Metro Nashville
DISTRICT ENERGY SYSTEM

Operations Monitoring Report

Fourth Quarter FY17

Prepared by:

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I. Executive Summary

A review of the fiscal year 2017 (FY17) Fourth 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 Fourth Quarter FY17, the chilled water sales decreased slightly over the previous Fourth Quarter (FY16). The chilled water sendout also decreased slightly over the previous Fourth Quarter. The system losses increased approximately 21.5%. The number of cooling degree days decreased 8.2% in the Fourth Quarter. The peak chilled water demand for the current quarter was 17,533 tons, which is 3.8% lower than the previous Fourth Quarter.

For FY17, chilled water sales were 4.5% higher than for FY16. Sendout was likewise 5.9% higher. However, FY17 was warmer than FY16, noted by a 15.1% increase in the number of cooling degree days. The peak chilled water demand, as recorded at the EGF, in FY17 was 20,016 tons, 2.1% higher than in FY16. The system losses increased by 39.8% in FY17.

Steam sendout for the current quarter decreased by approximately 5.9% over the previous Fourth Quarter with a 25.1% decrease in heating degree days. Likewise, steam sales also decreased by approximately 8.1% over the previous Fourth Quarter. Steam system losses, as a percentage of sendout, increased, and the total losses increased approximately 2.1% over the previous Fourth Quarter. The peak steam demand for the current quarter was 75,688 pounds per hour, which represents a decrease in the Fourth Quarter demand by approximately 11.2%.

For FY17, steam sendout decreased 2.0% over FY16 and steam sales were down 1.2%. The winter was warmer in FY17 than in FY16, noted by 9.2% decrease in the number of heating degree days. For the year, steam system losses were down 6.3%. The peak steam demand for the year was 136,250 pph, a 3.9% decrease from FY16.

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 FY17; however, it increased by 2.0% in the Fourth Quarter over the previous Fourth Quarter and was up marginally over FY16. The steam plant electric consumption per unit of sales also increased over the previous Fourth Quarter by 2.7% and 3.5% over the year. The total water consumption for the steam and chilled water plants decreased 9.1% from the previous Fourth Quarter but for the year, was approximately equal to FY16. However, the EDS make-up for the chilled water system increased 32.1% for the quarter and 30.2% for the year. The steam plant water usage increased by 10.9% for the quarter and 18.9% for the year.

Work continued on DES Capital and Repair & Improvement Projects during the Fourth Quarter of FY17. Repair and Improvements to the EDS continue as scheduled. The distribution piping

portion of DES134 was closed during the Fourth Quarter FY17, and DES137 was closed during the Fourth Quarter FY17. Bids were received for DES138, DES139 and DES140 during the Fourth Quarter FY17. Work on these projects is anticipated to begin during the Fourth Quarter FY17.

The current fiscal year system operating costs to date are $19,315,305. This value represents approximately 93.7% of the total budgeted operating cost for FY17. The customer revenues from the sales of steam and chilled water for FY17 (to date) are $17,548,518 which is approximately 92.9% of the budgeted amount. The difference between the operating costs and customer revenue is the Metro funding amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY17 is $1,722,000 (100% 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 Fourth Quarter chilled water sales is shown in Figure 1. This data reflects a 1.3% decrease in sales for the current quarter over the same quarter of the previous fiscal year.

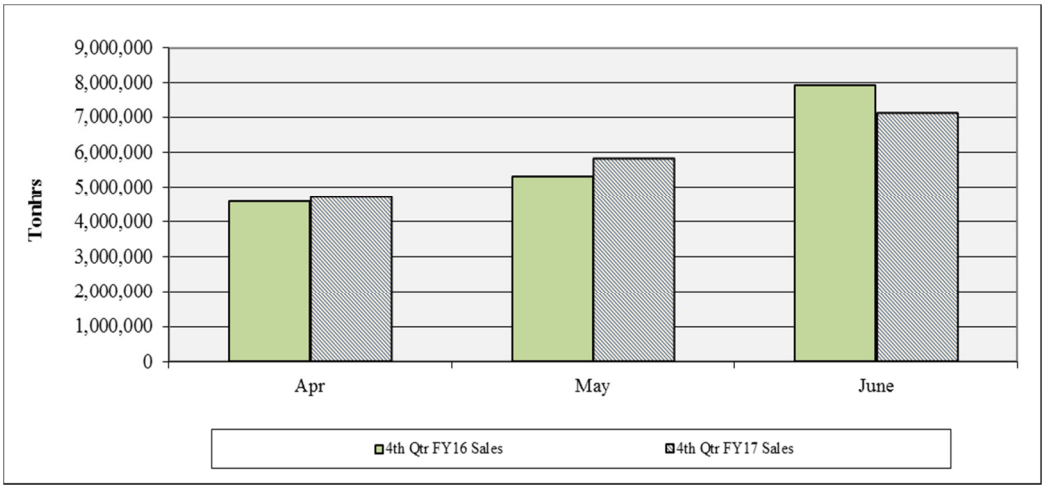

Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 17,533 tons, which represents a 3.8% decrease over the previous Fourth 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.

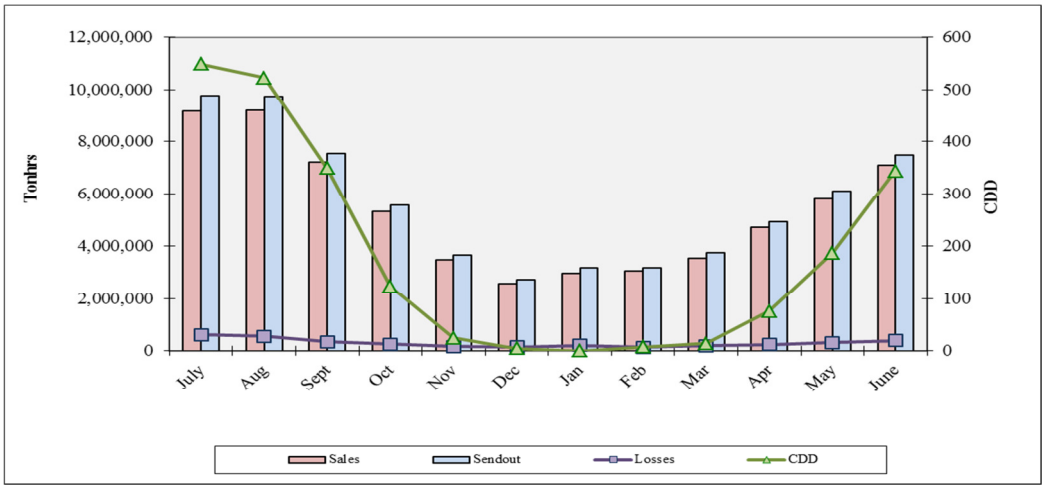

Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

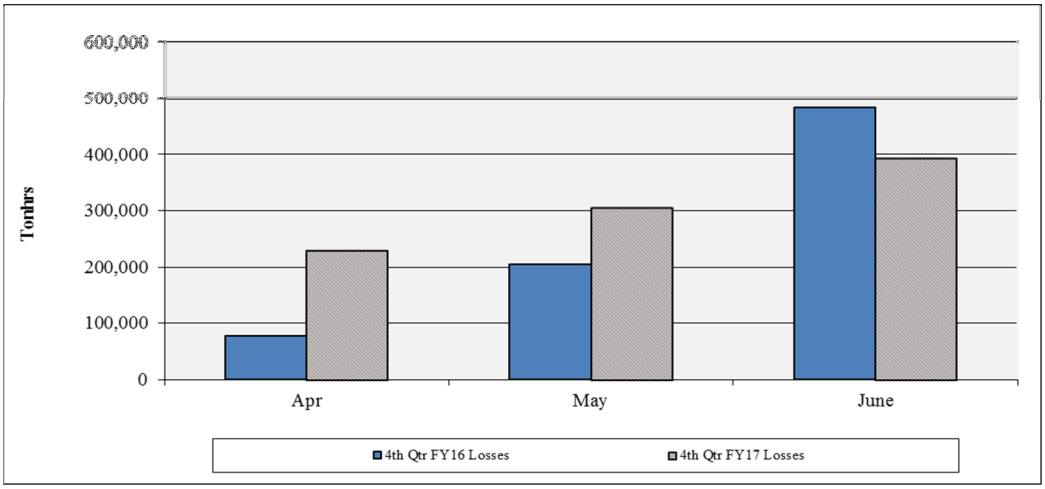

Figure 3. Chilled Water System Loss Comparison

The EDS make-up increased by approximately 32.1% over the previous Fourth Quarter. CNE and TEG are continuing to investigate the sources of the chilled water leaks that cause the increase in EDS make-up. Potential locations for the leak are suspected, but additional excavations have been halted 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 decreased approximately 16.7% during the quarter. The number of cycles of concentration in the condensing water circuit experienced a 3.6% increase during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

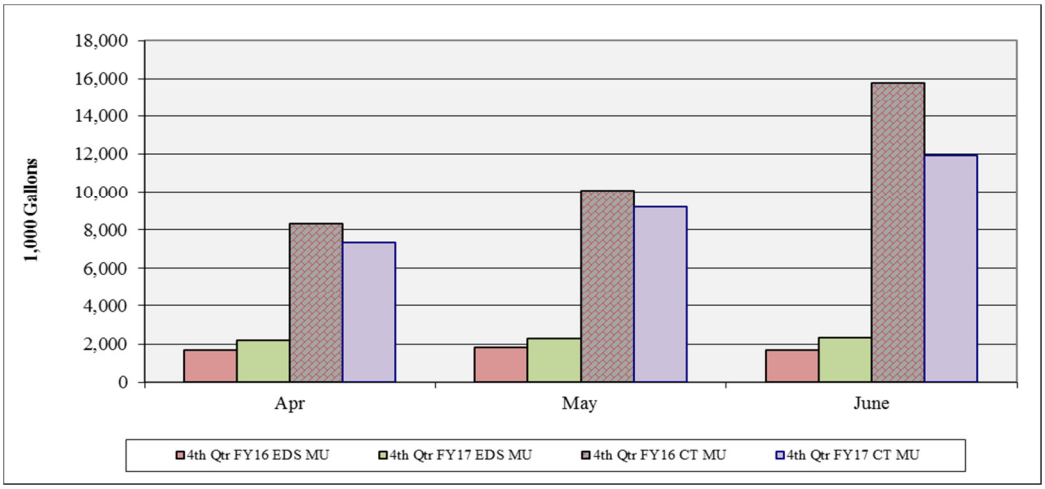

Figure 4. Chilled Water System City Water Usage Comparison

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.

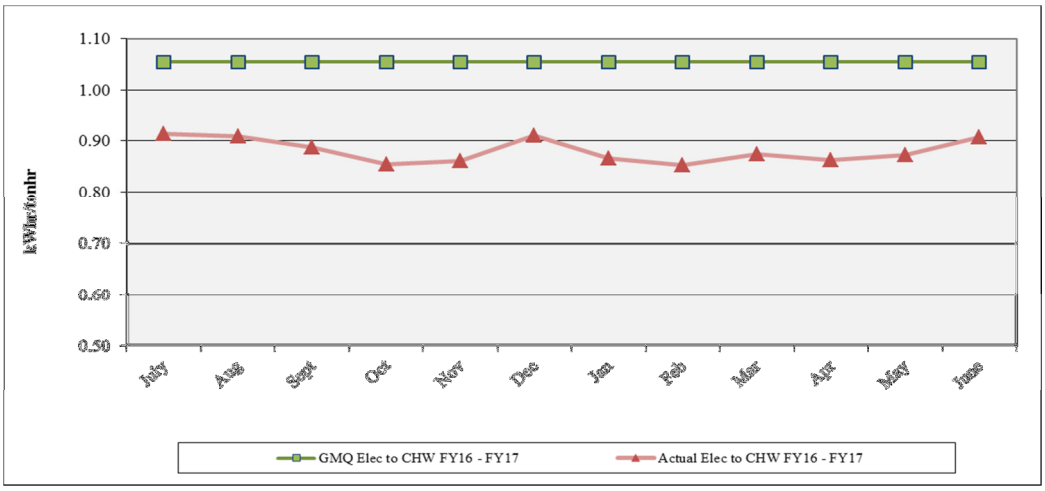

Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

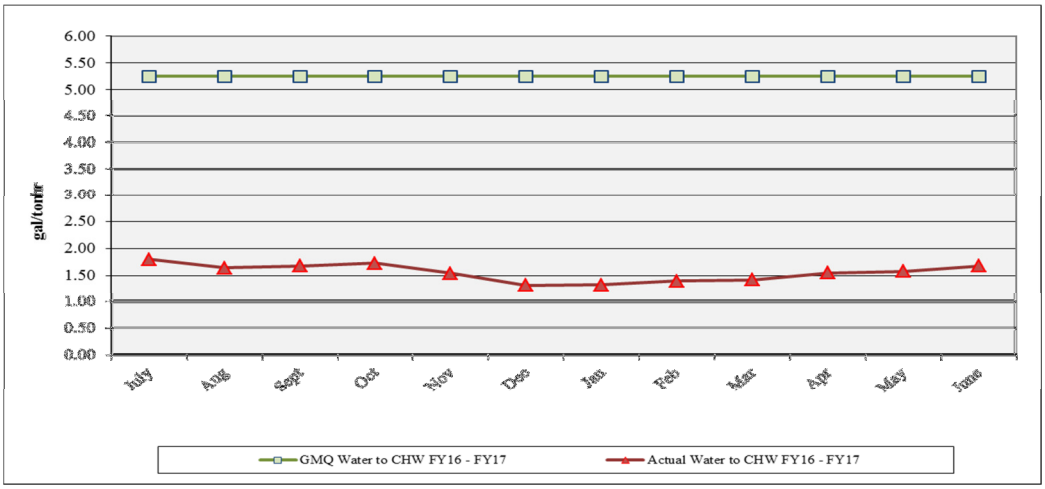

Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

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 approximately 2.1% over the Fourth Quarter for FY16, resulting in a slightly poorer performance.

The actual chiller plant water conversion factor decreased approximately 9.1% over the previous Fourth Quarter. The total consumption of city water for the chiller plant for the current quarter decreased 10.3%.

B. Steam

1. Sales and Sendout

The steam sendout decreased by approximately 5.9% over the previous Fourth Quarter (FY16), and the sales also decreased by approximately 8.1%. The Quarter experienced an approximate 25.1% decrease in the number of heating degree days. The steam system losses increased 8.5% over the previous Fourth Quarter. A comparison for the Fourth Quarter steam sales is shown in Figure 7.

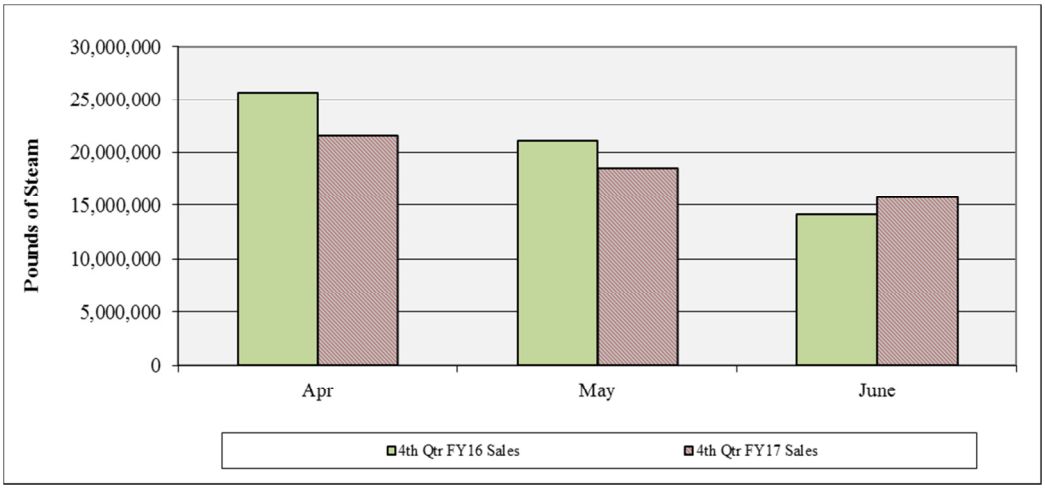

Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 75,688 pph, which reflects an approximate 11.2% decrease in the peak steam production over the previous Fourth 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.

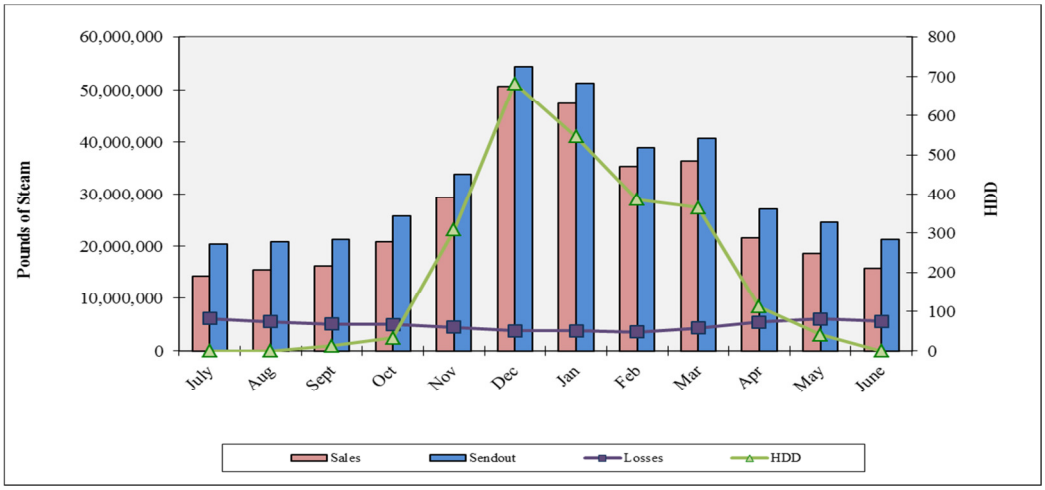

Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

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

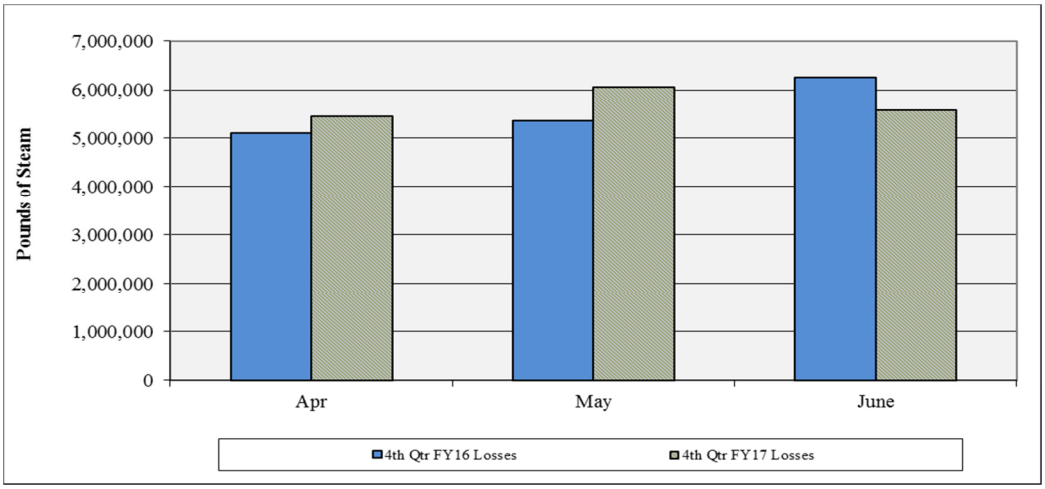

Figure 9. Steam System Losses

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 Fourth Quarter data in Figure 10.

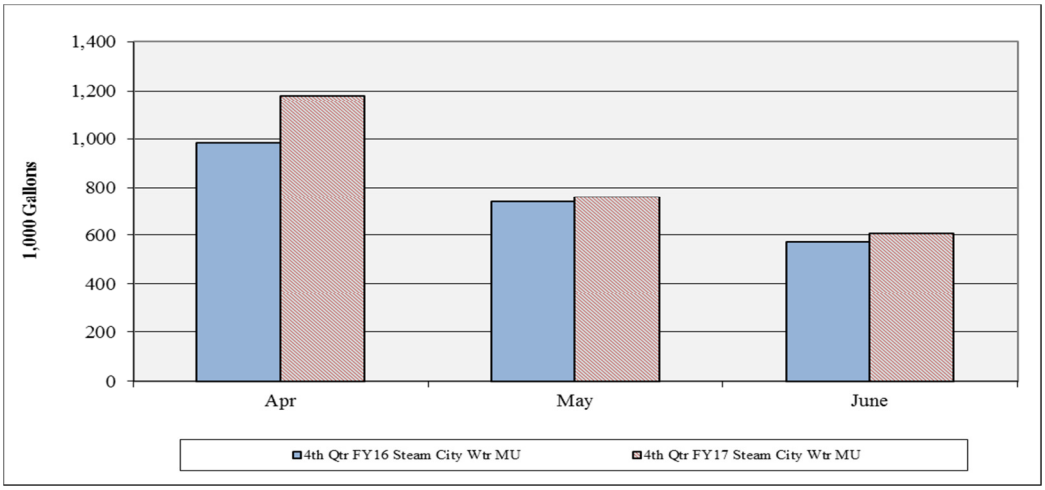

Figure 10. Steam System City Water Make-up Comparison

3. Performance

The performance of the steam system of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNE, the System

Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.

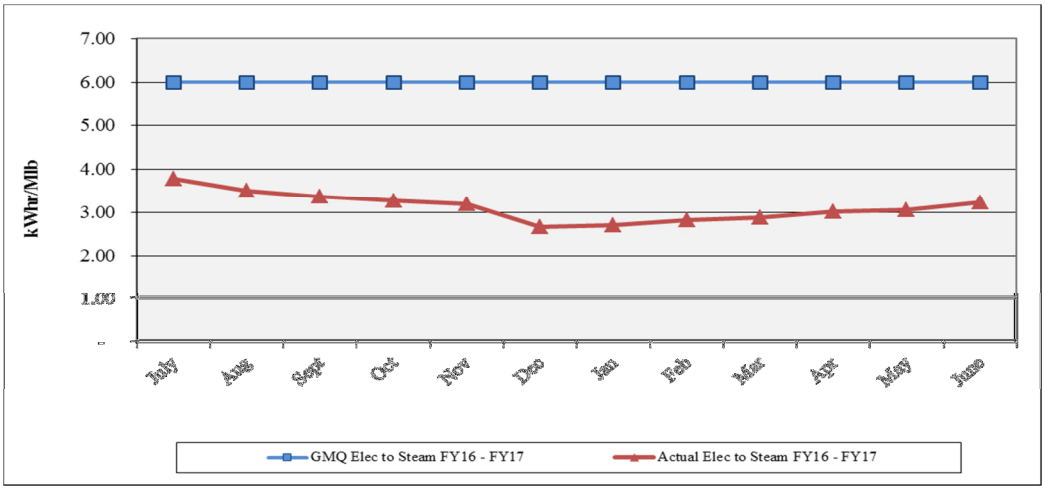

Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

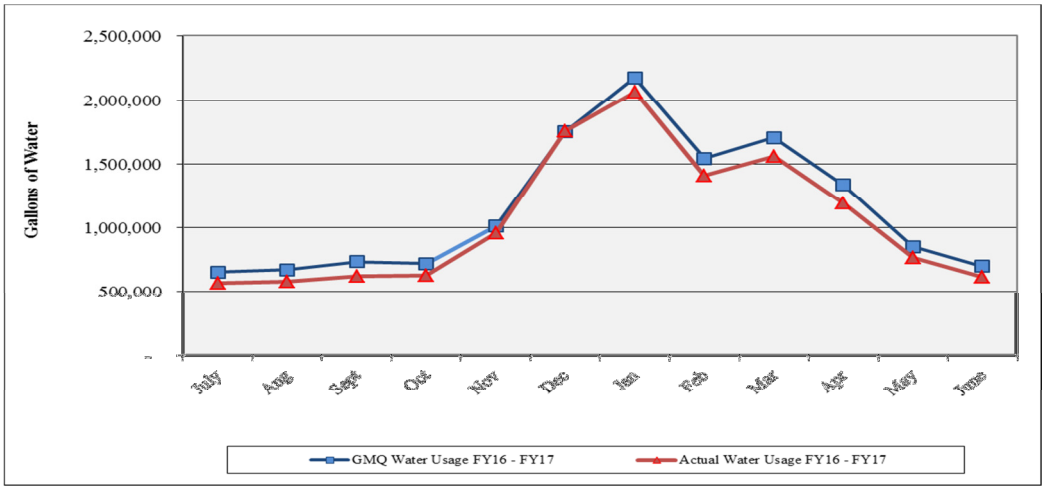

Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

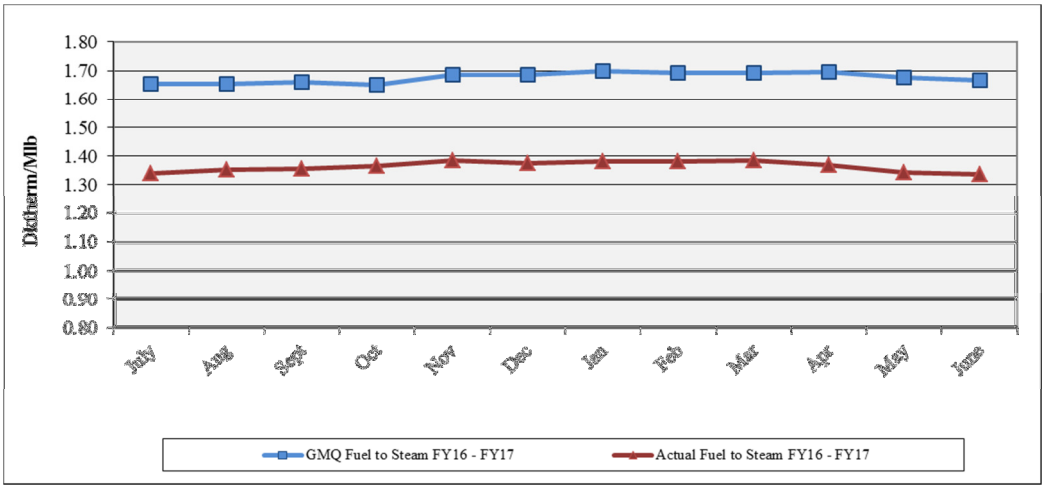

Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced a 5.5% decrease in the steam plant electric consumption while experiencing an approximate 2.8% increase in the electric conversion factor. The water consumption for the steam plant increased 10.9% this quarter as compared to the previous Fourth Quarter. The fuel consumption per unit of steam sales was marginally lower than in the previous Fourth 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 Fourth Quarter comparisons of the Guaranteed Maximum Quantities (GMQ) of the criteria commodities (fuel, water and electricity).

Table 1. Fourth Quarter FY17 and Annual Production, Sales and Consumption Summary

Item	Unit	Fourth Quarter FY17	Fourth Quarter FY16	*Percent Difference		Total Year FY17	Total Year FY16	*Percent Difference
	days	91	91	0.00%		365	366	-0.27%
Total Electric Use	kWhrs	15,729,286	15,626,281	0.66%		57,799,232	54,879,440	5.32%
Chilled Water	kWhrs	15,556,724	15,443,619	0.73%		56,837,045	53,939,445	5.37%
Steam	kWhrs	172,562	182,662	-5.53%		962,187	939,995	2.36%
Total Water Use	kgal	37,784	41,578	-9.13%		142,281	142,784	-0.35%
Total Chilled Water	kgal	35,240	39,283	-10.29%		129,699	132,200	-1.89%
EDS Make-up	kgal	6,799	5,148	32.07%		26,244	20,155	30.21%
Cooling Towers	kgal	28,441	34,135	-16.68%		103,455	112,045	-7.67%
Calc CT Evaporation	kgal	23,504	28,034	-16.16%		82,649	93,723	-11.82%
CT Blowdown	kgal	4,937	6,101	-19.08%		20,806	18,322	13.56%
Calc # Cycles		4.76	4.59	3.61%		3.97	5.12	-22.34%
Steam	kgal	2,544	2,295	10.85%		12,582	10,584	18.88%
Total Fuel Use	mmBTU	98,637	105,259	-6.29%		520,454	557,860	-6.71%
Natural Gas	mmBTU	98,637	105,106	-6.15%		520,118	557,609	-6.72%
Propane	mmBTU	0	153	-100.00%		336	251	33.86%
Condensate Return	kgal	6,440	7,470	-13.79%		34,565	37,643	-8.18%
	lbs	52,524,490	60,928,277	-13.79%		281,907,772	307,008,817	-8.18%
Avg Temp	°F	184.0	183.0	0.55%		182.0	179.9	1.16%
Sendout								
Chilled Water	tonhrs	18,539,800	18,611,800	-0.39%		67,646,900	63,860,400	5.93%
Steam	lbs	72,975,000	77,567,000	-5.92%		380,071,000	387,718,000	-1.97%
Peak CHW Demand	tons	17,533	18,224	-3.79%		20,016	19,612	2.06%
Peak Steam Demand	lb/hr	75,688	85,219	-11.18%		136,250	141,813	-3.92%
CHW LF		48.42%	46.76%	3.54%		38.58%	37.07%	4.08%
Steam LF		44.15%	41.68%	5.93%		31.84%	31.12%	2.31%
Sales								
Chilled Water	tonhrs	17,610,598	17,847,284	-1.33%		64,118,937	61,336,996	4.54%
Steam	lbs	55,924,271	60,865,390	-8.12%		321,508,409	325,247,980	-1.15%
Losses								
Chilled Water	tonhrs	929,202	764,516	21.54%		3,527,963	2,523,404	39.81%
Steam	lbs	17,050,729	16,701,610	2.09%		58,562,591	62,470,020	-6.25%
		23.37%	21.53%	8.51%				
Degree Days								
CDD		607	661	-8.17%		2,201	1,912	15.12%
HDD		152	203	-25.12%		2,485	2,736	-9.17%

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

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

GMQ Calculations	Unit	Fourth Quarter FY17	Fourth Quarter FY16	*Percent Difference		Total Year FY17	Total Year FY16	*Percent Difference
Steam								
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00			6.00	6.00	
Electric Conversion	kWhr/Mlb	3.09	3.00	2.82%		2.99	2.89	3.55%
GMQ Plant Efficiency	Dth/Mlb	1.679	1.667			1.676	1.671	
Plant Efficiency	Dth/Mlb	1.352	1.357	-0.39%		1.369	1.439	-4.83%
Actual %CR		71.98%	78.55%	-8.37%		74.17%	79.18%	-6.33%
Avg CR Temp	°F	184	183	0.55%		182	180	1.16%
GMQ Water Conversion	gal	2,883,585	2,346,111			13,841,318	11,380,244	
Water Conversion	gal	2,569,440	2,317,950	10.85%		12,707,820	10,689,840	18.88%
Chilled Water								
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055			1.055	1.055	
Electric Conversion	kWhr/tonhr	0.883	0.865	2.09%		0.886	0.879	0.80%
GMQ Water Conversion	gal/tonhr	5.25	5.25			5.25	5.25	
Water Conversion	gal/tonhr	2.00	2.20	-9.09%		2.02	2.16	-6.15%

*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 $19,315,305. This value represents approximately 93.8% 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 Fourth 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 $17,548,518 which is approximately 92.9% of the budgeted amount. The MFA transferred to date is $1,722,000 (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		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	$ 1,082,615	$ 4,330,462	97.67%
	9th Chiller	$ 41,500	$ 10,144	$ 10,144	$ 10,144	$ 10,144	$ 40,577	97.78%
	C/O 6A	$ 82,000	$ 20,028	$ 20,028	$ 20,028	$ 20,028	$ 80,111	97.70%
	C/O 6B	$ 71,800	$ 17,534	$ 17,534	$ 17,534	$ 17,534	$ 70,134	97.68%
	C/O 7	$ 27,100	$ 6,605	$ 6,605	$ 6,605	$ 6,605	$ 26,421	97.50%
	C/O 8	$ 11,800	$ 2,891	$ 2,891	$ 2,891	$ 2,891	$ 11,563	97.99%
Pass-thru Charges:	Chemical Treatment	$ 161,600	$ 49,131	$ 47,483	$ 50,938	$ 60,007	$ 207,559	128.44%
	Insurance	$ 36,600	$ -	$ -	$ -	$ 2,675	$ 2,675	7.31%
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	$ 21,104	$ 105,131	173.77%
	Chilled Water	$ 185,200	$ 142,582	$ 75,722	$ 67,667	$ 109,399	$ 395,370	213.48%
Misc:	Metro Credit	$ -	$ (243,525)	$ (141,220)	$ (107,993)	$ (152,595)	$ (645,332)	n.a.
	ARFA	$ 64,400	$ 15,723	$ 15,723	$ 15,723	$ 15,723	$ 62,893	97.66%
	Deferral	$ -	$ -	$ (23,446)	$ (106,591)	$ (130,503)	$ (260,540)	n.a.
	Subtotal - Man Fee =	**$ 5,189,100**	**$ 1,365,878**	**$ 1,285,964**	**$ 1,206,478**	**$ 1,218,222**	**$ 5,076,543**	**97.83%**
Reimbursed Management Fee + Chem Treatment			$ 1,365,878	$ 1,285,964	$ 1,206,478	$ 1,220,668	$ 5,078,988	0.00%
Metro Costs								
Pass-thru Charges:	Engineering	$ 9,300	$ 4,825	$ 4,936	$ 2,439	$ 528	$ 12,728	136.86%
	EDS R&I Transfers	$ 273,700	$ 68,425	$ 68,425	$ 68,425	$ 68,425	$ 273,700	100.00%
	Metro Marketing	$ 10,300	$ 1,274	$ 579	$ -	$ -	$ 1,854	18.00%
	Project Administration	$ 58,300	$ -	$ -	$ -	$ -	$ -	0.00%
	Metro Incremental Cost	$ 540,900	$ 129,303	$ 114,670	$ 139,251	$ 129,801	$ 513,026	94.85%
Utility Costs:	Water/Sewer	$ 553,600	$ 232,673	$ 133,296	$ 100,091	$ 140,667	$ 606,727	109.60%
	EDS Water/Sewer	$ -	$ 136	$ 90	$ 98	$ 120	$ 445	n.a.
	EDS Electricity	$ -	$ 10,853	$ 7,923	$ 7,902	$ 11,928	$ 38,606	n.a.
	Electricity	$ 5,978,700	$ 2,080,977	$ 972,581	$ 932,173	$ 1,376,040	$ 5,361,771	89.68%
	Natural Gas Consultant	$ 102,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 12,000	11.76%
	Natural Gas Transport	$ -	$ 48,008	$ 75,023	$ 88,483	$ 57,952	$ 269,466	n.a.
	Natural Gas Fuel	$ 2,516,100	$ 234,200	$ 473,379	$ 626,806	$ 308,678	$ 1,643,064	65.30%
	Propane	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Subtotal - Metro Costs =	**$ 10,042,900**	**$ 2,813,675**	**$ 1,853,903**	**$ 1,968,668**	**$ 2,097,139**	**$ 8,733,385**	**86.96%**
	Subtotal - Operations =	**$ 15,232,000**	**$ 4,179,553**	**$ 3,139,868**	**$ 3,175,146**	**$ 3,315,361**	**$ 13,809,928**	**90.66%**
Debt Service	2012 Bonds	$ 3,481,500	$ 870,075	$ 870,463	$ 870,463	$ 870,463	$ 3,481,463	100.00%
	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)	$ (6,538)	$ (19,576)	13.86%
	MIP	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Oper. Reserve Fund	$ -	$ -	$ -	$ -	$ -	$ -	n.a.
	Subtotal - Capital =	**$ 5,383,800**	**$ 1,549,573**	**$ 1,263,689**	**$ 1,505,391**	**$ 1,186,724**	**$ 5,505,377**	**102.26%**
	Total =	**$ 20,615,800**	**$ 5,729,125**	**$ 4,403,557**	**$ 4,680,537**	**$ 4,502,086**	**$ 19,315,305**	**93.69%**
Customer Revenues								
	Taxes Collected		$ 104,248	$ 84,283	$ 80,674	$ 100,037	$ 369,243	n.a.
	Taxes Paid		$ 104,248	$ 84,282	$ 75,980	$ 98,527	$ 363,037	n.a.
	Penalty Revenues/Credits		$ (24,245)	$ (14,272)	$ (32,502)	$ (7,533)	$ (78,553)	n.a.
	Energy Revenues Collected		$ 5,108,490	$ 4,134,211	$ 4,051,724	$ 4,326,440	$ 17,620,865	n.a.
	Revenues =	**$ 18,894,000**	**$ 5,084,245**	**$ 4,119,941**	**$ 4,023,916**	**$ 4,320,417**	**$ 17,548,518**	**92.88%**
	Metro Funding Amount =	**$ 1,721,800**	**$ 644,880**	**$ 283,616**	**$ 656,621**	**$ 181,669**	**$ 1,766,787**	**102.61%**

The DES serves 28 customers and 41 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	$ 3,615,050	19,335,114	$ 0.1870		$ 1,385,324	86,694	$ 15.9794
State Government	$ 3,271,609	13,650,178	$ 0.2397		$ 1,660,055	86,280	$ 19.2404
Metro Government	$ 5,558,851	31,130,545	$ 0.1786		$ 2,129,976	148,645	$ 14.3292
New Customers	$ 3,199,703	18,064,153	$ 0.1771		$ 1,296,197	107,827	$ 12.0211
Total	**$ 12,445,509**	**64,115,837**	**$ 0.1941**		**$ 5,175,355**	**321,620**	**$ 16.0915**

Total Revenue	**$ 17,620,865**
True-up and Adjustments (Net)	**$ (72,347)**
Net Revenue	**$ 17,548,518**

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.

- Electrical power to the EGF was lost on May 23 due to an issue with an NES substation. CNE personnel were called in and the plant was back online within an hour. The steam pressure was below 150 psig for two hours and the chilled water temperature was above 43.3°F for 88 minutes.
- 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 PPE Safety, Chemical Safety and Emergency Preparedness.

D. Personnel

The EGF currently has twenty-three full time employees and two relief operators. 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 has completed the cross training of 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 72.0% of the steam sendout during the quarter, which represents an 8.4% decrease over the previous Fourth 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, 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.
  - The presence of additional fouling material was discovered at two customer buildings during the quarter. CNE and their water chemistry vendor are analyzing the material to determine its source and possible remedy.

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.

- Condensate pump #3 was replaced during the quarter.
- The failed relay on transformer #1A was replaced during the quarter.
- The fire system air compressor was repaired.
- The fan belts on cooling towers 3, 5, 6, 10 and 15 were replaced.
- MRG rebuilt cooling towers 7, 8 and 17.
- Several repairs were made to the various pumps at the EGF.
- The fan belts were tightened on cooling towers 1, 3 and 15.
- Other maintenance on the chillers was performed in anticipation of the cooling season.
- 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 June 27, 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.

- The rebuild of the remaining three cooling towers was completed during the quarter. The rebuild included cleaning and repairing the corrosion from the tower riser pipes. However, rust spots were observed on 1, 5, 6, 11, 16 and 18. CNE intends to investigate and determine what efforts will be required to resolve the issues. Some of the repairs may be made under warranty with their sub-contractor.
- 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; however, CNE is investigating options.
- 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 has been repaired.
- Significant scale was observed on the fill for cooling tower 14. CNE was notified and will investigate.

- CNE discovered a leak on the propane vaporizer during the quarter. They were in the process of making repairs during the walkthrough, but the vaporizer remains non-operational as of the date of this report.
- The sign at the rear of each boiler that reads, "Confined Space," was noticed to be significantly more discolored for boiler #2 than for the other three boilers. The boiler lagging appeared to be hotter to the touch than normal. CNE was made aware of this issue and stated that this boiler is scheduled for inspection and maintenance soon. The discoloration could be indicative of missing or damaged insulation/refractory inside the boiler.
- The development of the lot to the west of the EGF is progressing. A portion of the new grade adjacent to the EGF has a steep slope and dirt has been piled against several of the EGF trees. CNE has been in contact with the site's contractor, but there is concern regarding the landscaping and maintenance of the sloped area and damage to the DES's trees. After additional conversations with MDHA (the owner of the lot), they have accepted responsibility for the trees and have agreed to replace any trees that may die as a result of the construction work.
- 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. Fourth Quarter FY17 Open Projects

The following projects remained open at the end of the Fourth 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

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. Construction began on the new structure in the Fourth Quarter.

Blasting at the old CJC site was completed in the Fourth Quarter. Damage to the AA Birch Tunnel has been documented. Once the construction for the new site progresses to the point that no additional damage to the tunnel is anticipated, the tunnel repairs will be made.

6. DES130 – Repair to Manhole B3

Construction was completed during the Third Quarter FY17. TEG is attempting to contact the communications contractor that damaged the manhole for reimbursement.

7. DES133 – Old Convention Center Site Redevelopment

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

The portion of the old Convention Center to remain is now under the ownership of the Renaissance Hotel. The steam and chilled water meters that formerly served the Convention Center are serving this space referred to as the Conference Center. Beginning in FY18, the demands for this space and the consumptions recorded by these meters will be added to the Renaissance Hotel's DES invoice. DES continued to negotiate the new demands and service to the new development, referred to as the Retail Space.

Meetings with the new owner and their design team have 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 closed in the Fourth Quarter.

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 and re-energized in the First Quarter FY18 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. "Pothole" excavations were done during the Fourth Quarter FY17 and no leaks were found. CNE/TEG will continue to monitor this area for additional evidence of the location(s) of the leak. Because we are now in 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

Construction was started and completed during the Third Quarter FY17. This project was closed in the Third Quarter FY17.

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 was bid and awarded during the Fourth Quarter FY17 and work is expected to take place during the First Quarter FY18.

12. DES139 – DES Options Review

The City of Nashville/Davidson County wants to explore its options regarding the Metro Nashville District Energy System. These options include: 1) maintaining a "status quo" with regard to the system; 2) exploring the potential of expansion of the plant and distribution system to provide additional chilled water and steam services to new customers in the downtown area; and 3) explore the possibility of selling the system or entering into a public/private partnership.

Request for proposals to evaluate these options were solicited and received by the City during the first half of 2017. The City selected a contractor to perform this evaluation and contract negotiations with the contractor are underway. It is anticipated that a contract will be signed and work shall begin on this evaluation in the First Quarter FY18. TEG will be involved in answering questions, providing information and reviewing the contractor's work product for this evaluation.

13. DES140 – Manhole N2 Fence

Manhole N2 is located in the northwest corner of the Nissan Stadium property. Several times when CNE employees have visited this manhole to perform reviews or maintenance, the manhole has been inaccessible due to materials or debris being placed on top of the manway. To prevent this occurrence, MNDES has received permission from the Metro Sports Authority to install a fence around the manhole through an MOU with the DES.

It is anticipated that this fence will be installed during the First Quarter FY18.

B. Fourth Quarter FY17 Closed Projects

The distribution piping portion of DES134 was closed during the Fourth Quarter FY17, and DES137 was closed during the Fourth 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	$ 67,000	$ 6,221	$ 65,447	$ 1,553
	DES117	Manhole S5 Modifications	$ 185,000	$ -	$ 180,161	$ 4,839
	DES139	Options Review	$ 13,600	$ 2,782	$ 2,782	$ 10,818
	MAS	Miscellaneous Development Projects	$ 96,900	$ 1,756	$ 1,756	$ 95,144
		Total Closed Projects	$ 2,308,661	$ -	$2,241,145	$ 67,517
		Metro Project Admin	$ -	$ -	$ -	$ -
		Project Man, Development, etc	$ (65,246)	$ -	$ -	$ (65,246)
		Total 2010 Bond	**$ 2,605,916**	**$ 10,759**	**$2,491,290**	**$ 114,626**
Customer Connection Fund-49107						
	DES104	Time of Use/ Customer Billing	$ 40,000	$ 4,156	$ 35,924	$ 4,076
	DES124	CJC Redevelopment	$ 300,000	$ 124,132	$ 142,191	$ 157,809
	DES129	MH 22B Repair	$ 20,000	$ (2,011)	$ 178	$ 19,822
	DES130	MH B3 Repair	$ 20,000	$ 11,782	$ 12,469	$ 7,531
	DES131	Wildhorse CHW Modifications	$ 40,000	$ 42,001	$ 42,001	$ (2,001)
	DES133	NCC Development	$ 20,000	$ 13,296	$ 20,721	$ (721)
	DES134	401 Union Hotel Reconnection	$ 40,000	$ 50,723	$ 50,723	$ (10,723)
	DES135	Chilled Water Leak 5th and Union	$ 50,000	$ 161,245	$ 161,245	$ (111,245)
	DES122	Miscellaneous MH Repairs	$ 170,000	$ 166,036	$ 166,036	$ 3,964
	DES138	MH-D	$ 100,000	$ 13,478	$ 13,478	$ 86,522
	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	$ 29,765	$ 115,508	$ 304,665
		Project Man, Development, etc	$ 40,000	$ -	$ -	$ 40,000
		Customer Connection Fund	**$ 8,509,000**	**$ 627,367**	**$7,387,802**	**$ 1,121,198**
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 Fourth 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 $26,261. 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	paid from Trustee Date
Value at end of FY16						**$ -**	**$ 5,067.65**	**$ 5,067.65**	
June R&I Invoice	08/29/16	DES-2337	CNE	$ 1,803.70					9/1/2016
DES-126 Exploratory Excavation on 3rd Ave 6/1	08/30/16	DES-2338	CNE	$ 25,520.61					9/1/2016
DES-121 Misc MH Repairs	09/07/16	DES-2340	TEG	$ 1,360.85					9/12/2016
DES-126 Exploratory Excavation on 3rd Ave 6/1	09/07/16	DES-2340	TEG	$ 243.96					9/12/2016
DES-127 MH13 Steam Anchor Repair	09/07/16	DES-2340	TEG	$ 813.19					9/12/2016
DES-128 MHA Sparge Tube	09/07/16	DES-2340	TEG	$ 160.10					9/12/2016
July R&I Invoice	09/27/16	DES-2354	CNE	$ 2,963.68					10/5/2016
DES-121 Misc MH Repairs	09/27/16	DES-2353	CNE	$ 33,558.75					10/5/2016
DES-121 Misc MH Repairs	10/27/16	DES-2370	TEG	$ 744.63					10/28/2016
DES-122 MH13 Repairs	10/27/16	DES-2370	TEG	$ 480.30					10/28/2016
DES-127 MH13 Steam Anchor Repair	10/27/16	DES-2370	TEG	$ 1,796.69					10/28/2016
DES-128 MHA Sparge Tube	10/27/16	DES-2370	TEG	$ 320.21					10/28/2016
DES-124.3 MH-D Sump Pumps	10/27/16	DES-2370	TEG	$ 120.08					10/28/2016
DES-135 CHW Leak at 5th and Union	10/27/16	DES-2370	TEG	$ 80.06					10/28/2016
DES-121 Misc MH Repairs	10/28/16	DES-2372	TEG	$ 480.31					11/1/2016
DES-122 MH13 Repairs	10/28/16	DES-2372	TEG	$ 2,477.56					11/1/2016
DES-127 MH13 Steam Anchor Repair	10/28/16	DES-2372	TEG	$ 80.06					11/1/2016
DES-128 MHA Sparge Tube	10/28/16	DES-2372	TEG	$ 720.46					11/1/2016
DES-124.3 MH-D Sump Pumps	10/28/16	DES-2372	TEG	$ 720.46					11/1/2016
DES-135 CHW Leak at 5th and Union	10/28/16	DES-2372	TEG	$ 2,855.66					11/1/2016
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					12/29/2016
Interest/Transfer	12/29/16	-	-	$ (1.89)					12/30/2016
DES 121 Misc Manhole Repairs	12/22/16	DES-2399	CNE	$ 11,186.25					12/29/2016
DES-124.3 MH-D Sump Pumps	01/06/17	DES-2403	CNE	$ 38,981.25					1/12/2017
DES-127 MH13 Steam Anchor Repair	01/06/17	DES-2404	CNE	$ 27,145.00					1/12/2017
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					2/8/2017
DES 121 Misc Manhole Repairs	01/05/17	DES-2415	TEG	$ 43.83					2/8/2017
DES-122 MH13 Repairs	01/05/17	DES-2415	TEG	$ 546.95					2/8/2017
DES-135 CHW Leak at 5th and Union	01/05/17	DES-2415	TEG	$ 975.82					2/8/2017
DES-137 Cordell Hull CHW Valves	01/05/17	DES-2415	TEG	$ 1,311.22					2/8/2017
DES 121 Misc Manhole Repairs	02/10/17	DES-2431	TEG	$ 284.39					2/21/2017
DES-122 MH13 Repairs	02/10/17	DES-2431	TEG	$ 2,177.31					2/21/2017
DES-127 MH13 Steam Anchor Repair	02/10/17	DES-2431	TEG	$ 3,171.00					2/21/2017
DES-137 Cordell Hull CHW Valves	02/10/17	DES-2431	TEG	$ 406.25					2/21/2017
Jan R&I Invoice	03/15/17	DES-2451	CNE	$ 5,613.55					3/30/2017
Interest/Transfer	01/31/17	-	-	$ 0.16					3/2/2017
Interest/Transfer	01/31/17	-	-	$ (0.16)					3/2/2017
Interest/Transfer	02/28/17	-	-	$ 0.95					3/2/2017
Interest/Transfer	02/28/17	-	-	$ (0.95)					3/2/2017
DES-122 MH13 Repairs	01/05/17	DES-2413	TEG	$ 2,817.57					3/2/2017
DES-128 MHA Sparge Tube	01/05/17	DES-2413	TEG	$ 200.13					3/2/2017
DES-124.3 MH-D Sump Pumps	01/05/17	DES-2413	TEG	$ 43.83					3/2/2017
DES-135 CHW Leak at 5th and Union	01/05/17	DES-2413	TEG	$ 5,629.88					3/2/2017
Adjustment	01/31/17	DES-2413	TEG	$ (6,653.34)					3/2/2017
DES 121 Misc Manhole Repairs	01/05/17	DES-2414	TEG	$ 480.31					3/2/2017
DES-122 MH13 Repairs	01/05/17	DES-2414	TEG	$ 1,801.00					3/2/2017
DES-128 MHA Sparge Tube	01/05/17	DES-2414	TEG	$ 120.08					3/2/2017
DES-135 CHW Leak at 5th and Union	01/05/17	DES-2414	TEG	$ 3,765.25					3/2/2017
DES-137 Cordell Hull CHW Valves	01/05/17	DES-2414	TEG	$ 1,400.88					3/2/2017
Adjustment	01/31/17	DES-2414	TEG	$ (6,653.33)					3/2/2017
Sept R&I Invoice	03/02/17	DES-2385	CNE	$ 1,677.24					3/2/2017
Dec R&I Invoice	03/02/17	DES-2440	CNE	$ 6,484.07					3/7/2017
DES-128 MHA Sparge Tube	03/02/17	DES-2441	CNE	$ 10,922.84					3/7/2017
DES 121 Misc Manhole Repairs	03/01/17	DES-2445	TEG	$ 1,423.63					4/4/2017
DES-122 MH13 Repairs	03/01/17	DES-2445	TEG	$ 3,117.12					4/4/2017
DES-137 Cordell Hull CHW Valves	03/01/17	DES-2445	TEG	$ 206.99					4/4/2017
Sub-Total Third Quarter				**$ 53,883.45**	**$ 68,424.99**	**$ -**	**$ 14,541.54**	**$ 14,541.54**	
Feb R&I Invoice	5/4/2017	DES-2476	CNE	$ 5,125.59					5/9/2017
Interest/Transfer	4/3/2017	-	-	$ 1.35					4/3/2017
Interest/Transfer	4/3/2017	-	-	$ (1.35)					4/3/2017
DES-121 Misc MH Repairs	5/10/2017	DES-2480	CNE	$ 13,766.75					5/15/2017
DES-124.3 MH-D Sump Pumps	5/11/2017	DES-2484	TEG	$ 121.88					5/18/2017
DES-121 Misc MH Repa	4/3/2017	DES-2466	TEG	$ 218.53					5/5/2017
DES-122 MH-13 Repair	4/3/2017	DES-2466	TEG	$ 794.73					5/5/2017
Interest/Transfer	3/31/2017	-	-	$ 1.11					3/1/2017
Interest/Transfer	3/31/2017	-	-	$ (1.11)					3/2/2017
Aug R&I Invoice	5/24/2017	DES-2490	CNE	$ 3,921.48					6/2/2017
Mar R&I Invoice	5/24/2017	DES-2493	CNE	$ 6,994.94					6/2/2017
DES-124.3 MH-D Sump Pumps	5/24/2017	DES-2494	CNE	$ 6,219.27					6/2/2017
Interest/Transfer	5/1/2017	-	-	$ 4.43					5/1/2017
Interest/Transfer	5/1/2017	-	-	$ (4.43)					5/1/2017
DES-124.3 MH-D Sump Pumps	6/8/2017	DES-2298	TEG	$ 369.48					6/20/2017
DES-140 MH-N2 Fence	7/21/2017	DES-2314	TEG	$ 255.31					
Apr R&I Invoice	7/6/2017	DES-2303	CNE	$ 1,336.83					
Interest/Transfer	6/1/2017	-	-	$ 8.80					6/1/2017
Interest/Transfer	6/1/2017	-	-	$ (8.80)					6/1/2017
Sub-Total Fourth Quarter				**$ 39,124.79**	**$ 68,424.99**	**$ -**	**$ 29,300.20**	**$ 29,300.20**	
FY17 Year to Date				**$ 252,506.79**	**$ 273,699.96**	**$ -**	**$ 26,260.82**	**$ 26,260.82**	

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 on July 11 and 12, 2017. The manholes that were visited include Manholes A, B, B5, K, L, M, N1, N2, S5, S6, 15 and 18A. The following comments and observations are a result of these visits:

1. Manhole A
   a. There was a small amount of water in this manhole which was pumped prior to entry.

b. There are some small areas of spalled concrete in the ceiling caused by the proximity of the "feet" of rebar chairs to the surface of the concrete. CNE should monitor these areas and report any further degradation to TEG.
c. There is some flaking of the paint on the steel supports. These supports were cleaned and painted as a part of DES107 in 2015. TEG has already contacted the painting inspector that participated in that project and asked for a repair specification. Once received, TEG will speak with CNE about repairs.
d. The seal on the small Fiber-lite manway lid is frayed and needs to be replaced. The lid OD is 27"; the frame OD is 28.5". TEG has made contact with the supplier and has forwarded model number, local supplier and pricing information to CNE. CNE should order the replacement seal and install it as soon as possible.

2. Manhole B
a. There was a small amount of water in the floor of both sides of this manhole.
b. There is some debris in the chilled water side of the manhole which should be removed. This includes some dirt that was probably introduced into the manhole during the West Riverfront Park construction. CNE should address this prior to TEG's next quarterly inspection.
c. The bases of the piping supports appear to have some rust stains caused by "creep" because the underside of the baseplates could not be painted. CNE should monitor the condition of the baseplates/supports and notify TEG if corrosion develops.
d. Condensate has collected on the ceiling in the chilled water side of this manhole believed to be caused by the moisture laden hot air being conveyed through the vent tube which connects the steam side of manhole to the chilled water side. During the manhole review, through TEG's recommendation, CNE purchased a 6" PVC cap and installed it on the vent tube on the chilled water side to see if this reduces the condensate formation. CNE should monitor this and report their findings to TEG.

3. Manhole M
a. There was no water present in this manhole.
b. The link seal on the steam line penetration at the northern wall has been dislodged from the top portion of the pipe. CNE personnel have tried to re-position this linkseal without success. CNE should continue to monitor the linkseal and report if water infiltration or other complications arise.
c. The seal on the large Fiber-lite manway lid is frayed and needs to be replaced. The lid OD is 33"; the frame OD is 38". TEG has made contact with the supplier and has forwarded model number, local supplier and pricing information to CNE. CNE should order the replacement seal and install it as soon as possible.

d. The bases of the piping supports appear to have some rust stains caused by "creep" because the underside of the baseplates could not be painted. However, there is some corrosion on the edges some of the baseplates. TEG will contact the paint inspector to determine a repair strategy for this corrosion. CNE should continue to monitor the condition of the baseplates/supports and notify TEG of significant changes.
e. The trap in this manhole is an Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. CNE should present a schedule to TEG for the replacement of this trap as soon as possible.
f. There is no strainer upstream of the trap in this manhole. When CNE replaces the trap (item e. above), a strainer with a blowdown valve should be added.

4. Manhole L
   a. There was not any appreciable water in this manhole.
   b. There is some corrosion of the structural components in this manhole, especially on the north side of the anchor beam on the west side where a strut penetrates the manhole floor. TEG will prioritize the extent of the corrosion in this manhole, and coordinate with CNE to have these metal surfaces cleaned and painted.
   c. There is some minor insulation damage that should be repaired on the steam piping that penetrates the north manhole wall. CNE should determine if this is a repair that they can make and report to TEG.
   d. The traps in this manhole are Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. CNE should present a schedule to TEG for the replacement of these traps as soon as possible
   e. There are 3 traps in this manhole and none of the strainers ahead of the traps have blowdown valves installed. CNE should present a schedule to TEG to add blowdown valves to these strainers as soon as possible.

5. Manhole K
   a. There is some minor insulation damage that should be repaired. CNE should determine if this is a repair that they can make and report to TEG.
   b. There is some mud in the floor of the manhole. CNE should clean this mud from the manhole prior to TEG's next quarterly review.
   c. There is some corrosion of the structural components in this manhole. TEG will prioritize the extent of the corrosion in this manhole, and coordinate with CNE to have these metal surfaces cleaned and painted.
   d. The exterior of the northeast corner of the manhole concrete roof has some cracking around the manway opening. These cracks should be filled with concrete crack filler available from a local hardware store. CNE should purchase crack filler and fill these cracks before fall and freezing precipitation occurs.
   e. There is some cracking and spalling of the interior southern wall at the steam penetration that has existed for a number of years. Pictures from this

review were compared with pictures from prior manhole reviews and no significant difference was detected. However, there has been some minor progression of this degradation over the years and repairs should be undertaken within the next year. This work will require hiring a contractor. TEG will develop specifications for this repair and coordinate the bidding and selection of a contractor to make these repairs. CNE should continue to monitor this area and other areas of the manhole and notify TEG of any significant changes.

f. The trap in this manhole is an Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. CNE should present a schedule to TEG for the replacement of this trap as soon as possible.

g. The strainer upstream of the steam trap does not have a blowdown valve. CNE should present a schedule to TEG to add blowdown valve to this strainer as soon as possible.

6. Manhole N1
   a. There was no water present in this manhole.
   b. The CHW branch connections for Nissan Stadium were never insulated in this manhole. Most of the piping in this manhole is ductile iron; however, there are some steel components and the surface condensing is causing some corrosion. Therefore, the non-insulated piping in this manhole should be insulated. TEG will develop specifications to have CNE bid and hire a contractor to have this manhole insulated.

7. Manhole N2
   a. There was water present in this manhole.
   b. Once again, a considerable amount of mud and water has accumulated in this manhole. CNE should have this manhole cleaned – see note c below.
   c. The CHW isolation valves and a small portion of the piping in this manhole were never insulated. All of the piping in this manhole is ductile iron, and the surface condensing is causing some slight corrosion. Therefore, the piping in this manhole should be re-insulated. CNE is in the process of having a fence constructed around this manhole and raising the manway to help alleviate surface water intrusion in this manhole. TEG will develop specifications to have CNE bid and hire a contractor to have this manhole insulated after the fence and manway modifications are accomplished.

8. Manhole S5
   a. No deficiencies to report.

9. Manhole S6
   a. There was no water in the manhole.
   b. The structural steel in this manhole is corroded as well as the steam and condensate piping. The insulation of this manhole should extend the life of these components – see item c below.

c. Insulation is non-existent. Because of the piping corrosion, the life of the piping can be extended with the installation of insulation. TEG will develop specifications to have CNE bid and hire a contractor to have this manhole insulated.
d. Because of the lack of serviceable equipment in this manhole, it is not necessary to inspect this manhole on a monthly basis; a yearly inspection is adequate.

10. Manhole B5
    a. The pipe nipple on the steam strainer blowdown line is leaking slightly. Per the customer contract agreement, this equipment is to be maintained by the customer. CNE should notify the customer of this leak so repairs can be made.

11. Manhole 15
    a. One of the lights is not working. CNE should repair this light as soon as possible.
    b. There is a small breach in the insulation on the eastern chilled water pipe coming up from the 4th Ave Tunnel. Condensate is dripping from this breach. The breach is in the horizontal run at the seam between the horizontal pipe and the elbow. CNE should repair this as soon as possible.
    c. There is some slight corrosion on the support beams in the sidewalk "entry area". Since these beams are powder coated, TEG will investigate the best method of repair. TEG will then prioritize the extent of the corrosion in this manhole, and coordinate with CNE to have these metal surfaces cleaned and painted.
    d. Portions of the entry grating are damaged or broken and could cause a pedestrian to trip/fall (especially if high heel shoes are worn). CNE should obtain pricing for new grating and present it to TEG for approval. Once approved, order and replace grating sections as soon as possible.

12. Manhole 18A
    a. There was water present in this manhole and it required pumping prior to entry.
    b. There is corrosion on the structural steel in this manhole. CNE recently cleaned and painted some of the most severe corrosion. However, there is still some fairly extensive corrosion that needs to be addressed. TEG will prioritize the extent of the corrosion in this manhole, and coordinate with CNE to have these metal surfaces cleaned and painted.
    c. The trap in this manhole is an Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. CNE should present a schedule to TEG for the replacement of this trap as soon as possible
    d. The strainer upstream of the trap does not have a blowdown valve. Due to its proximity to a structural beam, there might not be enough space to add a blowdown valve. The trap is an Armstrong 20XX series trap which CNE is

in the process of replacing with standard bucket traps. When this trap is replaced, CNE should be sure to install a blowdown valve on the strainer.

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 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.

Negotiations continued with the new development for the old Convention Center during the quarter. At this time, it is not believed that 100% of the capacity used by the Convention Center will be used for the new development, making additional loads available elsewhere in the system.

The Bobby Hotel (formerly the Wells Fargo building) is currently under redevelopment as a hotel. Service to this building was temporarily stopped during construction during the Third Quarter FY17. Service will be restored as the owner's construction schedule permits but is not anticipated until the Second or Third Quarters of FY18.

There have been no additional meetings or conversations with the Hastings Architects 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. The lot due west of the EGF was re-purposed as a parking lot during the quarter in anticipation the development in the other two lots that are currently used for surface parking.

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 building performance during the quarter.
- CNE and TEG personnel met with representatives to the Metro Library and Nissan Stadium to discuss cooling and building performance issues with their buildings.
- Heating and cooling were restored to the Cordell Hull building during the quarter after the building's contractor successfully completed a portion of the building's renovation.
- CNE and TEG met with the owner's contractors for the 401 Union Building (Fairlane Hotel) to discuss the requirements for reconnected the steam and chilled water service after the building's renovations are completed.
- CNE and TEG met with the owner's contractors for the Wells Fargo Building (Bobby Hotel) to discuss the requirements for reconnected the steam and chilled water service after the building's renovations are completed.
- The annual customer meeting was held on May 25.
- Other minor issues and customer interactions are noted in the monthly CNE reports.

VII. Recommendations

Based on the review of the Fourth 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.
- CNE needs to continue to monitor the chilled water chemistry to understand the source of the fouling of the distribution, 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 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 is continuing regarding the needed repairs in the State Tunnel with special attention to the determination of the structural integrity of specific areas within the tunnel.