



Operations Monitoring Report

First Quarter FY17

Prepared by:

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I. Executive Summary

A review of the fiscal year 2017 (FY17) First 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 First Quarter FY17, the chilled water sales increased 7.9% over the previous First Quarter (FY16). The chilled water sendout also increased 9.6% over the previous First Quarter. The system losses increased approximately 47.7%. The number of cooling degree days increased 22.0% in the First Quarter. The peak chilled water demand for the current quarter was 20,016 tons, which is 2.1% higher than the previous First Quarter and was the highest recorded at the Energy Generating Facility (EGF). However, this peak demand was greater than that measured at the customer meters suggesting that an error exists in the flow measurement at the EGF. The peak demand at the EGF is not used for customer billing or planning.

Steam sendout for the current quarter increased by approximately 5.4% over the previous First Quarter with a 333% increase in heating degree days due primarily to an increase in the heating degree days in September. Likewise, steam sales also increased by approximately 13.9% over the previous First Quarter. Steam system losses, as a percentage of sendout, decreased, and the total losses decreased approximately 12.6% over the previous First Quarter. The peak steam demand for the current quarter was 46,781 pounds per hour, which represents a decrease in the First Quarter demand by approximately 2.6%.

The EGF performance continues to surpass the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption continues to perform lower than the guaranteed levels; however, it has increased by 7.7% in the First Quarter. The steam plant electric consumption increased over the previous First Quarter by 1.2%, and the amount of electricity per unit of sales of steam decreased by approximately 11.2%. The total water consumption for the steam and chilled water plants decreased marginally from the previous First Quarter. However, the EDS make-up for the chilled water system increased 18.8%. The steam plant water usage increased by 15.2%.

Work continued on DES Capital and Repair & Improvement Projects during the First Quarter of FY17. Repair and Improvements to the EDS continue as scheduled. DES104, DES123 and DES126 were closed during the First Quarter FY17. Construction was completed on DES124, DES127, DES129 and DES131 during the First Quarter FY17, and it is anticipated that they will be closed during the Second Quarter FY17. DES134 (401 Union Street Service Connection) and DES135 (Chilled Water Leak at 5th and Union) were opened during the First Quarter FY17.

The current fiscal year system operating costs to date are \$5,736,292. This value represents approximately 27.8% of the total budgeted operating cost for FY17. The customer revenues from the sales of steam and chilled water for FY17 (to date) are \$5,084,245 which is

approximately 26.9% 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 \$430,500 (25% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices.

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	15
	A. First Quarter FY17 Open Projects	15
	B. First Quarter FY17 Closed Projects.....	17
	C. Capital Projects Budget.....	17
V.	Energy Distribution System Repair, Improvements, PM and Emergencies....	18
	A. Repairs and Improvements	18
	B. Preventive Maintenance.....	19
	C. Emergencies.....	19
	D. EDS Walk-through.....	20
VI.	Customer Relations	23
	A. Marketing.....	24
	B. Customer Interaction.....	24
VII.	Recommendations.....	25

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 First Quarter chilled water sales is shown in Figure 1. This data reflects a 7.9% increase in sales for the current quarter over the same quarter of the previous fiscal year.

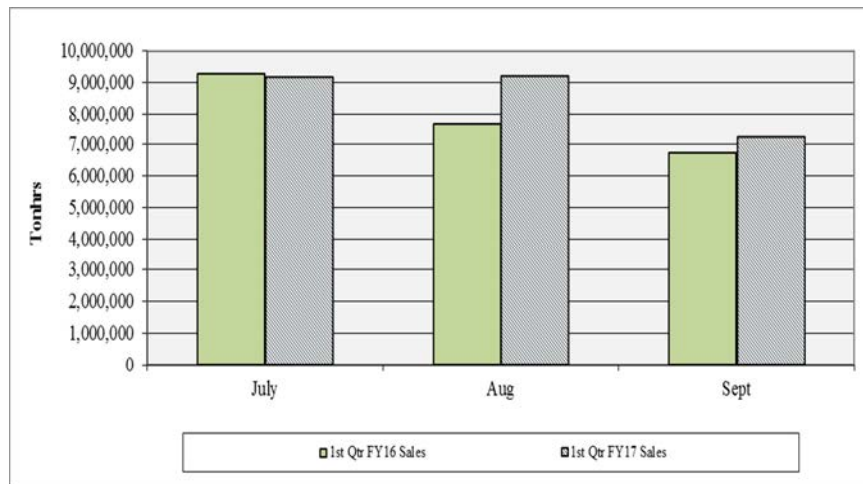


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 20,016 tons, which represents an approximate 2.1% increase over the previous First 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.

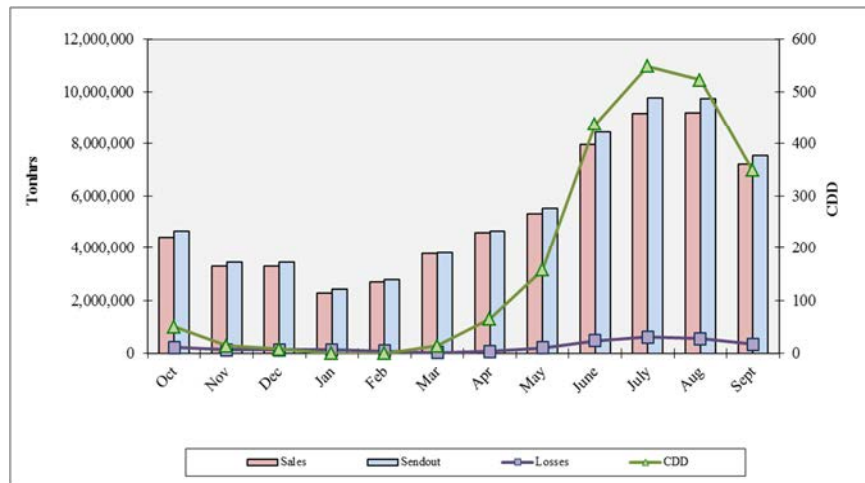


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

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

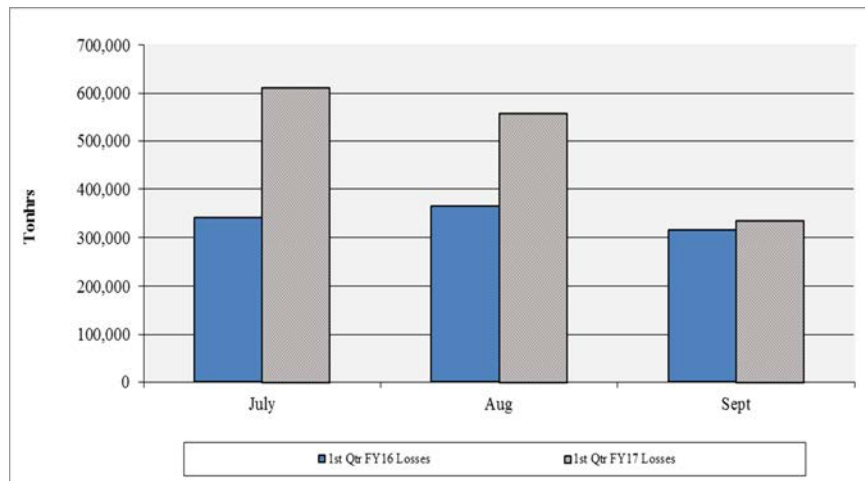


Figure 3. Chilled Water System Loss Comparison

The EDS make-up increased by approximately 18.8% over the previous First Quarter. CNE is continuing to investigate the sources of the chilled water leaks that cause the increase in EDS make-up. A potential source of a major leak was discovered on 5th Ave near the James K. Polk Building. A capital project, DES135, was created to perform an exploratory excavation of the area to determine the location of the leak and make the necessary repairs. The total EDS water usage represents only a small part of the total EGF water usage for the quarter, but the percentage is increasing.

The total energy losses have increased by approximately 47.7% over the previous First Quarter. The make-up to the cooling towers decreased marginally during the quarter. The number of cycles of concentration in the condensing water circuit experienced a 24.7% decrease during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

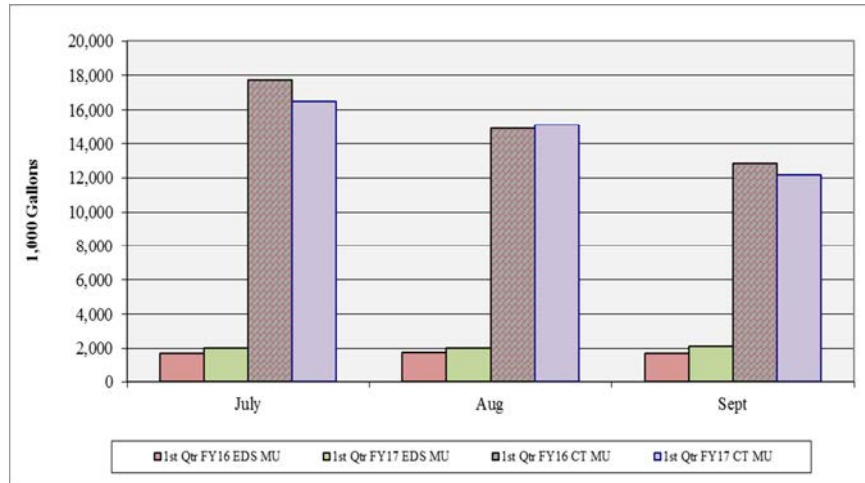


Figure 4. Chilled Water System City Water Usage Comparison

3. Performance

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

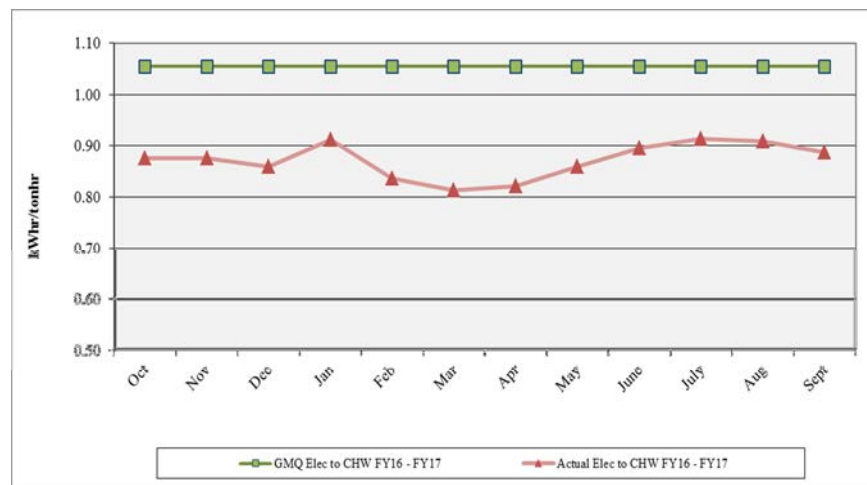


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

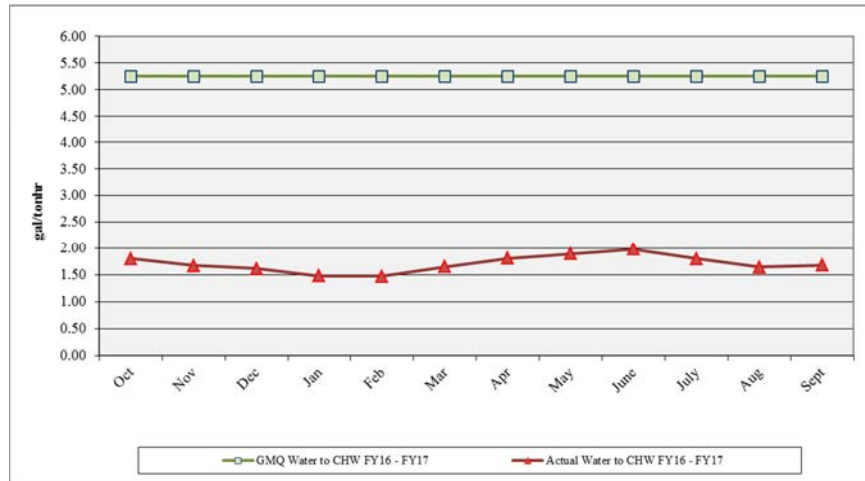


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales decreased approximately 0.23% over the First Quarter for FY16 (Figure 5), resulting in a slightly improved performance.

The actual chiller plant water conversion factor decreased approximately 8.6% over the previous First Quarter. The total consumption of city water for the chiller plant for the current quarter decreased 1.4%.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 5.4% over the previous First Quarter (FY16), and the sales also increased by approximately 7.9%. The Quarter experienced a significant increase in the number of heating degree days due to cooler than normal weather in late September. The steam system losses decreased 12.6% over the previous First Quarter. A comparison for the First Quarter steam sales is shown in Figure 7.

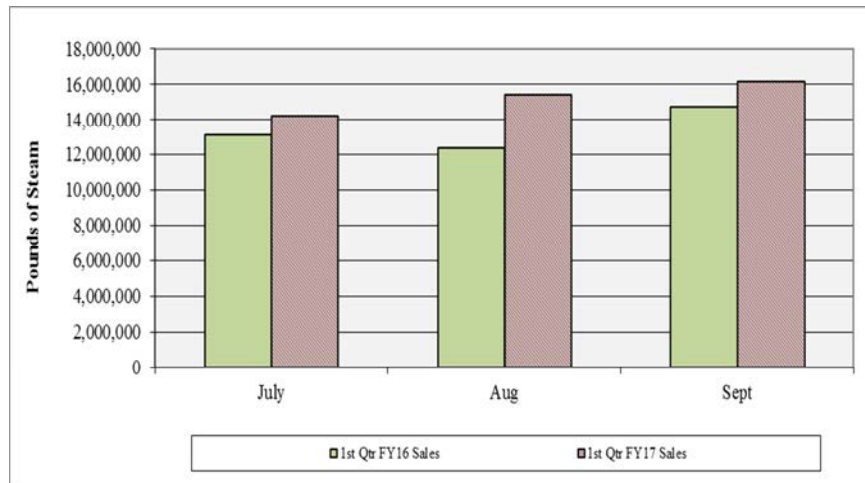


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 46,781 pph, which reflects an approximate 2.2% decrease in the peak steam production over the previous First 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.

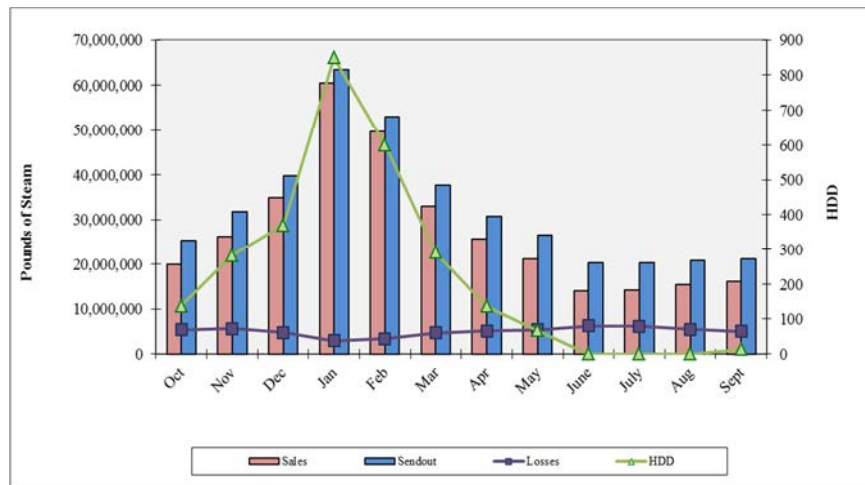


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

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

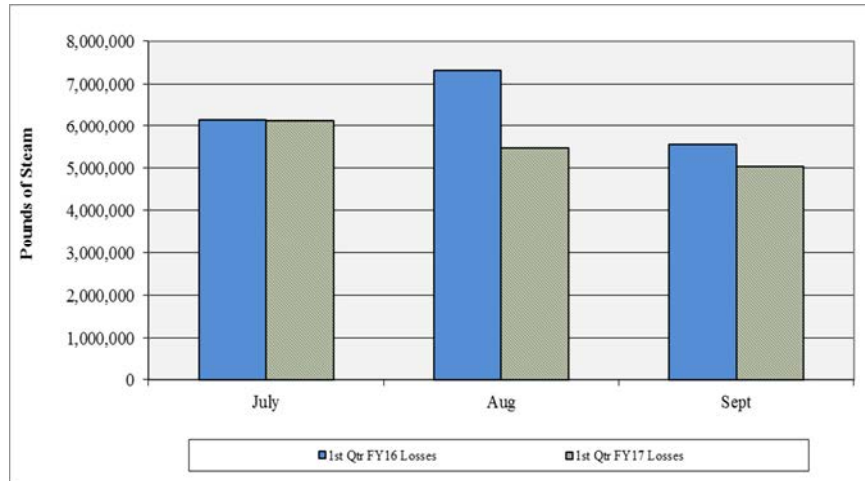


Figure 9. Steam System Losses

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 First Quarter data in Figure 10.

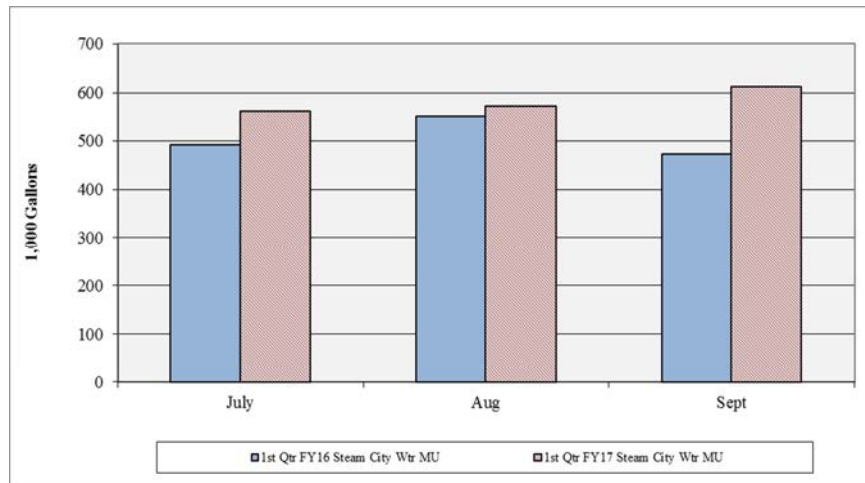


Figure 10. Steam System City Water Make-up Comparison

3. Performance

The performance of the steam system aspect 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.

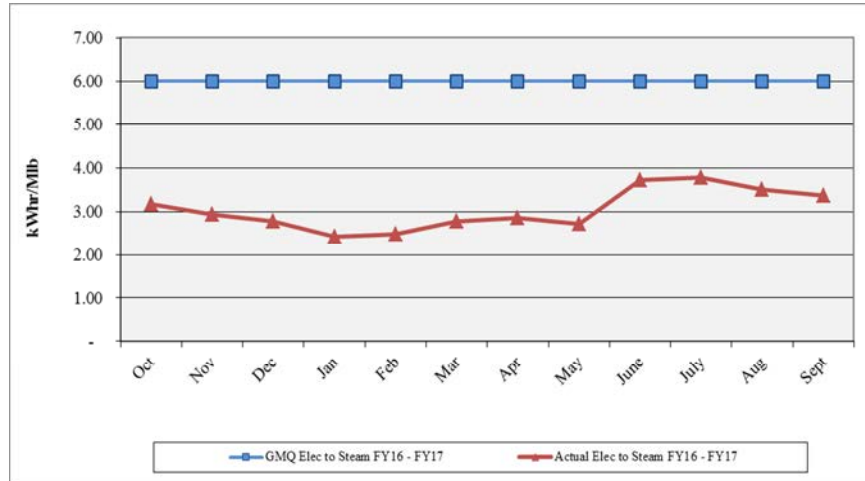


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

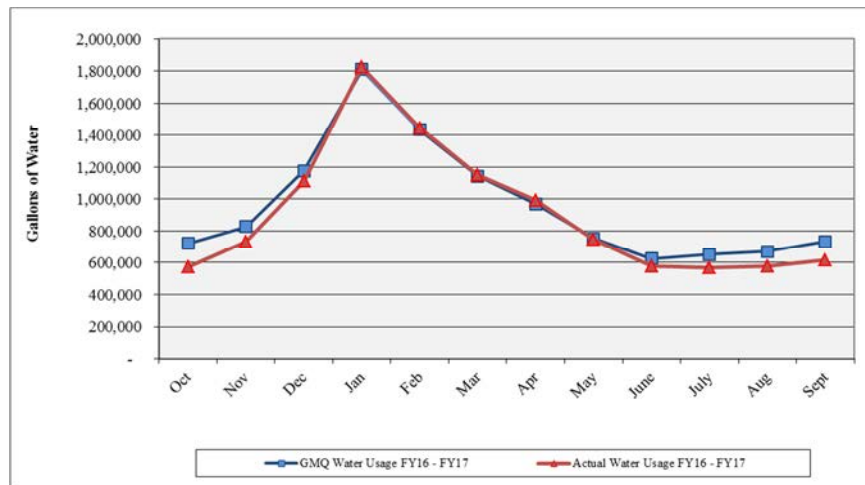


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

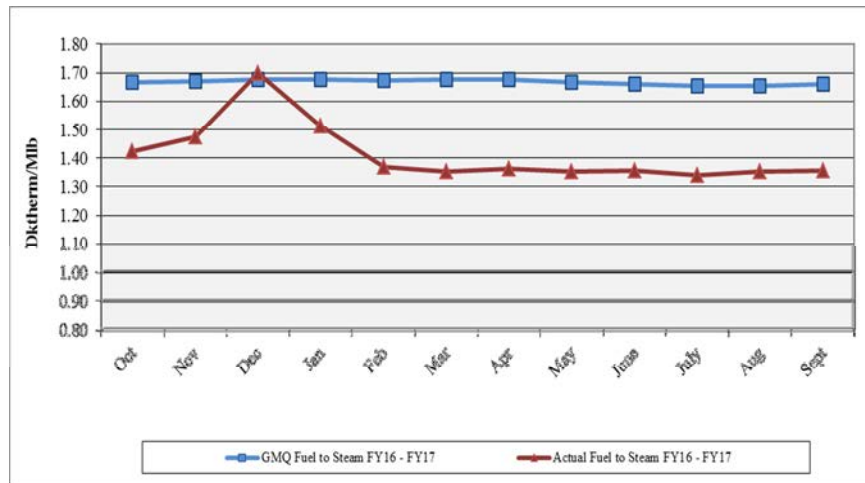


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced a 1.2% increase in the steam plant electric consumption while experiencing an 11.2% decrease in the electric conversion factor. The water consumption for the steam plant increased 15.2% this quarter as compared to the previous First Quarter. The fuel consumption per unit of steam sales was 3.4% lower than in the previous First 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 First Quarter and annual comparisons of the Guaranteed Maximum Quantities (GMQ) of the criteria commodities (fuel, water and electricity).

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

Item	Unit	First Quarter FY17	First Quarter FY16	*Percent Difference
	days	92	92	0.00%
Total Electric Use	kWhrs	23,282,634	21,634,862	7.62%
Chilled Water	kWhrs	23,120,725	21,474,806	7.66%
Steam	kWhrs	161,909	160,056	1.16%
Total Water Use	kgal	51,678	52,156	-0.92%
Total Chilled Water	kgal	49,932	50,640	-1.40%
EDS Make-up	kgal	6,164	5,189	18.79%
Cooling Towers	kgal	43,768	45,451	-3.70%
Calc CT Evaporation	kgal	34,843	38,103	-8.56%
CT Blowdown	kgal	8,925	7,348	21.46%
Calc # Cycles		3.90	5.19	-24.71%
Steam	kgal	1,746	1,516	15.17%
Total Fuel Use	mmBTU	84,227	82,728	1.81%
Natural Gas	mmBTU	84,227	82,663	1.89%
Propane	mmBTU	0	65	-100.00%
Condensate Return	kgal	5,866	5,592	4.89%
	lbs	47,839,769	45,609,747	4.89%
Avg Temp	°F	195.3	186.3	4.83%
Sendout				
Chilled Water	tonhrs	27,082,900	24,719,500	9.56%
Steam	lbs	62,409,000	59,226,000	5.37%
Peak CHW Demand	tons	20,016	19,612	2.06%
Peak Steam Demand	lb/hr	46,781	47,812	-2.16%
CHW LF		61.28%	57.08%	7.35%
Steam LF		60.42%	56.10%	7.70%
Sales				
Chilled Water	tonhrs	25,573,135	23,697,511	7.91%
Steam	lbs	45,775,281	40,199,239	13.87%
Losses				
Chilled Water	tonhrs	1,509,765	1,021,989	47.73%
Steam	lbs	16,633,719	19,026,761	-12.58%
		26.65%	32.13%	-17.04%
Degree Days				
CDD		1,421	1,165	21.97%
HDD		13	3	333.33%

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

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

GMQ Calculations	Unit	First Quarter FY17	First Quarter FY16	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	3.54	3.98	-11.16%
GMQ Plant Efficiency	Dth/Mlb	1.656	1.668	
Plant Efficiency	Dth/Mlb	1.350	1.397	-3.38%
Actual %CR		76.66%	77.01%	-0.46%
Avg CR Temp	°F	195	186	4.83%
GMQ Water Conversion	gal	2,054,306	1,919,934	
Water Conversion	gal	1,763,460	1,531,160	15.17%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.904	0.906	-0.23%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	1.95	2.14	-8.63%

*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 \$5,736,292. This value represents approximately 27.8% 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 First 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 \$5,084,245 which is approximately 26.9% of the

budgeted amount. The MFA transferred to date is \$430,500 (25% 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	24.42%
9th Chiller	\$ 41,500	\$ 10,144	\$ -	\$ -	\$ -	\$ 10,144	24.44%
C/O 6A	\$ 82,000	\$ 20,028	\$ -	\$ -	\$ -	\$ 20,028	24.42%
C/O 6B	\$ 71,800	\$ 17,534	\$ -	\$ -	\$ -	\$ 17,534	24.42%
C/O 7	\$ 27,100	\$ 6,605	\$ -	\$ -	\$ -	\$ 6,605	24.37%
C/O 8	\$ 11,800	\$ 2,891	\$ -	\$ -	\$ -	\$ 2,891	24.50%
Pass-thru Charges:							
Chemical Treatment	\$ 161,600	\$ 49,131	\$ -	\$ -	\$ -	\$ 49,131	30.40%
Insurance	\$ 36,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Marketing:							
CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ 12,800	\$ 3,139	\$ -	\$ -	\$ -	\$ 3,139	24.53%
FEA: Steam	\$ 60,500	\$ 15,485	\$ -	\$ -	\$ -	\$ 15,485	25.60%
Chilled Water	\$ 185,200	\$ 142,582	\$ -	\$ -	\$ -	\$ 142,582	76.99%
Misc:							
Metro Credit	\$ -	\$ (243,525)	\$ -	\$ -	\$ -	\$ (243,525)	n.a.
ARFA	\$ 64,400	\$ 15,723	\$ -	\$ -	\$ -	\$ 15,723	24.42%
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Man Fee =	\$ 5,189,100	\$ 1,365,878	\$ -	\$ -	\$ -	\$ 1,365,878	26.32%
Reimbursed Management Fee + Chem Treatment		\$ 456,177	\$ -	\$ -	\$ -	\$ 456,177	0.00%
Metro Costs							
Pass-thru Charges:							
Engineering	\$ 9,300	\$ 4,825	\$ -	\$ -	\$ -	\$ 4,825	51.89%
EDS R&I Transfers	\$ 273,700	\$ 68,425	\$ 22,808	\$ -	\$ -	\$ 91,233	33.33%
Metro Marketing	\$ 10,300	\$ 1,274	\$ -	\$ -	\$ -	\$ 1,274	12.37%
Project Administration	\$ 58,300	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Incremental Cost	\$ 540,900	\$ 106,856	\$ 7,806	\$ -	\$ -	\$ 114,662	21.20%
Utility Costs:							
Water/Sewer	\$ 553,600	\$ 232,673	\$ -	\$ -	\$ -	\$ 232,673	42.03%
EDS Water/Sewer	\$ -	\$ 136	\$ -	\$ -	\$ -	\$ 136	n.a.
EDS Electricity	\$ -	\$ 10,853	\$ -	\$ -	\$ -	\$ 10,853	n.a.
Electricity	\$ 5,978,700	\$ 2,080,977	\$ -	\$ -	\$ -	\$ 2,080,977	34.81%
Natural Gas Consultant	\$ 102,000	\$ 2,000	\$ -	\$ -	\$ -	\$ 2,000	1.96%
Natural Gas Transport	\$ -	\$ 48,008	\$ -	\$ -	\$ -	\$ 48,008	n.a.
Natural Gas Fuel	\$ 2,516,100	\$ 234,200	\$ -	\$ -	\$ -	\$ 234,200	9.31%
Propane	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Metro Costs =	\$ 10,042,900	\$ 2,790,228	\$ 30,614	\$ -	\$ -	\$ 2,820,842	28.09%
Subtotal - Operations =	\$ 15,232,000	\$ 4,156,106	\$ 30,614	\$ -	\$ -	\$ 4,186,720	27.49%
Debt Service							
2012 Bonds	\$ 3,481,500	\$ 870,075	\$ -	\$ -	\$ -	\$ 870,075	24.99%
2005 Bonds -Self Funded	\$ 752,300	\$ 687,877	\$ -	\$ -	\$ -	\$ 687,877	91.44%
2007 Bonds -Self Funded	\$ 198,700	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2008 Bonds -Self Funded	\$ 197,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2010 Bonds -Self Funded	\$ 197,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
MCCC Fund -Self Funded	\$ 697,000	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Interest & Misc Revenue	\$ (141,200)	\$ (8,380)	\$ -	\$ -	\$ -	\$ (8,380)	5.93%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,383,800	\$ 1,549,573	\$ -	\$ -	\$ -	\$ 1,549,573	28.78%
Total =	\$ 20,615,800	\$ 5,705,678	\$ 30,614	\$ -	\$ -	\$ 5,736,292	27.82%
Customer Revenues							
Taxes Collected		\$ 104,248	\$ -	\$ -	\$ -	\$ 104,248	n.a.
Taxes Paid		\$ 104,248	\$ -	\$ -	\$ -	\$ 104,248	n.a.
Penalty Revenues/Credits		\$ (24,245)	\$ -	\$ -	\$ -	\$ (24,245)	n.a.
Energy Revenues Collected		\$ 5,108,490	\$ -	\$ -	\$ -	\$ 5,108,490	n.a.
Revenues =	\$ 18,894,000	\$ 5,084,245	\$ -	\$ -	\$ -	\$ 5,084,245	26.91%
Metro Funding Amount =	\$ 1,721,800	\$ 621,433	\$ 30,614	\$ -	\$ -	\$ 652,047	37.87%

The DES serves 28 customers and 41 buildings in downtown Nashville. These customers are divided into three categories: 1) Private customers who privately own their buildings, 2) State of TN owned buildings and 3) Metro owned buildings. A summary of the annual costs for each of these three categories is presented in Table 4. These values include late fees and penalties and any unpaid balances.

Table 4. Customer Revenue Summary to Date

Building	Chilled Water			Steam		
	Total Cost	Consumption (tonhrs/yr)	Unit Cost (\$/tonhr)	Total Cost	Consumption (Mlb/yr)	Unit Cost (\$/Mlb)
Private Customers	\$ 1,164,007	7,759,964	\$ 0.1500	\$ 294,825	11,772	\$ 25.0436
State Government	\$ 1,024,325	5,507,923	\$ 0.1860	\$ 348,249	9,887	\$ 35.2225
Metro Government	\$ 1,800,051	12,305,148	\$ 0.1463	\$ 477,034	24,116	\$ 19.7810
New Customers	\$ 1,168,205	8,249,194	\$ 0.1416	\$ 273,020	18,645	\$ 14.6431
Total	\$ 3,988,383	25,573,035	\$ 0.1560	\$ 1,120,107	45,775	\$ 24.4697

Total Revenue	\$	5,108,490
True-up and Adjustments (Net)	\$	(24,245)
Net Revenue	\$	5,084,245

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.

- A feedwater control valve malfunction caused boiler #3 to trip in July due to low water. Steam pressure decreased below 150 psig. CNE I&E personnel repaired the feedwater control valve and boiler #3 is now available if needed.
- Issues with boiler #4 during late September caused the boiler to trip numerous times. CNE attempted to address each of these issues as they arose, but continue to investigate the causes of the trips. These trips caused the boiler header pressure to decrease below 150 psig on several occasions. As of the date of this report, the necessary repairs have not been made.
- 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 Fire Extinguisher Safety, Tools and Equipment, Compressed Gas Cylinders, Hot Work Permits, Confined Space Training and Rescue Pre-planning.

CNE continues cross-training its maintenance employees to fill in as relief operators.

D. Personnel

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

E. Training

Staff training for this quarter consisted of the Health and Safety training discussed previously. CNE continues cross training maintenance personnel to perform the tasks of the operators at the EGF in case of emergency or need.

F. Water Treatment

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

- Steam System
 - The condensate return averaged approximately 76.7% of the steam sendout during the quarter which represents a 0.5% decrease over the previous First 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 has decreased.

G. Maintenance and EGF Repairs

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

- The safety relief valve for boiler #3 was replaced.
- Transformer 3A tripped when water infiltrated the cabinet. Repairs were made to the cabinet and a contractor was hired by CNE to repair the high-side connections and perform the necessary tests prior to placing the transformer back in service.
- A leak was repaired on the boiler #2 steam drum door.
- The purge unit on chiller 7B was replaced.
- The packing gland on CWP #3 was repaired.
- The belts on cooling towers 3, 11, 15, 16 and 18 were adjusted.
- The motor for CWP #1 was removed for service after a failure of its soft start. The soft start was replaced.
- A new flamer scanner was installed on boiler #3.
- 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 September 27, 2016, by Kevin Jacobs, P.E. with TEG. This review involved a tour of the facility with the primary points of interest and concern noted herein.

- Some of the riser pipes in the cooling towers have been painted, but some repairs remain. CNE has dedicated itself to repaint these riser pipes as the tower basins are repaired and the fill is replaced. They estimate a complete restoration of these components over the next couple of winters.
- Cobwebs have reformed with a vengeance in various places throughout the plant and on motor control center #4 located near the boilers; these should be removed.
- A number of items that were previously noted as being stored on the mezzanine level near the water treatment area have been removed.
- Several condensing water pumps were noted to have significantly leaking seals and several pumps showed evidence of mineral deposits on the exterior of the volutes. CNE is addressing these issues.
- A water valve or its flange is leaking on a water line in the ceiling on the west side of boiler #4. Water is dripping to the floor and is puddling. Caution signs have been installed. CNE is investigating this issue.
- One of the light fixtures on the east side of boiler #4 was flickering.

- An issue with transformer 3A was noted in the log book that required manually engaging the tie-breaker and disconnecting the transformer. After discussing the matter with CNE, they indicated that the transformer had been inspected by their contractor (PGTI/CE) and that the transformer was now operational.
- The building exterior appears to have some mildew or other stains on the brick and concrete. These need to be cleaned.

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. First Quarter FY17 Open Projects

The following projects remained open at the end of the First 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

The final test to determine the effectiveness of the Hydroflow device at the Metro Courthouse was intended to be completed during the First Quarter FY17. However due to relatively high loads on the building, the test was postponed until the Second Quarter. CNE has continued taking and testing water samples from the building to determine its effectiveness in eliminating bacteria.

5. DES121 – Miscellaneous Manhole Repairs

Most of the work is complete with the exception of some insulation in Manhole B2. It is expected that this work will be completed during the Second Quarter FY17.

6. DES122 – Manhole 13 Structural Repairs

Engineering and design of the necessary repairs are almost complete. Bidding and construction are anticipated to begin during the Second Quarter FY17.

7. DES123 – John Sevier Building Condensate Return Piping Replacement

Construction was completed during the Fourth Quarter FY16 and was closed out during the First Quarter FY17.

8. DES124 - Criminal Justice Center Redevelopment

The demolition of the DES services to the Criminal Justice Center was completed during the quarter. A final punch-list was issued to the contractor, but final paving and surface restoration will not be completed until the Second Quarter.

9. DES126 – Chilled Water Leak Exploratory Excavation on 3rd Avenue

This project was completed during the Fourth Quarter FY16. Final invoices were issued by CNE during the First Quarter. This project was closed during the quarter.

10. DES127 – Manhole 12 Steam Anchor Repair

Construction was completed at the end of the Fourth Quarter FY16. This project will be closed during the First Quarter of FY17.

11. DES128 – Manhole A Sparge Tube Addition

Construction began during the First Quarter FY17. This project will be closed during the Second Quarter FY17.

12. DES129 – Repair to Manhole 22B

Construction began during the First Quarter FY17. This project will be closed during the Second Quarter FY17.

13. DES130 – Repair to Manhole B3

This repair work was designed, bid and awarded during the Fourth Quarter FY16. The necessary work on this project will begin and should be completed during the Second Quarter FY17.

14. DES131 – Wildhorse Saloon CHW Service Connections Modifications in MH-K

The work for this project was completed during the First Quarter. Some punch-list items remain to be completed and final invoices have not been issued. This project will be closed-out during the Second Quarter

15. DES134 – 401 Union Building Service Connection

401 Union Building was purchased and is currently being renovated to be a new hotel. Due to being offline for several years, the steam piping casing entering the building has deteriorated and needs to be remedied. This project involves the renewal of the steam service piping and the customer reconnection requirements for chilled water and steam service to the building.

16. 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.

B. First Quarter FY17 Closed Projects

DES104, DES123 and DES126 were closed during the Fourth Quarter FY16.

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	FY16 Spending to Date	Total Spent to Date	Remaining Balance
2010 Bond Projects-49109					
DES119	DES Delta T Issue	\$ 100,000	\$ 1,860	\$ 61,086	\$ 38,914
DES117	Manhole S5 Modifications	\$ 160,000	\$ -	\$ 180,161	\$ (20,161)
	Total Closed Projects	\$ 2,308,661	\$ -	\$2,241,145	\$ 67,517
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ 37,254	\$ -	\$ -	\$ 37,254
	Total 2010 Bond	\$ 2,605,916	\$ 1,860	\$2,482,391	\$ 123,525

Customer Connection Fund-49107					
DES104	Time of Use/ Customer Billing	\$ 30,000	\$ 4,156	\$ 35,924	\$ (5,924)
DES124	CJC Redevelopment	\$ 300,000	\$ 24,907	\$ 42,966	\$ 257,034
DES129	MH 22B Repair	\$ 20,000	\$ 3,027	\$ 5,215	\$ 14,785
DES130	MH B3 Repair	\$ 20,000	\$ 2,134	\$ 2,820	\$ 17,180
DES131	Wildhorse CHW Modifications	\$ 40,000	\$ 6,021	\$ 6,021	\$ 33,979
DES133	NCC Development	\$ 20,000	\$ -	\$ 7,425	\$ 12,575
DES134	401 Union Hotel Reconnection	\$ 40,000	\$ 7,516	\$ 7,516	\$ 32,484
	Total Closed Projects	\$ 7,233,827	\$ -	\$6,614,564	\$ 619,263
	Metro Project Admin	\$ 40,000	\$ 8,288	\$ 94,031	\$ (54,031)
	Project Man, Development, etc	\$ 765,173	\$ -	\$ -	\$ 765,173
	Customer Connection Fund	\$ 8,509,000	\$ 56,049	\$6,816,483	\$ 1,692,516

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 First 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 \$29,876 (including the deposit transfer for October). Table 6 provides a summary of the FY17 expenditures and revenues to date associated with the R&I budget.

Table 6. Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY16						\$ -	\$ 5,067.65	\$ 5,067.65
June R&I Invoice	8/29/2016	DES-2337	CNE	\$ 1,803.70				
DES-126 Exploratory Excavation on 3rd Ave 6/16	8/30/2016	DES-2338	CNE	\$ 25,520.61				
DES-121 Misc MH Repairs	9/7/2016	DES-2340	TEG	\$ 1,360.85				
DES-126 Exploratory Excavation on 3rd Ave 6/16	9/7/2016	DES-2340	TEG	\$ 243.96				
DES-127 MHI3 Steam Anchor Repair	9/7/2016	DES-2340	TEG	\$ 813.19				
DES-128 MHA Sparge Tube	9/7/2016	DES-2340	TEG	\$ 160.10				
July R&I Invoice	9/27/2016	DES-2354	CNE	\$ 2,963.68				
DES-121 Misc MH Repairs	9/27/2016	DES-2353	CNE	\$ 33,558.75				
Sub-Total First Quarter				\$ 66,424.84	\$ 68,424.99	\$ -	\$ 2,000.15	\$ 2,000.15
Sub-Total Second Quarter				\$ -	\$ 22,808.33	\$ -	\$ 22,808.33	\$ 22,808.33
Sub-Total Third Quarter				\$ -	\$ -	\$ -	\$ -	\$ -
Sub-Total Fourth Quarter				\$ -	\$ -	\$ -	\$ -	\$ -
FY17 Year to Date				\$ 66,424.84	\$ 91,233.32	\$ -	\$ 29,876.13	\$ 29,876.13

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.
 - 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. Spalled concrete needs to be repaired in some manholes.
 - e. Some minor insulation repairs are needed in some vaults.
 - f. Mud and debris needs to be removed from some manholes.
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 September 20 and 21, 2016. The manholes that were visited included Manholes 2, 3, 4, 5, 6, 9, 10, 11, 13, 15, 18A and D. The following comments and observations are a result of these visits:

1. Manhole 2
 - a. There was water present in this manhole and it required pumping before entry.
 - b. Both the entry manway and the secondary manway lids and frames need to be replaced. CNE should coordinate and schedule this with C-K Masonry under DES-033.
 - c. The walls and ceiling were patched with a concrete patch in September 2013; CNE personnel should monitor these patched areas and notify TEG if the patches begin to crack, deteriorate, etc.
 - d. There is moderate corrosion present in Manhole D2 on the support members underneath the grating and on the grating. This manhole should be added to the “MH & Tunnel Structural Corrosion Prevention/Repair” with a “moderate” priority.
2. Manhole 3
 - a. There was water present in this manhole and it required pumping before entry.
 - b. There are some hairline cracks in the concrete walls that should be monitored; one is above the condensate penetration on the east wall; the other is above the steam penetration on the west wall.
 - c. There is some minor debris in the manhole which should be removed.
3. Manhole 4
 - a. There was water present in this manhole and it required pumping before entry.
 - b. The paint on the entry ladder and some steel supports is peeling off. There is some moderate corrosion of essential structures in this manhole. The ladder and structures should be wire-wheeled and painted with cold galvanizing paint to prevent further corrosion.
4. Manhole 5
 - a. There was water present in this manhole and it required pumping before entry.
 - b. Minor insulation lagging repairs are needed in this manhole. CNE should be able to make these repairs.
 - c. Initially the trap in this manhole was not functioning; CNE was able to get it functioning.
 - d. The strainer upstream of the trap does not have a blowdown valve; a blowdown valve should be installed by CNE.

5. Manhole 6

- a. There was water present in this manhole and it required pumping before entry.
- b. There is some spalling of the manhole's concrete wall at the east steam piping entry point that does not appear any worse since the last review. TEG will coordinate repairs for this with CNE.
- c. The steam slip joint is leaking. CNE should continue monitoring this leak and once the leak is sufficient to warrant repair, make the necessary repair.
- d. There is a kicker on the backside of a steam piping elbow which extends to the west wall of the manhole that has severe corrosion. Because there is an existing floor-to-ceiling anchor on the steam piping within a couple of feet of this kicker, there is not any concern of a failure, however, TEG will perform some calculations to determine if this kicker needs to be replaced.
- e. The steel structural components in the manhole are corroded and need to be cleaned of all rust and painted to prevent further corrosion. Some corrosion is severe. This manhole is a "Moderate to High" priority on the "MH & Tunnel Structural Corrosion Prevention/Repair".
- f. Mud has accumulated in the floor of this manhole, presumably from seepage between the walls and floor. This mud should be cleaned from the manhole; possibly by introducing water into the floor and using a vacuum truck to remove the muddy water mixture. CNE needs to coordinate and schedule this effort. TEG will investigate sealant products to be applied at the wall/floor joints once this cleaning is complete.

6. Manhole 9

- a. There wasn't any water in the floor of the manhole, therefore, it appears that the existing sump pump has been functioning properly.
- b. The mortar on the entry manhole frame has broken loose. CNE should remove the broken mortar and install new mortar on this frame.
- c. There is corrosion on the piping support bases. CNE personnel should remove this corrosion with a wire wheel and paint these bases with cold galvanizing paint before the corrosion progresses.
- d. The link seals at the wall penetrations of the steam piping and the City water/drain piping are weeping groundwater. CNE should monitor these link seals and if the seepage worsens the link seals should be tightened; this will involve the removal of some insulation and lagging to access the link seal bolts.
- e. Some cracking has occurred in the underside of the concrete opening which was cut into the northern wall of the "old" manhole. TEG forwarded pictures from the prior review of this manhole to our structural engineer for comment and he is not overly concerned with the crack but does recommend that the crack be sealed. On 4/15/15 an email was sent to CNE which included product information on two recommended crack sealants to see if sealing the crack is a job which CNE could undertake. To date, TEG has not received a response to this email.

7. Manhole 10
 - a. There wasn't any water in the floor of the manhole; therefore, it appears that the existing sump pump has been functioning properly.
 - b. The condensate anchor has some minor corrosion on it. CNE should clean this anchor with a wire wheel and paint it with cold galvanizing paint before this corrosion progresses.
 - c. The grout surrounding the southern steam piping penetration has spalled. CNE should monitor this and inform TEG if it worsens.
 - d. There was some noted steam hammering in the manhole. CNE should monitor this and let TEG know if it worsens.

8. Manhole 11
 - a. There was a minor amount of water present in this manhole and it required pumping before entry.
 - b. There is some moderate corrosion on the structural members in this manhole. CNE should remove this corrosion with a wire wheel and paint it with cold galvanizing paint before this corrosion progresses.
 - c. The "feet" of some of the rebar chairs that were used in the manhole roof construction have corroded and cause minor spalling of the concrete. CNE should monitor this and the next time that there is a project that involves this manhole, these spalled places should be patched.

9. Manhole 13
 - a. There was very little water present in this manhole so it was not pumped prior to entry.
 - b. The entry ladder is corroded and should be replaced within the next 3 to 6 months with an aluminum ladder; this is an item in the DES122 project which is about to be bid.
 - c. There are several locations where concrete has spalled from the ceiling and concrete beams in the manhole and should be repaired; this is an item in the DES122 project which is about to be bid.
 - d. The manhole lids and frames need to be replaced. TEG is researching this to see if a lighter lid can be obtained for this replacement. CNE will purchase the lid/frames and have C-K Masonry replace them under DES033.

10. Manhole 15
 - a. Portions of the entry grating are damaged/broken and could cause a pedestrian to trip/fall (especially if high heel shoes). CNE should take measurements and get pricing for the replacement grating and submit it to TEG for approval.
 - b. One of the lights is not working; CNE should repair this as soon as possible.
 - c. There is some minor insulation damage in this manhole. This manhole should be put on the insulation repair list with a "minor" rating.

11. Manhole 18A
 - a. There was water present in this manhole and it required pumping prior to entry.
 - b. There is some minor corrosion on the structural metal components in this manhole. CNE should remove this corrosion and paint the steel with cold galvanizing paint to prevent its propagation.
 - c. 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. CNE should investigate this and add a blowdown valve if possible; if not possible, when the trap needs to be replaced, the trap piping should be re-configured to accommodate a blowdown valve.

12. Manhole
 - a. There was water present in the manhole and it required pumping prior to entry.
 - b. All of the steel structural components in the manhole need to be cleaned of all rust and painted to prevent further corrosion. Some corrosion is severe. This manhole is a “High” priority on the “MH & Tunnel Structural Corrosion Prevention/Repair”.
 - c. There is some minor concrete spalling within this manhole. These areas should be repaired to prevent any further deterioration. TEG will develop a scope for this repair.
 - d. There is some minor piping insulation damage in this manhole. These repairs should be made the next time manhole insulation repairs are done.
 - e. There is some debris in the manhole and the manhole should be cleaned.
 - f. Water/steam hammer is occurring in the manhole. The existing “sparge” station needs to be replaced with a more efficient unit that will eliminate this hammering.
 - g. Mud has accumulated in the floor of this manhole. This mud should be cleaned from the manhole; possibly by introducing water into the floor and using a vacuum truck to remove the muddy water mixture. CNE needs to coordinate and schedule this effort. TEG will investigate sealant products to be applied at the wall/floor joints once this cleaning is complete.
 - h. TEG will develop a scope for the cleaning/painting of the steel; the installation of a new sparge tube, the repair of the insulation and the cleaning of the manhole.

13. Manhole D Sump
 - a. No deficiencies to report.

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.

There have been no additional meetings or discussions with the engineers and developers of the “old” Convention Center during the quarter.

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

The 401 Union Building is anticipated to be reconnected as a hotel during the Third Quarter FY17. TEG and CNE remain in contact with the contractors and owner.

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 State building personnel and their contractors regarding the operation of the John Sevier, Citizen’s Plaza, War Memorial and Cordell Hull buildings. The State is in the process of renovating the Cordell Hull and demolishing the Central Services building (adjacent to John Sevier).
- CNE assisted the contractors and building personnel at the Renaissance Hotel during the quarter make adjustments to their in-building operation.
- Several meetings were held with the contractors for the 401 Union building in anticipation of the restoration of their services in the Third Quarter FY17.
- A meeting with the owner and contractors for the Wells Fargo building renovation was originally scheduled for early October, but has been postponed until later in the Second Quarter.
- Other minor issues and customer interactions are noted in the monthly CNE reports.

VII. Recommendations

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

- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced; TEG will continue to coordinate this effort with CNE.
- Insulation which is absent, or in disrepair, in the vaults should be addressed through either additional capital projects, which include work within these vaults, or through DES090.
- Steam traps which need repair or replacement should be addressed as soon as possible.
- 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.