



Operations Monitoring Report

Second Quarter FY18

Prepared by:

**Thermal Engineering Group, Inc.
105 Hazel Path Court, Ste 2
Hendersonville, TN 37075**

January 31, 2018

I. Executive Summary

A review of the fiscal year 2018 (FY18) Second Quarter performance and contract obligations between Constellation New Energy (CNE) and the Metropolitan Government of Nashville and Davidson County (Metro) is presented in this report by Thermal Engineering Group, Inc. (TEG). The status of the available funds for all active capital construction and repair and improvement projects are also presented. For the fiscal year 2018 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

For the Second Quarter FY18, the chilled water sales decreased 8.8% over the previous Second Quarter (FY17) due to a reduction in demand from the Criminal Justice Building (demolished), the Bobby Hotel (formerly Wells Fargo which is under renovation) and the Nashville Convention Center (demolished). The chilled water sendout also decreased 8.0% over the previous Second Quarter. The system losses increased approximately 7.3%. The number of cooling degree days decreased 21.1% in the Second Quarter. The peak chilled water demand for the current quarter was 14,926 tons, which is 8.3% higher than the previous Second Quarter.

Steam sendout for the current quarter increased by approximately 10.0% over the previous Second Quarter with a 28.9% increase in heating degree days. Likewise, steam sales also increased by approximately 10.0% over the previous Second Quarter. Steam system losses, as a percentage of sendout, increased slightly, and the total losses increased approximately 10.7% over the previous Second Quarter. The peak steam demand for the current quarter was 138,438 pounds per hour, which represents an increase in the Second Quarter demand by approximately 9.7%.

The EGF performance continues to satisfactorily meet the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption per unit of sales continues to perform lower than the guaranteed levels for both the quarter and FY18. Total chiller plant electric usage decreased 4.5% from the previous Second Quarter and the unit electric consumption was 4.7% higher than in the previous Second Quarter. The steam plant electric consumption per unit of sales also decreased over the previous Second Quarter by 8.1%. The total water consumption for the steam and chilled water plants increased 1.6% from the previous Second Quarter. However, the EDS make-up for the chilled water system increased 37.0% for the quarter. The steam plant water usage increased by 17.0% for the quarter.

Work continued on DES Capital and Repair & Improvement Projects during the Second Quarter of FY18. Repair and Improvements to the EDS continue as scheduled. The design was completed and the project was bid and awarded for DES124.4; construction began during the quarter. DES138 is expected to be closed during the Third Quarter FY18. DES134, DES140 and DES142 were closed during the Second Quarter FY18. Work on DES143 is expected to be bid and awarded, and possibly completed during the Third Quarter FY18. Work on DES144 is expected to be bid and awarded during the Third Quarter FY18.

The current fiscal year system operating costs to date are \$10,613,859. This value represents approximately 50.2% of the total budgeted operating cost for FY18. The customer revenues

from the sales of steam and chilled water for FY18 (to date) are \$8,848,312 which is approximately 45.6% of the budgeted amount. The difference between the operating costs and customer revenue is the Metro funding amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY18 is \$845,150 (50% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices as of the date of this report.

Table of Contents

Section	Description	Page
I.	Executive Summary	i
II.	Energy Distribution System Sales and Performance	1
	A. Chilled Water	1
	1. Sales and Sendout	1
	2. Losses.....	2
	3. Performance	3
	B. Steam.....	4
	1. Sales and Sendout	4
	2. Losses.....	5
	3. Performance	6
	C. Contract Guarantee Performance	8
	D. Operating Costs.....	10
III.	EGF Operations	12
	A. Reliability.....	12
	B. Efficiency.....	12
	C. Environment, Health and Safety	13
	D. Personnel.....	13
	E. Training.....	13
	F. Water Treatment	13
	G. Maintenance and EGF Repairs	14
	H. EGF Walk-through.....	14
IV.	Capital Projects	16
	A. Second Quarter FY18 Open Projects	16
	B. Second Quarter FY18 Closed Projects	19
	C. Capital Projects Budget.....	19
V.	Energy Distribution System Repair, Improvements, PM and Emergencies....	20
	A. Repairs and Improvements	20
	B. Preventive Maintenance.....	21
	C. Emergencies.....	22
	D. EDS Walk-through.....	22
VI.	Customer Relations.....	28
	A. Marketing.....	28
	B. Customer Interaction.....	28
VII.	Recommendations.....	29

II. Energy Distribution Sales and Performance

A. Chilled Water

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

1. Sales and Sendout

A comparison for the Second Quarter chilled water sales is shown in Figure 1. This data reflects an 8.8% decrease in sales for the current quarter over the same quarter of the previous fiscal year.

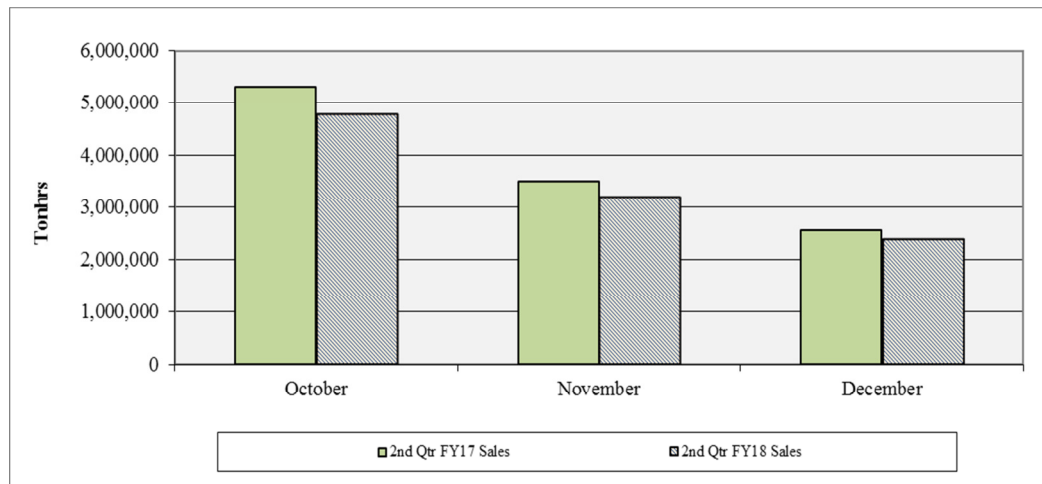


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 14,926 tons, which represents a 5.3% increase over the previous Second Quarter.

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

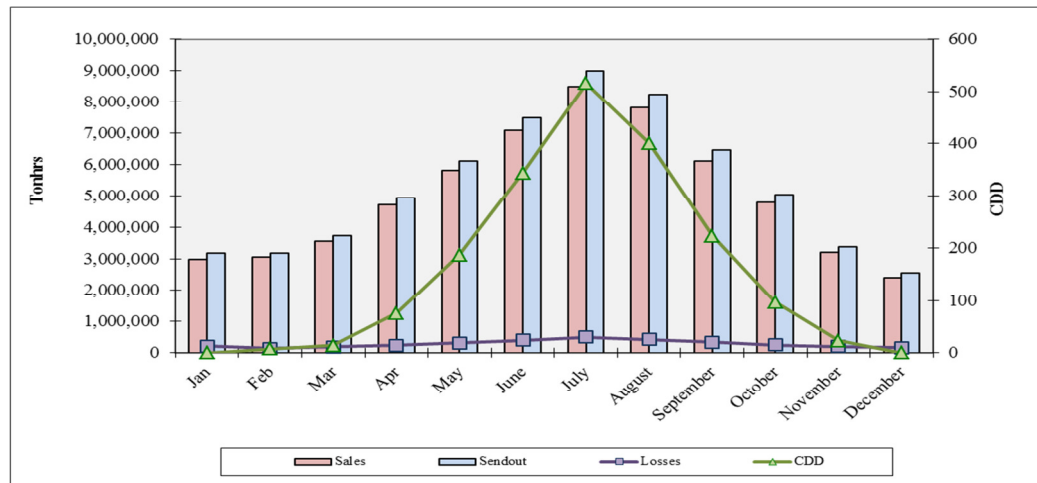


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

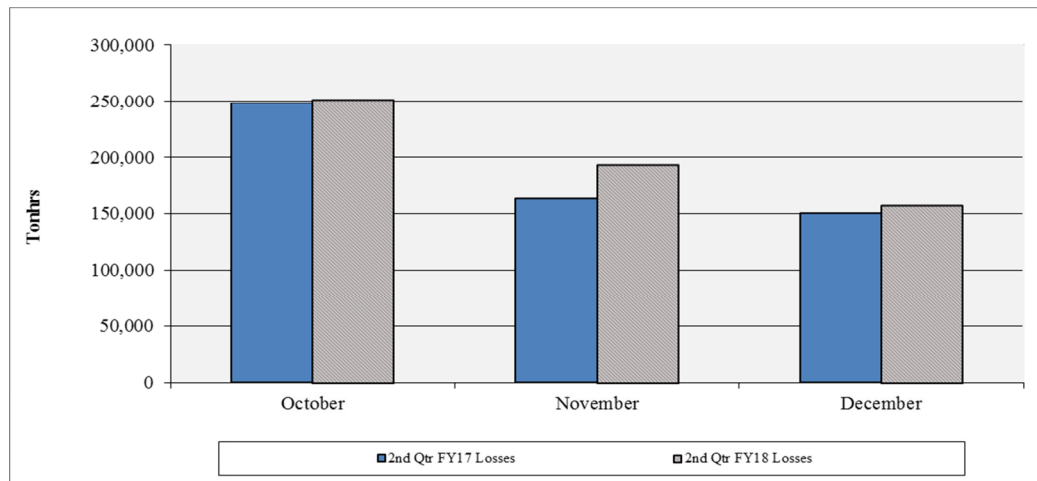


Figure 3. Chilled Water System Loss Comparison

The EDS make-up increased by approximately 37.0% over the previous Second 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, and additional excavations began during the quarter. 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 14.5% during the quarter. The number of cycles of concentration in the condensing water circuit experienced a 51.2% increase during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

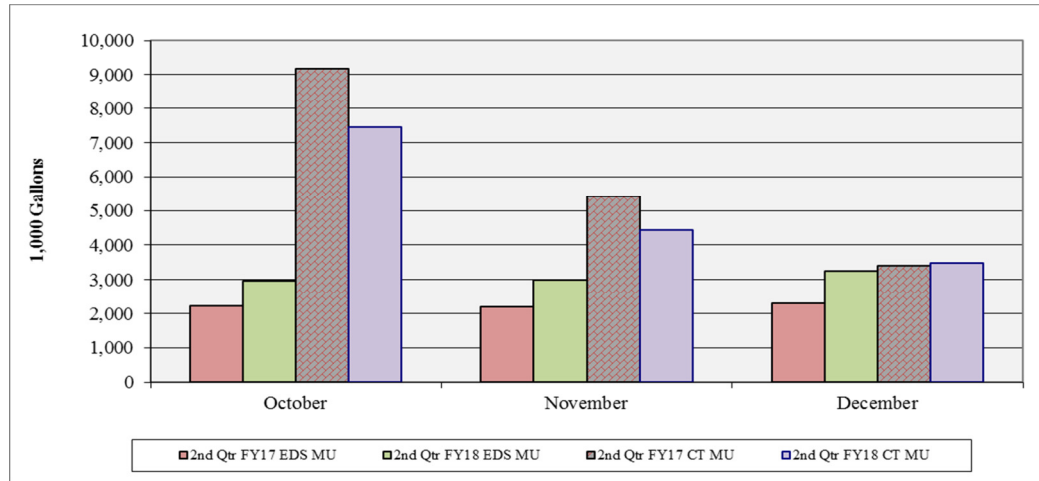


Figure 4. Chilled Water System City Water Usage Comparison

3. Performance

The performance of the chilled water aspect of the EGF is presented by the following two charts, Figures 5 and 6, for the previous twelve months. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.

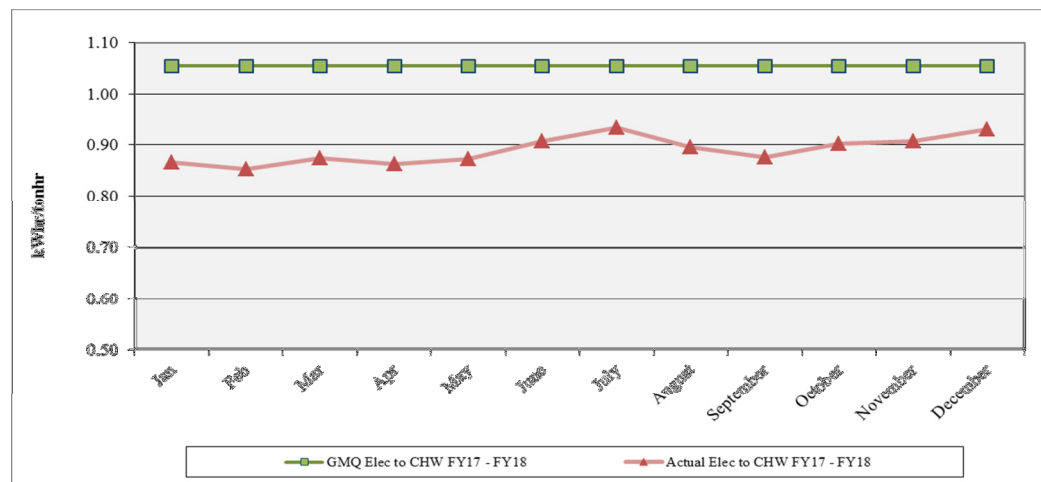


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

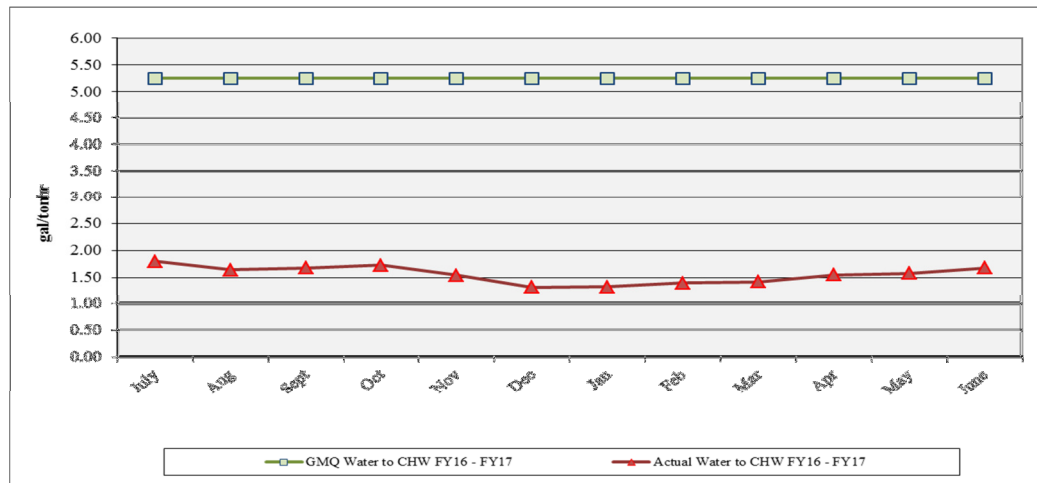


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales increased 4.7% over the previous Second Quarter.

The actual chiller plant water conversion factor increased 9.1% over the previous Second Quarter. The total consumption of city water for the chiller plant for the current quarter decreased 0.5%.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 10.0% over the previous Second Quarter (FY17), and the sales also increased by approximately 10.0%. The Quarter experienced an approximate 28.9% increase in the number of heating degree days. The steam system losses increased 10.7% over the previous Second Quarter. A comparison for the Second Quarter steam sales is shown in Figure 7.

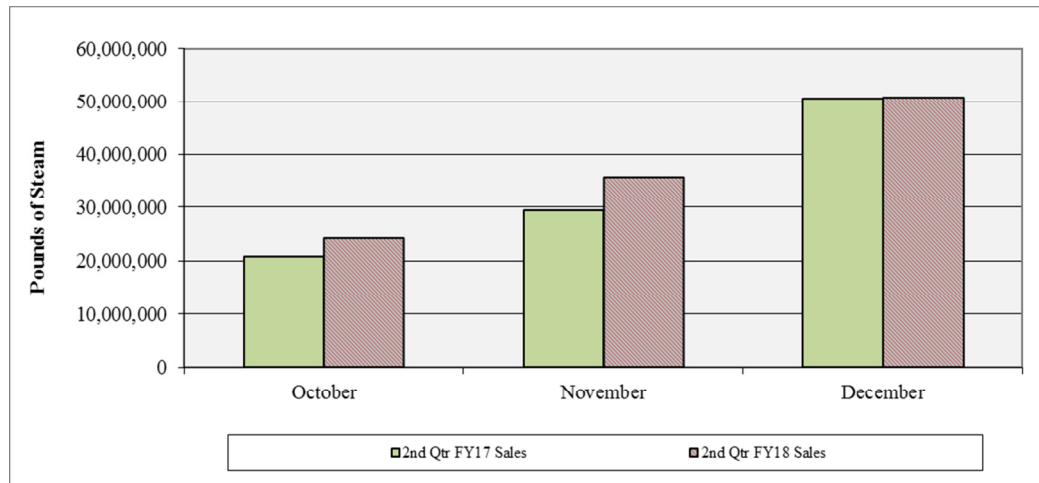


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 138,438 pph, which reflects an approximate 9.7% increase in the peak steam production over the previous Second Quarter.

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

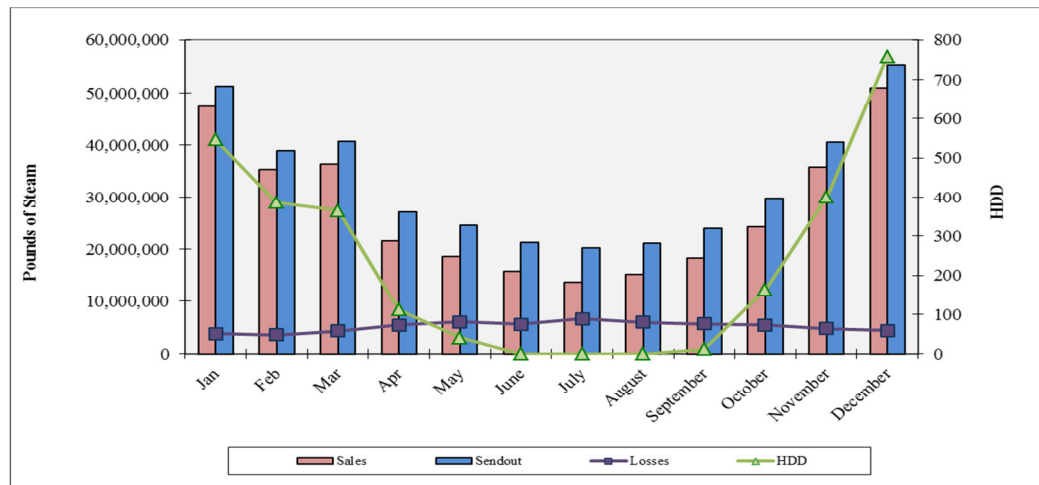


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

A comparison of the total steam mass losses in the EDS for the Second Quarter is shown in Figure 9. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty

traps, steam leaks or meter error could also be a contributing cause of these losses. Whenever steam sales decrease from the previous quarter, the percent of system losses can be expected to increase since the majority of these losses are based on a near constant heat loss of the system.

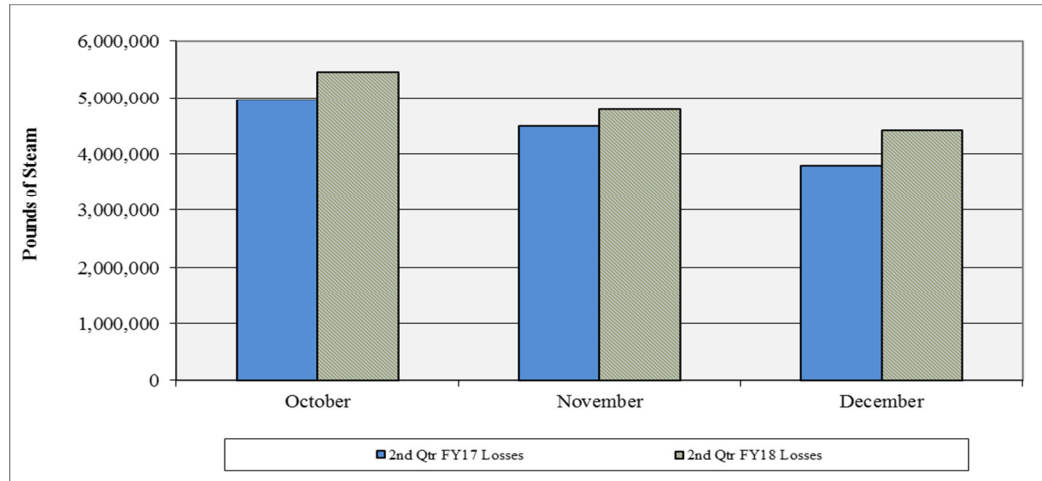


Figure 9. Steam System Losses

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 Second Quarter data in Figure 10.

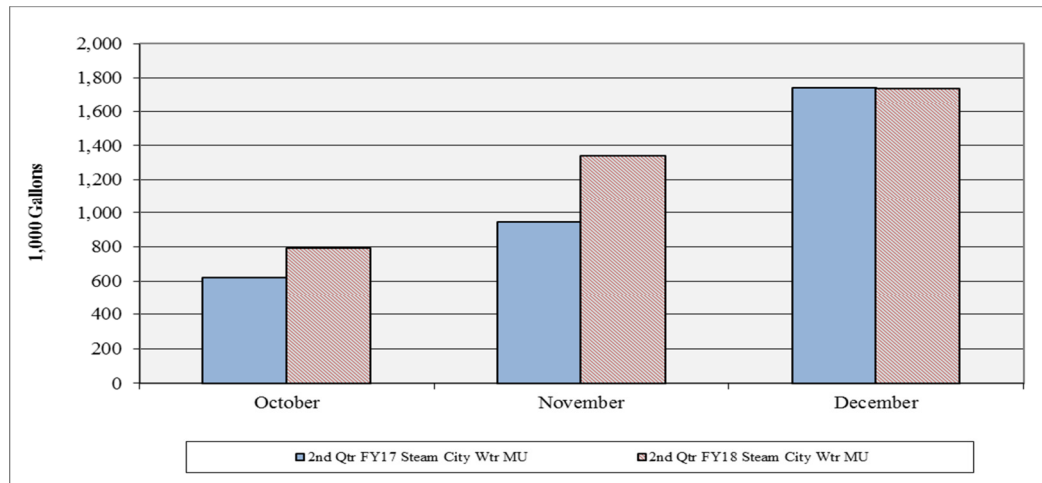


Figure 10. Steam System City Water Make-up Comparison

3. Performance

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

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

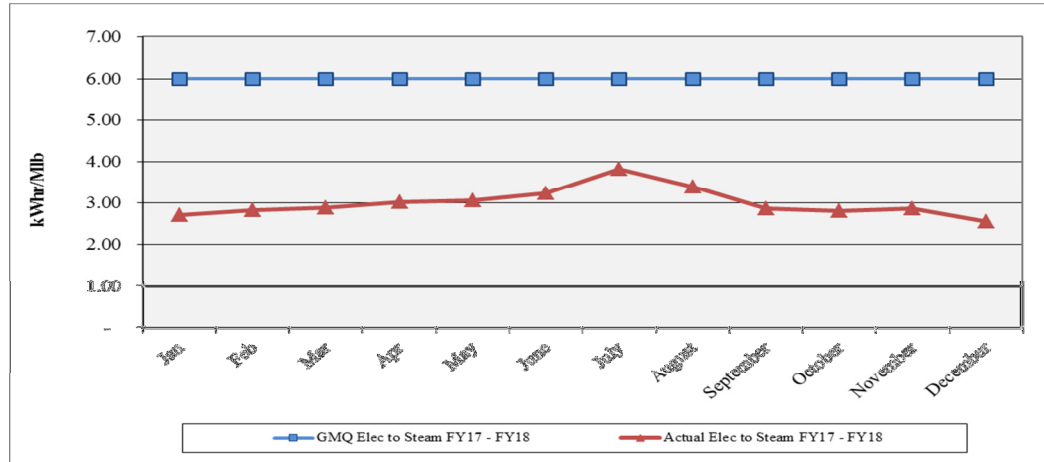


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

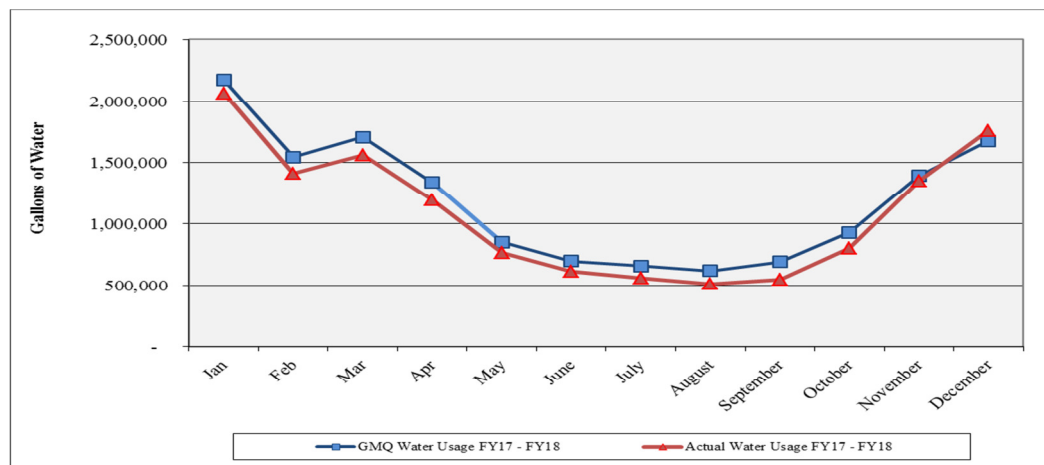


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

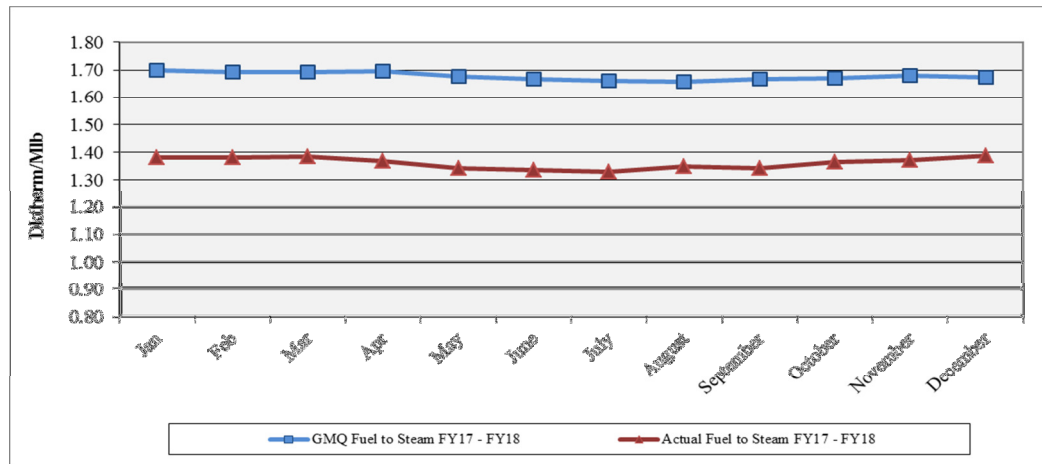


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced a 1.0% decrease in the steam plant electric consumption while experiencing an approximate 8.1% decrease in the electric conversion factor. The water consumption for the steam plant increased 17.0% this quarter as compared to the previous Second Quarter. The fuel consumption per unit of steam sales was marginally lower than in the previous Second Quarter.

C. Contract Guarantee Performance

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

Table 1. Second Quarter FY18 Production, Sales and Consumption Summary

Item	Unit	Second Quarter FY18	Second Quarter FY17	*Percent Difference
	days	92	92	0.00%
Total Electric Use	kWhrs	9,731,296	10,172,634	-4.34%
Chilled Water	kWhrs	9,431,973	9,876,277	-4.50%
Steam	kWhrs	299,323	296,357	1.00%
Total Water Use	kgal	28,445	27,995	1.61%
Total Chilled Water	kgal	24,576	24,687	-0.45%
EDS Make-up	kgal	9,208	6,721	37.00%
Cooling Towers	kgal	15,368	17,966	-14.46%
Calc CT Evaporation	kgal	12,944	13,987	-7.46%
CT Blowdown	kgal	2,424	3,979	-39.08%
Calc # Cycles		5.34	3.52	51.91%
Steam	kgal	3,869	3,308	16.96%
Total Fuel Use	mmBTU	172,943	156,901	10.22%
Natural Gas	mmBTU	172,943	156,802	10.29%
Propane	mmBTU	0	99	-100.00%
Condensate Return	kgal	11,920	10,957	8.79%
	lbs	97,216,101	89,365,280	8.79%
Avg Temp	°F	179.3	176.0	1.89%
Sendout				
Chilled Water	tonhrs	10,970,300	11,923,500	-7.99%
Steam	lbs	125,508,000	114,057,000	10.04%
Peak CHW Demand	tons	14,926	14,177	5.28%
Peak Steam Demand	lb/hr	138,438	126,156	9.74%
CHW LF		33.29%	38.09%	-12.61%
Steam LF		41.06%	40.95%	0.28%
Sales				
Chilled Water	tonhrs	10,367,458	11,361,720	-8.75%
Steam	lbs	110,849,320	100,817,579	9.95%
Losses				
Chilled Water	tonhrs	602,842	561,780	7.31%
Steam	lbs	14,658,680	13,239,421	10.72%
		11.68%	11.61%	0.62%
Degree Days				
CDD		120	152	-21.05%
HDD		1,320	1,024	28.91%

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

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

GMQ Calculations	Unit	Second Quarter FY18	Second Quarter FY17	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	2.70	2.94	-8.14%
GMQ Plant Efficiency	Dth/Mlb	1.674	1.675	
Plant Efficiency	Dth/Mlb	1.378	1.376	0.17%
Actual %CR		77.46%	78.35%	-1.14%
Avg CR Temp	°F	179	176	1.89%
GMQ Water Conversion	gal	3,989,245	3,481,609	
Water Conversion	gal	3,907,690	3,341,080	16.96%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.910	0.869	4.66%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.37	2.17	9.10%

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

D. Operating Costs

The fixed operating costs for the DES include the management fee to CNE, debt service payments on the bonds and engineering and administration costs and are charged to the customers relative to their contract demand. The variable costs are dependent on the amounts of steam and chilled water produced and sold to the customers. These latter costs include the utility and chemical treatment costs. The vast majority of the costs incurred for the operation of the DES are passed onto the customers in the form of the demand charges (fixed costs) and energy charges (variable costs). A summary of the total operating costs for the fiscal year to date are shown in Table 3.

The revenues shown reflect the charges to the customers for their respective steam and chilled water service. The difference between the total costs and revenues from the customers is the shortfall that must be paid by Metro. The shortfall exists due to the remaining capacity at the EGF that was included in the original construction and remains unsold and the debt service for bonds to which the customers do not directly contribute.

The system operating costs for FY17 to date are \$10,613,859. This value represents approximately 50.2% of the total budgeted operating cost for FY18 and includes expenses to date that have been invoiced but were not paid at the time of this report. Additional invoices that would be charged toward the Second Quarter expenses have not been issued or paid at the time of this report. The customer revenues from the sales of

steam and chilled water for FY18 are \$8,848,312 which is approximately 45.6% of the budgeted amount. The MFA transferred to date is \$845,150 (50.0% of budget). However, the actual MFA required cannot be accurately calculated due to the outstanding invoices.

Table 3. DES Expenses and Revenues to Date

Item	FY18 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
Operating Management Fee							
FOC: Basic	\$ 4,460,400	\$ 1,107,516	\$ 1,107,516	\$ -	\$ -	\$ 2,215,032	49.66%
9th Chiller	\$ 41,800	\$ 10,378	\$ 10,378	\$ -	\$ -	\$ 20,755	49.65%
C/O 6A	\$ 82,500	\$ 20,489	\$ 20,489	\$ -	\$ -	\$ 40,977	49.67%
C/O 6B	\$ 72,200	\$ 17,937	\$ 17,937	\$ -	\$ -	\$ 35,874	49.69%
C/O 7	\$ 27,200	\$ 6,757	\$ 6,757	\$ -	\$ -	\$ 13,515	49.69%
C/O 8	\$ 11,800	\$ 2,957	\$ 2,957	\$ -	\$ -	\$ 5,914	50.12%
Pass-thru Charges:							
Chemical Treatment	\$ 166,400	\$ 56,099	\$ 86,180	\$ -	\$ -	\$ 142,279	85.50%
Insurance	\$ 37,700	\$ -	\$ 20,588	\$ -	\$ -	\$ 20,588	54.61%
Marketing:							
CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA:							
Steam	\$ 69,329	\$ 18,061	\$ 32,304	\$ -	\$ -	\$ 50,364	72.65%
Chilled Water	\$ 177,828	\$ 126,951	\$ 60,728	\$ -	\$ -	\$ 187,679	105.54%
Misc:							
Metro Credit	\$ -	\$ (220,872)	\$ (148,142)	\$ -	\$ -	\$ (369,014)	n.a.
ARFA	\$ 64,800	\$ 16,085	\$ 16,085	\$ -	\$ -	\$ 32,170	49.64%
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Man Fee =	\$ 5,211,957	\$ 1,383,229	\$ 1,381,917	\$ -	\$ -	\$ 2,765,147	53.05%
Reimbursed Management Fee + Chem Treatment		\$ 1,414,684	\$ 449,711	\$ -	\$ -	\$ 1,864,396	0.00%
Metro Costs							
Pass-thru Charges:							
Engineering	\$ 9,600	\$ 6,648	\$ 4,272	\$ -	\$ -	\$ 10,920	113.75%
EDS R&I Transfers	\$ 275,300	\$ 68,825	\$ 68,825	\$ 22,942	\$ -	\$ 160,592	58.33%
Metro Marketing	\$ 10,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ 36,300	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Incremental Cost	\$ 578,400	\$ 135,897	\$ 115,081	\$ 8,561	\$ -	\$ 259,539	44.87%
Utility Costs:							
Water/Sewer	\$ 565,800	\$ 207,514	\$ 128,731	\$ -	\$ -	\$ 336,245	59.43%
EDS Water/Sewer	\$ -	\$ 131	\$ 124	\$ -	\$ -	\$ 255	n.a.
EDS Electricity	\$ -	\$ 13,425	\$ 17,686	\$ -	\$ -	\$ 31,111	n.a.
Electricity	\$ 5,888,500	\$ 1,842,726	\$ 952,545	\$ -	\$ -	\$ 2,795,271	47.47%
Natural Gas Consultant	\$ 102,000	\$ 3,000	\$ 3,000	\$ -	\$ -	\$ 6,000	5.88%
Natural Gas Transport	\$ -	\$ 54,384	\$ 90,346	\$ -	\$ -	\$ 144,730	n.a.
Natural Gas Fuel	\$ 3,135,800	\$ 261,475	\$ 510,059	\$ -	\$ -	\$ 771,534	24.60%
Propane	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Metro Costs =	\$ 10,602,300	\$ 2,594,025	\$ 1,890,668	\$ 31,503	\$ -	\$ 4,516,196	42.60%
Subtotal - Operations =	\$ 15,814,300	\$ 3,977,254	\$ 3,272,585	\$ 31,503	\$ -	\$ 7,281,343	46.04%
Debt Service							
2012 Bonds	\$ 3,484,400	\$ 870,463	\$ 871,313	\$ -	\$ -	\$ 1,741,775	49.99%
2005 Bonds -Self Funded	\$ 731,200	\$ -	\$ -	\$ 673,857	\$ -	\$ 673,857	92.16%
2007 Bonds -Self Funded	\$ 193,000	\$ 157,275	\$ -	\$ 35,725	\$ -	\$ 193,000	100.00%
2008 Bonds -Self Funded	\$ 192,400	\$ 157,275	\$ -	\$ 35,125	\$ -	\$ 192,400	100.00%
2010 Bonds -Self Funded	\$ 192,800	\$ 157,275	\$ -	\$ 35,525	\$ -	\$ 192,800	100.00%
MCCC Fund -Self Funded	\$ 680,000	\$ 157,275	\$ -	\$ 208,175	\$ -	\$ 365,450	53.74%
Interest & Misc Revenue	\$ (175,100)	\$ (12,332)	\$ (14,434)	\$ -	\$ -	\$ (26,766)	15.29%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,298,700	\$ 1,487,231	\$ 856,878	\$ 988,407	\$ -	\$ 3,332,517	62.89%
Total =	\$ 21,113,000	\$ 5,464,485	\$ 4,129,464	\$ 1,019,910	\$ -	\$ 10,613,859	50.27%
Customer Revenues							
Taxes Collected		\$ 99,571	\$ 81,801	\$ -	\$ -	\$ 181,372	n.a.
Taxes Paid		\$ 99,571	\$ 55,145	\$ -	\$ -	\$ 154,716	n.a.
Penalty Revenues/Credits		\$ (45,292)	\$ (29,907)	\$ -	\$ -	\$ (75,199)	n.a.
Energy Revenues Collected		\$ 4,806,890	\$ 4,089,965	\$ -	\$ -	\$ 8,896,855	n.a.
Revenues =	\$ 19,422,700	\$ 4,761,598	\$ 4,086,713	\$ -	\$ -	\$ 8,848,312	45.56%
Metro Funding Amount =	\$ 1,690,300	\$ 702,887	\$ 42,750	\$ 1,019,910	\$ -	\$ 1,765,548	104.45%

The DES serves 28 customers and 40 buildings in downtown Nashville. These customers are divided into three categories: 1) Privately owned buildings, 2) State of TN owned buildings and 3) Metro owned buildings. A summary of the annual costs for each of these three categories is presented in Table 4. These values include late fees and penalties and any unpaid balances.

Table 4. Customer Revenue Summary to Date

Building	Chilled Water			Steam		
	Total Cost	Consumption (tonhrs/yr)	Unit Cost (\$/tonhr)	Total Cost	Consumption (Mlb/yr)	Unit Cost (\$/Mlb)
Private Customers	\$ 2,005,674	10,549,734	\$ 0.1901	\$ 685,830	41,074	\$ 16.6976
State Government	\$ 1,781,382	7,545,463	\$ 0.2361	\$ 848,848	47,612	\$ 17.8285
Metro Government	\$ 2,665,893	14,705,281	\$ 0.1813	\$ 909,228	69,286	\$ 13.1227
New Customers	\$ 1,700,037	9,434,892	\$ 0.1802	\$ 638,720	55,453	\$ 11.5182
Total	\$ 6,452,948	32,800,478	\$ 0.1967	\$ 2,443,906	157,972	\$ 15.4705

Total Revenue	\$	8,896,855
True-up and Adjustments (Net)	\$	(48,543)
Net Revenue	\$	8,848,312

III. EGF Operations

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

A. Reliability

The principle issues surrounding the reliable operation of the EGF relates to the ability to operate without significant interruption, exclusive of planned outages, and disruption of service to the customers. The following disruptions in service occurred during the quarter.

- On October 11, the chiller plant tripped offline due to a voltage drop from the main electrical feeds into the plant. The chilled water system was returned to temperature within an hour.
- On October 18, boiler #4 tripped on low natural gas pressure but was immediately restarted. The steam sendout pressure dropped below 150 psig for approximately 45 minutes.
- The entire EGF was shut down at 11:00 p.m. on October 21 to allow NES to upgrade their switch conductors on the two main electric feeds to the plant. The steam and chilled water system were back in operation and at temperature and pressure in approximately twelve hours.
- On November 29, the boiler system pressure was lowered to facilitate the replacement of the boiler master controllers. The system pressure was restored within three hours.

B. Efficiency

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

current quarter. A more detailed discussion of the contract guarantee performance was presented previously in this report.

C. Environment, Health and Safety

No environmental violations were reported during the quarter.

Monthly safety meetings were held on the Storm Water Pollution Prevention Plan, the Spill Prevention Controls and Countermeasures Plan, Blood-borne Pathogens and Heat and Cold Stress, and Steam and Refrigeration Safety.

D. Personnel

The EGF currently has twenty-three full time employees and two relief staff. Of the current number of employees, seventeen were previously employed by Nashville Thermal Transfer Corporation.

E. Training

Staff training for this quarter consisted of the Health and Safety training discussed previously.

F. Water Treatment

The water treatment program consists of regular testing and monitoring of the water chemistry in the steam, chilled water and condensing water systems. Chemicals are added to control the water hardness, chlorine levels and biologicals. Remote testing of the condensate at the AA Birch, Tennessee Tower and the Andrew Jackson also occurs regularly to monitor the concentration and distribution of the steam system chemicals.

- Steam System
 - The condensate return averaged approximately 77.5% of the steam sendout during the quarter, which represents a 1.1% decrease over the previous Second Quarter.
 - Feedwater iron and hardness remained excellent during the quarter.
- Condensing Water System
 - The conductivity of the condensing water continues to be normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.
- Chilled Water System
 - CNE continues to monitor and test for the presence of bacteria in the system. The continuous dosage of the biocide continues. At this point, the biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent.

- CNE and their water chemistry vendor are preparing a recommendation for the installation of a side stream filter to the chilled water system at the EGF to filter and remove suspended solids that may be contributing to the fouling of customer coils. This recommendation should be available in the Third Quarter FY18.

G. Maintenance and EGF Repairs

CNE continues to report on the numerous routine maintenance and preventive maintenance activities performed on the EGF primary and ancillary equipment. The principle items are discussed herein as they relate to the repair, maintenance or replacement of equipment or devices at the facility and are not considered extraordinary. The cost for these items is included as part of the FOCs.

- Pump packing was adjusted on chilled water pumps #1 through #5 and feedwater pumps #3 and 4.
- Fan belts on cooling towers #4, 5, 7, 8, 11 and 18 were adjusted.
- The O₂ sensors on boilers #1, 2 and 4 were calibrated.
- The coupling on condensate pump #3 was replaced.
- The VFD for chilled water pump #3 was repaired.
- The oil pump on chiller #9 was repaired.
- The sub master controller #1, 2, 3 & 4 Boilers was replaced.
- The Boiler Master Controller was replaced.
- The chilled water pump #2 was repaired.
- The propane valve on boiler #1 was repaired.
- Repairs on the propane vaporizer began.
- Condenser water pumps #3 and 4 were painted.
- The breaker on cooling tower #8 was repaired.
- Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

H. EGF Walk-through

A quarterly Walk-through of the EGF was performed on January 2, 2018, by Kevin Jacobs, P.E. with TEG. This review involved a tour of the facility with the primary points of interest and concern noted herein.

- During the Fourth Quarter FY17 Walkthrough report, it was noted that additional rust spots were observed on towers #1, #5, #6, #11, #16 and #18. CNE has not made the repairs on the riser tubes. In addition, cooling tower fill is still being stored on the cooling tower deck beneath the basins. Since the entire fill is reported to have been replaced, the remaining fill should be removed.
- CNE has made an effort to remove cobwebs within the EGF; however, this removal process is ongoing.

- The fencing surrounding the garbage dumpster in the parking lot has begun to show cracks and is in need of repair. This item was noted in previous Walkthrough Reports and has not been addressed to date; however, CNE has investigated options and are expecting to have the fencing repaired or replaced by February 2018.
- The spraying noted in previous reports on the condensing and chilled water pumps has been addressed. CNE has repaired and painted the pumps, although some mineral deposits remain.
- In the previous Walkthrough report, it was noted that significant scale was observed on the fill to cooling tower #14. The scale remains on this cooling tower and most of the cells along the west-side of the plant now have significant scale or deposits on the fill. CNE does not appear to have addressed this issue since the last Walkthrough report.
- The leak in the propane vaporizer reported previously was repaired by CNE and a full load test on the unit was performed. However, during the quarter, a new leak was reported by CNE who have begun their investigation as to the source. Repairs cannot be readily made as the heating season is approaching.
- The plants previously noted as growing the cold water basins for cooling towers 11, 12, 13 and 18 have been removed.
- Scaling on the cooling tower fill on the east-side of the plant is present but less significant than on the west-side. The fill in cooling tower #1 appears to be more brittle than the others and has some broken or damaged pieces that the other cells do not appear to have. TEG recommends that CNE address the potential water chemistry issues that may be present to cause the scaling and determine if water chemistry is related to the brittleness.
- There appears to have been a water leak above MCC#3 located between boilers #1 and #2. CNE has made an effort to clean the affected area and unless the situation worsens, this item will be removed from subsequent reports.
- Boiler #3 was not operation during the Walkthrough. CNE reported that the boiler would not remain lit.
- A leak at the connection to the boiler #4 was observed at one of the safety relief valves. CNE reported that he leak is not affecting the operation of the boiler at this time and that repairs will be made as soon as possible.
- Due to the exceptionally cold weather, several leaks on the cooling tower structure and casings were observed during the Walkthrough. These leaks are evident by the icicles hanging from isolated locations on the sides of the cooling towers. CNE will address these leaks.
- A drain valve on the condensing water header on the northeast corner of the cooling tower deck was frozen and had apparently been leaking. If this line or valve ruptures, a significant leak of the condensing water system will occur. CNE will address this issue.
- A leaking chemical feed line was observed on the south side of the southern DA. CNE believes this line to the sulfite feed and will address the leak and clean the spilled and affected area.

- The level controller for cooling tower #6 was frozen over and had spilled down onto the roof decking. The spill was noticeable from the substantial frozen waterfall. CNE will address this issue.
- Other action items previously noted to be addressed by CNE have been completed.

IV. Capital Projects

The Capital Projects discussed in this section are those projects funded through the issuance of bonds by Metro. Costs for these projects will be paid from funds already appropriated. The statuses of the projects are discussed, and the project cost-to-date and bond balances are also presented.

A. Second Quarter FY18 Open Projects

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

1. DES111 – DES Combined Heat and Power

This project is currently on hold.

2. DES119 - Chilled Water System Delta T Issue

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

3. DES124 - Criminal Justice Center Redevelopment

The design of the reconnection of DES services to the new Criminal Justice Center was completed during the quarter. The project was bid and awarded in November. Construction began in December with an anticipated completion date in early January.

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

4. DES130 – Repair to Manhole B3

Construction was completed during the Third Quarter FY17. TEG has sent an invoice with back-up documentation to the communications contractor responsible for the damage to the manhole. TEG has had some follow-up communication but, to-date, reimbursement for the costs has not been provided. TEG has turned this issue over to Metro’s legal department to pursue.

5. DES133 – Old Convention Center Site Redevelopment

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

The site excavation includes blasting and the blasting, at its closest point, is 15 to 16 feet from the Broadway Tunnel. TEG and CNE have had several meetings with the contractor to review the blasting process, schedule, and to discuss the impact that a chilled water or steam service interruption would have on the DES and DES customers if damage to the tunnel were to result from the blasting shockwaves; specifically, the Bridgestone Arena and the Renaissance Hotel since their services are from the area of the Broadway Tunnel immediately adjacent to the construction site. TEG developed a contingency plan to address emergency/temporary service to these customers should it be required. A new steam isolation valve was installed in the Broadway Tunnel steam piping to address the vulnerability of the Renaissance Hotel. This new isolation valve now allows the Renaissance Hotel to be isolated from the tunnel section immediately impacted by the blasting.

Because of the Bridgestone Arena's event schedule, they cannot tolerate a disruption of services for several days. Therefore, stand-by chillers and a stand-by boiler were installed at the Bridgestone Arena in November to provide emergency services in case there is a disruption of services due to the blasting.

Blasting began September 19, 2017, and will continue through the end of February 2018. Blasts occur at daybreak on Tuesdays through Saturdays, weather permitting. Each day after the blasting, CNE inspects the condition of the tunnel and provides TEG and Metro with a report. TEG contacts the blasting contractor each day and distributes a status report to Metro.

The redevelopment site contractor, SkanskaUSA installed wood framing to protect the critical valves and portions of the tunnel piping; however, some damage has occurred to the Broadway Tunnel as a result of the blasting. This damage has included fallen rocks, some damage to the tunnel's structural integrity, loosening of some anchor bolts and damage to grout beneath structural baseplates. Based on the damage experienced and concerns of additional damage, DES hired a contractor to reinforce specific sections of the tunnel and to also make repairs to the tunnel as a result of the blasting. This work took about 2 months and was begun and completed during the Second Quarter FY18. Skanska avoided blasting near the tunnel while this work was completed. After the work was completed, Skanska USA resumed blasting adjacent to the tunnel. To-date, only minor damage has resulted since the tunnel reinforcement was complete.

In addition, TEG hired a blasting monitoring company to install seismographs in the tunnel and to report the readings to TEG. These seismographs will remain in the tunnel until the blasting adjacent to the tunnel is complete.

6. DES134 – 401 Union Building Service Connection

The full-service restoration to this customer was completed during the Second Quarter. This project is closed.

7. DES135 – CHW Leak at 5th and Union

After several exploratory excavations, the source of the chilled water leak at the James K Polk Building has not been located. However, a chilled water leak was discovered near the intersection of 3rd and Charlotte. An exploratory excavation was done in this area but the source of the leak was not found. Additional investigation in this area found additional evidence of the leak, but due to the Christmas and New Year's holiday, an excavation will not take place until the Third Quarter FY 18.

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

8. DES138 – Manhole D Repairs

All work has been completed on this project and it is in the final stages of close-out. It is expected that this project will be closed during the Third Quarter FY18.

9. DES139 – DES Options Review

Work began on the evaluation of the long-term options for the DES in the First Quarter. A draft report was issued by FVB during the Second Quarter. A final version is anticipated in the Third Quarter.

10. DES140 – Manhole N2 Fence

This project was closed during the Third Quarter FY18.

11. DES141 – EGF Camera Upgrades

Work began on the EGF camera system upgrades during the Second Quarter. The project is expected to be completed during the Third Quarter.

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

The insulation in these manholes is either non-existent or is in need of repair; therefore, this project addresses the replacement and/or installation of the needed insulation. It is expected that this work will be bid and awarded during the Third Quarter FY18.

13. DES 144 – Manhole 6 Repair

The structural steel piping supports in this manhole have experienced severe corrosion due to water infiltration and require replacement and repair to insure the structural integrity of the steam and condensate piping system. TEG is in the process of developing the scope for the needed repairs. The steam and condensate will have to be isolated at this manhole to complete this work. Therefore, it is expected that this work to be bid and awarded during the Fourth Quarter FY18.

14. DES145 – Manholes 9, 11 and K Repairs

These manholes need various repairs to the concrete structure. While the specialty contractor was in Nashville reinforcing the Broadway Tunnel, TEG developed a scope and asked for pricing from this contractor for these needed repairs. Significant savings could be realized by having these repairs made by this contractor while in Nashville; therefore, this work was awarded and completed during the Second Quarter FY18. It is expected that this project will be closed during the Third Quarter FY18.

B. Second Quarter FY18 Closed Projects

DES134, DES140 and DES142 were closed during the Second Quarter FY18.

C. Capital Projects Budget

The following table summarizes the costs and remaining balance of the DES capital projects based on reported expenditures to date. Open projects or completed projects that require some additional management are shown. Total costs for projects that are closed are shown with a gray highlight. Only the funds currently available are shown.

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

Table 5. Capital Projects Expense Summary

DES Project #	Description	Total Budget	FY18 Spending to Date	Total Spent to Date	Remaining Balance
2010 Bond Projects-49109					
DES119	DES Delta T Issue	\$ 67,000	\$ -	\$ 65,447	\$ 1,553
DES139	Options Review	\$ 63,600	\$ 81,972	\$ 84,754	\$ (21,154)
MAS	Miscellaneous Development Projects	\$ 46,900	\$ 10,070	\$ 11,826	\$ 35,074
	Total Closed Projects	\$ 2,493,661	\$ -	\$ 2,421,305	\$ 72,356
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ (65,246)	\$ -	\$ -	\$ (65,246)
	Total 2010 Bond	\$ 2,605,916	\$ 92,042	\$ 2,583,332	\$ 22,583
Customer Connection Fund-49107					
DES124	CJC Redevelopment	\$ 300,000	\$ 27,673	\$ 169,864	\$ 130,136
DES130	MH B3 Repair	\$ 20,000	\$ 801	\$ 13,269	\$ 6,731
DES133	NCC Development	\$ 40,000	\$ 106,875	\$ 127,597	\$ (87,597)
DES133.3	Broadway Tunnel Reinforcement	\$ 450,000	\$ 19,003	\$ 19,003	\$ 430,997
DES134	401 Union Hotel Reconnection	\$ 60,000	\$ 2,268	\$ 52,991	\$ 7,009
DES135	Chilled Water Leak 5th and Union	\$ 200,000	\$ 3,538	\$ 164,783	\$ 35,217
DES138	MH-D	\$ 130,000	\$ 107,763	\$ 121,242	\$ 8,758
DES141	EGF Security Camera Upgrade	\$ 50,000	\$ 445	\$ 445	\$ 49,555
	Total Closed Projects	\$ 7,348,827	\$ -	\$ 6,871,466	\$ 477,361
	Metro Project Admin	\$ (129,827)	\$ 16,953	\$ 132,461	\$ (262,288)
	Project Man, Development, etc	\$ 40,000	\$ -	\$ -	\$ 40,000
	Customer Connection Fund	\$ 8,509,000	\$ 285,318	\$ 7,673,120	\$ 835,880
CHP and EDS Repairs-49116					
DES111	DES CHP	\$26,000,000	\$ -	\$ 168,706	\$25,831,294
	Total Closed Projects	\$ -	\$ -	\$ -	\$ -
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ -	\$ -	\$ -	\$ -
	CHP and EDS Repairs	\$26,000,000	\$ -	\$ 168,706	\$25,831,294

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

Several EDS repairs and improvements were made during the Second Quarter. The principle items for discussion are presented in the following sections.

A. Repairs and Improvements

Several repairs were made to the EDS and at customer buildings during the quarter. The remaining value of the R&I budget at the end of the current quarter is \$127,232. Table 6 provides a summary of the FY18 expenditures and revenues to date associated with the R&I budget.

Table 6. Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY17						\$ -	\$ 26,260.82	\$ 26,260.82
Interest/Transfer	7/3/2017	-	-	\$ 9.64				
Interest/Transfer	7/3/2017	-	-	\$ (9.64)				
CNE June R&I Invoice	8/21/2017	DES-2320	CNE	\$ 2,677.12				
CNE May R&I Invoice	6/30/2017	-	CNE	\$ 4,672.28				
DES-140	8/31/2017	DES-2322	TEG	\$ 543.53				
DES-142	8/31/2017	DES-2322	TEG	\$ 3,596.49				
DES-143	8/31/2017	DES-2322	TEG	\$ 2,294.26				
Interest/Transfer	8/1/2017	-	-	\$ 21.29				
Interest/Transfer	8/1/2017	-	-	\$ (21.29)				
CNE July R&I Invoice	8/15/2017	DES-2322	CNE	\$ 1,978.44				
Interest/Transfer	9/1/2017	-	-	\$ 34.51				
Interest/Transfer	9/1/2017	-	-	\$ (34.51)				
		Sub-Total First Quarter		\$ 15,762.12	\$ 68,825.01	\$ -	\$ 53,062.89	\$ 53,062.89
DES-140	10/03/17	DES-2530	TEG	\$ 170.20				
DES-142	10/03/17	DES-2530	TEG	\$ 950.88				
DES-143	10/03/17	DES-2530	TEG	\$ 177.90				
Interest/Transfer	10/02/17	-	-	\$ 43.84				
Interest/Transfer	10/02/17	-	-	\$ (43.84)				
CNE Aug R&I Invoice	10/01/17	DES-2530	CNE	\$ 7,676.52				
DES-142	11/28/17	DES-2327	TEG	\$ 88.95				
DES-144	11/28/17	DES-2327	TEG	\$ 650.00				
Interest/Transfer	11/01/17	-	-	\$ 54.29				
Interest/Transfer	11/01/17	-	-	\$ (54.29)				
Sept R&I Invoice	11/01/17	DES-2327	CNE	\$ 9,464.47				
DES-144	12/27/17	-	TEG	\$ 1,292.42				
DES-145	12/27/17	-	TEG	\$ 814.93				
Interest/Transfer	12/01/17	-	-	\$ 68.81				
Interest/Transfer	12/01/17	-	-	\$ (68.81)				
Oct R&I Invoice	12/01/17	-	CNE	\$ 15,954.05				
DES-142 Bobby Hotel Steam Valve	12/01/17	-	CNE	\$ 6,618.00				
		Sub-Total Second Quarter		\$ 43,858.32	\$ 68,825.01	\$ -	\$ 24,966.69	\$ 24,966.69
		Sub-Total Third Quarter		\$ -	\$ 22,941.67	\$ -	\$ 22,941.67	\$ 22,941.67
		Sub-Total Fourth Quarter		\$ -	\$ -	\$ -	\$ -	\$ -
		FY18 Year to Date		\$ 59,620.44	\$ 160,591.69	\$ -	\$ 127,232.07	\$ 127,232.07

B. Preventive Maintenance

Preventive maintenance, tunnel and manhole inspections and reviews of customers' mechanical rooms were performed during the quarter. The principle items for discussion are presented.

1. EDS Manhole Inspections
 - a. The monthly vault and tunnel inspections were held as scheduled.
 - b. Communications continue with State personnel regarding needed repairs to the State Tunnel. The State had a registered structural engineer review the two areas which TEG has structural concerns during the First Quarter FY18. TEG is waiting on notification

from the State regarding what repairs will be made and the associated repair schedule.

- c. Customer metering station calibration checks were completed as scheduled.
- d. Water chemistry samples at customer buildings were taken as scheduled.
- e. CNE completed the repairs with the communications system between MH-18 (Broadway Tunnel) and the EGF.
- f. The Contrec device at the John Sevier Building was replaced.
- g. Water from several of the vaults had to be pumped due to the prevalent rain during the quarter.
- h. The condensate sump pump was replaced in the State Tunnel.
- i. Chilled water was pumped from the CJC construction site and from an electric vault on 3rd Ave near the CJC.
- j. Lighting and electrical repairs were made in the Broadway and AA Birch Tunnels.
- k. Several trap assemblies were fabricated for several installations within the EDS.
- l. CNE conducted inspections and assisted the building contractor (Skanska) with inspections in the Broadway Tunnel associated with the blasting at the construction site at 5th and Broadway.

2. Other EDS Inspections

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

C. Emergencies

No emergencies were reported during the quarter.

D. EDS Walk-through

The walkthrough was conducted on January 23 and 24, 2018. The manholes that were visited include Manholes B2, B3, B4, B6, B7, B8, B9, B10, 16A, 22B, Viridian, S4A and U. 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 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 “high” 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. This moisture has accelerated the corrosion of the structural metal piping supports. TEG will evaluate the needed repair.
- d. There are some hairline cracks in the manhole ceiling and walls. CNE should monitor these cracks and inform TEG of any significant changes.
- e. Recent development at this location now has the ventilation manway located in the sidewalk. The contractor that raised this manway lid and frame did not support the manway frame properly and the frame has dropped and the concrete sidewalk around the manway has several cracks in it. The developer has agreed to replace this manway lid and frame with a composite lid and frame, therefore this should be repaired in the near future.
- f. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a “standard” bucket trap as soon as possible.
- g. There is some debris in the manhole; this debris should be removed as soon as possible.

2. Manhole B3

- a. There was 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 was not functioning; CNE personnel discovered that the upstream strainer was clogged. The strainer was blown down and the trap began to function normally.

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 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 mud and debris in the floor of this manhole. This should be removed by CNE as soon as possible.
 - 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.
 - f. Some of the foam sealant used at the piping wall penetrations has started to “pull away” from the concrete holes. At this time, groundwater is not leaking through any of these penetrations. CNE should monitor this and report any changes to TEG.
 - g. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a “standard” bucket trap as soon as possible.
4. Manhole B6
- a. There was a little water in this manhole but it did not require pumping.
 - b. There is a lot of mud in the floor of this manhole; CNE should remove this mud as soon as possible.
 - c. One of the trap piping stanchion supports has failed due to corrosion. The remaining two trap piping stanchions are badly corroded. CNE has constructed some replacement stanchions. These new stanchions should be installed as soon as possible.
 - 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. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a “standard” bucket trap as soon as possible.
5. Manhole B7
- a. There was water in this manhole and it required pumping prior to entry.
 - b. There is mud and some debris in the manhole. CNE should remove the mud and debris as soon as possible.
 - c. 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 the jacketing should be re-caulked. This item was noted in the January 26, 2015 Quarterly Walkthrough Report; the April 25, 2016 Quarterly Walkthrough Report and the April 10, 2017 Quarterly Report.
 - d. The trap piping stanchion support has failed due to corrosion. This support appears to be only needed to support the trap piping during repair/replacement of the trap or trap train components; CNE should install a

new stanchion support if they feel it is needed for repair/replacement of the trap/components.

- e. Some deterioration of the grout behind the anchor beam baseplates has occurred. CNE should monitor this and report any significant deterioration to TEG.
- f. 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.
- g. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a “standard” bucket trap as soon as possible.

6. Manhole B8

- a. There was a minor amount of water in this manhole.
- b. There is some mud and debris in the manhole; CNE should remove the mud and debris as soon as possible.
- c. There are some hairline cracks in the ceiling; these should be monitored by CNE and any significant changes reported to TEG.
- d. Some 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.
- f. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a “standard” bucket trap as soon as possible.

7. Manhole B9

- a. There was some water present in this manhole and it required pumping prior to entry.
- b. There was some mud in this manhole; CNE should remove the mud as soon as possible.
- c. There are some hairline cracks in the ceiling of this vault. CNE should monitor these cracks and report any significant changes to TEG.
- d. Some deterioration of the grout behind the anchor beam baseplates has occurred. CNE should 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.
- f. The trap was not functioning; CNE personnel worked on it but could not get it to function. This is an Armstrong model 2011 trap which has a history of poor performance. CNE should replace this trap as soon as possible.

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. There is quite a bit of mud in this manhole from the recent city water piping leak which resulted in water infiltrating this manhole. CNE should remove this mud as soon as possible.
 - 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 water present in this manhole and it required pumping prior to entry.
 - b. There are several cracks in the concrete sidewalk above this manhole; these cracks are due to traffic driving on the sidewalk when making turns; TEG will again report the condition of this concrete to Metro Public Works.
 - c. There are hairline cracks in the walls of this manhole. CNE should monitor these cracks and report and significant changes to TEG.
 - d. A blow down valve needs to be added to the strainer upstream of the trap so the strainer can be blown down.
 - e. The existing trap is an Armstrong model 2011 which has a history of poor performance. This trap should be replaced with a “standard” bucket trap as soon as possible.

13. Manhole U

- a. There was water present in this manhole and it required pumping prior to entry.
- 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 infrequent; 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. CNE should monitor this condition and report any significant changes to TEG.
- d. The condensate piping in this manhole is leaking due to corrosion. TEG will develop a scope for these repairs and coordinate with CNE to bid and hire a contractor.
- e. TEG will evaluate whether this manhole should be abandoned and filled. To do this, components of the steam valve in this manhole will need to be welded (bonnet flange and stem) to prevent future leaks, and the piping needs to be insulated.

Action Items

Action items from the above walk through are presented in the separate quarterly manhole review report presented to CNE.

VI. Customer Relations

This section contains descriptions of the marketing efforts made by the DES Team during the quarter. The topics of interactions, meetings and training seminars with the customers are also discussed. There are currently 28 customers, comprised of 40 different buildings, connected to the EDS. Service to each of these buildings continues to prove satisfactory, and the responsiveness to customer issues is handled by CNE in an excellent and professional manner.

A. Marketing

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

Negotiations continued with the 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.

Conversations and meetings have been held with CB Ragland and others regarding the development of a new 253 room hotel to be constructed along Molloy Street between 2nd and 3rd Avenues South. It is believed that this hotel will require approximately 250 tons of chilled water. Discussions and negotiations are in the early stages since this hotel is currently in the post-planning phase.

B. Customer Interaction

The CNE customer service representative (CSR) continues to respond to customer issues as they arise. Much of the communication involves minor problems with the customers' heating and cooling systems that are unrelated to DES service. Other more significant issues are summarized herein.

- CNE's CSR was in contact with the personnel of several customer buildings to discuss leaks, building maintenance or building performance during the quarter.
- The Andrew Jackson building personnel notified CNE of excessive noise with the air compressor station for the State Tunnel pneumatic valve. CNE investigated and made repairs.

- Steam service was restored to several customers' buildings in preparation for the heating season.
- Coordination for the start-up and re-energizing the steam and chilled water services to the Fairlane and Bobby Hotels were made during the quarter.
- CNE coordinated the installation of the temporary chillers and boilers at the Bridgestone Arena.
- A meeting was held with the Fifth Third building between CNE and their chemical vendor to discuss the water chemistry in the building and system.
- Due to the increase in chilled water make-up to the EDS, CNE requested that all customers review their in-building systems to determine if a leak was present in their building.
- Other minor issues and customer interactions are noted in the monthly CNE reports.

VII. Recommendations

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

- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced; 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 piping (and in some cases the in-building piping) that appears to be contributing to the decrease in cooling performance at customer buildings.
- Insulation which is absent, or in disrepair, in the vaults should be addressed through additional capital and R&I projects, and through regular maintenance provided by CNE.
- Steam traps which need repair or replacement should be addressed as soon as possible.
- Expansion joint leaks should be repaired once the leak(s) is substantial enough to warrant repair.
- Lights in tunnels and/or manholes which are not functioning should be repaired or replaced as soon as possible.
- Minor concrete repairs need to be made in some manholes. TEG will continue to coordinate this effort with CNE.
- Mud and debris needs to be cleaned and removed from some manholes.
- Communication with the State is continuing regarding the needed repairs in the State Tunnel. During the Second Quarter FY18, TEG and CNE personnel have continued correspondence with the State to address these concerns. TEG and CNE are still awaiting a schedule from the State regarding these repairs.