Metro Nashville
DISTRICT ENERGY SYSTEM

Operations Monitoring Report

Fourth Quarter FY22

Prepared by:

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I. Executive Summary

A review of the fiscal year 2022 (FY22) 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. For the fiscal year 2022 to date, CES has failed to meet the performance guarantees for each month during the fiscal year and for the twelve consecutive months of FY21 as required by Paragraph 8.d of the 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 provided a draft report from their engineer during the Second Quarter. A virtual meeting was held between Metro, CES and their engineer during that quarter to discuss the report. The recommendations made by CES are currently being evaluated by their engineer and will be presented to Metro once the evaluation is completed. Delays with the contract agreement between CES and their engineer have postponed the release of the final report until sometime in FY23.

For the Fourth Quarter FY22, the chilled water sales increased 17.0% over the previous Fourth Quarter (FY21). The chilled water sendout also increased 16.56% over the previous Fourth Quarter. The system losses increased approximately 8.2%. The number of cooling degree days increased 37.3% resulting in greater chilled water sales. The peak chilled water demand for the current quarter was 18,085 tons, which is 8.6% higher than the previous Fourth Quarter.

The chilled water sales increased significantly for the fiscal year over FY21. The increase (22.2%) was due largely to an increase in the number of cooling degree days and the economic recovery from COVID-19. Visitors and events have returned to Downtown Nashville and 2022 marked the return of CMA Fest in June. The FY22 sendout likewise increased by 20.9% over FY21. The peak chilled water demand for the fiscal year was 18,414 tons. The number of cooling degree days was 5.4% higher in FY22 than in FY21.

Steam sendout for the current quarter increased by only 1.9% over the previous Fourth Quarter with steam sales increasing 10.2%. This increase came with a 20.9% decrease in heating degree days. Total steam system losses decreased 19.2% from the previous Fourth Quarter. The peak steam demand for the current quarter was 81,275 pounds per hour, which represents a decrease in the Fourth Quarter demand by approximately 13.1%.

For FY22, the steam sendout increased by only 0.4% over FY21 while the steam sales increased 2.7%. The peak steam demand for year was 149,750 pounds per hour. The fiscal year also experienced a decrease in the number of heating degree days of 3.9%.

With the implementation of the new System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels beginning in July 2020, CES has failed to consistently meet all of the

performance guarantees. CES failed to meet the chilled water plant electric consumption per unit of sales in December 2021 but have otherwise met this metric during FY22. CES continues to make changes to their operation at the EGF to address the issues preventing them from meeting the new performance criteria. These changes have resulted in some improvements. CES has met the chilled water-water guarantees for only five of the twelve months of FY22.

The steam-water conversion factor exceeded the performance guarantee for eleven out of the twelve months of the fiscal year. CES reported a faulty meter early in the year that was replaced in September. The issues with this meter do not account for the subsequent excursions. The steam fuel guarantee was exceeded seven out of the twelve months of the fiscal year but the difference between the actual and guaranteed values is consistently close. The steam electric conversion guarantee was exceeded only in July with no subsequent excursions noted. TEG is continuing to monitor CES's efforts in improving the system's performance.

Work continued with the DES Capital and Repair & Improvement Projects during the Fourth Quarter. Repair and Improvements to the EDS continue as scheduled. DES133.1, DES139, DES143, DES154, DES163, DES177, DES178, DES180, DES 189, DES191, DES192, DES193, DES194, DES195, DES 196, DES 197, DES198, DES199 and DES200 are ongoing. 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 DES201, DES202 and DES203 have been added. Projects DES179, DES184, DES185, DES187 and DES188 are closed/in close-out.

The current fiscal year system operating costs to date are $19,061,531. This value represents approximately 96.8% of the total budgeted operating cost for FY22. The customer revenues from the sales of steam and chilled water for FY22 are $18,469,561 (97.0% of budgeted amount) which includes the annual true-up amount for FY21. The Metro funding amount transferred to date for FY22 is $630,700 (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 FY22 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.

With the reopening of the businesses within Metro and increased events and commercial activities, chilled water sales are continuing to rebound. These changes are noted by the significant increases shown in the following graphs.

1. Sales and Sendout

A comparison for the Fourth Quarter chilled water sales is shown in Figure 1. This data reflects a 17.0% increase in sales for the current quarter over the same quarter of the previous fiscal year.

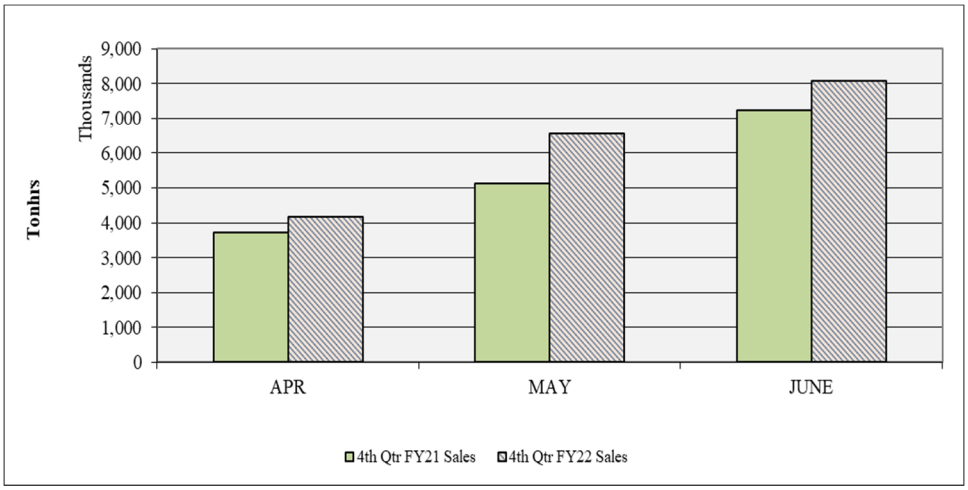

Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 18,085 tons, which represents an 8.6% increase over the previous Fourth Quarter. The number of cooling degree days were 37.3% higher in FY22 than in FY21.

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.

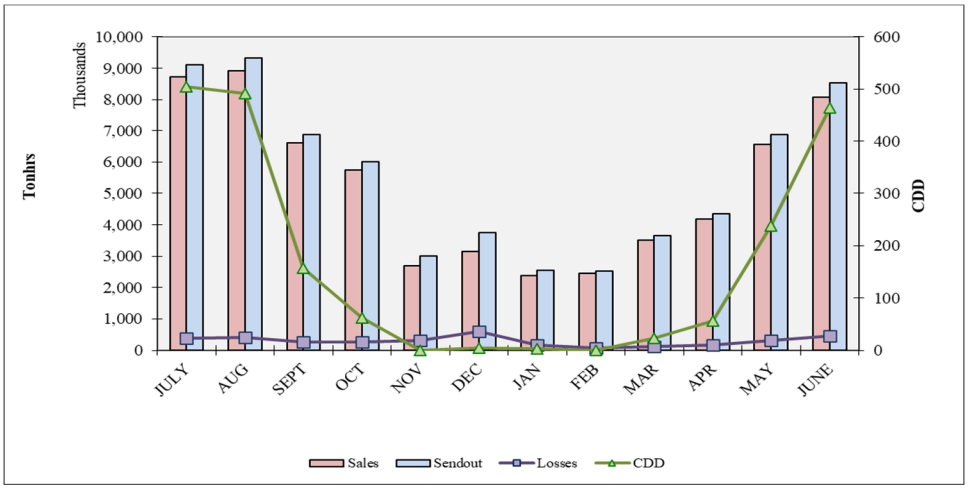

Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

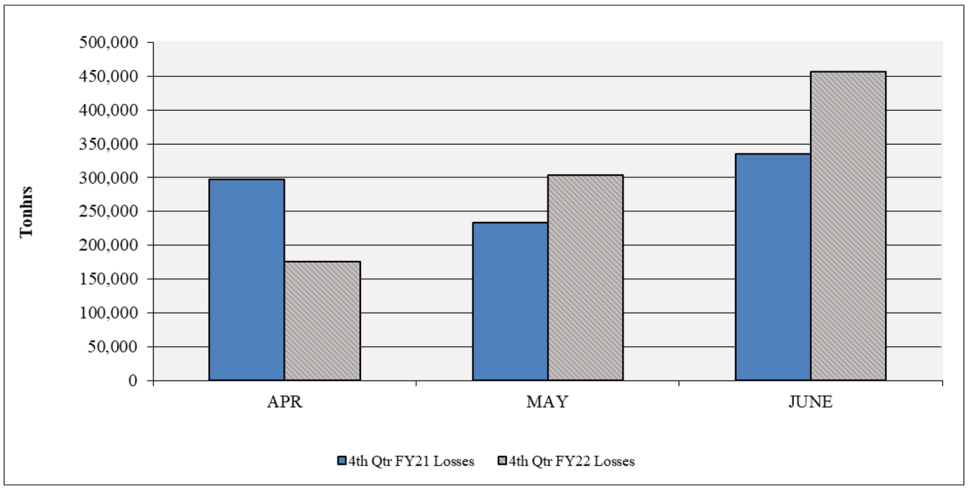

Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by 75.7% over the previous Fourth Quarter due to the repair in January of the chilled water leak on 3rd Ave North near where a repair had previously been made. The make-up dropped dramatically after the repairs were made and have remained relatively low since that time, although there were occasional increases in make-up due to repairs made by customers at their buildings.

Another leak is still suspected on 5th Ave N, but previous efforts to locate the actual source of the leak have been unsuccessful. CES and TEG are continuing to monitor the EDS make-up and investigate any potential leaks. If the specific location of an additional leak is discovered, DES will address the issue promptly.

The make-up to the cooling towers increased 20.5% over the previous Fourth Quarter. The water usage in the cooling towers is typically proportional to the consumption of chilled water and should vary with chilled water sales. The number of cycles of concentration in the condensing water circuit increased 3.8%. The total chiller plant water use increased 11.8% over the Fourth Quarter FY21. The overall city water make-up comparison for the chilled water system Fourth Quarter is shown in Figure 4.

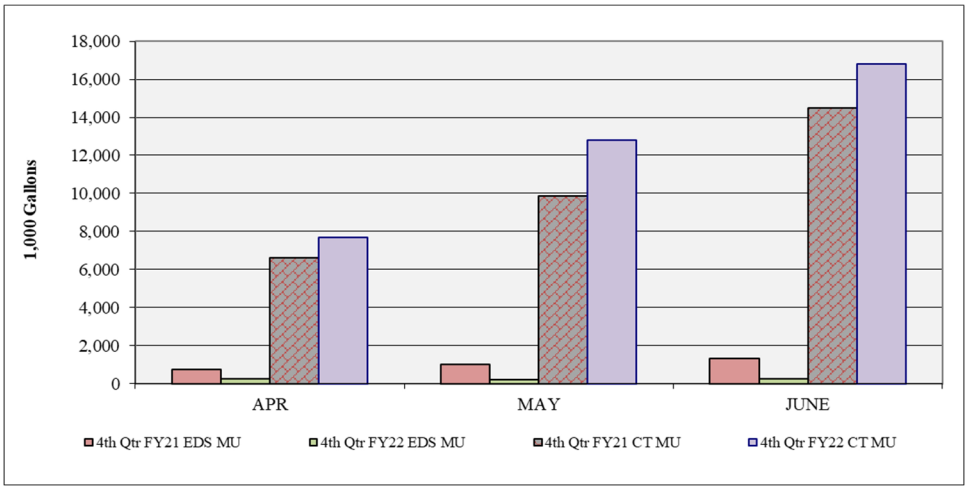

Figure 4. Chilled Water System City Water Usage Comparison

3. Performance

The performance of the chilled water aspect of the EGF is presented by 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 not consistently achieved for the chilled water-water conversion for FY22 until after the leak was repaired in the EDS in January 2022. CES has met the chilled water-electric guarantee for all but one month of the fiscal year.

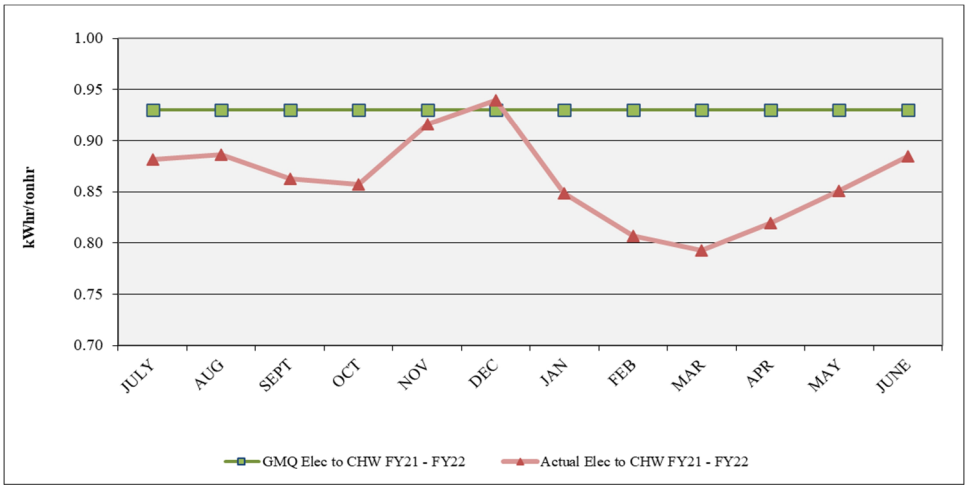

Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

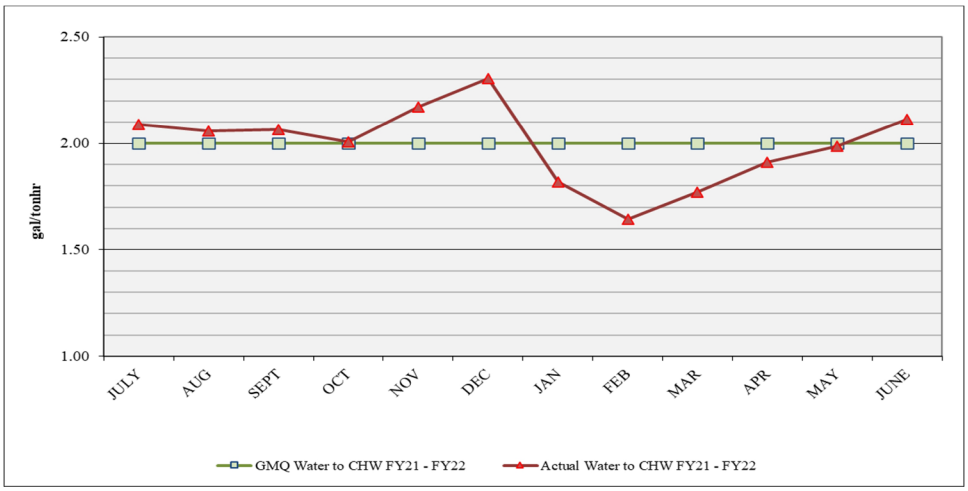

Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

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 only one excursion reported for the current fiscal year. The electric usage per unit of sales decreased 1.4% over the previous Fourth Quarter. For the fiscal year, the electric conversion factor decreased 3.3% over FY21.

CES has worked to address some operational issues within the plant in an additional effort to improve efficiency. CES and TEG are continuing to monitor the improvements created by these changes.

The total consumption of city water for the chiller plant for the current quarter has increased by approximately 11.8% due largely to the increase in chilled water sales.

The water conversion factor for the chiller plant decreased by approximately 3.3% (on average) over the Fourth Quarter FY21. The cooling tower blowdown increased 16.8% over the previous Fourth Quarter. For the fiscal year, the water conversion factor decreased 7.9% over FY21 – a marked improvement.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 1.9% over the previous Fourth Quarter (FY21), and the sales increased by approximately 10.2%. The Quarter experienced a 20.9% decrease in the number of heating degree days. The steam system losses decreased 19.2%, and the relative amount of condensate return decreased 15.4% during the quarter due dumping part of the condensate due to hardness at some of the customer buildings. A comparison for the Fourth Quarter steam sales is shown in Figure 7.

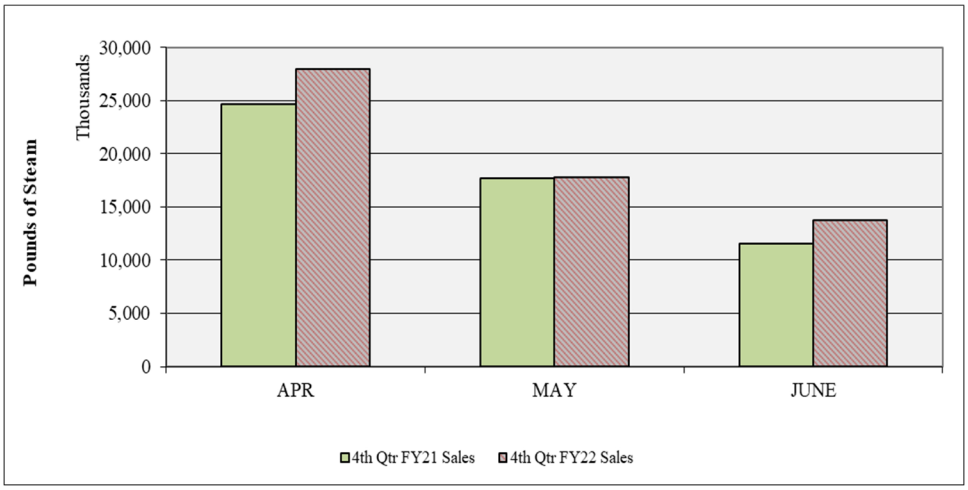

Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 81,275 pph, which reflects an approximate 13.1% decrease in the peak steam production over the previous Fourth 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.

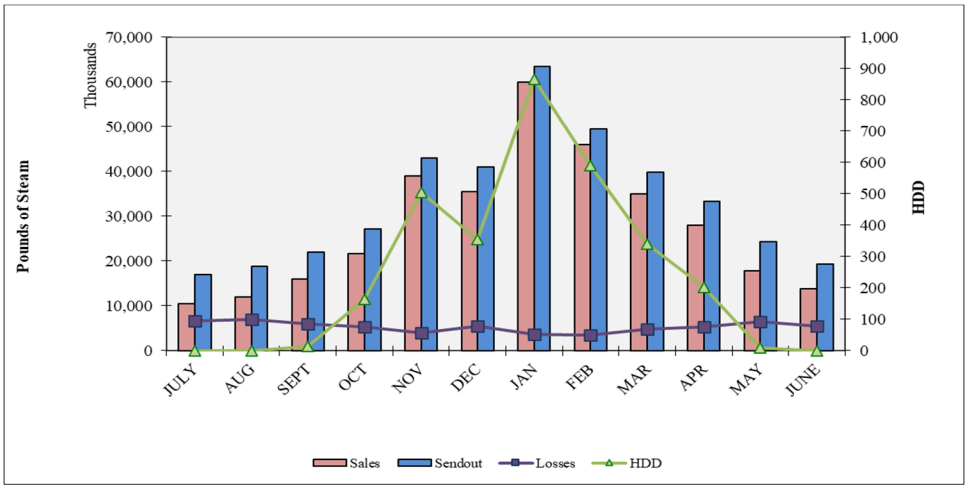

Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

A comparison of the total steam mass losses in the EDS for the Fourth 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 percent of system losses can be expected to increase since most of these losses are based on a near constant heat loss of the system.

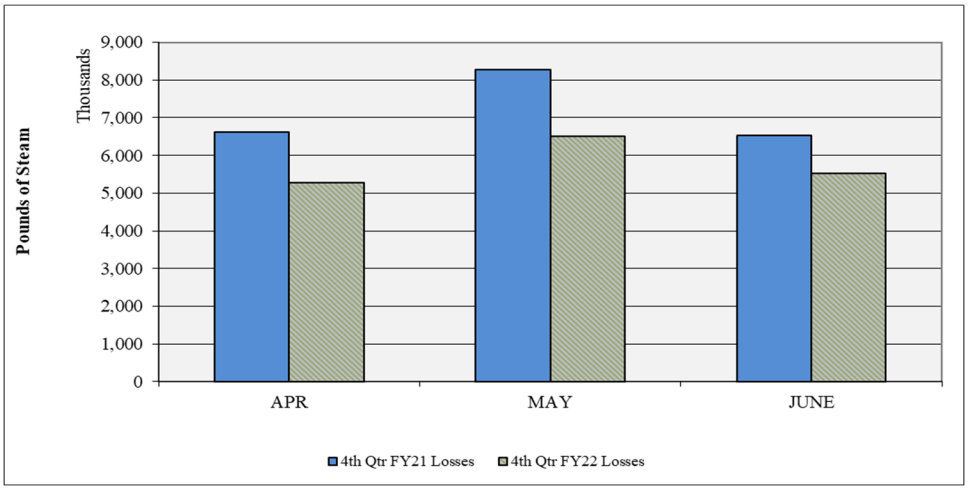

Figure 9. Steam System Losses

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 Fourth Quarter data in Figure 10.

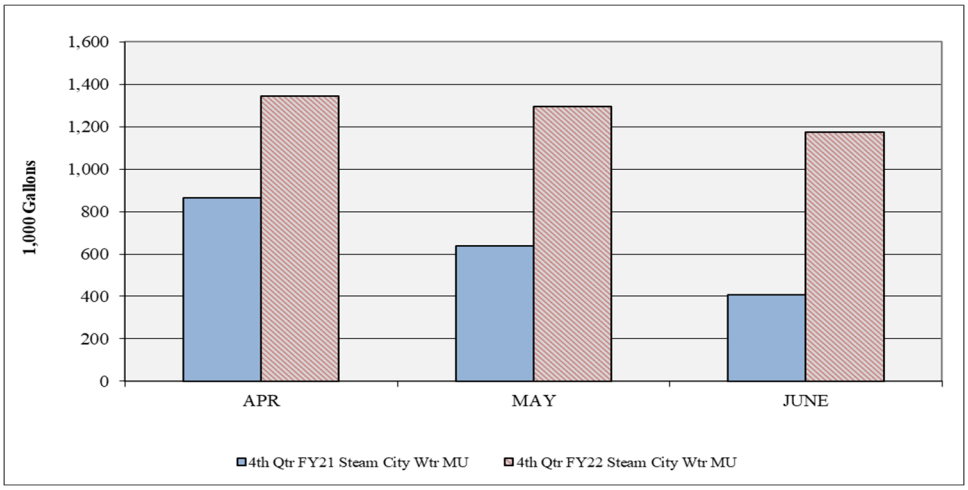

Figure 10. Steam System City Water Make-up Comparison

3. Performance

The performance of the steam system of the EGF is presented by the following three charts, Figures 11, 12 and 13. The steam fuel conversion factor exceeded the guaranteed values for five of the twelve months of FY22; however, the differences between the actual and guaranteed values were small. The steam electric conversion factor was exceeded in July but was not exceeded in subsequent months. TEG monitors CES's performance regularly and will continue to report any non-compliance in the EGF's operation. The steam water conversion factor exceeded the guaranteed values in every month of FY22 except July. The faulty meter at the EGF was replaced in September.

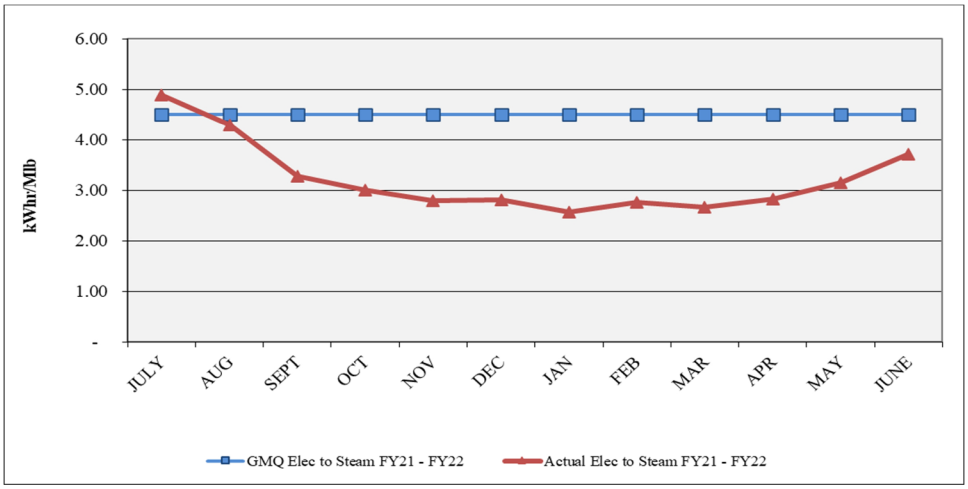

Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

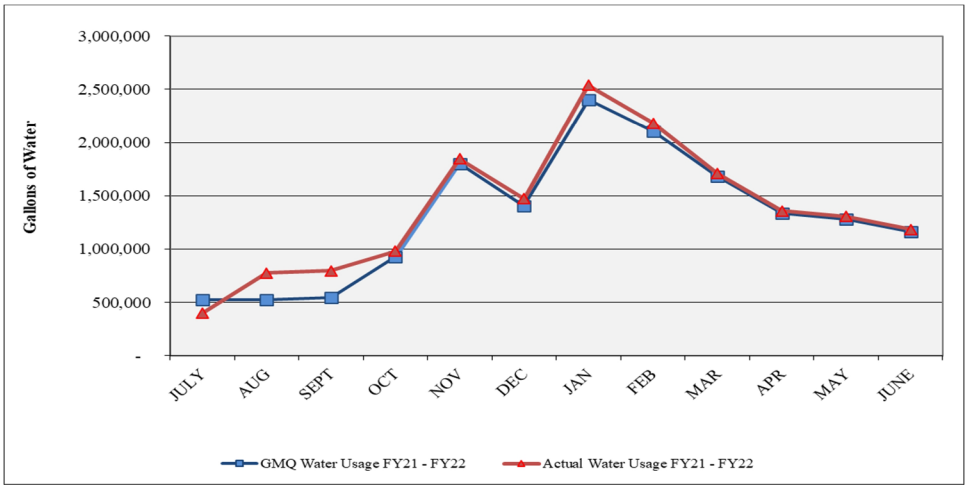

Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

The steam plant electric consumption for the current quarter was 0.4% lower in FY22 than in FY21. The steam-to-electric conversion factor decreased 10.8% over the same period. The monthly steam-to-electric conversion factors, along with the guaranteed values, are shown in Figure 11.

The water consumption for the steam plant increased 3.8% this quarter as compared to the previous Fourth Quarter due to a decrease in the amount of condensate returned during the quarter. Figure 12 shows the comparison between the actual and guaranteed steam-to-water usages for each month. The excursions above the guaranteed values in August and September are believed to be caused by a faulty meter that was replaced in September.

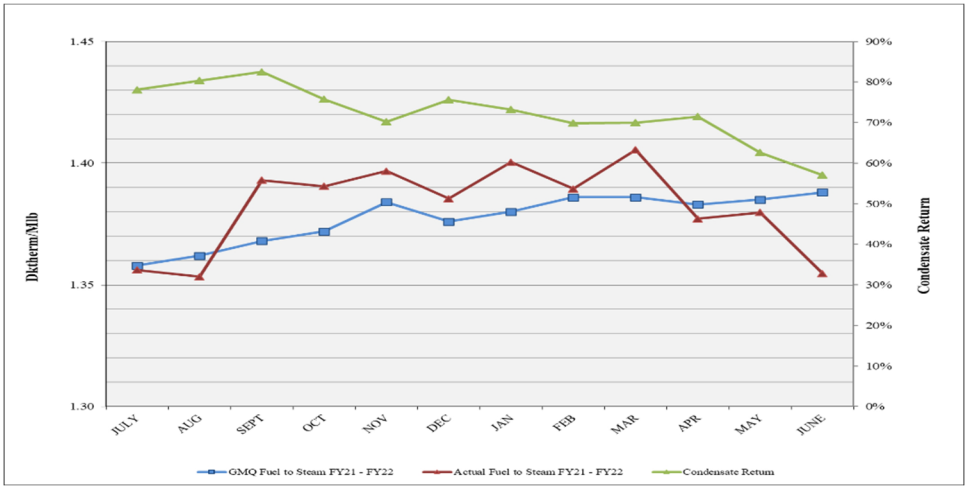

Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The fuel consumption per unit of steam sendout remained approximately the same as in the previous Fourth Quarter. As shown in Figure 13, the performance guarantee was met in July, August, and all of the Fourth Quarter of FY22. The relative amount of condensate return is shown on this graph to reflect the influence that the condensate return has on the plant efficiency.

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 and Annual comparisons of the Guaranteed Maximum Quantities (GMQ) or System Performance Guarantees of the criteria commodities (fuel, water, and electricity).

CES failed to meet all of the performance guarantees required under Amendment 2 of the ARMA for the quarter but some improvement in the operation of the EGF is noted.

Table 1. Fourth Quarter and Annual FY22 Production, Sales, and Consumption Summary

Item	Unit	Fourth Quarter FY22	Fourth Quarter FY21	*Percent Difference		Total Year FY22	Total Year FY21	*Percent Difference
	days	91	91	0.00%		365	365	0.00%
Total Electric Use	kWhrs	16,343,909	14,086,854	16.02%		55,560,768	46,947,139	18.35%
Chilled Water	kWhrs	16,157,874	13,900,099	16.24%		54,571,138	45,933,769	18.80%
Steam	kWhrs	186,035	186,755	-0.39%		989,630	1,013,370	-2.34%
Total Water Use	kgal	41,889	35,977	16.43%		151,842	131,471	15.49%
Total Chilled Water	kgal	38,077	34,071	11.76%		135,457	111,629	21.35%
EDS Make-up	kgal	751	3,093	-75.72%		15,099	14,278	5.75%
Cooling Towers	kgal	37,326	30,978	20.49%		120,358	97,351	23.63%
Calc CT Evaporation	kgal	31,351	25,863	21.22%		99,110	82,261	20.48%
CT Blowdown	kgal	5,975	5,115	16.81%		21,248	15,090	40.81%
Calc # Cycles		5.25	5.06	3.77%		4.66	5.45	-14.44%
Steam	kgal	3,812	1,906	100.00%		16,385	19,842	-17.42%
Total Fuel Use	mmBTU	105,356	103,158	2.13%		552,526	556,239	-0.67%
Natural Gas	mmBTU	105,356	103,158	2.13%		552,502	555,888	-0.61%
Propane	mmBTU	0	0	0.00%		24	352	-93.12%
Condensate Return	kgal	6,124	7,104	-13.80%		35,200	30,560	15.18%
	lbs	49,946,980	57,940,819	-13.80%		287,082,838	249,245,351	15.18%
Avg Temp	°F	178.7	195.3	-8.53%		173.1	185.7	-6.78%
Sendout								
Chilled Water	tonhrs	19,753,600	16,947,200	16.56%		66,553,400	55,044,600	20.91%
Steam	lbs	76,770,000	75,350,000	1.88%		398,356,000	396,827,000	0.39%
Peak CHW Demand	tons	18,085	16,655	8.59%		18,414	16,655	10.56%
Peak Steam Demand	lb/hr	81,275	93,500	-13.07%		149,750	138,100	8.44%
CHW LF		50.01%	46.59%	7.34%		41.26%	37.73%	9.36%
Steam LF		43.25%	36.90%	17.21%		30.37%	32.80%	-7.42%
Sales								
Chilled Water	tonhrs	18,817,583	16,082,366	17.01%		62,986,231	51,534,304	22.22%
Steam	lbs	59,472,499	53,950,997	10.23%		335,021,302	326,332,096	2.66%
Losses								
Chilled Water	tonhrs	936,017	864,834	8.23%		3,567,169	3,510,296	1.62%
Steam	lbs	17,297,501	21,399,003	-19.17%		63,334,698	70,494,904	-10.16%
		22.53%	28.40%	-20.66%				
Degree Days								
CDD		759	553	37.25%		2,005	1,903	5.36%
HDD		212	268	-20.90%		3,048	3,170	-3.85%

*positive percent difference values imply an increase from FY21 to FY22

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

GMQ Calculations	Unit	Fourth Quarter FY22	Fourth Quarter FY21	*Percent Difference		Total Year FY22	Total Year FY21	*Percent Difference
Steam								
GMQ Elec Conversion	kWhr/Mlb	4.50	4.50			4.50	4.50	
Electric Conversion	kWhr/Mlb	3.23	3.62	-10.79%		3.23	3.46	-6.70%
GMQ Plant Efficiency	Dth/Mlb	1.385	1.350			1.377	1.382	
Plant Efficiency	Dth/Mlb	1.371	1.369	0.11%		1.387	1.402	-1.05%
Actual %CR		65.06%	76.90%	-15.39%		72.07%	62.81%	14.74%
Avg CR Temp	°F	179	195	-8.53%		173	186	-6.78%
GMQ Water Conversion	gal	3,782,129	2,454,748			15,689,859	20,809,468	
Water Conversion	gal	3,850,120	1,925,060	100.00%		16,548,850	20,040,420	-17.42%
Chilled Water								
GMQ Elec Conversion	kWhr/tonhr	0.930	0.930			0.930	0.930	
Electric Conversion	kWhr/tonhr	0.852	0.864	-1.43%		0.862	0.891	-3.26%
GMQ Water Conversion	gal/tonhr	2.00	2.00			2.00	2.00	
Water Conversion	gal/tonhr	2.00	2.07	-3.32%		1.99	2.17	-7.92%

*positive percent difference values imply an increase from FY21 to FY22

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 $19,061,531. This value represents approximately 96.8% of the total budgeted operating cost for FY22. The customer revenues from the sales of steam and chilled water for FY22 are $18,469,561 (97.0% of budgeted amount) which includes the annual true-up amount for FY21. The Metro funding amount transferred to date for FY22 is $630,700 (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 FY22 True-up analysis.

Table 3. DES Expenses and Revenues to Date

Item		FY22 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date
Operating Management Fee							
FOC:	Basic	$ 3,890,100	$ 972,529	$ 972,529	$ 972,529	$ 972,529	$ 3,890,115
	9th Chiller	$ -	$ -	$ -	$ -	$ -	$ -
	C/O 6A	$ -	$ -	$ -	$ -	$ -	$ -
	C/O 6B	$ -	$ -	$ -	$ -	$ -	$ -
	C/O 7	$ -	$ -	$ -	$ -	$ -	$ -
	C/O 8	$ -	$ -	$ -	$ -	$ -	$ -
Pass-thru Charges:	Chemical Treatment	$ 232,200	$ 64,895	$ 58,523	$ 53,803	$ 61,681	$ 238,902
	Insurance	$ 16,500	$ -	$ 19,636	$ -	$ -	$ 19,636
Marketing:	CNE Sales Activity	$ -	$ -	$ -	$ -	$ -	$ -
	Incentive Payments	$ -	$ -	$ -	$ -	$ -	$ -
FEA:	Steam	$ 70,900	$ (4,267)	$ (1,921)	$ (5,132)	$ 3,366	$ (7,955)
	Chilled Water	$ 133,800	$ 19,059	$ 3,510	$ 25,437	$ 27,425	$ 75,431
Misc:	Metro Credit	$ -	$ (387,092)	$ (258,250)	$ (174,620)	$ (247,333)	$ (1,067,295)
	ARFA	$ 61,200	$ 15,296	$ 15,296	$ 15,296	$ 15,296	$ 61,182
	Deferral	$ -	$ -	$ -	$ -	$ -	$ -
	Subtotal - Man Fee =	**$ 4,404,700**	**$ 1,067,510**	**$ 1,067,573**	**$ 1,061,932**	**$ 1,080,296**	**$ 4,277,311**
Reimbursed Management Fee + Chem Treatment			$ 1,067,510	$ 1,067,573	$ 1,062,684	$ -	$ 3,197,767
Metro Costs							
Pass-thru Charges:	Engineering	$ 53,800	$ 8,693	$ 9,103	$ 21,028	$ 12,501	$ 51,325
	EDS R&I Transfers	$ 294,800	$ 73,700	$ 73,700	$ 73,700	$ 73,700	$ 294,800
	Metro Marketing	$ 10,900	$ -	$ -	$ -	$ -	$ -
	Project Administration	$ -	$ -	$ -	$ -	$ -	$ -
	Metro Incremental Cost	$ 378,400	$ 83,084	$ 76,047	$ 78,750	$ 90,345	$ 328,226
Utility Costs:	Water/Sewer	$ 737,500	$ 370,328	$ 242,161	$ 160,969	$ 226,655	$ 1,000,113
	EDS Water/Sewer	$ -	$ 45	$ 95	$ 754	$ 150	$ 1,043
	EDS Electricity	$ 62,100	$ 16,764	$ 16,088	$ 13,585	$ 19,778	$ 66,216
	Electricity	$ 6,122,000	$ 1,750,697	$ 933,362	$ 715,419	$ 1,515,781	$ 4,915,259
	Natural Gas Consultant	$ 12,400	$ 1,000	$ 5,000	$ 6,000	$ -	$ 12,000
	Natural Gas Transport	$ -	$ 46,378	$ 70,590	$ 89,712	$ 63,662	$ 270,341
	Natural Gas Fuel	$ 2,401,200	$ 314,641	$ 844,001	$ 974,653	$ 606,074	$ 2,739,369
	Propane	$ 111,900	$ -	$ 95,983	$ -	$ (84,407)	$ 11,576
	Subtotal - Metro Costs =	**$ 10,185,000**	**$ 2,665,331**	**$ 2,366,130**	**$ 2,134,571**	**$ 2,524,238**	**$ 9,690,269**
	Subtotal - Operations =	**$ 14,589,700**	**$ 3,732,841**	**$ 3,433,703**	**$ 3,196,502**	**$ 3,604,534**	**$ 13,967,580**
Debt Service	2012 Bonds	$ 3,478,700	$ 869,303	$ 880,082	$ 869,138	$ 869,138	$ 3,487,660
	2005 Bonds -Self Funded	$ 340,600	$ 318,779	$ 23,611	$ -	$ -	$ 342,391
	2007 Bonds -Self Funded	$ 170,300	$ 42,575	$ 42,575	$ 42,575	$ 42,575	$ 170,300
	2008 Bonds -Self Funded	$ 170,400	$ 42,600	$ 42,600	$ 42,600	$ 42,600	$ 170,400
	2010 Bonds -Self Funded	$ 173,500	$ 43,375	$ 43,375	$ 43,375	$ 43,375	$ 173,500
	Fund 49107 -Self Funded	$ 612,000	$ 153,000	$ 153,000	$ 153,000	$ 153,000	$ 612,000
	Fund 49116 -Self Funded	$ 137,700	$ 34,425	$ 34,425	$ 34,425	$ 34,425	$ 137,700
	MIP	$ -	$ -	$ -	$ -	$ -	$ -
	Oper. Reserve Fund	$ -	$ -	$ -	$ -	$ -	$ -
	Subtotal - Capital =	**$ 5,083,200**	**$ 1,504,058**	**$ 1,219,668**	**$ 1,185,113**	**$ 1,185,113**	**$ 5,093,951**
	Total =	**$ 19,672,900**	**$ 5,236,899**	**$ 4,653,371**	**$ 4,381,615**	**$ 4,789,646**	**$ 19,061,531**
Customer Revenues							
	Taxes Collected		$ 109,591	$ 97,050	$ 94,308	$ 111,779	$ 412,728
	Taxes Paid		$ 113,349	$ 97,051	$ 94,307	$ 111,779	$ 416,486
	Interest & Misc Revenue	$ 128,100	$ -	$ 127	$ -	$ 3,870	$ 3,997
	Penalty Revenues/Credits		$ (9,022)	$ 4,328	$ 6,279	$ 6,586	$ 8,171
	Energy Revenues Collected		$ 4,847,654	$ 4,436,890	$ 4,304,642	$ 4,781,564	$ 18,370,751
	Undesignated Fund Balance R	$ 90,400	$ 22,600	$ 22,600	$ 22,600	$ 22,600	$ 90,400
	Revenues =	**$ 19,042,200**	**$ 4,857,474**	**$ 4,463,944**	**$ 4,333,522**	**$ 4,814,621**	**$ 18,469,561**
	Metro Funding Amount =	**$ 630,700**	**$ 379,424**	**$ 189,427**	**$ 48,093**	**$ (24,975)**	**$ 591,970**

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	$ 4,264,460	22,909,117	$ 0.1861		$ 1,682,089	92,528	$ 18.1793
State Government	$ 3,365,613	13,888,176	$ 0.2423		$ 2,106,815	105,968	$ 19.8816
Metro Government	$ 4,805,921	26,461,938	$ 0.1816		$ 2,145,852	136,525	$ 15.7176
New Customers	$ 3,106,424	16,419,792	$ 0.1892		$ 1,474,848	99,851	$ 14.7704
Total	**$ 12,435,994**	**63,259,231**	**$ 0.1966**		**$ 5,934,756**	**335,021**	**$ 17.7146**

Total Revenue	**$ 18,370,750**
True-up and Adjustments (Net)	**$ 98,811**
Net Revenue	**$ 18,469,561**

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CES for FY22. 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; however, they have failed to meet all of the new performance guarantees in Amendment 2 for twenty-four consecutive months.

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 faulty valve indicator on chiller 4 evaporator prevented the chiller from starting on April 21. Another chiller was started in its place, but the chilled water sendout temperature exceeded the guarantee for thirty-six minutes. The indicator was replaced the same day.
- On May 8, chiller 6 was started due to an increase in chilled water load. Chiller 4, which was operating at the time, unloaded and would not re-start. Another chiller was started but the chilled water sendout temperature exceed the guarantee for thirty-four minutes.
- On June 21, the plant tripped offline momentarily due to an electric service issue with NES. A boiler was immediately re-started (only one was required) and the chiller plant was re-started. CES's investigation discovered that the transformer 1A breaker had tripped. The chillers were transferred to transformer 1B, and the plant returned to normal operation. The chilled water sendout temperature exceeded the guarantee for approximately 140 minutes. The steam pressure reached a low of 144 psig but was below 150 psig for less than thirty minutes.
- There were no other reported issues during the quarter.

B. Efficiency

The operation of the EGF did not satisfy all of the guaranteed levels for all commodity usage during the quarter. There were excursions above the guaranteed levels for the current quarter. 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 is requiring regular attendance for online safety courses for their employees. Masks are to be worn within the EGF and when social distancing cannot be implemented.

D. Personnel

CES is currently staffed with eighteen full time employees, one remote part-time employee and two shared employees. The General Manager, Tim Hestle, retired June 30, and a replacement has not been named as of the date of this report. Following Mr. Hestle's retirement, CES will only have seventeen full time employees which is two less than is required by Amendment 2 of the ARMA. CES continues interviewing replacements for the open electrician position. Of the current number of employees, fourteen were previously employed by Nashville Thermal Transfer Corporation. With Mr. Hestle's retirement leaves only thirteen former Nashville Thermal Transfer Corporation employees.

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 also occurs regularly to monitor the concentration and distribution of the steam system chemicals.

- Steam System
  - The condensate return averaged approximately 65.1% of the steam sendout during the quarter, which represents a 15.4% decrease over the previous Fourth Quarter. A portion of the condensate was dumped during the quarter

due to hardness. However, the average condensate for the fiscal year was 72.1% which represents an increase of 14.7% over FY21.
    - 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 increased 16.8% over the previous Fourth Quarter. This increase resulted in an average increase in the cycles of concentration in the cooling towers by 3.8%. The factors contribute to an increase in the chilled water system make-up water usage that may be contributing to the inability to meet the chilled water-water performance guarantee.
- 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.
    - Metro and CES are evaluating options for the installation of a side stream filter at the EGF.

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.

- Cleared debris around exterior of EGF;
- Checked, updated, backed-up and repaired plant computers and servers;
- Checked and adjusted packing on all pumps;
- Repaired plant lighting and electrical;
- Replaced bearings on boiler feedwater pumps 1 and 3;
- Replaced motor on the air compressor;
- Replaced belt tensioner on cooling towers 6 and 7;
- Repaired control valve on chiller 4;
- Repaired isolation valves on chillers 5, 7, and 9;
- Trane performed maintenance on several of the chillers;
- Repaired vibration switch on cooling towers 1 and 12;
- Repaired fire alarm system;

- Replaced conductivity controller and probe on boiler 3;
- Recharged chiller 5B with refrigerant;
- Assisted Shermco perform maintenance on switchgear;
- 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 21, 2022, by Kevin L. Jacobs, P.E. Ben Casteel with Metro Water Services joined Mr. Jacobs during the Walkthrough. Based on the review of the EGF, the following comments and observations are presented. Constellation Energy Solutions, LLC (CES) made significant efforts within the past year to address many of the issues contained in the previous reports; however, some items remain which are noted herein.

- 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 four of the cooling towers prior to the First Quarter FY22 Walkthrough. The riser tubes in four additional cooling towers (12, 13, 15 and 16) were coated prior to the Third Quarter FY22 Walkthrough. **CES stated that only a few more of the cooling towers require the new coating and that they would be addressed after the cooling season.**
- 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. **CES reported after the Second Quarter FY22 Walkthrough that they have requested a quote from their contractor to make these repairs. <u>The repairs had not been made prior to the Fourth Quarter Walkthrough.</u>**
- CES made significant efforts prior to the Third Quarter Walkthrough to clean the algae from the cooling towers and cooling tower deck. During the previous Walkthrough, the algae was essentially gone from the inside and outside of the cooling towers. The algae remaining on the cooling tower during this Walkthrough appeared to be dead but needs to be removed.
- Chemical feed lines were noted as leaking with visible salt build-up on some of the lines between the tanks labeled 12900 and 10600 and tanks 12001 and 34170. This item was first noted in the Second Quarter FY22 Walkthrough report. **CES has not cleaned these areas nor repaired the leaking joints.**
- De-aerator 2 was open during the Walkthrough. The steam valve was closed but some condensate appeared to be leaking through and dripping from the nozzles.

CES needs to investigate the condition of this valve and replace it, if necessary, since the steam may not be 100% isolated from the open de-aerator.

- CES, Metro and TEG have discussed the need for CES to perform additional cleaning of the EGF and to maintain an increased level of cleanliness through the plant. CES stated in the First Quarter FY21 that they intended to address the overall cleanliness of the EGF. **CES has made some improvement from the level noted in the Third Quarter FY21 Walkthrough Report. CES reported that they hired an extermination contractor that also helped remove cobwebs. Although CES was working to remove the cobwebs during the Walkthrough, additional work is required.**
- Older computer equipment is being stored in the electric room. Noted in previous Walkthrough reports, if the older computer equipment is not intended to be used or is "junk", it needs to be removed. Some empty carboard boxes were also noted. **These should also be removed.**
- An overhead lamp was not working properly at the south end of the expansion tank catwalk. During the Fourth Quarter Walkthrough, an additional lamp was not working above chilled water pump 5. **CES should repair the lamps.**
- The CHWS sign on the 42" chilled water piping at the wall had a broken tie and was hanging down. The insulation of the piping adjacent to this sign was also stained. **These items appeared in the previous Walkthrough report and need to be repaired.**
- The old monitors, controls equipment, electrical components, starters, etc., that are being stored in the electrical room need to be removed if they are not intended as spare parts. **CES should remove any damaged, broken, out-of-date, or otherwise un-reusable piece of equipment.**
- Other action items previously noted to be addressed by CES have been completed. (See also the "Quarterly EGF Walkthrough Report," dated June 22, 2022, 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 FY22 Open Projects

The following projects remained open at the end of the Fourth Quarter FY22.

1. DES133.1 - Old Convention Center Site Redevelopment: Monitoring of Broadway Tunnel

This project involved the monitoring/reporting on the condition of the Broadway Tunnel related to the construction and blasting at the 5th + Broadway Development. Metro is pursuing reimbursement from the contractor(s) responsible for the blasting

and subsequent damage to the tunnel through legal means. This project remains open. The repairs for tunnel damage were completed under project DES164 which has since been closed.

2. 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 remain under review by MWS, but TEG is working under this project number to address the questions and comments raised by MWS during this meeting and is preparing other documentation that presents recommendations for the DES moving into the future while remaining under Metro ownership. No additional work was requested by Metro during the quarter.

3. DES154 – Manhole K Repairs

The initial scope for this project has been completed. However, there were some other items that were added as change orders. The existing change order items were completed during the Fourth Quarter FY22; however, one additional item is being investigated and could be an added change order. Therefore, this project remains open until such time this item has been addressed.

4. DES143/161 – Manhole N1, N2 and S6 Insulation

This project addresses the installation of insulation in three (3) manholes: Manhole N1, Manhole N2 and Manhole S6. Manhole N1 and N2 house chilled water piping which is partially uninsulated. Manhole S6 is a small manhole that is a part of the State distribution system which houses steam and condensate return piping which is uninsulated. These projects address the insulation of this uninsulated piping.

Manhole S6 (DES-161) is closed.

Due to discussions regarding capital versus R&I tasks, these projects are not under contract yet. It is anticipated that the work in Manholes N1 and N2 will be completed during the First Quarter FY23.

5. 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 will be used to track costs and activities associated with the new road, the on-site construction activities, and their impact to DES.

Site work began during the Quarter which included earth moving and rock removal. Blasting is anticipated to begin in July.

6. DES177 – Manhole B1 Ladder and Platform

Manhole B1 is in 1st Ave South and houses a groundwater sump pump to alleviate the amount of groundwater that infiltrates into Manhole B. Manhole B1 is a 4 ft diameter, precast manhole with individual embedded rung access ladder. Currently, personnel stand on partially submerged concrete blocks when maintenance is required within this manhole. This project addresses the installation of a platform and ladder for maintenance.

This project was bid and verbally awarded during the Fourth Quarter FY21. There is a dispute between CES and DES regarding scope items that CES is requesting additional compensation to perform this work, therefore this project is on hold until the matter is resolved.

7. DES178 – Manhole 5 Repairs

Manhole 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 not been priced or completed. It is anticipated that this work will begin and be completed during the First Quarter FY23.

8. DES179 – Manhole 11 Repairs

Manhole 11 has structural steel piping anchors and supports which are corroded and need to be cleaned and coated. This project addresses this need along with the repair of piping wall penetration end cans.

Work was completed during the Fourth Quarter FY22, and this project is now in close-out.

9. 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. It is TEG's understanding that the structural engineer will develop a report on the findings within the tunnel and make repair recommendations to the State. Items needing immediate attention may be addressed through emergency funding. Other items will be entered into the State's budget to be addressed in two to three years.

TEG has initiated a scope outline. The project's initiation and completion will be dictated by the State's schedule to address the tunnel's structural deficiencies.

10. DES184 - 7th Avenue North Steam Leak Repair

This project is now closed.

11. DES185 – 5th Avenue North Exploratory Excavation

This project is complete and is in close-out.

12. DES187 – Exploratory Excavation at Manhole 22B

This project is now closed.

13. DES188 - 4th and Church Building Access Tunnel Repair

The work for this project was completed during the Fourth Quarter FY22 and is now in close-out.

14. DES189 – Manhole 4 Structural Steel and Insulation Repair

The structural steel piping supports in Manhole 4 are corroded and need to be cleaned and coated to mitigate further degradation. Some of the existing pipe insulation also needs repair or replacement. CES replaced the steam and condensate return piping insulation during the First Quarter FY22 under Amendment 2 of its contract with Metro and obtained quotes and ordered insulation blanket replacements during the 4th Quarter FY 22. The structural steel was cleaned and coated during the Fourth Quarter FY22.

It is anticipated that the insulation blankets will arrive and be installed during the First Quarter FY23.

15. DES191 – Manhole 20 Repairs

Manhole 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, and TEG has reviewed and rejected the initial submittals and is awaiting resubmittals. It is anticipated that this project will begin construction during the First Quarter FY23.

16. DES192 - Peabody Street Development

With new potential customer developments along Peabody Street, including the conversations for potential service to 133 KVB, 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 the Third Quarter. TEG is using this information to develop a plan to cross Hermitage Ave with new DES service and to formulate a course of action for a potential new parking area (DES195).

17. DES193 – Manhole 13 Repairs

The new pipe support was installed during the Third Quarter FY22 but the insulation in the area of the piping support has not been repaired yet. It is expected that this project will be in close-out during the First Quarter FY23.

18. DES194 – Manhole B4 Repairs

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

TEG completed construction documents for this work during the Third Quarter FY22. It is anticipated that CES will obtain a quotation for this work, and work will begin during the First Quarter FY23.

19. 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 may 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. Therefore, DES is investigating adding a parking area on the west side of the EGF that may be accessible from either Peabody St or Korean Veterans Blvd and could include a new doorway access to the expansion yard. Options were presented by a civil

engineering firm hired by TEG. These options have been reviewed and will be presented to Metro in the First Quarter FY23.

20. 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 evaluating the scope of repairs needed.

21. DES197 – Manhole 3 Coatings and Repairs

The structural steel piping supports in Manhole 3 are corroded and need to be cleaned and coated to mitigate further degradation. Some of the existing pipe insulation also needs repair or replacement. The structural steel was cleaned and coated during the Fourth Quarter FY22. CES is awaiting the arrival of replacement insulation blankets. It is anticipated that this project will be completed during the First Quarter FY23.

22. DES198 – Manhole 18 Condensate Pump Replacement

With the frequent issues with the existing condensate return pumps located in Manhole 18, DES has seen the need to evaluate the appropriateness of the pumping system and determine if a more consistent and reliable operation is plausible. TEG performed this evaluation during the Third Quarter and released CES to purchase the replacement pumps in coordination with their design in the Fourth Quarter. The pumps were purchased prior to issuing the design for bid due to the long delivery time for the pumps. CES's controls contractor is evaluating the control aspects of the design to ensure there are no additional long-lead items. Bid and construction are anticipated in the First or Second Quarter FY23 to coincide with the delivery of the pumps.

23. DES199 – Manhole D3 Sparge Tube Addition

The bottom of an existing pipe stanchion is severely corroded rendering the support ineffective. Due to the absence of this support, when a nearby trap discharges, the condensate piping shakes due to steam hammer. This project addresses the replacement of the support and the installation of a sparge tube to address any steam hammering.

CES has presented a proposal for this work. There is a dispute between CES and DES regarding scope items that CES is requesting additional compensation to perform this work, therefore this project is on hold until the matter is resolved.

24. DES200 – Chilled Water Side Stream Filter

A number of years ago, DES requested CES to provide information and a proposal for the installation of a side stream filter on the chilled water system. This filter would be located at the EGF and would operate continuously to filter solids from the chilled water system. The filter should improve the heat transfer capabilities of the customer coils and clean the system.

The original proposal was delayed due to the potential sale of the DES. In FY21, discussions resumed between Metro, CES, and TEG for the need to install the filter. CES was asked to receive bids on the new filter in FY22. The DES has approved this proposal and the construction and installation are anticipated in the Second Quarter FY23 due to the long lead time on the equipment.

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.

25. DES201 – East Bank Development

DES is represented by the Metro Liaison at the East Bank Technical Advisory Committee meetings. 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. TEG has recently become involved with the development of the East Bank at Metro's request.

TEG and Metro met with proposed stadium's design team during the quarter to discuss the possibilities of serving the stadium from either a new satellite plant on the East Bank or from a facility located within the new stadium. This new satellite plant would serve additional customers as properties are developed in the area.

MWS and DES have also made inquiries into the development plans for the Oracle campus. DES continues to explore options for serving the Oracle campus in a sustainable way.

26. DES203 – 7th and Commerce Hotel

A hotel is proposed to be installed at 7th Ave N and Commerce St. TEG has had several conversations with the engineers and developers and all discussions appear favorable for DES service. The design of the new hotel is progressing with the intention of utilizing the services from DES. This site would include hotel, restaurant, and retail spaces requiring approximately 700 tons of chilled water and 11,000 pph of steam.

27. DES203 – Printers and Bankers Alley Building

TEG has been in contact with the engineering team for a new development located on 3rd Ave N at Printer's and Banker's Alley. This potential customer could have a load as much as 600 tons serving its multi-story residential and retail structure. The engineer indicated that they are not currently interested in steam. Due to their limited footprint, DES may be their only practical option for cooling. Technical issues with the site have delayed the design of the building, but the intention is to connect to chilled water from DES.

B. Fourth Quarter FY22 Closed Projects

DES184 and DES187 were closed during the Fourth Quarter FY22. DES179 and DES188 are in close-out.

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	FY22 Spending to Date	Total Spent to Date	Remaining Balance
Fund-49116						
	DES133.1	NCC Blasting Issue	$ 200,000	$ 28,341	$ 167,516	$ 32,484
	DES139	Options Review	$ 450,000	$ 2,639	$ 318,440	$ 131,560
	DES143	MH N1, N2 and S6 Insulation	$ 30,000	$ 3,136	$ 6,548	$ 23,452
	DES152	MH A & M Repairs	$ 28,000	$ 67,983	$ 76,798	$ (48,798)
	DES153	MH L Repairs	$ 169,475	$ 129,614	$ 165,709	$ 3,766
	DES154	MH K Repairs	$ 75,085	$ 35,046	$ 35,720	$ 39,365
	DES161	MH S6 Insulation	$ 6,500	$ 7,759	$ 7,759	$ (1,259)
	DES162	3rd and Molloy Service	$ 150,000	$ -	$ 143,602	$ 6,398
	DES163	Parcel K Service	$ 1,018,802	$ 14,209	$ 25,683	$ 993,119
	DES171	Broadway Tunnel Support Repair	$ 268,907	$ 7,436	$ 119,367	$ 149,540
	DES172	Viridian Pipe Support Repair	$ 256,250	$ 68,125	$ 244,715	$ 11,535
	DES173	MH-B3 Structural Repair	$ 50,000	$ -	$ 45,751	$ 4,249
	DES174	7th Ave Pipe Support Repairs	$ 180,000	$ 118,832	$ 178,565	$ 1,435
	DES175	MH4 Condensate Repair	$ 118,090	$ -	$ 19,661	$ 98,429
	DES176	Condensate Leak at MH9	$ 175,000	$ -	$ 126,039	$ 48,961
	DES177	MHB1 Ladder & Platform	$ 45,500	$ 1,181	$ 6,833	$ 38,667
	DES178	MH-5 Repairs	$ 97,500	$ 27,851	$ 31,653	$ 65,847
	DES179	MH-11 Repairs	$ 58,500	$ 58,714	$ 63,080	$ (4,580)
	DES180	State Tunnel Support Repairs	$ 140,000	$ 1,412	$ 3,284	$ 136,716
	DES181	3rd Ave Leak Repair	$ 140,000	$ -	$ 3,079	$ 136,921
	DES182	MH-B10 Exp Joint Replacement	$ 145,000	$ 31,770	$ 132,821	$ 12,179
	DES183	Hermitage Hotel Service Relocation	$ 60,000	$ -	$ 1,032	$ 58,968
	DES184	7th Ave STM Leak	$ 125,000	$ 1	$ 122,550	$ 2,450
	DES185	MH10 Water Leak	$ 285,000	$ 273,321	$ 297,122	$ (12,122)
	DES186	Printers Alley Exploratory Excavation	$ 110,000	$ 90,552	$ 95,901	$ 14,099
	DES187	Exploratory Excavation/Steam Repair MH22B	$ 153,750	$ 324,461	$ 326,084	$ (172,334)
	DES188	4th and Church Access Tunnel Repairs	$ 125,000	$ 170,231	$ 177,140	$ (52,140)
	DES189	MH4 Structural Steel and Insulation Repairs	$ 56,750	$ 12,837	$ 13,963	$ 42,787
	DES190	MH Sparge Tube Repairs	$ 20,000	$ 12,661	$ 14,661	$ 5,339
	DES191	MH 20 Repairs	$ 94,875	$ 28,851	$ 28,851	$ 66,024
	DES192	Peabody Developments	$ 40,000	$ 28,697	$ 28,697	$ 11,303
	DES193	MH-13 Repairs	$ 30,000	$ 6,675	$ 6,675	$ 23,325
	DES194	MH-B4 Repairs	$ 80,000	$ 7,476	$ 7,476	$ 72,524
	DES195	DES Parking Lot	$ 275,000	$ 5,442	$ 5,442	$ 269,558
	DES196	Condensate Line Leak Repair at MH9	$ 130,000	$ 53	$ 53	$ 129,947
	DES197	MH3 Coatings and Repairs	$ 13,500	$ 9,913	$ 9,913	$ 3,587
	DES198	MH18 Condensate Return Pump Replacement	$ 175,000	$ 8,769	$ 8,769	$ 166,231
	DES199	MHD3 Sparge Tube	$ 25,000	$ 719	$ 719	$ 24,281
	DES200	Sidestream Filter	$ 330,000	$ 1,537	$ 1,537	$ 328,463
	DES201	East Bank and Oracle Development	$ 110,000	$ 5,839	$ 5,839	$ 104,161
	DES202	Service to 7th and Commerce	$ 1,630,000	$ 371	$ 371	$ 1,629,629
	DES203	Service to Printer's Alley Residential	$ 850,000	$ 106	$ 106	$ 849,894
	EMR22-001	CHW Leak at MHD Repair	$ 110,000	$ 97,952	$ 97,952	$ 12,048
		Total Closed Projects	$ 1,335,927	$ -	$1,335,927	$ -
		Metro Project Admin	$ -	$ -	$ -	$ -
		Project Man, Development, etc	$16,032,590	$ -	$ -	$16,032,590
		Fund Total	**$26,000,000**	**$ 1,690,511**	**$4,509,405**	**$21,490,595**

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 $254,535. Table 6 provides a summary of the FY22 expenditures and revenues to date associated with the R&I budget.

Table 6. FY22 Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY21				**$ 383,359.85**		**$ 20.97**	**$ 47,950.15**	**$ 47,950.15**
CNE July 2021 R&I	4/28/2022	DES-2411	CES	$ 1,792.37				
CNE Aug 2021 R&I	1/31/2022	DES-2408	CES	$ 15,254.82				
CNE Sept 2021 R&I	04/28/22	DES-2415	CES	$ 6,618.84				
		Sub-Total First Quarter		**$ 23,666.03**	**$ 73,700.01**	**$ -**	**$ 50,033.98**	**$ 97,984.13**
CNE Oct 2021 R&I	04/28/22	DES-2415	CES	$ 2,770.38				
CNE Nov 2021 R&I	04/28/22	DES-2413	CES	$ 2,212.34				
Dec Interest	12/30/21	-	-	$ 3.56				
Dec Interest	12/30/21	-	-	$ (3.56)				
CNE Dec 2021 R&I	02/25/22	DES-2415	CES	$ 1,552.50				
		Sub-Total Second Quarter		**$ 6,535.22**	**$ 73,700.01**	**$ -**	**$ 67,164.79**	**$ 165,148.92**
CNE Jan 2022 R&I	02/16/22	-	CES	$ 5,959.11				
CNE Feb 2022 R&I	07/06/22	DES-2419	CES	$ 10,968.26				
FVB Energy Inc	04/28/22	DES-2415	FVB	$ 17,252.50				
CNE Mar 2022 R&I	07/06/22	DES-2419	CES	$ 7,528.46				
		Sub-Total Third Quarter		**$ 41,708.33**	**$ 73,700.01**	**$ -**	**$ 31,991.68**	**$ 197,140.60**
CNE Apr 2022 R&I	05/18/22	-	CES	$ 8,472.10				
May Interest	05/02/22	-	-	$ 9.71				
May Interest	05/02/22	-	-	$ (9.71)				
CNE May R&I	06/17/22	-	CES	$ 4,764.77				
June Interest	06/01/22	-	-	$ 55.44				
June Interest	06/01/22	-	-	$ (55.44)				
CNE June R&I	07/22/22	-	CES	$ 3,068.83				
		Sub-Total Fourth Quarter		**$ 16,305.70**	**$ 73,700.01**	**$ -**	**$ 57,394.31**	**$ 254,534.91**
		FY22 Year to Date		**$ 88,215.28**	**$ 294,800.04**	**$ -**	**$ 254,534.91**	**$ 254,534.91**

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. Several of the vaults continue to require pumping due to the accumulation of either groundwater or surface run-off.
   c. CES continues to replace trap assemblies within the EDS as needed.

d. 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.

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

The Fourth Quarter FY 2022 walkthrough was conducted on July 5 and 6, 2022. It was extremely hot with the ambient temperatures above 95°F. The manholes that were visited included A, B, G, K, L, M, N1, N2, S5, 25, 26, S6 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 well and it is important that these supports be monitored closely by CES, and any degradation observed to be reported immediately to TEG and be repaired. This should result in instances of corrosion being addressed quickly and at minimal cost to Metro.

There is an action item list included at the end of this report.

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, therefore CES might have to remove the link seal and then remove any mud, dirt, etc. from the annular space so that the linkseal can be positioned back in place. **This item appeared in the Fourth Quarter FY21 report.**
   c. The end can of the steam penetration at the western wall on the chilled water side of the manhole was corroded and it was allowing groundwater to seep into the manhole through this penetration. TEG directed CES to have Enecon

install hydraulic grout around this penetration which was done and now the infiltration is now 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. The 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 reposition 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.) **This item appeared in the Fourth Quarter FY21 report.**
4. Manhole L
   a. The handwheel on the main condensate return piping has fallen off, presumably due to vibration. CES needs to reinstall this handwheel and determine if a cotter pin or Loctite can be used to prevent it from coming off in the future.
   b. CES should monitor the trough area and keep it clean of mud and debris.
5. Manhole K
   a. 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 or surface water is still accumulating in this manhole. There are some water stains at the ceiling to wall interface in the northwest corner and also along the west wall of the manhole. TEG has asked CES to have Enecon investigate these areas to determine if they have a product that can successfully seal these areas and present a quotation to accomplish this sealing.
   b. 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.
   c. The strainer upstream of the steam trap does not have a blowdown valve. CES has attempted to add a blowdown valve but due to the piping configuration, there is not sufficient space to make this addition. CES needs to reconfigure the trap piping so that a blowdown valve can be added to the strainer. **This item appeared in the Fourth Quarter FY21 report.**
6. Manhole G
   a. This is an abandoned manhole located in a grass median near the intersection of 1st Avenue North and Union Street. It is reviewed to ensure its structural integrity is not compromised.
   b. No issues were identified.

7. Manhole N1
    a. There was no water present in this manhole.
    b. The CHW piping in this manhole was never insulated. Most of the piping in this manhole is ductile iron; however, there are some steel and iron components which the surface condensation has corroded. Therefore, the surface corrosion should be cleaned and coated to prevent further corrosion and the non-insulated piping in this manhole should be insulated. This project has been postponed in several of the recent budgets, however it has now been approved and is an active project. CES needs to present a contract to TEG for this work to be executed, or this work should be executed under Amendment 2 of CES's contract.
    c. CES recently replaced the "individual rung" ladder with a new aluminum ladder under Amendment 2 of the revised contract. However, the cut-off individual rungs are exposed and will start to corrode. CES needs to cut back these individual rung "stubs" an inch below the concrete wall surface (which will require the removal of some concrete) and then the areas patched with a concrete patching material.
8. Manhole N2
    a. There was only a small amount of water in this manhole and pumping was not required 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. This project has been postponed in several of the recent budgets, however it has now been approved. The insulation of the piping also had to await the successful sealing of the manhole. Now that the sealing is complete, TEG will provide updated specifications to CES to have the uninsulated piping in this manhole insulated.
    d. There is a chain link fence around this manhole, which was installed to prevent the storage of dirt, sand, sod, etc. for Nissan Stadium from obstructing access to the manhole. The storage of these materials is now beside the fence; however, the fence has suffered some damage due to heavy equipment loading/unloading the sand, dirt, sod, etc. next to the manhole. CES should monitor and report any additional problems/damage. TEG will continue to try and contact Nissan Stadium personnel regarding the damage which has occurred.
9. Manhole S5
    a. Some leaves had accumulated on the screen windows in the manhole's above ground walls. These leaves were cleaned by CES personnel during this review.
    b. There are some cracks in the manhole interior wall surfaces. CES should monitor these cracks and report any degradation to TEG.

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. No deficiencies noted.
11. Manhole 25
    a. These manholes/valve boxes house the chilled water supply and return valves for the State Supreme Court service.
    b. The stem and handles are corroded, and it is questionable whether these valves could be operated if needed. CES should try and operate these valves during the heating season and report their findings to TEG.
12. Manhole 26
    a. These manholes/valve boxes house the chilled water supply and return valves for the State Library and Archives service.
    b. These valve boxes were inaccessible due to cars parked on top of them however, it is believed that they are in similar condition to the valves in Manhole 25. CES should try and operate these valves during the heating season and report their findings to TEG.
13. Chilled Water Piping Underneath Woodland St 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 immediately. Once installed, the siderail section needs to be painted to match the existing. **This item appeared in the Fourth Quarter FY21 report.**
    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 Fourth Quarter FY21 report.**
    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 jacketing breaches or changes to TEG.
    d. There are two guides on the vertical piping on the east side of the river that are badly corroded. It would probably be more cost effective to replace these guides with new hot dip galvanized members then to spend the time cleaning and coating the existing members with the use of a bucket truck. TEG will do some investigation and develop a scope for the replacement or possible re-use of these guides.
    e. There is some corrosion on the vertical piping insulation jacketing on the east side of the river. The corrosion occurs at joints between sections of insulation jacketing. These jacketing sections need to be removed and replaced along with any damaged insulation. TEG will include a scope for this work in its investigation of item 13.d. above.

ACTION ITEMS

CES:

1. Manhole A
   a. Monitor pipe support coating and report any degradation**.**
2. Manhole B
   a. Monitor pipe support coating and report any degradation.
   b. Steam Side
      (1) Remove northern wall steam penetration link seal and remove dirt, gravel, etc. obstruction behind link seal; re-install link seal and tighten. **This item appeared in the Fourth Quarter FY21 report.**
      (2) Re-position southern link seals into annular space and tighten link seals. If this is unsuccessful, remove link seals and remove dirt, gravel, etc. obstruction behind link seal; re-position link seal and tighten. **This item appeared in the Fourth Quarter FY21 report.**
   c. CHW Side:
      (1) Monitor west wall steam penetration and report changes to TEG.
3. Manhole M
   a. Monitor pipe support coating and report any degradation.
   b. Remove northern wall steam penetration link seal and remove dirt, gravel, etc. obstruction behind link seal; re-install link seal and tighten. **This item appeared in the Fourth Quarter FY21 report.**
4. Manhole L
   a. Monitor/clean “trough” in floor of manhole.
   b. Monitor pipe support coating and report any degradation.
   c. Re-install condensate return main valve handwheel.
5. Manhole K
   a. Monitor pipe support coating and report any degradation.
   b. Have Enecon investigate the sealing of the northwestern and western ceiling/wall joints.
   c. Monitor the hairline cracks in the concrete on the southern interior wall. Report any significant changes to TEG.
   d. Reconfigure the trap piping so that a blowdown valve can be added to the trap strainer. **This item appeared in the Fourth Quarter FY21 report.**
6. Manhole G
   a. None
7. Manhole N1
   a. Present a contract to TEG for the cleaning/coating of the pipe supports and to insulate the piping.
   b. Cut back the individual rung stubs which remain in the manhole wall and patch with a concrete patch material.
8. Manhole N2
   a. Once TEG has presented updated insulation specifications and scope, procure bids to insulate the un-insulated manhole piping.

b. Monitor the chain link fence and report any damage to TEG.

9. Manhole S5
   a. Monitor the interior wall cracks and report any degradation to TEG.
10. Manhole S6
    a. None.
11. Manhole 25
    a. Operate the valves and report findings to TEG.
12. Manhole 26
    a. Operate the valves and report findings to TEG.
13. Woodland St Bridge CHW Piping
    a. Replace the missing handrail section on the grated walkway; paint newly installed handrail section to match existing. **This item appeared in the Fourth Quarter FY21 report.**
    b. Replace the missing handrail bolts. **This item appeared in the Fourth Quarter FY21 report.**
    c. Monitor deformed pipe insulation jacketing and report changes to TEG.

TEG:

1. Manhole A
   a. None.
2. Manhole B
   a. Include steam piping exiting manhole in "Comprehensive Repair and Replacement Plan".
3. Manhole M
   a. None.
4. Manhole L
   a. None.
5. Manhole K
   a. None.
6. Manhole N1
   a. None.
7. Manhole N2
   a. Talk with stadium representative regarding damage to manhole fencing.
8. Manhole G
   a. None.
9. Manhole S5
   a. None.
10. Manhole S6
    a. None.
11. Manhole 25
    a. None.
12. Manhole 26
    a. None.

13. Woodland St Bridge
    a. Investigate replacement/renewal of existing guides on east bank and develop a repair scope.
    b. Develop repair scope for insulation jacketing.

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

Although the original design and development team for the two proposed hotels at 1st Ave S and KVB have been replaced by a new development team, TEG continued discussions with the design and ownership team for potential steam and chilled water service from DES to the 133 KVB site. Conversations are anticipated into FY23 as the developer and his team work 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. DES is represented by the Metro Liaison who also 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 have made initial inquiries into the developing plans for the Oracle campus, but those plans have not been widely publicized. DES continues to explore options for serving the Oracle campus in a sustainable way. Work associated with the East Bank Development is tracked under the project DES201.

TEG has made efforts to contact the parties involved with a new development south of Peabody St in the Rolling Mill Hill area. This potential development could be served from new service lines along Peabody St (DES192).

A hotel is proposed to be installed at 7th Ave N and Commerce St. TEG has had several conversations with the engineers and developers and all discussions appear favorable for DES service. This site would include hotel, restaurant, and retail spaces requiring approximately 700 tons of chilled water and 11,000 pph of steam. Work associated with this potential is tracked under the project DES202.

TEG has been in contact with the engineering team for a new development located on 3rd Ave N at Printer's and Banker's Alley. This potential customer could have a load as much as 600 tons serving its multi-story residential and retail structure. The engineer indicated that they are not currently interested in steam. Due to their limited footprint, DES may be their only practical option for cooling. Technical issues with the site have delayed the design of the building, but the intention is to connect to chilled water from DES. Work associated with this potential is tracked under the project DES203.

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.
- CES requested that JKP personnel remove an electrical ground wire that had been attached to the chilled water piping in the building.
- 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. Based upon the operating data, CES continues to fail to meet several of the performance guarantees. CES is developing a plan to improve the system performance which should be implemented in the coming quarters. In TEG's opinion, CES needs to continue to improve the operations of the EGF to comply with the ARMA. CES has improved its EDS maintenance over the last several quarters, and there are fewer items which have been repeated in TEG's quarterly reviews. CES has likewise addressed many of the recurring issues in the EGF walkthrough reports and improved the overall condition, appearance, and operation of the EGF during this fiscal year. CES needs to expeditiously address any long-outstanding items.

Based on the review of the Fourth Quarter FY22 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.

- CES needs to address their inability to meet the new performance guarantees for the EGF. Failure to meet the performance guarantees for twelve consecutive months may be considered an Event of Default according to Section 18.02 (B)(4) of the ARMA. CES has operated the EGF for twenty-four consecutive months with at least one performance guarantee excursion each month.
- CES needs to continue their efforts to improve the overall cleanliness and orderliness of the EGF.
- 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.