



Operations Monitoring Report

Third Quarter FY20

Prepared by:

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I. Executive Summary

A review of the fiscal year 2020 (FY20) Third 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 2020 to date, CNE has met their contract obligations to Metro and has had no contract violations.

For the Third Quarter FY20, the chilled water sales decreased 2.1% over the previous Third Quarter (FY19) due in part to the business shutdown created by the COVID-19 Safer-At-Home guidelines in March. The chilled water sendout decreased 2.4% over the previous Third Quarter. The system losses decreased approximately 8.2%. The peak chilled water demand for the current quarter was 8,955 tons, which is 23.8% lower than the previous Third Quarter.

Steam sendout for the current quarter decreased by approximately 8.6% over the previous Third Quarter with an 12.6% decrease in heating degree days. Likewise, steam sales also decreased by approximately 10.1% over the previous Third Quarter also due to the business shutdown. Total steam system losses increased by 10.5% over the previous Third Quarter. The peak steam demand for the current quarter was 136,906 pounds per hour, which represents a decrease in the Third Quarter demand by approximately 4.0%.

The EGF performance continues to satisfactorily meet the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption per unit of sales continues to perform better than the guaranteed levels for the quarter; however, the chiller plant efficiency continues to experience a decline. Total chiller plant electric usage increased 0.86% from the previous Third Quarter even as the amount of sales and sendout decreased. The unit electric consumption for chilled water has increased 2.9% over the past Third Quarter. TEG believes that the decline in performance of the chiller plant is related to a decrease in the condition, maintenance and operation of the cooling towers and chillers by CNE. However, the maintenance performed in the Fall of 2019 appears to have improved the chiller plant efficiency. The decrease in performance in the Third Quarter, in particularly March, may be due to a decrease in chiller plant load and system temperature difference (delta T). TEG is continuing to monitor the chiller plant performance.

The steam plant electric consumption per unit of sales increased over the previous Third Quarter by 2.5% due to a decrease in the overall steam demand. The total water consumption for the steam and chilled water plants increased 16.2% from the previous Third Quarter. The steam plant water usage increased by 24.4% for the quarter while experiencing a 15.8% decrease in the relative amount of condensate return.

Work continued with the DES Capital and Repair & Improvement Projects during the First Quarter. Repair and Improvements to the EDS continue as scheduled. DES133.1, DES139, DES152, DES153, DES154, DES157, DES159, DES160, DES161, DES162, DES163, DES168 and DES169 are ongoing. There were no closed projects during the Third Quarter FY20.

Recurring maintenance items are included in the EDS Walkthrough section of this report. CNE has begun to address some of these items. As noted in prior quarterly monitoring reports, the postponement or deference of these items will result in an increase in maintenance costs to the DES and could impact the delivery of steam and chilled water.

The current fiscal year system operating costs to date are \$14,181,015. This value represents approximately 69.6% of the total budgeted operating cost for FY20 and includes some expenses from the Fourth Quarter FY20. The customer revenues from the sales of steam and chilled water for FY20 (to date) are \$12,340,651 which is approximately 60.5% of the budgeted amount. 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. For FY20, no MFA has been budgeted. However, the required shortfall has been allocated from the Undesignated Fund Balance for FY20. The fiscal year to date amount required is \$1,840,364. Since some expenses for the Fourth Quarter are included in the costs-to-date, the additional revenue anticipated in the Fourth Quarter should reduce the annual funding balance required by the end of the fiscal year.

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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.

The Safer-At-Home strategy to combat the COVID-19 pandemic has impacted the DES by creating a significant decrease in the steam and chilled water energy usage and demand in March over a typical year. The venue-driven customers have had no events since early March, hotels are now empty and many of the office buildings have experienced a decline in tenant occupancies due to more employees working from home. These factors have contributed to a decline in the energy demand normally experienced during March.

1. Sales and Sendout

A comparison for the Third Quarter chilled water sales is shown in Figure 1. This data reflects a 2.1% decrease in sales for the current quarter over the same quarter of the previous fiscal year.

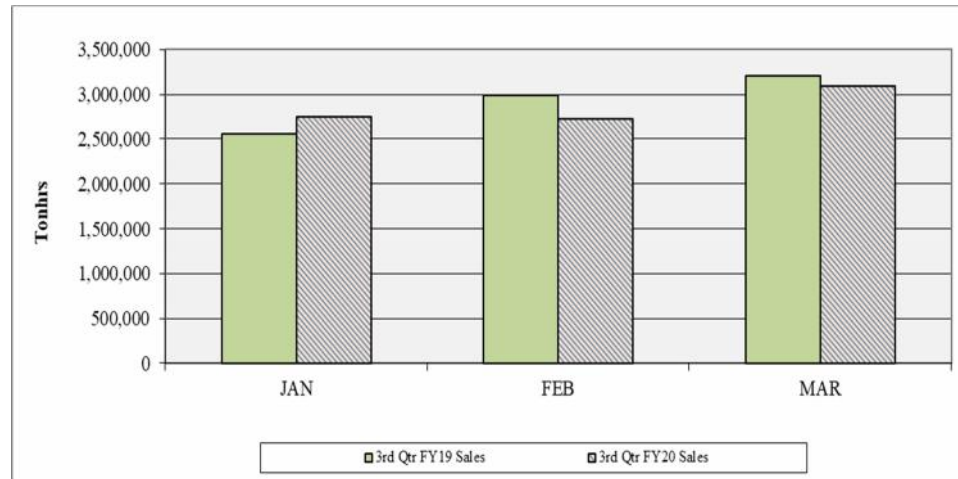


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current FY quarter was 8,955 tons, which represents a 23.8% decrease over the previous Third Quarter.

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

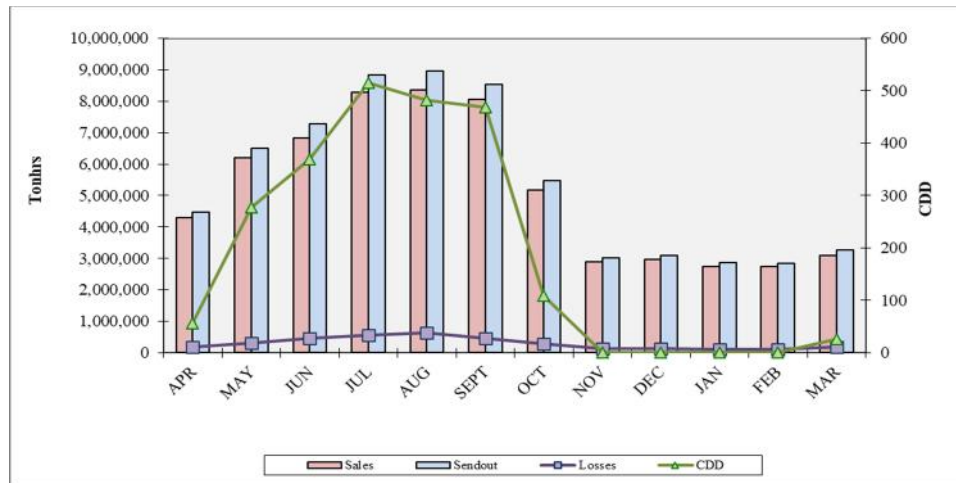


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

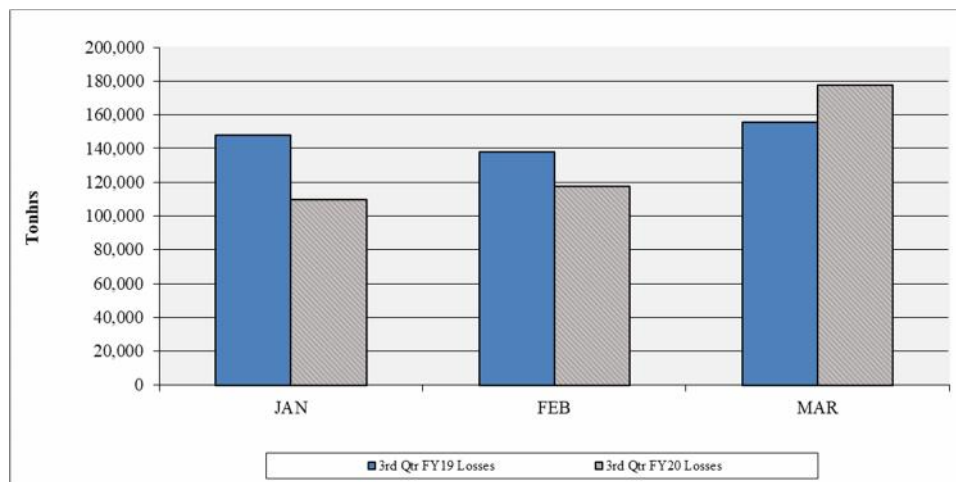


Figure 3. Chilled Water System Loss Comparison

The EDS make-up increased by 46.0% over the previous Third Quarter. All the known distribution leaks have been found and repaired. The locations where leaks remain suspected are on 3rd Ave N and 5th Ave N, but previous efforts to locate these leaks have been unsuccessful. TEG and CNE continue to investigate areas of suspected leaks and will continue to monitor the system losses to determine the cause.

The make-up to the cooling towers increased 4.9% over the previous Third Quarter. The number of cycles of concentration in the condensing water circuit decreased 15.6%. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

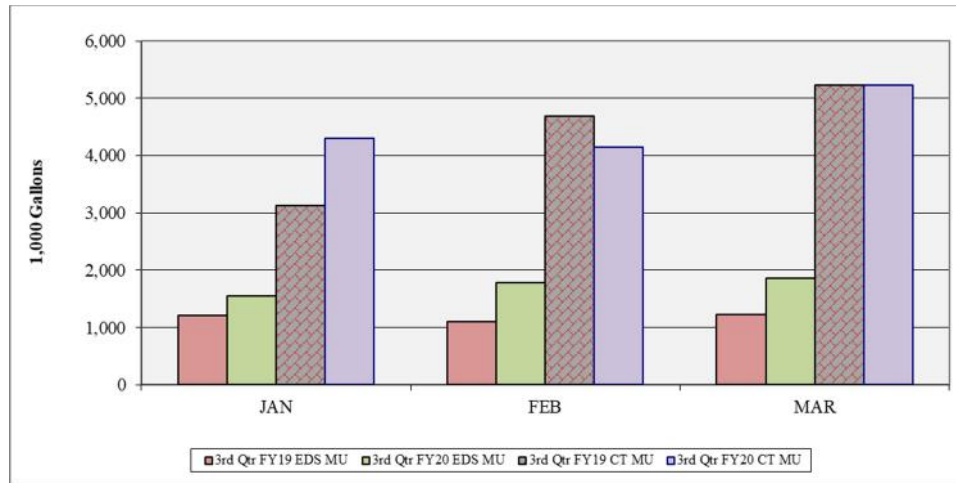


Figure 4. Chilled Water System City Water Usage Comparison

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. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved.

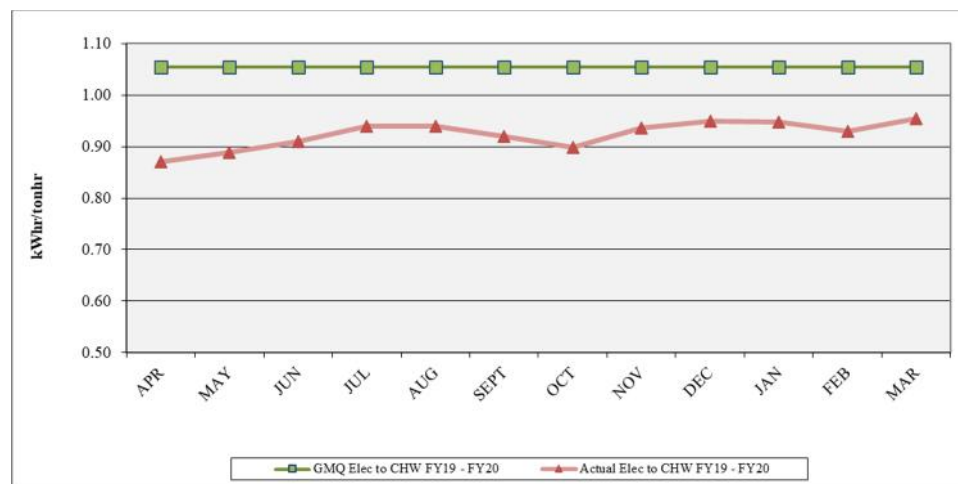


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

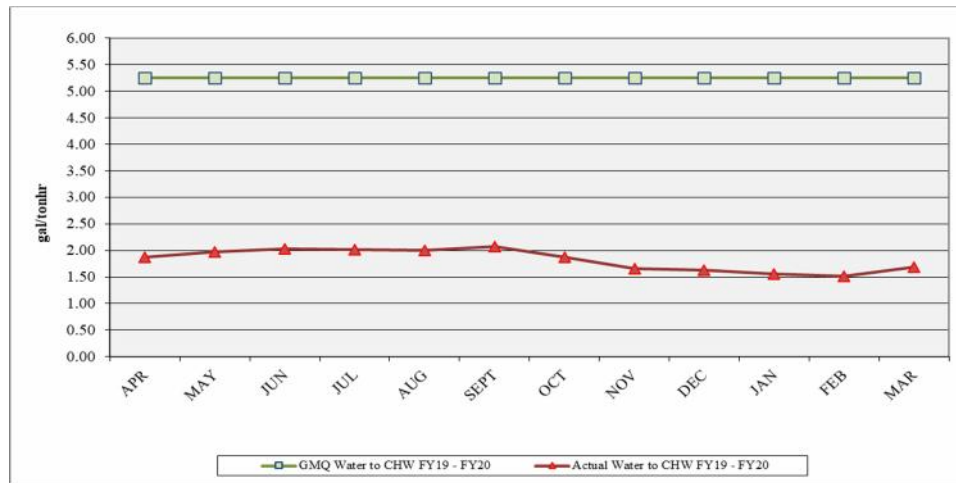


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales increased 2.9% over the previous Third Quarter. TEG believes this decrease in performance is related to a decrease in the condition, maintenance and operation of the cooling towers and chillers. CNE and TEG have had several conversations regarding this issue within the past year and TEG does not believe that CNE has adequately addressed this issue. However, CNE has performed some maintenance on the cooling towers during the quarter.

The total consumption of city water for the chiller plant for the current quarter has increased by approximately 16.2%. The water conversion factor for the chiller plant increased by approximately 16.1%. This increase in the factor means that more water than typical was required to produce the same amount of chilled water. The increase in this factor may also be indicative of reduced maintenance or changes in the operation. TEG is continuing to monitor this issue, as well.

B. Steam

1. Sales and Sendout

The steam sendout decreased by approximately 8.6% over the previous Third Quarter (FY19), and the sales also decreased by approximately 10.1%. The Quarter experienced a 12.6% decrease in the number of heating degree days. The steam system losses increased 10.5% over the previous Third Quarter and experienced a decrease in the relative amount of condensate return of 15.8%. A comparison for the Third Quarter steam sales is shown in Figure 7.

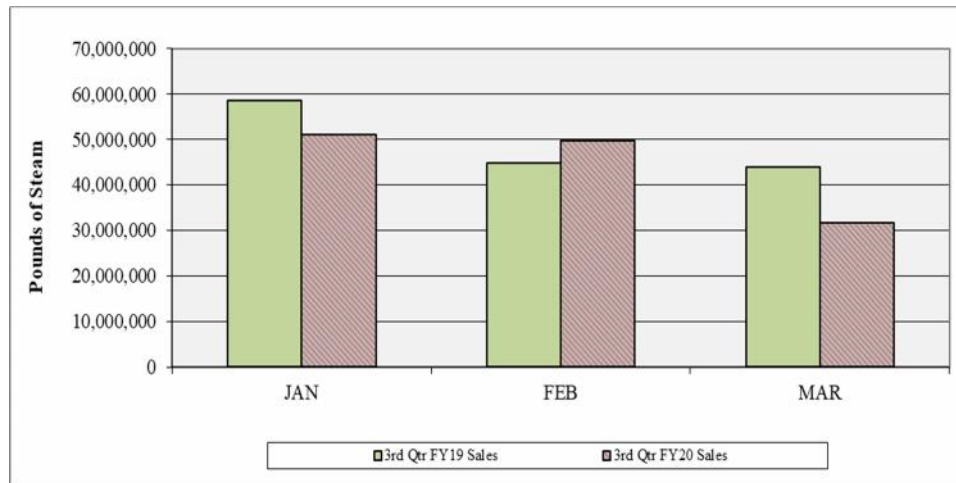


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 136,906 pph, which reflects an approximate 4.0% decrease in the peak steam production over the previous Third Quarter.

Figure 8 shows the steam sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in pounds per month between the recorded sendout and sales values and represent the total mass loss in the EDS between the EGF and the customer meters.

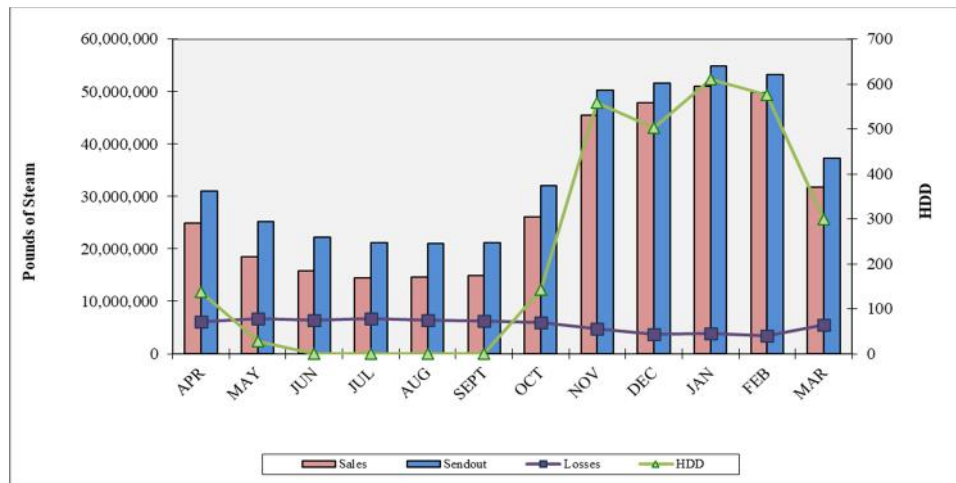


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

A comparison of the total steam mass losses in the EDS for the Third Quarter is shown in Figure 9. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty traps, steam leaks or meter error could also be a contributing cause of these losses. Whenever steam sales decrease from the previous quarter, the 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.

The increase in the losses shown in Figure 9 may be due to a new leak in the condensate system. CNE reported a new “hot spot” during March that was discovered with their monthly thermographic reviews of the system. This new “hot spot” is located on 3rd Ave N south of Deaderick St and may be a new condensate leak. TEG and CNE will investigate during April.

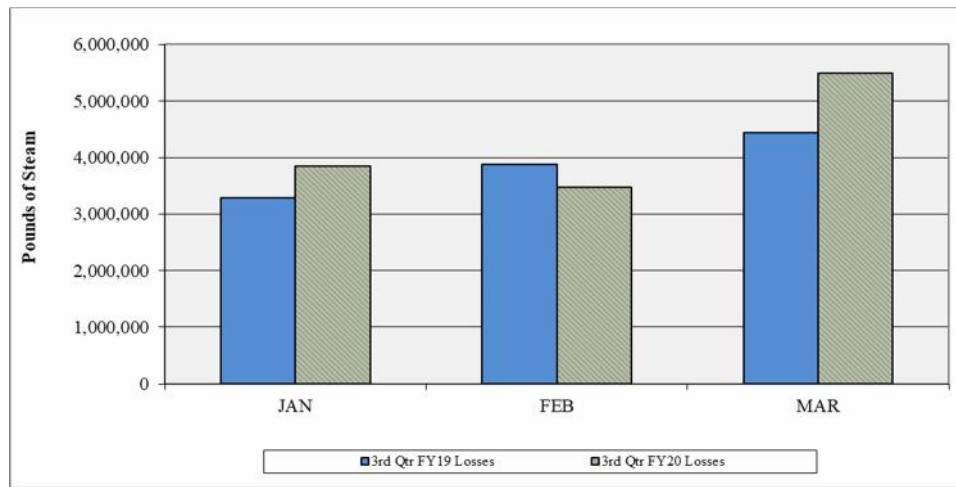


Figure 9. Steam System Losses

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 amount of condensate return decreased by approximately 15.89% during the Third Quarter. This data is shown in the comparison of Third Quarter data in Figure 10.

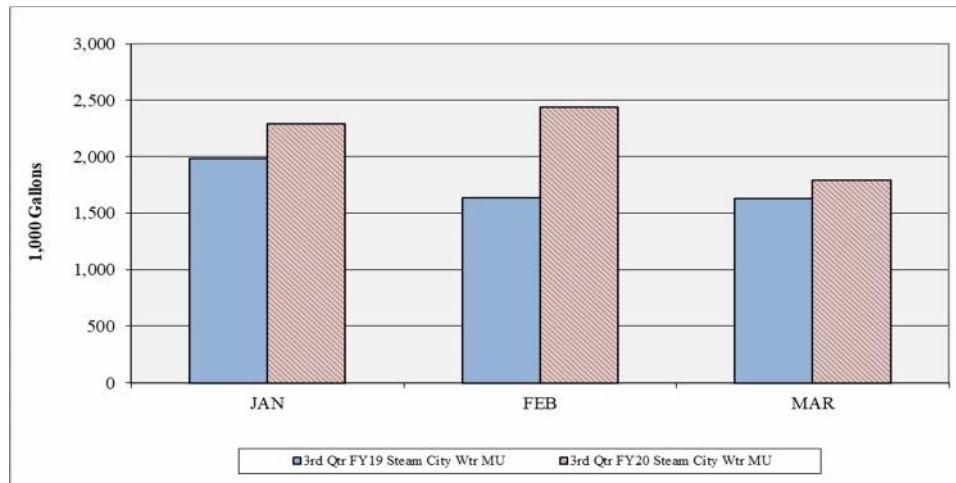


Figure 10. Steam System City Water Make-up Comparison

3. Performance

The performance of the steam system of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.

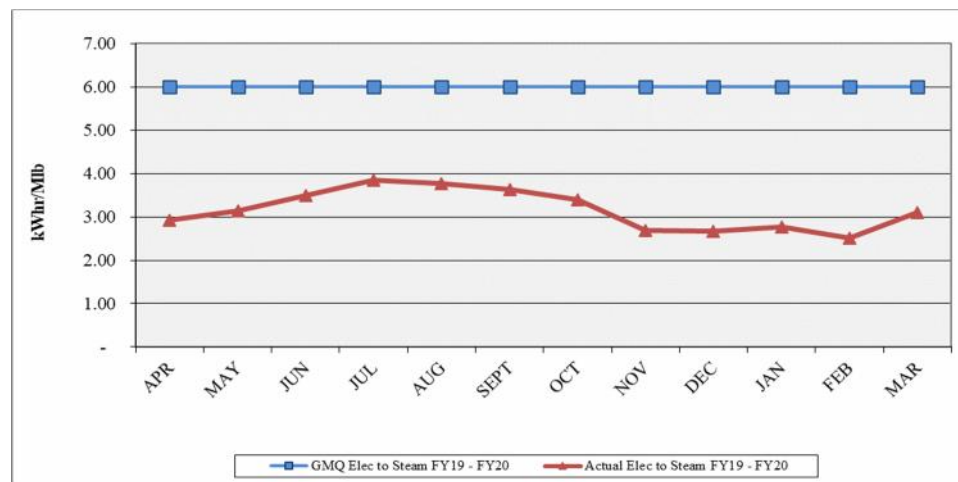


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

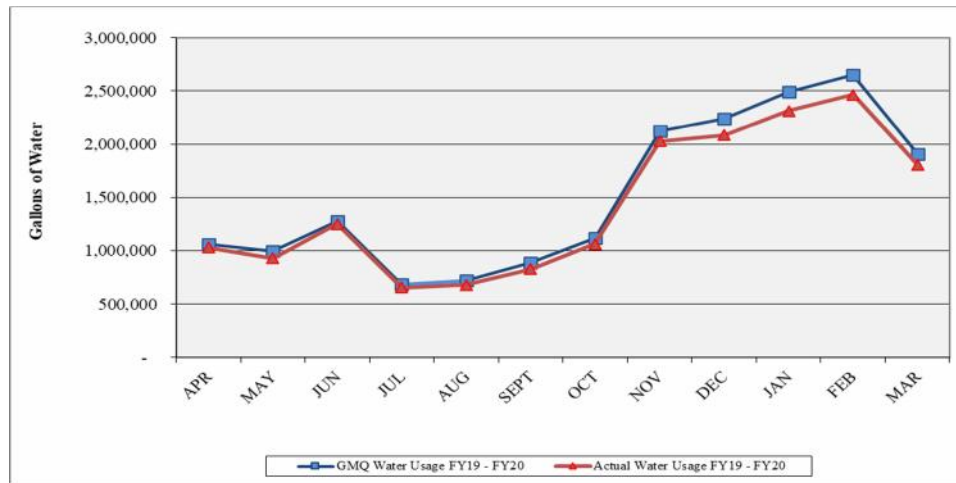


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

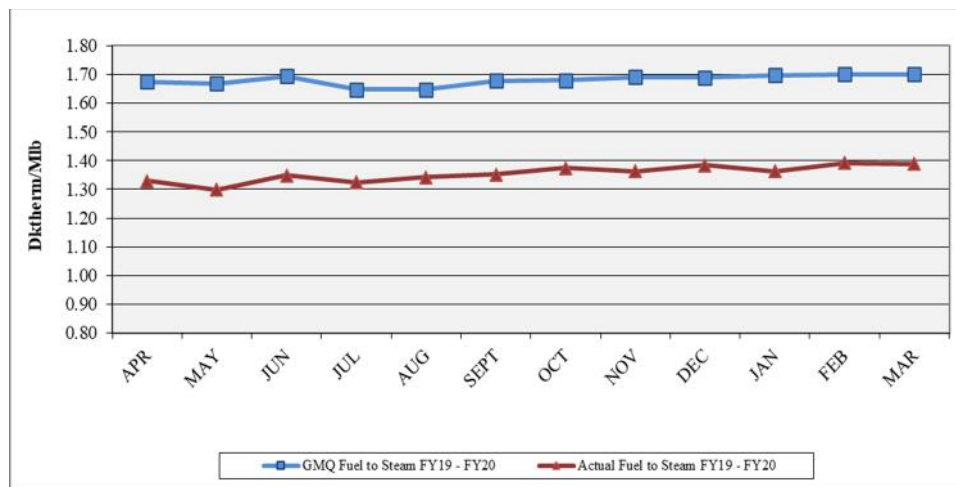


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced a 7.9% decrease in the steam plant electric consumption while experiencing a 2.5% increase in the electric conversion factor. The water consumption for the steam plant increased 24.4% this quarter as compared to the previous Third Quarter. The fuel consumption per unit of steam sales was 0.1% lower than in the previous Third Quarter.

C. Contract Guarantee Performance

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

Table 1. Third Quarter FY20 Production, Sales and Consumption Summary

Item	Unit	Third Quarter FY20	Third Quarter FY19	*Percent Difference
	days	91	90	1.11%
Total Electric Use	kWhrs	8,464,706	8,435,549	0.35%
Chilled Water	kWhrs	8,099,791	8,039,312	0.75%
Steam	kWhrs	364,915	396,237	-7.90%
Total Water Use	kgal	25,391	21,843	16.24%
Total Chilled Water	kgal	18,870	16,600	13.67%
EDS Make-up	kgal	5,184	3,550	46.03%
Cooling Towers	kgal	13,686	13,050	4.87%
Calc CT Evaporation	kgal	11,625	11,352	2.40%
CT Blowdown	kgal	2,061	1,698	21.38%
Calc # Cycles		5.64	6.69	-15.63%
Steam	kgal	6,521	5,243	24.38%
Total Fuel Use	mmBTU	200,527	219,677	-8.72%
Natural Gas	mmBTU	200,232	219,498	-8.78%
Propane	mmBTU	295	278	6.22%
Condensate Return	kgal	11,678	15,182	-23.08%
	lbs	95,240,755	123,820,484	-23.08%
Avg Temp	°F	177.3	175.0	1.33%
Sendout				
Chilled Water	tonhrs	8,981,300	9,197,400	-2.35%
Steam	lbs	145,265,000	158,976,000	-8.62%
Peak CHW Demand	tons	8,955	11,746	-23.76%
Peak Steam Demand	lb/hr	136,906	142,594	-3.99%
CHW LF		45.92%	36.25%	26.68%
Steam LF		48.58%	51.62%	-5.87%
Sales				
Chilled Water	tonhrs	8,576,340	8,756,478	-2.06%
Steam	lbs	132,446,011	147,374,471	-10.13%
Losses				
Chilled Water	tonhrs	404,960	440,922	-8.16%
Steam	lbs	12,818,989	11,601,529	10.49%
		8.82%	7.30%	20.92%
Degree Days				
CDD		26	3	766.67%
HDD		1,486	1,700	-12.59%

*positive percent difference values imply an increase from FY19 to FY20

Table 2. Third Quarter FY20 Performance Guarantee Comparison for Steam and Chilled Water

GMQ Calculations	Unit	Third Quarter FY20	Third Quarter FY19	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	2.76	2.69	2.48%
GMQ Plant Efficiency	Dth/Mlb	1.699	1.678	
Plant Efficiency	Dth/Mlb	1.380	1.382	-0.10%
Actual %CR		65.56%	77.89%	-15.82%
Avg CR Temp	°F	177	175	1.33%
GMQ Water Conversion	gal	7,053,573	4,957,036	
Water Conversion	gal	6,586,210	5,295,430	24.38%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.944	0.918	2.87%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.20	1.90	16.06%

*positive percent difference values imply an increase from FY19 to FY20

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 customers relative to their contract demand. 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. Most of the costs incurred for the operation of the DES are passed onto the customers in the form of the demand charges (fixed costs) and energy charges (variable costs). A summary of the total operating costs for the fiscal year to date are shown in Table 3.

The revenues shown 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 capacity at the EGF that was included in the original construction and remains unsold and the debt service for bonds to which the customers do not directly contribute.

The current fiscal year system operating costs to date are \$14,181,015. This value represents approximately 69.6% of the total budgeted operating cost for FY20 and includes some expenses from the Fourth Quarter FY20. The customer revenues from the

sales of steam and chilled water for FY20 (to date) are \$12,340,651 which is approximately 60.5% of the budgeted amount. 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. For FY20, no MFA has been budgeted. However, the required shortfall has been allocated from the Undesignated Fund Balance for FY20. The fiscal year to date amount required is \$1,840,364. Since some expenses for the Fourth Quarter are included in the costs-to-date, the additional revenue anticipated in the Fourth Quarter should reduce the annual funding balance required by the end of the fiscal year.

Table 3. DES Expenses and Revenues to Date

Item	FY20 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
Operating Management Fee							
FOC: Basic	\$ 4,357,000	\$ 1,096,984	\$ 1,096,984	\$ 1,096,984	\$ -	\$ 3,290,952	75.53%
9th Chiller	\$ 42,800	\$ 10,754	\$ 10,754	\$ 10,754	\$ -	\$ 32,263	75.38%
C/O 6A	\$ 86,200	\$ 21,233	\$ 21,233	\$ 21,233	\$ -	\$ 63,698	73.90%
C/O 6B	\$ 75,500	\$ 18,588	\$ 18,588	\$ 18,588	\$ -	\$ 55,765	73.86%
C/O 7	\$ 27,800	\$ 7,003	\$ 7,003	\$ 7,003	\$ -	\$ 21,008	75.57%
C/O 8	\$ 12,300	\$ 3,065	\$ 3,065	\$ 3,065	\$ -	\$ 9,194	74.75%
Pass-thru Charges: Chemical Treatment	\$ 253,100	\$ 47,826	\$ 55,733	\$ 60,782	\$ -	\$ 164,341	64.93%
Insurance	\$ 31,400	\$ 5,178	\$ 14,406	\$ -	\$ -	\$ 19,584	62.37%
Marketing: CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA: Steam	\$ 65,075	\$ 13,126	\$ 30,149	\$ 29,657	\$ -	\$ 72,932	112.07%
Chilled Water	\$ 177,124	\$ 109,741	\$ 57,013	\$ 48,888	\$ -	\$ 215,641	121.75%
Misc: Metro Credit	\$ -	\$ (202,506)	\$ (141,292)	\$ (154,719)	\$ -	\$ (498,517)	n.a.
ARFA	\$ 66,300	\$ 16,587	\$ 16,669	\$ 16,669	\$ -	\$ 49,925	75.30%
Deferral	\$ -	\$ -	\$ -	\$ (44,862)	\$ -	\$ (44,862)	n.a.
Subtotal - Man Fee =	\$ 5,194,600	\$ 1,350,083	\$ 1,331,597	\$ 1,268,760	\$ -	\$ 3,950,440	76.05%
Reimbursed Management Fee + Chem Treatment		\$ 1,345,653	\$ 1,336,028	\$ 436,062	\$ -	\$ 3,117,742	0.00%
Metro Costs							
Pass-thru Charges: Engineering	\$ 27,100	\$ 17,333	\$ 14,661	\$ 17,939	\$ -	\$ 49,932	184.25%
EDS R&I Transfers	\$ 287,600	\$ 71,900	\$ 71,900	\$ 71,900	\$ 23,967	\$ 239,667	83.33%
Metro Marketing	\$ 10,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Metro Incremental Cost	\$ 324,200	\$ 71,779	\$ 74,632	\$ 94,912	\$ -	\$ 241,322	74.44%
Utility Costs: Water/Sewer	\$ 620,000	\$ 189,195	\$ 126,787	\$ 138,958	\$ -	\$ 454,939	73.38%
EDS Water/Sewer	\$ -	\$ 273	\$ 730	\$ 899	\$ -	\$ 1,901	n.a.
EDS Electricity	\$ 59,200	\$ 13,414	\$ 14,505	\$ 15,761	\$ -	\$ 43,680	73.78%
Electricity	\$ 5,814,700	\$ 1,829,987	\$ 913,884	\$ 722,249	\$ -	\$ 3,466,121	59.61%
Natural Gas Consultant	\$ 12,400	\$ 1,000	\$ 3,000	\$ 1,000	\$ -	\$ 5,000	40.32%
Natural Gas Transport	\$ -	\$ 40,856	\$ 69,085	\$ 73,682	\$ -	\$ 183,623	n.a.
Natural Gas Fuel	\$ 2,959,100	\$ 185,302	\$ 457,256	\$ 390,782	\$ -	\$ 1,033,340	34.92%
Propane	\$ -	\$ -	\$ 61,141	\$ (40,000)	\$ -	\$ 21,141	n.a.
Subtotal - Metro Costs =	\$ 10,115,200	\$ 2,421,039	\$ 1,807,581	\$ 1,488,081	\$ 23,967	\$ 5,740,667	56.75%
Subtotal - Operations =	\$ 15,309,800	\$ 3,771,122	\$ 3,139,177	\$ 2,756,841	\$ 23,967	\$ 9,691,107	63.30%
Debt Service							
2012 Bonds	\$ 3,485,800	\$ 868,963	\$ 868,963	\$ 868,963	\$ 289,654	\$ 2,896,542	83.10%
2005 Bonds -Self Funded	\$ 401,100	\$ 356,106	\$ -	\$ 44,959	\$ -	\$ 401,066	99.99%
2007 Bonds -Self Funded	\$ 181,700	\$ 45,425	\$ 45,425	\$ 45,425	\$ 45,425	\$ 181,700	100.00%
2008 Bonds -Self Funded	\$ 181,400	\$ 45,350	\$ 45,350	\$ 45,350	\$ 45,350	\$ 181,400	100.00%
2010 Bonds -Self Funded	\$ 183,200	\$ 45,800	\$ 45,800	\$ 45,800	\$ 45,800	\$ 183,200	100.00%
Fund 49107 -Self Funded	\$ 646,000	\$ 161,500	\$ 161,500	\$ 161,500	\$ 161,500	\$ 646,000	100.00%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,079,200	\$ 1,523,144	\$ 1,167,038	\$ 1,211,997	\$ 587,729	\$ 4,489,907	88.40%
Total =	\$ 20,389,000	\$ 5,294,266	\$ 4,306,215	\$ 3,968,838	\$ 611,696	\$ 14,181,015	69.55%
Customer Revenues							
Taxes Collected		\$ 96,963	\$ 79,459	\$ 79,049	\$ -	\$ 255,471	n.a.
Taxes Paid		\$ 96,963	\$ 79,460	\$ 79,049	\$ -	\$ 255,472	n.a.
Interest & Misc Revenue	\$ 192,400	\$ 45,476	\$ 45,935	\$ 46,641	\$ -	\$ 138,051	71.75%
Penalty Revenues/Credits		\$ 22,252	\$ (153,877)	\$ (27,496)	\$ -	\$ (159,121)	n.a.
Energy Revenues Collected		\$ 4,658,529	\$ 3,958,519	\$ 3,744,673	\$ -	\$ 12,361,721	65.78%
Revenues =	\$ 20,389,000	\$ 4,726,257	\$ 3,850,576	\$ 3,763,818	\$ -	\$ 12,340,651	60.53%
Metro Funding Amount =	\$ -	\$ 568,009	\$ 455,639	\$ 205,020	\$ 611,696	\$ 1,840,364	0.00%

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. 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	\$ 2,727,797	14,258,688	\$ 0.1913	\$ 1,002,934	79,583	\$ 12.6023
State Government	\$ 2,396,719	9,103,579	\$ 0.2633	\$ 1,250,649	88,910	\$ 14.0665
Metro Government	\$ 3,700,723	20,946,014	\$ 0.1767	\$ 1,283,199	127,303	\$ 10.0799
New Customers	\$ 2,378,916	13,746,511	\$ 0.1731	\$ 892,038	99,261	\$ 8.9868
Total	\$ 8,825,239	44,308,281	\$ 0.1992	\$ 3,536,782	295,796	\$ 11.9568

Total Revenue \$ 12,362,021
True-up and Adjustments (Net) \$ (21,370)
Net Revenue \$ 12,340,651

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY20. TEG and CNE continue to meet monthly and regularly communicate about important issues. CNE has reported and managed EGF operations satisfactorily and according to the ARMA with no contract violations; however, chiller plant performance has continued to decline over its historic values.

A. Reliability

The principle 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.

-) Boiler tune-ups in January and February caused the steam sendout pressure to drop to 148 psig for a few minutes.
-) Due to the tornado striking parts of Nashville on March 3, the plant lost electrical power for about one hour. The chilled water temperature was below the guarantee amount for approximately 90 minutes and the steam pressure was below 150 psig for approximately three (3) hours.

B. Efficiency

The operation of the EGF satisfied the guaranteed levels for all commodity usage during the quarter. There were no significant 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.

Monthly safety meetings were held on Lockout/Tagout Procedures and Safe Work Practices. CNE did not hold any safety meetings in March in order to maintain the COVID-19 social distancing guidelines.

D. Personnel

CNE is currently staffed with nineteen full time employees, one part-time employee and one relief staff. 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.

) Steam System

- o The condensate return averaged approximately 65.6% of the steam sendout during the quarter, which represents a 15.8% decrease over the previous Third Quarter. TEG and CNE are investigating the reason for this decrease.
- 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.

- The project to install a side stream filter at the EGF remains on hold pending funding from Metro.

G. Maintenance and EGF Repairs

CNE continues to report on the numerous routine maintenance and preventive maintenance activities performed on the EGF primary and ancillary equipment. The principle 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 and repaired plant computers and servers;
-) Checked and adjusted packing on all pumps;
-) Repaired plant lighting;
-) Continued working on the replacement of chilled water pump 6 VFD;
-) Replaced condensing water pump 4 soft start;
-) Replaced the fan belts on cooling towers 3 and 7;
-) Replaced the fan bearings and repaired the bearing supports on cooling tower 3;
-) Repaired the inlet valves on cooling towers 10 and 17;
-) Repaired #1 softener controls;
-) Repaired boiler 2 conductivity controller;
-) Replaced the vibration switches on cooling towers 10 and 17;
-) Replaced the fan bearings for cooling towers 4 and 17;
-) Replaced the outboard bearings on boiler feedwater pump 2;
-) Cleaned out the floor drains at the EGF;
-) Repaired fire alarm and fire suppression sprinkler system;
-) Repaired the backflow preventer;
-) Removed the dead trees;
-) Repaired a leak on boiler feedwater pump 2;
-) Trane completed their chiller run inspections;
-) Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

H. EGF Walkthrough

Due to the State's "Stay-At-Home" directive in response to the COVID-19 pandemic and CNE's desire to limit visitors to the EGF, the Third Quarter Walkthrough was postponed until April. However, the EGF Walkthrough was conducted on April 20, 2020, 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.

- J 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. No additional work has been performed on the riser tubes since the First Quarter Walkthrough FY18.
- J In previous Walkthrough reports, it was noted that significant scale was observed on the fill (louvers) to several of the cooling towers. CNE began cleaning some of the towers and their louvers during the Second Quarter. Where the cleaning has occurred, the scale has been largely removed. CNE was actively cleaning the towers on the east side of the EGF during the Walkthrough. Work on the balance of the towers still needs to be completed prior to the cooling season. TEG has investigated the change in the chiller plant efficiency and determined that the chiller plant efficiency has declined in the past calendar year relative to the past 3 and 5 year averages. It is TEG's opinion that the cause of the decrease in the chiller plant efficiency is due to the condition of the cooling towers.
- J In previous Walkthrough reports, it was noted that a leaking chemical feed line was observed on the south side of the southern DA. CNE had cleaned the affected area and repaired the original leak first reported over a year prior; however, the new leak (that was first reported in the Q4FY19 report) has formed and has become worse than the previous one. The leak in this chemical feed line causes a localized build-up of the chemical salts at the leak point. CNE was notified and plans on addressing this issue.
- J An additional leak with salt build-up was noted on a valve at the sulfite (oxygen scavenger) tank on the mezzanine level. Additional build-up of material was also noted on a valve from the BWT6233 tank. Although CNE has addressed the build-up on the sulfite line in the Second Quarter, the build-up on the BWT6233 line needs to be addressed
- J A condensate leak in the header piping between the two de-aerators was noted. CNE has repaired this condensate leak but has not re-insulated the affected piping. CNE needs to repair the insulation in this area.
- J CNE has removed all of the dead trees and their detritus. CNE and Metro have discussed the plan to potentially replace the trees. CNE will meet with the city's Urban Forester to determine the appropriate tree density required by the city for the EGF site and the proper species to replant. CNE has postponed this meeting due to the "Stay-At-Home" directive.

-) Cooling tower #3 had been out of service for most of 2019. CNE has made the necessary repairs to cooling tower #3; however, the tower was not in operation during the Walkthrough. CNE has stated that the tower is now available to be operated. This item will be removed from future reports.
-) Mineral deposits on the condensing water pumps have been noted in previous Walkthrough reports and CNE has since cleaned the pumps and painted the volutes. During this Walkthrough the mineral deposits were noted as having returned on the condensing water pumps. These were last cleaned in the Second Quarter FY18. CNE needs to clean these pumps; painting may not be necessary.
-) Other action items previously noted to be addressed by CNE have been completed. (See also the “Quarterly EGF Walkthrough Report,” dated April 22, 2020, 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. Due to the Mayor’s “Stay-at-Home” order related to the COVID-19 pandemic, in consideration of the safety of both the contractor and CNE’s personnel, CNE has delayed all non-emergency, active project work until the “Stay-at-Home” order is lifted.

A. Third Quarter FY20 Open Projects

The following projects remained open at the end of the Third Quarter FY20.

1. DES111 – DES Combined Heat and Power

This project is currently on hold.

2. 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. Because the City is pursuing reimbursement from the contractor(s) responsible for the blasting and subsequent damage to the tunnel, including the need for the City to reinforce the tunnel and make repairs after the completion of the blasting, this project remains open. The repairs for tunnel damage were completed under project DES164.

3. DES139 – DES Options Review

Metro has placed the completion of the sale of the DES with Engie on hold pending further investigation. TEG continues to provide Metro with assistance in their evaluation of the options for the long-term goals of the system.

4. DES152 – Manhole A and Manhole M Coating Repairs

The structural steel in these manholes were cleaned and painted as part of DES107 in 2015. Portions of the paint is now flaking on these supports. The paint manufacturer reviewed the failing coatings. Their position is 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 is not willing to warrant the work. Before the existing corrosion progresses, these coating failures need to be repaired. This project addresses these needed repairs.

This work has been put on hold but is included in the FY20 capital budget request.

5. DES153 – Manhole L Repairs

The structural steel in Manhole L is corroded and needs to be cleaned and painted to prevent any additional corrosion. Additionally, the condensate piping in this manhole experiences severe hammering and the piping configuration needs to be modified to alleviate this problem.

TEG has completed the design for these repairs and is monitoring a new coating which has been used in DES157 and DES159. It appears that one of these coatings is performing well and will probably be specified for this project. Due to the Mayor's "Stay-at-Home" order related to the COVID-19 pandemic, in consideration of the safety of both the contractor and CNE's personnel, bidding and work on this project will not occur until the "Stay-at-Home" order is lifted. Therefore, it is anticipated that a pre-bid meeting will not be scheduled until the Fourth Quarter FY20 at the earliest.

6. DES154 – Manhole K Repairs

The structural steel in Manhole K is corroded and needs to be cleaned and painted to prevent any additional corrosion.

TEG started the design for these repairs during the First Quarter FY19, however, due to higher priority projects this work has been postponed.

7. DES157 – Manhole 9 Structural Steel Repairs

The structural steel piping supports in Manhole 9 are badly corroded and need to be replaced and/or cleaned and painted to maintain the integrity of the steam and condensate piping system. The design, bidding and award for this project took place during the First Quarter FY20. The work was started during the Second Quarter FY20, however due to the Mayor’s “Stay-at-Home” order related to the COVID-19 pandemic, in consideration of the safety of both the contractor and CNE’s personnel, CNE has delayed the completion of this project until the “Stay-at-Home” order is lifted. It is anticipated that the work will not be completed until the Fourth Quarter FY20 at the earliest.

8. DES159 – Manhole B2 Structural Steel Repairs

The structural steel piping supports in Manhole B2 are badly corroded and need to be cleaned and coated to maintain the integrity of the steam and condensate piping system. Due to higher priority projects, this project was initially delayed.

This project was bid and awarded during the First Quarter FY20 and the work was started during the Second Quarter FY20. However, due to the Mayor’s “Stay-at-Home” order related to the COVID-19 pandemic, in consideration of the safety of both the contractor and CNE’s personnel, CNE has delayed the completion of this project until the “Stay-at-Home” order is lifted. It is anticipated that the work will not be completed until the Fourth Quarter FY20 at the earliest.

9. DES160 – New Service to 5th + Broadway Development

The instrumentation for the 5th and Broadway development was installed late in the Third Quarter. The completion of the installation, along with the metering panel and its programming, is anticipated in April 2020. Upon completion of the instrumentation and metering system and a successful hydrostatic test of the chilled water piping, the chilled water will be energized and available for use by the building’s contractor during the Fourth Quarter FY20.

Due to delays in the building’s construction, the substantial completion date is not expected until late in the Fourth Quarter FY20. This new customer began receiving invoices for services in January 2020.

10. DES161 – Manhole S6 Insulation

This project addresses the installation of insulation in Manhole S6 which is a small manhole in the State distribution system. A scope for this work was developed by TEG and distributed to CNE for execution. However, due to the Mayor’s “Stay-at-Home” order related to the COVID-19 pandemic, in consideration of the safety of both the contractor and CNE’s personnel, CNE has

delayed the execution of this project until the “Stay-at-Home” order is lifted. It is anticipated that the execution of this work will not be completed until the Fourth Quarter FY20 at the earliest.

11. DES162 – Service to New Hotel at 3rd Ave & Molloy

The completion of the new service to the Hyatt Centric is anticipated in the late Fourth Quarter FY20 or early First Quarter FY21. The building’s contractor plans to need chilled water service during construction in August 2020. The Hyatt Centric is expected to open for commercial operation in April 2021.

12. DES163 – New Service to MDHA Parcel K

Negotiations with this potential customer are in the early stages.

13. DES168 – DES Service to 1st and KVB Hotels

TEG continued to be in contact with the engineer for two new hotels proposed to be developed at 1st Ave S and KVB during the quarter. The building’s preliminary design is reported to include service from the DES but is currently on hold pending direction from the building’s developer/owner.

14. DES169-Manhole 20 Repairs

Manhole 20 is connected to the 7th Avenue Tunnel and houses steam, condensate return and chilled water service piping to Hume Fogg High School. The pipe support stanchions in this manhole (adjacent to the 7th Avenue Tunnel), are badly corroded and require replacement. This project addresses the replacement of these pipe supports.

Design is complete and a pre-bid meeting occurred early in the Third Quarter FY20. However, due to the Mayor’s “Stay-at-Home” order related to the COVID-19 pandemic, in consideration of the safety of both the contractor and CNE’s personnel, CNE has delayed the start of this project until the “Stay-at-Home” order is lifted. It is anticipated that the work will not be completed until the Fourth Quarter FY20 at the earliest.

B. Third Quarter FY20 Closed Projects

There were no projects closed during the Third Quarter FY20.

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 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	FY20 Spending to Date	Total Spent to Date	Remaining Balance
Fund-49109					
DES139	Options Review	\$ 63,600	\$ -	\$ 44,019	\$ 19,581
DES133	NCC Development	\$ 10,000	\$ 47	\$ 8,808	\$ 1,192
DES133.3	Broadway Tunnel Reinforcement	\$ -	\$ -	\$ 1,427	\$ (1,427)
DES135	Chilled Water Leak 5th and Union	\$ 50,000	\$ 1,132	\$ 28,801	\$ 21,199
DES151	MH 23 Repairs	\$ -	\$ 47	\$ 7,446	\$ (7,446)
Total Closed Projects		\$ 2,493,661	\$ -	\$ 2,507,423	\$ (13,762)
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ (11,346)	\$ -	\$ -	\$ (11,346)
Total 2010 Bond		\$ 2,605,916	\$ 1,227	\$ 2,597,925	\$ 7,991
Fund-49107					
EMR 19-001	Steam Leak at Municipal	\$ 2,221	\$ 2,182	\$ 2,182	\$ 39
Total Closed Projects		\$ 8,497,779	\$ -	\$ 8,497,779	\$ 0
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ -	\$ -	\$ -	\$ -
Customer Connection Fund		\$ 8,500,000	\$ -	\$ 8,499,961	\$ 39
Fund-49116					
DES111	DES CHP	\$22,784,277	\$ -	\$ 168,706	\$22,615,571
DES133.1	NCC Blasting Issue	\$ -	\$ 8,273	\$ 8,273	\$ (8,273)
DES135	Chilled Water Leak	\$ 100,000	\$ 819	\$ 43,638	\$ 56,362
DES139.1	Options Review	\$ 75,000	\$ 42,057	\$ 120,366	\$ (45,366)
DES151	MH 23 Repairs	\$ 175,000	\$ 142,267	\$ 219,388	\$ (44,388)
DES152	MH A & M Repairs	\$ -	\$ -	\$ -	\$ -
DES153	MH L Repairs	\$ 110,000	\$ 5,533	\$ 8,466	\$ 101,534
DES154	MH K Repairs	\$ 100	\$ -	\$ 85	\$ 15
DES157	MH 9 Repairs	\$ 75,000	\$ 83,393	\$ 102,613	\$ (27,613)
DES158	MH 18A Repairs	\$ 110,000	\$ 97	\$ 64,760	\$ 45,240
DES159	MH B2 Repairs	\$ 110,000	\$ 8,181	\$ 19,867	\$ 90,133
DES160	5th + Broadway Service	\$ 60,000	\$ 8,215	\$ 56,172	\$ 3,828
DES161	MH S6 Insulation	\$ 30,000	\$ -	\$ -	\$ 30,000
DES162	3rd and Molloy Service	\$ 220,000	\$ 81,979	\$ 115,796	\$ 104,204
DES163	Parcel K Service	\$ 707,300	\$ 178	\$ 1,302	\$ 705,998
DES164	Broadway Tunnel Repairs	\$ 180,000	\$ -	\$ 175,329	\$ 4,671
DES165	AA Birch Tunnel Repairs	\$ 115,000	\$ -	\$ 63,242	\$ 51,758
DES166	Misc. Tunnel Repairs	\$ 195,000	\$ -	\$ -	\$ 195,000
DES167	EDS Fiber Optic Installation	\$ 5,000	\$ -	\$ 4,443	\$ 557
DES168	1st and KVB Hotels	\$ 10,000	\$ 367	\$ 5,777	\$ 4,223
DES169	MH-20 Repairs	\$ 40,000	\$ 3,594	\$ 13,326	\$ 26,674
DES170	MH-18 Anchor Repair PH-2	\$ 120,000	\$ 128,685	\$ 128,685	\$ (8,685)
	EMR 19-004 Emergency Leak Repairs	\$ 65,000	\$ 64,580	\$ 64,580	\$ 420
	EMR 19-001 Steam Leak at Municipal	\$ 2,221	\$ -	\$ -	\$ 2,221
DES171	Broadway Tunnel Support Repair	\$ 130,000	\$ 13,192	\$ 13,192	\$ 116,808
DES172	Viridian Pipe Support Repair	\$ 80,500	\$ 10,451	\$ 10,451	\$ 70,049
DES173	MH-B3 Structural Repair	\$ -	\$ -	\$ -	\$ -
DES174	7th Ave Pipe Support Repairs	\$ -	\$ 4,601	\$ 4,601	\$ (4,601)
Total Closed Projects		\$ 15,723	\$ -	\$ 15,723	\$ -
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ 484,879	\$ -	\$ -	\$ 484,879
CHP and EDS Repairs		\$26,000,000	\$ 607,760	\$1,430,080	\$24,569,920

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

Several EDS repairs and improvements were made during the Third Quarter. The principle 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 \$118,579. Table 6 provides a summary of the FY20 expenditures and revenues to date associated with the R&I budget.

Table 6. FY20 Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY19				\$ 322,271.31		\$ -	\$ 63,714.08	\$ 63,714.08
Interest/Transfer	07/01/19	DES-2370	-	\$ 151.26				
Interest/Transfer	07/01/19	DES-2370	-	\$ (151.26)				
CNE July 2019 Invoice	02/21/20	DES-2370	CNE	\$ 11,319.33				
EMR19-003	02/21/20	DES-2373	CNE	\$ 46,254.14				
Interest/Transfer	08/01/19	DES-2370	-	\$ 187.92				
Interest/Transfer	08/01/19	DES-2370	-	\$ (187.92)				
CNE Aug 2019 Invoice	02/21/20	DES-2373	CNE	\$ 8,278.99				
Interest/Transfer	09/03/19	DES-2370	-	\$ 208.87				
Interest/Transfer	09/03/19	DES-2370	-	\$ (208.87)				
EMR19-005 CND Leak Repair	02/01/20	DES-2378	CNE	\$ 2,850.00				
CNE Sept 2019 Invoice	02/01/20	DES-2378	CNE	\$ 8,531.49				
Sub-Total First Quarter				\$ 77,233.95	\$ 71,900.01	\$ -	\$ (5,333.94)	\$ (5,333.94)
EMR19-003 CO 1	02/01/20	DES-2378	CNE	\$ 8,357.26				
Interest/Transfer	10/01/19	-	-	\$ 222.72				
Interest/Transfer	10/01/19	-	-	\$ (222.72)				
EMR19-006 MH-D1 Vault Lid	02/01/20	DES-2378	CNE	\$ 17,330.83				
CNE Oct 2019 R&I Invoice	02/01/20	DES-2378	CNE	\$ 6,302.29				
Interest/Transfer	11/01/19	-	-	\$ 236.52				
Interest/Transfer	11/01/19	-	-	\$ (236.52)				
CNE Nov 2019 R&I Invoice	02/01/20	DES-2378	CNE	\$ 10,487.42				
EMR 19-007 3rd Ave Excavation	02/21/20	DES-2376	CNE	\$ 30,005.67				
Interest/Transfer	12/02/19	-	-	\$ 228.91				
Interest/Transfer	12/02/19	-	-	\$ (228.91)				
CNE Dec 2019 R&I Invoice	02/01/20	DES-2378	CNE	\$ 8,579.11				
Sub-Total Second Quarter				\$ 81,062.58	\$ 71,900.01	\$ -	\$ (9,162.57)	\$ (9,162.57)
Interest/Transfer	01/02/20	-	-	\$ 246.46				
Interest/Transfer	01/02/20	-	-	\$ (246.46)				
CNE Jan 2020 R&I Invoice	03/02/20	-	CNE	\$ 20,476.11				
CNE Feb 2020 R&I Invoice	03/18/20	-	CNE	\$ 6,029.08				
Interest/Transfer	02/03/20	-	-	\$ 258.85				
Interest/Transfer	02/03/20	-	-	\$ (258.85)				
Interest/Transfer	03/03/20	-	-	\$ 265.80				
Interest/Transfer	03/03/20	-	-	\$ (265.80)				
Sub-Total Third Quarter				\$ 26,505.19	\$ 71,900.01	\$ -	\$ 45,394.82	\$ 45,394.82
Sub-Total Fourth Quarter				\$ -	\$ 23,966.67	\$ -	\$ 23,966.67	\$ 23,966.67
FY20 Year to Date				\$ 184,801.72	\$ 239,666.70	\$ -	\$ 118,579.06	\$ 118,579.06

B. Preventive Maintenance

Preventive maintenance, tunnel and manhole inspections and reviews of customers' mechanical rooms were performed during the quarter. The principle 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 water.
 - c. CNE continues to fabricate and replace trap assemblies within the EDS.
 - d. CNE has begun to wire brush clean areas of minor corrosion and then paint these areas with a cold galvanizing paint. If maintained, this should help alleviate the progression of some areas of corrosion.
2. Customer metering station calibration checks were completed as scheduled.
3. Due to renovations occurring over the past year at the John Sevier building, CNE and TEG have been in contact with and have discussed the removal and subsequent installation of the DES metering equipment. This equipment was re-installed in new piping installed by the building's contract during the quarter. Re-activation and programming of the metering system is anticipated in April 2020.
4. Water chemistry samples at customer buildings were taken as scheduled.
5. Other EDS Inspections
 - a. Other items are included in the CNE monthly reports.

C. Emergencies

The tornado that struck downtown Nashville on March 3 caused a power failure at the EGF that lasted for approximately one hour. Although service the DES customers was interrupted during this period, the EGF and EDS did not experience any damage. There were no other emergencies were reported during the quarter.

D. EDS Walkthrough

The Third Quarter FY20 walkthrough was conducted on March 9 and 11, 2020. The manholes and tunnel systems that were visited include Manhole 23, the State Tunnel, the AA Birch Tunnel, the 4th Avenue Tunnel, the 7th Avenue Tunnel and the Broadway Tunnel. The following comments and observations are a result of these visits:

1. State Tunnel
 - a. There are several locations, where the concrete tunnel structure has minor, moderate and major cracking, spalling, exposed/corroded rebar and/or

shifting of structures. Minor repairs are needed at the following locations: E11, E13, E17, E28, E30, E37, E44, E51, E52, E60, E61, E66, E67, E68, E69, N31, N45, N48, N50, N54, N56, N59, N61, W3, W4, W7, W11, W15, W17, W20, W42, W42, W48, W52 and W72. Moderate repairs are needed at the following locations: E26, E28, E29, N6, N7, W27, W43, W44 and W75. Major repairs are needed at the following locations: south of E1 and N20. Maintenance of the tunnel structure is the State's responsibility. The quantity and severity of these needed repairs have been conveyed to the State. The State hired a professional structural engineer to review the major repair areas and he agreed that the area south of E1 and the area of N20 should be avoided until repairs are made. Therefore, CNE personnel should avoid the area south of E1 and the area of N20 until repairs are made.

- b. There are several communications cables and inner ducts throughout the tunnel. Some of these cables/inner ducts have been placed on the piping supports; this could pose a problem for both piping maintenance and for the cabling. CNE personnel should be careful when they are reviewing the tunnel as these inner ducts and cabling could be a trip hazard. TEG will contact State representatives to speak with them regarding the placement of this cabling and to confirm type of cabling that is within the tunnel.
- c. The concrete underneath the base plate of the piping support column at Station N33 needs to be repaired. TEG has confirmed that the use of Enecon's Duraquartz product for this repair is suitable; CNE may use another suitable repair product is desired. **This item appeared in the 4/30/19 report.**
- d. Several of the pipe support C channels and W shapes have minor to moderate corrosion. These locations include E1, E2, E3, E4, E5, E7, E8, E9, E12, E13, E17, E20, E24, E25, E26, E28, E29, E37, E44, E46, E51, E53, E54, E55, E56, E58, E59, E60, E62, E63, E64, E65, E66, E67, E69, W2, W3, W4, W5, W6, W7, W8, W9, W11, W27, W54, W55, W56, W58, W59, W60, W62, W67, W73, W74, W75, N2, N8, N9, N10, N11, N12, N13, N14, N15, N16, N17, N18, N19, N20, N21, N22, N23, N24, N25, N26, N27, N28, N29, N30, N31, N32, N34, N38, N39, N40, N41, N42, N43, N44, N45, N46, N47, N48, N49, N50, N51, N52, N54, N55, N56, N57, N58, N59, N60, N61, N62, N63 and N64. These members support DES piping and are not considered part of the structure and need to be cleaned and coated. Some of this corrosion is due to leaks in the tunnel structure and therefore should not be repaired until the leaks are repaired – it is the State's responsibility to repair structure leaks. TEG will coordinate with CNE how much of this needed work can be accomplished by CNE and how much will require the hiring of an outside contractor.
- e. There is some insulation repair needed at station W1. This should be repaired the next time insulation work is done in the State Tunnel.
- f. One of the "riser clamps" of the spider guide assembly on the high-pressure condensate return piping at station E45 is not installed. CNE should re-install this clamp as soon as possible.

- j. The condensate return piping in Manhole D3, Manhole D3's vertical shaft and the eastern end of the tunnel was shaking/vibrating during a portion of the site visit. It is believed that this might occur when the AA Birch Building's condensate return pumps engage. CNE should investigate this shaking to determine the cause and update TEG on their findings. This investigation needs to happen as soon as possible.
 - k. There is dirt and mud in the elevated floor area of Manhole D2; CNE should remove this dirt and mud and clean this manhole as soon as possible.
3. 4th Avenue Tunnel
- a. The steam expansion joints at Stations 4-45, 4-62 and 4-78 are leaking. CNE should first tighten the packing injection bolts to try and stop this leak. If this is not successful, CNE should make repairs once the leak is enough that injection repairs will be successful.
 - b. The pipe supports at Stations 4-11, 4-12, 4-14,4-17, 4-38, 4-45, 4-79, 4-80, 4-81, 4-82, 4-83, 4-84, 4-85, 4-86, 4-87, 4-88, 4-90 and 4-95 have minor to heavy corrosion and need to be cleaned and coated/ painted. The stanchion support at the north end of the 4th Avenue Tunnel also is corroded and should be cleaned and coated. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
 - c. The pipe stanchions for the service piping at 4-52 (Viridian service) have moderate to severe corrosion and need to be repaired or replaced. TEG is currently developing a scope of work for these repairs.
 - d. The piping support Teflon slides at locations 4-2, 4-3, 4-4, 4-5, 4-10, 4-26, 4-27, 4-28, 4-29, 4-30, 4-32, 4-35, 4-39, 4-40, 4-42, 4-45, 4-49, 4-56, 4-57, 4-68, 4-69, 4-72, 4-74, 4-77, 4-84, 4-89, 4-91 and 4-94 are in need of repair. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
 - e. Some of the overhead electrical conduits in the area of 4-12 are moderately to severely corroded. CNE should clean these conduits with a wire brush/wheel so that the extent of any damage can be assessed and repaired as soon as possible. **This item appeared in the 4/30/19 report.**
 - f. The branch steam piping at station 4-62 in the vertical shaft (Manhole 16) at the 4th and Church Building (formerly the old Sun Trust Building) has a blind flange connection at the top of the vertical piping. The gasket at this blind flange connection was recently replaced due to a leak, but the insulation has not been repaired/replaced. CNE needs to have the insulation repaired and order an insulation blanket to be installed on the flange connection as soon as possible. The insulation repair should match the existing material and thickness. **This item appeared in the 4/30/19 report.**
 - g. The grating in the lower level of the vertical shaft (Manhole 16) at the 4th and Church Building (formerly the old Sun Trust Building) is corroded and needs replacement. TEG is currently developing a scope of work for needed repairs within the 4th Avenue Tunnel and will include this item within that scope.

- h. Some minor insulation repairs are needed at 4-94. CNE should make note of this need and when additional insulation repairs are needed within the 4th Avenue Tunnel, this location should be included.
 - i. The emergency lights at 4-61 and 4-74 are not working properly. CNE should repair these lights as soon as possible. **This item appeared in the 4/30/19 report.**
 - j. The grout beneath the baseplates of the pipe supports at stations 4-45, 4-50, 4-51, 4-52, 4-53, 4-54, 4-55, 4-56, 4-57, 4-58, 4-59, 4-60 and 4-67 are cracked and need to be repaired. These were repaired during DES-166 and are still under warranty. The contractor has been contacted and will make the needed repairs within the next 6 months.
4. 7th Avenue Tunnel
- a. The pipe support stanchions at location 7-81 were recently cleaned and painted. However, the stanchion baseplates were buried under dirt and silt and had to be “dug out” to permit the cleaning and painting that was done. Groundwater can now accumulate in this dug out area. A trench needs to be dug from this low point, southward to allow any water that may accumulate to drain down the tunnel. CNE should dig this trench as soon as possible. **This item appeared in the 4/30/19 report.**
 - b. The pipe supports at Stations 7-23, 7-33, 7-42, 7-45, 7-46, 7-47, 7-48, 7-52, 7-53, 7-56, 7-57, 7-59, 7-63, 7-77 and 7-80 have minor to heavy corrosion and need to be cleaned and coated. Some of these locations will be included in an upcoming scope of work being developed by TEG. Any locations not addressed by the upcoming scope should be cleaned and painted with cold galvanizing paint by CNE as soon as possible.
 - c. The steam and condensate anchor table at location 7-42 has moderate to severe corrosion. This location experiences a lot of groundwater intrusion. Due to physical constraints and water infiltration, it does not appear that cleaning and coating/painting the structure will be effective, therefore a new structure needs to be designed and installed adjacent to the existing structure. TEG is currently developing a scope to replace this anchor table.
 - d. The pipe stanchion supports at Stations 7-11 (Hume Fogg service) and 7-45 (Library service) have moderate to severe corrosion and should be replaced or cleaned and painted to prevent further corrosion. TEG is currently developing a scope to repair/replace these supports.
 - e. The piping support Teflon slides at locations 7-3, 7-5, 7-6, 7-9, 7-11, 7-12, 7-14, 7-15, 7-18, 7-20, 7-28, 7-29, 7-32, 7-37, 7-41, 7-44, 7-45, 7-46, 7-55, 7-65 and 7-68 need repair. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
 - f. One of the light support brackets at Station 7-42 is broken and the electrical conduit is corroded. CNE needs to repair/replace the light support and conduit in this area as soon as possible. **This item appeared in the 4/30/19 report.**

- g. The steam expansion joints at Stations 7-22 and 7-61 are leaking. CNE should tighten the packing bolts to see if this stops the leak. If this is not successful in stopping the leak, CNE should make repairs once the leak is sufficient that injection repairs will be successful.
 - h. The lights at Station 7-14 and 7-45 are not working. CNE needs to repair these lights as soon as possible.
 - i. The emergency light at station 7-41 is not working properly. CNE should repair or replace this emergency light as soon as possible.
 - j. Groundwater infiltration continues at Station 7-44. TEG had wicking material draped over the piping at this location to mitigate any damage which may occur to the piping, insulation or piping supports. CNE should continue to monitor this infiltration and notify TEG of any significant changes.
 - k. There is a small amount of groundwater infiltration at station 7-29. CNE should monitor this infiltration and notify TEG of any significant changes.
5. Broadway Tunnel
- a. The steam expansion joints at Stations B-96, B-82, the Bridgestone Tunnel and B-19/20 are leaking. CNE should tighten the packing bolts to see if this stops the leak. If this is not successful in stopping the leak, CNE should make repairs once the leak is sufficient that injection repairs will be successful.
 - b. Original Nashville Convention Center service/Manhole 19:
 - (1) The lights in the vertical shaft are not working. This presents a safety hazard for maintenance personnel and therefore these lights should be repaired or replaced as soon as possible
 - (2) The grating “hatch door” at the top of the vertical shaft could not be opened. Because the lights were not working, it was difficult to determine the reason that the hatch would not open. However, the Manhole 19 manway lid and frame were recently replaced/raised in elevation and it was apparent that some mortar had fallen on top of the hatch and might be preventing the hatch from opening. CNE should investigate the reason that the hatch is not opening and notify TEG of their findings. In addition, CNE should investigate if the site was not properly cleaned after the manway lid and frame installation and, if needed, have the contractor adequately clean the site. This needed action should take place as soon as possible
 - (3) From prior reviews: There is some minor corrosion on the pipe hanger lugs at the top of the vertical service shaft in Manhole 19. CNE should clean these lugs with wire brushes/wire wheels and paint them with cold galvanizing paint to prevent further corrosion. Requires action within the next 6 months. **This item appeared in the 4/10/17, 4/13/18 and 4/30/19 reports.**
 - c. There is some insulation damage at Stations B-96, B-82, B-80, B-50, B-49 and Manhole 18. Some of this is the result of the contraction of the piping from system shutdowns. CNE should make repairs to these areas using

aerogel insulation to eliminate any interference with the piping supports. Some insulation is missing on a Bridgestone Arena chilled water service line. It appears this insulation was removed when some instrumentation was installed. This insulation should be repaired/replaced when the other locations are repaired. These repairs should be coordinated with other insulation repairs in the 4th, 7th and AA Birch Tunnels and should be executed as soon as possible.

- d. There is trash and debris in the Bridgestone service tunnel that needs to be removed. Requires action as soon as possible. **This item appeared in the in the 4/10/17, 4/13/18 and 4/30/19 reports.**
- e. The trap at Station B-50 is hammering and there is only about a 10 to 15 second lag between cycles. It is an Armstrong 812 bucket trap. Based upon heat loss calculations by TEG and the length of piping that is serviced by this trap, the trap should only be exposed to approximately 75 to 100 lb/hr of condensate. CNE should confirm that the traps west/upstream of this trap are functioning properly and report their findings to TEG. CNE should also confirm the size and rating of the orifice of the B-50 trap and report this information to TEG. This information should be confirmed and reported to TEG as soon as possible. Upon TEG's review of this information, TEG will determine if a sparge tube needs to be installed at this location.
- f. The trap piping at Station B-20 should be insulated for personnel protection. Requires action within the next quarter. **This item appeared in the 4/10/17, 4/13/18 and 4/30/19 reports.**
- g. There is some minor to severe corrosion on the piping supports in Manhole 18 (at the east end of the tunnel), B-17, B-32, B-65, B-66 and B-68. TEG is developing a scope to address this and will coordinate the implementation of this scope with CNE.
- h. The piping support Teflon slides at locations B-6, B-8, B-10, B-13, B-14, B-16, B-17, B-19, B-20, B-21, B-22, B-26, B-31, B-33, B-34, B-35, B-37, B-41, B-43, B-46, B-53, B-57, B-60, B-62, B-63, B-65, B-68, B-69, B-72, B-74, B-75, B-77, B-78, B-80, B-81, B-85, B-86, B-88, B-89, B-93, B-94 and B-96 are in need of repair. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
- i. The condensate piping support at Station B-38 has failed. It consists of an upside-down tee placed underneath, and welded to, the underside of the piping that rests on a horizontal square tube. Either side of the tee's flange is "cradled" by small angles that guide the movement of the piping. The tee has buckled, and its web is now in an angled position. TEG is currently developing a scope to make this repair and will coordinate the repair with CNE.
- j. The emergency lights at Stations B-29, B-77 and B-85 are not working. CNE should repair these lights as soon as possible.
- k. The chilled water drain piping at Station B-62 is uninsulated. This piping should be insulated to prevent sweating and potentially prevent freezing of this piping in the winter months. CNE should have this work done when

making the other needed insulation repairs in the tunnels. This work should be executed as soon as possible.

- l. The electrical receptacle at Station B-29 is damaged and requires repair. CNE should make this repair as soon as possible.
 - m. There is a lot of debris in Manhole 18 that needs to be cleaned/removed. CNE should have this debris removed within the next quarter. **This item appeared in the 4/25/16, 4/10/17, 4/13/18 and 4/30/19 reports.**
 - n. Lights are not working at stations B-73, B-75, B-76, B-78, B-80, B-83 (Manhole 19 vertical shaft), B-89, B-91 and B-93. In addition, lights are not working in the Bridgestone service tunnel. CNE should repair/replace these lights as soon as possible.
 - o. There is a small hole in the northern wall at station B-49, next to the upper horizontal support connection. CNE should monitor this hole and notify TEG if there are any significant changes.
 - p. There is a pinhole leak just above the trap discharge piping connection on the condensate slip joint at station B-49. CNE should repair this leak as soon as possible.
 - q. A new condensate piping anchor was installed at station ~2+60. The tops of the anchor bolts have surface rust. CNE should wire brush these and paint them with cold galvanizing paint as soon as possible.
6. Manhole 23
- a. There are some surface cracks in the steam and condensate slip joint concrete pedestal. CNE should monitor these cracks and notify TEG of any significant changes.
 - b. The strainer upstream of one of the traps does not have a blowdown valve; A blowdown valve needs to be added to this strainer. Requires attention within the next quarter.
 - c. There is a flanged steam valve in this manhole that is blind flanged. The pipe flange connection is leaking. This flange has a clamp on it with injection nozzles presumably because of prior leaks. CNE should make repairs once the leak is sufficient that injection repairs will be successful.
 - d. The drain in the air intake area in the sidewalk is not draining and water has accumulated. Using a camera, it was discovered that this drain line has collapsed so the drain is not able to drain continuously and at times water will accumulate in this area. The location of the drain line collapse is about 15 feet below grade in 7th Ave. CNE should monitor this floor drain and pump out this area as needed.

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. 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 excellent and professional manner.

A. Marketing

Conversations with the engineering team for two proposed hotels at 1st Ave S and KVB continued during the quarter. This project is tracked under DES-168.

The developer and engineering team for Lot K reported that they remain interested in DES service but are continuing to work through a revised building plan.

Communications with these potential customers and their design teams decreased late in the quarter, presumably due to nCovid-19 pandemic and the decline in economic activity within Davidson County.

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.

-) TEG and CNE met with representatives from the John Sevier building's contractors to discuss the re-installation of the metering equipment and their need to reposition the DES chilled water isolation valves to the building. TEG and CNE coordinated the remaining wiring and programming of the DES metering equipment. Re-activation and startup of the equipment is anticipated in April 2020. TEG and CNE have continue to have ongoing conversations with the building's contractors during their renovations.
-) CNE scheduled and performed a partial shutdown in February to replace a chilled water valve at the Andrew Jackson building.
-) Personnel at the Metro Courthouse notified CNE that they had replaced their chilled water heat exchanger in February and that the new unit was currently operating.
-) The steam isolation valve was replaced at the Fairlane Hotel in coordination with a steam shut down requested by the building.
-) The air compressor at the Andrew Jackson building failed during the quarter and was replaced the same day. This air compressor provides air to the steam control valve for the main State steam tunnel. When air pressure is lost, the valve closes, shutting down the State steam service.

-) Other minor issues and customer interactions are noted in the monthly reports from CNE.

VII. Recommendations

Based on the review of the Third Quarter FY20 EGF and EDS operations, the following recommendations are made.

-) The items noted in the Walkthrough Reports as in need of repair need to be completed prior to the end of the operating contract for the System Operator in accordance with the ARMA paragraph 12.03.
-) TEG is continuing to monitor the chilled water system losses, the water usage at the EGF and the decrease in chiller plant electric efficiency. Although CNE had performed some of the previously noted work on the cooling towers, they need to complete the remaining items and work towards restoring the chiller plant efficiency to its historic values.
-) CNE needs to adequately address the recurring maintenance items included in the EDS Walkthrough section of this report.
-) Corroded structural steel within the vaults and tunnels should be cleaned and coated or replaced.
-) Insulation that is absent or in disrepair in the vaults and tunnels should be addressed through additional capital and R&I projects, and through regular maintenance provided by CNE.
-) Steam traps which need repair or replacement should be addressed as soon as possible.
-) Expansion joint leaks should be repaired by either tightening the packing bolts or injection of packing once the leak(s) is sufficient for the repair to be effective.
-) Debris needs to be cleaned and removed from some areas of the tunnels.