Metro Nashville
DISTRICT ENERGY SYSTEM

Operations Monitoring Report

Second Quarter FY20

Prepared by:

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I. Executive Summary

A review of the fiscal year 2020 (FY20) Second 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 Second Quarter FY20, the chilled water sales increased 2.8% over the previous Second Quarter (FY19) due to a milder than normal quarter. The chilled water sendout increased 2.9% over the previous Second Quarter. The system losses increased approximately 5.6%. The peak chilled water demand for the current quarter was 17,078 tons, which is 13.7% higher than the previous Second Quarter.

Steam sendout for the current quarter increased by approximately 0.5% over the previous Second Quarter with an 11.0% decrease in heating degree days. Likewise, steam sales also decreased by approximately 1.4% over the previous Second Quarter also due to a milder than normal quarter. Total steam system losses increased by 19.2% over the previous Second Quarter. The peak steam demand for the current quarter was 135,438 pounds per hour, which represents an increase in the Second Quarter demand by approximately 10.5%.

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 has experienced a decline over the past year. Total chiller plant electric usage increased 1.6% from the previous Second Quarter. The trend for the unit electric consumption for chilled water has increased over the past year but was 1.2% lower in the Second Quarter FY20 than in FY19. 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. TEG is continuing to monitor the chiller plant performance.

The steam plant electric consumption per unit of sales decreased slightly over the previous Second Quarter by 0.2%. The total water consumption for the steam and chilled water plants increased 11.7% from the previous Second Quarter. The steam plant water usage increased by 5.9% for the quarter.

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, DES152, DES153, DES154, DES157, DES159, DES160, DES161, DES162, DES163, DES168 and DES169 are ongoing. DES135 and DES170 were closed during the Second 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 the prior quarterly monitoring report, 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 $9,304,093. This value represents approximately 45.6% of the total budgeted operating cost for FY20. The customer revenues from the sales of steam and chilled water for FY20 (to date) are $8,753,255 which is approximately 42.9% 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 $550,838.

Metro Nashville
DISTRICT ENERGY SYSTEM

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II. Energy Distribution Sales and Performance

A. Chilled Water

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

1. Sales and Sendout

A comparison for the Second Quarter chilled water sales is shown in Figure 1. This data reflects a 2.9% increase in sales for the current quarter over the same quarter of the previous fiscal year.

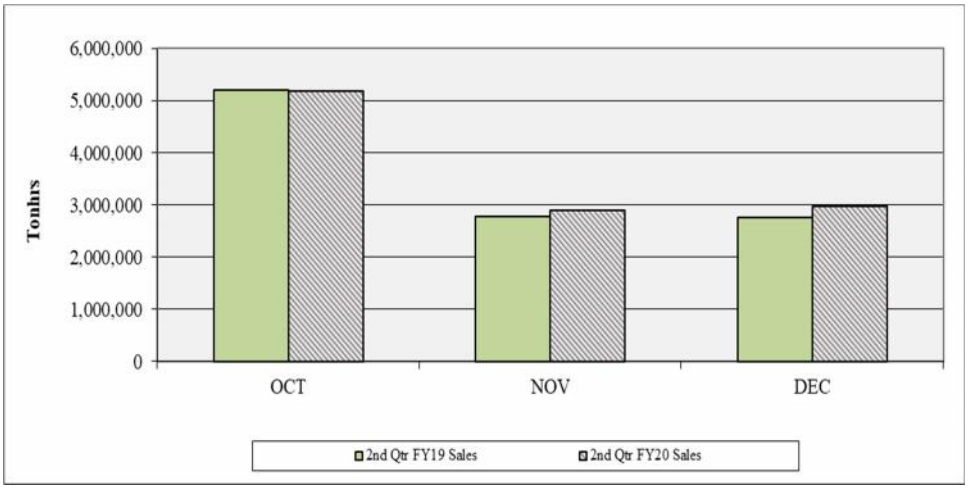

Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 17,078 tons, which represents a 13.7% increase over the previous Second 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.

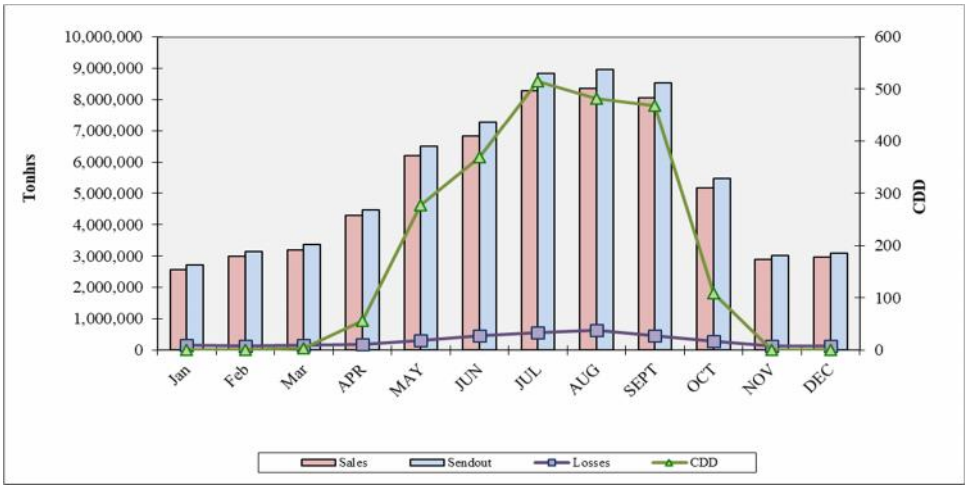

Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

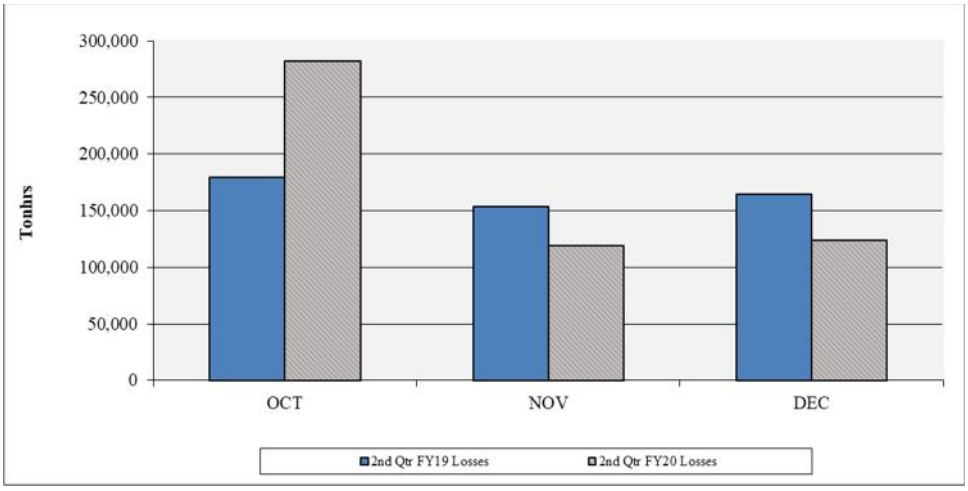

Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by 23.2% over the previous Second Quarter. All but one of the known distribution leaks have been found and repaired. The remaining leak location is on 3rd Ave N but previous efforts to locate this leak 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 27.0% over the previous Second Quarter. The number of cycles of concentration in the condensing water circuit

increased 97.1%; however, CNE had to replace the faulty blowdown meter in September 2019, thus the number of cycles presented could include some erroneous meter readings. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

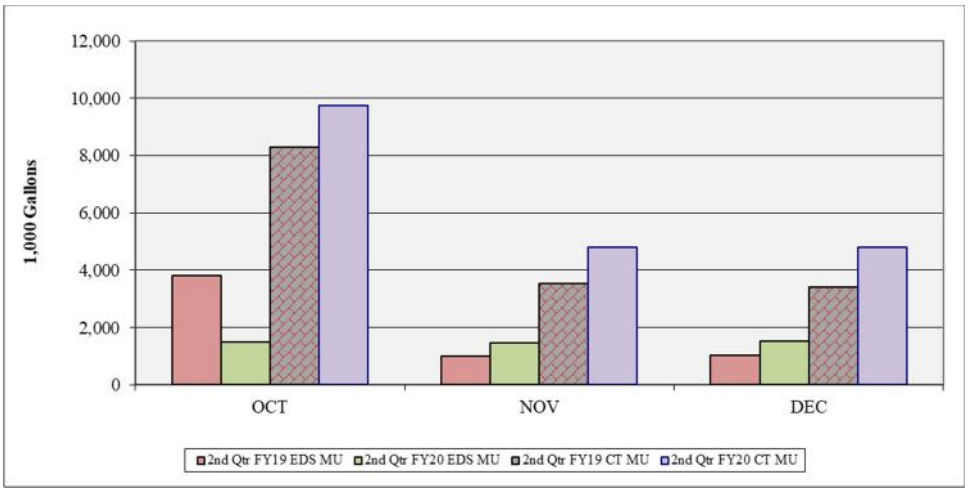

Figure 4. Chilled Water System City Water Usage Comparison

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.

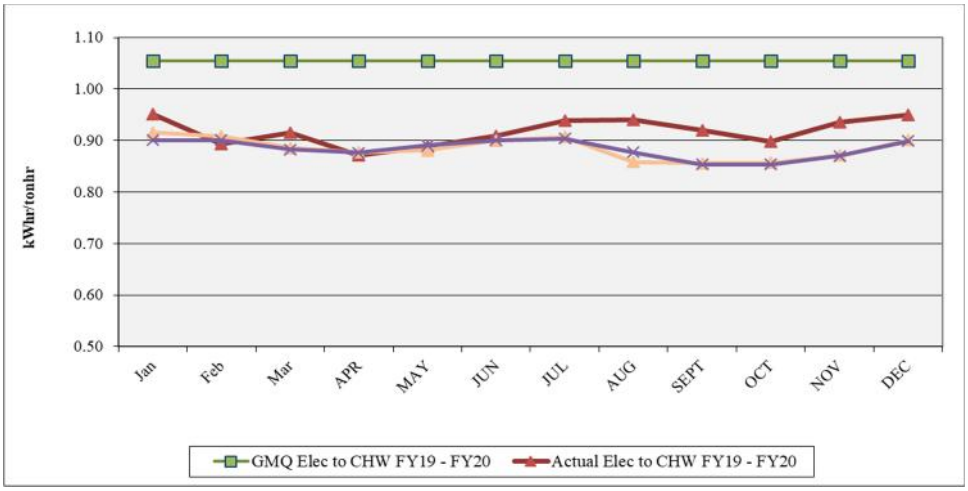

Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

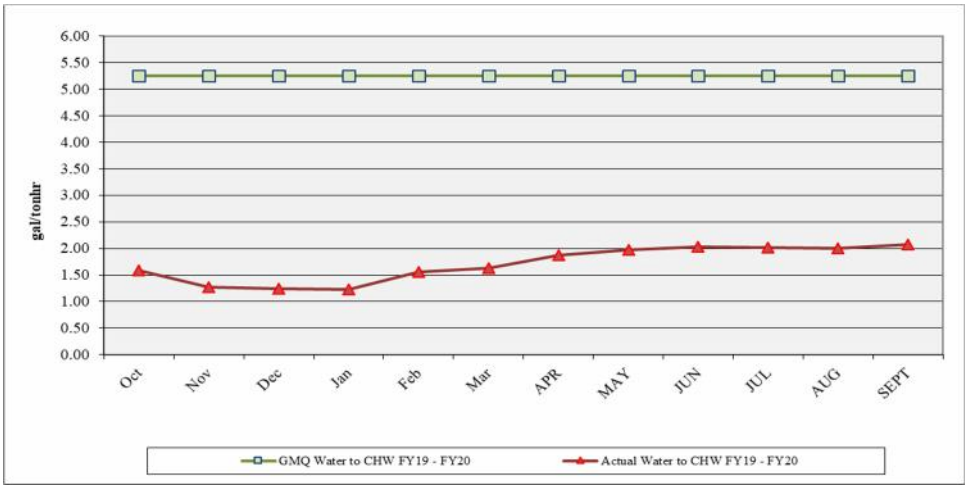

Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

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 decreased 1.2% over the previous Second Quarter. Although the performance for the current quarter is similar to the previous Second Quarter's performance, the general trend of the chiller plant performance shows a decrease in efficiency over historic values (see Figure 5). 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 which may have helped improve this quarter's performance.

The total consumption of city water for the chiller plant for the current quarter has increased by approximately 13.0%. The water conversion factor for the chiller plant increased by approximately 10.0%. 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 0.5% over the previous Second Quarter (FY19), and the sales also decreased by approximately 1.4%. The Quarter experienced an 11.0% decrease in the number of heating degree days.

The steam system losses increased 19.2% over the previous Second Quarter. A comparison for the Second Quarter steam sales is shown in Figure 7.

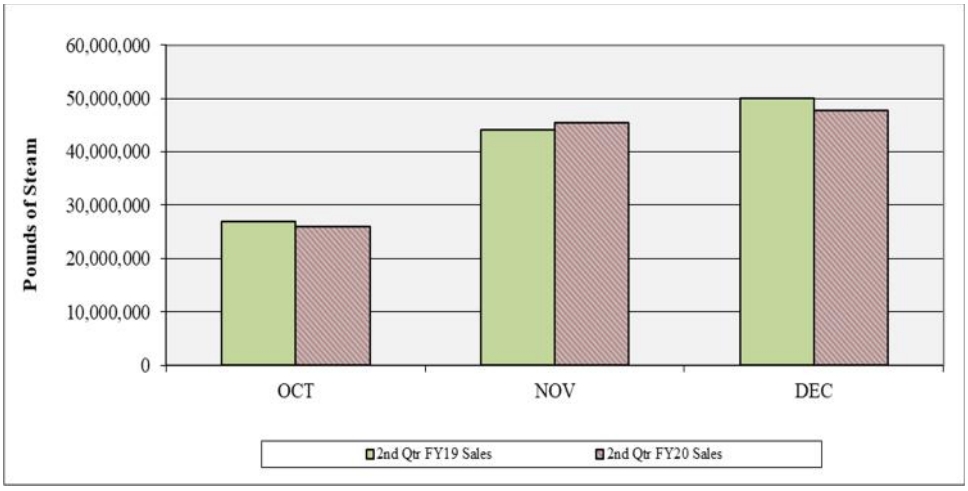

Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 135,438 pph, which reflects an approximate 10.5% increase in the peak steam production over the previous Second 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.

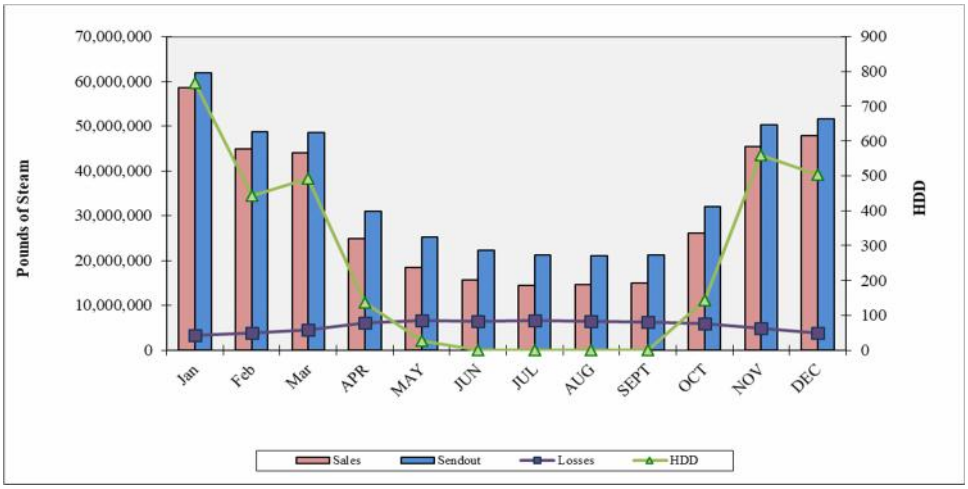

Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

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

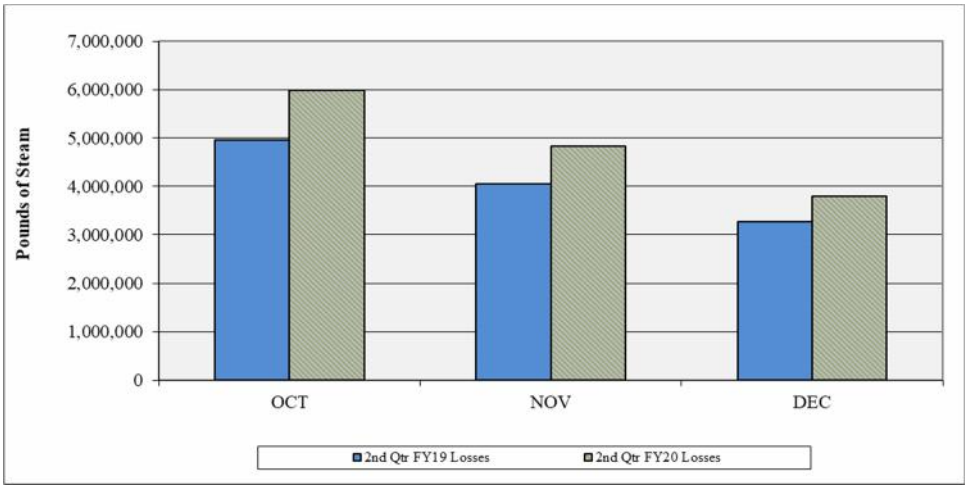

Figure 9. Steam System Losses

The amount of city water make-up (MU) to the steam system consists of the loss in mass between the EGF and the customers, in the condensate return from the customers to the EGF and losses at the EGF. The amount of condensate return decreased by approximately 5.9% during the Second Quarter. This data is shown in the comparison of Second Quarter data in Figure 10.

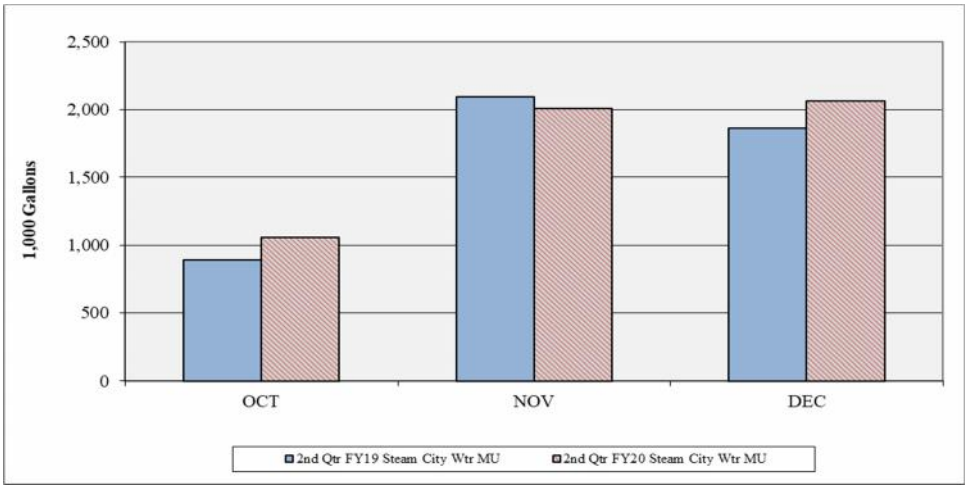

Figure 10. Steam System City Water Make-up Comparison

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.

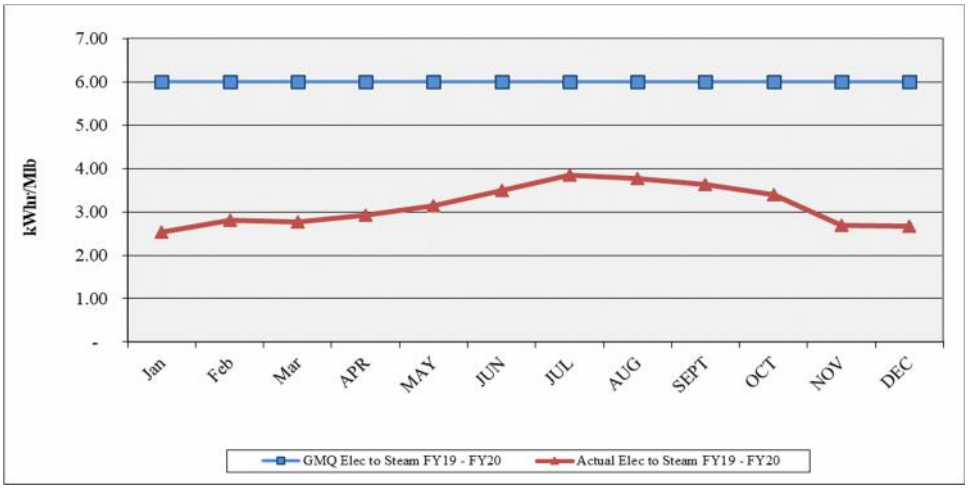

Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

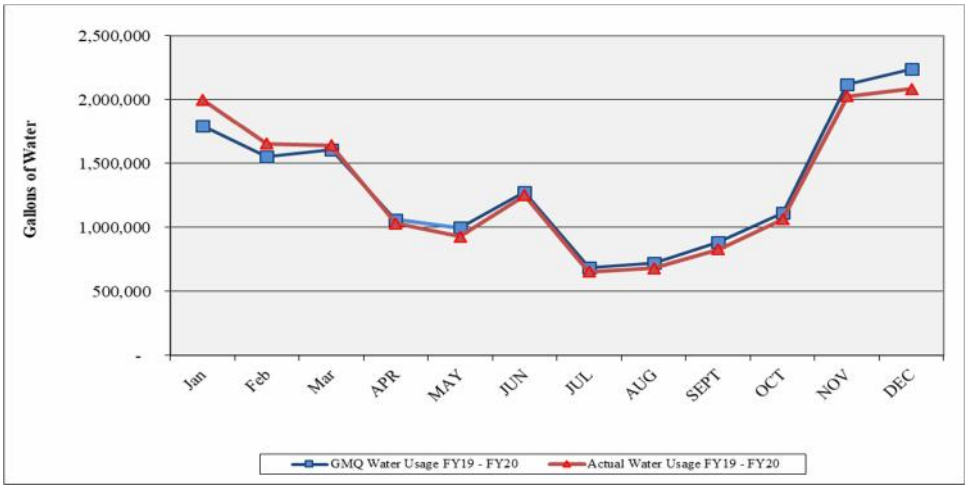

Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

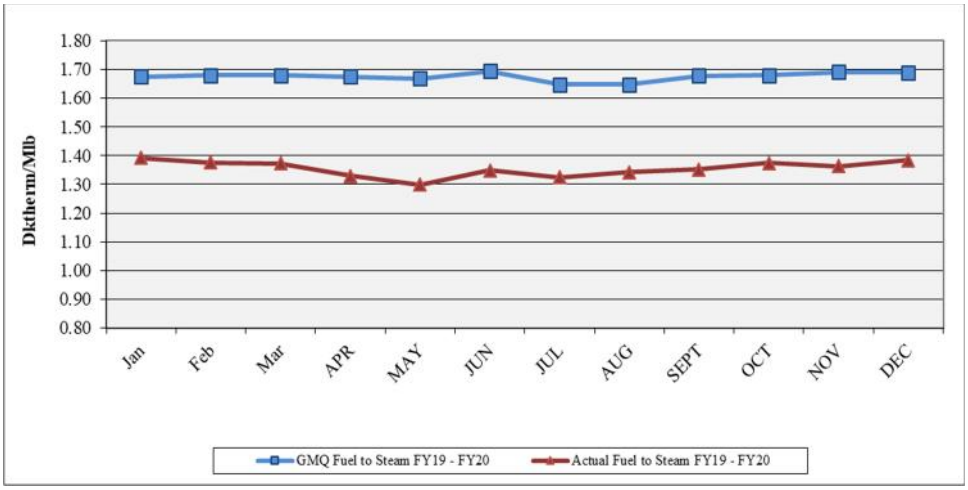

Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced a 1.6% decrease in the steam plant electric consumption while experiencing a marginal decrease in the electric conversion factor. The water consumption for the steam plant increased 5.9% this quarter as compared to the previous Second Quarter. The fuel consumption per unit of steam sales was 0.6% lower than in the previous Second 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 Second Quarter comparisons of the Guaranteed Maximum Quantities (GMQ) of the criteria commodities (fuel, water and electricity).

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

Item	Unit	Second Quarter FY20	Second Quarter FY19	*Percent Difference
	days	92	92	0.00%
Total Electric Use	kWhrs	10,513,955	10,361,974	1.47%
Chilled Water	kWhrs	10,175,942	10,018,497	1.57%
Steam	kWhrs	338,013	343,477	-1.59%
Total Water Use	kgal	28,982	25,945	11.71%
Total Chilled Water	kgal	23,857	21,105	13.04%
EDS Make-up	kgal	4,501	5,864	-23.24%
Cooling Towers	kgal	19,356	15,241	27.00%
Calc CT Evaporation	kgal	17,004	11,976	41.98%
CT Blowdown	kgal	2,352	3,265	-27.96%
Calc # Cycles		7.23	3.67	97.10%
Steam	kgal	5,125	4,840	5.89%
Total Fuel Use	mmBTU	184,041	184,198	-0.09%
Natural Gas	mmBTU	183,934	184,112	-0.10%
Propane	mmBTU	107	86	24.42%
Condensate Return	kgal	11,666	12,401	-5.92%
	lbs	95,146,146	101,138,249	-5.92%
Avg Temp	°F	178.3	177.7	0.38%
Sendout				
Chilled Water	tonhrs	11,566,300	11,237,600	2.93%
Steam	lbs	133,974,000	133,286,000	0.52%
Peak CHW Demand	tons	17,078	15,025	13.66%
Peak Steam Demand	lb/hr	135,438	122,531	10.53%
CHW LF		30.67%	33.87%	-9.45%
Steam LF		44.80%	49.27%	-9.06%
Sales				
Chilled Water	tonhrs	11,040,871	10,740,092	2.80%
Steam	lbs	119,346,942	121,015,317	-1.38%
Losses				
Chilled Water	tonhrs	525,429	497,508	5.61%
Steam	lbs	14,627,058	12,270,683	19.20%
		10.92%	9.21%	18.59%
Degree Days				
CDD		109	138	-21.01%
HDD		1,205	1,354	-11.00%

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

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

GMQ Calculations	Unit	Second Quarter FY20	Second Quarter FY19	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	2.83	2.84	-0.22%
GMQ Plant Efficiency	Dth/Mlb	1.687	1.678	
Plant Efficiency	Dth/Mlb	1.374	1.382	-0.60%
Actual %CR		71.02%	75.88%	-6.41%
Avg CR Temp	°F	178	178	0.38%
GMQ Water Conversion	gal	5,474,847	4,532,932	
Water Conversion	gal	5,176,250	4,888,400	5.89%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.922	0.933	-1.20%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.16	1.97	9.96%

*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 $9,304,093. This value represents approximately 45.6% of the total budgeted operating cost for FY20. The customer revenues from the sales of steam and chilled water for FY20 (to date) are

$8,753,255 which is approximately 42.9% 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. The fiscal year to date amount required is $550,838.

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	$ -	$ -	$ 2,193,968	50.36%
	9th Chiller	$ 42,800	$ 10,754	$ 10,754	$ -	$ -	$ 21,509	50.25%
	C/O 6A	$ 86,200	$ 21,233	$ 21,233	$ -	$ -	$ 42,465	49.26%
	C/O 6B	$ 75,500	$ 18,588	$ 18,588	$ -	$ -	$ 37,176	49.24%
	C/O 7	$ 27,800	$ 7,003	$ 7,003	$ -	$ -	$ 14,005	50.38%
	C/O 8	$ 12,300	$ 3,065	$ 3,065	$ -	$ -	$ 6,129	49.83%
Pass-thru Charges:	Chemical Treatment	$ 253,100	$ 47,826	$ 55,733	$ -	$ -	$ 103,559	40.92%
	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	$ -	$ -	$ 43,275	66.50%
	Chilled Water	$ 177,124	$ 109,741	$ 57,013	$ -	$ -	$ 166,753	94.14%
Misc:	Metro Credit	$ -	$ (202,506)	$ (141,292)	$ -	$ -	$ (343,798)	n.a.
	ARFA	$ 66,300	$ 16,587	$ 16,669	$ -	$ -	$ 33,256	50.16%
	Deferral	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Subtotal - Man Fee =	**$ 5,194,600**	**$ 1,350,083**	**$ 1,331,597**	**$ -**	**$ -**	**$ 2,681,680**	**51.62%**
Reimbursed Management Fee + Chem Treatment			$ 902,059	$ -	$ -	$ -	$ 902,059	0.00%
Metro Costs								
Pass-thru Charges:	Engineering	$ 27,100	$ 17,333	$ 14,661	$ -	$ -	$ 31,994	118.06%
	EDS R&I Transfers	$ 287,600	$ 71,900	$ 71,900	$ 23,967	$ -	$ 167,767	58.33%
	Metro Marketing	$ 10,900	$ -	$ -	$ -	$ -	$ -	0.00%
	Project Administration	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Metro Incremental Cost	$ 324,200	$ 71,779	$ 64,457	$ -	$ -	$ 136,235	42.02%
Utility Costs:	Water/Sewer	$ 620,000	$ 189,195	$ 126,787	$ -	$ -	$ 315,981	50.96%
	EDS Water/Sewer	$ -	$ 273	$ 334	$ -	$ -	$ 607	n.a.
	EDS Electricity	$ 59,200	$ 13,414	$ 14,505	$ -	$ -	$ 27,919	47.16%
	Electricity	$ 5,814,700	$ 1,829,987	$ 913,884	$ -	$ -	$ 2,743,871	47.19%
	Natural Gas Consultant	$ 12,400	$ 1,000	$ -	$ -	$ -	$ 1,000	8.06%
	Natural Gas Transport	$ -	$ 40,856	$ 69,085	$ -	$ -	$ 109,941	n.a.
	Natural Gas Fuel	$ 2,959,100	$ 185,302	$ 457,256	$ -	$ -	$ 642,558	21.71%
	Propane	$ -	$ -	$ 61,141	$ -	$ -	$ 61,141	n.a.
	Subtotal - Metro Costs =	**$ 10,115,200**	**$ 2,421,039**	**$ 1,794,009**	**$ 23,967**	**$ -**	**$ 4,239,015**	**41.91%**
	Subtotal - Operations =	**$ 15,309,800**	**$ 3,771,122**	**$ 3,125,606**	**$ 23,967**	**$ -**	**$ 6,920,695**	**45.20%**
Debt Service	2012 Bonds	$ 3,485,800	$ 868,963	$ 868,963	$ -	$ -	$ 1,737,925	49.86%
	2005 Bonds -Self Funded	$ 401,100	$ 49,323	$ -	$ -	$ -	$ 49,323	12.30%
	2007 Bonds -Self Funded	$ 181,700	$ 45,425	$ 45,425	$ -	$ -	$ 90,850	50.00%
	2008 Bonds -Self Funded	$ 181,400	$ 45,350	$ 45,350	$ -	$ -	$ 90,700	50.00%
	2010 Bonds -Self Funded	$ 183,200	$ 45,800	$ 45,800	$ -	$ -	$ 91,600	50.00%
	Fund 49107 -Self Funded	$ 646,000	$ 161,500	$ 161,500	$ -	$ -	$ 323,000	50.00%
	MIP	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Oper. Reserve Fund	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Subtotal - Capital =	**$ 5,079,200**	**$ 1,216,361**	**$ 1,167,038**	**$ -**	**$ -**	**$ 2,383,398**	**46.92%**
	Total =	**$ 20,389,000**	**$ 4,987,483**	**$ 4,292,644**	**$ 23,967**	**$ -**	**$ 9,304,093**	**45.63%**
Customer Revenues								
	Taxes Collected		$ 96,963	$ 79,459	$ -	$ -	$ 176,422	n.a.
	Taxes Paid		$ -	$ -	$ -	$ -	$ -	n.a.
	Interest & Misc Revenue	$ 192,400	$ 45,476	$ 45,935	$ -	$ -	$ 91,410	47.51%
	Penalty Revenues/Credits		$ 22,252	$ (153,877)	$ -	$ -	$ (131,625)	n.a.
	Energy Revenues Collected		$ 4,658,529	$ 3,958,519	$ -	$ -	$ 8,617,048	45.85%
	Revenues =	**$ 20,389,000**	**$ 4,823,220**	**$ 3,930,036**	**$ -**	**$ -**	**$ 8,753,255**	**42.93%**
	Metro Funding Amount =	**$ -**	**$ 164,263**	**$ 362,608**	**$ 23,967**	**$ -**	**$ 550,838**	**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	$ 1,979,821	11,607,847	$ 0.1706	$ 633,329	41,453	$ 15.2782
State Government	$ 1,692,593	7,161,939	$ 0.2363	$ 804,027	48,450	$ 16.5948
Metro Government	$ 2,671,457	16,962,155	$ 0.1575	$ 835,820	73,447	$ 11.3800
New Customers	$ 1,728,075	10,930,615	$ 0.1581	$ 578,537	57,285	$ 10.0993
Total	**$ 6,343,871**	**35,731,941**	**$ 0.1775**	**$ 2,273,176**	**163,350**	**$ 13.9160**

Total Revenue	**$ 8,617,047**
True-up and Adjustments (Net)	**$ 136,208**
Net Revenue	**$ 8,753,255**

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.

- The steam pressure dropped due to a jack shaft sticking on boiler 3's air damper on October 21. The system was below 150 psig for approximately 60 minutes.
- The boilers tripped offline while C.E. Power was conducting the annual preventative maintenance on the switchgear on October 29. The system was below 150 psi for approximately 105 minutes with a low pressure of 59 psig.
- A scheduled steam outage occurred on November 10 through 11 that lasted for 11 hours. The system pressure was below 150 psig for this time.

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 CNE's Storm Water Pollution Prevention Plan and their Spill Prevention Controls and Countermeasures, Heat and Cold Stress and Steam and Refrigerant Safety.

D. Personnel

With the passing of one CNE employee during the quarter and the retirement of two others, CNE finished the quarter 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
  - The condensate return averaged approximately 71.0% of the steam sendout during the quarter, which represents a 6.4% decrease over the previous Second Quarter.
  - Feedwater iron, pH and hardness remained within their acceptable ranges during the quarter.
- Condensing Water System
  - The conductivity of the condensing water continues to be normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.
- Chilled Water System
  - 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;
- Repaired level transmitter on cooling towers;
- Repaired leak on boiler 2 low water cutout;
- Replaced the fan belt on cooling towers 12 and 16;
- Repaired cooling tower 9 inlet valve;
- Replaced cooling tower make-up valve and repaired leak;
- Replaced flow switch on chiller 6 evaporator;
- Replaced capacitor bank fuses;
- Repaired CWP 5 soft start;
- Repaired boiler 1 blowdown valve;
- Replaced relays in switchgear 1;
- Repaired the strainer on cooling tower 18;
- Adjusted the fan jack shaft on boiler 1;
- Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

H. EGF Walkthrough

A quarterly Walkthrough of the EGF was performed on January 7, 2020, by Kevin Jacobs, P.E. with TEG. This review involved a tour of the facility with the primary points of interest and concern noted herein. 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.

- During the Fourth Quarter FY17 Walkthrough report, it was noted that additional rust spots were observed on the riser tubes for cooling towers #1, #5, #6, #11, #16 and #18. The riser tubes for most of the cooling towers now show signs of degradation. CNE has not made the repairs on the riser tubes. In addition,

cooling tower fill being stored on the cooling tower deck beneath the basins has been noted by CNE as being of the new style. No old or damaged fill is currently being stored. No additional work has been performed on the riser tubes since the First Quarter Walkthrough FY18.

- In previous Walkthrough reports, it was noted that significant scale was observed on the fill (louvers) to several of the cooling towers. The scale remains on these cooling towers and most of the cells now have significant scale or deposits on the fill (louvers). CNE began cleaning some of the towers and their louvers during the quarter. Where the cleaning has occurred, the scale has been largely removed. Work on the balance of the towers 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.
- 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 is becoming 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.
- CNE repaired the leak on the condensate line between the two de-aerators. However, the repaired piping had not been re-insulated.
- Four of the sycamore trees on the west side of the EGF appear to have died. CNE needs to cut down and remove the dead trees and replace them. The remains of the one tree that fell over during storms in June 2019 have been stacked against the plant wall. An additional tree has fallen over or was pushed over during the quarter. CNE has stated that they are soliciting bids to have the dead trees and their debris removed. CNE and Metro plan to discuss CNE's tree replacement plan during the January Operations Meeting.
- Cooling tower 3 has been out of service for at least six months. CNE is aware of the problem and what is needed to make repairs. CNE stated that they plan on making the necessary repairs and returning the tower to service by the cooling season.
- Other action items previously noted to be addressed by CNE have been completed. (See also the "Quarterly EGF Walkthrough Report," dated January 8, 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 statuses of the projects are discussed, and the project cost-to-date and bond balances are also presented.

A. Second Quarter FY20 Open Projects

The following projects remained open at the end of the Second 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. DES135 – CHW Leak at 5th and Union

The water department is substantially complete with the replacement of the water main in 5th Avenue North, one block south of the JK Polk Building and the water infiltration at the JK Polk has been reduced substantially, therefore, this project is being closed. However, TEG and CNE will continue to monitor the system and its make-up rate and if evidence of a leak location is discovered, it will be addressed as an R&I project or through the assignment of a capital project.

4. 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.

5. 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.

6. 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. It is anticipated that a pre-bid meeting will be scheduled during the Third Quarter FY20.

7. 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.

8. 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. It is anticipated that the work will be completed during the Third Quarter FY20.

9. 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.

However, this project was bid and awarded during the First Quarter FY20 and the work was begun during the Second Quarter FY20. It is anticipated that the work will be completed during the Third Quarter FY20.

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

The instrumentation and metering system were delivered to the building's contractor during the Fourth Quarter FY19. Chilled water is expected to be used by the contractor during construction; however, the contractor has not completed enough of the HVAC system to utilize chilled water as of the date of this report. Due to delays in the building's construction, the substantial completion date is not expected until the Fourth Quarter FY20. However, the date of actual chilled water service usage remains unknown and subject to the building's requirements. Invoicing for their demand charges will begin in January 2020 based on the terms of their agreement executed in October 2018.

11. DES161 – Manhole S6 Insulation

This project addresses the installation of insulation in Manhole S6 which is a small manhole in the State distribution system. Due to higher priority projects, this project was delayed. It is anticipated that this work will be bid and started during the Third Quarter FY20.

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

Completion of the wet taps on the DES chilled water mains near 2nd Avenue South and Molloy St occurred during the First Quarter FY20. The delivery and installation of some of the piping was completed during the Second Quarter FY20. The building's contractor elected to postpone the completion of this piping until February 2020 due to some higher priority work in the vicinity of the piping. It is anticipated that the piping installation will be complete during the Third Quarter FY20. Service should be available by the Spring of 2020 if required by the building's owner or contractor. The Hyatt Centric is expected to open in April 2021.

13. DES163 – New Service to MDHA Parcel K

Negotiations with this potential customer are in the early stages.

14. 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.

15. DES169-Manhole 20 Repairs

Manhole 20 is connected to the 7th Avenue Tunnel and houses the 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 is scheduled early in the Third Quarter FY20. The work is anticipated to be complete by the end of the Third Quarter FY20.

16. DES170 – Manhole 18 Anchor Repairs Phase II

It was discovered that a steam/condensate anchor at the east end of the Broadway Tunnel at Manhole 18 had moved to the east 3 to 4 inches. TEG reviewed the piping/anchor and determined that a partial anchor failure had occurred. TEG also analyzed the piping configuration and determined that additional undesirable movement could occur with this piping which could jeopardize the integrity and operation of the steam and condensate system. A Change Directive was issued on project DES158 (Manhole 18A Repairs) to install bracing to prevent further movement of the steam piping and this work was substantially completed on March 19, 2019. DES170 addresses the additional work needed to re-position both the steam and condensate return piping and permanently re-anchor this piping.

This work was designed, bid and awarded during the First Quarter FY20. A steam system shutdown occurred during the Second Quarter FY20 and the work was successfully executed. The City has been invoiced and this project is now closed.

B. Second Quarter FY20 Closed Projects

DES135 and DES170 were closed during the Second 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	$ -
	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	$ -	$ 6,172	$ 6,172	$ (6,172)
DES135	Chilled Water Leak	$ 100,000	$ 819	$ 43,638	$ 56,362
DES139.1	Options Review	$ 75,000	$ 30,152	$ 108,461	$ (33,461)
DES151	MH 23 Repairs	$ 175,000	$ 180,757	$ 257,878	$ (82,878)
DES152	MH A & M Repairs	$ -	$ -	$ -	$ -
DES153	MH L Repairs	$ 110,000	$ 4,718	$ 7,651	$ 102,349
DES154	MH K Repairs	$ 100	$ -	$ 85	$ 15
DES157	MH 9 Repairs	$ 75,000	$ 58,478	$ 77,698	$ (2,698)
DES158	MH 18A Repairs	$ 110,000	$ -	$ 64,662	$ 45,338
DES159	MH B2 Repairs	$ 110,000	$ 3,657	$ 15,344	$ 94,656
DES160	5th + Broadway Service	$ 60,000	$ 1,943	$ 49,900	$ 10,100
DES161	MH S6 Insulation	$ 30,000	$ -	$ -	$ 30,000
DES162	3rd and Molloy Service	$ 220,000	$ 77,259	$ 111,076	$ 108,924
DES163	Parcel K Service	$ 707,300	$ -	$ 1,124	$ 706,176
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	$ 190	$ 5,600	$ 4,400
DES169	MH-20 Repairs	$ 40,000	$ 442	$ 10,174	$ 29,826
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
	Total Closed Projects	$ 15,723	$ -	$ 15,723	$ -
	Metro Project Admin	$ -	$ -	$ -	$ -
	Project Man, Development, etc	$ 697,600	$ -	$ -	$ 697,600
	CHP and EDS Repairs	**$26,000,000**	**$ 558,337**	**$1,380,657**	**$24,619,343**

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

Several EDS repairs and improvements were made during the Second 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 $73,184. 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	-	-	$ 151.26				
Interest/Transfer	07/01/19	-	-	$ (151.26)				
CNE July 2019 Invoice	09/11/19	-	CNE	$ 11,319.33				
EMR19-003	08/26/19	-	CNE	$ 46,254.14				
Interest/Transfer	08/01/19	-	-	$ 187.92				
Interest/Transfer	08/01/19	-	-	$ (187.92)				
CNE Aug 2019 Invoice	09/19/19	-	CNE	$ 8,278.99				
Interest/Transfer	09/03/19	-	-	$ 208.87				
Interest/Transfer	09/03/19	-	-	$ (208.87)				
EMR19-005 CND Leak Repair	10/22/19	-	CNE	$ 2,850.00				
CNE Sept 2019 Invoice	10/22/19	-	CNE	$ 8,531.49				
		Sub-Total First Quarter		**$ 77,233.95**	**$ 71,900.01**	**$ -**	**$ (5,333.94)**	**$ (5,333.94)**
EMR19-003 CO 1	10/28/19	-	CNE	$ 8,357.26				
Interest/Transfer	10/01/19	-	-	$ 222.72				
Interest/Transfer	10/01/19	-	-	$ (222.72)				
EMR19-006 MH-D1 Vault Lid	11/20/19	-	CNE	$ 17,330.83				
CNE Oct 2019 R&I Invoice	11/20/19	-	CNE	$ 6,302.29				
Interest/Transfer	11/01/19	-	-	$ 236.52				
Interest/Transfer	11/01/19	-	-	$ (236.52)				
CNE Nov 2019 R&I Invoice	12/18/19	-	CNE	$ 10,487.42				
EMR 19-007 3rd Ave Excavation	12/18/19	-	CNE	$ 30,005.67				
Interest/Transfer	12/02/19	-	-	$ 228.91				
Interest/Transfer	12/02/19	-	-	$ (228.91)				
CNE Dec 2019 R&I Invoice	01/16/20	-	CNE	$ 8,579.11				
		Sub-Total Second Quarter		**$ 81,062.58**	**$ 71,900.01**	**$ -**	**$ (9,162.57)**	**$ (9,162.57)**
		Sub-Total Third Quarter		**$ -**	**$ 23,966.67**	**$ -**	**$ 23,966.67**	**$ 23,966.67**
		Sub-Total Fourth Quarter		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		FY20 Year to Date		**$ 158,296.53**	**$ 167,766.69**	**$ -**	**$ 73,184.24**	**$ 73,184.24**

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 Inspections
    a. The monthly vault 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. Water chemistry samples at customer buildings were taken as scheduled.
4. Other EDS Inspections
    a. Other items are included in the CNE monthly reports.

C. Emergencies

No emergencies were reported during the quarter.

D. EDS Walkthrough

The Second Quarter FY20 walkthrough was conducted on January 8, 21 and 22, 2020. The manholes that were visited include Manholes B1, B2, B3, B4, B6, B7, B8, B9, B10, 14A, 16A, 22B, Viridian, S4A, U, D1 and D. The following comments and observations are a result of these visits:

1. Manhole B1
    a. This is sump pump manhole located in 1st Avenue South to the west of Manhole B. It was constructed a few years ago to reduce the amount of groundwater infiltration in Manhole B.
    b. The ladder in this manhole is comprised of individual rungs embedded in the manhole concrete wall. Our experience with these ladders is that an individual rung might fail without warning. Therefore, this ladder should be replaced with a siderail type ladder. TEG will coordinate with CNE to have this replacement scheduled.
    c. There is not a working platform in this manhole to enable maintenance personnel to maintain the sump pump and its controls. A working platform should be added to this manhole. TEG will coordinate with CNE to have this work scheduled.

2. Manhole B2
    a. There was water in this manhole, and it required pumping prior to entry.
    b. This manhole has an electric sump pump, however because the sump is not very deep, the pump and float mechanism are not sufficiently below the

manhole floor to enable all of the water in the floor to be removed. Therefore, there is always a small amount of water in the floor of the manhole. A current project, DES-159, included the replacement/deepening of this sump to eliminate this problem. Before starting the replacement of this sump, the contractor was instructed to drill a test hole in the bottom of the existing sump to determine the impact of the groundwater table on its replacement. Unfortunately, groundwater began streaming into the manhole from this test hole, so it was determined that there was not a reasonable way to remove/replace this sump.

c. The electric sump pump in this manhole was not working and requires repair or replacement.
d. DES-159 included the addition of two clean outs in the sump pump discharge piping.
e. DES-159 included the cleaning and coating of corroded steel supports within this manhole.
f. There are some hairline cracks in the manhole ceiling and walls. CNE should continue to monitor these cracks and inform TEG of any significant changes.
g. Since the Second Quarter FY19 report, the ventilation manway located in the sidewalk that was protruding above the surface has been repaired by the developer of the site.
h. Any mud and debris in the manhole will be removed at the completion of DES-159 by the contractor.

3. Manhole B3
   a. This manhole is within the construction site of a new hotel and therefore access had to be coordinated with the site contractor.
   b. There was water present in this vault, and it required pumping prior to entry.
   c. There is some corrosion on the piping supports. These supports should be cleaned and coated to prevent additional corrosion. TEG is communicating with the hotel contractor to try and schedule this to be done prior to the end of 2020. Some minor cleaning and painting were conducted during the review.
   d. There is some minor insulation and insulation jacketing repair needed in this vault; TEG will coordinate with CNE to have this insulation work completed when the steel corrosion is addressed.
   e. There is some minor spalling of a concrete wall where it appears that rebar chairs were placed during the vault's original construction. These spalled places should be patched to prevent further deterioration of the concrete. TEG will coordinate with CNE to have this insulation work completed when the steel corrosion is addressed.
   f. There are several hairline cracks in the ceiling of this vault; CNE should continue to monitor these cracks and inform TEG of any significant changes.

g. There is some debris and mud in this manhole that was removed during this review.

4. Manhole B4
   a. There was water in this manhole which required pumping prior to entry.
   b. There is some corrosion of the structural components in this manhole. CNE has cleaned and painted most of these areas however there was one additional area that required cleaning and painting. This area was cleaned and painted during this review. CNE should continue to monitor these structural components for corrosion and clean and paint as needed. This manhole is budgeted to have all structural steel thoroughly cleaned and coated in FY21.
   c. There is some moderate insulation repair needed in this vault; this will be included in the FY21 budgeted work scope.
   d. There are several hairline cracks in the ceiling of this vault; these cracks should be monitored, and any significant changes should be reported to TEG.
   e. Some of the foam sealant used at the piping wall penetrations has started to "pull away" from the concrete holes. At this time, groundwater is not leaking through any of these penetrations. CNE should continue to monitor these seals and report any changes to TEG.

5. Manhole B6
   a. There was water in this manhole which required pumping prior to entry.
   b. Some minor deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.
   c. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a "standard" bucket trap as soon as possible. This item appeared in the January 22, 2019 and the January 26, 2018 Quarterly Walkthrough Report.
   d. There is some hairline cracking of the concrete. CNE should monitor this cracking and notify TEG if there are any significant changes.
   e. A trap line support stanchion is corroded and should be replaced. To reduce the susceptibility to corrosion, CNE should install a galvanized wall brace support to replace this support. TEG will provide a design drawing for this addition for CNE to execute.

6. Manhole B7
   a. There was not any appreciable water in this manhole, and it did not require pumping prior to entry.
   b. The insulation on the sparge tube has been repaired by CNE.
   c. Some deterioration of the grout behind the anchor beam baseplates has occurred. CNE should repair this as soon as possible using a plastic

consistency, non-shrink, nonmetallic grout. This should be repaired within the next quarter.

d. CNE has wire brushed/wire wheeled/cleaned and then painted the areas of minor corrosion. CNE should continue to monitor and maintain these areas as required.
e. The entry ladder has an extension that was added to the upper portion to be closer to street level. The original entry ladder was galvanized but the extension was not and had some minor corrosion. CNE cleaned and painted this extension during this review. CNE should monitor and maintain this ladder section.
f. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a "standard" bucket trap as soon as possible. This item appeared in the January 22, 2019 and the January 26, 2018 Quarterly Walkthrough Reports.
g. The existing trap piping support stanchion is badly corroded and should be removed. Due to the short length of trap piping, a replacement support is not needed.

7. Manhole B8
   a. There was water in this manhole, and it required pumping prior to entry.
   b. There are some hairline cracks in the ceiling; these should be monitored by CNE and any significant changes reported to TEG.
   c. Some deterioration of the grout behind the anchor beam baseplates has occurred. CNE should repair this as soon as possible using a plastic consistency, non-shrink, nonmetallic grout. This should be repaired within the next quarter.
   d. CNE has wire brushed/wire wheeled/cleaned and then painted the areas of minor corrosion. CNE should continue to monitor and maintain these areas as required.
   e. One of the two trap strainers did not have a blowdown valve. CNE should add a blowdown valve to this strainer.
   f. A trap line isolation valve is missing its handwheel. CNE should install a new handwheel on this valve as soon as possible.

8. Manhole B9
   a. There was water in this manhole, and it required pumping before entry.
   b. There was some mud in this manhole; CNE should remove the mud as soon as possible.
   c. There are some hairline cracks in the ceiling of this vault. CNE should monitor these cracks and report any significant changes to TEG.
   d. Some deterioration of the grout behind the anchor beam baseplates has occurred. CNE should repair this as soon as possible using a plastic consistency, non-shrink, nonmetallic grout. This should be repaired within the next quarter.

e. CNE has wire brushed/wire wheeled/cleaned and then painted the areas of minor corrosion. CNE should continue to monitor and maintain these areas as required.

9. Manhole B10
   a. There was water in this manhole, and it required pumping prior to entry.
   b. Some deterioration of the grout behind the anchor beam baseplates has occurred. CNE should repair this as soon as possible using a plastic consistency, non-shrink, nonmetallic grout. This should be repaired within the next quarter.
   c. CNE has wire brushed/wire wheeled/cleaned and then painted the areas of minor corrosion. CNE should continue to monitor and maintain these areas as required.
   d. There are some hairline cracks in the ceiling of this vault. CNE should monitor these cracks and report any significant changes to TEG.
   e. There are two trap piping support stanchions which have experienced some moderate corrosion. These supports can be replaced with a single galvanized wall mounted pipe support. TEG will provide a design drawing for this addition for CNE to execute.

10. Viridian Manhole
   a. There was a minor amount of water in the manhole and did not require pumping prior to entry.
   b. There is some minor insulation jacketing repairs needed in this vault but they are not significant enough to warrant repair at this time.

11. Manhole 16A
   a. CNE wire brushed/cleaned and then painted the shear lugs attached to the chilled water piping during this review. CNE should continue to monitor and maintain these areas as required.
   b. There was a small quantity of grout and debris in this manhole which was removed during this review.

12. Manhole 22B
   a. The end can on the steam service piping to the Library has corroded and the end plate is partially detached from the can. At times, secondary steam from groundwater infiltration is wafting from the damaged end can. The end can should not be repaired until the breach in the service piping is repaired that is permitting the infiltration. This repair will repair excavation and there is a steam anchor nearby. TEG will evaluate what repair remedies are available.
   b. Groundwater is leaking into this manhole through the steam end can in the east wall penetration. This relates to the needed repair noted in item 12.a. above.
   c. There is some insulation repair needed in this vault. These repairs should be executed when additional work is done in this manhole.

d. There was mud and debris in the floor of this manhole which was removed during this review.
e. Some of the grating around the pipe penetrations in the floor is corroded. CNE should remove/clean this corrosion and the grating painted with cold galvanizing paint before the corrosion progresses.

13. Manhole S4A
    a. There was a water present in this manhole, and it required pumping prior to entry.
    b. There are several cracks in the concrete sidewalk above this manhole; these cracks are due to traffic driving on the sidewalk when making turns; TEG will again report the condition of this concrete to Metro Public Works.
    c. There are hairline cracks in the walls of this manhole. CNE should monitor these cracks and report and significant changes to TEG.
    d. There is some spalling of the concrete walls in this manhole. CNE should monitor this spalling and notify TEG of any significant changes.
    e. The existing trap is an Armstrong model 2011 which has a history of poor performance and it was not functioning properly during this review. This trap should be replaced with a "standard" bucket trap as soon as possible. This item appeared in the January 22, 2019 and January 26, 2018 Quarterly Walkthrough Reports.
    f. The trap piping supports were wire brushed and painted during this review. CNE should now monitor and maintain these supports as required.

14. Manhole U
    a. One of the manway lids was dislodged and broke in half at some point in the past and vehicular traffic rode over the open manway, hitting and damaging the access ladder. The ladder is corroded badly and requires replacement.
    b. Because of groundwater infiltration into this manhole, secondary steam results and the roadway area above this manhole remains hot. This heat has caused "settlement/depression" of the asphalt above the manhole and may result in damage to one or both of the manway lids/frames. CNE should monitor this condition and report any significant changes to TEG.
    c. The repair clamp on the condensate piping in this manhole was not leaking during this review.
    d. TEG will continue to evaluate whether this manhole should be abandoned and filled. To do this, components of the steam valve in this manhole will need to be welded (bonnet flange and stem) to prevent future leaks, and the piping needs to be insulated.

15. Manhole D
    a. This manhole recently underwent some extensive repairs and the replacement of all of the piping insulation.
    b. Water is infiltrating into the manhole through the steam casing at the southern wall penetration. It appears that this is from a city water leak.

TEG contacted Water Services and they are going to investigate if they have a leak in the area. Once this leak is repaired, CNE will need to install loose insulation into the annular space around the steam penetration.

c. During the review of this water infiltration, it was discovered that during the extensive repairs mentioned in item 15.a. above, the contractor installed a slip joint insulation jacket on top of standard pipe insulation. When the system is shut down, this might result in some damage to the standard insulation. The insulation blanket should have been installed directly on the slip joint. The 12-month warranty period for the work has expired, but CNE should bring this to the attention of the contractor who performed the work.

d. Some corrosion "creep" is occurring on the anchor baseplates and top plates. CNE should monitor this creep and report any significant changes to TEG.

16. Manhole D1 (sump)

a. There is extensive dirt and mud on top of the platform and in the sump of this manhole, presumably from the street construction/re-paving which occurred as a result of the construction of the new CJC. CNE should schedule a vac truck to clean this dirt and mud from this manhole.

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.

The Four Seasons elected to not pursue service from DES due to the timing of their project.

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.
- CNE scheduled a partial shutdown in October and another one in December.
- TEG and CNE met with personnel from the Fairlane Hotel to discuss the potential modifications to their steam system.
- CNE assisted the State's contractor at the Andrew Jackson building isolate their chilled water system.
- CNE and TEG met with personnel from the Metro Library to discuss issues related to their steam system.
- CNE investigated the possibility of slip-lining the condensate line at the Fairlane Hotel back to MH-4.
- CNE assisted the Metro Courthouse personnel isolate their steam system and assisted them in locating the source of a steam leak on their piping.
- CNE assisted the Fifth Third building personnel troubleshoot some cooling issues. The issues were a result of the DES metering panel losing communications with the chilled water temperature control valve.
- Other minor issues and customer interactions are noted in the monthly reports from CNE.

VII. Recommendations

Based on the review of the Second 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. CNE needs to address the maintenance issues related to the cooling towers 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 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 substantial enough for the repair to be effective.
- Debris needs to be cleaned and removed from some manholes.