



Operations Monitoring Report

Third Quarter FY18

Prepared by:

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I. Executive Summary

A review of the fiscal year 2018 (FY18) 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 2018 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

For the Third Quarter FY18, the chilled water sales decreased 11.7% over the previous Third Quarter (FY17). This reduction in sales may be due to a reduction in demand from the Criminal Justice Building (demolished), the Bobby Hotel (formerly Wells Fargo which is under renovation) and the Nashville Convention Center (demolished); however, the number of cooling degree days increased 10.5% over the same periods. The chilled water sendout also decreased 12.3% over the previous Third Quarter. The system losses decreased approximately 23%. The peak chilled water demand for the current quarter was 10,929 tons, which is 2.4% lower than the previous Third Quarter.

Steam sendout for the current quarter increased by approximately 17.8% over the previous Third Quarter with a 35.7% increase in heating degree days. Likewise, steam sales also increased by approximately 20.0% over the previous Third Quarter. Total steam system losses increased approximately 5.7% over the previous Third Quarter. The peak steam demand for the current quarter was 150,565 pounds per hour, which represents an increase in the Third 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 lower than the guaranteed levels for both the quarter and FY18. Total chiller plant electric usage decreased 7.5% from the previous Third Quarter and the unit electric consumption was 40% higher than in the previous Third Quarter. The steam plant electric consumption per unit of sales also decreased over the previous Third Quarter by 7.5%. The total water consumption for the steam and chilled water plants decreased 6.8% from the previous Third Quarter due in large part to a 30% decrease in the EDS make-up. The steam plant water usage decreased by 11.0% for the quarter.

Work continued on DES Capital and Repair & Improvement Projects during the Third Quarter of FY18. Repair and Improvements to the EDS continue as scheduled. Construction was completed on DES124.4. DES138, DES 141 and DES145 were closed during the Third Quarter FY18. Work on DES133, DES135, DES139, DES143 and DES144 is ongoing and DES146, DES147, DES148 and DES149 were opened during the Third Quarter FY18. Design and bidding for DES144 will be completed during the Fourth Quarter FY18. DES146 was designed and bid during the quarter with construction commencing in the Fourth Quarter. DES 147 was designed during the Third Quarter FY18 and will be bid and constructed during the Fourth Quarter FY 18. Excavation for DES149 will be started and completed during the Fourth Quarter FY18.

The current fiscal year system operating costs to date are \$14,890,544. This value represents approximately 71% of the total budgeted operating cost for FY18. The customer revenues from the sales of steam and chilled water for FY18 (to date) are \$12,769,505 which is approximately 66% 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. The MFA transferred to date for FY18 is \$1,690,300 (100% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices as of the date of this report.

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II. Energy Distribution Sales and Performance

A. Chilled Water

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

1. Sales and Sendout

A comparison for the Third Quarter chilled water sales is shown in Figure 1. This data reflects an 11.7% decrease in sales for the current quarter over the same quarter of the previous fiscal year.

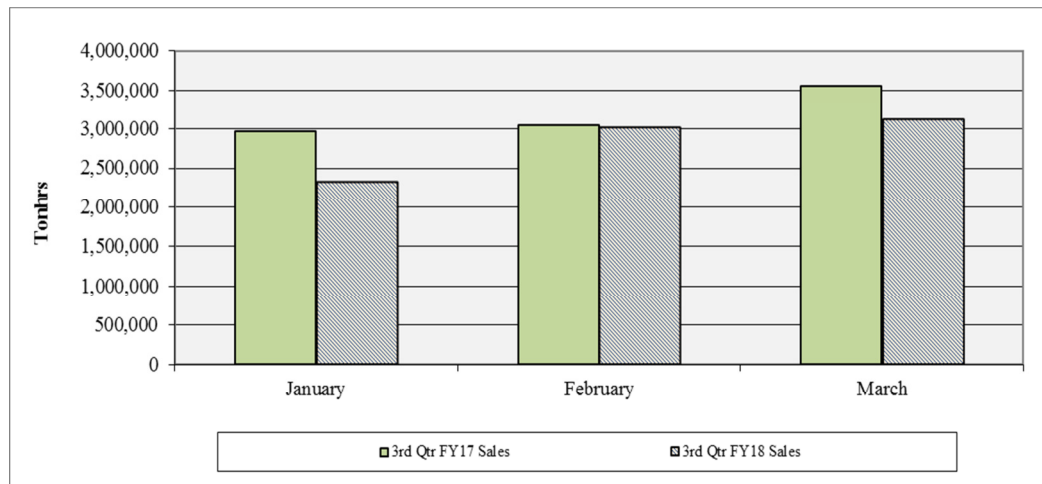


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 10,929 tons, which represents a 2.4% 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.

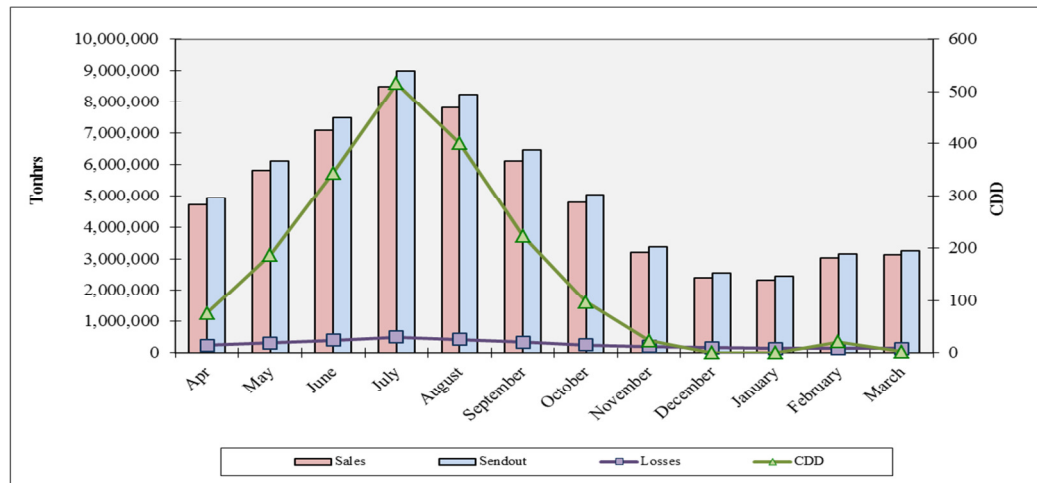


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

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.

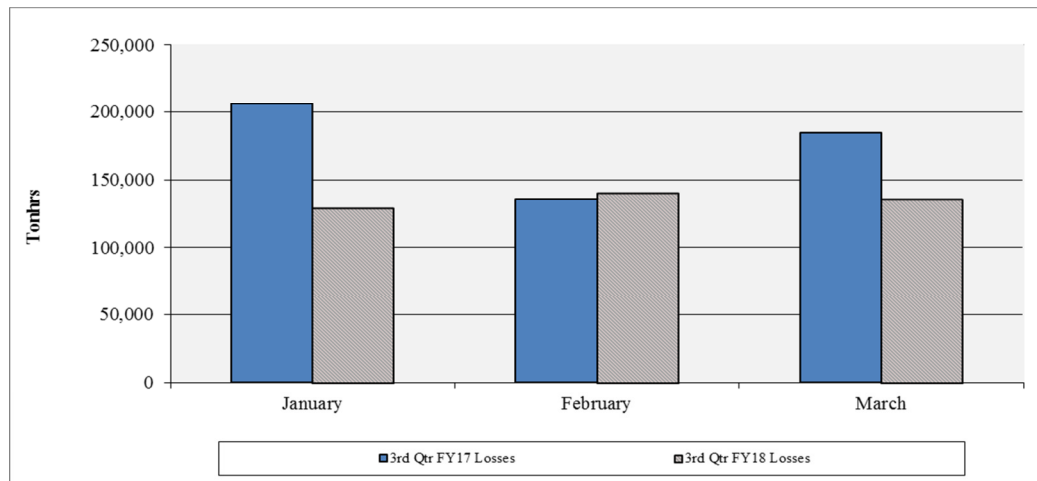


Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by approximately 30% over the previous Third Quarter. A leak was discovered and repaired at 3rd Ave and Charlotte during the quarter which had a significant impact on the EDS make-up. Additional locations for leaks are suspected but additional excavations may not begin again until after the cooling season. Any repairs to the chilled water piping will have to be made immediately and most likely require the shutdown of customer buildings.

The make-up to the cooling towers increased approximately 6.3% during the quarter. The number of cycles of concentration in the condensing water circuit experienced a 90.4% increase during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

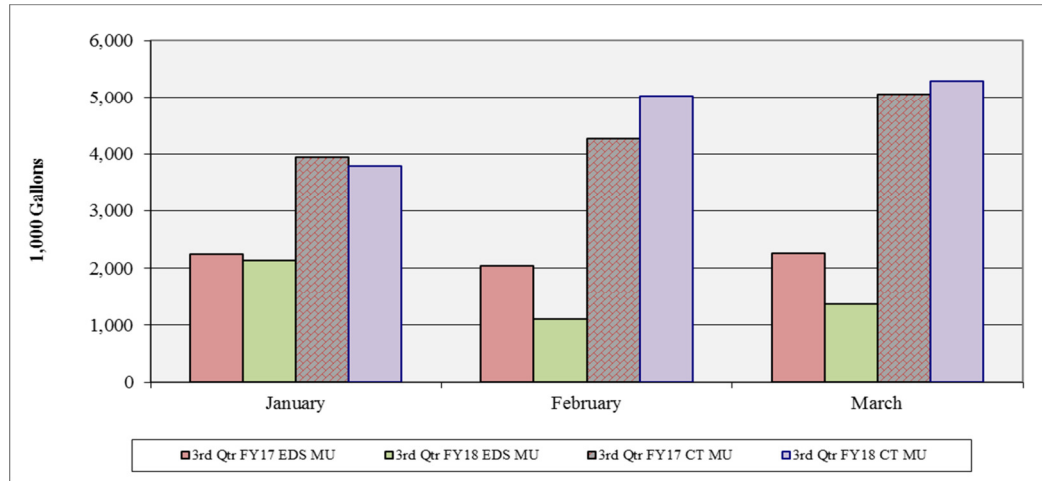


Figure 4. Chilled Water System City Water Usage Comparison

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 satisfactorily.

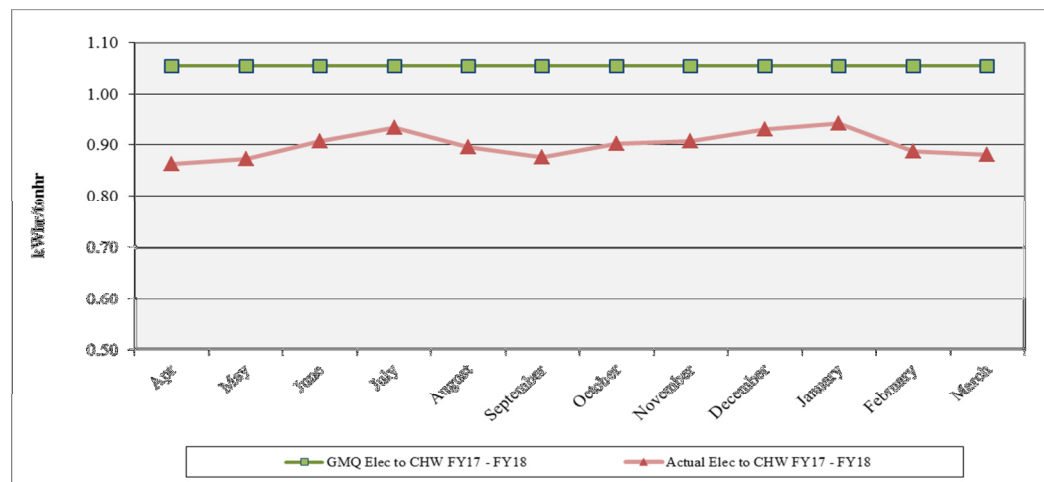


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

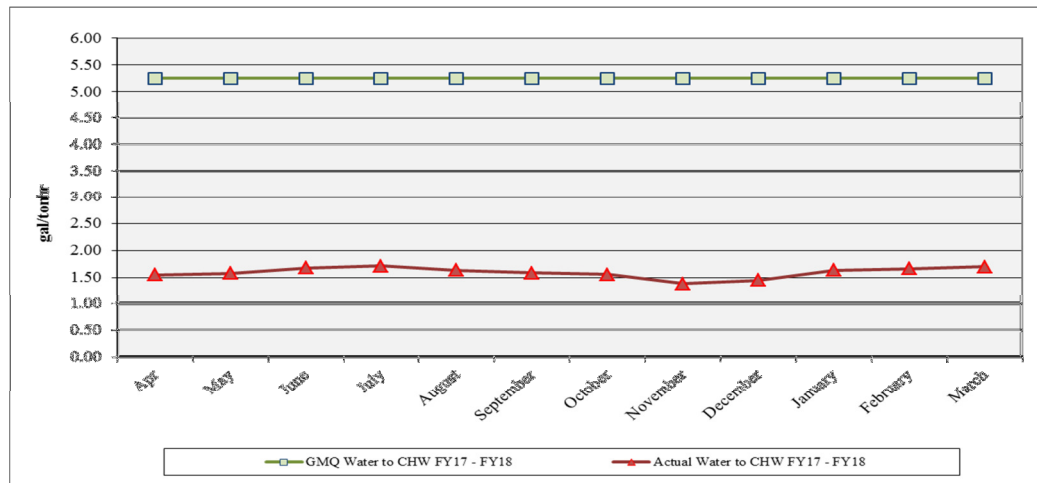


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

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 4.0% over the previous Third Quarter.

The actual chiller plant water conversion factor increased 6.8% over the previous Third Quarter. The total consumption of city water for the chiller plant for the current quarter decreased 5.7%.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 17.8% over the previous Third Quarter (FY17), and the sales also increased by approximately 20.0%. The Quarter experienced an approximate 35.7% increase in the number of heating degree days. The steam system losses decreased 5.7% over the previous Third Quarter. A comparison for the Third Quarter steam sales is shown in Figure 7.

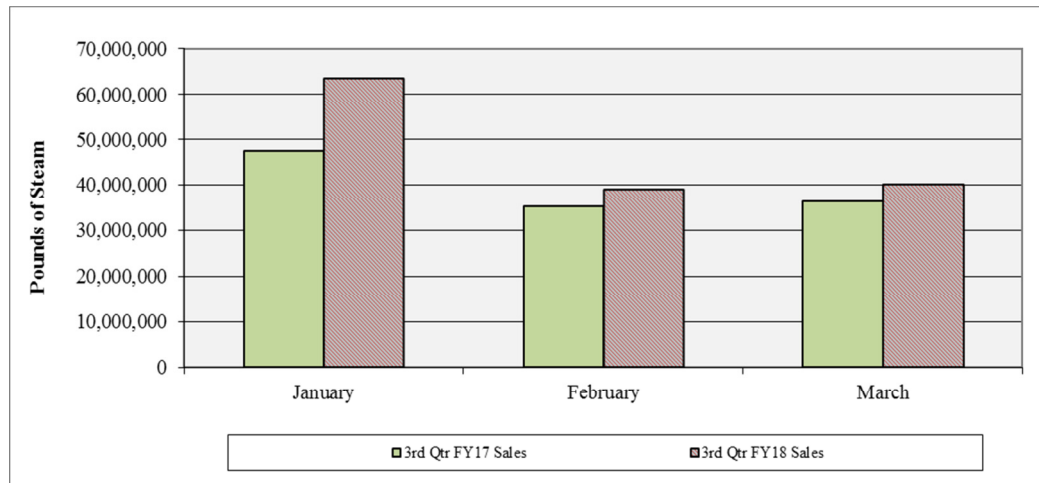


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 150,565 pph, which reflects an approximate 10.5% increase 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.

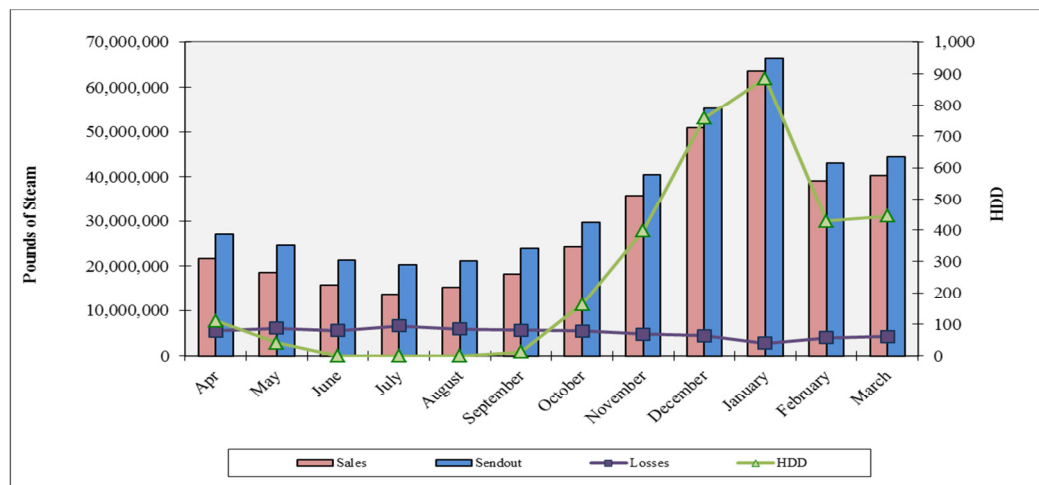


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

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 the majority of these losses are based on a near constant heat loss of the system.

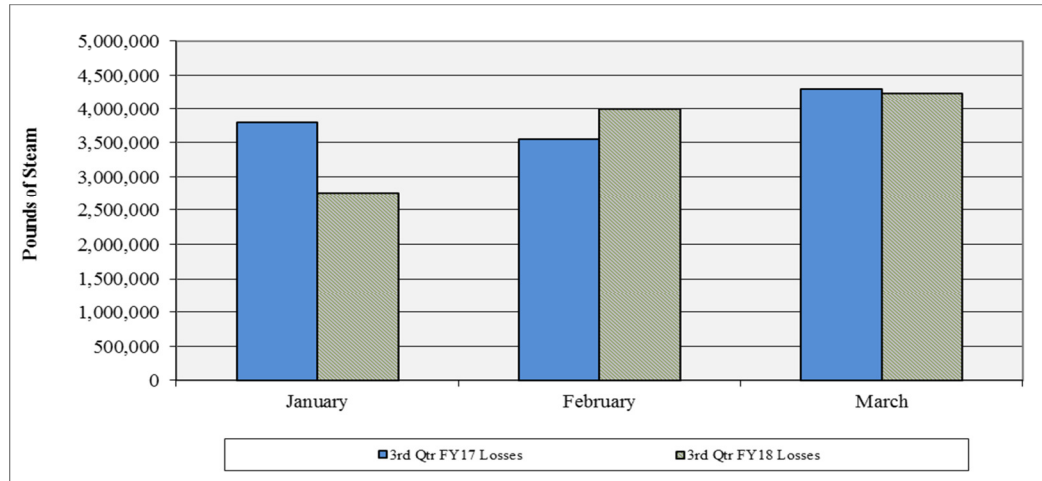


Figure 9. Steam System Losses

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. This data is shown in the comparison of Third Quarter data in Figure 10.

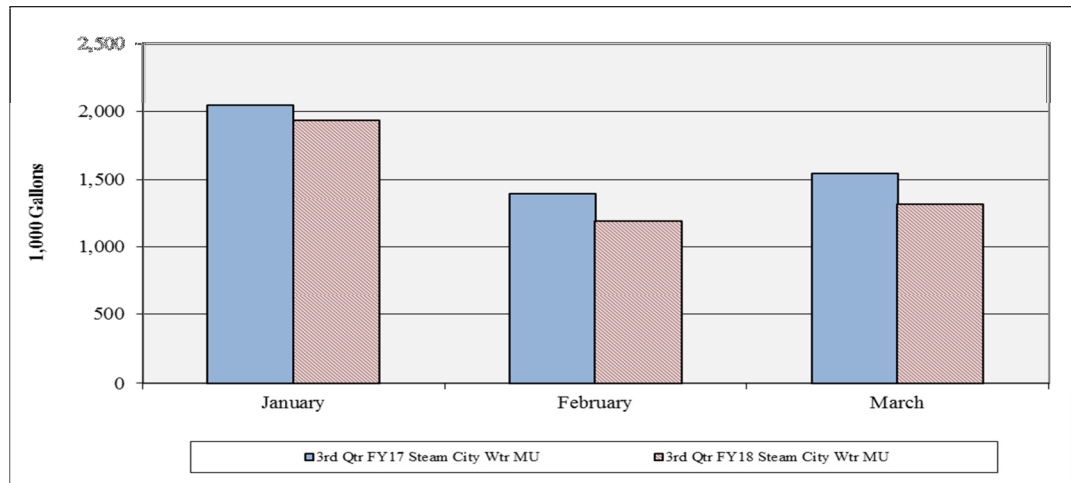


Figure 10. Steam System City Water Make-up Comparison

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.

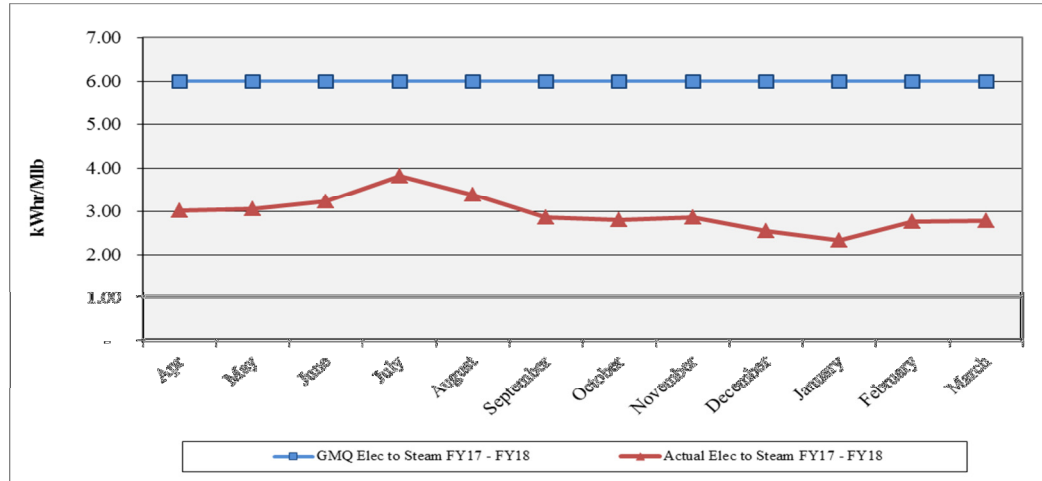


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

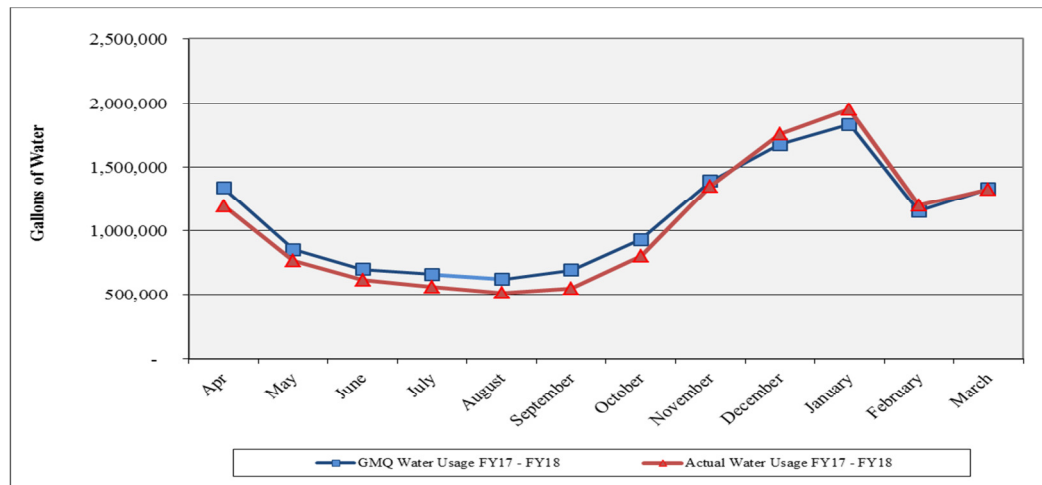


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

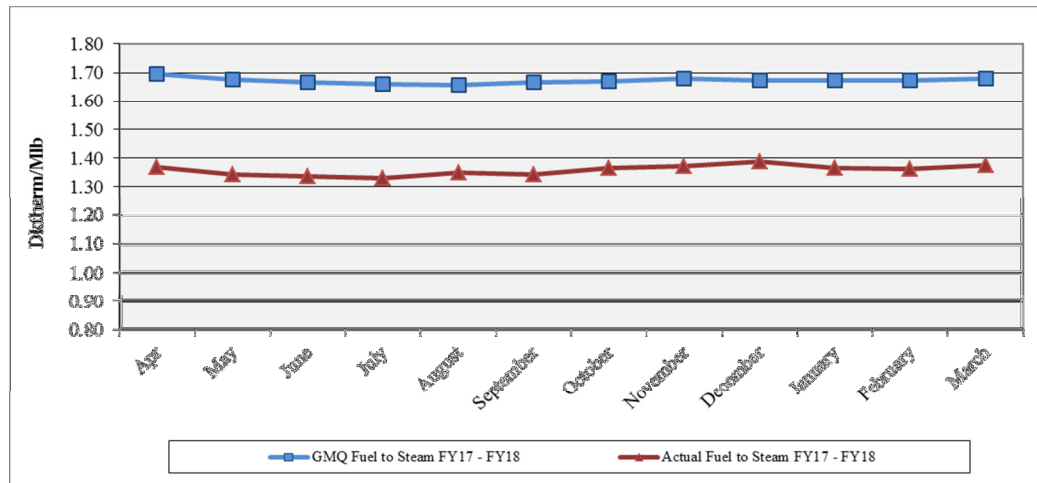


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced an 11.0% decrease in the steam plant electric consumption while experiencing an approximate 7.5% decrease in the electric conversion factor. The water consumption for the steam plant decreased 11.2% this quarter as compared to the previous Third Quarter. The fuel consumption per unit of steam sales was marginally 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 FY18 Production, Sales and Consumption Summary

Item	Unit	Third Quarter FY18	Third Quarter FY17	*Percent Difference
	days	90	90	0.00%
Total Electric Use	kWhrs	7,972,096	8,614,678	-7.46%
Chilled Water	kWhrs	7,604,198	8,283,319	-8.20%
Steam	kWhrs	367,898	331,359	11.03%
Total Water Use	kgal	23,136	24,824	-6.80%
Total Chilled Water	kgal	18,709	19,840	-5.70%
EDS Make-up	kgal	4,591	6,560	-30.02%
Cooling Towers	kgal	14,118	13,280	6.31%
Calc CT Evaporation	kgal	12,266	10,315	18.91%
CT Blowdown	kgal	1,852	2,965	-37.54%
Calc # Cycles		6.62	3.48	90.38%
Steam	kgal	4,427	4,984	-11.18%
Total Fuel Use	mmBTU	210,349	180,689	16.41%
Natural Gas	mmBTU	210,324	180,452	16.55%
Propane	mmBTU	25	237	-89.45%
Condensate Return	kgal	15,113	11,302	33.72%
	lbs	123,257,730	92,178,233	33.72%
Avg Temp	°F	174.7	172.7	1.16%
Sendout				
Chilled Water	tonhrs	8,856,100	10,100,700	-12.32%
Steam	lbs	153,834,000	130,630,000	17.76%
Peak CHW Demand	tons	10,929	11,195	-2.38%
Peak Steam Demand	lb/hr	150,565	136,250	10.51%
CHW LF		37.52%	41.77%	-10.19%
Steam LF		47.30%	44.39%	6.57%
Sales				
Chilled Water	tonhrs	8,450,272	9,573,484	-11.73%
Steam	lbs	142,856,897	118,991,278	20.06%
Losses				
Chilled Water	tonhrs	405,828	527,216	-23.02%
Steam	lbs	10,977,103	11,638,722	-5.68%
		7.14%	8.91%	-19.91%
Degree Days				
CDD		23	21	9.52%
HDD		1,759	1,296	35.73%

*positive percent difference values imply an increase from FY17 to FY18

Table 2. Third Quarter FY18 Performance Guarantee Comparison for Steam and Chilled Water

GMQ Calculations	Unit	Third Quarter FY18	Third Quarter FY17	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	2.58	2.78	-7.52%
GMQ Plant Efficiency	Dth/Mlb	1.674	1.695	
Plant Efficiency	Dth/Mlb	1.367	1.383	-1.14%
Actual %CR		80.12%	70.56%	13.55%
Avg CR Temp	°F	175	173	1.16%
GMQ Water Conversion	gal	4,311,348	5,421,818	
Water Conversion	gal	4,471,270	5,033,840	-11.18%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.900	0.865	4.00%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.21	2.07	6.83%

*positive percent difference values imply an increase from FY17 to FY18

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. The vast majority 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 paid 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 system operating costs for FY17 to date are \$14,890,544. This value represents approximately 71% of the total budgeted operating cost for FY18 and includes expenses to date that have been invoiced but were not paid at the time of this report. Additional invoices that would be charged toward the Third Quarter expenses have not been issued or paid at the time of this report. The customer revenues from the sales of steam and

chilled water for FY18 are \$12,769,505 which is approximately 66% of the budgeted amount. The MFA transferred to date is \$1,690,300 (100% of budget). However, the actual MFA required cannot be accurately calculated due to the outstanding invoices.

Table 3. DES Expenses and Revenues to Date

Item	FY18 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
Operating Management Fee							
FOC: Basic	\$ 4,460,400	\$ 1,107,516	\$ 1,107,516	\$ 1,107,516	\$ -	\$ 3,322,547	74.49%
9th Chiller	\$ 41,800	\$ 10,378	\$ 10,378	\$ 10,378	\$ -	\$ 31,133	74.48%
C/O 6A	\$ 82,500	\$ 20,489	\$ 20,489	\$ 20,489	\$ -	\$ 61,466	74.50%
C/O 6B	\$ 72,200	\$ 17,937	\$ 17,937	\$ 17,937	\$ -	\$ 53,810	74.53%
C/O 7	\$ 27,200	\$ 6,757	\$ 6,757	\$ 6,757	\$ -	\$ 20,272	74.53%
C/O 8	\$ 11,800	\$ 2,957	\$ 2,957	\$ 2,957	\$ -	\$ 8,871	75.18%
Pass-thru Charges:							
Chemical Treatment	\$ 166,400	\$ 56,099	\$ 86,180	\$ 51,714	\$ -	\$ 193,994	116.58%
Insurance	\$ 37,700	\$ -	\$ 20,588	\$ -	\$ -	\$ 20,588	54.61%
Marketing:							
CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA: Steam	\$ 69,329	\$ 18,061	\$ 32,304	\$ 41,322	\$ -	\$ 91,686	132.25%
Chilled Water	\$ 177,828	\$ 126,951	\$ 60,728	\$ 50,123	\$ -	\$ 237,802	133.73%
Misc:							
Metro Credit	\$ -	\$ (220,872)	\$ (148,142)	\$ (101,479)	\$ -	\$ (470,493)	n.a.
ARFA	\$ 64,800	\$ 16,085	\$ 16,085	\$ 16,085	\$ -	\$ 48,255	74.47%
Deferral	\$ -	\$ -	\$ -	\$ (84,007)	\$ -	\$ (84,007)	n.a.
Subtotal - Man Fee =	\$ 5,211,957	\$ 1,383,229	\$ 1,381,917	\$ 1,241,270	\$ -	\$ 4,006,416	76.87%
Reimbursed Management Fee + Chem Treatment		\$ 1,414,684	\$ 1,329,874	\$ 422,602	\$ -	\$ 3,167,161	0.00%
Metro Costs							
Pass-thru Charges:							
Engineering	\$ 9,600	\$ 6,648	\$ 4,272	\$ 769	\$ -	\$ 11,689	121.77%
EDS R&I Transfers	\$ 275,300	\$ 68,825	\$ 68,825	\$ 68,825	\$ 22,942	\$ 229,417	83.33%
Metro Marketing	\$ 10,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ 36,300	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Incremental Cost	\$ 578,400	\$ 135,897	\$ 115,081	\$ 134,171	\$ 8,543	\$ 393,691	68.07%
Utility Costs:							
Water/Sewer	\$ 565,800	\$ 207,514	\$ 128,731	\$ 88,079	\$ -	\$ 424,324	75.00%
EDS Water/Sewer	\$ -	\$ 131	\$ 124	\$ 572	\$ -	\$ 827	n.a.
EDS Electricity	\$ -	\$ 13,425	\$ 17,686	\$ 13,399	\$ -	\$ 44,511	n.a.
Electricity	\$ 5,888,500	\$ 1,842,726	\$ 952,545	\$ 778,241	\$ -	\$ 3,573,512	60.69%
Natural Gas Consultant	\$ 102,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ -	\$ 9,000	8.82%
Natural Gas Transport	\$ -	\$ 54,384	\$ 90,346	\$ 107,241	\$ -	\$ 251,971	n.a.
Natural Gas Fuel	\$ 3,135,800	\$ 261,475	\$ 510,059	\$ 619,172	\$ -	\$ 1,390,706	44.35%
Propane	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Metro Costs =	\$ 10,602,300	\$ 2,594,025	\$ 1,890,668	\$ 1,813,470	\$ 31,484	\$ 6,329,648	59.70%
Subtotal - Operations =	\$ 15,814,300	\$ 3,977,254	\$ 3,272,585	\$ 3,054,740	\$ 31,484	\$ 10,336,064	65.36%
Debt Service							
2012 Bonds	\$ 3,484,400	\$ 870,463	\$ 871,313	\$ 871,313	\$ -	\$ 2,613,088	74.99%
2005 Bonds -Self Funded	\$ 731,200	\$ -	\$ -	\$ 731,225	\$ -	\$ 731,225	100.00%
2007 Bonds -Self Funded	\$ 193,000	\$ 157,275	\$ -	\$ 35,725	\$ -	\$ 193,000	100.00%
2008 Bonds -Self Funded	\$ 192,400	\$ 157,275	\$ -	\$ 35,125	\$ -	\$ 192,400	100.00%
2010 Bonds -Self Funded	\$ 192,800	\$ 157,275	\$ -	\$ 35,525	\$ -	\$ 192,800	100.00%
MCCC Fund -Self Funded	\$ 680,000	\$ 157,275	\$ -	\$ 208,175	\$ 314,550	\$ 680,000	100.00%
Interest & Misc Revenue	\$ (175,100)	\$ (12,332)	\$ (14,434)	\$ (21,267)	\$ -	\$ (48,032)	27.43%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,298,700	\$ 1,487,231	\$ 856,878	\$ 1,895,820	\$ 314,550	\$ 4,554,480	85.95%
Total =	\$ 21,113,000	\$ 5,464,485	\$ 4,129,464	\$ 4,950,560	\$ 346,034	\$ 14,890,544	70.53%
Customer Revenues							
Taxes Collected		\$ 99,571	\$ 81,801	\$ 79,335	\$ -	\$ 260,707	n.a.
Taxes Paid		\$ 99,571	\$ 81,800	\$ 53,971	\$ -	\$ 235,342	n.a.
Penalty Revenues/Credits		\$ (45,292)	\$ (29,907)	\$ 1,717	\$ -	\$ (73,482)	n.a.
Energy Revenues Collected		\$ 4,806,890	\$ 4,089,965	\$ 3,920,767	\$ -	\$ 12,817,622	n.a.
Revenues =	\$ 19,422,700	\$ 4,761,598	\$ 4,060,058	\$ 3,947,848	\$ -	\$ 12,769,505	65.75%
Metro Funding Amount =	\$ 1,690,300	\$ 702,887	\$ 69,405	\$ 1,002,712	\$ 346,034	\$ 2,121,038	125.48%

The DES serves 28 customers and 40 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	\$ 2,749,938	13,138,536	\$ 0.2093	\$ 1,123,847	81,915	\$ 13.7197
State Government	\$ 2,485,635	9,694,795	\$ 0.2564	\$ 1,381,161	94,155	\$ 14.6691
Metro Government	\$ 3,636,640	18,417,419	\$ 0.1975	\$ 1,442,937	124,759	\$ 11.5657
New Customers	\$ 2,339,816	11,997,969	\$ 0.1950	\$ 1,024,947	100,375	\$ 10.2112
Total	\$ 8,872,213	41,250,750	\$ 0.2151	\$ 3,947,944	300,829	\$ 13.1236

Total Revenue \$ 12,820,157
 True-up and Adjustments (Net) \$ (50,652)
 Net Revenue \$ 12,769,505

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY18. Communication between TEG and CNE continues to be excellent, and CNE has reported and managed all EGF operations satisfactorily and according to the ARMA with no contract violations.

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.

- On January 2, 2018, the sensing line on the master pressure controller for the steam system froze and caused the steam pressure to drop below 150 psig for approximately 120 minutes. Portable heaters were placed in the boiler plant to remedy the issue.
- While Siemens was working on the communications system with the new boiler controls on March 23, the system steam pressure dropped below 150 psig for approximately 60 minutes.

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 the Lock-out/Tag out, Hazard Management, Office Safety, Job Hazard Analysis and Elevated Work and Vehicle Safety.

D. Personnel

The EGF currently has twenty-three full time employees and two relief staff. Of the current number of employees, seventeen 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 80.1% of the steam sendout during the quarter, which represents a 13.6% increase over the previous Third Quarter.
 - Feedwater iron and hardness remained excellent 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. At this point, the biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent.
 - CNE and their water chemistry vendor are preparing a recommendation for the installation of a side stream filter to the chilled water system at the EGF to filter and remove suspended solids that may be contributing to the fouling of customer coils. This recommendation should be available in the Fourth Quarter FY18.

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.

- Leaks in chiller #8 and a valve regulator were repaired.
- The sink in the breakroom was repaired.
- A chemical line leak on de-aerator #2 was repaired.
- Condensate pump #6 was repaired.
- The siding on the garbage can enclosure was replaced and painted.
- Repairs were made to the chilled water pump #3 VFD.
- The differential pressure switch on boiler feed water pump #3 was replaced.
- The air curtain in the boiler plant was repaired.
- The low water cut out, feedwater valve, the ignitor, gas solenoids, blower motor and safety relief flange for boiler #3 were repaired.
- Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

H. EGF Walk-through

A quarterly Walk-through of the EGF was performed on March 27, 2018, 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.

- During the Fourth Quarter FY17 Walkthrough report, it was noted that additional rust spots were observed on towers #1, #5, #6, #11, #16 and #18. CNE has not made the repairs on the riser tubes. In addition, cooling tower fill is still being stored on the cooling tower deck beneath the basins. Since the entire fill is reported to have been replaced, the remaining fill should be removed.
- CNE has made an effort to remove cobwebs within the EGF; however, this removal process is ongoing.
- The fencing surrounding the garbage dumpster in the parking lot was replaced during the quarter and will be painted during the Fourth Quarter per CNE.
- In the previous Walkthrough report, it was noted that significant scale was observed on the fill to cooling tower #14. The scale remains on this cooling tower and most of the cells along the west-side of the plant now have significant scale or deposits on the fill. CNE does not appear to have addressed this issue since the last Walkthrough report.
- The leak in the propane vaporizer was repaired by CNE during the quarter.
- Scaling on the cooling tower fill on the east-side of the plant is present but less significant than on the west-side. The fill in cooling tower #1 appears to be more

brittle than the others and has some broken or damaged pieces that the other cells do not appear to have. TEG recommends that CNE address the potential water chemistry issues that may be present to cause the scaling and determine if water chemistry is related to the brittleness.

- Repairs to Boiler #3 were made during the quarter and was operational for much of the quarter.
- The leak at the connection to the boiler #4 safety relief valves was repaired during the quarter.
- Due to the exceptionally cold weather, several leaks on the cooling tower structure and casings were observed during the Second Quarter Walkthrough. These leaks were evident by the icicles hanging from isolated locations on the sides of the cooling towers. CNE will address these leaks.
- A drain valve on the condensing water header on the northeast corner of the cooling tower deck was observed to be frozen and leaking during the Second Quarter Walkthrough. This valve was still leaking during the Third Quarter Walkthrough and CNE has not addressed this issue.
- A leaking chemical feed line was observed on the south side of the southern DA during the Second Quarter Walkthrough. CNE has not addressed the issue or cleaned the area.
- The level controller for cooling tower #6 was frozen over and had spilled down onto the roof decking. The spill was noticeable from the substantial frozen waterfall. CNE will address this issue.
- Other action items previously noted to be addressed by CNE have been completed.

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. Third Quarter FY18 Open Projects

The following projects remained open at the end of the Third Quarter FY18.

1. DES111 – DES Combined Heat and Power

This project is currently on hold.

2. DES119 - Chilled Water System Delta T Issue

CNE has returned the Hydroflow device for a refund and is waiting for reimbursement from the vendor for final invoicing to Metro.

3. DES124 - Criminal Justice Center Redevelopment

The construction associated with the reconnection of the CJC to the DES was completed during the quarter. The meters and metering instrumentation will be installed by the building's contractor during the Fourth Quarter as their schedule permits. This project is expected to be closed during the Fourth Quarter and service restored to the building during construction prior to the cooling season. Unmetered service is currently available.

The damage to the AA Birch Tunnel that occurred as a result of the blasting at the Criminal Justice Center site has been documented. Once the construction for the new site progresses to the point that no additional damage to the tunnel is anticipated, and the sites storm water system is installed and commissioned, repairs will be made to this tunnel.

4. DES130 – Repair to Manhole B3

Construction was completed during the Third Quarter FY17. After failed attempts to receive reimbursement from the contractor which caused the damage, TEG turned the matter over to Metro's legal department. Since then, reimbursement has been received from the contractor's insurance company.

5. DES133 – Old Convention Center Site Redevelopment

Negotiations continue between the new owner of the site and Metro for the easement and a customer service agreement. The resolution of these issues is expected in the Fourth Quarter FY18.

The blasting and hoe-ramming adjacent to the Broadway Tunnel was completed at the development site during the Third Quarter FY18. Additional blasting on the north side of the site (away from the Broadway Tunnel) continues and is expected to be complete early in the Fourth Quarter FY18. Because the blasting and hoe-ramming adjacent to the tunnel was complete, and the blasting on the north side of the site has not registered on the DES seismographs, the stand-by boiler and chillers at the Bridgestone Arena were removed.

DES is maintaining the seismographs in the tunnel to monitor vibrations until blasting is complete on the north side of the site. It is anticipated that these seismographs will be removed early in the Fourth Quarter FY18.

TEG conducted a walk-through of the tunnel with our structural engineer and a representative from the contractor that reinforced the tunnel on March 28, 2018. Damage to some of the tunnel structure and piping support elements was documented. Fortunately, the damage is not major, but repairs will be needed.

TEG will present a report on the findings along with an estimated repair cost once an estimate is received from the contractor.

6. DES135 – CHW Leak at 5th and Union

After several exploratory excavations, the source of the chilled water leak at the James K Polk Building has not been located. However, a chilled water leak at the intersection of 3rd and Charlotte was located and repaired during the Third Quarter FY18. As a result of this repair, the water make-up to the chilled water system was reduced by 50 to 60 gallons per minute.

The search continues for the source of the chilled water leak near the James K Polk Building.

7. DES138 – Manhole D Repairs

This project was closed during the Third Quarter FY18.

8. DES139 – DES Options Review

Work began on the evaluation of the long-term options for the DES in the First Quarter. A draft report was issued by FVB during the Second Quarter. Metro Finance requested an expanded scope that has delayed the issuance of FVB's final report. A final report is anticipated in the Fourth Quarter.

9. DES141 – EGF Camera Upgrades

The work associated with this project was completed during the quarter and is closed.

10. DES143 – Manholes N1, N2 and S6 Insulation Repair and Replacement

The insulation in these manholes is either non-existent or is in need of repair; therefore, this project addresses the replacement and/or installation of the needed insulation. Due to unexpected expenses associated with the reinforcement of the Broadway Tunnel, this work has been put on hold.

11. DES 144 – Manhole 6 Repair

The structural steel piping supports in this manhole have experienced severe corrosion due to water infiltration and require replacement and repair to insure the structural integrity of the steam and condensate piping system. TEG has met with coating specialists and reviewed this manhole with them. TEG is in the process of developing the specifications for the needed repairs based on recommendations from the coating specialists. The steam and condensate will

have to be isolated at this manhole to complete this work. Therefore, it is expected that this work to be bid and awarded during the Fourth Quarter FY18.

12. DES145 – Manholes 9, 11 and K Repairs

This project was closed during the Third Quarter FY18 and is waiting final invoicing.

13. DES146– Ryman Auditorium Steam Meter Replacement

During the Second and Third Quarters, the steam demand for the Ryman Auditorium significantly exceeded their contract capacity and the rated capacity of the steam meter. TEG and CNE reviewed their billing data and met with Ryman personnel to discuss their high steam demands. The building reported a significant growth in attendance and the number of shows within the past year. They anticipate that the number of guests will continue to be high.

Due to the steam demand reaching the existing steam meter's limit, the existing meter will be replaced with a larger size meter that will permit significantly more steam demand to be accurately measured. This project was designed and bid during the quarter. Work is anticipated to begin during the Fourth Quarter.

14. DES147 – Repair of Steam Pipe Insulation in 3rd Avenue North

A contractor for AT&T damaged the pre-insulated steam pipe which serves the Parkway Towers on 3rd Avenue North. The damage includes the pipe outer casing and insulation. CNE and TEG met the contractor that caused the damage on the site. TEG developed a scope and design to repair the damage and a pre-bid meeting was conducted during the Third Quarter FY18. Bids will be received and the work should be completed during the Fourth Quarter FY18.

15. DES148 – 10 Lea Ave/Rolling Mill Hill Site

MDHA has sold the site directly south and across Peabody Street from the EGF at a new building with an underground parking garage is going to be constructed. The site development/construction includes blasting of the bed rock. Therefore, TEG is conducting due diligence to monitor the EGF an attempt to safeguard it from an unexpected shut down resulting from damage/vibrations from the blasting operations. This includes meetings with the contractor managing the blasting operations, a vibration monitoring consultant, NES, our structural engineer and electrical engineer.

16. DES149 – Hot Spot at 1st and Molloy

As a result of CNE’s monthly thermographic survey, increases in temperature at a hot spot at the corner of 1st Avenue and Molloy Street were noted. Additionally, steam was evident from a curb inlet located at this corner. Based on TEG’s request, the City water department checked the area but did not find evidence of a city water leak. Therefore, TEG instructed CNE to conduct an exploratory excavation to determine the reason for the hot spot. It is expected that this excavation and the subsequent repair (if required) will be completed during the Fourth Quarter FY18.

B. Third Quarter FY18 Closed Projects

DES138, DES141 and DES 145 were closed during the Third Quarter FY18.

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.

The \$26,000,000 shown for the bond fund 49116 is only available for the CHP project (DES110). Since this project is currently on hold, the remaining balance of this fund is not available for other projects.

Table 5. Capital Projects Expense Summary

DES Project #	Description	Total Budget	FY18 Spending to Date	Total Spent to Date	Remaining Balance
2010 Bond Projects-49109					
DES119	DES Delta T Issue	\$ 67,000	\$ -	\$ 65,447	\$ 1,553
DES139	Options Review	\$ 63,600	\$ 85,113	\$ 86,383	\$ (22,783)
MAS	Miscellaneous Development Projects	\$ 46,900	\$ 20,888	\$ 22,644	\$ 24,256
	Total Closed Projects	\$ 2,493,661	\$ -	\$ 2,405,553	\$ 88,108
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ (65,246)	\$ -	\$ -	\$ (65,246)
	Total 2010 Bond	\$ 2,605,916	\$ 106,001	\$ 2,580,027	\$ 25,889
Customer Connection Fund-49107					
DES124	CJC Redevelopment	\$ 300,000	\$ 31,239	\$ 173,430	\$ 126,570
DES130	MH B3 Repair	\$ 20,000	\$ (11,001)	\$ 1,468	\$ 18,532
DES133	NCC Development	\$ 40,000	\$ 180,984	\$ 201,705	\$ (161,705)
DES133.3	Broadway Tunnel Reinforcement	\$ 450,000	\$ 430,745	\$ 430,745	\$ 19,255
DES134	401 Union Hotel Reconnection	\$ 60,000	\$ 2,268	\$ 52,991	\$ 7,009
DES135	Chilled Water Leak 5th and Union	\$ 200,000	\$ 15,428	\$ 176,673	\$ 23,327
DES138	MH-D	\$ 130,000	\$ 107,763	\$ 121,242	\$ 8,758
DES141	EGF Security Camera Upgrade	\$ 50,000	\$ 39,655	\$ 39,655	\$ 10,345
DES148	89 Peabody	\$ 10,000	\$ 1,502	\$ 1,502	\$ 8,498
	Total Closed Projects	\$ 7,348,827	\$ -	\$ 6,879,033	\$ 469,794
	Metro Project Admin	\$ (129,827)	\$ 24,137	\$ 142,645	\$ (272,472)
	Project Man, Development, etc	\$ 21,000	\$ -	\$ -	\$ 21,000
	Customer Connection Fund	\$ 8,500,000	\$ 822,721	\$ 8,221,089	\$ 278,911
CHP and EDS Repairs-49116					
DES111	DES CHP	\$ 26,000,000	\$ -	\$ 168,706	\$ 25,831,294
	Total Closed Projects	\$ -	\$ -	\$ -	\$ -
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ -	\$ -	\$ -	\$ -
	CHP and EDS Repairs	\$ 26,000,000	\$ -	\$ 168,706	\$ 25,831,294

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 budget at the end of the current quarter is \$135,063. Table 6 provides a summary of the FY18 expenditures and revenues to date associated with the R&I budget.

Table 6. Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY17						\$ -	\$ 26,260.82	\$ 26,260.82
Interest/Transfer	7/3/2017	-	-	\$ 9.64				
Interest/Transfer	7/3/2017	-	-	\$ (9.64)				
CNE June R&I Invoice	8/21/2017	DES-2320	CNE	\$ 2,677.12				
CNE May R&I Invoice	6/30/2017	-	CNE	\$ 4,672.28				
DES-140	8/31/2017	DES-2322	TEG	\$ 543.53				
DES-142	8/31/2017	DES-2322	TEG	\$ 3,596.49				
DES-143	8/31/2017	DES-2322	TEG	\$ 2,294.26				
Interest/Transfer	8/1/2017	-	-	\$ 21.29				
Interest/Transfer	8/1/2017	-	-	\$ (21.29)				
CNE July R&I Invoice	8/15/2017	DES-2322	CNE	\$ 1,978.44				
Interest/Transfer	9/1/2017	-	-	\$ 34.51				
Interest/Transfer	9/1/2017	-	-	\$ (34.51)				
Sub-Total First Quarter				\$ 15,762.12	\$ 68,825.01	\$ -	\$ 53,062.89	\$ 53,062.89
DES-140	10/03/17	DES-2530	TEG	\$ 170.20				
DES-142	10/03/17	DES-2530	TEG	\$ 950.88				
DES-143	10/03/17	DES-2530	TEG	\$ 177.90				
Interest/Transfer	10/02/17	-	-	\$ 43.84				
Interest/Transfer	10/02/17	-	-	\$ (43.84)				
CNE Aug R&I Invoice	10/01/17	DES-2530	CNE	\$ 7,676.52				
DES-142	11/28/17	DES-2327	TEG	\$ 88.95				
DES-144	11/28/17	DES-2327	TEG	\$ 650.00				
Interest/Transfer	11/01/17	-	-	\$ 54.29				
Interest/Transfer	11/01/17	-	-	\$ (54.29)				
Sept R&I Invoice	11/01/17	DES-2327	CNE	\$ 9,464.47				
DES-144	12/27/17	DES-2329	TEG	\$ 1,292.42				
DES-145	12/27/17	DES-2329	TEG	\$ 814.93				
Interest/Transfer	12/01/17	-	-	\$ 68.81				
Interest/Transfer	12/01/17	-	-	\$ (68.81)				
Oct R&I Invoice	12/01/17	DES-2329	CNE	\$ 15,954.05				
DES-142 Bobby Hotel Steam Valve	12/01/17	DES-2329	CNE	\$ 6,618.00				
Sub-Total Second Quarter				\$ 43,858.32	\$ 68,825.01	\$ -	\$ 24,966.69	\$ 24,966.69
DES-144	01/30/18	DES-2331	TEG	\$ 617.28				
DES-145	01/30/18	DES-2331	TEG	\$ 1,045.38				
Interest/Transfer	01/02/18	-	-	\$ 89.71				
Interest/Transfer	01/02/18	-	-	\$ (89.71)				
Nov R&I Invoice	01/01/18	DES-2331	CNE	\$ 7,526.19				
Dec R&I Invoice	02/01/18	DES-2333	CNE	\$ 5,067.96				
DES-145	02/21/18	-	CNE	\$ 17,900.00				
Jan R&I Invoice	03/01/18	-	CNE	\$ 2,439.99				
DES-143	02/26/18	DES-2333	TEG	\$ 416.50				
DES-144	02/26/18	DES-2333	TEG	\$ 2,564.20				
DES-145	02/26/18	DES-2333	TEG	\$ 41.65				
Interest/Transfer	02/01/18	-	-	\$ 119.25				
Interest/Transfer	02/01/18	-	-	\$ (119.25)				
Feb R&I Invoice	03/21/18	-	CNE	\$ 6,510.01				
DES-140	03/21/18	-	CNE	\$ 4,730.00				
DES-144	03/26/18	-	TEG	\$ 4,562.74				
DES-146	03/26/18	-	TEG	\$ 3,471.98				
DES-147	03/26/18	-	TEG	\$ 2,932.73				
DES-149	03/26/18	-	TEG	\$ 424.35				
Interest/Transfer	03/01/18	-	-	\$ 125.38				
Interest/Transfer	03/01/18	-	-	\$ (125.38)				
Mar R&I Invoice	04/19/18	-	CNE	\$ 742.86				
Sub-Total Third Quarter				\$ 60,993.82	\$ 68,825.01	\$ -	\$ 7,831.19	\$ 7,831.19
Sub-Total Fourth Quarter				\$ -	\$ 22,941.67	\$ -	\$ 22,941.67	\$ 22,941.67
FY18 Year to Date				\$ 120,614.26	\$ 229,416.70	\$ -	\$ 135,063.26	\$ 135,063.26

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 and tunnel inspections were held as scheduled.
- b. Communications continue with State personnel regarding needed repairs to the State Tunnel. The State had a registered structural engineer review the two areas which TEG has structural concerns during the First Quarter FY18. TEG is waiting on notification from the State regarding what repairs will be made and the associated repair schedule.
- c. Customer metering station calibration checks were completed as scheduled.
- d. Water chemistry samples at customer buildings were taken as scheduled.
- e. CNE completed the repairs with the communications system between MH-18 (Broadway Tunnel) and the EGF.
- f. The Contrec device at the John Sevier Building was replaced.
- g. Water from several of the vaults had to be pumped due to the prevalent rain during the quarter.
- h. The condensate sump pump was replaced in the State Tunnel.
- i. Chilled water was pumped from the CJC construction site and from an electric vault on 3rd Ave near the CJC.
- j. Lighting and electrical repairs were made in the Broadway and AA Birch Tunnels.
- k. Several trap assemblies were fabricated for several installations within the EDS.
- l. CNE conducted inspections and assisted the building contractor (Skanska) with inspections in the Broadway Tunnel associated with the blasting at the construction site at 5th and Broadway.

2. Other EDS Inspections

- a. Minor items are included in the CNE monthly reports.

C. Emergencies

No emergencies were reported during the quarter.

D. EDS Walk-through

This walkthrough was conducted in three segments. The first segment was conducted on March 9, 2018; the second segment was conducted on March 13, 2018; and the third

segment was conducted on April 11, 2018. The manholes and tunnel systems that were visited include Manhole C, 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. Manhole C

- a. There was water present in this manhole and it required pumping before entry.
- b. The link seals on the water line which passes through the vault are leaking slightly. These link seals should be tightened. Requires action within the next quarter.
- c. There is a pinhole steam leak at the coupling in the trap piping after the second isolation valve; this needs to be repaired. Requires action as soon as possible.
- d. There is a small accumulation of mud in the floor of this manhole; this mud needs to be removed/cleaned. Requires action within the next quarter.

2. State Tunnel

- a. There are several locations, where the concrete tunnel structure has some minor, moderate and major cracking, spalling, exposed rusty 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 inner ducts throughout the tunnel. CNE personnel should be careful when they are reviewing the tunnel as these inner ducts could be a trip hazard.
- c. There is a condensate leak near Station W-75. This leak should be located and repaired. Requires action as soon as possible.
- d. The grout underneath the base plate of the piping support column at Station N-33 needs to be repaired. Requires action within the next quarter.
- e. Several of the pipe support C channels and W shapes have minor to moderate corrosion. These locations include E13, E66, E69, N20, W3 and W27. These members support DES piping and are not considered part of the structure and need to be cleaned and painted. Requires action within the next 6 to 12 months.

3. AA Birch Tunnel

- a. The existing Criminal Justice Center (CJC) has recently been completely demolished and a new CJC is being constructed in its place. The CJC is located above the AA Birch Tunnel. The construction for the new CJC involved dynamiting, drilling and hoe-ramming existing rock near and around the AA Birch Tunnel. Water and mud infiltration, along with cracking and sloughing of the tunnel structure occurred as a result of this blasting. The tunnel was reviewed by TEG, TEG's structural engineer and a contractor on March 28, 2018 and some repairs are needed as a result of the blasting. It is the structural engineer's recommendation that the needed repairs be delayed until the storm water piping for the new CJC is installed and commissioned.
- b. There is a flange leak on the steam isolation valve in upper level of Manhole D3. CNE personnel attempted to tighten the flange connection during this review and the leak was reduced but not eliminated. This flange leak and/or gasket should be repaired/replaced as soon as possible.
- c. There was a leak on a 45 threaded elbow on the blowdown piping of the trap strainer in Manhole D3. CNE personnel tightened this elbow during the review and eliminated the leak. CNE should monitor this fitting.
- d. The insulation was removed from a section of the chilled water piping at Station 1+25 to repair a pinhole leak. Due to CJC construction site blasting activity, the replacement of this insulation was delayed. Now that the blasting is complete and with the cooling season approaching, CNE should have this insulation replaced with insulation to match the existing within the next quarter.
- e. Groundwater is leaking into Manhole D2 at the west end of the tunnel at the western chilled water piping penetration. CNE should tighten the link seal at this location to attempt to reduce or eliminate this leak. Requires action within the next quarter.
- f. There are some hairline cracks radiating from the chilled water piping penetrations in Manhole D2. CNE should monitor these cracks and report any significant changes to TEG.
- g. The grating and some of the structural members supporting the grating in Manhole D2 has experienced some moderate corrosion. These areas should be cleaned and painted to prevent further corrosion. Requires action within the next 6 to 12 months.
- h. The base of a piping support at Station 0+85 has some corrosion. CNE should wire brush/wire-wheel this base and paint it with cold galvanizing paint to prevent further corrosion. Requires action within the next quarter.
- i. There is debris around the sump pumps. This area/debris should be cleaned within the next quarter.
- j. The entry ladder has some minor corrosion where two ladder sections were welded together. CNE should clean/remove this corrosion and then paint the area with cold galvanizing paint. Requires action within the next quarter.

4. 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 location bolts in an attempt to stop the leak. If this is not successful, CNE should continue to monitor these leaks and make repairs once the leaks are substantial enough for the repairs to be effective.
 - b. The pipe supports at Stations 4-45, 4-80, 4-81, 4-82, 4-83, 4-84, 4-85, 4-86, 4-87, 4-88 and 4-95 are corroded and need to be cleaned and painted. Requires action within the next 6 to 12 months.
 - c. The branch steam piping in the vertical shaft at the old Suntrust Building has a blind flange connection that is leaking. CNE needs to remove the pipe insulation and tighten the flange bolts to try and seal this leak. If this is unsuccessful, CNE needs to coordinate a shutdown of the service to the old Suntrust Building and replace the flange gasket. Once the leak is fixed, CNE should order an insulation blanket to re-insulate this flange connection. Requires action within the next quarter.

5. 7th Avenue Tunnel
 - a. The trap isolation valve packing at Station 7-81 is leaking. This packing should be tightened to stop this leak. Requires action as soon as possible.
 - b. Piping stanchions and the ladder platform at Station 7-81 has some moderate to severe corrosion. These need to be cleaned and painted to prevent further corrosion. Requires action within 6 to 12 months.
 - c. The pipe supports at Stations 7-23, 7-33, 7-52, 7-53, 7-57, 7-59, 7-63, 7-77 and 7-80 are corroded and need to be cleaned and painted. These need to be cleaned and painted to prevent further corrosion. Requires action within 6 to 12 months.
 - d. The pipe stanchion supports at Stations 7-11 (Hume Fogg service) and 7-45 (Library) are corroded and should be cleaned and painted to prevent further corrosion. Requires action within 6 to 12 months.
 - e. The steam expansion joint at Station 7-61 is leaking. CNE should tighten the packing bolts to see if this stops the leak. If unsuccessful in stopping the leak, continue to monitor this leak until it is substantial enough to be repaired by injection.
 - f. The Teflon pad on some of the piping slide supports (such as at Station 7-45) has become dislodged and there is some corrosion present. The corrosion needs to be removed, the steel painted and the slide repaired. Requires action within 6 to 12 months.
 - g. Groundwater infiltration continues at Station 7-44. TEG had wicking material draped over the piping at this location in an attempt to mitigate any damage which may occur to the piping or piping supports. CNE should continue to monitor this infiltration and let TEG know if significant changes occur.
 - h. The pipe support/anchor table at Station 7-41/7-42 is corroded. Due to physical constraints, it does not appear that cleaning and painting the

structure will be effective, therefore a new structure needs to be designed and installed adjacent to the existing structure. The condition of the steel which anchors the piping to the existing structure needs to be evaluated to determine the timeframe for replacement of the structure. The evaluation of the anchor steel requires action within the next quarter.

- i. There are several cracks in the shotcrete throughout the tunnel that need to be repaired. CNE should have these cracks repaired when the blasting repairs are made to the Broadway Tunnel.
- j. There are some areas in the tunnel which require “scaling” to remove rock which appear to be loose and could present a hazard to maintenance personnel. CNE should have these areas scaled when the blasting repairs are made to the Broadway Tunnel.

6. Broadway Tunnel

- a. The steam expansion joints at Stations B-96, B-83, B-65 and B-19/20 are leaking. CNE should tighten the packing bolts to see if this stops the leak. If unsuccessful in stopping the leaks, continue to monitor the leaks until they are substantial enough to be repaired by injection.
- b. The condensate piping on the west side of the condensate expansion joint is leaking at Station B-96. To make this repair, a section of the condensate piping will have to be isolated and removed. Requires action within the next 3 to 6 months.
- c. Original Nashville Convention Center service: 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.
- d. Original Nashville Convention Center service: There is a spalling of the concrete in the ceiling around the manway entrance of Manhole 19. CNE should have this repaired when the blasting repairs are made to the Broadway Tunnel.
- e. There is some insulation damage at Station B-82 that is the result of the contraction of the piping from a shut down. There are several other positions with similar damage. There has always been some minor damage at support columns due to the proximity of the insulation to the columns, however it appears that the degree of damage has increased at these locations. CNE should continue to monitor the damaged areas and report any significant changes to TEG.
- f. The steam expansion joint at the southern end of the Bridgestone service tunnel is leaking; the maintenance of this expansion joint is the City’s responsibility. CNE needs to tighten the packing injection bolts to try and stop this leak. If this is unsuccessful, since this line can be isolated fairly easily, the next step is to obtain the make and model number of the joint and order packing material. Once received, arrange an agreeable time with Bridgestone to isolate the service piping, remove the packing bolts and

- inject additional packing. If this is unsuccessful, CNE should continue to monitor the leak until it is substantial enough to be repaired by injection.
- g. In the concrete ceiling above the steam expansion joint at the southern end of the Bridgestone service tunnel, there is a small area of concrete spalling that needs to be repaired. CNE should have this repaired when the blasting repairs are made to the Broadway Tunnel.
 - h. There is trash and debris in the Bridgestone service tunnel. Requires attention within the next quarter.
 - i. The expansion joint anchor/support “table” at Station B-65 has a square tube knee brace to the tunnel floor which is badly corroded. It appears that this knee brace can be repaired by welding plate to the brace and then cleaning and painting the area. Requires action within the next quarter.
 - j. The trap injection point into the condensate return piping at Station B-50 is hammering badly. Typically there has been some slight hammering at this location but the hammering seems to have gotten worse. TEG will investigate the possible addition of a sparge tube at this location.
 - k. The trap piping at Station B-20 should be insulated for personnel protection. Requires action within the next quarter.
 - l. There are several locations throughout the tunnel where the grout underneath the baseplates of the pipe supports is cracked/damaged and needs to be repaired/replaced. The majority of this damage is the result of the blasting at the 5th + Broadway development. CNE should have the grout repaired when the blasting repairs are made to the Broadway Tunnel.
 - m. There is some minor corrosion at the base of the pipe support at Station B-16. This needs to be cleaned and painted with cold galvanizing paint to prevent the corrosion from progressing. Requires attention within 3 to 6 months.
 - n. The area at Station B-2 requires a small amount of “scaling” to remove rock which appear to be loose and could present a hazard to maintenance personnel. CNE should have the rock scaled when the blasting repairs are made to the Broadway Tunnel.
 - o. There is some corrosion of the structural members in Manhole 18 at the far-east end of the Broadway Tunnel. This corrosion needs to be cleaned and the structures painted to prevent additional corrosion. Requires action within 6 to 12 months.
 - p. The condensate return piping in Manhole 18 appears to be leaking. The source of the leak should be investigated and the leak repaired. Action required within the next quarter.
 - q. There are some areas of spalled concrete in Manhole 18 that require repair.
 - r. There is some debris in Manhole 18 that needs to be cleaned/removed.
7. Manhole 23
- a. The entry area was full of rainwater indicating that the drain is clogged. This area needs to be pumped out and cleaned. The drain then needs to unclogged and a screen installed over the drain opening to try and prevent the

- drain from becoming clogged in the future. Requires action within the next quarter.
- b. The bottom rung of the entry ladder is badly corroded because it has been exposed to so much water accumulation. The rung is close to the floor, therefore, it should be cut and removed along with the ladder side rails just below the lowest ladder wall brackets. This bottom area should then be cleaned and painted with cold galvanizing paint. Requires action within the next quarter.
 - c. The concrete pedestal for the steam and condensate piping expansion joints has experienced some spalling. CNE should have this repaired when the blasting repairs are made to the Broadway Tunnel.
 - d. There is some spalled areas of concrete in the ceiling of this manhole near the manway opening. CNE should have this repaired when the blasting repairs are made to the Broadway Tunnel.
 - e. There is insulation debris and other debris in this manhole that needs to be removed. Action required within the next quarter.
 - f. The steel structural supports are corroded and need to be repaired/replaced, cleaned and painted.
 - g. 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.
 - h. The manway lid in the street sounded unsecure when vehicles traveled over it. As soon as possible, the lid should be checked to determine if it needs replacement and replace if necessary.
 - i. The entry ladder at the manway lid consists of individual embedded rungs which can be hazardous for personnel (it is difficult to determine if the rungs are loose or weak until they break). These rungs should be removed and a new ladder installed as soon as possible.
 - j. 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 continue to monitor this leak until it is substantial enough to be repaired by injection.

Action Items

Action items from the above walk through 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 28 customers, comprised of 40 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

The DES has placed a temporary hold on active marketing at this time due to the uncertainty of the anticipated steam and chilled water loads on the reconstructed Criminal Justice Center and due to the higher than normal system temperature differences that may be related to the chilled water chemistry. TEG and CNE continue to monitor the system temperature difference issue and make recommendations to Metro regarding the availability of any additional capacity.

Negotiations continued with the OMSE (new development for the old Convention Center) during the quarter. At this time, OMSE would only take 1,200 tons of chilled water capacity and do not require any steam. These loads result in a reduction of demand and income for the DES. OMSE has yet to accept their CSA with the DES.

A tenant of the 5th + Broadway development began discussions with TEG regarding the potential use of DES steam for a brewery during the quarter. They anticipate no more than 1,500 pph of steam demand, but are evaluating additional uses for steam.

Conversations and meetings have been held with CB Ragland and others regarding the development of a new 253 room hotel to be constructed along Molloy Street between 2nd and 3rd Avenues South. It is believed that this hotel will require approximately 250 tons of chilled water, although, the discussions with the Owner's engineer have revolved around using 400 tons. Discussions and negotiations are in the early stages since this hotel is currently in the design phase.

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.

- CNE's CSR was in contact with the personnel of several customer buildings to discuss leaks, building maintenance or building performance during the quarter.
- CNE's CSR and TEG reviewed the issues related to the overflowing of the condensate receiver at the Cordell Hull building and met with building personnel to discuss the issue.
- CNE's CSR informed the affected customers that a partial chilled water outage was scheduled on January 19 so that crews could repair a chilled water leak on 3rd Ave near Charlotte.

- The building's contractor replaced butterfly valves and the chilled water actuator for the War Memorial building in February. CNE's I&E personnel reset the building's delta T control set point upon completion of the work.
- Communications were restored to the CX panels at the Municipal Auditorium and the James K Polk buildings in February.
- There were discussions between TEG, CNE, Metro General Services and the Metro Library regarding the operation of their chilled water system while the Library is making improvements to their control system.
- TEG and CNE met with personnel from the Ryman Auditorium in March to discuss their increased steam usage and the possibility of increasing the size of their steam meter (DES146).
- The Fairlane and Bobby Hotels are expected to be fully operational and open for commercial operations in the Fourth Quarter FY18 and have been experiencing the normal start-up issues with their systems. TEG and CNE have been in contact with these DES customers regarding the operations of their individual systems.
- Other minor issues and customer interactions are noted in the monthly reports from CNE.

VII. Recommendations

Based on the review of the Third Quarter FY18 EGF and EDS operations, the following recommendations are made.

- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced;
- CNE needs to continue to monitor the chilled water chemistry to understand the source of the fouling of the distribution piping (and in some cases the in-building piping) that appears to be contributing to the decrease in cooling performance at customer buildings.
- Insulation which 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 packing injection once the leak(s) is substantial enough to warrant repair.
- Lights in tunnels and/or manholes which are not functioning should be repaired or replaced as soon as possible.
- Minor concrete repairs need to be made in some manholes.
- Several repairs need to be made in the tunnels as a result of the blasting at the 5th + Broadway development.
- Mud and debris needs to be cleaned and removed from some manholes.
- Communication with the State is continuing regarding the needed repairs in the State Tunnel. During the Second Quarter FY18, TEG and CNE personnel have

continued correspondence with the State to address these concerns. TEG and CNE are still awaiting a schedule from the State regarding these repairs.