Metro Nashville
DISTRICT ENERGY SYSTEM

Operations Monitoring Report

Third Quarter FY17

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April 28, 2017

I. Executive Summary

A review of the fiscal year 2017 (FY17) 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 2017 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

For the Third Quarter FY17, the chilled water sales increased 9.4% over the previous Third Quarter (FY16). The chilled water sendout also increased 12.2% over the previous Third Quarter. The system losses increased approximately 110.2%. The number of cooling degree days increased 50% in the Third Quarter. The peak chilled water demand for the current quarter was 11,195 tons, which is marginally higher than the previous Third Quarter.

Steam sendout for the current quarter decreased by approximately 15.2% over the previous Third Quarter with a 25.5% decrease in heating degree days. Likewise, steam sales also decreased by approximately 16.8% over the previous Third Quarter. Steam system losses, as a percentage of sendout, increased, and the total losses increased approximately 6.0% over the previous Third Quarter. The peak steam demand for the current quarter was 136,250 pounds per hour, which represents a decrease in the Third Quarter demand by approximately 3.9%.

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; however, it increased by 2.2% in the Third Quarter over the previous Third Quarter. The steam plant electric consumption per unit of sales increased over the previous Third Quarter by 10.6%. The total water consumption for the steam and chilled water plants increased 8.2% from the previous Third Quarter. However, the EDS make-up for the chilled water system increased 31.8%. The steam plant water usage increased by 13.8%.

Work continued on DES Capital and Repair & Improvement Projects during the Third Quarter of FY17. Repair and Improvements to the EDS continue as scheduled. DES121, DES122, DES127, DES128 and DES129 were closed during the Third Quarter FY17. Construction was started and completed on DES130, DES134 and DES137 during the Third Quarter FY17, and it is anticipated that they will be closed during the Fourth Quarter FY17. DES138 (Manhole D Repairs) was opened during the Third Quarter FY17.

The current fiscal year system operating costs to date are $15,172,088. This value represents approximately 74% of the total budgeted operating cost for FY17. The customer revenues from the sales of steam and chilled water for FY17 (to date) are $13,252,844 which is approximately 70% 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 FY17 is $1,291,500 (75% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices.

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 Third Quarter chilled water sales is shown in Figure 1. This data reflects a 9.4% increase in sales for the current quarter over the same quarter of the previous fiscal year.

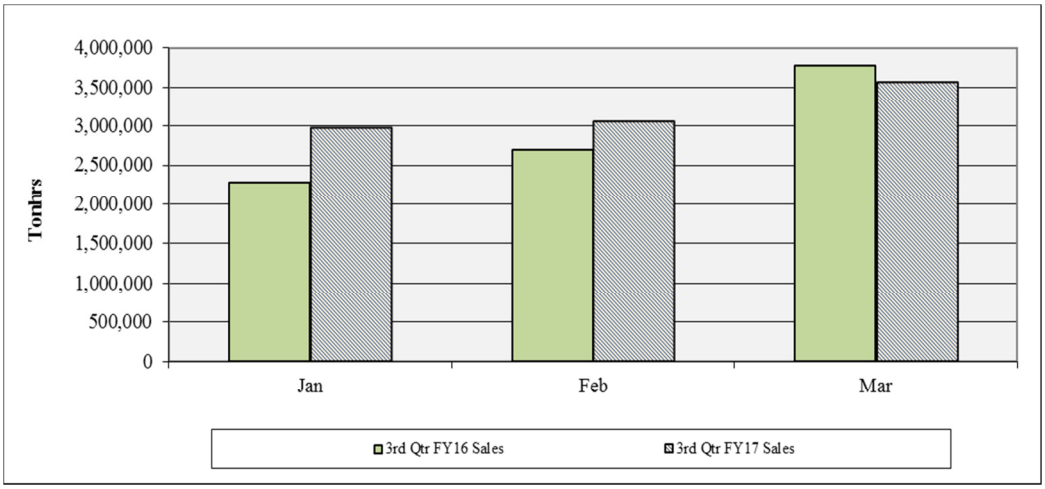

Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 11,195 tons, which represents a marginal increase over the previous Third Quarter.

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

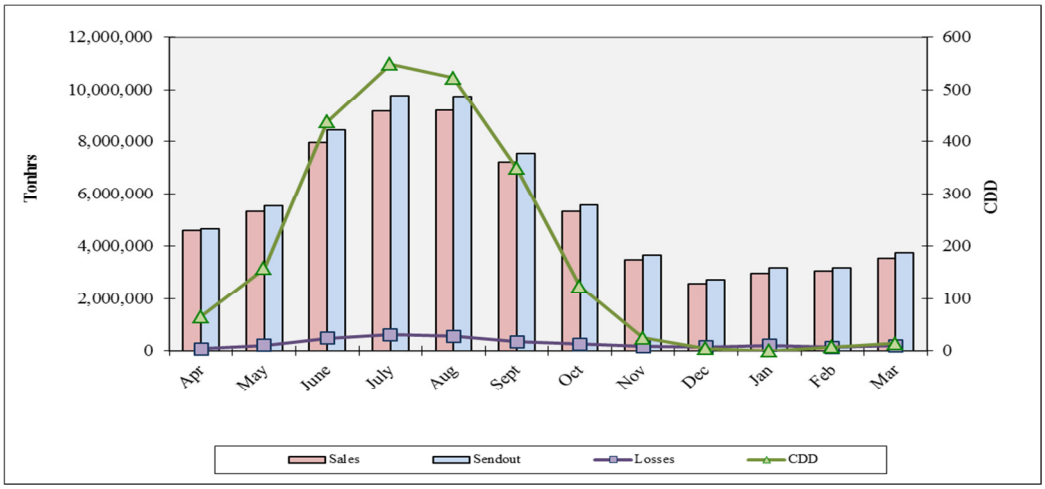

Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

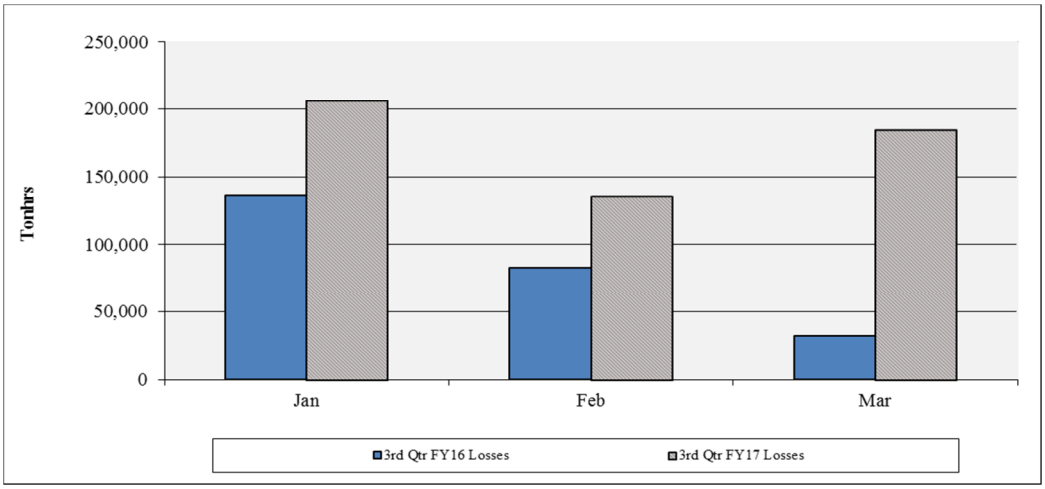

Figure 3. Chilled Water System Loss Comparison

The EDS make-up increased by approximately 31.8% over the previous Third Quarter. CNE and TEG are continuing to investigate the sources of the chilled water leaks that cause the increase in EDS make-up. A potential source of a major leak was discovered on 5th Ave near the James K. Polk Building. A capital project, DES135, was created to perform an exploratory excavation of the area to determine the location of the leak and make the necessary repairs. Unfortunately after several excavations, the leak has yet to be located. The total EDS water

usage represents approximately 26% of the total EGF water usage for the quarter at its current rate.

The make-up to the cooling towers decreased approximately 2.2% during the quarter. The number of cycles of concentration in the condensing water circuit experienced a 42.1% decrease during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

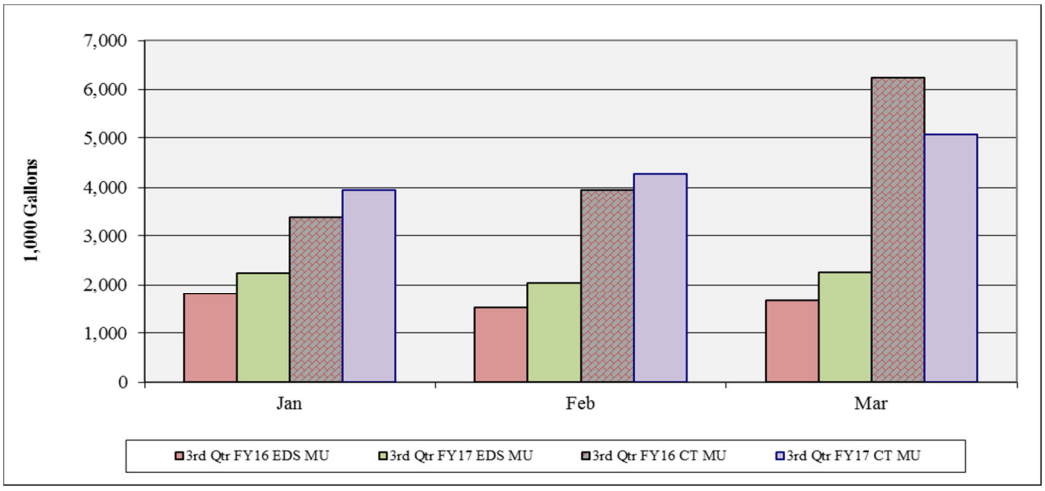

Figure 4. Chilled Water System City Water Usage Comparison

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 quite satisfactorily.

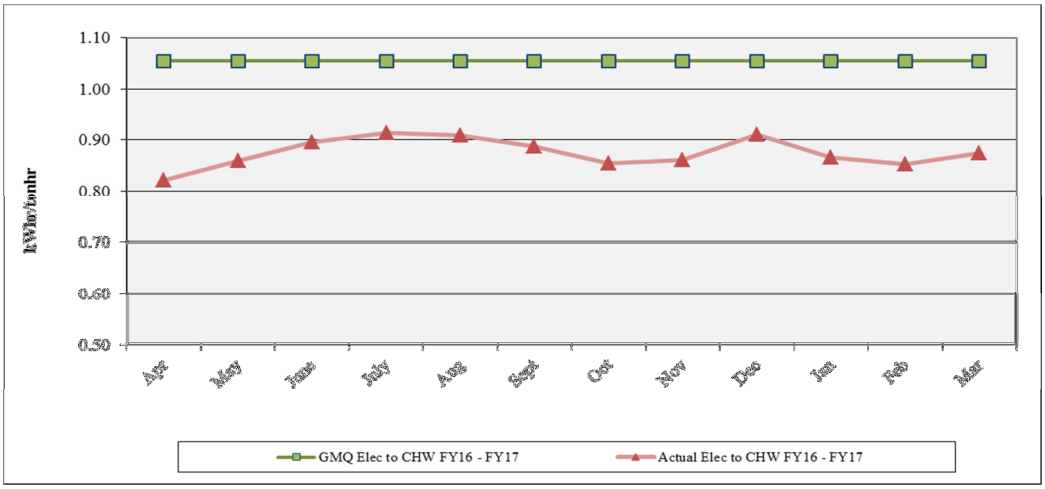

Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

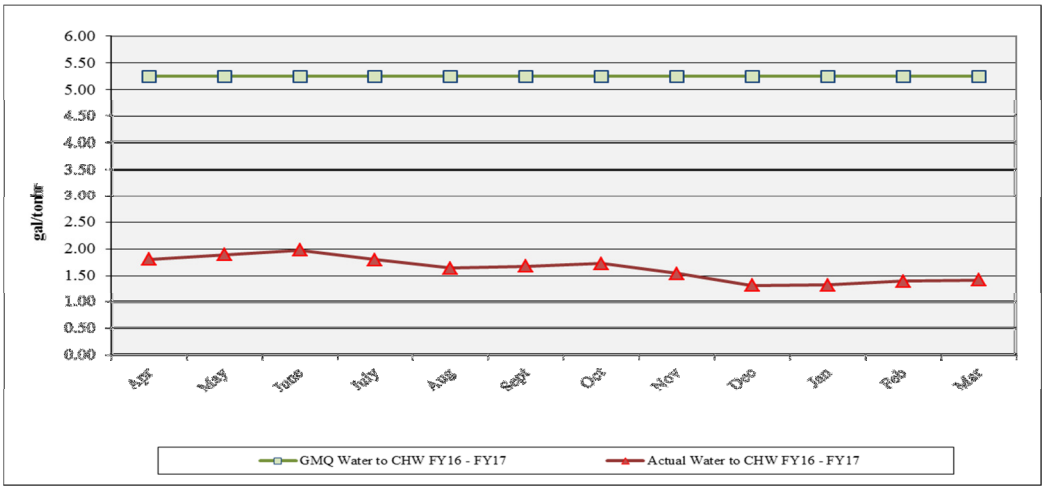

Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

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 approximately 2.2% over the Third Quarter for FY16, resulting in a slightly poorer performance.

The actual chiller plant water conversion factor decreased approximately 2.3% over the previous Third Quarter. The total consumption of city water for the chiller plant for the current quarter increased 6.9%.

B. Steam

1. Sales and Sendout

The steam sendout decreased by approximately 15.2% over the previous Third Quarter (FY16), and the sales also decreased by approximately 16.8%. The Quarter experienced an approximate 25.5% decrease in the number of heating degree days. The steam system losses increased 6.0% over the previous Third Quarter. A comparison for the Third Quarter steam sales is shown in Figure 7.

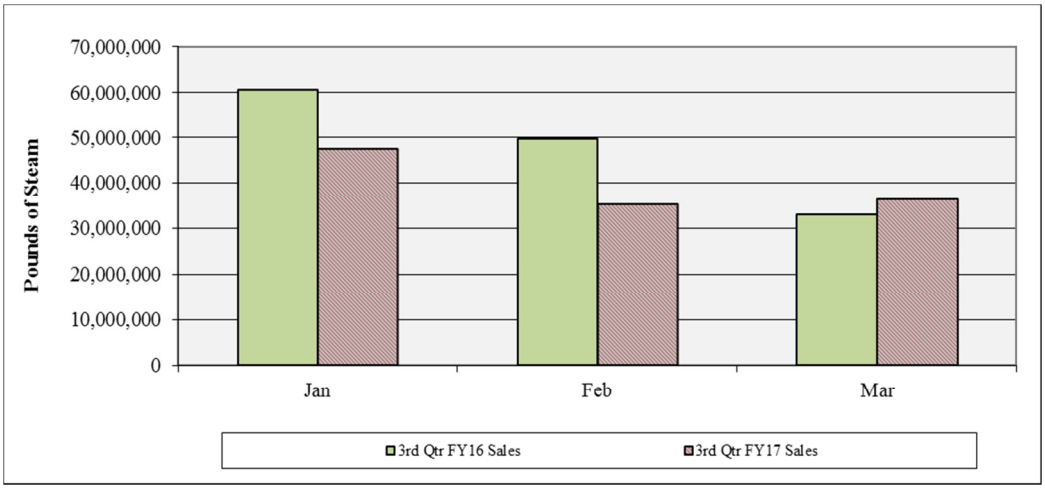

Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 136,250 pph, which reflects an approximate 3.9% decrease in the peak steam production over the previous Third Quarter.

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

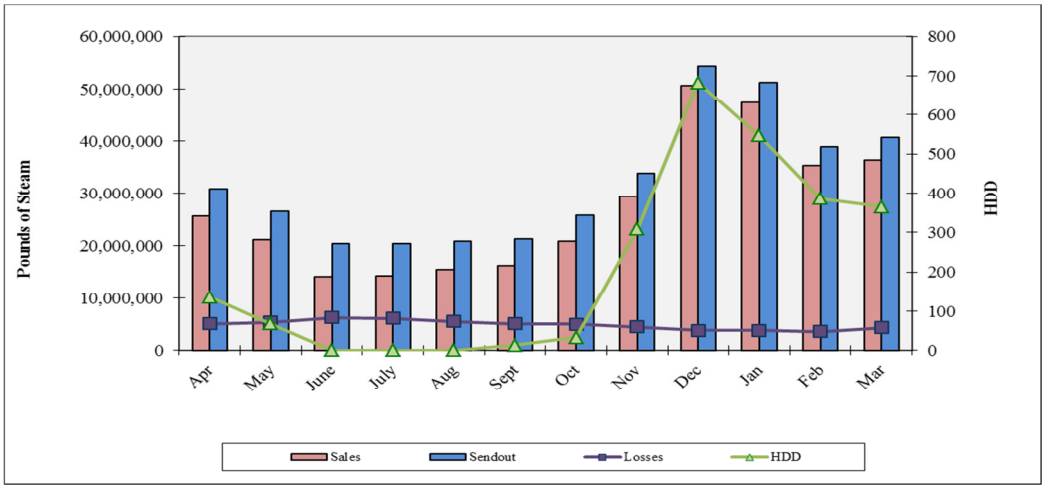

Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

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

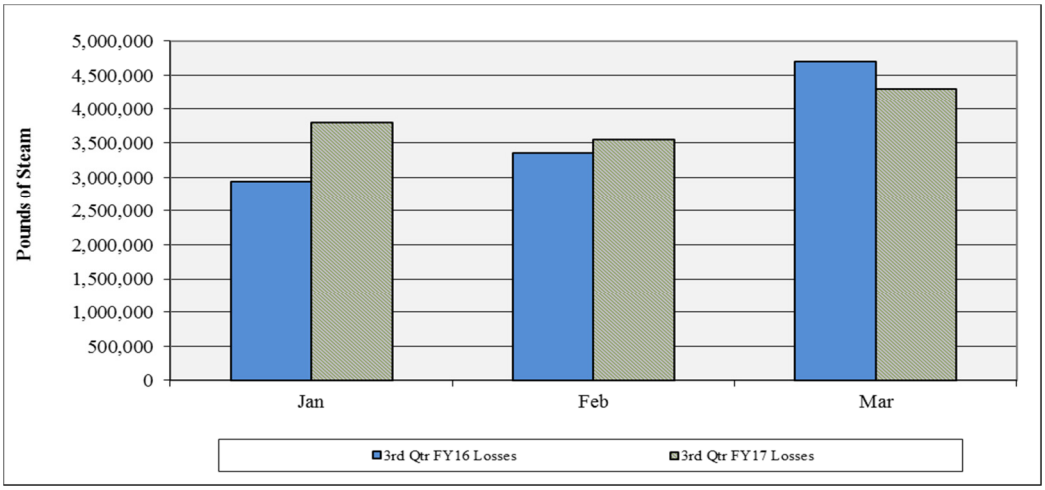

Figure 9. Steam System Losses

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.

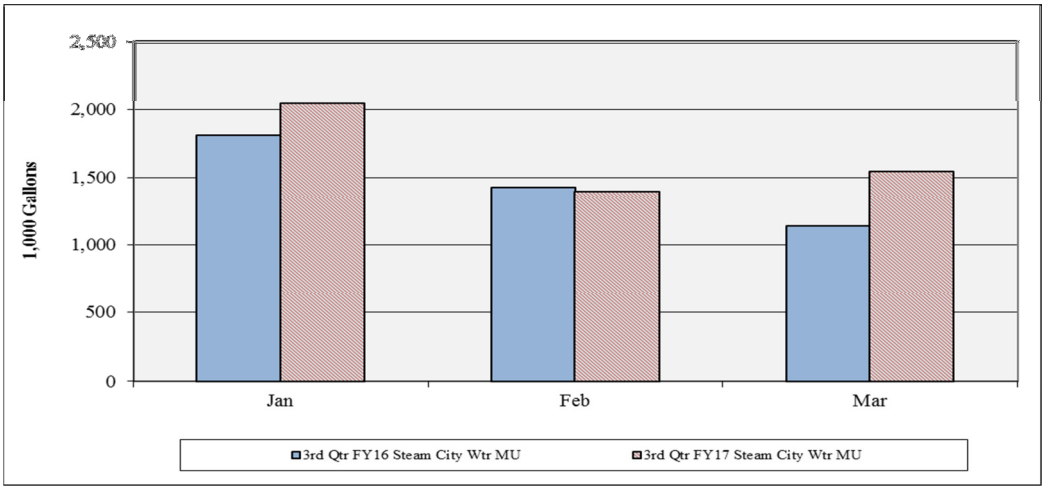

Figure 10. Steam System City Water Make-up Comparison

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.

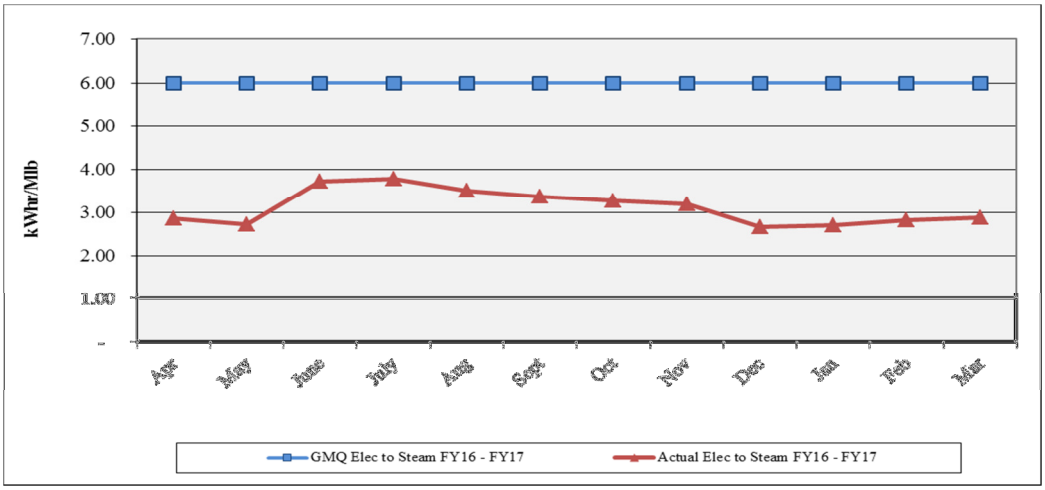

Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

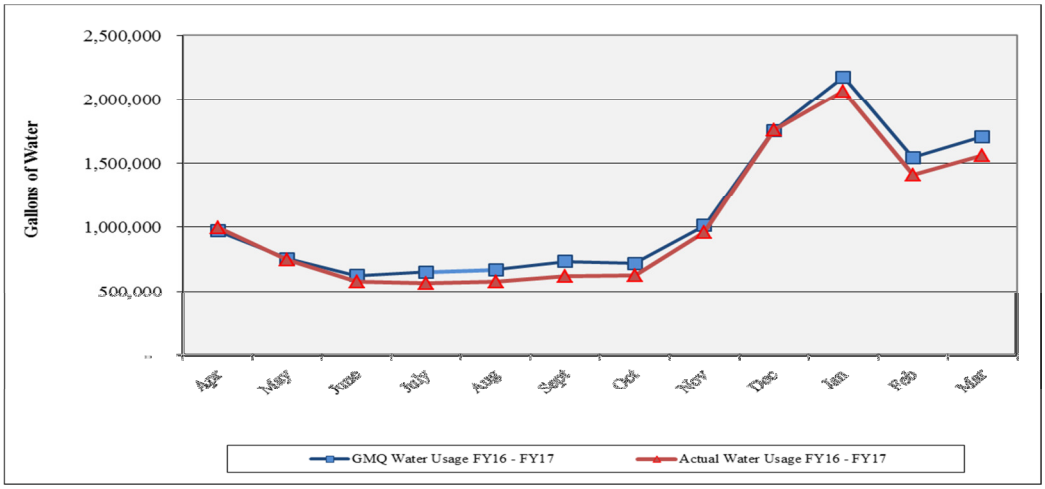

Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

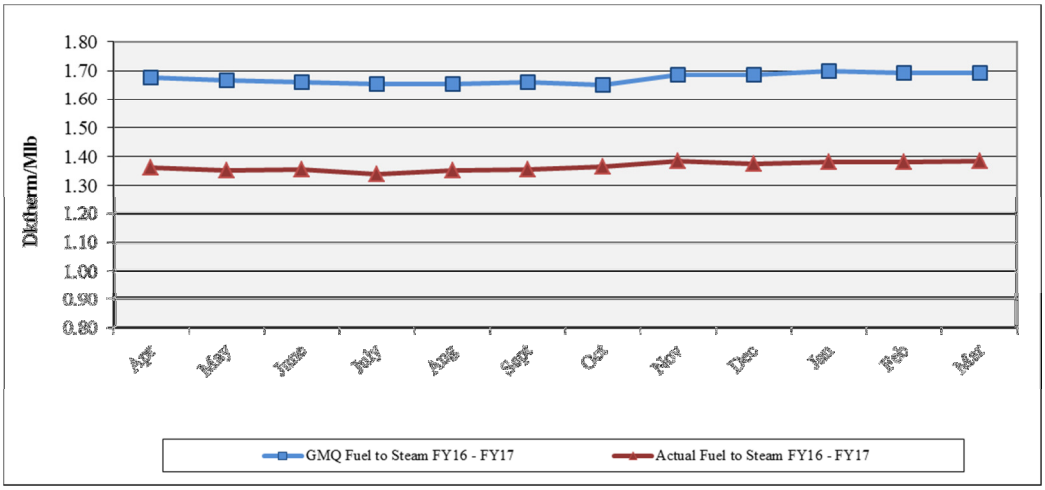

Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced an 8.0% decrease in the steam plant electric consumption while experiencing an approximate 10.6% increase in the electric conversion factor. The water consumption for the steam plant increased 13.8% this quarter as compared to the previous Third Quarter. The fuel consumption per unit of steam sales was 2.89% 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 FY17 and Annual Production, Sales and Consumption Summary

Item	Unit	Third Quarter FY17	Third Quarter FY16	*Percent Difference
	days	90	91	-1.10%
Total Electric Use	kWhrs	8,614,678	7,765,275	10.94%
Chilled Water	kWhrs	8,283,319	7,405,189	11.86%
Steam	kWhrs	331,359	360,086	-7.98%
Total Water Use	kgal	24,824	22,936	8.23%
Total Chilled Water	kgal	19,840	18,557	6.91%
EDS Make-up	kgal	6,560	4,979	31.75%
Cooling Towers	kgal	13,280	13,578	-2.19%
Calc CT Evaporation	kgal	10,315	11,640	-11.38%
CT Blowdown	kgal	2,965	1,938	52.99%
Calc # Cycles		3.48	6.01	-42.08%
Steam	kgal	4,984	4,379	13.82%
Total Fuel Use	mmBTU	180,689	219,426	-17.65%
Natural Gas	mmBTU	180,452	219,401	-17.75%
Propane	mmBTU	237	25	848.00%
Condensate Return	kgal	11,302	15,073	-25.02%
	lbs	92,178,233	122,936,389	-25.02%
Avg Temp	°F	172.7	174.0	-0.77%
Sendout				
Chilled Water	tonhrs	10,100,700	9,000,400	12.23%
Steam	lbs	130,630,000	154,052,000	-15.20%
Peak CHW Demand	tons	11,195	11,180	0.13%
Peak Steam Demand	lb/hr	136,250	141,813	-3.92%
CHW LF		41.77%	36.86%	13.32%
Steam LF		44.39%	49.74%	-10.76%
Sales				
Chilled Water	tonhrs	9,573,484	8,749,357	9.42%
Steam	lbs	118,991,278	143,068,498	-16.83%
Losses				
Chilled Water	tonhrs	527,216	251,043	110.01%
Steam	lbs	11,638,722	10,983,502	5.97%
		8.91%	7.13%	24.97%
Degree Days				
CDD		21	14	50.00%
HDD		1,296	1,740	-25.52%

*positive percent difference values imply an increase from FY16 to FY17

Table 2. Third Quarter FY17 and Annual Performance Guarantee Comparison for Steam and Chilled Water

GMQ Calculations	Unit	Third Quarter FY17	Third Quarter FY16	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	2.78	2.52	10.64%
GMQ Plant Efficiency	Dth/Mlb	1.695	1.675	
Plant Efficiency	Dth/Mlb	1.383	1.424	-2.89%
Actual %CR		70.56%	79.80%	-11.58%
Avg CR Temp	°F	173	174	-0.77%
GMQ Water Conversion	gal	5,421,818	4,387,397	
Water Conversion	gal	5,033,840	4,422,790	13.82%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.865	0.846	2.23%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.07	2.12	-2.29%

*positive percent difference values imply an increase from FY16 to FY17

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 $15,172,088. This value represents approximately 74% of the total budgeted operating cost for FY17 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 FY17 are $13,252,844 which is approximately 70% of the budgeted amount. The MFA transferred to date is $1,291,500 (75% 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		FY17 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
Operating Management Fee								
FOC:	Basic	$ 4,433,800	$ 1,082,615	$ 1,082,615	$ 1,082,615	$ -	$ 3,247,846	73.25%
	9th Chiller	$ 41,500	$ 10,144	$ 10,144	$ 10,144	$ -	$ 30,433	73.33%
	C/O 6A	$ 82,000	$ 20,028	$ 20,028	$ 20,028	$ -	$ 60,083	73.27%
	C/O 6B	$ 71,800	$ 17,534	$ 17,534	$ 17,534	$ -	$ 52,601	73.26%
	C/O 7	$ 27,100	$ 6,605	$ 6,605	$ 6,605	$ -	$ 19,816	73.12%
	C/O 8	$ 11,800	$ 2,891	$ 2,891	$ 2,891	$ -	$ 8,672	73.49%
Pass-thru Charges:	Chemical Treatment	$ 161,600	$ 49,131	$ 47,483	$ 50,938	$ -	$ 147,552	91.31%
	Insurance	$ 36,600	$ -	$ -	$ -	$ -	$ -	0.00%
Marketing:	CNE Sales Activity	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Incentive Payments	$ 12,800	$ 3,139	$ 1,046	$ -	$ -	$ 4,186	32.70%
FEA:	Steam	$ 60,500	$ 15,485	$ 29,618	$ 38,924	$ -	$ 84,027	138.89%
	Chilled Water	$ 185,200	$ 142,582	$ 75,722	$ 67,667	$ -	$ 285,971	154.41%
Misc:	Metro Credit	$ -	$ (243,525)	$ (141,220)	$ (107,993)	$ -	$ (492,738)	n.a.
	ARFA	$ 64,400	$ 15,723	$ 15,723	$ 15,723	$ -	$ 47,170	73.25%
	Deferral	$ -	$ -	$ (23,446)	$ (106,591)	$ -	$ (130,037)	n.a.
	Subtotal - Man Fee =	**$ 5,189,100**	**$ 1,365,878**	**$ 1,285,964**	**$ 1,206,478**	**$ -**	**$ 3,858,320**	**74.35%**
Reimbursed Management Fee + Chem Treatment			$ 1,365,878	$ 1,285,964	$ 402,159	$ -	$ 3,054,002	0.00%
Metro Costs								
Pass-thru Charges:	Engineering	$ 9,300	$ 4,825	$ 4,936	$ 2,439	$ -	$ 12,200	131.18%
	EDS R&I Transfers	$ 273,700	$ 68,425	$ 68,425	$ 68,425	$ 22,808	$ 228,083	83.33%
	Metro Marketing	$ 10,300	$ 1,274	$ 579	$ -	$ -	$ 1,854	18.00%
	Project Administration	$ 58,300	$ -	$ -	$ -	$ -	$ -	0.00%
	Metro Incremental Cost	$ 540,900	$ 129,303	$ 121,437	$ 139,251	$ 6,493	$ 396,484	73.30%
Utility Costs:	Water/Sewer	$ 553,600	$ 232,673	$ 133,296	$ 100,091	$ -	$ 466,060	84.19%
	EDS Water/Sewer	$ -	$ 136	$ 90	$ 98	$ -	$ 325	n.a.
	EDS Electricity	$ -	$ 10,853	$ 7,923	$ 7,902	$ -	$ 26,678	n.a.
	Electricity	$ 5,978,700	$ 2,080,977	$ 972,581	$ 932,173	$ -	$ 3,985,730	66.67%
	Natural Gas Consultant	$ 102,000	$ 3,000	$ 3,000	$ 3,000	$ -	$ 9,000	8.82%
	Natural Gas Transport	$ -	$ 48,008	$ 75,023	$ 88,483	$ -	$ 211,514	n.a.
	Natural Gas Fuel	$ 2,516,100	$ 234,200	$ 473,379	$ 626,806	$ -	$ 1,334,386	53.03%
	Propane	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Subtotal - Metro Costs =	**$ 10,042,900**	**$ 2,813,675**	**$ 1,860,670**	**$ 1,968,668**	**$ 29,302**	**$ 6,672,314**	**66.44%**
	Subtotal - Operations =	**$ 15,232,000**	**$ 4,179,553**	**$ 3,146,634**	**$ 3,175,146**	**$ 29,302**	**$ 10,530,635**	**69.13%**
Debt Service	2012 Bonds	$ 3,481,500	$ 870,075	$ 870,463	$ 870,463	$ -	$ 2,611,000	75.00%
	2005 Bonds -Self Funded	$ 752,300	$ 687,877	$ -	$ 64,413	$ -	$ 752,290	100.00%
	2007 Bonds -Self Funded	$ 198,700	$ -	$ 198,700	$ -	$ -	$ 198,700	100.00%
	2008 Bonds -Self Funded	$ 197,900	$ -	$ 197,900	$ -	$ -	$ 197,900	100.00%
	2010 Bonds -Self Funded	$ 197,600	$ -	$ -	$ 197,600	$ -	$ 197,600	100.00%
	MCCC Fund -Self Funded	$ 697,000	$ -	$ -	$ 374,200	$ 322,800	$ 697,000	100.00%
	Interest & Misc Revenue	$ (141,200)	$ (8,380)	$ (3,373)	$ (1,284)	$ -	$ (13,037)	9.23%
	MIP	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Oper. Reserve Fund	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Subtotal - Capital =	**$ 5,383,800**	**$ 1,549,573**	**$ 1,263,689**	**$ 1,505,391**	**$ 322,800**	**$ 4,641,453**	**86.21%**
	Total =	**$ 20,615,800**	**$ 5,729,125**	**$ 4,410,323**	**$ 4,680,537**	**$ 352,102**	**$ 15,172,088**	**73.59%**
Customer Revenues								
	Taxes Collected		$ 104,248	$ 84,283	$ 80,674	$ -	$ 269,206	n.a.
	Taxes Paid		$ 104,248	$ 84,282	$ 51,237	$ -	$ 239,767	n.a.
	Penalty Revenues/Credits		$ (24,245)	$ (14,272)	$ (32,502)	$ -	$ (71,020)	n.a.
	Energy Revenues Collected		$ 5,108,490	$ 4,134,211	$ 4,051,724	$ -	$ 13,294,425	n.a.
	Revenues =	**$ 18,894,000**	**$ 5,084,245**	**$ 4,119,941**	**$ 4,048,659**	**$ -**	**$ 13,252,844**	**70.14%**
	Metro Funding Amount =	**$ 1,721,800**	**$ 644,880**	**$ 290,383**	**$ 631,878**	**$ 352,102**	**$ 1,919,243**	**111.47%**

The DES serves 28 customers and 42 buildings in downtown Nashville. These customers are divided into three categories: 1) Privately owned buildings, 2) State of TN owned buildings and 3) Metro owned buildings. A summary of the annual costs for each of these three categories is presented in Table 4. These values include late fees and penalties and any unpaid balances.

Table 4. Customer Revenue Summary to Date

Building	Chilled Water				Steam		
	Total Cost	Consumption (tonhrs/yr)	Unit Cost ($/tonhr)		Total Cost	Consumption (Mlb/yr)	Unit Cost ($/Mlb)
Private Customers	$ 2,703,327	14,144,425	$ 0.1911		$ 1,068,074	70,814	$ 15.0829
State Government	$ 2,433,431	9,889,300	$ 0.2461		$ 1,287,849	72,377	$ 17.7937
Metro Government	$ 4,142,681	22,471,514	$ 0.1844		$ 1,659,064	122,394	$ 13.5551
New Customers	$ 2,394,260	13,046,013	$ 0.1835		$ 1,012,369	88,195	$ 11.4787
Total	**$ 9,279,438**	**46,505,239**	**$ 0.1995**		**$ 4,014,987**	**265,584**	**$ 15.1176**

Total Revenue	**$ 13,294,425**
True-up and Adjustments (Net)	**$ (41,581)**
Net Revenue	**$ 13,252,844**

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY17. 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.

- The chilled water sendout temperature went above 43.3°F for approximately two hours in January due to a chiller being turned off at the panel during a run test performed by Trane.
- The steam pressure dropped below 150 psig in February for approximately 75 minutes due to a failure with the boiler #3 ignitor. The ignitor was repaired the same day.
- The steam pressure dropped below 150 psig in March for approximately 45 minutes while the operator was adjusting to a change in steam demand.
- Excursions and disruptions in operations that have occurred throughout the year are included in the individual Monthly Operational Reports from CNE.

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 Lock Out/Tag Out Procedures, Hazard Management and Office Safety, Fall Protection, Motor Vehicle Safety and Powered Industrial Truck Safety.

CNE has completed their cross-training for its maintenance employees so that they can fill in as relief operators.

D. Personnel

The EGF currently has twenty-five full time employees. 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. CNE continues cross training maintenance personnel to perform the tasks of the operators at the EGF in case of emergency or need.

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 70.6% of the steam sendout during the quarter which represents an 11.6% decrease over the previous Third Quarter. Elevated levels of hardness were discovered in the condensate return during March which prompted CNE to place the condensate to drain for several customers until the source of the hardness could be determined.
  - 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, has become essentially non-existent. Biological growth has been found at several customer buildings and CNE is developing a plan to address the growth at these locations.

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.

- The tube leak on boiler #1 has been repaired.
- The packing was replaced on condensate pump #3. This pump experienced additional issues during the quarter and was discovered in March to have a damaged impeller. Cavitation is believed to have caused the problems. CNE has ordered a replacement pump which should be online in the Fourth Quarter.
- The ignitor for boiler #3 was repaired.
- The bearing and oil seals on boiler feedwater pumps #4 and #5 were replaced.
- The fan belts were adjusted on cooling towers #3 and #18.
- The coupling was replaced on condensate pump #5.
- The ignitor for boiler #1 was replaced.
- A relay failed on transformer 1A. CNE has ordered a replacement but it will not arrive until May.
- Other minor repairs and 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 24, 2017, 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.

- Some of the riser pipes in the cooling towers have been painted, but some repairs remain. CNE has dedicated itself to repaint these riser pipes as the tower basins are repaired and the fill is replaced. Repairs remain on only three cooling towers which are anticipated to be completed in FY18.
- 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 has begun to show cracks and is in need of repair. This item was noted in the previous Walkthrough Report and has not been addressed to date.
- The leaking seals at the condensing water pumps have been repaired, but mineral deposits remain on one of the pump volutes. CNE was notified.
- Condensate pump #3 was found to be disassembled during the walkthrough. CNE reported that the pump had experienced what they believed to be cavitation. The impeller had been damaged. CNE has purchased a replacement pump and intends to complete the repairs once the pump arrives in the Fourth Quarter FY17.
- 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 FY17 Open Projects

The following projects remained open at the end of the Third Quarter FY17.

1. DES033 – Manhole Lid and Ring Replacement/Restoration

This project relates to the repair and replacement of manhole lids and rings whenever Metro Public Works performs Street re-paving. This project will remain open and on-going.

2. DES090 – Manhole & Tunnel Insulation Repair (Revised from DES060)

Work associated with this project will be on-going as required.

3. DES111 – DES Combined Heat and Power

This project is currently on hold.

4. 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.

5. DES124 - Criminal Justice Center Redevelopment

The site preparation for the construction of the new CJC began in the Third Quarter. TEG continues to work with Metro's re-development team in preparation for the re-connection of DES services to the new building once construction is complete.

The contractor preparing the old CJC site for the new construction began blasting in late March. Due to concerns about the structural integrity of the AA Birch Tunnel passing beneath the old CJC, the contractor, Metro, CNE and TEG have worked closely together to monitor the condition of the tunnel. A plan has also been developed by TEG, in coordination with Metro General Services and CNE, to provide emergency steam and chilled water to the AA Birch building should services to the building be disrupted along the tunnel due to the demolition or construction occurring at the CJC site.

6. DES130 – Repair to Manhole B3

Construction was completed during the Third Quarter FY17 and this project is now in close-out.

7. DES133 – Old Convention Center Site Redevelopment

The demolition of the existing Nashville Convention Center is scheduled to begin in May 2017. This site will be redeveloped as a mixed-use residential, retail and event center. The new facilities are expected to utilize 100% of the existing contract capacities of the old Convention Center. DES will most likely not serve any additional loads for any new construction. The Renaissance Hotel and Office will remain DES customers and should not be affected by the demolition or construction of the new buildings.

In the Third Quarter, TEG and CNE have met with the new owner and their engineers and contractors and informed them of the extent of the DES services located on their site. Meetings have also been held regarding the continuation of the DES shaft located at 5th Ave and Broadway that provides fresh air to the DES tunnels. The DES is not anticipated to have to incur any construction costs for this project or redevelopment of the site at this time.

8. DES134 – 401 Union Building Service Connection

Construction to repair/renovate the steam and chilled water services lines to the building was started and completed during the Third Quarter FY17. This portion of the project is now in close-out.

The remaining portions of this project involve the re-installation of the DES metering instruments and panel and final piping interconnections. The instrumentation is anticipated to be installed in the Fourth Quarter FY17 with the finalization of the piping and interconnection soon following. Services are anticipated to be completely restored and a full utilization of DES services during the First Quarter FY18.

9. DES135 – CHW Leak at 5th and Union

A chilled water leak was reported by the James K Polk Building on the east side of the building. This project involves locating and repairing this leak. Two separate exploratory excavations took place during the Second Quarter FY17 but no leaks where found. Another possible leak location was discovered by a different leak detection company. An excavation was done during the Third Quarter FY17 and no leak was found. TEG is now planning with CNE to conduct several "pothole" excavations consisting of 1 foot diameter holes along the piping route to try and locate the leak. Because we are now entering the cooling season, if a leak is found, excavation and repairs would not take place until the weather cools (fall of 2017 or winter of 2018).

10. DES137 – Cordell Hull New CHW Valves

The Cordell Hull Building is undergoing extensive renovations by the State of Tennessee. In order to perform some of these renovations, The State requested that the chilled water service to the building be isolated. During the isolation process, CNE discovered that the in-building isolation valves were extremely difficult to operate and achieve isolation. Concerns were raised about the use of these valves in the future. TEG reviewed the valves (which are 40+ years old) and recommended that new valves be installed. Because a substantial portion of the CHW distribution system would have to be drained in order to replace these existing valves, it was decided to install new valves and then abandon-in-place the existing valves.

Construction was started and completed during the Third Quarter FY17. This project is now in close-out.

11. DES138 – Manhole D Repairs

Because Manhole D is located near one of the several "underground streams" in downtown Nashville, water infiltration into this manhole has been a constant nuisance. A separate vault containing a sump and pumps was constructed several years ago just south of Manhole D to reduce the accumulation of groundwater in Manhole D. While this has helped, it has not eliminated the water infiltration into Manhole D.

This continued water infiltration has resulted in the corrosion of the structural steel components within Manhole D. TEG has been monitoring the progression of this corrosion for several years and, even though CNE has regularly pumped this manhole to reduce the water's impact, the corrosion now needs to be addressed. This project involves the cleaning and painting (and potential replacement) of structural steel components within this manhole. In addition, the existing sparge assembly in this manhole has not been functioning properly and will be replaced. The project also includes the installation of an electric sump pump, re-insulation of the manhole piping, concrete repairs, the replacement of the entry ladder and other minor repairs.

This project will be bid during the Fourth Quarter FY17.

B. Third Quarter FY17 Closed Projects

DES121, DES122, DES127, DES128 and DES129 were closed during the Third Quarter FY17.

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	FY17 Spending to Date	Total Spent to Date	Remaining Balance
2010 Bond Projects-49109						
	DES119	DES Delta T Issue	$ 100,000	$ 6,221	$ 65,447	$ 34,553
	DES117	Manhole S5 Modifications	$ 185,000	$ -	$ 180,161	$ 4,839
		Total Closed Projects	$ 2,308,661	$ -	$2,241,145	$ 67,517
		Metro Project Admin	$ -	$ -	$ -	$ -
		Project Man, Development, etc	$ 12,254	$ -	$ -	$ 12,254
		Total 2010 Bond	**$ 2,605,916**	**$ 6,221**	**$2,486,752**	**$ 119,164**
Customer Connection Fund-49107						
	DES104	Time of Use/ Customer Billing	$ 40,000	$ 4,156	$ 35,924	$ 4,076
	DES124	CJC Redevelopment	$ 300,000	$ 104,263	$ 122,321	$ 177,679
	DES129	MH 22B Repair	$ 20,000	$ 10,701	$ 12,890	$ 7,110
	DES130	MH B3 Repair	$ 20,000	$ 2,377	$ 3,064	$ 16,936
	DES131	Wildhorse CHW Modifications	$ 40,000	$ 42,001	$ 42,001	$ (2,001)
	DES133	NCC Development	$ 20,000	$ 1,106	$ 8,531	$ 11,469
	DES134	401 Union Hotel Reconnection	$ 40,000	$ 24,511	$ 24,511	$ 15,489
	DES135	Chilled Water Leak 5th and Union	$ 50,000	$ 46,728	$ 46,728	$ 3,272
	DES122	Miscellaneous MH Repairs	$ 170,000	$ 166,036	$ 166,036	$ 3,964
	DES138	MH-D	$ 100,000	$ 122	$ 122	$ 99,878
	DES137	Cordell Hull CHW Valves	$ 15,000	$ 12,763	$ 12,763	$ 2,237
		Total Closed Projects	$ 7,233,827	$ -	$6,614,564	$ 619,263
		Metro Project Admin	$ 420,173	$ 22,891	$ 108,635	$ 311,538
		Project Man, Development, etc	$ 40,000	$ -	$ -	$ 40,000
		Customer Connection Fund	**$ 8,509,000**	**$ 437,655**	**$7,198,090**	**$ 1,310,910**
CHP and EDS Repairs-49116						
	DES111	DES CHP	$26,000,000	$ 41,020	$ 168,706	$25,831,294
		Total Closed Projects	$ -	$ -	$ -	$ -
		Metro Project Admin	$ -	$ -	$ -	$ -
		Project Man, Development, etc	$ -	$ -	$ -	$ -
		CHP and EDS Repairs	**$26,000,000**	**$ 41,020**	**$ 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 $19,769 (including the deposit transfer for April). Table 6 provides a summary of the FY17 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 FY16						**$ -**	**$ 5,067.65**	**$ 5,067.65**
June R&I Invoice	08/29/16	DES-2337	CNE	$ 1,803.70				
DES-126 Exploratory Excavation on 3rd Ave 6/16	08/30/16	DES-2338	CNE	$ 25,520.61				
DES-121 Misc MH Repairs	09/07/16	DES-2340	TEG	$ 1,360.85				
DES-126 Exploratory Excavation on 3rd Ave 6/16	09/07/16	DES-2340	TEG	$ 243.96				
DES-127 MH13 Steam Anchor Repair	09/07/16	DES-2340	TEG	$ 813.19				
DES-128 MHA Sparge Tube	09/07/16	DES-2340	TEG	$ 160.10				
July R&I Invoice	09/27/16	DES-2354	CNE	$ 2,963.68				
DES-121 Misc MH Repairs	09/27/16	DES-2353	CNE	$ 33,558.75				
DES-121 Misc MH Repairs	10/27/16	DES-2370	TEG	$ 744.63				
DES-122 MH13 Repairs	10/27/16	DES-2370	TEG	$ 480.30				
DES-127 MH13 Steam Anchor Repair	10/27/16	DES-2370	TEG	$ 1,796.69				
DES-128 MHA Sparge Tube	10/27/16	DES-2370	TEG	$ 320.21				
DES-124.3 MH-D Sump Pumps	10/27/16	DES-2370	TEG	$ 120.08				
DES-135 CHW Leak at 5th and Union	10/27/16	DES-2370	TEG	$ 80.06				
DES-121 Misc MH Repairs	10/28/16	DES-2372	TEG	$ 480.31				
DES-122 MH13 Repairs	10/28/16	DES-2372	TEG	$ 2,477.56				
DES-127 MH13 Steam Anchor Repair	10/28/16	DES-2372	TEG	$ 80.06				
DES-128 MHA Sparge Tube	10/28/16	DES-2372	TEG	$ 720.46				
DES-124.3 MH-D Sump Pumps	10/28/16	DES-2372	TEG	$ 720.46				
DES-135 CHW Leak at 5th and Union	10/28/16	DES-2372	TEG	$ 2,855.66				
Sub-Total First Quarter				**$ 77,301.32**	**$ 68,424.99**	**$ -**	**$ (8,876.33)**	**$ (8,876.33)**
Oct R&I Invoice	12/22/16	DES-2398	CNE	$ 4,886.62				
Interest/Transfer	12/29/16	-	-	$ (1.89)				
DES 121 Misc Manhole Repairs	12/22/16	DES-2399	CNE	$ 11,186.25				
DES-124.3 MH-D Sump Pumps	01/06/17	DES-2403	CNE	$ 38,981.25				
DES-127 MH13 Steam Anchor Repair	01/06/17	DES-2404	CNE	$ 27,145.00				
Sub-Total Second Quarter				**$ 82,197.23**	**$ 68,424.99**	**$ -**	**$ (13,772.24)**	**$ (13,772.24)**
Nov R&I Invoice	01/15/17	DES-2410	CNE	$ 12,568.98				
DES 121 Misc Manhole Repairs	01/05/17	DES-2415	TEG	$ 43.83				
DES-122 MH13 Repairs	01/05/17	DES-2415	TEG	$ 546.95				
DES-135 CHW Leak at 5th and Union	01/05/17	DES-2415	TEG	$ 975.82				
DES-137 Cordell Hull CHW Valves	01/05/17	DES-2415	TEG	$ 1,311.22				
DES 121 Misc Manhole Repairs	02/10/17	DES-2431	TEG	$ 284.39				
DES-122 MH13 Repairs	02/10/17	DES-2431	TEG	$ 2,177.31				
DES-127 MH13 Steam Anchor Repair	02/10/17	DES-2431	TEG	$ 3,171.00				
DES-137 Cordell Hull CHW Valves	02/10/17	DES-2431	TEG	$ 406.25				
Jan R&I Invoice	03/15/17	DES-2451	CNE	$ 5,613.55				
Interest/Transfer	01/31/17	-	-	$ 0.16				
Interest/Transfer	01/31/17	-	-	$ (0.16)				
Interest/Transfer	02/28/17	-	-	$ 0.95				
Interest/Transfer	02/28/17	-	-	$ (0.95)				
DES-122 MH13 Repairs	01/05/17	DES-2413	TEG	$ 2,817.57				
DES-128 MHA Sparge Tube	01/05/17	DES-2413	TEG	$ 200.13				
DES-124.3 MH-D Sump Pumps	01/05/17	DES-2413	TEG	$ 43.83				
DES-135 CHW Leak at 5th and Union	01/05/17	DES-2413	TEG	$ 5,629.88				
Adjustment	01/31/17	DES-2413	TEG	$ (6,653.34)				
DES 121 Misc Manhole Repairs	01/05/17	DES-2414	TEG	$ 480.31				
DES-122 MH13 Repairs	01/05/17	DES-2414	TEG	$ 1,801.00				
DES-128 MHA Sparge Tube	01/05/17	DES-2414	TEG	$ 120.08				
DES-135 CHW Leak at 5th and Union	01/05/17	DES-2414	TEG	$ 3,765.25				
DES-137 Cordell Hull CHW Valves	01/05/17	DES-2414	TEG	$ 1,400.88				
Adjustment	01/31/17	DES-2414	TEG	$ (6,653.33)				
Sept R&I Invoice	03/02/17	DES-2385	CNE	$ 1,677.24				
Dec R&I Invoice	03/02/17	DES-2440	CNE	$ 6,484.07				
DES-128 MHA Sparge Tube	03/02/17	DES-2441	CNE	$ 10,922.84				
DES 121 Misc Manhole Repairs	03/01/17	N/A	TEG	$ 1,423.63				
DES-122 MH13 Repairs	03/01/17	N/A	TEG	$ 3,117.12				
DES-137 Cordell Hull CHW Valves	03/01/17	N/A	TEG	$ 206.99				
Sub-Total Third Quarter				**$ 53,883.45**	**$ 68,424.99**	**$ -**	**$ 14,541.54**	**$ 14,541.54**
Sub-Total Fourth Quarter				**$ -**	**$ 22,808.33**	**$ -**	**$ 22,808.33**	**$ 22,808.33**
FY17 Year to Date				**$ 213,382.00**	**$ 228,083.30**	**$ -**	**$ 19,768.95**	**$ 19,768.95**

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. Some traps were found not to be functioning properly; CNE is continuing to repair or replace traps in the system, however some of these repairs/replacements require a partial or system-wide outage.
   b. Some of the trap-piping strainers do not have blowdown valves installed. These valves need to be installed to permit maintenance personnel to discharge any debris from the trap piping that can cause the traps to fail.
   c. Structural metal in the vaults and tunnels need to be cleaned and painted or replaced.
   d. Expansion joints which are leaking need to be repaired once the leaks are large enough to warrant repair.
   e. Lights and emergency lights within the tunnels need to be repaired or replaced as soon as possible.
   f. Spalled concrete needs to be repaired in some manholes.
   g. Some minor insulation repairs are needed in some manholes.
   h. Mud and debris needs to be removed from some manholes.
   i. Communications need to continue with State personnel regarding needed repairs to the State Tunnel.

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

The EDS walkthrough was conducted in several segments. The first segment was conducted on February 15 and 16, 2017; the second segment was conducted on February 22, 2017; the third segment was conducted on March 8, 2017; and the fourth segment was conducted on March 16, 2017. The manholes and tunnel systems that were visited include Manholes 12, 16A, 22B, C, B2, B3, B4, B6, B7, B8, B9, B10, Viridian, S4A, U, 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 B2
   a. This manhole has an electric sump pump, however due to the size of the sump, the float mechanism is not able drop far enough for all of the water in the floor of the manhole to be pumped out. Therefore, there was a small amount of water in the manhole.
   b. There is some corrosion on the piping supports. These supports should be cleaned and painted to prevent additional corrosion. This vault should be included in the capital project to repair and prevent structural corrosion with a "moderate" rating.
   c. There is steam coming into the manhole from the western steam piping wall penetration. The steam is from groundwater coming in contact with the steam piping. The wall penetration has grout installed around this wall penetration and a section of this grout has broken off and is no longer "sealing" the wall penetration – this is where the steam is coming into the manhole. TEG will evaluate the needed repair. This moisture has caused damage to some recently installed insulation in the manhole on the chilled water piping – see next item, 1.d.
   d. Recently, the chilled water piping in this manhole was re-insulated. Some of this insulation is now damaged from the high humidity in the manhole. TEG will evaluate the needed repairs for this manhole.
   e. There are some hairline cracks in the manhole ceiling and walls. CNE should monitor these cracks and inform TEG of any significant changes.
   f. Some additional portions of the mortar which was placed at the joint between the upper half of the precast vault and the lower half has fallen off. A new building is being constructed very close to this manhole and it is possible that some slight shifting of the manhole sections have occurred to cause the mortar to fall off. There was no evidence of groundwater infiltration at this joint, nor has there been a history of any groundwater seepage at this joint. Therefore, there is not a need to patch the places where the mortar has fallen. CNE should remove the fallen mortar from the vault and monitor this joint for future movement/water leakage.

2. Manhole B3
   a. There was a small amount of water present in this vault and it required pumping prior to entry.
   b. There is some corrosion on the piping supports. These supports should be cleaned and painted to prevent additional corrosion. This vault should be included in the capital project to repair and prevent structural corrosion with a "moderate" rating.
   c. There is some minor insulation repair needed in this vault; this vault should be included in the capital project to repair insulation with a "moderate" rating.
   d. 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 done.

e. 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.
f. The trap in this manhole is not functioning. (This trap was replaced by CNE personnel a few days after this review.)
g. There is a hole in the ceiling of this vault caused by a fiber optic directional boring contractor. When the directional boring contractor caused the damage, mud and water infiltrated the manhole. The hole needs to be repaired and the manhole cleaned. The repair of this hole was bid and awarded, however the successful bidder has now closed its Nashville operations. TEG/CNE has transferred this contract to an alternate bidder and the repair work should begin in the next few weeks.

3. Manhole B4
   a. There was water present in this vault and it required pumping prior to entry.
   b. There is some corrosion of the structural components in this manhole. This vault should be included in the capital project to repair and prevent structural corrosion with a "moderate" rating.
   c. There is some minor insulation repair needed in this vault; this vault should be included in the capital project to repair insulation with a "moderate" rating.
   d. There was some mud buildup in the floor of this manhole. This was cleaned out by CNE personnel during this manhole review.
   e. 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.

4. Manhole B6
   a. There was a little water in this manhole that was pumped out prior to entry.
   b. There was a lot of mud in the floor of this manhole; CNE should remove this mud.
   c. One of the trap piping stanchion supports has failed due to corrosion. The remaining two trap piping stanchions are badly corroded. TEG will put together a scope for replacement of this stanchion(s).
   d. Some minor deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.

5. Manhole B7
   a. There was a minor amount of water in this manhole but it did not require pumping.
   b. The insulation on the sparge tube has fallen off; it appears that it was only held in place with caulking. This insulation should be re-positioned and an aluminum strap installed to keep it in place and then re-caulked. This item

was noted in the January 26, 2015 Quarterly Walkthrough Report and the April 25, 2016 Quarterly Walkthrough Report.

c. The trap piping stanchion support has failed due to corrosion. This support is only needed to support the trap piping during repair/replacement of the trap or trap train components; therefore, a replacement support is not needed.
d. Some minor deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.
e. There is some corrosion on the welds on the anchor beam support in this manhole. These welds should be wire brushed/wire wheeled/cleaned and then painted with cold galvanizing paint to prevent additional corrosion.

6. Manhole B8
   a. There was a minor amount of water in this manhole.
   b. There are some hairline cracks in the ceiling; these should be monitored by CNE and any significant changes reported to TEG.
   c. Some minor deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.
   d. There is some corrosion on the welds on the anchor beam support in this manhole. These welds should be wire brushed/wire wheeled/cleaned and then painted with cold galvanizing paint to prevent additional corrosion.

7. Manhole B9
   a. There was some water present in this manhole and it required pumping.
   b. There are some hairline cracks in the ceiling of this vault. CNE should monitor these cracks and report any significant changes to TEG.
   c. Some minor deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.
   d. There is some corrosion on the welds on the anchor beam support in this manhole. These welds should be wire brushed/wire wheeled/cleaned and then painted with cold galvanizing paint to prevent additional corrosion.

8. Manhole B10
   a. There was some water present in this manhole and it required pumping.
   b. The piping kicker Teflon pads on the Music City Convention Center service lines have fallen out. Larger pads that incorporate the baseplate anchor bolts should be installed to prevent these pads from falling out.
   c. Some minor deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.

d. There is some corrosion on the welds on the anchor beam support in this manhole. These welds should be wire brushed/wire wheeled/cleaned and then painted with cold galvanizing paint to prevent additional corrosion.
e. There are some hairline cracks in the ceiling of this vault. CNE should monitor these cracks and report any significant changes to TEG.

9. Viridian Manhole
   a. There was water in the manhole and it required pumping.
   b. There is some minor insulation lagging repairs needed in this vault but they are not significant enough to warrant repair at this time.

10. Manhole 16A
    a. There is some minor corrosion on the welding lugs attached to the chilled water piping. This corrosion should be wire brushed/wire wheeled/cleaned and then painted with cold galvanizing paint to prevent additional corrosion.
    b. Once Item a. is addressed, because there are no valves or piping appurtenances in this manhole, and due to the traffic hazard created to access this manhole, this manhole only needs to be reviewed annually.

11. 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. 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 has gained access to the steam service piping to the Library and a small amount of steam is wafting into the manhole. This, combined with the fact that the 7th Avenue Tunnel exhaust fan is not currently operating has caused this manhole to have an elevated humidity level. This humidity is condensing on exposed portions of the chilled water piping (drains/vents) and valves and it is also condensing on the ceiling of the manhole. This condensate is ponding in the low areas of the manhole floor and draining/dripping down the vertical access shaft to the 7th Avenue Tunnel. Once Item 11.a. is repaired and/or the 7th Avenue Tunnel fan is repaired, the condensing problem should be alleviated.
    c. There is some minor insulation repair needed in this vault. This vault should be included in the capital project to repair insulation with a “minor” rating.

12. Manhole S4A
    a. There was a small amount of water present in this manhole.
    b. There are several cracks in the concrete sidewalk above this manhole; these cracks are probably due to traffic driving on the sidewalk when making turns; the condition of this concrete has been reported 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. A blow down valve needs to be added to the strainer upstream of the trap so the strainer can be blown down.
e. When this manhole was rebuilt, the concrete form tie-backs were cut or removed below the concrete surface and the subsequent depressions at these locations were patched. Several of these patches are loose and "popping" out.

13. Manhole U
    a. There was some water present in this manhole.
    b. 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 lower rung of the ladder is corroded badly. Access to this manhole is not needed; therefore, replacement of this ladder is not necessary at this time.
    c. 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.
    d. At some point in the future, this manhole should be abandoned and filled. To do this, components of the steam valve in this manhole should be welded (bonnet flange and stem) to prevent future leaks, and the piping insulated. The small portion of condensate piping in this manhole should also be insulated before abandonment.

14. Manhole 12
    a. There was no water present in this manhole.
    b. There is a hairline crack in the ceiling of this manhole; CNE should monitor this crack and notify TEG if there is a significant change.
    c. The trap was recently replaced in this manhole. The isolation valve upstream of the trap has a packing leak. CNE personnel attempted to tighten the packing on the valve, but the hex nut is rounded and even though the leak was reduced, it was not eliminated. CNE should make this repair as soon as possible.

15. 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.
    c. The trap was blowing through; CNE should replace this trap as soon as possible.
    d. There is a small accumulation of mud in the floor of this manhole; because of the limited access hours, and before this accumulation gets much greater,

CNE should carry 5 gallon buckets during the next inspection to clean some of this accumulation.

16. Manhole 23
    a. The entry area was dry indicating that the drain is not clogged. This is the first time this area has been dry in a long time. While this area is dry, CNE should clean out the accumulated leaves and debris to try and prevent the drain from becoming clogged. In addition, CNE should put a screen over the drain opening to try and prevent debris from getting into the drain.
    b. The bottom rung of the entry ladder is badly corroded because it has been exposed to so much water accumulation. Since this rung is so close to the floor, CNE should cut and remove this rung and the ladder side rails just below the ladder wall brackets. Then clean and paint this area, especially the bare meatal, with cold galvanizing paint. This might prolong the life of this ladder.
    c. The concrete pedestal for the steam and condensate piping expansion joints has experienced some cracks. In comparison of the pictures from the review one year earlier, it doesn't appear that the cracks have progressed. CNE should continue to monitor these cracks and report any significant changes.
    d. There is insulation debris and other debris in this manhole that needs to be collected and removed.
    e. The structural steel supports in Manhole 23 are corroded and need to be cleaned and re-painted and possibly replaced at some locations. TEG will develop a scope and coordinate these repairs with CNE.
    f. The strainer upstream of the trap does not have a blowdown valve; CNE should add a blowdown valve to this strainer.
    g. The concrete around the manway opening is starting to spall. CNE should monitor this until repairs can be completed.
    h. There is some other minor concrete spalling in this manhole. CNE should monitor this until repairs can be completed.
    i. The manway lid in the street sounded unsecure when vehicles traveled over it. As soon as possible, CNE should check the manway lid and frame to determine if it needs replacement.
    j. The entry ladder for the manway consists of individual embedded rungs which can be hazardous for personnel (it is difficult to determine if the rungs are loose or weak until it is used). CNE recently acquired some used metal manhole ladders and plans to replace the embedded rungs with one of these ladders. This should be done as soon as possible.

17. 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 roof structures. Minor repairs are needed at the following locations: E13, E17, E28, E30, E37, E44, E51, E52, E60, E61, E66, E67, E68, E69, N31, N45, N48, N54, N56, N59, N61, W3, W4, W7, W11, W15,

W17, W42, W42, W48 and W52. Moderate repairs are needed at the following locations: E26, E28, N6, W27, W43 and W44. Major repairs are needed at the following locations: south of E1 and N20. TEG and CNE personnel met with the State's contractors to review these conditions. The quantity and severity of these needed repairs have been conveyed to the State and it has been recommended to them that they have a registered professional structural engineer review these areas to assess any safety concerns and recommend repair procedures. It is TEG's opinion that CNE personnel should avoid the area south of E1 and the area of N20 until a professional structural engineer has rendered an opinion on the safety of these areas.

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 at Station W-75. CNE should repair this as soon as possible.
d. 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; TEG will develop a scope to clean and paint these areas.

18. AA Birch Tunnel
    a. The City is replacing the Criminal Justice Center (CJC) which is located above the AA Birch Tunnel. The existing CJC has recently been completely demolished and a new CJC will be constructed in its place. The construction for the new CJC involves 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 has already taken place. The City, the construction company, TEG and CNE are closely monitoring the condition of the tunnel as the blasting and construction takes place. CNE is conducting daily tunnel inspections and is sending reports to all parties involved. Some repairs will be needed once the blasting, drilling and hoe-ramming is completed.
    b. Grounding water 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.
    c. 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.
    d. 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. TEG will coordinate an action plan for this cleaning and painting with CNE.
    e. The emergency light in Manhole D2 is not functioning. CNE should make the needed repairs as soon as possible.

f. A leak was repaired on the lower chilled water piping near Station 01+25. This piping has not been re-insulated since the repair. Once the construction dynamiting, drilling and hoe-ramming have been completed, TEG will coordinate with CNE to have this piping re-insulated.
g. Several of the station numbers have faded and are difficult to read. CNE should renew these station numbers as soon as possible.
h. The emergency lights at Stations 0+28 and 01+05 are not working. CNE should repair these lights as soon as possible.
i. The emergency lights at Stations 0+28 and 01+05 are not working. CNE should repair these lights as soon as possible.
j. There is debris around the sump pumps. CNE should clean this debris as soon as possible.
k. The trap at the east end of the tunnel is not functioning properly. CNE should repair or replace this trap as soon as possible.
l. The entry ladder has some minor corrosion present where two ladder sections were welded together. This corrosion should be cleaned and then the ladder should be painted with cold galvanizing paint.

19. 4th Avenue Tunnel
a. A conduit section in the ceiling at Station 4-12 is badly corroded. TEG and CNE will develop a strategy to address this.
b. The steam expansion joints at Stations 4-45, 4-62 and 4-79 are leaking. CNE should continue monitoring these leaks and make repairs once the leaks are large enough for the repairs to be effective.

20. 7th Avenue Tunnel
a. The trap isolation valve at Station 7-81 is leaking and cannot be repaired without a shutdown. This valve should be repaired or replaced during the next system shut down.
b. Piping stanchions and the ladder platform at Station 7-81 has some moderate to severe corrosion. These members need to be cleaned and painted to prevent further corrosion. TEG will coordinate these repairs with CNE.
c. The light is not working at Station 7-65; CNE should repair this light as soon as possible.
d. The steam expansion joint at Station 7-62 is leaking. CNE should continue to monitor this leak until it is substantial enough to be repaired.
e. The Teflon pad on the piping slide support at Station 7-45 has become dislodged and there is some corrosion present on this support. TEG will develop a repair plan and coordinate the repair with CNE.
f. 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. CNE should continue to monitor this situation and let TEG know if significant changes occur.
g. The pipe supports at Station 7-41 and 7-42 are badly corroded. TEG will develop a repair plan and coordinate the repair with CNE.

h. A pipe stanchion at Station 7-23 is corroded. CNE should wire brush/wire wheel this support and paint it with cold galvanizing paint to prevent any further corrosion.
i. The ventilation fan at Station 7-22 is not working. CNE is aware of this and should make the needed repairs as soon as possible.
j. There is a pin-hole leak on the steam piping at Station 7-22. A shutdown is required to make this repair. This repair should be completed at the next steam shutdown.
k. The pipe stanchion supports at Station 7-11 (Hume Fogg service) are corroded and should be cleaned and painted to prevent further corrosion. TEG will coordinate with CNE to have these repairs completed.
l. The trap strainer at Station 7-11 does not have a blowdown valve installed. CNE should install a blowdown valve on this strainer as soon as possible to allow cleaning of this strainer.

21. Broadway Tunnel
a. The steam expansion joint at Station B-96, B-83, B-65 and B-19 is leaking. CNE should continue monitoring these leaks and make repairs once the leaks are large enough for the repairs to be effective.
b. The condensate piping on the west side of the condensate expansion joint is leaking at Station B-96. To make proper repairs, the condensate piping will have to be isolated and this section of piping removed. CNE should investigate how extensive a shut-down/isolation is required.
c. Original Nashville Convention Center service: There is some minor corrosion on the pipe hanger lugs at the top of the vertical service shaft. These lugs should be cleaned with wire brushes/wire wheels and painted with cold galvanizing paint to prevent further corrosion.
d. 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 at these locations has increased. CNE should continue to monitor the damaged areas and report any significant changes to TEG.
e. There is a light out at Station B-75; CNE should repair this as soon as possible.
f. The steam expansion joint at the southern end of the Bridgestone service tunnel is leaking; TEG/CNE need to investigate is the maintenance of this expansion joint is the City's responsibility. If it is the City's responsibility then CNE needs to continue monitoring this joint until repairs can be completed.
g. There is debris in the Bridgestone service tunnel. CNE should remove this debris and clean up this area.

h. There is some moderate corrosion on the pipe supports at Station B-66. This corrosion needs to be cleaned/removed and the steel members painted with cold galvanizing paint.
i. The expansion joint support "table" and structural members at Station B-65 are corroded badly. This corrosion needs to be cleaned/removed and the structural members painted to preserve the integrity of this support; a contractor will need to be hired to make these repairs. TEG will coordinate this effort with CNE.
j. The emergency light at Station B-29 is not functioning. CNE should repair this as soon as possible.
k. The emergency light at Station B-29 is not functioning. CNE should repair this as soon as possible.
l. The trap strainer upstream of the southern trap in Manhole 18 does not have a blowdown valve. CNE needs to install a blowdown valve on this strainer.
m. There is some debris in Manhole 18 that needs to be cleaned.

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 41 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.

Additional meetings and discussions between CNE, TEG and the site development team from the "old" Convention Center occurred during the quarter. The site is scheduled to be razed beginning in the Fourth Quarter but the Renaissance Hotel and Office and the existing mechanical room that receives the DES services will remain in place and in operation. Work associated with the redevelopment will be tracked as a project, DES-133. However at this time, there are no scheduled costs other than coordination and planning efforts.

The Wells Fargo building is currently under redevelopment as a hotel. This building is anticipated to remain a DES customer.

The 401 Union Building is anticipated to be reconnected as a hotel sometime in FY18. TEG and CNE remain in contact with the contractors and owner.

TEG met with the Hastings Architects in December to discuss options for service from DES to potential developments across Peabody St (directly south of the EGF) and east of the plant. The developments could become mixed use high rise buildings that may require DES services.

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 or potential leaks and building performance during the quarter.
- A partial steam outage occurred on January 20 and 21. The CSR scheduled this outage with the affected buildings and appropriately communicated the shut-downs and start-ups of the affected areas.
- The CSR scheduled the removal of the DES instrumentation from the Wells Fargo building to facilitate the demolition of the existing piping as they progress in their renovations.
- Other minor issues and customer interactions are noted in the monthly CNE reports.

VII. Recommendations

Based on the review of the Third Quarter FY17 EGF and EDS operations, the following recommendations are made.

- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced; TEG will continue to coordinate this effort with CNE.
- Insulation which is absent, or in disrepair, in the vaults should be addressed through either additional capital projects, which include work within these vaults, or through DES090.
- Steam traps which need repair or replacement should be addressed as soon as possible.
- Expansion joint leaks should be repaired once the leak(s) is substantial enough to warrant repair.
- Lights which are not functioning should be repaired or replaced as soon as possible.
- Concrete repairs need to be made in some manholes. TEG will continue to coordinate this effort with CNE.

- Mud and debris needs to be cleaned from some manholes.
- Communication with the State should continue regarding the needed repairs in the State Tunnel with special attention to the determination of the structural integrity of specific areas within the tunnel.