



Operations Monitoring Report

First Quarter FY22

Prepared by:

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I. Executive Summary

A review of the fiscal year 2022 (FY22) First Quarter performance and contract obligations between Constellation New Energy (CNE) 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 are also presented. For the fiscal year 2022 to date, CNE has failed to meet the performance guarantees for each month during the first quarter 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 CNE and Section 18 of the ARMA. TEG will continue to monitor CNE's operations.

Metro asked CNE during the quarter for a plan to bring the EGF into compliance with the new performance guarantees. CNE provided a plan prior to the deadline of September 30, however, they are waiting on additional guidance from their engineering team. A final plan with recommendations is anticipated in the Second Quarter FY22.

For the First Quarter FY22, the chilled water sales increased 22.7% over the previous First Quarter (FY21). The chilled water sendout also increased 19.7% over the previous First Quarter. The system losses decreased approximately 23.9%. The number of cooling degree days decreased 9.4%. The peak chilled water demand for the current quarter was 18,414 tons, which is 18.7% higher than the previous First Quarter. The increase in chilled water sales is attributed to the re-opening of the city and recovery from the nCOVID-19 pandemic.

Steam sendout for the current quarter increased by approximately 4.8% over the previous First Quarter and steam sales, likewise, increased by approximately 7.5%. This increase came with a 40.0% increase in heating degree days. Total steam system losses were approximately the same as in the previous First Quarter. The peak steam demand for the current quarter was 49,300 pounds per hour, which represents a decrease in the First Quarter demand by approximately 2.3%. The increase in steam sales may be due to the change in building occupancy experienced as the city re-opens.

With the implementation of the new System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels beginning in July 2020, CNE has failed to consistently meet all of the performance guarantees. CNE has consistently met the chilled water plant electric consumption per unit of sales metric. CNE 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 the quarterly average chiller plant efficiency being approximately 4.1% better than in the First Quarter FY21. The chilled water-water guarantee was not met in each month during the Quarter, but the average conversion factor was 2.5% lower than the average in the First Quarter FY21. This change is indicative of improved performance.

The steam-water conversion exceeded the performance guarantee in August and September, but CNE believes these excursions are related to a faulty water meter. The steam fuel guarantee was exceeded only in the month of September. The steam electric conversion guarantee was exceeded

only in July with no subsequent excursions noted. TEG is continuing to monitor CNE'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, DES152, DES154, DES 143/161, DES163, DES172, DES174, DES177, DES178, DES179, DES180, DES182, DES185, DES186, DES187, DES188 and DES189 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. Project DES191 has been added. Projects DES182, DES186 and DES190 are in close-out.

The current fiscal year system operating costs to date are \$5,215,804. This value represents approximately 26.5% of the total budgeted operating cost for FY22. The customer revenues from the sales of steam and chilled water for FY22 are \$4,870,995 (25.6% of budgeted amount) which includes the annual true-up amount for FY21. The difference between the operating costs and customer revenue is the Metro funding amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY22 is \$315,350 (50% of budget) which includes the Second Quarter FY22 MFA payment. The actual MFA can only be estimated due to outstanding invoices as of the date of this report.

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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, 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 First Quarter chilled water sales is shown in Figure 1. This data reflects a 22.7% increase in sales for the current quarter over the same quarter of the previous fiscal year.

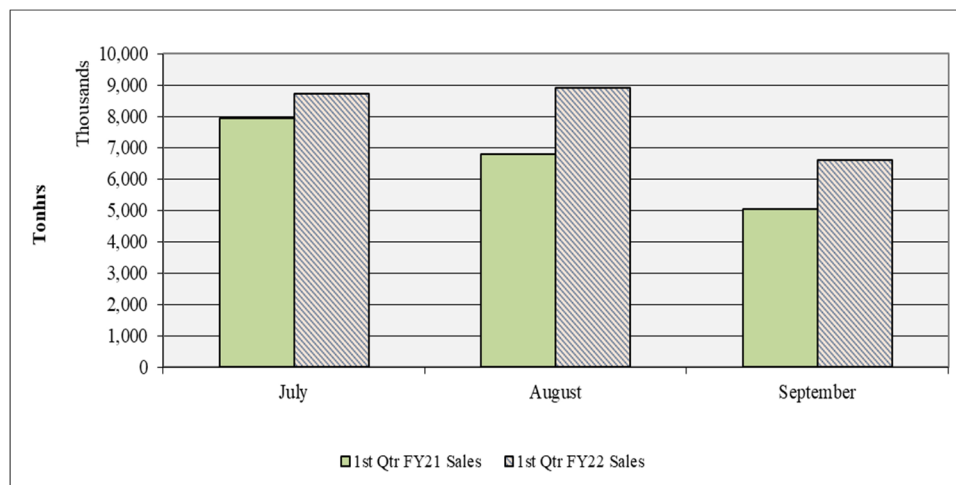


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 18,414 tons, which represents an 18.7% increase over the previous First Quarter. This increase in chilled water demand must be due to an increase in building occupancies since the number of cooling degree days were 9.4% lower 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.

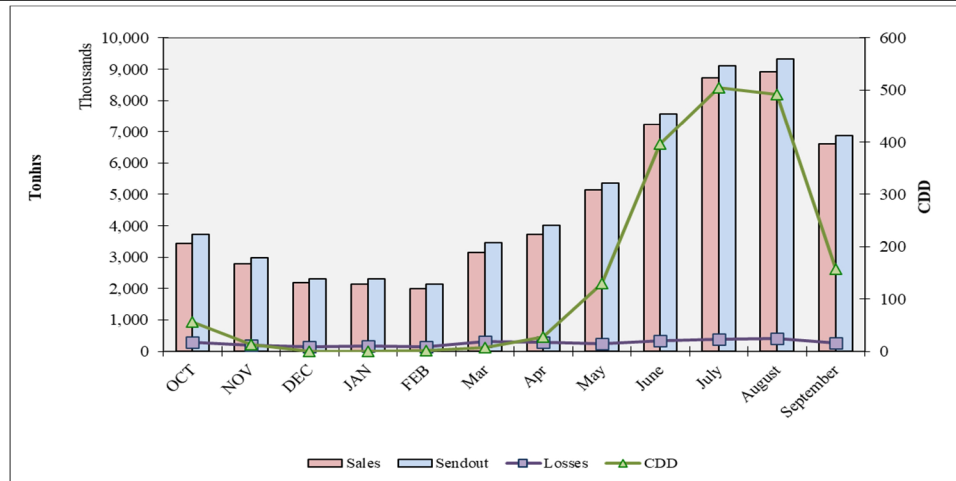


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

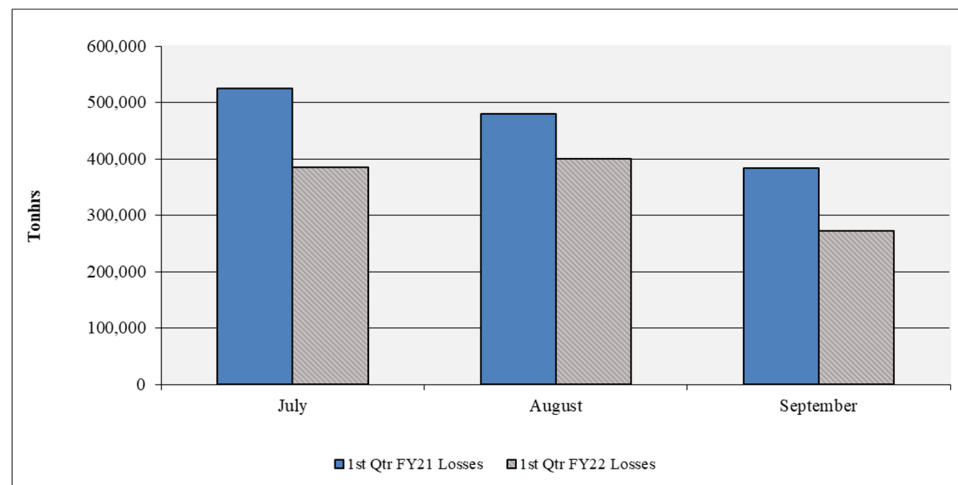


Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by 21.5% over the previous First Quarter. All of the known leaks were repaired during FY21. However, some leaks still remain with the actual source remaining uncertain.

A leak is still suspected on 5th Ave N, but previous efforts to locate the actual source of the leak have been unsuccessful. However, CNE and TEG will continue 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 21.1% over the previous First 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 decreased 21.3%. The total chiller plant water use increased 14.6% over the First Quarter FY21. The overall city water make-up comparison for the chilled water system First Quarter is shown in Figure 4.

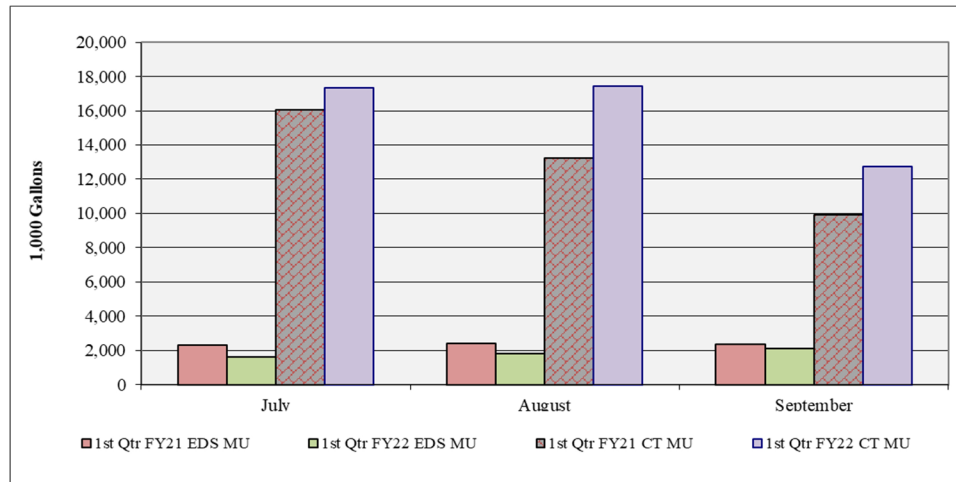


Figure 4. Chilled Water System City Water Usage Comparison

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. CNE has met the chilled water-electric guarantee each month of the fiscal year.

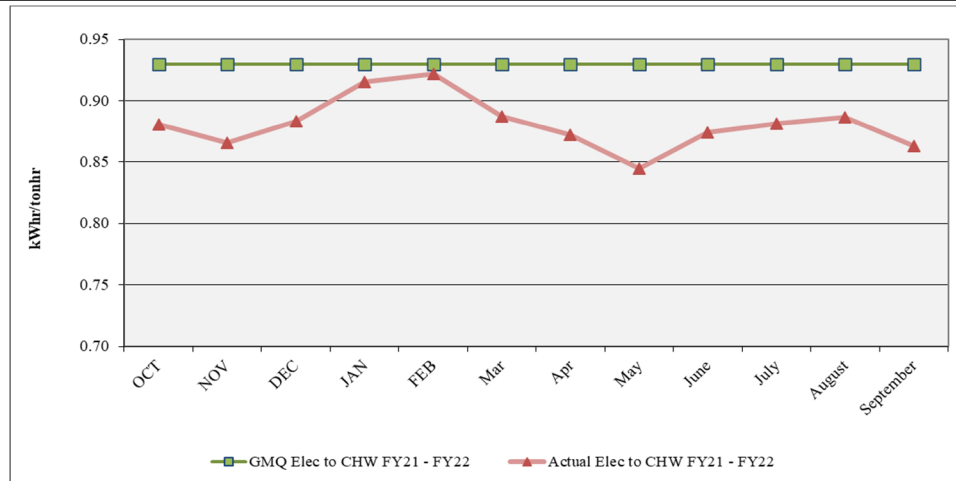


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

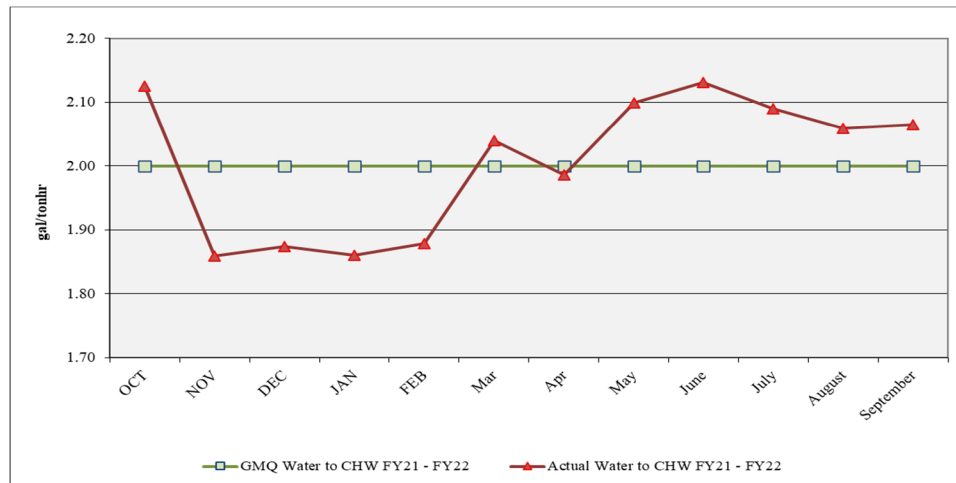


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 0.93 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales decreased 4.1% over the previous First Quarter. These values reflect an improved chiller plant electric efficiency.

CNE has worked to address some operational issues within the plant in an additional effort to improve efficiency. CNE 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 14.6% due largely to the increase in chilled water sales.

The water conversion factor for the chiller plant decreased by approximately 2.5% (on average) over the First Quarter FY21. This change is indicative of an improvement in the operation of the EGF.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 4.8% over the previous First Quarter (FY21), and the sales also increased by approximately 7.5%. The Quarter experienced a 40.0% increase in the number of heating degree days. The steam system losses decreased marginally, and the relative amount of condensate return increased 61.0%. A comparison for the First Quarter steam sales is shown in Figure 7.

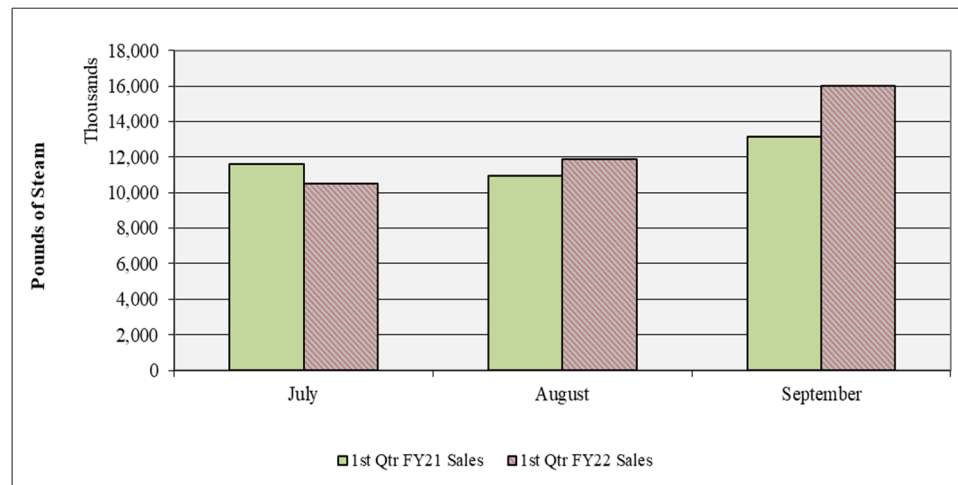


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 49,300 pph, which reflects an approximate 2.3% decrease in the peak steam production over the previous First 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.

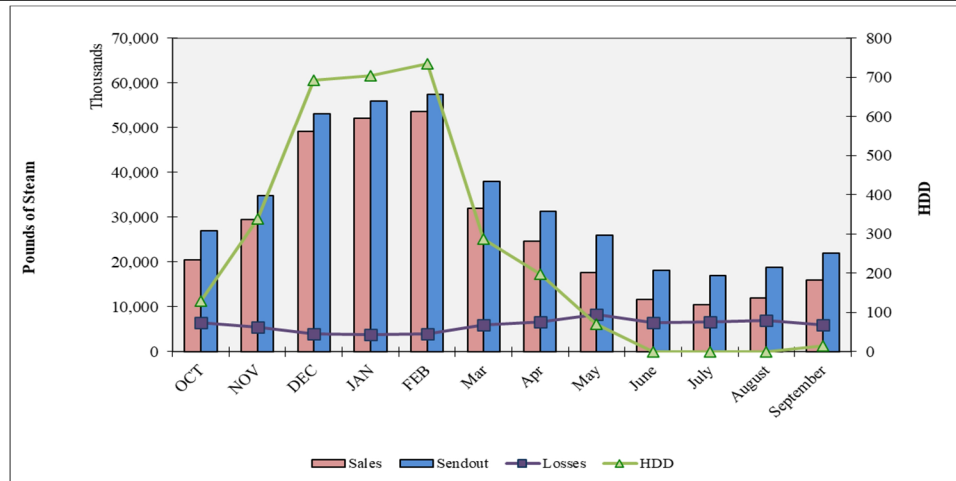


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

A comparison of the total steam mass losses in the EDS for the First 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.

With the recent repairs to the condensate return system, the amount of condensate returned to the EGF has increased and is approaching historically typical values.

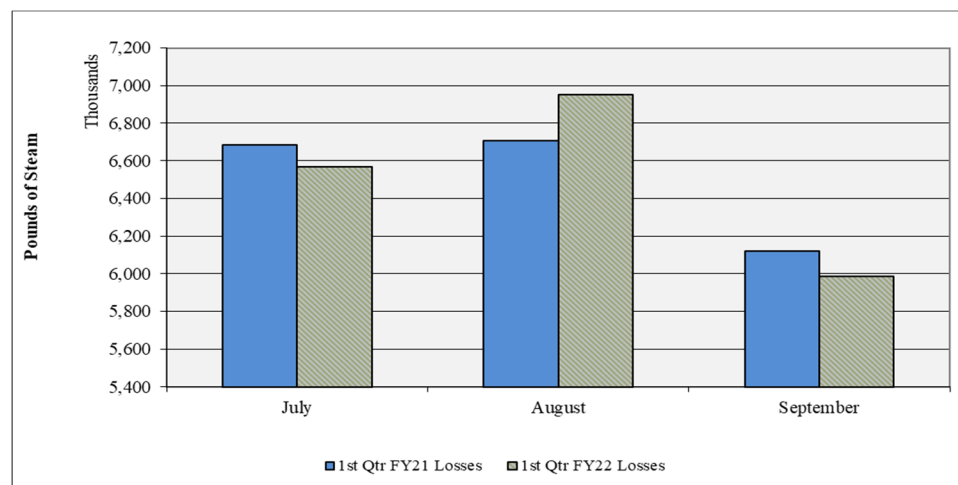


Figure 9. Steam System Losses

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 First Quarter data in Figure 10.

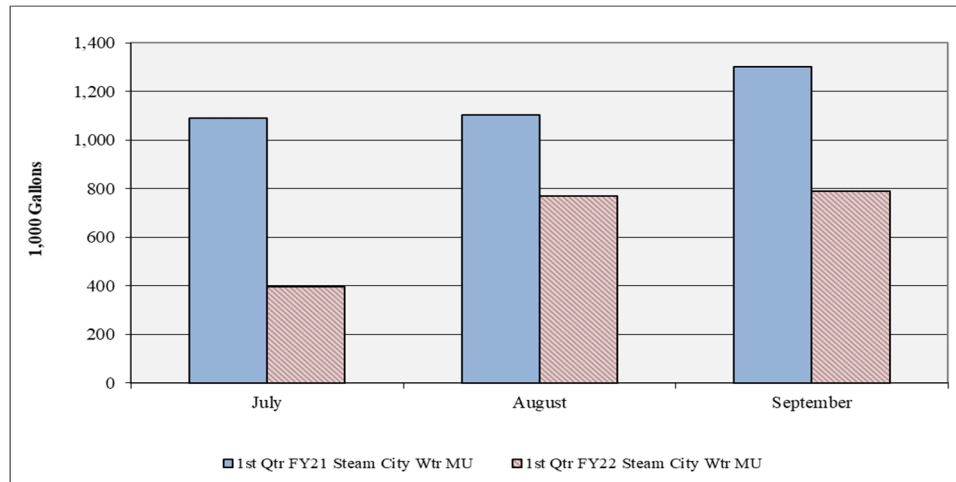


Figure 10. Steam System City Water Make-up Comparison

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 the month of September. The steam electric conversion factor was exceeded in July but was not exceeded in subsequent months. TEG monitors CNE 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 August and September. CNE believes these excursions may be due to a faulty meter which has been replaced.

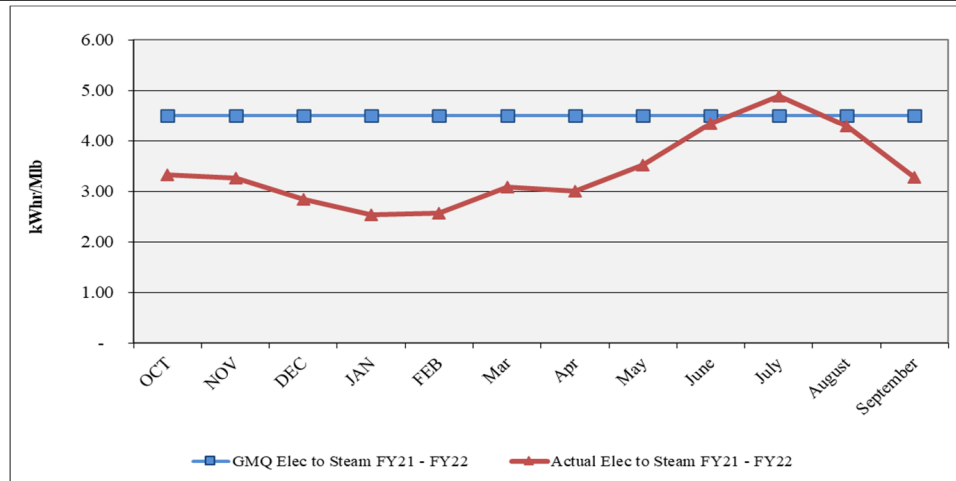


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

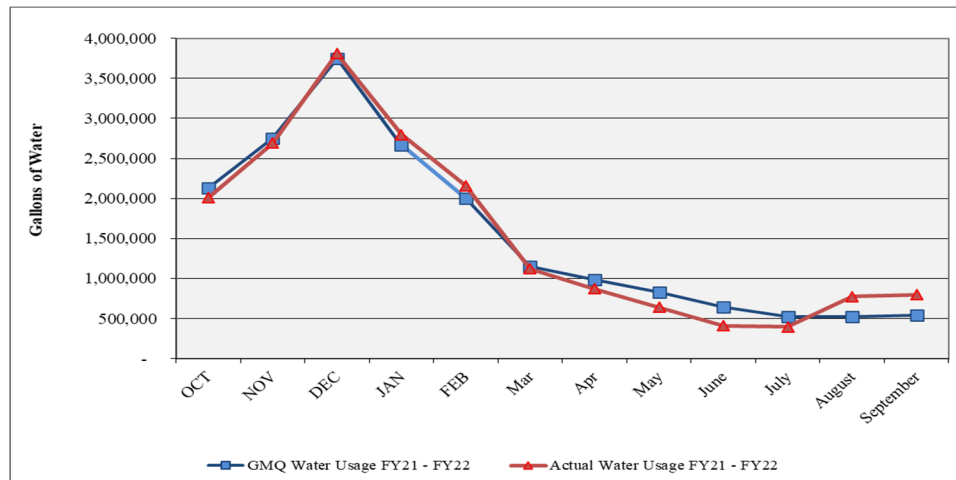


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

The steam plant electric consumption for the current quarter was approximately the same as in FY21; however, the steam-to-electric conversion factor decreased 4.7% 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 decreased 44.2% this quarter as compared to the previous First Quarter due to a significant 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.

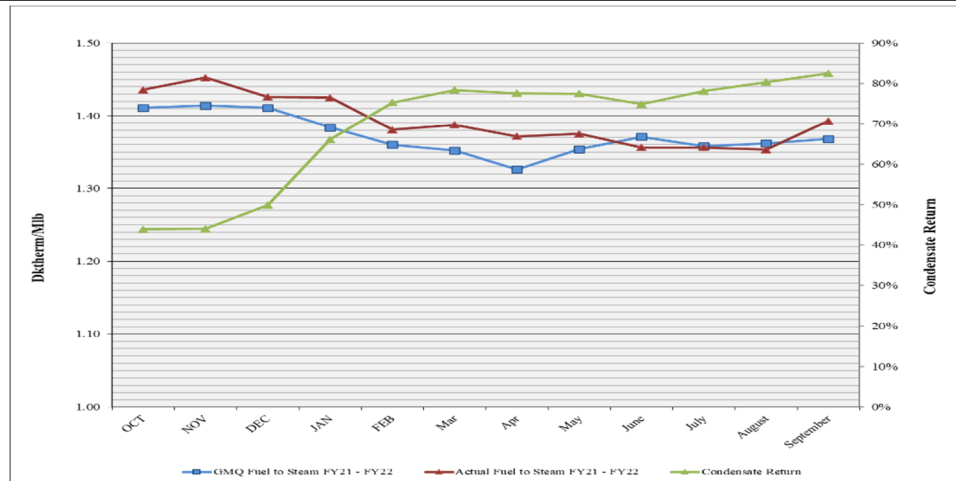


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The fuel consumption per unit of steam sales decreased 1.1% over the previous First Quarter. As shown in Figure 13, the performance guarantee was met in July and August. The relative amount of condensate return is shown on this graph to reflect the influence that the increase in 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 First Quarter comparisons of the Guaranteed Maximum Quantities (GMQ) or System Performance Guarantees of the criteria commodities (fuel, water, and electricity).

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

Table 1. First Quarter FY22 Production, Sales and Consumption Summary

Item	Unit	First Quarter FY22	First Quarter FY21	*Percent Difference
	days	92	92	0.00%
Total Electric Use	kWhrs	21,455,904	18,236,099	17.66%
Chilled Water	kWhrs	21,301,060	18,081,279	17.81%
Steam	kWhrs	154,844	154,820	0.02%
Total Water Use	kgal	54,990	49,783	10.46%
Total Chilled Water	kgal	53,038	46,288	14.58%
EDS Make-up	kgal	5,545	7,060	-21.46%
Cooling Towers	kgal	47,493	39,228	21.07%
Calc CT Evaporation	kgal	39,141	33,588	16.53%
CT Blowdown	kgal	8,352	5,640	48.09%
Calc # Cycles		4.69	5.96	-21.31%
Steam	kgal	1,952	3,495	-44.15%
Total Fuel Use	mmBTU	79,291	76,338	3.87%
Natural Gas	mmBTU	79,291	76,306	3.91%
Propane	mmBTU	0	32	-100.00%
Condensate Return	kgal	5,718	3,387	68.83%
	lbs	46,631,480	27,620,601	68.83%
Avg Temp	°F	176.0	185.0	-4.86%
Sendout				
Chilled Water	tonhrs	25,315,400	21,158,300	19.65%
Steam	lbs	57,909,000	55,233,000	4.84%
Peak CHW Demand	tons	18,414	15,511	18.72%
Peak Steam Demand	lb/hr	49,300	50,469	-2.32%
CHW LF		62.26%	61.78%	0.78%
Steam LF		53.20%	49.56%	7.33%
Sales				
Chilled Water	tonhrs	24,257,500	19,768,598	22.71%
Steam	lbs	38,404,964	35,723,358	7.51%
Losses				
Chilled Water	tonhrs	1,057,900	1,389,702	-23.88%
Steam	lbs	19,504,036	19,509,642	-0.03%
		33.68%	35.32%	-4.65%
Degree Days				
CDD		1,154	1,273	-9.35%
HDD		14	10	40.00%

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

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

GMQ Calculations	Unit	First Quarter FY22	First Quarter FY21	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	4.50	4.50	
Electric Conversion	kWhr/Mlb	4.15	4.36	-4.70%
GMQ Plant Efficiency	Dth/Mlb	1.363	1.402	
Plant Efficiency	Dth/Mlb	1.367	1.382	-1.06%
Actual %CR		80.53%	50.01%	61.03%
Avg CR Temp	°F	176	185	-4.86%
GMQ Water Conversion	gal	1,590,165	3,893,433	
Water Conversion	gal	1,971,520	3,529,950	-44.15%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	0.930	0.930	
Electric Conversion	kWhr/tonhr	0.877	0.915	-4.14%
GMQ Water Conversion	gal/tonhr	2.00	2.00	
Water Conversion	gal/tonhr	2.07	2.12	-2.53%

*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 CNE, 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 CNE'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. Therefore, the reduction in monthly energy usage decreases the revenue for the DES but has negligible impact on the required Metro Funding Amount. 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.

For FY22, the current fiscal year system operating costs to date are \$5,215,804. This value represents approximately 26.5% of the total budgeted operating cost for FY22. The customer revenues from the sales of steam and chilled water for FY22 are \$4,870,995 (25.6% of budgeted amount), including the FY21 customer true-up. The difference between the operating costs and customer revenue is the Metro Funding Amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY22 is \$315,350 (50% of budget) and includes the Second Quarter FY22 transfer. However, the actual MFA required can only be estimated due to outstanding invoices as of the date of this report.

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	% of Budget
Operating Management Fee							
FOC: Basic	\$ 3,890,100	\$ 972,529	\$ -	\$ -	\$ -	\$ 972,529	25.00%
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	\$ 232,200	\$ 64,895	\$ -	\$ -	\$ -	\$ 64,895	27.95%
Insurance	\$ 16,500	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Marketing: CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA: Steam	\$ 70,900	\$ (4,267)	\$ -	\$ -	\$ -	\$ (4,267)	-6.02%
Chilled Water	\$ 133,800	\$ 19,059	\$ -	\$ -	\$ -	\$ 19,059	14.24%
Misc: Metro Credit	\$ -	\$ (387,092)	\$ -	\$ -	\$ -	\$ (387,092)	n.a.
ARFA	\$ 61,200	\$ 15,296	\$ -	\$ -	\$ -	\$ 15,296	24.99%
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Man Fee =	\$ 4,404,700	\$ 1,067,510	\$ -	\$ -	\$ -	\$ 1,067,510	24.24%
Reimbursed Management Fee + Chem Treatment		\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Costs							
Pass-thru Charges: Engineering	\$ 53,800	\$ 8,693	\$ -	\$ -	\$ -	\$ 8,693	16.16%
EDS R&I Transfers	\$ 294,800	\$ 73,700	\$ 24,567	\$ -	\$ -	\$ 98,267	33.33%
Metro Marketing	\$ 10,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Metro Incremental Cost	\$ 378,400	\$ 66,434	\$ -	\$ -	\$ -	\$ 66,434	17.56%
Utility Costs: Water/Sewer	\$ 737,500	\$ 370,328	\$ -	\$ -	\$ -	\$ 370,328	50.21%
EDS Water/Sewer	\$ -	\$ 45	\$ -	\$ -	\$ -	\$ 45	n.a.
EDS Electricity	\$ 62,100	\$ 16,764	\$ -	\$ -	\$ -	\$ 16,764	27.00%
Electricity	\$ 6,122,000	\$ 1,750,697	\$ -	\$ -	\$ -	\$ 1,750,697	28.60%
Natural Gas Consultant	\$ 12,400	\$ 1,000	\$ -	\$ -	\$ -	\$ 1,000	8.06%
Natural Gas Transport	\$ -	\$ 46,378	\$ -	\$ -	\$ -	\$ 46,378	n.a.
Natural Gas Fuel	\$ 2,401,200	\$ 314,641	\$ -	\$ -	\$ -	\$ 314,641	13.10%
Propane	\$ 111,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Subtotal - Metro Costs =	\$ 10,185,000	\$ 2,648,681	\$ 24,567	\$ -	\$ -	\$ 2,673,247	26.25%
Subtotal - Operations =	\$ 14,589,700	\$ 3,716,191	\$ 24,567	\$ -	\$ -	\$ 3,740,758	25.64%
Debt Service							
2012 Bonds	\$ 3,478,700	\$ 869,303	\$ 289,768	\$ -	\$ -	\$ 1,159,071	33.32%
2005 Bonds -Self Funded	\$ 340,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2007 Bonds -Self Funded	\$ 170,300	\$ 42,575	\$ -	\$ -	\$ -	\$ 42,575	25.00%
2008 Bonds -Self Funded	\$ 170,400	\$ 42,600	\$ -	\$ -	\$ -	\$ 42,600	25.00%
2010 Bonds -Self Funded	\$ 173,500	\$ 43,375	\$ -	\$ -	\$ -	\$ 43,375	25.00%
Fund 49107 -Self Funded	\$ 612,000	\$ 153,000	\$ -	\$ -	\$ -	\$ 153,000	25.00%
Fund 49116 -Self Funded	\$ 137,700	\$ 34,425	\$ -	\$ -	\$ -	\$ 34,425	25.00%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,083,200	\$ 1,185,278	\$ 289,768	\$ -	\$ -	\$ 1,475,046	29.02%
Total =	\$ 19,672,900	\$ 4,901,469	\$ 314,334	\$ -	\$ -	\$ 5,215,804	26.51%
Customer Revenues							
Taxes Collected		\$ 109,591	\$ -	\$ -	\$ -	\$ 109,591	n.a.
Taxes Paid		\$ 77,228	\$ -	\$ -	\$ -	\$ 77,228	n.a.
Interest & Misc Revenue	\$ 128,100	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Penalty Revenues/Credits		\$ (9,022)	\$ -	\$ -	\$ -	\$ (9,022)	n.a.
Energy Revenues Collected		\$ 4,847,654	\$ -	\$ -	\$ -	\$ 4,847,654	25.80%
Revenues =	\$ 19,042,200	\$ 4,870,995	\$ -	\$ -	\$ -	\$ 4,870,995	25.58%
Metro Funding Amount =	\$ 630,700	\$ 30,474	\$ 314,334	\$ -	\$ -	\$ 344,808	54.67%

The DES serves 29 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	\$ 1,318,467	9,031,343	\$ 0.1460	\$ 298,846	9,778	\$ 30.5619
State Government	\$ 996,207	5,304,260	\$ 0.1878	\$ 379,668	10,591	\$ 35.8480
Metro Government	\$ 1,462,241	10,194,897	\$ 0.1434	\$ 392,225	18,036	\$ 21.7473
New Customers	\$ 933,020	6,065,196	\$ 0.1538	\$ 275,885	13,863	\$ 19.9010
Total	\$ 3,776,916	24,530,500	\$ 0.1540	\$ 1,070,738	38,405	\$ 27.8802

Total Revenue \$ 4,847,654
 True-up and Adjustments (Net) \$ 23,341
 Net Revenue \$ 4,870,995

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY22. TEG and CNE continue to meet monthly and regularly communicate about important issues and on-going projects. CNE has reported and managed EGF operations satisfactorily; however, they have failed to meet all of the new performance guarantees in Amendment 2 for fifteen consecutive months. A portion of this inability to meet the new guarantees may be attributed to the operation of the EGF equipment. Due to unanticipated failures of the fan motors for boilers 3 and 4 during FY21, CNE pro-actively replaced the fan motors for boilers 1 and 2 during the First Quarter FY22. These two fans were replaced over the same period resulting in only one-half of the boiler plant capacity being available instead of three-fourths, as required by 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.

- J The chilled water temperature was above 43.3°F for 132 minutes in July due to an incorrect reading on the chilled water pump suction temperature transmitter.
- J Boiler 3 tripped offline on low water level in July due to an issue with the de-aerator 1 level controller. The sendout pressure was below 150 psig for approximately 120 minutes.
- J The FD fan motors for boilers 1 and 2 were replaced during the quarter. The outage for these boilers lasted “several days” according to CNE. However, the operation

of the boiler plant was not otherwise affected and service to the customers was not disrupted.

) 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.

In order to maintain the COVID-19 social distancing guidelines as required by Exelon, CNE has implemented and is requiring regular attendance for online safety courses for their employees.

D. Personnel

CNE is currently staffed with nineteen full time employees, one part-time employee and one relief staff. This current level of staffing satisfies the level listed in the Amendment 2 of the ARMA. Of the current number of employees, fourteen were previously employed by Nashville Thermal Transfer Corporation.

E. Training

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

F. Water Treatment

The water treatment program consists of regular testing and monitoring of the water chemistry in the steam, chilled water, and condensing water systems. Chemicals are added to control the water hardness, chlorine levels and biologicals. 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.

CNE and Chem-Aqua (CNE's water treatment vendor) are nearing the completion of upgrading and replacing the EGF's chemical storage tanks and chemical feed systems.

-) Steam System
 - o The condensate return averaged approximately 80.5% of the steam sendout during the quarter, which represents a 61.0% increase over the previous First Quarter.
 - o Feedwater iron, pH, and hardness remained within their acceptable ranges during the quarter.
-) Condensing Water System
 - o The conductivity of the condensing water continues to be normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.
-) Chilled Water System
 - o CNE continues to monitor and test for the presence of bacteria in the system. The continuous dosage of the biocide continues. The biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent. Chem-Aqua has installed its proprietary biological treatment system.
 - o Metro and CNE are evaluating options for the installation of a side stream filter at the EGF.

G. Maintenance and EGF Repairs

CNE 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;
-) Assisted Chem-Aqua with the replacement of chemical storage and feed equipment;
-) Replaced blowdown valves on boilers 1 and 3;
-) Repaired softener flow meters;
-) Repaired condensate return valve;
-) Replaced the dryer on chiller 8;
-) Replaced purge filters on chillers 8B, 6A, 5A and 5B;
-) Repaired lagging on boiler 3;
-) Cleaned cooling tower 9 hot deck;

-) Replaced bearings on cooling tower 16;
-) Replaced safety relief valves on boilers 2 and 4;
-) Repaired boiler 1 and 4 level controllers;
-) Rewired and repaired instrument air compressor;
-) Replaced boiler 1 and 2 FD fan motors;
-) Repaired chilled water pump 6 communications;
-) Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

H. EGF Walkthrough

The EGF Walkthrough was conducted on September 28, 2021, by Kevin L. Jacobs, P.E. Based on the review of the EGF, the following comments and observations are presented. The items noted in this section need to be completed prior to the end of the operating contract for the System Operator in accordance with the ARMA paragraph 12.03.

-) CNE 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 have continued to worsen. **CNE has stated that they will address any remaining rust spots during the Fall.**
-) The louvers and portions of the fill at cooling towers 1, 6 and 15 appear to have been damaged. **No additional work appears to have been completed since the previous 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. CNE has stated that they will address any remaining rust spots during the Fall.**
-) The presence of algae on the cooling towers and cooling tower deck has grown from the previous Walkthrough. Algae was also noted beneath the water level in nearly every basin. **CNE needs to clean the existing algae and take measures to prevent or reduce its re-occurrence.**
-) As noted in the previous Walkthrough report, the insulation on the feedwater piping at the boiler 4 economizer appears to have been damaged. During the Third Quarter Walkthrough, insulation on the condensate piping near the unit heaters for the boiler plant make-up air was missing. **CNE did not make the insulation repairs prior to the Walkthrough but has stated that the repairs will be completed once their contractor has completed insulation repairs in the EDS.**
-) The water levels in the basins for CT 17 and 18 were noticeably higher than in the other operating cooling towers. Water was also overflowing, through the internal overflow piping, in each of these cells. **CNE should investigate the cause of this overflowing to reduce their water usage in the chilled water system.**

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-) As noted in the previous Walkthrough reports, the weather stripping on the doors to the two MCC's located on the cooling tower deck has deteriorated or is missing. Trash, including a coke can, wiring and other debris from electrical work was located within the MCC's. The door hardware was also damaged or broken on several of the MCC doors. **CNE has replaced and repaired the door hardware and removed all of the trash from within the MCC's. Weather stripping was added but some of the older weather stripping remains and should be replaced if it is leaking. This item will be removed from future reports unless the conditions change.**
 -) A contractor had the FD fan for boiler 1 disassembled and was working on the FD fan for boiler 2 during the Walkthrough. Therefore, the minimum capacity requirement from the ARMA could not be met.
 -) CNE, Metro and TEG have discussed the need for CNE to perform additional cleaning of the EGF and to maintain an increased level of cleanliness through the plant. CNE stated in the First Quarter FY21 that they intended to address the overall cleanliness of the EGF. **CNE has made some improvement from the level noted in the Third Quarter Walkthrough Report. CNE needs to address the remaining issues promptly.**
 -) The concrete facade of the EGF has noticeable water stains and has blackened in some places. **This item was discussed with CNE during the Fourth Quarter Walkthrough, and they plan on pressure washing and cleaning the concrete portion of the building's façade.**
 -) Other action items previously noted to be addressed by CNE have been completed. (See also the "Quarterly EGF Walkthrough Report," dated September 28, 2021, 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. First Quarter FY22 Open Projects

The following projects remained open at the end of the First 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.

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.

3. DES152 – Manhole A and Manhole M Coating Repairs

The structural steel in these manholes was cleaned and painted as part of DES107 in 2015. Portions of the paint are failing, resulting in spots of corrosion on these supports. The paint manufacturer reviewed the failing coatings. Their position was that the surface preparation and paint application was at fault. However, TEG employed a painting inspector during this work and records were maintained regarding the ambient conditions, surface preparation and coating application process. Even with this evidence, the paint manufacturer was not willing to warrant the paint. To prevent progression of this corrosion, these areas need to be repaired. This project addresses these needed repairs. Due to similar issues resulting from DES107 work, Manhole B has been added to this scope.

Pricing has been received and CNE has been directed to contract to have this work done with Enecon. It is anticipated that this work will be completed during the Second Quarter FY22.

4. DES154 – Manhole K Repairs

The structural steel in Manhole K is corroded and needs to be cleaned and painted to prevent additional corrosion. The base of the manhole walls also need to be sealed to reduce/prevent mud infiltration into the manhole.

TEG started the design for these repairs during the First Quarter FY19; however, due to higher priority projects, this work was postponed. Additionally, this manhole needs to be sealed to substantially reduce/prevent mud infiltration into this manhole and TEG wanted to gauge the results of sealing Manhole N2 before Manhole K is undertaken. Manhole N2 was sealed and thus far the results are positive. Based on this, TEG requested that CNE get pricing from Enecon for sealing Manhole K. Enecon should also provide pricing for cleaning and coating this manhole's structural steel and entry ladder. This project is anticipated to be executed during FY22.

5. 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. This project is anticipated to be completed during FY22.

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

TEG, Metro, and the Peabody Union personnel continued to have conversations and negotiations for their twenty-seven story, mixed-use development. Part of the negotiations involve chilled water service to the site and modifications to the DES property at the north and south corners of the property to accommodate a new through road east of the DES property line.

7. DES172 – Viridian and 4th Avenue Tunnel Pipe Support Repairs

This project has had several change orders due to damage that was not discovered until the structural steel was thoroughly cleaned. This project is nearing completion and should be completed during the Second Quarter FY22.

8. DES174 – 7th Avenue Tunnel Pipe Support Repairs

This project had some change orders due to damage that was not discovered until the structural steel was thoroughly cleaned. This project is nearing completion and should be completed during the Second Quarter FY22.

9. DES177 – Manhole B1 Ladder and Platform

Manhole B1 is located 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 CNE and DES regarding scope items that CNE is requesting additional compensation to perform this work, therefore this project is on hold until the matter is resolved.

10. 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/missing piping insulation.

It is anticipated that this project will be completed during FY22.

11. DES179 – Manhole 11 Repairs

Manhole 11 has structural steel piping anchors/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.

This project will be bid and awarded early in the Second Quarter FY22.

12. 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/damage. TEG is waiting to hear back from the State on this matter.

TEG has initiated a scope outline and it is hoped that work can begin and be completed during FY22.

13. DES182 – Manhole B10 Expansion Joint Replacement

Most of the work for this project was completed during the Fourth Quarter FY21. The contractor was awaiting the receipt of insulation blankets to complete this work. These blankets were received and installed during the First Quarter FY22. This project is now in close-out.

14. DES184 - 7th Avenue North Steam Leak Repair

This project was completed during the Fourth Quarter FY21 and is awaiting cost documentation on the final paving. It is anticipated that this project will be closed out during the Second Quarter FY22.

15. DES185 – 5th Avenue North Exploratory Excavation

This project was substantially completed during the First Quarter FY22, and a final walk-through is to be scheduled. It is anticipated that this project will be closed out during the Second Quarter FY22.

16. DES186 – Printers Alley Exploratory Excavation

This project was substantially completed during the First Quarter FY22, and the back-up documentation has been reviewed and approved. This project is in close-out.

17. DES187 – Exploratory Excavation at Manhole 22B

Water has been leaking into Manhole 22B (located on 7th Avenue North beside the Metro Public Library) through the steam piping casing that serves the Metro Public Library for several months. Therefore, there is a breach in the steam casing outside the manhole.

CNE began an exploratory excavation east of Manhole 22B during the Fourth Quarter FY21 to locate the damage to the casing and make repairs. Extensive damage to the steam piping casing was discovered and some damage to the condensate return pipe casing. Sections of new pre-insulated piping have been ordered and are expected to arrive early in the Second Quarter FY22.

It is anticipated that this project will be completed during the Second Quarter FY 22.

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

Chilled water, steam and condensate return service piping to the 4th and Church Building and the 5/3 Financial Center originates in the 4th Ave Tunnel, comes up a vertical shaft and then turns horizontal through an access tunnel into the underground parking garage of the 4th & Church Building. This access tunnel was constructed out of individual galvanized metal liner plates bolted together. Steel piping supports were then added inside this tunnel and these supports were welded to the steel liner plates. The pipe supports and liner plates are corroded and need to be repaired or replaced. This project addresses these needs.

This project will be bid and awarded early in the Second Quarter FY22. It is anticipated that this project will be completed during the Third Quarter FY22.

19. 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/replacement – CNE replaced the steam and condensate return piping insulation during the First Quarter FY22 under Amendment 2 of its contract with Metro. TEG will direct CNE to have the structural steel cleaned and coated.

It is anticipated that this work will take place during the Second or Third Quarter FY22.

20. DES190 - Manhole 2 Sparge Tube and Trap Modifications

The pipe modifications were completed during the Fourth Quarter FY21, and the piping insulation was repaired/replaced during the First Quarter FY22. This project is now in close-out

21. 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. TEG has begun engineering on this project and anticipate bidding this project during the Second Quarter FY22 with the work taking place late in the Second Quarter and extending into the Third Quarter FY22.

B. First Quarter FY22 Closed Projects

DES182, DES186 and DES190 were closed during the First Quarter FY22.

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. 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	\$ 5,305	\$ 144,480	\$ 55,520
DES139	Options Review	\$ 450,000	\$ 249	\$ 316,049	\$ 133,951
DES143	MH N1, N2 and S6 Insulation	\$ 5,000	\$ 2,504	\$ 5,917	\$ (917)
DES152	MH A & M Repairs	\$ 28,000	\$ 752	\$ 9,568	\$ 18,432
DES153	MH L Repairs	\$ 129,893	\$ -	\$ 36,094	\$ 93,799
DES154	MH K Repairs	\$ 75,085	\$ 46	\$ 721	\$ 74,364
DES161	MH S6 Insulation	\$ 38,000	\$ 1,627	\$ 1,627	\$ 36,373
DES162	3rd and Molloy Service	\$ 150,000	\$ -	\$ 143,602	\$ 6,398
DES163	Parcel K Service	\$ 1,018,802	\$ 9,092	\$ 20,566	\$ 998,236
DES171	Broadway Tunnel Support Repair	\$ 268,907	\$ 6,952	\$ 118,883	\$ 150,024
DES172	Viridian Pipe Support Repair	\$ 190,128	\$ 61,238	\$ 243,754	\$ (53,626)
DES173	MH-B3 Structural Repair	\$ 50,000	\$ -	\$ 45,751	\$ 4,249
DES174	7th Ave Pipe Support Repairs	\$ 160,534	\$ 108,449	\$ 168,182	\$ (7,648)
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	\$ -	\$ 3,802	\$ 93,698
DES179	MH-11 Repairs	\$ 58,500	\$ 2,562	\$ 6,928	\$ 51,572
DES180	State Tunnel Support Repairs	\$ 140,000	\$ 1,391	\$ 3,263	\$ 136,737
DES181	3rd Ave Leak Repair	\$ 140,000	\$ -	\$ 3,079	\$ 136,921
DES182	MH-B10 Exp Joint Replacement	\$ 110,000	\$ 31,770	\$ 132,821	\$ (22,821)
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	\$ 110,000	\$ 3,733	\$ 27,535	\$ 82,465
DES186	Printers Alley Exploratory Excavation	\$ 110,000	\$ 84,056	\$ 89,404	\$ 20,596
DES187	Exploratory Excavation/Steam Repair MH22B	\$ 153,750	\$ 13,217	\$ 14,841	\$ 138,909
DES188	4th and Church Access Tunnel Repairs	\$ 125,000	\$ 10,478	\$ 17,388	\$ 107,612
DES189	MH4 Structural Steel and Insulation Repairs	\$ 56,750	\$ 149	\$ 1,276	\$ 55,474
DES190	MH Sparge Tube Repairs	\$ 20,000	\$ 12,208	\$ 14,208	\$ 5,792
DES191	MH 20 Repairs	\$ 94,875	\$ 12,819	\$ 12,819	\$ 82,056
Total Closed Projects		\$ 1,335,927	\$ -	\$ 1,335,927	\$ -
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ 20,159,760	\$ -	\$ -	\$ 20,159,760
Fund Total		\$ 26,000,000	\$ 369,779	\$ 3,194,599	\$ 22,805,401

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

Several EDS repairs and improvements were made during the First 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 \$122,551. 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	8/18/2021		CNE	\$ 1,792.37				
CNE Aug 2021 R&I	9/22/2021		CNE	\$ 15,254.82				
CNE Sept 2021 R&I	10/20/2021		CNE	\$ 6,618.84				
Sub-Total First Quarter				\$ 23,666.03	\$ 73,700.01	\$ -	\$ 50,033.98	\$ 97,984.13
Sub-Total Second Quarter				\$ -	\$ 24,566.67	\$ -	\$ 24,566.67	\$ 122,550.80
Sub-Total Third Quarter				\$ -	\$ -	\$ -	\$ -	\$ 122,550.80
Sub-Total Fourth Quarter				\$ -	\$ -	\$ -	\$ -	\$ 122,550.80
FY22 Year to Date				\$ 23,666.03	\$ 98,266.68	\$ -	\$ 122,550.80	\$ 122,550.80

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. CNE continues to replace trap assemblies within the EDS as needed.
 - d. CNE 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 CNE monthly reports.

C. Emergencies

There were no emergencies reported during the quarter.

D. EDS Walkthrough

The First Quarter FY22 walkthrough was conducted on October 6 and 7, 2021. The manholes that were visited included Manholes 2, 3, 4, 5, 6, 6A, 9, 10, 11, 12, 13, 15, 20, D and D1. The following comments and observations are a result of these visits:

1. Manhole 2
 - a. There was water in this manhole, and it required pumping before entry.

- b. There was a small amount of mud in this manhole. TEG directed CNE to include the purchase of an “in-flow protector” for the manway closest to the curb with the hope that it would reduce the amount of mud accumulation in this manhole. (An in-flow protector is a pan which is installed in the manway frame before the manway lid is placed. Its purpose is to prevent the inflow of surface water into the manhole.) When the in-flow protector was removed, the stainless steel removal strap broke (the stainless steel cable came out of the crimped end piece that is bolted to the wall of the in-flow protector.) In addition, the high temperature silicone seal is already deteriorating. The removal strap can be repaired by CNE, but TEG has notified the manufacturer about these failures and the manufacturer is going to replace the protector free of charge – they are going to ship a new unit to the plant. The amount of mud present is significantly less than prior visits. However, CNE informed TEG that Water Services recently found and repaired a water leak near this manhole which has probably had a positive impact on the amount of mud accumulation in the manhole from seepage between the walls and floor of the manhole. In addition, the manhole was noticeably cooler than past visits indicating that the amount of “groundwater” surrounding the manhole has been reduced. CNE should replace the in-flow protector when the new unit arrives. CNE should clean this manhole/remove the mud as soon as possible.
- c. A concrete patching material was applied to several small areas on the walls and ceiling in September 2013. Some of these patches are beginning to experience some flaking. CNE personnel should monitor these patched areas and notify TEG as the deterioration progresses.
- d. Work was recently completed in this manhole which repaired a condensate leak on the sparge tube and the sparge tube was re-configured. The work also included the replacement of the trap piping support and all of the piping insulation.
- e. The steam end can at the western wall penetration is corroded and deteriorating. CNE should monitor this end can and report any groundwater infiltration or other problems to TEG. TEG will research a solution/repair.
- f. The steam and condensate return piping originally passed through this vault. A few years ago, the piping east of this vault (and Manhole 1) was abandoned and both the steam and condensate return piping through the east wall was capped. The capped steam line penetration (wall sleeve and link seals) through the east wall has deteriorated and it is likely that groundwater will start seeping into the manhole at some point. CNE should monitor these penetrations and report any changes to TEG.

2. Manhole 3

- a. There was water in this manhole, and it required pumping before entry.
- b. There are some hairline cracks in the concrete walls; one is above the condensate penetration on the east wall; the other is above the steam penetration on the west wall. Pictures from prior reviews indicate that these

- cracks have not progressed. CNE should continue to monitor these cracks and report any significant changes to TEG.
- c. CNE just replaced the insulation in this manhole. However, the steam expansion joint and the valves need new insulation blankets. CNE should obtain itemized quotes from two insulation contractors for replacement insulation blankets per TEG's specifications and present the quotes to TEG for review/approval.
 - d. The steel piping supports, and entry ladder need to be cleaned and re-painted with cold galvanizing paint. CNE should do this as soon as possible. CNE should obtain a quote from Enecon to clean and coat the manhole structural steel/entry ladder and present the quote to TEG for review/approval.
 - e. There is insulation debris in the manhole floor presumably left by the insulation contractor. CNE needs to clean this manhole or have the insulation contractor clean the manhole.
3. Manhole 4
- a. There was water in this manhole, and it required pumping before entry.
 - b. The entry ladder and the steel piping supports are corroded to different degrees. CNE should clean these surfaces with a wire brush/wheel and apply a coating of cold galvanizing paint to try and prevent additional deterioration. CNE should obtain a quote from Enecon to clean and coat the manhole structural steel/entry ladder and present the quote to TEG for review/approval.
 - c. CNE just replaced the steam piping insulation in this manhole, however the insulation blankets also need to be replaced. CNE should obtain itemized quotes from two insulation contractors for replacement insulation blankets per TEG's specifications and present the quotes to TEG for review/approval.
 - d. The entry manway lid and frame need to be replaced – the lid is noticeably smaller in diameter than the frame. CNE should schedule this as soon as possible.
 - e. The chilled water piping jacketing is corroded in a couple of places. CNE should have portions of the jacketing replaced as soon as possible.
 - f. The condensate return piping between Manhole 3 and Manhole 4 failed several years ago and was abandoned in place. Therefore, the condensate from 401 Union St (Fairlane Hotel) could no longer be returned to the DES plant. Because of this, DES installed a tempering station in the basement of 401 Union St. to cool the building's condensate return so it could be drained to the sewer system. The condensate return piping between Manhole 4 and 401 Union St. was used for a while to direct condensate from the trap assembly in Manhole 4 to the tempering station. Several months ago, this piping between Manhole 4 and 401 Union St. collapsed and can no longer be used. TEG solved this problem by evaluating the piping slopes from/to Manhole 4 and determined that with 401 Union Street's current load, the trap in Manhole 4 could be eliminated. The abandoned condensate return piping from Manhole 4 to 401 Union is stubbed into Manhole 4 and is open ended. Steam is wafting into Manhole 4 through this abandoned piping presumably

from groundwater contacting the steam service line to 401 Union St. This may be due to the recent heavy rains and may dissipate. CNE should plug this open pipe with a wooden plug to prevent the wafting steam from entering the manhole.

4. Manhole 5

- a. There was water in this manhole, and it required pumping before entry.
- b. There are some insulation repairs that are needed in this manhole including the replacement of insulation blanket(s). The dripleg insulation is absent due to repairs to a pin hole leak on the trap piping connection. TEG has a project planned for this manhole (DES178) which will include the insulation replacement/repair.
- c. There is a significant amount of structural steel pipe supports/anchors within this manhole that are corroded and need to be cleaned and coated. This work is included in the planned DES178 project. Until this work takes place, CNE should clean and paint the steel with cold galvanizing paint.

5. Manhole 6

- a. There was water in this manhole, and it required pumping before entry.
- b. There is some a minor amount of mud in the floor of the manhole which should be removed by CNE personnel before the end of the 2nd Quarter FY22.
- c. Holes and cracks in the concrete surfaces in this manhole were repaired during a past project. CNE should monitor these repairs and report any deterioration to TEG.
- d. The structural pipe supports were cleaned and painted in the fall of 2018. Some of the structures are presenting “creep” (the migration of rust stains from concealed surfaces that could not be exposed, cleaned, and painted). Other portions of the steel has some active corrosion. CNE should wire brush/wheel/clean these areas of corrosion and paint them with cold galvanizing paint as soon as possible.
- e. CNE should obtain a quotation from Enecon to:
 - (1) Clean and coat the active corrosion areas on the structural steel.
 - (2) Clean and coat all structural steel within the manhole.
- f. The condensate piping valve is underneath the ventilation manway, therefore surface water falls on this valve. The yoke of the valve is starting to delaminate due to corrosion caused by this water infiltration. These manways need in-flow protectors to help prevent the water/mud infiltration. TEG will coordinate this with CNE.

6. Manhole 6A

- a. There are two separate manholes at the Hermitage Hotel service lines; one houses the chilled water service line isolation valves, the other house the steam and condensate return service isolation valves. Each of these manholes only have one manway which is a potential safety hazard for personnel entry/maintenance. If maintenance is required, the services are isolated at

other locations in the system before entry. Both manholes have dirt/fill floors and therefore the steam/condensate manhole is extremely hot and perpetually has secondary steaming; therefore, a thorough review without isolation of the services is not possible. Because the only serviceable equipment in these manholes are valves, if a leak were to develop it should be found during CNE's monthly inspections and remedied quickly.

- b. CNE should schedule an isolation of the steam/condensate manhole every 6 months in order to service these valves.

7. Manhole 9

- a. There was a small amount of water in this manhole because the existing sump pump/level control and it had to be pumped prior to entry. The existing sump pump was not functioning properly. CNE should investigate the reason that the sump pump was not functioning properly and make any needed repairs/adjustments. Since the operation of this sump pump is not monitored remotely, CNE should check on the operation of this sump pump on a weekly basis until this problem is remedied.
- b. The structural pipe supports/anchors have been cleaned and coated to eliminate corrosion. CNE should monitor these structures and report any degradation to TEG.
- c. The insulation in this manhole was replaced. CNE should monitor the insulation and report any degradation to TEG.
- d. Some cracking has occurred in the underside of the concrete opening which was cut into the northern wall of the "old" manhole. This crack was sealed by a contractor in early 2018. CNE should monitor these sealed cracks and report any degradation to TEG.
- e. The link seals around the city water line within this manhole seep a little water. CNE has tried tightening the link seals to no avail. Now that Enecon is an approved vendor, CNE should direct Enecon to seal these link seals with the Enecon hydraulic cement product.

8. Manhole 10

- a. There was some water present in this manhole which was pumped out with the existing sump pump.
- b. The condensate anchor was recently cleaned and coated under DES185. CNE should monitor this anchor and report any degradation to TEG.
- c. The southern steam and condensate return piping, piping penetrations and manhole wall was rebuilt under DES185. CNE should monitor this repair and report any degradation to TEG.
- d. A leak on a 90-degree elbow on the condensate return piping in this manhole was recently repaired. This elbow needs to be replaced based upon a visual review of the fitting's condition. CNE should remove the insulation from this elbow to the western wall penetration to determine the extent of the corrosion. If the corrosion is isolated to just the elbow, CNE should coordinate/schedule an isolation to replace this elbow as soon as possible.

- e. The manhole needs to be cleaned of debris most likely leftover from the DES185 work.

9. Manhole 11

- a. There was water in this manhole, and it required pumping before entry.
- b. There is corrosion on the structural members in this manhole that will be addressed under DES179.
- c. Spalling of the manhole roof was repaired in 2018. CNE should continue to monitor the ceiling and report any degradation of these repairs to TEG.
- d. The wall penetration end cans are corroded and require repair/replacement. This work will be addressed under DES179.
- e. The steam slip joint insulation blanket is in poor condition and needs to be replaced. This will be addressed under DES179.
- f. This manhole requires in-flow protectors for both manways to reduce surface water and mud infiltration. TEG will coordinate this with CNE.
- g. There are some hairline cracks in the manhole walls. CNE should monitor these cracks and notify TEG of any significant changes.

10. Manhole 12

- a. No water was present in this manhole.
- b. Some areas on the structural steel coatings are beginning to fail. CNE needs to clean these areas with a wire brush/wheel and paint them with cold galvanizing paint to deter propagation of the corrosion. Since Enecon is now an approved vendor, CNE should obtain a price from Enecon to clean and coat 1) the corroded structural steel areas and the entry ladder; 2) All of the structural steel including the entry ladder and present this pricing to TEG.
- c. CNE should monitor the hairline cracks in the ceiling and report any significant changes to TEG for review/approval.
- d. The grout under the northern base plate on the east end of the manhole has some small cracks. CNE should monitor this and report any significant changes to TEG.
- e. The trap was recently replaced in this manhole which resulted in the removal of insulation from the dripleg. CNE should have this insulation repaired/replaced as soon as possible to match the existing insulation/jacketing.

11. Manhole 13

- a. There was water present in this manhole, and it required pumping prior to entry.
- b. There is corrosion on a condensate pipe support on the 6” condensate piping extending west out of the manhole. This support should be replaced within the next 6 months. TEG will develop a design for the replacement support and coordinate this work with CNE.

- c. There was some minor corrosion on the condensate return piping kicker. CNE personnel cleaned it and painted it with cold galvanizing paint during the review.
 - d. The existing trap train does not include a strainer; a strainer should be added ahead of the trap. CNE should add this strainer as soon as possible.
12. Manhole 15
- a. There is some slight corrosion on the support beams in the sidewalk “entry area.” CNE should clean these areas and paint them with cold galvanizing paint.
 - b. The floor grating over the vertical shaft to the 4th Ave Tunnel has some corrosion: CNE should obtain pricing to replace this grating and present it to TEG for review/approval. TEG will develop specifications and a scope of work for the grating replacement.
 - c. There is a steam butterfly valve on the steam header piping that is extremely difficult to operate. CNE should coordinate and schedule the replacement of this valve to result in minimal impact to the steam customers.
 - d. The eastern chilled water vent valve is in questionable condition. CNE should investigate the integrity of this valve and if needed, coordinate, and schedule its replacement.
13. Manhole 20
- a. This manhole is located at the top of a vertical shaft which connects to the 7th Ave. Tunnel. It houses chilled water, steam and condensate return piping which serves the Hume Fogg High School. There is not any serviceable equipment (valves, traps, etc.) in this manhole. The manhole consists of a lower rectangular concrete vault with 2 manway openings in the concrete ceiling. Above these 2 manway openings are 2 separate precast round manholes with conical upper sections. Each of these precast round manhole sections include individual embedded ladder rungs (which are prone to failure without warning) which do not extend into the lower rectangular vault section making access a challenge. TEG is developing drawings to address this problem under DES191.
 - b. There is a metal caisson at the top of the vertical shaft which protrudes above the concrete floor of the lower rectangular vault. This protruding caisson creates a “wall” which helps prevent groundwater in the lower vault from seeping down the vertical shaft onto piping and pipe supports at the bottom of the shaft. Portions of this caisson has corroded and broken away permitting groundwater to fall down the vertical shaft promoting corrosion on the pipe supports below. TEG is developing drawings to address this problem under DES191.
 - c. There is a beam in the southern end of the rectangular lower vault that 4 structural tees pipe supports rest on. This beam is corroded. It would be difficult to access this beam to clean and coat it, and there is not an apparent
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reason for the beam's existence. Therefore, TEG will investigate the need for the beam and, if necessary, an alternate pipe support system under DES191.

14. Manhole D

- a. There is a stream of water coming into this manhole from an abandoned pipe penetration in the western wall. Because of the low temperature of this water, it is believed to be chilled water. CNE notified TEG of this water infiltration several weeks ago. Upon that notification, and the probability that it was chilled water, TEG instructed CNE to notify the contractor which repaired the last chilled water leak in this area under DES181 because the timeframe was within the 12-month warranty period of that project. TEG has further instructed CNE to monitor the leak until the cooling season has passed hoping that the severity of the leak will not intensify until an exploratory excavation/repair can be conducted. CNE should monitor this water infiltration and notify TEG of any significant changes.
- b. The coating on the structural steel pipe supports within this manhole has failed. This failure is primarily due to the prior water infiltration into this manhole which contacted the steam piping and boiled. The boiling action is the primary reason for the coating failure. The areas of failure are rather extensive therefore, this manhole will require the steel to be cleaned and coated with Enecon products. After the chilled water leak is found and repaired, CNE should ask Enecon to present a quotation to clean and coat the structural metal in this manhole and present this quotation to TEG for review.

15. Manhole D1 (Sump)

- a. There is chilled water "leaking" into Manhole D1 (immediately south of Manhole D).
- b. The manhole includes two steel electrical boxes that are corroded and should be replaced. CNE should replace these boxes as soon as possible, if permissible with non-metallic boxes.

Action Items

Action items from the above walkthrough are presented in the separate quarterly manhole review report presented to CNE.

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 29 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 CNE 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 was in contact with this new team and discussed the potential for DES services to the site.

TEG has continued its negotiations with the development team for Lot K (Peabody Union). Additional conversations are anticipated in the Second Quarter FY22 as service to the site appears favorable. This project is tracked under DES163.

TEG remained in contact with the potential customer at 333 Union St. This small boutique hotel is currently in the design phase.

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.

Another potential customer is a proposed hotel to be located near Peabody and 8th Ave S. Although initial discussions with this potential customer were favorable, it is believed that progress on this development has slowed due to the pandemic.

B. Customer Interaction

The CNE 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 CNE, which was provided. Some of these repairs involved isolating the steam or chilled water services to the building for the customers.
-) Personnel from the Bridgestone Arena and the Sheraton contacted CNE's CSR in July to ask if there was an issue with the chilled water supply temperature. The CSR informed the customers that CNE was in the process of starting an additional chiller.
-) The Sheraton Hotel was operating their system with the chilled water bypass around their heat exchanger open during July and August. This method of operation also bypasses the customer's meter resulting in CNE having to estimate their usage. Their operation returned to normal on September 10.
-) Renaissance Hotel personnel contacted CNE's CSR in July to report a low steam pressure to the building. The CSR reported that the cause of the low pressure was a boiler trip.

-) The State Tunnel condensate system was placed to drain in September in order for CNE to make repairs to the condensate line in MH10. Service was restored the following day.
-) A steam leak was found inside the TSU building on the steam trap line near the drip leg. The CSR informed the building personnel that the pit sump pump would have to be repaired prior to making the steam line repairs, and they agreed to repair or replace their sump pump. The steam line repairs were not made during the quarter.
-) Other minor issues and customer interactions are noted in the monthly reports from CNE.

VII. Recommendations

CNE is obligated to meet the standard of good utility practice as required by the ARMA. In TEG's opinion, CNE needs to continue to improve the operations of the EGF to comply with the ARMA and to bring the operation of the EGF in compliance with the performance guarantees. CNE has improved its EDS maintenance over the last several quarters and there are fewer items which have been repeated in TEG's quarterly reviews. CNE needs to address the long-outstanding items.

Based on the review of the First Quarter FY22 EGF and EDS operations, the following recommendations are made.

-) CNE needs to address the maintenance and repair items included in the EGF and EDS Walkthrough sections of this report as soon as possible.
-) CNE needs to increase their preventative maintenance program to decrease the number of equipment trips within the EGF or otherwise improve the operation of the system to prevent such frequent occurrences in the future.
-) CNE 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. CNE has operated the EGF for fifteen consecutive months with at least one performance guarantee excursion.
-) CNE needs to improve the overall cleanliness and orderliness of the EGF.
-) Corroded structural steel within the vaults and tunnels should be cleaned and coated and/or repaired/replaced.
-) CNE should continue to clean and paint the minor instances of corrosion in the vaults and tunnels 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 CNE'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.
-) CNE should continue to remove debris and mud from manholes.