



## **Operations Monitoring Report**

**Fourth Quarter FY23**

**Prepared by:**

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## **I. Executive Summary**

A review of the fiscal year 2023 (FY23) Fourth 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 Fourth 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 implemented some of the recommendations presented in the report from their engineer during FY23. The operational changes made by CES have resulted in additional energy savings and improved performance. CES and TEG continue to monitor the efficiency and performance of the DES and look for means of improving the system.

For the Fourth Quarter FY23, the chilled water sales decreased 11.9% over the previous Fourth Quarter (FY22). The chilled water sendout also decreased 8.6% over the previous Fourth Quarter. However, the system losses increased 56.8%. TEG and CES will investigate the cause of the significant increase in system losses. The number of cooling degree days decreased 26.5%. The peak chilled water demand for the current quarter was 15,972 tons, which is 11.7% lower than the previous Fourth Quarter.

For the Fiscal Year 2023, the chilled water sales decreased only 0.4% while the sendout increased 0.5% over the previous fiscal year. The system losses increased 15.7%. The number of cooling degree days decreased by 2.3%. The peak demand for the system in FY23 was 18,360 tons which is 0.3% lower than in FY22.

Steam sendout for the current quarter decreased by 3.3% over the previous Fourth Quarter with steam sales decreasing 3.8%. This decrease came with an 11.3% decrease in heating degree days. Total steam system losses decreased 1.8% from the previous Fourth Quarter. The peak steam demand for the current quarter is 72,100 pounds per hour, which represents a decrease in the previous Fourth Quarter demand of approximately 11.3%.

In FY23, the total steam sendout was approximately the same as in FY22; however, the steam sales increased 2.2%. The steam system losses decreased 11.0% over the previous fiscal year. The number of heating degree days decreased 9.4%. The peak steam demand for the year was 136,325 pounds per hour, which reflects a 9.0% decrease over FY22.



Overall, DES experienced a decrease in chilled water and steams sales in FY23 driven by a decrease in the number of cooling and heating degree days, respectively. Although the decrease in sales reduces the overall revenue of the DES, the impact on the Metro Funding Amount is minimal. All of the electricity, water, sewer, chemical, and fuel costs are directly proportional to the overall sales and directly passed through to the customers.

Work continued with the DES Capital and Repair & Improvement Projects during the Fourth Quarter. Repair and Improvements to the EDS continue as scheduled. Of these ongoing projects, currently CES has an active role in eight with two nearing completion and one not being executed until the fall. As noted in prior quarterly monitoring reports, the postponement or deferral of some 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 DES208, DES209 and DES210 have been added. Projects DES205 was closed during the quarter.

The current fiscal year system operating costs to date are \$19,657,124. This value represents approximately 95.7% of the total budgeted operating cost for FY23. The customer revenues from the sales of steam and chilled water for FY23 are \$19,957,205 (99% of budgeted amount) which includes the annual true-up amount for FY22 and other miscellaneous revenue sources. The Metro funding amount transferred to date for FY23 is \$374,300 (100% 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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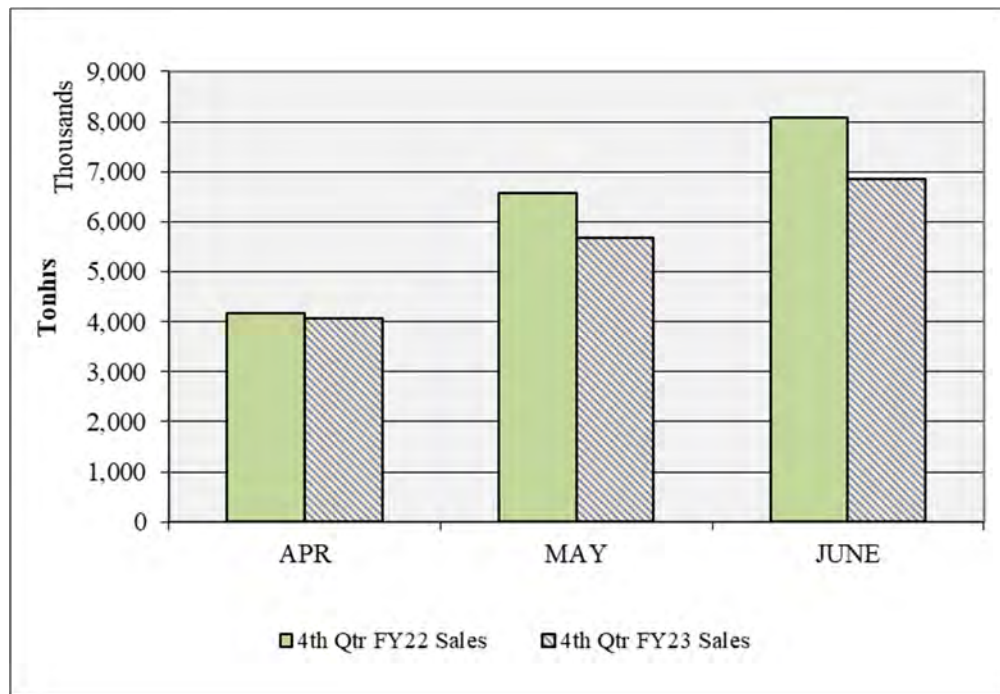
## II. Energy Distribution Sales and Performance

### 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

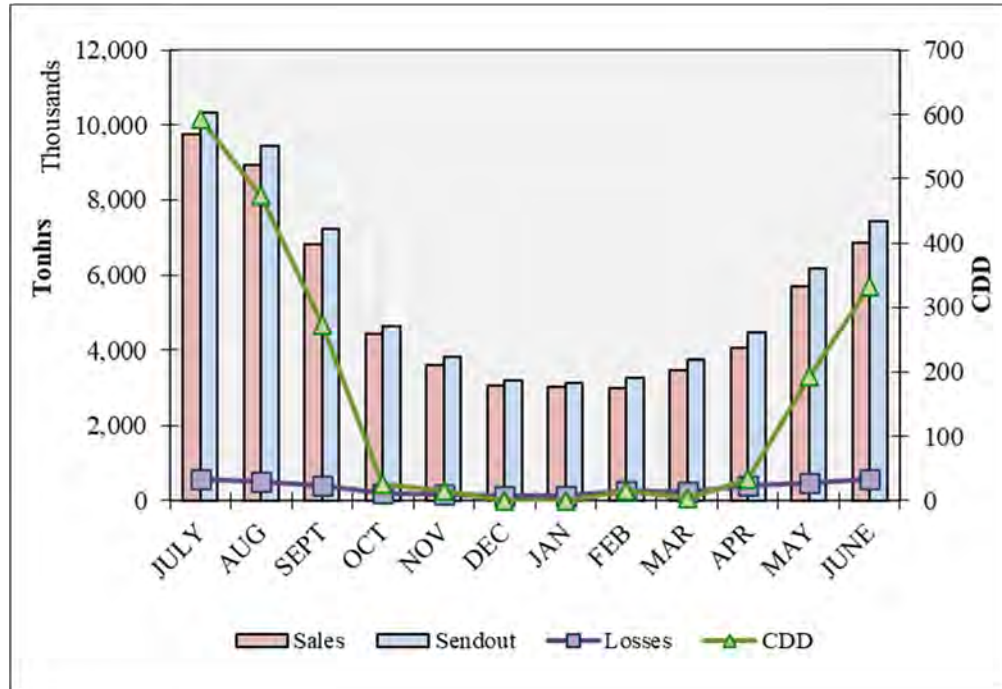
A comparison for the Fourth Quarter chilled water sales is shown in Figure 1. This data reflects an 11.9% decrease in sales for the current quarter over the same quarter of the previous fiscal year.



**Figure 1. Chilled Water Sales Comparison**

The peak chilled water demand for the current quarter was 15,972 tons, which represents a 11.7% decrease over the previous Fourth Quarter. The number of cooling degree days were 26.5% lower in FY23 than in FY22.

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.

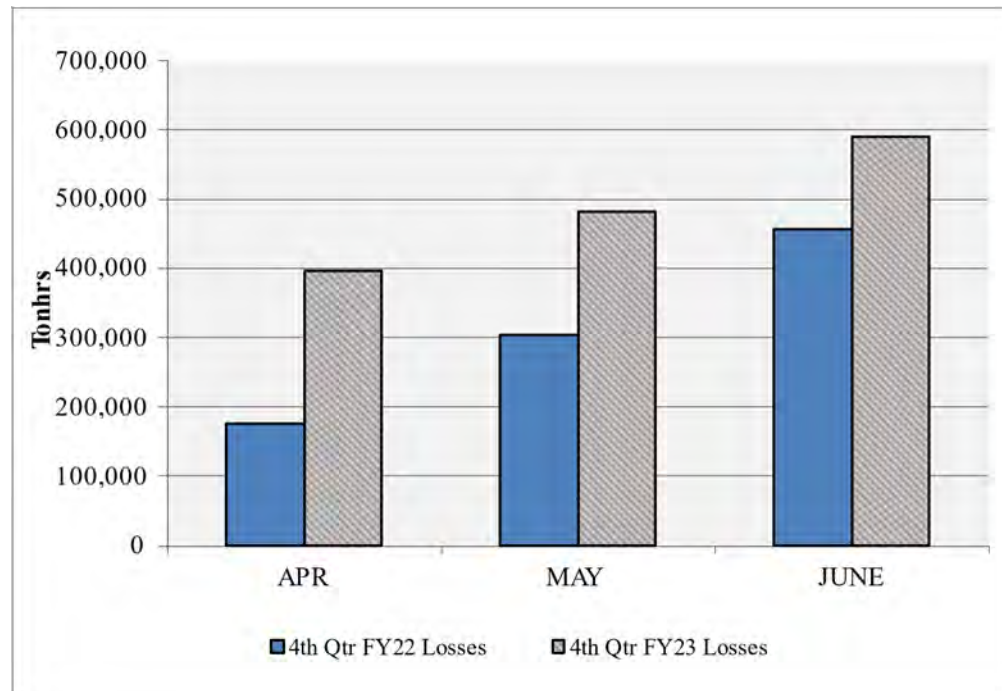


**Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months**



## 2. Losses

A significant increase in the chilled water energy losses is noted for the Fourth Quarter. A portion of these losses may be attributed to an issue with the chilled water meter at the Bridgestone Arena. TEG and CES are investigating the potential causes and remedies for the increase in losses. A comparison of the total chilled water energy losses in the EDS for the Fourth Quarter is shown in Figure 3. These losses are the difference in chilled water sendout and sales and may reflect differences in the meter accuracy between the EGF sendout meter and the customer meters.

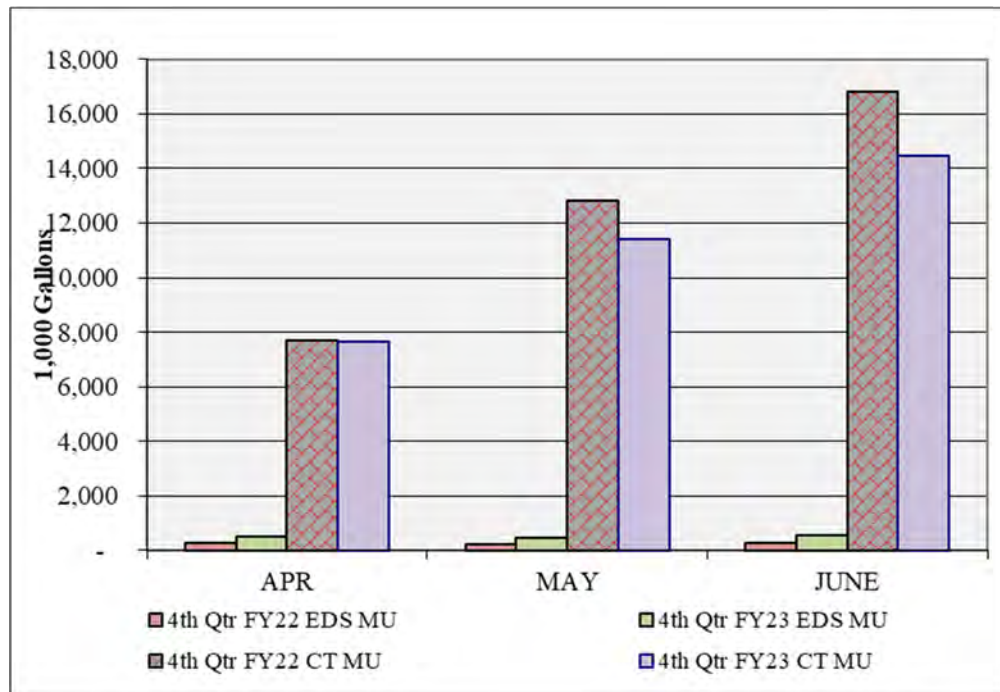


**Figure 3. Chilled Water System Loss Comparison**

The EDS make-up decreased by 105.2% over the previous Fourth Quarter as the average daily make-up amounts continue to increase. TEG and CES suspect another leak in 5<sup>th</sup> 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 decreased 10.2% over the previous Fourth 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 decrease in cooling tower make-up would be expected with a decrease in sales. The total chiller plant water use decreased 8.0% over the Fourth Quarter FY22. The

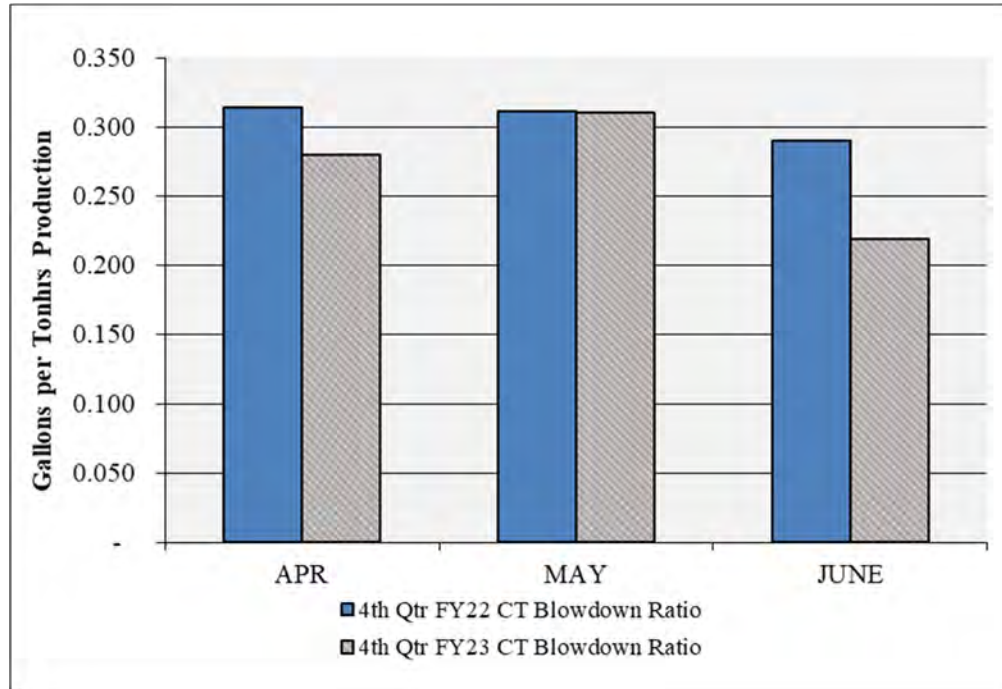
overall city water make-up comparison for the chilled water system Fourth Quarter is shown in Figure 4.



**Figure 4. Chilled Water System City Water Usage Comparison**

The number of cycles of concentration in the condensing water circuit increased 14.4%. This metric may assist CES in determining if operational changes to the condensing water system have resulted in an overall reduction in chiller plant water usage. Although monitoring of this particular metric by CES did not begin until March 2023, a comparison may still be made between the Fourth Quarter FY22 and FY23. The result is a 12.3% decrease in the amount of cooling tower blowdown per unit of chilled water sales which may result in reduction in the chilled water system water usage. Figure 5 shows the comparison of this metric for the Fourth Quarter.

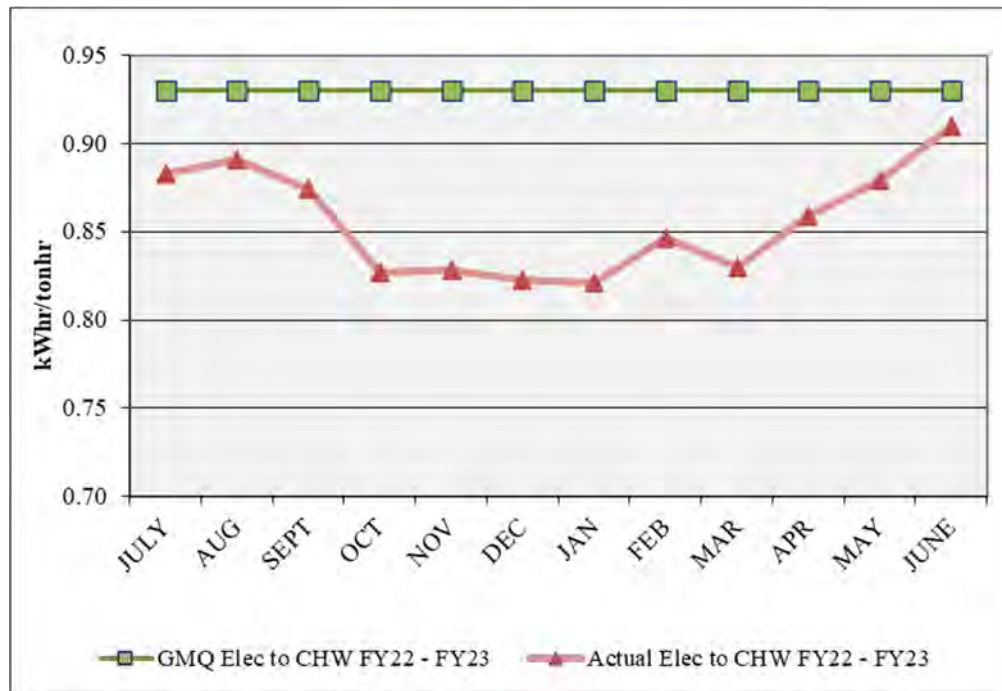




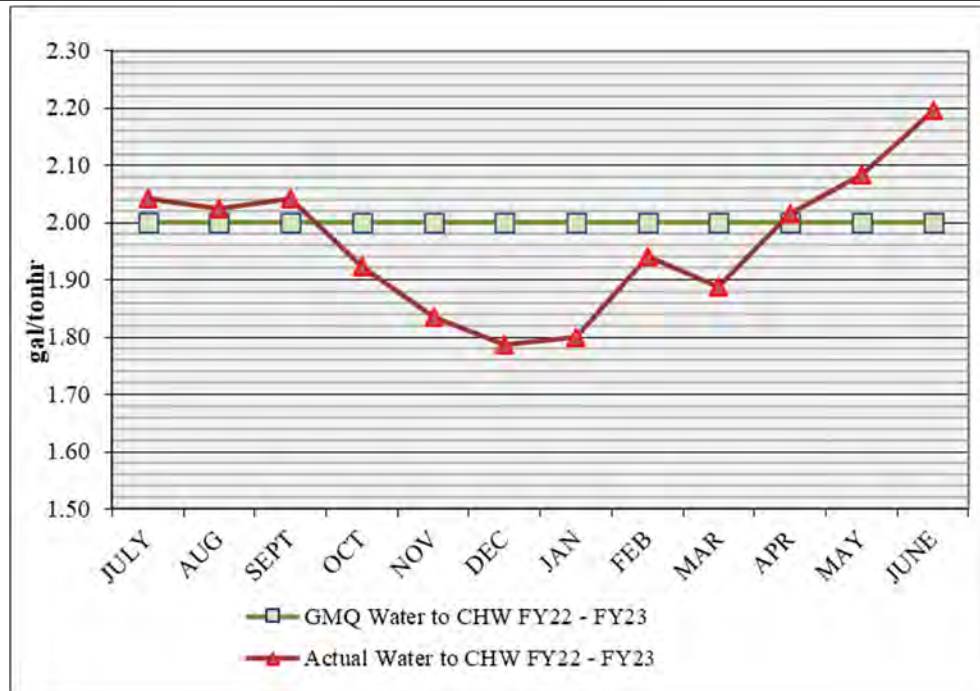
**Figure 5. Cooling Tower Blowdown Ratio Comparison**

### 3. Performance

The performance of the chilled water portion of the EGF is presented in the following two charts, Figures 6 and 7, 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 Fourth 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. The values represented below do not include the annual true-up adjustment which will occur in the First Quarter FY24.



**Figure 6. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months**



**Figure 7. 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 2.8% over the previous Fourth Quarter. For the fiscal year, the annual aggregate electric usage per unit of sales decreased 1.2%. CES and TEG continue to monitor the improvements created by CES’s operational changes.

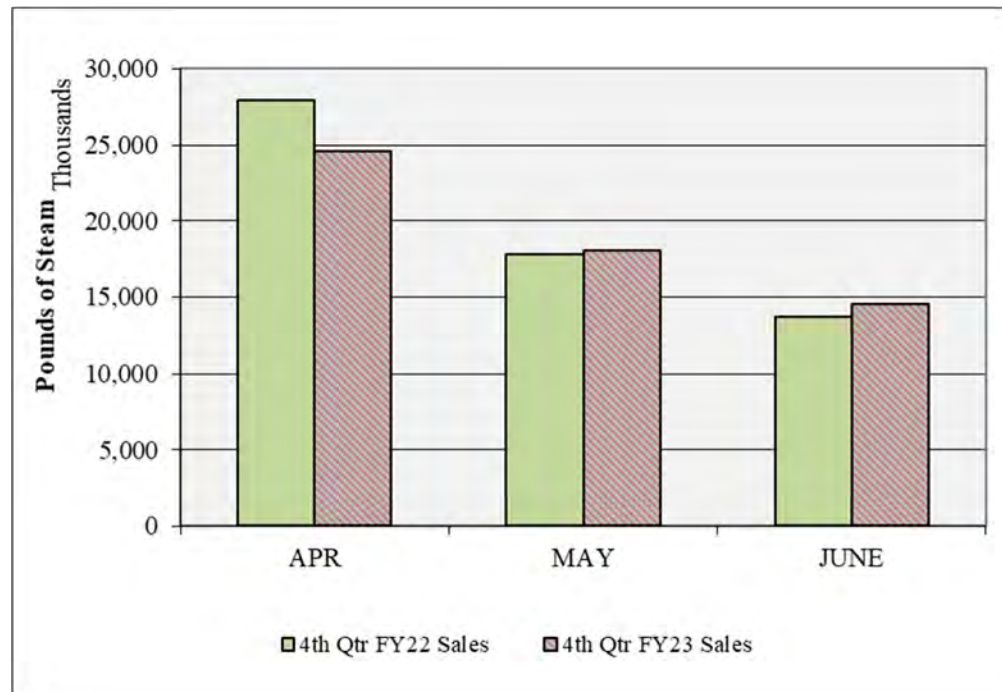
The total consumption of city water for the chiller plant for the current quarter has decreased over the previous Fourth Quarter due largely to a decrease in chilled water sales. The water conversion factor for the chiller plant increased by 4.8% (on average) over the Fourth Quarter FY23. For the fiscal year, the water conversion factor decreased 8.6% over FY22. The guaranteed value was not met in each month of the Fourth Quarter and for six months during the fiscal year.

**B. Steam**

**1. Sales and Sendout**

The steam sendout decreased by approximately 3.3% over the previous Fourth Quarter (FY22), and the sales decreased 3.8%. The Quarter experienced a 11.3% decrease in the number of heating degree days. The steam system losses decreased 1.8%, and the relative amount of condensate return increased 13.6% during the quarter. The peak steam demand for the current quarter was 72,100 pph, which

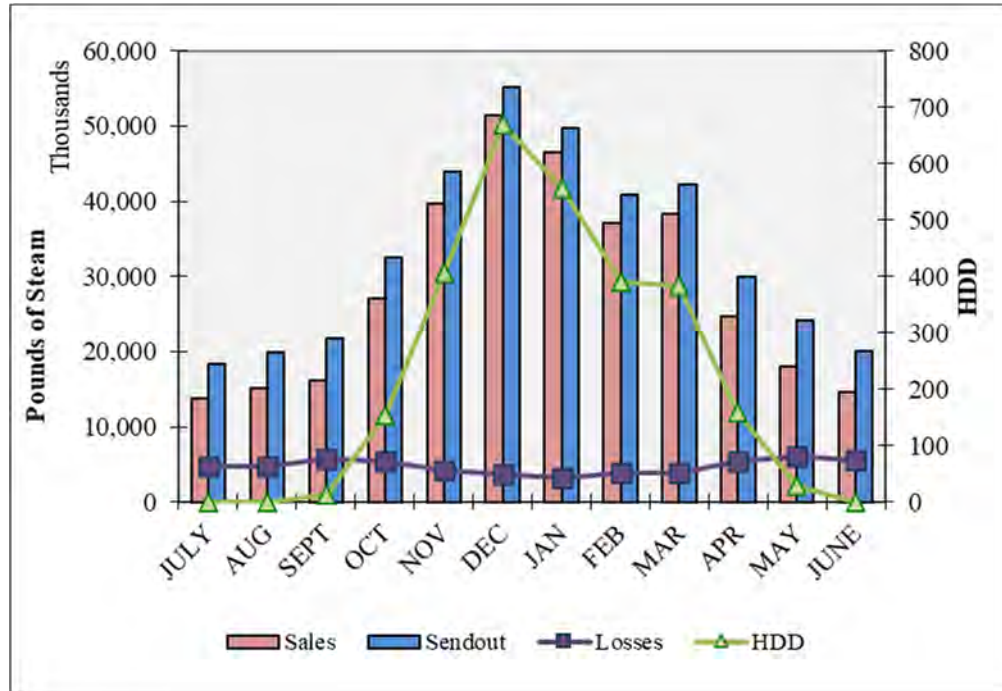
reflects an 11.3% decrease in the peak steam production over the previous Fourth Quarter. A comparison for the Fourth Quarter steam sales is shown in Figure 8.



**Figure 8. Steam Sales Comparison**

For the fiscal year, the steam sendout is approximately the same as in FY22, but the steam sales increased by 2.2%. This relationship results in a decrease in the system losses by 11.0% over FY22.

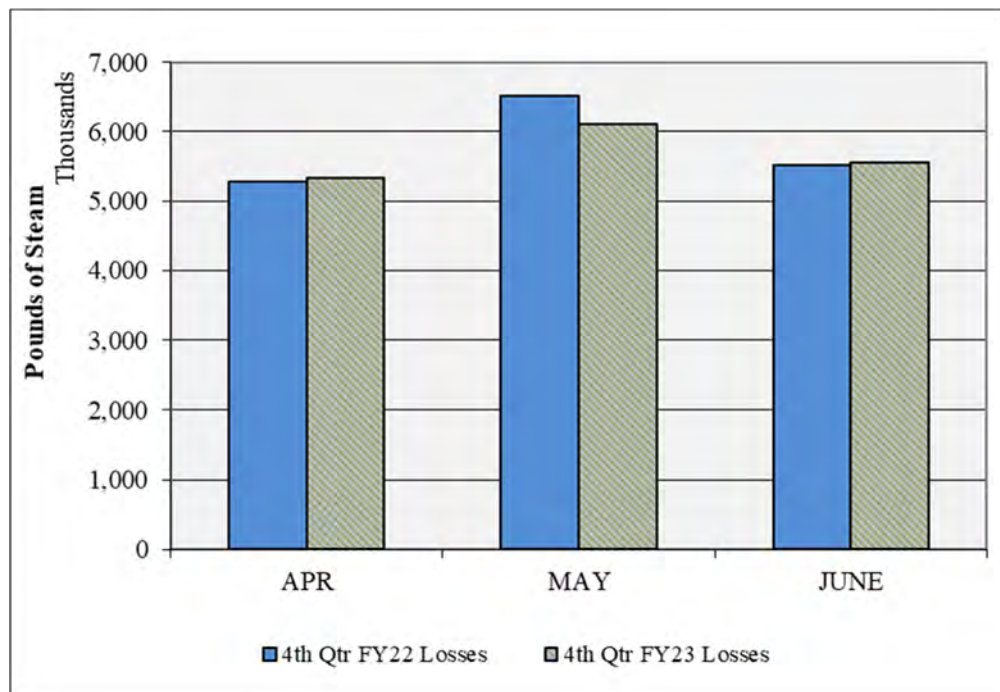
Figure 9 shows the steam sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in pounds per month between the recorded sendout and sales values and represent the total mass loss in the EDS between the EGF and the customer meters.



**Figure 9. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months**

## 2. Losses

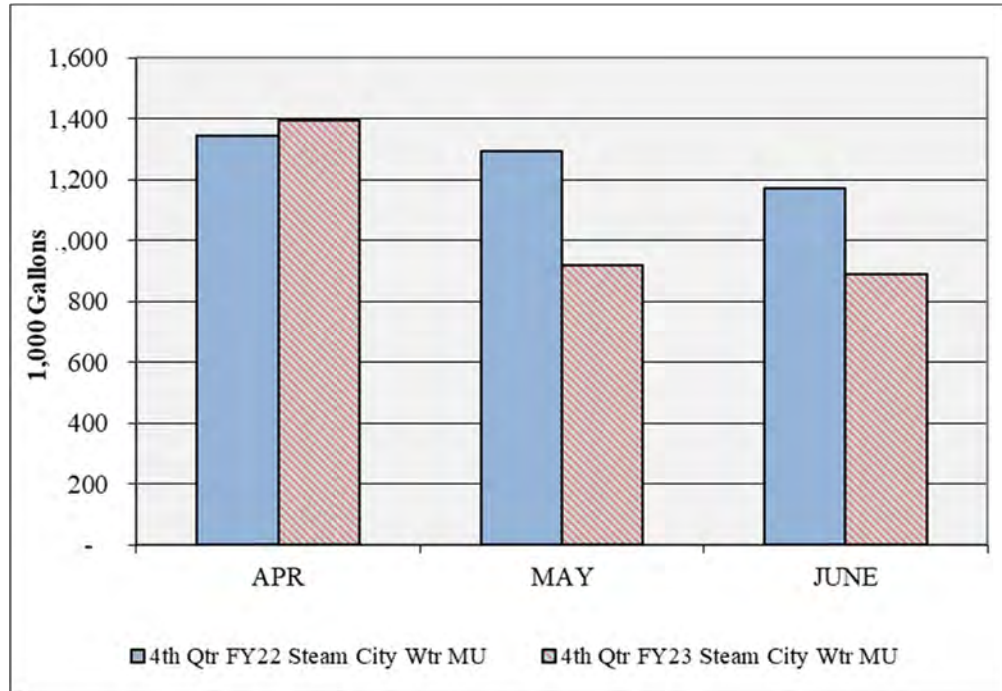
A comparison of the total steam mass losses in the EDS for the Fourth Quarter is shown in Figure 10. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty traps, steam leaks or meter error could also be a contributing 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. However, for the Fourth Quarter, steam losses have decreased due in part to additional maintenance performed in the distribution system.



**Figure 10. 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 amount of make-up to the steam system decreased 15.9% over the Fourth Quarter FY22. However, the total FY23 water usage increased 8.0% over FY22. The corresponding data for steam system make-up is shown in the comparison of Fourth Quarter data in Figure 11.



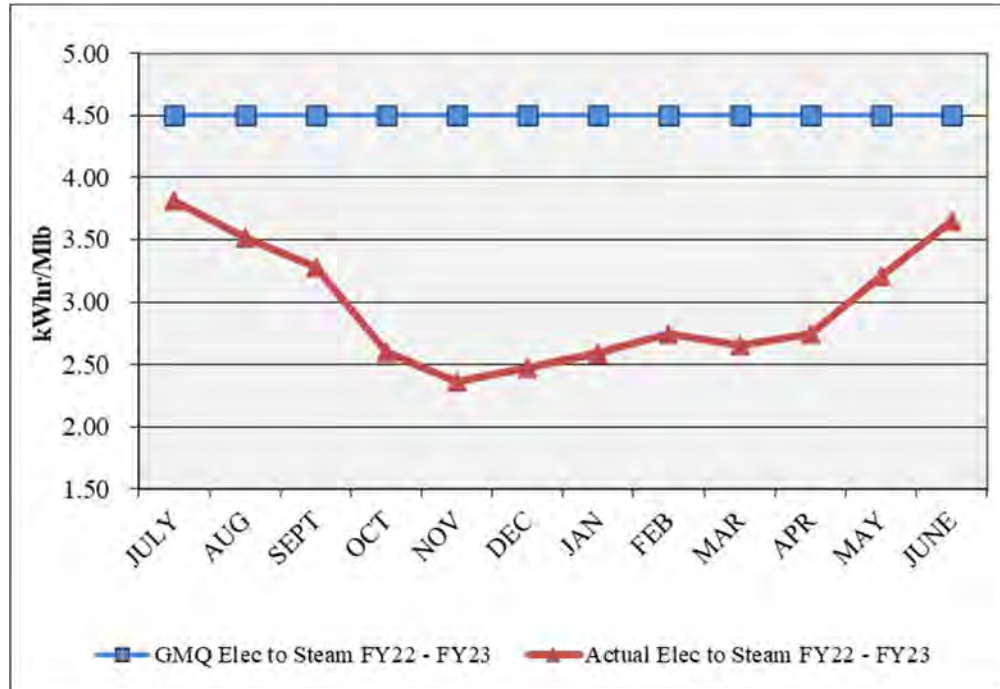


**Figure 51. Steam System City Water Make-up Comparison**

### 3. Performance

The performance of the steam system of the EGF is presented in the following three charts, Figures 12, 13 and 14. The values represented below do not include the annual true-up adjustment which will occur in the First Quarter FY24.

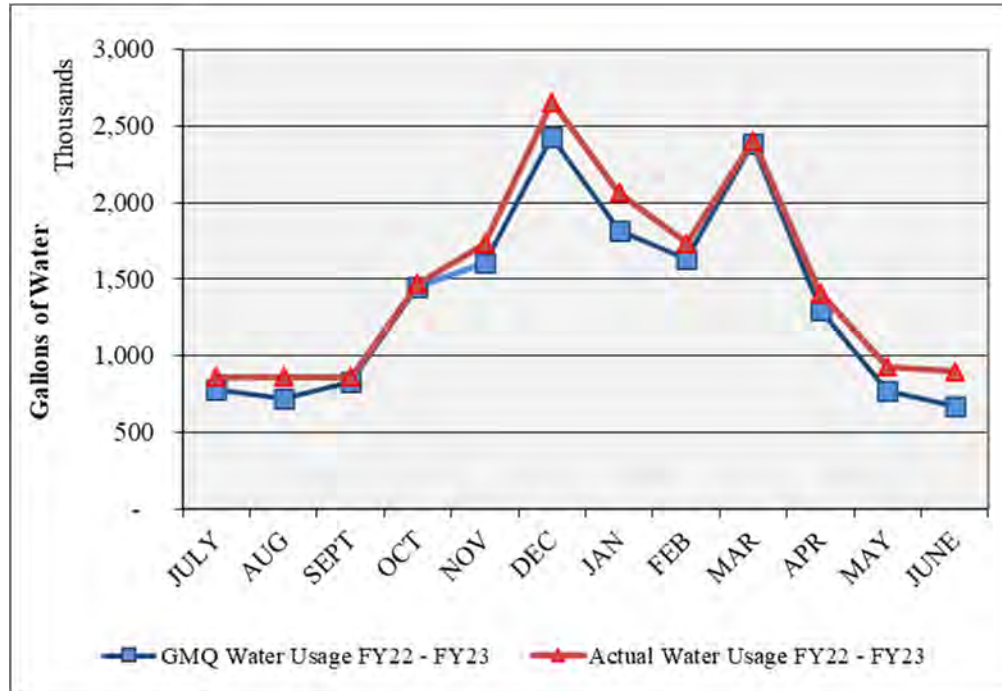
The steam electric conversion factor was met each month of the quarter and for each month of FY23. The steam plant electric consumption for the current quarter was 4.1% lower in FY23 than in FY22. The steam-electric metric decreased 1.1% over the previous Fourth Quarter. However, for FY23, the average metric was 8.1% lower in FY23 than in FY22. The monthly steam-to-electric conversion factors, along with the guaranteed values, are shown in Figure 12.



**Figure 62. Steam Plant Electric Performance Guarantee for the Previous Twelve Months**

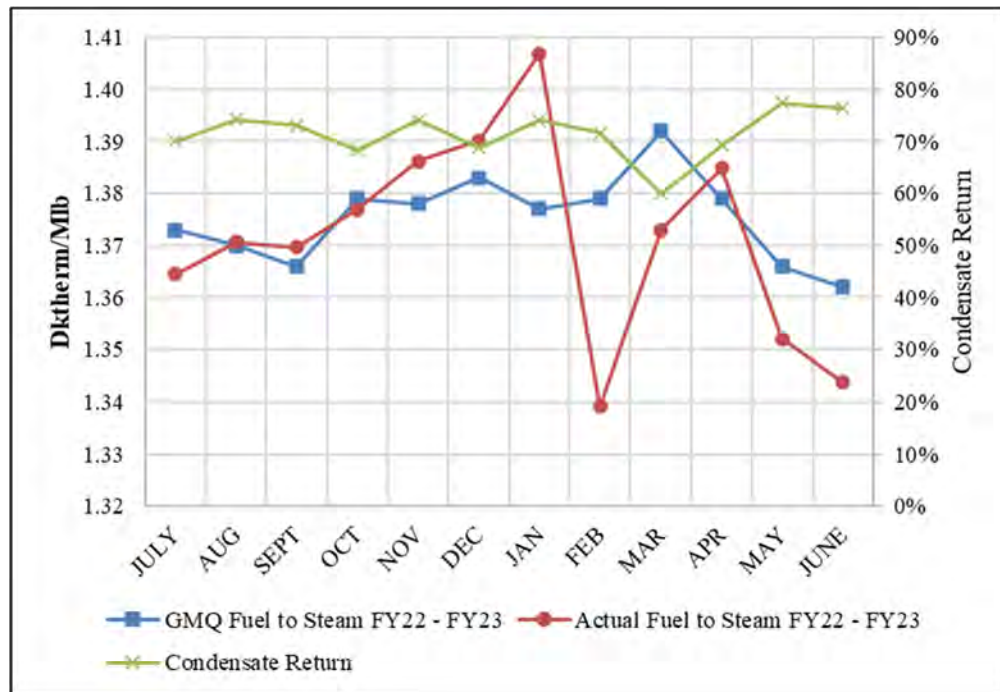
The steam water conversion factor exceeded the guaranteed values for each month in the quarter by magnitudes ranging from approximately 1% to 34% in June 2023. However, the water consumption for the steam plant decreased 15.9% this quarter as compared to the previous Fourth Quarter. TEG monitors CES’s performance regularly and will continue to report any non-compliance in the EGF’s operation. The steam water conversion factors are shown in Figure 13.

CES and TEG continue to monitor the performance of the EGF as CES makes efforts to improve the DES performance. 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.



**Figure 73. Steam Plant Water Performance Guarantee for the Previous Twelve Months**

The steam fuel conversion factor exceeded the guaranteed values in April 2023. For the fiscal year, the guaranteed values were exceeded for six months of the year. However, the differences between the actual and guaranteed values were relatively small except for January 2023. The fuel consumption per unit of steam sendout decreased 0.9% over the previous Fourth Quarter and 0.8% over FY23. 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 14 shows the performance of the conversion factors for the previous twelve months.



**Figure 84. 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 Fourth Quarter comparisons of the Guaranteed Maximum Quantities (GMQ) or System Performance Guarantees of the criteria commodities (fuel, water, and electricity). The comparisons between the totals for FY23 and FY22 are also shown.

**Table 1. Fourth Quarter FY23 and Annual Production, Sales, and Consumption Summary**

Item	Unit	Fourth Quarter FY23	Fourth Quarter FY22	*Percent Difference	Total Year FY23	Total Year FY22	*Percent Difference
	days	91	91	0.00%	365	365	0.00%
<b>Total Electric Use</b>	kWhrs	14,884,449	16,343,909	-8.93%	55,322,049	55,560,768	-0.43%
Chilled Water	kWhrs	14,706,079	16,157,874	-8.99%	54,370,215	54,571,138	-0.37%
Steam	kWhrs	178,370	186,035	-4.12%	951,834	989,630	-3.82%
<b>Total Water Use</b>	kgal	38,256	41,889	-8.67%	143,631	151,842	-5.41%
Total Chilled Water	kgal	35,051	38,077	-7.95%	125,930	135,457	-7.03%
EDS Make-up	kgal	1,541	751	105.19%	5,312	15,099	-64.82%
Cooling Towers	kgal	33,510	37,326	-10.22%	120,618	120,358	0.22%
Calc CT Evaporation	kgal	28,726	31,351	-8.37%	101,384	99,110	2.29%
CT Blowdown	kgal	4,784	5,975	-19.93%	19,234	21,248	-9.48%
Calc # Cycles		6.00	5.25	14.43%	5.27	4.66	13.00%
Steam	kgal	3,205	3,812	-15.92%	17,701	16,385	8.03%
<b>Total Fuel Use</b>	mmBTU	101,157	105,356	-3.99%	548,289	552,526	-0.77%
Natural Gas	mmBTU	101,157	105,356	-3.99%	548,248	552,502	-0.77%
Propane	mmBTU	0	0	0.00%	41	24	69.42%
<b>Condensate Return</b>	kgal	6,725	6,124	9.81%	34,644	35,200	-1.58%
	lbs	54,848,434	49,946,980	9.81%	282,551,146	287,082,838	-1.58%
Avg Temp	°F	179.0	178.7	0.19%	176.5	173.1	1.97%
<b>Sendout</b>							
Chilled Water	tonhrs	18,052,600	19,753,600	-8.61%	66,878,600	66,553,400	0.49%
Steam	lbs	74,212,000	76,770,000	-3.33%	398,649,000	398,356,000	0.07%
Peak CHW Demand	tons	15,972	18,085	-11.68%	18,360	18,414	-0.29%
Peak Steam Demand	lb/hr	72,100	81,275	-11.29%	136,325	149,750	-8.96%
CHW LF		51.75%	50.01%	3.48%	41.58%	41.26%	0.78%
Steam LF		47.13%	43.25%	8.97%	33.38%	30.37%	9.93%
<b>Sales</b>							
Chilled Water	tonhrs	16,585,144	18,817,583	-11.86%	62,752,210	62,986,231	-0.37%
Steam	lbs	57,230,376	59,472,499	-3.77%	342,268,552	335,021,302	2.16%
<b>Losses</b>							
Chilled Water	tonhrs	1,467,456	936,017	56.78%	4,126,390	3,567,169	15.68%
Steam	lbs	16,981,624	17,297,501	-1.83%	56,380,448	63,334,698	-10.98%
		22.88%	22.53%	1.56%			
<b>Degree Days</b>							
CDD		558	759	-26.48%	1,958	2,005	-2.34%
HDD		188	212	-11.32%	2,762	3,048	-9.38%
<b>Cooling Tower Blowdown Ratio</b>							
Cooling Tower Blowdown	gal	4,784,400	5,975,000	-19.93%	19,234,400	21,248,000	-9.48%
Chilled Water Production	tonhrs	18,052,600	19,753,600	-8.61%	51,667,600	66,553,400	-22.37%
Ratio	gal/tonhrs	0.265	0.302	-12.38%	0.372	0.319	16.60%

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

**Table 2. Fourth Quarter FY23 and Annual Performance Guarantee Comparison for Steam and Chilled Water**

GMQ Calculations	Unit	Fourth Quarter FY23	Fourth Quarter FY22	*Percent Difference	Total Year FY23	Total Year FY22	*Percent Difference
<b>Steam</b>							
GMQ Elec Conversion	kWhr/Mlb	4.50	4.50		4.50	4.50	
Electric Conversion	kWhr/Mlb	3.20	3.23	-1.07%	2.97	3.23	-8.11%
GMQ Plant Efficiency	Dth/Mlb	1.369	1.385		1.375	1.377	
Plant Efficiency	Dth/Mlb	1.360	1.372	-0.88%	1.375	1.387	-0.84%
Actual %CR		73.91%	65.06%	13.60%	70.88%	72.07%	-1.65%
Avg CR Temp	°F	179	179	0.19%	177	173	1.97%
GMQ Water Conversion	gal	2,730,323	3,782,129		16,370,155	15,689,859	
Water Conversion	gal	3,237,050	3,850,120	-15.92%	17,878,010	16,548,850	8.03%
<b>Chilled Water</b>							
GMQ Elec Conversion	kWhr/tonhr	0.930	0.930		0.930	0.930	
Electric Conversion	kWhr/tonhr	0.883	0.859	2.78%	0.856	0.866	-1.21%
GMQ Water Conversion	gal/tonhr	2.00	2.00		2.00	2.00	
Water Conversion	gal/tonhr	2.10	2.00	4.78%	1.97	2.15	-8.62%

\*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 \$19,657,124. This value represents approximately 95.7% of the total budgeted operating cost for FY23. The customer revenues from the sales of steam and chilled water for FY23 are \$19,957,205 (99.0% of budgeted amount) which includes the annual true-up amount for FY22 and other miscellaneous revenue sources. The Metro funding amount transferred to date for FY23 is \$374,300 (100% 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
<b>Operating Management Fee</b>							
FOC: Basic	\$ 4,006,800	\$ 1,001,705	\$ 1,001,705	\$ 1,001,705	\$ 1,001,705	\$ 4,006,819	100.00%
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	\$ 53,289	\$ 210,828	82.45%
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)	\$ (236)	\$ (277)	-0.33%
Chilled Water	\$ 126,200	\$ 25,885	\$ 39,621	\$ 25,835	\$ 9,128	\$ 100,470	79.61%
Misc: Metro Credit	\$ -	\$ (415,775)	\$ (223,940)	\$ (181,022)	\$ (244,435)	\$ (1,065,172)	n.a.
ARFA	\$ 63,000	\$ 15,754	\$ 15,754	\$ 15,754	\$ 15,754	\$ 63,018	100.03%
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>Subtotal - Man Fee =</b>	<b>\$ 4,559,300</b>	<b>\$ 1,100,504</b>	<b>\$ 1,139,691</b>	<b>\$ 1,090,498</b>	<b>\$ 1,079,640</b>	<b>\$ 4,410,332</b>	<b>96.73%</b>
<b>Reimbursed Management Fee + Chem Treatment</b>		\$ 1,100,504	\$ 1,139,691	\$ 1,090,498	\$ 728,914	\$ 4,059,606	0.00%
<b>Metro Costs</b>							
Pass-thru Charges: Engineering	\$ 129,500	\$ 6,332	\$ 6,723	\$ 11,188	\$ 12,320	\$ 36,562	28.23%
EDS R&I Transfers	\$ 303,700	\$ 75,925	\$ 75,925	\$ 75,925	\$ 75,925	\$ 303,700	100.00%
Metro Marketing	\$ 60,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Metro Incremental Cost	\$ 718,800	\$ 118,250	\$ 133,172	\$ 119,432	\$ 141,418	\$ 512,272	71.27%
Utility Costs: Water/Sewer	\$ 759,700	\$ 394,055	\$ 207,531	\$ 169,886	\$ 231,722	\$ 1,003,195	132.05%
EDS Water/Sewer	\$ -	\$ 47	\$ 535	\$ 445	\$ 142	\$ 1,168	n.a.
EDS Electricity	\$ 71,700	\$ 21,920	\$ 16,416	\$ 11,173	\$ 12,713	\$ 62,223	86.78%
Electricity	\$ 6,181,900	\$ 2,286,229	\$ 994,219	\$ 904,133	\$ 1,431,329	\$ 5,615,909	90.84%
Natural Gas Consultant	\$ 12,400	\$ -	\$ 9,080	\$ 3,960	\$ 3,420	\$ 16,460	132.74%
Natural Gas Transport	\$ -	\$ 56,143	\$ 97,308	\$ 96,291	\$ 64,302	\$ 314,045	n.a.
Natural Gas Fuel	\$ 3,203,850	\$ 495,442	\$ 1,001,717	\$ 976,425	\$ 463,343	\$ 2,936,927	91.67%
Propane	\$ 139,050	\$ -	\$ 119,216	\$ (72,000)	\$ -	\$ 47,216	33.96%
<b>Subtotal - Metro Costs =</b>	<b>\$ 11,581,500</b>	<b>\$ 3,454,343</b>	<b>\$ 2,661,842</b>	<b>\$ 2,296,859</b>	<b>\$ 2,436,633</b>	<b>\$ 10,849,677</b>	<b>93.68%</b>
<b>Subtotal - Operations =</b>	<b>\$ 16,140,800</b>	<b>\$ 4,554,847</b>	<b>\$ 3,801,532</b>	<b>\$ 3,387,356</b>	<b>\$ 3,516,273</b>	<b>\$ 15,260,009</b>	<b>94.54%</b>
<b>Debt Service</b>							
2012A Bonds	\$ 3,178,500	\$ 869,138	\$ 769,787	\$ 769,787	\$ 769,787	\$ 3,178,500	100.00%
2005B Bonds	\$ 281,100	\$ 261,398	\$ -	\$ 19,677	\$ -	\$ 281,076	99.99%
Series 2018	\$ 117,200	\$ 29,307	\$ 29,307	\$ 29,307	\$ 29,307	\$ 117,228	100.02%
Series 2015C	\$ 64,700	\$ 16,169	\$ 16,169	\$ 16,169	\$ 16,169	\$ 64,676	99.96%
Series 2017	\$ 41,800	\$ 10,456	\$ 10,456	\$ 10,456	\$ 10,456	\$ 41,825	100.06%
Series 2013A	\$ 506,000	\$ 126,503	\$ 126,503	\$ 126,503	\$ 126,503	\$ 506,012	100.00%
Series 2021C	\$ 122,000	\$ 30,500	\$ 30,500	\$ 30,500	\$ 30,500	\$ 122,000	100.00%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ 85,800	\$ 21,450	\$ 21,450	\$ 21,450	\$ 21,450	\$ 85,800	100.00%
<b>Subtotal - Capital =</b>	<b>\$ 4,397,100</b>	<b>\$ 1,364,921</b>	<b>\$ 1,004,173</b>	<b>\$ 1,023,850</b>	<b>\$ 1,004,173</b>	<b>\$ 4,397,116</b>	<b>100.00%</b>
<b>Total =</b>	<b>\$ 20,537,900</b>	<b>\$ 5,919,768</b>	<b>\$ 4,805,705</b>	<b>\$ 4,411,206</b>	<b>\$ 4,520,446</b>	<b>\$ 19,657,124</b>	<b>95.71%</b>
<b>Customer Revenues</b>							
Taxes Collected		\$ 133,033	\$ 105,053	\$ 99,399	\$ 107,243	\$ 444,729	n.a.
Taxes Paid		\$ 133,033	\$ 105,052	\$ 99,399	\$ 107,242	\$ 444,726	n.a.
Interest & Misc Revenue	\$ 50,600	\$ 35,408	\$ 79,142	\$ 103,505	\$ 129,948	\$ 348,003	687.75%
Penalty Revenues/Credits		\$ 21,733	\$ 75,571	\$ 6,376	\$ 3,842	\$ 107,522	n.a.
Energy Revenues Collected	\$ 20,113,000	\$ 5,639,947	\$ 4,721,500	\$ 4,560,033	\$ 4,580,197	\$ 19,501,676	96.96%
<b>Revenues =</b>	<b>\$ 20,163,600</b>	<b>\$ 5,697,088</b>	<b>\$ 4,876,214</b>	<b>\$ 4,669,914</b>	<b>\$ 4,713,988</b>	<b>\$ 19,957,205</b>	<b>98.98%</b>
<b>Metro Funding Amount =</b>	<b>\$ 374,300</b>	<b>\$ 222,680</b>	<b>\$ (70,510)</b>	<b>\$ (258,708)</b>	<b>\$ (193,542)</b>	<b>\$ (300,080)</b>	<b>-80.17%</b>

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	\$ 4,603,991	22,666,656	\$ 0.2031	\$ 1,765,185	93,802	\$ 18.8182
State Government	\$ 3,534,277	14,127,231	\$ 0.2502	\$ 2,263,886	113,295	\$ 19.9822
Metro Government	\$ 5,098,511	25,958,323	\$ 0.1964	\$ 2,235,828	135,172	\$ 16.5406
New Customers	\$ 3,373,198	16,475,796	\$ 0.2047	\$ 1,584,641	102,468	\$ 15.4648
<b>Total</b>	<b>\$ 13,236,778</b>	<b>62,752,210</b>	<b>\$ 0.2109</b>	<b>\$ 6,264,898</b>	<b>342,269</b>	<b>\$ 18.3040</b>

Total Revenue \$ 19,501,676  
 True-up and Adjustments (Net) \$ 455,528  
 Net Revenue \$ 19,957,205

### 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.

- ) In April, while changing which boiler was operating, a boiler tripped causing the steam pressure to drop to a low of 143 psig. The steam sendout pressure was below 150 psig for approximately thirty minutes.
- ) Boiler 3 also tripped in April due to a problem with the I to P converter on the feedwater regulating valve. A new converter was installed. The steam pressure dropped to a low of 115 psig causing the steam sendout pressure to be below 150 psig for approximately sixty minutes.
- ) In May, a problem with the fire-eye flame scanner for boiler 3 caused the boiler to trip. A new scanner was installed. The steam pressure dropped to a low of 136 psig. The steam sendout pressure was below 150 psig for approximately sixty minutes.
- ) While performing annual preventative maintenance on the deaerator 2 in June, boiler 2 tripped due to low water level. The boiler was restarted. The steam pressure dropped to a low of 103 psig and was below 150 psig for approximately ninety minutes.
- ) Due to a storm passing through the area on June 30, NES required an emergency outage of the EGF in order for them to make repairs to the 69 kW service. This outage required the entire plant to be shut down. The steam sendout pressure dropped to a low of 18 psig and remained below 150 psig for 195 minutes. The chilled water sendout temperature rose to a high of 55.3°F and was above 43.3°F

for 294 minutes. Even though DES is served with two separate electric feeds, NES was unable to switch service to the second source.

- ) Additional outages and operational trips are noted in the previous DES Operations Monitoring Reports for FY23 produced by TEG and in the Monthly Operations reports produced by CES.
- ) 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 each month during the fiscal year. The steam-fuel metric was not met in April and five other months during the fiscal year. 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 and DEI 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 73.9% of the steam sendout during the quarter, which represents a 13.6% increase over the previous Fourth 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.
- For the fiscal year, the condensate return averaged 70.9% for the year which represents a 1.7% decrease compared to FY22.
- 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 19.9% over the previous Fourth Quarter. This decrease resulted in an average increase in the cycles of concentration in the cooling towers by 14.4%.
- For the fiscal year, the cooling tower blowdown decreased 9.5% resulting in a 13% increase in the cycles of concentration.
- During the quarter, CES began monitoring and tracking the ratio of the cooling tower blowdown to the chilled water production. The average value for the quarter decreased 12.4% over the previous Fourth Quarter, but the annual total increased 16.6% over FY22. TEG and CES continue to monitor various performance metrics within the EGF and EDS in order to look for ways to improve the system efficiencies.

) 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 side stream filter at the EGF became operational in May. Additional punch list items remained to be completed during the quarter. The work related to the filter is tracked 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 and are not the responsibility of Metro or the DES customers.

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## 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;
- ) Assisted with the boiler inspections;

## Repairs or Replacement

- ) Repaired boiler 2 level transmitter;
- ) Replaced boiler 1 conductivity probe;
- ) Repaired boiler 3 feedwater valve;
- ) Replaced the breaker on the fan motor for cooling tower 18;
- ) Trane performed repairs on chillers 6A, 7B, and 8;
- ) Cleaned the hot deck for cooling tower 9;
- ) Placed deaerator 1 into service and repaired deaerator 2;
- ) Performed the annual safety valve tests;
- ) Replaced several steam traps in the boiler plant;
- ) Replaced the variable speed drive for chilled water pump 4;
- ) Replaced the conductivity probe for boiler 2;
- ) Replaced the conductivity controller for boiler 1;
- ) Repaired the motor wiring for chilled water pump 1;
- ) Repaired the breaker for cooling tower 1;
- ) Replaced the flame scanner for boiler 2;
- ) Repaired the cooling water makeup line;
- ) Removed and replaced the plant address sign;
- ) Installed lighting around the boiler feedwater pumps;
- ) Repaired the plant gate;
- ) Repaired plant cameras;
- ) Repaired the exhaust fan motors on switchgear 1;
- ) 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 June 27, 2023, by Kevin L. Jacobs, P.E. Based on the review of the EGF, the following comments and observations are presented. Constellation Energy Solutions, LLC (CES) had a contractor onsite installing the piping for the new side-stream filter. In addition, CES appears to have been in the process of cleaning the cooling towers.

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- ) TEG previously reported the louvers and portions of the fill at cooling towers 1, 6 and 15 appeared to have been damaged. Cooling tower 5 was repaired prior to the Fourth Quarter Walkthrough. A contractor was working on making the necessary repairs to cooling tower 15 during the site visit. CES stated the remaining repairs will be made after the cooling season.
  - ) 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 has cleaned all affected areas. This item will be removed from future reports.**
  - ) The air curtain heaters were venting steam and dripping condensate. Water had accumulated on the floor in the area. **CES stated they have repaired the air curtain heaters. This item will be removed from future reports.**
  - ) The pressure gauge on the steam bypass line located at the expansion tank level no longer operates. **CES has replaced this gauge. This item will be removed from future reports.**
  - ) 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. **CES intends to replace these valves during the scheduled steam outage in September 2023.**
  - ) 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. TEG discovered discrepancies with other pressure instrumentation on the city water make-up line during the Walkthrough and found that the valves for the compressed air service to the expansion tanks had been closed. TEG discussed the issues with CES. **CES intends to verify or replace the instruments. After such work has been performed, TEG will investigate to determine if there are any setpoint changes which should be made or if further action is required.**
  - ) 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 repaired these lamps. This item will be removed from future reports.**
  - ) The “90 Peabody St” sign at the southwest corner of the building remains discolored. **CES replaced this sign. This item will be removed from future reports.**
  - ) Chemical leaks and build-up were noted between chemical tanks 12900 and 10600 and between tanks 12001 and 34170. **CES should clean these areas and repair the leaks.**
  - ) A rust spot has occurred on the west side of one of the cooling tower support beams near the south end of the cooling tower deck. No other beams appear to have any surface rust. **CES should clean the beam of rust and paint the affected area with galvanic paint.**



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- ) Boilers 1 and 3 and de-aerator 2 were offline and open for inspection. The mud drums appear to have excessive corrosion in some locations and chemical residue remains in the bottom of boiler 1 mud drum. See pictures below. **The presence of the residue should be addressed by Chem Aqua by determining what it is and why it remains. The cause and degree of the corrosion should also be investigated.**
  - ) Other action items previously noted to be addressed by CES have been completed. (See also the “Quarterly EGF Walkthrough Report,” dated June 28, 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. Fourth Quarter FY23 Open Projects**

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

##### **1. 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. 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.

DES remains in contact with the contractor and the developer regarding construction at this site. TEG, Metro, and CES discussed the need to upgrade or replace the door entry security system since the proposed changes to the DES property will most likely warrant the need for remote access to the property gates.

##### **2. 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. The blankets have been received and the

installing contractor is scheduled to complete the insulation portion of this project before the end of July.

### 3. 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 was recently copied on an email which indicated that the State had received bids for repairs to the tunnel, however it is not known when these repairs will be implemented.

TEG compiled a scope outline for the most severely corroded supports to be cleaned and coated. This scope was presented to CES and Enecon. Enecon provided a proposal for this work, it was approved, and the work was implemented. This work was completed in early June. This project will now be closed.

### 4. 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 7<sup>th</sup> 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 was expected that the project would be completed during the Fourth Quarter FY23, however the contractor was still working out terms with the mechanical subcontractor and was delayed by additional permit requirements. It is expected that the project will be completed prior to the end of the 1st Quarter FY24.

5. DES192 – Peabody Street Development

This project number is used to track expenses with the proposed expansion of the EDS along Peabody Street and into the Rolling Mill Hill area. This project is on hold pending confirmation of additional customers along the proposed route.

6. 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.

The coating portion of the scope was completed in April and the insulation began in May. The insulation blankets did not fit properly so the manufacturer had to make some modifications. The modified blankets are scheduled to be installed in July and once completed, TEG will review the work.

7. DES195 – DES Parking Area

This project is on hold pending the completion of the Guthrie Street construction.

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

CES has identified condensate entering the condensate pipe wall penetration in MH-9. This section of condensate piping between Manholes 9 and 10 has been repaired at least twice in recent years and therefore TEG recommended replacing the entire piping run between the two manholes. The design was completed, and the scope was bid, however only one bidder responded, and the price was significantly higher than expected. TEG is investigating a reduced scope and will meet with CES and a contractor that did not bid the work to discuss options to either make the needed repairs or replace the entire line between manholes.

9. DES198 – MH-18 Condensate Pump Replacement

A pre-bid meeting was held during the Fourth Quarter FY23. FM Sylvan was awarded this project and is expected to begin site work in early August 2023 following the Grand Prix race.

10. DES200 – Chilled Water Side Stream Filter

The side stream filter installation was completed and May and became operational soon thereafter. The few remaining punch list items are expected to be completed in July 2023.

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.

11. 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 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.

12. DES202 – 7<sup>th</sup> and Commerce Hotel

The preliminary drawings and final draft of the Customer Service Agreement was presented to the developer/owner (Alamo Manhattan) during the quarter. The design of the new service for this customer will begin upon execution of the agreement. The design of the new site is progressing with the intention of utilizing the services from DES. The demand loads currently included within their agreement are 660 tons of chilled water and 14,500 pph of steam.

13. 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 3<sup>rd</sup> 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.

14. 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 5<sup>th</sup> Ave N and Union St intersection that are suspected to be leaking.

CES provided the cost substantiation reports to TEG for all of the work and TEG had some questions/comments. These questions have been addressed and CES was directed to proceed with invoicing Metro for the work. It is expected that this project will be closed during the 1<sup>st</sup> Quarter FY24.

15. DES206 - 7th Ave Fan Replacement

The 7<sup>th</sup> Ave ventilation fan broke apart during operation and needs to be replaced. A new fan was ordered and has been received by CES. TEG completed the design documents for the fan's installation and because of the immediate need to have the fan in operation, the project was awarded to a contractor on a T&M basis with cost substantiation. The contractor has encountered some delays with Metro's additional permitting requirements, but work is expected to begin in late July/early August.

16. 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.

CES bid the work and an award was made. However, due to field conditions, some changes needed to be made to the specifications. CES and TEG met with the insulation contractor and reviewed changes to the specifications, and a revised, and lower priced proposal was presented. This work is scheduled to take place during the fall of 2023 to allow the humidity levels to lower so the surface condensation is reduced/eliminated to have a more successful result.

17. DES208 – 2023 Steam Outage

There are some maintenance/repair items at the EGF and in the EDS that cannot be completed without the steam system being off-line. Therefore, CES has assembled a list of items to be completed and has spoken with the DES customers and a preliminary date of September 24-25, 2023, has been chosen.

18. DES209 – MH B2 Sump Pump Discharge Repair

The sump pump discharge piping from Manhole B2 is either obstructed or possibly damaged which is preventing the evacuation of the accumulated groundwater in this manhole. TEG researched and found a company that could trace buried piping and located the obstructed/damaged portion of the discharge piping. This company (GPRS) was retained by CES to determine the location of the blockage and GPRS was also able to locate the buried piping beyond the blockage.

This project involves the excavation of the discharge piping to repair/replace the obstructed/damaged portion of the piping and to also determine if the remaining piping still discharges to a nearby catch basin. If not, then the project also involves the re-introduction of this discharge piping to the catch basin.

CES and TEG have met with a contractor and this work is scheduled to take place during September 2023.

#### 19. DES210 – MH C Electric Sump Pump Installation

Manhole C is in the street adjacent to the MTA bus station. CES reviews this manhole monthly, however its access is complicated due to its proximity to the bus station. Portions of the DES piping in this manhole has been replaced due to corrosion from groundwater accumulation. And CES has had to visit this manhole more than once per month to pump out the groundwater. To reduce the number of visits and lessen the likelihood of corrosion, TEG contacted MTA and asked if DES could obtain electric power from the bus station for a small sump pump. MTA has agreed to this and has signed an agreement.

This project involves the evaluation of the cost to install this sump pump, and if acceptable, the installation of the power and pump. TEG is going to investigate the scope and cost associated with providing power to the manhole for an electric sump pump.

#### B. Fourth Quarter FY23 Closed Projects

DES180 and DES205 was closed during the Fourth 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. All of the projects closed during FY23 may not be noted due to outstanding invoices from the contractors.



**Table 5. Capital Projects Expense Summary**

DES Project #	Description	Total Budget	FY23 Spending to Date	Total Spent to Date	Remaining Balance
<b>Fund-49116</b>					
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	\$ 58,861	\$ 84,219	\$ 934,583
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	\$ 4,717	\$ 8,001	\$ 131,999
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	\$ 22,816	\$ 30,241	\$ 49,759
DES195	DES Parking Lot	\$ 275,000	\$ 7,327	\$ 12,688	\$ 262,312
DES196	Condensate Line Leak Repair at MH9	\$ 130,000	\$ 16,245	\$ 16,298	\$ 113,702
DES197	MH3 Coatings and Repairs	\$ 13,500	\$ -	\$ 9,888	\$ 3,612
DES198	MH18 Condensate Return Pump Replacement	\$ 175,000	\$ 38,545	\$ 47,220	\$ 127,780
DES199	MHD3 Sparge Tube	\$ 25,000	\$ 11,313	\$ 11,998	\$ 13,002
DES200	Sidestream Filter	\$ 330,000	\$ 3,771	\$ 5,201	\$ 324,799
DES201	East Bank and Oracle Development	\$ 110,000	\$ 27,841	\$ 33,133	\$ 76,867
DES202	Service to 7th and Commerce	\$ 1,630,000	\$ 13,706	\$ 14,043	\$ 1,615,957
DES203	Service to Printer's Alley Residential	\$ 850,000	\$ 1,411	\$ 1,507	\$ 848,493
DES204	DES Sign Replacement	\$ 73,000	\$ 54,703	\$ 54,703	\$ 18,297
DES205	5th & Union CHW Outage	\$ 137,500	\$ 2,548	\$ 2,548	\$ 134,952
DES206	7th Avenue Fan	\$ 110,000	\$ 24,403	\$ 24,403	\$ 85,597
EDS R&I	CES January 2022	\$ 5,959	\$ 5,959	\$ 5,959	\$ -
DES207	MH N1 Insulation	\$ 25,300	\$ 2,975	\$ 2,975	\$ 22,325
DES208	2023 Stm Outage	\$ 33,000	\$ 2,251	\$ 2,251	\$ 30,749
DES209	MB B2 Pump Line Repair	\$ 44,000	\$ 114	\$ 114	\$ 43,886
<b>Total Closed Projects</b>		<b>\$ 3,698,579</b>	<b>\$ -</b>	<b>\$3,698,579</b>	<b>\$ -</b>
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$15,719,150	\$ -	\$ -	\$15,719,150
<b>Fund Total</b>		<b>\$26,000,000</b>	<b>\$ 361,647</b>	<b>\$5,011,311</b>	<b>\$20,988,689</b>

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

Several EDS repairs and improvements were made during the Fourth 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 \$278,274. 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	Balance
<b>Value at end of FY22</b>				<b>\$ 94,174.39</b>		<b>\$ 260,494.02</b>
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		
		<b>Sub-Total First Quarter</b>		<b>\$ 25,032.12</b>	<b>\$ 75,924.99</b>	<b>\$ 311,386.89</b>
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	06/21/23	DES2438	CES	\$ 1,111.35		
		<b>Sub-Total Second Quarter</b>		<b>\$ 21,276.10</b>	<b>\$ 75,924.99</b>	<b>\$ 366,035.78</b>
Interest	01/03/23	-	-	\$ 1,228.76		
Interest	01/03/23	-	-	\$ (1,228.76)		
Jan 2023 EDS R&I	06/21/23	DES2438	-	\$ 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		
		<b>Sub-Total Third Quarter</b>		<b>\$ 28,696.67</b>	<b>\$ 75,924.99</b>	<b>\$ 413,264.10</b>
Apr 2023 EDS R&I	05/17/23	-	CES	\$ 4,165.17		
Interest	04/03/23	-	-	\$ 1,614.44		
Interest	04/03/23	-	-	\$ (1,614.44)		
Interest	05/01/23	-	-	\$ 1,631.39		
Interest	05/01/23	-	-	\$ (1,631.39)		
May 2023 EDS R&I	06/21/23	-	CES	\$ 10,734.91		
DES 180 - State Tunnel Support Repairs	06/21/23	-	CES	\$ 57,900.00		
Interest	06/01/23	-	-	\$ 1,798.77		
Interest	06/01/23	-	-	\$ (1,798.77)		
June 2023 EDS R&I	07/19/23	-	CES	\$ 1,943.22		
DES 205 CHW Outage	07/19/23	-	CES	\$ 136,171.72		
		<b>Sub-Total Fourth Quarter</b>		<b>\$ 210,915.02</b>	<b>\$ 75,924.99</b>	<b>\$ 278,274.07</b>
		<b>FY23 Year to Date</b>		<b>\$ 285,919.91</b>	<b>\$ 303,699.96</b>	<b>\$ 278,274.07</b>

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

Due to scheduling conflicts, the Fourth Quarter FY 2023 walkthrough was conducted on July 10 and 11, 2023. The manholes that were visited included A, B, B1, G, K, L, M, N1, N2, S5, S6, 25, 26, and the chilled water piping suspended underneath the Woodland Street Bridge. The following comments and observations are a result of these visits.

Many of the manholes reviewed this quarter have steel piping supports which have been part of our ongoing effort to remediate, repair and prevent corrosion and have recently been cleaned and coated as a part of this effort. The coating appears to be performing relatively well however a couple of instances were reviewed that need to be repaired. It is important that these supports be monitored closely by CES, and any degradation observed be reported immediately to TEG and repairs made quickly. This should result in instances of corrosion being addressed at minimal cost to Metro.

1. Manhole A
    - a. There was some water present in this manhole, and it required pumping prior to entry.
    - b. No deficiencies noted.
  2. Manhole B
    - a. There was a small amount of water in the floor of both sides of this manhole.
-

- b. The link seals at the southern and northern steam and condensate return wall penetrations are starting to become dislodged; the northern seal is more advanced. CES should attempt to push the links back in place and tighten them. However, from prior experience with similar situations, the link seal will not go back in place without the mud, dirt, etc. from the annular space being removed so that the linkseal can be put back in place. It is possible that a link seal cannot be positioned back in place. In this instance, the annular space may need to be packed with hydraulic cement or another material to keep the wall penetration sealed. **This item appeared on the last two years' reports.**
  - c. The southern condensate slip joint support coating is cracking at the base. CES should have Enecon review this area to determine the cause of this cracking and make a recommendation for a repair. TEG has notified Enecon (copied CES) and Enecon has volunteered to repair these areas at no charge to Metro. CES needs to coordinate with Enecon to have these repairs made.
  - d. The southern steam slip joint support coating is cracking at the base. CES should have Enecon review this area to determine the cause of this cracking and make a recommendation for a repair. TEG has notified Enecon (copied CES) and Enecon has volunteered to repair these areas at no charge to Metro. CES needs to coordinate with Enecon to have these repairs made.
  - e. The end can of the steam penetration at the western wall on the chilled water side of the manhole was repaired with hydraulic cement by Enecon. As a result, water infiltration at this point is minimal. CES should monitor this penetration and report any changes to TEG. TEG has included this section of piping in its "Comprehensive Repair and Replacement Plan."
3. Manhole M
- a. There was no water present in this manhole.
  - b. The link seal on the steam line penetration at the northern wall has dislodged from the top portion of the pipe. CES personnel have tried to re-position this linkseal without success. CES should remove the linkseal and then remove the dirt, mud, gravel, etc. from the annular space and try to re-install the linkseal and tighten it. (A similar situation exists in Manhole B, therefore CES should probably attempt this at one location to determine if it can be done successfully before attempting numerous locations.) It is possible that a link seal cannot be positioned back in place. In this instance, the annular space may need to be packed with hydraulic cement or another material to keep the wall penetration sealed. **This item appeared on the last two years' reports.**
4. Manhole L
- a. The northern structural member that extends from the large horizontal anchor beam to the floor of the manhole is badly corroded. This area was cleaned and coated by Enecon but apparently the existing corrosion was too severe for the coating to be effective. TEG will verify if this member is
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- needed; if not needed, this member can be removed.
      - b. The west end of the horizontal anchor beam has several locations where the coating is failing. TEG has notified Enecon (copied CES) and Enecon has volunteered to repair these areas at no charge to Metro. CES needs to coordinate with Enecon to have these repairs made.
      - c. This manhole contains three traps. Two of the three traps were functioning; the third trap was hot but did not cycle during this site visit. CES should verify that the third trap is functioning properly.
  - 5. Manhole K
    - a. There was an appreciable amount of water in this manhole, and it required pumping prior to entry.
    - b. Mud used to accumulate in the floor of this manhole. It was believed that the mud was originating from the joint between the walls and the floor or from the interface between the floor and the abandoned manhole below the floor. TEG directed CES to have Enecon seal the wall/floor joints and seal the manway areas of the abandoned manhole underneath the floor. This has solved the mud accumulation; however, ground/surface water is now accumulating in greater quantities in this manhole. CES and TEG need to continue to try and determine where the water is entering this manhole. TEG has some ideas and will coordinate with CES some additional actions to prevent water infiltration.
    - c. There are some hairline cracks in the concrete patching of the southern manhole wall. CES should monitor these cracks and notify TEG of any significant changes:
    - d. The trap piping was reconfigured recently, and a new trap was installed. CES needs to insulate the trap piping from the dripleg to just prior to the trap.
  - 6. Manhole N1
    - a. There was a small amount of water in the floor of this manhole, but not enough to require pumping.
    - b. The CHW piping in this manhole has never been insulated. Most of the piping in this manhole is ductile iron; however, there are some steel and iron components, and the surface condensation has resulted in some corrosion. CES had Enecon clean and coat the steel components within this manhole and CES is in the process of scheduling an insulator to insulate the piping.
    - c. CES removed the individual rung ladder with a new aluminum ladder under Amendment 2 of the revised contract and patched the wall areas where the individual rungs were embedded into the wall.
  - 7. Manhole G
    - a. This is an abandoned manhole located in a grass median near the intersection of 1<sup>st</sup> Avenue North and Union Street. It is reviewed to ensure
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- its structural integrity is not compromised.
    - b. No issues were identified.
  
  - 8. Manhole N2
    - a. There was a small amount of water in this manhole, and it was pumped prior to entry.
    - b. This manhole was recently sealed by Enecon to reduce/prevent water accumulation. This effort was successful.
    - c. The CHW bypass piping and isolation valves in this manhole were never insulated. The surface condensation (“sweating”) is causing some corrosion to occur, therefore, the uninsulated piping in this manhole needs to be insulated. However, with the construction of a new stadium for the Tennessee Titans, it is not known if the chilled water service is going to continue to serve the stadium. Therefore, the insulation of this piping is on hold. If it proceeds, TEG will provide insulation specifications to CES to have the uninsulated piping in this manhole insulated.
  
  - 9. Manhole S5
    - a. Some leaves had accumulated inside this manhole. Because these leaves will absorb and hold moisture, CES should continue to remove these leaves during their monthly inspections.
    - b. There are some cracks in the manhole interior wall surfaces. CES should monitor these cracks and report any degradation to TEG.
    - c. There is some minor insulation jacket damage in this manhole. This should be repaired the next time insulation work is done in this manhole.
  
  - 10. Manhole S6
    - a. The piping in this manhole was recently insulated and the anchor was recently replaced with a hot dip galvanized structural member.
    - b. CES should continue to monitor the structure, anchor, and piping.
  
  - 11. Manhole 25
    - a. These manholes/valve boxes (two each – one for CHW supply and one for CHW return) house the chilled water supply and return valves for the State Library and Archives service.
    - b. CES recently attempted to operate these valves but based upon the resistance encountered, they were unsuccessful. If the State is going to continue to use/occupy the Library and Archives, these valves should be replaced. TEG will research the plans that the State has for this building.
  
  - 12. Manhole 26
    - a. These manholes/valve boxes (two each – one for CHW supply and one for CHW return) house the chilled water supply and return valves for the State Library and Archives service.
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- b. CES recently attempted to operate these valves but based upon the resistance encountered, they were unsuccessful. If the State us going to continue to use/occupy the Library and Archives, these valves should be replaced. TEG will research the plans that the State has for this building.
13. Chilled Water Piping Underneath Woodland Street Bridge
- a. There is a section of an angle siderail missing from the north side of the grated walkway underneath the bridge. This section is close to the west side of the river. A new section of angle which matches the existing angle siderails needs to be installed as soon as possible. Once installed, the siderail section needs to be painted to match. CES needs to contact the government representative responsible for the maintenance of this bridge to determine whose responsibility this handrail is and discuss the installation of this missing section and its attachment to the bridge members. **This item appeared in the last two year's reports.**
  - b. There are some missing bolts which attach siderails to the bridge structure. New bolts need to be installed at these locations. **This item appeared in the last two year's reports.**
  - c. Portions of the chilled water piping insulation and jacketing are deformed with depressions/creases. It is unclear how these depressions occurred. CES needs to monitor these and report any changes to TEG.
  - d. There are two guides made of structural angles on the vertical piping on the east side of the river that are badly corroded. It might be more cost effective to replace these guides with new hot dip galvanized members than to spend the time cleaning and coating the existing members with the use of a bucket truck. The government representative responsible for the maintenance of this bridge should be contacted by either CES or the contractor doing this work to determine what requirements need to be met before executing any work. This work also involves movement over railroad tracks to access. The railroad company should also be contacted before any work is executed.
  - e. There is some corrosion on the vertical piping insulation jacketing on the east side of the river. Corrosion occurs at joints between sections of insulation jacketing. These jacketing sections need to be removed and replaced along with any damaged insulation.

## 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.

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A. Marketing

TEG continues to have discussions with potential developments along the Peabody St corridor and the Rolling Mill Hill area. These potential sites include 1<sup>st</sup> Ave S and KVB, 4<sup>th</sup> and Lea, Peabody and Rutledge, and 2<sup>nd</sup> Ave S and Peabody. In addition to the Peabody St corridor, TEG continues to reach out to other developments within the service area for DES.

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.

Oracle's development plan for the East Bank has been placed on hold until later this 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 other potential developments on the East Bank, including proposed developments with MDHA.

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 Bridgestone Arena Operations Manager contacted CES to report cooling issues in their building. CES adjusted the EGF chilled water sendout pressure to provide additional pumping head on the system which alleviated their problems.
- ) On several occasions, CES responded to the automated alarm on the compressed air system at the Andrew Jackson building. DES owns and maintains this system which provides control air to a steam pressure reducing valve.
- ) Metro General Services personnel reported to TEG and CES issues related to their repairs on their chilled water heat exchanger.
- ) TEG met with the current operators at the Sheraton Hotel to discuss their heating and cooling operations and address how they can reduce their demands and improve their efficiency.

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- ) DES held its annual customer meeting in May. Many customers were represented at this meeting and had many follow-up questions and comments.
  - ) CES responded to issues reported by the Renaissance Hotel building personnel regarding their cooling system. CES found their temperature control valve had been placed in manual. CES placed the valve in automatic-mode, and the issue was corrected. At a later date, CES responded to additional issues at the hotel and found they had too many chilled water pumps running.
  - ) 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 continues to improve its operation and has succeeded in meeting several of the guaranteed metrics. In TEG's opinion, CES needs to continue their efforts 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 Fourth 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.