourth Quarter FY23.

8. DES192 – Peabody Street Development

With new potential customer developments along Peabody Street, a survey of the area from the west side of the EGF and along Peabody to 4th Avenue South was commissioned and provided to DES during FY22. TEG used this information to develop a plan to cross Hermitage Ave with new DES services and to formulate a course of action for a potential new parking area (DES195). Any new customer connection south and west of the EGF would be connected from this proposed service.

In addition, this project number is used to track costs associated with connecting the proposed development at 133 KVB to the DES. TEG has remained in contact with this potential customer who has stated they are continuing to develop their plans for the site but remain interested in DES service.

9. DES194 – MH- B4 Repairs

The structural steel pipe supports within MH-B4 are corroded and require cleaning and coating. In addition, most of the insulation within MH-B4 needs replacement and the entry ladder needs to be extended. This project addresses these needs.

CES has bid and retained contractors to perform this work. CES has also elected to install a new ladder under their Amendment 2 obligations in lieu of extending the existing ladder. It is expected that this project will be completed during the Fourth Quarter FY23.

10. DES195 – DES Parking Area

With the addition of Guthrie St adjacent to the east side of the DES property line (see DES163), the new road will impact the north and south ends of the DES property. This change will decrease the available parking area at the DES and also eliminate laydown areas used by CES and the DES contractors. Options for the new parking area were presented by a civil engineering firm hired by TEG. These options have been reviewed and discussed with Metro, but no decision has been made to date.

11. DES196 – Exploratory Excavation and Condensate Leak Repair at MH-9

CES has identified condensate entering the condensate pipe wall penetration in MH-9. TEG is close to completing a work scope along with construction drawings. It is expected that this work will be bid during the Fourth Quarter FY23.

12. DES198 – MH-18 Condensate Pump Replacement

The pumps and variable speed drives arrived during the Second Quarter. The construction must now be delayed until after the heating season to facilitate a possible shut-down of the condensate system at MH-18 and to wait until the steam sales decrease. A pre-bid meeting is anticipated in the Fourth Quarter FY23 with construction beginning during the First Quarter FY24.

13. DES199 – MH-D3 Sparge Tube Addition

This project is closed.

14. DES200 – Chilled Water Side Stream Filter

The side stream filter arrived onsite during the quarter and construction began on its installation in March. The filter is expected to be operational in the Fourth QuartersFY23.

Since the filter will be considered part of the chemical treatment system, the DES customers will be charged for its capital cost over the course of approximately five (5) years once the filter becomes operational.

15. DES201 – East Bank Development

TEG, the DES Metro Liaison, and Metro's other engineering consultant, FVB, have been involved during the quarter with meetings and investigations into the developments on the East Bank. These developments include the possible construction of the new stadium for the Tennessee Titans, the development of the Oracle campus on River North, and the other potential commercial and residential developments in the area which could benefit from district energy. The options for district energy on the East Bank include the development of one or more new sustainable plants serving multiple customers.

16. DES202 – 7th and Commerce Hotel

TEG has remained in contact with the engineers and development team for a proposed hotel, restaurant, and retail spaces at 7th Ave N and Commerce St. The design of the new site is progressing with the intention of utilizing the services from

DES. The estimated loads are 660 tons of chilled water and 14,500 pph of steam. Additional engineering is anticipated during the Fourth Quarter FY23.

17. DES203 – Printers and Bankers Alley Building

TEG has remained in contact with the engineers and development team for a new multi-story residential and retail development located on 3rd Ave N at Printer's and Banker's Alley. The design of the new site is progressing with the intention of utilizing chilled water from DES with an estimated load of 600 tons.

18. DES204 – New Signs for the EGF

The new signs were installed during the quarter. Upon submission of the invoices for this work, this project was closed during the quarter.

19. DES205 (EMR23-001) – Chilled Water Outage

A twenty-four-hour chilled water took place from 12:15 a.m. January 4, 2023, until 12:15 a.m. January 5, 2023. This outage was necessary to 1) replace several valves in the EGF; 2) remove the corroded chilled water vent valves in MH-15; and 3) remove buried chilled water drain valves from the distribution piping in the 5th Ave N and Union St intersection that are suspected to be leaking.

CES has delivered cost substantiation reports to TEG for all of the work except the final milling and paving. The final milling and paving is expected to be complete during the Fourth Quarter FY23.

20. DES206 - 7th Ave Fan Replacement

The 7th Ave ventilation fan broke apart during operation and needs to be replaced. A new fan has been ordered and TEG is in the process of completing a work scope and construction drawings for the installation of the new fan.

It is anticipated that this work will be bid and begun during the Fourth Quarter FY23.

21. DES207 – MH-N1 Insulation

This project was moved from DES143 since CES initially intended to address the insulation of this manhole under its Amendment 2 obligations. DES143 was closed. Since the insulation of the piping in this manhole would meet CES's obligations beyond its contract expiration, TEG instructed CES this work would not be completed under CES's Amendment 2 obligations.

B. Third Quarter FY23 Closed Projects

DES139, DES143, DES177, DES188, DES197, DES199 and DES204 were closed during the Third Quarter FY23.

C. Capital Projects Budget

The following table summarizes the costs and remaining balance of the DES capital projects based on reported expenditures to date. Open projects or completed projects that require some additional management efforts are shown. Projects discussed in this report that are not listed did not have any expenses during the quarter. Total costs for projects that are closed are shown with a gray highlight. Only the funds currently available are shown.

Table 5. Capital Projects Expense Summary

DES Project #	Description	Total Budget	FY23 Spending to Date	Total Spent to Date	Remaining Balance
Fund-49116					
DES133.1	NCC Blasting Issue	\$ 200,000	\$ -	\$ 166,017	\$ 33,983
DES139.1	Options Review	\$ 450,000	\$ 769	\$ 319,209	\$ 130,791
DES143	MH N1, N2 and S6 Insulation	\$ 30,000	\$ 8,248	\$ 14,796	\$ 15,204
DES154	MH K Repairs	\$ 75,085	\$ 45	\$ 35,732	\$ 39,353
DES163	Parcel K Service	\$ 1,018,802	\$ 56,158	\$ 81,516	\$ 937,286
DES177	MHB1 Ladder & Platform	\$ 45,500	\$ -	\$ 6,833	\$ 38,667
DES178	MH-5 Repairs	\$ 97,500	\$ 144	\$ 31,797	\$ 65,703
DES179	MH-11 Repairs	\$ 76,500	\$ 12,588	\$ 75,537	\$ 963
DES180	State Tunnel Support Repairs	\$ 140,000	\$ 3,788	\$ 7,072	\$ 132,928
DES188	4th and Church Access Tunnel Repairs	\$ 180,000	\$ 3	\$ 177,045	\$ 2,955
DES189	MH4 Structural Steel and Insulation Repairs	\$ 56,750	\$ -	\$ 13,960	\$ 42,790
DES191	MH 20 Repairs	\$ 94,875	\$ 40,346	\$ 69,055	\$ 25,820
DES192	Peabody Developments	\$ 40,000	\$ 1	\$ 28,689	\$ 11,311
DES193	MH-13 Repairs	\$ 30,000	\$ -	\$ 6,673	\$ 23,327
DES194	MH-B4 Repairs	\$ 80,000	\$ 1,038	\$ 8,463	\$ 71,537
DES195	DES Parking Lot	\$ 275,000	\$ 7,327	\$ 12,688	\$ 262,312
DES196	Condensate Line Leak Repair at MH9	\$ 130,000	\$ 3,218	\$ 3,271	\$ 126,729
DES197	MH3 Coatings and Repairs	\$ 13,500	\$ -	\$ 9,888	\$ 3,612
DES198	MH18 Condensate Return Pump Replacement	\$ 175,000	\$ 1,204	\$ 9,880	\$ 165,120
DES199	MHD3 Sparge Tube	\$ 25,000	\$ 11,313	\$ 11,998	\$ 13,002
DES200	Sidestream Filter	\$ 330,000	\$ 1,981	\$ 3,411	\$ 326,589
DES201	East Bank and Oracle Development	\$ 110,000	\$ 21,645	\$ 26,937	\$ 83,063
DES202	Service to 7th and Commerce	\$ 1,630,000	\$ 4,575	\$ 4,912	\$ 1,625,088
DES203	Service to Printer's Alley Residential	\$ 850,000	\$ 1,411	\$ 1,507	\$ 848,493
DES204	DES Sign Replacement	\$ 73,000	\$ 28,306	\$ 28,306	\$ 44,694
DES205	5th & Union CHW Outage	\$ 137,500	\$ 279	\$ 279	\$ 137,221
DES206	7th Avenue Fan	\$ 110,000	\$ 13,034	\$ 13,034	\$ 96,966
EDS R&I	CES January 2022	\$ 5,959	\$ 5,959	\$ 5,959	\$ -
DES207	MH N1 Insulation	\$ 25,300	\$ 285	\$ 285	\$ 25,015
Total Closed Projects		\$ 3,698,579	\$ -	\$ 3,698,579	\$ -
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ 15,796,150	\$ -	\$ -	\$ 15,796,150
Fund Total		\$ 26,000,000	\$ 223,664	\$ 4,873,327	\$ 21,126,673

V. Energy Distribution System Repairs, Improvements, PM, and Emergencies

Several EDS repairs and improvements were made during the Third Quarter. The principal items for discussion are presented in the following sections.

A. Repairs and Improvements

Several repairs were made to the EDS and at customer buildings during the quarter. The remaining value of the R&I account to date is \$438,572. Table 6 provides a summary of the FY23 expenditures and revenues to date associated with the R&I budget.

Table 6. FY23 Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY22				\$ 94,174.39		\$ -	\$ 260,494.02	\$ 260,494.02
July 2022 EDS R&I	11/4/2022	DES2426	CES	\$ 12,814.77				
Interest	7/1/2022	-	-	\$ 115.92				
Interest	7/1/2022	-	-	\$ (115.92)				
Interest	8/1/2022	-	-	\$ 232.10				
Interest	8/1/2022	-	-	\$ (232.10)				
Aug 2022 EDS R&I	12/22/2022	DES2430	CES	\$ 8,376.70				
Interest	9/1/2022	-	-	\$ 465.76				
Interest	9/1/2022	-	-	\$ (465.76)				
Sept 2022 EDS R&I	12/22/22	DES2430	CES	\$ 3,840.65				
Sub-Total First Quarter				\$ 25,032.12	\$ 75,924.99	\$ -	\$ 50,892.87	\$ 311,386.89
Interest	10/03/22	-	-	\$ 589.35				
Interest	10/03/22	-	-	\$ (589.35)				
Oct 2022 EDS R&I	03/23/23	DES2432	CES	\$ 4,851.51				
Interest	11/01/22	-	-	\$ 796.31				
Interest	11/01/22	-	-	\$ (796.31)				
Nov 2022 EDS R&I	03/23/23	DES2434	CES	\$ 15,313.24				
Interest	12/01/22	-	-	\$ 1,014.33				
Interest	12/01/22	-	-	\$ (1,014.33)				
Dec 2022 EDS R&I	01/18/23	-	CES	\$ 1,111.35				
Sub-Total Second Quarter				\$ 21,276.10	\$ 75,924.99	\$ -	\$ 54,648.89	\$ 366,035.78
Interest	01/03/23	-	-	\$ 1,228.76				
Interest	01/03/23	-	-	\$ (1,228.76)				
Jan 2023 EDS R&I	02/23/23	-	-	\$ 4,114.83				
Interest	02/01/23	-	-	\$ 1,341.50				
Interest	02/01/23	-	-	\$ (1,341.50)				
Feb 2023 EDS R&I	03/20/23	-	CES	\$ 849.52				
Interest	03/01/23	-	-	\$ 1,347.96				
Interest	03/01/23	-	-	\$ (1,347.96)				
Mar 2023 EDS R&I	04/19/23	-	CES	\$ 6,084.32				
DES 206 - 7th Ave Fan	04/19/23	-	CES	\$ 17,648.00				
Sub-Total Third Quarter				\$ 28,696.67	\$ 75,924.99	\$ -	\$ 47,228.32	\$ 413,264.10
Sub-Total Fourth Quarter				\$ -	\$ 25,308.33	\$ -	\$ 25,308.33	\$ 438,572.43
FY23 Year to Date				\$ 75,004.89	\$ 253,083.30	\$ -	\$ 438,572.43	\$ 438,572.43

B. Preventive Maintenance

Preventive maintenance, tunnel and manhole inspections and reviews of customers' mechanical rooms were performed during the quarter. The principal items for discussion are presented.

1. EDS Manhole/Tunnel Inspections
 - a. The monthly vault/tunnel reviews were conducted as scheduled.
 - b. CES continues to replace trap assemblies within the EDS as needed.
 - c. CES should continue to clean areas of minor corrosion and then paint those areas with a cold galvanizing paint. If maintained, this should help reduce/slow down the progression of some areas of corrosion.
 - d. Minor insulation repairs are needed in some vaults; some of these needs will be addressed through capital projects.
2. Customer metering station calibration checks were completed as scheduled.
3. Water chemistry samples at customer buildings were taken as scheduled.
4. Other EDS items are included in the CES monthly reports.

C. Emergencies

There were no emergencies reported during the quarter.

D. EDS Walkthrough

Both the Second and Third Quarter Walkthroughs were conducted during the last quarter. The Second Quarter's Walkthrough was conducted on February 1 and 3, 2023 and the manholes that were visited included Manholes B1, B2, B3, B4, B6, B7, B8, B9, B10, 14A, 16A, 22B, Viridian, S4A, U. The Third Quarter's Walkthrough was conducted on March 13 and 14, 2023. The manholes that were visited included Manholes 15, 16 (integral to the 4th Ave Tunnel), 22 (integral to the 7th Avenue Tunnel), 18 (integral to the Broadway Tunnel) and 23. The tunnels that were visited included 4th Avenue, 7th Avenue, Broadway, AA Birch, and State. The following comments and observations are a result of these visits.

Second Quarter

1. MH-B1
 - a. This is a sump pump manhole located in 1st Avenue South to the west of MH-B. It was constructed to reduce/control the amount of groundwater infiltration in MH-B
 - b. There is not a platform in this manhole to assist maintenance personnel to maintain the sump pump and its controls. A platform is scheduled to be added to this manhole under DES-177 but this project is on hold pending resolution of the CES mark-up dispute.
 - c. The ladder in this manhole is comprised of individual rungs embedded in the manhole concrete wall. Our experience with these ladders is that an

individual rung might fail without warning. Therefore, this ladder is scheduled to be replaced with a siderail type ladder under DES-177 and CES has agreed to replace this ladder under their Amendment 2 obligations. Because of the delay regarding the mark-up dispute, CES should proceed with the replacement of this ladder and have it extend to the floor of the manhole. The ladder can then be modified to accommodate a platform once the mark-up dispute is resolved. The ladder wall brackets should be positioned to allow the installation of a platform without the need for modification to the wall brackets.

2. MH-B2
 - a. There was some water present in the manhole, and it required pumping prior to entry.
 - b. This manhole has an electric sump pump. However, the sump is not deep enough to enable the removal of all water before the level control stops the pump. As a result, there is always a small amount of water in the floor of this manhole. TEG investigated deepening this sump to eliminate this problem, but a well point needs to be installed to prevent the groundwater from flooding the manhole while the work takes place. The addition of a well point would add substantially to the construction cost, so this option has been rejected.
 - c. An extension needs to be added to the access ladder so that the first rung is closer to grade. However, CES has decided to replace this ladder with a new aluminum ladder under their Amendment 2 obligations.
 - d. The piping support steel in this manhole was cleaned and coated by Enecon to help prevent corrosion. There is some flaking on the ends of some bolts on the overhead support steel. In addition, there is an area of coating failure on one of the overhead steel supports. TEG has notified Enecon of these areas and was told that Enecon will make the necessary repairs to these areas.
 - e. The anchor bolts on the sparge tube stanchion are rusting. TEG will coordinate with CES to have Enecon add the cleaning and coating of this entire stanchion to their scope as an R&I item.
 - f. CES should continue to monitor the structural steel coatings and report any degradation to TEG.
 - g. CES should continue to monitor the concrete surfaces and the concrete patching and report any degradation to TEG.
 - h. The western steam penetration pre-insulated piping end can was badly corroded and allowing groundwater to enter the manhole. This penetration was repaired using Enecon products to rebuild the end can and then form a “donut” around the penetration with an Enecon hydraulic cement material. There is some minor distress to this cement material. CES should have Enecon review and address any needed repairs they execute the coating repairs. CES should continue to monitor this penetration and report any degradation to TEG.

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- i. The insulation jacketing was removed from the steam isolation valve next to the western steam wall penetration when the penetration repairs were completed. The re-installation of this jacketing was postponed in order to ensure that the wall penetration repair was effective. Sufficient time has lapsed and CES should now have this insulation and jacketing re-installed after Enecon's review of the wall seal (see item h above). **This item appeared in the last quarterly review.**
 - j. The insulation jacketing on the northern lower CHW 90 ell needs to be repaired. CES should have this insulation jacketing repaired within the next quarter. **This item appeared in the last quarterly review.**
 - k. The trap piping was re-routed to avoid being in the path of maintenance personnel. The new and disturbed piping has not yet been insulated which includes portions of the dripleg and sparge tube. CES should have this piping re-insulated within the next quarter. **This item appeared in the last quarterly review.**
 - l. The sump pump discharge piping was thought to be clogged, but under TEG's direction, CES inserted a drain auger and discovered that the piping has probably been damaged or crushed. This possibly occurred during the construction of the 222 Molloy St. building. TEG has contacted a company that believes that they can locate the damage/blockage so that the pipe could be excavated, and if needed, additional pipe installed from this point to the nearest curb inlet. TEG will coordinate this with CES.
 - m. There are 3 electrical enclosures in the manhole for the sump pump; one of these enclosures is stainless steel and in good condition. The other two enclosures are steel and are corroded, one of them badly. In the last quarterly report, TEG estimates these enclosures needed to be replaced within the next 2 years. Based upon the condition of one of these enclosures, they need replacement soon. CES needs to replace these two enclosures as soon as possible with non-corrosive, code compliant enclosures such as stainless steel.
 - n. Unistrut supports are used for the electrical conduit and sump pump discharge piping; these supports are experiencing corrosion. CES should plan on replacing these supports with non-corrosive supports (such as stainless steel) within the next year.
3. MH-B3
- a. There was some water present in the manhole, and it required pumping prior to entry.
 - b. CES should monitor the structural steel coatings and report any degradation to TEG.
 - c. CES should monitor the concrete surfaces and the concrete patching and report any degradation to TEG.
 - d. The trap piping was re-routed to avoid being in the path of maintenance personnel. The new and disturbed piping has not yet been insulated which includes portions of the steam dripleg. CES should insulate this piping within the next quarter. **This item appeared in the last quarterly review.**
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- e. The CHW piping drain valves are sweating and causing ponding water in the manhole floor. These drain valves should be insulated within the next quarter. **This item appeared in the last quarterly review.**
4. MH-B4
- a. There was water present in this manhole, and it required pumping prior to entry.
- b. The structural components in this manhole are experiencing corrosion and should be professionally cleaned and coated to prevent further degradation. The current project, DES194 addresses this need.
- c. The insulation in this manhole is in poor condition and needs to be replaced; DES194 addresses this need.
- d. There are several hairline cracks in the ceiling of this vault; DES194 addresses the patching of these cracks.
- e. Some of the foam sealant used at the piping wall penetrations has shrunk and “pulled away” from the penetration holes. DES194 will include the re-sealing of these penetrations.
5. MH-B6
- a. There was water present in this manhole, and it required pumping prior to entry.
- b. The entry ladder was recently replaced by CES under their Amendment 2 obligations. However, the first rung distance from grade is ~22” and OSHA requires it to be no more than 16”. CES needs to have an extension added to this ladder (similar to the addition in MH-M when the Riverfront Park construction was completed).
- c. There are some insulation repairs/replacements needed in this manhole. This includes:
- i. The trap piping should be insulated up to the trap (excluding the trap); some of this insulation is absent due to piping repairs/replacements and needs to be insulated within the next quarter. **This item appeared in the last quarterly review.**
- ii. A main steam valve is un-insulated due to the trap piping repairs/replacement; this valve needs to be re-insulated within the next quarter. **This item appeared in the last quarterly review.**
- iii. Both the condensate return slip-type expansion joint, and the steam slip-type expansion joint insulation blankets need to be replaced. TEG obtained the specific blanket ID numbers and reached out to the blanket manufacturer to see if new blankets could be ordered with just this information; the blanket manufacturer responded that the ID number information was sufficient. CES has ordered these blankets and, to save mobilization costs, they should arrange installation when the new blankets for MH-B8 are delivered. **This item appeared in the last quarterly review.**
- d. The grout behind the anchor beam baseplates has cracked and needs to be repaired. When making this repair, if the system is active, only half of the grout behind each end plate should be removed/replaced at a time. Then,
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- the new grout should be allowed to cure before the remaining half of the grout is removed/replaced. CES should have these repairs completed within the next three months to prevent further degradation and possible failure of the wall attachments. **This item appeared in the last quarterly review.**
- e. There is some corrosion on the wall penetration end can retainer plates and components. CES should clean and paint these areas with cold galvanizing paint during CES's next manhole review:
 - f. There is some hairline cracking of the concrete. CES should monitor this cracking and notify TEG of any significant changes.
6. MH-B7
- a. Portions of the grout behind the anchor beam wall plates has cracked and fallen out; this grout needs to be replaced. When making this repair, if the system is active, only half of the grout behind each end plate should be removed/replaced at a time. The new grout should be allowed to cure before the remaining half of the grout is removed/replaced. CES should have this grout replaced within the next 3 months to prevent further degradation and possible failure of the wall attachments. **This item appeared in the last quarterly review.**
 - b. The southern steam piping wall penetration appears to have moved. There is debris in the floor of the manhole that appears to have been some type of sealant at the wall penetration. It is also evident that the link seal at the wall penetration has become dislodged and there are creases in the insulation jacketing on the steam piping. The anchor welds were reviewed and there is no evidence of any cracking or splitting. There was an incident during December when the electrical supply to the EGF caused all the boilers to trip and the system pressure dropped to just a few pounds. It is possible that a water hammer or steam hammer event occurred as the system was brought back online which could have resulted in the observations in this manhole. CES should monitor the piping and the pipe anchor in this manhole and report any changes immediately to TEG.
 - c. The nuts on the anchor beam anchor bolts are loose. These nuts should be tightened to return the base plates to their proper structural integrity and CES should monitor the structural integrity of this attachment and report any changes to TEG. TEG will check with the structural engineer and provide the proper torque specifications.
 - d. CES should continue to monitor and clean/paint the structural steel as needed.
7. MH-B8
- a. There was a small amount of water in this manhole that was pumped out prior to entry.
 - b. There are some hairline cracks in the ceiling; these should be monitored by CES, and any significant changes reported to TEG.
 - c. Some deterioration of the grout behind the anchor beam baseplates has occurred and some portions of the grout is missing. All the grout behind the baseplates needs to be replaced. When making this replacement, if the
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- system is active, only half of the grout behind each end plate should be removed and replaced at a time. The new grout should be installed and allowed to cure before the remaining half of the grout is removed/replaced. CES should have these repairs done within the next 3 months to prevent further degradation and possible failure of the wall attachments. **This item appeared in the last quarterly review.**
- d. There is some corrosion on the steel components within this manhole; CES should clean and paint these areas with cold galvanizing paint. These areas include portions of the anchor beam, and the end can retaining plates.
 - e. One of the retaining all-thread pieces on the eastern condensate piping end can retainer plate is broken. CES should furnish and install new all-thread and connect it to the existing rod coupling as soon as possible.
 - f. The eastern condensate end can vent valve has corroded and the vent piping has failed. This vent piping and valve needs to be replaced. This will require the removal of the remaining piece of vent piping attached to the end can and the subsequent installation of a new vent pipe and valve. This should be replaced as soon as possible to prevent the possible infiltration of water into the pre-insulated piping casing due to accumulation of surface and groundwater within the manhole. **This item appeared in the last quarterly review.**
 - g. Both the condensate return slip-type expansion joint, and the steam slip-type expansion joint insulation blankets need to be replaced. Fit Tight Blankets measured for replacement blankets on 02/02/23. CES is going to retain an insulator to order and install these blankets and, to reduce mobilization costs, CES should have the MH-B6 insulation blankets installed at that time.
8. MH-B9
- a. There was a little water in this manhole, so it was pumped prior to entry.
 - b. There are some hairline cracks in the ceiling of this vault. CES should monitor these cracks and report any significant changes to TEG.
 - c. There is some corrosion on portions of the anchor beam support in this manhole. These areas were cleaned and painted by CES personnel during this review. CES should continue to monitor, and clean/paint areas of corrosion as needed.
 - d. The handwheel on the blowdown valve on the trap strainer is missing. It is my understanding that CES has been unsuccessful in locating a replacement handwheel. Because this strainer is located downstream of the trap, it can be eliminated. CES should plan on removing this valve at the earliest opportunity.
9. MH-B10
- a. There was water in this manhole, and it required pumping prior to entry.
 - b. CES should continue to monitor the corrosion on the steel and clean/paint it as needed.
 - c. There are some hairline cracks in the ceiling of this vault. CNE should monitor these cracks and report any significant changes to TEG.
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- d. The handwheel on the blowdown valve on the trap strainer is missing. It is my understanding that CES has been unsuccessful in locating a replacement handwheel. Because this strainer is located downstream of the trap, it can be eliminated. CES should plan on removing this valve at the earliest opportunity.
10. Viridian Manhole
- a. There was water in the manhole, and it required pumping prior to entry.
 - b. There is some mud in this manhole. CES should clean this manhole within the next quarter.
 - c. The northern blind flange needs to be re-insulated along with the two vent valves. CES should have this done within the next 6 months. **This item appeared in the last quarterly review.**
11. MH-14A
- a. There was water present in this manhole, and it required pumping before entry.
 - b. This manhole is no longer in service. It is located in Dr MLK Jr. Blvd (formerly Charlotte Ave) between 3rd and 4th Avenue. It is reviewed annually to make sure that the structure is sound. The main manhole houses abandoned steam and condensate return piping. There are two smaller manholes west of the main manhole which house abandoned chilled water supply and return piping isolation valves.
 - c. There is a large amount of mud in the floor of the main manhole. The next time CES schedules a vac truck to clean other manholes, this manhole should be cleaned also.
 - d. The ceiling is beginning to flake where rebar chair feet are close to the surface. CES should monitor these areas and report any significant changes to TEG.
12. MH-16A
- a. No deficiencies to report.
13. MH-22B
- a. The steam and condensate return service lines to the Public Library which originate in this manhole were recently replaced because of breaches in the piping outer casings.
 - b. The thermal movement of the steam and condensate piping has created indentions in the insulation jacketing at the penetration of the piping through the floor grating. Most likely this is the result of the vertical shaft piping being in a slightly different position than what it was originally when the new piping mentioned in 13) a) above was installed. CES should monitor the piping/insulation at the grate penetration and report any significant changes to TEG.
 - c. The condensate piping end can at the east wall penetration has some surface rust. CES should clean this end can and paint it with cold galvanizing paint to prevent the propagation of this corrosion. CES should then clean and paint this area as needed.
 - d. CES should monitor/clean/paint the CHW piping support steel as needed.
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14. MH-S4A
 - a. There was a no water present in this manhole.
 - b. There are hairline cracks in the walls of this manhole. CES should monitor these cracks and report any significant changes to TEG.
 - c. There is some minor spalling of the concrete walls in this manhole. CES should monitor this spalling and notify TEG of any significant changes.
 - d. There is some debris in the northeast corner floor. CES should remove this debris during their next review of this manhole.

15. MH-U
 - a. There was a small amount of water present in this manhole, but it did not require pumping prior to entry.
 - b. Because of groundwater infiltration into this manhole, secondary steam results and the roadway area above this manhole remains warm. In the past, this heat has caused settlement and some depression of the asphalt above the manhole and could result in damage to one, or both, of the manway lids/frames. CES should monitor this condition and report any significant changes to TEG.
 - c. The condensate return piping that passes through this manhole began leaking several years ago and a repair clamp was installed. This repair clamp was not leaking during this review. CES should continue to monitor this clamp and report any leaks/changes to TEG.
 - d. A steel plate was installed against the exterior lower southern wall of this manhole several years ago to prevent dirt/fill from flowing into the manhole. This plate has begun to delaminate. CES should clean this plate and paint it with cold galvanizing paint to mitigate the progression of this corrosion.

Third Quarter Tunnel and Manhole Review Summary

State Tunnel

There are several locations within the tunnel with minor, moderate, or major instances of concrete cracking and/or spalling, shifting of structures and/or groundwater infiltration. The maintenance of the tunnel structure is the responsibility of the State. The State hired a structural engineer to review the tunnel structure and present a report with their findings and recommendations regarding needed repairs. Based upon communications with the State, they are preparing budgets and schedules to address the structural deficiencies within the tunnel. TEG has requested a copy of their schedule/plan once it is available.

As a result of water infiltration, several of the structural steel pipe supports have varying degrees of corrosion. TEG has prepared a scope for the cleaning and coating of the most severely corroded pipe supports; however, the implementation of these repairs is awaiting the resolution of whether CES is entitled to a mark-up on this work.

There are a few small steam leaks and a small piping leak that need to be addressed by CES. Additionally, there are some insulation repairs needed along with some bolting issues that need to be addressed. Several of these items have appeared in several of the past reports and it is imperative that these be addressed within the next few months [see items 1): e), h), i), k), l) and m)]. For more in-depth information, please refer to the detailed description below.

AA Birch Tunnel

Immediately prior to this review, there was a nearby water main break which resulted in the flooding of this tunnel. CES pumped the accumulated water out, however there continued to be heavy groundwater infiltration during the review. The piping supports are experiencing some corrosion which CES is addressing, however the structures should be professionally cleaned and coated so TEG will develop a scope for this work to be executed. Other minor maintenance issues that need to be addressed include groundwater seepage at a pipe penetration and the replacement of some manway lids/frames. For more in-depth information, please refer to the detailed description below.

4th Avenue, 7th Avenue and Broadway Tunnels

There are some minor insulation repairs/additions needed (some of these items have appeared in several past reports and need to be addressed immediately); and some minor piping support corrosion issues and minor lighting issues that need to be addressed. There are some electrical service corrosion issues that are more severe that have been included in several past reports that need to be addressed immediately. In addition, several of the pipe supports incorporate Teflon slides that are worn or damaged – TEG is investigating a solution/repair for these. For more in-depth information, please refer to the detailed description below.

Manholes 15 and 23

Some groundwater intrusion point(s) in MH-15 need to be identified; some grating replacement in MH-15 needs to be addressed; and some corrosion “creep” in MH-23 needs attention. For more in-depth information, please refer to the detailed description below.

16. State Tunnel

- a. There are several locations, where the concrete tunnel structure has minor, moderate and major cracking, spalling, exposed/corroded rebar and/or shifting of structures. Some of these locations have also experienced, or are currently experiencing, water intrusion. Minor repairs are needed at the following locations: E4, E7, E8, E18, E19, E23, E25, E27, E29, E30, E31, E44, E47, E48, E52, E55, E60, E63, E68, N28, N29, N39, N48, W8, W10, W11, W17A, W18, W26, W29, W37, W42, W46, W48, W53, W57, W64,

W68, W72 and W73. Moderate repairs are needed at the following locations: E11, E12, E13, E28, E37, E47, E51, E67, E69, N4, N5, N6, N8, N12, N31, N45, N49, N50, N51, N55, N59, N60, N61, N62, W4, W5, W15, W44, W59, W67 and W71. Major repairs are needed at the following locations: E26, E66, N19, N20, N53, N54, N63, W27, W43, W44 and W45. Maintenance of the tunnel structure is the State's responsibility. In late 2018 or early 2019, the State hired a professional structural engineer to review the major repair areas at E1 and N19/ N20. Repairs were made in these areas however, not all areas at N19/N20 were addressed. The original plans for repairs at E1 included the demolition of the existing manhole and the construction of a new cast-in-place manhole. Instead, the actual construction included the installation of galvanized steel supports, application of concrete to areas of exposed rebar and the installation of a new precast manhole upper section. However, what was originally a difficult point of exit is now even more complicated with a lower manhole roof (due to the addition of galvanized steel) which makes egress more difficult. A little over a year ago, the State hired a different structural engineer who reviewed the tunnel. At that time, a representative of the State told TEG that the purpose of the review was to evaluate the structural needs of the tunnel and then budget funds for repairs in the next 2-3 years. TEG responded that that were a couple of areas in the tunnel that probably cannot wait 2-3 years to be addressed. Since that time, the State's engineer has been back on-site at least once to perform an additional review and update their findings to put together a construction estimate. A State representative has told TEG that the State is working on a budget and is preparing a schedule for the needed repairs.

- b. Several of the pipe support columns/beams have minor, moderate and severe corrosion. Locations with minor corrosion include: E5, E11, E18, E20, E24, E29, E34, E38, E46, E47, E51, E52, E53, E54, E55, E56, E58, E59, E60, E62, E63, E65, N2, N3, N7, N11, N21, N22, N27, N28, N51, W1, W5, W6, W8, W13, W14, W19, W54 and W69. Moderate corrosion exists at the following locations: E1, E2, E3, E4, E7, E8, E9, E12, E17, E26, E28, E37, E44, E64, E69, N4, N5, N8, N9, N10, N12, N13, N14, N15, N16, N17, N18, N23, N24, N25, N26, N29, N30, N31, N32, N34, N35, N36, N37, N38, N39, N40, N41, N42, N43, N44, N45, N47, N48, N49, N50, N52, N53, N54, N55, N56, N57, N58, N59, N60, N61, N63, N64, W2, W4, W7, W9, W55, W56, W59, W60, W62, W63, W67, W71, W73 and W74. Major corrosion exists at the following locations: E13, E66, E67, N20, N62, W3, W27 and W75. These members support DES piping and are not considered part of the structure and need to be cleaned and coated. Most of this corrosion is due to leaks in the tunnel structure and ideally, should not be repaired until the leaks are repaired (as stated above, it is the State's responsibility to repair structure leaks). TEG provided a list of the more severe corrosion locations to CES, and they obtained a quote to have these supports cleaned and coated. CES then presented a proposal to TEG to have

- this work completed but CES included a statement in their proposal which retained the right to include a mark-up on this work. TEG requested a statement from CES to explain their position and justification for a mark-up. TEG recently received CES's explanation, and it is being reviewed.
- c. The steam valve at station W1 has a small packing leak. CES has attempted to tighten this packing, but their attempts have not been successful. Although the leak is not significant, if the packing cannot be tightened it will only get worse with time. CES should investigate if this leak can be "shot" to stop this leak. If this cannot be done, CES should schedule to replace this valve during the next planned outage of the State steam system.
 - d. There is a small condensate piping leak near W75. CES is scheduling a repair.
 - e. The concrete underneath the base plate of the piping support column at Station N33 needs to be repaired. TEG has confirmed that the use of Enecon's Duraquartz product is suitable for this repair. Because Enecon is an approved vendor, CES should retain Enecon to make this repair and submit it as an R&I expense. **This item appeared in the 4/30/19, 4/13/20 and 4/27/21 reports.**
 - f. There is a small steam expansion joint leak at Station W17. Once this leak is large enough to be sealed, CES should schedule this repair.
 - g. The steam guide support at Station W18 is broken. CES has ordered and new guide and will schedule to have it installed once it is delivered.
 - h. The anchor bolt nuts are missing on the baseplates at Stations W19 and W63. CNE should furnish and install nuts on these anchor bolts as soon as possible. **This item appeared in the 4/27/21 and 4/13/22 reports.**
 - i. One of the anchor bolts on the top plate of the pipe support at station E19 is missing. CES should investigate if the bolt can be reinstalled and notify TEG of its findings. **This item appeared in the 4/30/20, 4/27/21 and 4/13/22 reports.**
 - j. There is an excessive amount of spider webbing in the western leg of the tunnel. CES has notified the State of this condition through their monthly reporting.
 - k. There is a blind flange on the steam piping at Station N20 that the studs do not pass completely through the nuts. CES should either re-work or replace these studs so that there is a minimum of 3 threads exposed outside of these nuts. **This item appeared in the 4/27/21 and 4/13/22 reports.**
 - l. At Station N20, there are some insulation repairs needed. CES should address this either through their obligation under Amendment 2 or by having an insulation contractor make these repairs and submitting it with their monthly R&I expenses. **This item appeared in the 4/27/21 and 4/13/22 reports.**
 - m. One of the traps at Station E1 does not have a blowdown valve on the strainer. CES should install a blowdown valve as soon as possible. **This item appeared on the 4/22/21 and 4/13/22 reports.**

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17. AA Birch Tunnel
- a. A water main break occurred just south of the AA Birch Tunnel on the day that this review was scheduled. The water from this main break flooded the AA Birch Tunnel and resulted in the need to isolate the steam piping in this tunnel by CES. The water main was isolated which enabled CES to pump the tunnel out. This review was conducted once the water in the tunnel was only a few inches deep.
 - b. The tunnel was experiencing heavy water infiltration during this review due to the water main break.
 - c. CES should continue to monitor the active water infiltration locations and report any significant changes to TEG.
 - d. Groundwater is seeping into MH-D2 at the western chilled water piping penetration. CES has tightened the link seals to try and reduce or eliminate this leak, however these attempts were unsuccessful. CES was instructed to hire Enecon to install hydraulic cement in the linkseal cavities of the pipe penetrations, and it appears that this was done, however it looks as though a portion of the western penetration was not adequately filled. CES should have Enecon install additional hydraulic cement in the voids of the western penetration.
 - e. There are some hairline cracks radiating from the chilled water piping penetrations in MH-D2. CES should continue to monitor these cracks and report any significant changes to TEG.
 - f. The grating and some of the structural members supporting the grating in MH-D2 is moderately to severely corroded. The grating in this area should be replaced with new grating. The structural framing should be cleaned and coated using the Enecon products. TEG will prepare a scope to address these needed repairs along with other areas of corrosion within the tunnel.
 - g. There is minor to moderate corrosion on the piping supports at Stations 0+08, 0+47, 0+65, 0+85, 1+05, 1+25, 1+45, 1+65, 2+03, 2+20, 2+38, 2+58, 2+79, 3+00 and 3+20. CES cleaned and coated these areas with cold galvanizing paint. These areas need to be professionally cleaned and coated with Enecon products. TEG will prepare a scope to address this along with other areas of corrosion within the tunnel. Until this scope is executed, CES should continue to monitor these areas and clean them and paint them with cold galvanizing paint as needed.
 - h. Some of the insulation jacketing in MH-D3 is damaged. The next time that insulation work is needed in this tunnel, these jacketing areas should be replaced.
 - i. The manway frame at MH-D3 is chipped and should be replaced as soon as possible.
 - j. The manway lid at MH-D2 sounds loose when traffic passes over. CES should review this lid to determine if it needs replacement.
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18. 4th Ave Tunnel
- a. There is some debris at Station 4-95. It appears that it is aluminum insulation jacketing. This needs to be removed/disposed if it isn't going to be used.
 - b. There is some insulation damage at Stations 4-57, 4-71, 4-87 and 4-94. These repairs should be made under CES's Amendment 2 obligations or through monthly R&I reimbursements. **This item appeared in the 4/13/22 report.**
 - c. There is some minor corrosion at the base of the pipe supports at Stations 4-1, 4-3, 4-38 and 4-43. CES has cleaned and painted the support at Station 4-1, CES should clean the other areas with a wire brush and apply cold galvanizing paint. Because there are some other locations experiencing some minor corrosion within the 7th Avenue and Broadway Tunnels, TEG will put together a scope for CES to have Enecon clean and coat these areas.
 - d. There is an overhead steel structure with some corrosion at Station 4-13. TEG will include this in the scope to be prepared for Enecon.
 - e. The gearbox and handwheel of the butterfly valves at Station 4-13 were corroded. CES has cleaned and painted these gearboxes with cold galvanizing paint. CES also installed some aluminum sheet metal above one of the valves to divert groundwater. CES should monitor these gearboxes and clean/paint them as needed.
 - f. The steam expansion joints at Stations 4-45 and 4-62 are leaking. CES should first tighten the packing injection bolts to try and stop this leak. If this is not successful, CES should make repairs once the leak is sufficient that injection repairs will be successful.
 - g. The piping support Teflon slides at locations 4-2, 4-3, 4-4, 4-5, 4-10, 4-26, 4-27, 4-28, 4-29, 4-30, 4-32, 4-35, 4-39, 4-40, 4-42, 4-45, 4-49, 4-56, 4-57, 4-68, 4-69, 4-72, 4-74, 4-77, 4-84, 4-89, 4-91 and 4-94 need repair. TEG will develop a repair/replacement method and scope of work and coordinate with CES to have this work accomplished.
 - h. The branch steam piping at station 4-62 in the vertical shaft (MH-16) at the 4th and Church Building:
 - i. Has a segment of piping that the insulation was removed. A temporary "wrap" of fiberglass insulation has been placed around some of this exposed piping. CES needs to have this insulation repaired to match the existing insulation and jacketing as soon as possible. There is also some debris in this area that needs to be removed.
 - ii. At the access tunnel area, the steam piping insulation needed repair. This was done during DES-188, however there is some insulation jacketing that was not installed. CES should have the missing insulation jacket installed as soon as possible.
19. 7th Ave Tunnel
- a. There is some minor corrosion at the base of the pipe supports at Stations 7-29, 7-30, 7-34, 7-38, 7-42, 7-45, 7-48, 7-49, 7-51, 7-57, 7-62, 7-64, 7-68
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- and 7-79. CES should clean these areas with a wire brush and apply cold galvanizing paint to slow the corrosion until they can be professionally cleaned and coated by Enecon.
- b. The piping support Teflon slides at locations 7-3, 7-5, 7-6, 7-9, 7-11, 7-12, 7-14, 7-15, 7-18, 7-20, 7-28, 7-29, 7-32, 7-37, 7-41, 7-44, 7-45, 7-46, 7-55, 7-65 and 7-68 need repair. TEG will develop a scope of work and coordinate with CES to have this work accomplished.
 - c. An electrical junction box at the southern end of MH-22 (Station 7-22) is corroded. There are also some conduits in this area that are corroded. CES should schedule to replace this enclosure and conduits within the next year with non-corrosive materials such as stainless steel.
 - d. The trap strainer at Station 7-45 does not have a blowdown valve. CES should add a blow down valve to this strainer as soon as possible.
 - e. The electrical junction box at Station 7-71 is not anchored. The anchoring “tab” is broken off. CES should investigate the needed repairs/replacements for this conduit and make the needed repair as soon as possible.
 - f. The steam expansion joints at Station 7-22 and 7-62 are leaking. CES should tighten the packing bolts to see if this stops the leak. If this is not successful in stopping the leak, CES should make repairs once the leak is sufficient that injection repairs will be successful.
 - g. The dripleg and a portion of the trap piping at Station 7-81 is not insulated. CES should have this piping insulated as soon as possible.
 - h. One of the two manway lids at MH-22 sounds loose when traffic passes over. CES should review this lid to determine if it needs replacement.
 - i. Continue to monitor the groundwater infiltration and notify TEG of any significant changes.
20. **Broadway Tunnel**
- a. The steam expansion joints at Stations B-20, B-69, B-82 and in the Bridgestone Arena’s Service Tunnel are leaking. CES should tighten the packing bolts to see if this stops the leak. If this is not successful in stopping the leak, CES should make repairs once the leak is sufficient that injection repairs will be successful.
 - b. There is some minor corrosion on the baseplates of the supports at Stations B-33, B-63, B-65, and B-85. CES should clean these areas with a wire brush and paint them with cold galvanizing paint until Enecon can professionally clean and coat these areas.
 - c. Several of the bases of the piping supports in the Bridgestone Arena service tunnel have some minor corrosion. These areas should be cleaned and painted with cold galvanizing paint until Enecon is scheduled to professionally clean and coat these areas.
 - d. The lights are out at Stations B-15 B-38, B-49, and B-69. CES should repair these lights as soon as possible.
 - e. There is a portion of the grout at the baseplate at Station B-19 that is missing. The missing grout is not underneath the baseplate. CES should
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- monitor this and if any of the grout underneath the baseplate cracks or becomes damaged, the grout should be repaired.
- f. There is some damaged grout under an existing wall plate at Station B-38. This grout needs to be repaired as soon as possible to prevent further degradation and possible failure of the attachment to the wall. **This item appeared in the 4/13/22 report.**
 - g. Some insulation is missing on the Bridgestone Arena service lines near the Arena's mechanical room. It appears this insulation was removed when some instrumentation was installed, and maintenance was performed on a valve. This insulation should be replaced under CES's Amendment 2 obligation or by a contractor with the expense included in CES's monthly R&I charges. **This item has appeared in several prior reports.**
 - h. There is some insulation damage at Stations B-49, B-50, B-65, B-80, B-82, and B-96. Some of this is the result of the contraction/expansion of the piping from system shutdowns. CES should make repairs to these areas using aerogel insulation to reduce the overall diameter to eliminate interference with the piping supports. When this is done, a smooth transition should be made between the existing insulation thickness and the new insulation thickness. This insulation should be replaced under CNE's Amendment 2 obligation or by a contractor with the expense included in CNE's monthly R&I charges. **This item appeared in the 4/13/22 report.**
 - i. The chilled water drain piping at Station B-62 is uninsulated. This piping should be insulated to prevent sweating and potentially prevent freezing of this piping in the winter months. This insulation should be replaced under CES's Amendment 2 obligation or by a contractor with the expense included in CES's monthly R&I charges. **This item appeared in the 4/22/21 and 4/13/22 reports.**
 - j. The trap at Station B-96 was recently replaced. The trap piping between the dripleg and the trap needs to be insulated. Re-insulation after a trap replacement should be part of the work scope.
 - k. A drain has been added to the condensate return piping at Station B-96. This piping needs to be insulated under CES's Amendment 2 obligation or by a contractor with the expense included in CES's monthly R&I charges. **This item appeared on the 4/13/22 report.**
 - l. MH-18:
 - i. The Enecon coating on the northeastern portion of the upper beam flange at the entrance to the sump area is beginning to fail. CES should schedule Enecon to clean and re-coat this area as soon as possible.
 - ii. The Enecon coating on the bottom flange of a horizontal beam on the mezzanine level has some corrosion. CES should schedule Enecon to clean and re-coat this area as soon as possible.
 - iii. There is a beam high in the ceiling on the east end of MH-18 that needs to be cleaned and coated by Enecon. CES should schedule Enecon to clean and coat this area as soon as possible.
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- iv. There is some missing/damaged insulation in MH-18 at a steam dripleg and the condensate return piping. These insulation repairs should be made in conjunction with DES-198 (MH 18 Condensate Pump Replacement).
- v. There is some debris in MH-18 that needs to be cleaned/removed. CNE should have this debris removed within the next quarter. **This item appeared in the 4/13/22 report.**
- vi. Electrical:
 - 1. The sump pump electrical control box on the mezzanine level is badly corroded and needs to be replaced with a non-corrosive material such as stainless steel. CES should investigate if this repair can be made during the DES-198 work.
 - 2. The cable box underneath the sump pump electrical control box on the mezzanine level is corroded and requires replacement with a non-corrosive material such as stainless steel. CES should investigate if this repair can be made during the DES-198 work.
 - 3. The 2" or 3" conduit that is above the entrance to the sump area is corroded and requires replacement. CES should investigate if this repair can be made during the DES-198 work. **This item appeared in the 4/13/22 report.**
 - 4. There is an electrical junction box located in the "ceiling" of the tunnel at the western entrance to MH-18 that is corroded. If possible, CES should schedule to replace this junction box during DES-198 with a non-corrosive material such as stainless steel. Otherwise, this box should be replaced within the next year.
- m. The trap at Station B-20 sometimes does not function properly. TEG believes this is due to the trap piping configuration (elevation changes). TEG has presented a revised piping layout to CES. The isolation valve does not seal properly at this location. Therefore, the replacement of this trap and the reconfiguration of the trap piping will have to be done during a steam outage. CES has this listed as an item to address during the next steam isolation/outage. The trap piping should be insulated after this repair is made. **This insulation repair has appeared in the 4/10/17, 4/13/18, 4/30/19, 4/13/20, 4/22/21 and 4/13/22 reports.**
- n. There is a thermometer on the Bridgestone Arena chilled water piping that is broken. If there is not another thermometer nearby which "reads" the same temperature (Bridgestone mechanical room?), this thermometer should be replaced as soon as possible.
- o. The piping support Teflon slides at locations B-6, B-8, B-10, B-13, B-14, B-16, B-17, B-19, B-20, B-21, B-22, B-26, B-31, B-33, B-34, B-35, B-37, B-41, B-43, B-46, B-53, B-57, B-60, B-62, B-63, B-65, B-68, B-69, B-72, B-74, B-75, B-77, B-78, B-80, B-81, B-85, B-86, B-88, B-89, B-93, B-94

- and B-96 are in need of repair. TEG will develop a scope of work and coordinate with CES to have this work accomplished.
- p. There is a small hole in the northern wall at station B-49, next to the upper horizontal support connection. CNE should monitor this hole and notify TEG if there are any significant changes.
21. MH-15
- a. CES has been cleaning and applying cold galvanizing paint to the beams in the sidewalk intake area of MH-15. CES should continue to monitor these beams and clean/paint areas of corrosion as needed.
- b. Groundwater is leaking into MH-15 and is flowing down the vertical shaft resulting in a large amount of mud in the floor of the northern section of the 4th Avenue Tunnel. The water infiltration has significantly increased since the last review. It was originally believed that this water was coming through the eastern steam piping wall penetration. However, upon closer review, it does not appear this is the entry point. The water may be entering at the joint between the walls and the floor. The water in the floor of the manhole should be removed and the floor cleaned to try and determine the groundwater entry point. If the water is entering between the wall/floor joint, Enecon can be hired to seal this joint to try and eliminate this infiltration.
- c. The western steam butterfly isolation valve is extremely difficult to operate. CES has determined that the valve can be closed with some effort. CES should plan/schedule a partial system outage to replace this valve as soon as possible. The replacement valve should be a high-performance butterfly valve manufactured by either Adams or Zwick. **This item appeared in the 4/13/22 report.**
- d. Some of the “openings” in the grating at the top of the 4th Avenue Tunnel vertical shaft are clogged with debris (this is an air intake for the 4th Ave Tunnel fans. Therefore, these openings should be cleared) and portions of the grating is corroded and needs to be repaired or replaced. TEG will develop a scope for the replacement of the grating and coordinate with CES to have this work done.
- e. Continue to monitor/inspect the sidewalk intake grating. If portions of the grating become damaged or warped resulting in a pedestrian trip hazard, replace grating sections as needed.
22. MH-23
- a. There are some surface cracks in the steam and condensate slip joint concrete pedestal. CES should monitor these cracks and notify TEG of any significant changes.
- b. There is a flanged steam valve in this manhole that is blind flanged. The pipe blind flange connection is leaking. This flange has a clamp on it with injection nozzles presumably because of prior leaks. CES should monitor this steam leak and make repairs once the leak is sufficient that injection repairs will be successful.
- c. The drain in the air intake area in the sidewalk is not draining and water has
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accumulated. A camera was used to scope this drain piping and it was discovered that this drain line has collapsed so the drain is not able to drain continuously and at times water will accumulate in this area. The location of the drain line collapse is about 15 feet below grade in 7th Ave. CES should monitor this floor drain and pump out this area on an as-needed basis.

- d. The upper two steps of the grating staircase which leads to the ventilation opening are corroded because they are not galvanized. CES should monitor these steps and before they become a safety hazard, replace them with new galvanized grating sections.
- e. Several of the pipe support slides have rust stains. This is referred to as “creep.” This occurs because some areas of the metal could not be accessed to be cleaned and coated so the corrosion in the inaccessible areas “stain” the coated areas. The few accessible areas can be cleaned and coated, and the rust stains can be cleaned from the coated surfaces, however the only way to eliminate the creep is to replace the corroded metal. Because there are some areas within the 4th, 7th and Broadway Tunnels that require cleaning and coating by Enecon, these areas in MH-23 can be addressed at that time. However, eventually, the pipe slide supports will need to be replaced. CES should monitor these support slides and report any significant deterioration to TEG.
- f. The ceiling is comprised of individual concrete slabs to allow their removal for maintenance. Groundwater is seeping through these joints and resulting in calcium deposits. CES should monitor these joints and report any major changes to TEG. TEG will investigate with Enecon to determine if one of their products can seal these joints.

VI. Customer Relations

This section contains descriptions of the marketing efforts made by the DES Team during the quarter and prominent existing customer interactions. The topics of interactions, meetings and training seminars with the customers are also discussed. There are currently 21 customers, comprised of 42 different buildings connected to the EDS. Service to each of these buildings continues to prove satisfactory, and the responsiveness to customer issues is handled by CES in an expeditious and professional manner.

A. Marketing

The design and development of the proposed hotels at 1st Ave S and KVB have been delayed. However, TEG continued discussions with the development team for the site and will continue to collaborate with them through their design options.

Metro Water Services (MWS) participates on the East Bank Technical Advisory Committee, which consists of more than two dozen representatives of interested utilities, regulatory bodies, planning agencies, property owners, and design professionals. The

Metro Liaison represents DES and represents the interests of MWS infrastructure. The Metro Liaison has been actively promoting the use of district energy in the East Bank planning process by identifying synergies with other utility, transportation, and public recreation agencies. Work associated with the East Bank Development is tracked under the project DES201.

MWS and DES are currently in discussions regarding the developing plans for the Oracle campus, but those plans have been placed on hold by Oracle until later in the year. DES is also pursuing opportunities to serve other developments and MWS infrastructure in the River North area. DES continues to explore options for serving the Oracle campus, the proposed Titans Stadium, and other East Bank developments in a sustainable way.

TEG continues to have discussions with potential developments along the Peabody St corridor and the Rolling Mill Hill area. These developments could potentially be served from an expansion of the EDS (DES192).

TEG has remained in contact with the development team for a new hotel to be located at Demonbreun and 8th Ave S during the quarter. The design and development are in the early stages and more conversations are anticipated in the coming months.

B. Customer Interaction

The CES customer service representative (CSR) continues to respond to customer issues as they arise. Much of the communication involves minor problems with the customers' heating and cooling systems that are unrelated to DES service. Other more significant issues are summarized herein.

-) Several customers made repairs within their buildings during the Quarter and requested assistance from CES, which was provided. Some of these repairs involved isolating the steam or chilled water services to the building for the customers.
-) The CSR notified the necessary parties that a ventilation fan in the State Tunnel had a broken belt.
-) CES scheduled and replaced a steam trap at the Hyatt Place.
-) James K. Polk Building personnel notified the CSR of a chilled water leak in one of their coils. The coil was isolated while waiting for repairs.
-) CES's CSR was contacted by personnel from the War Memorial Building to investigate water entering their mechanical room. The water was entering from the pipe chase after leaving MH-S4A. It was determined that the water was coming from a faulty drain inside the pipe chase. CES personnel isolated the steam to the building on two occasions to assist the customer with repairs. TEG requested that CES seal the pipe chase in S4A to eliminate any draft from entering the mechanical room. This was completed on February 24, 2023.
-) Due to a potential meter error, CES began investigating a possible issue with the operation of the chilled water system at the Bridgestone Arena. CES determined

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- the issue may have been related to a faulty transmitter on the chilled water meter. This transmitter was replaced.
-) The Andrew Jackson building began dumping their condensate return due to a failure of their condensate pump.
 -) The Renaissance Hotel reported a broken drain line in the loading dock area on the chilled water system. CES isolated the building until the repairs were made. Service was restored the same day.
 -) Steam service was interrupted to the AA Birch Building due to a water line leak on 2nd Avenue North which caused the AA Birch Tunnel to fill with water up to the steam line. The interruption of the service protected the steam line as well as the customer's pressure reducing valves. CES pumped the tunnel for approximately twelve hours and monitored the situation to verify the sump pumps could manage the flow of water entering the tunnel. Steam service was restored as soon as the water level was below the steam piping.
 -) CES personnel responded to an emergency locate request at 6th Avenue North due to a city water leak near the State Tunnel. CES personnel inspected the State Tunnel and found no water entering any portion of the tunnel.
 -) The CES control room operator notified the CSR that the chilled water flow at the Music City Center was varying between 1,400 gpm to 4,800 gpm over a short period. The sudden variation in flow caused additional issues at the EGF. The CSR contacted the building engineer. After several failed attempts to adjust their flow rate, building personnel agreed to contact their control vendor.
 -) Other minor issues and customer interactions are noted in the monthly reports from CES.

VII. Recommendations

CES is obligated to meet the standard of good utility practice and performance guarantees as outlined by the ARMA. CES has improved their operation and met many of the performance guarantees for the quarter due in part to the implementation of the plan developed by their engineer. In TEG's opinion, CES needs to continue to improve the operations of the EGF to meet the remaining metrics more consistently. In addition, CES has greatly improved its maintenance over the last several quarters resulting in fewer recurring items in TEG's quarterly walkthrough reports regarding manholes and the EGF. However, there are still several long-term outstanding tunnel items. CES needs to expeditiously address any long-outstanding items.

Based on the review of the Third Quarter FY23 EGF and EDS operations, the following recommendations are made.

-) CES needs to address the maintenance items included in the EGF and EDS Walkthrough sections of this report as soon as possible.
-) CES needs to increase their preventative maintenance program to decrease the number of equipment malfunctions and trips within the EGF or otherwise improve the operation of the system to prevent such frequent occurrences in the future.

-) The structural steel within vaults and tunnels that has been professionally cleaned and coated should be closely monitored so that if deterioration occurs, it can be addressed quickly and cost effectively.
-) Structural steel within the vaults and tunnels that have not been professionally cleaned and coated which exhibit evidence of corrosion should be cleaned and coated by CES using cold galvanizing paint to mitigate the progression of corrosion.
-) Insulation that is absent or in disrepair in the vaults and tunnels should be repaired/replaced through Amendment 2 of CES's contract or through capital and R&I projects.
-) Steam traps which need repair or replacement should be addressed immediately.
-) Expansion joint leaks should be repaired by either re-packing the joint or injection of a sealant once the leak(s) is sufficient for the repair to be effective.
-) CES should continue to remove debris and mud from manholes.